英飞凌XMC7200 微控制器

32-bit Arm® Cortex®-M7

概述

XMC7200 是针对工业应用的 XMC7000 微控系列。XMC7200 有一个或两个Arm® Cortex®-M7 CPU 用于主处理，还有一个Arm® Cortex®-M0+ CPU 用于外设和安全处理。器件的外设包含具有灵活数据速率的控制器区域网络 (CAN FD)跟千兆以太网。XMC7200 采用先进的 40 纳米工艺制造。XMC7200 集成英飞凌低功耗闪存、多种高性能模拟和数字外设，并支持创建安全的计算平台。

特性

- CPU 子系统
  - 一个或两个 350 MHz 32 位 Arm® Cortex®-M7 CPU，每个都配备
    - 单周期乘法
    - 单/双精度浮点运算单元（FPU）
    - 16 KB 数据缓存、16 KB 指令缓存
    - 存储器保护单元 (MPU)
    - 16 KB 指令和 16 KB 数据紧耦合存储器 (TCM)
  - 100 MHz 32 位 Arm® Cortex® M0+ CPU，带有
    - 单周期乘法
    - 存储器保护单元
  - 处理器之间硬件通信单元（IPC)
  - 三个 DMA 控制器
    - 外设 DMA 控制器 #0 (P-DMA0, DW0) 带143 个通道
    - 外设 DMA 控制器 #1 (P-DMA1,DW1) 带 65 个通道
    - 内存 DMA 控制器 (M-DMA0, DMAC0) 带 8 个通道
- 集成存储器
  - 8384 KB 代码闪存，另加 256 KB 工作闪存
    - 边读边写 (RWW) 允许在执行代码时对代码闪存/工作闪存进行更新
    - 单存储区和双存储区模式（专门用于OTA固件更新 [FOTA]）
    - 通过 SWD/JTAG 接口对闪存进行编程
  - 1024 KB SRAM，具有可选保留粒度
- 加密引擎
  - 支持增强安全硬件扩展 (eSHE) 和硬件安全模块 (HSM)
  - 安全启动和身份验证
    - 使用数字签名验证
    - 使用快速安全启动
  - AES：128 位块，128/192/256 位密钥
  - 3DES：64 位块，64 位密钥
  - 向量单元支持非对称密钥加密算法（如 Rivest-Shamir-Adleman (RSA) 和 Elliptic Curve (ECC)）
  - SHA-1/2/3：SHA-512、SHA-256、SHA-160，输入数据长度可变
  - CRC：支持 CCITT CRC16 和 IEEE -802.3CRC32
  - 真随机数生成器 (TRNG) 和伪随机数生成器 (PRNG)
  - 伽罗瓦/计数器模式 (GCM)
- 应用安全
  - 存储器保护单元 (MPU)
  - 共享存储器保护单元 (SMPU)

本数据手册的原文使用英文撰写。为方便起见，英飞凌提供了译文；由于翻译过程中可能使用了自动化工具，英飞凌不保证译文的准确性。 为确认准确性，请务必访问 infineon.cn参考最新的英文版本（控制文档）。

Features

- 外设保护单元(PPU)
- 看门狗计时器 (WDT)
- 多计数器看门狗定时器 (MCWDT)
- 低电压检测器（LVD）
- 掉电检测 (BOD)
- 过压检测 (OVD)
- 时钟监视器 (CSV)
- 硬件纠错（SECDED ECC）在所有安全关键存储器（SRAM, Flash, TCM）

• 低功耗 2.7 V 至 5.5 V 工作电压
- 低功耗活动、睡眠、低功耗睡眠、深度睡眠和休眠模式，实现精细的电源管理
- 可配置的稳健断电检测 (BOD) 选项
  • 两个阈值电平（2.7 V 和 3.0 V）用于 BOD 在 V_{DDD} 和 V_{DDA}
  • 一个阈值电平 (1.1 V) 用于 BOD 在V_{CCD}

• 唤醒
- 最多两个引脚可唤醒休眠模式
- 最多 220 个 GPIO 引脚可唤醒睡眠模式
- 事件发生器、串行通信块 (SCB)、看门狗定时器、RTC 警报，可从深度睡眠模式唤醒

• 时钟
- 内部主振荡器 (IMO)
- 内部低速振荡器(ILO)
- 外部晶体振荡器(ECO)
- 时钟晶体振荡器（WCO）
- 锁相环（PLL）
- 锁频环（FLL）

• 通信接口
- 最多十个 CAN FD 通道
  • 与传统 CAN 相比，数据速率有所提高（高达 8 Mbps），但受物理层拓扑和收发器的限制
  • 符合 ISO 11898-1:2015 标准
  • 支持 Bosch CAN FD 规范 V1.0 对 non-ISO CAN FD 的所有要求
  • ISO 16845:2015 证书可用
- 多达11个运行时可配置的串行通讯功能块 (SCB) 通道，每个功能块可配置为 I^2C, SPI,或 UART
- 最多两个符合 IEEE-802.3az 标准的 10/100/1000 Mbps 以太网 MAC 接口
  • 支持以下 PHY 接口：独立媒体接口 (MII)、精简独立媒体接口 (RMII)、精简千兆独立媒体接口 (RGMII)
  • 符合 IEEE-802.1BA 音频视频桥接 (AVB)
  • 符合 IEEE-1588 精确时间协议 (PTP)

• 外部存储器接口
- 一个 SPI（单、双、四或八）或 HYPERBUS™ 接口
- 即时加密和解密
- 从外部存储器就地执行 (XIP)

• SDHC 接口
- 一个安全数字高容量 (SDHC) 接口，支持嵌入式多媒体卡 (eMMC)、安全数字 (SD) 或安全数字输入输出 (SDIO)
  • 符合 eMMC 5.1、SD 6.0 和 SDIO 4.10 规范
- 数据速率高达 SD 高速 50 MHz 或 eMMC 52 MHz DDR

Features

- 音频接口
  - 三个 IC 间音频 (I²S)接口，用于连接数字音频设备
  - I² S 左对齐或时分复用 (TDM) 音频格式
  - 独立发送或接收操作，每个支持主模式或从模式
- 计时器
  - 最多 102 个 16 位16 个 32 位定时器/计数器脉冲宽度调制器 (TCPWM) 模块
    - 最多 15 个 16 位计数器用于电机控制
    - 最多 87 个 16 位计数器和16个 32 位计数器用于常规操作
    - 支持定时器、捕获、正交解码、脉冲宽度调制 (PWM)、带死区时间的 PWM (PWM_DT)、伪随机 PWM (PWM_PR) 和移位寄存器 (SR) 模式
  - 最多十六个事件生成 (EVTGEN) 定时器，支持从深度睡眠循环唤醒
    - 事件触发特定的设备操作（例如执行中断处理程序、SAR ADC 转换等）
- 实时时钟(RTC)
  - 年/月/日、星期、小时：分钟：秒字段
  - 12 小时和 24 小时格式
  - 自动闰年校正
- I/O
  - 最多 220 个可编程 I/O
  - 三种 I/O 类型
    - GPIO 标准 (GPIO_STD)
    - GPIO 增强 (GPIO_ENH)
    - 高速 I/O 标准 (HSIO_STD)
- 稳压器
  - 支持 2.7 V 至 5.5 V 输入电压生成 1.1 V 内核电压
  - 三个稳压器：
    - Deep Sleep
    - Core internal
    - Core external
- 可编程的模拟资源
  - 三个 SAR A/D 转换器，最多具有 99 个外部通道（96 个 I/O + 3 个用于电机控制的 I/O）
    - ADC 支持 32 个逻辑通道，有 32 + 1 个物理连接任何外部通道都可以连接到相应 SAR 中的任何逻辑通道
  - 每个 ADC 支持 12 位分辨率和高达 1 Msps 的采样率
  - 每个 ADC 还支持六个内部模拟输入，如
    - 带隙基准电压源用于提供绝对电压值
    - 用于结温计算的校准二极管
    - 两个 AMUXBUS 输入和两个直接连接至电源监测器
  - 每个 ADC 支持外部多路复用器的寻址
  - 每个 ADC 都有一个序列器，支持对已配置通道进行自主扫描
  - 针对电机感应应用的所有 ADC 的同步采样
- **Smart I/O**
  - 最多五个Samrt I/O 模块，可对进出 I/O 的信号执行布尔运算
  - 支持多达 36 个 I/O (GPIO_STD)

Features

- 调试接口
  - 符合 IEEE-1149.1-2001 的 JTAG 控制器和接口
  - Arm® 串行线调试 (SWD) 端口
  - 支持Arm® 嵌入式跟踪宏单元 (ETM)
    - 使用 SWD 进行数据跟踪
    - 使用 JTAG 进行指令和数据跟踪
- 业界先进的开发工具
  - 用于代码开发和调试的 ModusToolbox™ 软件
- 封装
  - 176 引脚 TEQFP，24 × 24 × 1.7 毫米（最大），0.5 毫米引脚间距
  - 272-ball，16 × 16 × 1.7 毫米（最大），0.8 毫米球距

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1 功能列表

表 1 XMC7200、XMC7200D 所有封装的功能列表

Features	Packages	
	176-pin TEQFP	**272-ball FBGA**
CPU		
Core	One or two 32-bit Arm® Cortex®-M7 CPUs and a 32-bit Arm® Cortex® M0+ CPU	
Operating voltage	2.7 V to 5.5 V	
Operating voltage for HSIO_STD	Not supported	2.7 V to 3.6 V
Core voltage	1.05 V to 1.15 V	
Operating frequency	Arm® Cortex®-M7 350 MHz (max for each) and Arm® Cortex®-M0+ 100 MHz (max)	
MPU, PPU	Supported	
FPU	Supports both single (32-bit) and double (64-bit) precision	
DSP-MUL/DIV/MAC	Supported by Arm® Cortex®-M7 CPUs	
TCM	16 KB instruction and 16-KB data for each Cortex-M7 CPU	
Memory		
Code flash	8384 KB (8128 KB + 256 KB)	
Work flash	256 KB (192 KB + 64 KB)	
SRAM (configurable for retention)	1024 KB	
ROM	64 KB	
Communication interfaces		
CAN0 (CAN-FD: Up to 8 Mbps)	5 ch	
CAN1 (CAN-FD: Up to 8 Mbps)	5 ch	
CAN RAM	40 KB per instance (5 ch), 80 KB in total	
Serial communication block (SCB/UART)	10 ch	11 ch
Serial communication block (SCB/I^{2}C)	10 ch	11 ch
Serial communication block (SCB/SPI)	10 ch	11 ch
Ethernet MAC	1 ch × 10/100	2 ch (option) × 10/100/1000
	ETH0: MII/RMII on GPIO_STD	ETH0: MII/RMII on GPIO_STD, ETH1: RGMII on HSIO_STD
Memory interfaces		
eMMC/SD	1 ch (GPIO_STD at 26 MHz)	1 ch (HSIO_STD at 50 MHz, GPIO_STD at 26 MHz)
Single SPI / Dual SPI / Quad SPI / Octal SPI / HYPERBUS™	1 ch (GPIO_STD at 32 MHz)	1 ch (HSIO_STD at 100 MHz, GPIO_STD at 32 MHz)
Timers		
RTC	1 ch	
TCPWM (16-bit) (Motor control)	15 ch (TCPWM0/3, TCPWM1/12)	
TCPWM (16-bit)	87 ch (TCPWM0/3, TCPWM1/84)	
TCPWM (32-bit)	16 ch (TCPWM0/3, TCPWM1/13)	
External interrupts	148	220

表 1　　XMC7200、XMC7200D 所有封装的功能列表 *(续)*

Features	Packages	
	176-pin TEQFP	**272-ball FBGA**
Analog		
12-bit, 1 Msps SAR ADC	3 units (SAR0/32, SAR1/32, SAR2/32 logical channels)	
	81 external channels (SAR0/24 ch, SAR1/32 ch, SAR2/25 ch)	96 external channels (each SAR supports 32 ch)
	18 ch (6 per ADC) Internal sampling	
Motor control input	3 ch (synchronous sampling of one channel on each of the three ADCs)	
Security		
Flash security (program/work read protection)	Supported	
Flash chip erase enable	Configurable	
eSHE / HSM	By separate firmware[1]	
Audio		
I^2S / TDM	TX 3 ch, RX 3 ch	
System		
DMA controller	P-DMA0 with 143 channels (16 general purpose), P-DMA1 with 65 channels (eight general purpose), and M-DMA0 with eight channels	
Internal main oscillator (IMO)	8 MHz	
Internal low-speed oscillator (ILO)	32.768 kHz (nominal)	
PLL	Input: 3.988 to 33.34 MHz, PLL output: up to 350 MHz	
FLL	Input: 0.25 to 80 MHz, FLL output: up to 100 MHz	
Watchdog timer and multi-counter watch-dog timer	Supported (WDT + 3× MCWDT) MCWDT#0 tied to CM0+, MCWDT#1 to CM7_0, MCWDT#2 to CM7_1	
Clock supervisor	Supported	
Cyclic wakeup from Deep Sleep	Supported	
GPIO_STD	144	187
GPIO_ENH	4	
HSIO_STD	Not supported	29
Smart I/O (blocks)	5 blocks, mapped through 36 I/Os	
Low-voltage detect	Two, 26 selectable levels	
Maximum ambient temperature	125°C	
Debug interface	SWD/JTAG	
Debug trace	Arm® Cortex®-M7 ETB size of 8 KB, Arm® Cortex® M0+ MTB size of 4 KB	

注释

1. 增强安全硬件扩展 (eSHE) 和硬件安全模块 (HSM) 支持由第三方固件实现。

1.1 通信外设实例列表

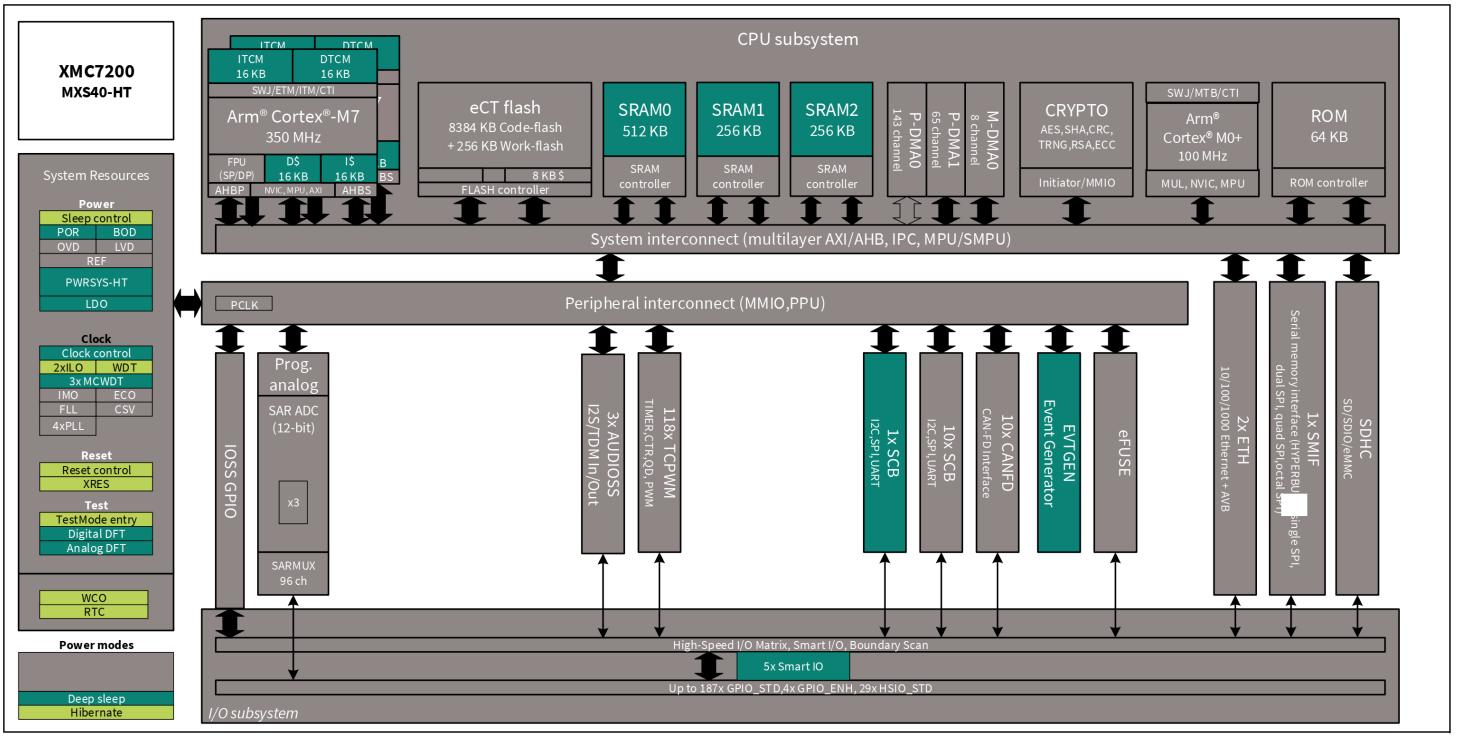
表 2 列出了通讯外设在每个封装下支持的实例，根据实现功能所需的最少引脚数。

表 2 通信外设实例列表

Module	176-TEQFP	272-FBGA	Minimum pin functions
CAN0	0/1/2/3/4	0/1/2/3/4	TX, RX
CAN1	0/1/2/3/4	0/1/2/3/4	TX, RX
SCB/UART	0 to 9	0 to 10	TX, RX
SCB/I2C	0 to 9	0 to 10	SCL, SDA
SCB/SPI	0 to 9	0 to 10	MISO, MOSI, SCK, SELECT0

2 模块和功能

2.1 框图



框图 显示了 XMC7200、XMC7200D 的架构，简化了子系统和模块之间的互连。XMC7200 和 XMC7200D 有四个主要子系统：CPU、系统资源、外设和 I/O[2，3，4]。彩色编码表示特定模块仍可正常工作的最低功率模式。

XMC7200 器件支持硬件和固件的编程、测试、调试和跟踪。

片上调试功能支持使用生产器件进行系统调试。它不需要特殊的接口、调试转接板、模拟器或仿真器。

JTAG接口与I-jet、J-Link和GHS等行业标准的第三方探测器完全兼容。

调试电路默认启用。XMC7200 提供高级的安全性，具有强大的闪存保护以及禁用调试等功能。

此外，如果某些应用担心网络钓鱼攻击会通过对器件恶意重新编程或试图启动和中断闪存编程序列来击败安全设定，所有器件接口都可以被永久禁用。当器件的最大安全级别被使能时，将禁用所有编程、调试和测试接口。

注释
2. GPIO_STD 支持 2.7 V 至 5.5 V V_{DDIO}范围。
3. GPIO_ENH 支持 2.7 V 至 5.5 V V_{DDIO}范围，在较低电压下具有较高的电流。
4. HSIO_STD 支持 2.7 V 至 3.6 V V_{DDIO} 范围，支持高速信号和可编程驱动强度。

3 功能说明

3.1 CPU 子系统

3.1.1 CPU

XMC7200 CPU 子系统包含一个 32 位Arm®Cortex® -M0+ CPU带有MPU，以及两个 32 位Arm®Cortex® -M7 CPU，每个都带有MPU 、单/双精度FPU 以及 16 KB 数据和指令缓存。该子系统还包括 P-/M-DMA 控制器、加密加速器、8384 KB 代码闪存、256 KB 工作闪存、1024 KB SRAM 和 64 KB ROM。

Cortex®-M0+ CPU 提供了安全、不可中断的启动函数。这保证了启动函数完成后，系统完整性有效且权限得到强制执行。共享资源（闪存、 SRAM 、外设等）可以通过总线仲裁进行访问，并且使用硬件信号量的处理器间通讯（IPC）机制来支持独占访问。

每个Cortex® -M7 CPU 具有 16 KB 指令和 16 KB 数据 TCM，并带有可编程读取等待状态。 每个 TCM 时钟均由相关的Cortex®-M7 CPU 时钟提供。

3.1.2 DMA控制器

XMC7200 有三个 DMA 控制器：具有 16 个通用通道和 127 个专用通道的 P-DMA0、具有 8 个通用通道和 57 个专用通道的 P-DMA1 以及具有八个通道的 M-DMA0。P-DMA 用于外设到存储器和存储器到外设的数据传输，并为大量通道提供低延迟。每个 P-DMA 控制器使用单个数据传输引擎并由相关通道共享。
通用通道具有丰富的互连矩阵，包括 P-DMA 交叉触发，可满足苛刻的数据传输场景的要求。专用通道具有单个触发输入（例如 ADC 通道）来处理常见的传输需求。M-DMA 用于存储器到存储器的数据传输，并为少量通道提供高内存带宽。M-DMA 为每个通道使用专用的数据传输引擎。它们支持使用 AHB 多层总线去独立访问外设。

3.1.3 闪存

XMC7200 具有 8384 KB（8128 KB 扇区大小为 32 KB，256 KB 扇区大小为 8 KB）的代码闪存，以及额外的工作闪存 256 KB（192 KB 扇区大小为 2 KB，64 KB 扇区大小为128 B）。工作闪存经过了优化，可以比代码闪存进行更多次重新编程。代码闪存支持
边写边读（RWW）操作允许在CPU运行模式时更新闪存。代码闪存和工作闪存区域均支持远程升级 (OTA) 编程的双区操作。

3.1.4 SRAM

XMC7200 具有 1024 KB SRAM 和三个独立控制器。SRAM0 以 32 KB 为增量提供深度睡眠保留，而 SRAM1/2 可在完全保留和不保留之间选择。

3.1.5 ROM

XMC7200 具有 64 KB 的 ROM，其中包含启动和配置例程。该 ROM 可实现安全启动和用户的闪存验证，以保证系统的安全。

3.1.6 安全加密加速器

密码加速器实现 (3)DES 功能块密码、AES 功能块密码、SHA 散列、循环冗余校验、伪随机数生成、真随机数生成、伽罗瓦/计数器模式和矢量装置以支持 RSA 和 ECC 等非对称密钥密码。

3.2 系统资源

3.2.1 电源系统

电源系统确保电源电压水平满足每种电源模式的要求，并在这些水平无效时提供全系统复位。内部上电复位 (POR) 保证初始电源上升期间的全芯片复位。

三个 BOD 电路用于监控外部电源电压(V_{DDD}, V_{DDA}, V_{CCD})。V_{DDD} 和 V_{CCD} 上的 BOD 初始状态为使能，无法禁用。V_{DDA} 上的 BOD 初始状态为禁用，用户可以启用。对于外部电源 V_{DDD} 和 V_{DDA} ，BOD 电路可通过软件配置两种设置：2.7 V 最小电压适用于所有内部信号和 3.0 V 最小电压适用于所有 I/O 规格（保证电压为 2.7 V）。V_{CCD} 上的 BOD 是一种安全措施，并非可靠的检测器。

提供三个过压检测 (OVD) 电路用于监控外部电源（V_{DDD}、V_{DDA}、V_{CCD}），以及过流检测电路 (OCD) 用于监控内部和外部稳压器。V_{DDD}和 V_{DDA}上的 OVD 阈值可配置为两种设置：5.0 V 和 5.5 V 最高电压。

提供了两个电压检测电路来监控外部电源电压 (V_{DDD}) 的下降和上升电平，每个电路均可配置为 26 个可选电平之一。

V_{DDD} 和 V_{CCD} 上的所有 BOD、OVD 和 OCD 电路都会产生复位，因为它们用于保护 CPU 和故障逻辑。V_{DDA} 上的 BOD 和 OVD 电路可以配置为产生复位或故障。

3.2.2 稳压器

XMC7200 包含三个稳压器，为低压核晶体管提供电源：深度睡眠、核内和核外。这些稳压器接受 2.7 V 至 5.5 V V_{DDD} 供电，并为器件的各个部分提供低噪声的 1.1 V 供电。

在电源模式之间切换时，硬件和固件会自动启用和禁用这些稳压器。核内和核外稳压器在工作模式下运行，并为 CPU 子系统和相关外设提供电源。

3.2.2.1 深度睡眠

深度睡眠稳压器用于在深度睡眠模式下维持供电给少数模块。这些模块包括 ILO 和 WDT 定时器、BOD 检测器、SCB0、SRAM 存储器、Samrt I/O 和其他配置存储器。深度睡眠稳压器在深度睡眠模式下启用，此时核内稳压器被禁用。当 XRES_L 有效（低电平）并且核内稳压器被禁用时，它被禁用。

3.2.2.2 核内稳压器

核内稳压器支持高达 300 mA 的负载电流，并且在器件启动（启动过程）期间以及在工作/睡眠模式下运行。

3.2.2.3 核芯外部[5]

为了支持最坏情况的负载：当两个 M7 CPU 和 M0+ CPU 都处于最大时钟频率并且所有集成外设都运行时，需要一个核外部稳压器，其负载电流可达 600 mA。虽然核外部稳压器的控制和监测器电路位于 XMC7200 内部，但供电调节元件（NPN 传输晶体管、PMIC 或 LDO）位于外部。这降低了 XMC7200 封装内的整体功率耗散，同时保持了稳定的核供电。

核外部稳压器可以通过外部 NPN 通道晶体管、 PMIC 或线性电压稳压器 (LDO) 来实现。每种用例都需要在 PCB 上加入的不同外部器件，以及与 XMC7200 的不同连接用于进行调节和控制。

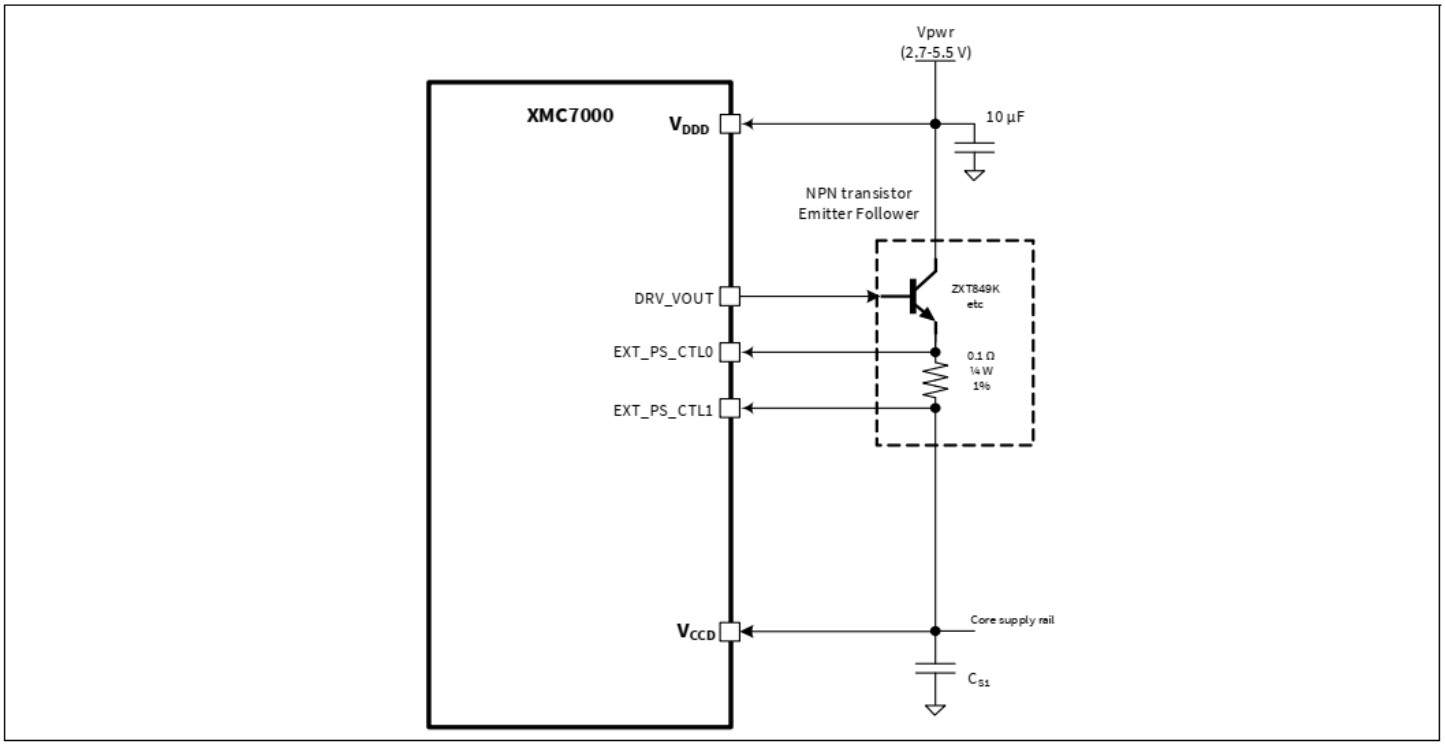


图 1　　带 NPN 晶体管的核外部稳压器示例

注释：

5. 当 XMC7200 处于休眠模式时，用于控制核外部稳压器的 GPIO 为高阻态。这可能需要一个外部上拉或下拉电阻来禁用外部稳压器，并将其配置为最小工作电流。

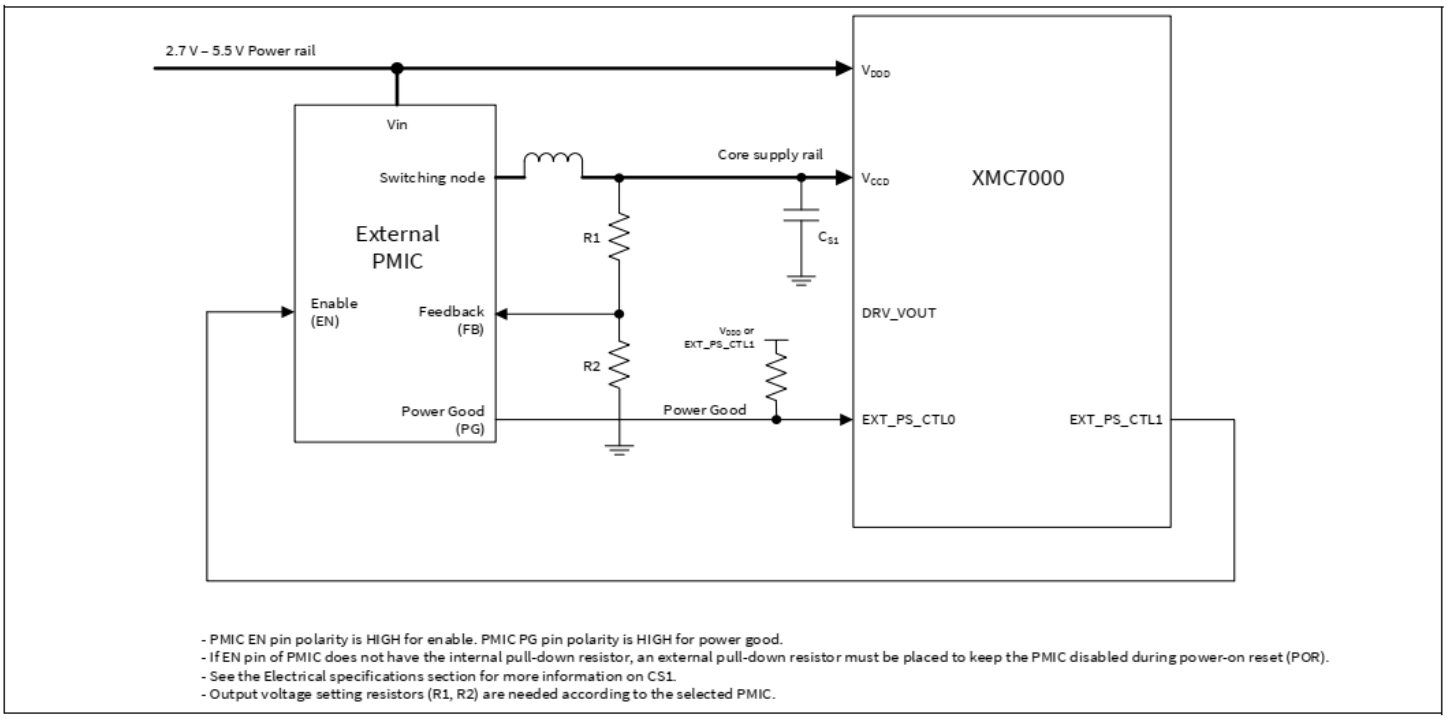


图 2　　带PMIC / LDO的核外部稳压器示例

核内部和核外部稳压器都需要外部大容量存储电容并连接到 VCCD 引脚。该电容在低压核晶体管的动态负载下提供充电。

3.2.3　　时钟系统

XMC7200 时钟系统为所有需要时钟的子系统提供时钟，并在不同时钟源之间实现无缝切换。此外，它还确保不发生亚稳态。

XMC7200 的时钟系统由 8 MHz IMO、两个 ILO、四个看门狗定时器、四个 PLL、一个 FLL、五个时钟监视器 (CSV)、一个 8 至 33.34 MHz ECO 和一个 32.768 kHz WCO 组成。

时钟系统支持三个主时钟域：CLK_HF、CLK_SLOW、CLK_LF。

- CLK_HFx 是工作模式时钟。每个都可以使用任何高频时钟源，包括 IMO、EXT_CLK、ECO、FLL 或 PLL
- CLK_SLOW 为 Cortex-CM0+ CPU、Crypto、P-/M-DMA 和 CPU 子系统的其他慢速基础模块提供基准时钟
- CLK_LF 是深度睡眠域时钟，为 MCWDT 或 RTC 模块提供基准时钟。CLK_LF 域的基准时钟可以禁用，也可以从 ILO0、ILO1 或 WCO 中选择。

表 3　　CLK_HF destinations

Name	Description
CLK_HF0	CPUSS (Memories, CLK_SLOW, peripherals)
CLK_HF1	CPUSS (Cortex-M7 CPU 0, 1)
CLK_HF2	CAN FD, TCPWM, SCB, SAR
CLK_HF3	Event Generator
CLK_HF4	Ethernet
CLK_HF5	Audio Subsystem (I^2S)
CLK_HF6	SDHC Interface, SMIF

3.2.3.1 内部主振荡器 (IMO) 时钟源

IMO 是 XMC7200 的频率基准，当没有外部基准可用或被使能时。IMO 的运行频率约为 8 MHz。

3.2.3.2 内部低功耗振荡器 (ILO) 时钟源

ILO 是一种低功耗振荡器，标称频率为 32.768 kHz，在深度睡眠模式下为看门狗定时器提供时钟。有两个 ILO 可确保深度睡眠模式下的时钟监控器 (CSV) 功能。
可以根据 IMO、WCO 或 ECO 来校准 ILO 驱动的计数器，以提高其精度。ILO1 也用于时钟监控。

3.2.3.3 PLL 和 FLL

可以使用 PLL（两个 200 MHz 和两个 400 MHz 中的其中一个）或 FLL 从 IMO、ECO 或 EXT_CLK 生成高速时钟。FLL 的锁定速度比 PLL 快得多（5 µs 而非 45 µs），但频率误差较小 (±2%) [6]。400 MHz PLL 支持向下扩频的扩频时钟生成 (SSCG)。

3.2.3.4 时钟监控器

每个时钟监控器 (CSV) 允许一个时钟 (基准) 监控另一个时钟 (被监控) 的行为。每个 CSV 都有用于监控和参考时钟的计数器。每个计数器的参数决定基准时钟的频率以及受监控时钟的频率上限和下限。如果频率范围比较器检测到停止的时钟或指定频率范围之外的时钟，则会发出异常状态信号并产生复位或中断。

3.2.3.5 EXT_CLK

三个 GPIO_STD I/O 中的一个可用于提供高达 80 MHz 的外部时钟输入。该时钟可以用作 PLL 或 FLL 的源时钟，也可以直接由 CLK_HF 域使用。

3.2.3.6 外部晶体振荡器(ECO)

ECO 使用连接到 ECO_IN 和 ECO_OUT 引脚的外部晶体提供高频时钟。它支持基模（非泛音）石英晶体，范围为 8 至 33.34 MHz。与 PLL 结合使用时，它能生成 CPU 和外设所需的器件最大时钟。ECO 精度取决于所选的晶体。如果 ECO 被禁用，则相关引脚可用于任何可用的 I/O 功能。

3.2.3.7 时钟晶体振荡器（WCO）

WCO 是一款低功耗时钟晶振振荡器，适用于实时时钟应用。它需要一个外部 32.768-kHz 晶振连接到 WCO_IN 和 WCO_OUT 引脚。WCO 还可以配置为 CLK_LF 的时钟基准，CLK_LF 是MCWDT 和 RTC 的时钟源。

3.2.4 复位

XMC7200 可以从多种来源复位，包括软件。复位事件是异步的，并能够确保器件恢复到一个已知状态。复位原因（POR、BOD、OVD、过流、XRES_L、WDT、MCWDT、软件复位、故障、CSV、休眠唤醒、调试）记录在一个寄存器中，该寄存器在复位后保留，并允许软件确定复位的原因。XRES_L 引脚可用于外部复位。

注释：
6. 由于频率误差，不建议使用基于 FLL 的参考源来操作参考定时外设（例如 UART）。

3.2.5 看门狗定时器

XMC7200，XMC7200D 有一个看门狗定时器（WDT）和三个多计数器看门狗定时器（MCWDT）。

WDT 是一个自由运行的计数器，仅由 ILO0 提供时钟，因此可以将其用作休眠模式的唤醒源。在所有电源模式下都可以进行看门狗操作。为了防止因WDT超时而导致器件复位，必须在配置的窗口期间对WDT进行喂狗。看门狗复位被记录在复位原因寄存器中。

每个 CPU 核都有一个 MCWDT。这些定时器提供比 WDT 更多的功能，并且仅在工作、睡眠和深度睡眠模式下可用。这些计时器有多个计数器，可以单独使用或级联使用来触发中断和/或复位。它们由 ILO0 或 WCO 提供时钟。

3.2.6 功耗模式

XMC7200 有六种电源模式。

- 工作模式 – 所有外围设备均可用
- 低功耗工作模式 (LPACTIVE) – 工作模式的低功耗配置，其中所有外设和 CPU 均可用，但功能有限
- 睡眠 – 除 CPU 外的所有外设均可用
- 低功耗睡眠 (LPSLEEP) – 睡眠模式的低功耗配置，其中除 CPU 之外的所有外设均可用，但功能有限
- 深度睡眠 – 仅与 CLK_LF 配合的外设可以使用
- 休眠 – 器件和 I/O 状态被冻结，器件在唤醒时会复位

3.3 外设

3.3.1 外设时钟分频器

提供整数和小数时钟分频器用于外设和定时目的。

表 4 时钟分频器 - CPUSS 组（0号）

Divider type	Instances	Description
div_8	4	Integer divider, 8 bits
div_16	3	Integer divider, 16 bits
div_24_5	1	Fractional divider, 24.5 bits (24 integer bits, 5 fractional bits)

表 5 时钟分频器 - COMM 组（1 号）

Divider type	Instances	Description
div_8	19	Integer divider, 8 bits
div_16	20	Integer divider, 16 bits
div_24_5	21	Fractional divider, 24.5 bits (24 integer bits, 5 fractional bits)

3.3.2 外设保护单元(PPU)

外设保护单元(PPU)控制和监视从所有主设备(CPU、P-/M-DMA、加密和任何启用的调试接口)到外设的未经授权的访问。它允许或限制总线基础设施上的数据传输。访问规则是根据传输的特定属性来强制执行的，例如传输的地址范围和访问属性（例如读/写、用户/特殊权限和安全/非安全）。

3.3.3 12 位 SAR ADC

XMC7200，XMC7200D 包含三个 1 Msps SAR ADC。这些 ADC 的时钟频率高达 26.67 MHz，可在 26 个时钟周期内提供 12 位结果。所有三个 SAR ADC 的参考电压均来自一对专用输入：VREFH 和 VREFL [7]。

XMC7200 支持多达 117 个逻辑 ADC 通道，以及多达 99 个 I/O 的外部输入。每个 ADC 还支持六个内部连接，用于诊断和监控。**表 1** 列出了 ADC 通道数量（每个 ADC 和封装类型）。

每个 ADC 都有一个序列器，能够自主循环配置的通道（序列扫描），并且没有切换开销（也就是说，当时钟频率为26.67 MHz时，无论用于单个通道还是分布在多个通道上，总采样率都等于 1 Msps。序列器切换通过状态机或固件控制。序列器对触发请求进行优先级排序，启用适当的模拟通道，控制 ADC 采样，启动 ADC 数据转换，管理结果，并启动后续的重复转换或组转换，而无需 CPU 干预。

每个 SAR ADC 都有一个模拟多路复用器，用于将要测量的信号连接到 ADC。它有 32 个 GPIO_STD 输入、一个用于电机感应的特殊 GPIO_STD 输入，以及六个附加输入，用于测量内部信号，如带隙基准、温度传感器和电源。该器件支持三个 ADC 上一个电机检测通道的同步采样。

XMC7200 有一个温度传感器，由所有三个 ADC 共享。温度传感器每次只能由一个 ADC 进行采样。需要软件后处理将温度传感器读数转换为开尔文或摄氏度值。

为了适应各种源阻抗和频率的信号，每个通道可以编程不同的采样时间。每个 ADC 还支持量程比较，可快速检测
无需等待定序器扫描完成，也无需等待 CPU 固件评估测量值是否超出量程。

ADC 不能用于深度睡眠和休眠模式，因为它们需要高速时钟。ADC 输入基准电压 VREFH 范围为 2.7 V 至 V_{DDA}，VREFL 为V_{SSA}。

3.3.4 定时器/计数器/脉宽调制器模块 (TCPWM)

TCPWM 功能块由 16 位（102 个通道）和 32 位（16 个通道）计数器组成，具有用户可编程周期。其中十五个 16 位计数器针对电机控制操作进行了优化。每个 TCPWM 计数器包含一个捕获寄存器，用于记录发生事件时的计数值，一个周期寄存器 (用于停止或自动重新加载计数值，当计数值等于周期寄存器的值) 和比较寄存器，用于控制 PWM 占空比。

TCPWM 模块内的每个计数器都支持多种功能模式，例如定时器、捕获、正交、PWM、带死区插入的 PWM（PWM_DT，8 位）、伪随机 PWM（PWM_PR）和移位寄存器。

在电机控制应用中， TCPWM功能块内的计数器支持增强型正交模式，具有非对称 PWM 产生、死区插入（16位）以及 PWM 输出信号的不同死区关联等功能。

TCPWM 模块还提供了正向输出和反向输出，它们之间偏移可编程控制，以允许它们用作死区反向 PWM 输出。TCPWM 模块还有一个 (Kill) 输入（仅适用于PWM模式）用于强制输出进入预定状态；例如，在马达驱动系统中，当出现过电流状态时，需要立即使用它来关闭驱动 FET 的PWM（没有时间软件干预）。

注释：

7. VREF_L 可防止 VSSIO 和 VSSA 路径中的 IR 压降影响测量。当 VREF_L 正确连接时，可以降低或消除 VSSIO 和 VSSA 路径中的 IR 压降对测量的影响。

3.3.5 串行通信模块 (SCB)

XMC7200 包含最多 11 个串行通信模块，每个模块可配置为 I²C、UART 或 SPI。

3.3.5.1 I²C接口

SCB可配置为实现完整的 I²C主设备（能够进行多主设备仲裁）或从设备接口。每个由 SCB 配置的 I²C都可以以高达 1 Mbps 的速度运行（增强型快速模式），并具有灵活的缓冲选项，以减少中断开销和 CPU 的延迟。此外，每个SCB都支持接收和发送数据的 FIFO 缓冲，这通过增加 CPU 读取数据的时间，减少了时钟延长的需要。I²C接口与标准、快速模式和增强型快速模式设备兼容，
并按 NXP I²C 总线规范和用户手册 (UM10204) 中指定。I²C 总线 I/O 通过开漏模式的 GPIO 实现[8, 9]。

3.3.5.2 UART 接口

当配置为 UART，每个 SCB 提供全功能 UART，其最大速率由配置的外设时钟频率和过采样率确定。它支持红外接口 (IrDA) 和智能卡 (ISO 7816) 协议，这些协议是UART协议的小变种。此外，它还支持 9 位多处理器模式，此模式允许寻址连接到通用 RX 和 TX 线的外设。支持通用 UART 功能，如奇偶校验、停止位的数量、中断检测和帧错误。发送和接收数据的 FIFO 缓冲允许容忍更大的 CPU 服务延迟。

3.3.5.3 SPI 接口

SPI 配置支持完整的 Motorola SPI、TI 同步串行协议 (SSP，本质上是添加启动脉冲用于同步基于 SPI 的编解码) 和 National Microwire (SPI 的半双工形式)。SPI 接口可以使用 FIFO。SPI 接口以高达 12.5 MHz 的 SPI 时钟运行。SCB 还支持 EZSPI [10]模式。

SCB0 支持以下附加功能：

- 可在深度睡眠模式下作为从属设备运行
- I²C 从机 EZ (EZI²C [11]) 模式，最多可容纳 256-B 数据缓冲 无需 CPU 干预即可实现多字节通讯
- I²C 从机外部供时钟操作
- 具有 512 B 数据缓冲区的命令/响应模式，可进行多字节通信，无需 CPU 干预

注释

8. 这并非 100% 符合 I²C总线规范；I/O 不耐过压，不支持增强型快速模式的 20 mA 灌电流要求，并且在不供电的情况下违反泄漏规范。
9. 只有 Port 0 启用斜率控制下满足最小下降时间要求。
10. Easy SPI (EZSPI) 协议基于摩托罗拉 SPI 协议可在任何模式（0、1、2 或 3）下运行。它允许主机和从机之间进行通信，同时减少 CPU 干预的需要。
11. 简易I²C （EZI2C）协议是英飞凌在 I²C 协议基础上开发的一种独特通信方案。
它使用标准I²C协议的元协议，通过索引内存传输与I²C从站进行通信。这减少了对 CPU 干预的需求。

3.3.6 CAN FD

XMC7200，XMC7200D 包含两个 CAN FD 控制器模块，每个模块支持五个 CAN FD 通道。所有 CAN FD 控制器均符合 ISO 11898-1:2015 标准；可提供 ISO 16845:2015 证书。它还在硬件中完全实现了 ISO 11898-4（TTCAN 协议级别 1 和 2）中指定的时间触发 CAN（TTCAN）协议。所有与信息处理有关的功能均由 Rx 和 Tx 处理程序实现。Rx 处理器管理信息接受过滤、将接收到的消息从 CAN 核心传输到消息 RAM，并提供接收消息状态。Tx 处理器负责将发送信息从信息 RAM 传输到 CAN 核心，并提供发送消息状态。

3.3.7 Ethernet MAC

XMC7200 和 XMC7200D 支持两个以太网通道，传输速率为 10、100 或 1000 Mbps[12]。输入/输出帧和流量控制符合以太网/IEEE 802.3az 标准和 IEEE-1588 精确时间协议（PTP）。XMC7200 和 XMC7200D 支持使用外部 PHY 设备进行全双工数据传输。MAC 支持通过 IEEE 标准 MII、RMII 和 RGMII 接口与 PHY 进行无胶连接。该设备还支持音频视频桥接（AVB）。MAC 支持标准 6 字节可编程地址。

3.3.8 外部存储器接口

除了内部闪存外，XMC7200 还支持直接连接多达 128 MB 的外部闪存或 RAM 存储器。此连接通过 HYPERBUS™ 或串行外设接口 (SPI) 建立。HYPERBUS™允许连接HYPERFLASH™和HYPERRAM™设备，而SPI（单、双、四或八进制SPI ）可以连接串行闪存。 通过该接口连接的内存中存储的代码允许就地执行 (XIP) 操作，该操作不需要先将指令复制到内部内存，并且对于需要安全外部数据和代码的环境可以进行即时加密和解密。

3.3.9 SDHC 接口

XMC7200，XMC7200D 支持一个安全数字高容量 (SDHC) 接口，符合安全数字 (SD) 6.0、安全数字输入输出 (SDIO) 4.10 和嵌入式多媒体卡 (eMMC) 5.1 规范以及主机控制接口 (HCI) 4.2 规范。该接口支持系统 DMA (SDMA)、高级 DMA (ADMA2、ADMA3) 和命令排队 (CQ) 功能。该接口支持 SD DS（默认速度，25 MHz 时为 4 位）、SD HS（高速，50 MHz 时为 4 位）和 eMMC 52 MHz DDR（52 MHz 卡时钟时为 8 位）的数据速率。

3.3.10 音频接口

XMC7200，XMC7200D支持三种 Inter-IC 声音总线 (I^2S) 接口实例，用于连接数字音频设备：支持主模式和从模式的 I^2S、左对齐 (LJ) 和八通道时分复用 (TDM) 数字音频接口格式，接收和发送方向可独立操作。

3.3.11 一次性可编程 (OTP) eFuse

XMC7200，XMC7200D包含一个 1024 位 OTP eFuse 存储器，可用于存储和访问每个设备的唯一且不可更改的标识符或序列号。eFuse 还用于控制设备生命周期（制造、编程、正常运行、寿命终止等）和安全状态。在 1024 位中，有 192 位可供用户使用。

注释：
12. 176-TEQFP 封装器件仅提供 10/100 Mbps。

3.3.12 事件发生器

事件发生器支持在运行模式下生成中断和触发器，以及在深度睡眠模式下生成中断。事件生成器用于触发特定的器件操作（执行中断处理程序、 SAR ADC 转换等）并提供从深度睡眠模式的循环唤醒机制。它们为器件功能提供无需 CPU 的触发器，减少 CPU 在触发器件功能时的参与，从而降低总体功率消耗和处理开销。

3.3.13 触发用多路复用器

XMC7200，XMC7200D 支持使用触发信号连接各种外设。触发器用于通知外部设备事件的发生或状态的改变。这些触发器用于影响或启动其他外围设备的某些操作。触发器多路复用器用于将触发器从来源设备路由到目的地。 触发器提供主动的逻辑功能，并且通常在运行模式下支持。

3.4 I/O

XMC7200 具有多达 220 个可编程 I/O。

I/O 被组织为称为端口的逻辑实体，其最大宽度为 8 位。在上电和复位期间，I/O 被强制进入 High-Z 状态。在休眠模式期间，I/O 被冻结。

每个 I/O 引脚都能生成一个中断(如果中断被使能)，并且每个 I/O 端口都有一个与其相关的中断请求 (IRQ) 和中断服务子程序 (ISR) 向量。

I/O 端口功率源映射列于 **表 6** 中。相关电源决定了 配置为 CMOS 和汽车阈值时的 V_{OH}、 V_{OL}、 V_{IH} 和 V_{IL} 电平。

表 6 I/O 端口电源

Supply pins	Ports
VDDD	P0, P1, P2, P3, P4, P5, P16, P17, P18, P19, P20, P21, P22, P23, P28, P29, P30, P31
VDDIO_1	P6, P7, P8, P9, P32
VDDIO_2	P10, P11, P12, P13, P14, P15
VDDIO_3	P24, P25
VDDIO_4	P26, P27

3.4.1 端口命名法

Px.y 描述 I/O 端口“x”内可用的特定位“y”。

例如，P4.2 读取“端口 4，位 2”。

每个 I/O 实现以下内容：

- 可编程驱动模式
  - 高阻抗（High impedance）
  - 电阻上拉（Resistive pull-up）
  - 电阻下拉（Resistive pull-down）
  - 开漏和强下拉模式（Open drain with strong pull-down）
  - 开漏和强上拉模式（Open drain with strong pull-up）
  - 强上拉或下拉（Strong pull-up or pull-down）
  - 弱上拉或下拉（Weak pull-up or pull-down）

XMC7200 有三种类型的可编程 I/O：GPIO 标准、GPIO 增强和 HSIO 标准。

3.4.2 标准 GPIO（GPIO_STD）

支持 2.7 V 至 5.5 V V_{DDIO}范围内的标准工业信号。GPIO 标准 I/O 具有多种可配置的驱动级别、驱动模式和可选的输入电平。

3.4.3 增强 GPIO（GPIO_ENH）

支持 2.7 V 至 5.5 V V_{DDIO} 范围内的扩展功能工业信号传输，在较低电压下具有较高的电流（完全 I^2C 时序支持、斜率控制）。

GPIO_STD 和 GPIO_ENH 都实现了以下内容：

- 可配置输入阈值（CMOS、TTL 或工业）
- 保持模式，用于锁存先前状态 (即保持 I/O 状态处于深度睡眠模式)
- 模拟输入模式（输入和输出缓冲区禁用）

3.4.4 HSIO 标准（HSIO_STD）

这些 I/O 专门针对高速信号传输进行了优化，不支持斜率控制、DeepSleep 操作、POR 模式控制、模拟连接或非 CMOS 信号传输级别。HSIO_STD 支持高速外设，例如QSPI 、 HYPERBUS™ 、以太网和 SDHC 控制器。HSIO_STD 还支持可编程驱动强度。这些 I/O 仅在运行模式下可用，并在深度睡眠模式下保留状态。

3.4.5 Smart I/O

Smart I/O 允许对从芯片子系统发送到 I/O 的信号或进入芯片的信号进行布尔运算。XMC7200 有五个Smart I/O 模块。操作可以是同步或异步，并且块可以在除休眠之外的所有器件功率模式下操作。

4 XMC7200 地址映射

XMC7200 和 XMC7200D 微控制器支持 图 3 所示的存储器空间。

- 8384 KB (8128 KB + 256 KB)工作闪存，用于单组或双组模式基于相关的位元在闪存控制寄存器
  - 单组模式：8384 KB
  - 双组模式：每组4192 KB
- 256 KB (192 KB + 64 KB)工作闪存，用于单组或双组模式基于相关的位元在闪存控制寄存器
  - 单组模式：256 KB
  - 双组模式：每组128KB
- 64 KB 安全 ROM
- 1024 KB SRAM（前 2 KB 保留供内部使用）
- 每个 Cortex®-M7 CPU 有 16 KB 的指令 TCM
- 每个 Cortex®-M7 CPU 有 16 KB 的数据 TCM
- 128 MB SMIF XIP

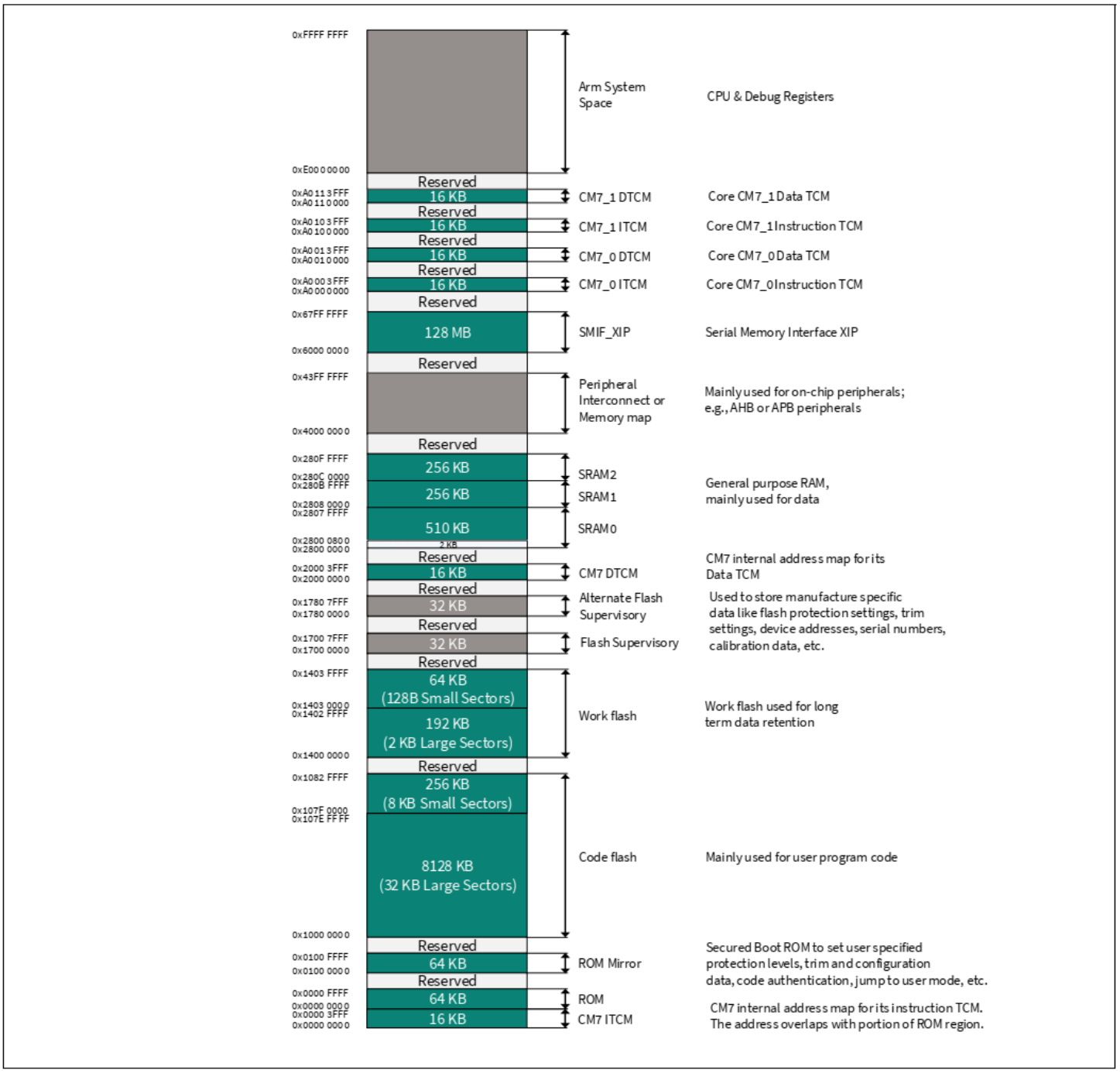


图 3　　XMC7200 地址映射[13, 14]

注释

13. 尺寸不是等比例缩放。

14. 前 2KB SRAM 被保留，不供用户使用。用户必须将 SRAM0 的前 32KB 功能块的保持供电，在所有的工作、低功耗工作、睡眠、低功耗睡眠、深度睡眠模式下无论使能还是保持。

5 闪存基地址映射

表 7 通过表 12 提供有关代码和工作闪存区域的扇区映射及其各自基地址的信息。

表 7 Single-bank 模式下代码闪存地址映射

Code-flash size (KB)	Large sectors (LS)	Small sectors (SS)	Large sector base address	Small sector base address
8384	32 KB × 254	8 KB × 32	0x1000 0000	0x107F 0000

表 8 Single-bank 模式下下工作闪存地址映射

Work-flash size (KB)	Large sectors	Small sectors	Large sector base address	Small sector base address
256	2 KB × 96	128 B × 512	0x1400 0000	0x1403 0000

表 9 Dual-bank 模式下的代码闪存地址映射（映射 A）

Code-flash size (KB)	First half LS	First half SS	Second half LS	Second half SS	First half LS base address	First Half SS Base address	Second half LS base address	Second half SS base address
8384	32 KB × 127	8 KB × 16	32 KB × 127	8 KB × 16	0x1000 0000	0x103F 8000	0x1200 0000	0x123F 8000

表 10 Dual-bank 模式下的代码闪存地址映射（映射 B）

Code-flash size (KB)	First half LS	First half SS	Second half LS	Second half SS	First half LS base address	First half SS base address	Second half LS base address	Second half SS base address
8384	32 KB × 127	8 KB × 16	32 KB × 127	8 KB × 16	0x1200 0000	0x123F 8000	0x1000 0000	0x103F 8000

表 11 Dual-bank 模式下工作闪存地址映射（映射 A）

Work-flash size (KB)	First half LS	First half SS	Second half LS	Second half SS	First half LS base address	First half SS base address	Second half LS base address	Second half SS base address
256	2 KB × 48	128 B × 256	2 KB × 48	128 B × 256	0x1400 0000	0x1401 8000	0x1500 0000	0x1501 8000

表 12 Dual-bank模式下的工作闪存地址映射（映射 B）

Work-flash size (KB)	First half LS	First half SS	Second half LS	Second half SS	First half LS base address	First half SS base address	Second half LS base address	Second half SS base address
256	2 KB × 48	128 B × 256	2 KB × 48	128 B × 256	0x1500 0000	0x1501 8000	0x1400 0000	0x1401 8000

6 外设 I/O 映射

表 13 XMC7200 外设 I/O 映射(续)

Section	Description	Base address	Instances	Instance size	Group	Slave
PERI	Peripheral interconnect	0x4000 0000	–	–	0	0
	Peripheral group (0, 1, 2, 3, 4, 5, 6, 8, 9)	0x4000 4000	9	0x40		
	Peripheral trigger group	0x4000 8000	13	0x400		
	Peripheral 1:1 trigger group	0x4000 C000	14	0x400		
PERI_MS	Peripheral interconnect, master interface	0x4002 0000	–	–	0	1
	PERI Programmable PPU	0x4002 0000	10[15]	0x40		
	PERI Fixed PPU	0x4002 0800	700	0x40		
PERI_PCLK	Peripheral Clock Groups	0x4004 0000	2	0x2000	0	2
CRYPTO	Cryptography component	0x4010 0000	–	–	1	0
CPUSS	CPU subsystem (CPUSS)	0x4020 0000	–	–	2	0
FAULT	Fault structure subsystem	0x4021 0000	–	–	2	1
	Fault structures	0x4021 0000	4	0x100		
IPC	Inter process communication	0x4022 0000	–	–	2	2
	IPC structures	0x4022 0000	8	0x20		
	IPC interrupt structures	0x4022 1000	8	0x20		
PROT	Protection	0x4023 0000	–	–	2	3
	Shared memory protection unit structures	0x4023 2000	16	0x40		
	Memory protection unit structures	0x4023 4000	16	0x400		
FLASHC	Flash controller	0x4024 0000	–	–	2	4
SRSS	System Resources Sub-System Core Registers	0x4026 0000	–	–	2	5
	Clock Supervision High Frequency	0x4026 1400	8	0x10		
	Clock Supervision Reference Frequency	0x4026 1710	1	–		
	Clock Supervision Low Frequency	0x4026 1720	1	–		
	Clock Supervision Internal Low Frequency	0x4026 1730	1	–		
	Clock PLL 400 MHz	0x4026 1900	2	0x10		
	Multi Counter WDT	0x4026 8000	3	0x100		
	Free Running WDT	0x4026 C000	1	–		
BACKUP	SRSS Backup Domain/RTC	0x4027 0000	–	–	2	6
	Backup Register	0x4027 1000	4	0x04		
P-DMA	P-DMA0 Controller	0x4028 0000	–	–	2	7
	P-DMA0 channel structures	0x4028 8000	143	0x40		
	P-DMA1 Controller	0x4029 0000	–	–	2	8
	P-DMA1 channel structures	0x4029 8000	65	0x40		
M-DMA	M-DMA0 Controller	0x402A 0000	–	–	2	9
	M-DMA0 channels	0x402A 1000	8	0x100		
eFUSE	eFUSE Customer Data (192 bits)	0x402C 0868	6	0x04	2	10
HSIOM	High-Speed I/O Matrix (HSIOM)	0x4030 0000	35	0x10	3	0
GPIO	GPIO port control/configuration	0x4031 0000	35	0x80	3	1

注释:

15.这些可编程 PPU 由 Boot ROM配置，并根据访问权限供用户使用。请参阅特定于设备的 TRM 以了解有关这些可编程 PPU 的配置的更多信息。

表 13 XMC7200 外设 I/O 映射*(续)*

Section	Description	Base address	Instances	Instance size	Group	Slave
SMARTIO	Programmable I/O configuration	0x4032 0000	–	–	3	2
	SMARTIO port configuration	0x4032 0C00	5	0x100		
TCPWM	Timer/Counter/PWM 0 (TCPWM0)	0x4038 0000	–	–	3	3
	TCPWM0 Group #0 (16-bit)	0x4038 0000	3	0x80		
	TCPWM0 Group #1 (16-bit, Motor control)	0x4038 8000	3	0x80		
	TCPWM0 Group #2 (32-bit)	0x4039 0000	3	0x80		
EVTGEN	Event generator 0 (EVTGEN0)	0x403F 0000	–	–	3	4
	Event generator 0 comparator structures	0x403F 0800	16	0x20		
SMIF	Serial Memory Interface 0 (SMIF0)	0x4042 0000	–	–	4	0
	SMIF0 Devices	0x4042 0800	1	0x80		
SDHC	Secure Digital High Capacity 0 (SDHC0)	0x4046 0000	–	–	4	1
	SDHC0 Wrap	0x4046 0000	–	–		
	SDHC0 Core	0x4046 1000	–	–		
ETH	Ethernet 0 (ETH0)	0x4048 0000	2	0x10000	4	2
TTCANFD	CAN0 controller	0x4052 0000	5	0x200	5	1
	Message RAM CAN0	0x4053 0000		0x9FFF		
	CAN1 controller	0x4054 0000	5	0x200	5	2
	Message RAM CAN1	0x4055 0000	–	0x9FFF		
TCPWM	Timer/Counter/PWM 1 (TCPWM1)	0x4058 0000	–	–	5	4
	TCPWM1 Group #0 (16-bit)	0x4058 0000	84	0x80		
	TCPWM1 Group #1 (16-bit, Motor control)	0x4058 8000	12	0x80		
	TCPWM1 Group #2 (32-bit)	0x4059 0000	13	0x80		
SCB	Serial Communications Block (SPI/UART/I^2C)	0x4060 0000	11	0x10000	6	0-10
I^2S	I^2S Audio SubSystem	0x4080 0000	3	0x1000	8	0-2
SAR PASS	Programmable Analog Subsystem (PASS0)	0x4090 0000	–	–	9	0
	SAR0 channel controller	0x4090 0000	–	–		
	SAR1 channel controller	0x4090 1000	–	–		
	SAR2 channel controller	0x4090 2000	–	–		
	SAR0 channel structures	0x4090 0800	32	0x40		
	SAR1 channel structures	0x4090 1800	32	0x40		
	SAR2 channel structures	0x4090 2800	32	0x40		

7 XMC7200 时钟图

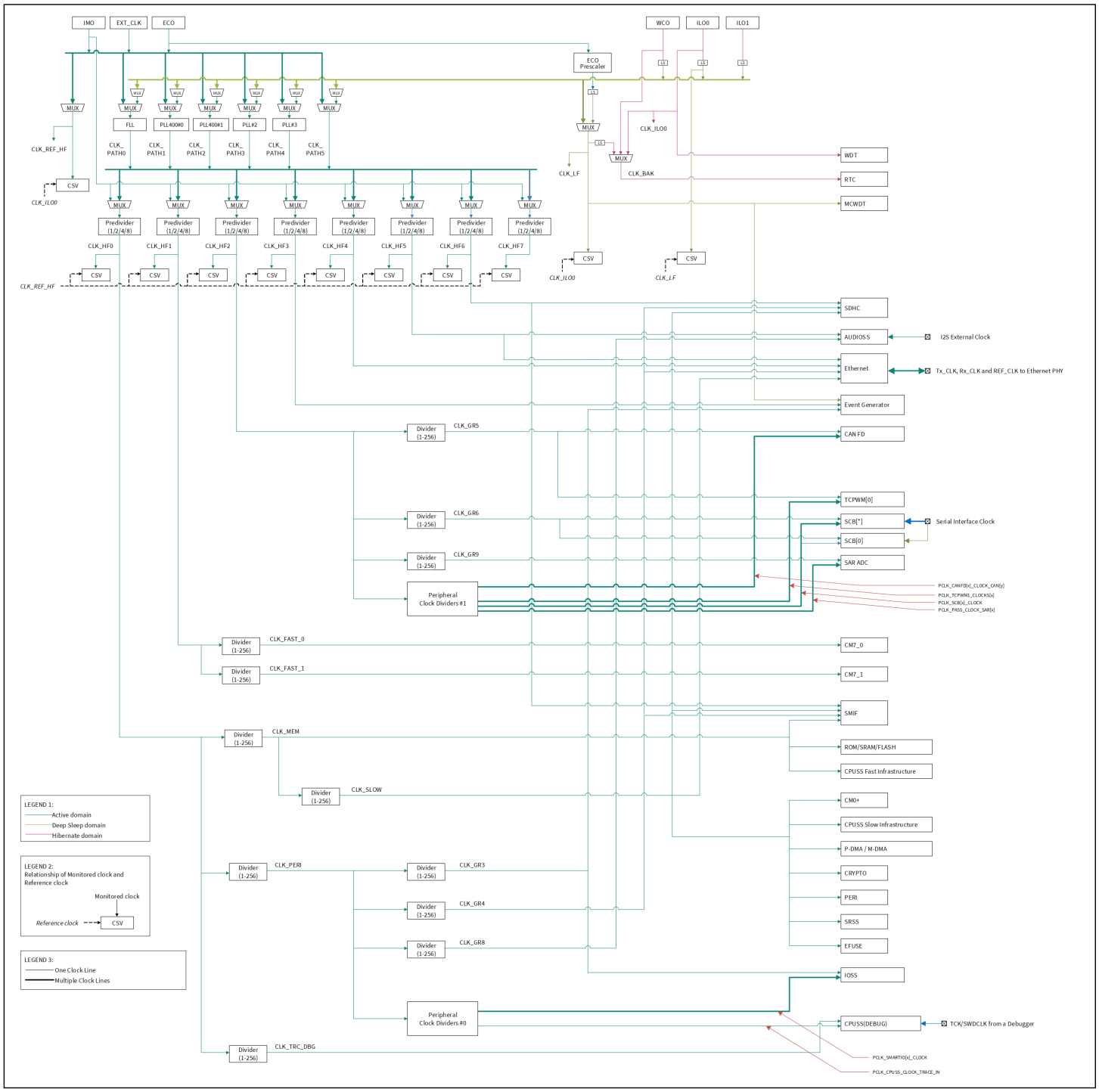


图 4 XMC7200 时钟图

8 XMC7200 CPU 启动顺序

启动顺序按以下步骤描述：

1. 系统重置（@0x0000 0000）
2. CM0+执行ROM启动（@0x0000 0004）
   a. 应用调整
   b. 使能调试访问端口 (DAP) 访问限制以及根据来自 eFuse 和supervisory flash 的内容来开启系统保护
   c. 验证闪存启动（仅在安全生命周期阶段）并将控制权转移给它
3. CM0+执行闪存启动（来自 supervisory flash@0x1700 2000）
   a. 调试引脚根据 SWD/JTAG 规范配置 [16]
   b. 将 CM0+ 矢量偏移寄存器（ Arm®系统空间的 CM0_VTOR 部分）设置为闪存的开头 (@0x1000 0000)
   c. CM0+ 分支到其复位处理程序
4. CM0+开始执行应用程序
   a. 将 CM0+ 向量表移至 SRAM（更新 CM0+ 向量表基址）
   b. 为 CM7_0 (CLK_HF1) 和 CM7_1 设置时钟
   c. 设置 CM7_0 (CM7_0_VECTOR_TABLE_BASE @0x4020 0200) 和 CM7_1 (CM7_1_VECTOR_TABLE_BASE@ 0x4020 0600) 向量表到各自的位置，也在闪存涉及（在 ld 文件中指定）
   d. 为 CPU 核心 CM7_0 和 CM7_1 启用电源
   e. 禁用 CPU_WAIT 以允许从调试器访问
   f. 释放 CM7_0 和/或 CM7_1 的复位
   g. 继续执行 CM0+ 用户应用程序
5. CM7_0 和/或 CM7_1 直接从代码闪存或 SRAM 执行
   a. CM7_0/CM7_1 分支到其复位处理程序
   b. 继续执行用户应用程序

注释

16. SWD/JTAG 引脚的端口配置将从默认的 GPIO 模式更改，以支持启动过程后的调试，参考 **表 15** 用于引脚分配。

9 引脚分配

注意散热垫需连接至 VSSD。

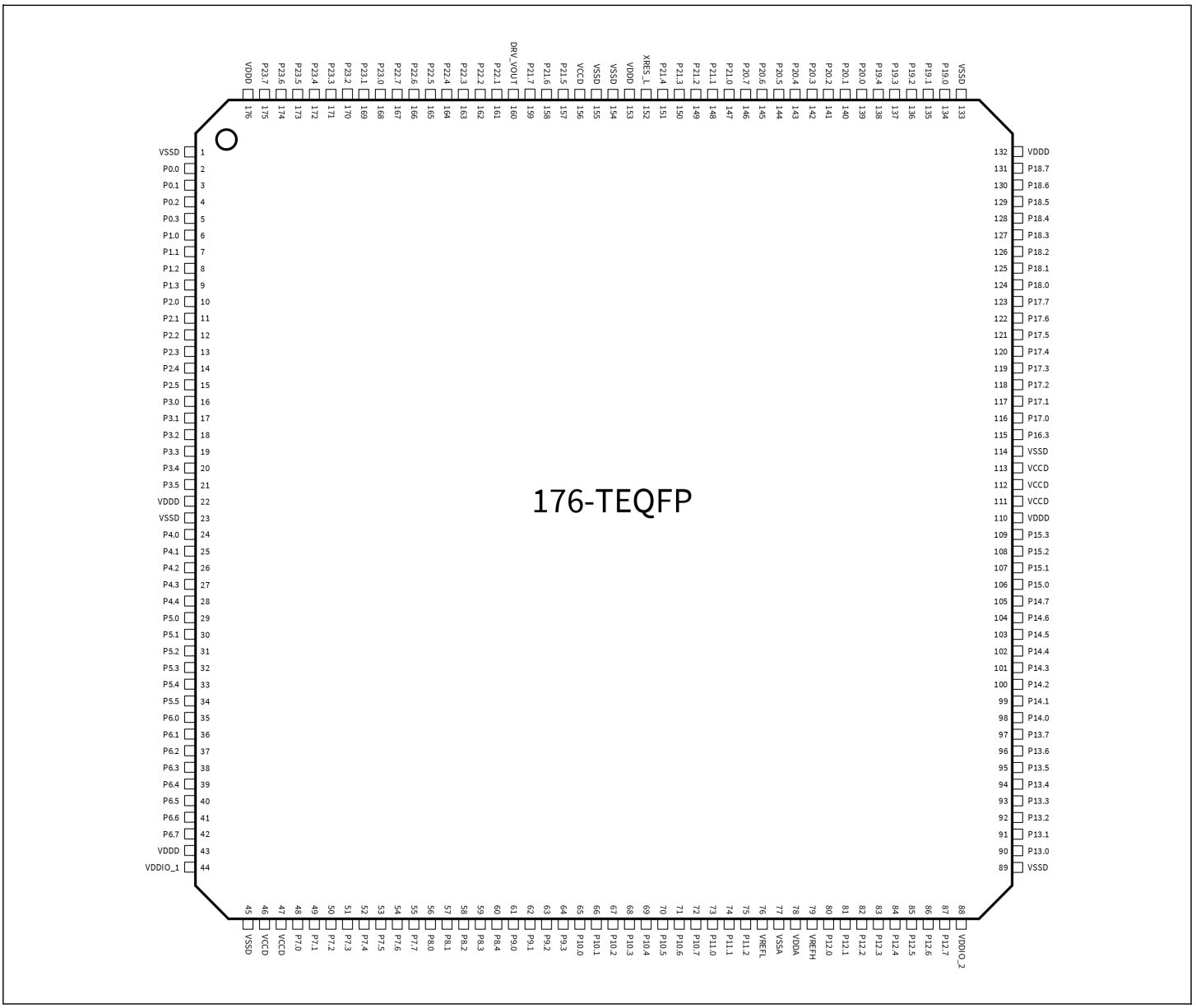


图 5 176-TEQFP引脚分配

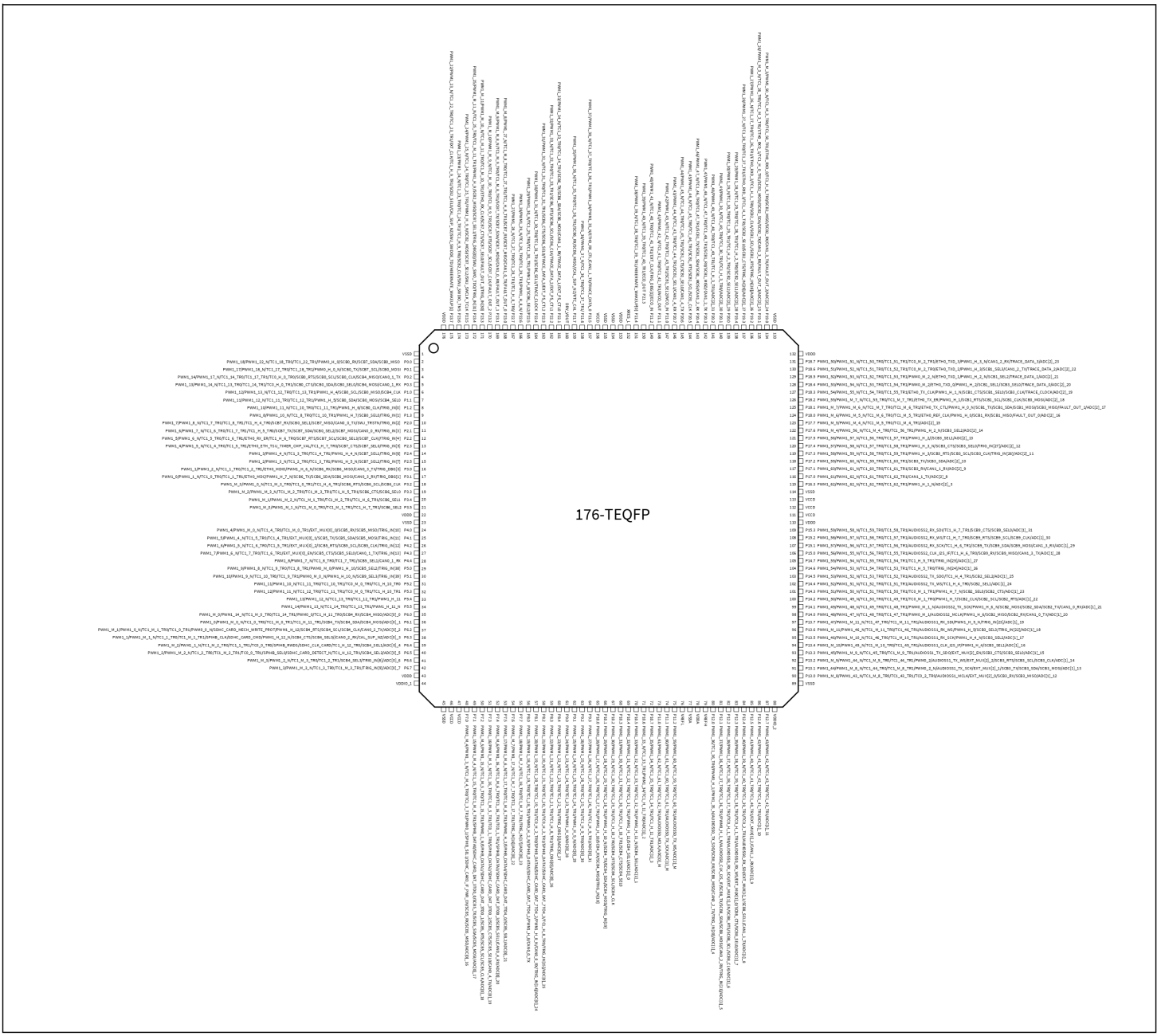


图 6　　176 引脚 TEQFP 引脚分配（带备用功能）（初步设计）

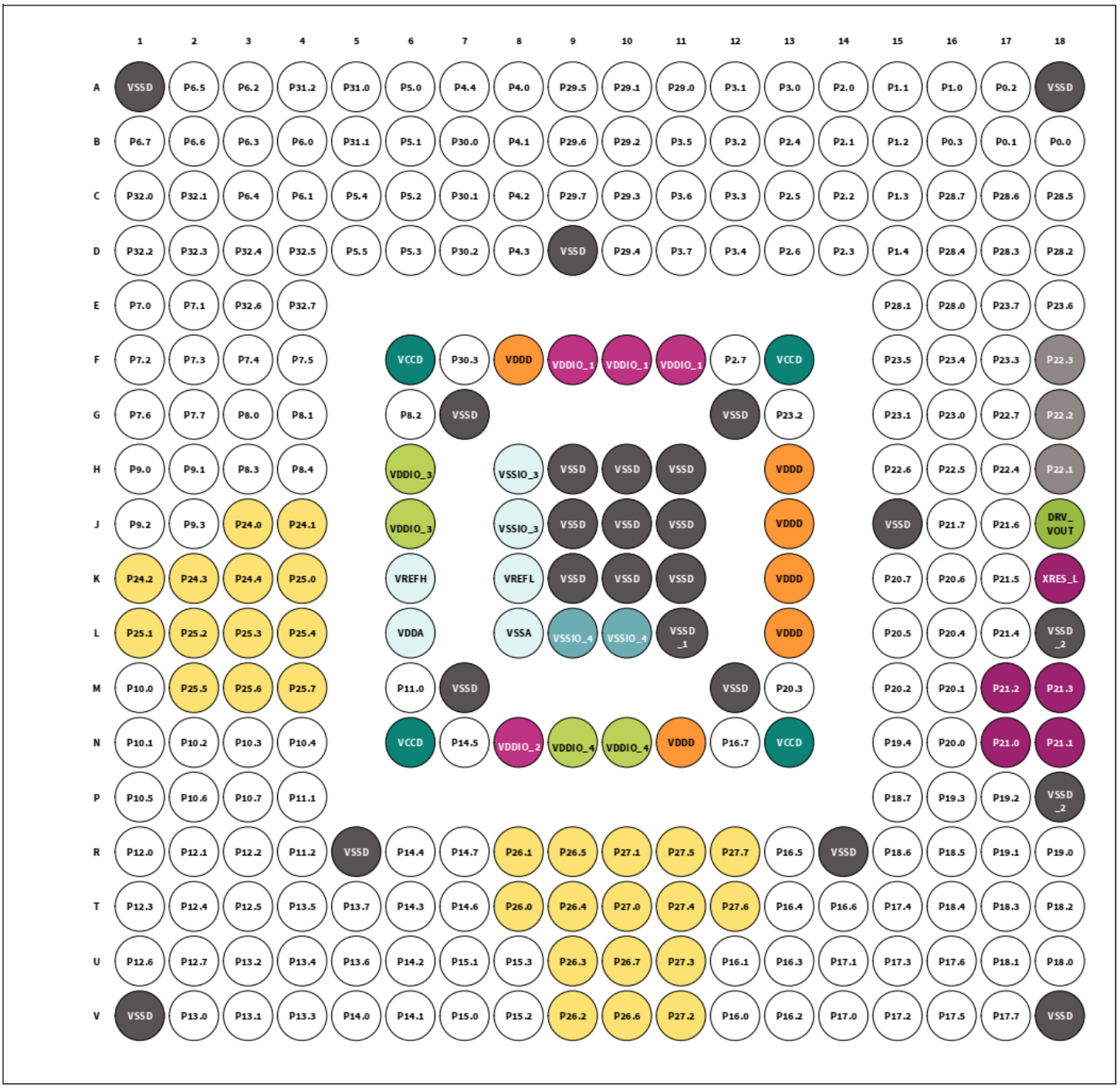

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
A VSSD P6.5 P6.2 P31.2 P31.0 P5.0 P4.4 P4.0 P29.5 P29.1 P29.0 P3.1 P3.0 P2.0 P1.1 P1.0 P0.2 VSSD
B P6.7 P6.6 P6.3 P6.0 P31.1 P5.1 P30.0 P4.1 P29.6 P29.2 P3.5 P3.2 P2.4 P2.1 P1.2 P0.3 P0.1 P0.0
C P32.0 P32.1 P6.4 P6.1 P5.4 P5.2 P30.1 P4.2 P29.7 P29.3 P3.6 P3.3 P2.5 P2.2 P1.3 P28.7 P28.6 P28.5
D P32.2 P32.3 P32.4 P32.5 P5.5 P5.3 P30.2 P4.3 VSSD P29.4 P3.7 P3.4 P2.6 P2.3 P1.4 P28.4 P28.3 P28.2
E P7.0 P7.1 P32.6 P32.7 P28.1 P28.0 P23.7 P23.6
F P7.2 P7.3 P7.4 P7.5 VCCD P30.3 VDDD VDDIO_1 VDDIO_1 VDDIO_1 P2.7 VCCD P23.5 P23.4 P23.3 P22.3
G P7.6 P7.7 P8.0 P8.1 P8.2 VSSD VSSD P23.2 P23.1 P23.0 P22.7 P22.2
H P9.0 P9.1 P8.3 P8.4 VDDIO_3 VSSIO_3 VSSD VSSD VSSD VDDD P22.6 P22.5 P22.4 P22.1
J P9.2 P9.3 P24.0 P24.1 VDDIO_3 VSSIO_3 VSSD VSSD VSSD VDDD VSSD P21.7 P21.6 DRV_VOUT
K P24.2 P24.3 P24.4 P25.0 VREFH VREFL VSSD VSSD VSSD VDDD P20.7 P20.6 P21.5 XRES_L
L P25.1 P25.2 P25.3 P25.4 VDDA VSSA VSSIO_4 VSSIO_4 VSSD_1 VDDD P20.5 P20.4 P21.4 VSSD_2
M P10.0 P25.5 P25.6 P25.7 P11.0 VSSD VSSD P20.3 P20.2 P20.1 P21.2 P21.3
N P10.1 P10.2 P10.3 P10.4 VCCD P14.5 VDDIO_2 VDDIO_4 VDDIO_4 VDDD P16.7 VCCD P19.4 P20.0 P21.0 P21.1
P P10.5 P10.6 P10.7 P11.1 P18.7 P19.3 P19.2 VSSD_2
R P12.0 P12.1 P12.2 P11.2 VSSD P14.4 P14.7 P26.1 P26.5 P27.1 P27.5 P27.7 P16.5 VSSD P18.6 P18.5 P19.1 P19.0
T P12.3 P12.4 P12.5 P13.5 P13.7 P14.3 P14.6 P26.0 P26.4 P27.0 P27.4 P27.6 P16.4 P16.6 P17.4 P18.4 P18.3 P18.2
U P12.6 P12.7 P13.2 P13.4 P13.6 P14.2 P15.1 P15.3 P26.3 P26.7 P27.3 P16.1 P16.3 P17.1 P17.3 P17.6 P18.1 P18.0
V VSSD P13.0 P13.1 P13.3 P14.0 P14.1 P15.0 P15.2 P26.2 P26.6 P27.2 P16.0 P16.2 P17.0 P17.2 P17.5 P17.7 VSSD

图 7　　272-BGA 球图

10 高速 I/O 矩阵连接

表 14 HSIOM 连接参考

Name	Number	Description
HSIOM_SEL_GPIO	0	GPIO controls 'out'
HSIOM_SEL_GPIO_DSI	1	Reserved
HSIOM_SEL_DSI_DSI	2	
HSIOM_SEL_DSI_GPIO	3	
HSIOM_SEL_AMUXA	4	
HSIOM_SEL_AMUXB	5	
HSIOM_SEL_AMUXA_DSI	6	
HSIOM_SEL_AMUXB_DSI	7	Reserved
HSIOM_SEL_ACT_0	8	Active functionality 0
HSIOM_SEL_ACT_1	9	Active functionality 1
HSIOM_SEL_ACT_2	10	Active functionality 2
HSIOM_SEL_ACT_3	11	Active functionality 3
HSIOM_SEL_DS_0	12	Deep Sleep functionality 0
HSIOM_SEL_DS_1	13	Deep Sleep functionality 1
HSIOM_SEL_DS_2	14	Deep Sleep functionality 2
HSIOM_SEL_DS_3	15	Deep Sleep functionality 3
HSIOM_SEL_ACT_4	16	Active functionality 4
HSIOM_SEL_ACT_5	17	Active functionality 5
HSIOM_SEL_ACT_6	18	Active functionality 6
HSIOM_SEL_ACT_7	19	Active functionality 7
HSIOM_SEL_ACT_8	20	Active functionality 8
HSIOM_SEL_ACT_9	21	Active functionality 9
HSIOM_SEL_ACT_10	22	Active functionality 10
HSIOM_SEL_ACT_11	23	Active functionality 11
HSIOM_SEL_ACT_12	24	Active functionality 12
HSIOM_SEL_ACT_13	25	Active functionality 13
HSIOM_SEL_ACT_14	26	Active functionality 14
HSIOM_SEL_ACT_15	27	Active functionality 15
HSIOM_SEL_DS_4	28	Deep Sleep functionality 4
HSIOM_SEL_DS_5	29	Deep Sleep functionality 5
HSIOM_SEL_DS_6	30	Deep Sleep functionality 6
HSIOM_SEL_DS_7	31	Deep Sleep functionality 7

11 封装引脚列表和备用功能

大多数引脚具有复用功能，如 **表 15** 所示。

端口 11 具有以下附加功能：

- 当 $V_{DDIO} < V_{DDA}$ 时，能够将全电平模拟信号传送至 SAR，而不会削波至 V DDIO
- 能够同时捕获三个具有最高优先级的 ADC 信号 (ADC[0:2]_M)
- 噪音更低，适用于采样灵敏的传感器

表 15 深度睡眠 (DS) 模式、模拟、Samrt I/O 下的引脚选择器和可选引脚功能（初步）

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P0.0	GPIO_ENH	B18	2	–	–	SCB0_MISO	–	–
P0.1	GPIO_ENH	B17	3	–	–	SCB0_MOSI	–	–
P0.2	GPIO_ENH	A17	4	SCB0_SCL	–	SCB0_CLK	–	–
P0.3	GPIO_ENH	B16	5	SCB0_SDA	–	SCB0_SEL0	–	–
P1.0	GPIO_STD	A16	6	SCB0_SCL	–	SCB0_MISO	–	–
P1.1	GPIO_STD	A15	7	SCB0_SDA	–	SCB0_MOSI	–	–
P1.2	GPIO_STD	B15	8	–	–	SCB0_CLK	–	–
P1.3	GPIO_STD	C15	9	–	–	SCB0_SEL0	–	–
P1.4	GPIO_STD	D15	NA	–	–	–	–	–
P1.5	GPIO_STD	NA	NA	–	–	–	–	–
P1.6	GPIO_STD	NA	NA	–	–	–	–	–
P2.0	GPIO_STD	A14	10	–	SWJ_TRSTN	SCB0_SEL1	–	–
P2.1	GPIO_STD	B14	11	–	–	SCB0_SEL2	–	–
P2.2	GPIO_STD	C14	12	–	–	SCB0_SEL3	–	–
P2.3	GPIO_STD	D14	13	–	–	–	–	–
P2.4	GPIO_STD	B13	14	–	–	–	–	–
P2.5	GPIO_STD	C13	15	–	–	–	–	–
P2.6	GPIO_STD	D13	NA	–	–	–	–	–
P2.7	GPIO_STD	F12	NA	–	–	–	–	–

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P3.0	GPIO_STD	A13	16	–	–	–	–	–
P3.1	GPIO_STD	A12	17	–	–	–	–	–
P3.2	GPIO_STD	B12	18	–	–	–	–	–
P3.3	GPIO_STD	C12	19	–	–	–	–	–
P3.4	GPIO_STD	D12	20	–	–	–	–	–
P3.5	GPIO_STD	B11	21	–	–	–	–	–
P3.6	GPIO_STD	C11	NA	–	–	–	–	–
P3.7	GPIO_STD	D11	NA	–	–	–	–	–
P4.0	GPIO_STD	A8	24	–	–	–	–	–
P4.1	GPIO_STD	B8	25	–	–	–	–	–
P4.2	GPIO_STD	C8	26	–	–	–	–	–
P4.3	GPIO_STD	D8	27	–	–	–	–	–
P4.4	GPIO_STD	A7	28	–	–	–	–	–
P4.5	GPIO_STD	NA	NA	–	–	–	–	–
P4.6	GPIO_STD	NA	NA	–	–	–	–	–
P5.0	GPIO_STD	A6	29	–	–	–	–	–
P5.1	GPIO_STD	B6	30	–	–	–	–	–
P5.2	GPIO_STD	C6	31	–	–	–	–	–
P5.3	GPIO_STD	D6	32	–	–	–	–	–
P5.4	GPIO_STD	C5	33	–	–	–	–	–
P5.5	GPIO_STD	D5	34	–	–	–	–	–
P6.0	GPIO_STD	B4	35	–	–	–	ADC[0]_0	–
P6.1	GPIO_STD	C4	36	–	–	–	ADC[0]_1	–
P6.2	GPIO_STD	A3	37	–	–	–	ADC[0]_2	–
P6.3	GPIO_STD	B3	38	–	–	–	ADC[0]_3	–
P6.4	GPIO_STD	C3	39	–	–	–	ADC[0]_4	–
P6.5	GPIO_STD	A2	40	–	–	–	ADC[0]_5	–

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P6.6	GPIO_STD	B2	41	–	–	–	ADC[0]_6	–
P6.7	GPIO_STD	B1	42	–	–	–	ADC[0]_7	–
P7.0	GPIO_STD	E1	48	–	–	–	ADC[0]_16	–
P7.1	GPIO_STD	E2	49	–	–	–	ADC[0]_17	–
P7.2	GPIO_STD	F1	50	–	–	–	ADC[0]_18	–
P7.3	GPIO_STD	F2	51	–	–	–	ADC[0]_19	–
P7.4	GPIO_STD	F3	52	–	–	–	ADC[0]_20	–
P7.5	GPIO_STD	F4	53	–	–	–	ADC[0]_21	–
P7.6	GPIO_STD	G1	54	–	–	–	ADC[0]_22	–
P7.7	GPIO_STD	G2	55	–	–	–	ADC[0]_23	–
P8.0	GPIO_STD	G3	56	–	–	–	–	–
P8.1	GPIO_STD	G4	57	–	–	–	ADC[0]_24	–
P8.2	GPIO_STD	G6	58	–	–	–	ADC[0]_25	–
P8.3	GPIO_STD	H3	59	–	–	–	ADC[0]_26	–
P8.4	GPIO_STD	H4	60	–	–	–	ADC[0]_27	–
P9.0	GPIO_STD	H1	61	–	–	–	ADC[0]_28	–
P9.1	GPIO_STD	H2	62	–	–	–	ADC[0]_29	–
P9.2	GPIO_STD	J1	63	–	–	–	ADC[0]_30	–
P9.3	GPIO_STD	J2	64	–	–	–	ADC[0]_31	–
P10.0	GPIO_STD	M1	65	–	–	–	–	–
P10.1	GPIO_STD	N1	66	–	–	–	–	–
P10.2	GPIO_STD	N2	67	–	–	–	–	–
P10.3	GPIO_STD	N3	68	–	–	–	–	–
P10.4	GPIO_STD	N4	69	–	–	–	ADC[1]_0	–
P10.5	GPIO_STD	P1	70	–	–	–	ADC[1]_1	–
P10.6	GPIO_STD	P2	71	–	–	–	ADC[1]_2	–
P10.7	GPIO_STD	P3	72	–	–	–	ADC[1]_3	–

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P11.0	GPIO_STD	M6	73	–	–	–	ADC[0]_M	–
P11.1	GPIO_STD	P4	74	–	–	–	ADC[1]_M	–
P11.2	GPIO_STD	R4	75	–	–	–	ADC[2]_M	–
P12.0	GPIO_STD	R1	80	–	–	–	ADC[1]_4	SMARTIO12_0
P12.1	GPIO_STD	R2	81	–	–	–	ADC[1]_5	SMARTIO12_1
P12.2	GPIO_STD	R3	82	–	–	–	ADC[1]_6	SMARTIO12_2
P12.3	GPIO_STD	T1	83	–	–	–	ADC[1]_7	SMARTIO12_3
P12.4	GPIO_STD	T2	84	–	–	–	ADC[1]_8	SMARTIO12_4
P12.5	GPIO_STD	T3	85	–	–	–	ADC[1]_9	SMARTIO12_5
P12.6	GPIO_STD	U1	86	–	–	–	ADC[1]_10	SMARTIO12_6
P12.7	GPIO_STD	U2	87	–	–	–	ADC[1]_11	SMARTIO12_7
P13.0	GPIO_STD	V2	90	–	–	–	ADC[1]_12	SMARTIO13_0
P13.1	GPIO_STD	V3	91	–	–	–	ADC[1]_13	SMARTIO13_1
P13.2	GPIO_STD	U3	92	–	–	–	ADC[1]_14	SMARTIO13_2
P13.3	GPIO_STD	V4	93	–	–	–	ADC[1]_15	SMARTIO13_3
P13.4	GPIO_STD	U4	94	–	–	–	ADC[1]_16	SMARTIO13_4
P13.5	GPIO_STD	T4	95	–	–	–	ADC[1]_17	SMARTIO13_5
P13.6	GPIO_STD	U5	96	–	–	–	ADC[1]_18	SMARTIO13_6
P13.7	GPIO_STD	T5	97	–	–	–	ADC[1]_19	SMARTIO13_7
P14.0	GPIO_STD	V5	98	–	–	–	ADC[1]_20	SMARTIO14_0
P14.1	GPIO_STD	V6	99	–	–	–	ADC[1]_21	SMARTIO14_1
P14.2	GPIO_STD	U6	100	–	–	–	ADC[1]_22	SMARTIO14_2
P14.3	GPIO_STD	T6	101	–	–	–	ADC[1]_23	SMARTIO14_3
P14.4	GPIO_STD	R6	102	–	–	–	ADC[1]_24	SMARTIO14_4
P14.5	GPIO_STD	N7	103	–	–	–	ADC[1]_25	SMARTIO14_5
P14.6	GPIO_STD	T7	104	–	–	–	ADC[1]_26	SMARTIO14_6
P14.7	GPIO_STD	R7	105	–	–	–	ADC[1]_27	SMARTIO14_7

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P15.0	GPIO_STD	V7	106	–	–	–	ADC[1]_28	SMARTIO15_0
P15.1	GPIO_STD	U7	107	–	–	–	ADC[1]_29	SMARTIO15_1
P15.2	GPIO_STD	V8	108	–	–	–	ADC[1]_30	SMARTIO15_2
P15.3	GPIO_STD	U8	109	–	–	–	ADC[1]_31	SMARTIO15_3
P16.0	GPIO_STD	V12	NA	–	–	–	ADC[2]_0	–
P16.1	GPIO_STD	U12	NA	–	–	–	ADC[2]_1	–
P16.2	GPIO_STD	V13	NA	–	–	–	ADC[2]_2	–
P16.3	GPIO_STD	U13	115	–	–	–	ADC[2]_3	–
P16.4	GPIO_STD	T13	NA	–	–	–	ADC[2]_4	–
P16.5	GPIO_STD	R13	NA	–	–	–	ADC[2]_5	–
P16.6	GPIO_STD	T14	NA	–	–	–	ADC[2]_6	–
P16.7	GPIO_STD	N12	NA	–	–	–	ADC[2]_7	–
P17.0	GPIO_STD	V14	116	–	–	–	ADC[2]_8	SMARTIO17_0
P17.1	GPIO_STD	U14	117	–	–	–	ADC[2]_9	SMARTIO17_1
P17.2	GPIO_STD	V15	118	–	–	–	ADC[2]_10	SMARTIO17_2
P17.3	GPIO_STD	U15	119	–	–	–	ADC[2]_11	SMARTIO17_3
P17.4	GPIO_STD	T15	120	–	–	–	ADC[2]_12	SMARTIO17_4
P17.5	GPIO_STD	V16	121	–	–	–	ADC[2]_13	SMARTIO17_5
P17.6	GPIO_STD	U16	122	–	–	–	ADC[2]_14	SMARTIO17_6
P17.7	GPIO_STD	V17	123	–	–	–	ADC[2]_15	SMARTIO17_7
P18.0	GPIO_STD	U18	124	–	–	–	ADC[2]_16	–
P18.1	GPIO_STD	U17	125	–	–	–	ADC[2]_17	–
P18.2	GPIO_STD	T18	126	–	–	–	ADC[2]_18	–
P18.3	GPIO_STD	T17	127	–	–	–	ADC[2]_19	–
P18.4	GPIO_STD	T16	128	–	–	–	ADC[2]_20	–
P18.5	GPIO_STD	R16	129	–	–	–	ADC[2]_21	–
P18.6	GPIO_STD	R15	130	–	–	–	ADC[2]_22	–

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P18.7	GPIO_STD	P15	131	–	–	–	ADC[2]_23	–
P19.0	GPIO_STD	R18	134	–	–	–	ADC[2]_24	–
P19.1	GPIO_STD	R17	135	–	–	–	ADC[2]_25	–
P19.2	GPIO_STD	P17	136	–	–	–	ADC[2]_26	–
P19.3	GPIO_STD	P16	137	–	–	–	ADC[2]_27	–
P19.4	GPIO_STD	N15	138	–	–	–	ADC[2]_28	–
P20.0	GPIO_STD	N16	139	–	–	–	ADC[2]_29	–
P20.1	GPIO_STD	M16	140	–	–	–	ADC[2]_30	–
P20.2	GPIO_STD	M15	141	–	–	–	ADC[2]_31	–
P20.3	GPIO_STD	M13	142	–	–	–	–	–
P20.4	GPIO_STD	L16	143	–	–	–	–	–
P20.5	GPIO_STD	L15	144	–	–	–	–	–
P20.6	GPIO_STD	K16	145	–	–	–	–	–
P20.7	GPIO_STD	K15	146	–	–	–	–	–
P21.0	GPIO_STD	N17	147	–	–	–	WCO_IN[17]	–
P21.1	GPIO_STD	N18	148	–	–	–	WCO_OUT[17]	–
P21.2	GPIO_STD	M17	149	–	–	–	ECO_IN[17]	–
P21.3	GPIO_STD	M18	150	–	–	–	ECO_OUT[17]	–
P21.4	GPIO_STD	L17	151	–	–	–	HIBER-NATE_WAKEUP[0][18]	–
P21.5	GPIO_STD	K17	157	–	–	–	–	–
P21.6	GPIO_STD	J17	158	–	–	–	–	–
P21.7	GPIO_STD	J16	159	–	RTC_CAL		–	–
P22.1	GPIO_STD	H18	161	–	–	–	EXT_PS_CTL0	–
P22.2	GPIO_STD	G18	162	–	–	–	EXT_PS_CTL1	–
P22.3	GPIO_STD	F18	163	–	–	–	EXT_PS_CTL2	–
P22.4	GPIO_STD	H17	164	–	–	–	–	–

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P22.5	GPIO_STD	H16	165	–	–	–	–	–
P22.6	GPIO_STD	H15	166	–	–	–	–	–
P22.7	GPIO_STD	G17	167	–	–	–	–	–
P23.0	GPIO_STD	G16	168	–	–	–	–	–
P23.1	GPIO_STD	G15	169	–	–	–	–	–
P23.2	GPIO_STD	G13	170	–	–	–	–	–
P23.3	GPIO_STD	F17	171	–	–	–	–	–
P23.4	GPIO_STD	F16	172	–	SWJ_SWO_TDO	–	–	–
P23.5	GPIO_STD	F15	173	–	SWJ_SWCLK_TCLK	–	–	–
P23.6	GPIO_STD	E18	174	–	SWJ_SWDIO_TMS	–	–	–
P23.7	GPIO_STD	E17	175	–	SWJ_SWDOE_TDI		HIBER-NATE_WAKEUP[1]	–
P24.0	HSIO_STD	J3	NA	–	–	–	–	–
P24.1	HSIO_STD	J4	NA	–	–	–	–	–
P24.2	HSIO_STD	K1	NA	–	–	–	–	–
P24.3	HSIO_STD	K2	NA	–	–	–	–	–
P24.4	HSIO_STD	K3	NA	–	–	–	–	–
P25.0	HSIO_STD	K4	NA	–	–	–	–	–
P25.1	HSIO_STD	L1	NA	–	–	–	–	–
P25.2	HSIO_STD	L2	NA	–	–	–	–	–
P25.3	HSIO_STD	L3	NA	–	–	–	–	–
P25.4	HSIO_STD	L4	NA	–	–	–	–	–
P25.5	HSIO_STD	M2	NA	–	–	–	–	–
P25.6	HSIO_STD	M3	NA	–	–	–	–	–
P25.7	HSIO_STD	M4	NA	–	–	–	–	–
P26.0	HSIO_STD	T8	NA	–	–	–	–	–
P26.1	HSIO_STD	R8	NA	–	–	–	–	–

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P26.2	HSIO_STD	V9	NA	–	–	–	–	–
P26.3	HSIO_STD	U9	NA	–	–	–	–	–
P26.4	HSIO_STD	T9	NA	–	–	–	–	–
P26.5	HSIO_STD	R9	NA	–	–	–	–	–
P26.6	HSIO_STD	V10	NA	–	–	–	–	–
P26.7	HSIO_STD	U10	NA	–	–	–	–	–
P27.0	HSIO_STD	T10	NA	–	–	–	–	–
P27.1	HSIO_STD	R10	NA	–	–	–	–	–
P27.2	HSIO_STD	V11	NA	–	–	–	–	–
P27.3	HSIO_STD	U11	NA	–	–	–	–	–
P27.4	HSIO_STD	T11	NA	–	–	–	–	–
P27.5	HSIO_STD	R11	NA	–	–	–	–	–
P27.6	HSIO_STD	T12	NA	–	–	–	–	–
P27.7	HSIO_STD	R12	NA	–	–	–	–	–
P28.0	GPIO_STD	E16	NA	–	–	–	–	–
P28.1	GPIO_STD	E15	NA	–	–	–	–	–
P28.2	GPIO_STD	D18	NA	–	–	–	–	–
P28.3	GPIO_STD	D17	NA	–	–	–	–	–
P28.4	GPIO_STD	D16	NA	–	–	–	–	–
P28.5	GPIO_STD	C18	NA	–	–	–	–	–
P28.6	GPIO_STD	C17	NA	–	–	–	–	–
P28.7	GPIO_STD	C16	NA	–	–	–	–	–
P29.0	GPIO_STD	A11	NA	–	–	–	–	–
P29.1	GPIO_STD	A10	NA	–	–	–	–	–
P29.2	GPIO_STD	B10	NA	–	–	–	–	–
P29.3	GPIO_STD	C10	NA	–	–	–	–	–
P29.4	GPIO_STD	D10	NA	–	–	–	–	–

Name		Package		Deep Sleep mapping			Analog	SMARTIO
	HCon#0[17]	272-FBGA	176-TEQFP	HCon#14	HCon#29	HCon#30		
	I/O Type	Pin	Pin	DS #0[18, 19]	DS #1	DS #2		
P29.5	GPIO_STD	A9	NA	–	–	–	–	–
P29.6	GPIO_STD	B9	NA	–	–	–	–	–
P29.7	GPIO_STD	C9	NA	–	–	–	–	–
P30.0	GPIO_STD	B7	NA	–	–	–	–	–
P30.1	GPIO_STD	C7	NA	–	–	–	–	–
P30.2	GPIO_STD	D7	NA	–	–	–	–	–
P30.3	GPIO_STD	F7	NA	–	–	–	–	–
P31.0	GPIO_STD	A5	NA	–	–	–	–	–
P31.1	GPIO_STD	B5	NA	–	–	–	–	–
P31.2	GPIO_STD	A4	NA	–	–	–	–	–
P32.0	GPIO_STD	C1	NA	–	–	–	ADC[0]_8	–
P32.1	GPIO_STD	C2	NA	–	–	–	ADC[0]_9	–
P32.2	GPIO_STD	D1	NA	–	–	–	ADC[0]_10	–
P32.3	GPIO_STD	D2	NA	–	–	–	ADC[0]_11	–
P32.4	GPIO_STD	D3	NA	–	–	–	ADC[0]_12	–
P32.5	GPIO_STD	D4	NA	–	–	–	ADC[0]_13	–
P32.6	GPIO_STD	E3	NA	–	–	–	ADC[0]_14	–
P32.7	GPIO_STD	E4	NA	–	–	–	ADC[0]_15	–

注释

17. HCon refers to Hi-Speed I/O matrix connection reference as per **Table 14**.
18. Deep Sleep ordering (DS #0, DS #1, DS #2) does not have any impact on choosing any alternate functions; the HSIOM module handles the individual alternate function assignment.
19. All port pin functions available in Deep Sleep mode are also available in Active mode.
20. I/O pins that support an oscillator function (WCO or ECO) must be configured for high-Z if the oscillator is enabled.

12 电源引脚分配

表 16 电源引脚分配[21]

Pin name	Package		Remarks
	272-FBGA	176-TEQFP	
VDDD	F8, H13, J13, K13, L13, N11	176, 153, 132, 110, 43, 22	Main digital supply
VSSD	A1, A18, D9, G7, G12, H9, H10, H11, J9, J10, J11, J15, K9, K10, K11, M7, M12, R5, R14, V1, V18	155, 154, 133, 114, 89, 45, 23, 1	Main digital ground
VSSD_1	L11	NA	Digital Ground
VSSD_2	L18, P18	NA	Noise guard for ECO inputs
VDDIO_1	F9, F10, F11	44	I/O supply (except analog I/Os on V_{DDA})
VDDIO_2	N8	88	I/O supply (except analog I/Os on V_{DDA})
VDDIO_3	H6, J6	NA	I/O supply for high speed domain#0 (HSIO_STD), P24, P25
VDDIO_4	N9, N10	NA	I/O supply for high speed domain#1 (HSIO_STD), P26, P27
VSSIO_3	H8, J8	NA	HSIO ground
VSSIO_4	L9, L10	NA	HSIO ground
VCCD[21]	F6, F13, N6, N13	46, 47, 111, 112, 113, 156	Main regulated supply. Driven by LDO regulator (either internal LDO or external LDO/PMIC)
VREFH	K6	79	High reference voltage for SAR ADCs
VREFL	K8	76	Low reference voltage for SAR ADCs
VDDA	L6	78	Main analog supply for SAR ADCs
VSSA	L8	77	Main analog ground

注释：

21. V_{CCD} 引脚必须连接在一起，以确保低阻抗连接。（参见**第122页“器件级规范”**）。

13 备用功能引脚分配

表 17 激活模式下的备用引脚功能 [22, 24]

Pin	Active mapping															
	HCon#8[22]	HCon#9	HCon#10	HCon#11	HCon#16	HCon#17	HCon#18	HCon#19	HCon#20	HCon#21	HCon#22	HCon#23	HCon#24	HCon#25	HCon#26	HCon#27
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P0.0	PWM1_18	PWM1_22_N	TC1_18_TR0	TC1_22_TR1	–	SCB0_RX	SCB7_SDA	–	–	–	PWM0_H_0	–	–	–	–	–
P0.1	PWM1_17	PWM1_18_N	TC1_17_TR0	TC1_18_TR1	–	SCB0_TX	SCB7_SCL	–	–	–	PWM0_H_0_N	–	–	–	–	–
P0.2	PWM1_14	PWM1_17_N	TC1_14_TR0	TC1_17_TR1	–	SCB0_RTS	–	SCB4_MISO	–	CAN0_1_TX	TC0_H_0_TR0	–	–	–	–	–
P0.3	PWM1_13	PWM1_14_N	TC1_13_TR0	TC1_14_TR1	–	SCB0_CTS	–	SCB4_MOSI	–	CAN0_1_RX	TC0_H_0_TR1	–	–	–	–	–
P1.0	PWM1_12	PWM1_13_N	TC1_12_TR0	TC1_13_TR1	PWM1_H_4	–	–	SCB4_CLK	–	–	–	–	–	–	–	–
P1.1	PWM1_11	PWM1_12_N	TC1_11_TR0	TC1_12_TR1	PWM1_H_5	–	–	SCB4_SEL0 (2)	–	–	–	–	–	–	–	–
P1.2	PWM1_10	PWM1_11_N	TC1_10_TR0	TC1_11_TR1	PWM1_H_6	–	–	–	–	–	–	–	–	–	TRIG_IN[0]	–
P1.3	PWM1_8	PWM1_10_N	TC1_8_TR0	TC1_10_TR1	PWM1_H_7	–	–	–	–	–	–	–	–	–	TRIG_IN[1]	–
P1.4	PWM1_71	PWM1_70_N	TC1_71_TR0	TC1_70_TR1	–	SCB8_RX	–	SCB8_MISO	–	–	–	–	–	–	–	–
P2.0	PWM1_7	PWM1_8_N	TC1_7_TR0	TC1_8_TR1	TC1_H_4_TR0	SCB7_RX	–	SCB7_MISO	–	CAN0_0_TX	–	–	–	–	TRIG_IN[2]	–
P2.1	PWM1_6	PWM1_7_N	TC1_6_TR0	TC1_7_TR1	TC1_H_5_TR0	SCB7_TX	SCB7_SDA	SCB7_MOSI	–	CAN0_0_RX	–	–	–	–	TRIG_IN[3]	–
P2.2	PWM1_5	PWM1_6_N	TC1_5_TR0	TC1_6_TR1	TC1_H_6_TR0	SCB7_RTS	SCB7_SCL	SCB7_CLK	–	–	–	–	ETH0_RX_ER	–	TRIG_IN[4]	–
P2.3	PWM1_4	PWM1_5_N	TC1_4_TR0	TC1_5_TR1	TC1_H_7_TR0	SCB7_CTS	–	SCB7_SEL0	–	–	–	–	ETH0_ETH_TSU_TIM-ER_CMP_VAL	–	TRIG_IN[5]	–
P2.4	PWM1_3	PWM1_4_N	TC1_3_TR0	TC1_4_TR1	PWM1_H_4_N	–	–	SCB7_SEL1	–	–	–	–	–	–	TRIG_IN[6]	–
P2.5	PWM1_2	PWM1_3_N	TC1_2_TR0	TC1_3_TR1	PWM1_H_5_N	–	–	SCB7_SEL2	–	–	–	–	–	–	TRIG_IN[7]	–
P2.6	PWM1_72	PWM1_71_N	TC1_72_TR0	TC1_71_TR1	–	SCB8_CTS	–	SCB8_SEL0	–	–	–	–	–	–	–	–
P2.7	PWM1_73	PWM1_72_N	TC1_73_TR0	TC1_72_TR1	–	–	–	SCB8_SEL1	–	–	–	–	–	–	–	–
P3.0	PWM1_1	PWM1_2_N	TC1_1_TR0	TC1_2_TR1	PWM1_H_6_N	SCB6_RX	–	SCB6_MISO	–	CAN0_3_TX	–	–	ETH0_MDIO	–	–	TRIG_DBG[0]
P3.1	PWM1_0	PWM1_1_N	TC1_0_TR0	TC1_1_TR1	PWM1_H_7_N	SCB6_TX	SCB6_SDA	SCB6_MOSI	–	CAN0_3_RX	–	–	ETH0_MDC	–	–	TRIG_DBG[1]
P3.2	PWM1_M_3	PWM1_0_N	TC1_M_3_TR0	TC1_0_TR1	TC1_H_4_TR1	SCB6_RTS	SCB6_SCL	SCB6_CLK	–	–	–	–	–	–	–	–
P3.3	PWM1_M_2	PWM1_M_3_N	TC1_M_2_TR0	TC1_M_3_TR1	TC1_H_5_TR1	SCB6_CTS	–	SCB6_SEL0	–	–	–	–	–	–	–	–
P3.4	PWM1_M_1	PWM1_M_2_N	TC1_M_1_TR0	TC1_M_2_TR1	TC1_H_6_TR1	–	–	SCB6_SEL1	–	–	–	–	–	–	–	–

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P3.5	PWM1_M_0	PWM1_M_1_N	TC1_M_0_TR0	TC1_M_1_TR1	TC1_H_7_TR1	–	–	SCB6_SEL2	–	–	–	–	–	–	–	–
P3.6	PWM1_74	PWM1_73_N	TC1_74_TR0	TC1_73_TR1	–	–	–	SCB8_SEL2	–	CAN1_2_TX	–	–	–	–	–	–
P3.7	PWM1_75	PWM1_74_N	TC1_75_TR0	TC1_74_TR1	–	–	–		–	CAN1_2_RX	–	–	–	–	–	–
P4.0	PWM1_4	PWM1_M_0_N	TC1_4_TR0	TC1_M_0_TR1	EXT_MUX[0]_0	SCB5_RX	–	SCB5_MISO	–	–	–	–	–	–	TRIG_IN[10]	–
P4.1	PWM1_5	PWM1_4_N	TC1_5_TR0	TC1_4_TR1	EXT_MUX[0]_1	SCB5_TX	SCB5_SDA	SCB5_MOSI	–	–	–	–	–	–	TRIG_IN[11]	–
P4.2	PWM1_6	PWM1_5_N	TC1_6_TR0	TC1_5_TR1	EXT_MUX[0]_2	SCB5_RTS	SCB5_SCL	SCB5_CLK	–	–	–	–	–	–	TRIG_IN[12]	–
P4.3	PWM1_7	PWM1_6_N	TC1_7_TR0	TC1_6_TR1	EXT_MUX[0]_EN	SCB5_CTS	–	SCB5_SEL0	–	CAN0_1_TX	–	–	–	–	TRIG_IN[13]	–
P4.4	PWM1_8	PWM1_7_N	TC1_8_TR0	TC1_7_TR1	–	–	–	SCB5_SEL1	–	CAN0_1_RX	–	–	–	–	–	–
P5.0	PWM1_9	PWM1_8_N	TC1_9_TR0	TC1_8_TR1	PWM1_H_10	–	–	SCB5_SEL2	–	–	PWM0_M_0	–	–	–	TRIG_IN[38]	–
P5.1	PWM1_10	PWM1_9_N	TC1_10_TR0	TC1_9_TR1	PWM1_H_10_N	–	–	SCB9_SEL3	–	–	PWM0_M_0_N	–	–	–	TRIG_IN[39]	–
P5.2	PWM1_11	PWM1_10_N	TC1_11_TR0	TC1_10_TR1	TC1_H_10_TR0	–	–	–	–	–	TC0_M_0_TR0	–	–	–	–	–
P5.3	PWM1_12	PWM1_11_N	TC1_12_TR0	TC1_11_TR1	TC1_H_10_TR1	–	–	–	–	–	TC0_M_0_TR1	–	–	–	–	–
P5.4	PWM1_13	PWM1_12_N	TC1_13_TR0	TC1_12_TR1	PWM1_H_11	–	–	–	–	–	–	–	–	–	–	–
P5.5	PWM1_14	PWM1_13_N	TC1_14_TR0	TC1_13_TR1	PWM1_H_11_N	–	–	–	–	–	–	–	–	–	–	–
P6.0	PWM1_M_0	PWM1_14_N	TC1_M_0_TR0	TC1_14_TR1	TC1_H_11_TR0	SCB4_RX	–	SCB4_MISO	–	–	PWM0_0	–	–	–	–	–
P6.1	PWM1_0	PWM1_M_0_N	TC1_0_TR0	TC1_M_0_TR1	TC1_H_11_TR1	SCB4_TX	SCB4_SDA	SCB4_MOSI	–	–	–	–	–	–	–	–
P6.2	PWM1_M_1	PWM1_0_N	TC1_M_1_TR0	TC1_0_TR1	PWM1_H_12	SCB4_RTS	SCB4_SCL	SCB4_CLK	–	CAN0_2_TX	PWM0_0_N	–	–	SDHC_CARD_-MECH_WRITE_PROT	–	–
P6.3	PWM1_1	PWM1_M_1_N	TC1_1_TR0	TC1_M_1_TR1	PWM1_H_12_N	SCB4_CTS	–	SCB4_SEL0	–	CAN0_2_RX	–	SPIHB_CLK	–	SDHC_-CARD_CMD	–	CAL_SUP_NZ
P6.4	PWM1_M_2	PWM1_1_N	TC1_M_2_TR0	TC1_1_TR1	TC1_H_12_TR0	–	–	SCB4_SEL1	–	–	TC0_0_TR0	SPIHB_RWDS	–	SDHC_-CLK_CARD	–	–
P6.5	PWM1_2	PWM1_M_2_N	TC1_2_TR0	TC1_M_2_TR1	TC1_H_12_TR1	–	–	SCB4_SEL2	–	–	TC0_0_TR1	SPIHB_SEL0	–	SDHC_CARD_-DETECT_N	–	–
P6.6	PWM1_M_3	PWM1_2_N	TC1_M_3_TR0	TC1_2_TR1	–	–	–	SCB4_SEL3	–	–	–	–	–	–	TRIG_IN[8]	–
P6.7	PWM1_3	PWM1_M_3_N	TC1_3_TR0	TC1_M_3_TR1	–	–	–	–	–	–	–	–	–	–	TRIG_IN[9]	–

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P7.0	PWM1_M_4	PWM1_3_N	TC1_M_4_TR0	TC1_3_TR1	–	SCB5_RX	–	SCB5_MISO	–	–	PWM0_1	SPIHB_SEL 1	–	SDHC_-CARD_IF_P-WR_EN	–	–
P7.1	PWM1_15	PWM1_M_4_N	TC1_15_TR0	TC1_M_4_TR1	–	SCB5_TX	SCB5_SDA	SCB5_MOSI	–	–	–	SPIHB_-DATA0	–	SDHC_CARD_-DAT_3TO0_0	–	–
P7.2	PWM1_M_5	PWM1_15_N	TC1_M_5_TR0	TC1_15_TR1	–	SCB5_RTS	SCB5_SCL	SCB5_CLK	–	–	PWM0_1_N	SPIHB_-DATA1	–	SDHC_CARD_-DAT_3TO0_1	–	–
P7.3	PWM1_16	PWM1_M_5_N	TC1_16_TR0	TC1_M_5_TR1	–	SCB5_CTS	–	SCB5_SEL0	–	CAN0_4_TX	TC0_1_TR0	SPIHB_-DATA2	–	SDHC_CARD_-DAT_3TO0_2	–	–
P7.4	PWM1_M_6	PWM1_16_N	TC1_M_6_TR0	TC1_16_TR1	–	–	–	SCB5_SEL1	–	CAN0_4_RX	TC0_1_TR1	SPIHB_-DATA3	–	SDHC_CARD_-DAT_3TO0_3	–	–
P7.5	PWM1_17	PWM1_M_6_N	TC1_17_TR0	TC1_M_6_TR1	–	–	–	SCB5_SEL2	–	–	PWM0_H_2	SPIHB_-DATA4	–	SDHC_CARD_-DAT_7TO4_0	–	–
P7.6	PWM1_M_7	PWM1_17_N	TC1_M_7_TR0	TC1_17_TR1	–	–	–	–	–	–	–	–	–	–	TRIG_IN[16]	–
P7.7	PWM1_18	PWM1_M_7_N	TC1_18_TR0	TC1_M_7_TR1	–	–	–	–	–	–	–	–	–	–	TRIG_IN[17]	–
P8.0	PWM1_19	PWM1_18_N	TC1_19_TR0	TC1_18_TR1	PWM1_H_8	–	–	–	–	CAN0_0_TX	PWM0_H_2_N	SPIHB_-DATA5	–	SDHC_CARD_-DAT_7TO4_1	–	–
P8.1	PWM1_20	PWM1_19_N	TC1_20_TR0	TC1_19_TR1	PWM1_H_8_N	–	–	–	–	CAN0_0_RX	TC0_H_2_TR0	SPIHB_-DATA6	–	SDHC_CARD_-DAT_7TO4_2	TRIG_IN[14]	–
P8.2	PWM1_21	PWM1_20_N	TC1_21_TR0	TC1_20_TR1	TC1_H_8_TR0	–	–	–	–	–	TC0_H_2_TR1	SPIHB_-DATA7	–	SDHC_CARD_-DAT_7TO4_3	TRIG_IN[15]	–
P8.3	PWM1_22	PWM1_21_N	TC1_22_TR0	TC1_21_TR1	TC1_H_8_TR1	–	–	–	–	–	–	–	–	–	–	TRIG_DBG[0]
P8.4	PWM1_23	PWM1_22_N	TC1_23_TR0	TC1_22_TR1	–	–	–	–	–	–	–	–	–	–	–	TRIG_DBG[1]
P9.0	PWM1_24	PWM1_23_N	TC1_24_TR0	TC1_23_TR1	PWM1_H_9	–	–	–	–	–	–	–	–	–	–	–
P9.1	PWM1_25	PWM1_24_N	TC1_25_TR0	TC1_24_TR1	PWM1_H_9_N	–	–	–	–	–	–	–	–	–	–	–
P9.2	PWM1_26	PWM1_25_N	TC1_26_TR0	TC1_25_TR1	TC1_H_9_TR0	–	–	–	–	–	–	–	–	–	–	–
P9.3	PWM1_27	PWM1_26_N	TC1_27_TR0	TC1_26_TR1	TC1_H_9_TR1	–	–	–	–	–	–	–	–	–	–	–
P10.0	PWM1_28	PWM1_27_N	TC1_28_TR0	TC1_27_TR1	PWM1_H_10	SCB4_RX	–	SCB4_MISO	–	–	–	–	–	–	TRIG_IN[18]	–
P10.1	PWM1_29	PWM1_28_N	TC1_29_TR0	TC1_28_TR1	PWM1_H_10_N	SCB4_TX	SCB4_SDA	SCB4_MOSI	–	–	–	–	–	–	TRIG_IN[19]	–
P10.2	PWM1_30	PWM1_29_N	TC1_30_TR0	TC1_29_TR1	TC1_H_10_TR0	SCB4_RTS	SCB4_SCL	SCB4_CLK	–	–	–	–	–	–	–	–
P10.3	PWM1_31	PWM1_30_N	TC1_31_TR0	TC1_30_TR1	TC1_H_10_TR1	SCB4_CTS	–	SCB4_SEL0	–	–	–	–	–	–	–	–
P10.4	PWM1_32	PWM1_31_N	TC1_32_TR0	TC1_31_TR1	PWM1_H_11	–	–	SCB4_SEL1	–	–	–	–	–	–	–	–
P10.5	PWM1_33	PWM1_32_N	TC1_33_TR0	TC1_32_TR1	PWM1_H_11_N	–	–	SCB4_SEL2	–	–	–	–	–	–	–	–

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P10.6		PWM1_33_N		TC1_33_TR1	TC1_H_11_TR0	–	–	TC1_34_TR0	–	–	PWM1_34	–	–	–	–	–
P10.7	PWM1_35	PWM1_34_N	TC1_35_TR0	TC1_34_TR1	TC1_H_11_TR1	–	–		–	–	–	–	–		–	–
P11.0	PWM1_61	PWM1_62_N	TC1_61_TR0	TC1_62_TR1	–	–	–		–	–	–	–	–	AUDIOSS0_MCLK	–	–
P11.1	PWM1_60	PWM1_61_N	TC1_60_TR0	TC1_61_TR1	–	–	–		–	–	–	–	–	AUDIOSS0_TX_SCK	–	–
P11.2	PWM1_59	PWM1_60_N	TC1_59_TR0	TC1_60_TR1	–	–	–		–	–	–	–	–	AUDIOSS0_TX_WS	–	–
P12.0	PWM1_36	–	TC1_36_TR0	–	–	SCB8_RX	TC1_35_TR1	SCB8_MISO	–	CAN0_2_TX	PWM0_H_1	PWM1_35_N	–	AUDIOSS0_TX_SDO	TRIG_IN[20]	–
P12.1	PWM1_37	PWM1_36_N	TC1_37_TR0	TC1_36_TR1	–	SCB8_TX	SCB8_SDA	SCB8_MOSI	–	CAN0_2_RX	PWM0_H_1_N	–	–	AUDIOSS0_-CLK_I2S_IF	TRIG_IN[21]	–
P12.2	PWM1_38	PWM1_37_N	TC1_38_TR0	TC1_37_TR1	EXT_MUX[1]_EN	SCB8_RTS	SCB8_SCL	SCB8_CLK	–	–	TC0_H_1_TR0	–	–	AUDIOSS0_RX_SCK	–	–
P12.3	PWM1_39	PWM1_38_N	TC1_39_TR0	TC1_38_TR1	EXT_MUX[1]_0	SCB8_CTS		SCB8_SEL0	–	–	TC0_H_1_TR1	–	–	AUDIOSS0_RX_WS	–	–
P12.4	PWM1_40	PWM1_39_N	TC1_40_TR0	TC1_39_TR1	EXT_MUX[1]_1	–	–	SCB8_SEL1		CAN1_1_TX	TC0_2_TR1	–	–	AUDIOSS0_RX_SDI	–	–
P12.5	PWM1_41	PWM1_40_N	TC1_41_TR0	TC1_40_TR1	EXT_MUX[1]_2	–	–	–	–	CAN1_1_RX	–	–	–	–	–	–
P12.6	PWM1_42	PWM1_41_N	TC1_42_TR0	TC1_41_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P12.7	PWM1_43	PWM1_42_N	TC1_43_TR0	TC1_42_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P13.0	PWM1_M_8	PWM1_43_N	TC1_M_8_TR0	TC1_43_TR1	EXT_MUX[2]_0	SCB3_RX		–	–	SCB3_MISO	TC0_2_TR0	–	–	AUDIOSS1_MCLK	–	–
P13.1	PWM1_44	PWM1_M_8_N	TC1_44_TR0	TC1_M_8_TR1	EXT_MUX[2]_1	SCB3_TX	SCB3_SDA	–	–	SCB3_MOSI	PWM0_2_N	–	–	AUDIOSS1_TX_SCK	–	–
P13.2	PWM1_M_9	PWM1_44_N	TC1_M_9_TR0	TC1_44_TR1	EXT_MUX[2]_2	SCB3_RTS	SCB3_SCL	–	–	SCB3_CLK	PWM0_2	–	–	AUDIOSS1_TX_WS	–	–
P13.3	PWM1_45	PWM1_M_9_N	TC1_45_TR0	TC1_M_9_TR1	EXT_MUX[2]_EN	SCB3_CTS	–	–	–	SCB3_SEL0	–	–	–	AUDIOSS1_TX_SDO	–	–
P13.4	PWM1_M_10	PWM1_45_N	TC1_M_10_TR0	TC1_45_TR1	PWM1_H_4	–	–	–	–	SCB3_SEL1	–	–	–	AUDIOSS1_-CLK_I2S_IF	–	–
P13.5	PWM1_46	PWM1_M_10_N	TC1_46_TR0	TC1_M_10_TR1	PWM1_H_4_N	–	–	–	–	SCB3_SEL2	–	–	–	AUDIOSS1_RX_SCK	–	–
P13.6	PWM1_M_11	PWM1_46_N	TC1_M_11_TR0	TC1_46_TR1	PWM1_H_5	–	–	–	–	SCB3_SEL3	–	–	–	AUDIOSS1_RX_WS	TRIG_IN[22]	–
P13.7	PWM1_47	PWM1_M_11_N	TC1_47_TR0	TC1_M_11_TR1	PWM1_H_5_N	–	–	–	–	–	–	–	–	AUDIOSS1_RX_SDI	TRIG_IN[23]	–
P14.0	PWM1_48	PWM1_47_N	TC1_48_TR0	TC1_47_TR1	PWM1_H_6	SCB2_MISO	–	SCB2_RX	–	CAN1_0_TX	PWM0_M_1	–	–	AUDIOSS2_MCLK	–	–

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P14.1	PWM1_49	PWM1_48_N	TC1_49_TR0	TC1_48_TR1	PWM1_H_6_N	SCB2_MOSI	SCB2_SDA	SCB2_TX	–	CAN1_0_RX	PWM0_M_1_N	–	–	AUDIOSS2_TX_SCK	–	–
P14.2	PWM1_50	PWM1_49_N	TC1_50_TR0	TC1_49_TR1	PWM1_H_7	SCB2_CLK	SCB2_SCL	SCB2_RTS	–	–	TC0_M_1_TR0	–	–	–	–	–
P14.3	PWM1_51	PWM1_50_N	TC1_51_TR0	TC1_50_TR1	PWM1_H_7_N	SCB2_SEL 0	–	SCB2_CTS	–	–	TC0_M_1_TR1	–	–	–	–	–
P14.4	PWM1_52	PWM1_51_N	TC1_52_TR0	TC1_51_TR1	TC1_H_4_TR0	SCB2_SEL 1	–	–	–	–	–	–	–	AUDIOSS2_TX_WS	–	–
P14.5	PWM1_53	PWM1_52_N	TC1_53_TR0	TC1_52_TR1	TC1_H_4_TR1	SCB2_SEL 2	–	–	–	–	–	–	–	AUDIOSS2_TX_SDO	–	–
P14.6	PWM1_54	PWM1_53_N	TC1_54_TR0	TC1_53_TR1	TC1_H_5_TR0	–	–	–	–	–	–	–	–	–	TRIG_IN[24]	–
P14.7	PWM1_55	PWM1_54_N	TC1_55_TR0	TC1_54_TR1	TC1_H_5_TR1	–	–	–	–	–	–	–	–	–	TRIG_IN[25]	–
P15.0	PWM1_56	PWM1_55_N	TC1_56_TR0	TC1_55_TR1	TC1_H_6_TR0	SCB9_RX		SCB9_MISO	–	CAN1_3_TX	–	–	–	AUDIOSS2_-CLK_I2S_IF	–	–
P15.1	PWM1_57	PWM1_56_N	TC1_57_TR0	TC1_56_TR1	TC1_H_6_TR1	SCB9_TX	SCB9_SDA	SCB9_MOSI	–	CAN1_3_RX	–	–	–	AUDIOSS2_RX_SCK	–	–
P15.2	PWM1_58	PWM1_57_N	TC1_58_TR0	TC1_57_TR1	TC1_H_7_TR0	SCB9_RTS	SCB9_SCL	SCB9_CLK	–	–	–	–	–	AUDIOSS2_RX_WS	–	–
P15.3	PWM1_59	PWM1_58_N	TC1_59_TR0	TC1_58_TR1	TC1_H_7_TR1	SCB9_CTS	–	SCB9_SEL0	–	–	–	–	–	AUDIOSS2_RX_SDI	–	–
P16.0	PWM1_60	PWM1_59_N	TC1_60_TR0	TC1_59_TR1	PWM1_H_0	–	–	SCB9_SEL1	–	–	–	–	–	–	–	–
P16.1	PWM1_61	PWM1_60_N	TC1_61_TR0	TC1_60_TR1	PWM1_H_0_N	–	–	SCB9_SEL2	–	–	–	–	–	–	–	–
P16.2	PWM1_62	PWM1_61_N	TC1_62_TR0	TC1_61_TR1	PWM1_H_1	–	–	SCB9_SEL3	–	–	–	–	–	–	–	–
P16.3	PWM1_62	PWM1_62_N	TC1_62_TR0	TC1_62_TR1	PWM1_H_1_N	–	–	–	–	–	–	–	–	–	–	–
P16.4	PWM1_68	PWM1_69_N	TC1_68_TR0	TC1_69_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P16.5	PWM1_67	PWM1_68_N	TC1_67_TR0	TC1_68_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P16.6	PWM1_66	PWM1_67_N	TC1_66_TR0	TC1_67_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P16.7	PWM1_65	PWM1_66_N	TC1_65_TR0	TC1_66_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P17.0	PWM1_61	PWM1_62_N	TC1_61_TR0	TC1_62_TR1	–	–	–	–	–	CAN1_1_TX	–	–	–	–	–	–
P17.1	PWM1_60	PWM1_61_N	TC1_60_TR0	TC1_61_TR1	–	SCB3_RX		–	–	CAN1_1_RX	–	–	–	–	–	–
P17.2	PWM1_59	PWM1_60_N	TC1_59_TR0	TC1_60_TR1	–	SCB3_TX	SCB3_SDA	–	–		–	–	–	–	–	–
P17.3	PWM1_58	PWM1_59_N	TC1_58_TR0	TC1_59_TR1	PWM1_H_3	SCB3_RTS	SCB3_SCL	–	–	SCB3_CLK	–	–	–	–	TRIG_IN[26]	–
P17.4	PWM1_57	PWM1_58_N	TC1_57_TR0	TC1_58_TR1	PWM1_H_3_N	SCB3_CTS	–	–	–	SCB3_SEL0	–	–	–	–	TRIG_IN[27]	–
P17.5	PWM1_56	PWM1_57_N	TC1_56_TR0	TC1_57_TR1	PWM1_H_2	–	–	–	–	SCB3_SEL1	–	–	–	–	–	–

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P17.6	PWM1_M_4	PWM1_56_N	TC1_M_4_TR0	TC1_56_TR1	PWM1_H_2_N	–	–	–	–	SCB3_SEL2	–	–	–	–	–	–
P17.7	PWM1_M_5	PWM1_M_4_N	TC1_M_5_TR0	TC1_M_4_TR1	_	–	–	–	–	–	–	–	–	–	–	–
P18.0	PWM1_M_6	PWM1_M_5_N	TC1_M_6_TR0	TC1_M_5_TR1	PWM1_H_0	SCB1_RX	–	SCB1_MISO	–	–	–	–	ETH0_REF_CLK	–	–	FAULT_OUT_0
P18.1	PWM1_M_7	PWM1_M_6_N	TC1_M_7_TR0	TC1_M_6_TR1	PWM1_H_0_N	SCB1_TX	SCB1_SDA	SCB1_MOSI	–	SCB3_MISO	–	–	ETH0_TX_CTL	–	–	FAULT_OUT_1
P18.2	PWM1_55	PWM1_M_7_N	TC1_55_TR0	TC1_M_7_TR1	PWM1_H_1	SCB1_RTS	SCB1_SCL	SCB1_CLK	–	SCB3_MOSI	–	–	ETH0_TX_ER	–	–	–
P18.3	PWM1_54	PWM1_55_N	TC1_54_TR0	TC1_55_TR1	PWM1_H_1_N	SCB1_CTS	–	SCB1_SEL0	–	SCB3_CLK	–	–	ETH0_TX_CLK	–	–	TRACE_-CLOCK
P18.4	PWM1_53	PWM1_54_N	TC1_53_TR0	TC1_54_TR1	PWM1_H_2	–	–	SCB1_SEL1	–	SCB3_SEL0	PWM0_M_2	–	ETH0_TXD_0	–	–	TRACE_-DATA_0
P18.5	PWM1_52	PWM1_53_N	TC1_52_TR0	TC1_53_TR1	PWM1_H_2_N	–	–	SCB1_SEL2	–	–	PWM0_M_2_N	–	ETH0_TXD_1	–	–	TRACE_-DATA_1
P18.6	PWM1_51	PWM1_52_N	TC1_51_TR0	TC1_52_TR1	PWM1_H_3	–	–	SCB1_SEL3	–	CAN1_2_TX	TC0_M_2_TR0	–	ETH0_TXD_2	–	–	TRACE_-DATA_2
P18.7	PWM1_50	PWM1_51_N	TC1_50_TR0	TC1_51_TR1	PWM1_H_3_N	–	–	–	–	CAN1_2_RX	TC0_M_2_TR1	–	ETH0_TXD_3	–	–	TRACE_-DATA_3
P19.0	PWM1_M_3	PWM1_50_N	TC1_M_3_TR0	TC1_50_TR1	TC1_H_0_TR0	SCB2_MISO	–	SCB2_RX	–	CAN1_3_TX	–	–	ETH0_RXD_0	–	–	FAULT_OUT_2
P19.1	PWM1_26	PWM1_M_3_N	TC1_26_TR0	TC1_M_3_TR1	TC1_H_0_TR1	SCB2_MOSI	SCB2_SDA	SCB2_TX	–	CAN1_3_RX	–	–	ETH0_RXD_1	–	–	FAULT_OUT_3
P19.2	PWM1_27	PWM1_26_N	TC1_27_TR0	TC1_26_TR1	TC1_H_1_TR0	SCB2_CLK	SCB2_SCL	SCB2_RTS	–	–	–	–	ETH0_RXD_2	–	TRIG_IN[28]	–
P19.3	PWM1_28	PWM1_27_N	TC1_28_TR0	TC1_27_TR1	TC1_H_1_TR1	SCB2_SEL0	–	SCB2_CTS	–	–	–	–	ETH0_RXD_3	–	TRIG_IN[29]	–
P19.4	PWM1_29	PWM1_28_N	TC1_29_TR0	TC1_28_TR1	TC1_H_2_TR0	SCB2_SEL1	–	–	–	–	–	–		–	–	–
P20.0	PWM1_30	PWM1_29_N	TC1_30_TR0	TC1_29_TR1	TC1_H_2_TR1	SCB2_SEL2	–	–	–	–	–	–		–	–	–
P20.1	PWM1_49	PWM1_30_N	TC1_49_TR0	TC1_30_TR1	TC1_H_3_TR0	–	–	–	–	–	–	–		–	–	–
P20.2	PWM1_48	PWM1_49_N	TC1_48_TR0	TC1_49_TR1	TC1_H_3_TR1	–	–	–	–	–	–	–	–	–	–	–
P20.3	PWM1_47	PWM1_48_N	TC1_47_TR0	TC1_48_TR1	–	SCB1_RX	–	SCB1_MISO	–	CAN1_2_TX	–	–	–	–	–	–
P20.4	PWM1_46	PWM1_47_N	TC1_46_TR0	TC1_47_TR1	–	SCB1_TX	SCB1_SDA	SCB1_MOSI	–	CAN1_2_RX	–	–	–	–	–	–
P20.5	PWM1_45	PWM1_46_N	TC1_45_TR0	TC1_46_TR1	–	SCB1_RTS	SCB1_SCL	SCB1_CLK	–	–	–	–	–	–	–	–
P20.6	PWM1_44	PWM1_45_N	TC1_44_TR0	TC1_45_TR1	–	SCB1_CTS	–	SCB1_SEL0	–	CAN1_4_TX	–	–	–	–	–	–
P20.7	PWM1_43	PWM1_44_N	TC1_43_TR0	TC1_44_TR1	–	–	–	SCB1_SEL1	–	CAN1_4_RX	–	–	–	–	–	–

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P21.0	PWM1_42	PWM1_43_N	TC1_42_TR0	TC1_43_TR1	–	–	–	SCB1_SEL2	–	–	–	–	–	–	–	–
P21.1	PWM1_41	PWM1_42_N	TC1_41_TR0	TC1_42_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P21.2	PWM1_40	PWM1_41_N	TC1_40_TR0	TC1_41_TR1	–	–	–	–	–	–	EXT_CLK	–	–	–	–	TRIG_DBG[1]
P21.3	PWM1_39	PWM1_40_N	TC1_39_TR0	TC1_40_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P21.4	PWM1_38	PWM1_39_N	TC1_38_TR0	TC1_39_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P21.5	PWM1_37	PWM1_38_N	TC1_37_TR0	TC1_38_TR1	–	–	TC1_35_TR1	TC1_34_TR0	–	CAN1_1_TX	PWM1_34	PWM1_35_N	ETH0_RX_CTL	–	–	TRACE_-DATA_0
P21.6	PWM1_36	PWM1_37_N	TC1_36_TR0	TC1_37_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P21.7	PWM1_35	PWM1_36_N	TC1_35_TR0	TC1_36_TR1	–	SCB6_RX	–	SCB6_MISO	–	–	–	–	–	–	–	CAL_SUP_NZ
P22.1	PWM1_33	PWM1_34_N	TC1_33_TR0	TC1_34_TR1	–	SCB6_TX	SCB6_SDA	SCB6_MOSI	–	CAN1_1_RX	–	–	–	–	–	TRACE_-DATA_1
P22.2	PWM1_32	PWM1_33_N	TC1_32_TR0	TC1_33_TR1	–	SCB6_RTS	SCB6_SCL	SCB6_CLK	–	–	–	–	–	–	–	TRACE_-DATA_2
P22.3	PWM1_31	PWM1_32_N	TC1_31_TR0	TC1_32_TR1	–	SCB6_CTS	–	SCB6_SEL0	–	–	–	–	–	–	–	TRACE_-DATA_3
P22.4	PWM1_30	PWM1_31_N	TC1_30_TR0	TC1_31_TR1	–	–	–	SCB6_SEL1	–	–	–	–	–	–	–	TRACE_-CLOCK
P22.5	PWM1_29	PWM1_30_N	TC1_29_TR0	TC1_30_TR1	PWM1_H_8	–	–	SCB6_SEL2	–	–	–	–	–	–	–	–
P22.6	PWM1_28	PWM1_29_N	TC1_28_TR0	TC1_29_TR1	PWM1_H_8_N	–	–	–	–	–	–	–	–	–	–	–
P22.7	PWM1_27	PWM1_28_N	TC1_27_TR0	TC1_28_TR1	TC1_H_8_TR0	–	–	–	–	–	–	–	–	–	–	–
P23.0	PWM1_M_8	PWM1_27_N	TC1_M_8_TR0	TC1_27_TR1	TC1_H_8_TR1	SCB7_RX	–	SCB7_MISO	–	CAN1_0_TX	–	–	–	–	–	FAULT_OUT_0
P23.1	PWM1_M_9	PWM1_M_8_N	TC1_M_9_TR0	TC1_M_8_TR1	–	SCB7_TX	SCB7_SDA	SCB7_MOSI	–	CAN1_0_RX	–	–	–	–	–	FAULT_OUT_1
P23.2	PWM1_M_10	PWM1_M_9_N	TC1_M_10_TR0	TC1_M_9_TR1	–	SCB7_RTS	SCB7_SCL	SCB7_CLK	–	–	–	–	–	–	–	FAULT_OUT_2
P23.3	PWM1_M_11	PWM1_M_10_N	TC1_M_11_TR0	TC1_M_10_TR1	–	SCB7_CTS	–	SCB7_SEL0	–	–	–	–	ETH0_RX_CLK	–	TRIG_IN[30]	FAULT_OUT_3
P23.4	PWM1_25	PWM1_M_11_N	TC1_25_TR0	TC1_M_11_TR1	PWM1_H_9	SCB2_MISO	–	SCB7_SEL1	–	–	–	–	–	–	TRIG_IN[31]	TRIG_DBG[0]
P23.5	PWM1_24	PWM1_25_N	TC1_24_TR0	TC1_25_TR1	PWM1_H_9_N	SCB2_MOSI	–	SCB7_SEL2	–	–	–	–	–	–	–	–
P23.6	PWM1_23	PWM1_24_N	TC1_23_TR0	TC1_24_TR1	TC1_H_9_TR0	SCB2_CLK	–		–	–	–	–	–	–	–	–
P23.7	PWM1_22	PWM1_23_N	TC1_22_TR0	TC1_23_TR1	TC1_H_9_TR1	SCB2_SEL0	–	–	–	–	EXT_CLK	–	–	–	–	CAL_SUP_NZ

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P24.0	–	–	–	–	–	–	–	–	–	–	EXT_CLK	–	–	SDHC_CARD_-DETECT_N	–	–
P24.1	–	–	–	–	–	–	–	–	–	–	–	SPIHB_CLK	–	SDHC_CARD_-MECH_WRITE_PROT	–	–
P24.2	–	–	–	–	–	–	–	–	–	–	–	SPIHB_RWDS	–	SDHC_-CLK_CARD	–	–
P24.3	–	–	–	–	–	–	–	–	–	–	–	SPIHB_SEL 0	–	SDHC_-CARD_CMD	–	–
P24.4	–	–	–	–	–	–	–	–	–	–	–	SPIHB_SEL 1	–	SDHC_-CARD_IF_P-WR_EN	–	–
P25.0	–	–	–	–	–	–	–	–	–	–	–	SPIHB_-DATA0	–	SDHC_CARD_-DAT_3TO0_0	–	–
P25.1	–	–	–	–	–	–	–	–	–	–	–	SPIHB_-DATA1	–	SDHC_CARD_-DAT_3TO0_1	–	–
P25.2	–	–	–	–	–	–	–	–	–	–	–	SPIHB_-DATA2	–	SDHC_CARD_-DAT_3TO0_2	–	–
P25.3	–	–	–	–	–	–	–	–	–	–	–	SPIHB_-DATA3	–	SDHC_CARD_-DAT_3TO0_3	–	–
P25.4	–	–	–	–	–	–	–	–	–	–	–	SPIHB_-DATA4	–	SDHC_CARD_-DAT_7TO4_0	–	–
P25.5	–	–	–	–	–	–	–	–	–	–	–	SPIHB_-DATA5	–	SDHC_CARD_-DAT_7TO4_1	–	–
P25.6	–	–	–	–	–	–	–	–	–	–	–	SPIHB_-DATA6	–	SDHC_CARD_-DAT_7TO4_2	–	–
P25.7	–	–	–	–	–	–	–	–	–	–	–	SPIHB_-DATA7	–	SDHC_CARD_-DAT_7TO4_3	–	–
P26.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_REF_CLK
P26.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_TX_CTL
P26.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_TX_CLK
P26.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_TXD_0
P26.4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_TXD_1
P26.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_TXD_2
P26.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_TXD_3
P26.7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_RXD_0
P27.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_RXD_1

注释
22. High Speed I/O 矩阵连接 (HCon) 基准请参见**表 14**。
23. 运行模式顺序（ACT #0、ACT #1 等）对配置备用功能没有任何影响； HSIOM 模块处理替换功能分配。
24. 有关使用的引脚多路复用器缩写的更多信息，请参见**表 18**。
25. 对于任何标有标识符 (n) 的函数，交流时序仅在相应的组“n”内得到保证。

Pin	Active mapping															
	HCon#8[22]	HCon#9	HCon#10	HCon#11	HCon#16	HCon#17	HCon#18	HCon#19	HCon#20	HCon#21	HCon#22	HCon#23	HCon#24	HCon#25	HCon#26	HCon#27
Name	ACT #0[23]	ACT #1	ACT #2	ACT #3	ACT #4	ACT #5	ACT #6	ACT #7	ACT #8	ACT #9	ACT #10	ACT #11	ACT #12	ACT #13	ACT #14	ACT #15
P27.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_RXD_2
P27.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_RXD_3
P27.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_RX_CTL
P27.4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_RX_CLK
P27.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_MDIO
P27.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_MDC
P27.7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	ETH1_ETH_T SU_TIM-ER_CMP_VAL
P28.0	PWM1_63	PWM1_65_N	TC1_63_TR0	TC1_65_TR1	PWM1_H_12	SCB10_RX	–	SCB10_MISO	–	–	–	–	–	–	–	–
P28.1	PWM1_64	PWM1_63_N	TC1_64_TR0	TC1_63_TR1	PWM1_H_12_N	SCB10_TX	SCB10_SDA	SCB10_MOSI	–	–	–	–	–	–	–	–
P28.2	PWM1_65	PWM1_64_N	TC1_65_TR0	TC1_64_TR1	TC1_H_12_TR0	SCB10_RTS	SCB10_SCL	SCB10_CLK	–	–	–	–	–	–	–	–
P28.3	PWM1_66	PWM1_65_N	TC1_66_TR0	TC1_65_TR1	TC1_H_12_TR1	SCB10_CTS	–	SCB10_SEL0	–	–	–	–	–	–	–	–
P28.4	PWM1_67	PWM1_66_N	TC1_67_TR0	TC1_66_TR1	–	–	–	SCB10_SEL1	–	–	–	–	–	–	–	–
P28.5	PWM1_68	PWM1_67_N	TC1_68_TR0	TC1_67_TR1	–	–	–	SCB10_SEL2	–	–	–	–	–	–	–	–
P28.6	PWM1_69	PWM1_68_N	TC1_69_TR0	TC1_68_TR1	–	–	–	SCB10_SEL3	–	–	–	–	–	–	–	–
P28.7	PWM1_70	PWM1_69_N	TC1_70_TR0	TC1_69_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P29.0	PWM1_76	PWM1_75_N	TC1_76_TR0	TC1_75_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P29.1	PWM1_77	PWM1_76_N	TC1_77_TR0	TC1_76_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P29.2	PWM1_78	PWM1_77_N	TC1_78_TR0	TC1_77_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P29.3	PWM1_79	PWM1_78_N	TC1_79_TR0	TC1_78_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P29.4	PWM1_80	PWM1_79_N	TC1_80_TR0	TC1_79_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P29.5	PWM1_81	PWM1_80_N	TC1_81_TR0	TC1_80_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P29.6	PWM1_82	PWM1_81_N	TC1_82_TR0	TC1_81_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P29.7	PWM1_83	PWM1_82_N	TC1_83_TR0	TC1_82_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P30.0	PWM1_83	PWM1_83_N	TC1_83_TR0	TC1_83_TR1	–	SCB9_RTS	SCB9_SCL	SCB9_CLK	–	–	–	–	–	–	TRIG_IN[34]	–
P30.1	PWM1_82	PWM1_83_N	TC1_82_TR0	TC1_83_TR1	–	SCB9_CTS	–	SCB9_SEL0	–	–	–	–	–	–	TRIG_IN[35]	–

注释
22. High Speed I/O 矩阵连接 (HCon) 基准请参见**表 14**。
23. 运行模式顺序（ACT #0、ACT #1 等）对配置备用功能没有任何影响； HSIOM 模块处理替换功能分配。
24. 有关使用的引脚多路复用器缩写的更多信息，请参见**表 18**。
25. 对于任何标有标识符 (n) 的函数，交流时序仅在相应的组“n”内得到保证。

Pin	Active mapping															
	HCon#8[22]	HCon#9	HCon#10	HCon#11	HCon#16	HCon#17	HCon#18	HCon#19	HCon#20	HCon#21	HCon#22	HCon#23	HCon#24	HCon#25	HCon#26	HCon#27
Name	ACT #0[23]	ACT #1	ACT #2	ACT #3	ACT #4	ACT #5	ACT #6	ACT #7	ACT #8	ACT #9	ACT #10	ACT #11	ACT #12	ACT #13	ACT #14	ACT #15
P30.2	PWM1_81	PWM1_82_N	TC1_81_TR0	TC1_82_TR1	–	–	–	SCB9_SEL1	–	CAN1_3_TX	–	–	–	–	TRIG_IN[36]	–
P30.3	PWM1_80	PWM1_81_N	TC1_80_TR0	TC1_81_TR1	–	–	–	SCB9_SEL2	–	CAN1_3_RX	–	–	–	–	TRIG_IN[37]	–
P31.0	PWM1_79	PWM1_80_N	TC1_79_TR0	TC1_80_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P31.1	PWM1_78	PWM1_79_N	TC1_78_TR0	TC1_79_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P31.2	PWM1_77	PWM1_78_N	TC1_77_TR0	TC1_78_TR1	–	–	–	–	–	–	–	–	–	–	–	–
P32.0	PWM1_76	PWM1_77_N	TC1_76_TR0	TC1_77_TR1	–	SCB10_RX	–	SCB10_MISO	–	–	–	–	–	–	TRIG_IN[40]	–
P32.1	PWM1_75	PWM1_76_N	TC1_75_TR0	TC1_76_TR1	–	SCB10_TX	SCB10_SDA	SCB10_MOSI	–	–	–	–	–	–	TRIG_IN[41]	–
P32.2	PWM1_74	PWM1_75_N	TC1_74_TR0	TC1_75_TR1	–	SCB10_RTS	SCB10_SCL	SCB10_CLK	–	–	–	–	–	–	TRIG_IN[42]	–
P32.3	PWM1_73	PWM1_74_N	TC1_73_TR0	TC1_74_TR1	–	SCB10_CTS	–	SCB10_SEL0	–	–	–	–	–	–	TRIG_IN[43]	–
P32.4	PWM1_72	PWM1_73_N	TC1_72_TR0	TC1_73_TR1	–	–	–	SCB10_SEL1	–	–	–	–	–	–	TRIG_IN[44]	–
P32.5	PWM1_71	PWM1_72_N	TC1_71_TR0	TC1_72_TR1	–	–	–	SCB10_SEL2	–	–	–	–	–	–	TRIG_IN[45]	–
P32.6	PWM1_70	PWM1_71_N	TC1_70_TR0	TC1_71_TR1	–	–	–	SCB10_SEL3	–	CAN1_4_TX	–	–	–	–	TRIG_IN[46]	–
P32.7	PWM1_69	PWM1_70_N	TC1_69_TR0	TC1_70_TR1	–	–	–	–	–	CAN1_4_RX	–	–	–	–	TRIG_IN[47]	–

注释
22. High Speed I/O 矩阵连接 (HCon) 基准请参见**表 14**。
23. 运行模式顺序（ACT #0、ACT #1 等）对配置备用功能没有任何影响； HSIOM 模块处理替换功能分配。
24. 有关使用的引脚多路复用器缩写的更多信息，请参见**表 18**。
25. 对于任何标有标识符 (n) 的函数，交流时序仅在相应的组“n”内得到保证。

13.1 引脚功能描述

表 18 引脚功能描述

Sl. No.	Pin	Module	Description
1	PWMx_y	TCPWM	TCPWM 16-bit PWM (no motor control), PWM_DT and PWM_PR line out, x-TCPWM block, y-counter number
2	PWMx_y_N	TCPWM	TCPWM 16-bit PWM (no motor control), PWM_DT and PWM_PR complementary line out (N), x-TCPWM block, y-counter number
3	PWMx_M_y	TCPWM	TCPWM 16-bit PWM with motor control line out, x-TCPWM block, y-counter number
4	PWMx_M_y_N	TCPWM	TCPWM 16-bit PWM with motor control complementary line out (N), x-TCPWM block, y-counter number
5	PWMx_H_y	TCPWM	TCPWM 32-bit PWM, PWM_DT and PWM_PR line out, x-TCPWM block, y-counter number
6	PWMx_H_y_N	TCPWM	TCPWM 32-bit PWM, PWM_DT and PWM_PR complementary line out (N), x-TCPWM block, y-counter number
7	TCx_y_TRz	TCPWM	TCPWM 16-bit dedicated counter input triggers, x-TCPWM block, y-counter number, z-trigger number
8	TCx_M_y_TRz	TCPWM	TCPWM 16-bit dedicated counter input triggers with motor control, x-TCPWM block, y-counter number, z-trigger number
9	TCx_H_y_TRz	TCPWM	TCPWM 32-bit dedicated counter input triggers, x-TCPWM block, y-counter number, z-trigger number
10	SCBx_RX	SCB	UART Receive, x-SCB block
11	SCBx_TX	SCB	UART Transmit, x-SCB block
12	SCBx_RTS	SCB	UART Request to Send (handshake), x-SCB block
13	SCBx_CTS	SCB	UART Clear to Send (handshake), x-SCB block
14	SCBx_SDA	SCB	I2C Data line, x-SCB block
15	SCBx_SCL	SCB	I2C Clock line, x-SCB block
16	SCBx_MISO	SCB	SPI Master Input Slave Output, x-SCB block
17	SCBx_MOSI	SCB	SPI Master Output Slave Input, x-SCB block
18	SCBx_CLK	SCB	SPI Serial Clock, x-SCB block
19	SCBx_SELy	SCB	SPI Slave Select, x-SCB block, y-select line
23	CANx_y_TX	CANFD	CAN Transmit line, x-CAN block, y-channel number
24	CANx_y_RX	CANFD	CAN Receive line, x-CAN block, y-channel number
25	SPIHB_CLK	SMIF	SMIF interface clock
26	SPIHB_RWDS	SMIF	SMIF (SPI/HYPERBUS™) read-write-data-strobe line
27	SPIHB_SELx	SMIF	SMIF (SPI/HYPERBUS™) memory select line, x-select line number
28	SPIHB_DATAx	SMIF	SMIF (SPI/HYPERBUS™) memory data read and write line, x-0 to 7 data lines
29	ETHx_RX_ER	Ethernet	Ethernet receive error indication line, x-ETH module number
30	ETHx_ETH_TSU_TIMER_C-MP_VAL	Ethernet	Ethernet time stamp unit timer compare indication line, x-ETH module number
31	ETHx_MDIO	Ethernet	Ethernet management data input/output (MDIO) interface to PHY, x-ETH module number
32	ETHx_MDC	Ethernet	Ethernet management data clock (MDC) line, x-ETH module number
33	ETHx_REF_CLK	Ethernet	Ethernet reference clock line, x-ETH module number
34	ETHx_TX_CTL	Ethernet	Ethernet transmit control line, x-ETH module number
35	ETHx_TX_ER	Ethernet	Ethernet transmit error indication line, x-ETH module number
36	ETHx_TX_CLK	Ethernet	Ethernet transmit clock line, x-ETH module number

表 18 引脚功能描述 *(续)*

Sl. No.	Pin	Module	Description
37	ETHx_TXD_y	Ethernet	Ethernet transmit data line, x-ETH module number, y-transmit channel number
38	ETHx_RXD_y	Ethernet	Ethernet receive data line, x-ETH module number, y-receive channel number
39	ETHx_RX_CTL	Ethernet	Ethernet receive control line, x-ETH module number
40	ETHx_RX_CLK	Ethernet	Ethernet receive clock line, x-ETH module number
41	SDHC_CARD_-MECH_WRITE_PROT	SDHC	SDHC mechanical write protect
42	SDHC_CARD_CMD	SDHC	SDHC command line
43	SDHC_CLK_CARD	SDHC	SDHC clock line
44	SDHC_CARD_DETECT_N	SDHC	SDHC interface insertion or removal detection line
45	SDHC_CARD_IF_PWR_EN	SDHC	SDHC interface power cycle line
46	SDHC_CARD_DAT_3TO0_x	SDHC	SDHC lower 4-bits of the data
47	SDHC_CARD_DAT_7TO4_x	SDHC	SDHC upper 4-bits of the data in 8-bit mode
48	AUDIOSSx_MCLK	AUDIOSS	AudioSS master clock out, x-AudioSS block
49	AUDIOSSx_TX_SCK	AUDIOSS	I^2S serial clock for transmitter, x-AudioSS block
50	AUDIOSSx_TX_WS	AUDIOSS	I^2S word select for transmitter, x-AudioSS block
51	AUDIOSSx_TX_SDO	AUDIOSS	I^2S serial data output for transmitter, x-AudioSS block
52	AUDIOSSx_CLK_I2S_IF	AUDIOSS	I^2S clock supplied from external I2S bus host, x-AudioSS block
53	AUDIOSSx_RX_SCK	AUDIOSS	I^2S serial clock for receiver, x-AudioSS block
54	AUDIOSSx_RX_WS	AUDIOSS	I^2S word select for receiver, x-AudioSS block
55	AUDIOSSx_RX_SDI	AUDIOSS	I^2S serial data input for receiver, x-AudioSS block
59	CAL_SUP_NZ	System	ETAS Calibration support line
60	FAULT_OUT_x	SRSS	Fault output line x-0 to 3
61	TRACE_DATA_x	SRSS	Trace dataout line x-0 to 3
62	TRACE_CLOCK	SRSS	Trace clock line
63	RTC_CAL	SRSS RTC	RTC calibration clock input
64	SWJ_TRSTN	SRSS	JTAG Test reset line (Active low)
65	SWJ_SWO_TDO	SRSS	JTAG Test data output/SWO (Serial Wire Output)
66	SWJ_SWCLK_TCLK	SRSS	JTAG Test clock/SWD clock (Serial Wire Clock)
67	SWJ_SWDIO_TMS	SRSS	JTAG Test mode select/SWD data (Serial Wire Data Input/Output)
68	SWJ_SWDOE_TDI	SRSS	JTAG Test data input
69	HIBERNATE_WAKEUP[x]	SRSS	Hibernate wakeup line x-0 to 3
70	EXT_CLK	SRSS	External clock input or output
71	EXT_PS_CTL0	SRSS REGHC	REGHC control line, Transistor mode/Positive terminal of the current sense resistor, PMIC mode/Power good input from PMIC
72	EXT_PS_CTL1	SRSS REGHC	REGHC control line, Transistor mode/Negative terminal of the current sense resistor, PMIC mode/Enable output for PMIC
73	EXT_PS_CTL2	SRSS REGHC	REGHC control line, Transistor mode/unused, PMIC mode/Reset threshold adjustment for some PMICs
74	ADC[x]_y	PASS SAR	SAR, channel, x-SAR number, y-channel number
75	ADC[x]_M	PASS SAR	SAR motor control input, x-SAR number
76	EXT_MUX[x]_y	PASS SAR	External SAR MUX inputs, x-MUX number, y-MUX input 0 to 2
77	EXT_MUX[x]_EN	PASS SAR	External SAR MUX enable line
78	TRIG_IN[x]	HSIOM	HSIOM_IO_INPUT[x] of trigger inputs, x-0 to 47

表 18 引脚功能描述 *(续)*

Sl. No.	Pin	Module	Description
79	TRIG_DBG[x]	HSIOM	HSIOM_IO_OUTPUT[x] of trigger outputs, x-0 to 1
80	WCO_IN	SRSS	Watch crystal oscillator input
81	WCO_OUT	SRSS	Watch crystal oscillator output
82	ECO_IN	SRSS	External crystal oscillator input
83	ECO_OUT	SRSS	External crystal oscillator output

14 中断和唤醒分配

表 19 外设中断分配和唤醒源

Interrupt	Source	Power mode	Description
0	cpuss_interrupts_ipc_0_IRQn	Deep Sleep	CPUSS Inter Process Communication Interrupt #0
1	cpuss_interrupts_ipc_1_IRQn	Deep Sleep	CPUSS Inter Process Communication Interrupt #1
2	cpuss_interrupts_ipc_2_IRQn	Deep Sleep	CPUSS Inter Process Communication Interrupt #2
3	cpuss_interrupts_ipc_3_IRQn	Deep Sleep	CPUSS Inter Process Communication Interrupt #3
4	cpuss_interrupts_ipc_4_IRQn	Deep Sleep	CPUSS Inter Process Communication Interrupt #4
5	cpuss_interrupts_ipc_5_IRQn	Deep Sleep	CPUSS Inter Process Communication Interrupt #5
6	cpuss_interrupts_ipc_6_IRQn	Deep Sleep	CPUSS Inter Process Communication Interrupt #6
7	cpuss_interrupts_ipc_7_IRQn	Deep Sleep	CPUSS Inter Process Communication Interrupt #7
8	cpuss_interrupts_fault_0_IRQn	Deep Sleep	CPUSS Fault Structure #0 Interrupt
9	cpuss_interrupts_fault_1_IRQn	Deep Sleep	CPUSS Fault Structure #1 Interrupt
10	cpuss_interrupts_fault_2_IRQn	Deep Sleep	CPUSS Fault Structure #2 Interrupt
11	cpuss_interrupts_fault_3_IRQn	Deep Sleep	CPUSS Fault Structure #3 Interrupt
12	srss_interrupt_backup_IRQn	Deep Sleep	BACKUP domain Interrupt
13	srss_interrupt_mcwdt_0_IRQn	Deep Sleep	Multi Counter Watchdog Timer #0 interrupt
14	srss_interrupt_mcwdt_1_IRQn	Deep Sleep	Multi Counter Watchdog Timer #1 interrupt
15	srss_interrupt_mcwdt_2_IRQn	Deep Sleep	Multi Counter Watchdog Timer #2 interrupt
16	srss_interrupt_wdt_IRQn	Deep Sleep	Hardware Watchdog Timer interrupt
17	srss_interrupt_IRQn	Deep Sleep	Other combined Interrupts for SRSS (LVD, CLKCAL)
18	scb_0_interrupt_IRQn	Deep Sleep	SCB0 interrupt (Deep Sleep capable)
19	evtgen_0_interrupt_dpslp_IRQn	Deep Sleep	Event gen Deep Sleep domain interrupt
20	ioss_interrupt_vdd_IRQn	Deep Sleep	I/O Supply (V_{DDIO}, V_{DDA}, V_{DDD}) state change Interrupt
21	ioss_interrupt_gpio_dpslp_IRQn	Deep Sleep	Consolidated Interrupt for GPIO_STD and GPIO_ENH, All Ports
22	ioss_interrupts_gpio_dpslp_0_IRQn	Deep Sleep	GPIO_ENH Port #0 Interrupt
23	ioss_interrupts_gpio_dpslp_1_IRQn	Deep Sleep	GPIO_STD Port #1 Interrupt
24	ioss_interrupts_gpio_dpslp_2_IRQn	Deep Sleep	GPIO_STD Port #2 Interrupt
25	ioss_interrupts_gpio_dpslp_3_IRQn	Deep Sleep	GPIO_STD Port #3 Interrupt
26	ioss_interrupts_gpio_dpslp_4_IRQn	Deep Sleep	GPIO_STD Port #4 Interrupt
27	ioss_interrupts_gpio_dpslp_5_IRQn	Deep Sleep	GPIO_STD Port #5 Interrupt
28	ioss_interrupts_gpio_dpslp_6_IRQn	Deep Sleep	GPIO_STD Port #6 Interrupt
29	ioss_interrupts_gpio_dpslp_7_IRQn	Deep Sleep	GPIO_STD Port #7 Interrupt
30	ioss_interrupts_gpio_dpslp_8_IRQn	Deep Sleep	GPIO_STD Port #8 Interrupt
31	ioss_interrupts_gpio_dpslp_9_IRQn	Deep Sleep	GPIO_STD Port #9 Interrupt
32	ioss_interrupts_gpio_dpslp_10_IRQn	Deep Sleep	GPIO_STD Port #10 Interrupt
33	ioss_interrupts_gpio_dpslp_11_IRQn	Deep Sleep	GPIO_STD Port #11 Interrupt

表 19　　外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
34	ioss_interrupts_gpio_dpslp_12_IRQn	Deep Sleep	GPIO_STD Port #12 Interrupt
35	ioss_interrupts_gpio_dpslp_13_IRQn	Deep Sleep	GPIO_STD Port #13 Interrupt
36	ioss_interrupts_gpio_dpslp_14_IRQn	Deep Sleep	GPIO_STD Port #14 Interrupt
37	ioss_interrupts_gpio_dpslp_15_IRQn	Deep Sleep	GPIO_STD Port #15 Interrupt
38	ioss_interrupts_gpio_dpslp_16_IRQn	Deep Sleep	GPIO_STD Port #16 Interrupt
39	ioss_interrupts_gpio_dpslp_17_IRQn	Deep Sleep	GPIO_STD Port #17 Interrupt
40	ioss_interrupts_gpio_dpslp_18_IRQn	Deep Sleep	GPIO_STD Port #18 Interrupt
41	ioss_interrupts_gpio_dpslp_19_IRQn	Deep Sleep	GPIO_STD Port #19 Interrupt
42	ioss_interrupts_gpio_dpslp_20_IRQn	Deep Sleep	GPIO_STD Port #20 Interrupt
43	ioss_interrupts_gpio_dpslp_21_IRQn	Deep Sleep	GPIO_STD Port #21 Interrupt
44	ioss_interrupts_gpio_dpslp_22_IRQn	Deep Sleep	GPIO_STD Port #22 Interrupt
45	ioss_interrupts_gpio_dpslp_23_IRQn	Deep Sleep	GPIO_STD Port #23 Interrupt
46	ioss_interrupts_gpio_dpslp_28_IRQn	Deep Sleep	GPIO_STD Port #28 Interrupt
47	ioss_interrupts_gpio_dpslp_29_IRQn	Deep Sleep	GPIO_STD Port #29 Interrupt
48	ioss_interrupts_gpio_dpslp_30_IRQn	Deep Sleep	GPIO_STD Port #30 Interrupt
49	ioss_interrupts_gpio_dpslp_31_IRQn	Deep Sleep	GPIO_STD Port #31 Interrupt
50	ioss_interrupts_gpio_dpslp_32_IRQn	Deep Sleep	GPIO_STD Port #32 Interrupt
51	ioss_interrupts_gpio_act_IRQn	Active	Consolidated Interrupt for HSIO_STD, All Ports
52	ioss_interrupts_gpio_act_24_IRQn	Active	HSIO_STD Port #24 Interrupt
53	ioss_interrupts_gpio_act_25_IRQn	Active	HSIO_STD Port #25 Interrupt
54	ioss_interrupts_gpio_act_26_IRQn	Active	HSIO_STD Port #26 Interrupt
55	ioss_interrupts_gpio_act_27_IRQn	Active	HSIO_STD Port #27 Interrupt
58	cpuss_interrupt_crypto_IRQn	Active	CRYPTO Accelerator Interrupt
59	cpuss_interrupt_fm_IRQn	Active	Flash Macro Interrupt
60	cpuss_interrupts_cm7_0_fp_IRQn	Active	CM7_0 Floating Point operation fault
61	cpuss_interrupts_cm7_1_fp_IRQn	Active	CM7_1 Floating Point operation fault
62	cpuss_interrupts_cm0_cti_0_IRQn	Active	CM0+ CTI (Cross Trigger Interface) #0
63	cpuss_interrupts_cm0_cti_1_IRQn	Active	CM0+ CTI #1
64	cpuss_interrupts_cm7_0_cti_0_IRQn	Active	CM7_0 CTI #0
65	cpuss_interrupts_cm7_0_cti_1_IRQn	Active	CM7_0 CTI #1
66	cpuss_interrupts_cm7_1_cti_0_IRQn	Active	CM7_1 CTI #0
67	cpuss_interrupts_cm7_1_cti_1_IRQn	Active	CM7_1 CTI #1
68	evtgen_0_interrupt_IRQn	Active	Event gen Active domain Interrupt
69	canfd_0_interrupt0_IRQn	Active	CAN0, Consolidated Interrupt #0 for all five channels
70	canfd_0_interrupt1_IRQn	Active	CAN0, Consolidated Interrupt #1for all five channels
71	canfd_1_interrupt0_IRQn	Active	CAN1, Consolidated Interrupt #0for all five channels
72	canfd_1_interrupt1_IRQn	Active	CAN1, Consolidated Interrupt #1for all five channels
73	canfd_0_interrupts0_0_IRQn	Active	CAN0, Interrupt #0, Channel #0
74	canfd_0_interrupts0_1_IRQn	Active	CAN0, Interrupt #0, Channel #1
75	canfd_0_interrupts0_2_IRQn	Active	CAN0, Interrupt #0, Channel #2
76	canfd_0_interrupts0_3_IRQn	Active	CAN0, Interrupt #0, Channel #3

表 19　　外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
77	canfd_0_interrupts0_4_IRQn	Active	CAN0, Interrupt #0, Channel #4
78	canfd_0_interrupts1_0_IRQn	Active	CAN0, Interrupt #1, Channel #0
79	canfd_0_interrupts1_1_IRQn	Active	CAN0, Interrupt #1, Channel #1
80	canfd_0_interrupts1_2_IRQn	Active	CAN0, Interrupt #1, Channel #2
81	canfd_0_interrupts1_3_IRQn	Active	CAN0, Interrupt #1, Channel #3
82	canfd_0_interrupts1_4_IRQn	Active	CAN0, Interrupt #1, Channel #4
83	canfd_1_interrupts0_0_IRQn	Active	CAN1, Interrupt #0, Channel #0
84	canfd_1_interrupts0_1_IRQn	Active	CAN1, Interrupt #0, Channel #1
85	canfd_1_interrupts0_2_IRQn	Active	CAN1, Interrupt #0, Channel #2
86	canfd_1_interrupts0_3_IRQn	Active	CAN1, Interrupt #0, Channel #3
87	canfd_1_interrupts0_4_IRQn	Active	CAN1, Interrupt #0, Channel #4
88	canfd_1_interrupts1_0_IRQn	Active	CAN1, Interrupt #1, Channel #0
89	canfd_1_interrupts1_1_IRQn	Active	CAN1, Interrupt #1, Channel #1
90	canfd_1_interrupts1_2_IRQn	Active	CAN1, Interrupt #1, Channel #2
91	canfd_1_interrupts1_3_IRQn	Active	CAN1, Interrupt #1, Channel #3
92	canfd_1_interrupts1_4_IRQn	Active	CAN1, Interrupt #1, Channel #4
113	scb_1_interrupt_IRQn	Active	SCB1 Interrupt
114	scb_2_interrupt_IRQn	Active	SCB2 Interrupt
115	scb_3_interrupt_IRQn	Active	SCB3 Interrupt
116	scb_4_interrupt_IRQn	Active	SCB4 Interrupt
117	scb_5_interrupt_IRQn	Active	SCB5 Interrupt
118	scb_6_interrupt_IRQn	Active	SCB6 Interrupt
119	scb_7_interrupt_IRQn	Active	SCB7 Interrupt
120	scb_8_interrupt_IRQn	Active	SCB8 Interrupt
121	scb_9_interrupt_IRQn	Active	SCB9 Interrupt
122	scb_10_interrupt_IRQn	Active	SCB10 Interrupt
123	pass_0_interrupts_sar_0_IRQn	Active	SAR0, Logical Channel #0 Interrupt
124	pass_0_interrupts_sar_1_IRQn	Active	SAR0, Logical Channel #1 Interrupt
125	pass_0_interrupts_sar_2_IRQn	Active	SAR0, Logical Channel #2 Interrupt
126	pass_0_interrupts_sar_3_IRQn	Active	SAR0, Logical Channel #3 Interrupt
127	pass_0_interrupts_sar_4_IRQn	Active	SAR0, Logical Channel #4 Interrupt
128	pass_0_interrupts_sar_5_IRQn	Active	SAR0, Logical Channel #5 Interrupt
129	pass_0_interrupts_sar_6_IRQn	Active	SAR0, Logical Channel #6 Interrupt
130	pass_0_interrupts_sar_7_IRQn	Active	SAR0, Logical Channel #7 Interrupt
131	pass_0_interrupts_sar_8_IRQn	Active	SAR0, Logical Channel #8 Interrupt
132	pass_0_interrupts_sar_9_IRQn	Active	SAR0, Logical Channel #9 Interrupt
133	pass_0_interrupts_sar_10_IRQn	Active	SAR0, Logical Channel #10 Interrupt
134	pass_0_interrupts_sar_11_IRQn	Active	SAR0, Logical Channel #11 Interrupt
135	pass_0_interrupts_sar_12_IRQn	Active	SAR0, Logical Channel #12 Interrupt
136	pass_0_interrupts_sar_13_IRQn	Active	SAR0, Logical Channel #13 Interrupt
137	pass_0_interrupts_sar_14_IRQn	Active	SAR0, Logical Channel #14 Interrupt
138	pass_0_interrupts_sar_15_IRQn	Active	SAR0, Logical Channel #15 Interrupt
139	pass_0_interrupts_sar_16_IRQn	Active	SAR0, Logical Channel #16 Interrupt
140	pass_0_interrupts_sar_17_IRQn	Active	SAR0, Logical Channel #17 Interrupt

表 19 外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
141	pass_0_interrupts_sar_18_IRQn	Active	SAR0, Logical Channel #18 Interrupt
142	pass_0_interrupts_sar_19_IRQn	Active	SAR0, Logical Channel #19 Interrupt
143	pass_0_interrupts_sar_20_IRQn	Active	SAR0, Logical Channel #20 Interrupt
144	pass_0_interrupts_sar_21_IRQn	Active	SAR0, Logical Channel #21 Interrupt
145	pass_0_interrupts_sar_22_IRQn	Active	SAR0, Logical Channel #22 Interrupt
146	pass_0_interrupts_sar_23_IRQn	Active	SAR0, Logical Channel #23 Interrupt
147	pass_0_interrupts_sar_24_IRQn	Active	SAR0, Logical Channel #24 Interrupt
148	pass_0_interrupts_sar_25_IRQn	Active	SAR0, Logical Channel #25 Interrupt
149	pass_0_interrupts_sar_26_IRQn	Active	SAR0, Logical Channel #26 Interrupt
150	pass_0_interrupts_sar_27_IRQn	Active	SAR0, Logical Channel #27 Interrupt
151	pass_0_interrupts_sar_28_IRQn	Active	SAR0, Logical Channel #28 Interrupt
152	pass_0_interrupts_sar_29_IRQn	Active	SAR0, Logical Channel #29 Interrupt
153	pass_0_interrupts_sar_30_IRQn	Active	SAR0, Logical Channel #30 Interrupt
154	pass_0_interrupts_sar_31_IRQn	Active	SAR0, Logical Channel #31 Interrupt
155	pass_0_interrupts_sar_32_IRQn	Active	SAR1, Logical Channel #0 Interrupt
156	pass_0_interrupts_sar_33_IRQn	Active	SAR1, Logical Channel #1 Interrupt
157	pass_0_interrupts_sar_34_IRQn	Active	SAR1, Logical Channel #2 Interrupt
158	pass_0_interrupts_sar_35_IRQn	Active	SAR1, Logical Channel #3 Interrupt
159	pass_0_interrupts_sar_36_IRQn	Active	SAR1, Logical Channel #4 Interrupt
160	pass_0_interrupts_sar_37_IRQn	Active	SAR1, Logical Channel #5 Interrupt
161	pass_0_interrupts_sar_38_IRQn	Active	SAR1, Logical Channel #6 Interrupt
162	pass_0_interrupts_sar_39_IRQn	Active	SAR1, Logical Channel #7 Interrupt
163	pass_0_interrupts_sar_40_IRQn	Active	SAR1, Logical Channel #8 Interrupt
164	pass_0_interrupts_sar_41_IRQn	Active	SAR1, Logical Channel #9 Interrupt
165	pass_0_interrupts_sar_42_IRQn	Active	SAR1, Logical Channel #10 Interrupt
166	pass_0_interrupts_sar_43_IRQn	Active	SAR1, Logical Channel #11 Interrupt
167	pass_0_interrupts_sar_44_IRQn	Active	SAR1, Logical Channel #12 Interrupt
168	pass_0_interrupts_sar_45_IRQn	Active	SAR1, Logical Channel #13 Interrupt
169	pass_0_interrupts_sar_46_IRQn	Active	SAR1, Logical Channel #14 Interrupt
170	pass_0_interrupts_sar_47_IRQn	Active	SAR1, Logical Channel #15 Interrupt
171	pass_0_interrupts_sar_48_IRQn	Active	SAR1, Logical Channel #16 Interrupt
172	pass_0_interrupts_sar_49_IRQn	Active	SAR1, Logical Channel #17 Interrupt
173	pass_0_interrupts_sar_50_IRQn	Active	SAR1, Logical Channel #18 Interrupt
174	pass_0_interrupts_sar_51_IRQn	Active	SAR1, Logical Channel #19 Interrupt
175	pass_0_interrupts_sar_52_IRQn	Active	SAR1, Logical Channel #20 Interrupt
176	pass_0_interrupts_sar_53_IRQn	Active	SAR1, Logical Channel #21 Interrupt
177	pass_0_interrupts_sar_54_IRQn	Active	SAR1, Logical Channel #22 Interrupt
178	pass_0_interrupts_sar_55_IRQn	Active	SAR1, Logical Channel #23 Interrupt
179	pass_0_interrupts_sar_56_IRQn	Active	SAR1, Logical Channel #24 Interrupt
180	pass_0_interrupts_sar_57_IRQn	Active	SAR1, Logical Channel #25 Interrupt
181	pass_0_interrupts_sar_58_IRQn	Active	SAR1, Logical Channel #26 Interrupt
182	pass_0_interrupts_sar_59_IRQn	Active	SAR1, Logical Channel #27 Interrupt
183	pass_0_interrupts_sar_60_IRQn	Active	SAR1, Logical Channel #28 Interrupt
184	pass_0_interrupts_sar_61_IRQn	Active	SAR1, Logical Channel #29 Interrupt

表 19 外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
185	pass_0_interrupts_sar_62_IRQn	Active	SAR1, Logical Channel #30 Interrupt
186	pass_0_interrupts_sar_63_IRQn	Active	SAR1, Logical Channel #31 Interrupt
187	pass_0_interrupts_sar_64_IRQn	Active	SAR2, Logical Channel #0 Interrupt
188	pass_0_interrupts_sar_65_IRQn	Active	SAR2, Logical Channel #1 Interrupt
189	pass_0_interrupts_sar_66_IRQn	Active	SAR2, Logical Channel #2 Interrupt
190	pass_0_interrupts_sar_67_IRQn	Active	SAR2, Logical Channel #3 Interrupt
191	pass_0_interrupts_sar_68_IRQn	Active	SAR2, Logical Channel #4 Interrupt
192	pass_0_interrupts_sar_69_IRQn	Active	SAR2, Logical Channel #5 Interrupt
193	pass_0_interrupts_sar_70_IRQn	Active	SAR2, Logical Channel #6 Interrupt
194	pass_0_interrupts_sar_71_IRQn	Active	SAR2, Logical Channel #7 Interrupt
195	pass_0_interrupts_sar_72_IRQn	Active	SAR2, Logical Channel #8 Interrupt
196	pass_0_interrupts_sar_73_IRQn	Active	SAR2, Logical Channel #9 Interrupt
197	pass_0_interrupts_sar_74_IRQn	Active	SAR2, Logical Channel #10 Interrupt
198	pass_0_interrupts_sar_75_IRQn	Active	SAR2, Logical Channel #11 Interrupt
199	pass_0_interrupts_sar_76_IRQn	Active	SAR2, Logical Channel #12 Interrupt
200	pass_0_interrupts_sar_77_IRQn	Active	SAR2, Logical Channel #13 Interrupt
201	pass_0_interrupts_sar_78_IRQn	Active	SAR2, Logical Channel #14 Interrupt
202	pass_0_interrupts_sar_79_IRQn	Active	SAR2, Logical Channel #15 Interrupt
203	pass_0_interrupts_sar_80_IRQn	Active	SAR2, Logical Channel #16 Interrupt
204	pass_0_interrupts_sar_81_IRQn	Active	SAR2, Logical Channel #17 Interrupt
205	pass_0_interrupts_sar_82_IRQn	Active	SAR2, Logical Channel #18 Interrupt
206	pass_0_interrupts_sar_83_IRQn	Active	SAR2, Logical Channel #19 Interrupt
207	pass_0_interrupts_sar_84_IRQn	Active	SAR2, Logical Channel #20 Interrupt
208	pass_0_interrupts_sar_85_IRQn	Active	SAR2, Logical Channel #21 Interrupt
209	pass_0_interrupts_sar_86_IRQn	Active	SAR2, Logical Channel #22 Interrupt
210	pass_0_interrupts_sar_87_IRQn	Active	SAR2, Logical Channel #23 Interrupt
211	pass_0_interrupts_sar_88_IRQn	Active	SAR2, Logical Channel #24 Interrupt
212	pass_0_interrupts_sar_89_IRQn	Active	SAR2, Logical Channel #25 Interrupt
213	pass_0_interrupts_sar_90_IRQn	Active	SAR2, Logical Channel #26 Interrupt
214	pass_0_interrupts_sar_91_IRQn	Active	SAR2, Logical Channel #27 Interrupt
215	pass_0_interrupts_sar_92_IRQn	Active	SAR2, Logical Channel #28 Interrupt
216	pass_0_interrupts_sar_93_IRQn	Active	SAR2, Logical Channel #29 Interrupt
217	pass_0_interrupts_sar_94_IRQn	Active	SAR2, Logical Channel #30 Interrupt
218	pass_0_interrupts_sar_95_IRQn	Active	SAR2, Logical Channel #31 Interrupt
219	cpuss_interrupts_dmac_0_IRQn	Active	CPUSS M-DMA0, Channel #0 Interrupt
220	cpuss_interrupts_dmac_1_IRQn	Active	CPUSS M-DMA0, Channel #1 Interrupt
221	cpuss_interrupts_dmac_2_IRQn	Active	CPUSS M-DMA0, Channel #2 Interrupt
222	cpuss_interrupts_dmac_3_IRQn	Active	CPUSS M-DMA0, Channel #3 Interrupt
223	cpuss_interrupts_dmac_4_IRQn	Active	CPUSS M-DMA0, Channel #4 Interrupt
224	cpuss_interrupts_dmac_5_IRQn	Active	CPUSS M-DMA0, Channel #5 Interrupt
225	cpuss_interrupts_dmac_6_IRQn	Active	CPUSS M-DMA0, Channel #6 Interrupt
226	cpuss_interrupts_dmac_7_IRQn	Active	CPUSS M-DMA0, Channel #7 Interrupt
227	cpuss_interrupts_dw0_0_IRQn	Active	CPUSS P-DMA0, Channel #0 Interrupt
228	cpuss_interrupts_dw0_1_IRQn	Active	CPUSS P-DMA0, Channel #1 Interrupt

表 19　　外设中断分配和唤醒源 *（续）*

Interrupt	Source	Power mode	Description
229	cpuss_interrupts_dw0_2_IRQn	Active	CPUSS P-DMA0, Channel #2 Interrupt
230	cpuss_interrupts_dw0_3_IRQn	Active	CPUSS P-DMA0, Channel #3 Interrupt
231	cpuss_interrupts_dw0_4_IRQn	Active	CPUSS P-DMA0, Channel #4 Interrupt
232	cpuss_interrupts_dw0_5_IRQn	Active	CPUSS P-DMA0, Channel #5 Interrupt
233	cpuss_interrupts_dw0_6_IRQn	Active	CPUSS P-DMA0, Channel #6 Interrupt
234	cpuss_interrupts_dw0_7_IRQn	Active	CPUSS P-DMA0, Channel #7 Interrupt
235	cpuss_interrupts_dw0_8_IRQn	Active	CPUSS P-DMA0, Channel #8 Interrupt
236	cpuss_interrupts_dw0_9_IRQn	Active	CPUSS P-DMA0, Channel #9 Interrupt
237	cpuss_interrupts_dw0_10_IRQn	Active	CPUSS P-DMA0, Channel #10 Interrupt
238	cpuss_interrupts_dw0_11_IRQn	Active	CPUSS P-DMA0, Channel #11 Interrupt
239	cpuss_interrupts_dw0_12_IRQn	Active	CPUSS P-DMA0, Channel #12 Interrupt
240	cpuss_interrupts_dw0_13_IRQn	Active	CPUSS P-DMA0, Channel #13 Interrupt
241	cpuss_interrupts_dw0_14_IRQn	Active	CPUSS P-DMA0, Channel #14 Interrupt
242	cpuss_interrupts_dw0_15_IRQn	Active	CPUSS P-DMA0, Channel #15 Interrupt
243	cpuss_interrupts_dw0_16_IRQn	Active	CPUSS P-DMA0, Channel #16 Interrupt
244	cpuss_interrupts_dw0_17_IRQn	Active	CPUSS P-DMA0, Channel #17 Interrupt
245	cpuss_interrupts_dw0_18_IRQn	Active	CPUSS P-DMA0, Channel #18 Interrupt
246	cpuss_interrupts_dw0_19_IRQn	Active	CPUSS P-DMA0, Channel #19 Interrupt
247	cpuss_interrupts_dw0_20_IRQn	Active	CPUSS P-DMA0, Channel #20 Interrupt
248	cpuss_interrupts_dw0_21_IRQn	Active	CPUSS P-DMA0, Channel #21 Interrupt
249	cpuss_interrupts_dw0_22_IRQn	Active	CPUSS P-DMA0, Channel #22 Interrupt
250	cpuss_interrupts_dw0_23_IRQn	Active	CPUSS P-DMA0, Channel #23 Interrupt
251	cpuss_interrupts_dw0_24_IRQn	Active	CPUSS P-DMA0, Channel #24 Interrupt
252	cpuss_interrupts_dw0_25_IRQn	Active	CPUSS P-DMA0, Channel #25 Interrupt
253	cpuss_interrupts_dw0_26_IRQn	Active	CPUSS P-DMA0, Channel #26 Interrupt
254	cpuss_interrupts_dw0_27_IRQn	Active	CPUSS P-DMA0, Channel #27 Interrupt
255	cpuss_interrupts_dw0_28_IRQn	Active	CPUSS P-DMA0, Channel #28 Interrupt
256	cpuss_interrupts_dw0_29_IRQn	Active	CPUSS P-DMA0, Channel #29 Interrupt
257	cpuss_interrupts_dw0_30_IRQn	Active	CPUSS P-DMA0, Channel #30 Interrupt
258	cpuss_interrupts_dw0_31_IRQn	Active	CPUSS P-DMA0, Channel #31 Interrupt
259	cpuss_interrupts_dw0_32_IRQn	Active	CPUSS P-DMA0, Channel #32 Interrupt
260	cpuss_interrupts_dw0_33_IRQn	Active	CPUSS P-DMA0, Channel #33 Interrupt
261	cpuss_interrupts_dw0_34_IRQn	Active	CPUSS P-DMA0, Channel #34 Interrupt
262	cpuss_interrupts_dw0_35_IRQn	Active	CPUSS P-DMA0, Channel #35 Interrupt
263	cpuss_interrupts_dw0_36_IRQn	Active	CPUSS P-DMA0, Channel #36 Interrupt
264	cpuss_interrupts_dw0_37_IRQn	Active	CPUSS P-DMA0, Channel #37 Interrupt
265	cpuss_interrupts_dw0_38_IRQn	Active	CPUSS P-DMA0, Channel #38 Interrupt
266	cpuss_interrupts_dw0_39_IRQn	Active	CPUSS P-DMA0, Channel #39 Interrupt
267	cpuss_interrupts_dw0_40_IRQn	Active	CPUSS P-DMA0, Channel #40 Interrupt
268	cpuss_interrupts_dw0_41_IRQn	Active	CPUSS P-DMA0, Channel #41 Interrupt
269	cpuss_interrupts_dw0_42_IRQn	Active	CPUSS P-DMA0, Channel #42 Interrupt
270	cpuss_interrupts_dw0_43_IRQn	Active	CPUSS P-DMA0, Channel #43 Interrupt
271	cpuss_interrupts_dw0_44_IRQn	Active	CPUSS P-DMA0, Channel #44 Interrupt
272	cpuss_interrupts_dw0_45_IRQn	Active	CPUSS P-DMA0, Channel #45 Interrupt

表 19 外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
273	cpuss_interrupts_dw0_46_IRQn	Active	CPUSS P-DMA0, Channel #46 Interrupt
274	cpuss_interrupts_dw0_47_IRQn	Active	CPUSS P-DMA0, Channel #47 Interrupt
275	cpuss_interrupts_dw0_48_IRQn	Active	CPUSS P-DMA0, Channel #48 Interrupt
276	cpuss_interrupts_dw0_49_IRQn	Active	CPUSS P-DMA0, Channel #49 Interrupt
277	cpuss_interrupts_dw0_50_IRQn	Active	CPUSS P-DMA0, Channel #50 Interrupt
278	cpuss_interrupts_dw0_51_IRQn	Active	CPUSS P-DMA0, Channel #51 Interrupt
279	cpuss_interrupts_dw0_52_IRQn	Active	CPUSS P-DMA0, Channel #52 Interrupt
280	cpuss_interrupts_dw0_53_IRQn	Active	CPUSS P-DMA0, Channel #53 Interrupt
281	cpuss_interrupts_dw0_54_IRQn	Active	CPUSS P-DMA0, Channel #54 Interrupt
282	cpuss_interrupts_dw0_55_IRQn	Active	CPUSS P-DMA0, Channel #55 Interrupt
283	cpuss_interrupts_dw0_56_IRQn	Active	CPUSS P-DMA0, Channel #56 Interrupt
284	cpuss_interrupts_dw0_57_IRQn	Active	CPUSS P-DMA0, Channel #57 Interrupt
285	cpuss_interrupts_dw0_58_IRQn	Active	CPUSS P-DMA0, Channel #58 Interrupt
286	cpuss_interrupts_dw0_59_IRQn	Active	CPUSS P-DMA0, Channel #59 Interrupt
287	cpuss_interrupts_dw0_60_IRQn	Active	CPUSS P-DMA0, Channel #60 Interrupt
288	cpuss_interrupts_dw0_61_IRQn	Active	CPUSS P-DMA0, Channel #61 Interrupt
289	cpuss_interrupts_dw0_62_IRQn	Active	CPUSS P-DMA0, Channel #62 Interrupt
290	cpuss_interrupts_dw0_63_IRQn	Active	CPUSS P-DMA0, Channel #63 Interrupt
291	cpuss_interrupts_dw0_64_IRQn	Active	CPUSS P-DMA0, Channel #64 Interrupt
292	cpuss_interrupts_dw0_65_IRQn	Active	CPUSS P-DMA0, Channel #65 Interrupt
293	cpuss_interrupts_dw0_66_IRQn	Active	CPUSS P-DMA0, Channel #66 Interrupt
294	cpuss_interrupts_dw0_67_IRQn	Active	CPUSS P-DMA0, Channel #67 Interrupt
295	cpuss_interrupts_dw0_68_IRQn	Active	CPUSS P-DMA0, Channel #68 Interrupt
296	cpuss_interrupts_dw0_69_IRQn	Active	CPUSS P-DMA0, Channel #69 Interrupt
297	cpuss_interrupts_dw0_70_IRQn	Active	CPUSS P-DMA0, Channel #70 Interrupt
298	cpuss_interrupts_dw0_71_IRQn	Active	CPUSS P-DMA0, Channel #71 Interrupt
299	cpuss_interrupts_dw0_72_IRQn	Active	CPUSS P-DMA0, Channel #72 Interrupt
300	cpuss_interrupts_dw0_73_IRQn	Active	CPUSS P-DMA0, Channel #73 Interrupt
301	cpuss_interrupts_dw0_74_IRQn	Active	CPUSS P-DMA0, Channel #74 Interrupt
302	cpuss_interrupts_dw0_75_IRQn	Active	CPUSS P-DMA0, Channel #75 Interrupt
303	cpuss_interrupts_dw0_76_IRQn	Active	CPUSS P-DMA0, Channel #76 Interrupt
304	cpuss_interrupts_dw0_77_IRQn	Active	CPUSS P-DMA0, Channel #77 Interrupt
305	cpuss_interrupts_dw0_78_IRQn	Active	CPUSS P-DMA0, Channel #78 Interrupt
306	cpuss_interrupts_dw0_79_IRQn	Active	CPUSS P-DMA0, Channel #79 Interrupt
307	cpuss_interrupts_dw0_80_IRQn	Active	CPUSS P-DMA0, Channel #80 Interrupt
308	cpuss_interrupts_dw0_81_IRQn	Active	CPUSS P-DMA0, Channel #81 Interrupt
309	cpuss_interrupts_dw0_82_IRQn	Active	CPUSS P-DMA0, Channel #82 Interrupt
310	cpuss_interrupts_dw0_83_IRQn	Active	CPUSS P-DMA0, Channel #83 Interrupt
311	cpuss_interrupts_dw0_84_IRQn	Active	CPUSS P-DMA0, Channel #84 Interrupt
312	cpuss_interrupts_dw0_85_IRQn	Active	CPUSS P-DMA0, Channel #85 Interrupt
313	cpuss_interrupts_dw0_86_IRQn	Active	CPUSS P-DMA0, Channel #86 Interrupt
314	cpuss_interrupts_dw0_87_IRQn	Active	CPUSS P-DMA0, Channel #87 Interrupt
315	cpuss_interrupts_dw0_88_IRQn	Active	CPUSS P-DMA0, Channel #88 Interrupt
316	cpuss_interrupts_dw0_89_IRQn	Active	CPUSS P-DMA0, Channel #89 Interrupt

表 19 外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
317	cpuss_interrupts_dw0_90_IRQn	Active	CPUSS P-DMA0, Channel #90 Interrupt
318	cpuss_interrupts_dw0_91_IRQn	Active	CPUSS P-DMA0, Channel #91 Interrupt
319	cpuss_interrupts_dw0_92_IRQn	Active	CPUSS P-DMA0, Channel #92 Interrupt
320	cpuss_interrupts_dw0_93_IRQn	Active	CPUSS P-DMA0, Channel #93 Interrupt
321	cpuss_interrupts_dw0_94_IRQn	Active	CPUSS P-DMA0, Channel #94 Interrupt
322	cpuss_interrupts_dw0_95_IRQn	Active	CPUSS P-DMA0, Channel #95 Interrupt
323	cpuss_interrupts_dw0_96_IRQn	Active	CPUSS P-DMA0, Channel #96 Interrupt
324	cpuss_interrupts_dw0_97_IRQn	Active	CPUSS P-DMA0, Channel #97 Interrupt
325	cpuss_interrupts_dw0_98_IRQn	Active	CPUSS P-DMA0, Channel #98 Interrupt
326	cpuss_interrupts_dw0_99_IRQn	Active	CPUSS P-DMA0, Channel #99 Interrupt
327	cpuss_interrupts_dw0_100_IRQn	Active	CPUSS P-DMA0, Channel #100 Interrupt
328	cpuss_interrupts_dw0_101_IRQn	Active	CPUSS P-DMA0, Channel #101 Interrupt
329	cpuss_interrupts_dw0_102_IRQn	Active	CPUSS P-DMA0, Channel #102 Interrupt
330	cpuss_interrupts_dw0_103_IRQn	Active	CPUSS P-DMA0, Channel #103 Interrupt
331	cpuss_interrupts_dw0_104_IRQn	Active	CPUSS P-DMA0, Channel #104 Interrupt
332	cpuss_interrupts_dw0_105_IRQn	Active	CPUSS P-DMA0, Channel #105 Interrupt
333	cpuss_interrupts_dw0_106_IRQn	Active	CPUSS P-DMA0, Channel #106 Interrupt
334	cpuss_interrupts_dw0_107_IRQn	Active	CPUSS P-DMA0, Channel #107 Interrupt
335	cpuss_interrupts_dw0_108_IRQn	Active	CPUSS P-DMA0, Channel #108 Interrupt
336	cpuss_interrupts_dw0_109_IRQn	Active	CPUSS P-DMA0, Channel #109 Interrupt
337	cpuss_interrupts_dw0_110_IRQn	Active	CPUSS P-DMA0, Channel #110 Interrupt
338	cpuss_interrupts_dw0_111_IRQn	Active	CPUSS P-DMA0, Channel #111 Interrupt
339	cpuss_interrupts_dw0_112_IRQn	Active	CPUSS P-DMA0, Channel #112 Interrupt
340	cpuss_interrupts_dw0_113_IRQn	Active	CPUSS P-DMA0, Channel #113 Interrupt
341	cpuss_interrupts_dw0_114_IRQn	Active	CPUSS P-DMA0, Channel #114 Interrupt
342	cpuss_interrupts_dw0_115_IRQn	Active	CPUSS P-DMA0, Channel #115 Interrupt
343	cpuss_interrupts_dw0_116_IRQn	Active	CPUSS P-DMA0, Channel #116 Interrupt
344	cpuss_interrupts_dw0_117_IRQn	Active	CPUSS P-DMA0, Channel #117 Interrupt
345	cpuss_interrupts_dw0_118_IRQn	Active	CPUSS P-DMA0, Channel #118 Interrupt
346	cpuss_interrupts_dw0_119_IRQn	Active	CPUSS P-DMA0, Channel #119 Interrupt
347	cpuss_interrupts_dw0_120_IRQn	Active	CPUSS P-DMA0, Channel #120 Interrupt
348	cpuss_interrupts_dw0_121_IRQn	Active	CPUSS P-DMA0, Channel #121 Interrupt
349	cpuss_interrupts_dw0_122_IRQn	Active	CPUSS P-DMA0, Channel #122 Interrupt
350	cpuss_interrupts_dw0_123_IRQn	Active	CPUSS P-DMA0, Channel #123 Interrupt
351	cpuss_interrupts_dw0_124_IRQn	Active	CPUSS P-DMA0, Channel #124 Interrupt
352	cpuss_interrupts_dw0_125_IRQn	Active	CPUSS P-DMA0, Channel #125 Interrupt
353	cpuss_interrupts_dw0_126_IRQn	Active	CPUSS P-DMA0, Channel #126 Interrupt
354	cpuss_interrupts_dw0_127_IRQn	Active	CPUSS P-DMA0, Channel #127 Interrupt
355	cpuss_interrupts_dw0_128_IRQn	Active	CPUSS P-DMA0, Channel #128 Interrupt
356	cpuss_interrupts_dw0_129_IRQn	Active	CPUSS P-DMA0, Channel #129 Interrupt
357	cpuss_interrupts_dw0_130_IRQn	Active	CPUSS P-DMA0, Channel #130 Interrupt
358	cpuss_interrupts_dw0_131_IRQn	Active	CPUSS P-DMA0, Channel #131 Interrupt
359	cpuss_interrupts_dw0_132_IRQn	Active	CPUSS P-DMA0, Channel #132 Interrupt
360	cpuss_interrupts_dw0_133_IRQn	Active	CPUSS P-DMA0, Channel #133 Interrupt

表 19 外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
361	cpuss_interrupts_dw0_134_IRQn	Active	CPUSS P-DMA0, Channel #134 Interrupt
362	cpuss_interrupts_dw0_135_IRQn	Active	CPUSS P-DMA0, Channel #135 Interrupt
363	cpuss_interrupts_dw0_136_IRQn	Active	CPUSS P-DMA0, Channel #136 Interrupt
364	cpuss_interrupts_dw0_137_IRQn	Active	CPUSS P-DMA0, Channel #137 Interrupt
365	cpuss_interrupts_dw0_138_IRQn	Active	CPUSS P-DMA0, Channel #138 Interrupt
366	cpuss_interrupts_dw0_139_IRQn	Active	CPUSS P-DMA0, Channel #139 Interrupt
367	cpuss_interrupts_dw0_140_IRQn	Active	CPUSS P-DMA0, Channel #140 Interrupt
368	cpuss_interrupts_dw0_141_IRQn	Active	CPUSS P-DMA0, Channel #141 Interrupt
369	cpuss_interrupts_dw0_142_IRQn	Active	CPUSS P-DMA0, Channel #142 Interrupt
370	cpuss_interrupts_dw1_0_IRQn	Active	CPUSS P-DMA1, Channel #0 Interrupt
371	cpuss_interrupts_dw1_1_IRQn	Active	CPUSS P-DMA1, Channel #1 Interrupt
372	cpuss_interrupts_dw1_2_IRQn	Active	CPUSS P-DMA1, Channel #2 Interrupt
373	cpuss_interrupts_dw1_3_IRQn	Active	CPUSS P-DMA1, Channel #3 Interrupt
374	cpuss_interrupts_dw1_4_IRQn	Active	CPUSS P-DMA1, Channel #4 Interrupt
375	cpuss_interrupts_dw1_5_IRQn	Active	CPUSS P-DMA1, Channel #5 Interrupt
376	cpuss_interrupts_dw1_6_IRQn	Active	CPUSS P-DMA1, Channel #6 Interrupt
377	cpuss_interrupts_dw1_7_IRQn	Active	CPUSS P-DMA1, Channel #7 Interrupt
378	cpuss_interrupts_dw1_8_IRQn	Active	CPUSS P-DMA1, Channel #8 Interrupt
379	cpuss_interrupts_dw1_9_IRQn	Active	CPUSS P-DMA1, Channel #9 Interrupt
380	cpuss_interrupts_dw1_10_IRQn	Active	CPUSS P-DMA1, Channel #10 Interrupt
381	cpuss_interrupts_dw1_11_IRQn	Active	CPUSS P-DMA1, Channel #11 Interrupt
382	cpuss_interrupts_dw1_12_IRQn	Active	CPUSS P-DMA1, Channel #12 Interrupt
383	cpuss_interrupts_dw1_13_IRQn	Active	CPUSS P-DMA1, Channel #13 Interrupt
384	cpuss_interrupts_dw1_14_IRQn	Active	CPUSS P-DMA1, Channel #14 Interrupt
385	cpuss_interrupts_dw1_15_IRQn	Active	CPUSS P-DMA1, Channel #15 Interrupt
386	cpuss_interrupts_dw1_16_IRQn	Active	CPUSS P-DMA1, Channel #16 Interrupt
387	cpuss_interrupts_dw1_17_IRQn	Active	CPUSS P-DMA1, Channel #17 Interrupt
388	cpuss_interrupts_dw1_18_IRQn	Active	CPUSS P-DMA1, Channel #18 Interrupt
389	cpuss_interrupts_dw1_19_IRQn	Active	CPUSS P-DMA1, Channel #19 Interrupt
390	cpuss_interrupts_dw1_20_IRQn	Active	CPUSS P-DMA1, Channel #20 Interrupt
391	cpuss_interrupts_dw1_21_IRQn	Active	CPUSS P-DMA1, Channel #21 Interrupt
392	cpuss_interrupts_dw1_22_IRQn	Active	CPUSS P-DMA1, Channel #22 Interrupt
393	cpuss_interrupts_dw1_23_IRQn	Active	CPUSS P-DMA1, Channel #23 Interrupt
394	cpuss_interrupts_dw1_24_IRQn	Active	CPUSS P-DMA1, Channel #24 Interrupt
395	cpuss_interrupts_dw1_25_IRQn	Active	CPUSS P-DMA1, Channel #25 Interrupt
396	cpuss_interrupts_dw1_26_IRQn	Active	CPUSS P-DMA1, Channel #26 Interrupt
397	cpuss_interrupts_dw1_27_IRQn	Active	CPUSS P-DMA1, Channel #27 Interrupt
398	cpuss_interrupts_dw1_28_IRQn	Active	CPUSS P-DMA1, Channel #28 Interrupt
399	cpuss_interrupts_dw1_29_IRQn	Active	CPUSS P-DMA1, Channel #29 Interrupt
400	cpuss_interrupts_dw1_30_IRQn	Active	CPUSS P-DMA1, Channel #30 Interrupt
401	cpuss_interrupts_dw1_31_IRQn	Active	CPUSS P-DMA1, Channel #31 Interrupt
402	cpuss_interrupts_dw1_32_IRQn	Active	CPUSS P-DMA1, Channel #32 Interrupt
403	cpuss_interrupts_dw1_33_IRQn	Active	CPUSS P-DMA1, Channel #33 Interrupt
404	cpuss_interrupts_dw1_34_IRQn	Active	CPUSS P-DMA1, Channel #34 Interrupt

表 19 外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
405	cpuss_interrupts_dw1_35_IRQn	Active	CPUSS P-DMA1, Channel #35 Interrupt
406	cpuss_interrupts_dw1_36_IRQn	Active	CPUSS P-DMA1, Channel #36 Interrupt
407	cpuss_interrupts_dw1_37_IRQn	Active	CPUSS P-DMA1, Channel #37 Interrupt
408	cpuss_interrupts_dw1_38_IRQn	Active	CPUSS P-DMA1, Channel #38 Interrupt
409	cpuss_interrupts_dw1_39_IRQn	Active	CPUSS P-DMA1, Channel #39 Interrupt
410	cpuss_interrupts_dw1_40_IRQn	Active	CPUSS P-DMA1, Channel #40 Interrupt
411	cpuss_interrupts_dw1_41_IRQn	Active	CPUSS P-DMA1, Channel #41 Interrupt
412	cpuss_interrupts_dw1_42_IRQn	Active	CPUSS P-DMA1, Channel #42 Interrupt
413	cpuss_interrupts_dw1_43_IRQn	Active	CPUSS P-DMA1, Channel #43 Interrupt
414	cpuss_interrupts_dw1_44_IRQn	Active	CPUSS P-DMA1, Channel #44 Interrupt
415	cpuss_interrupts_dw1_45_IRQn	Active	CPUSS P-DMA1, Channel #45 Interrupt
416	cpuss_interrupts_dw1_46_IRQn	Active	CPUSS P-DMA1, Channel #46 Interrupt
417	cpuss_interrupts_dw1_47_IRQn	Active	CPUSS P-DMA1, Channel #47 Interrupt
418	cpuss_interrupts_dw1_48_IRQn	Active	CPUSS P-DMA1, Channel #48 Interrupt
419	cpuss_interrupts_dw1_49_IRQn	Active	CPUSS P-DMA1, Channel #49 Interrupt
420	cpuss_interrupts_dw1_50_IRQn	Active	CPUSS P-DMA1, Channel #50 Interrupt
421	cpuss_interrupts_dw1_51_IRQn	Active	CPUSS P-DMA1, Channel #51 Interrupt
422	cpuss_interrupts_dw1_52_IRQn	Active	CPUSS P-DMA1, Channel #52 Interrupt
423	cpuss_interrupts_dw1_53_IRQn	Active	CPUSS P-DMA1, Channel #53 Interrupt
424	cpuss_interrupts_dw1_54_IRQn	Active	CPUSS P-DMA1, Channel #54 Interrupt
425	cpuss_interrupts_dw1_55_IRQn	Active	CPUSS P-DMA1, Channel #55 Interrupt
426	cpuss_interrupts_dw1_56_IRQn	Active	CPUSS P-DMA1, Channel #56 Interrupt
427	cpuss_interrupts_dw1_57_IRQn	Active	CPUSS P-DMA1, Channel #57 Interrupt
428	cpuss_interrupts_dw1_58_IRQn	Active	CPUSS P-DMA1, Channel #58 Interrupt
429	cpuss_interrupts_dw1_59_IRQn	Active	CPUSS P-DMA1, Channel #59 Interrupt
430	cpuss_interrupts_dw1_60_IRQn	Active	CPUSS P-DMA1, Channel #60 Interrupt
431	cpuss_interrupts_dw1_61_IRQn	Active	CPUSS P-DMA1, Channel #61 Interrupt
432	cpuss_interrupts_dw1_62_IRQn	Active	CPUSS P-DMA1, Channel #62 Interrupt
433	cpuss_interrupts_dw1_63_IRQn	Active	CPUSS P-DMA1, Channel #63 Interrupt
434	cpuss_interrupts_dw1_64_IRQn	Active	CPUSS P-DMA1, Channel #64 Interrupt
435	tcpwm_1_interrupts_0_IRQn	Active	TCPWM1 Group #0, Counter #0 Interrupt
436	tcpwm_1_interrupts_1_IRQn	Active	TCPWM1 Group #0, Counter #1 Interrupt
437	tcpwm_1_interrupts_2_IRQn	Active	TCPWM1 Group #0, Counter #2 Interrupt
438	tcpwm_1_interrupts_3_IRQn	Active	TCPWM1 Group #0, Counter #3 Interrupt
439	tcpwm_1_interrupts_4_IRQn	Active	TCPWM1 Group #0, Counter #4 Interrupt
440	tcpwm_1_interrupts_5_IRQn	Active	TCPWM1 Group #0, Counter #5 Interrupt
441	tcpwm_1_interrupts_6_IRQn	Active	TCPWM1 Group #0, Counter #6 Interrupt
442	tcpwm_1_interrupts_7_IRQn	Active	TCPWM1 Group #0, Counter #7 Interrupt
443	tcpwm_1_interrupts_8_IRQn	Active	TCPWM1 Group #0, Counter #8 Interrupt
444	tcpwm_1_interrupts_9_IRQn	Active	TCPWM1 Group #0, Counter #9 Interrupt
445	tcpwm_1_interrupts_10_IRQn	Active	TCPWM1 Group #0, Counter #10 Interrupt
446	tcpwm_1_interrupts_11_IRQn	Active	TCPWM1 Group #0, Counter #11 Interrupt
447	tcpwm_1_interrupts_12_IRQn	Active	TCPWM1 Group #0, Counter #12 Interrupt
448	tcpwm_1_interrupts_13_IRQn	Active	TCPWM1 Group #0, Counter #13 Interrupt

表 19　　外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
449	tcpwm_1_interrupts_14_IRQn	Active	TCPWM1 Group #0, Counter #14 Interrupt
450	tcpwm_1_interrupts_15_IRQn	Active	TCPWM1 Group #0, Counter #15 Interrupt
451	tcpwm_1_interrupts_16_IRQn	Active	TCPWM1 Group #0, Counter #16 Interrupt
452	tcpwm_1_interrupts_17_IRQn	Active	TCPWM1 Group #0, Counter #17 Interrupt
453	tcpwm_1_interrupts_18_IRQn	Active	TCPWM1 Group #0, Counter #18 Interrupt
454	tcpwm_1_interrupts_19_IRQn	Active	TCPWM1 Group #0, Counter #19 Interrupt
455	tcpwm_1_interrupts_20_IRQn	Active	TCPWM1 Group #0, Counter #20 Interrupt
456	tcpwm_1_interrupts_21_IRQn	Active	TCPWM1 Group #0, Counter #21 Interrupt
457	tcpwm_1_interrupts_22_IRQn	Active	TCPWM1 Group #0, Counter #22 Interrupt
458	tcpwm_1_interrupts_23_IRQn	Active	TCPWM1 Group #0, Counter #23 Interrupt
459	tcpwm_1_interrupts_24_IRQn	Active	TCPWM1 Group #0, Counter #24 Interrupt
460	tcpwm_1_interrupts_25_IRQn	Active	TCPWM1 Group #0, Counter #25 Interrupt
461	tcpwm_1_interrupts_26_IRQn	Active	TCPWM1 Group #0, Counter #26 Interrupt
462	tcpwm_1_interrupts_27_IRQn	Active	TCPWM1 Group #0, Counter #27 Interrupt
463	tcpwm_1_interrupts_28_IRQn	Active	TCPWM1 Group #0, Counter #28 Interrupt
464	tcpwm_1_interrupts_29_IRQn	Active	TCPWM1 Group #0, Counter #29 Interrupt
465	tcpwm_1_interrupts_30_IRQn	Active	TCPWM1 Group #0, Counter #30 Interrupt
466	tcpwm_1_interrupts_31_IRQn	Active	TCPWM1 Group #0, Counter #31 Interrupt
467	tcpwm_1_interrupts_32_IRQn	Active	TCPWM1 Group #0, Counter #32 Interrupt
468	tcpwm_1_interrupts_33_IRQn	Active	TCPWM1 Group #0, Counter #33 Interrupt
469	tcpwm_1_interrupts_34_IRQn	Active	TCPWM1 Group #0, Counter #34 Interrupt
470	tcpwm_1_interrupts_35_IRQn	Active	TCPWM1 Group #0, Counter #35 Interrupt
471	tcpwm_1_interrupts_36_IRQn	Active	TCPWM1 Group #0, Counter #36 Interrupt
472	tcpwm_1_interrupts_37_IRQn	Active	TCPWM1 Group #0, Counter #37 Interrupt
473	tcpwm_1_interrupts_38_IRQn	Active	TCPWM1 Group #0, Counter #38 Interrupt
474	tcpwm_1_interrupts_39_IRQn	Active	TCPWM1 Group #0, Counter #39 Interrupt
475	tcpwm_1_interrupts_40_IRQn	Active	TCPWM1 Group #0, Counter #40 Interrupt
476	tcpwm_1_interrupts_41_IRQn	Active	TCPWM1 Group #0, Counter #41 Interrupt
477	tcpwm_1_interrupts_42_IRQn	Active	TCPWM1 Group #0, Counter #42 Interrupt
478	tcpwm_1_interrupts_43_IRQn	Active	TCPWM1 Group #0, Counter #43 Interrupt
479	tcpwm_1_interrupts_44_IRQn	Active	TCPWM1 Group #0, Counter #44 Interrupt
480	tcpwm_1_interrupts_45_IRQn	Active	TCPWM1 Group #0, Counter #45 Interrupt
481	tcpwm_1_interrupts_46_IRQn	Active	TCPWM1 Group #0, Counter #46 Interrupt
482	tcpwm_1_interrupts_47_IRQn	Active	TCPWM1 Group #0, Counter #47 Interrupt
483	tcpwm_1_interrupts_48_IRQn	Active	TCPWM1 Group #0, Counter #48 Interrupt
484	tcpwm_1_interrupts_49_IRQn	Active	TCPWM1 Group #0, Counter #49 Interrupt
485	tcpwm_1_interrupts_50_IRQn	Active	TCPWM1 Group #0, Counter #50 Interrupt
486	tcpwm_1_interrupts_51_IRQn	Active	TCPWM1 Group #0, Counter #51 Interrupt
487	tcpwm_1_interrupts_52_IRQn	Active	TCPWM1 Group #0, Counter #52 Interrupt
488	tcpwm_1_interrupts_53_IRQn	Active	TCPWM1 Group #0, Counter #53 Interrupt
489	tcpwm_1_interrupts_54_IRQn	Active	TCPWM1 Group #0, Counter #54 Interrupt
490	tcpwm_1_interrupts_55_IRQn	Active	TCPWM1 Group #0, Counter #55 Interrupt
491	tcpwm_1_interrupts_56_IRQn	Active	TCPWM1 Group #0, Counter #56 Interrupt
492	tcpwm_1_interrupts_57_IRQn	Active	TCPWM1 Group #0, Counter #57 Interrupt

表 19 外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
493	tcpwm_1_interrupts_58_IRQn	Active	TCPWM1 Group #0, Counter #58 Interrupt
494	tcpwm_1_interrupts_59_IRQn	Active	TCPWM1 Group #0, Counter #59 Interrupt
495	tcpwm_1_interrupts_60_IRQn	Active	TCPWM1 Group #0, Counter #60 Interrupt
496	tcpwm_1_interrupts_61_IRQn	Active	TCPWM1 Group #0, Counter #61 Interrupt
497	tcpwm_1_interrupts_62_IRQn	Active	TCPWM1 Group #0, Counter #62 Interrupt
498	tcpwm_1_interrupts_63_IRQn	Active	TCPWM1 Group #0, Counter #63 Interrupt
499	tcpwm_1_interrupts_64_IRQn	Active	TCPWM1 Group #0, Counter #64 Interrupt
500	tcpwm_1_interrupts_65_IRQn	Active	TCPWM1 Group #0, Counter #65 Interrupt
501	tcpwm_1_interrupts_66_IRQn	Active	TCPWM1 Group #0, Counter #66 Interrupt
502	tcpwm_1_interrupts_67_IRQn	Active	TCPWM1 Group #0, Counter #67 Interrupt
503	tcpwm_1_interrupts_68_IRQn	Active	TCPWM1 Group #0, Counter #68 Interrupt
504	tcpwm_1_interrupts_69_IRQn	Active	TCPWM1 Group #0, Counter #69 Interrupt
505	tcpwm_1_interrupts_70_IRQn	Active	TCPWM1 Group #0, Counter #70 Interrupt
506	tcpwm_1_interrupts_71_IRQn	Active	TCPWM1 Group #0, Counter #71 Interrupt
507	tcpwm_1_interrupts_72_IRQn	Active	TCPWM1 Group #0, Counter #72 Interrupt
508	tcpwm_1_interrupts_73_IRQn	Active	TCPWM1 Group #0, Counter #73 Interrupt
509	tcpwm_1_interrupts_74_IRQn	Active	TCPWM1 Group #0, Counter #74 Interrupt
510	tcpwm_1_interrupts_75_IRQn	Active	TCPWM1 Group #0, Counter #75 Interrupt
511	tcpwm_1_interrupts_76_IRQn	Active	TCPWM1 Group #0, Counter #76 Interrupt
512	tcpwm_1_interrupts_77_IRQn	Active	TCPWM1 Group #0, Counter #77 Interrupt
513	tcpwm_1_interrupts_78_IRQn	Active	TCPWM1 Group #0, Counter #78 Interrupt
514	tcpwm_1_interrupts_79_IRQn	Active	TCPWM1 Group #0, Counter #79 Interrupt
515	tcpwm_1_interrupts_80_IRQn	Active	TCPWM1 Group #0, Counter #80 Interrupt
516	tcpwm_1_interrupts_81_IRQn	Active	TCPWM1 Group #0, Counter #81 Interrupt
517	tcpwm_1_interrupts_82_IRQn	Active	TCPWM1 Group #0, Counter #82 Interrupt
518	tcpwm_1_interrupts_83_IRQn	Active	TCPWM1 Group #0, Counter #83 Interrupt
519	tcpwm_0_interrupts_0_IRQn	Active	TCPWM0 Group #0, Counter #0 Interrupt
520	tcpwm_0_interrupts_1_IRQn	Active	TCPWM0 Group #0, Counter #1 Interrupt
521	tcpwm_0_interrupts_2_IRQn	Active	TCPWM0 Group #0, Counter #2 Interrupt
522	tcpwm_1_interrupts_256_IRQn	Active	TCPWM1 Group #1, Counter #0 Interrupt
523	tcpwm_1_interrupts_257_IRQn	Active	TCPWM1 Group #1, Counter #1 Interrupt
524	tcpwm_1_interrupts_258_IRQn	Active	TCPWM1 Group #1, Counter #2 Interrupt
525	tcpwm_1_interrupts_259_IRQn	Active	TCPWM1 Group #1, Counter #3 Interrupt
526	tcpwm_1_interrupts_260_IRQn	Active	TCPWM1 Group #1, Counter #4 Interrupt
527	tcpwm_1_interrupts_261_IRQn	Active	TCPWM1 Group #1, Counter #5 Interrupt
528	tcpwm_1_interrupts_262_IRQn	Active	TCPWM1 Group #1, Counter #6 Interrupt
529	tcpwm_1_interrupts_263_IRQn	Active	TCPWM1 Group #1, Counter #7 Interrupt
530	tcpwm_1_interrupts_264_IRQn	Active	TCPWM1 Group #1, Counter #8 Interrupt
531	tcpwm_1_interrupts_265_IRQn	Active	TCPWM1 Group #1, Counter #9 Interrupt
532	tcpwm_1_interrupts_266_IRQn	Active	TCPWM1 Group #1, Counter #10 Interrupt
533	tcpwm_1_interrupts_267_IRQn	Active	TCPWM1 Group #1, Counter #11 Interrupt
534	tcpwm_0_interrupts_256_IRQn	Active	TCPWM0 Group #1, Counter #0 Interrupt
535	tcpwm_0_interrupts_257_IRQn	Active	TCPWM0 Group #1, Counter #1 Interrupt
536	tcpwm_0_interrupts_258_IRQn	Active	TCPWM0 Group #1, Counter #2 Interrupt

表 19 外设中断分配和唤醒源 *(续)*

Interrupt	Source	Power mode	Description
537	tcpwm_1_interrupts_512_IRQn	Active	TCPWM1 Group #2, Counter #0 Interrupt
538	tcpwm_1_interrupts_513_IRQn	Active	TCPWM1 Group #2, Counter #1 Interrupt
539	tcpwm_1_interrupts_514_IRQn	Active	TCPWM1 Group #2, Counter #2 Interrupt
540	tcpwm_1_interrupts_515_IRQn	Active	TCPWM1 Group #2, Counter #3 Interrupt
541	tcpwm_1_interrupts_516_IRQn	Active	TCPWM1 Group #2, Counter #4 Interrupt
542	tcpwm_1_interrupts_517_IRQn	Active	TCPWM1 Group #2, Counter #5 Interrupt
543	tcpwm_1_interrupts_518_IRQn	Active	TCPWM1 Group #2, Counter #6 Interrupt
544	tcpwm_1_interrupts_519_IRQn	Active	TCPWM1 Group #2, Counter #7 Interrupt
545	tcpwm_1_interrupts_520_IRQn	Active	TCPWM1 Group #2, Counter #8 Interrupt
546	tcpwm_1_interrupts_521_IRQn	Active	TCPWM1 Group #2, Counter #9 Interrupt
547	tcpwm_1_interrupts_522_IRQn	Active	TCPWM1 Group #2, Counter #10 Interrupt
548	tcpwm_1_interrupts_523_IRQn	Active	TCPWM1 Group #2, Counter #11 Interrupt
549	tcpwm_1_interrupts_524_IRQn	Active	TCPWM1 Group #2, Counter #12 Interrupt
550	tcpwm_0_interrupts_512_IRQn	Active	TCPWM0 Group #2, Counter #0 Interrupt
551	tcpwm_0_interrupts_513_IRQn	Active	TCPWM0 Group #2, Counter #1 Interrupt
552	tcpwm_0_interrupts_514_IRQn	Active	TCPWM0 Group #2, Counter #2 Interrupt
555	smif_0_interrupt_IRQn	Active	SMIF0 (QSPI) interrupt
556	eth_0_interrupt_eth_IRQn	Active	Ethernet0 interrupt
557	eth_0_interrupt_eth_q2_IRQn	Active	Ethernet0 interrupt for dma_priority_queue2
558	eth_0_interrupt_eth_q1_IRQn	Active	Ethernet0 interrupt for dma_priority_queue1
559	eth_1_interrupt_eth_IRQn	Active	Ethernet1 interrupt
560	eth_1_interrupt_eth_q2_IRQn	Active	Ethernet1 interrupt for dma_priority_queue2
561	eth_1_interrupt_eth_q1_IRQn	Active	Ethernet1 interrupt for dma_priority_queue1
562	sdhc_0_interrupt_general_IRQn	Active	SDHC0 general interrupt
563	sdhc_0_interrupt_wakeup_IRQn	Active	SDHC0 wakeup interrupt
564	audioss_0_interrupt_i2s_IRQn	Active	AUDIOSS I^2S0 interrupt
565	audioss_1_interrupt_i2s_IRQn	Active	AUDIOSS I^2S1 interrupt
566	audioss_2_interrupt_i2s_IRQn	Active	AUDIOSS I^2S2 interrupt

15 核心中断类型

表 20 核心中断类型

Interrupt	Source	Power mode	Description
0	CPUIntIdx0_IRQn[26]	Deep Sleep	CPU User Interrupt #0
1	CPUIntIdx1_IRQn[26]	Deep Sleep	CPU User Interrupt #1
2	CPUIntIdx2_IRQn	Deep Sleep	CPU User Interrupt #2
3	CPUIntIdx3_IRQn	Deep Sleep	CPU User Interrupt #3
4	CPUIntIdx4_IRQn	Deep Sleep	CPU User Interrupt #4
5	CPUIntIdx5_IRQn	Deep Sleep	CPU User Interrupt #5
6	CPUIntIdx6_IRQn	Deep Sleep	CPU User Interrupt #6
7	CPUIntIdx7_IRQn	Deep Sleep	CPU User Interrupt #7
8	Internal0_IRQn	Active	Internal Software Interrupt #0
9	Internal1_IRQn	Active	Internal Software Interrupt #1
10	Internal2_IRQn	Active	Internal Software Interrupt #2
11	Internal3_IRQn	Active	Internal Software Interrupt #3
12	Internal4_IRQn	Active	Internal Software Interrupt #4
13	Internal5_IRQn	Active	Internal Software Interrupt #5
14	Internal6_IRQn	Active	Internal Software Interrupt #6
15	Internal7_IRQn	Active	Internal Software Interrupt #7

注释：

26.用户中断不能用于 CM0+ 应用程序，因为它由系统调用内部使用。请注意，这不会影响 CM7 应用程序。

16 触发多路复用器

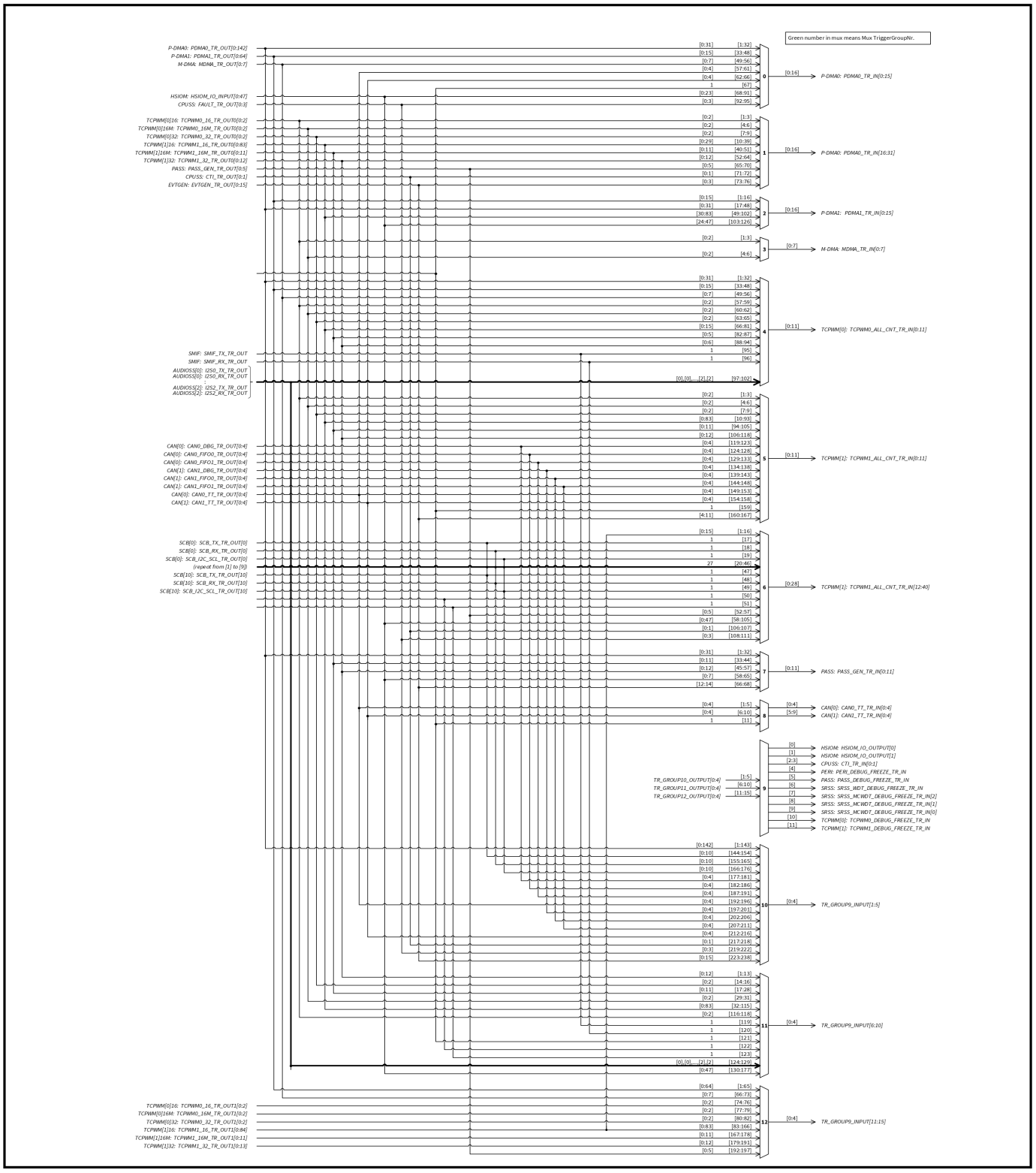

图 8 触发器多路复用器组[27]

注

27.该图仅显示 TRIG_LABEL；最终触发形成基于公式 TRIG_{PREFIX(IN/OUT)}_{MUX_x}_{TRIG_LABEL} 和**表 21** 和**表 22** 中提供的信息。

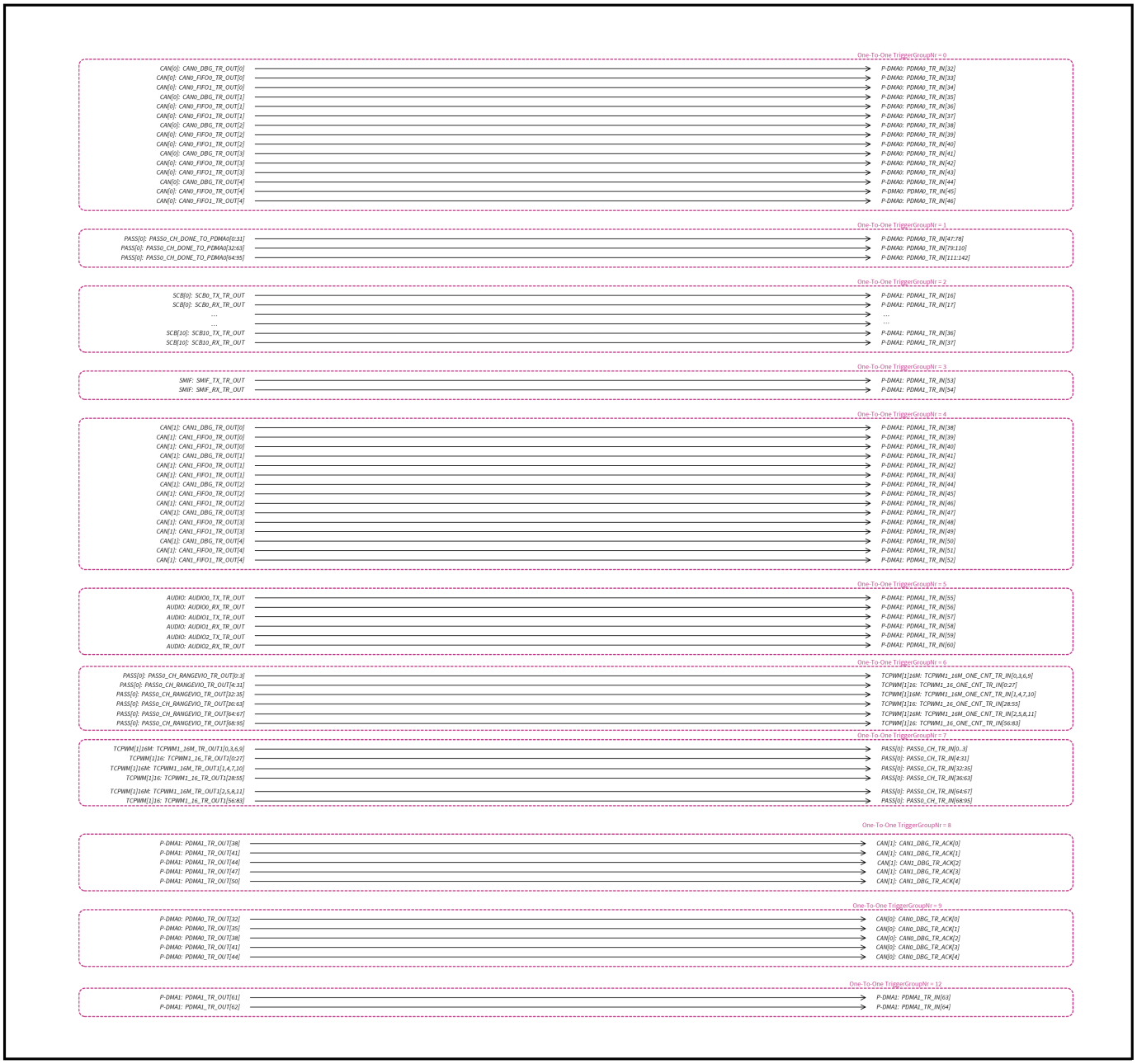

图 9　　一对一触发器[28]

注释：

28.该图仅显示 TRIG_LABEL；最终触发形成基于公式

TRIG_{PREFIX(IN_1TO1/OUT_1TO1)}_{x}_{TRIG_LABEL} 和 **表 23** 中提供的信息。

17 触发组输入

表 21 触发输入

Input	Trigger	Description
MUX Group 0: P-DMA0 trigger multiplexer		
1:32[29]	PDMA0_TR_OUT[0:31]	Allow P-DMA0 to chain to itself. Channels 0 - 31 are dedicated for chaining
33:48	PDMA1_TR_OUT[0:15]	Cross connections from P-DMA1 to P-DMA0, Channels 0-15 are used
49:56	MDMA_TR_OUT[0:7]	Cross connections from M-DMA0 to P-DMA0
57:61	CAN0_TT_TR_OUT[0:4]	CAN0 Time Trigger Sync Outputs
62:66	CAN1_TT_TR_OUT[0:4]	CAN1 Time Trigger Sync Outputs
68:91	HSIOM_IO_INPUT[0:23]	I/O Inputs
92:95	FAULT_TR_OUT[0:3]	Fault events
MUX Group 1: TCPWM to P-DMA0 trigger multiplexer		
1:3	TCPWM0_16_TR_OUT0[0:2]	16-bit TCPWM0 counters
4:6	TCPWM0_16M_TR_OUT0[0:2]	16-bit Motor enhanced TCPWM0 counters
7:9	TCPWM0_32_TR_OUT0[0:2]	32-bit TCPWM0 counters
10:39	TCPWM1_16_TR_OUT0[0:29]	16-bit TCPWM1 counters
40:51	TCPWM1_16M_TR_OUT0[0:11]	16-bit Motor enhanced TCPWM1 counters
52:64	TCPWM1_32_TR_OUT0[0:12]	32-bit TCPWM1 counters
65:70	PASS_GEN_TR_OUT[0:5]	PASS SAR events
71:72	CTI_TR_OUT[0:1]	Trace events
73:76	EVTGEN_TR_OUT[0:3]	Event generator triggers
MUX Group 2: P-DMA1 trigger multiplexer		
1:16	PDMA1_TR_OUT[0:15]	Allow P-DMA1 to chain to itself. Channels 0–15 are dedicated for chaining
17:48	PDMA0_TR_OUT[0:31]	Cross connections from P-DMA0 to P-DMA1, channels 0–31 are used.
49:102	TCPWM1_16_TR_OUT0[30:83]	16-bit TCPWM1 counters
103:126	HSIOM_IO_INPUT[24:47]	I/O Inputs
MUX Group 3: M-DMA0 trigger multiplexer		
1:3	TCPWM0_16_TR_OUT0[0:2]	16-bit TCPWM0 counters
4:6	TCPWM0_16M_TR_OUT0[0:2]	16-bit Motor enhanced TCPWM0 counters
MUX Group 4: TCPWM0 Loop back trigger multiplexer		
1:32	PDMA0_TR_OUT[0:31]	General-purpose P-DMA0 triggers
33:48	PDMA1_TR_OUT[0:15]	General-purpose P-DMA1 triggers
49:56	MDMA_TR_OUT[0:7]	M-DMA0 triggers
57:59	TCPWM0_16_TR_OUT0[0:2]	16-bit TCPWM0 counters
60:62	TCPWM0_16M_TR_OUT0[0:2]	16-bit Motor enhanced TCPWM0 counters
63:65	TCPWM0_32_TR_OUT0[0:2]	32-bit TCPWM0 counters
66:81	TCPWM1_16_TR_OUT0[0:15]	16-bit TCPWM1 counters
82:87	TCPWM1_16M_TR_OUT0[0:5]	16-bit Motor enhanced TCPWM1 counters
88:94	TCPWM1_32_TR_OUT0[0:6]	32-bit TCPWM1 counters
95	SMIF_TX_TR_OUT	SMIF0 TX trigger
96	SMIF_RX_TR_OUT	SMIF0 RX trigger
97	I2S0_TX_TR_OUT	I^2S0 TX trigger
98	I2S0_RX_TR_OUT	I^2S0 RX trigger

注释：

29. “x:y”表示从“x”到“y”的范围。

Triggers group inputs

表 21 触发输出 *(续)*

Input	Trigger	Description
99	I2S1_TX_TR_OUT	I^2S1 TX trigger
100	I2S1_RX_TR_OUT	I^2S1 RX trigger
101	I2S2_TX_TR_OUT	I^2S2 TX trigger
102	I2S2_RX_TR_OUT	I^2S2 RX trigger
MUX Group 5: TCPWM1 Loop back trigger multiplexer		
1:3	TCPWM0_16_TR_OUT0[0:2]	16-bit TCPWM0 counters
4:6	TCPWM0_16M_TR_OUT0[0:2]	16-bit Motor enhanced TCPWM0 counters
7:9	TCPWM0_32_TR_OUT0[0:2]	32-bit TCPWM0 counters
10:93	TCPWM1_16_TR_OUT0[0:83]	16-bit TCPWM1 counters
94:105	TCPWM1_16M_TR_OUT0[0:11]	16-bit Motor enhanced TCPWM1 counters
106:118	TCPWM1_32_TR_OUT0[0:12]	32-bit TCPWM1 counters
119:123	CAN0_DBG_TR_OUT[0:4]	CAN0 M-DMA0 events
124:128	CAN0_FIFO0_TR_OUT[0:4]	CAN0 FIFO0 events
129:133	CAN0_FIFO1_TR_OUT[0:4]	CAN0 FIFO1 events
134:138	CAN1_DBG_TR_OUT[0:4]	CAN1 M-DMA0 events
139:143	CAN1_FIFO0_TR_OUT[0:4]	CAN1 FIFO0 events
144:148	CAN1_FIFO1_TR_OUT[0:4]	CAN1 FIFO1 events
149:153	CAN0_TT_TR_OUT[0:4]	CAN0 TT Sync Outputs
154:158	CAN1_TT_TR_OUT[0:4]	CAN1 TT Sync Outputs
160:167	EVTGEN_TR_OUT[4:11]	Event generator triggers
MUX Group 6: TCPWM1 trigger multiplexer		
1:16	TCPWM1_16_TR_OUT1[0:15]	16-bit TCPWM1 counters
17	SCB_TX_TR_OUT[0]	SCB0 TX trigger
18	SCB_RX_TR_OUT[0]	SCB0 RX trigger
19	SCB_I2C_SCL_TR_OUT[0]	SCB0 I^2C trigger
20	SCB_TX_TR_OUT[1]	SCB1 TX trigger
21	SCB_RX_TR_OUT[1]	SCB1 RX trigger
22	SCB_I2C_SCL_TR_OUT[1]	SCB1 I^2C trigger
23	SCB_TX_TR_OUT[2]	SCB2 TX trigger
24	SCB_RX_TR_OUT[2]	SCB2 RX trigger
25	SCB_I2C_SCL_TR_OUT[2]	SCB2 I^2C trigger
26	SCB_TX_TR_OUT[3]	SCB3 TX trigger
27	SCB_RX_TR_OUT[3]	SCB3 RX trigger
28	SCB_I2C_SCL_TR_OUT[3]	SCB3 I^2C trigger
29	SCB_TX_TR_OUT[4]	SCB4 TX trigger
30	SCB_RX_TR_OUT[4]	SCB4 RX trigger
31	SCB_I2C_SCL_TR_OUT[4]	SCB4 I^2C trigger
32	SCB_TX_TR_OUT[5]	SCB5 TX trigger
33	SCB_RX_TR_OUT[5]	SCB5 RX trigger
34	SCB_I2C_SCL_TR_OUT[5]	SCB5 I^2C trigger
35	SCB_TX_TR_OUT[6]	SCB6 TX trigger
36	SCB_RX_TR_OUT[6]	SCB6 RX trigger
37	SCB_I2C_SCL_TR_OUT[6]	SCB6 I^2C trigger
38	SCB_TX_TR_OUT[7]	SCB7 TX trigger

Triggers group inputs

表 21 触发输出 *(续)*

Input	Trigger	Description
39	SCB_RX_TR_OUT[7]	SCB7 RX trigger
40	SCB_I2C_SCL_TR_OUT[7]	SCB7 I^2C trigger
41	SCB_TX_TR_OUT[8]	SCB8 TX trigger
42	SCB_RX_TR_OUT[8]	SCB8 RX trigger
43	SCB_I2C_SCL_TR_OUT[8]	SCB8 I^2C trigger
44	SCB_TX_TR_OUT[9]	SCB9 TX trigger
45	SCB_RX_TR_OUT[9]	SCB9 RX trigger
46	SCB_I2C_SCL_TR_OUT[9]	SCB9 I^2C trigger
47	SCB_TX_TR_OUT[10]	SCB10 TX trigger
48	SCB_RX_TR_OUT[10]	SCB10 RX trigger
49	SCB_I2C_SCL_TR_OUT[10]	SCB10 I^2C trigger
52:57	PASS_GEN_TR_OUT[0:5]	PASS SAR ADC events
58:105	HSIOM_IO_INPUT[0:47]	I/O Inputs
106:107	CTI_TR_IN[0:1]	CPUSS CTI Trace events
108:111	FAULT_TR_OUT[0:3]	Fault events
MUX Group 7: PASS trigger multiplexer		
1:31	PDMA0_TR_OUT[0:31]	General purpose P-DMA0 triggers
32:44	TCPWM1_16M_TR_OUT0[0:11]	16-bit Motor enhanced TCPWM1 counters
45:57	TCPWM1_32_TR_OUT0[0:12]	32-bit TCPWM1 counters
58:65	HSIOM_IO_INPUT[0:7]	I/O Inputs
66:68	EVTGEN_TR_OUT[12:14]	Event generator triggers
MUX Group 8: CAN TT Sync		
1:5	CAN0_TT_TR_OUT[0:4]	CAN0 TT Sync Outputs
6:10	CAN1_TT_TR_OUT[0:4]	CAN1 TT Sync Outputs
MUX Group 9: Debug multiplexer		
1:5	TR_GROUP10_OUTPUT[0:4]	Output from debug reduction multiplexer #1
6:10	TR_GROUP11_OUTPUT[0:4]	Output from debug reduction multiplexer #2
11:15	TR_GROUP12_OUTPUT[0:4]	Output from debug reduction multiplexer #3
MUX Group 10: Debug Reduction #1		
1:143	PDMA0_TR_OUT[0:142]	General purpose P-DMA0 triggers
144:154	SCB_TX_TR_OUT[0:10]	SCB TX triggers
155:165	SCB_RX_TR_OUT[0:10]	SCB RX triggers
166:176	SCB_I2C_SCL_TR_OUT[0:10]	SCB I^2C triggers
177:181	CAN0_DBG_TR_OUT[0:4]	CAN0 M-DMA0
182:186	CAN0_FIFO0_TR_OUT[0:4]	CAN0 FIFO0
187:191	CAN0_FIFO1_TR_OUT[0:4]	CAN0 FIFO1
192:196	CAN0_TT_TR_OUT[0:4]	CAN0 TT Sync Outputs
197:201	CAN1_DBG_TR_OUT[0:4]	CAN1 M-DMA0
202:206	CAN1_FIFO0_TR_OUT[0:4]	CAN1 FIFO0
207:211	CAN1_FIFO1_TR_OUT[0:4]	CAN1 FIFO1
212:216	CAN1_TT_TR_OUT[0:4]	CAN1 TT Sync Outputs
217:218	CTI_TR_OUT[0:1]	CPUSS CTI Trace events
219:222	FAULT_TR_OU[0:3]	Fault events
223:238	EVTGEN_TR_OUT[0:15]	EVTGEN Triggers

Triggers group inputs

表 21 触发输出 *(续)*

Input	Trigger	Description
MUX Group 11: Debug Reduction #2		
1:13	TCPWM1_32_TR_OUT0[0:12]	32-bit TCPWM1 counters
14:16	TCPWM0_32_TR_OUT0[0:2]	32-bit TCPWM0 counters
17:28	TCPWM1_16M_TR_OUT0[0:11]	16-bit Motor enhanced TCPWM1 counters
29:31	TCPWM0_16M_TR_OUT0[0:2]	16-bit Motor enhanced TCPWM0 counters
32:115	TCPWM1_16_TR_OUT0[0:83]	16-bit TCPWM1 counters
116:118	TCPWM0_16_TR_OUT0[0:2]	16-bit TCPWM0 counters
119	SMIF_TX_TR_OUT	SMIF TX trigger
120	SMIF_RX_TR_OUT	SMIF RX trigger
124	I2S0_TX_TR_OUT	I^2S0 TX trigger
125	I2S0_RX_TR_OUT	I^2S0 RX trigger
126	I2S1_TX_TR_OUT	I^2S1 TX trigger
127	I2S1_RX_TR_OUT	I^2S1 RX trigger
128	I2S2_TX_TR_OUT	I^2S2 TX trigger
129	I2S2_RX_TR_OUT	I^2S2 RX trigger
130:177	HSIOM_IO_INPUT[0:47]	I/O inputs
MUX Group 12: Debug Reduction #3		
1:65	PDMA1_TR_OUT[0:64]	General purpose P-DMA1 triggers
66:73	MDMA_TR_OUT[0:7]	M-DMA0 triggers
74:76	TCPWM0_16_TR_OUT1[0:2]	16-bit TCPWM0 counters
77:79	TCPWM0_16M_TR_OUT1[0:2]	16-bit Motor enhanced TCPWM0 counters
80:82	TCPWM0_32_TR_OUT1[0:2]	32-bit TCPWM0 counters
83:166	TCPWM1_16_TR_OUT1[0:83]	16-bit TCPWM1 counters
167:178	TCPWM1_16M_TR_OUT1[0:11]	16-bit Motor enhanced TCPWM1 counters
179:191	TCPWM1_32_TR_OUT1[0:12]	32-bit TCPWM1 counters
192:197	PASS_GEN_TR_OUT[0:5]	PASS SAR ADC events

18 触发组输出

表 22 触发输出

Output	Trigger	Description
MUX Group 0: P-DMA0 trigger multiplexer		
0:15	PDMA0_TR_IN[0:15]	Triggers to P-DMA0[0:15]
MUX Group 1: TCPWM to P-DMA0 trigger multiplexer		
0:15	PDMA0_TR_IN[16:31]	Triggers to P-DMA0[16:31]
MUX Group 2: P-DMA1 trigger multiplexer		
0:15	PDMA1_TR_IN[0:15]	Triggers to P-DMA1
MUX Group 3: M-DMA0 trigger multiplexer		
0:7	M-DMA_TR_IN[0:7]	Triggers to M-DMA0
MUX Group 4: TCPWM0 Loop back trigger multiplexer MUX		
0:11	TCPWM0_ALL_CNT_TR_IN[0:11]	Triggers to TCPWM0
Group 5: TCPWM1 Loop back trigger multiplexer MUX		
0:11	TCPWM1_ALL_CNT_TR_IN[0:11]	Triggers to TCPWM1
Group 6: TCPWM1 trigger multiplexer		
0:28	TCPWM1_ALL_CNT_TR_IN[12:40]	Triggers to TCPWM1
MUX Group 7: PASS trigger multiplexer		
0:11	PASS_GEN_TR_IN[0:11]	Triggers to PASS SAR ADCs
MUX Group 8: CAN TT Sync		
0:4	CAN0_TT_TR_IN[0:4]	CAN0 TT Sync Inputs
5:9	CAN1_TT_TR_IN[0:4]	CAN1 TT Sync Inputs
MUX Group 9: Debug multiplexer		
0	HSIOM_IO_OUTPUT[0]	To HSIOM as an output
1	HSIOM_IO_OUTPUT[1]	To HSIOM as an output
2:3	CTI_TR_IN[0:1]	To the Cross Trigger system
4	PERI_DEBUG_FREEZE_TR_IN	Signal to Freeze PERI operation
5	PASS_DEBUG_FREEZE_TR_IN	Signal to Freeze SAR ADC operation
6	SRSS_WDT_DEBUG_FREEZE_TR_IN	Signal to Freeze WDT operation
7	SRSS_MCWDT_DEBUG_FREEZE_TR_IN[2]	Signal to Freeze MCWDT2 operation
8	SRSS_MCWDT_DEBUG_FREEZE_TR_IN[1]	Signal to Freeze MCWDT1 operation
9	SRSS_MCWDT_DEBUG_FREEZE_TR_IN[0]	Signal to Freeze MCWDT0 operation
10	TCPWM0_DEBUG_FREEZE_TR_IN	Signal to Freeze TCPWM0 operation
11	TCPWM1_DEBUG_FREEZE_TR_IN	Signal to Freeze TCPWM1 operation
MUX Group 10: Debug Reduction #1		
0:4	TR_GROUP9_INPUT[1:5]	To main debug multiplexer
MUX Group 11: Debug Reduction #2		
0:4	TR_GROUP9_INPUT[6:10]	To main debug multiplexer
MUX Group 12: Debug Reduction #3		
0:4	TR_GROUP9_INPUT[11:15]	To main debug multiplexer

19 触发器一对一

表 23 触发器 1:1

Input	Trigger In	Trigger Out	Description
MUX Group 0: CAN0 to P-DMA0 Triggers			
0	CAN0_DBG_TR_OUT[0]	PDMA0_TR_IN[32]	CAN0, Channel #0 P-DMA0 trigger
1	CAN0_FIFO0_TR_OUT[0]	PDMA0_TR_IN[33]	CAN0, Channel #0 FIFO0 trigger
2	CAN0_FIFO1_TR_OUT[0]	PDMA0_TR_IN[34]	CAN0, Channel #0 FIFO1 trigger
3	CAN0_DBG_TR_OUT[1]	PDMA0_TR_IN[35]	CAN0, Channel #1 P-DMA0 trigger
4	CAN0_FIFO0_TR_OUT[1]	PDMA0_TR_IN[36]	CAN0, Channel #1 FIFO0 trigger
5	CAN0_FIFO1_TR_OUT[1]	PDMA0_TR_IN[37]	CAN0, Channel #1 FIFO1 trigger
6	CAN0_DBG_TR_OUT[2]	PDMA0_TR_IN[38]	CAN0, Channel #2 P-DMA0 trigger
7	CAN0_FIFO0_TR_OUT[2]	PDMA0_TR_IN[39]	CAN0, Channel #2 FIFO0 trigger
8	CAN0_FIFO1_TR_OUT[2]	PDMA0_TR_IN[40]	CAN0, Channel #2 FIFO1 trigger
9	CAN0_DBG_TR_OUT[3]	PDMA0_TR_IN[41]	CAN0, Channel #3 P-DMA0 trigger
10	CAN0_FIFO0_TR_OUT[3]	PDMA0_TR_IN[42]	CAN0, Channel #3 FIFO0 trigger
11	CAN0_FIFO1_TR_OUT[3]	PDMA0_TR_IN[43]	CAN0, Channel #3 FIFO1 trigger
12	CAN0_DBG_TR_OUT[4]	PDMA0_TR_IN[44]	CAN0, Channel #4 P-DMA0 trigger
13	CAN0_FIFO0_TR_OUT[4]	PDMA0_TR_IN[45]	CAN0, Channel #4 FIFO0 trigger
14	CAN0_FIFO1_TR_OUT[4]	PDMA0_TR_IN[46]	CAN0, Channel #4 FIFO1 trigger
MUX Group 1: PASS SARx to P-DMA0 direct connect			
0:31	PASS0_CH_DONE_TR_OUT[0:31]	PDMA0_TR_IN[47:78]	PASS SAR0 [0:31] to P-DMA0 direct connect
32:63	PASS0_CH_DONE_TR_OUT[32:63]	PDMA0_TR_IN[79:110]	PASS SAR1 [0:31] to P-DMA0 direct connect
64:95	PASS0_CH_DONE_TR_OUT[64:95]	PDMA0_TR_IN[111:142]	PASS SAR2 [0:31] to P-DMA0 direct connect
MUX Group 2: SCBx to P-DMA1 Triggers			
0	SCB0_TX_TR_OUT	PDMA1_TR_IN[16]	SCB0 to P-DMA1 Trigger
1	SCB0_RX_TR_OUT	PDMA1_TR_IN[17]	SCB0 to P-DMA1 Trigger
2	SCB1_TX_TR_OUT	PDMA1_TR_IN[18]	SCB1 to P-DMA1 Trigger
3	SCB1_RX_TR_OUT	PDMA1_TR_IN[19]	SCB1 to P-DMA1 Trigger
4	SCB2_TX_TR_OUT	PDMA1_TR_IN[20]	SCB2 to P-DMA1 Trigger
5	SCB2_RX_TR_OUT	PDMA1_TR_IN[21]	SCB2 to P-DMA1 Trigger
6	SCB3_TX_TR_OUT	PDMA1_TR_IN[22]	SCB3 to P-DMA1 Trigger
7	SCB3_RX_TR_OUT	PDMA1_TR_IN[23]	SCB3 to P-DMA1 Trigger
8	SCB4_TX_TR_OUT	PDMA1_TR_IN[24]	SCB4 to P-DMA1 Trigger
9	SCB4_RX_TR_OUT	PDMA1_TR_IN[25]	SCB4 to P-DMA1 Trigger
10	SCB5_TX_TR_OUT	PDMA1_TR_IN[26]	SCB5 to P-DMA1 Trigger
11	SCB5_RX_TR_OUT	PDMA1_TR_IN[27]	SCB5 to P-DMA1 Trigger
12	SCB6_TX_TR_OUT	PDMA1_TR_IN[28]	SCB6 to P-DMA1 Trigger
13	SCB6_RX_TR_OUT	PDMA1_TR_IN[29]	SCB6 to P-DMA1 Trigger
14	SCB7_TX_TR_OUT	PDMA1_TR_IN[30]	SCB7 to P-DMA1 Trigger
15	SCB7_RX_TR_OUT	PDMA1_TR_IN[31]	SCB7 to P-DMA1 Trigger

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

Triggers one-to-one

表 23 触发器 1:1 *(续)*

Input	Trigger In	Trigger Out	Description
16	SCB8_TX_TR_OUT	PDMA1_TR_IN[32]	SCB8 to P-DMA1 Trigger
17	SCB8_RX_TR_OUT	PDMA1_TR_IN[33]	SCB8 to P-DMA1 Trigger
18	SCB9_TX_TR_OUT	PDMA1_TR_IN[34]	SCB9 to P-DMA1 Trigger
19	SCB9_RX_TR_OUT	PDMA1_TR_IN[35]	SCB9 to P-DMA1 Trigger
20	SCB10_TX_TR_OUT	PDMA1_TR_IN[36]	SCB10 to P-DMA1 Trigger
21	SCB10_RX_TR_OUT	PDMA1_TR_IN[37]	SCB10 to P-DMA1 Trigger
MUX Group 3: SMIF0 to P-DMA1 Triggers			
0	SMIF_TX_TR_OUT	PDMA1_TR_IN[53]	SMIF0 to P-DMA1 Trigger
1	SMIF_RX_TR_OUT	PDMA1_TR_IN[54]	SMIF0 to P-DMA1 Trigger
MUX Group 4: CAN1 to P-DMA1 triggers			
0	CAN1_DBG_TR_OUT[0]	PDMA1_TR_IN[38]	CAN1 Channel #0 P-DMA1 trigger
1	CAN1_FIFO0_TR_OUT[0]	PDMA1_TR_IN[39]	CAN1 Channel #0 FIFO0 trigger
2	CAN1_FIFO1_TR_OUT[0]	PDMA1_TR_IN[40]	CAN1 Channel #0 FIFO1 trigger
3	CAN1_DBG_TR_OUT[1]	PDMA1_TR_IN[41]	CAN1 Channel #1 P-DMA1 trigger
4	CAN1_FIFO0_TR_OUT[1]	PDMA1_TR_IN[42]	CAN1 Channel #1 FIFO0 trigger
5	CAN1_FIFO1_TR_OUT[1]	PDMA1_TR_IN[43]	CAN1 Channel #1 FIFO1 trigger
6	CAN1_DBG_TR_OUT[2]	PDMA1_TR_IN[44]	CAN1 Channel #2 P-DMA1 trigger
7	CAN1_FIFO0_TR_OUT[2]	PDMA1_TR_IN[45]	CAN1 Channel #2 FIFO0 trigger
8	CAN1_FIFO1_TR_OUT[2]	PDMA1_TR_IN[46]	CAN1 Channel #2 FIFO1 trigger
9	CAN1_DBG_TR_OUT[3]	PDMA1_TR_IN[47]	CAN1 Channel #3 P-DMA1 trigger
10	CAN1_FIFO0_TR_OUT[3]	PDMA1_TR_IN[48]	CAN1 Channel #3 FIFO0 trigger
11	CAN1_FIFO1_TR_OUT[3]	PDMA1_TR_IN[49]	CAN1 Channel #3 FIFO1 trigger
12	CAN1_DBG_TR_OUT[4]	PDMA1_TR_IN[50]	CAN1 Channel #4 P-DMA1 trigger
13	CAN1_FIFO0_TR_OUT[4]	PDMA1_TR_IN[51]	CAN1 Channel #4 FIFO0 trigger
14	CAN1_FIFO1_TR_OUT[4]	PDMA1_TR_IN[52]	CAN1 Channel #4 FIFO1 trigger
MUX Group 5: I^2Sx to P-DMA1 Triggers			
0	AUDIO0_TX_TR_OUT	PDMA1_TR_IN[55]	I^2S0 TX to P-DMA1 trigger
1	AUDIO0_RX_TR_OUT	PDMA1_TR_IN[56]	I^2S0 RX to P-DMA1 trigger
2	AUDIO1_TX_TR_OUT	PDMA1_TR_IN[57]	I^2S1 TX to P-DMA1 trigger
3	AUDIO1_RX_TR_OUT	PDMA1_TR_IN[58]	I^2S1 RX to P-DMA1 trigger
4	AUDIO2_TX_TR_OUT	PDMA1_TR_IN[59]	I^2S2 TX to P-DMA1 trigger
5	AUDIO2_RX_TR_OUT	PDMA1_TR_IN[60]	I^2S2 RX to P-DMA1 trigger
MUX Group 6: PASS SARx to TCPWM1 direct connect			
0	PASS0_CH_RANGEVIO_TR_OUT[0]	TCPWM1_16M_ONE_CNT_TR_IN[0]	SAR0 ch#0[30], range violation to TCPWM1 Group #1 Counter #00 trig = 4trig = 4
1	PASS0_CH_RANGEVIO_TR_OUT[1]	TCPWM1_16M_ONE_CNT_TR_IN[3]	SAR0 ch#1, range violation to TCPWM1 Group #1 Counter #03 trig = 4trig = 4
2	PASS0_CH_RANGEVIO_TR_OUT[2]	TCPWM1_16M_ONE_CNT_TR_IN[6]	SAR0 ch#2, range violation to TCPWM1 Group #1 Counter #06 trig = 4trig = 4

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

Triggers one-to-one

表 23　　触发器 1:1 *（续）*

Input	Trigger In	Trigger Out	Description
3	PASS0_CH_RANGEVIO_TR_OUT[3]	TCPWM1_16M_ONE_CNT_TR_IN[9]	SAR0 ch#3, range violation to TCPWM1 Group #1 Counter #09 trig = 4
4	PASS0_CH_RANGEVIO_TR_OUT[4]	TCPWM1_16_ONE_CNT_TR_IN[0]	SAR0 ch#4, range violation to TCPWM1 Group #0 Counter #00 trig = 4
5	PASS0_CH_RANGEVIO_TR_OUT[5]	TCPWM1_16_ONE_CNT_TR_IN[1]	SAR0 ch#5, range violation to TCPWM1 Group #0 Counter #01 trig = 4
6	PASS0_CH_RANGEVIO_TR_OUT[6]	TCPWM1_16_ONE_CNT_TR_IN[2]	SAR0 ch#6, range violation to TCPWM1 Group #0 Counter #02 trig = 4
7	PASS0_CH_RANGEVIO_TR_OUT[7]	TCPWM1_16_ONE_CNT_TR_IN[3]	SAR0 ch#7, range violation to TCPWM1 Group #0 Counter #03 trig = 4
8	PASS0_CH_RANGEVIO_TR_OUT[8]	TCPWM1_16_ONE_CNT_TR_IN[4]	SAR0 ch#8, range violation to TCPWM1 Group #0 Counter #04 trig = 4
9	PASS0_CH_RANGEVIO_TR_OUT[9]	TCPWM1_16_ONE_CNT_TR_IN[5]	SAR0 ch#9, range violation to TCPWM1 Group #0 Counter #05 trig = 4
10	PASS0_CH_RANGEVIO_TR_OUT[10]	TCPWM1_16_ONE_CNT_TR_IN[6]	SAR0 ch#10, range violation to TCPWM1 Group #0 Counter #06 trig = 4
11	PASS0_CH_RANGEVIO_TR_OUT[11]	TCPWM1_16_ONE_CNT_TR_IN[7]	SAR0 ch#11, range violation to TCPWM1 Group #0 Counter #07 trig = 4
12	PASS0_CH_RANGEVIO_TR_OUT[12]	TCPWM1_16_ONE_CNT_TR_IN[8]	SAR0 ch#12, range violation to TCPWM1 Group #0 Counter #08 trig = 4
13	PASS0_CH_RANGEVIO_TR_OUT[13]	TCPWM1_16_ONE_CNT_TR_IN[9]	SAR0 ch#13, range violation to TCPWM1 Group #0 Counter #09 trig = 4
14	PASS0_CH_RANGEVIO_TR_OUT[14]	TCPWM1_16_ONE_CNT_TR_IN[10]	SAR0 ch#14, range violation to TCPWM1 Group #0 Counter #10 trig = 4
15	PASS0_CH_RANGEVIO_TR_OUT[15]	TCPWM1_16_ONE_CNT_TR_IN[11]	SAR0 ch#15, range violation to TCPWM1 Group #0 Counter #11 trig = 4
16	PASS0_CH_RANGEVIO_TR_OUT[16]	TCPWM1_16_ONE_CNT_TR_IN[12]	SAR0 ch#16, range violation to TCPWM1 Group #0 Counter #12 trig = 4
17	PASS0_CH_RANGEVIO_TR_OUT[17]	TCPWM1_16_ONE_CNT_TR_IN[13]	SAR0 ch#17, range violation to TCPWM1 Group #0 Counter #13 trig = 4
18	PASS0_CH_RANGEVIO_TR_OUT[18]	TCPWM1_16_ONE_CNT_TR_IN[14]	SAR0 ch#18, range violation to TCPWM1 Group #0 Counter #14 trig = 4
19	PASS0_CH_RANGEVIO_TR_OUT[19]	TCPWM1_16_ONE_CNT_TR_IN[15]	SAR0 ch#19, range violation to TCPWM1 Group #0 Counter #15 trig = 4

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

Triggers one-to-one

表 23 触发器 1:1 *(续)*

Input	Trigger In	Trigger Out	Description
20	PASS0_CH_RANGEVIO_TR_OUT[20]	TCPWM1_16_ONE_CNT_TR_IN[16]	SAR0 ch#20, range violation to TCPWM1 Group #0 Counter #16 trig = 4
21	PASS0_CH_RANGEVIO_TR_OUT[21]	TCPWM1_16_ONE_CNT_TR_IN[17]	SAR0 ch#21, range violation to TCPWM1 Group #0 Counter #17 trig = 4
22	PASS0_CH_RANGEVIO_TR_OUT[22]	TCPWM1_16_ONE_CNT_TR_IN[18]	SAR0 ch#22, range violation to TCPWM1 Group #0 Counter #18 trig = 4
23	PASS0_CH_RANGEVIO_TR_OUT[23]	TCPWM1_16_ONE_CNT_TR_IN[19]	SAR0 ch#23, range violation to TCPWM1 Group #0 Counter #19 trig = 4
24	PASS0_CH_RANGEVIO_TR_OUT[24]	TCPWM1_16_ONE_CNT_TR_IN[20]	SAR0 ch#24, range violation to TCPWM1 Group #0 Counter #20 trig = 4
25	PASS0_CH_RANGEVIO_TR_OUT[25]	TCPWM1_16_ONE_CNT_TR_IN[21]	SAR0 ch#25, range violation to TCPWM1 Group #0 Counter #21 trig = 4
26	PASS0_CH_RANGEVIO_TR_OUT[26]	TCPWM1_16_ONE_CNT_TR_IN[22]	SAR0 ch#26, range violation to TCPWM1 Group #0 Counter #22 trig = 4
27	PASS0_CH_RANGEVIO_TR_OUT[27]	TCPWM1_16_ONE_CNT_TR_IN[23]	SAR0 ch#27, range violation to TCPWM1 Group #0 Counter #23 trig = 4
28	PASS0_CH_RANGEVIO_TR_OUT[28]	TCPWM1_16_ONE_CNT_TR_IN[24]	SAR0 ch#28, range violation to TCPWM1 Group #0 Counter #24 trig = 4
29	PASS0_CH_RANGEVIO_TR_OUT[29]	TCPWM1_16_ONE_CNT_TR_IN[25]	SAR0 ch#29, range violation to TCPWM1 Group #0 Counter #25 trig = 4
30	PASS0_CH_RANGEVIO_TR_OUT[30]	TCPWM1_16_ONE_CNT_TR_IN[26]	SAR0 ch#30, range violation to TCPWM1 Group #0 Counter #26 trig = 4
31	PASS0_CH_RANGEVIO_TR_OUT[31]	TCPWM1_16_ONE_CNT_TR_IN[27]	SAR0 ch#31, range violation to TCPWM1 Group #0 Counter #27 trig = 4
32	PASS0_CH_RANGEVIO_TR_OUT[32]	TCPWM1_16M_ONE_CNT_TR_IN[1]	SAR1 ch#0, range violation to TCPWM1 Group #1 Counter #01 trig = 4
33	PASS0_CH_RANGEVIO_TR_OUT[33]	TCPWM1_16M_ONE_CNT_TR_IN[4]	SAR1 ch#1, range violation to TCPWM1 Group #1 Counter #04 trig = 4
34	PASS0_CH_RANGEVIO_TR_OUT[34]	TCPWM1_16M_ONE_CNT_TR_IN[7]	SAR1 ch#2, range violation to TCPWM1 Group #1 Counter #07 trig = 4
35	PASS0_CH_RANGEVIO_TR_OUT[35]	TCPWM1_16M_ONE_CNT_TR_IN[10]	SAR1 ch#3, range violation to TCPWM1 Group #1 Counter #10 trig = 4
36	PASS0_CH_RANGEVIO_TR_OUT[36]	TCPWM1_16_ONE_CNT_TR_IN[28]	SAR1 ch#4, range violation to TCPWM1 Group #0 Counter #28 trig = 4

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

Triggers one-to-one

表 23　　触发器 1:1 *（续）*

Input	Trigger In	Trigger Out	Description
37	PASS0_CH_RANGEVIO_TR_OUT[37]	TCPWM1_16_ONE_CNT_TR_IN[29]	SAR1 ch#5, range violation to TCPWM1 Group #0 Counter #29 trig = 4
38	PASS0_CH_RANGEVIO_TR_OUT[38]	TCPWM1_16_ONE_CNT_TR_IN[30]	SAR1 ch#6, range violation to TCPWM1 Group #0 Counter #30 trig = 4
39	PASS0_CH_RANGEVIO_TR_OUT[39]	TCPWM1_16_ONE_CNT_TR_IN[31]	SAR1 ch#7, range violation to TCPWM1 Group #0 Counter #31 trig = 4
40	PASS0_CH_RANGEVIO_TR_OUT[40]	TCPWM1_16_ONE_CNT_TR_IN[32]	SAR1 ch#8, range violation to TCPWM1 Group #0 Counter #32 trig = 4
41	PASS0_CH_RANGEVIO_TR_OUT[41]	TCPWM1_16_ONE_CNT_TR_IN[33]	SAR1 ch#9, range violation to TCPWM1 Group #0 Counter #33 trig = 4
42	PASS0_CH_RANGEVIO_TR_OUT[42]	TCPWM1_16_ONE_CNT_TR_IN[34]	SAR1 ch#10, range violation to TCPWM1 Group #0 Counter #34 trig = 4
43	PASS0_CH_RANGEVIO_TR_OUT[43]	TCPWM1_16_ONE_CNT_TR_IN[35]	SAR1 ch#11, range violation to TCPWM1 Group #0 Counter #35 trig = 4
44	PASS0_CH_RANGEVIO_TR_OUT[44]	TCPWM1_16_ONE_CNT_TR_IN[36]	SAR1 ch#12, range violation to TCPWM1 Group #0 Counter #36 trig = 4
45	PASS0_CH_RANGEVIO_TR_OUT[45]	TCPWM1_16_ONE_CNT_TR_IN[37]	SAR1 ch#13, range violation to TCPWM1 Group #0 Counter #37 trig = 4
46	PASS0_CH_RANGEVIO_TR_OUT[46]	TCPWM1_16_ONE_CNT_TR_IN[38]	SAR1 ch#14, range violation to TCPWM1 Group #0 Counter #38 trig = 4
47	PASS0_CH_RANGEVIO_TR_OUT[47]	TCPWM1_16_ONE_CNT_TR_IN[39]	SAR1 ch#15, range violation to TCPWM1 Group #0 Counter #39 trig = 4
48	PASS0_CH_RANGEVIO_TR_OUT[48]	TCPWM1_16_ONE_CNT_TR_IN[40]	SAR1 ch#16, range violation to TCPWM1 Group #0 Counter #40 trig = 4
49	PASS0_CH_RANGEVIO_TR_OUT[49]	TCPWM1_16_ONE_CNT_TR_IN[41]	SAR1 ch#17, range violation to TCPWM1 Group #0 Counter #41 trig = 4
50	PASS0_CH_RANGEVIO_TR_OUT[50]	TCPWM1_16_ONE_CNT_TR_IN[42]	SAR1 ch#18, range violation to TCPWM1 Group #0 Counter #42 trig = 4
51	PASS0_CH_RANGEVIO_TR_OUT[51]	TCPWM1_16_ONE_CNT_TR_IN[43]	SAR1 ch#19, range violation to TCPWM1 Group #0 Counter #43 trig = 4
52	PASS0_CH_RANGEVIO_TR_OUT[52]	TCPWM1_16_ONE_CNT_TR_IN[44]	SAR1 ch#20, range violation to TCPWM1 Group #0 Counter #44 trig = 4
53	PASS0_CH_RANGEVIO_TR_OUT[53]	TCPWM1_16_ONE_CNT_TR_IN[45]	SAR1 ch#21, range violation to TCPWM1 Group #0 Counter #45 trig = 4

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

Triggers one-to-one

表 23　　触发器 1:1 *(续)*

Input	Trigger In	Trigger Out	Description
54	PASS0_CH_RANGEVIO_TR_OUT[54]	TCPWM1_16_ONE_CNT_TR_IN[46]	SAR1 ch#22, range violation to TCPWM1 Group #0 Counter #46 trig = 4
55	PASS0_CH_RANGEVIO_TR_OUT[55]	TCPWM1_16_ONE_CNT_TR_IN[47]	SAR1 ch#23, range violation to TCPWM1 Group #0 Counter #47 trig = 4
56	PASS0_CH_RANGEVIO_TR_OUT[56]	TCPWM1_16_ONE_CNT_TR_IN[48]	SAR1 ch#24, range violation to TCPWM1 Group #0 Counter #48 trig = 4
57	PASS0_CH_RANGEVIO_TR_OUT[57]	TCPWM1_16_ONE_CNT_TR_IN[49]	SAR1 ch#25, range violation to TCPWM1 Group #0 Counter #49 trig = 4
58	PASS0_CH_RANGEVIO_TR_OUT[58]	TCPWM1_16_ONE_CNT_TR_IN[50]	SAR1 ch#26, range violation to TCPWM1 Group #0 Counter #50 trig = 4
59	PASS0_CH_RANGEVIO_TR_OUT[59]	TCPWM1_16_ONE_CNT_TR_IN[51]	SAR1 ch#27, range violation to TCPWM1 Group #0 Counter #51 trig = 4
60	PASS0_CH_RANGEVIO_TR_OUT[60]	TCPWM1_16_ONE_CNT_TR_IN[52]	SAR1 ch#28, range violation to TCPWM1 Group #0 Counter #52 trig = 4
61	PASS0_CH_RANGEVIO_TR_OUT[61]	TCPWM1_16_ONE_CNT_TR_IN[53]	SAR1 ch#29, range violation to TCPWM1 Group #0 Counter #53 trig = 4
62	PASS0_CH_RANGEVIO_TR_OUT[62]	TCPWM1_16_ONE_CNT_TR_IN[54]	SAR1 ch#30, range violation to TCPWM1 Group #0 Counter #54 trig = 4
63	PASS0_CH_RANGEVIO_TR_OUT[63]	TCPWM1_16_ONE_CNT_TR_IN[55]	SAR1 ch#31, range violation to TCPWM1 Group #0 Counter #55 trig = 4
64	PASS0_CH_RANGEVIO_TR_OUT[64]	TCPWM1_16M_ONE_CNT_TR_IN[2]	SAR2 ch#0, range violation to TCPWM1 Group #1 Counter #02 trig = 4
65	PASS0_CH_RANGEVIO_TR_OUT[65]	TCPWM1_16M_ONE_CNT_TR_IN[5]	SAR2 ch#1, range violation to TCPWM1 Group #1 Counter #05 trig = 4
66	PASS0_CH_RANGEVIO_TR_OUT[66]	TCPWM1_16M_ONE_CNT_TR_IN[8]	SAR2 ch#2, range violation to TCPWM1 Group #1 Counter #08 trig = 4
67	PASS0_CH_RANGEVIO_TR_OUT[67]	TCPWM1_16M_ONE_CNT_TR_IN[11]	SAR2 ch#3, range violation to TCPWM1 Group #1 Counter #11 trig = 4
68	PASS0_CH_RANGEVIO_TR_OUT[68]	TCPWM1_16_ONE_CNT_TR_IN[56]	SAR2 ch#4, range violation to TCPWM1 Group #0 Counter #56 trig = 4
69	PASS0_CH_RANGEVIO_TR_OUT[69]	TCPWM1_16_ONE_CNT_TR_IN[57]	SAR2 ch#5, range violation to TCPWM1 Group #0 Counter #57 trig = 4
70	PASS0_CH_RANGEVIO_TR_OUT[70]	TCPWM1_16_ONE_CNT_TR_IN[58]	SAR2 ch#6, range violation to TCPWM1 Group #0 Counter #58 trig = 4

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

Triggers one-to-one

表 23　　触发器 1:1 *(续)*

Input	Trigger In	Trigger Out	Description
71	PASS0_CH_RANGEVIO_TR_OUT[71]	TCPWM1_16_ONE_CNT_TR_IN[59]	SAR2 ch#7, range violation to TCPWM1 Group #0 Counter #59 trig = 4
72	PASS0_CH_RANGEVIO_TR_OUT[72]	TCPWM1_16_ONE_CNT_TR_IN[60]	SAR2 ch#8, range violation to TCPWM1 Group #0 Counter #60 trig = 4
73	PASS0_CH_RANGEVIO_TR_OUT[73]	TCPWM1_16_ONE_CNT_TR_IN[61]	SAR2 ch#9, range violation to TCPWM1 Group #0 Counter #61 trig = 4
74	PASS0_CH_RANGEVIO_TR_OUT[74]	TCPWM1_16_ONE_CNT_TR_IN[62]	SAR2 ch#10, range violation to TCPWM1 Group #0 Counter #62 trig = 4
75	PASS0_CH_RANGEVIO_TR_OUT[75]	TCPWM1_16_ONE_CNT_TR_IN[63]	SAR2 ch#11, range violation to TCPWM1 Group #0 Counter #63 trig = 4
76	PASS0_CH_RANGEVIO_TR_OUT[76]	TCPWM1_16_ONE_CNT_TR_IN[64]	SAR2 ch#12, range violation to TCPWM1 Group #0 Counter #64 trig = 4
77	PASS0_CH_RANGEVIO_TR_OUT[77]	TCPWM1_16_ONE_CNT_TR_IN[65]	SAR2 ch#13, range violation to TCPWM1 Group #0 Counter #65 trig = 4
78	PASS0_CH_RANGEVIO_TR_OUT[78]	TCPWM1_16_ONE_CNT_TR_IN[66]	SAR2 ch#14, range violation to TCPWM1 Group #0 Counter #66 trig = 4
79	PASS0_CH_RANGEVIO_TR_OUT[79]	TCPWM1_16_ONE_CNT_TR_IN[67]	SAR2 ch#15, range violation to TCPWM1 Group #0 Counter #67 trig = 4
80	PASS0_CH_RANGEVIO_TR_OUT[80]	TCPWM1_16_ONE_CNT_TR_IN[68]	SAR2 ch#16, range violation to TCPWM1 Group #0 Counter #68 trig = 4
81	PASS0_CH_RANGEVIO_TR_OUT[81]	TCPWM1_16_ONE_CNT_TR_IN[69]	SAR2 ch#17, range violation to TCPWM1 Group #0 Counter #69 trig = 4
82	PASS0_CH_RANGEVIO_TR_OUT[82]	TCPWM1_16_ONE_CNT_TR_IN[70]	SAR2 ch#18, range violation to TCPWM1 Group #0 Counter #70 trig = 4
83	PASS0_CH_RANGEVIO_TR_OUT[83]	TCPWM1_16_ONE_CNT_TR_IN[71]	SAR2 ch#19, range violation to TCPWM1 Group #0 Counter #71 trig = 4
84	PASS0_CH_RANGEVIO_TR_OUT[84]	TCPWM1_16_ONE_CNT_TR_IN[72]	SAR2 ch#20, range violation to TCPWM1 Group #0 Counter #72 trig = 4
85	PASS0_CH_RANGEVIO_TR_OUT[85]	TCPWM1_16_ONE_CNT_TR_IN[73]	SAR2 ch#21, range violation to TCPWM1 Group #0 Counter #73 trig = 4
86	PASS0_CH_RANGEVIO_TR_OUT[86]	TCPWM1_16_ONE_CNT_TR_IN[74]	SAR2 ch#22, range violation to TCPWM1 Group #0 Counter #74 trig = 4
87	PASS0_CH_RANGEVIO_TR_OUT[87]	TCPWM1_16_ONE_CNT_TR_IN[75]	SAR2 ch#23, range violation to TCPWM1 Group #0 Counter #75 trig = 4

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

Triggers one-to-one

表 23 触发器 1:1 *(续)*

Input	Trigger In	Trigger Out	Description
88	PASS0_CH_RANGEVIO_TR_OUT[88]	TCPWM1_16_ONE_CNT_TR_IN[76]	SAR2 ch#24, range violation to TCPWM1 Group #0 Counter #76 trig = 4
89	PASS0_CH_RANGEVIO_TR_OUT[89]	TCPWM1_16_ONE_CNT_TR_IN[77]	SAR2 ch#25, range violation to TCPWM1 Group #0 Counter #77 trig = 4
90	PASS0_CH_RANGEVIO_TR_OUT[90]	TCPWM1_16_ONE_CNT_TR_IN[78]	SAR2 ch#26, range violation to TCPWM1 Group #0 Counter #78 trig = 4
91	PASS0_CH_RANGEVIO_TR_OUT[91]	TCPWM1_16_ONE_CNT_TR_IN[79]	SAR2 ch#27, range violation to TCPWM1 Group #0 Counter #79 trig = 4
92	PASS0_CH_RANGEVIO_TR_OUT[92]	TCPWM1_16_ONE_CNT_TR_IN[80]	SAR2 ch#28, range violation to TCPWM1 Group #0 Counter #80 trig = 4
93	PASS0_CH_RANGEVIO_TR_OUT[93]	TCPWM1_16_ONE_CNT_TR_IN[81]	SAR2 ch#29, range violation to TCPWM1 Group #0 Counter #81 trig = 4
94	PASS0_CH_RANGEVIO_TR_OUT[94]	TCPWM1_16_ONE_CNT_TR_IN[82]	SAR2 ch#30, range violation to TCPWM1 Group #0 Counter #82 trig = 4
95	PASS0_CH_RANGEVIO_TR_OUT[95]	TCPWM1_16_ONE_CNT_TR_IN[83]	SAR2 ch#31, range violation to TCPWM1 Group #0 Counter #83 trig = 4
MUX Group 7: TCPWM1 to PASS SARx			
0	TCPWM1_16M_TR_OUT1[0]	PASS0_CH_TR_IN[0]	TCPWM1 Group #1 Counter #00 (PWM1_M_0) to SAR0 ch#0
1	TCPWM1_16M_TR_OUT1[3]	PASS0_CH_TR_IN[1]	TCPWM1 Group #1 Counter #03 (PWM1_M_3) to SAR0 ch#1
2	TCPWM1_16M_TR_OUT1[6]	PASS0_CH_TR_IN[2]	TCPWM1 Group #1 Counter #06 (PWM1_M_6) to SAR0 ch#2
3	TCPWM1_16M_TR_OUT1[9]	PASS0_CH_TR_IN[3]	TCPWM1 Group #1 Counter #09 (PWM1_M_9) to SAR0 ch#3
4:31	TCPWM1_16_TR_OUT1[0:27]	PASS0_CH_TR_IN[4:31]	TCPWM1 Group #0 Counter #00 through 27 (PWM1_0 to PWM1_27) to SAR0 ch#4 through SAR0 ch#31
32	TCPWM1_16M_TR_OUT1[1]	PASS0_CH_TR_IN[32]	TCPWM1 Group #1 Counter #01 (PWM1_M_1) to SAR1 ch#0
33	TCPWM1_16M_TR_OUT1[4]	PASS0_CH_TR_IN[33]	TCPWM1 Group #1 Counter #04 (PWM1_M_4) to SAR1 ch#1
34	TCPWM1_16M_TR_OUT1[7]	PASS0_CH_TR_IN[34]	TCPWM1 Group #1 Counter #07 (PWM1_M_7) to SAR1 ch#2
35	TCPWM1_16M_TR_OUT1[10]	PASS0_CH_TR_IN[35]	TCPWM1 Group #1 Counter #10 (PWM1_M_10) to SAR1 ch#3
36:63	TCPWM1_16_TR_OUT1[28:55]	PASS0_CH_TR_IN[36:63]	TCPWM1 Group #0 Counter #28 through 55 (PWM1_28 to PWM1_55) to SAR1 ch#4 through SAR1 ch#31
64	TCPWM1_16M_TR_OUT1[2]	PASS0_CH_TR_IN[64]	TCPWM1 Group #1 Counter #02 (PWM1_M_2) to SAR2 ch#0
65	TCPWM1_16M_TR_OUT1[5]	PASS0_CH_TR_IN[65]	TCPWM1 Group #1 Counter #05 (PWM1_M_5) to SAR2 ch#1

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

Triggers one-to-one

表 23 触发器 1:1 *(续)*

Input	Trigger In	Trigger Out	Description
66	TCPWM1_16M_TR_OUT1[8]	PASS0_CH_TR_IN[66]	TCPWM1 Group #1 Counter #08 (PWM1_M_8) to SAR2 ch#2
67	TCPWM1_16M_TR_OUT1[11]	PASS0_CH_TR_IN[67]	TCPWM1 Group #1 Counter #11 (PWM1_M_11) to SAR2 ch#3
68:95	TCPWM1_16_TR_OUT1[56:83]	PASS0_CH_TR_IN[68:95]	TCPWM1 Group #1 Counter #56 through 83 (PWM1_56 to PWM1_83) to SAR2 ch#4 through SAR2 ch#31
MUX Group 8: Acknowledge triggers from P-DMA1 to CAN1			
0	PDMA1_TR_OUT[38]	CAN1_DBG_TR_ACK[0]	CAN1 Channel#0 P-DMA1 acknowledge
1	PDMA1_TR_OUT[41]	CAN1_DBG_TR_ACK[1]	CAN1 Channel#1 P-DMA1 acknowledge
2	PDMA1_TR_OUT[44]	CAN1_DBG_TR_ACK[2]	CAN1 Channel#2 P-DMA1 acknowledge
3	PDMA1_TR_OUT[47]	CAN1_DBG_TR_ACK[3]	CAN1 Channel#3 P-DMA1 acknowledge
4	PDMA1_TR_OUT[50]	CAN1_DBG_TR_ACK[4]	CAN1 Channel#4 P-DMA1 acknowledge
MUX Group 9: Acknowledge triggers from P-DMA0 to CAN0			
0	PDMA0_TR_OUT[32]	CAN0_DBG_TR_ACK[0]	CAN0 Channel#0 P-DMA0 acknowledge
1	PDMA0_TR_OUT[35]	CAN0_DBG_TR_ACK[1]	CAN0 Channel#1 P-DMA0 acknowledge
2	PDMA0_TR_OUT[38]	CAN0_DBG_TR_ACK[2]	CAN0 Channel#2 P-DMA0 acknowledge
3	PDMA0_TR_OUT[41]	CAN0_DBG_TR_ACK[3]	CAN0 Channel#3 P-DMA0 acknowledge
4	PDMA0_TR_OUT[44]	CAN0_DBG_TR_ACK[4]	CAN0 Channel#4 P-DMA0 acknowledge
MUX Group 12: P-DMA1 TO P-DMA1 triggers			
0	PDMA1_TR_OUT[61]	PDMA1_TR_IN[63]	P-DMA1 to P-DMA1
1	PDMA1_TR_OUT[62]	PDMA1_TR_IN[64]	P-DMA1 to P-DMA1

注释：

30. SAR ADC[x] 的每个逻辑通道都可以连接到任意 SAR ADC[x]_y 外部引脚。(x = 0, or 1, or, 2 and y=0 to max 31).

20 外设时钟

表 24 外设时钟分配

Output	Destination	Description
CPUSS root clocks（Group 0）		
0	PCLK_CPUSS_CLOCK_TRACE_IN	Trace clock
1	PCLK_SMARTIO12_CLOCK	Smart I/O #12
2	PCLK_SMARTIO13_CLOCK	Smart I/O #13
3	PCLK_SMARTIO14_CLOCK	Smart I/O #14
4	PCLK_SMARTIO15_CLOCK	Smart I/O #15
5	PCLK_SMARTIO17_CLOCK	Smart I/O #17
6	PCLK_TCPWM0_CLOCKS0	TCPWM0 Group #0, Counter #0
7	PCLK_TCPWM0_CLOCKS1	TCPWM0 Group #0, Counter #1
8	PCLK_TCPWM0_CLOCKS2	TCPWM0 Group #0, Counter #2
9	PCLK_TCPWM0_CLOCKS256	TCPWM0 Group #1, Counter #0
10	PCLK_TCPWM0_CLOCKS257	TCPWM0 Group #1, Counter #1
11	PCLK_TCPWM0_CLOCKS258	TCPWM0 Group #1, Counter #2
12	PCLK_TCPWM0_CLOCKS512	TCPWM0 Group #2, Counter #0
13	PCLK_TCPWM0_CLOCKS513	TCPWM0 Group #2, Counter #1
14	PCLK_TCPWM0_CLOCKS514	TCPWM0 Group #2, Counter #2
COMM root clocks (Group 1)		
0	PCLK_CANFD0_CLOCK_CAN0	CAN0, Channel #0
1	PCLK_CANFD0_CLOCK_CAN1	CAN0, Channel #1
2	PCLK_CANFD0_CLOCK_CAN2	CAN0, Channel #2
3	PCLK_CANFD0_CLOCK_CAN3	CAN0, Channel #3
4	PCLK_CANFD0_CLOCK_CAN4	CAN0, Channel #4
5	PCLK_CANFD1_CLOCK_CAN0	CAN1, Channel #0
6	PCLK_CANFD1_CLOCK_CAN1	CAN1, Channel #1
7	PCLK_CANFD1_CLOCK_CAN2	CAN1, Channel #2
8	PCLK_CANFD1_CLOCK_CAN3	CAN1, Channel #3
9	PCLK_CANFD1_CLOCK_CAN4	CAN1, Channel #4
30	PCLK_SCB0_CLOCK	SCB0
31	PCLK_SCB1_CLOCK	SCB1
32	PCLK_SCB2_CLOCK	SCB2
33	PCLK_SCB3_CLOCK	SCB3
34	PCLK_SCB4_CLOCK	SCB4
35	PCLK_SCB5_CLOCK	SCB5
36	PCLK_SCB6_CLOCK	SCB6
37	PCLK_SCB7_CLOCK	SCB7
38	PCLK_SCB8_CLOCK	SCB8
39	PCLK_SCB9_CLOCK	SCB9
40	PCLK_SCB10_CLOCK	SCB10
42	PCLK_PASS0_CLOCK_SAR0	SAR0

表 24　　外设时钟分配 *(续)*

Output	Destination	Description
43	PCLK_PASS0_CLOCK_SAR1	SAR1
44	PCLK_PASS0_CLOCK_SAR2	SAR2
45	PCLK_TCPWM1_CLOCKS0	TCPWM1 Group #0, Counter #0
46	PCLK_TCPWM1_CLOCKS1	TCPWM1 Group #0, Counter #1
47	PCLK_TCPWM1_CLOCKS2	TCPWM1 Group #0, Counter #2
48	PCLK_TCPWM1_CLOCKS3	TCPWM1 Group #0, Counter #3
49	PCLK_TCPWM1_CLOCKS4	TCPWM1 Group #0, Counter #4
50	PCLK_TCPWM1_CLOCKS5	TCPWM1 Group #0, Counter #5
51	PCLK_TCPWM1_CLOCKS6	TCPWM1 Group #0, Counter #6
52	PCLK_TCPWM1_CLOCKS7	TCPWM1 Group #0, Counter #7
53	PCLK_TCPWM1_CLOCKS8	TCPWM1 Group #0, Counter #8
54	PCLK_TCPWM1_CLOCKS9	TCPWM1 Group #0, Counter #9
55	PCLK_TCPWM1_CLOCKS10	TCPWM1 Group #0, Counter #10
56	PCLK_TCPWM1_CLOCKS11	TCPWM1 Group #0, Counter #11
57	PCLK_TCPWM1_CLOCKS12	TCPWM1 Group #0, Counter #12
58	PCLK_TCPWM1_CLOCKS13	TCPWM1 Group #0, Counter #13
59	PCLK_TCPWM1_CLOCKS14	TCPWM1 Group #0, Counter #14
60	PCLK_TCPWM1_CLOCKS15	TCPWM1 Group #0, Counter #15
61	PCLK_TCPWM1_CLOCKS16	TCPWM1 Group #0, Counter #16
62	PCLK_TCPWM1_CLOCKS17	TCPWM1 Group #0, Counter #17
63	PCLK_TCPWM1_CLOCKS18	TCPWM1 Group #0, Counter #18
64	PCLK_TCPWM1_CLOCKS19	TCPWM1 Group #0, Counter #19
65	PCLK_TCPWM1_CLOCKS20	TCPWM1 Group #0, Counter #20
66	PCLK_TCPWM1_CLOCKS21	TCPWM1 Group #0, Counter #21
67	PCLK_TCPWM1_CLOCKS22	TCPWM1 Group #0, Counter #22
68	PCLK_TCPWM1_CLOCKS23	TCPWM1 Group #0, Counter #23
69	PCLK_TCPWM1_CLOCKS24	TCPWM1 Group #0, Counter #24
70	PCLK_TCPWM1_CLOCKS25	TCPWM1 Group #0, Counter #25
71	PCLK_TCPWM1_CLOCKS26	TCPWM1 Group #0, Counter #26
72	PCLK_TCPWM1_CLOCKS27	TCPWM1 Group #0, Counter #27
73	PCLK_TCPWM1_CLOCKS28	TCPWM1 Group #0, Counter #28
74	PCLK_TCPWM1_CLOCKS29	TCPWM1 Group #0, Counter #29
75	PCLK_TCPWM1_CLOCKS30	TCPWM1 Group #0, Counter #30
76	PCLK_TCPWM1_CLOCKS31	TCPWM1 Group #0, Counter #31
77	PCLK_TCPWM1_CLOCKS32	TCPWM1 Group #0, Counter #32
78	PCLK_TCPWM1_CLOCKS33	TCPWM1 Group #0, Counter #33
79	PCLK_TCPWM1_CLOCKS34	TCPWM1 Group #0, Counter #34
80	PCLK_TCPWM1_CLOCKS35	TCPWM1 Group #0, Counter #35
81	PCLK_TCPWM1_CLOCKS36	TCPWM1 Group #0, Counter #36
82	PCLK_TCPWM1_CLOCKS37	TCPWM1 Group #0, Counter #37
83	PCLK_TCPWM1_CLOCKS38	TCPWM1 Group #0, Counter #38

表 24　　外设时钟分配 *(续)*

Output	Destination	Description
84	PCLK_TCPWM1_CLOCKS39	TCPWM1 Group #0, Counter #39
85	PCLK_TCPWM1_CLOCKS40	TCPWM1 Group #0, Counter #40
86	PCLK_TCPWM1_CLOCKS41	TCPWM1 Group #0, Counter #41
87	PCLK_TCPWM1_CLOCKS42	TCPWM1 Group #0, Counter #42
88	PCLK_TCPWM1_CLOCKS43	TCPWM1 Group #0, Counter #43
89	PCLK_TCPWM1_CLOCKS44	TCPWM1 Group #0, Counter #44
90	PCLK_TCPWM1_CLOCKS45	TCPWM1 Group #0, Counter #45
91	PCLK_TCPWM1_CLOCKS46	TCPWM1 Group #0, Counter #46
92	PCLK_TCPWM1_CLOCKS47	TCPWM1 Group #0, Counter #47
93	PCLK_TCPWM1_CLOCKS48	TCPWM1 Group #0, Counter #48
94	PCLK_TCPWM1_CLOCKS49	TCPWM1 Group #0, Counter #49
95	PCLK_TCPWM1_CLOCKS50	TCPWM1 Group #0, Counter #50
96	PCLK_TCPWM1_CLOCKS51	TCPWM1 Group #0, Counter #51
97	PCLK_TCPWM1_CLOCKS52	TCPWM1 Group #0, Counter #52
98	PCLK_TCPWM1_CLOCKS53	TCPWM1 Group #0, Counter #53
99	PCLK_TCPWM1_CLOCKS54	TCPWM1 Group #0, Counter #54
100	PCLK_TCPWM1_CLOCKS55	TCPWM1 Group #0, Counter #55
101	PCLK_TCPWM1_CLOCKS56	TCPWM1 Group #0, Counter #56
102	PCLK_TCPWM1_CLOCKS57	TCPWM1 Group #0, Counter #57
103	PCLK_TCPWM1_CLOCKS58	TCPWM1 Group #0, Counter #58
104	PCLK_TCPWM1_CLOCKS59	TCPWM1 Group #0, Counter #59
105	PCLK_TCPWM1_CLOCKS60	TCPWM1 Group #0, Counter #60
106	PCLK_TCPWM1_CLOCKS61	TCPWM1 Group #0, Counter #61
107	PCLK_TCPWM1_CLOCKS62	TCPWM1 Group #0, Counter #62
108	PCLK_TCPWM1_CLOCKS63	TCPWM1 Group #0, Counter #63
109	PCLK_TCPWM1_CLOCKS64	TCPWM1 Group #0, Counter #64
110	PCLK_TCPWM1_CLOCKS65	TCPWM1 Group #0, Counter #65
111	PCLK_TCPWM1_CLOCKS66	TCPWM1 Group #0, Counter #66
112	PCLK_TCPWM1_CLOCKS67	TCPWM1 Group #0, Counter #67
113	PCLK_TCPWM1_CLOCKS68	TCPWM1 Group #0, Counter #68
114	PCLK_TCPWM1_CLOCKS69	TCPWM1 Group #0, Counter #69
115	PCLK_TCPWM1_CLOCKS70	TCPWM1 Group #0, Counter #70
116	PCLK_TCPWM1_CLOCKS71	TCPWM1 Group #0, Counter #71
117	PCLK_TCPWM1_CLOCKS72	TCPWM1 Group #0, Counter #72
118	PCLK_TCPWM1_CLOCKS73	TCPWM1 Group #0, Counter #73
119	PCLK_TCPWM1_CLOCKS74	TCPWM1 Group #0, Counter #74
120	PCLK_TCPWM1_CLOCKS75	TCPWM1 Group #0, Counter #75
121	PCLK_TCPWM1_CLOCKS76	TCPWM1 Group #0, Counter #76
122	PCLK_TCPWM1_CLOCKS77	TCPWM1 Group #0, Counter #77
123	PCLK_TCPWM1_CLOCKS78	TCPWM1 Group #0, Counter #78
124	PCLK_TCPWM1_CLOCKS79	TCPWM1 Group #0, Counter #79

表 24　　外设时钟分配 *(续)*

Output	Destination	Description
125	PCLK_TCPWM1_CLOCKS80	TCPWM1 Group #0, Counter #80
126	PCLK_TCPWM1_CLOCKS81	TCPWM1 Group #0, Counter #81
127	PCLK_TCPWM1_CLOCKS82	TCPWM1 Group #0, Counter #82
128	PCLK_TCPWM1_CLOCKS83	TCPWM1 Group #0, Counter #83
129	PCLK_TCPWM1_CLOCKS256	TCPWM1 Group #1, Counter #0
130	PCLK_TCPWM1_CLOCKS257	TCPWM1 Group #1, Counter #1
131	PCLK_TCPWM1_CLOCKS258	TCPWM1 Group #1, Counter #2
132	PCLK_TCPWM1_CLOCKS259	TCPWM1 Group #1, Counter #3
133	PCLK_TCPWM1_CLOCKS260	TCPWM1 Group #1, Counter #4
134	PCLK_TCPWM1_CLOCKS261	TCPWM1 Group #1, Counter #5
135	PCLK_TCPWM1_CLOCKS262	TCPWM1 Group #1, Counter #6
136	PCLK_TCPWM1_CLOCKS263	TCPWM1 Group #1, Counter #7
137	PCLK_TCPWM1_CLOCKS264	TCPWM1 Group #1, Counter #8
138	PCLK_TCPWM1_CLOCKS265	TCPWM1 Group #1, Counter #9
139	PCLK_TCPWM1_CLOCKS266	TCPWM1 Group #1, Counter #10
140	PCLK_TCPWM1_CLOCKS267	TCPWM1 Group #1, Counter #11
141	PCLK_TCPWM1_CLOCKS512	TCPWM1 Group #2, Counter #0
142	PCLK_TCPWM1_CLOCKS513	TCPWM1 Group #2, Counter #1
143	PCLK_TCPWM1_CLOCKS514	TCPWM1 Group #2, Counter #2
144	PCLK_TCPWM1_CLOCKS515	TCPWM1 Group #2, Counter #3
145	PCLK_TCPWM1_CLOCKS516	TCPWM1 Group #2, Counter #4
146	PCLK_TCPWM1_CLOCKS517	TCPWM1 Group #2, Counter #5
147	PCLK_TCPWM1_CLOCKS518	TCPWM1 Group #2, Counter #6
148	PCLK_TCPWM1_CLOCKS519	TCPWM1 Group #2, Counter #7
149	PCLK_TCPWM1_CLOCKS520	TCPWM1 Group #2, Counter #8
150	PCLK_TCPWM1_CLOCKS521	TCPWM1 Group #2, Counter #9
151	PCLK_TCPWM1_CLOCKS522	TCPWM1 Group #2, Counter #10
152	PCLK_TCPWM1_CLOCKS523	TCPWM1 Group #2, Counter #11
153	PCLK_TCPWM1_CLOCKS524	TCPWM1 Group #2, Counter #12

21 故障

表 25 故障分配

Fault	Source	Description
0	CPUSS_MPU_VIO_0	CM0+ SMPU violation DATA0[31:0]: Violating address. DATA1[0]: User read. DATA1[1]: User write. DATA1[2]: User execute. DATA1[3]: Privileged read. DATA1[4]: Privileged write. DATA1[5]: Privileged execute. DATA1[6]: Non-secure. DATA1[11:8]: Master identifier. DATA1[15:12]: Protection context identifier. DATA1[31]: '0' MPU violation; '1': SMPU violation.
1	CPUSS_MPU_VIO_1	CRYPTO SMPU violation. See CPUSS_MPU_VIO_0 description.
2	CPUSS_MPU_VIO_2	P-DMA0 MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
3	CPUSS_MPU_VIO_3	P-DMA1 MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
4	CPUSS_MPU_VIO_4	M-DMA0 MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
5	CPUSS_MPU_VIO_5	SDHC MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
9	CPUSS_MPU_VIO_9	Ethernet0 MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
10	CPUSS_MPU_VIO_10	Ethernet1 MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
13	CPUSS_MPU_VIO_13	CM7_1 MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
14	CPUSS_MPU_VIO_14	CM7_0 MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
15	CPUSS_MPU_VIO_15	Test Controller MPU/SMPU violation. See CPUSS_MPU_VIO_0 description.
16	CPUSS_CM7_1_TCM_C_ECC	Correctable ECC error in CM7_1 TCM memory DATA0[23:2]: Violating address. DATA1[7:0]: Syndrome of code word (at address offset 0x0). DATA1[31:30]: 0= ITCM, 2=D0TCM, 3=D1TCM
17	CPUSS_CM7_1_TCM_NC_ECC	Non Correctable ECC error in CM7_1 TCM memory. See CPUSS_CM7_1_TCM_C_ECC description.
18	CPUSS_CM7_0_CACHE_C_ECC	Correctable ECC error in CM7_0 Cache memories DATA0[16:2]: location information: Tag/Data SRAM, Way, Index and line Offset, see CM7 UGRM IEBR0/DEBR0 description for details. DATA0[31]: 0=Instruction cache, 1= Data cache
19	CPUSS_CM7_0_CACHE_NC_ECC	Non Correctable ECC error in CM7_0 Cache memories. See CPUSS_CM7_0_CACHE_C_ECC description.
20	CPUSS_CM7_1_CACHE_C_ECC	Correctable ECC error in CM7_1 Cache memories. See CPUSS_CM7_0_CACHE_C_ECC description.
21	CPUSS_CM7_1_CACHE_NC_ECC	Non Correctable ECC error in CM7_1 Cache memories. See CPUSS_CM7_0_CACHE_C_ECC description.
25	PERI_MS_VIO_4	P-DMA1 Peripheral Master Interface PPU violation. See PERI_MS_VIO_0 description.
26	PERI_PERI_C_ECC	Peripheral protection SRAM correctable ECC violation DATA0[10:0]: Violating address. DATA1[7:0]: Syndrome of SRAM word.
27	PERI_PERI_NC_ECC	Peripheral protection SRAM non-correctable ECC violation

表 25 故障分配 *(续)*

Fault	Source	Description
28	PERI_MS_VIO_0	CM0+ Peripheral Master Interface PPU violation DATA0[31:0]: Violating address. DATA1[0]: User read. DATA1[1]: User write. DATA1[2]: User execute. DATA1[3]: Privileged read. DATA1[4]: Privileged write. DATA1[5]: Privileged execute. DATA1[6]: Non-secure. DATA1[11:8]: Master identifier. DATA1[15:12]: Protection context identifier. DATA1[31:28]: “0”: master interface, PPU violation, “1': timeout detected, “2”: bus error, other: undefined.
29	PERI_MS_VIO_1	CM7_0 Peripheral Master Interface PPU violation. See PERI_MS_VIO_0 description.
30	PERI_MS_VIO_2	CM7_1 Peripheral Master Interface PPU violation. See PERI_MS_VIO_0 description.
31	PERI_MS_VIO_3	P-DMA0 Peripheral Master Interface PPU_3 violation. See PERI_MS_VIO_0 description.
32	PERI_GROUP_VIO_0	Peripheral Group #0 violation. DATA0[31:0]: Violating address. DATA1[0]: User read. DATA1[1]: User write. DATA1[2]: User execute. DATA1[3]: Privileged read. DATA1[4]: Privileged write. DATA1[5]: Privileged execute. DATA1[6]: Non-secure. DATA1[11:8]: Master identifier. DATA1[15:12]: Protection context identifier. DATA1[31:28]: “0”: decoder or peripheral bus error, other: undefined.
33	PERI_GROUP_VIO_1	Peripheral Group #1 violation. See PERI_GROUP_VIO_0 description.
34	PERI_GROUP_VIO_2	Peripheral Group #2 violation. See PERI_GROUP_VIO_0 description.
35	PERI_GROUP_VIO_3	Peripheral Group #3 violation. See PERI_GROUP_VIO_0 description.
36	PERI_GROUP_VIO_4	Peripheral Group #4 violation. See PERI_GROUP_VIO_0 description.
37	PERI_GROUP_VIO_5	Peripheral Group #5 violation. See PERI_GROUP_VIO_0 description.
38	PERI_GROUP_VIO_6	Peripheral Group #6 violation. See PERI_GROUP_VIO_0 description.
40	PERI_GROUP_VIO_8	Peripheral Group #8 violation. See PERI_GROUP_VIO_0 description.
41	PERI_GROUP_VIO_9	Peripheral Group #9 violation. See PERI_GROUP_VIO_0 description.
48	CPUSS_FLASHC_MAIN_BUS_ERR	Flash controller main flash bus error FAULT_DATA0[26:0]: Violating address. Append 5'b00010 as most significant bits to derive 32-bit system address. FAULT_DATA1[11:8]: Master identifier.
49	CPUSS_FLASHC_MAIN_C_ECC	Flash controller main flash correctable ECC violation. DATA[26:0]: Violating address. Append 5'b00010 as most significant bits to derive 32-bit system address. DATA1[7:0]: Syndrome of 64-bit word (at address offset 0x00). DATA1[15:8]: Syndrome of 64-bit word (at address offset 0x08). DATA1[23:16]: Syndrome of 64-bit word (at address offset 0x10). DATA1[31:24]: Syndrome of 64-bit word (at address offset 0x18).
50	CPUSS_FLASHC_MAIN_NC_ECC	Flash controller main flash non-correctable ECC violation. See CPUSS_FLASHC_MAIN_C_ECC description.
51	CPUSS_FLASHC_WORK_BUS_ERR	Flash controller work-flash bus error. See CPUSS_FLASHC_MAIN_BUS_ERR description.

表 25 故障分配 *(续)*

Fault	Source	Description
52	CPUSS_FLASHC_WORK_C_ECC	Flash controller work-flash non-correctable ECC violation. DATA0[26:0]: Violating address. Append 5'b00010 as most significant bits to derive 32-bit system address. DATA1[6:0]: Syndrome of 32-bit word.
53	CPUSS_FLASHC_WORK_NC_ECC	Flash controller work-flash cache non-correctable ECC violation. See CPUSS_FLASHC_WORK_C_ECC description.
54	CPUSS_FLASHC_CM0_CA_C_ECC	Flash controller CM0+ cache correctable ECC violation. DATA0[26:0]: Violating address. DATA1[6:0]: Syndrome of 32-bit SRAM word (at address offset 0x0). DATA1[14:8]: Syndrome of 32-bit SRAM word (at address offset 0x4). DATA1[22:16]: Syndrome of 32-bit SRAM word (at address offset 0x8). DATA1[30:24]: Syndrome of 32-bit SRAM word (at address offset 0xc).
55	CPUSS_FLASHC_CM0_CA_NC_ECC	Flash controller CM0+ cache non-correctable ECC violation. See CPUSS_FLASHC_CM0_CA_C_ECC description.
56	CPUSS_CM7_0_TCM_C_ECC	CPU CM7_0 TCM memory correctable ECC violation. See CPUSS_CM7_1_TCM_C_ECC description.
57	CPUSS_CM7_0_TCM_NC_ECC	CPU CM7_0 TCM memory non-correctable ECC violation. See CPUSS_CM7_1_TCM_C_ECC description.
58	CPUSS_RAMC0_C_ECC	System memory controller 0 correctable ECC violation: DATA0[31:0]: Violating address. DATA1[6:0]: Syndrome of 32-bit SRAM code word.
59	CPUSS_RAMC0_NC_ECC	System memory controller 0 non-correctable ECC violation. See CPUSS_RAMC0_C_ECC description.
60	CPUSS_RAMC1_C_ECC	System memory controller 1 correctable ECC violation. See CPUSS_RAMC0_C_ECC description.
61	CPUSS_RAMC1_NC_ECC	System memory controller 1 non-correctable ECC violation. See CPUSS_RAMC0_C_ECC description.
62	CPUSS_RAMC2_C_ECC	System memory controller 2 correctable ECC violation. See CPUSS_RAMC0_C_ECC description.
63	CPUSS_RAMC2_NC_ECC	System memory controller 2 non-correctable ECC violation. See CPUSS_RAMC0_C_ECC description.
64	CPUSS_CRYPTO_C_ECC	Crypto memory correctable ECC violation. DATA0[31:0]: Violating address. DATA1[6:0]: Syndrome of Least Significant 32-bit SRAM. DATA1[14:8]: Syndrome of Most Significant 32-bit SRAM.
65	CPUSS_CRYPTO_NC_ECC	CRYPTO memory non-correctable ECC violation. See CPUSS_CRYPTO_C_ECC description.
70	CPUSS_DW0_C_ECC	P-DMA0 memory correctable ECC violation: DATA0[11:0]: Violating DW SRAM address (word address, assuming byte addressable). DATA1[6:0]: Syndrome of 32-bit SRAM code word.
71	CPUSS_DW0_NC_ECC	P-DMA0 memory non-correctable ECC violation. See CPUSS_DW0_C_ECC description.
72	CPUSS_DW1_C_ECC	P-DMA1 memory correctable ECC violation. See CPUSS_DW0_C_ECC description.
73	CPUSS_DW1_NC_ECC	P-DMA1 memory non-correctable ECC violation. See CPUSS_DW0_C_ECC description.
74	CPUSS_FM_SRAM_C_ECC	Flash code storage SRAM memory correctable ECC violation: DATA0[15:0]: Address location in the eCT Flash SRAM. DATA1[6:0]: Syndrome of 32-bit SRAM word.
75	CPUSS_FM_SRAM_NC_ECC	Flash code storage SRAM memory non-correctable ECC violation: See CPUSS_FM_SRAMC_C_ECC description.

表 25 故障分配 *(续)*

Fault	Source	Description
80	CANFD_0_CAN_C_ECC	CAN0 message buffer correctable ECC violation: DATA0[15:0]: Violating address. DATA0[22:16]: ECC violating data[38:32] from MRAM. DATA0[27:24]: Master ID: 0-7 = CAN channel ID within mxttcanfd cluster, 8 = AHB I/F DATA1[31:0]: ECC violating data[31:0] from MRAM.
81	CANFD_0_CAN_NC_ECC	CAN0 message buffer non-correctable ECC violation: DATA0[15:0]: Violating address. DATA0[22:16]: ECC violating data[38:32] from MRAM (not for Address Error). DATA0[27:24]: Master ID: 0-7 = CAN channel ID within mxttcanfd cluster, 8 = AHB I/F DATA0[30]: Write access, only possible for Address Error DATA0[31]: Address Error: a CAN channel did an MRAM access above MRAM_SIZE DATA1[31:0]: ECC violating data[31:0] from MRAM (not for Address Error).
82	CANFD_1_CAN_C_ECC	CAN1 message buffer correctable ECC violation. See CANFD_0_CAN_C_ECC description.
83	CANFD_1_CAN_NC_ECC	CAN1 message buffer non-correctable ECC violation. See CANFD_0_CAN_NC_ECC description.
90	SRSS_FAULT_CSV	Consolidated fault output for clock supervisors. Multiple CSV can detect a violation at the same time. DATA0[15:0]: CLK_HF* root CSV violation flags. DATA0[24]: CLK_REF CSV violation flag (reference clock for CLK_HF CSVs) DATA0[25]: CLK_LF CSV violation flag DATA0[26]: CLK_HVILO CSV violation flag
91	SRSS_FAULT_SSV	Consolidated fault output for supply supervisors. Multiple CSV can detect a violation at the same time. DATA0[0]: BOD on VDDA DATA[1]: OVD on VDDA DATA[16]: LVD/HVD #1 DATA0[17]: LVD/HVD #2
92	SRSS_FAULT_MCWDT0	Fault output for MCWDT0 (all sub-counters) Multiple counters can detect a violation at the same time. DATA0[0]: MCWDT sub counter 0 LOWER_LIMIT DATA0[1]: MCWDT sub counter 0 UPPER_LIMIT DATA0[2]: MCWDT sub counter 1 LOWER_LIMIT DATA0[3]: MCWDT sub counter 1 UPPER_LIMIT
93	SRSS_FAULT_MCWDT1	Fault output for MCWDT1 (all sub-counters). See SRSS_FAULT_MCWDT0 description.
94	SRSS_FAULT_MCWDT2	Fault output for MCWDT2 (all sub-counters). See SRSS_FAULT_MCWDT0 description.

22 外设保护单元固定结构配对

保护配对由一对PPU结构、一个主机、一个从机结构组成。主结构保护从机结构，从机结构保护外设寄存器等资源，或外设本身。

表 26 PPU 固定结构配对

Pair No.	PPU fixed structure pair	Address	Size	Description
0	PERI_MS_PPU_FX_PERI_MAIN	0x40000200	0x00000040	Peripheral Interconnect main
1	PERI_MS_PPU_FX_PERI_SECURE	0x40002000	0x00000004	Peripheral interconnect secure
2	PERI_MS_PPU_FX_PERI_GR0_GROUP	0x40004010	0x00000004	Peripheral Group #0 main
3	PERI_MS_PPU_FX_PERI_GR1_GROUP	0x40004050	0x00000004	Peripheral Group #1 main
4	PERI_MS_PPU_FX_PERI_GR2_GROUP	0x40004090	0x00000004	Peripheral Group #2 main
5	PERI_MS_PPU_FX_PERI_GR3_GROUP	0x400040C0	0x00000020	Peripheral Group #3 main
6	PERI_MS_PPU_FX_PERI_GR4_GROUP	0x40004100	0x00000020	Peripheral Group #4 main
7	PERI_MS_PPU_FX_PERI_GR5_GROUP	0x40004140	0x00000020	Peripheral Group #5 main
8	PERI_MS_PPU_FX_PERI_GR6_GROUP	0x40004180	0x00000020	Peripheral Group #6 main
9	PERI_MS_PPU_FX_PERI_GR8_GROUP	0x40004200	0x00000020	Peripheral Group #8 main
10	PERI_MS_PPU_FX_PERI_GR9_GROUP	0x40004240	0x00000020	Peripheral Group #9 main
11	PERI_MS_PPU_FX_PERI_GR0_BOOT	0x40004020	0x00000004	Peripheral Group #0 boot
12	PERI_MS_PPU_FX_PERI_GR1_BOOT	0x40004060	0x00000004	Peripheral Group #1 boot
13	PERI_MS_PPU_FX_PERI_GR2_BOOT	0x400040A0	0x00000004	Peripheral Group #2 boot
14	PERI_MS_PPU_FX_PERI_GR3_BOOT	0x400040E0	0x00000004	Peripheral Group #3 boot
15	PERI_MS_PPU_FX_PERI_GR4_BOOT	0x40004120	0x00000004	Peripheral Group #4 boot
16	PERI_MS_PPU_FX_PERI_GR5_BOOT	0x40004160	0x00000004	Peripheral Group #5 boot
17	PERI_MS_PPU_FX_PERI_GR6_BOOT	0x400041A0	0x00000004	Peripheral Group #6 boot
18	PERI_MS_PPU_FX_PERI_GR8_BOOT	0x40004220	0x00000004	Peripheral Group #8 boot
19	PERI_MS_PPU_FX_PERI_GR9_BOOT	0x40004260	0x00000004	Peripheral Group #9 boot
20	PERI_MS_PPU_FX_PERI_TR	0x40008000	0x00008000	Peripheral trigger multiplexer
21	PERI_MS_PPU_FX_PERI_MS_BOOT	0x40030000	0x00001000	Peripheral master slave boot
22	PERI_MS_PPU_FX_PERI_PCLK_MAIN	0x40040000	0x00004000	Peripheral clock main
23	PERI_MS_PPU_FX_CRYPTO_MAIN	0x40100000	0x00000400	Crypto main
24	PERI_MS_PPU_FX_CRYPTO_CRYPTO	0x40101000	0x00000800	Crypto MMIO (Memory Mapped I/O)
25	PERI_MS_PPU_FX_CRYPTO_BOOT	0x40102000	0x00000100	Crypto boot
26	PERI_MS_PPU_FX_CRYPTO_KEY0	0x40102100	0x00000004	Crypto Key #0
27	PERI_MS_PPU_FX_CRYPTO_KEY1	0x40102120	0x00000004	Crypto Key #1
28	PERI_MS_PPU_FX_CRYPTO_BUF	0x40108000	0x00002000	Crypto buffer
29	PERI_MS_PPU_FX_CPUSS_CM7_0	0x40200000	0x00000400	CM7_0 CPU core
30	PERI_MS_PPU_FX_CPUSS_CM7_1	0x40200400	0x00000400	CM7_1 CPU core
31	PERI_MS_PPU_FX_CPUSS_CM0	0x40201000	0x00001000	CM0+ CPU core
32	PERI_MS_PPU_FX_CPUSS_BOOT[31]	0x40202000	0x00000200	CPUSS boot
33	PERI_MS_PPU_FX_CPUSS_CM0_INT	0x40208000	0x00001000	CPUSS CM0+ interrupts
34	PERI_MS_PPU_FX_CPUSS_CM7_0_INT	0x4020A000	0x00001000	CPUSS CM7_0 interrupts
35	PERI_MS_PPU_FX_CPUSS_CM7_1_INT	0x4020C000	0x00001000	CPUSS CM7_1 interrupts
36	PERI_MS_PPU_FX_FAULT_STRUCT0_MAIN	0x40210000	0x00000100	CPUSS Fault Structure #0 main

注释：

31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
37	PERI_MS_PPU_FX_FAULT_STRUCT1_MAIN	0x40210100	0x00000100	CPUSS Fault Structure #1 main
38	PERI_MS_PPU_FX_FAULT_STRUCT2_MAIN	0x40210200	0x00000100	CPUSS Fault Structure #2 main
39	PERI_MS_PPU_FX_FAULT_STRUCT3_MAIN	0x40210300	0x00000100	CPUSS Fault Structure #3 main
40	PERI_MS_PPU_FX_IPC_STRUCT0_IPC	0x40220000	0x00000020	CPUSS IPC Structure #0
41	PERI_MS_PPU_FX_IPC_STRUCT1_IPC	0x40220020	0x00000020	CPUSS IPC Structure #1
42	PERI_MS_PPU_FX_IPC_STRUCT2_IPC	0x40220040	0x00000020	CPUSS IPC Structure #2
43	PERI_MS_PPU_FX_IPC_STRUCT3_IPC	0x40220060	0x00000020	CPUSS IPC Structure #3
44	PERI_MS_PPU_FX_IPC_STRUCT4_IPC	0x40220080	0x00000020	CPUSS IPC Structure #4
45	PERI_MS_PPU_FX_IPC_STRUCT5_IPC	0x402200A0	0x00000020	CPUSS IPC Structure #5
46	PERI_MS_PPU_FX_IPC_STRUCT6_IPC	0x402200C0	0x00000020	CPUSS IPC Structure #6
47	PERI_MS_PPU_FX_IPC_STRUCT7_IPC	0x402200E0	0x00000020	CPUSS IPC Structure #7
48	PERI_MS_PPU_FX_IPC_INTR_STRUCT0_INTR	0x40221000	0x00000010	CPUSS IPC Interrupt Structure #0
49	PERI_MS_PPU_FX_IPC_INTR_STRUCT1_INTR	0x40221020	0x00000010	CPUSS IPC Interrupt Structure #1
50	PERI_MS_PPU_FX_IPC_INTR_STRUCT2_INTR	0x40221040	0x00000010	CPUSS IPC Interrupt Structure #2
51	PERI_MS_PPU_FX_IPC_INTR_STRUCT3_INTR	0x40221060	0x00000010	CPUSS IPC Interrupt Structure #3
52	PERI_MS_PPU_FX_IPC_INTR_STRUCT4_INTR	0x40221080	0x00000010	CPUSS IPC Interrupt Structure #4
53	PERI_MS_PPU_FX_IPC_INTR_STRUCT5_INTR	0x402210A0	0x00000010	CPUSS IPC Interrupt Structure #5
54	PERI_MS_PPU_FX_IPC_INTR_STRUCT6_INTR	0x402210C0	0x00000010	CPUSS IPC Interrupt Structure #6
55	PERI_MS_PPU_FX_IPC_INTR_STRUCT7_INTR	0x402210E0	0x00000010	CPUSS IPC Interrupt Structure #7
56	PERI_MS_PPU_FX_PROT_SMPU_MAIN	0x40230000	0x00000040	Peripheral protection SMPU main
57	PERI_MS_PPU_FX_PROT_MPU0_MAIN	0x40234000	0x00000004	Peripheral protection MPU #0 main
58	PERI_MS_PPU_FX_PROT_MPU5_MAIN	0x40235400	0x00000400	Peripheral protection MPU #5 main
59	PERI_MS_PPU_FX_PROT_MPU9_MAIN	0x40236400	0x00000400	Peripheral protection MPU #9 main
60	PERI_MS_PPU_FX_PROT_MPU10_MAIN	0x40236800	0x00000400	Peripheral protection MPU #10 main
61	PERI_MS_PPU_FX_PROT_MPU13_MAIN	0x40237400	0x00000004	Peripheral protection MPU #13 main
62	PERI_MS_PPU_FX_PROT_MPU14_MAIN	0x40237800	0x00000004	Peripheral protection MPU #14 main
63	PERI_MS_PPU_FX_PROT_MPU15_MAIN	0x40237C00	0x00000400	Peripheral protection MPU #15 main
64	PERI_MS_PPU_FX_FLASHC_MAIN	0x40240000	0x00000008	Flash controller main
65	PERI_MS_PPU_FX_FLASHC_CMD	0x40240008	0x00000004	Flash controller command
66	PERI_MS_PPU_FX_FLASHC_DFT	0x40240200	0x00000100	Flash controller tests
67	PERI_MS_PPU_FX_FLASHC_CM0	0x40240400	0x00000080	Flash controller CM0+
68	PERI_MS_PPU_FX_FLASHC_CM7_0	0x402404E0	0x00000004	Flash controller CM7_0
69	PERI_MS_PPU_FX_FLASHC_CM7_1	0x40240560	0x00000004	Flash controller CM7_1
70	PERI_MS_PPU_FX_FLASHC_CRYPTO	0x40240580	0x00000004	Flash controller Crypto
71	PERI_MS_PPU_FX_FLASHC_DW0	0x40240600	0x00000004	Flash controller P-DMA0
72	PERI_MS_PPU_FX_FLASHC_DW1	0x40240680	0x00000004	Flash controller P-DMA1
73	PERI_MS_PPU_FX_FLASHC_DMAC	0x40240700	0x00000004	Flash controller M-DMA0

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
74	PERI_MS_PPU_FX_FLASHC_SLOW0	0x40240780	0x00000004	Flash External AHB-Lite Master 0
75	PERI_MS_PPU_FX_FLASHC_FlashMgmt[31]	0x4024F000	0x00000080	Flash management
76	PERI_MS_PPU_FX_FLASHC_MainSafety	0x4024F400	0x00000008	Flash controller code-flash safety
77	PERI_MS_PPU_FX_FLASHC_WorkSafety	0x4024F500	0x00000004	Flash controller work-flash safety
78	PERI_MS_PPU_FX_SRSS_GENERAL	0x40260000	0x00000400	SRSS General
79	PERI_MS_PPU_FX_SRSS_MAIN	0x40261000	0x00001000	SRSS main
80	PERI_MS_PPU_FX_SRSS_SECURE	0x40262000	0x00002000	SRSS secure
81	PERI_MS_PPU_FX_MCWDT0_CONFIG	0x40268000	0x00000080	MCWDT #0 configuration
82	PERI_MS_PPU_FX_MCWDT1_CONFIG	0x40268100	0x00000080	MCWDT #1 configuration
83	PERI_MS_PPU_FX_MCWDT2_CONFIG	0x40268200	0x00000080	MCWDT #2 configuration
84	PERI_MS_PPU_FX_MCWDT0_MAIN	0x40268080	0x00000040	MCWDT #0 main
85	PERI_MS_PPU_FX_MCWDT1_MAIN	0x40268180	0x00000040	MCWDT #1 main
86	PERI_MS_PPU_FX_MCWDT2_MAIN	0x40268280	0x00000040	MCWDT #2 main
87	PERI_MS_PPU_FX_WDT_CONFIG	0x4026C000	0x00000020	System WDT configuration
88	PERI_MS_PPU_FX_WDT_MAIN	0x4026C040	0x00000020	System WDT main
89	PERI_MS_PPU_FX_BACKUP_BACKUP	0x40270000	0x00010000	SRSS backup
90	PERI_MS_PPU_FX_DW0_DW	0x40280000	0x00000100	P-DMA0 main
91	PERI_MS_PPU_FX_DW1_DW	0x40290000	0x00000100	P-DMA1 main
92	PERI_MS_PPU_FX_DW0_DW_CRC	0x40280100	0x00000080	P-DMA0 CRC
93	PERI_MS_PPU_FX_DW1_DW_CRC	0x40290100	0x00000080	P-DMA1 CRC
94	PERI_MS_PPU_FX_DW0_CH_STRUCT0_CH	0x40288000	0x00000040	P-DMA0 Channel #0
95	PERI_MS_PPU_FX_DW0_CH_STRUCT1_CH	0x40288040	0x00000040	P-DMA0 Channel #1
96	PERI_MS_PPU_FX_DW0_CH_STRUCT2_CH	0x40288080	0x00000040	P-DMA0 Channel #2
97	PERI_MS_PPU_FX_DW0_CH_STRUCT3_CH	0x402880C0	0x00000040	P-DMA0 Channel #3
98	PERI_MS_PPU_FX_DW0_CH_STRUCT4_CH	0x40288100	0x00000040	P-DMA0 Channel #4
99	PERI_MS_PPU_FX_DW0_CH_STRUCT5_CH	0x40288140	0x00000040	P-DMA0 Channel #5
100	PERI_MS_PPU_FX_DW0_CH_STRUCT6_CH	0x40288180	0x00000040	P-DMA0 Channel #6
101	PERI_MS_PPU_FX_DW0_CH_STRUCT7_CH	0x402881C0	0x00000040	P-DMA0 Channel #7
102	PERI_MS_PPU_FX_DW0_CH_STRUCT8_CH	0x40288200	0x00000040	P-DMA0 Channel #8
103	PERI_MS_PPU_FX_DW0_CH_STRUCT9_CH	0x40288240	0x00000040	P-DMA0 Channel #9
104	PERI_MS_PPU_FX_DW0_CH_STRUCT10_CH	0x40288280	0x00000040	P-DMA0 Channel #10
105	PERI_MS_PPU_FX_DW0_CH_STRUCT11_CH	0x402882C0	0x00000040	P-DMA0 Channel #11
106	PERI_MS_PPU_FX_DW0_CH_STRUCT12_CH	0x40288300	0x00000040	P-DMA0 Channel #12
107	PERI_MS_PPU_FX_DW0_CH_STRUCT13_CH	0x40288340	0x00000040	P-DMA0 Channel #13
108	PERI_MS_PPU_FX_DW0_CH_STRUCT14_CH	0x40288380	0x00000040	P-DMA0 Channel #14
109	PERI_MS_PPU_FX_DW0_CH_STRUCT15_CH	0x402883C0	0x00000040	P-DMA0 Channel #15
110	PERI_MS_PPU_FX_DW0_CH_STRUCT16_CH	0x40288400	0x00000040	P-DMA0 Channel #16
111	PERI_MS_PPU_FX_DW0_CH_STRUCT17_CH	0x40288440	0x00000040	P-DMA0 Channel #17
112	PERI_MS_PPU_FX_DW0_CH_STRUCT18_CH	0x40288480	0x00000040	P-DMA0 Channel #18
113	PERI_MS_PPU_FX_DW0_CH_STRUCT19_CH	0x402884C0	0x00000040	P-DMA0 Channel #19
114	PERI_MS_PPU_FX_DW0_CH_STRUCT20_CH	0x40288500	0x00000040	P-DMA0 Channel #20

注释：
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表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
115	PERI_MS_PPU_FX_DW0_CH_STRUCT21_CH	0x40288540	0x00000040	P-DMA0 Channel #21
116	PERI_MS_PPU_FX_DW0_CH_STRUCT22_CH	0x40288580	0x00000040	P-DMA0 Channel #22
117	PERI_MS_PPU_FX_DW0_CH_STRUCT23_CH	0x402885C0	0x00000040	P-DMA0 Channel #23
118	PERI_MS_PPU_FX_DW0_CH_STRUCT24_CH	0x40288600	0x00000040	P-DMA0 Channel #24
119	PERI_MS_PPU_FX_DW0_CH_STRUCT25_CH	0x40288640	0x00000040	P-DMA0 Channel #25
120	PERI_MS_PPU_FX_DW0_CH_STRUCT26_CH	0x40288680	0x00000040	P-DMA0 Channel #26
121	PERI_MS_PPU_FX_DW0_CH_STRUCT27_CH	0x402886C0	0x00000040	P-DMA0 Channel #27
122	PERI_MS_PPU_FX_DW0_CH_STRUCT28_CH	0x40288700	0x00000040	P-DMA0 Channel #28
123	PERI_MS_PPU_FX_DW0_CH_STRUCT29_CH	0x40288740	0x00000040	P-DMA0 Channel #29
124	PERI_MS_PPU_FX_DW0_CH_STRUCT30_CH	0x40288780	0x00000040	P-DMA0 Channel #30
125	PERI_MS_PPU_FX_DW0_CH_STRUCT31_CH	0x402887C0	0x00000040	P-DMA0 Channel #31
126	PERI_MS_PPU_FX_DW0_CH_STRUCT32_CH	0x40288800	0x00000040	P-DMA0 Channel #32
127	PERI_MS_PPU_FX_DW0_CH_STRUCT33_CH	0x40288840	0x00000040	P-DMA0 Channel #33
128	PERI_MS_PPU_FX_DW0_CH_STRUCT34_CH	0x40288880	0x00000040	P-DMA0 Channel #34
129	PERI_MS_PPU_FX_DW0_CH_STRUCT35_CH	0x402888C0	0x00000040	P-DMA0 Channel #35
130	PERI_MS_PPU_FX_DW0_CH_STRUCT36_CH	0x40288900	0x00000040	P-DMA0 Channel #36
131	PERI_MS_PPU_FX_DW0_CH_STRUCT37_CH	0x40288940	0x00000040	P-DMA0 Channel #37
132	PERI_MS_PPU_FX_DW0_CH_STRUCT38_CH	0x40288980	0x00000040	P-DMA0 Channel #38
133	PERI_MS_PPU_FX_DW0_CH_STRUCT39_CH	0x402889C0	0x00000040	P-DMA0 Channel #39
134	PERI_MS_PPU_FX_DW0_CH_STRUCT40_CH	0x40288A00	0x00000040	P-DMA0 Channel #40
135	PERI_MS_PPU_FX_DW0_CH_STRUCT41_CH	0x40288A40	0x00000040	P-DMA0 Channel #41
136	PERI_MS_PPU_FX_DW0_CH_STRUCT42_CH	0x40288A80	0x00000040	P-DMA0 Channel #42
137	PERI_MS_PPU_FX_DW0_CH_STRUCT43_CH	0x40288AC0	0x00000040	P-DMA0 Channel #43
138	PERI_MS_PPU_FX_DW0_CH_STRUCT44_CH	0x40288B00	0x00000040	P-DMA0 Channel #44
139	PERI_MS_PPU_FX_DW0_CH_STRUCT45_CH	0x40288B40	0x00000040	P-DMA0 Channel #45
140	PERI_MS_PPU_FX_DW0_CH_STRUCT46_CH	0x40288B80	0x00000040	P-DMA0 Channel #46
141	PERI_MS_PPU_FX_DW0_CH_STRUCT47_CH	0x40288BC0	0x00000040	P-DMA0 Channel #47
142	PERI_MS_PPU_FX_DW0_CH_STRUCT48_CH	0x40288C00	0x00000040	P-DMA0 Channel #48
143	PERI_MS_PPU_FX_DW0_CH_STRUCT49_CH	0x40288C40	0x00000040	P-DMA0 Channel #49
144	PERI_MS_PPU_FX_DW0_CH_STRUCT50_CH	0x40288C80	0x00000040	P-DMA0 Channel #50
145	PERI_MS_PPU_FX_DW0_CH_STRUCT51_CH	0x40288CC0	0x00000040	P-DMA0 Channel #51
146	PERI_MS_PPU_FX_DW0_CH_STRUCT52_CH	0x40288D00	0x00000040	P-DMA0 Channel #52
147	PERI_MS_PPU_FX_DW0_CH_STRUCT53_CH	0x40288D40	0x00000040	P-DMA0 Channel #53
148	PERI_MS_PPU_FX_DW0_CH_STRUCT54_CH	0x40288D80	0x00000040	P-DMA0 Channel #54
149	PERI_MS_PPU_FX_DW0_CH_STRUCT55_CH	0x40288DC0	0x00000040	P-DMA0 Channel #55
150	PERI_MS_PPU_FX_DW0_CH_STRUCT56_CH	0x40288E00	0x00000040	P-DMA0 Channel #56
151	PERI_MS_PPU_FX_DW0_CH_STRUCT57_CH	0x40288E40	0x00000040	P-DMA0 Channel #57
152	PERI_MS_PPU_FX_DW0_CH_STRUCT58_CH	0x40288E80	0x00000040	P-DMA0 Channel #58
153	PERI_MS_PPU_FX_DW0_CH_STRUCT59_CH	0x40288EC0	0x00000040	P-DMA0 Channel #59
154	PERI_MS_PPU_FX_DW0_CH_STRUCT60_CH	0x40288F00	0x00000040	P-DMA0 Channel #60
155	PERI_MS_PPU_FX_DW0_CH_STRUCT61_CH	0x40288F40	0x00000040	P-DMA0 Channel #61

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
156	PERI_MS_PPU_FX_DW0_CH_STRUCT62_CH	0x40288F80	0x00000040	P-DMA0 Channel #62
157	PERI_MS_PPU_FX_DW0_CH_STRUCT63_CH	0x40288FC0	0x00000040	P-DMA0 Channel #63
158	PERI_MS_PPU_FX_DW0_CH_STRUCT64_CH	0x40289000	0x00000040	P-DMA0 Channel #64
159	PERI_MS_PPU_FX_DW0_CH_STRUCT65_CH	0x40289040	0x00000040	P-DMA0 Channel #65
160	PERI_MS_PPU_FX_DW0_CH_STRUCT66_CH	0x40289080	0x00000040	P-DMA0 Channel #66
161	PERI_MS_PPU_FX_DW0_CH_STRUCT67_CH	0x402890C0	0x00000040	P-DMA0 Channel #67
162	PERI_MS_PPU_FX_DW0_CH_STRUCT68_CH	0x40289100	0x00000040	P-DMA0 Channel #68
163	PERI_MS_PPU_FX_DW0_CH_STRUCT69_CH	0x40289140	0x00000040	P-DMA0 Channel #69
164	PERI_MS_PPU_FX_DW0_CH_STRUCT70_CH	0x40289180	0x00000040	P-DMA0 Channel #70
165	PERI_MS_PPU_FX_DW0_CH_STRUCT71_CH	0x402891C0	0x00000040	P-DMA0 Channel #71
166	PERI_MS_PPU_FX_DW0_CH_STRUCT72_CH	0x40289200	0x00000040	P-DMA0 Channel #72
167	PERI_MS_PPU_FX_DW0_CH_STRUCT73_CH	0x40289240	0x00000040	P-DMA0 Channel #73
168	PERI_MS_PPU_FX_DW0_CH_STRUCT74_CH	0x40289280	0x00000040	P-DMA0 Channel #74
169	PERI_MS_PPU_FX_DW0_CH_STRUCT75_CH	0x402892C0	0x00000040	P-DMA0 Channel #75
170	PERI_MS_PPU_FX_DW0_CH_STRUCT76_CH	0x40289300	0x00000040	P-DMA0 Channel #76
171	PERI_MS_PPU_FX_DW0_CH_STRUCT77_CH	0x40289340	0x00000040	P-DMA0 Channel #77
172	PERI_MS_PPU_FX_DW0_CH_STRUCT78_CH	0x40289380	0x00000040	P-DMA0 Channel #78
173	PERI_MS_PPU_FX_DW0_CH_STRUCT79_CH	0x402893C0	0x00000040	P-DMA0 Channel #79
174	PERI_MS_PPU_FX_DW0_CH_STRUCT80_CH	0x40289400	0x00000040	P-DMA0 Channel #80
175	PERI_MS_PPU_FX_DW0_CH_STRUCT81_CH	0x40289440	0x00000040	P-DMA0 Channel #81
176	PERI_MS_PPU_FX_DW0_CH_STRUCT82_CH	0x40289480	0x00000040	P-DMA0 Channel #82
177	PERI_MS_PPU_FX_DW0_CH_STRUCT83_CH	0x402894C0	0x00000040	P-DMA0 Channel #83
178	PERI_MS_PPU_FX_DW0_CH_STRUCT84_CH	0x40289500	0x00000040	P-DMA0 Channel #84
179	PERI_MS_PPU_FX_DW0_CH_STRUCT85_CH	0x40289540	0x00000040	P-DMA0 Channel #85
180	PERI_MS_PPU_FX_DW0_CH_STRUCT86_CH	0x40289580	0x00000040	P-DMA0 Channel #86
181	PERI_MS_PPU_FX_DW0_CH_STRUCT87_CH	0x402895C0	0x00000040	P-DMA0 Channel #87
182	PERI_MS_PPU_FX_DW0_CH_STRUCT88_CH	0x40289600	0x00000040	P-DMA0 Channel #88
183	PERI_MS_PPU_FX_DW0_CH_STRUCT89_CH	0x40289640	0x00000040	P-DMA0 Channel #89
184	PERI_MS_PPU_FX_DW0_CH_STRUCT90_CH	0x40289680	0x00000040	P-DMA0 Channel #90
185	PERI_MS_PPU_FX_DW0_CH_STRUCT91_CH	0x402896C0	0x00000040	P-DMA0 Channel #91
186	PERI_MS_PPU_FX_DW0_CH_STRUCT92_CH	0x40289700	0x00000040	P-DMA0 Channel #92
187	PERI_MS_PPU_FX_DW0_CH_STRUCT93_CH	0x40289740	0x00000040	P-DMA0 Channel #93
188	PERI_MS_PPU_FX_DW0_CH_STRUCT94_CH	0x40289780	0x00000040	P-DMA0 Channel #94
189	PERI_MS_PPU_FX_DW0_CH_STRUCT95_CH	0x402897C0	0x00000040	P-DMA0 Channel #95
190	PERI_MS_PPU_FX_DW0_CH_STRUCT96_CH	0x40289800	0x00000040	P-DMA0 Channel #96
191	PERI_MS_PPU_FX_DW0_CH_STRUCT97_CH	0x40289840	0x00000040	P-DMA0 Channel #97
192	PERI_MS_PPU_FX_DW0_CH_STRUCT98_CH	0x40289880	0x00000040	P-DMA0 Channel #98
193	PERI_MS_PPU_FX_DW0_CH_STRUCT99_CH	0x402898C0	0x00000040	P-DMA0 Channel #99
194	PERI_MS_PPU_FX_DW0_CH_STRUCT100_CH	0x40289900	0x00000040	P-DMA0 Channel #100
195	PERI_MS_PPU_FX_DW0_CH_STRUCT101_CH	0x40289940	0x00000040	P-DMA0 Channel #101
196	PERI_MS_PPU_FX_DW0_CH_STRUCT102_CH	0x40289980	0x00000040	P-DMA0 Channel #102

注释：
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表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
197	PERI_MS_PPU_FX_DW0_CH_STRUCT103_CH	0x402899C0	0x00000040	P-DMA0 Channel #103
198	PERI_MS_PPU_FX_DW0_CH_STRUCT104_CH	0x40289A00	0x00000040	P-DMA0 Channel #104
199	PERI_MS_PPU_FX_DW0_CH_STRUCT105_CH	0x40289A40	0x00000040	P-DMA0 Channel #105
200	PERI_MS_PPU_FX_DW0_CH_STRUCT106_CH	0x40289A80	0x00000040	P-DMA0 Channel #106
201	PERI_MS_PPU_FX_DW0_CH_STRUCT107_CH	0x40289AC0	0x00000040	P-DMA0 Channel #107
202	PERI_MS_PPU_FX_DW0_CH_STRUCT108_CH	0x40289B00	0x00000040	P-DMA0 Channel #108
203	PERI_MS_PPU_FX_DW0_CH_STRUCT109_CH	0x40289B40	0x00000040	P-DMA0 Channel #109
204	PERI_MS_PPU_FX_DW0_CH_STRUCT110_CH	0x40289B80	0x00000040	P-DMA0 Channel #110
205	PERI_MS_PPU_FX_DW0_CH_STRUCT111_CH	0x40289BC0	0x00000040	P-DMA0 Channel #111
206	PERI_MS_PPU_FX_DW0_CH_STRUCT112_CH	0x40289C00	0x00000040	P-DMA0 Channel #112
207	PERI_MS_PPU_FX_DW0_CH_STRUCT113_CH	0x40289C40	0x00000040	P-DMA0 Channel #113
208	PERI_MS_PPU_FX_DW0_CH_STRUCT114_CH	0x40289C80	0x00000040	P-DMA0 Channel #114
209	PERI_MS_PPU_FX_DW0_CH_STRUCT115_CH	0x40289CC0	0x00000040	P-DMA0 Channel #115
210	PERI_MS_PPU_FX_DW0_CH_STRUCT116_CH	0x40289D00	0x00000040	P-DMA0 Channel #116
211	PERI_MS_PPU_FX_DW0_CH_STRUCT117_CH	0x40289D40	0x00000040	P-DMA0 Channel #117
212	PERI_MS_PPU_FX_DW0_CH_STRUCT118_CH	0x40289D80	0x00000040	P-DMA0 Channel #118
213	PERI_MS_PPU_FX_DW0_CH_STRUCT119_CH	0x40289DC0	0x00000040	P-DMA0 Channel #119
214	PERI_MS_PPU_FX_DW0_CH_STRUCT120_CH	0x40289E00	0x00000040	P-DMA0 Channel #120
215	PERI_MS_PPU_FX_DW0_CH_STRUCT121_CH	0x40289E40	0x00000040	P-DMA0 Channel #121
216	PERI_MS_PPU_FX_DW0_CH_STRUCT122_CH	0x40289E80	0x00000040	P-DMA0 Channel #122
217	PERI_MS_PPU_FX_DW0_CH_STRUCT123_CH	0x40289EC0	0x00000040	P-DMA0 Channel #123
218	PERI_MS_PPU_FX_DW0_CH_STRUCT124_CH	0x40289F00	0x00000040	P-DMA0 Channel #124
219	PERI_MS_PPU_FX_DW0_CH_STRUCT125_CH	0x40289F40	0x00000040	P-DMA0 Channel #125
220	PERI_MS_PPU_FX_DW0_CH_STRUCT126_CH	0x40289F80	0x00000040	P-DMA0 Channel #126
221	PERI_MS_PPU_FX_DW0_CH_STRUCT127_CH	0x40289FC0	0x00000040	P-DMA0 Channel #127
222	PERI_MS_PPU_FX_DW0_CH_STRUCT128_CH	0x4028A000	0x00000040	P-DMA0 Channel #128
223	PERI_MS_PPU_FX_DW0_CH_STRUCT129_CH	0x4028A040	0x00000040	P-DMA0 Channel #129
224	PERI_MS_PPU_FX_DW0_CH_STRUCT130_CH	0x4028A080	0x00000040	P-DMA0 Channel #130
225	PERI_MS_PPU_FX_DW0_CH_STRUCT131_CH	0x4028A0C0	0x00000040	P-DMA0 Channel #131
226	PERI_MS_PPU_FX_DW0_CH_STRUCT132_CH	0x4028A100	0x00000040	P-DMA0 Channel #132
227	PERI_MS_PPU_FX_DW0_CH_STRUCT133_CH	0x4028A140	0x00000040	P-DMA0 Channel #133
228	PERI_MS_PPU_FX_DW0_CH_STRUCT134_CH	0x4028A180	0x00000040	P-DMA0 Channel #134
229	PERI_MS_PPU_FX_DW0_CH_STRUCT135_CH	0x4028A1C0	0x00000040	P-DMA0 Channel #135
230	PERI_MS_PPU_FX_DW0_CH_STRUCT136_CH	0x4028A200	0x00000040	P-DMA0 Channel #136
231	PERI_MS_PPU_FX_DW0_CH_STRUCT137_CH	0x4028A240	0x00000040	P-DMA0 Channel #137
232	PERI_MS_PPU_FX_DW0_CH_STRUCT138_CH	0x4028A280	0x00000040	P-DMA0 Channel #138
233	PERI_MS_PPU_FX_DW0_CH_STRUCT139_CH	0x4028A2C0	0x00000040	P-DMA0 Channel #139
234	PERI_MS_PPU_FX_DW0_CH_STRUCT140_CH	0x4028A300	0x00000040	P-DMA0 Channel #140
235	PERI_MS_PPU_FX_DW0_CH_STRUCT141_CH	0x4028A340	0x00000040	P-DMA0 Channel #141
236	PERI_MS_PPU_FX_DW0_CH_STRUCT142_CH	0x4028A380	0x00000040	P-DMA0 Channel #142
237	PERI_MS_PPU_FX_DW1_CH_STRUCT0_CH	0x40298000	0x00000040	P-DMA1 Channel #0

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
238	PERI_MS_PPU_FX_DW1_CH_STRUCT1_CH	0x40298040	0x00000040	P-DMA1 Channel #1
239	PERI_MS_PPU_FX_DW1_CH_STRUCT2_CH	0x40298080	0x00000040	P-DMA1 Channel #2
240	PERI_MS_PPU_FX_DW1_CH_STRUCT3_CH	0x402980C0	0x00000040	P-DMA1 Channel #3
241	PERI_MS_PPU_FX_DW1_CH_STRUCT4_CH	0x40298100	0x00000040	P-DMA1 Channel #4
242	PERI_MS_PPU_FX_DW1_CH_STRUCT5_CH	0x40298140	0x00000040	P-DMA1 Channel #5
243	PERI_MS_PPU_FX_DW1_CH_STRUCT6_CH	0x40298180	0x00000040	P-DMA1 Channel #6
244	PERI_MS_PPU_FX_DW1_CH_STRUCT7_CH	0x402981C0	0x00000040	P-DMA1 Channel #7
245	PERI_MS_PPU_FX_DW1_CH_STRUCT8_CH	0x40298200	0x00000040	P-DMA1 Channel #8
246	PERI_MS_PPU_FX_DW1_CH_STRUCT9_CH	0x40298240	0x00000040	P-DMA1 Channel #9
247	PERI_MS_PPU_FX_DW1_CH_STRUCT10_CH	0x40298280	0x00000040	P-DMA1 Channel #10
248	PERI_MS_PPU_FX_DW1_CH_STRUCT11_CH	0x402982C0	0x00000040	P-DMA1 Channel #11
249	PERI_MS_PPU_FX_DW1_CH_STRUCT12_CH	0x40298300	0x00000040	P-DMA1 Channel #12
250	PERI_MS_PPU_FX_DW1_CH_STRUCT13_CH	0x40298340	0x00000040	P-DMA1 Channel #13
251	PERI_MS_PPU_FX_DW1_CH_STRUCT14_CH	0x40298380	0x00000040	P-DMA1 Channel #14
252	PERI_MS_PPU_FX_DW1_CH_STRUCT15_CH	0x402983C0	0x00000040	P-DMA1 Channel #15
253	PERI_MS_PPU_FX_DW1_CH_STRUCT16_CH	0x40298400	0x00000040	P-DMA1 Channel #16
254	PERI_MS_PPU_FX_DW1_CH_STRUCT17_CH	0x40298440	0x00000040	P-DMA1 Channel #17
255	PERI_MS_PPU_FX_DW1_CH_STRUCT18_CH	0x40298480	0x00000040	P-DMA1 Channel #18
256	PERI_MS_PPU_FX_DW1_CH_STRUCT19_CH	0x402984C0	0x00000040	P-DMA1 Channel #19
257	PERI_MS_PPU_FX_DW1_CH_STRUCT20_CH	0x40298500	0x00000040	P-DMA1 Channel #20
258	PERI_MS_PPU_FX_DW1_CH_STRUCT21_CH	0x40298540	0x00000040	P-DMA1 Channel #21
259	PERI_MS_PPU_FX_DW1_CH_STRUCT22_CH	0x40298580	0x00000040	P-DMA1 Channel #22
260	PERI_MS_PPU_FX_DW1_CH_STRUCT23_CH	0x402985C0	0x00000040	P-DMA1 Channel #23
261	PERI_MS_PPU_FX_DW1_CH_STRUCT24_CH	0x40298600	0x00000040	P-DMA1 Channel #24
262	PERI_MS_PPU_FX_DW1_CH_STRUCT25_CH	0x40298640	0x00000040	P-DMA1 Channel #25
263	PERI_MS_PPU_FX_DW1_CH_STRUCT26_CH	0x40298680	0x00000040	P-DMA1 Channel #26
264	PERI_MS_PPU_FX_DW1_CH_STRUCT27_CH	0x402986C0	0x00000040	P-DMA1 Channel #27
265	PERI_MS_PPU_FX_DW1_CH_STRUCT28_CH	0x40298700	0x00000040	P-DMA1 Channel #28
266	PERI_MS_PPU_FX_DW1_CH_STRUCT29_CH	0x40298740	0x00000040	P-DMA1 Channel #29
267	PERI_MS_PPU_FX_DW1_CH_STRUCT30_CH	0x40298780	0x00000040	P-DMA1 Channel #30
268	PERI_MS_PPU_FX_DW1_CH_STRUCT31_CH	0x402987C0	0x00000040	P-DMA1 Channel #31
269	PERI_MS_PPU_FX_DW1_CH_STRUCT32_CH	0x40298800	0x00000040	P-DMA1 Channel #32
270	PERI_MS_PPU_FX_DW1_CH_STRUCT33_CH	0x40298840	0x00000040	P-DMA1 Channel #33
271	PERI_MS_PPU_FX_DW1_CH_STRUCT34_CH	0x40298880	0x00000040	P-DMA1 Channel #34
272	PERI_MS_PPU_FX_DW1_CH_STRUCT35_CH	0x402988C0	0x00000040	P-DMA1 Channel #35
273	PERI_MS_PPU_FX_DW1_CH_STRUCT36_CH	0x40298900	0x00000040	P-DMA1 Channel #36
274	PERI_MS_PPU_FX_DW1_CH_STRUCT37_CH	0x40298940	0x00000040	P-DMA1 Channel #37
275	PERI_MS_PPU_FX_DW1_CH_STRUCT38_CH	0x40298980	0x00000040	P-DMA1 Channel #38
276	PERI_MS_PPU_FX_DW1_CH_STRUCT39_CH	0x402989C0	0x00000040	P-DMA1 Channel #39
277	PERI_MS_PPU_FX_DW1_CH_STRUCT40_CH	0x40298A00	0x00000040	P-DMA1 Channel #40
278	PERI_MS_PPU_FX_DW1_CH_STRUCT41_CH	0x40298A40	0x00000040	P-DMA1 Channel #41

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
279	PERI_MS_PPU_FX_DW1_CH_STRUCT42_CH	0x40298A80	0x00000040	P-DMA1 Channel #42
280	PERI_MS_PPU_FX_DW1_CH_STRUCT43_CH	0x40298AC0	0x00000040	P-DMA1 Channel #43
281	PERI_MS_PPU_FX_DW1_CH_STRUCT44_CH	0x40298B00	0x00000040	P-DMA1 Channel #44
282	PERI_MS_PPU_FX_DW1_CH_STRUCT45_CH	0x40298B40	0x00000040	P-DMA1 Channel #45
283	PERI_MS_PPU_FX_DW1_CH_STRUCT46_CH	0x40298B80	0x00000040	P-DMA1 Channel #46
284	PERI_MS_PPU_FX_DW1_CH_STRUCT47_CH	0x40298BC0	0x00000040	P-DMA1 Channel #47
285	PERI_MS_PPU_FX_DW1_CH_STRUCT48_CH	0x40298C00	0x00000040	P-DMA1 Channel #48
286	PERI_MS_PPU_FX_DW1_CH_STRUCT49_CH	0x40298C40	0x00000040	P-DMA1 Channel #49
287	PERI_MS_PPU_FX_DW1_CH_STRUCT50_CH	0x40298C80	0x00000040	P-DMA1 Channel #50
288	PERI_MS_PPU_FX_DW1_CH_STRUCT51_CH	0x40298CC0	0x00000040	P-DMA1 Channel #51
289	PERI_MS_PPU_FX_DW1_CH_STRUCT52_CH	0x40298D00	0x00000040	P-DMA1 Channel #52
290	PERI_MS_PPU_FX_DW1_CH_STRUCT53_CH	0x40298D40	0x00000040	P-DMA1 Channel #53
291	PERI_MS_PPU_FX_DW1_CH_STRUCT54_CH	0x40298D80	0x00000040	P-DMA1 Channel #54
292	PERI_MS_PPU_FX_DW1_CH_STRUCT55_CH	0x40298DC0	0x00000040	P-DMA1 Channel #55
293	PERI_MS_PPU_FX_DW1_CH_STRUCT56_CH	0x40298E00	0x00000040	P-DMA1 Channel #56
294	PERI_MS_PPU_FX_DW1_CH_STRUCT57_CH	0x40298E40	0x00000040	P-DMA1 Channel #57
295	PERI_MS_PPU_FX_DW1_CH_STRUCT58_CH	0x40298E80	0x00000040	P-DMA1 Channel #58
296	PERI_MS_PPU_FX_DW1_CH_STRUCT59_CH	0x40298EC0	0x00000040	P-DMA1 Channel #59
297	PERI_MS_PPU_FX_DW1_CH_STRUCT60_CH	0x40298F00	0x00000040	P-DMA1 Channel #60
298	PERI_MS_PPU_FX_DW1_CH_STRUCT61_CH	0x40298F40	0x00000040	P-DMA1 Channel #61
299	PERI_MS_PPU_FX_DW1_CH_STRUCT62_CH	0x40298F80	0x00000040	P-DMA1 Channel #62
300	PERI_MS_PPU_FX_DW1_CH_STRUCT63_CH	0x40298FC0	0x00000040	P-DMA1 Channel #63
301	PERI_MS_PPU_FX_DW1_CH_STRUCT64_CH	0x40299000	0x00000040	P-DMA1 Channel #64
302	PERI_MS_PPU_FX_DMAC_TOP	0x402A0000	0x00000010	M-DMA0 main
303	PERI_MS_PPU_FX_DMAC_CH0_CH	0x402A1000	0x00000100	M-DMA0 Channel #0
304	PERI_MS_PPU_FX_DMAC_CH1_CH	0x402A1100	0x00000100	M-DMA0 Channel #1
305	PERI_MS_PPU_FX_DMAC_CH2_CH	0x402A1200	0x00000100	M-DMA0 Channel #2
306	PERI_MS_PPU_FX_DMAC_CH3_CH	0x402A1300	0x00000100	M-DMA0 Channel #3
307	PERI_MS_PPU_FX_DMAC_CH4_CH	0x402A1400	0x00000100	M-DMA0 Channel #4
308	PERI_MS_PPU_FX_DMAC_CH5_CH	0x402A1500	0x00000100	M-DMA0 Channel #5
309	PERI_MS_PPU_FX_DMAC_CH6_CH	0x402A1600	0x00000100	M-DMA0 Channel #6
310	PERI_MS_PPU_FX_DMAC_CH7_CH	0x402A1700	0x00000100	M-DMA0 Channel #7
311	PERI_MS_PPU_FX_EFUSE_CTL	0x402C0000	0x00000200	EFUSE control
312	PERI_MS_PPU_FX_EFUSE_DATA	0x402C0800	0x00000200	EFUSE data
313	PERI_MS_PPU_FX_BIST	0x402F0000	0x00001000	Built-in self test
314	PERI_MS_PPU_FX_HSIOM_PRT0_PRT	0x40300000	0x00000008	HSIOm Port #0
315	PERI_MS_PPU_FX_HSIOM_PRT1_PRT	0x40300010	0x00000008	HSIOm Port #1
316	PERI_MS_PPU_FX_HSIOM_PRT2_PRT	0x40300020	0x00000008	HSIOm Port #2
317	PERI_MS_PPU_FX_HSIOM_PRT3_PRT	0x40300030	0x00000008	HSIOm Port #3
318	PERI_MS_PPU_FX_HSIOM_PRT4_PRT	0x40300040	0x00000008	HSIOm Port #4
319	PERI_MS_PPU_FX_HSIOM_PRT5_PRT	0x40300050	0x00000008	HSIOm Port #5

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

Peripheral protection unit fixed structure pairs

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
320	PERI_MS_PPU_FX_HSIOM_PRT6_PRT	0x40300060	0x00000008	HSIOm Port #6
321	PERI_MS_PPU_FX_HSIOM_PRT7_PRT	0x40300070	0x00000008	HSIOm Port #7
322	PERI_MS_PPU_FX_HSIOM_PRT8_PRT	0x40300080	0x00000008	HSIOm Port #8
323	PERI_MS_PPU_FX_HSIOM_PRT9_PRT	0x40300090	0x00000008	HSIOm Port #9
324	PERI_MS_PPU_FX_HSIOM_PRT10_PRT	0x403000A0	0x00000008	HSIOm Port #10
325	PERI_MS_PPU_FX_HSIOM_PRT11_PRT	0x403000B0	0x00000008	HSIOm Port #11
326	PERI_MS_PPU_FX_HSIOM_PRT12_PRT	0x403000C0	0x00000008	HSIOm Port #12
327	PERI_MS_PPU_FX_HSIOM_PRT13_PRT	0x403000D0	0x00000008	HSIOm Port #13
328	PERI_MS_PPU_FX_HSIOM_PRT14_PRT	0x403000E0	0x00000008	HSIOm Port #14
329	PERI_MS_PPU_FX_HSIOM_PRT15_PRT	0x403000F0	0x00000008	HSIOm Port #15
330	PERI_MS_PPU_FX_HSIOM_PRT16_PRT	0x40300100	0x00000008	HSIOm Port #16
331	PERI_MS_PPU_FX_HSIOM_PRT17_PRT	0x40300110	0x00000008	HSIOm Port #17
332	PERI_MS_PPU_FX_HSIOM_PRT18_PRT	0x40300120	0x00000008	HSIOm Port #18
333	PERI_MS_PPU_FX_HSIOM_PRT19_PRT	0x40300130	0x00000008	HSIOm Port #19
334	PERI_MS_PPU_FX_HSIOM_PRT20_PRT	0x40300140	0x00000008	HSIOm Port #20
335	PERI_MS_PPU_FX_HSIOM_PRT21_PRT	0x40300150	0x00000008	HSIOm Port #21
336	PERI_MS_PPU_FX_HSIOM_PRT22_PRT	0x40300160	0x00000008	HSIOm Port #22
337	PERI_MS_PPU_FX_HSIOM_PRT23_PRT	0x40300170	0x00000008	HSIOm Port #23
338	PERI_MS_PPU_FX_HSIOM_PRT24_PRT	0x40300180	0x00000008	HSIOm Port #24
339	PERI_MS_PPU_FX_HSIOM_PRT25_PRT	0x40300190	0x00000008	HSIOm Port #25
340	PERI_MS_PPU_FX_HSIOM_PRT26_PRT	0x403001A0	0x00000008	HSIOm Port #26
341	PERI_MS_PPU_FX_HSIOM_PRT27_PRT	0x403001B0	0x00000008	HSIOm Port #27
342	PERI_MS_PPU_FX_HSIOM_PRT28_PRT	0x403001C0	0x00000008	HSIOm Port #28
343	PERI_MS_PPU_FX_HSIOM_PRT29_PRT	0x403001D0	0x00000008	HSIOm Port #29
344	PERI_MS_PPU_FX_HSIOM_PRT30_PRT	0x403001E0	0x00000008	HSIOm Port #30
345	PERI_MS_PPU_FX_HSIOM_PRT31_PRT	0x403001F0	0x00000008	HSIOm Port #31
346	PERI_MS_PPU_FX_HSIOM_PRT32_PRT	0x40300200	0x00000008	HSIOm Port #32
347	PERI_MS_PPU_FX_HSIOM_PRT33_PRT	0x40300210	0x00000008	HSIOm Port #33
348	PERI_MS_PPU_FX_HSIOM_PRT34_PRT	0x40300220	0x00000008	HSIOm Port #34
349	PERI_MS_PPU_FX_HSIOM_AMUX	0x40302000	0x00000010	HSIOm Analog multiplexer
350	PERI_MS_PPU_FX_HSIOM_MON	0x40302200	0x00000010	HSIOm monitor
351	PERI_MS_PPU_FX_HSIOM_ALTJTAG	0x40302240	0x00000004	HSIOm Alternate JTAG
352	PERI_MS_PPU_FX_GPIO_PRT0_PRT	0x40310000	0x00000040	GPIO_ENH Port #0
353	PERI_MS_PPU_FX_GPIO_PRT1_PRT	0x40310080	0x00000040	GPIO_STD Port #1
354	PERI_MS_PPU_FX_GPIO_PRT2_PRT	0x40310100	0x00000040	GPIO_STD Port #2
355	PERI_MS_PPU_FX_GPIO_PRT3_PRT	0x40310180	0x00000040	GPIO_STD Port #3
356	PERI_MS_PPU_FX_GPIO_PRT4_PRT	0x40310200	0x00000040	GPIO_STD Port #4
357	PERI_MS_PPU_FX_GPIO_PRT5_PRT	0x40310280	0x00000040	GPIO_STD Port #5
358	PERI_MS_PPU_FX_GPIO_PRT6_PRT	0x40310300	0x00000040	GPIO_STD Port #6
359	PERI_MS_PPU_FX_GPIO_PRT7_PRT	0x40310380	0x00000040	GPIO_STD Port #7
360	PERI_MS_PPU_FX_GPIO_PRT8_PRT	0x40310400	0x00000040	GPIO_STD Port #8

注释：

31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
361	PERI_MS_PPU_FX_GPIO_PRT9_PRT	0x40310480	0x00000040	GPIO_STD Port #9
362	PERI_MS_PPU_FX_GPIO_PRT10_PRT	0x40310500	0x00000040	GPIO_STD Port #10
363	PERI_MS_PPU_FX_GPIO_PRT11_PRT	0x40310580	0x00000040	GPIO_STD Port #11
364	PERI_MS_PPU_FX_GPIO_PRT12_PRT	0x40310600	0x00000040	GPIO_STD Port #12
365	PERI_MS_PPU_FX_GPIO_PRT13_PRT	0x40310680	0x00000040	GPIO_STD Port #13
366	PERI_MS_PPU_FX_GPIO_PRT14_PRT	0x40310700	0x00000040	GPIO_STD Port #14
367	PERI_MS_PPU_FX_GPIO_PRT15_PRT	0x40310780	0x00000040	GPIO_STD Port #15
368	PERI_MS_PPU_FX_GPIO_PRT16_PRT	0x40310800	0x00000040	GPIO_STD Port #16
369	PERI_MS_PPU_FX_GPIO_PRT17_PRT	0x40310880	0x00000040	GPIO_STD Port #17
370	PERI_MS_PPU_FX_GPIO_PRT18_PRT	0x40310900	0x00000040	GPIO_STD Port #18
371	PERI_MS_PPU_FX_GPIO_PRT19_PRT	0x40310980	0x00000040	GPIO_STD Port #19
372	PERI_MS_PPU_FX_GPIO_PRT20_PRT	0x40310A00	0x00000040	GPIO_STD Port #20
373	PERI_MS_PPU_FX_GPIO_PRT21_PRT	0x40310A80	0x00000040	GPIO_STD Port #21
374	PERI_MS_PPU_FX_GPIO_PRT22_PRT	0x40310B00	0x00000040	GPIO_STD Port #22
375	PERI_MS_PPU_FX_GPIO_PRT23_PRT	0x40310B80	0x00000040	GPIO_STD Port #23
376	PERI_MS_PPU_FX_GPIO_PRT24_PRT	0x40310C00	0x00000040	HSIO_STD Port #24
377	PERI_MS_PPU_FX_GPIO_PRT25_PRT	0x40310C80	0x00000040	HSIO_STD Port #25
378	PERI_MS_PPU_FX_GPIO_PRT26_PRT	0x40310D00	0x00000040	HSIO_STD Port #26
379	PERI_MS_PPU_FX_GPIO_PRT27_PRT	0x40310D80	0x00000040	HSIO_STD Port #27
380	PERI_MS_PPU_FX_GPIO_PRT28_PRT	0x40310E00	0x00000040	GPIO_STD Port #28
381	PERI_MS_PPU_FX_GPIO_PRT29_PRT	0x40310E80	0x00000040	GPIO_STD Port #29
382	PERI_MS_PPU_FX_GPIO_PRT30_PRT	0x40310F00	0x00000040	GPIO_STD Port #30
383	PERI_MS_PPU_FX_GPIO_PRT31_PRT	0x40310F80	0x00000040	GPIO_STD Port #31
384	PERI_MS_PPU_FX_GPIO_PRT32_PRT	0x40311000	0x00000040	GPIO_STD Port #32
385	PERI_MS_PPU_FX_GPIO_PRT33_PRT	0x40311080	0x00000040	HSIO_STD Port #33
386	PERI_MS_PPU_FX_GPIO_PRT34_PRT	0x40311100	0x00000040	HSIO_STD Port #34
387	PERI_MS_PPU_FX_GPIO_PRT0_CFG	0x40310040	0x00000020	GPIO_ENH Port #0 configuration
388	PERI_MS_PPU_FX_GPIO_PRT1_CFG	0x403100C0	0x00000020	GPIO_STD Port #1 configuration
389	PERI_MS_PPU_FX_GPIO_PRT2_CFG	0x40310140	0x00000020	GPIO_STD Port #2 configuration
390	PERI_MS_PPU_FX_GPIO_PRT3_CFG	0x403101C0	0x00000020	GPIO_STD Port #3 configuration
391	PERI_MS_PPU_FX_GPIO_PRT4_CFG	0x40310240	0x00000020	GPIO_STD Port #4 configuration
392	PERI_MS_PPU_FX_GPIO_PRT5_CFG	0x403102C0	0x00000020	GPIO_STD Port #5 configuration
393	PERI_MS_PPU_FX_GPIO_PRT6_CFG	0x40310340	0x00000020	GPIO_STD Port #6 configuration
394	PERI_MS_PPU_FX_GPIO_PRT7_CFG	0x403103C0	0x00000020	GPIO_STD Port #7 configuration
395	PERI_MS_PPU_FX_GPIO_PRT8_CFG	0x40310440	0x00000020	GPIO_STD Port #8 configuration
396	PERI_MS_PPU_FX_GPIO_PRT9_CFG	0x403104C0	0x00000020	GPIO_STD Port #9 configuration
397	PERI_MS_PPU_FX_GPIO_PRT10_CFG	0x40310540	0x00000020	GPIO_STD Port #10 configuration
398	PERI_MS_PPU_FX_GPIO_PRT11_CFG	0x403105C0	0x00000020	GPIO_STD Port #11 configuration
399	PERI_MS_PPU_FX_GPIO_PRT12_CFG	0x40310640	0x00000020	GPIO_STD Port #12 configuration
400	PERI_MS_PPU_FX_GPIO_PRT13_CFG	0x403106C0	0x00000020	GPIO_STD Port #13 configuration
401	PERI_MS_PPU_FX_GPIO_PRT14_CFG	0x40310740	0x00000020	GPIO_STD Port #14 configuration

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
402	PERI_MS_PPU_FX_GPIO_PRT15_CFG	0x403107C0	0x00000020	GPIO_STD Port #15 configuration
403	PERI_MS_PPU_FX_GPIO_PRT16_CFG	0x40310840	0x00000020	GPIO_STD Port #16 configuration
404	PERI_MS_PPU_FX_GPIO_PRT17_CFG	0x403108C0	0x00000020	GPIO_STD Port #17 configuration
405	PERI_MS_PPU_FX_GPIO_PRT18_CFG	0x40310940	0x00000020	GPIO_STD Port #18 configuration
406	PERI_MS_PPU_FX_GPIO_PRT19_CFG	0x403109C0	0x00000020	GPIO_STD Port #19 configuration
407	PERI_MS_PPU_FX_GPIO_PRT20_CFG	0x40310A40	0x00000020	GPIO_STD Port #20 configuration
408	PERI_MS_PPU_FX_GPIO_PRT21_CFG	0x40310AC0	0x00000020	GPIO_STD Port #21 configuration
409	PERI_MS_PPU_FX_GPIO_PRT22_CFG	0x40310B40	0x00000020	GPIO_STD Port #22 configuration
410	PERI_MS_PPU_FX_GPIO_PRT23_CFG	0x40310BC0	0x00000020	GPIO_STD Port #23 configuration
411	PERI_MS_PPU_FX_GPIO_PRT24_CFG	0x40310C40	0x00000020	HSIO_STD Port #24 configuration
412	PERI_MS_PPU_FX_GPIO_PRT25_CFG	0x40310CC0	0x00000020	HSIO_STD Port #25 configuration
413	PERI_MS_PPU_FX_GPIO_PRT26_CFG	0x40310D40	0x00000020	HSIO_STD Port #26 configuration
414	PERI_MS_PPU_FX_GPIO_PRT27_CFG	0x40310DC0	0x00000020	HSIO_STD Port #27 configuration
415	PERI_MS_PPU_FX_GPIO_PRT28_CFG	0x40310E40	0x00000020	GPIO_STD Port #28 configuration
416	PERI_MS_PPU_FX_GPIO_PRT29_CFG	0x40310EC0	0x00000020	GPIO_STD Port #29 configuration
417	PERI_MS_PPU_FX_GPIO_PRT30_CFG	0x40310F40	0x00000020	GPIO_STD Port #30 configuration
418	PERI_MS_PPU_FX_GPIO_PRT31_CFG	0x40310FC0	0x00000020	GPIO_STD Port #31 configuration
419	PERI_MS_PPU_FX_GPIO_PRT32_CFG	0x40311040	0x00000020	GPIO_STD Port #32 configuration
420	PERI_MS_PPU_FX_GPIO_PRT33_CFG	0x403110C0	0x00000020	HSIO_STD Port #33 configuration
421	PERI_MS_PPU_FX_GPIO_PRT34_CFG	0x40311140	0x00000020	HSIO_STD Port #34 configuration
422	PERI_MS_PPU_FX_GPIO_GPIO	0x40314000	0x00000040	GPIO main
423	PERI_MS_PPU_FX_GPIO_TEST	0x40315000	0x00000008	GPIO test
424	PERI_MS_PPU_FX_SMARTIO_PRT12_PRT	0x40320C00	0x00000100	SMART I/O #12
425	PERI_MS_PPU_FX_SMARTIO_PRT13_PRT	0x40320D00	0x00000100	SMART I/O #13
426	PERI_MS_PPU_FX_SMARTIO_PRT14_PRT	0x40320E00	0x00000100	SMART I/O #14
427	PERI_MS_PPU_FX_SMARTIO_PRT15_PRT	0x40320F00	0x00000100	SMART I/O #15
428	PERI_MS_PPU_FX_SMARTIO_PRT17_PRT	0x40321100	0x00000100	SMART I/O #17
429	PERI_MS_PPU_FX_TCPWM0_GRP0_CNT0_CNT	0x40380000	0x00000080	TCPWM0 Group #0, Counter #0
430	PERI_MS_PPU_FX_TCPWM0_GRP0_CNT1_CNT	0x40380080	0x00000080	TCPWM0 Group #0, Counter #1
431	PERI_MS_PPU_FX_TCPWM0_GRP0_CNT2_CNT	0x40380100	0x00000080	TCPWM0 Group #0, Counter #2
432	PERI_MS_PPU_FX_TCPWM0_GRP1_CNT0_CNT	0x40388000	0x00000080	TCPWM0 Group #1, Counter #0
433	PERI_MS_PPU_FX_TCPWM0_GRP1_CNT1_CNT	0x40388080	0x00000080	TCPWM0 Group #1, Counter #1
434	PERI_MS_PPU_FX_TCPWM0_GRP1_CNT2_CNT	0x40388100	0x00000080	TCPWM0 Group #1, Counter #2
435	PERI_MS_PPU_FX_TCPWM0_GRP2_CNT0_CNT	0x40390000	0x00000080	TCPWM0 Group #2, Counter #0
436	PERI_MS_PPU_FX_TCPWM0_GRP2_CNT1_CNT	0x40390080	0x00000080	TCPWM0 Group #2, Counter #1
437	PERI_MS_PPU_FX_TCPWM0_GRP2_CNT2_CNT	0x40390100	0x00000080	TCPWM0 Group #2, Counter #2
438	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT0_CNT	0x40580000	0x00000080	TCPWM1 Group #0, Counter #0
439	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT1_CNT	0x40580080	0x00000080	TCPWM1 Group #0, Counter #1
440	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT2_CNT	0x40580100	0x00000080	TCPWM1 Group #0, Counter #2
441	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT3_CNT	0x40580180	0x00000080	TCPWM1 Group #0, Counter #3
442	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT4_CNT	0x40580200	0x00000080	TCPWM1 Group #0, Counter #4

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
443	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT5_CNT	0x40580280	0x00000080	TCPWM1 Group #0, Counter #5
444	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT6_CNT	0x40580300	0x00000080	TCPWM1 Group #0, Counter #6
445	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT7_CNT	0x40580380	0x00000080	TCPWM1 Group #0, Counter #7
446	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT8_CNT	0x40580400	0x00000080	TCPWM1 Group #0, Counter #8
447	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT9_CNT	0x40580480	0x00000080	TCPWM1 Group #0, Counter #9
448	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT10_CNT	0x40580500	0x00000080	TCPWM1 Group #0, Counter #10
449	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT11_CNT	0x40580580	0x00000080	TCPWM1 Group #0, Counter #11
450	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT12_CNT	0x40580600	0x00000080	TCPWM1 Group #0, Counter #12
451	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT13_CNT	0x40580680	0x00000080	TCPWM1 Group #0, Counter #13
452	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT14_CNT	0x40580700	0x00000080	TCPWM1 Group #0, Counter #14
453	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT15_CNT	0x40580780	0x00000080	TCPWM1 Group #0, Counter #15
454	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT16_CNT	0x40580800	0x00000080	TCPWM1 Group #0, Counter #16
455	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT17_CNT	0x40580880	0x00000080	TCPWM1 Group #0, Counter #17
456	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT18_CNT	0x40580900	0x00000080	TCPWM1 Group #0, Counter #18
457	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT19_CNT	0x40580980	0x00000080	TCPWM1 Group #0, Counter #19
458	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT20_CNT	0x40580A00	0x00000080	TCPWM1 Group #0, Counter #20
459	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT21_CNT	0x40580A80	0x00000080	TCPWM1 Group #0, Counter #21
460	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT22_CNT	0x40580B00	0x00000080	TCPWM1 Group #0, Counter #22
461	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT23_CNT	0x40580B80	0x00000080	TCPWM1 Group #0, Counter #23
462	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT24_CNT	0x40580C00	0x00000080	TCPWM1 Group #0, Counter #24
463	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT25_CNT	0x40580C80	0x00000080	TCPWM1 Group #0, Counter #25
464	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT26_CNT	0x40580D00	0x00000080	TCPWM1 Group #0, Counter #26
465	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT27_CNT	0x40580D80	0x00000080	TCPWM1 Group #0, Counter #27
466	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT28_CNT	0x40580E00	0x00000080	TCPWM1 Group #0, Counter #28
467	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT29_CNT	0x40580E80	0x00000080	TCPWM1 Group #0, Counter #29
468	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT30_CNT	0x40580F00	0x00000080	TCPWM1 Group #0, Counter #30
469	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT31_CNT	0x40580F80	0x00000080	TCPWM1 Group #0, Counter #31
470	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT32_CNT	0x40581000	0x00000080	TCPWM1 Group #0, Counter #32
471	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT33_CNT	0x40581080	0x00000080	TCPWM1 Group #0, Counter #33
472	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT34_CNT	0x40581100	0x00000080	TCPWM1 Group #0, Counter #34
473	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT35_CNT	0x40581180	0x00000080	TCPWM1 Group #0, Counter #35
474	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT36_CNT	0x40581200	0x00000080	TCPWM1 Group #0, Counter #36
475	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT37_CNT	0x40581280	0x00000080	TCPWM1 Group #0, Counter #37
476	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT38_CNT	0x40581300	0x00000080	TCPWM1 Group #0, Counter #38
477	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT39_CNT	0x40581380	0x00000080	TCPWM1 Group #0, Counter #39
478	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT40_CNT	0x40581400	0x00000080	TCPWM1 Group #0, Counter #40
479	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT41_CNT	0x40581480	0x00000080	TCPWM1 Group #0, Counter #41
480	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT42_CNT	0x40581500	0x00000080	TCPWM1 Group #0, Counter #42
481	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT43_CNT	0x40581580	0x00000080	TCPWM1 Group #0, Counter #43
482	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT44_CNT	0x40581600	0x00000080	TCPWM1 Group #0, Counter #44
483	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT45_CNT	0x40581680	0x00000080	TCPWM1 Group #0, Counter #45

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
484	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT46_CNT	0x40581700	0x00000080	TCPWM1 Group #0, Counter #46
485	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT47_CNT	0x40581780	0x00000080	TCPWM1 Group #0, Counter #47
486	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT48_CNT	0x40581800	0x00000080	TCPWM1 Group #0, Counter #48
487	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT49_CNT	0x40581880	0x00000080	TCPWM1 Group #0, Counter #49
488	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT50_CNT	0x40581900	0x00000080	TCPWM1 Group #0, Counter #50
489	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT51_CNT	0x40581980	0x00000080	TCPWM1 Group #0, Counter #51
490	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT52_CNT	0x40581A00	0x00000080	TCPWM1 Group #0, Counter #52
491	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT53_CNT	0x40581A80	0x00000080	TCPWM1 Group #0, Counter #53
492	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT54_CNT	0x40581B00	0x00000080	TCPWM1 Group #0, Counter #54
493	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT55_CNT	0x40581B80	0x00000080	TCPWM1 Group #0, Counter #55
494	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT56_CNT	0x40581C00	0x00000080	TCPWM1 Group #0, Counter #56
495	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT57_CNT	0x40581C80	0x00000080	TCPWM1 Group #0, Counter #57
496	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT58_CNT	0x40581D00	0x00000080	TCPWM1 Group #0, Counter #58
497	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT59_CNT	0x40581D80	0x00000080	TCPWM1 Group #0, Counter #59
498	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT60_CNT	0x40581E00	0x00000080	TCPWM1 Group #0, Counter #60
499	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT61_CNT	0x40581E80	0x00000080	TCPWM1 Group #0, Counter #61
500	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT62_CNT	0x40581F00	0x00000080	TCPWM1 Group #0, Counter #62
501	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT63_CNT	0x40581F80	0x00000080	TCPWM1 Group #0, Counter #63
502	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT64_CNT	0x40582000	0x00000080	TCPWM1 Group #0, Counter #64
503	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT65_CNT	0x40582080	0x00000080	TCPWM1 Group #0, Counter #65
504	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT66_CNT	0x40582100	0x00000080	TCPWM1 Group #0, Counter #66
505	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT67_CNT	0x40582180	0x00000080	TCPWM1 Group #0, Counter #67
506	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT68_CNT	0x40582200	0x00000080	TCPWM1 Group #0, Counter #68
507	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT69_CNT	0x40582280	0x00000080	TCPWM1 Group #0, Counter #69
508	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT70_CNT	0x40582300	0x00000080	TCPWM1 Group #0, Counter #70
509	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT71_CNT	0x40582380	0x00000080	TCPWM1 Group #0, Counter #71
510	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT72_CNT	0x40582400	0x00000080	TCPWM1 Group #0, Counter #72
511	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT73_CNT	0x40582480	0x00000080	TCPWM1 Group #0, Counter #73
512	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT74_CNT	0x40582500	0x00000080	TCPWM1 Group #0, Counter #74
513	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT75_CNT	0x40582580	0x00000080	TCPWM1 Group #0, Counter #75
514	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT76_CNT	0x40582600	0x00000080	TCPWM1 Group #0, Counter #76
515	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT77_CNT	0x40582680	0x00000080	TCPWM1 Group #0, Counter #77
516	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT78_CNT	0x40582700	0x00000080	TCPWM1 Group #0, Counter #78
517	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT79_CNT	0x40582780	0x00000080	TCPWM1 Group #0, Counter #79
518	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT80_CNT	0x40582800	0x00000080	TCPWM1 Group #0, Counter #80
519	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT81_CNT	0x40582880	0x00000080	TCPWM1 Group #0, Counter #81
520	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT82_CNT	0x40582900	0x00000080	TCPWM1 Group #0, Counter #82
521	PERI_MS_PPU_FX_TCPWM1_GRP0_CNT83_CNT	0x40582980	0x00000080	TCPWM1 Group #0, Counter #83
522	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT0_CNT	0x40588000	0x00000080	TCPWM1 Group #1, Counter #0
523	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT1_CNT	0x40588080	0x00000080	TCPWM1 Group #1, Counter #1
524	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT2_CNT	0x40588100	0x00000080	TCPWM1 Group #1, Counter #2

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
525	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT3_CNT	0x40588180	0x00000080	TCPWM1 Group #1, Counter #3
526	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT4_CNT	0x40588200	0x00000080	TCPWM1 Group #1, Counter #4
527	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT5_CNT	0x40588280	0x00000080	TCPWM1 Group #1, Counter #5
528	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT6_CNT	0x40588300	0x00000080	TCPWM1 Group #1, Counter #6
529	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT7_CNT	0x40588380	0x00000080	TCPWM1 Group #1, Counter #7
530	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT8_CNT	0x40588400	0x00000080	TCPWM1 Group #1, Counter #8
531	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT9_CNT	0x40588480	0x00000080	TCPWM1 Group #1, Counter #9
532	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT10_CNT	0x40588500	0x00000080	TCPWM1 Group #1, Counter #10
533	PERI_MS_PPU_FX_TCPWM1_GRP1_CNT11_CNT	0x40588580	0x00000080	TCPWM1 Group #1, Counter #11
534	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT0_CNT	0x40590000	0x00000080	TCPWM1 Group #2, Counter #0
535	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT1_CNT	0x40590080	0x00000080	TCPWM1 Group #2, Counter #1
536	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT2_CNT	0x40590100	0x00000080	TCPWM1 Group #2, Counter #2
537	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT3_CNT	0x40590180	0x00000080	TCPWM1 Group #2, Counter #3
538	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT4_CNT	0x40590200	0x00000080	TCPWM1 Group #2, Counter #4
539	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT5_CNT	0x40590280	0x00000080	TCPWM1 Group #2, Counter #5
540	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT6_CNT	0x40590300	0x00000080	TCPWM1 Group #2, Counter #6
541	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT7_CNT	0x40590380	0x00000080	TCPWM1 Group #2, Counter #7
542	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT8_CNT	0x40590400	0x00000080	TCPWM1 Group #2, Counter #8
543	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT9_CNT	0x40590480	0x00000080	TCPWM1 Group #2, Counter #9
544	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT10_CNT	0x40590500	0x00000080	TCPWM1 Group #2, Counter #10
545	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT11_CNT	0x40590580	0x00000080	TCPWM1 Group #2, Counter #11
546	PERI_MS_PPU_FX_TCPWM1_GRP2_CNT12_CNT	0x40590600	0x00000080	TCPWM1 Group #2, Counter #12
547	PERI_MS_PPU_FX_EVTGEN0	0x403F0000	0x00001000	Event generator #0
548	PERI_MS_PPU_FX_SMIF0	0x40420000	0x00010000	Serial Memory Interface #0
549	PERI_MS_PPU_FX_SDHC0	0x40460000	0x00010000	Secure Digital High Capacity #0
550	PERI_MS_PPU_FX_ETH0	0x40480000	0x00010000	Ethernet0
551	PERI_MS_PPU_FX_ETH1	0x40490000	0x00010000	Ethernet1
573	PERI_MS_PPU_FX_CANFD0_CH0_CH	0x40520000	0x00000200	CAN0, Channel #0
574	PERI_MS_PPU_FX_CANFD0_CH1_CH	0x40520200	0x00000200	CAN0, Channel #1
575	PERI_MS_PPU_FX_CANFD0_CH2_CH	0x40520400	0x00000200	CAN0, Channel #2
576	PERI_MS_PPU_FX_CANFD0_CH3_CH	0x40520600	0x00000200	CAN0, Channel #3
577	PERI_MS_PPU_FX_CANFD0_CH4_CH	0x40520800	0x00000200	CAN0, Channel #4
578	PERI_MS_PPU_FX_CANFD1_CH0_CH	0x40540000	0x00000200	CAN1, Channel #0
579	PERI_MS_PPU_FX_CANFD1_CH1_CH	0x40540200	0x00000200	CAN1, Channel #1
580	PERI_MS_PPU_FX_CANFD1_CH2_CH	0x40540400	0x00000200	CAN1, Channel #2
581	PERI_MS_PPU_FX_CANFD1_CH3_CH	0x40540600	0x00000200	CAN1, Channel #3
582	PERI_MS_PPU_FX_CANFD1_CH4_CH	0x40540800	0x00000200	CAN1, Channel #4
583	PERI_MS_PPU_FX_CANFD0_MAIN	0x40521000	0x00000100	CAN0 main
584	PERI_MS_PPU_FX_CANFD1_MAIN	0x40541000	0x00000100	CAN1 main
585	PERI_MS_PPU_FX_CANFD0_BUF	0x40530000	0x00010000	CAN0 buffer
586	PERI_MS_PPU_FX_CANFD1_BUF	0x40550000	0x00010000	CAN1 buffer

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
588	PERI_MS_PPU_FX_SCB0	0x40600000	0x00010000	SCB0
589	PERI_MS_PPU_FX_SCB1	0x40610000	0x00010000	SCB1
590	PERI_MS_PPU_FX_SCB2	0x40620000	0x00010000	SCB2
591	PERI_MS_PPU_FX_SCB3	0x40630000	0x00010000	SCB3
592	PERI_MS_PPU_FX_SCB4	0x40640000	0x00010000	SCB4
593	PERI_MS_PPU_FX_SCB5	0x40650000	0x00010000	SCB5
594	PERI_MS_PPU_FX_SCB6	0x40660000	0x00010000	SCB6
595	PERI_MS_PPU_FX_SCB7	0x40670000	0x00010000	SCB7
596	PERI_MS_PPU_FX_SCB8	0x40680000	0x00010000	SCB8
597	PERI_MS_PPU_FX_SCB9	0x40690000	0x00010000	SCB9
598	PERI_MS_PPU_FX_SCB10	0x406A0000	0x00010000	SCB10
599	PERI_MS_PPU_FX_I2S0	0x40800000	0x00001000	AUDIOSS I2S0
600	PERI_MS_PPU_FX_I2S1	0x40801000	0x00001000	AUDIOSS I2S1
601	PERI_MS_PPU_FX_I2S2	0x40802000	0x00001000	AUDIOSS I2S2
602	PERI_MS_PPU_FX_PASS0_SAR0_SAR	0x40900000	0x00000400	PASS SAR0
603	PERI_MS_PPU_FX_PASS0_SAR1_SAR	0x40901000	0x00000400	PASS SAR1
604	PERI_MS_PPU_FX_PASS0_SAR2_SAR	0x40902000	0x00000400	PASS SAR2
605	PERI_MS_PPU_FX_PASS0_SAR0_CH0_CH	0x40900800	0x00000040	SAR0, Channel #0
606	PERI_MS_PPU_FX_PASS0_SAR0_CH1_CH	0x40900840	0x00000040	SAR0, Channel #1
607	PERI_MS_PPU_FX_PASS0_SAR0_CH2_CH	0x40900880	0x00000040	SAR0, Channel #2
608	PERI_MS_PPU_FX_PASS0_SAR0_CH3_CH	0x409008C0	0x00000040	SAR0, Channel #3
609	PERI_MS_PPU_FX_PASS0_SAR0_CH4_CH	0x40900900	0x00000040	SAR0, Channel #4
610	PERI_MS_PPU_FX_PASS0_SAR0_CH5_CH	0x40900940	0x00000040	SAR0, Channel #5
611	PERI_MS_PPU_FX_PASS0_SAR0_CH6_CH	0x40900980	0x00000040	SAR0, Channel #6
612	PERI_MS_PPU_FX_PASS0_SAR0_CH7_CH	0x409009C0	0x00000040	SAR0, Channel #7
613	PERI_MS_PPU_FX_PASS0_SAR0_CH8_CH	0x40900A00	0x00000040	SAR0, Channel #8
614	PERI_MS_PPU_FX_PASS0_SAR0_CH9_CH	0x40900A40	0x00000040	SAR0, Channel #9
615	PERI_MS_PPU_FX_PASS0_SAR0_CH10_CH	0x40900A80	0x00000040	SAR0, Channel #10
616	PERI_MS_PPU_FX_PASS0_SAR0_CH11_CH	0x40900AC0	0x00000040	SAR0, Channel #11
617	PERI_MS_PPU_FX_PASS0_SAR0_CH12_CH	0x40900B00	0x00000040	SAR0, Channel #12
618	PERI_MS_PPU_FX_PASS0_SAR0_CH13_CH	0x40900B40	0x00000040	SAR0, Channel #13
619	PERI_MS_PPU_FX_PASS0_SAR0_CH14_CH	0x40900B80	0x00000040	SAR0, Channel #14
620	PERI_MS_PPU_FX_PASS0_SAR0_CH15_CH	0x40900BC0	0x00000040	SAR0, Channel #15
621	PERI_MS_PPU_FX_PASS0_SAR0_CH16_CH	0x40900C00	0x00000040	SAR0, Channel #16
622	PERI_MS_PPU_FX_PASS0_SAR0_CH17_CH	0x40900C40	0x00000040	SAR0, Channel #17
623	PERI_MS_PPU_FX_PASS0_SAR0_CH18_CH	0x40900C80	0x00000040	SAR0, Channel #18
624	PERI_MS_PPU_FX_PASS0_SAR0_CH19_CH	0x40900CC0	0x00000040	SAR0, Channel #19
625	PERI_MS_PPU_FX_PASS0_SAR0_CH20_CH	0x40900D00	0x00000040	SAR0, Channel #20
626	PERI_MS_PPU_FX_PASS0_SAR0_CH21_CH	0x40900D40	0x00000040	SAR0, Channel #21
627	PERI_MS_PPU_FX_PASS0_SAR0_CH22_CH	0x40900D80	0x00000040	SAR0, Channel #22
628	PERI_MS_PPU_FX_PASS0_SAR0_CH23_CH	0x40900DC0	0x00000040	SAR0, Channel #23

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
629	PERI_MS_PPU_FX_PASS0_SAR0_CH24_CH	0x40900E00	0x00000040	SAR0, Channel #24
630	PERI_MS_PPU_FX_PASS0_SAR0_CH25_CH	0x40900E40	0x00000040	SAR0, Channel #25
631	PERI_MS_PPU_FX_PASS0_SAR0_CH26_CH	0x40900E80	0x00000040	SAR0, Channel #26
632	PERI_MS_PPU_FX_PASS0_SAR0_CH27_CH	0x40900EC0	0x00000040	SAR0, Channel #27
633	PERI_MS_PPU_FX_PASS0_SAR0_CH28_CH	0x40900F00	0x00000040	SAR0, Channel #28
634	PERI_MS_PPU_FX_PASS0_SAR0_CH29_CH	0x40900F40	0x00000040	SAR0, Channel #29
635	PERI_MS_PPU_FX_PASS0_SAR0_CH30_CH	0x40900F80	0x00000040	SAR0, Channel #30
636	PERI_MS_PPU_FX_PASS0_SAR0_CH31_CH	0x40900FC0	0x00000040	SAR0, Channel #31
637	PERI_MS_PPU_FX_PASS0_SAR1_CH0_CH	0x40901800	0x00000040	SAR1, Channel #0
638	PERI_MS_PPU_FX_PASS0_SAR1_CH1_CH	0x40901840	0x00000040	SAR1, Channel #1
639	PERI_MS_PPU_FX_PASS0_SAR1_CH2_CH	0x40901880	0x00000040	SAR1, Channel #2
640	PERI_MS_PPU_FX_PASS0_SAR1_CH3_CH	0x409018C0	0x00000040	SAR1, Channel #3
641	PERI_MS_PPU_FX_PASS0_SAR1_CH4_CH	0x40901900	0x00000040	SAR1, Channel #4
642	PERI_MS_PPU_FX_PASS0_SAR1_CH5_CH	0x40901940	0x00000040	SAR1, Channel #5
643	PERI_MS_PPU_FX_PASS0_SAR1_CH6_CH	0x40901980	0x00000040	SAR1, Channel #6
644	PERI_MS_PPU_FX_PASS0_SAR1_CH7_CH	0x409019C0	0x00000040	SAR1, Channel #7
645	PERI_MS_PPU_FX_PASS0_SAR1_CH8_CH	0x40901A00	0x00000040	SAR1, Channel #8
646	PERI_MS_PPU_FX_PASS0_SAR1_CH9_CH	0x40901A40	0x00000040	SAR1, Channel #9
647	PERI_MS_PPU_FX_PASS0_SAR1_CH10_CH	0x40901A80	0x00000040	SAR1, Channel #10
648	PERI_MS_PPU_FX_PASS0_SAR1_CH11_CH	0x40901AC0	0x00000040	SAR1, Channel #11
649	PERI_MS_PPU_FX_PASS0_SAR1_CH12_CH	0x40901B00	0x00000040	SAR1, Channel #12
650	PERI_MS_PPU_FX_PASS0_SAR1_CH13_CH	0x40901B40	0x00000040	SAR1, Channel #13
651	PERI_MS_PPU_FX_PASS0_SAR1_CH14_CH	0x40901B80	0x00000040	SAR1, Channel #14
652	PERI_MS_PPU_FX_PASS0_SAR1_CH15_CH	0x40901BC0	0x00000040	SAR1, Channel #15
653	PERI_MS_PPU_FX_PASS0_SAR1_CH16_CH	0x40901C00	0x00000040	SAR1, Channel #16
654	PERI_MS_PPU_FX_PASS0_SAR1_CH17_CH	0x40901C40	0x00000040	SAR1, Channel #17
655	PERI_MS_PPU_FX_PASS0_SAR1_CH18_CH	0x40901C80	0x00000040	SAR1, Channel #18
656	PERI_MS_PPU_FX_PASS0_SAR1_CH19_CH	0x40901CC0	0x00000040	SAR1, Channel #19
657	PERI_MS_PPU_FX_PASS0_SAR1_CH20_CH	0x40901D00	0x00000040	SAR1, Channel #20
658	PERI_MS_PPU_FX_PASS0_SAR1_CH21_CH	0x40901D40	0x00000040	SAR1, Channel #21
659	PERI_MS_PPU_FX_PASS0_SAR1_CH22_CH	0x40901D80	0x00000040	SAR1, Channel #22
660	PERI_MS_PPU_FX_PASS0_SAR1_CH23_CH	0x40901DC0	0x00000040	SAR1, Channel #23
661	PERI_MS_PPU_FX_PASS0_SAR1_CH24_CH	0x40901E00	0x00000040	SAR1, Channel #24
662	PERI_MS_PPU_FX_PASS0_SAR1_CH25_CH	0x40901E40	0x00000040	SAR1, Channel #25
663	PERI_MS_PPU_FX_PASS0_SAR1_CH26_CH	0x40901E80	0x00000040	SAR1, Channel #26
664	PERI_MS_PPU_FX_PASS0_SAR1_CH27_CH	0x40901EC0	0x00000040	SAR1, Channel #27
665	PERI_MS_PPU_FX_PASS0_SAR1_CH28_CH	0x40901F00	0x00000040	SAR1, Channel #28
666	PERI_MS_PPU_FX_PASS0_SAR1_CH29_CH	0x40901F40	0x00000040	SAR1, Channel #29
667	PERI_MS_PPU_FX_PASS0_SAR1_CH30_CH	0x40901F80	0x00000040	SAR1, Channel #30
668	PERI_MS_PPU_FX_PASS0_SAR1_CH31_CH	0x40901FC0	0x00000040	SAR1, Channel #31
669	PERI_MS_PPU_FX_PASS0_SAR2_CH0_CH	0x40902800	0x00000040	SAR2, Channel #0

注释：
31. PPU 配置固定在 Boot 内部，用户无权更改该 PPU 的属性。

表 26　　PPU 固定结构配对 *（续）*

Pair No.	PPU fixed structure pair	Address	Size	Description
670	PERI_MS_PPU_FX_PASS0_SAR2_CH1_CH	0x40902840	0x00000040	SAR2, Channel #1
671	PERI_MS_PPU_FX_PASS0_SAR2_CH2_CH	0x40902880	0x00000040	SAR2, Channel #2
672	PERI_MS_PPU_FX_PASS0_SAR2_CH3_CH	0x409028C0	0x00000040	SAR2, Channel #3
673	PERI_MS_PPU_FX_PASS0_SAR2_CH4_CH	0x40902900	0x00000040	SAR2, Channel #4
674	PERI_MS_PPU_FX_PASS0_SAR2_CH5_CH	0x40902940	0x00000040	SAR2, Channel #5
675	PERI_MS_PPU_FX_PASS0_SAR2_CH6_CH	0x40902980	0x00000040	SAR2, Channel #6
676	PERI_MS_PPU_FX_PASS0_SAR2_CH7_CH	0x409029C0	0x00000040	SAR2, Channel #7
677	PERI_MS_PPU_FX_PASS0_SAR2_CH8_CH	0x40902A00	0x00000040	SAR2, Channel #8
678	PERI_MS_PPU_FX_PASS0_SAR2_CH9_CH	0x40902A40	0x00000040	SAR2, Channel #9
679	PERI_MS_PPU_FX_PASS0_SAR2_CH10_CH	0x40902A80	0x00000040	SAR2, Channel #10
680	PERI_MS_PPU_FX_PASS0_SAR2_CH11_CH	0x40902AC0	0x00000040	SAR2, Channel #11
681	PERI_MS_PPU_FX_PASS0_SAR2_CH12_CH	0x40902B00	0x00000040	SAR2, Channel #12
682	PERI_MS_PPU_FX_PASS0_SAR2_CH13_CH	0x40902B40	0x00000040	SAR2, Channel #13
683	PERI_MS_PPU_FX_PASS0_SAR2_CH14_CH	0x40902B80	0x00000040	SAR2, Channel #14
684	PERI_MS_PPU_FX_PASS0_SAR2_CH15_CH	0x40902BC0	0x00000040	SAR2, Channel #15
685	PERI_MS_PPU_FX_PASS0_SAR2_CH16_CH	0x40902C00	0x00000040	SAR2, Channel #16
686	PERI_MS_PPU_FX_PASS0_SAR2_CH17_CH	0x40902C40	0x00000040	SAR2, Channel #17
687	PERI_MS_PPU_FX_PASS0_SAR2_CH18_CH	0x40902C80	0x00000040	SAR2, Channel #18
688	PERI_MS_PPU_FX_PASS0_SAR2_CH19_CH	0x40902CC0	0x00000040	SAR2, Channel #19
689	PERI_MS_PPU_FX_PASS0_SAR2_CH20_CH	0x40902D00	0x00000040	SAR2, Channel #20
690	PERI_MS_PPU_FX_PASS0_SAR2_CH21_CH	0x40902D40	0x00000040	SAR2, Channel #21
691	PERI_MS_PPU_FX_PASS0_SAR2_CH22_CH	0x40902D80	0x00000040	SAR2, Channel #22
692	PERI_MS_PPU_FX_PASS0_SAR2_CH23_CH	0x40902DC0	0x00000040	SAR2, Channel #23
693	PERI_MS_PPU_FX_PASS0_SAR2_CH24_CH	0x40902E00	0x00000040	SAR2, Channel #24
694	PERI_MS_PPU_FX_PASS0_SAR2_CH25_CH	0x40902E40	0x00000040	SAR2, Channel #25
695	PERI_MS_PPU_FX_PASS0_SAR2_CH26_CH	0x40902E80	0x00000040	SAR2, Channel #26
696	PERI_MS_PPU_FX_PASS0_SAR2_CH27_CH	0x40902EC0	0x00000040	SAR2, Channel #27
697	PERI_MS_PPU_FX_PASS0_SAR2_CH28_CH	0x40902F00	0x00000040	SAR2, Channel #28
698	PERI_MS_PPU_FX_PASS0_SAR2_CH29_CH	0x40902F40	0x00000040	SAR2, Channel #29
699	PERI_MS_PPU_FX_PASS0_SAR2_CH30_CH	0x40902F80	0x00000040	SAR2, Channel #30
700	PERI_MS_PPU_FX_PASS0_SAR2_CH31_CH	0x40902FC0	0x00000040	SAR2, Channel #31
701	PERI_MS_PPU_FX_PASS0_TOP	0x409F0000	0x00001000	PASS0 SAR main

注释：

31. PPU配置固定在Boot内部，用户不得更改此PPU的属性。

23 总线主控器

仲裁器（闪存控制器的一部分）根据主控标识符执行基于优先级的仲裁。每个总线主控都有一个专用的 4 位主控标识符。该主控标识符用于总线仲裁和 IPC 功能。

表 27 用于访问和保护控制的总线主控器

ID No.	Master ID	Description
0	CPUSS_MS_ID_CM0	Master ID for CM0+
1	CPUSS_MS_ID_CRYPTO	Master ID for Crypto
2	CPUSS_MS_ID_DW0	Master ID for P-DMA0
3	CPUSS_MS_ID_DW1	Master ID for P-DMA1
4	CPUSS_MS_ID_DMAC	Master ID for M-DMA0
5	CPUSS_MS_ID_SLOW0	Master ID for External AHB-Lite Master 0 (SDHC)
9	CPUSS_MS_ID_FAST0	Master ID for External AXI Master 0 (ETH0)
10	CPUSS_MS_ID_FAST1	Master ID for External AXI Master 1 (ETH1)
13	CPUSS_MS_ID_CM7_1	Master ID for CM7_1
14	CPUSS_MS_ID_CM7_0	Master ID for CM7_0
15	CPUSS_MS_ID_TC	Master ID for DAP Tap Controller

24 杂项配置

表 28 XMC7200 器件的杂项配置

Sl. No.	Configuration	Number/ instances	Description
0	SRSS_NUM_CLKPATH	7	Number of clock paths. One for each of FLL, PLL, Direct and CSV
1	SRSS_NUM_HFROOT	8	Number of CLK_HFs present
2	PERI_PC_NR	8	Number of protection contexts
3	PERI_PERI_PCLK_PCLK_GROUP_NR	2	Number of asynchronous PCLK groups
4	PERI_PERI_PCLK_P-CLK_GROUP_NR0_GR_DIV_8_VECT	4	Group 0, Number of divide-by-8 clock dividers
5	PERI_PERI_PCLK_P-CLK_GROUP_NR0_GR_DIV_16_VECT	3	Group 0, Number of divide-by-16 clock dividers
6	PERI_PERI_PCLK_P-CLK_GROUP_NR0_GR_DIV_24_5_VECT	1	Group 0, Number of divide-by-24.5 clock dividers
7	PERI_PERI_PCLK_PCLK_GROUP_NR0_GR_-CLOCK_VECT	15	Group 0, Number of programmable clocks [1, 256]
8	PERI_PERI_PCLK_P-CLK_GROUP_NR1_GR_DIV_8_VECT	19	Group 1, Number of divide-by-8 clock dividers
9	PERI_PERI_PCLK_P-CLK_GROUP_NR1_GR_DIV_16_VECT	20	Group 1, Number of divide-by-16 clock dividers
10	PERI_PERI_PCLK_P-CLK_GROUP_NR1_GR_DIV_24_5_VECT	21	Group 1, Number of divide-by-24.5 clock dividers
11	PERI_PERI_PCLK_PCLK_GROUP_NR1_GR_-CLOCK_VECT	154	Group 1, Number of programmable clocks [1, 256]
12	CPUSS_CM0P_MPU_NR	8	Number of MPU regions in CM0+
13	CPUSS_CM7_0_FPU_LVL	2	CM7_0 Floating point unit configuration. 0 - No FPU 1 - Single precision FPU 2 - Single and Double precision FPU
14	CPUSS_CM7_0_MPU_NR	16	Number of MPU regions in CM7_0
15	CPUSS_CM7_0_ICACHE_SIZE	16	CM7_0 Instruction cache (ICACHE) size in KB
16	CPUSS_CM7_0_DCACHE_SIZE	16	CM7_0 Data cache size (DCACHE) in KB
17	CPUSS_CM7_0_ITCM_SIZE	16	CM7_0 Instruction TCM (ITCM) size in KB
18	CPUSS_CM7_0_DTCM_SIZE	16	CM7_0 Data TCM (DTCM) size in KB
19	CPUSS_CM7_1_FPU_LVL	2	CM7_1 Floating point unit configuration. 0 - No FPU 1 - Single precision FPU 2 - Single and Double precision FPU
20	CPUSS_CM7_1_MPU_NR	16	Number of MPU regions in CM7_1
21	CPUSS_CM7_1_ICACHE_SIZE	16	CM7_1 Instruction cache (ICACHE) size in KB
22	CPUSS_CM7_1_DCACHE_SIZE	16	CM7_1 Data cache size (DCACHE) in KB
23	CPUSS_CM7_1_ITCM_SIZE	16	CM7_1 Instruction TCM (ITCM) size in KB
24	CPUSS_CM7_1_DTCM_SIZE	16	CM7_1 Data TCM (DTCM) size in KB
25	CPUSS_DW0_CH_NR	143	Number of P-DMA0 channels
26	CPUSS_DW1_CH_NR	65	Number of P-DMA1 channels
27	CPUSS_DMAC_CH_NR	8	Number of M-DMA0 controller channels
28	CPUSS_CRYPTO_BUFF_SIZE	2048	Number of 32-bit words in the IP internal memory buffer (to allow for a 256-B, 512-B, 1-KB, 2-KB, 4-KB, 8-KB, 16-KB, and 32-KB memory buffer)
29	CPUSS_FAULT_FAULT_NR	4	Number of fault structures

表 28 XMC7200 器件的杂项配置 *(续)*

Sl. No.	Configuration	Number/ instances	Description
30	CPUSS_IPC_IPC_NR	8	Number of IPC structures 0 - Reserved for CM0+ access 1 - Reserved for CM7_0 access 2 - Reserved for CM7_1 access 3 - Reserved for DAP access Remaining for user purposes
31	CPUSS_PROT_SMPU_STRUCT_NR	16	Number of SMPU protection structures
32	SCB0_EZ_DATA_NR	256	Number of EZ memory bytes. This memory is used in EZ mode, CMD_RESP mode and FIFO mode. Note: Only SCB0 supports CMD_RESP mode
33	TCPWM0_TR_ONE_CNT_NR	3	Number of input triggers per counter, routed to one counter
34	TCPWM0_TR_ALL_CNT_NR	12	Number of input triggers routed to all counters, based on the pin package
35	TCPWM0_GRP_NR	3	Number of TCPWM0 counter groups
36	TCPWM0_GRP_NR0_GRP_GRP_CNT_NR	3	Number of counters per TCPWM0 Group #0
37	TCPWM0_GRP_NR0_CNT_GRP_CNT_WIDTH	16	Counter width in number of bits per TCPWM0 Group #0
38	TCPWM0_GRP_NR1_GRP_GRP_CNT_NR	3	Number of counters per TCPWM0 Group #1
39	TCPWM0_GRP_NR1_CNT_GRP_CNT_WIDTH	16	Counter width in number of bits per TCPWM0 Group #1
40	TCPWM0_GRP_NR2_GRP_GRP_CNT_NR	3	Number of counters per TCPWM0 Group #2
41	TCPWM0_GRP_NR2_CNT_GRP_CNT_WIDTH	32	Counter width in number of bits per TCPWM0 Group #2
42	TCPWM1_GRP_NR	3	Number of TCPWM1 counter groups
43	TCPWM1_GRP_NR0_GRP_GRP_CNT_NR	84	Number of counters per TCPWM1 Group #0
44	TCPWM1_GRP_NR0_CNT_GRP_CNT_WIDTH	16	Counter width in number of bits per TCPWM1 Group #0
45	TCPWM1_GRP_NR1_GRP_GRP_CNT_NR	12	Number of counters per TCPWM1 Group #1
46	TCPWM1_GRP_NR1_CNT_GRP_CNT_WIDTH	16	Counter width in number of bits per TCPWM1 Group #1
47	TCPWM1_GRP_NR2_GRP_GRP_CNT_NR	13	Number of counters per TCPWM1 Group #2
48	TCPWM1_GRP_NR2_CNT_GRP_CNT_WIDTH	32	Counter width in number of bits per TCPWM1 Group #2
49	CANFD0_MRAM_SIZE / CANFD1_MRAM_SIZE	40	Message RAM size in KB shared by all the channels
50	EVTGEN_COMP_STRUCT_NR	16	Number of Event Generator comparator structures

25 开发支持

XMC7200，XMC7200D 拥有丰富的文档、编程工具和在线资源，协助开发过程。请访问**www.infineon.com** 了解更多信息。

25.1 文档

一系列支持文档 XMC7200，XMC7200D 确保您能够快速找到问题的答案。本节列出了一些关键文档。

25.1.1 软件用户指南

使用外设驱动示例程序库以及 Infineon IDE ModusToolbox ™软件的分步指南。

25.1.2 参考手册

技术参考手册 (TRM) 包含使用 XMC7200，XMC7200D 器件所需的所有技术细节，包括所有寄存器的完整描述。TRM 可在 **www.infineon.com** 的文档部分找到 。

25.2 工具

XMC7200，XMC7200D 支持英飞凌 IDE ModusToolbox™ 软件，该软件为用户提供本地或 GitHub 托管的软件仓库体验。XMC7200，XMC7200D 还支持英飞凌编程实用程序，可使用英飞凌 MiniProg4 或 KitProg3 进行编程、擦除或读取。更多详情，请参阅**www.infineon.com**上的文档部分。

26 电气规格

此处列出的规格为初步规格。

26.1 绝对最大额定值

在 **表 29** 所列最小和最大限制之外的条件下使用本设备，可能会对设备造成永久性损坏。长时间 暴露在 **表 29** 限制范围内 但超出正常操作限制的条件下，可能会影响器件的可靠性。最高存储温度为 150°C，符合 JEDEC 标准 JESD22-A103 "高温存储寿命"。如果在 **表 29** 的限制条件下运行，但超出正常运行的限制条件，器件可能无法按规格运行。

电源设计考虑因素

平均芯片结温 T_J以°C 为单位可采用公式 1 计算：

$$T_J = T_A + (P_D \times \theta_{JA}) \quad \text{公式 1}$$

其中：

T_A是环境温度，单位为°C。

θ_{JA} 是封装结点至环境的热阻抗，单位为 °C/W。

P_D 是 P_{INT} 与 P_{IO} 之和 （$P_D = P_{INT} + P_{IO}$）。

P_{INT}为芯片内部电源。（$P_{INT} = V_{DDD} \times I_{DD} + V_{DDA} \times I_A$）

P_{IO}表示输入和输出引脚上的功耗；由用户确定。

对于大多数应用，$P_{IO} < P_{INT}$可以忽略。

另一方面， 如果器件配置为连续驱动外部模块和/或存储器，则 P_{IO} 可能很重要。

警告

- 需要遵循推荐的工作条件来确保半导体器件的正常运行。当器件在这些条件下运行时，器件的所有电气特性均得到保证。
- 在除各自“详细信息/条件”中所述以外的任何条件下运行都可能对器件的可靠性产生不利影响，并可能导致器件故障。
- 对于本数据表中未提及的任何使用、工作条件或组合，不提供任何保证。如果您想在此处列出的条件以外的任何条件下运行器件，请联系销售代表。

表 29 绝对最大额定值

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID10	V_{DDD_ABS}	V_{DDD} power supply voltage[32]	V_{SSD} – 0.3	–	V_{SSD} + 6.0	V	For ports 0, 1, 2, 3, 4, 5, 16, 17, 18, 19, 20, 21, 22, 23, 28, 29, 30, 31
SID10B	$V_{DDIO\_1\_ABS}$	V_{DDIO_1} power supply voltage[32]	V_{SSD} – 0.3	–	V_{SSD} + 6.0	V	For ports 6, 7, 8, 9, 32
SID10C	$V_{DDIO\_2\_ABS}$	V_{DDIO_2} power supply voltage[32]	V_{SSD} – 0.3	–	V_{SSD} + 6.0	V	For ports 10, 11, 12, 13, 14, 15
SID10D	$V_{DDIO\_3\_ABS}$	V_{DDIO_3} power supply voltage[32]	V_{SSIO_3} – 0.3	–	V_{SSIO_3} + 4.0	V	For ports 24, 25
SID10E	$V_{DDIO\_4\_ABS}$	V_{DDIO_4} power supply voltage[32]	V_{SSIO_4} – 0.3	–	V_{SSIO_4} + 4.0	V	For ports 26, 27
SID11	V_{DDA_ABS}	V_{DDA} analog power supply voltage[32]	V_{SSA} – 0.3	–	V_{SSA} + 6.0	V	$V_{DDIO\_2} = V_{DDA}$
SID12	V_{REFH_ABS}	Analog reference voltage, HIGH[32]	V_{SSA} – 0.3	–	V_{SSA} + 6.0	V	$V_{REFH} \leq (V_{DDA} + 0.3\ V)$
SID12A	V_{REFL_ABS}	Analog reference voltage, LOW[32]	V_{SSA} – 0.3	–	V_{SSA} + 0.3	V	–
SID13	V_{CCD_ABS}	V_{CCD} Power supply voltage[32]	V_{SSD} – 0.3	–	V_{SSD} + 1.21	V	–
SID15A	V_{I0_ABS}	Input voltage[32]	V_{SSD} – 0.5	–	V_{DDD} + 0.5	V	For ports 0, 1, 2, 3, 4, 5, 16, 17, 18, 19, 20, 21, 22, 23, 28, 29, 30, 31
SID15B	V_{I1_ABS}	Input voltage[32]	V_{SSD} – 0.5	–	V_{DDIO_1} + 0.5	V	For ports 6, 7, 8, 9, 32
SID15C	V_{I2_ABS}	Input voltage[32]	V_{SSD} – 0.5	–	V_{DDIO_2} + 0.5	V	For ports 10, 11, 12, 13, 14, 15
SID15D	V_{I3_ABS}	Input voltage[32]	V_{SSIO_3} – 0.5	–	V_{DDIO_3} + 0.5	V	For ports 24, 25
SID15E	V_{I4_ABS}	Input voltage[32]	V_{SSIO_4} – 0.5	–	V_{DDIO_4} + 0.5	V	For ports 26, 27
SID15F	V_{I5_ABS}	Input voltage[32]	V_{SSD} – 0.5	–	V_{DDD} + 0.5	V	For EXT_PS_CTL0 in external PMIC/transistor mode, EXT_PS_CTL1 in external transistor mode.
SID16	V_{IA_ABS}	Analog input voltage[32]	V_{SSA} – 0.3	–	V_{DDA} + 0.3	V	–
SID17A	V_{O0_ABS}	Output voltage[32]	V_{SSD} – 0.3	–	V_{DDD} + 0.3	V	For ports 0, 1, 2, 3, 4, 5, 16, 17, 18, 19, 20, 21, 22, 23, 28, 29, 30, 31

注：

32. 这些参数基于 $V_{SSD} = V_{SSA} = V_{SSIO\_3} = V_{SSIO\_4} = 0.0$ V.
33. 必须配备限流电阻，使得 I/O 引脚的电流在任何时候都不超过额定值，包括功率瞬变期间。请参阅**图 10** 了解有关推荐电路的更多信息。
34. V_{DDD}和 V_{DDIO}必须有足够的负载或受到保护，以防止它们被钳位电流拉出建议的工作范围。
35. 当满足 [33]、[34] 和 SID18A/B/C/D 条件时，|ICLAMP_ABS | 取代 VIA_ABS和 VI_ABS。
36. “更近”的定义取决于封装。在 TEQFP 封装中，“最近”通过计算引脚数来决定。例如，在 176-TEQFP 封装中，P17.4（引脚 120）距离引脚 110 上的 V_{DDD}比距离引脚 132 上的 V DDD 更近。端口 11 和 21 不应用于注入电流。注入电流的影响仅针对 GPIO_STD/GPIO_ENH 类型 I/O 进行定义。在 BGA 封装中，以下 IO 端口组被视为具有单独的电源引脚：端口 0、1、2、22、23 和 28；端口 3、4、5、29、30 和 31；端口 6、7、8、9 和 32；端口 10、12、13、14、15、26 和 27；端口 16 和 17；端口 18、19 和 20。
37. 最大输出电流是流过任何一个 I/O 的峰值电流。
38. 平均输出电流定义为 10 ms 周期内流过任一个对应引脚的平均电流值。平均值为工作电流×工作比率。工作电流周期超过平均电流的规格应小于 100 ns。
39. 总输出电流是流过所有 GPIO_STD 和 GPIO_ENH I/O 的最大电流。
40. 总输出电流是流过所有 HSIO_STD I/O 的最大电流。
41. 总输出功率耗散是流经所有 I/O 的最大功率耗散。$PIO = (V_{DDD}, V_{DDIO\_1}, V_{DDIO\_2}) \times (|\Sigma I_{OH\_ABS\_GPIO}| + |\Sigma I_{OL\_ABS\_GPIO}|) + (V_{DDIO\_3}, V_{DDIO\_4}) \times (|\Sigma I_{OH\_ABS\_HSIO}| + |\Sigma IOL\_ABS\_HSIO|)$.

表 29 绝对最大额定值 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID17B	V_{O1_ABS}	Output voltage[32]	V_{SSD} – 0.3	–	V_{DDIO_1} + 0.3	V	For ports 6, 7, 8, 9, 32
SID17C	V_{O2_ABS}	Output voltage[32]	V_{SSD} – 0.3	–	V_{DDIO_2} + 0.3	V	For ports 10, 11, 12, 13, 14, 15
SID17D	V_{O3_ABS}	Output voltage[32]	V_{SSIO_3} – 0.3	–	V_{DDIO_3} + 0.3	V	For ports 24, 25
SID17E	V_{O5_ABS}	Output voltage[32]	V_{SSIO_4} – 0.3	–	V_{DDIO_4} + 0.3	V	For ports 26, 27
SID17F	V_{O4_ABS}	Output voltage[32]	V_{SSD} – 0.3	–	V_{DDD} + 0.3	V	For EXT_PS_CTL1/2 in external PMIC mode, DRV_VOUT in external transistor mode
SID18	$\lvert I_{CLAMP\_ABS}\rvert$	Maximum clamp current[33, 34, 35]	–5	–	5	mA	–
SID18A	$I_{CLAMP\_SUPPLY\_POS\_ABS}$	Maximum positive clamp current per I/O supply pin. Limit applies to I/O supply pin closest to the B+ injected current[36]	–	–	10	mA	+B injected DC current is not allowed for ports 11 and 21
SID18B	$I_{CLAMP\_SUPPLY\_NEG\_ABS}$	Maximum negative clamp current per I/O ground pin. Limit applies to I/O supply pin closest to the B+ injected current.[36]	–	–	10	mA	+B injected DC current is not allowed for ports 11 and 21
SID18C	$I_{CLAMP\_TOTAL\_POS\_ABS}$	Maximum positive clamp current per I/O supply, if not limited by the per supply pin (based on SID18A).	–	–	50	mA	–
SID18D	$I_{CLAMP\_TOTAL\_NEG\_ABS}$	Maximum negative clamp current per I/O ground, if not limited by the per supply pin (based on SID18B).	–	–	50	mA	–
SID20A	I_{OL1A_ABS}	LOW-level maximum output current[37]	–	–	6	mA	GPIO_STD, configured for drive_sel<1:0>= 0b0X
SID20B	I_{OL1B_ABS}	LOW-level maximum output current[37]	–	–	2	mA	GPIO_STD, configured for drive_sel<1:0>= 0b10
SID20C	I_{OL1C_ABS}	LOW-level maximum output current[37]	–	–	1	mA	GPIO_STD, configured for drive_sel<1:0>= 0b11

注释

32. 这些参数基于$V_{SSD} = V_{SSA} = V_{SSIO_3} = V_{SSIO_4} = 0.0$ V.
33. 必须设置限流电阻，确保 I/O 引脚的电流在任何时候（包括电源瞬变期间）都不会超过额定值。有关推荐电路的更多信息，请参见**图 10**。
34. V_{DDD}和 V_{DDIO}必须有足够的负载或受到保护，以防止它们被钳位电流拉出建议的工作范围。
35. 当满足 [33]、[34] 和 SID18A/B/C/D 条件时，$\lvert I_{CLAMP\_ABS}\rvert$ 取代 V_{IA_ABS}和 V_{I_ABS}。
36. “更近”的定义取决于封装。在 TEQFP 封装中，“最近”通过计算引脚数来决定。例如，在 176-TEQFP 封装中，P17.4（引脚 120）距离引脚 110 上的 V_{DDD}比距离引脚 132 上的 V DDD 更近。端口 11 和 21 不应用于注入电流。注入电流的影响仅针对 GPIO_STD/GPIO_ENH 类型 I/O 进行定义。在 BGA 封装中，以下 IO 端口组被视为具有单独的电源引脚：端口 0、1、2、22、23 和 28；端口 3、4、5、29、30 和 31；端口 6、7、8、9 和 32；端口 10、12、13、14、15、26 和 27；端口 16 和 17；端口 18、19 和 20。
37. 最大输出电流是流过任何一个 I/O 的峰值电流。
38. 平均输出电流定义为 10 ms 周期内流过任一个对应引脚的平均电流值。平均值为工作电流×工作比率。工作电流周期超过平均电流的规格应小于 100 ns。
39. 总输出电流是流过所有 GPIO_STD 和 GPIO_ENH I/O 的最大电流。
40. 总输出电流是流过所有 HSIO_STD I/O 的最大电流。
41. 总输出功率耗散是流经所有 I/O 的最大功率耗散。$PIO = (V_{DDD}, V_{DDIO\_1}, V_{DDIO\_2}) \times (\lvert\Sigma I_{OH\_ABS\_GPIO}\rvert + \lvert\Sigma I_{OL\_ABS\_GPIO}\rvert) + (V_{DDIO\_3}, V_{DDIO\_4}) \times (\lvert\Sigma I_{OH\_ABS\_HSIO}\rvert + \lvert\Sigma IOL\_ABS\_HSIO\rvert)$.

表 29 绝对最大额定值 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID21A	I_{OL2A_ABS}	LOW-level maximum output current[37]	–	–	6	mA	GPIO_ENH, configured for drive_sel<1:0>= 0b0X
SID21B	I_{OL2B_ABS}	LOW-level maximum output current[37]	–	–	2	mA	GPIO_ENH, configured for drive_sel<1:0>= 0b10
SID21C	I_{OL2C_ABS}	LOW-level maximum output current[37]	–	–	1	mA	GPIO_ENH, configured for drive_sel<1:0>= 0b11
SID22A	I_{OL3A_ABS}	LOW-level maximum output current[37]	–	–	10	mA	HSIO, configured for drive_sel<1:0>= 0b00
SID22B	I_{OL3B_ABS}	LOW-level maximum output current[37]	–	–	2	mA	HSIO, configured for drive_sel<1:0>= 0b01
SID22C	I_{OL3C_ABS}	LOW-level maximum output current[37]	–	–	1	mA	HSIO, configured for drive_sel<1:0>= 0b10
SID22D	I_{OL3D_ABS}	LOW-level maximum output current[37]	–	–	0.5	mA	HSIO, configured for drive_sel<1:0>= 0b11
SID23A	I_{OL4A_ABS}	Sink maximum current[37]	–	–	4	mA	For pin EXT_PS_CTL1 in external PMIC mode and internal regulator mode and pin EXT_PS_CTL2 in external PMIC mode
SID23B	I_{OL4B_ABS}	Sink average current[37]	–	–	1	mA	For pin EXT_PS_CTL1 in external PMIC mode and internal regulator mode and pin EXT_PS_CTL2 in external PMIC mode
SID23C	I_{OL4C_ABS}	Sink maximum current[37]	–	–	25	mA	For pin DRV_VOUT in external transistor mode
SID26A	$\Sigma I_{OL\_ABS\_GPIO}$	LOW-level total output current[37]	–	–	50	mA	–
SID26B	$\Sigma I_{OL\_ABS\_HSIO}$	LOW-level total output current[37]	–	–	85	mA	–
SID27A	I_{OH1A_ABS}	HIGH-level maximum output current[37]	–	–	–5	mA	GPIO_STD, configured for drive_sel<1:0>= 0b0X

注释

32. 这些参数基于$V_{SSD} = V_{SSA} = V_{SSIO_3} = V_{SSIO_4} = 0.0$ V.
33. 必须设置限流电阻，确保 I/O 引脚的电流在任何时候（包括电源瞬变期间）都不会超过额定值。有关推荐电路的更多信息，请参见图 10。
34. V_{DDD}和 V_{DDIO}必须有足够的负载或受到保护，以防止它们被钳位电流拉出建议的工作范围。
35. 当满足 [33]、[34] 和 SID18A/B/C/D 条件时，$|I_{CLAMP\_ABS}|$ 取代 V_{IA_ABS}和 V_{I_ABS}。
36. “更近”的定义取决于封装。在 TEQFP 封装中，“最近”通过计算引脚数来决定。例如，在 176-TEQFP 封装中，P17.4（引脚 120）距离引脚 110 上的 V_{DDD}比距离引脚 132 上的 V DDD 更近。端口 11 和 21 不应用于注入电流。注入电流的影响仅针对 GPIO_STD/GPIO_ENH 类型 I/O 进行定义。在 BGA 封装中，以下 IO 端口组被视为具有单独的电源引脚：端口 0、1、2、22、23 和 28；端口 3、4、5、29、30 和 31；端口 6、7、8、9 和 32；端口 10、12、13、14、15、26 和 27；端口 16 和 17；端口 18、19 和 20。
37. 最大输出电流是流过任何一个 I/O 的峰值电流。
38. 平均输出电流定义为 10 ms 周期内流过任一个对应引脚的平均电流值。平均值为工作电流×工作比率。工作电流周期超过平均电流的规格应小于 100 ns。
39. 总输出电流是流过所有 GPIO_STD 和 GPIO_ENH I/O 的最大电流。
40. 总输出电流是流过所有 HSIO_STD I/O 的最大电流。
41. 总输出功率耗散是流经所有 I/O 的最大功率耗散。$PIO = (V_{DDD}, V_{DDIO\_1}, V_{DDIO\_2}) \times (|\Sigma I_{OH\_ABS\_GPIO}| + |\Sigma I_{OL\_ABS\_GPIO}|) + (V_{DDIO\_3}, V_{DDIO\_4}) \times (|\Sigma I_{OH\_ABS\_HSIO}| + |\Sigma IOL\_ABS\_HSIO|)$.

表 29　　绝对最大额定值 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID27B	I_{OH1B_ABS}	HIGH-level maximum output current[37]	–	–	–2	mA	GPIO_STD, configured for drive_sel<1:0>= 0b10
SID27C	I_{OH1C_ABS}	HIGH-level maximum output current[37]	–	–	–1	mA	GPIO_STD, configured for drive_sel<1:0>= 0b11
SID28A	I_{OH2A_ABS}	HIGH-level maximum output current[37]	–	–	–5	mA	GPIO_ENH, configured for drive_sel<1:0>= 0b0X
SID28B	I_{OH2B_ABS}	HIGH-level maximum output current[37]	–	–	–2	mA	GPIO_ENH, configured for drive_sel<1:0>= 0b10
SID28C	I_{OH2C_ABS}	HIGH-level maximum output current[37]	–	–	–1	mA	GPIO_ENH, configured for drive_sel<1:0>= 0b11
SID29A	I_{OH3A_ABS}	HIGH-level maximum output current[37]	–	–	–10	mA	HSIO, configured for drive_sel<1:0>= 0b00
SID29B	I_{OH3B_ABS}	HIGH-level maximum output current[37]	–	–	–2	mA	HSIO, configured for drive_sel<1:0>= 0b01
SID29C	I_{OH3C_ABS}	HIGH-level maximum output current[37]	–	–	–1	mA	HSIO, configured for drive_sel<1:0>= 0b10
SID29D	I_{OH3D_ABS}	HIGH-level maximum output current[37]	–	–	–0.5	mA	HSIO, configured for drive_sel<1:0>= 0b11
SID30A	I_{OH4A_ABS}	Source maximum current[37]	–	–	–4	mA	For pin EXT_PS_CTL1 in external PMIC mode and internal regulator mode and pin EXT_PS_CTL2 in external PMIC mode.
SID30B	I_{OH4B_ABS}	Source maximum current[37]	–	–	–25	mA	For pin DRV_VOUT in external transistor mode.
SID30C	I_{OH4C_ABS}	Source average current[38]	–	–	–1	mA	For pin EXT_PS_CTL1 in external PMIC mode and internal regulator mode and pin EXT_PS_CTL2 in external PMIC mode.

注释

32. 这些参数基于$V_{SSD} = V_{SSA} = V_{SSIO_3} = V_{SSIO_4} = 0.0$ V.
33. 必须设置限流电阻，确保 I/O 引脚的电流在任何时候（包括电源瞬变期间）都不会超过额定值。有关推荐电路的更多信息，请参见**图 10**。
34. V_{DDD}和 V_{DDIO}必须有足够的负载或受到保护，以防止它们被钳位电流拉出建议的工作范围。
35. 当满足 [33]、[34] 和 SID18A/B/C/D 条件时，$|I_{CLAMP\_ABS}|$ 取代 V_{IA_ABS}和 V_{I_ABS}。
36. “更近”的定义取决于封装。在 TEQFP 封装中，“最近”通过计算引脚数来决定。例如，在 176-TEQFP 封装中，P17.4（引脚 120）距离引脚 110 上的 V_{DDD}比距离引脚 132 上的 V DDD 更近。端口 11 和 21 不应用于注入电流。注入电流的影响仅针对 GPIO_STD/GPIO_ENH 类型 I/O 进行定义。在 BGA 封装中，以下 IO 端口组被视为具有单独的电源引脚：端口 0、1、2、22、23 和 28；端口 3、4、5、29、30 和 31；端口 6、7、8、9 和 32；端口 10、12、13、14、15、26 和 27；端口 16 和 17；端口 18、19 和 20。
37. 最大输出电流是流过任何一个 I/O 的峰值电流。
38. 平均输出电流定义为 10 ms 周期内流过任一个对应引脚的平均电流值。平均值为工作电流×工作比率。工作电流周期超过平均电流的规格应小于 100 ns。
39. 总输出电流是流过所有 GPIO_STD 和 GPIO_ENH I/O 的最大电流。
40. 总输出电流是流过所有 HSIO_STD I/O 的最大电流。
41. 总输出功率耗散是流经所有 I/O 的最大功率耗散。$PIO = (V_{DDD}, V_{DDIO\_1}, V_{DDIO\_2}) \times (|\Sigma I_{OH\_ABS\_GPIO}| + |\Sigma I_{OL\_ABS\_GPIO}|) + (V_{DDIO\_3}, V_{DDIO\_4}) \times (|\Sigma I_{OH\_ABS\_HSIO}| + |\Sigma IOL\_ABS\_HSIO|)$.

表 29　　绝对最大额定值 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID30D	I_{OH4D_ABS}	Source average current[38]	–	–	–12	mA	For pin DRV_VOUT in external transistor mode.
SID33A	$\Sigma I_{OH\_ABS\_GPIO}$	HIGH-level total output current[39]	–	–	–50	mA	–
SID33B	$\Sigma I_{OH\_ABS\_HSIO}$	HIGH-level total output current[40]	–	–	–85	mA	–
SID33D	PIO	Total output power dissipation[41]	–	–	307	mW	–
SID34	P_D	Power dissipation for external PMIC/transistor mode	–	–	1000	mW	T_J should not exceed 150°C
SID34A	P_D	Power dissipation for internal regulator mode	–	–	2000	mW	T_J should not exceed 150°C
SID36	T_A	Ambient temperature	–40	–	125	°C	–
SID37	T_{STG}	Storage temperature	–55	–	150	°C	–
SID38	T_J	Operating Junction temperature	–40	–	150	°C	–
SID39A	V_{ESD_HBM}	Electrostatic discharge human body model	2000	–	–	V	–
SID39B1	V_{ESD_CDM1}	Electrostatic discharge charged device model for corner pins	750	–	–	V	–
SID39B2	V_{ESD_CDM2}	Electrostatic discharge charged device model for all other pins	500	–	–	V	–
SID39C	I_{LU}	The maximum pin current the device can tolerate before triggering a latch-up	–100	–	100	mA	

注释

32. 这些参数基于$V_{SSD} = V_{SSA} = V_{SSIO_3} = V_{SSIO_4} = 0.0$ V.
33. 必须设置限流电阻，确保 I/O 引脚的电流在任何时候（包括电源瞬变期间）都不会超过额定值。有关推荐电路的更多信息，请参见**图 10**。
34. V_{DDD}和 V_{DDIO}必须有足够的负载或受到保护，以防止它们被钳位电流拉出建议的工作范围。
35. 当满足 [33]、[34] 和 SID18A/B/C/D 条件时，$|I_{CLAMP\_ABS}|$ 取代 V_{IA_ABS}和 V_{I_ABS}。
36. “更近”的定义取决于封装。在 TEQFP 封装中，“最近”通过计算引脚数来决定。例如，在 176-TEQFP 封装中，P17.4（引脚 120）距离引脚 110 上的 V_{DDD}比距离引脚 132 上的 V DDD 更近。端口 11 和 21 不应用于注入电流。注入电流的影响仅针对 GPIO_STD/GPIO_ENH 类型 I/O 进行定义。在 BGA 封装中，以下 IO 端口组被视为具有单独的电源引脚：端口 0、1、2、22、23 和 28；端口 3、4、5、29、30 和 31；端口 6、7、8、9 和 32；端口 10、12、13、14、15、26 和 27；端口 16 和 17；端口 18、19 和 20。
37. 最大输出电流是流过任何一个 I/O 的峰值电流。
38. 平均输出电流定义为 10 ms 周期内流过任一个对应引脚的平均电流值。平均值为工作电流×工作比率。工作电流周期超过平均电流的规格应小于 100 ns。
39. 总输出电流是流过所有 GPIO_STD 和 GPIO_ENH I/O 的最大电流。
40. 总输出电流是流过所有 HSIO_STD I/O 的最大电流。
41. 总输出功率耗散是流经所有 I/O 的最大功率耗散。$PIO = (V_{DDD}, V_{DDIO\_1}, V_{DDIO\_2}) \times (|\Sigma I_{OH\_ABS\_GPIO}| + |\Sigma I_{OL\_ABS\_GPIO}|) + (V_{DDIO\_3}, V_{DDIO\_4}) \times (|\Sigma I_{OH\_ABS\_HSIO}| + |\Sigma IOL\_ABS\_HSIO|)$.

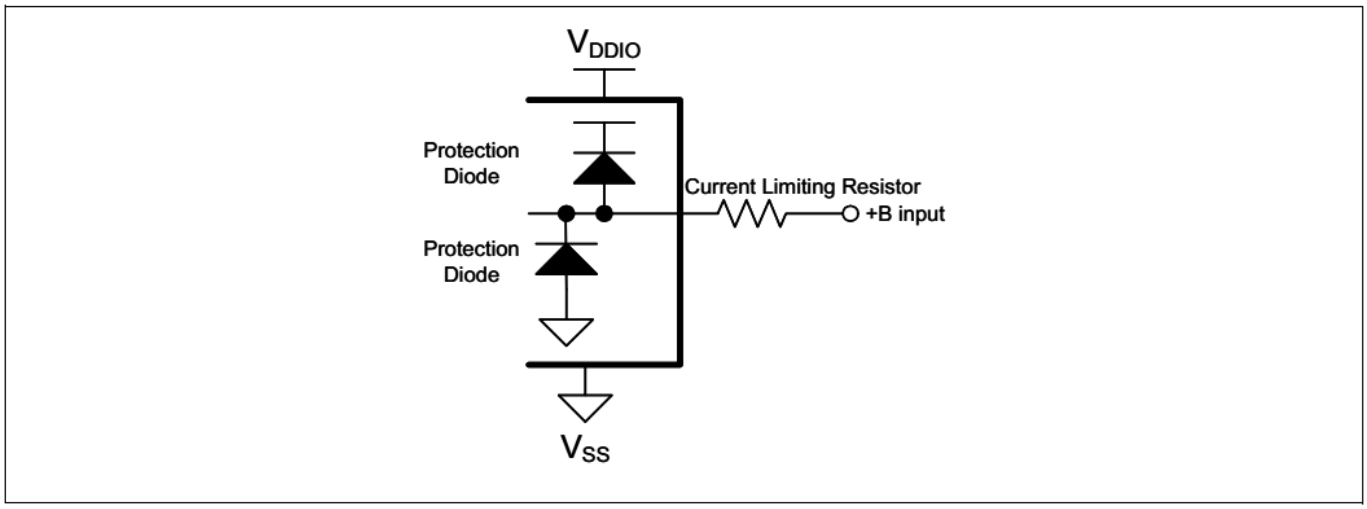


图 10　　推荐电路示例[42]

注释

半导体器件可能因施加超过绝对最大额定值的压力（包括但不限于电压、电流或温度）而导致永久损坏。不要超过任何这些额定值。

注释：

42. +B 是电池正极电压，约为 45 V。

26.2 器件级规范

表 30 推荐运行条件

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
Recommened operating conditions							
SID40	V_{DDD}, V_{DDA}, V_{DDIO_1}, V_{DDIO_2},	Power supply voltage[43]	2.7[44]	–	5.5[45]	V	–
SID40A	$V_{DDIO\_1\_EFP}$	Power supply voltage for eFuse programming[46]	3	–	5.5	V	–
SID40B	V_{DDIO_3}, V_{DDIO_4}	Power supply voltage	2.7	–	3.6	V	–
SID40C	V_{CCD}	External V_{CCD} power supply	1.10	1.15	1.20	V	External V_{CCD} power supply range when externally supplying V_{CCD}
SID41	C_{S1}	Smoothing capacitor[47, 48]	6.79	–	22	µF	–

注释

43. V_{DDD}、V_{DDIO_1}、V_{DDIO_2}、V_{DDIO_3}，V_{DDIO_4}和V_{DDA}没有任何顺序限制，可以按任意顺序建立。这些电源（V_{DDA}和V_{DDIO_2}）的电压电平是独立的。使用 ADC 单元时，请参阅 12 位 SAR ADC DC规格。
44. 3.0 V ±10% 支持V_{DDD}和V_{DDA}的较低 BOD 设置选项。该设置可为内部定时提供强大的保护但 BOD 复位发生在电压低于规定工作条件时。可提供更高的 BOD 设置选项（与低至 3.0 V 的电压一致），确保满足所有运行条件。
45. 5.0 V ±10% 支持更高的 VDDD 和 VDDA OVD 设置选项。此设置可为内部和接口时序提供稳健的保护，但 OVD 复位会在电压高于指定工作条件时发生。可选择较低的 OVD 设置（最高 5.0 V），确保满足所有运行条件。允许 VDDD 和 VDDA 电压过冲至更高的 OVD 设置范围，但累计持续时间不得超过 2 小时。请注意，在过冲电压条件下，电气参数无法得到保证。
46. eFuse 编程必须在部件处于“安静”状态时进行，尽量减少活动（最好只有 JTAG 或单个 LIN/CAN 通道在 V_{DDD} 域，V_{DDIO_1} 上无活动）。
47. 每个芯片都需要一个平滑电容 C_{S1}（而不是每个 V_{CCD} 引脚）。V_{CCD} 引脚必须连接在一起，以确保低阻抗连接（参见 **图 11** 和 **表 31**）。
48. 用于电源去耦或滤波的电容器在连续直流偏置下运行。许多使用直流电源的电容器提供的电容小于其目标电容，并且其电容在其工作电压范围内不是恒定的。选择用于此设备的电容器时，请确保所选组件在设计中使用的特定温度和电压工作条件下提供所需的电容。虽然温度系数通常可以在零件目录中找到（例如 X7R、C0G、Y5V），但匹配的电压系数可能仅在组件数据表上提供或直接从制造商处获得。在实际运行条件下使用不能提供所需电容的组件可能会导致器件运行不符合数据表规格。

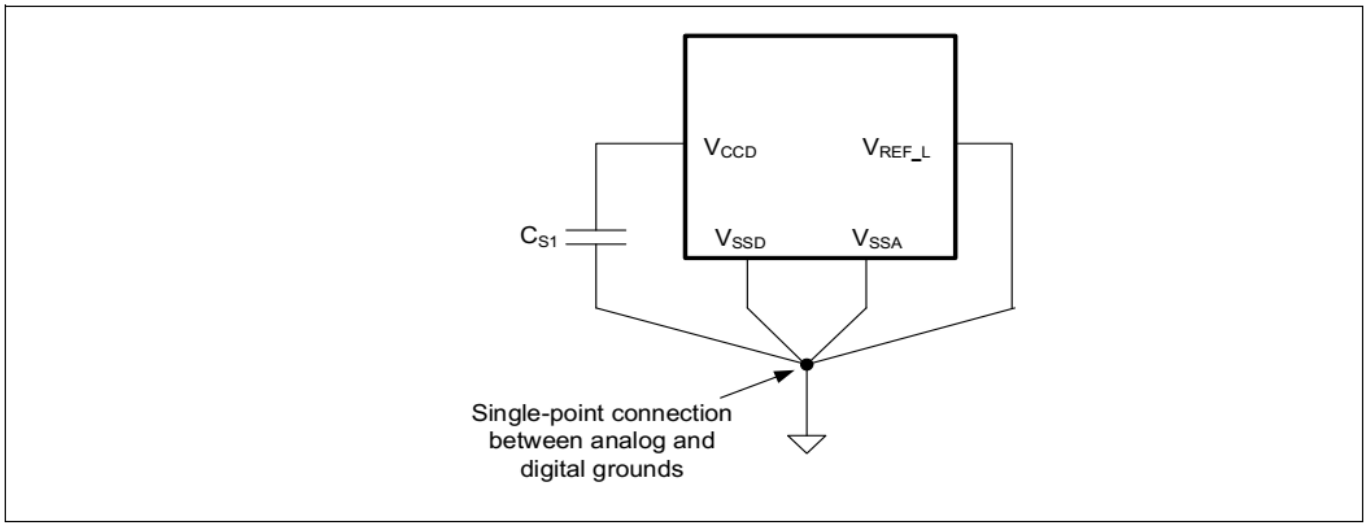


图 11 平滑电容器

平滑电容器应尽可能靠近 V_{CCD} 引脚放置。

26.3 直流规格

表 31 直流规格、CPU电流和转换时间规格

除非另有说明， 所有规范均适用于 –40°C ≤ T_A ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
Active/Sleep mode							
SID49C1	$I_{DD\_VDDD\_CM07\_8\_1}$	V_{DDD} current in internal regulator mode, LPACTIVE mode (CM0+ and CM7_0 at 8 MHz, all peripherals are disabled)	–	10	17	mA	CM0+ and CM7_0 clocked at 8 MHz with IMO. CM7_1 powered off. All peripherals are disabled. No IO toggling. CPUs CM7_0 and CM0+ executing Dhrystone from flash with cache enabled. Typ: T_A = 25°C, V_{DDD} = 5.0 V, process typ (TT) Max: T_A = 25 C, V_{DDD} = 5.5 V, process worst (FF)
SID49C	$I_{DD\_VDDD\_CM07\_8}$	V_{DDD} current in internal regulator mode, LPACTIVE mode (CM0+ and CM7_0 at 8 MHz, all peripherals are enabled)	–	12	226	mA	CM0+ and CM7_0 clocked at 8 MHz with IMO. CM7_1 powered off. All peripherals are enabled. No IO toggling. M-DMA transferring data from code + work flash, P-DMA chains with maximum trigger activity. CPUs CM7_0 and CM0+ executing Dhrystone from flash with cache enabled. Typ: T_A = 25°C, V_{DDD} = 5.0 V, process typ (TT) Max: T_A = 105°C, V_{DDD} = 5.5 V, process worst (FF)
SID49E1	$I_{DD1\_VCCD\_CM7\_350}$	V_{CCD} current in external PMIC/transistor mode, Active mode (CM7_0 at 350 MHz, CM0+ at 100 MHz, all peripherals are enabled)	–	155	431	mA	PLL enabled at 350 MHz with ECO reference. All peripherals are enabled. No IO toggling. CM7_1 powered off. M-DMA transferring data from code + work flash, P-DMA chains with maximum trigger activity. CPUs CM7_0 and CM0+ executing Dhrystone from flash with cache enabled. Typ: TA= 2°C,VCCD= 1.15 V, process typ (TT) Max: TA= 125°C,VCCD= 1.20 V, process worst (FF)

注释：

49. 在低温 –5 °C 至 –40 °C 下，深度睡眠到运行模式的转换时间可能比指示的最大时间高出 20 µs。

表 31　　直流规格、CPU 电流和转换时间规格 *(续)*

除非另有说明，所有规范均适用于 –40°C ≤ T_A ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID49E2	$I_{DD1\_VDDD\_CM7\_350}$	V_{DDD} current in external PMIC/transistor mode, Active mode (CM7_0 at 350 MHz, CM0+ at 100 MHz, all peripherals are enabled)	–	7	9	mA	PLL enabled at 350 MHz with ECO reference. All peripherals are enabled. No IO toggling. CM7_1 powered off. M-DMA transferring data from code + work flash, P-DMA chains with maximum trigger activity. CPUs CM7_0 and CM0+ executing Dhrystone from flash with cache enabled. Typ: TA= 25°C, VCCD= 1.15 V, process typ (TT) Max: TA= 125°C,VCCD= 1.20 V, process worst (FF)
SID50A1	$I_{DD1\_VCCD\_F}$	VCCD current in external PMIC/transistor mode, Active mode (CM7 CPUs at 350 MHz, CM0+ at 100 MHz, all peripherals are enabled)	–	209	543	mA	PLL enabled at 350 MHz with ECO reference. All peripherals are enabled. No IO toggling. M-DMA transferring data from code + work flash, P-DMA chains with maximum trigger activity. CM7 CPUs and CM0+ executing Dhrystone from flash with cache enabled. Typ: T_A = 25°C, V_{DDD} = 5.0 V, process typ (TT) Max: T_A = 125°C, V_{DDD} = 5.5 V, process worst (FF)
SID50A2	$I_{DD1\_VDDD\_F}$	VDDD current in external PMIC/transistor mode, Active mode (CM7 CPUs at 350 MHz, CM0+ at 100 MHz, all peripherals are enabled)	–	7	9.3	mA	PLL enabled at 350 MHz with ECO reference. All peripherals are enabled. No IO toggling. M-DMA transferring data from code + work flash, P-DMA chains with maximum trigger activity. CM7 CPUs and CM0+ executing Dhrystone from flash with cache enabled. Typ: T_A = 25°C, V_{DDD} = 5.0 V, process typ (TT) Max: T_A = 125°C, V_{DDD} = 5.5 V, process worst (FF)
SID53A	$I_{DD2\_8\_VDDD}$	V_{DDD} current in internal regulator mode. CM7_1=OFF, Other CPUs in Sleep	–	7	218	mA	IMO clocked at 8 MHz. All peripherals, PLL, FLL, peripheral clocks, interrupts, CSV, DMA are disabled. No IO toggling. Typ: T_A = 25°C, V_{DDD} = 5.0 V, process typ (TT) Max: T_A = 105°C, V_{DDD} = 5.5 V, process worst (FF)

注释：

49.在低温 –5 °C 至 –40 °C 下，深度睡眠到运行模式的转换时间可能比指示的最大时间高出 20 µs。

表 31　　直流规格、CPU 电流和转换时间规格 *(续)*

除非另有说明， 所有规范均适用于 –40°C ≤ T_A ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID58A	I_{DD_CWU2}	Average current for cyclic wake-up operation. This is the average current for the specified LPACTIVE mode and Deep Sleep mode (RTC, WDT, and Event Generator operating).	–	60	198	µA	T_A = 25°C, 64-KB SRAM retention, Event generator operates with ILO0 in Deep Sleep and LP Active, Smart I/O operates with ILO0, CM0+, CM7_0: Retained, CM7_1: OFF. Typ: V_{DDD} = 5.0 V, process typ (TT) Max: V_{DDD} = 5.5 V, process worst (FF) This average current is achieved under the following conditions. 1. MCU repetitively goes from Deep Sleep to LP Active with a period of 32 ms. 2. One of the I/Os is toggled using Smart I/O to activate an external sensor connected to an analog input of A/D in Deep Sleep 3. After 200 µs delay, the CM7_0 wakes up by Event generator trigger to LP Active mode with IMO and A/D conversion is triggered by software. 4. Group A/D conversion is performed on 5 channels with the sampling time of 1 µs each. 5. Once the group A/D conversion is finished, and the results fit in the window of the range comparator, the I/O is toggled back by software to de-activate the sensor and the CM7_0 goes back to Deep Sleep.
Deep Sleep mode							
SID64A	I_{DD_DS64A}	64-KB SRAM retention, ILO0 operation	–	50	176	µA	Deep Sleep Mode (RTC, WDT, and event generator operating, all other peripherals are off except for retention registers), CM0+, CM7_0: Retained T_A = 25°C Typ: V_{DDD} = 5.0 V, process typ (TT) Max: V_{DDD} = 5.5 V, process worst (FF)
SID64C	I_{DD_DS64C}	64 KB SRAM retention, ILO0 operation	–	1.4	5.5	mA	Deep Sleep Mode steady state at T_A = 125°C (RTC, WDT, and event generator operating, all other peripherals are off except for retention registers), CM0+, CM7_0: Retained Typ: V_{DDD} = 5.0 V process worst (TT) Max: V_{DDD} = 5.5 V process worst (FF)

注释：

49.在低温 –5 °C 至 –40 °C 下，深度睡眠到运行模式的转换时间可能比指示的最大时间高出 20 µs。

表 31　　直流规格、CPU 电流和转换时间规格 *(续)*

除非另有说明，所有规范均适用于 –40°C ≤ T_A ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
Hibernate mode							
SID66	I_{DD_HIB1}	Hibernate Mode	–	8	–	µA	ILO0/WDT operating. All other peripherals and all CPUs are off. T_A = 25°C, V_{DDD} = 5.0 V, process typ (TT)
SID66A	I_{DD_HIB2}	Hibernate Mode	–	–	180	µA	ILO0/WDT operating. All other peripherals, and all CPUs are off. T_A = 125°C, V_{DDD} = 5.5 V, process worst (FF)
Power mode transition times							
SID69	t_{ACT_DS}	Power down time from Active to Deep Sleep	–	–	2.5	µs	When the IMO is already running and all HFCLK roots are at least 8 MHz. HFCLK roots that are slower than this will require additional time to turn off.
SID67	t_{DS_ACT}	Deep Sleep to Active transition time (IMO clock)	–	–	10[49]	µs	When using the 8-MHz IMO. Measured from wakeup interrupt during Deep Sleep until wakeup[49]
SID67C	t_{DS_ACT1}	Deep Sleep to Active transition time (IMO clock, flash execution)	–	–	26[49]	µs	When using the 8-MHz IMO. Measured from wakeup interrupt during Deep Sleep until flash execution[49]
SID67A	$t_{DS\_ACT\_FLL}$	Deep Sleep to Active transition time (FLL clock)	–	–	15[49]	µs	When using the FLL to generate 96 MHz from the 8-MHz IMO. Measured from wakeup interrupt during Deep Sleep until the FLL locks[49]
SID67D	$t_{DS\_ACT\_FLL1}$	Deep Sleep to Active transition time (FLL clock, flash execution)	–	–	26[49]	µs	When using the FLL to generate 96 MHz from the 8-MHz IMO. Measured from wakeup interrupt during Deep Sleep until flash execution[49]
SID67B	$t_{DS\_ACT\_PLL}$	Deep Sleep to Active transition time (PLL clock)	–	–	60[49]	µs	When using the PLL to generate 96 MHz from the 8-MHz IMO. Measured from wakeup interrupt during Deep Sleep until the PLL locks[49]
SID68	t_{HVR_ACT}	Release time from HV reset (POR, BOD, OVD, OCD, WDT, Hibernate wakeup, or XRES_L) release until CM0+ begins executing ROM boot	–	–	265	µs	Without boot runtime, guaranteed by design
SID68A	t_{LVR_ACT}	Release time from LV reset (Fault, Internal system reset, MCWDT, or CSV) during Active/Sleep until CM0+ begins executing ROM boot	–	–	10	µs	Without boot runtime. Guaranteed by design
SID68B	t_{LVR_DS}	Release time from LV reset (Fault, or MCWDT) during Deep Sleep until CM0+ begins executing ROM boot	–	–	15	µs	Without boot runtime. Guaranteed by design
SID80A	t_{RB_N}	ROM boot startup time or wakeup time from hibernate in NORMAL protection state	–	–	1640	µs	Guaranteed by design,CM0+ clocked at 100 MHz (Flash boot v3.1.0.554 and later)

注释：

49.在低温 –5 °C 至 –40 °C 下，深度睡眠到运行模式的转换时间可能比指示的最大时间高出 20 µs。

表 31　　直流规格、CPU 电流和转换时间规格 *(续)*

除非另有说明，所有规范均适用于 –40°C ≤ T_A ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID80B	t_{RB_S}	ROM boot startup time or wakeup time from hibernate in SECURE protection state	–	–	2330	µs	Guaranteed by design, CM0+ clocked at 100 MHz (Flash boot version 3.1.0.554 and later)
SID81A	t_{FB}	Flash boot startup time or wakeup time from hibernate in NORMAL/SECURE protection state	–	–	80	µs	Guaranteed by design, TOC2_-FLAGS=0x2CF, CM0+ clocked at 100MHz (Flash boot version 3.1.0.554 and later), Listen window = 0 ms
SID81B	t_{FB_A}	Flash boot with app authentication time in NORMAL/SECURE protection state	–	–	5000	µs	Guaranteed by Design, TOC2_FLAGS=0x24F, CM0+ clocked at 100 MHz (Flash boot version 3.1.0.554 and later), Listen window = 0 ms, Public key exponent e = 0x010001, App size is 64 KB with the last 256 bytes being a digital signature in RSASSA-PKCS1-v1.5 Valid for RSA-2048.
SID80A_2	$t_{RB\_N\_2}$	ROM boot startup time or wakeup time from hibernate in NORMAL protection state	–	–	2640	µs	Guaranteed by design, CM0+ clocked at 50 MHz (Flash boot version earlier than 3.1.0.554)
SID80B_2	$t_{RB\_S\_2}$	ROM boot startup time or wakeup time from hibernate in SECURE protection state	–	–	3890	µs	Guaranteed by design, CM0+ clocked at 50 MHz (Flash boot version earlier than 3.1.0.554)
SID81A_2	t_{FB_2}	Flash boot startup time or wakeup time from hibernate in NORMAL/SECURE protection state	–	–	200	µs	Guaranteed by design, TOC2_-FLAGS=0x2CF, CM0+ clocked at 50MHz (Flash boot version earlier than3.1.0.554), Listen window = 0 ms
SID81B_2	$t_{FB\_A\_2}$	Flash boot with app authentication time in NORMAL/SECURE protection state	–	–	10000	µs	Guaranteed by design, TOC2_-FLAGS=0x24F, CM0+ clocked at 50MHz (Flash boot version earlier than 3.1.0.554), Listen window = 0 ms,Public key exponent e = 0x010001, App size is 64 KB with the last 256 bytes being a digital signature in RSASSA-PKCS1-v1.5. Valid for RSA2K.
SID81B	t_{FB_A}	Flash boot with app authentication time in NORMAL/SECURE protection state	–	–	5000	µs	Guaranteed by design, TOC2_-FLAGS=0x24F, CM0+ clocked at 100MHz (Flash boot version 3.1.0.554 and later), Listen window = 0 ms, Public key exponent e = 0x010001, App size is 64 KB with the last 256 bytes being a digital signature in RSASSA-PKCS1-v1.5. Valid for RSA2K.
Regulator specifications							
SID600	V_{CCD}	Core supply voltage (transient range)	1.05	1.1	1.15	V	–

注释：

49.在低温 –5 °C 至 –40 °C 下，深度睡眠到运行模式的转换时间可能比指示的最大时间高出 20 µs。

表 31　　直流规格、CPU 电流和转换时间规格 *(续)*

除非另有说明，所有规范均适用于 –40°C ≤ T_A ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID600A	V_{CCD_S}	Core supply voltage (static range, no load)	1.075	1.1	1.15	V	Guaranteed by design
SID601	I_{DDD_ACT}	Regulator operating current in Active/Sleep mode	–	900	1500	µA	Guaranteed by design
SID602	I_{DDD_DPSLP}	Regulator operating current in Deep Sleep mode	–	1.5	20	µA	Guaranteed by design
SID603	I_{RUSH}	In-rush current	–	–	850	mA	Average V_{DDD} current until C_{s1} (connected to V_{CCD} pin) is charged after Active regulator is turned on
SID604	I_{ILDOUT}	Internal regulator output current for operation	–	–	300	mA	–
SID605	I_{HCROUT}	High current regulator output current for operation	–	–	600	mA	Using an external pass transistor
SID606	V_{OL_HCR}	Output voltage LOW level for external PMIC enable output (EXT_PS_CTL1)	–	–	0.5	V	I_{OL} = 1 mA
SID606A	V_{OH_HCR}	Output voltage HIGH level for external PMIC enable output (EXT_PS_CTL1)	V_{DDD} – 0.5	–	–	V	I_{OH} = –1 mA
SID607	V_{IH_HCR}	Input voltage HIGH threshold for external PMIC power OK input (EXT_PS_CTL0)	0.7 × V_{DDD}	–	–	V	–
SID607A	V_{IL_HCR}	Input voltage LOW threshold for external PMIC power OK input (EXT_PS_CTL0)	–	–	0.3 × V_{DDD}	V	–
SID607B	V_{HYS_HCR}	Hysteresis for external PMIC power OK input (EXT_PS_CTL0)	0.05 × V_{DDD}	–	–	V	–
SID608	I_{DRV_VOUT}	DRV_VOUT pin output current to external NPN base current	–	–	9	mA	See architecture reference manual for external NPN transistor selection

注释：

49. 在低温 –5 °C 至 –40 °C 下，深度睡眠到运行模式的转换时间可能比指示的最大时间高出 20 µs。

26.4 复位规格

表 32 XRES_L 复位

Spec ID	Parameter	Description	Min	Typ	Max	Units	Details/conditions
XRES_L DC specifications							
SID73	I_{IDD_XRES}	I_{DD} when XRES_L asserted	–	–	2.5	mA	MAX: T_A = 125 °C, V_{DDD} = 5.5 V, V_{CCD} = 1.15 V, process worst (FF)
SID74	V_{IH}	Input voltage HIGH threshold	0.7 × V_{DDD}	–	–	V	CMOS Input
SID75	V_{IL}	Input voltage LOW threshold	–	–	0.3 × V_{DDD}	V	CMOS Input
SID76	R_{PULLUP}	Pull-up resistor	7	–	20	kΩ	–
SID77	C_{IN}	Input capacitance	–	–	5	pF	–
SID78	$V_{HYSXRES}$	Input voltage hysteresis	0.05 × V_{DDD}	–	–	V	–
XRES_L AC specifications							
SID70	t_{XRES_ACT}	XRES_L deasserted to Active transition time	–	–	265	µs	Without boot runtime, guaranteed by design
SID71	t_{XRES_PW}	XRES_L pulse width	5	–	–	µs	–
SID72	t_{XRES_FT}	Pulse suppression width	100	–	–	ns	–

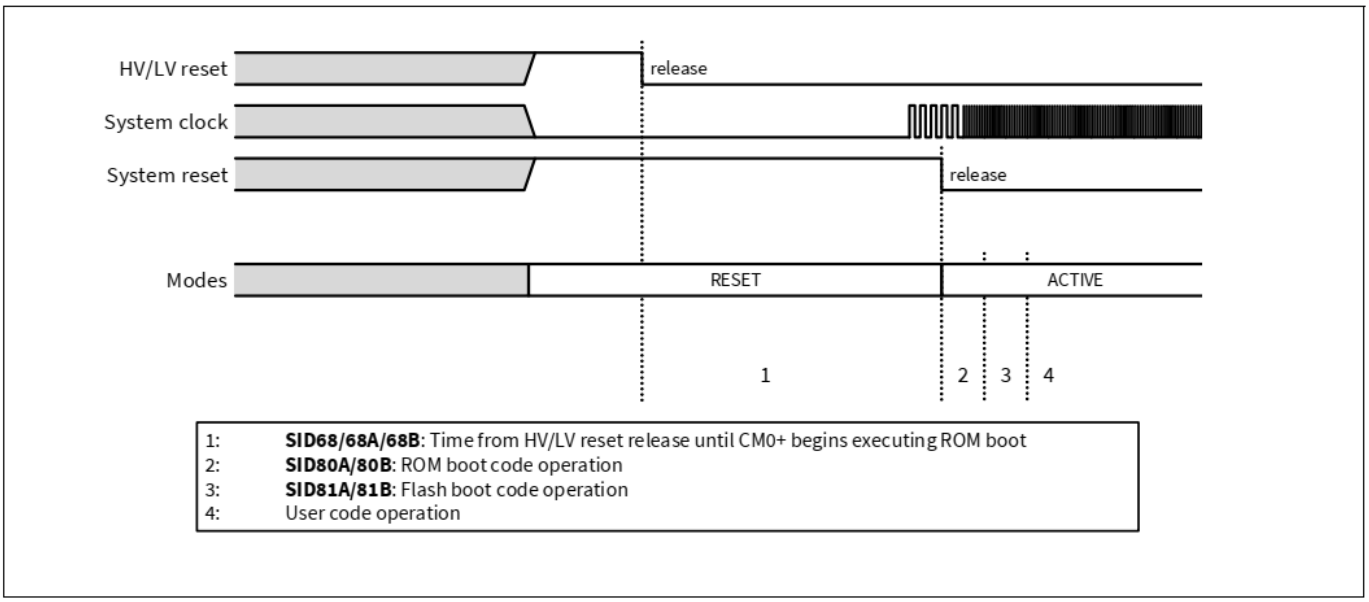


图 12 复位序列

26.5 I/O

表 33 I/O 规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
GPIO_STD specifications for porta P1 through P2, P28, to P32							
SID650	$V_{OL1\_GPIO\_STD}$	Output voltage LOW level	–	–	0.6	V	I_{OL} = 6 mA drive_sel<1:0> = 0b0X, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID650C	$V_{OL1C\_GPIO\_STD}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 5 mA drive_sel<1:0> = 0b0X, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID651	$V_{OL2\_GPIO\_STD}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 2 mA drive_sel<1:0> = 0b0X, 2.7 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} < 4.5 V
SID652	$V_{OL3\_GPIO\_STD}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 1 mA drive_sel<1:0> = 0b10, 2.7 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} < 4.5 V
SID652C	$V_{OL3C\_GPIO\_STD}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 2 mA drive_sel<1:0> = 0b10, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID653	$V_{OL4\_GPIO\_STD}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 0.5 mA drive_sel<1:0> = 0b11, 2.7 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} < 4.5 V
SID653C	$V_{OL4C\_GPIO\_STD}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 1 mA drive_sel<1:0> = 0b11, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID654	$V_{OH1\_GPIO\_STD}$	Output voltage HIGH level	(V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) – 0.5	–	–	V	I_{OH} = –2 mA drive_sel<1:0> = 0b0X, 2.7 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} < 4.5 V
SID655	$V_{OH2\_GPIO\_STD}$	Output voltage HIGH level	(V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) – 0.5	–	–	V	I_{OH} = –5 mA drive_sel<1:0> = 0b0X, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID656	$V_{OH3\_GPIO\_STD}$	Output voltage HIGH level	(V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) – 0.5	–	–	V	I_{OH} = –1 mA drive_sel<1:0> = 0b10, 2.7 V ≤ (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) < 4.5 V
SID656C	$V_{OH3C\_GPIO\_STD}$	Output voltage HIGH level	(V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) – 0.5	–	–	V	I_{OH} = –2 mA drive_sel<1:0> = 0b10, 4.5 V ≤ (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) ≤ 5.5 V
SID657	$V_{OH4\_GPIO\_STD}$	Output voltage HIGH level	(V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) – 0.5	–	–	V	I_{OH} = –0.5 mA drive_sel<1:0> = 0b11, 2.7 V ≤ (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) < 4.5 V
SID657C	$V_{OH4C\_GPIO\_STD}$	Output voltage HIGH level	(V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) – 0.5	–	–	V	I_{OH} = –1 mA drive_sel<1:0> = 0b11, 4.5 V ≤ (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2}) ≤ 5.5 V
SID658	$R_{PD\_GPIO\_STD}$	Pull-down resistance	25	50	100	kΩ	–
SID659	$R_{PU\_GPIO\_STD}$	Pull-up resistance	25	50	100	kΩ	–

表 33 I/O 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID660	$V_{IH\_CMOS\_GPIO\_STD}$	Input voltage HIGH threshold in CMOS mode	0.7 × (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2})	–	–	V	–
SID661	$V_{IH\_TTL\_GPIO\_STD}$	Input voltage HIGH threshold in TTL mode	2.0	–	–	V	–
SID662	$V_{IH\_AUTO\_GPIO\_STD}$	Input voltage HIGH threshold in AUTO mode	0.8 × (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2})	–	–	V	–
SID663	$V_{IL\_CMOS\_GPIO\_STD}$	Input voltage LOW threshold in CMOS mode	–	–	0.3 × (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2})	V	–
SID664	$V_{IL\_TTL\_GPIO\_STD}$	Input voltage LOW threshold in TTL mode	–	–	0.8	V	–
SID665	$V_{IL\_AUTO\_GPIO\_STD}$	Input voltage LOW threshold in AUTO mode	–	–	0.5 × (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2})	V	–
SID666	$V_{HYST\_CMOS\_GPIO\_STD}$	Hysteresis in CMOS mode	0.05 × (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2})	–	–	V	–
SID668	$V_{HYST\_AUTO\_GPIO\_STD}$	Hysteresis in AUTO mode	0.05 × (V_{DDD}, V_{DDIO_1}, or V_{DDIO_2})	–	–	V	–
SID669	$C_{in\_GPIO\_STD}$	Input pin capacitance	–	–	5	pF	For 10 MHz and 100 MHz
SID670	$I_{IL\_GPIO\_STD}$	Input leakage current	–250	0.02	250	nA	For GPIO_STD except P21.0, P21.1, P21.2, P21.3, P21.4, P22.1, P22.2, P22.3, P23.3, P23.4. $V_{DDIO\_1} = V_{DDIO\_2} = V_{DDD} = V_{DDA} = 5.5$ V, $V_{SSD} < V_I < V_{DDD}$, V_{DDIO_1}, V_{DDIO_2} –40 °C ≤ T_A ≤ 125 °C Typ: T_A = 25 °C, $V_{DDIO\_1} = V_{DDIO\_2} = V_{DDD} = V_{DDA}$ = 5.0 V
SID670C	$I_{IL\_GPIO\_STD\_B}$	Input leakage current	–700	0.02	700	nA	Only for P21.0, P21.1, P21.2, P21.3, P21.4, P22.1, P22.2, P22.3, P23.3, P23.4. $V_{DDIO\_1} = V_{DDIO\_2} = V_{DDD} = V_{DDA} = 5.5$ V, $V_{SSD} < V_I < V_{DDD}$, V_{DDIO_1}, V_{DDIO_2} –40 °C ≤ T_A ≤ 125 °C Typ: T_A = 25 °C, $V_{DDIO\_1} = V_{DDIO\_2} = V_{DDD} = V_{DDA}$ = 5.0 V
SID671	t_R or t_F (fast)_20_0_GPIO_STD	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	10	ns	20-pF load, drive_sel<1:0> = 0b00
SID672	t_R or t_F (fast)_50_0_GPIO_STD	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	20	ns	50-pF load, drive_sel<1:0> = 0b00
SID673	t_R or t_F (fast)_20_1_GPIO_STD	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	20	ns	20-pF load, drive_sel<1:0> = 0b01

表 33 I/O 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID674	t_R or t_F (fast)$_{10\_2\_GPIO\_STD}$	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	20	ns	10-pF load, drive_sel<1:0> = 0b10
SID675	t_R or t_F (fast)$_{6\_3\_GPIO\_STD}$	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	20	ns	6-pF load, drive_sel<1:0> = 0b11
SID676	t_F (fast)$_{100\_GPIO\_STD}$	Fall time (30% to 70% of V_{DDIO})	0.35	–	250	ns	10-pF to 400-pF load, RPU = 767 Ω, drive_sel<1:0>= 0b00, Freq = 100 kHz
SID677	t_F (fast)$_{400\_GPIO\_STD}$	Fall time (30% to 70% of V_{DDIO})	0.35	–	250	ns	10-pF to 400-pF load, RPU = 350 Ω, drive_sel<1:0>= 0b00, Freq = 400 kHz
SID678	$f_{IN\_GPIO\_STD}$	Input frequency	–	–	100	MHz	–
SID679	$f_{OUT\_GPIO\_STD0H}$	Output frequency	–	–	50	MHz	20 pF load, drive_sel<1:0>= 00, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID680	$f_{OUT\_GPIO\_STD0L}$	Output frequency	–	–	32	MHz	20 pF load, drive_sel<1:0>= 00, 2.7 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} < 4.5 V
SID681	$f_{OUT\_GPIO\_STD1H}$	Output frequency	–	–	25	MHz	20 pF load, drive_sel<1:0>= 01, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID682	$f_{OUT\_GPIO\_STD1L}$	Output frequency	–	–	15	MHz	20 pF load, drive_sel<1:0>= 01, 2.7 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} < 4.5 V
SID683	$f_{OUT\_GPIO\_STD2H}$	Output frequency	–	–	25	MHz	10 pF load, drive_sel<1:0>= 10, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID684	$f_{OUT\_GPIO\_STD2L}$	Output frequency	–	–	15	MHz	10 pF load, drive_sel<1:0>= 10, 2.7 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} < 4.5 V
SID685	$f_{OUT\_GPIO\_STD3H}$	Output frequency	–	–	15	MHz	6 pF load, drive_sel<1:0>= 11, 4.5 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} ≤ 5.5 V
SID686	$f_{OUT\_GPIO\_STD3L}$	Output frequency	–	–	10	MHz	6 pF load, drive_sel<1:0>= 11, 2.7 V ≤ V_{DDD} or V_{DDIO_1} or V_{DDIO_2} < 4.5 V
GPIO_ENH specifications for P0							
SID650A	$V_{OL1\_GPIO\_ENH}$	Output voltage LOW level	–	–	0.6	V	I_{OL} = 6 mA drive_sel<1:0> = 0b0X, 2.7 V ≤ V_{DDD} ≤ 5.5 V
SID650D	$V_{OL1D\_GPIO\_ENH}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 5 mA drive_sel<1:0> = 0b0X, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID651A	$V_{OL2\_GPIO\_ENH}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 2 mA drive_sel<1:0> = 0b0X, 2.7 V ≤ V_{DDD} < 4.5 V

表 33 I/O 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID652A	$V_{OL3\_GPIO\_ENH}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 1 mA drive_sel<1:0> = 0b10, 2.7 V ≤ V_{DDD} < 4.5 V
SID652D	$V_{OL3D\_GPIO\_ENH}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 2 mA drive_sel<1:0> = 0b10, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID653A	$V_{OL4\_GPIO\_ENH}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 0.5 mA drive_sel<1:0> = 0b11, 2.7 V ≤ V_{DDD} < 4.5 V
SID653D	$V_{OL4D\_GPIO\_ENH}$	Output voltage LOW level	–	–	0.4	V	I_{OL} = 1 mA drive_sel<1:0> = 0b11, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID654A	$V_{OH1\_GPIO\_ENH}$	Output voltage HIGH level	V_{DDD} – 0.5	–	–	V	I_{OH} = –2 mA drive_sel<1:0> = 0b0X, 2.7 V ≤ V_{DDD} < 4.5 V
SID655A	$V_{OH2\_GPIO\_ENH}$	Output voltage HIGH level	V_{DDD} – 0.5	–	–	V	I_{OH} = –5 mA drive_sel<1:0> = 0b0X, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID656A	$V_{OH3\_GPIO\_ENH}$	Output voltage HIGH level	V_{DDD} – 0.5	–	–	V	I_{OH} = –1 mA drive_sel<1:0> = 0b10, 2.7 V ≤ V_{DDD} < 4.5 V
SID656D	$V_{OH3D\_GPIO\_ENH}$	Output voltage HIGH level	V_{DDD} – 0.5	–	–	V	I_{OH} = –2 mA drive_sel<1:0> = 0b10, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID657A	$V_{OH4\_GPIO\_ENH}$	Output voltage HIGH level	V_{DDD} – 0.5	–	–	V	I_{OH} = –0.5 mA drive_sel<1:0> = 0b11, 2.7 V ≤ V_{DDD} < 4.5 V
SID657D	$V_{OH4D\_GPIO\_ENH}$	Output voltage HIGH level	V_{DDD} – 0.5	–	–	V	I_{OH} = –1 mA drive_sel<1:0> = 0b11, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID658A	$R_{PD\_GPIO\_ENH}$	Pull-down resistance	25	50	100	kΩ	–
SID659A	$R_{PU\_GPIO\_ENH}$	Pull-up resistance	25	50	100	kΩ	–
SID660A	$V_{IH\_CMOS\_GPIO\_ENH}$	Input voltage HIGH threshold in CMOS mode	0.7 × V_{DDD}	–	–	V	–
SID661A	$V_{IH\_TTL\_GPIO\_ENH}$	Input voltage HIGH threshold in TTL mode	2.0	–	–	V	–
SID662A	$V_{IH\_AUTO\_GPIO\_ENH}$	Input voltage HIGH threshold in AUTO mode	0.8 × V_{DDD}	–	–	V	–
SID663A	$V_{IL\_CMOS\_GPIO\_ENH}$	Input voltage LOW threshold in CMOS mode	–	–	0.3 × V_{DDD}	V	–
SID664A	$V_{IL\_TTL\_GPIO\_ENH}$	Input voltage LOW threshold in TTL mode	–	–	0.8	V	–
SID665A	$V_{IL\_AUTO\_GPIO\_ENH}$	Input voltage LOW threshold in AUTO mode	–	–	0.5 × V_{DDD}	V	–
SID666A	$V_{HYST\_CMOS\_GPIO\_ENH}$	Hysteresis in CMOS mode	0.05 × V_{DDD}	–	–	V	–
SID668A	$V_{HYST\_AUTO\_GPIO\_ENH}$	Hysteresis in AUTO mode	0.05 × V_{DDD}	–	–	V	–
SID669A	$C_{in\_GPIO\_ENH}$	Input pin capacitance	–	–	5	pF	For 10 MHz and 100 MHz

表 33 I/O 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID670A	$I_{IL\_GPIO\_ENH}$	Input leakage current	–350	0.055	350	nA	$V_{DDD} = V_{DDA} = 5.5$ V, $V_{SSD} < V_I < V_{DDD}$ –40 °C ≤ T_A ≤ 125 °C Typ: T_A = 25 °C, $V_{DDD} = V_{DDA} = 5.0$ V
SID671A	t_R or t_F (fast)$_{20\_0\_GPIO\_ENH}$	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	10	ns	20 pF load, drive_sel<1:0> = 0b00, slow = 0
SID672A	t_R or t_F (fast)$_{50\_0\_GPIO\_ENH}$	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	20	ns	50 pF load, drive_sel<1:0> = 0b00, slow = 0
SID673A	t_R or t_F (fast)$_{20\_1\_GPIO\_ENH}$	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	20	ns	20-pF load, drive_sel<1:0> = 0b01, slow = 0
SID674A	t_R or t_F (fast)$_{10\_2\_GPIO\_ENH}$	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	20	ns	10-pF load, drive_sel<1:0> = 0b10, slow = 0
SID675A	t_R or t_F (fast)$_{6\_3\_GPIO\_ENH}$	Rise time or fall time (10% to 90% of V_{DDIO})	1	–	20	ns	6-pF load, drive_sel<1:0> = 0b11, slow = 0
SID676A	t_{F_I2C} (slow)$_{GPIO\_ENH}$	Fall time (30% to 70% of V_{DDIO})	20 × (V_{DDD} / 5.5)	–	250	ns	10-pF to 400-pF load, drive_sel<1:0> = 0b00, slow = 1, minimum R_{PU} = 400 Ω
SID677A	t_R or t_F (slow)$_{20\_GPIO\_ENH}$	Rise time or fall time (10% to 90% of V_{DDIO})	20 × (V_{DDD} / 5.5)	–	160	ns	20-pF load, drive_sel<1:0> = 0b00, slow = 1, output frequency = 1 MHz
SID678A	t_R or t_F (slow)$_{400\_GPIO\_ENH}$	Rise time or fall time (10% to 90% of V_{DDIO})	20 × (V_{DDD} / 5.5)	–	250	ns	400-pF load, drive_sel<1:0> = 0b00, slow = 1, output frequency = 400 kHz
SID679A	$f_{IN\_GPIO\_ENH}$	Input frequency	–	–	100	MHz	–
SID680A	$f_{OUT\_GPIO\_ENH0H}$	Output frequency	–	–	50	MHz	20 pF load, drive_sel<1:0>= 0b00, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID681A	$f_{OUT\_GPIO\_ENH0L}$	Output frequency	–	–	32	MHz	20 pF load, drive_sel<1:0>= 0b00, 2.7 V ≤ V_{DDD} < 4.5 V
SID682A	$f_{OUT\_GPIO\_ENH1H}$	Output frequency	–	–	25	MHz	20 pF load, drive_sel<1:0>= 0b01, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID683A	$f_{OUT\_GPIO\_ENH1L}$	Output frequency	–	–	15	MHz	20 pF load, drive_sel<1:0>= 0b01, 2.7 V ≤ V_{DDD} < 4.5 V
SID684A	$f_{OUT\_GPIO\_ENH2H}$	Output frequency	–	–	25	MHz	10 pF load, drive_sel<1:0>= 0b10, 4.5 V ≤ V_{DDD} ≤ 5.5 V
SID685A	$f_{OUT\_GPIO\_ENH2L}$	Output frequency	–	–	15	MHz	10 pF load, drive_sel<1:0>= 0b10, 2.7 V ≤ V_{DDD} < 4.5 V
SID686A	$f_{OUT\_GPIO\_ENH3H}$	Output frequency	–	–	15	MHz	6 pF load, drive_sel<1:0>= 0b11, 4.5 V ≤ V_{DDD} ≤ 5.5 V

表 33 I/O 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID687A	$f_{OUT\_GPIO\_ENH3L}$	Output frequency	–	–	10	MHz	6 pF load, drive_sel<1:0>= 0b11, 2.7 V ≤ V_{DDD} < 4.5 V
HSIO Specification for ports P24 through P27							
SID651B	$V_{OL\_HB\_HSSPI}$	Output LOW voltage	–	–	0.2	V	I_{OL} = 0.1 mA, drive_sel<1:0> = 0b00
SID652B	V_{OL_eMMC}	Output LOW voltage	–	–	0.125 × $V_{DDIO\_3/4}$	V	I_{OL} = 0.1 mA, drive_sel<1:0> = 0b00
SID653B	V_{OL_SD}	Output LOW voltage	–	–	0.125 × $V_{DDIO\_3/4}$	V	I_{OL} = 2 mA, drive_sel<1:0> = 0b00
SID654B	V_{OL1}	Output LOW voltage	–	–	0.4	V	I_{OL} = 10 mA, drive_sel<1:0> = 0b00, $V_{DDIO\_3/4}$ = 2.7 V
SID655B	V_{OL2}	Output LOW voltage	–	–	0.4	V	I_{OL} = 2 mA, drive_sel<1:0> = 0b01, $V_{DDIO\_3/4}$ = 2.7 V
SID656B	V_{OL3}	Output LOW voltage	–	–	0.4	V	I_{OL} = 1 mA, drive_sel<1:0> = 0b10, $V_{DDIO\_3/4}$ = 2.7 V
SID656E	V_{OL4}	Output LOW voltage	–	–	0.4	V	I_{OL} = 0.5 mA, drive_sel<1:0> = 0b11, $V_{DDIO\_3/4}$ = 2.7 V
SID658B	$V_{OH\_HB\_HSSPI}$	Output HIGH voltage	$V_{DDIO\_3/4}$ – 0.2	–	–	V	I_{OH} = –0.1 mA drive_sel<1:0> = 0b00
SID659B	V_{OH_eMMC}	Output HIGH voltage	$V_{DDIO\_3/4}$ – (0.25 × $V_{DDIO\_3/4}$)	–	–	V	I_{OH} = –0.1 mA drive_sel<1:0> = 0b00
SID660B	V_{OH_SD}	Output HIGH voltage	$V_{DDIO\_3/4}$ – (0.25 × $V_{DDIO\_3/4}$)	–	–	V	I_{OH} = –2 mA drive_sel<1:0> = 0b00
SID661B	V_{OH1}	Output HIGH voltage	$V_{DDIO\_3/4}$ – 0.5	–	–	V	I_{OH} = –10 mA drive_sel<1:0> = 0b00, $V_{DDIO\_3/4}$ = 2.7 V
SID662B	V_{OH2}	Output HIGH voltage	$V_{DDIO\_3/4}$ – 0.5	–	–	V	I_{OH} = –2 mA drive_sel<1:0> = 0b01, $V_{DDIO\_3/4}$ = 2.7 V
SID663B	V_{OH3}	Output HIGH voltage	$V_{DDIO\_3/4}$ – 0.5	–	–	V	I_{OH} = –1 mA drive_sel<1:0> = 0b10, $V_{DDIO\_3/4}$ = 2.7 V
SID663E	V_{OH3}	Output HIGH voltage	$V_{DDIO\_3/4}$ – 0.5	–	–	V	I_{OH} = –0.5 mA drive_sel<1:0> = 0b11, $V_{DDIO\_3/4}$ = 2.7 V
SID664B	R_{PD}	Pull-down resistance	25	50	100	kΩ	–
SID665B	R_{PU}	Pull-up resistance	25	50	100	kΩ	–
SID666B	V_{IH_CMOS}	Input HIGH voltage for HYPERBUS™ and HSSPI in CMOS mode	0.7 × $V_{DDIO\_3/4}$	–	–	V	vtrip_sel<1:0>=0b00
SID667B	V_{IH_RGMII}	Input HIGH voltage for RGMII in CMOS mode	0.8 × $V_{DDIO\_3/4}$	–	–	V	vtrip_sel<1:0>=0b00
SID668E	V_{IH_TTL}	Input Voltage HIGH threshold for TTL mode	2	–	–	V	vtrip_sel<1:0>=0b01
SID668B	V_{IH_GMII}	Input HIGH voltage for GMII mode	1.7	–	–	V	vtrip_sel<1:0> = 0b11

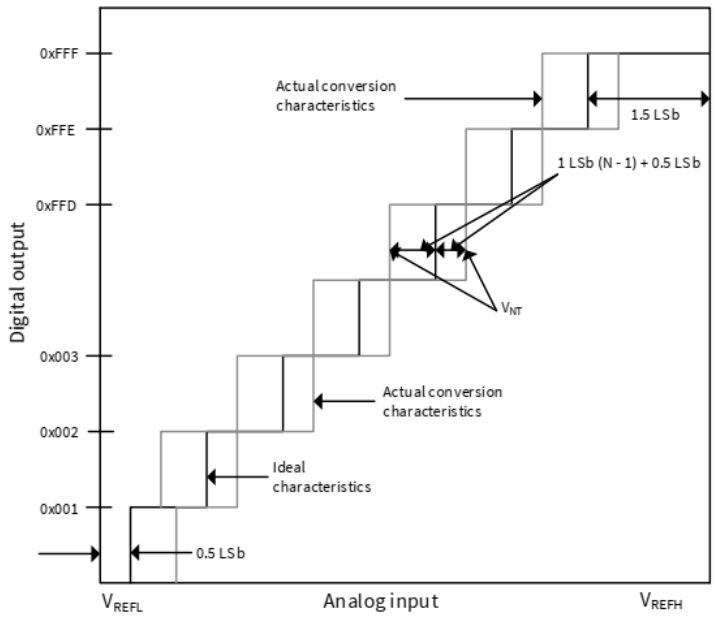
表 33 I/O 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID669B	$V_{IH\_SD\_eMMC}$	Input HIGH voltage for SD and eMMC in CMOS mode	0.625 × $V_{DDIO\_3/4}$	–	–	V	vtrip_sel<1:0>=0b00
SID669E	V_{IH_AUTO}	Input Voltage HIGH threshold in AUTO mode	0.8 × $V_{DDIO\_3/4}$	–	–	V	vtrip_sel<1:0>=0b10
SID670B	V_{IL_CMOS}	Input LOW voltage for HYPERBUS™ and HSSPI in CMOS mode	–	–	0.3 × $V_{DDIO\_3/4}$	V	vtrip_sel<1:0>=0b00
SID671B	V_{IL_RGMII}	Input LOW voltage for RGMII in CMOS mode	–	–	0.2 × $V_{DDIO\_3/4}$	V	vtrip_sel<1:0>=0b00
SID672E	V_{IL_TTL}	Input Voltage LOW threshold for TTL mode	–	–	0.8	V	vtrip_sel<1:0>=0b01
SID672B	V_{IL_GMII}	Input LOW voltage for GMII mode	–	–	0.9	V	vtrip_sel<1:0> = 0b11
SID673B	$V_{IL\_SD\_eMMC}$	Input LOW voltage for SD and eMMC in CMOS mode	–	–	0.25 × $V_{DDIO\_3/4}$	V	vtrip_sel<1:0>=0b00
SID673E	V_{IL_AUTO}	Input Voltage LOW threshold in AUTO mode	–	–	0.5 × $V_{DDIO\_3/4}$	V	vtrip_sel<1:0>=0b10
SID674B	V_{HYST_CMOS}	Hysteresis in CMOS mode	0.05 × $V_{DDIO\_3/4}$	–	–	V	vtrip_sel<1:0>=0b00
SID674F	V_{HYST_AUTO}	Hysteresis in AUTO mode	0.05 × V_{DDIO_3}	–	–	V	vtrip_sel<1:0>=0b10
SID675B	C_{IN}	Input pin capacitance	–	–	5	pF	For 10 MHz and 100 MHz
SID676B	I_{IL}	Input leakage current	–450	1.02	450	nA	$V_{DDIO\_3/4}$ = 3.6 V, $V_{SSIO\_3/4} < V_I < V_{DDIO\_3/4}$ –40 °C ≤ T_A ≤ 125 °C Typ: T_A = 25 °C, $V_{DDIO\_3/4}$ = 3.3 V
SID678B	f_{IN_RGMII}	Input frequency	–	–	125	MHz	–
SID679B	$f_{IN\_HB\_HSSPI}$	Input frequency	–	–	100	MHz	–
SID680B	f_{IN_eMMC}	Input frequency	–	–	52	MHz	–
SID681B	f_{IN_SD}	Input frequency	–	–	50	MHz	–
SID682B	f_{OUT_RGMII}	Output frequency	–	–	125	MHz	–
SID683B	$f_{OUT\_HB\_HSSPI}$	Output frequency	–	–	100	MHz	–
SID684B	f_{OUT_eMMC}	Output frequency	–	–	52	MHz	–
SID685B	f_{OUT_SD}	Output frequency	–	–	50	MHz	–
GPIO input specifications							
SID98	t_{FT}	Analog glitch filter (pulse suppression width)	–	–	50[50]	ns	One filter per port
SID99	t_{INT}	Minimum pulse width for GPIO interrupt	160	–	–	ns	–

注释：
50. 如果需要更长的脉冲抑制宽度，请使用Samrt I/O。

26.6 模拟外设

26.6.1 SAR ADC



Total error of digital output N = (V_{NT} {1 LSb × (N – 1) + 0.5 LSb}) / 1 LSb [LSb]

1 LSb (Ideal value) = (V_{REFH} – V_{REFL}) / 4096 [V]

N: A/D converter digital output value
V_{ZT} (Ideal value): V_{REFL} + 0.5 LSb [V]
V_{FST} (Ideal value): V_{REFH} – 1.5 LSb [V]
V_{NT}: Voltage at which the digital output changes from N – 1 to N

图 13 ADC特性及误差描述

表 34 12 位 SAR ADC DC规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID100	A_RES	SAR ADC resolution	–	–	12	bits	–
SID101	A_V_{INS}	Input voltage range	V_{REFL}	–	V_{REFH}	V	–
SID102A	A_V_{DDA}[51]	V_{DDA} voltage range	2.7	–	5.5	V	–
SID102	A_V_{REFH}	V_{REFH} voltage range	2.7	–	V_{DDA}	V	ADC performance degrades when high reference is higher than supply (V_{DDA})
SID103	A_V_{REFL}	V_{REFL} voltage range	V_{SSA}	–	V_{SSA}	V	ADC performance degrades when low reference is lower than ground

注释：
51. 当 ADC[2] 启用时， V_{DDD} 必须大于 0.8 × V_{DDA}。 当 ADC[0] 启用时， V_{DDIO_1} 必须大于 0.8 × V_{DDA}。

表 34　　12 位 SAR ADC DC规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID103A	V_{band_gap}	Internal band gap reference voltage	0.882	0.9	0.918	V	–
SID19A	CLAMP_COUPLING_RATIO_POS	Ratio of current collected on a pin to the positive current injected into a neigh-boring pin	–	–	0.1	%	–
SID19B	CLAMP_COUPLING_RATIO_NEG	Ratio of current collected on a pin to the negative current injected into a neigh-boring pin	–	–	1.2	%	–
SID19C	$R_{CLAMP\_INTERNAL}$	Internal pin resistance to current collection point	–	–	50	Ω	–

26.6.2　　计算相邻引脚的影响

基于SID19A、SID19B和SID19C的三个ADC规格可用于计算引脚泄漏以及注入电流引起的ADC偏移，公式如下：

$I_{LEAK} = I_{INJECTED} \times CLAMP\_COUPLING\_RATIO$

$V_{ERROR} = I_{LEAK} \times (R_{CLAMP\_INTERNAL} + R_{SOURCE})$

$Code\ Error = V_{ERROR} \times 2^{12} / V_{REF}$

其中：

$I_{INJECTED}$是注入电流（以 mA 为单位）。

I_{LEAK}是计算出的漏电流（以 mA 为单位）。

V_{ERROR}是由于 V 中的漏电流而计算出的电压误差。

V_{REF}是 ADC 参考电压，单位为 V。

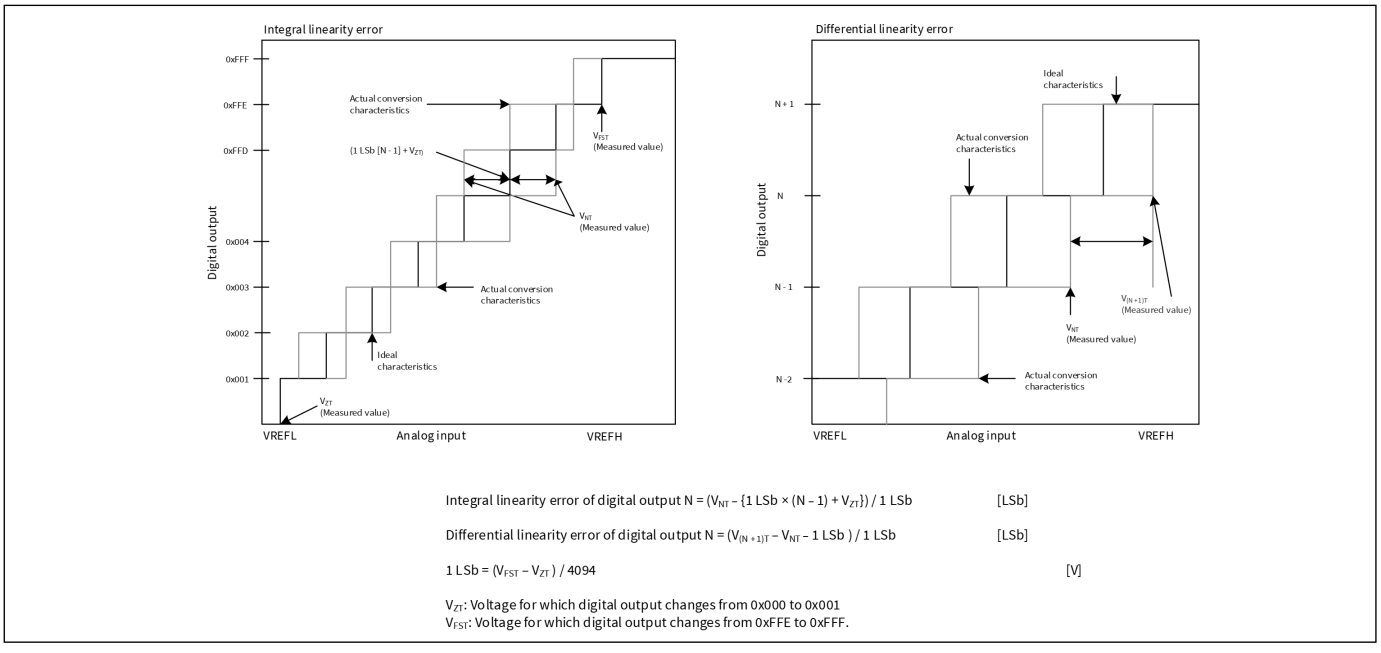
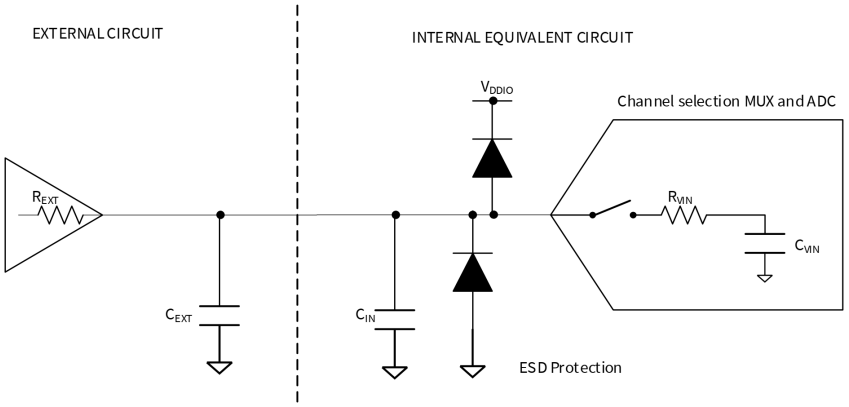


图 14　　积分和微分线性误差



R_{EXT}: Source impedance
C_{EXT}: On-PCB capacitance
C_{IN}: I/O pad or Input capacitance
R_{VIN}: ADC equivalent input resistance
C_{VIN}: ADC equivalent input capacitance
K: Constant for sampling accuracy, $K = \ln(\text{abs}(4096/LSb_{SAMPLE}))$

Sampling Time (t_{SAMPLE}) requirement is shown in the following equation
$t_{SAMPLE} > K \times \{ C_{VIN} \times (R_{VIN} + R_{EXT}) + (C_{IN} + C_{EXT}) \times (R_{EXT}) \}$ [seconds]

K = value of 9.0 is recommended to get ±0.5 LSb sampling accuracy at 12-bit (LSb_{SAMPLE} = ±0.5)

图 15　　ADC模拟输入等效电路

表 35　　SAR ADC 交流规格

Spec ID	Parameter	Description	Min	Typ	Max	Units	Details/conditions
SID104	V_{ZT}	Zero transition voltage	–20	–	20	mV	V_{DDA} = 2.7 V to 5.5 V, –40 °C ≤ T_A ≤ 125 °C before offset adjustment
SID105	V_{FST}	Full-scale transition voltage	–20	–	20	mV	V_{DDA} = 2.7 V to 5.5 V, –40 °C ≤ T_A ≤ 125 °C before offset adjustment
SID114	f_{ADC_4P5}	ADC operating frequency	2	–	26.67	MHz	4.5 V ≤ V_{DDA} ≤ 5.5 V
SID114A	f_{ADC_2P7}	ADC operating frequency	2	–	13.34	MHz	2.7 V ≤ V_{DDA} ≤ 4.5 V
SID113	t_{S_4P5}	Analog input sample time for channels of own SARMUX (4.5 V ≤ V_{DDA})	412	–	–	ns	4.5 V ≤ V_{DDA} ≤ 5.5 V, guaranteed by design
SID113A	t_{S_2P7}	Analog input sample time for channels of own SARMUX(2.7 V ≤ V_{DDA})	600	–	–	ns	2.7 V ≤ V_{DDA} ≤ 4.5 V, guaranteed by design
SID113B	$t_{S\_DR\_4P5}$	Analog input sample time when input is from diagnostic reference (4.5 V ≤ V_{DDA})	2	–	–	µs	4.5 V ≤ V_{DDA} ≤ 5.5 V, guaranteed by design
SID113C	$t_{S\_DR\_2P7}$	Analog input sample time when input is from diagnostic reference (2.7 V ≤ V_{DDA})	2.5	–	–	µs	2.7 V ≤ V_{DDA} ≤ 4.5 V, guaranteed by design
SID113D	t_{S_TS}	Analog input sample time for temperature sensor	7	–	–	µs	2.7V ≤ VDDA < 4.5 V guaranteed by design

表 35 SAR ADC 交流规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Units	Details/conditions
SID113E	$t_{S\_4P5\_A}$	Analog input sample time for channels of another SARMUXn (n=1,2)	824	–	–	ns	4.5 V ≤ VDDA ≤ 5.5 V When ADC0 borrows the SARMUX of another ADC, guaranteed by design
SID113F	$t_{S\_2P7\_A}$	Analog input sample time for channels of another SARMUXn (n=1,2)	1648	–	–	ns	2.7 V ≤ VDDA < 4.5 V When ADC0 borrows the SARMUX of another ADC, guaranteed by design
SID106	t_{ST_4P5}	ADC max throughput (samples per second) when using the SARMUX of own ADC	–	–	1	Msps	4.5 V ≤ V_{DDA} ≤ 5.5 V, 3.0 V ≤VDDA≤ 5.5 V for –40 °C ≤ TA≤ 105 °C. 80 MHz / 3 = 26.67 MHz, 11 sampling cycles, 15 conversion cycles
SID106A	t_{ST_2P7}	ADC max throughput (samples per second) when using the SARMUX of own ADC	–	–	0.5	Msps	2.7 V ≤ V_{DDA} < 4.5 V 80 MHz / 6 = 13.3 MHz, 11 sampling cycles, 15 conversion cycles
SID106B	tST_4P5_A	ADC0 max throughput (samples per second) when borrowing the SARMUXn of another ADC (n=1,2)	–	–	0.5	Msps	4.5 V ≤ VDDA ≤ 5.5 V, 3.0 V ≤VDDA ≤ 5.5 V for –40°C ≤ TA≤ 105°C 80 MHz/6 = 13.3 MHz, 11 sampling cycles, 15 conversion cycles
SID106C	tST_2P7_A	ADC0 max throughput (samples per second) when borrowing the SARMUXn of another ADC (n=1,2)	–	–	0.25	Msps	2.7 V ≤ VDDA < 4.5 V, 80 MHz / 12 = 6.67 MHz, 11 sampling cycles, 15 conversion cycles
SID107	C_{VIN}	ADC input sampling capacitance	–	–	4.8	pF	Guaranteed by design
SID108	R_{VIN1}	Input path ON resistance (4.5 V to 5.5 V)	–	–	9.4	kΩ	Guaranteed by design
SID108A	R_{VIN2}	Input path ON resistance (2.7 V to 4.5 V)	–	–	13.9	kΩ	Guaranteed by design
SID108B	R_{DREF1}	Diagnostic path ON resistance (4.5 V to 5.5 V)	–	–	40	kΩ	Guaranteed by design
SID108C	R_{DREF2}	Diagnostic path ON resistance (2.7 V to 4.5 V)	–	–	50	kΩ	Guaranteed by design
SID119	ACC_RLAD	Diagnostic reference resistor ladder accuracy	–4	–	4	%	–
SID109	A_TE	Total error	–5	–	5	LSb	VDDA = VREFH = 2.7 V to 5.5 V, VREFL = VSSA –40°C ≤ T_A ≤ 125°C Total Error after offset and gain adjustment at 12-bit resolution mode
SID109A	A_TEB	Total error	–12	–	12	LSb	VDDA = VREFH = 2.7 V to 5.5 V, VREFL = VSSA –40°C ≤ T_A ≤ 125°C Total error before offset and gain adjustment at 12 bit resolution mode
SID110	A_INL	Integral nonlinearity	–2.5	–	2.5	LSb	V_{DDA} = 2.7 V to 5.5 V, –40°C ≤ T_A ≤ 125°C

表 35 SAR ADC 交流规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Units	Details/conditions
SID111	A_DNL	Differential nonlinearity	–0.99	–	1.9	LSb	V_{DDA} = 2.7 V to 5.5 V, –40 °C ≤ T_A ≤ 125 °C
SID112	A_CE	Channel to channel variation (for channels connected to same ADC)	–1	–	1	LSb	V_{DDA} = 2.7 V to 5.5 V, –40°C ≤ T_A ≤ 125°C
SID115	I_{AIC}	Analog input leakage current	–350	70	350	nA	When input pad is selected for conversion
SID116	$I_{DIAGREF}$	Diagnostic reference current	–	–	70	µA	–
SID117	I_{VDDA}	Analog power supply current while ADC is operating	–	360	550	µA	Per enabled ADC
SID117A	I_{VDDA_DS}	Analog power supply current while ADC is not operating	–	1	21	µA	Per enabled ADC
SID118	I_{VREF}	Analog reference voltage current while ADC is operating	–	360	550	µA	Per enabled ADC
SID118A	I_{VREF_LEAK}	Analog reference voltage current while ADC is not operating	–	1.8	5	µA	Per enabled ADC

26.6.3 温度传感器

表 36 温度传感器规格

Spec ID	Parameter	Description	Min	Typ	Max	Units	Details/conditions
SID201	TSENSACC2	Temperature sensor accuracy 2	–5	–	5	°C	–40°C ≤ T_J < 150°C This spec is valid when using ADC[0] (V_{DDIO_1}), ADC[1] (V_{DDIO_2}) or ADC[2] (V_{DDD}) with the following conditions: a. 3.0 V ≤ V_{DDD}, V_{DDIO_1} or V_{DDIO_2} = V_{DDA} = V_{REFH} ≤ 3.6 V or b. 4.5 V ≤ V_{DDD}, V_{DDIO_1} or V_{DDIO_2} = V_{DDA} = V_{REFH} ≤ 5.5 V
SID201A	TSENSACC3	Temperature sensor accuracy 3	–10	–	10	°C	–40°C ≤ T_J ≤ 150°C This spec is valid when using ADC[0] (V_{DDIO_1}) or ADC[2] (V_{DDD}) with the following condition: 2.7 V ≤ V_{DDD} or V_{DDIO_1} ≤ 5.5 V and 2.7 V ≤ V_{DDA} = V_{REFH} ≤ 5.5 V and 0.8 × V_{DDA} < V_{DDD} or V_{DDIO_1}

26.6.4 分压器精度

表 37 分压器精度

Spec ID	Parameter	Description	Min	Typ	Max	Units	Details/conditions
SID202	V_{MONDIV}	Uncorrected monitor voltage divider accuracy (measured by ADC), compared to ideal supply/2	–20	2	20	%	Any HV supply pad within 2.7 V–5.5 V operating range

26.7 交流规格

除非另有说明，时序均按照图 16 中提到的指导原则定义。

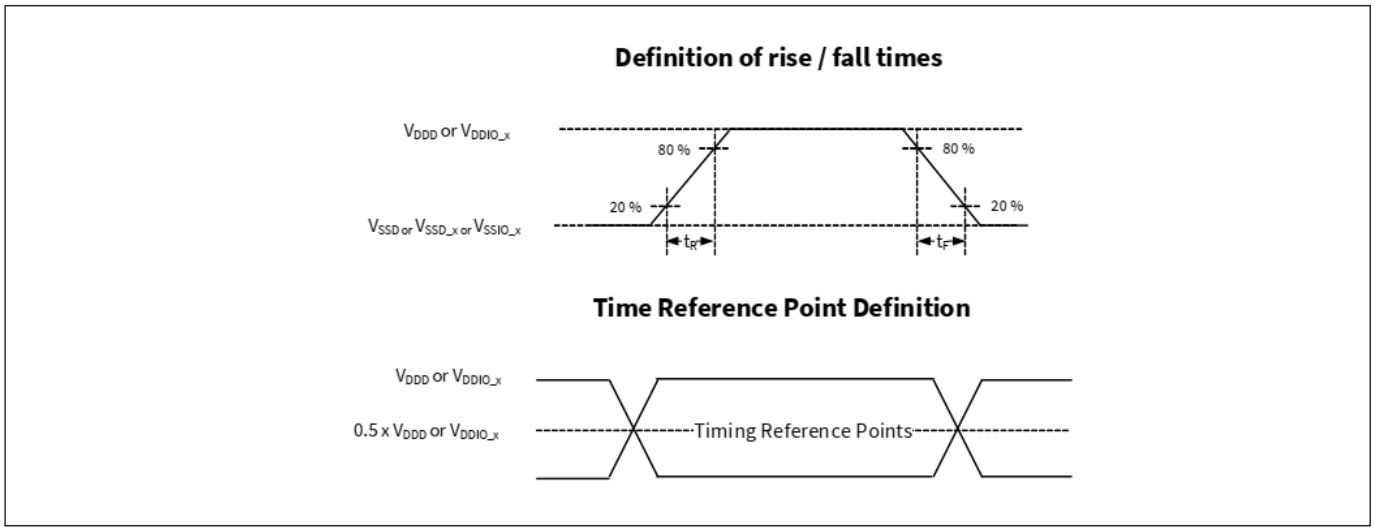


图 16 交流时序规格

26.8 数字外设

表 38 定时器/计数器/PWM（TCPWM）规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID120	f_C	TCPWM operating frequency	–	–	100	MHz	f_C = peripheral clock
SID121	$t_{PWMENEXT}$	Input trigger pulse width for all trigger events	2 / f_C	–	–	ns	Trigger Events can be Stop, Start, Reload, Count, Capture, or Kill depending on which mode of operation is selected.
SID122	t_{PWMEXT}	Output trigger pulse widths	2 / f_C	–	–	ns	Minimum possible width of Overflow, Underflow, and Counter = Compare (CC) value trigger outputs
SID123	t_{CRES}	Resolution of counter	1 / f_C	–	–	ns	Minimum time between successive counts
SID124	t_{PWMRES}	PWM resolution	1 / f_C	–	–	ns	Minimum pulse width of PWM output
SID125	t_{QRES}	Quadrature inputs resolution	2 / f_C	–	–	ns	Minimum pulse width between Quadrature phase inputs.

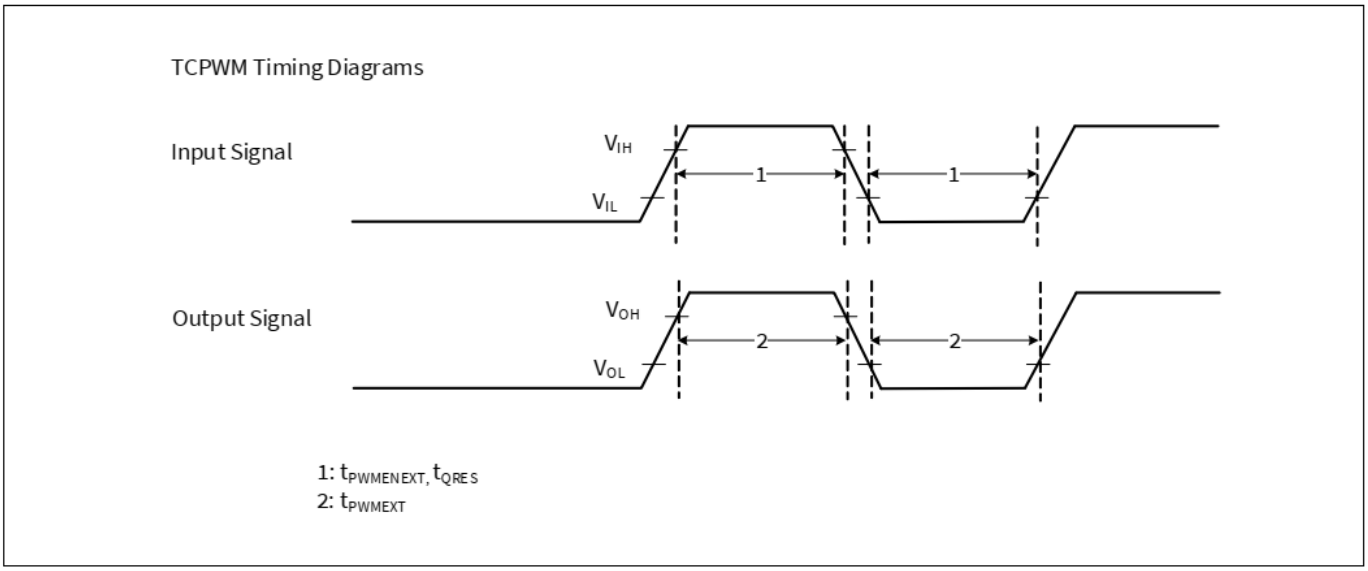


图 17 TCPWM 时序图

表 39　　串行通信模块 (SCB) 规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID129	f_{SCB}	SCB operating frequency	–	–	100	MHz	–
I²C Interface-Standard-mode							
SID130	f_{SCL}	SCL clock frequency	–	–	100	kHz	–
SID131	$t_{HD;STA}$	Hold time, START condition	4000	–	–	ns	–
SID132	t_{LOW}	Low period of SCL	4700	–	–	ns	–
SID133	t_{HIGH}	High period of SCL	4000	–	–	ns	–
SID134	$t_{SU;STA}$	Setup time for a repeated START	4700	–	–	ns	–
SID135	$t_{HD;DAT}$	Data hold time, for receiver	0	–	–	ns	–
SID136	$t_{SU;DAT}$	Data setup time	250	–	–	ns	–
SID138	t_F	Fall time of SCL and SDA	–	–	300	ns	Input and output
SID139	$t_{SU;STO}$	Setup time for STOP	4000	–	–	ns	–
SID140	t_{BUF}	Bus-free time between START and STOP	4700	–	–	ns	–
SID141	C_B	Capacitive load for each bus line	–	–	400	pF	–
SID142	$t_{VD;DAT}$	Time for data signal from SCL LOW to SDA output	–	–	3450	ns	–
SID143	$t_{VD;ACK}$	Data valid acknowledge time	–	–	3450	ns	–
SID144	V_{OL}	LOW level output voltage	0	–	0.4	V	Open-drain at 3 mA sink current
SID145	I_{OL}	LOW level output current	3	–	–	mA	V_{OL} = 0.4 V
I²C Interface-Fast-mode							
SID150	f_{SCL_F}	SCL clock frequency	–	–	400	kHz	–
SID151	$t_{HD;STA\_F}$	Hold time, START condition	600	–	–	ns	–
SID152	t_{LOW_F}	Low period of SCL	1300	–	–	ns	–
SID153	t_{HIGH_F}	High period of SCL	600	–	–	ns	–
SID154	$t_{SU;STA\_F}$	Setup time for a repeated START	600	–	–	ns	–
SID155	$t_{HD;DAT\_F}$	Data hold time, for receiver	0	–	–	ns	–
SID156	$t_{SU;DAT\_F}$	Data setup time	100	–	–	ns	–
SID158	t_{F_F}	Fall time of SCL and SDA	20 × (V_{DDD} / 5.5)	–	300	ns	Input and output, GPIO_ENH: slow mode, 400 pF load
SID158A	t_{FA_F}	Fall time of SCL and SDA	0.35	–	300	ns	Input and output GPIO_STD: drive_sel<1:0>= 0b00 MIN: 10 pF load, RPU = 35.41 kΩ Max: 400 pF load, RPU = 350 Ω
SID159	$t_{SU;STO\_F}$	Setup time for STOP	600	–	–	ns	Input and output
SID160	t_{BUF_F}	Bus free time between START and STOP	1300	–	–	ns	–
SID161	C_{B_F}	Capacitive load for each bus line	–	–	400	pF	–

注释

52. 为了以 400 kHz 的频率驱动满总线负载， 在 0.6 VV $_{OL}$ 时需要 6 mA I OL 。
53. 为了以 1 MHz 的频率驱动满总线负载， 在 0.4 VV $_{OL}$ 时需要 20 mA I OL 。但是，该器件不支持它。

表 39　　串行通信模块 (SCB) 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID162	$t_{VD;DAT\_F}$	Time for data signal from SCL LOW to SDA output	–	–	900	ns	–
SID163	$t_{VD;ACK\_F}$	Data valid acknowledge time	–	–	900	ns	–
SID164	t_{SP_F}	Pulse width of spikes that must be suppressed by the input filter	–	–	50	ns	–
SID165	V_{OL_F}	LOW level output voltage	0	–	0.4	V	Open-drain at 3 mA sink current
SID166	I_{OL_F}	LOW level output current	3	–	–	mA	V_{OL} = 0.4 V
SID167	I_{OL2_F}	LOW level output current	6	–	–	mA	V_{OL} = 0.6 V[52]
I²C Interface-Fast-Plus mode							
SID170	f_{SCL_FP}	SCL clock frequency	–	–	1	MHz	–
SID171	$t_{HD;STA\_FP}$	Hold time, START condition	260	–	–	ns	–
SID172	t_{LOW_FP}	Low period of SCL	500	–	–	ns	–
SID173	t_{HIGH_FP}	High period of SCL	260	–	–	ns	–
SID174	$t_{SU;STA\_FP}$	Setup time for a repeated START	260	–	–	ns	–
SID175	$t_{HD;DAT\_FP}$	Data hold time, for receiver	0	–	–	ns	–
SID176	$t_{SU;DAT\_FP}$	Data setup time	50	–	–	ns	–
SID178	t_{F_FP}	Fall time of SCL and SDA	20 × (V_{DDD} / 5.5)	–	160	ns	Input and output 20-pF load GPIO_ENH: slow mode
SID179	$t_{SU;STO\_FP}$	Setup time for STOP	260	–	–	ns	Input and output
SID180	t_{BUF_FP}	Bus free time between START and STOP	500	–	–	ns	–
SID181	C_{B_FP}	Capacitive load for each bus line	–	–	20	pF	–
SID182	$t_{VD;DAT\_FP}$	Time for data signal from SCL LOW to SDA output	–	–	450	ns	–
SID183	$t_{VD;ACK\_FP}$	Data valid acknowledge time	–	–	450	ns	–
SID184	t_{SP_FP}	Pulse width of spikes that must be suppressed by the input filter	–	–	50	ns	–
SID186	V_{OL_FP}	LOW level output voltage	0	–	0.4	V	Open-drain at 3 mA sink current
SID187	I_{OL_FP}	LOW level output current	3[53]	–	–	mA	V_{OL} = 0.4 V[53]
SPI Interface Master (Full-clock mode: LATE_MISO_SAMPLE = 1) [Conditions: drive_sel<1:0>= 0x]							
SID190	f_{SPI}	SPI operating frequency	–	–	12.5	MHz	Do not use half-clock mode: LATE_MISO_SAMPLE = 0
SID191	t_{DMO}	SPI Master: MOSI valid after SCLK driving edge	–	–	15	ns	–
SID192	t_{DSI}	SPI Master: MISO valid before SCLK capturing edge	40	–	–	ns	–
SID193	t_{HMO}	SPI Master: Previous MOSI data hold time	0	–	–	ns	–

注释

52. 为了以 400 kHz 驱动满总线负载， 在 0.6 V V_{OL} 时需要 6 mA I_{OL}。
53. 为了以 1 MHz 的频率驱动满总线负载， 在 0.4 VV_{OL} 时需要 20 mA I_{OL} 。但是，该器件不支持它。

表 39　　串行通信模块 (SCB) 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID193A	t_{HMOA}	SPI Master: Previous MOSI data hold time	–3.5	–	–	ns	Only for SCB4_MOSI/P0.3 and SCB4_CLK/P1.0
SID196	t_{DHI}	SPI Master: MISO hold time after SCLK capturing edge	0	–	–	ns	–
SID198	t_{EN_SETUP}	SSEL valid, before the first SCK capturing edge	0.5 × (1/f_{SPI})	–	–	ns	Min is half clock period
SID199	t_{EN_SHOLD}	SSEL hold, after the last SCK capturing edge	0.5 × (1/f_{SPI})	–	–	ns	Min is half clock period
SID195	C_{SPIM_MS}	SPI capacitive load	–	–	10	pF	–
SPI Interface Slave (internally clocked) [Conditions: drive_sel<1:0>= 0x]							
SID205	f_{SPI_INT}	SPI operating frequency	–	–	10	MHz	–
SID206	t_{DMI_INT}	SPI Slave: MOSI Valid before Sclock capturing edge	5	–	–	ns	–
SID207	t_{DSO_INT}	SPI Slave: MISO Valid after Sclock driving edge, in the internal-clocked mode	–	–	62	ns	–
SID208	t_{HSP}	SPI Slave: Previous MISO data hold time	3	–	–	ns	–
SID209	$t_{EN\_SETUP\_INT}$	SPI Slave: SSEL valid to first SCK valid edge	33	–	–	ns	–
SID210	$t_{EN\_HOLD\_INT}$	SPI Slave Select active (LOW) from last SCLK hold	33	–	–	ns	–
SID211	$t_{EN\_SETUP\_PRE}$	SPI Slave: from SSEL valid, to SCK falling edge before the first data bit	20	–	–	ns	–
SID212	$t_{EN\_HOLD\_PRE}$	SPI Slave: from SCK falling edge before the first data bit, to SSEL invalid	20	–	–	ns	–
SID213	$t_{EN\_SETUP\_CO}$	SPI Slave: from SSEL valid, to SCK falling edge in the first data bit	20	–	–	ns	–
SID214	$t_{EN\_HOLD\_CO}$	SPI Slave: from SCK falling edge in the first data bit, to SSEL invalid	20	–	–	ns	–
SID215	$t_{W\_DIS\_INT}$	SPI Slave Select inactive time	40	–	–	ns	–
SID216	$t_{W\_SCLKH\_INT}$	SPI SCLK pulse width HIGH	20	–	–	ns	–
SID217	$t_{W\_SCLKL\_INT}$	SPI SCLK pulse width LOW	20	–	–	ns	–
SID218	t_{SIH_INT}	SPI MOSI hold from SCLK	12	–	–	ns	–
SID219	C_{SPIS_INT}	SPI Capacitive Load	–	–	10	pF	–
SPI Interface Slave (externally clocked) [Conditions: drive_sel<1:0>= 0x]							
SID220	f_{SPI_EXT}	SPI operating frequency	–	–	12.5	MHz	–
SID221	t_{DMI_EXT}	SPI Slave: MOSI Valid before Sclock capturing edge	5	–	–	ns	–
SID222	t_{DSO_EXT}	SPI Slave: MISO Valid after Sclock driving edge, in the external-clocked mode	–	–	32	ns	–

注释

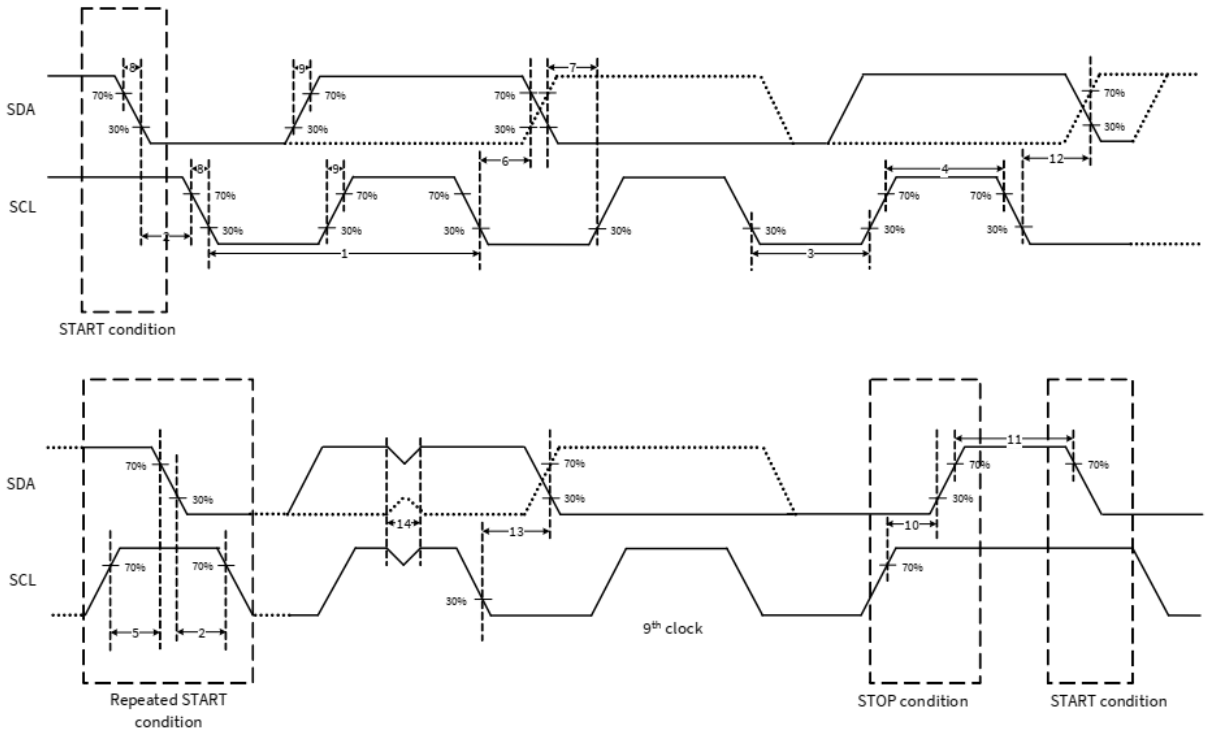
52. 为了以 400 kHz 驱动满总线负载， 在 0.6 V V_{OL} 时需要 6 mA I_{OL}。
53. 为了以 1 MHz 的频率驱动满总线负载， 在 0.4 VV_{OL} 时需要 20 mA I_{OL}。 但是，该器件不支持它。

表 39　　串行通信模块 (SCB) 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID223	t_{HSO_EXT}	SPI Slave: Previous MISO data hold time	3	–	–	ns	–
SID224	$t_{EN\_SETUP\_EXT}$	SPI Slave: SSEL valid to first SCK valid edge	40	–	–	ns	–
SID225	$t_{EN\_HOLD\_EXT}$	SPI Slave Select active (LOW) from last SCLK hold	40	–	–	ns	–
SID226	$t_{W\_DIS\_EXT}$	SPI Slave Select inactive time	80	–	–	ns	–
SID227	$t_{W\_SCLKH\_EXT}$	SPI SCLK pulse width HIGH	34	–	–	ns	–
SID228	$t_{W\_SCLKL\_EXT}$	SPI SCLK pulse width LOW	34	–	–	ns	–
SID229	t_{SIH_EXT}	SPI MOSI hold from SCLK	20	–	–	ns	–
SID230	C_{SPIS_EXT}	SPI Capacitive Load	–	–	10	pF	–
SID231	t_{VSS_EXT}	SPI Slave: MISO valid after SSEL falling edge (CPHA = 0)	–	–	33	ns	–
UART interfaces							
SID240	f_{BPS}	Data rate	–	–	10	Mbps	–

注：

52. 为了以 400 kHz 驱动满总线负载， 在 0.6 V V_{OL} 时需要 6 mA I_{OL}。
53. 为了以 1 MHz 的频率驱动满总线负载， 在 0.4 VV_{OL} 时需要 20 mA I_{OL}。 但是，该器件不支持它。



1: SCL clock period = $1/f_{SCL}$
2: Hold time, START condition = $t_{HD;STA}$
3: LOW period of SCL = t_{LOW}
4: HIGH period of SCL = t_{HIGH}
5: Setup time for a repeated START = $t_{SU;STA}$
6: Data hold time, for receiver = $t_{HD;DAT}$
7: Data setup time = $t_{SU;DAT}$
8: Fall time of SCL and SDA = t_F
9: Rise time of SCL and SDA = t_R
10: Setup time for STOP = $t_{SU;STO}$
11: Bus-free time between START and STOP = t_{BUF}
12: Time for data signal from SCL LOW to SDA output = $t_{VD;DAT}$
13: Data valid acknowledge time = $t_{VD;ACK}$
14: Pulse width of spikes that must be suppressed by the input filter = t_{SP}

图 18　　I² C 时序图

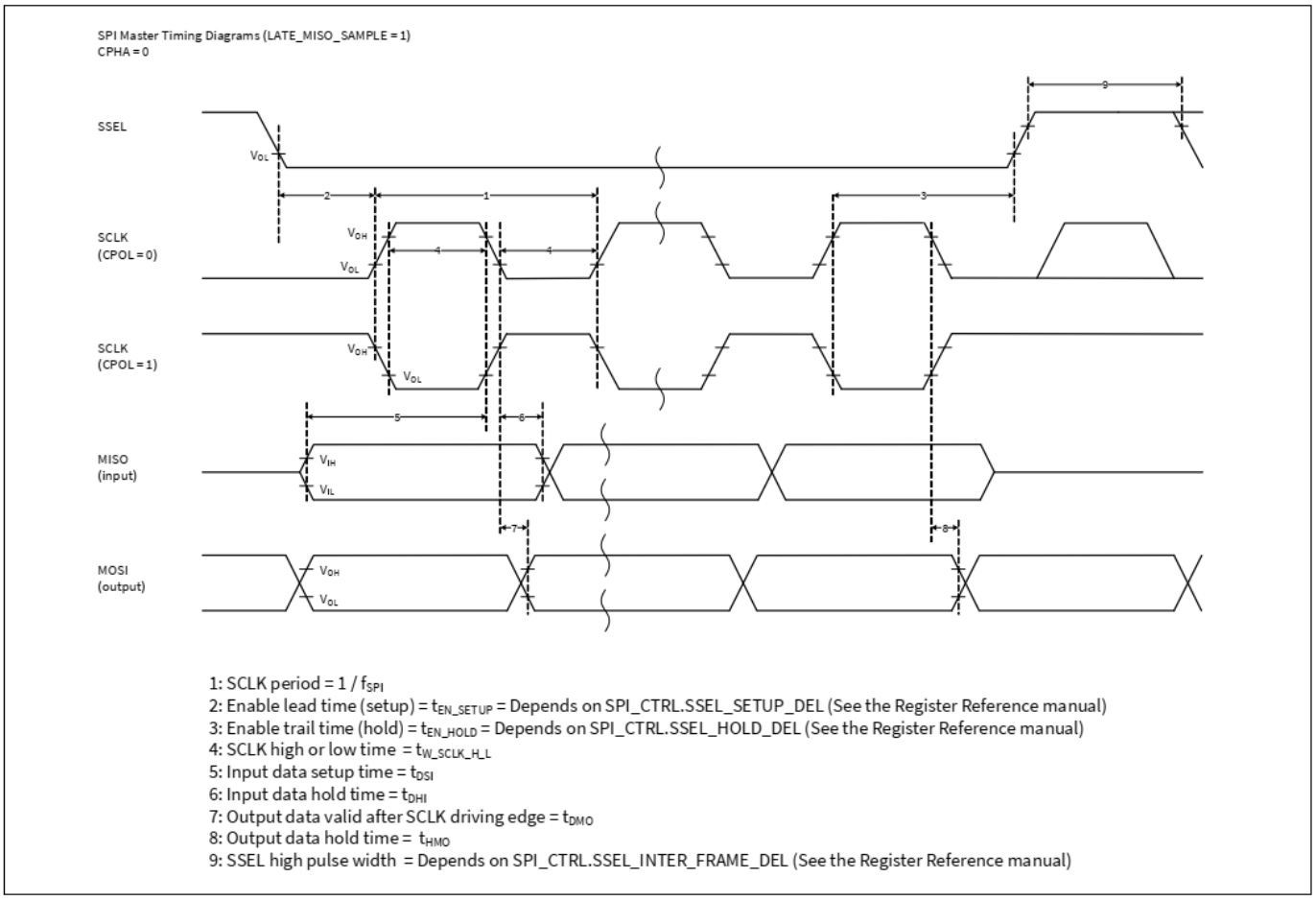


图 19　　SPI 主机时序图（低时钟相位）

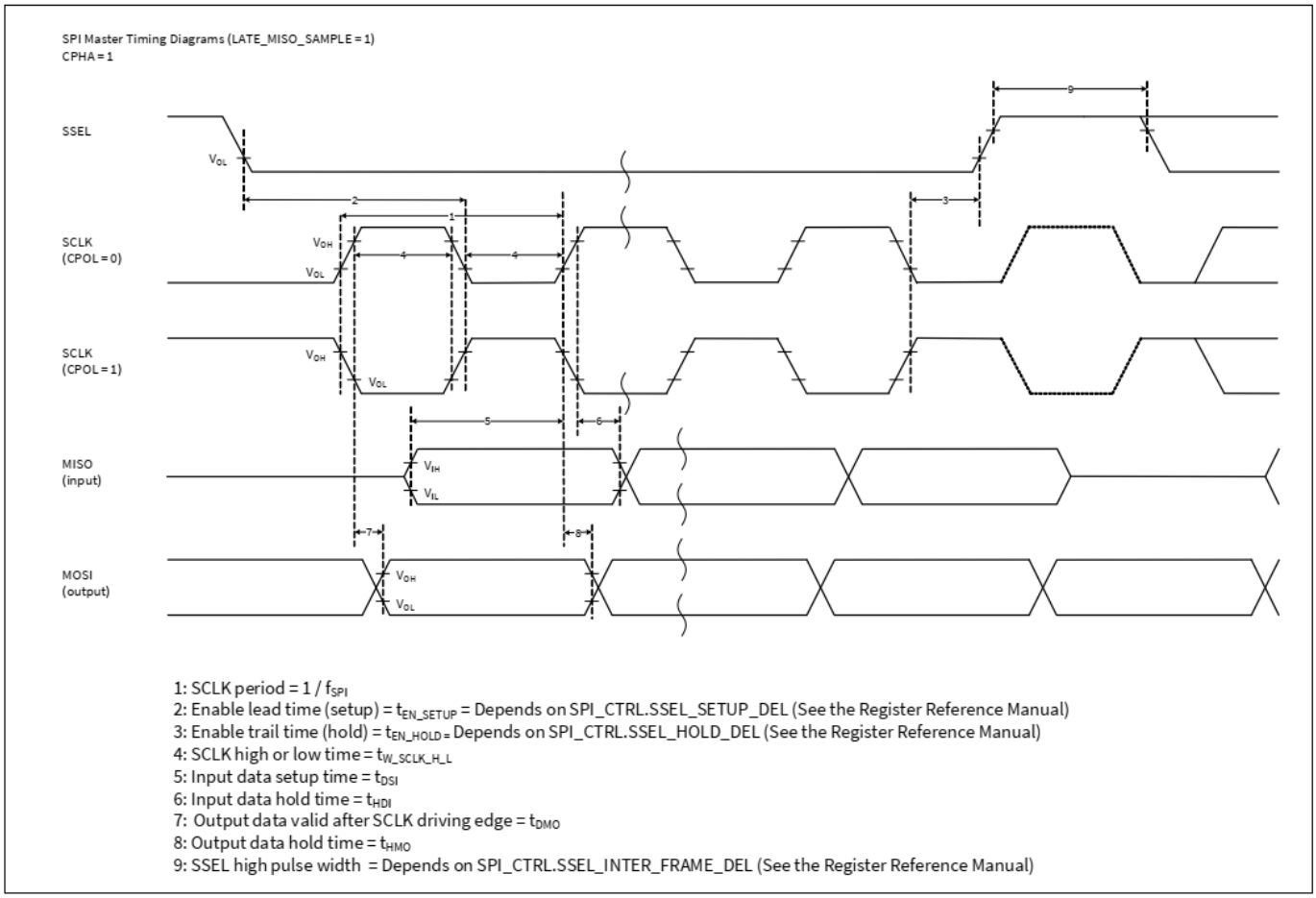


图 20　　SPI 主机时序图（高时钟相位）

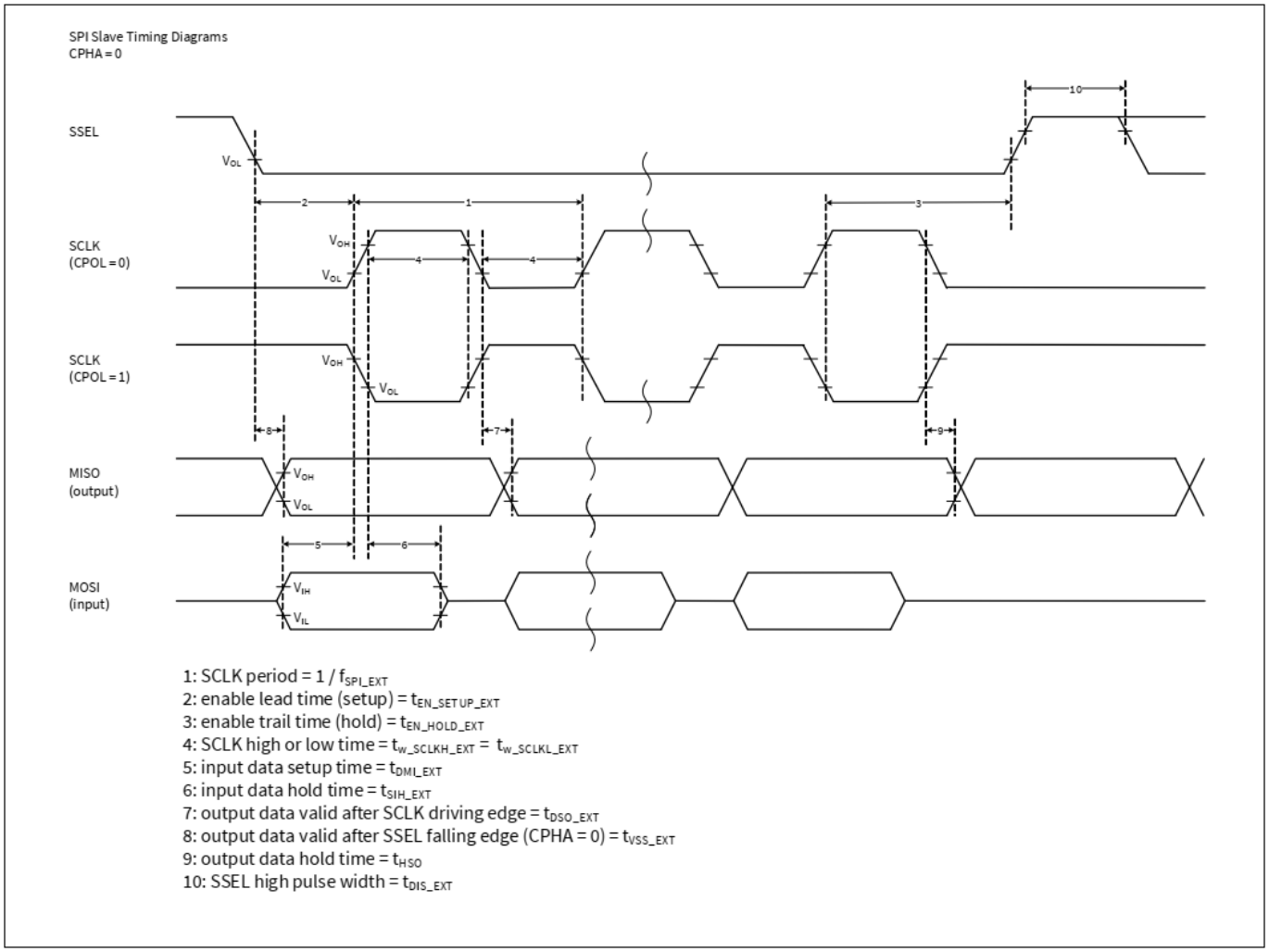


图 21　　SPI 从机时序图（低时钟相位）

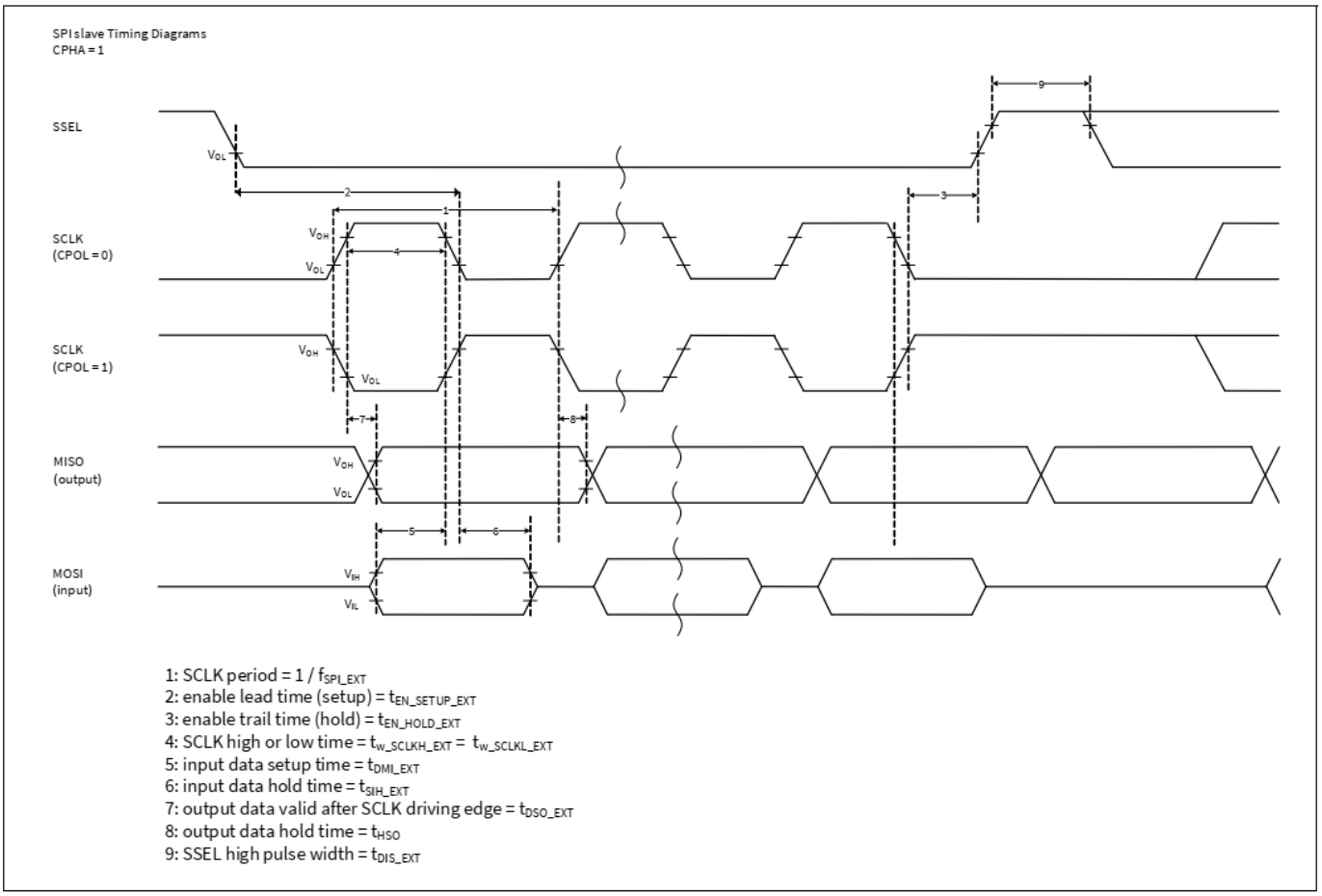


图 22　　SPI 从机时序图（高时钟相位）

表 40 CAN FD 规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID630	f_{HCLK}	System clock frequency	–	–	100	MHz	$f_{CCLK} \le f_{HCLK}$, guaranteed by design
SID631	f_{CCLK}	CAN clock frequency	–	–	100	MHz	$f_{CCLK} \le f_{HCLK}$, guaranteed by design

26.9 存储器

表 41 Flash 直流规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID260A	V_{PE}	Erase and program voltage	2.7	–	5.5	V	–

表 42 Flash 交流规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID257	f_{FO}	Maximum flash memory operation frequency	–	–	100	MHz	Zero wait access to code-flash memory up to 100 MHz Zero wait access with cache hit up to 350 MHz
SID254	t_{ERS_SUS}	Maximum time from erase suspend command till erase is indeed suspend	–	–	37.5	µs	–
SID255	$t_{ERS\_RES\_SUS}$	Minimum time allowed from erase resume to erase suspend	250	–	–	µs	Guaranteed by design
SID258	t_{BC_WF}	Blank check time for N-bytes of work-flash	–	–	10 + 0.3 × N	µs	At 100 MHz, N ≥ 4 and multiple of 4, excludes system overhead time
SID259	$t_{SECTORERASE1}$	Sector erase time (code-flash: 32 KB)	–	45	90	ms	Includes internal preprogramming time
SID260	$t_{SECTORERASE2}$	Sector erase time (code-flash: 8 KB)	–	15	30	ms	Includes internal preprogramming time
SID261	$t_{SECTORERASE3}$	Sector erase time (work-flash, 2 KB)	–	80	160	ms	Includes internal preprogramming time
SID262	$t_{SECTORERASE4}$	Sector erase time (work-flash, 128 B)	–	5	15	ms	Includes internal preprogramming time
SID263	t_{WRITE1}	64-bit write time (code-flash)	–	30	60	µs	Excludes system overhead time
SID264	t_{WRITE2}	256-bit write time (code-flash)	–	40	70	µs	Excludes system overhead time
SID265	t_{WRITE3}	4096-bit write time (code-flash)[54]	–	320	1200	µs	Excludes system overhead time
SID266	t_{WRITE4}	32-bit write time (work-flash)	–	30	60	µs	Excludes system overhead time
SID267	t_{FRET1}	Code-flash retention. 1000 program/erase cycles	20	–	–	years	T_A (power on and off) ≤ 85°C average
SID268	t_{FRET3}	Work-flash retention. 125,000 program/erase cycles	20	–	–	years	T_A (power on and off) ≤ 85°C average
SID269	t_{FRET4}	Work-flash retention. 250,000 program/erase cycles	10	–	–	years	T_A (power on and off) ≤ 85°C average

注释：

54.代码闪存包括一个 4096 位的“写入缓冲区”。如果应用软件多次写入该缓冲器，要获得总写入时间，请将一个扇区写入时间乘以相应的因子（假设因子为 64，例如 64 x 512 B = 32 KB [一个扇区]）。

表 42 Flash 交流规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID612	I_{CC_ACT2}	Program operating V_{CCD} current (code or work-flash)	–	7	58	mA	Typ: T_A = 25°C, V_{DDD} = 5.0 V, V_{CCD} = 1.15 V, process typ (TT) Max: T_A = 125°C, V_{DDD} = 5.5 V, V_{CCD} = 1.2 V, process worst (FF) Guaranteed by design
SID613	I_{CC_ACT3}	Erase operating V_{CCD} current (code- or work-flash)	–	7	52	mA	Typ: T_A = 25°C, V_{DDD} = 5.0 V, V_{CCD} = 1.15 V, process typ (TT) Max: T_A = 125°C, V_{DDD} = 5.5 V, V_{CCD} = 1.2 V, process worst (FF) Guaranteed by design
SID612A	I_{CC_ACT2A}	Program operating V_{DDD} current (code or work-flash)	–	8	10	mA	Typ: T_A = 25°C, V_{DDD} = 5.0 V, V_{CCD} = 1.15 V, process typ (TT) Max: T_A = 125°C, V_{DDD} = 5.5 V, V_{CCD} = 1.2 V, process worst (FF) Guaranteed by design
SID613A	I_{CC_ACT3A}	Erase operating V_{DDD} current (code- or work-flash)	–	8	16	mA	Typ: T_A = 25°C, V_{DDD} = 5.0 V, V_{CCD} = 1.15 V, process typ (TT) Max: T_A = 125°C, V_{DDD} = 5.5 V, V_{CCD} = 1.2 V, process worst (FF) Guaranteed by design

26.9.1 系统资源

表 43 系统资源

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
Power- on reset specifications							
SID270	V_{POR_D}	V_{DDD} rising voltage to de assert POR	1.5	–	2.35	V	Guaranteed by design
SID276	V_{POR_A}	V_{DDD} falling voltage to assert POR	1.45	–	2.1	V	–
SID271	V_{POR_H}	Level detection hysteresis	20	–	300	mV	–
SID272	t_{DLY_POR}	Delay between V_{DDD} rising through 2.3 V and internal deassertion of POR	–	–	3	µs	Guaranteed by design
SID273	t_{POFF}	V_{DDD} Power off time	100	–	–	µs	V_{DDD} < 1.45 V
SID274	POR_RR1	V_{DDD} power ramp rate with robust BOD (BOD operation is guaranteed)	–	–	100	mV/µs	This ramp supports robust BOD
SID275	POR_RR2	V_{DDD} power ramp rate without robust BOD	–	–	1000	mV/µs	This ramp does not support robust BOD t_{POFF} must be satisfied.
High-voltage BOD (HV BOD) specifications							
SID500	$V_{TR\_2P7\_R}$	HV BOD 2.7 V rising detection point for V_{DDD} and V_{DDA} (default)	2.474	2.55	2.627	V	–
SID501	$V_{TR\_2P7\_F}$	HV BOD 2.7 V falling detection point for V_{DDD} and V_{DDA} (default)	2.449	2.525	2.601	V	–
SID502	$V_{TR\_3P0\_R}$	HV BOD 3.0 V rising detection point for V_{DDD} and V_{DDA}	2.765	2.85	2.936	V	–
SID503	$V_{TR\_3P0\_F}$	HV BOD 3.0 V falling detection point for V_{DDD} and V_{DDA}	2.74	2.825	2.91	V	–
SID505	HVBOD_RR_A	Power ramp rate: V_{DDD} and V_{DDA} (Active)	–	–	100	mV/µs	–
SID506	HVBOD_RR_DS	Power ramp rate: V_{DDD} and V_{DDA} (Deep Sleep)	–	–	10	mV/µs	–
SID507	$t_{DLY\_ACT\_HVBOD}$	Active mode delay between V_{DDD} falling/rising through $V_{TR\_2P7\_F/R}$ or $V_{TR\_3P0\_F/R}$ and an internal HV BOD signal transitioning	–	–	0.5	µs	Guaranteed by design
SID507A	$t_{DLY\_ACT\_HVBOD}$	Active mode delay between V_{DDA} falling/rising through $V_{TR\_2P7\_F/R}$ or $V_{TR\_3P0\_F/R}$ and internal HV BOD signal transitioning	–	–	1	µs	Guaranteed by design
SID507B	$t_{DLY\_DS\_HVBOD}$	Deep Sleep mode delay between V_{DDD}/V_{DDA} falling/rising through $V_{TR\_2P7\_F/R}$ or $V_{TR\_3P0\_F/R}$ and an internal HV BOD signal transitioning	–	–	4	µs	Guaranteed by design

表 43　　系统资源 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID508	t_{RES_HVBOD}	Response time of HV BOD, V_{DDD}/V_{DDA} supply. (For falling-then-rising supply at max ramp rate; threshold is $V_{TR\_2P7\_F}$ or $V_{TR\_3P0\_F}$)	100	–	–	ns	Guaranteed by design
Low-voltage BOD (LV BOD) specifications							
SID510	$V_{TR\_R\_LVBOD}$	LV BOD rising detection point for V_{CCD}	0.917	0.945	0.973	V	–
SID511	$V_{TR\_F\_LVBOD}$	LV BOD falling detection point for V_{CCD}	0.892	0.920	0.948	V	–
SID515	$t_{DLY\_ACT\_LVBOD}$	Active delay between V_{CCD} falling/rising through V_{TR_R/F_LVBOD} and an internal LV BOD signal transitioning	–	–	1	µs	Guaranteed by design
SID515A	$t_{DLY\_DS\_LVBOD}$	Deep Sleep mode delay between V_{CCD} falling/rising through V_{TR_R/F_LVBOD} and an internal LV BOD signal transitioning	–	–	12	µs	Guaranteed by design
SID516	t_{RES_LVBOD}	Response time of LV BOD (for falling-then-rising supply at max ramp rate; threshold is $V_{TR\_F\_LVBOD}$)	100	–	–	ns	Guaranteed by design
Low-voltage detector (LVD) DC specifications							
SID520	$V_{TR\_2P8\_F}$	LVD 2.8 V falling detection point for V_{DDD}	Typ – 4%	2800	Typ + 4%	mV	–
SID521	$V_{TR\_2P9\_F}$	LVD 2.9 V falling detection point for V_{DDD}	Typ – 4%	2900	Typ + 4%	mV	–
SID522	$V_{TR\_3P0\_F}$	LVD 3.0 V falling detection point for V_{DDD}	Typ – 4%	3000	Typ + 4%	mV	–
SID523	$V_{TR\_3P1\_F}$	LVD 3.1 V falling detection point for V_{DDD}	Typ – 4%	3100	Typ + 4%	mV	–
SID524	$V_{TR\_3P2\_F}$	LVD 3.2 V falling detection point for V_{DDD}	Typ – 4%	3200	Typ + 4%	mV	–
SID525	$V_{TR\_3P3\_F}$	LVD 3.3 V falling detection point for V_{DDD}	Typ – 4%	3300	Typ + 4%	mV	–
SID526	$V_{TR\_3P4\_F}$	LVD 3.4 V falling detection point for V_{DDD}	Typ – 4%	3400	Typ + 4%	mV	–
SID527	$V_{TR\_3P5\_F}$	LVD 3.5 V falling detection point for V_{DDD}	Typ – 4%	3500	Typ + 4%	mV	–
SID528	$V_{TR\_3P6\_F}$	LVD 3.6 V falling detection point for V_{DDD}	Typ – 4%	3600	Typ + 4%	mV	–
SID529	$V_{TR\_3P7\_F}$	LVD 3.7 V falling detection point for V_{DDD}	Typ – 4%	3700	Typ + 4%	mV	–
SID530	$V_{TR\_3P8\_F}$	LVD 3.8 V falling detection point for V_{DDD}	Typ – 4%	3800	Typ + 4%	mV	–
SID531	$V_{TR\_3P9\_F}$	LVD 3.9 V falling detection point for V_{DDD}	Typ – 4%	3900	Typ + 4%	mV	–
SID532	$V_{TR\_4P0\_F}$	LVD 4.0 V falling detection point for V_{DDD}	Typ – 4%	4000	Typ + 4%	mV	–
SID533	$V_{TR\_4P1\_F}$	LVD 4.1 V falling detection point for V_{DDD}	Typ – 4%	4100	Typ + 4%	mV	–

表 43　　系统资源 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID534	$V_{TR\_4P2\_F}$	LVD 4.2 V falling detection point for V_{DDD}	Typ – 4%	4200	Typ + 4%	mV	–
SID535	$V_{TR\_4P3\_F}$	LVD 4.3 V falling detection point for V_{DDD}	Typ – 4%	4300	Typ + 4%	mV	–
SID536	$V_{TR\_4P4\_F}$	LVD 4.4 V falling detection point for V_{DDD}	Typ – 4%	4400	Typ + 4%	mV	–
SID537	$V_{TR\_4P5\_F}$	LVD 4.5 V falling detection point for V_{DDD}	Typ – 4%	4500	Typ + 4%	mV	–
SID538	$V_{TR\_4P6\_F}$	LVD 4.6 V falling detection point for V_{DDD}	Typ – 4%	4600	Typ + 4%	mV	–
SID539	$V_{TR\_4P7\_F}$	LVD 4.7 V falling detection point for V_{DDD}	Typ – 4%	4700	Typ + 4%	mV	–
SID540	$V_{TR\_4P8\_F}$	LVD 4.8 V falling detection point for V_{DDD}	Typ – 4%	4800	Typ + 4%	mV	–
SID541	$V_{TR\_4P9\_F}$	LVD 4.9 V falling detection point for V_{DDD}	Typ – 4%	4900	Typ + 4%	mV	–
SID542	$V_{TR\_5P0\_F}$	LVD 5.0 V falling detection point for V_{DDD}	Typ – 4%	5000	Typ + 4%	mV	–
SID543	$V_{TR\_5P1\_F}$	LVD 5.1 V falling detection point for V_{DDD}	Typ – 4%	5100	Typ + 4%	mV	–
SID544	$V_{TR\_5P2\_F}$	LVD 5.2 V falling detection point for V_{DDD}	Typ – 4%	5200	Typ + 4%	mV	–
SID545	$V_{TR\_5P3\_F}$	LVD 5.3 V falling detection point for V_{DDD}	Typ – 4%	5300	Typ + 4%	mV	–
SID546	$V_{TR\_2P8\_R}$	LVD 2.8 V rising detection point for V_{DDD}	Typ – 4%	2825	Typ + 4%	mV	Same as $V_{TR\_2P8\_F}$ + 25 mV
SID547	$V_{TR\_2P9\_R}$	LVD 2.9 V rising detection point for V_{DDD}	Typ – 4%	2925	Typ + 4%	mV	Same as $V_{TR\_2P9\_F}$ + 25 mV
SID548	$V_{TR\_3P0\_R}$	LVD 3.0 V rising detection point for V_{DDD}	Typ – 4%	3025	Typ + 4%	mV	Same as $V_{TR\_3P0\_F}$ + 25 mV
SID549	$V_{TR\_3P1\_R}$	LVD 3.1 V rising detection point for V_{DDD}	Typ – 4%	3125	Typ + 4%	mV	Same as $V_{TR\_3P1\_F}$ + 25 mV
SID550	$V_{TR\_3P2\_R}$	LVD 3.2 V rising detection point for V_{DDD}	Typ – 4%	3225	Typ + 4%	mV	Same as $V_{TR\_3P2\_F}$ + 25 mV
SID551	$V_{TR\_3P3\_R}$	LVD 3.3 V rising detection point for V_{DDD}	Typ – 4%	3325	Typ + 4%	mV	Same as $V_{TR\_3P3\_F}$ + 25 mV
SID552	$V_{TR\_3P4\_R}$	LVD 3.4 V rising detection point for V_{DDD}	Typ – 4%	3425	Typ + 4%	mV	Same as $V_{TR\_3P4\_F}$ + 25 mV
SID553	$V_{TR\_3P5\_R}$	LVD 3.5 V rising detection point for V_{DDD}	Typ – 4%	3525	Typ + 4%	mV	Same as $V_{TR\_3P5\_F}$ + 25 mV
SID554	$V_{TR\_3P6\_R}$	LVD 3.6 V rising detection point for V_{DDD}	Typ – 4%	3625	Typ + 4%	mV	Same as $V_{TR\_3P6\_F}$ + 25 mV
SID555	$V_{TR\_3P7\_R}$	LVD 3.7 V rising detection point for V_{DDD}	Typ – 4%	3725	Typ + 4%	mV	Same as $V_{TR\_3P7\_F}$ + 25 mV
SID556	$V_{TR\_3P8\_R}$	LVD 3.8 V rising detection point for V_{DDD}	Typ – 4%	3825	Typ + 4%	mV	Same as $V_{TR\_3P8\_F}$ + 25 mV
SID557	$V_{TR\_3P9\_R}$	LVD 3.9 V rising detection point for V_{DDD}	Typ – 4%	3925	Typ + 4%	mV	Same as $V_{TR\_3P9\_F}$ + 25 mV
SID558	$V_{TR\_4P0\_R}$	LVD 4.0 V rising detection point for V_{DDD}	Typ – 4%	4025	Typ + 4%	mV	Same as $V_{TR\_4P0\_F}$ + 25 mV
SID559	$V_{TR\_4P1\_R}$	LVD 4.1 V rising detection point for V_{DDD}	Typ – 4%	4125	Typ + 4%	mV	Same as $V_{TR\_4P1\_F}$ + 25 mV

表 43　　系统资源 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID560	$V_{TR\_4P2\_R}$	LVD 4.2 V rising detection point for V_{DDD}	Typ – 4%	4225	Typ + 4%	mV	Same as $V_{TR\_4P2\_F}$ + 25 mV
SID561	$V_{TR\_4P3\_R}$	LVD 4.3 V rising detection point for V_{DDD}	Typ – 4%	4325	Typ + 4%	mV	Same as $V_{TR\_4P3\_F}$ + 25 mV
SID562	$V_{TR\_4P4\_R}$	LVD 4.4 V rising detection point for V_{DDD}	Typ – 4%	4425	Typ + 4%	mV	Same as $V_{TR\_4P4\_F}$ + 25 mV
SID563	$V_{TR\_4P5\_R}$	LVD 4.5 V rising detection point for V_{DDD}	Typ – 4%	4525	Typ + 4%	mV	Same as $V_{TR\_4P5\_F}$ + 25 mV
SID564	$V_{TR\_4P6\_R}$	LVD 4.6 V rising detection point for V_{DDD}	Typ – 4%	4625	Typ + 4%	mV	Same as $V_{TR\_4P6\_F}$ + 25 mV
SID565	$V_{TR\_4P7\_R}$	LVD 4.7 V rising detection point for V_{DDD}	Typ – 4%	4725	Typ + 4%	mV	Same as $V_{TR\_4P7\_F}$ + 25 mV
SID566	$V_{TR\_4P8\_R}$	LVD 4.8 V rising detection point for V_{DDD}	Typ – 4%	4825	Typ + 4%	mV	Same as $V_{TR\_4P8\_F}$ + 25 mV
SID567	$V_{TR\_4P9\_R}$	LVD 4.9 V rising detection point for V_{DDD}	Typ – 4%	4925	Typ + 4%	mV	Same as $V_{TR\_4P9\_F}$ + 25 mV
SID568	$V_{TR\_5P0\_R}$	LVD 5.0 V rising detection point for V_{DDD}	Typ – 4%	5025	Typ + 4%	mV	Same as $V_{TR\_5P0\_F}$ + 25 mV
SID569	$V_{TR\_5P1\_R}$	LVD 5.1 V rising detection point for V_{DDD}	Typ – 4%	5125	Typ + 4%	mV	Same as $V_{TR\_5P1\_F}$ + 25 mV
SID570	$V_{TR\_5P2\_R}$	LVD 5.2 V rising detection point for V_{DDD}	Typ – 4%	5225	Typ + 4%	mV	Same as $V_{TR\_5P2\_F}$ + 25 mV
SID571	$V_{TR\_5P3\_R}$	LVD 5.3 V rising detection point for V_{DDD}	Typ – 4%	5325	Typ + 4%	mV	Same as $V_{TR\_5P3\_F}$ + 25 mV
SID573	LVD_RR_A	Power ramp rate: V_{DDD} (Active)	–	–	100	mV/µs	–
SID574	LVD_RR_DS	Power ramp rate: V_{DDD} (Deep Sleep)	–	–	10	mV/µs	–
SID575	$t_{DLY\_ACT\_LVD}$	Active mode delay between V_{DDD} falling/rising through LVD rising/falling point and an internal LVD signal transitioning	–	–	1	µs	Guaranteed by design
SID575A	$t_{DLY\_DS\_LVD}$	Deep Sleep mode delay between V_{DDD} falling/rising through LVD rising/falling point and an internal LVD signal transitioning	–	–	4	µs	Guaranteed by design
SID576	t_{RES_LVD}	Response time of LVD, V_{DDD} supply. (For falling-then-rising supply at max ramp rate; threshold is LVD falling point)	100	–	–	ns	Guaranteed by design
High-voltage OVD specifications							
SID580	$V_{TR\_5P0\_R}$	HV OVD 5.0-V rising detection point for V_{DDD} and V_{DDA}	5.049	5.205	5.361	V	–
SID581	$V_{TR\_5P0\_F}$	HV OVD 5.0-V falling detection point for V_{DDD} and V_{DDA}	5.025	5.18	5.335	V	–
SID582	$V_{TR\_5P5\_R}$	HV OVD 5.5-V rising detection point for V_{DDD} and V_{DDA} (default)	5.548	5.72	5.892	V	–

表 43　　系统资源 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID583	$V_{TR\_5P5\_F}$	HV OVD 5.5-V falling detection point for V_{DDD} and V_{DDA} (default)	5.524	5.695	5.866	V	–
SID585	HVOVD_RR_A	Power ramp rate: V_{DDD} and V_{DDA} (Active)	–	–	100	mV/µs	–
SID586	HVOVD_RR_DS	Power ramp rate: V_{DDD} and V_{DDA} (Deep Sleep)	–	–	10	mV/µs	–
SID587	$t_{DLY\_ACT\_HVOVD}$	Active mode delay between V_{DDD} falling/rising through $V_{TR\_5P0\_F/R}$ or $V_{TR\_5P5\_F/R}$ and an internal HV OVD signal transitioning	–	–	1	µs	Guaranteed by design
SID587A	$t_{DLY\_ACT\_HVOVD\_A}$	Active mode delay between V_{DDA} falling/rising through $V_{TR\_5P0\_F/R}$ or $V_{TR\_5P5\_F/R}$ and an internal HV OVD signal transitioning	–	–	1.5	µs	Guaranteed by design
SID587B	$t_{DLY\_DS\_HVOVD}$	Deep Sleep mode delay between V_{DDD}/V_{DDA} falling/rising through $V_{TR\_5P0\_F/R}$ or $V_{TR\_5P5\_F/R}$ and an internal HV OVD signal transitioning	–	–	4	µs	Guaranteed by design
SID588	t_{RES_HVOVD}	Response time of HV OVD (for rising-then-falling supply at max ramp rate; threshold is $V_{TR\_5P0\_R}$ or $V_{TR\_5P5\_R}$)	100	–	–	ns	Guaranteed by design
Low-voltage OVD specifications							
SID590	$V_{TR\_R\_LVOVD}$	LV OVD rising detection point for V_{CCD}	1.261	1.3	1.339	V	–
SID591	$V_{TR\_F\_LVOVD}$	LV OVD falling detection point for V_{CCD}	1.237	1.275	1.313	V	–
SID595	$t_{DLY\_ACT\_LVOVD}$	Active mode delay between V_{CCD} falling/rising through V_{TR_F/R_LVOVD} and an internal LV OVD signal transitioning	–	–	1	µs	Guaranteed by design
SID595A	$t_{DLY\_DS\_LVOVD}$	Deep Sleep mode delay between V_{CCD} falling/rising through V_{TR_F/R_LVOVD} and an internal LV OVD signal transitioning	–	–	12	µs	Guaranteed by design
SID596	t_{RES_LVOVD}	Response time of LV OVD. (For rising-then-falling supply at max ramp rate; threshold is $V_{TR\_R\_LVOVD}$)	100	–	–	ns	Guaranteed by design
Over current detection (OCD) specifications							
SID598A	I_{OCD_LDO}	Overcurrent detection range for internal Active regulator	312	–	630	mA	Guaranteed by design
SID598B	I_{OCD_EXT}	Overcurrent detection range for external transistor mode	675	–	825	mA	–

表 43　　系统资源 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID599	I_{OCD_DPSLP}	Overcurrent detection range for internal Deep Sleep regulator	18	–	72	mA	–

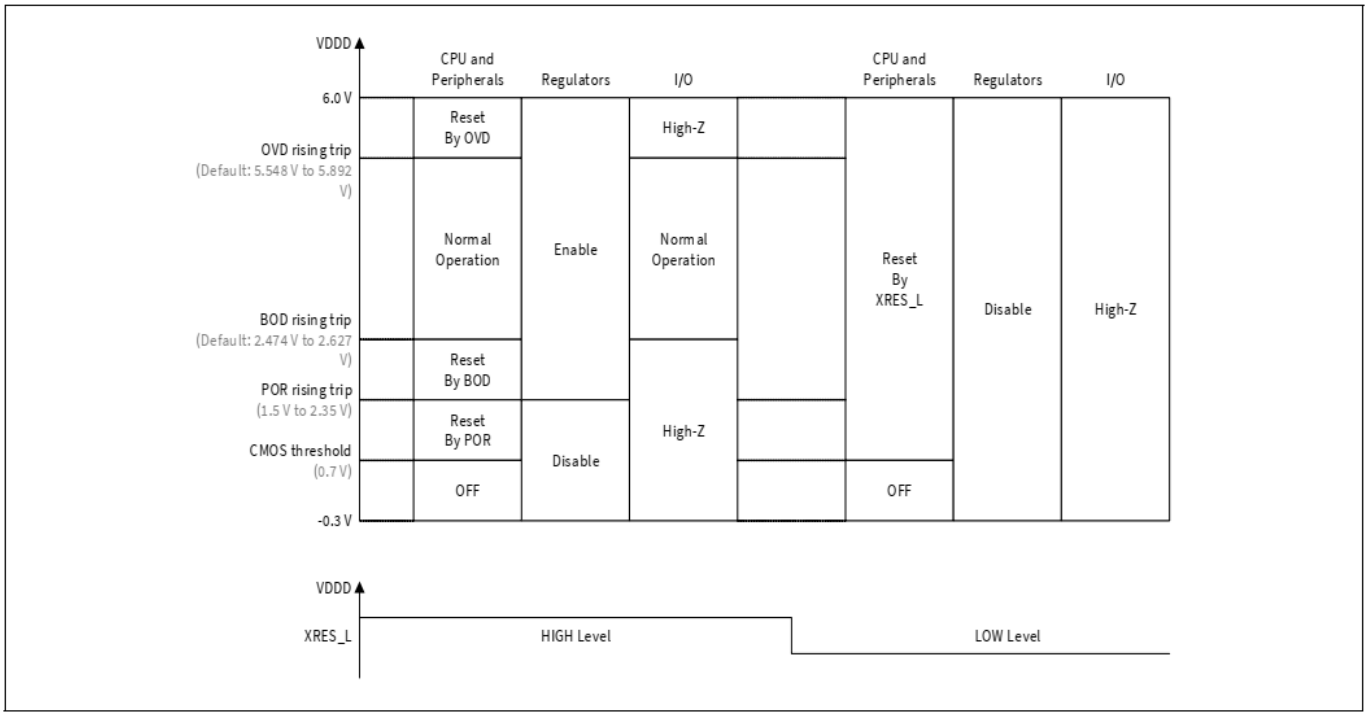


图 23　　器件操作电源范围

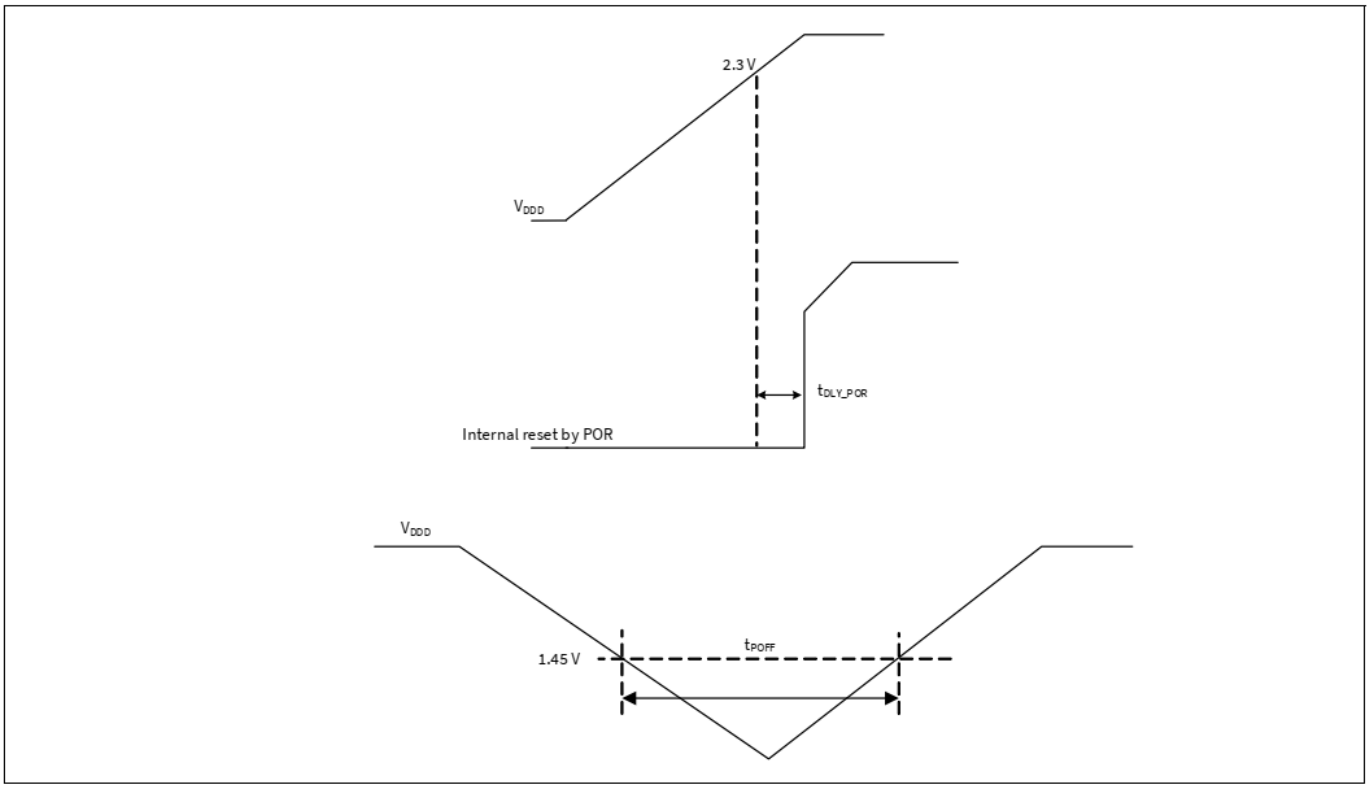


图 24　　POR 规格

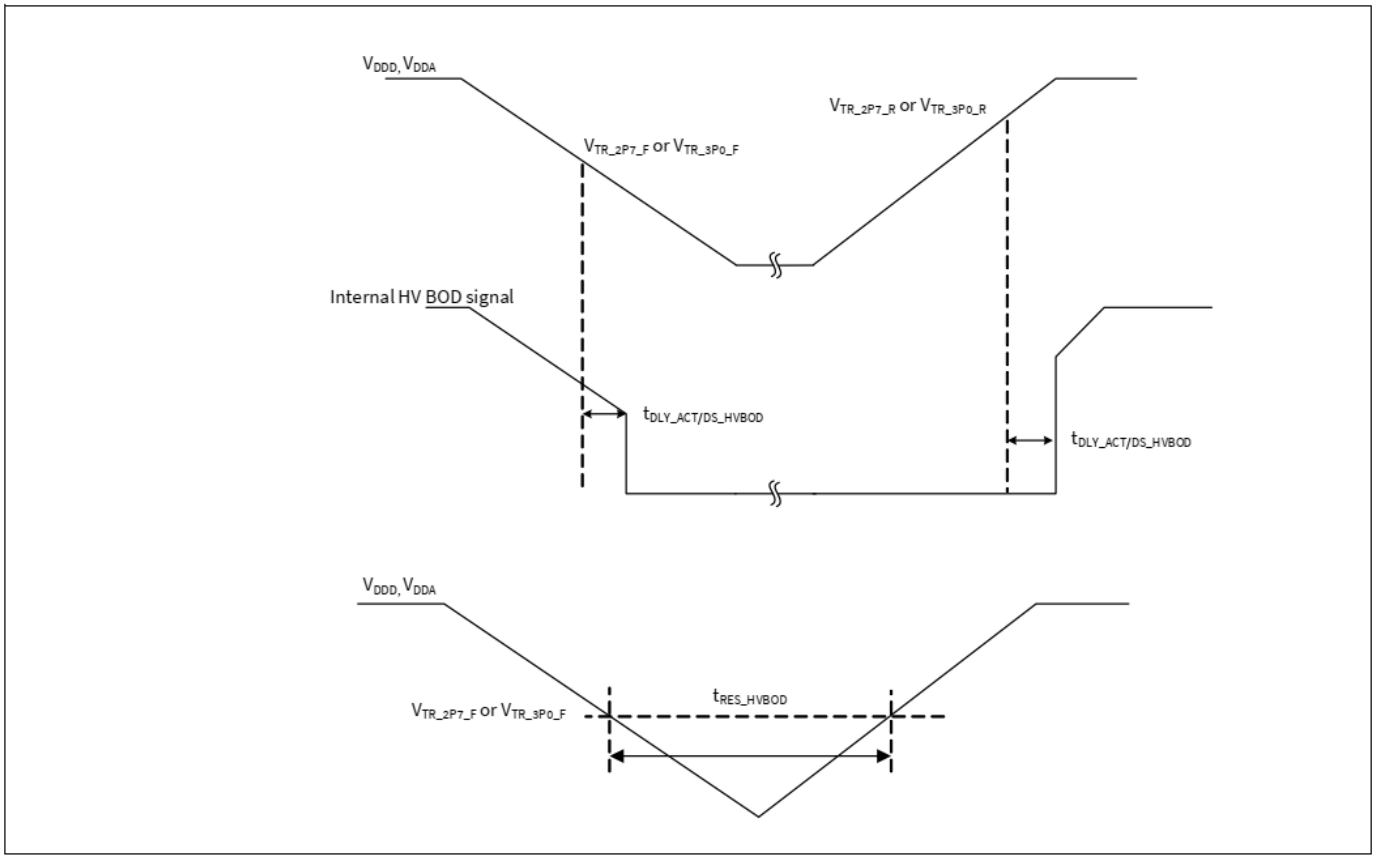


图 25　　高压 BOD 规格

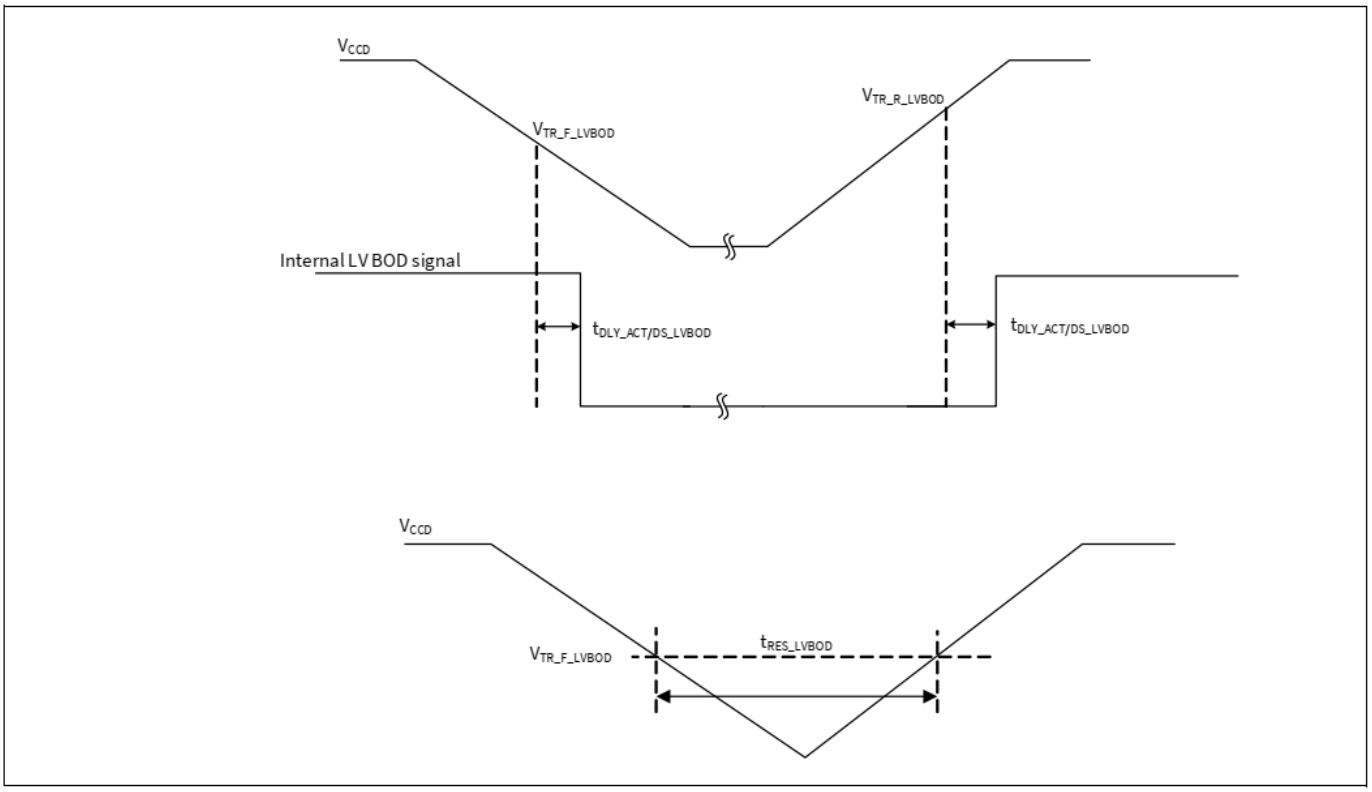


图 26　　低压 BOD 规格

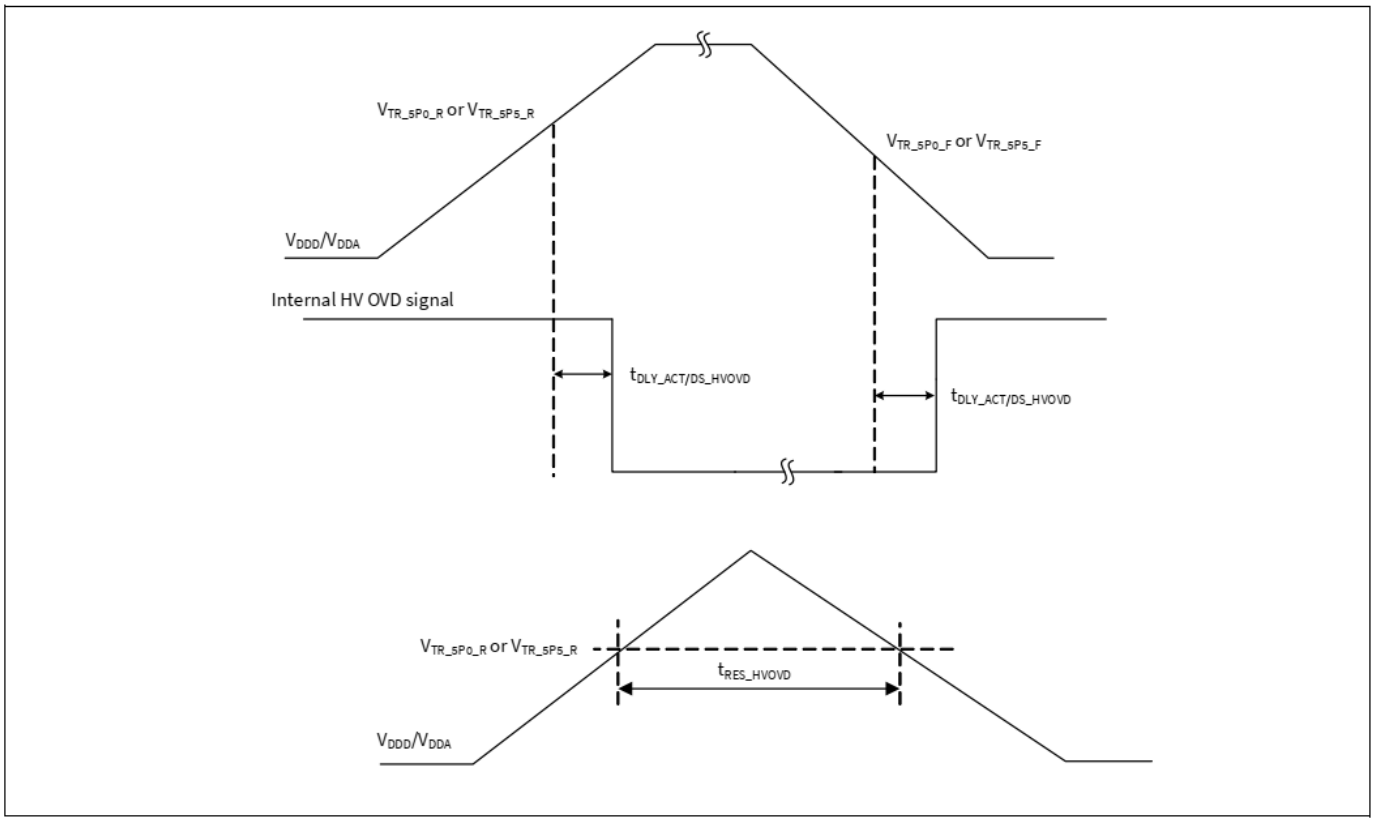


图 27　　高压 OVD 规格

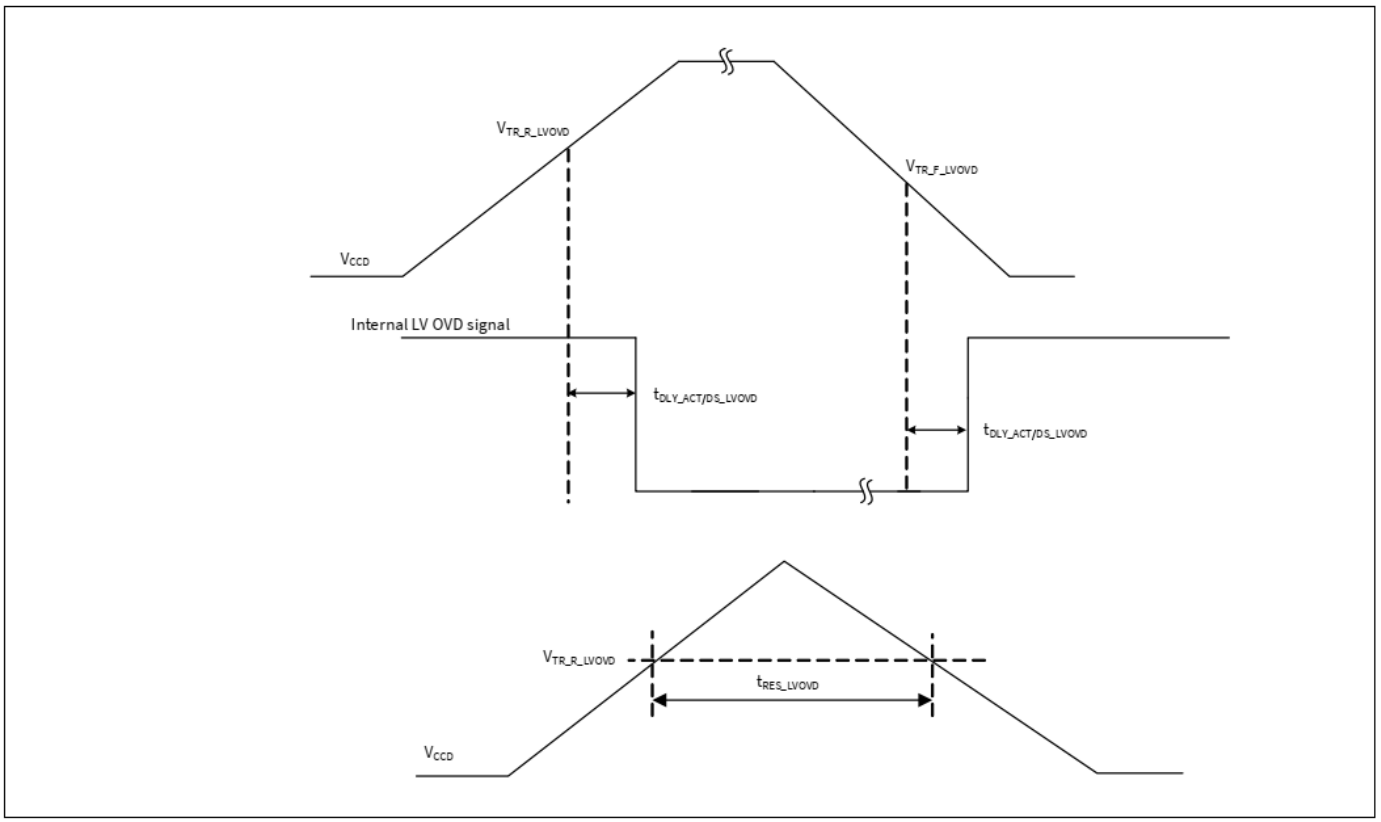


图 28　　低压 OVD 规格

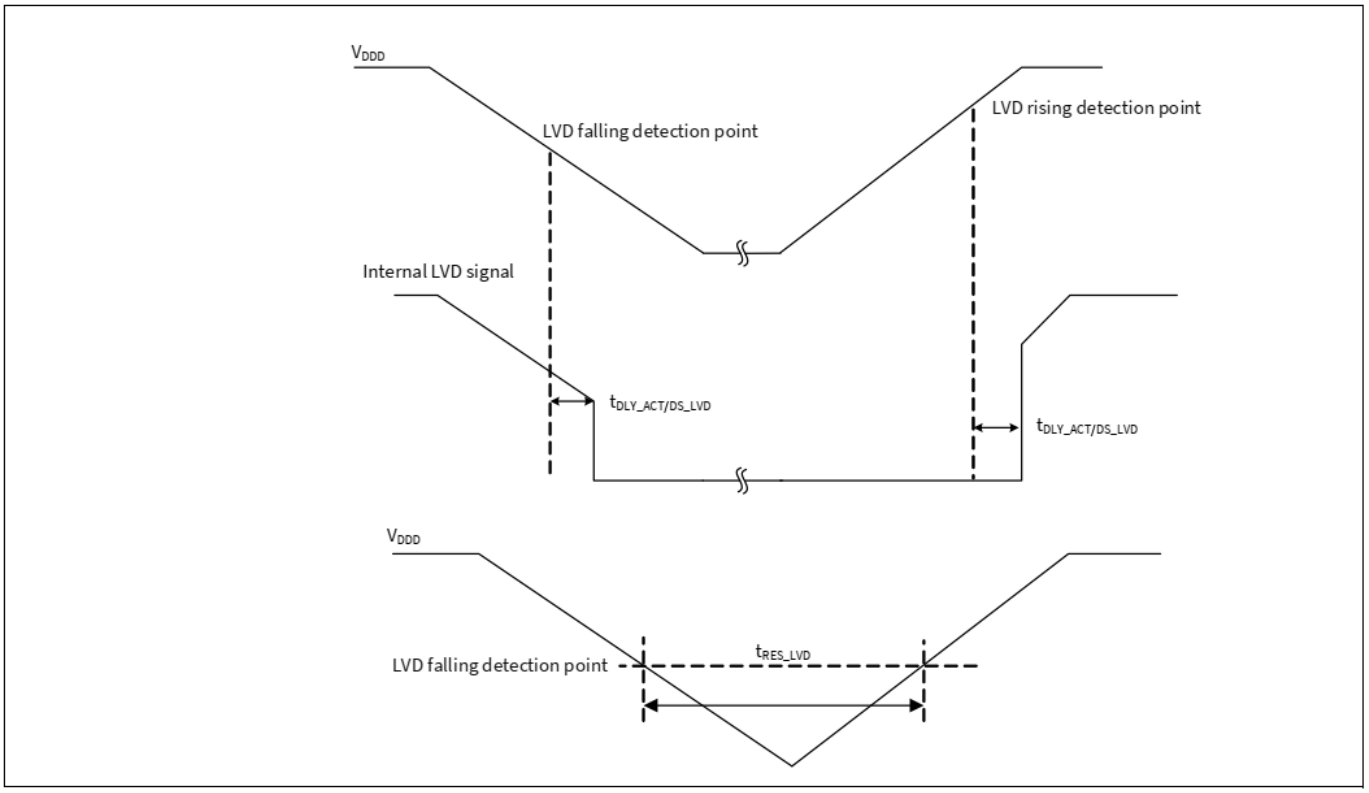


图 29　　LVD规格

26.9.2 SWD 接口

表 44 SWD 接口规格

[条件：drive_sel<1:0>= 00]

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID300	f_{SWDCLK}	SWD clock input frequency	–	–	10	MHz	2.7 V ≤ V_{DDD} ≤ 5.5 V
SID301	t_{SWDI_SETUP}	SWDI setup time	0.25 × T	–	–	ns	T = 1 / f_{SWDCLK}
SID302	t_{SWDI_HOLD}	SWDI hold time	0.25 × T	–	–	ns	T = 1 / f_{SWDCLK}
SID303	t_{SWDO_VALID}	SWDO valid time	–	–	0.5 × T	ns	T = 1 / f_{SWDCLK}
SID304	t_{SWDO_HOLD}	SWDO hold time	1	–	–	ns	T = 1 / f_{SWDCLK}

表45 JTAG 交流规格

[条件：drive_sel<1:0>= 00]

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID620	t_{JCKH}	TCK HIGH time	30	–	–	ns	30-pF load
SID621	t_{JCKL}	TCK LOW time	30	–	–	ns	30-pF load
SID622	t_{JCP}	TCK clock period	66.7	–	–	ns	30-pF load
SID623	t_{JSU}	TDI/TMS setup time	12	–	–	ns	30-pF load
SID624	t_{JH}	TDI/TMS hold time	12	–	–	ns	30-pF load
SID625	t_{JZX}	TDO High-Z to active	–	–	30	ns	30-pF load
SID626	t_{JXZ}	TDO active to High-Z	–	–	30	ns	30-pF load
SID627	t_{JCO}	TDO clock to output	–	–	30	ns	30-pF load

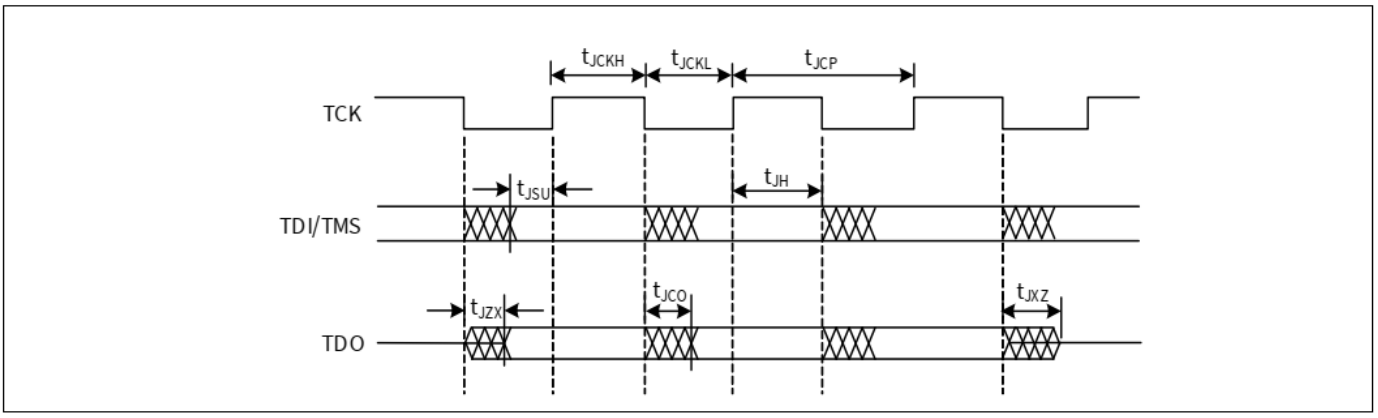


图 30 JTAG 规格

表 46 跟踪规格

[条件：drive_sel<1:0>= 00]

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID1412A	C_{TRACE}	Trace Capacitive Load	–	–	30	pF	–
SID1412	t_{TRACE_CYC}	Trace clock period	40	–	–	ns	Trace clock cycle time for 25 MHz
SID1413	t_{TRACE_CLKL}	Trace clock LOW pulse width	2	–	–	ns	Clock low pulse width

表 46 跟踪规格

[条件：drive_sel<1:0>= 00]

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID1414	t_{TRACE_CLKH}	Trace clock HIGH pulse width	2	–	–	ns	Clock high pulse width
SID1415A	t_{TRACE_SETUP}	Trace data setup time	3	–	–	ns	Trace data setup time
SID1416A	t_{TRACE_HOLD}	Trace data hold time	2	–	–	ns	Trace data hold time

26.10 时钟规格

除非另有说明， 所有规范均适用于 –40°C ≤ T_A ≤ 125°C 和 2.7 V 至 5.5 V。

表 47 根时钟和中间时钟[60]

Clock	Max permitted clock frequency (MHz)[56]	Source	Maximum permitted clock frequency setting (MHz)[56]						Description
			PLL/FLL Clock source: ECO[57]			PLL/FLL Clock source: IMO[58]			
			Integer	SSCG	Fractional	Integer	SSCG	Fractional	
CLK_HF0	200	PLL200#0	200	NA	NA	190	NA	NA	Root clock for CPUSS, PERI
		FLL	100	NA	NA	96	NA	NA	
	100	PLL200#0	100	NA	NA	98	NA	NA	
		FLL	100	NA	NA	96	NA	NA	
CLK_HF1	350	PLL400#0	350	340	344	333	326	330	CM7 CPU Core#0, CM7 CPU Core#1 clock
		FLL	100	NA	NA	96	NA	NA	
CLK_HF2	100	PLL200#1	100	NA	NA	98	NA	NA	Peripheral clock root other than CLK_PERI
		FLL	100	NA	NA	96	NA	NA	
CLK_HF3	100	PLL200#0	100	NA	NA	98	NA	NA	Event generator (CLK_REF), clock output on EXT_CLK pins (when used as output)
		FLL	100	NA	NA	96	NA	NA	
CLK_HF4	125	PLL400#1	125	122	122	119	117	117	Ethernet Channel#0, Ethernet Channel#1 internal clock
		FLL	100	NA	NA	96	NA	NA	
CLK_HF5	196.608	PLL400#1	196.608	193	196.608	189	185	187	I^2S channel#0, I^2S channel#1, I^2S channel#2 interface clock, Ethernet Channel#0 TSU, Ethernet Channel#1 TSU
		FLL	100	NA	NA	96	NA	NA	
CLK_HF6	200	PLL200#0	200	NA	NA	190	NA	NA	Root clock for SDHC, SMIF interface clock
		FLL	100	NA	NA	96	NA	NA	
CLK_HF7	8	ILO	NA	NA	NA	NA	NA	NA	CSV
CLK_FAST_0	350	PLL400#0	350	340	344	333	326	330	Generated by clock gating CLK_HF1, CM7 CPU Core#0, intermediate clock
		FLL	100	NA	NA	96	NA	NA	
CLK_FAST_1	350	PLL400#0	350	340	344	333	326	330	Generated by clock gating CLK_HF1, CM7 CPU Core#1, intermediate clock
		FLL	100	NA	NA	96	NA	NA	

注释

55. 未列出的中间时钟具有与其继承的父时钟相同的限制。
56. 相应时钟源 (PLL/FLL + 分频器) 之后的最大时钟频率。所有内部公差和影响都包含在这些频率内。
57. 对于 ECO：设计可容忍外部时钟源高达 ±150 ppm 的不确定度。
58. IMO操作频率公差包括在内。 当不使用深度睡眠模式时，时钟源 IMO 情况下的最大允许时钟频率设置等于时钟源 ECO 情况下的最大允许时钟频率设置。
59. CLOCK_SLOW 和 CLK_HF0 以整数频率比相关（即 1:1、1:2、1:3 等）。

表 47　根时钟和中间时钟[60] *(续)*

Clock	Max permitted clock frequency (MHz)[56]	Source	Maximum permitted clock frequency setting (MHz)[56]						Description
			PLL/FLL Clock source: ECO[57]			PLL/FLL Clock source: IMO[58]			
			Integer	SSCG	Fractional	Integer	SSCG	Fractional	
CLK_MEM	200	PLL200#0	200	NA	NA	190	NA	NA	Generated by clock gating CLK_HF0, intermediate clock for SMIF, Flash, Ethernet
		FLL	100	NA	NA	96	NA	NA	
	100	PLL200#0	100	NA	NA	98	NA	NA	
		FLL	100	NA	NA	96	NA	NA	
CLK_SLOW	100	PLL200#0	100	NA	NA	98	NA	NA	Generated by clock gating CLK_MEM, intermediate clock for CM0+, P-DMA, M-DMA, Crypto, SMIF, SDHC
		FLL	100	NA	NA	96	NA	NA	
CLK_PERI	100	PLL200#0	100	NA	NA	98	NA	NA	Generated by clock gating CLK_HF0, intermediate clock for IOSS, TCPWM0, CPU trace, SMIF
		FLL	100	NA	NA	96	NA	NA	

表 48 CLK_HF0 和 CLK_SLOW 之间的关系（示例）[61]

CLK_HF0 (MHz)	CLK_SLOW (MHz)
200	100
180	90
160	80
120	60
100	100
80	80

表 49 PLL400 操作模式

PLL400 operation mode	Spread spectrum clock generation (SSCG)	Fractional
Integer	OFF	OFF
SSCG	ON	OFF
Fractional	OFF	ON

表 50 IMO 交流规格

Spec ID	Parameter	Description	Min	Typ	Max	Units	Details/conditions
SID310	f_{IMOTOL}	IMO operating frequency	7.68	8	8.32	MHz	–
SID311	tSTARTIMO	IMO start-up time	–	–	7.5	µs	Start-up time to 90% of final frequency
SID312	IIMO_ACT	IMO current	–	13.5	22	µA	–

表 51 ILO 交流规格

Spec ID	Parameter	Description	Min	Typ	Max	Units	Details/conditions
SID320	$f_{ILOTRIM}$	ILO operating frequency	30.47424	32.768	35.06176	kHz	–
SID321	$t_{STARTILO}$	ILO start-up time	–	8	12	µs	Start-up time to 90% of final frequency
SID323	I_{ILO}	ILO current	–	500	2800	nA	–

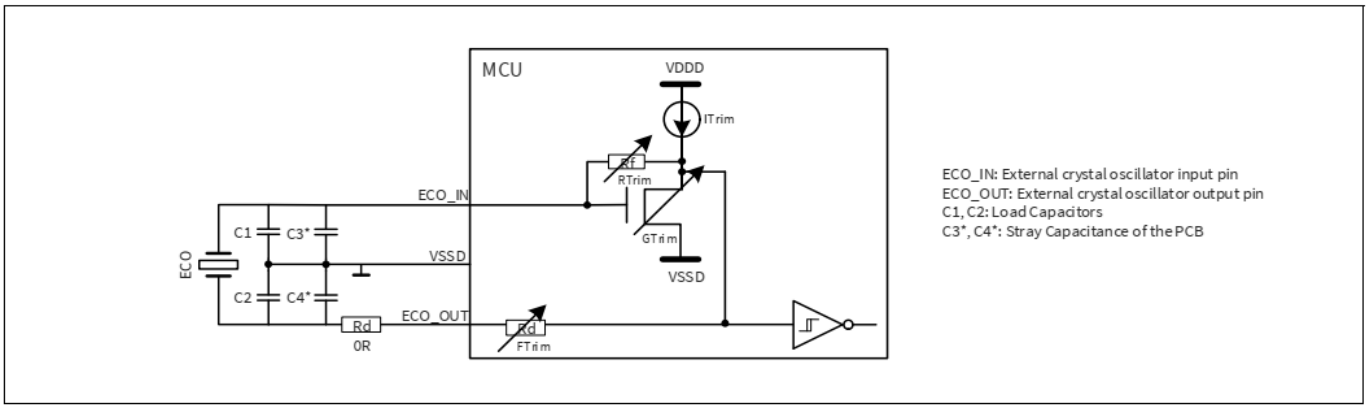


图 31 ECO连接方案[62]

注释

60. 未列出的中间时钟具有与其继承的父时钟相同的限制。61.CLOCK_SLOW 和 CLK_HF0 以整数频率比相关（即 1:1、1:2、1:3 等）。

62. 有关晶体要求的更多信息，请参阅特定系列架构参考手册（32 位 Arm® Cortex® -M7 工业 MCU XMC7000 系列）。

表 52 ECO 规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID330	f_{ECO}	Crystal frequency range	8	–	33.34	MHz	–
SID332	R_{FDBK}	Feedback resistor value. Min: RTRIM = 3; Max: RTRIM = 0 with 100-kΩ step size on RTRIM	100	–	400	kΩ	Guaranteed by design
SID333	I_{ECO3}	ECO current at T_J = 150 °C	–	–	2000	µA	Maximum operation current with a 33-MHz crystal, 18-pF load
SID334	t_{START_8M}	8-MHz ECO start-up time[63]	–	–	10	ms	Time from set CLK_ECO_-CONFIG.ECO_EN to 1 until-CLK_ECO_STATUS.ECO_READY is set to '1'. (See Clock Timing Diagrams)
SID335	t_{START_33M}	33-MHz ECO start-up time[63]	–	–	1	ms	Time from set CLK_ECO_-CONFIG.ECO_EN to 1 until-CLK_ECO_STATUS.ECO_READY is set to '1'. (See Clock timing diagrams)

注释:
63. 主要看外部晶振。

表 53 PLL 规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
PLL (without SSCG and fractional divider) specifications for 200 MHz							
SID340	t_{PLL200_LOCK}	Time to achieve PLL lock	–	–	35	µs	Time from stable reference clock until PLL frequency is within 0.1% of final value and lock indicator is set
SID341	f_{PLL_OUT}	Output frequency from PLL block	11	–	200	MHz	–
SID342	PLL_LJIT1	Long term jitter	–0.25	–	0.25	ns	For 125 ns Guaranteed by design f_{PLL_VCO}: 320 MHz or 400 MHz f_{PLL_OUT}: 40 MHz to 200 MHz f_{PLL_PFD}: 8 MHz f_{PLL_IN}: ECO
SID343	PLL_LJIT2	Long term jitter	–0.5	–	0.5	ns	For 500 ns Guaranteed by design f_{PLL_VCO}: 320 MHz or 400 MHz f_{PLL_OUT}: 40 MHz to 200 MHz f_{PLL_PFD}: 8 MHz f_{PLL_IN}: ECO
SID344	PLL_LJIT3	Long term jitter	–0.5	–	0.5	ns	For 1000 ns Guaranteed by design f_{PLL_VCO}: 320 MHz or 400 MHz f_{PLL_OUT}: 40 MHz to 200 MHz f_{PLL_PFD}: 8 MHz f_{PLL_IN}: ECO
SID345A1	PLL_LJIT5	Long term jitter	–0.75	–	0.75	ns	For 10000 ns Guaranteed by design f_{PLL_VCO}: 320 MHz or 400 MHz f_{PLL_OUT}: 40 MHz to 200 MHz f_{PLL_PFD}: 8 MHz f_{PLL_IN}: ECO
SID346	f_{PLL_IN}	PLL input frequency	3.988	–	33.34	MHz	–
SID347	I_{PLL_200M}	PLL operating current (f_{OUT} = 200 MHz)	–	0.87	1.85	mA	f_{OUT} = 200 MHz
SID348C	f_{PLL_VCO}	VCO frequency	170	–	400	MHz	–
SID349C	f_{PLL_PFD}	PFD frequency	3.988	–	8	MHz	–
PLL (with SSCG and fractional divider) specifications for 400 MHz							
SID340A	t_{PLL400_LOCK}	Time to achieve PLL lock	–	–	50	µs	Time from stable reference clock until PLL frequency is within 0.1% of final value and lock indicator is set
SID341A	f_{OUT}	Programmed output frequency from PLL Block	25	–	350	MHz	Integer mode
SID341B	f_{OUT}	Programmed output frequency from PLL Block	25	–	340	MHz	SSCG mode
SID343A	SPREAD_D	Spread spectrum modulation depth	0.5		3	%	Downspread only, triangle modulation
SID343B	f_{SPREAD_MR}	Spread spectrum modulation rate	–	–	32	kHz	Selected by modulation divider from f_{PFD}
SID342D1	PLL400_LJIT1	Long term jitter	–0.25	–	0.25	ns	For 125 ns Guaranteed by design f_{VCO}: 800 MHz or 700 MHz Integer mode f_{IN}: ECO f_{PFD}: 4 MHz f_{OUT}: 100 MHz to 350 MHz

表 53 PLL 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID343D1	PLL400_LJIT2	Long term jitter	–0.5	–	0.5	ns	For 500 ns Guaranteed by design f_{VCO}: 800 MHz or 700 MHz Integer mode f_{IN}: ECO f_{PFD}: 4 MHz f_{OUT}: 100 MHz to 350 MHz
SID344D1	PLL400_LJIT3	Long term jitter	–1	–	1	ns	For 1000 ns Guaranteed by design f_{VCO}: 800 MHz or 700 MHz Integer mode f_{IN}: ECO f_{PFD}: 4 MHz f_{OUT}: 100 MHz to 350 MHz
SID345E1	PLL400_LJIT5	Long term jitter	–1.5	–	1.5	ns	For 10000 ns Guaranteed by design f_{VCO}: 800 MHz or 700 MHz Integer mode f_{IN}: ECO f_{PFD}: 4 MHz f_{OUT}: 100 MHz to 350 MHz
SID345A	f_{VCO}	VCO frequency	400	–	800	MHz	–
SID346A	f_{IN}	PLL input frequency	3.988	–	33.34	MHz	–
SID347A	I_{PLL_400M}	PLL operating current (f_{OUT} = 400 MHz)	–	1.4	2.2	mA	f_{OUT} = 400 MHz
SID348A	f_{PFD_S}	PFD Frequency (fIN / Reference divider)	3.988	–	20	MHz	Integer/SSCG mode
SID349A	f_{PFD_F}	PFD Frequency (fIN / Reference divider)	8	–	20	MHz	Fractional operation
SID341C	$f_{OUT\_400\_8S1}$	Output frequency from PLL Block (SSCG mode)	93	–	105	MHz	f_{PFD} = 8 MHz, f_{VCO} = 400 MHz, f_{OUT} = 100MHz, Modulation frequency: f_{PFD} / 512, Modulation depth: 3%
SID342C	$t_{PLL\_CJIT400\_8S1}$	Cycle to cycle jitter (SSCG mode)	–710	–	710	ps	f_{PFD} = 8 MHz, f_{VCO} = 400 MHz, f_{OUT} = 100MHz, Modulation frequency: f_{PFD} / 512, Modulation depth: 3%
SID341D	$f_{OUT\_400\_8S2}$	Output frequency from PLL Block (SSCG mode)	93	–	105	MHz	f_{PFD} = 8 MHz, f_{VCO} = 400 MHz, f_{OUT} = 100MHz, Modulation frequency: f_{PFD} / 256, Modulation depth: 3%
SID342D	$t_{PLL\_CJIT400\_8S2}$	Cycle to cycle jitter (SSCG mode)	–710	–	710	ps	f_{PFD} = 8 MHz, f_{VCO} = 400 MHz, f_{OUT} = 100MHz, Modulation frequency: f_{PFD} / 256, Modulation depth: 3%

表 54 FLL 规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID350	t_{FLL_WAKE}	FLL wake up time	–	–	5	µs	Wakeup with < 10°C temperature change while in Deep Sleep. f_{FLL_IN} = 8 MHz, f_{FLL_OUT} = 100 MHz, Time from stable reference clock until FLL frequency is within 5% of final value
SID351	f_{FLL_OUT}	Output frequency from FLL block	24	–	100	MHz	Output range of FLL divided-by-2 output
SID352	FLL_CJIT	FLL frequency accuracy	–1	–	1	%	This is added to the error of the source
SID353	f_{FLL_IN}	Input frequency	0.25	–	80	MHz	–
SID354	I_{FLL}	FLL operating current	–	250	360	µA	Reference clock: IMO, CCO frequency: 200 MHz, FLL frequency: 100 MHz, guaranteed by design

表 55 WCO规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID360	f_{WCO}	Crystal frequency	–	32.768	–	kHz	Maximum drive level: 0.5 µW
SID361	WCO_DC	WCO duty cycle	10	–	90	%	–
SID362	t_{START_WCO}	WCO start up time[64]	–	–	1000	ms	For grade-S devices Time from set CTL.WCO_EN to ‘1’ until STATUS.WCO_OK is set to ‘1’ (See Clock Timing Diagrams
SID362E	t_{START_WCOE}	WCO start-up time[64]	–	–	1400	ms	For Grade-E devices Time from set CTL.WCO_EN to 1 until STATUS.WCO_OK is set to ‘1’ (See Clock Timing Diagrams).
SID363	I_{WCO}	WCO current	–	1.4	–	µA	For Grade-E devices, time from set CTL.WCO_EN to 1 untiSTATUS.WCO_OK is set to ‘1’ (See Clock timing diagrams)

注释：
64. 主要看外部晶振。

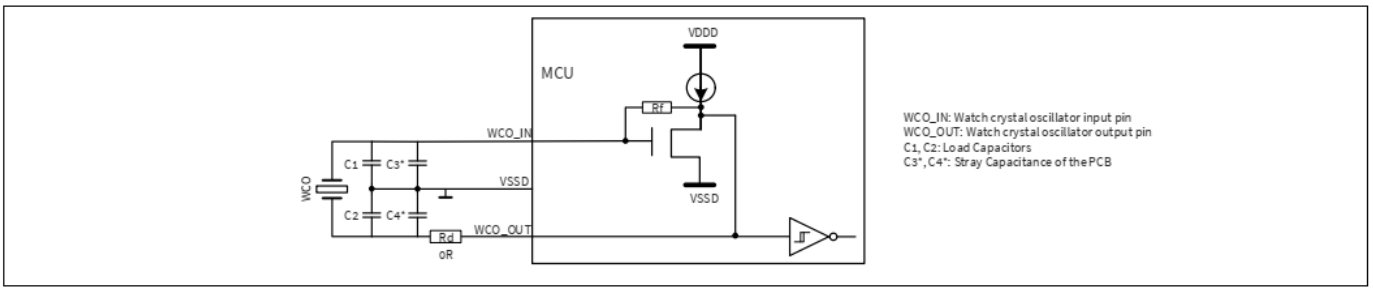


图 32 WCO 连接方案[65]

表 56 外部时钟输入规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID366	f_{EXT}	External clock input frequency	0.25	–	80	MHz	For EXT_CLK pin (all input level settings: CMOS, TTL, Industrial)
SID367	EXT_DC	External clock duty cycle	45	–	55	%	–

表 57 MCWDT 超时规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID410	t_{MCWDT1}	Minimum MCWDT timeout	57	–	–	µs	When using the ILO (32.768 kHz + 7%) and 16-bit MCWDT counter Guaranteed by design
SID411	t_{MCWDT2}	Maximum MCWDT timeout	–	–	2.15	s	When using the ILO (32.768 kHz – 7%) and 16-bit MCWDT counter Guaranteed by design

表 58 WDT 超时规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID412	t_{WDT1}	Minimum WDT timeout	57	–	–	µs	When using the ILO (32.768 kHz + 7%) and 16-bit WDT counter, guaranteed by design
SID413	t_{WDT2}	Maximum WDT timeout	–	–	39.15	h	When using the ILO (32.768 kHz – 7%) and 16-bit WDT counter, guaranteed by design
SID414	t_{WDT3}	Default WDT timeout	–	1000	–	ms	When using the ILO and 32-bit WDT counter at 0x8000 (default value). Guaranteed by design.

注释：

65. 有关晶体要求的更多信息，请参阅特定系列的架构参考手册（32 位 Arm® Cortex® -M7 工业微控制器 XMC7000 系列架构参考手册）。

26.11 时钟时序图

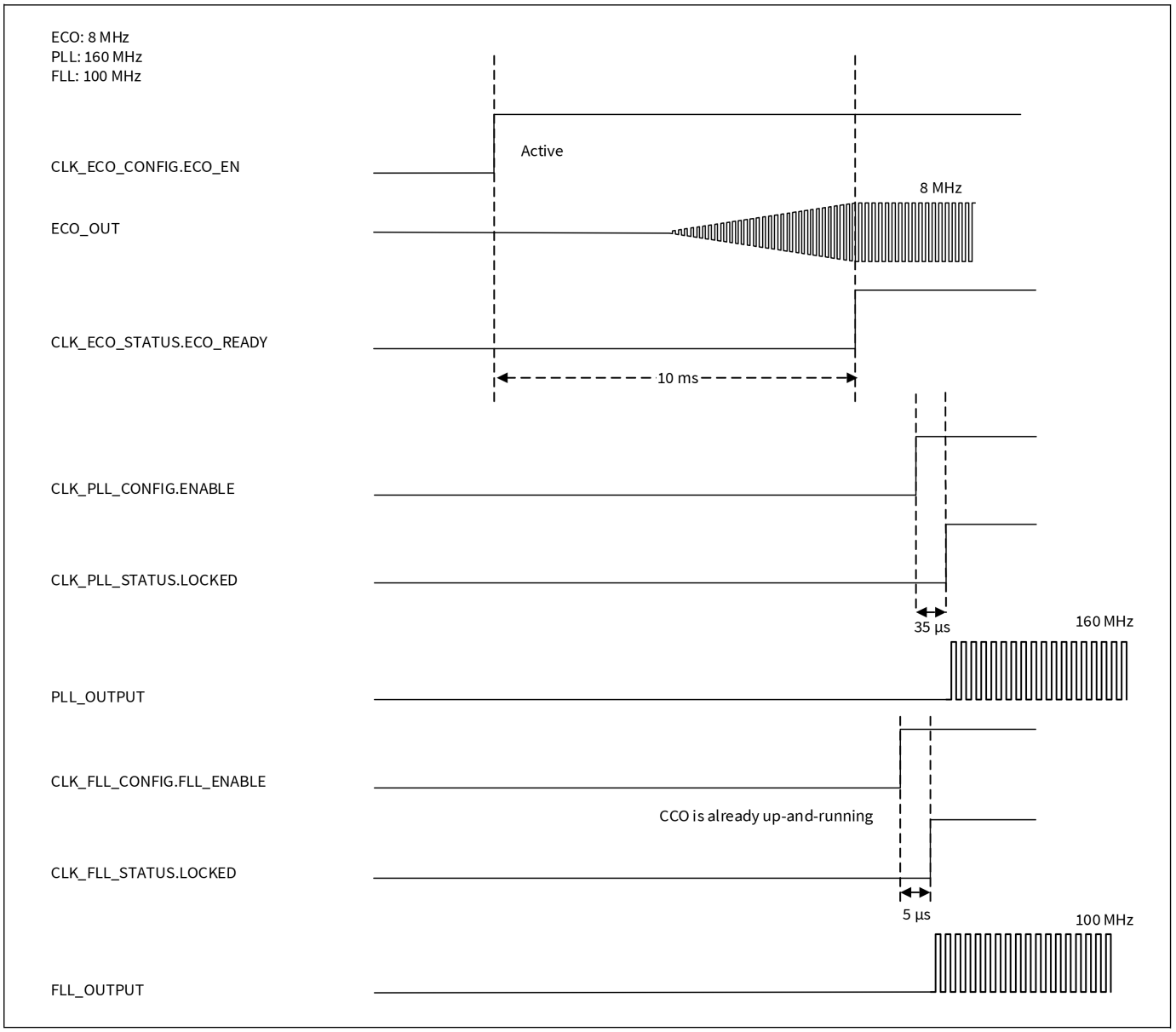


图 33 ECO 至 PLL 或 FLL 图

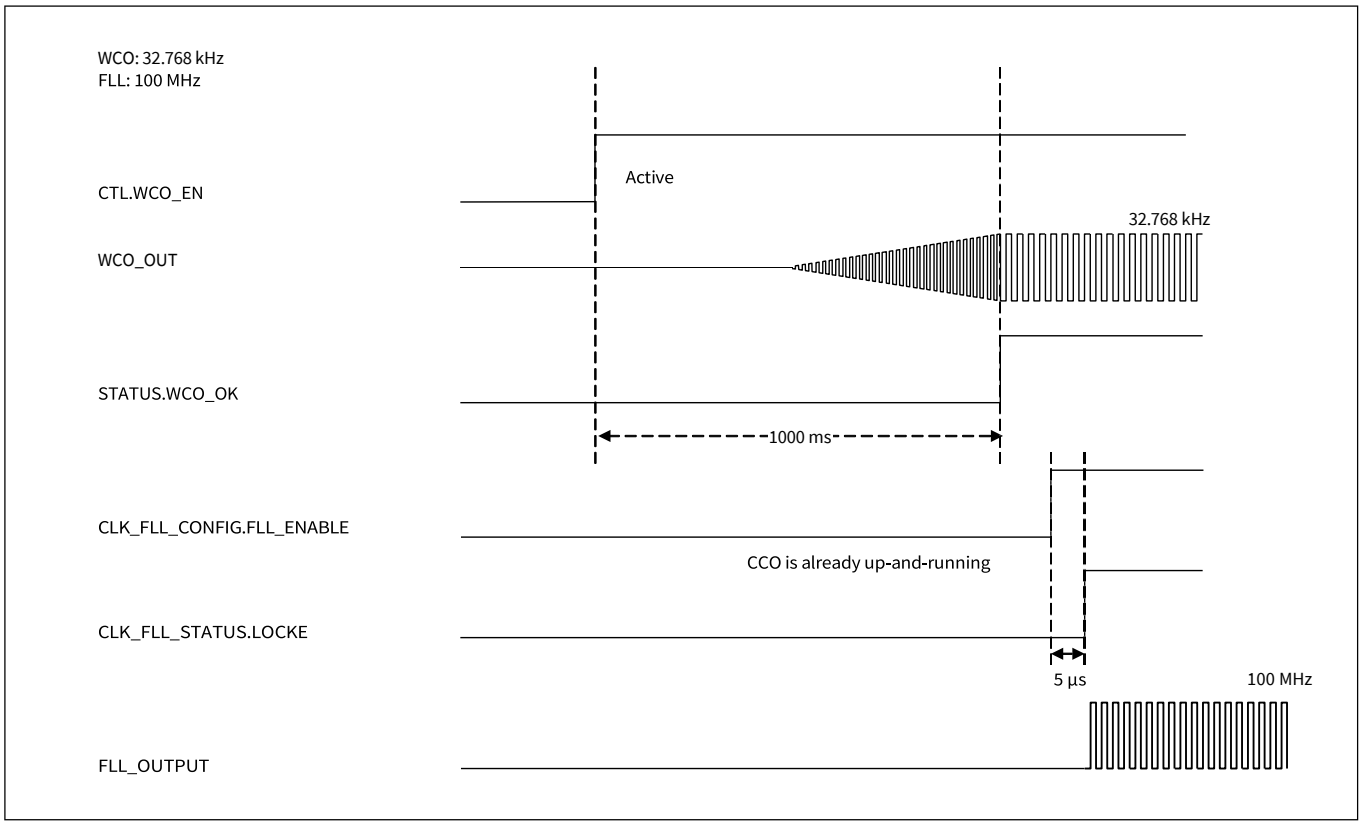


图 34 WCO 至 FLL 图

26.12 以太网规格

表 59 以太网规格 [条件： drive_sel<1:0>= 00]

除非另有说明， 所有规范均适用于 –40°C ≤ TA ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
Ethernet general specifications							
SID368	f_{SYS}	System clock max frequency	–	–	100	MHz	Guaranteed by design
SID369	f_{AXI}	AXI clock max frequency	–	–	200	MHz	Guaranteed by design
SID370	V_{ETH}	Ethernet MAC IO supply voltage	3.0	–	3.6	V	For V_{DDD} or V_{DDIO_4}
SID364A	CL_MD	Load capacitance	–	–	25	pF	For MDIO all signals between MAC and PHY using GPIO_STD and HSIO_STD
SID364A1	CL_MH	Load capacitance	–	–	25	pF	For MII and RMII all signals between MAC and PHY using HSIO_STD
SID364A2	CL_MG	Load capacitance	–	–	15	pF	For MII and RMII all signals between MAC and PHY using GPIO_STD
SID364B	CL_GH	Load capacitance	–	–	10	pF	For GMII and RGMII all signals between MAC and PHY using HSIO_STD
SID365B	tRF_G	Rise / fall time (for input and output pins)	–	–	1	ns	20% to 80%, for GMII using HSIO_STD
SID365A	t_{RF}	Rise / fall time (for input pins)	–	–	2	ns	20% to 80%, for MII, RMII, and MDIO using GPIO_STD and HSIO_STD
SID365B1	t_{RF_GM}	Rise / fall time (For input and output pins)	–	–	0.75	ns	20% to 80%, For RGMII using HSIO_STD
Ethernet MII specifications for GPIO_STD							
SID375	f_{TXRX_CLK}	MII TX/RX_CLK Clock frequency at 100 Mbps	–100ppm	25	100ppm	MHz	–
SDI376	DUTY_TX-RX_CLK	TX/RX_CLK duty	35	–	65	%	–
SID372	t_{SKEWT}	MII Transmit data (TXD,TX_CTL,TX_ER) valid after TX_CLK	0.5	–	25	ns	–
SID373	t_{SUR}	MII Receive data setup to RX_CLK rising edge	10	–	–	ns	–
SID374	t_{HOLDR}	MII Receive data hold to RX_CLK rising edge	10	–	–	ns	–
Ethernet RMII specifications for GPIO_STD							
SID375A	f_{REF_CLK}	RMII reference Clock frequency	–50ppm	50	50 ppm	MHz	External clock
SID376A	DUTY_REF_CLK	Duty cycle of reference clock (input)	35	–	65	%	–

表 59　　以太网规格 *(续)* [条件： drive_sel<1:0>= 00]

除非另有说明， 所有规范均适用于 –40°C ≤ TA ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID377	t_{SU}	RXD[1:0], RX_CTL, RX_ER Data Setup to REF_CLK rising edge	4	–	–	ns	–
SID378	t_{HOLD}	RXD[1:0], RX_CTL, RX_ER, Data hold from REF_CLK rising edge	2	–	–	ns	–
SID393	t_{TXOUT}	TX_EN,TXD[1:0], Data output delay from REF_CLK rising edge	2	–	14.6	ns	For GPIO_ST
SID393A	t_{TXOUT_A}	TX_CTL, TXD[1:0], data output delay from REF_CLK rising edge	2		14	ns	For HSIO_STD
Ethernet GMII specifications for HSIO_STD							
SID379	f_{P_REFCLK}	REF_CLK clock frequency	–	125	–	MHz	–
SID380	f_{P_RXCLK}	RX_CLK clock frequency	–50ppm	125	50ppm	MHz	–
SID380A	t_{P_RXCLK}	RX_CLK clock period	7.5	–	8.5	ns	–
SID380B	$t_{P\_HL\_RXCLK}$	RX_CLK clock time HIGH/LOW	2.5	–	–	ns	–
SID389	f_{P_TXCLK}	TX(GTX)_CLK frequency (External/Internal mode)	–100ppm	125	100ppm	MHz	–
SID389A	t_{P_TXCLK}	TX(GTX)_CLK clock period (External/Internal mode)	7.5	–	8.5	ns	–
SID389B	$t_{P\_HL\_TXCLK}$	TX(GTX)_CLK clock time HIGH/LOW (External/Internal mode)	2.5	–	–	ns	–
SID381	t_{SETUPT}	TX_CTL, TXD, TX_ER Setup to TX(GTX)_CLK rising edge	2.5	–	–	ns	–
SID382	t_{HOLDT}	TX_CTL, TXD, TX_ER hold from TX(GTX)_CLK rising edge	0.5	–	–	ns	–
SID383	t_{SETUPR}	RX_CTL, RXD, RX_ER setup to RX_CLK rising edge	2	–	–	ns	–
SID384	t_{HOLDR}	RX_CTL, RXD, RX_ER hold from RX_CLK rising edge	0	–	–	ns	–
Ethernet RGMII specifications for HSIO_STD							
SID385	f_{CYC}	REF_CLK clock frequency	–	125	–	MHz	–
SID385_1	f_{P_TXCRXC}	TX(TXC)_CLK (External mode) and RX(RXC)_CLK clock frequency	–50ppm	125	50ppm	MHz	–
SID385B	t_{P_TXCRXC}	tP_TXCRXC Description: TX(TXC)_CLK (External mode)/RX(RXC)_CLK clock period	7.2	8	8.8	ns	–
SID386B	DUTY_TXC RXC	Duty for TX(TXC)_CLK (External mode)/RX(RXC)_CLK clock	45	–	55	%	–
SID387	t_{SKEWT}	Data to clock output skew	–0.5	–	0.5	ns	–
SID388	t_{SKEWR}	Data to clock input skew	1	–	2.6	ns	–
Ethernet MDIO specifications for GPIO_STD/HSIO_STD							
SID395	t_{MDCYC}	MDC clock cycle	400	–	–	ns	–
SID395A	t_{HL_MDCYC}	The minimum HIGH and LOW times for MDC	160	–	–	ns	–
SID396	t_{MDIS}	MDIO input setup time to MDC rising edge	100	–	–	ns	–
SID397	t_{MDIH}	MDIO input hold time to MDC rising edge	0	–	–	ns	–

表 59　　以太网规格 *(续)* [条件： drive_sel<1:0>= 00]

除非另有说明， 所有规范均适用于 –40°C ≤ TA ≤ 125°C 和 2.7 V 至 5.5 V。

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID398	t_{MDIO}	MDIO output skew from MDC rising edge	10	–	390	ns	–

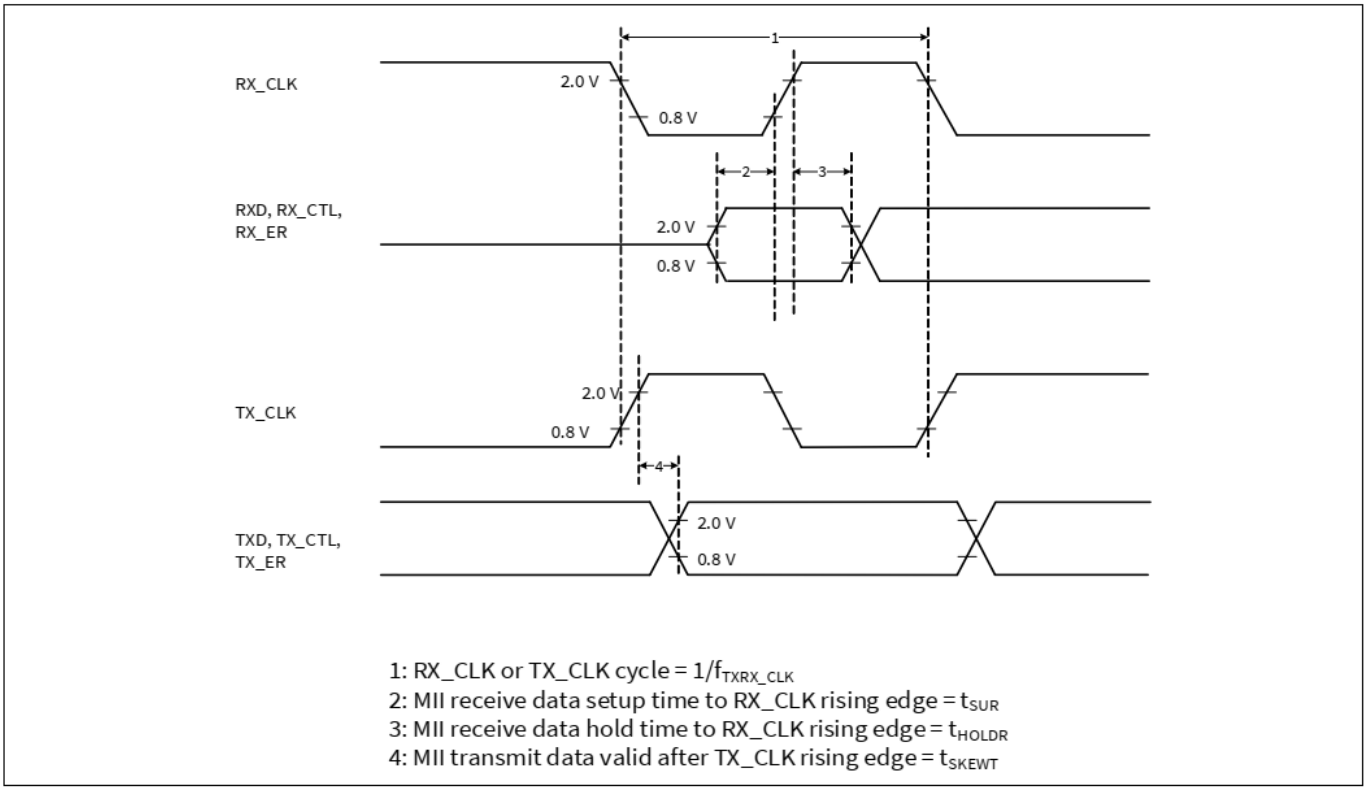


图 35　　MII 时序图

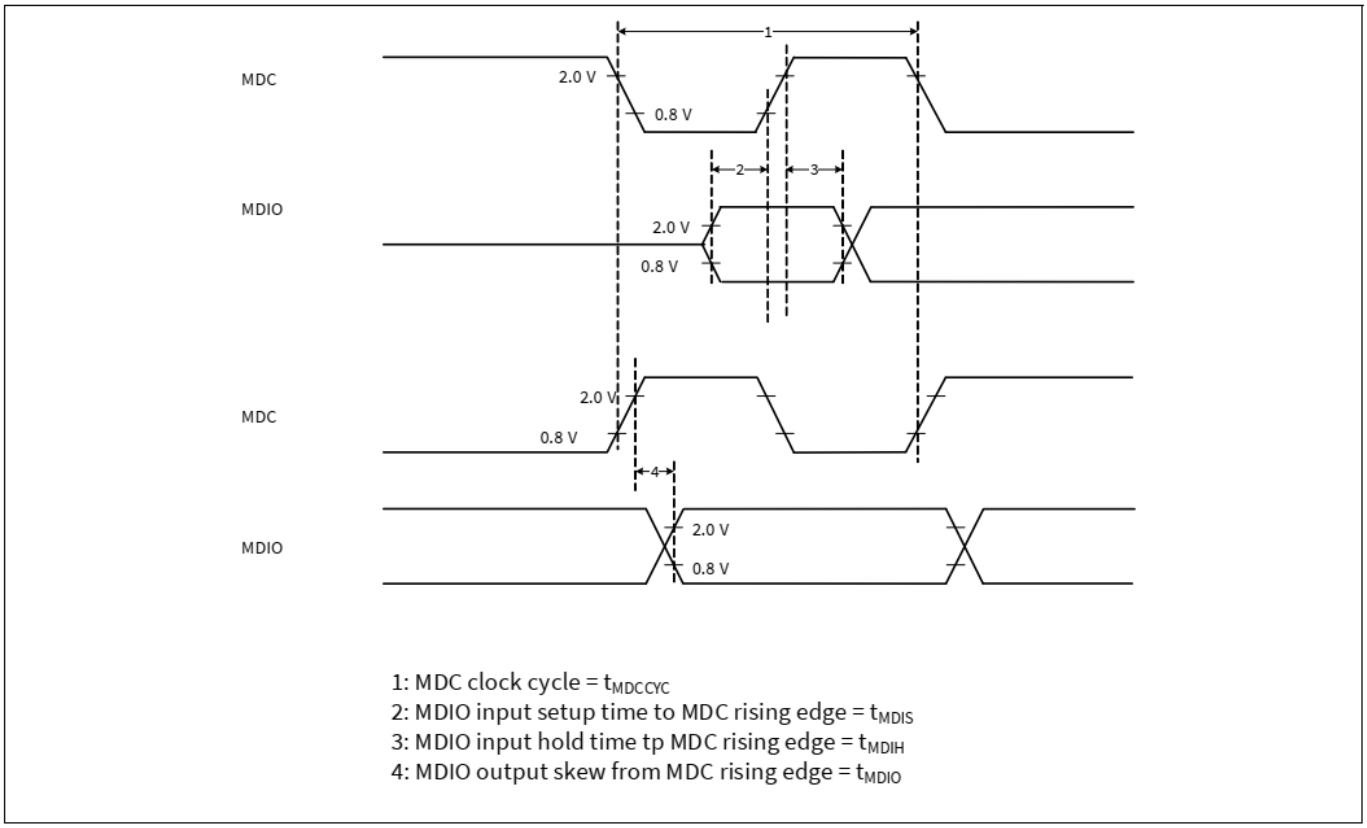


图 36　　MDIO 时序图

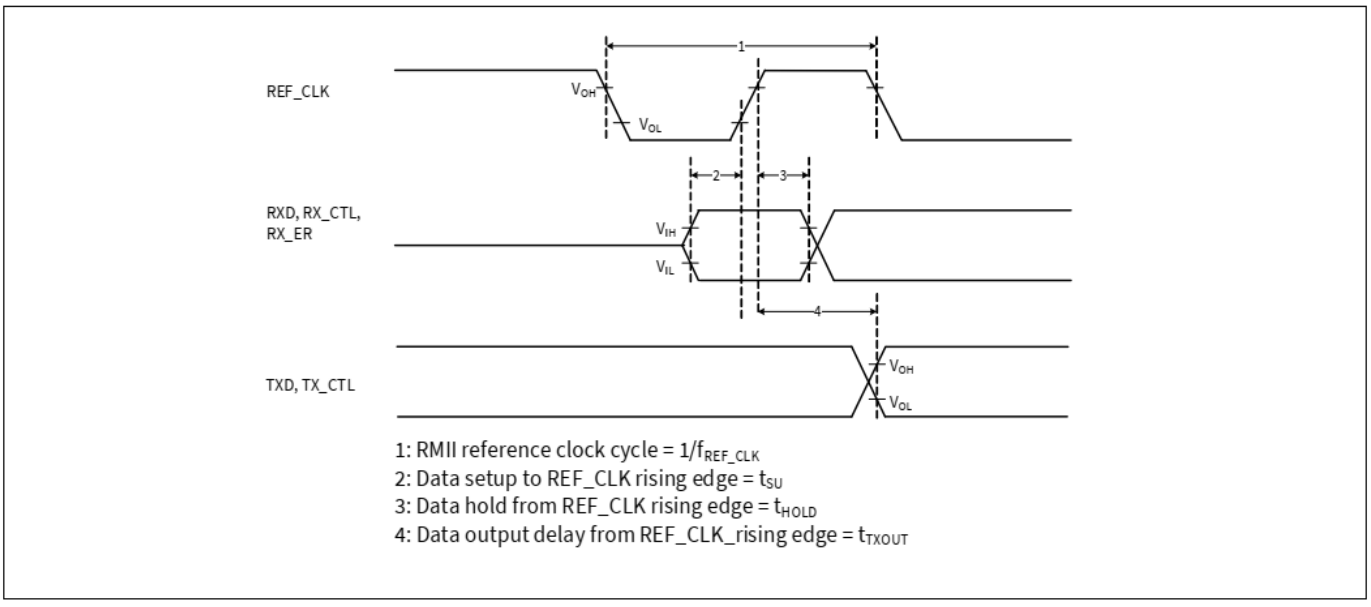
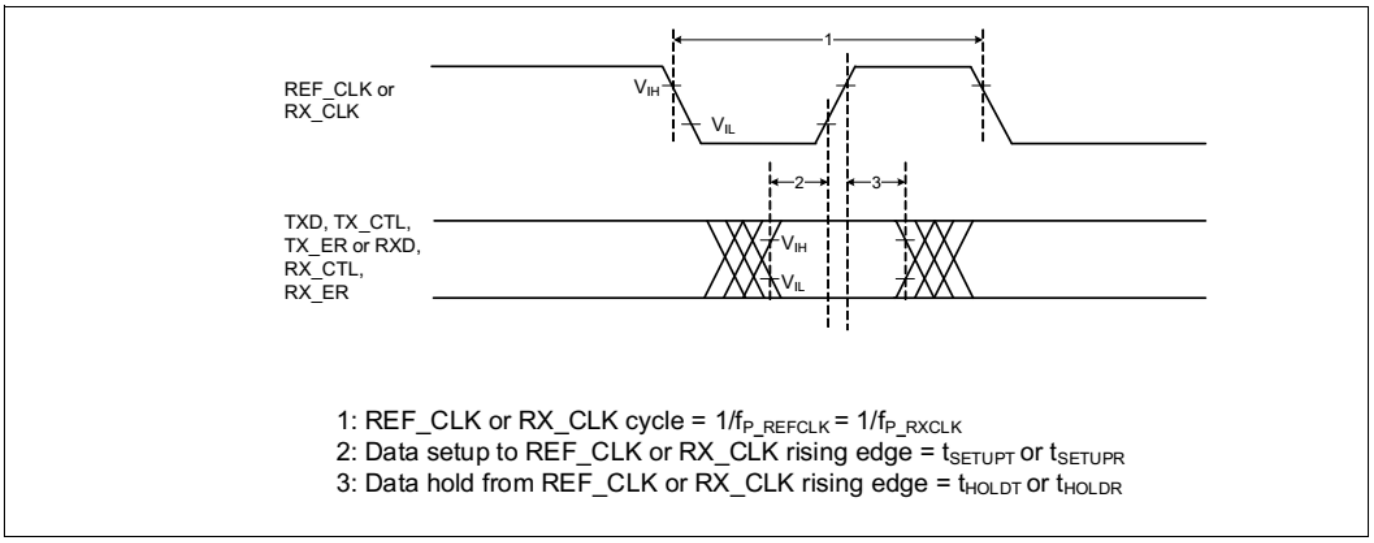
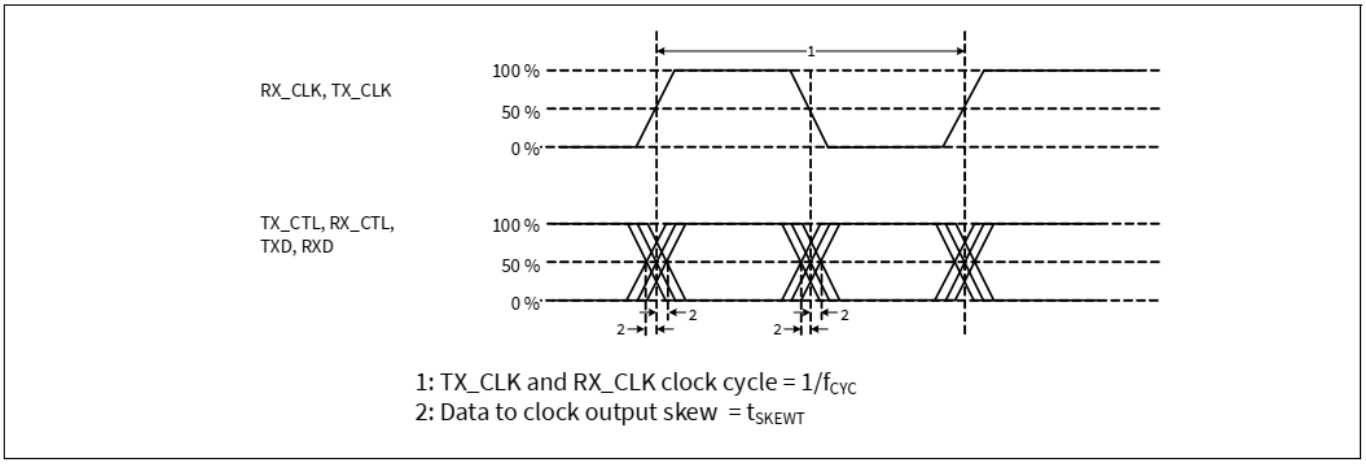


图 37　　RMII 时序图



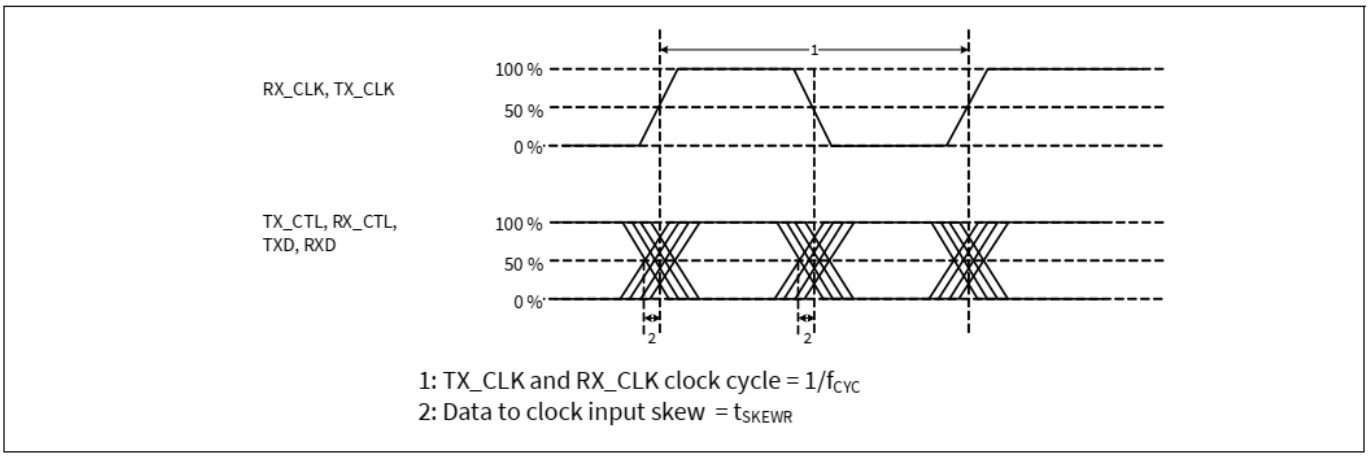
1: REF_CLK or RX_CLK cycle = $1/f_{P\_REFCLK} = 1/f_{P\_RXCLK}$
2: Data setup to REF_CLK or RX_CLK rising edge = t_{SETUPT} or t_{SETUPR}
3: Data hold from REF_CLK or RX_CLK rising edge = t_{HOLDT} or t_{HOLDR}

图 38 GMII 时序图



1: TX_CLK and RX_CLK clock cycle = $1/f_{CYC}$
2: Data to clock output skew = t_{SKEWT}

图 39 RGMII Tx 时序图



1: TX_CLK and RX_CLK clock cycle = $1/f_{CYC}$
2: Data to clock input skew = t_{SKEWR}

图 40 RGMII Rx 时序图

26.13 SDHC 规格

表 60 SDHC 规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SDHC and eMMC specifications (source clock must be divided by 2 or more in DDR modes)							
SID801	V_{SDHC}	SDHC IO supply voltage	2.7	–	3.6	V	For V_{DDIO_1} or V_{DDIO_3}
SID802	I_{ODS}	I/O drive select	8	–	8	mA	drive_sel<1:0>= 0b00 for all modes
SID803	t_{IT}	Input transition time	0.7	–	3	ns	–
SD: DS timing specifications for GPIO_STD/HSIO_STD							
SID810	f_{LP}	Interface clock period	–	–	25	MHz	40-ns period
SID812	C_D	I/O loading at DATA/CMD pins	40	–	40	pF	–
SID813	C_C	I/O loading at CLK pins	40	–	40	pF	–
SID814	t_{OS}	Output setup time of CMD/DAT prior to CLK	5.5	–	–	ns	–
SID815	t_{OH}	Output hold time of CMD/DAT after CLK	5.5	–	–	ns	–
SID816	t_{IS_LP}	Input setup time of CMD/DAT prior to CLK	24	–	–	ns	Clock period - Output delay
SID818	t_{IH}	Input hold time of CMD/DAT after CLK	0	–	–	ns	–
SD: HS timing specifications for HSIO_STD							
SID820	$f_{LP\_SD\_HS}$	Interface clock period	–	–	50	MHz	20-ns period
SID822	$C_{D\_SD\_HS}$	I/O loading at DATA/CMD pins	40	–	40	pF	–
SID823	$C_{C\_SD\_HS}$	I/O loading at CLK pins	40	–	40	pF	–
SID824	$t_{OS\_SD\_HS}$	Output setup time of CMD/DAT prior to CLK	6.5	–	–	ns	–
SID825	$t_{OH\_SD\_HS}$	Output hold time of CMD/DAT after CLK	2.5	–	–	ns	–
SID826	$t_{IS\_LP\_SD\_HS}$	Input setup time of CMD/DAT prior to CLK	4	–	–	ns	Clock period less output delay
SID828	$t_{IH\_SD\_HS}$	Input hold time of CMD/DAT after CLK	2.5	–	–	ns	–
eMMC: BWC timing specifications for GPIO_STD/HSIO_STD							
SID870	$f_{LP\_eMMC\_BWC}$	Interface clock period	–	–	26	MHz	38.4-ns period
SID872	$C_{D\_eMMC\_BWC}$	I/O loading at DATA/CMD pins	30	–	30	pF	–
SID873	$C_{C\_eMMC\_BWC}$	I/O loading at CLK pins	30	–	30	pF	–
SID874	$t_{OS\_eMMC\_BWC}$	Output setup time of CMD/DAT prior to CLK	3.5	–	–	ns	–
SID875	$t_{OH\_eMMC\_BWC}$	Output hold time of CMD/DAT after CLK	3.5	–	–	ns	–
SID876	$t_{IS\_LP\_eMMC\_BWC}$	Input setup time of CMD/DAT prior to CLK	9.7	–	–	ns	Clock period less output delay
SID878	$t_{IH\_eMMC\_BWC}$	Input hold time of CMD/DAT after CLK	8.3	–	–	ns	–
eMMC: SDR timing specifications for HSIO_STD							
SID880	$f_{LP\_eMMC\_SDR}$	Interface clock period	–	–	52	MHz	19.2-ns period
SID882	$C_{D\_eMMC\_SDR}$	I/O loading at DATA/CMD pins	30	–	30	pF	–
SID883	$C_{C\_eMMC\_SDR}$	I/O loading at CLK pins	30	–	30	pF	–
SID884	$t_{OS\_eMMC\_SDR}$	Output setup time of CMD/DAT prior to CLK	3.5	–	–	ns	–

表 60 SDHC 规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/conditions
SID885	$t_{OH\_eMMC\_SDR}$	Output hold time of CMD/DAT after CLK	3.5	–	–	ns	–
SID886	$t_{IS\_LP\_eMMC\_SDR}$	Input setup time of CMD/DAT prior to CLK	3.5	–	–	ns	Clock period less output delay
SID888	$t_{IH\_eMMC\_SDR}$	Input hold time of CMD/DAT after CLK	2.5	–	–	ns	–
eMMC: DDR timing specifications for HSIO_STD							
SID890	$f_{LP\_eMMC\_DDR}$	Interface clock period	–	–	52	MHz	19.2-ns period
SID892	$DUTY\_CLK_{\_eMMC\_DDR}$	Duty cycle of output CLK	45	–	55	%	–
SID893	$C_{D\_eMMC\_DDR}$	I/O loading at DATA/CMD pins	20	–	20	pF	–
SID894	$C_{C\_eMMC\_DDR}$	I/O loading at CLK pins	20	–	20	pF	–
SID895	$t_{OS\_eMMC\_DDR}$	Output setup time of CMD/DAT prior to CLK	2.6	–	–	ns	–
SID896	$t_{OH\_eMMC\_DDR}$	Output hold time of CMD/DAT after CLK	2.6	–	–	ns	–
SID897	$t_{IS\_LP\_eMMC\_DDR}$	Input setup time of CMD/DAT prior to CLK	2.4	–	–	ns	Clock period less output delay
SID899	$t_{IH\_eMMC\_DDR}$	Input hold time of CMD/DAT after CLK	1.5	–	–	ns	–

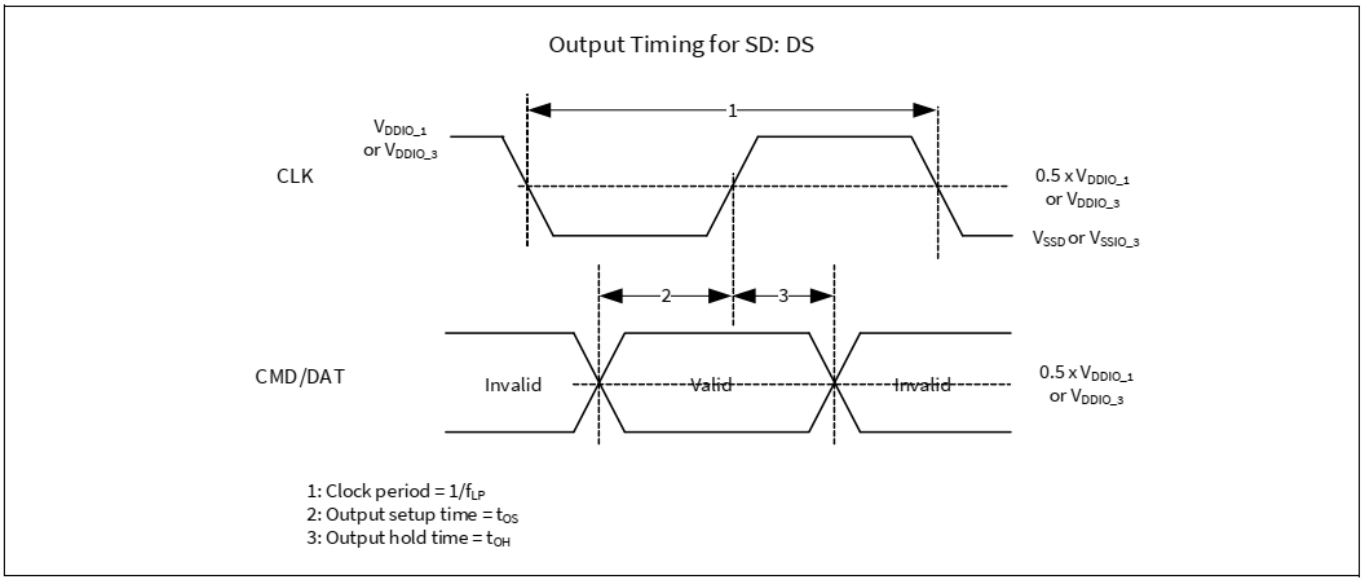


图 41 SD 默认速度输出时序

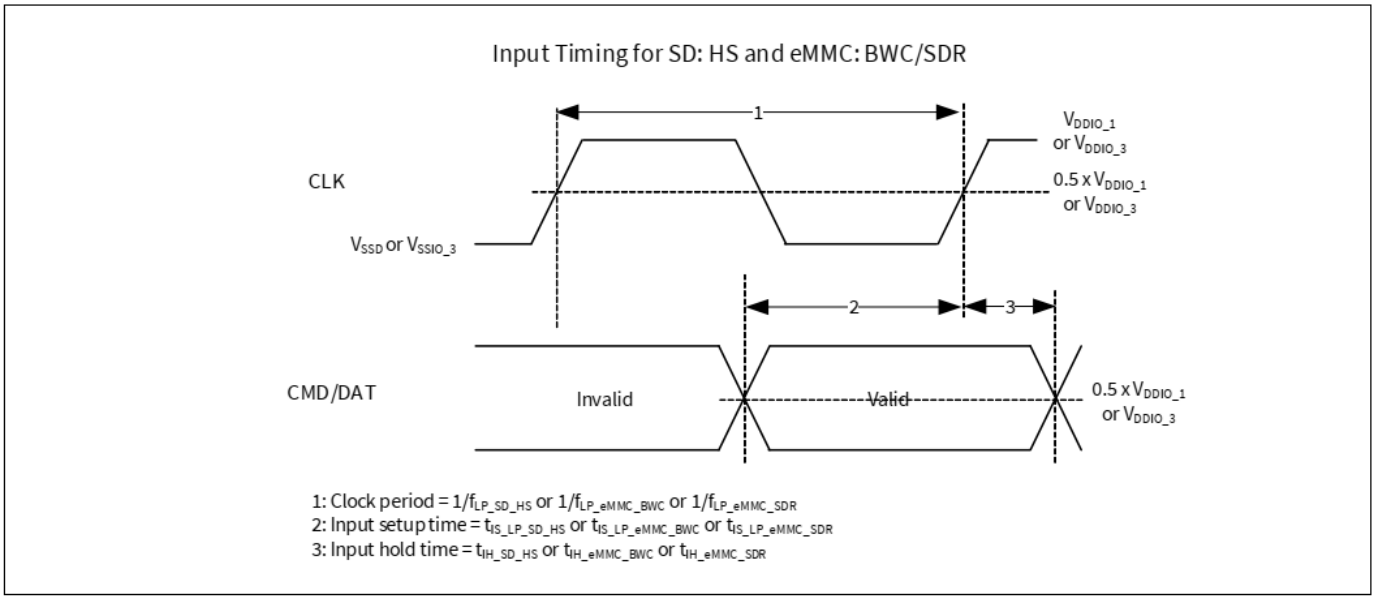


图 42　　SD 高速和 eMMC BWC/SDR 输入时序

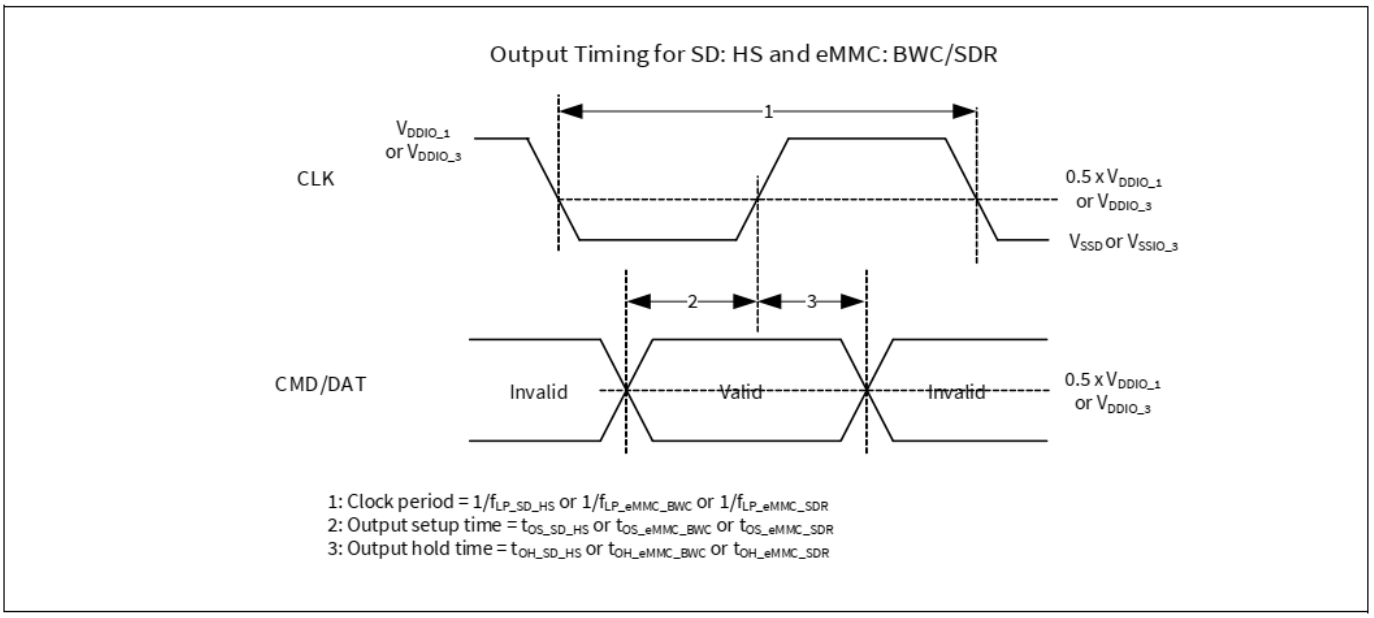


图 43　　SD 高速和eMMC BWC/SDR 输出时序

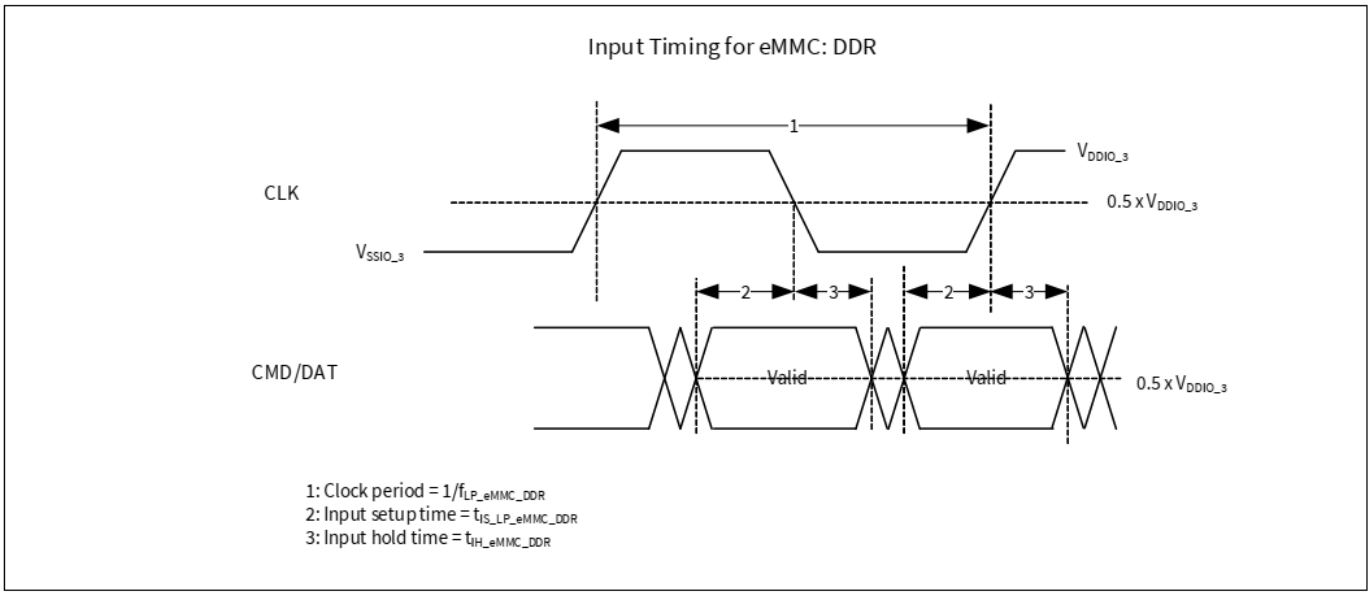


图 44　　eMMC DDR 输入时序

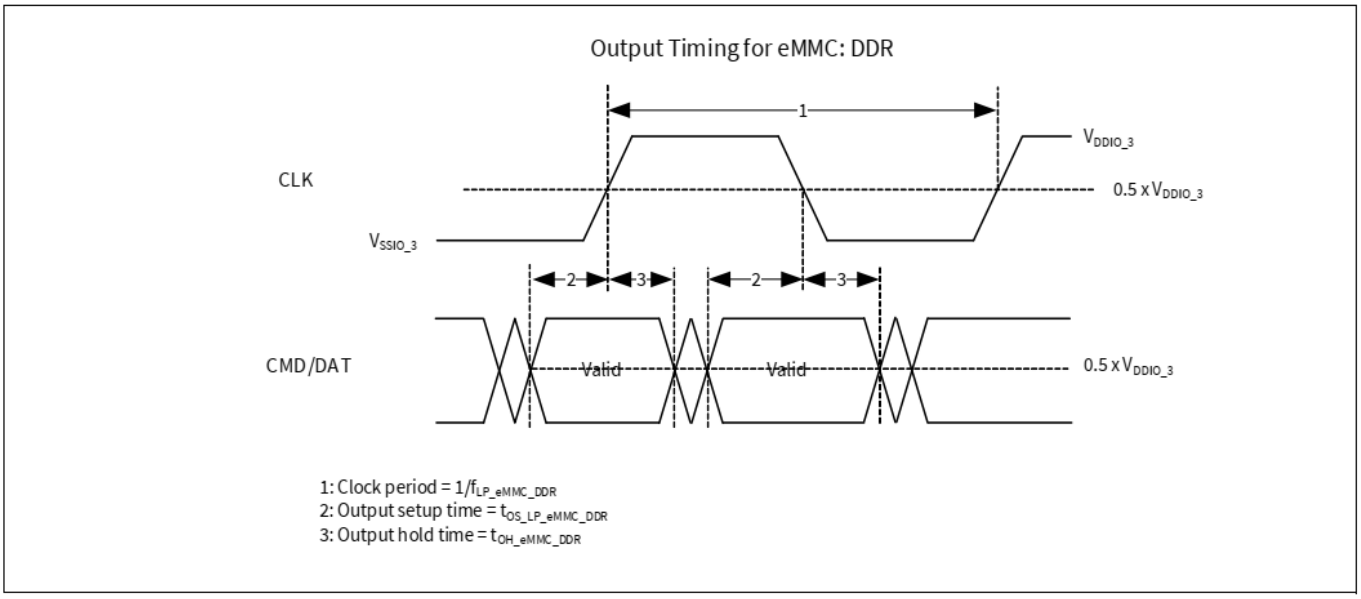


图 45　　eMMC DDR 输出时序

26.14 音频子系统规格

表 61 音频子系统规格

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID770	f_{AUDIO}	Audio subsystem frequency	–	–	200	MHz	Guaranteed by design
SID772	V_{AUDIO}	Audio Sub System I/O supply voltage	3.0	–	3.6	V	For V_{DDIO_2}
SID773	V_{OL_A}	Output Voltage LOW level	–	–	0.4	V	drive_sel<1:0>= 0b0X, Pull-up, pull-down: off
SID774	V_{OH_A}	Output Voltage HIGH level	V_{DDIO_2} – 0.5	–	–	V	drive_sel<1:0>= 0b0X, Pull-up, pull-down: off
SID775	$V_{IH\_CMOS\_A}$	Input Voltage HIGH threshold in CMOS mode	0.7 × V_{DDIO_2}	–	–	V	–
SID776	$V_{IL\_CMOS\_A}$	Input Voltage LOW threshold in CMOS mode	–	–	0.3 × V_{DDIO_2}	V	–
I^2S/TDM word clock frequency							
SID796	f_{WS_I2S}	WS Clock Rate in I^2S mode	8	–	192	kHz	Guaranteed by design
SID797	f_{WS_TDM}	WS Clock Rate in TDM mode	–	–	96	kHz	Guaranteed by design
SID798	Word	Length of I^2S Word	8	–	32	bit	Guaranteed by design
I^2S/TDM Master mode							
SID740	t_{D_WS}	Delay Time of TX/RX_WS Output Transition from Falling Edge of TX/RX_SCK Output	–8	–	9	ns	Except TDM 96 kHz mode, TX/RX_WS output and TX/RX_SCK output with drive_sel<1:0> = 0b 01, guaranteed by design
SID740A	$t_{D\_WS\_TDM96A}$	Delay Time of TX/RX_WS output Transition from Falling Edge of TX/RX_SCK output	–8	–	11	ns	TDM 96 kHz mode, TX/RX_WS output with drive_sel<1:0> = 0b01 and TX/RX_SCK output with drive_sel<1:0> = 0b00, guaranteed by design
SID741	t_{D_SDO}	Delay Time of TX_SDO Transition from Falling Edge of TX_SCK Output	–8	–	8	ns	TX_SDO and TX_SCK output with drive_sel<1:0> = 0b01 for except TDM 96 kHz mode, guaranteed by design
SID741A	$t_{D\_SDO\_TDM96}$	Delay Time of TX_SDO Transition from Falling Edge of TX_SCK Output	–8	–	8	ns	TX_SDO with drive_sel<1:0> = 0b01 and TX_SCK output with drive_sel<1:0> = 0b00 for TDM 96 kHz mode, guaranteed by design
SID742	t_{S_SDI}	RX_SDI Setup Time to the Following Rising Edge of RX_SCK Output (RX_CTL.B_CLOCK_INV = 0)	11	–	–	ns	RX_SCK output with drive_sel<1:0> = 0b00, guaranteed by design
SID743	t_{H_SDI}	RX_SDI Hold Time to the Rising Edge of RX_SCK Output (RX_CTL.B_CLOCK_INV = 0)	t_{MCLK_SOC} – 0.9	–	–	ns	RX_SCK output with drive_sel<1:0> = 0b00, guaranteed by design

表 61　　音频子系统规格 *(续)*

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID744	t_{S_SDI1}	RX_SDI Setup Time to the Following Falling Edge of RX_SCK Output (RX_CTL.B_CLOCK_INV = 1)	11	–	–	ns	RX_SCK output with drive_sel<1:0> = 0b00, guaranteed by design
SID745	t_{H_SDI1}	RX_SDI Hold Time to the Falling Edge of RX_SCK Output (RX_CTL.B_CLOCK_INV = 1)	t_{MCLK_SOC} – 0.9	–	–	ns	RX_SCK output with drive_sel<1:0> = 0b00, guaranteed by design
SID746	t_{SCKCY}	TX/RX_SCK Output Bit Clock Duty Cycle	45	–	55	%	Guaranteed by design
SID748	f_{MCLK_SOC}	MCLK input clock frequency	1.024	–	196.608	MHz	Internal Fractional PLL, guaranteed by design
SID748A	$f_{MCLK\_SOC\_E}$	MCLK input clock frequency	1.024	–	98.304	MHz	External clock
SID749	t_{MCLK_SOC}	MCLK input clock period	5.086	–	976.563	ns	Guaranteed by design
SID750	t_{JITTER}	MCLK Input clock jitter tolerance	–200	–	200	ps	Guaranteed by design
SID748B	f_{MCLK}	MCLK output clock frequency	1.024	–	25	MHz	MCLK output with drive_sel<1:0> = 0b00 Guaranteed by design
SID748C	f_{MCLK1}	MCLK output clock frequency	1.024	–	15	MHz	MCLK output with drive_sel<1:0> = 0b01 Guaranteed by design
SID749B	f_{MCLK_DT}	MCLK output clock duty	45	–	55	%	Guaranteed by design
I^2S/TDM Slave mode							
SID751	t_{S_WS}	TX/RX_WS Input Alignment Clock Setup Time to the following Rising Edge of TX/RX_SCK Input	5	–	–	ns	Guaranteed by design
SID752	t_{H_WS}	TX/RX_WS Input Alignment Clock Hold Time to the Rising Edge of TX/RX_SCK Input	t_{MCLK_SOC} + 5.0	–	–	ns	Guaranteed by design
SID753	t_{D_SDO}	Delay Time of TX_SDO Transition from Falling Edge of TX_SCK Input (TX_CTL.B_CLOCK_INV = 0)	$-t_{MCLK\_SOC}$ + 5.0	–	t_{MCLK_SOC}+ 15	ns	TX_SDO with drive_sel<1:0>= 0b00, guaranteed by design
SID754	t_{D_SDO1}	Delay Time of TX_SDO Transition from Rising Edge of TX_SCK Input (TX_CTL.B_CLOCK_INV = 1)	$-t_{MCLK\_SOC}$ + 5.0	–	t_{MCLK_SOC}+ 15	ns	TX_SDO with drive_sel<1:0>= 0b00, guaranteed by design
SID755	t_{S_SDI}	RX_SDI Setup Time to the Following Rising Edge of RX_SCK Input	5	–	–	ns	Guaranteed by design
SID756	t_{H_SDI}	RX_SDI Hold Time to the Rising Edge of RX_SCK Input	t_{MCLK_SOC} + 5.0	–	–	ns	Guaranteed by design
SID757	t_{SCKCY}	TX/RX_SCK Input Bit Clock Duty Cycle	45	–	55	%	Guaranteed by design

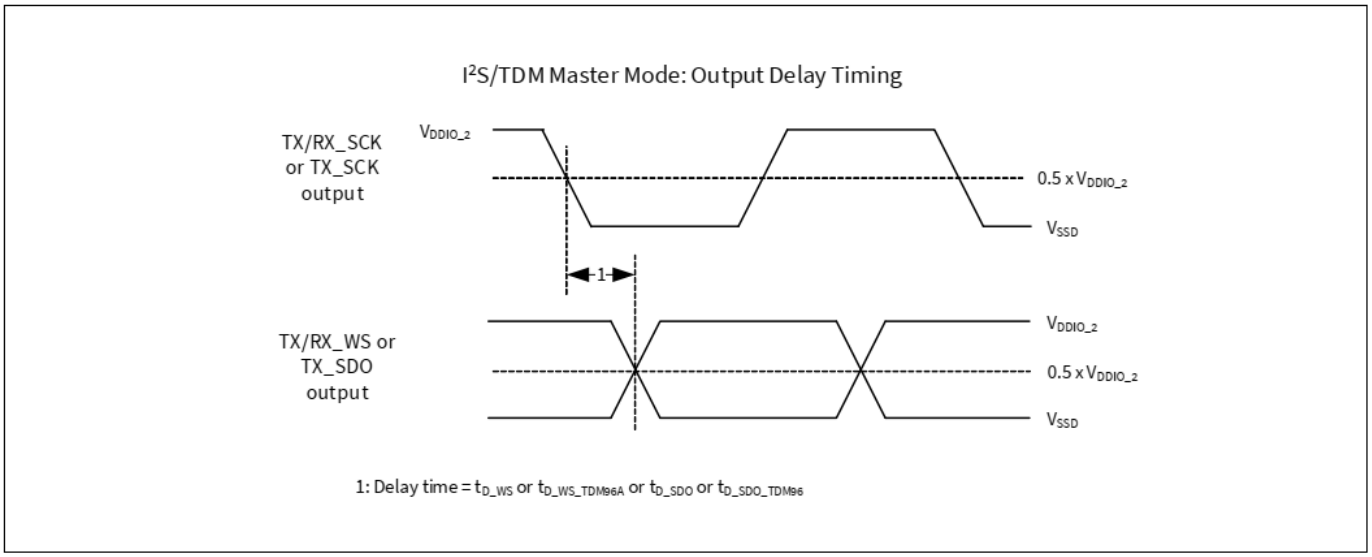


图 46　　主输出延迟

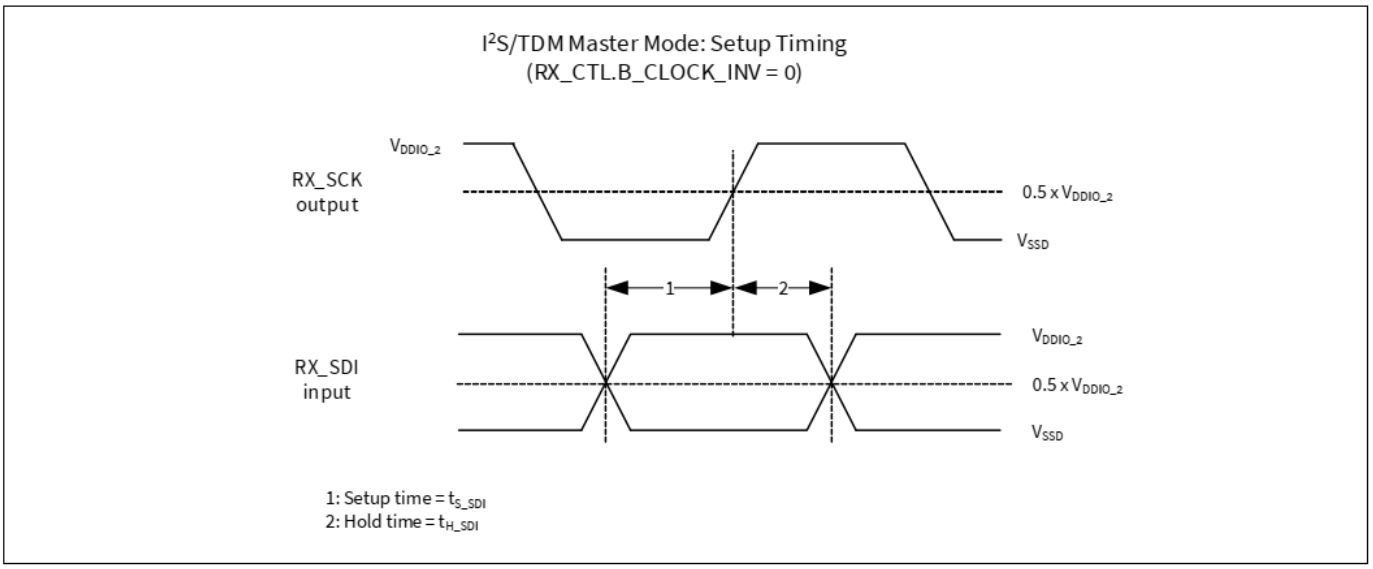


图 47　　无时钟反转的主设置

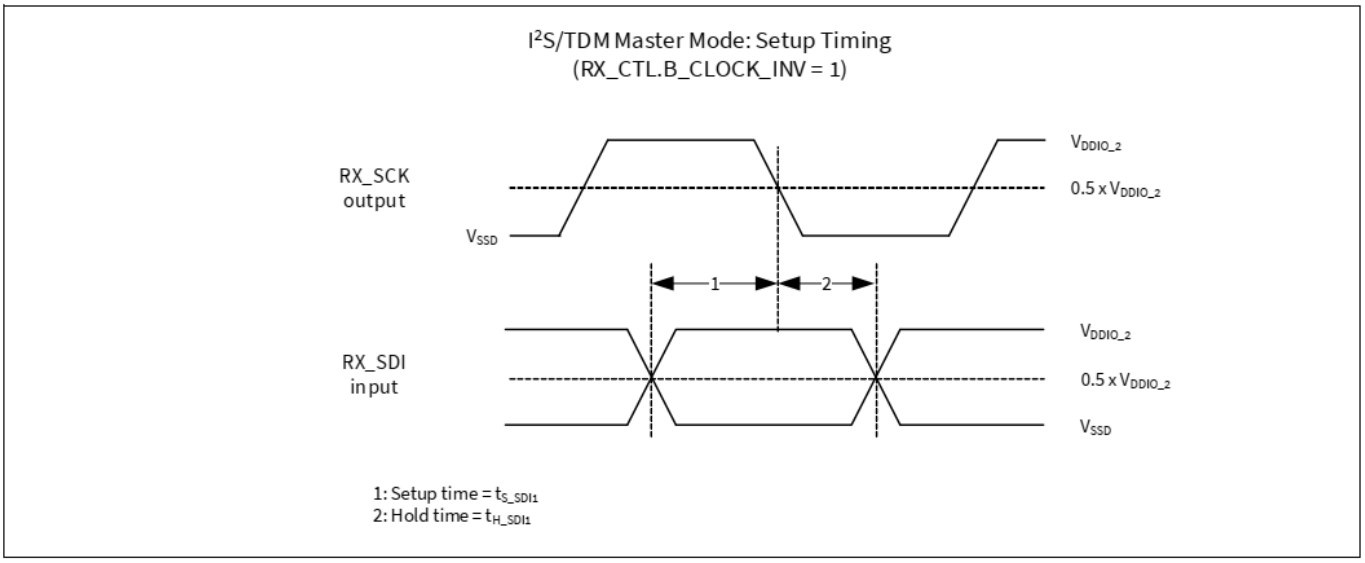


图 48　　带时钟反转的主设置

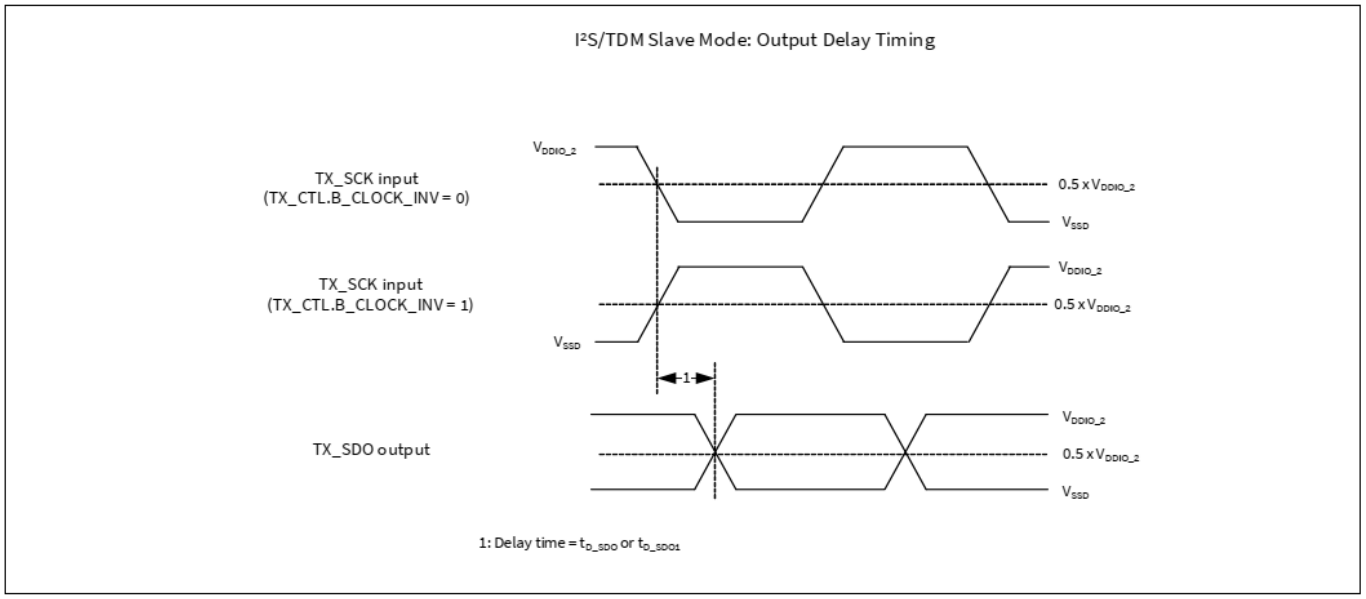


图 49　　从机输出延迟

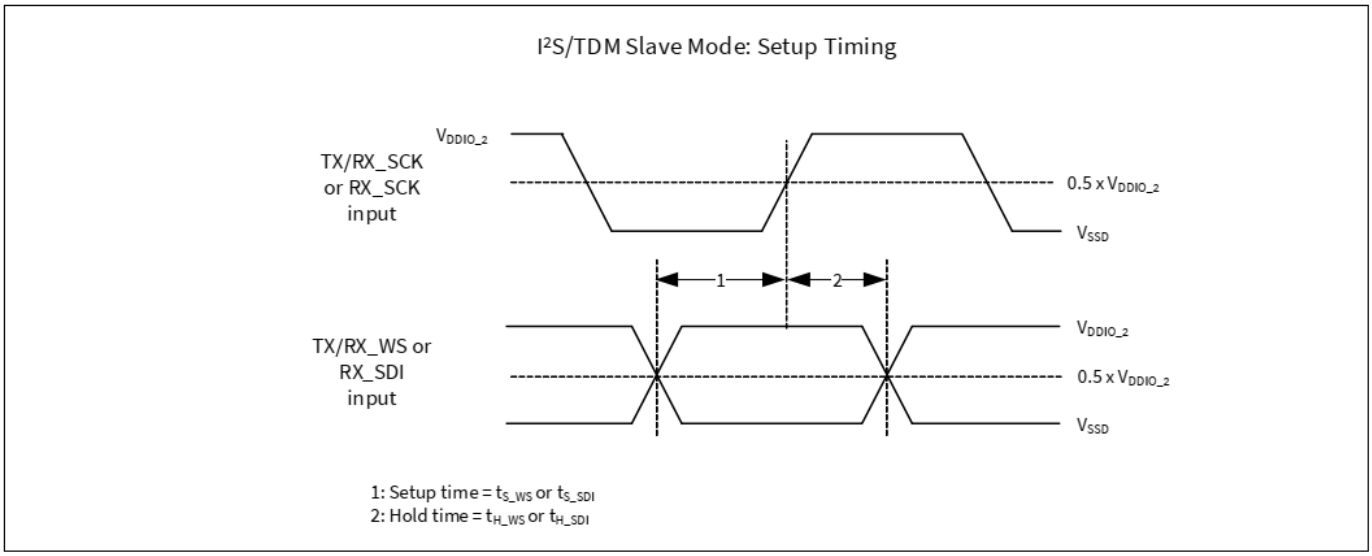

I²S/TDM Slave Mode: Setup Timing
VDDIO_2
TX/RX_SCK or RX_SCK input
0.5 x VDDIO_2
VSSD
1
2
TX/RX_WS or RX_SDI input
VDDIO_2
0.5 x VDDIO_2
VSSD
1: Setup time = tS_WS or tS_SDI
2: Hold time = tH_WS or tH_SDI

图 50　　从机设置

26.15 串行存储器接口规格

表 62 SMIF 规格

[条件：drive_sel<1:0>= 00]

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SMIF DC specification							
SID785	V_{SMIF}	SMIF I/O supply voltage	2.7	–	3.6	V	For V_{DDIO_1} or V_{DDIO_3}
SMIF HSSPI(SDR) specification for HSIO_STD							
SID760	$C_{L\_SDR\_HSIO}$	Load capacitance	–	–	30	pF	–
SID761	$SR_{\_SDR\_HSIO}$	Input rise and fall slew rates	1.5	–	–	V/ns	Guaranteed by design
SID762	$f_{CK\_SDR\_HSIO}$	Clock frequency	-	–	100	MHz	–
SID763	$t_{CK\_SDR\_HSIO}$	Clock period	$1 / f_{CK\_SDR\_HSIO}$	–	–	ns	–
SID764	DCK_SDR_HSIO	Clock duty	45	–	55	%	–
SID765	$CSR_{\_SDR\_HSIO}$	Clock rise and fall slew rates	1.5	–	–	V/ns	–
SID766	$t_{CS\_SDR\_HSIO}$	Chip select HIGH time	10	–	–	ns	–
SID767	$t_{CSS\_SDR\_HSIO}$	Chip select active setup time	3	–	–	ns	–
SID768	$t_{CSH\_SDR\_HSIO}$	Chip select active hold time	5	–	–	ns	–
SID769	$t_{SU\_SDR\_HSIO}$	Data setup time	1.5	–	–	ns	–
SID780	$t_{HD\_SDR\_HSIO}$	Data hold time	2	–	–	ns	–
SID781	$t_{V\_SDR\_HSIO}$	Clock LOW output valid	1.5	–	7.65	ns	–
SID782	$t_{HO\_SDR\_HSIO}$	Input hold time	2	–	–	ns	–
SID783	$t_{DIS\_SDR\_HSIO}$	Input disable time	0	–	7.5	ns	Guaranteed by design
SID784	$t_{IO\_SKEW\_SDR\_HSIO}$	Data skew (first data bit to last data bit)	–	–	0.6	ns	Guaranteed by design
SMIF HSSPI(SDR) specification for GPIO_STD							
SID760A	$C_{L\_SDR\_GPIO}$	Load capacitance	–	–	30	pF	–
SID761A	$SR_{\_SDR\_GPIO}$	Input rise and fall slew rates	1	–	–	V/ns	Guaranteed by design
SID762A	$f_{CK\_SDR\_GPIO}$	Clock frequency	–	–	32	MHz	–
SID763A	$t_{CK\_SDR\_GPIO}$	Clock period	$1 / f_{CK\_SDR\_GPIO}$	–	–	ns	–
SID764A	DCK_SDR_GPIO	Clock duty	45	–	55	%	–
SID765A	$CSR_{\_SDR\_GPIO}$	Clock rise and fall slew rates	1	–	–	V/ns	–
SID766A	$t_{CS\_SDR\_GPIO}$	Chip select HIGH time	30	–	–	ns	–
SID767A	$t_{CSS\_SDR\_GPIO}$	Chip select active setup time	9	–	–	ns	–
SID768A	$t_{CSH\_SDR\_GPIO}$	Chip select active hold time	15	–	–	ns	–
SID769A	$t_{SU\_SDR\_GPIO}$	Data setup time	4.5	–	–	ns	–
SID780A	$t_{HD\_SDR\_GPIO}$	Data hold time	6	–	–	ns	–
SID781A	$t_{V\_SDR\_GPIO}$	Clock LOW output valid	4.5	–	9	ns	–
SID782A	$t_{HO\_SDR\_GPIO}$	Input hold time	2	–	–	ns	–
SID783A	$t_{DIS\_SDR\_GPIO}$	Input disable time	0	–	22.5	ns	Guaranteed by design
SID784A	$t_{IO\_SKEW\_SDR\_GPIO}$	Data skew (first data bit to last data bit)	–	–	1.8	ns	Guaranteed by design
SMIF HSSPI(DDR) specification for HSIO_STD							
SID760B	$C_{L\_DDR\_HSIO}$	Load capacitance	–	–	15	pF	–

表 62 SMIF 规格

[条件：drive_sel<1:0>= 00]

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID761B	SR_{DDR_HSIO}	Input rise and fall slew rates	1.5	–	-	V/ns	Guaranteed by design
SID762B2	$f_{CK\_DDR\_HSIO}$	Clock frequency	-	–	90	MHz	–
SID763B	$t_{CK\_DDR\_HSIO}$	Clock period	$1 / f_{CK\_DDR\_HSIO}$	–	–	ns	–
SID764B	DCK_DDR_HSIO	Clock duty	45	–	55	%	–
SID765B	CSR_DDR_HSIO	Clock rise and fall slew rates	1.5	–	–	V/ns	–
SID766B	$t_{CS\_DDR\_HSIO}$	Chip select HIGH time	10	–	–	ns	–
SID767B	$t_{CSS\_DDR\_HSIO}$	Chip select active setup time	4	–	–	ns	–
SID768B	$t_{CSH\_DDR\_HSIO}$	Chip select active hold time	4	–	–	ns	–
SID769B	$t_{SU\_DDR\_HSIO}$	Data setup time	2	–	–	ns	–
SID780B	$t_{HD\_DDR\_HSIO}$	Data hold time	1.2	–	–	ns	–
SID781B	$t_{V\_DDR\_HSIO}$	Clock LOW output valid	0	–	6.5	ns	–
SID782B	$t_{HO\_DDR\_HSIO}$	Input hold time	1	–	–	ns	–
SID783B	$t_{DIS\_DDR\_HSIO}$	Input disable time	–	–	7.5	ns	Guaranteed by design
SID784B	$t_{IO\_SKEW\_DDR\_HSIO}$	Data skew (first data bit to last data bit)	–	–	0.6	ns	Guaranteed by design
SMIF HSSPI(DDR) specification for GPIO_STD							
SID760C	$C_{L\_DDR\_GPIO}$	Load capacitance	–	–	15	pF	–
SID761C	SR_{DDR_GPIO}	Input rise and fall slew rates	1	–	–	V/ns	Guaranteed by design
SID762C	$f_{CK\_DDR\_GPIO}$	Clock frequency	–	–	32	MHz	–
SID763C	$t_{CK\_DDR\_GPIO}$	Clock period	$1 / f_{CK\_DDR\_GPIO}$	–	-	ns	–
SID764C	DCK_DDR_GPIO	Clock duty	45	–	55	%	–
SID765C	CSR_DDR_GPIO	Clock rise and fall slew rates	1	–	–	V/ns	–
SID766C	$t_{CS\_DDR\_GPIO}$	Chip select HIGH time	30	–	–	ns	–
SID767C	$t_{CSS\_DDR\_GPIO}$	Chip select active setup time	5	–	–	ns	–
SID768C	$t_{CSH\_DDR\_GPIO}$	Chip select active hold time	4	–	–	ns	–
SID769C	$t_{SU\_DDR\_GPIO}$	Data setup time	5	–	–	ns	–
SID780C	$t_{HD\_DDR\_GPIO}$	Data hold time	4.5	–	–	ns	–
SID781C	$t_{V\_DDR\_GPIO}$	Clock LOW output valid	0	–	9	ns	–
SID782C	$t_{HO\_DDR\_GPIO}$	Input hold time	3	–	–	ns	–
SID783C	$t_{DIS\_DDR\_GPIO}$	Input disable time	–	–	22.5	ns	Guaranteed by design
SID784C	$t_{IO\_SKEW\_DDR\_GPIO}$	Data skew (first data bit to last data bit)	–	–	1.8	ns	Guaranteed by design
SMIF HYPERBUS™ Specification for HSIO_STD							
SID788	$C_{L\_HB\_HSIO}$	Load capacitance	–	–	20	pF	–
SID786	SRI_HB_HSIO	Input rise and fall slew rates	1	–	–	V/ns	For all signals, guaranteed by design
SID787	SRO_HB_HSIO	Output rise and fall slew rates	1	–	–	V/ns	For all signals
Clock characteristics							
SID700	$f_{CK\_HB\_HSIO}$	Clock frequency	–	–	100	MHz	–

表 62 SMIF 规格

[条件：drive_sel<1:0>= 00]

Spec ID	Parameter	Description	Min	Typ	Max	Unit	Details/ conditions
SID701	$t_{CK\_HB\_HSIO}$	Clock period	$1 / f_{CK\_HB\_HSIO}$	–	–	ns	–
SID702	DCK_HB_HSIO	Clock duty	45	–	55	%	–
AC parameters							
SID706	$t_{CSHI\_HB\_HSIO}$	Chip select HIGH between transactions	10	–	–	ns	Guaranteed by design
SID708	$t_{CSS\_HB\_HSIO}$	Chip select setup to next CK rising edge	3	–	–	ns	–
SID709	$t_{DSV\_HB\_HSIO}$	Data strobe valid	–	–	12	ns	–
SID710	$t_{OSU\_HB\_HSIO}$	DQ output setup	1	–	–	ns	–
SID711	$t_{OH\_HB\_HSIO}$	DQ output hold	1	–	–	ns	–
SID715	$t_{CKD\_HB\_HSIO}$	CK transition to DQ valid	1	–	5.5	ns	–
SID718	$t_{CKDS\_HB\_HSIO}$	CK transition to RWDS valid	1	–	5.5	ns	–
SID719	$t_{DSS\_HB\_HSIO}$	RWDS transition to input DQ valid	–0.8	–	0.8	ns	–
SID720	$t_{DSH\_HB\_HSIO}$	Input DQ invalid to RWDS transition	–0.8	–	0.8	ns	–
SID721	$t_{CSH\_HB\_HSIO}$	Chip select hold after CK falling edge	0	–	-	ns	–
SMIF HYPERBUS™ specification for GPIO_STD							
SID785A	$C_{L\_HB\_GPIO}$	Load capacitance	–	–	20	pF	–
SID786A	SRI_HB_GPIO	Input rise and fall slew rates	0.45	–	–	V/ns	For all signals, guaranteed by design
SID787A	SRO_HB_GPIO	Output rise and fall slew rates	0.45	–	–	V/ns	For all signals
Clock characteristics							
SID700A	$f_{CK\_HB\_GPIO}$	Clock frequency	-	–	32	MHz	–
SID701A	$t_{CK\_HB\_GPIO}$	Clock period	$1 / f_{CK\_HB\_GPIO}$	–	–	ns	–
SID702A	DCK_HB_GPIO	Clock duty	45	–	55	%	–
AC parameters							
SID706A	$t_{CSHI\_HB\_GPIO}$	Chip select HIGH between transactions	30	–	–	ns	Guaranteed by design
SID708A	$t_{CSS\_HB\_GPIO}$	Chip select setup to next CK rising edge	9	–	–	ns	–
SID709A	$t_{DSV\_HB\_GPIO}$	Data strobe valid	–	–	36	ns	Guaranteed by design
SID710A	$t_{OSU\_HB\_GPIO}$	DQ output setup	3	–	–	ns	–
SID711A	$t_{OH\_HB\_GPIO}$	DQ output hold	3	–	–	ns	–
SID715A	$t_{CKD\_HB\_GPIO}$	CK transition to DQ valid	3	–	16.5	ns	–
SID718A	$t_{CKDS\_HB\_GPIO}$	CK transition to RWDS valid	3	–	16.5	ns	–
SID719A	$t_{DSS\_HB\_GPIO}$	RWDS transition to input DQ valid	–2.4	–	2.4	ns	–
SID720A	$t_{DSH\_HB\_GPIO}$	Input DQ invalid to RWDS transition	–2.4	–	2.4	ns	–
SID721A	$t_{CSH\_HB\_GPIO}$	Chip select hold after CK falling edge	0	–	–	ns	–

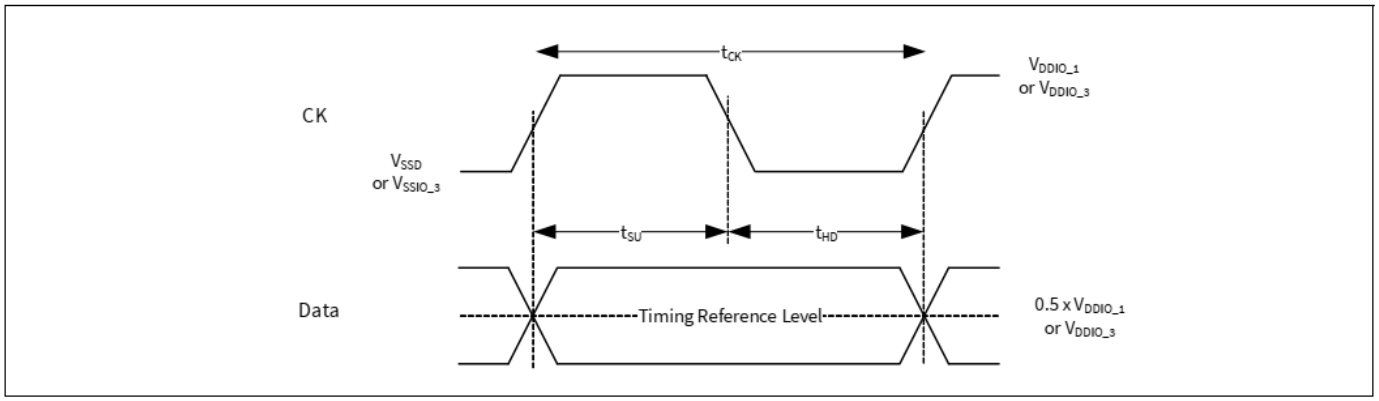


图 51 SDR 写入时序参考电平

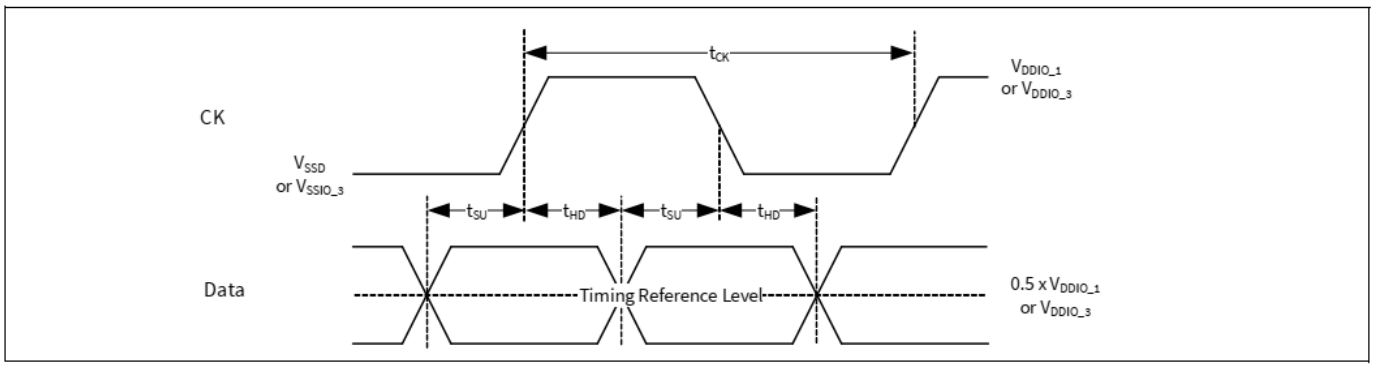


图 52 SDR 读取时序参考电平

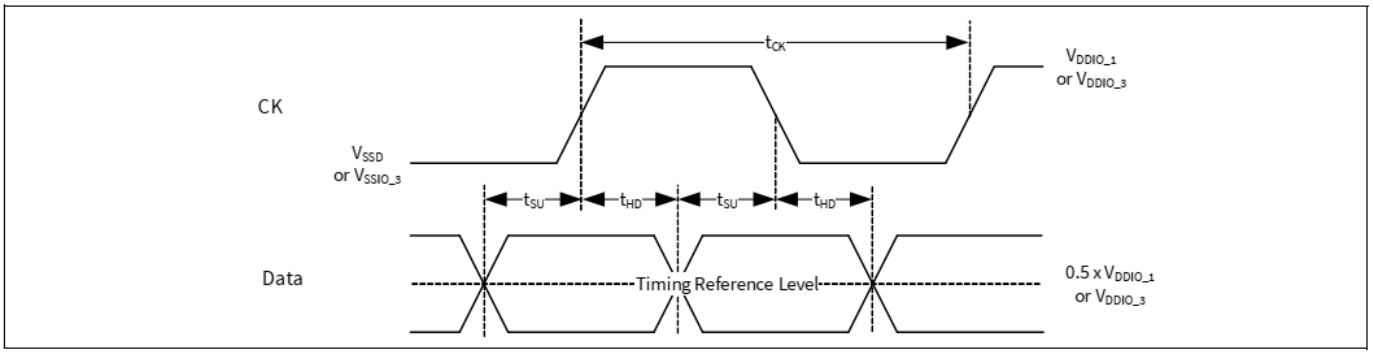


图 53 DDR 写入时序参考电平

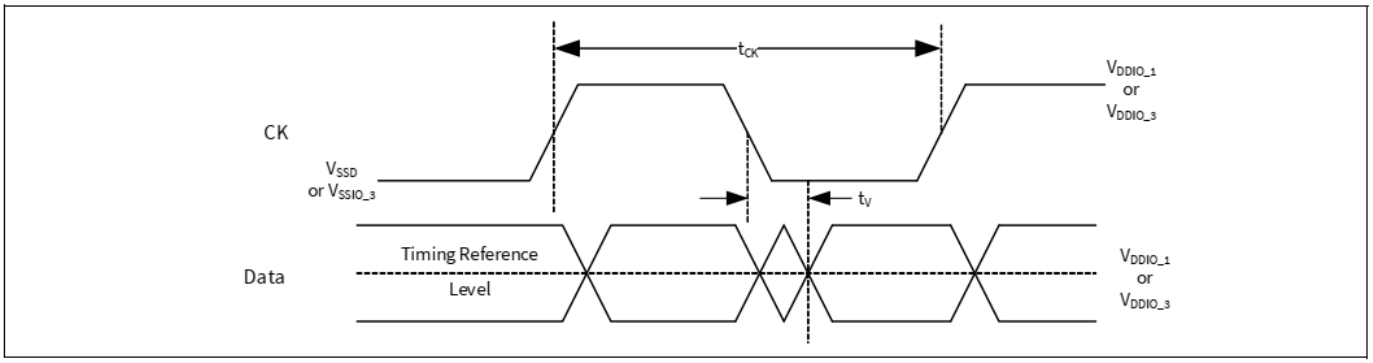


图 54　　DDR 读取时序参考电平

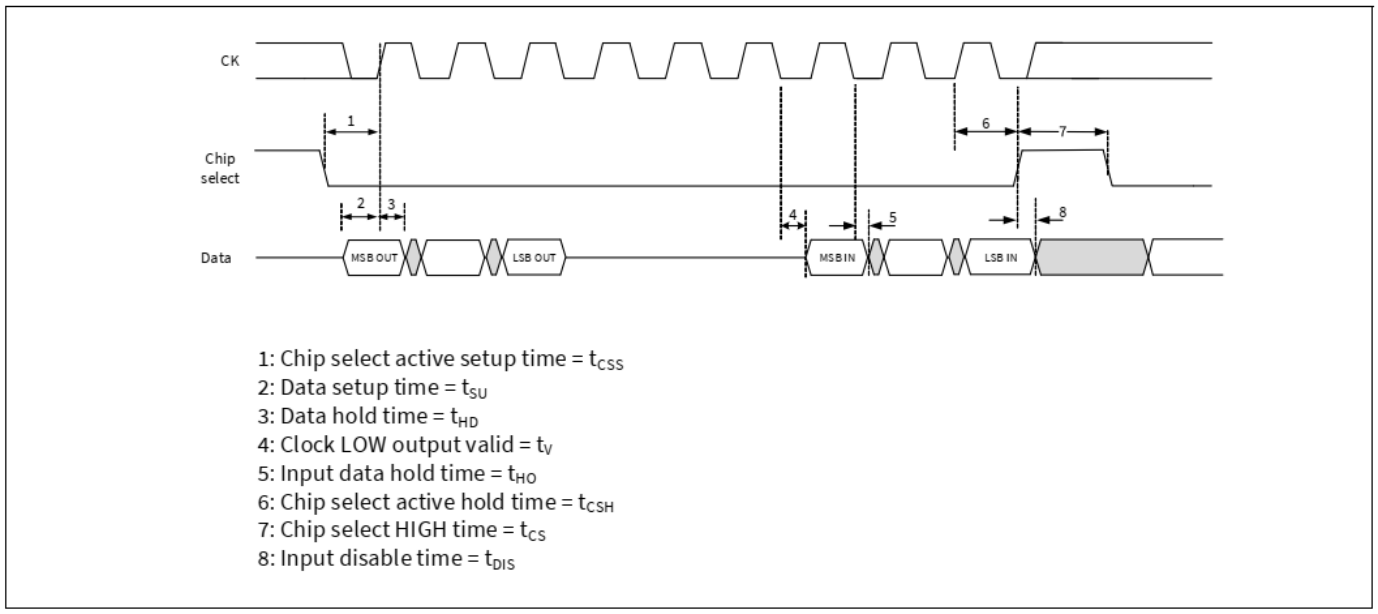


图 55　　SDR 写入和读取时序图

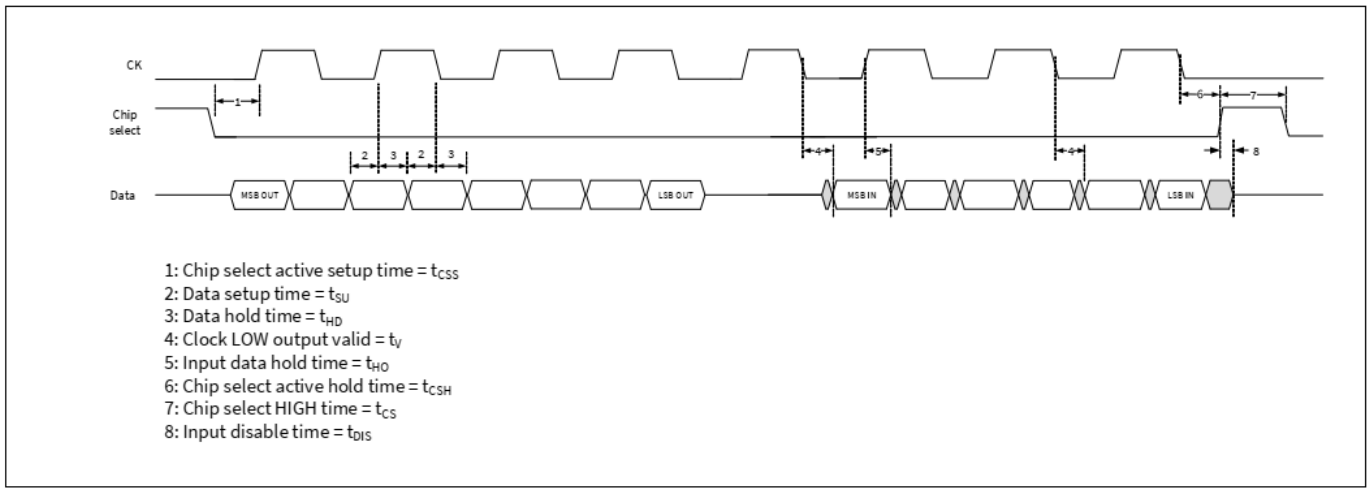


图 56　　DDR 写入和读取时序图

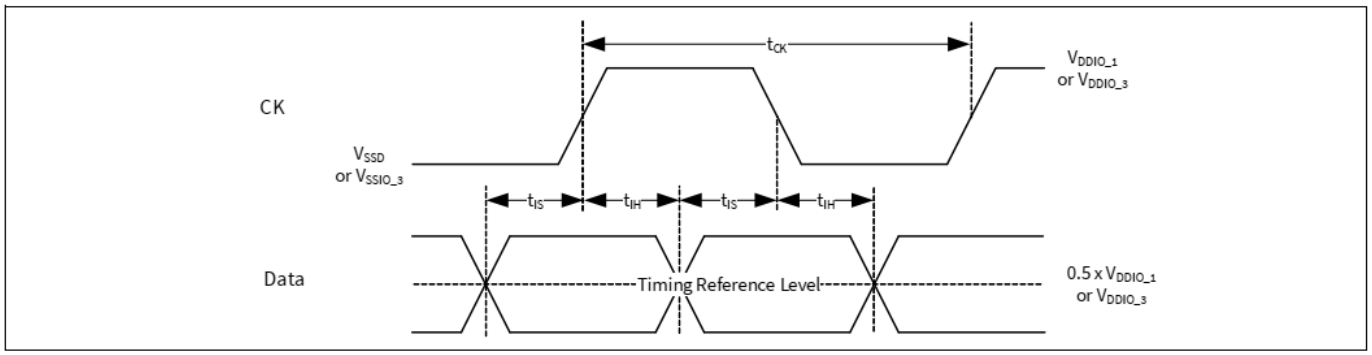


图 57 HYPERBUS™ 时序参考电平

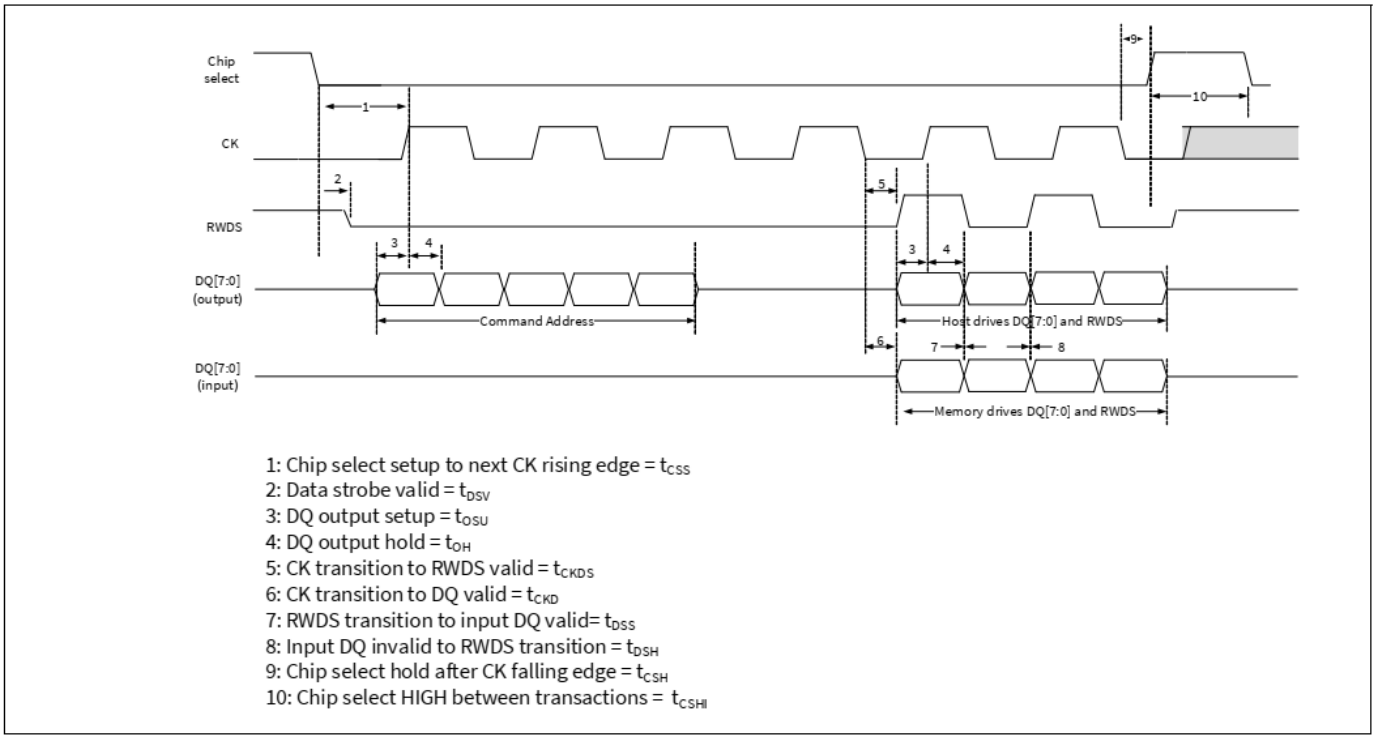


图 58 HYPERBUS™ 时序图

27 订购信息

XMC7200 和 XMC7200D 微控制器部件号和功能见表 63。Arm® TAP JTAG ID 为 0x6BA0 0477。

表 63 XMC7200 订购信息

Product	Package	CM7 Cores	Code-flash (KB)	Work-flash (KB)	RAM (KB)	ADC channels	SCB channels	Ethernet channels	Temp grade	JTAG ID code
XMC7200-F176K8384	176-TEQFP	1	8384	256	1024	81	10	1	125°C	0x1E540069
XMC7200D-F176K8384	176-TEQFP	2	8384	256	1024	81	10	1	125°C	0x1E541069
XMC7200-E272K8384	272-BGA	1	8384	256	1024	96	11	2	125°C	0x1E542069
XMC7200D-E272K8384	272-BGA	2	8384	256	1024	96	11	2	125°C	0x1E543069

表 64 订购代码命名规则

Description	Values	Meaning	Comment
XMC prefix	XMC	XMC prefix- Industrial microcontroller	Fixed
Series name	7200	High-end XMC7000 series	–
Dual-core option	D	Dual-core option based on both dies	Optional. Omitting “D” in part number means single core version
Code-flash/ Work-flash/RAM Density	8348	8348KB/256KB/1024KB	Fixed
PKG pin count	176	176-pin	PKG pin count options
	272	272-ball	
Package option	F	TEQFP	Available package options
	E	FBGA	

28 封装

XMC7200，XMC7200D 微控制器采用 表 65 中列出的封装。

表 65 封装信息

Package	Dimensions[66]	Contact/lead pitch	Coefficient of thermal expansion	I/O pins
176-TEQFP	24 × 24 × 1.70 mm (max)	0.5-mm	a1[67] = 8.4 ppm/°C, a2[68] = 29.4 ppm/°C	148
272-FBGA	16 × 16 × 1.70 mm (max)	0.8-mm	a1[67] = 11.9 ppm/°C, a2[68] = 34.3 ppm/°C	220

表 66 封装特性

Parameter	Description	Conditions	Min	Typ	Max	Unit
T_A	Operating ambient temperature	S-grade	–40	–	105	°C
T_A	Operating ambient temperature	E-grade	–40	–	125	°C
T_J	Operating junction temperature	–	–	–	150	°C
$R_{\theta JA}$	Package thermal resistance, junction to ambient θ_{JA}[69, 70]	176-TEQFP	–	–	17.8	°C/W
		272-BGA	–	–	22.4	°C/W
$R_{\theta JB}$	Package thermal resistance, junction to board	176-TEQFP	–	–	13.4	°C/W
		272-BGA	–	–	13.5	°C/W
$R_{\theta JC}$	Package thermal resistance, junction to case θ_{JC}	176-TEQFP	–	–	12.3	°C/W
		272-BGA	–	–	8.9	°C/W

表 67 回流焊峰值温度、封装湿度敏感度等级 (MSL)、IPC/JEDEC J-STD-2

Package	Maximum peak temperature (°C)	Maximum time at peak temperature (s)	MSL
176-TEQFP	260	30	3
272-FBGA	260	30	3

注释
66. 尺寸（第 2 列）适用于室温。
67. .a1 = 低于 T_g 的 CTE（热膨胀系数）值 （ppm/°C） （T_g 是玻璃化转变温度，为 131°C）。
68. a2 = 高于 T_g 的 CET 值(ppm/°C).
69. 所示的最大值°C/Watt 适用于 T_A = 125 °C。
70. 电路板条件符合JESD51-7（4层）。

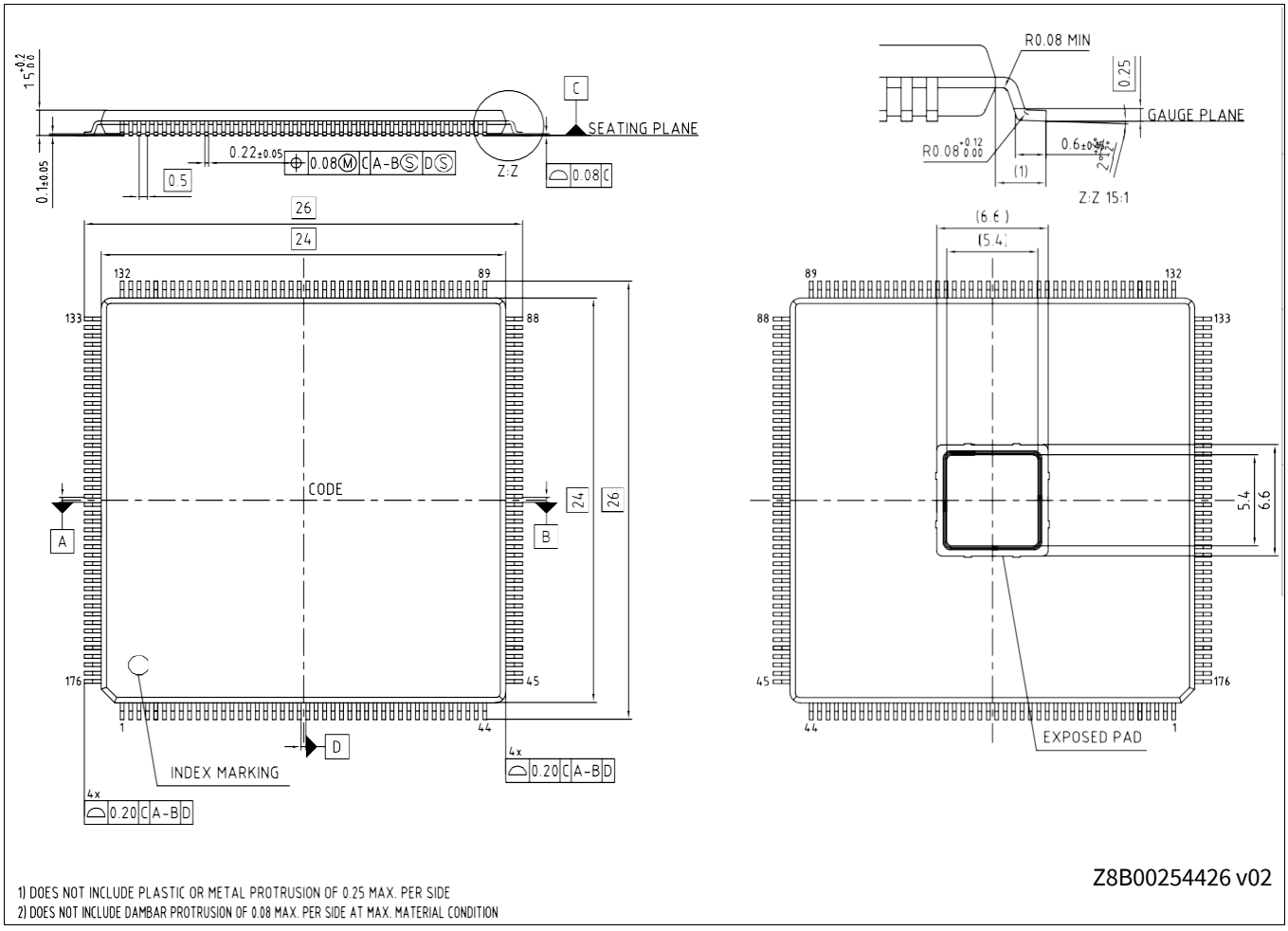


图 59　　176 引脚 TEQFP（24.0 × 24.0 × 1.7 mm）LEE176（PG-TQFP-176），封装外形

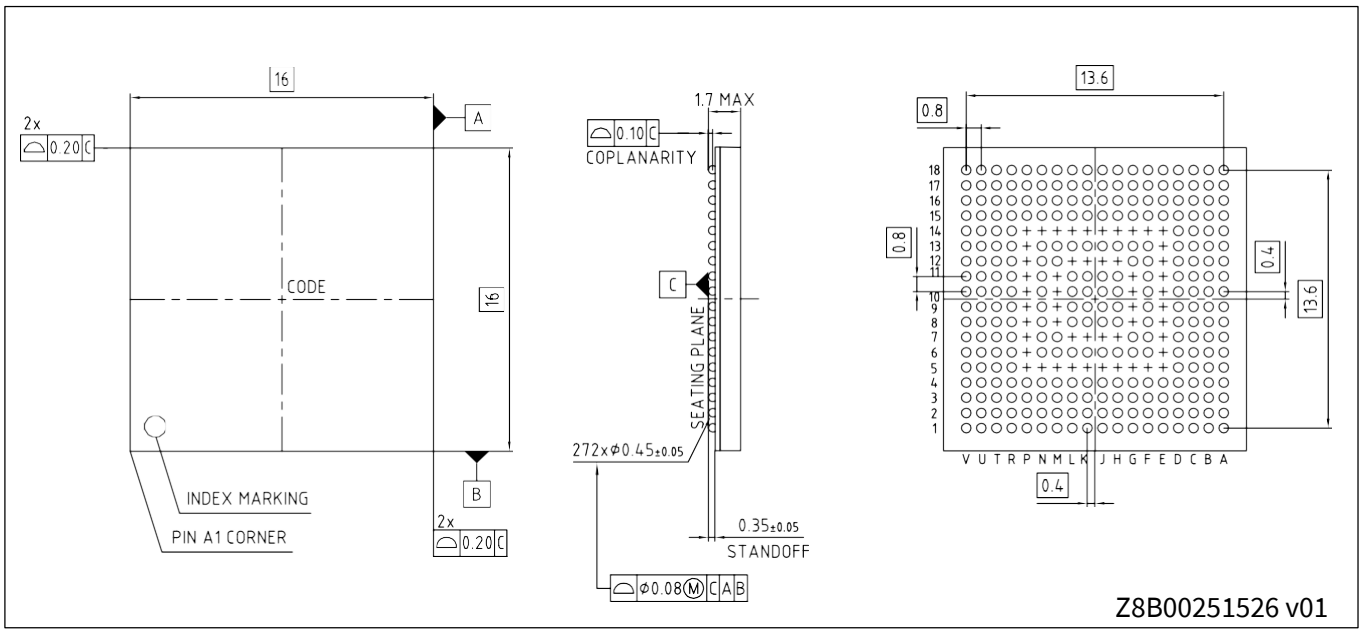


图 60　　272 球 FBGA（16 × 16 × 1.70 mm）LBM272（PG-LFBGA-272），封装外形

29 附录

29.1 引导加载程序或生产线末端（EoL）编程

- 如果满足触发条件，则在设备启动时触发
- 可能使用 CAN 通信
- 引导加载程序在不同的时间帧上轮询 CAN 上的通信，直到达到整体 300 秒的超时时间
- 如果在任一通信接口上收到引导加载程序命令，则轮询停止，并且引导加载程序开始使用该接口

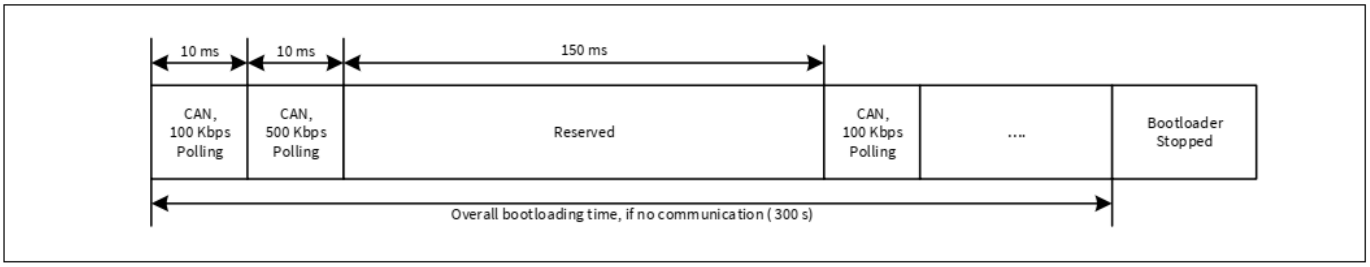


图 61 引导加载序列

表 68 CAN 接口详情

Sl. No.	CAN interface	Configuration
1	CAN Mode	Classic CAN
2	CAN Instance	CAN0, Channel#1
3	CAN TX	P0.2 / CAN0_1_TX
4	CAN RX	P0.3 / CAN0_1_RX
5	CAN Transceiver NSTB / EN (Low)	P23.3 (optional)
6	CAN Transceiver EN / EN (High)	P2.1 (optional)
7	CAN RX Message ID	0x1A1
8	CAN TX Message ID	0x1B1
9	Baud	100 or 500 kbps alternating

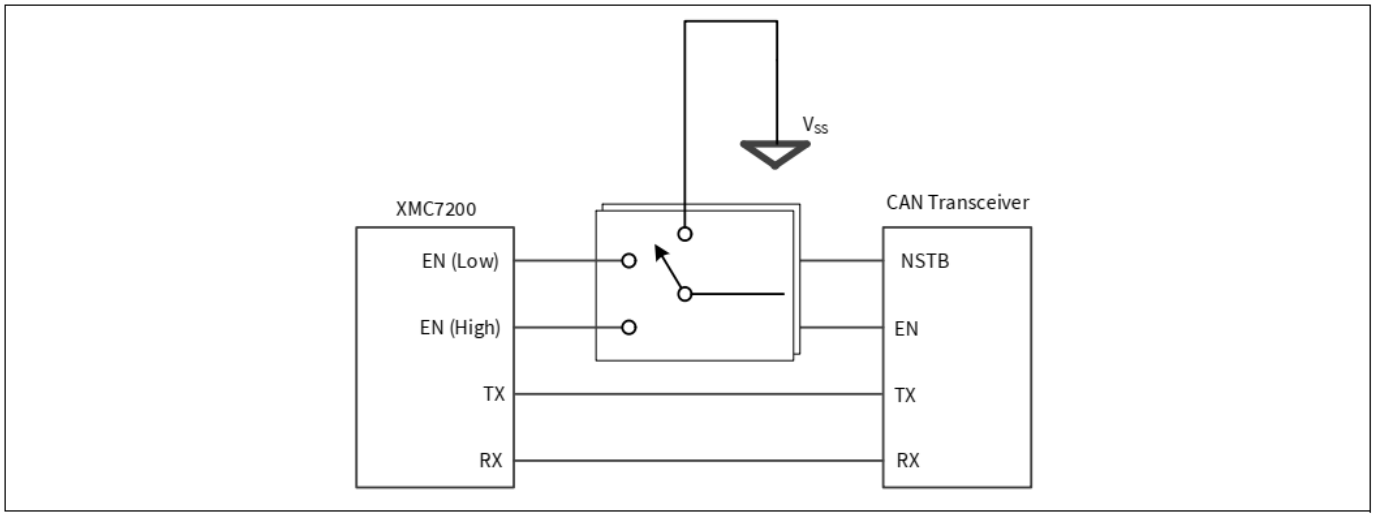


图 62 MCU 到 CAN 收发器的连接

29.2 外部 IP 修订

表 69 IP 修订

Module	IP	Revision	Vendor
SDHC	mxsdhc	version 1.70a	Synopsys
CANFD	mxttcanfd	M_TTCAN IP revision: Rev.3.2.3	Bosch
Arm® Cortex®-M0+	armcm0p	Cortex®-M0+ AT590-r0p1-00rel0	Arm®
Arm® Cortex®-M7	armcm7	Cortex®-M7-r1p1-00rel0	Arm®
Arm® Coresight	armcoresighttk	CoreSight-SoC-TM100-r3p2-00rel0	Arm®
Ethernet	mxeth	GEM_GXL r1p09	Cadence

30 缩略语

表 70 本文档中使用的缩略语

Acronym	Description
A/D	analog to digital
ABS	absolute
ADC	analog to digital converter
AES	advanced encryption standard
AHB	AMBA (advanced microcontroller bus architecture) high-performance bus, Arm® data transfer bus
Arm®	Advanced RISC machine, a CPU architecture
BOD	brownout detection
CAN FD	controller area network with Flexible Data rate
CMOS	complementary metal-oxide-semiconductor
CPU	Central Processing Unit
CRC	cyclic redundancy check, an error-checking protocol
CSV	clock supervisor
CTI	Cross Trigger Interface
DES	data encryption standard
ECC	error correcting code
ECO	external crystal oscillator
ETM	Embedded Trace Macrocell
FLL	frequency Locked Loop
FPU	floating point unit
GHS	Green hills tool chain with IDE
GPIO	general purpose input/output
HSM	hardware security module
I/O	input/output
I^2C	Inter-Integrated circuit, a communications protocol
I^2S	Inter-Integrated Circuit Sound
ILO	internal low-speed oscillator
IMO	internal main oscillator
IPC	inter-processor communication
IrDA	infrared interface
IRQ	interrupt request
JTAG	Joint test action group
LVD	low voltage detection
OTA	over-the-air programming
OTP	one-time programmable
UART	Universal Asynchronous Transmitter Receiver, a communications protocol
WCO	watch crystal oscillator
WDT	watchdog timer reset

表 70 本文档中使用的缩略语

Acronym	Description
OVD	overvoltage detection
PASS	Programmable Analog Subsystem
P-DMA	peripheral-direct memory Access
PLL	Phase locked loop
POR	power-on reset
PPU	Peripheral protection unit
PRNG	Pseudo random number generator
PSoC	Programmable system on chip
PWM	Pulse-width modulation
MCU	Microcontroller Unit
MCWDT	Multi-counter watchdog timer
M-DMA	Memory-Direct Memory Access
MISO	master-in slave-out
MMIO	memory mapped I/O
MOSI	master-out slave-in
MPU	Memory protection unit
NVIC	Nested vectored interrupt controller
RAM	random access memory
RISC	reduced-instruction-set computing
ROM	read only memory
RTC	real-time clock
SAR	Successive approximation register
SCB	Serial communication block
SCL	I^2C serial clock
SDA	I^2C serial data
SHA	Secure hash algorithm
SHE	Secure hardware extension
SMPU	Shared memory protection unit
SPI	Serial peripheral interface, a communications protocol
SRAM	static random access memory
SWD	single wire debug
TCM	tightly coupled memory
TCPWM	timer/counter Pulse-width modulator
TTL	transistor-transistor logic
TRNG	True random number generator
XIP	eXecute In Place
XTAL	crystal

31 勘误表

本节介绍 XMC7200 产品系列的勘误表。具体内容包括勘误触发条件、影响范围、可用解决方案和芯片版本的适用性。若有任何问题，请联系您当地英飞凌销售代表。

受影响的器件编号

Part numbers
All XMC7200 parts

XMC7200 认证状态

生产样品

XMC7200 勘误摘要

下表定义了勘误表对可用 XMC7200 系列设备的适用性。

Items	Errata ID	XMC7200	Silicon rev.	Fix status
[1] CAN FD RX FIFO top pointer feature does not function as expected	96	XMC7200-F176K8320 XMC7200D-F176K8320 XMC7200-E272K8320 XMC7200D-E272K8320	D	No silicon fix planned. Use workaround.
[2] CAN FD debug message handling state machine is not reset to Idle state when CANFD_CH_CCCR.INIT is set	97			No silicon fix planned. Use workaround.
[3] Limitation of the memory hole in SCB register space	124			No silicon fix planned. Use workaround.
[4] Limitation of the memory hole in Ethernet (ETH) register space	128			No silicon fix planned. Use workaround.
[5] CAN FD controller message order inversion when transmitting from dedicated Tx Buffers configured with same Message ID	147			No silicon fix planned. Use workaround.
[6] CAN FD incomplete description of Dedicated TX buffers and TX queue related to transmission from multiple buffers configured with the same Message ID	167			No silicon fix planned. Use workaround.
[7] Misleading status is returned for Flash and eFuse system calls, if there are pending NC ECC faults in SRAM controller #0	175			No silicon fix planned.
[8] WDT reset causes loss of SRAM retention	176			No silicon fix planned.
[9] RMII TX output maximum delay spec change for GPIO_STD	177			No silicon fix planned.
[10] Crypto ECC errors may be set after boot with application authentication	185			No silicon fix planned.

Items	Errata ID	XMC7200	Silicon rev.	Fix status
[11]Incomplete erase of Code Flash cells could happen Erase Suspend / Erase Resume is used along with Erase Sector operation in Non-Blocking mode	198	XMC7200-F176K8320 XMC7200D-F176K8320 XMC7200-E272K8320 XMC7200D-E272K8320	D	Fixed to update the Flash settings from date code 312xxxxx.
[12]Limitation for keeping the port state from peripheral IP after wakeup from	199			No silicon fix planned.
[13] A part of the PWR_CTL2.BGREF_LPMODE description is lacked in the existing register reference manual	201			No silicon fix planned.
[14]Limitation of clock configuration before entering mode	202			No silicon fix planned.
[15] Several data retention information in the register reference manual are incorrect	203			No silicon fix planned.
[16] SCBx_INTR_TX.UNDERFLOW bit may be set unintentionally	204			No silicon fix planned.
[17] Hardfault may occur when calling the SROM APIs listed below while executingw EraseSector or ProgramRow in non-blocking mode	206			No silicon fix planned.
[18] CAN FD sporadic data corruption (payload) in case acceptance filtering does not finish before reception of data R3 (DB7..DB4) is complete	209			No silicon fix planned. Use workaround.
[19] Description for PASS SARx to TCPWMx direct connect triggers one-to-one is incorrect in datasheet	212			No silicon fix planned. Use workaround.

1. CAN FD RX FIFO top pointer feature does not function as expected

Problem Definition	RX FIFO top pointer function calculates the address for received messages in Message RAM by hardware. This address should restart back from the start address after reading all messages of RX FIFO n size (n: 0 or 1). However, the address does not restart back from the start address when RX FIFO n size is set to 1(CANFD_CH_RXFnC.FnS = 0x01). This results in CPU/DMA reading messages from the wrong address in Message RAM.
Parameters Affected	NA
Trigger Condition(s)	The RX FIFO top pointer function is used when RX FIFO n size is set to 1 element (CANFD_CH_RXFnC.FnS = 0x01).
Scope of Impact	Received message cannot be correctly read by using the RX FIFO top pointer function, when RX FIFO n size is set to 1 element.
Workaround	Any of the following can be used as a workaround: 1) Set RX FIFO n size to 2 or more when using RX FIFO top pointer function. 2) Do not use the RX FIFO top pointer function when RX FIFO n size is set to 1 element. Instead of RX FIFO top pointer, read received messages from the Message RAM directly.
Fix Status	No silicon fix planned. Use workaround.

2. CAN FD debug message handling state machine is not reset to Idle state when CANFD_CH_CCCR.INIT is set	
Problem Definition	If either of the CANFD_CH_CCCR.INIT bits is set by the Host or when the M_TTCAN module enters BusOff state, the debug message handling state machine stays in its current state instead of being reset to Idle state. Configuring the bit CANFD_CH_CCCR.CCE does not change CANFD_CH_RXF1S.DMS.
Parameters Affected	NA
Trigger Condition(s)	Either of the CANFD_CH_CCCR.INIT bits is set by the Host or when the M_TTCAN module enters BusOff state.
Scope of Impact	The errata is limited to the use case when the debug on CAN functionality is active. Normal operation of the CAN module is not affected, in which case the debug message handling state machine always remains in Idle state. In the described use case, the debug message handling state machine is stopped and remains in the current state signaled by the CANFD_CH_RXF1S.DMS bit. In case CANFD_CH_RXF1S.DMS is set to 0b11, the DMA request remains active. Bosch classifies this as a non-critical error with low severity, there is no fix for the IP. Bosch recommends the workaround listed here.
Workaround	In case the debug message handling state machine has stopped while CANFD_CH_RXF1S.DMS is 0b01 or 0b10, it can be reset to Idle state by hardware reset or by reception of debug messages after CANFD_CH_CCCR.INIT is reset to zero.
Fix Status	No silicon fix planned. Use workaround.

3. Limitation of the memory hole in SCB register space	
Problem Definition	The memory hole [offset address: 0x1000 to 0xFFFF] inside SCB register space is not aligned to the below defined spec. The offset address bits [15:12] are ignored and treated as 4'b0000, so write/read access to offset address [0x1000 to 0xFFFF], will actually happen to [0x0000 to 0x0FFF]. - Access to address gaps in memory mapped space: writes are ignored and any read returns a zero.
Parameters Affected	NA
Trigger Condition(s)	Access to the memory hole [offset address: 0x1000 to 0xFFFF] in SCB register space.
Scope of Impact	The memory hole [offset address: 0x1000 to 0xFFFF] in SCB register space is not aligned to other IP registers.
Workaround	Do not access to the memory hole [offset address: 0x1000 to 0xFFFF] in SCB register space.
Fix Status	No silicon fix planned.

4. Limitation of the memory hole in Ethernet (ETH) register space	
Problem Definition	The memory hole [offset address: 0x2000 to 0xFFFF] in ETH register space has the below mentioned original spec. However, when accessing to address gaps within [0x1000 to 0x1FFF], the offset address bits [15:13] are ignored and treated as 3'b000, so write/read access to offset address [0x3000 to 0x3FFF, 0x5000 to 0x5FFF, 0x7000 to 0x7FFF, 0x9000 to 0x9FFF, 0xB000 to 0xBFFF, 0xD000 to 0xDFFF, 0xF000 to 0xFFFF], will actually happen to [0x1000 to 0x1FFF]. - Access to address gaps within [0x0000 to 0x0FFF]: writes are ignored and any read returns a zero. - Access to address gaps within [0x1000 to 0x1FFF]: returns AHB ERROR.
Parameters Affected	NA
Trigger Condition(s)	Access to the memory hole [offset address: 0x3000 to 0x3FFF, 0x5000 to 0x5FFF, 0x7000 to 0x7FFF, 0x9000 to 0x9FFF, 0xB000 to 0xBFFF, 0xD000 to 0xDFFF, 0xF000 to 0xFFFF] in ETH register space.
Scope of Impact	Write/read access to offset address [0x3000 to 0x3FFF, 0x5000 to 0x5FFF, 0x7000 to 0x7FFF, 0x9000 to 0x9FFF, 0xB000 to 0xBFFF, 0xD000 to 0xDFFF, 0xF000 to 0xFFFF], will actually happen to [0x1000 to 0x1FFF].
Workaround	Do not access to the memory hole [offset address: 0x3000 to 0x3FFF, 0x5000 to 0x5FFF, 0x7000 to 0x7FFF, 0x9000 to 0x9FFF, 0xB000 to 0xBFFF, 0xD000 to 0xDFFF, 0xF000 to 0xFFFF] in ETH register space.
Fix Status	No silicon fix planned.

5. CAN FD controller message order inversion when transmitting from dedicated Tx Buffers configured with same Message ID	
Problem Definition	Configuration: Several Tx buffers are configured with same Message ID. Transmission of these TX buffers is requested sequentially with a delay between the individual TX requests. Expected behavior: When multiple Tx buffers that are configured with the same Message ID have pending TX requests, they shall be transmitted in ascending order of their TX buffer numbers. The TX buffer with lowest buffer number and pending TX request is transmitted first. Observed behavior: It may happen, depending on the delay between the individual TX requests, that if multiple TX buffers are configured with the same Message ID, the TX buffers are not transmitted in order of the TX buffer number (lowest number first).
Parameters Affected	NA
Trigger Condition(s)	When multiple TX buffers configured with the same Message ID have pending TX requests.
Scope of Impact	In the case described, it is possible that TX buffers configured with the same Message ID and pending TX request are not transmitted with lowest TX buffer number first (message order inversion).
Workaround	Any of the following: 1) First, write the group of TX message with the same Message ID to the Message RAM and then afterwards request transmission of all these messages concurrently by a single write access to CANFDx_CHy_TXBAR. Before requesting a group of TX messages with this Message ID ensure that no message with this Message ID has a pending TX request. 2) Use the TX FIFO instead of dedicated TX buffers for the transmission of several messages with the same Message ID in a specific order. Applications not able to use workaround #1 or #2 can implement a counter within the data section of their messages sent with same ID in order to allow the recipients to determine the correct sending sequence.
Fix Status	No silicon fix planned. Use workaround.

6. CAN FD incomplete description of Dedicated TX Buffers and TX Queue related to transmission from multiple buffers configured with the same Message ID	
Problem Definition	The following are the updated description in Sections "Dedicated TX Buffers" and "TX Queue" of the Architecture TRM related to the transmission from multiple buffers configured with the same Message ID. Dedicated TX buffers - TRM Statement: If multiple TX buffers are configured with the same Message ID, the TX buffer with the lowest buffer number is transmitted first. - Enhancement: These TX buffers shall be requested in ascending order with lowest buffer number first. Alternatively all TX buffers configured with the same Message ID can be requested simultaneously by a single write access to CANFDx_CHy_TXBAR. Tx queue - Reference manual statement: If multiple queue buffers are configured with the same Message ID, the queue buffer with the lowest buffer number is transmitted first. - Replacement: If multiple Tx queue buffers are configured with the same Message ID, the transmission order depends on numbers of the buffers where the messages were stored for transmission. As these buffer numbers depend on the then current states of the PUT Index, a prediction of the transmission order is not possible. - Reference manual statement: An Add request cyclically increments the Put Index to the next free Tx Buffer. - Replacement: The PUT Index always points to that free buffer of the TX Queue with the lowest number.
Parameters Affected	NA
Trigger Condition(s)	Using multiple dedicated TX buffers or TX queue buffers configured with the same Message ID.
Scope of Impact	If the dedicated TX buffers with the same Message ID are not requested in ascending order or at the same time, or if there are multiple TX queue buffers with the same Message ID, it cannot be guaranteed, that these messages are transmitted in ascending order with lowest buffer number first.

Workaround	In case a defined order of transmission is required the TX FIFO shall be used for transmission of messages with the same Message ID. Alternatively dedicated Tx buffers with the same Message ID shall be requested in ascending order with lowest buffer number first or by a single write access to CANFDx_CHy_TXBAR. Alternatively a single Tx Buffer can be used to transmit those messages one after the other.
Fix Status	No silicon fix planned. Use workaround. Reference manual was updated.

7. Misleading status is returned for Flash and eFuse system calls, if there are pending NC ECC faults in SRAM controller #0	
Problem Definition	Flash and eFuse system calls will return misleading status of 0xF0000005 (“Page is write protected”) even for non-protected row, or 0xF0000002 (“Invalid eFuse address”) for valid eFuse address in case of pending NC ECC faults in SRAM controller #0.
Parameters Affected	Return status of Flash and eFuse system calls.
Trigger Condition(s)	NC ECC fault(s) pending in SRAM controller #0 and SWPUs are populated in the design.
Scope of Impact	Flash and eFuse system calls will not work until the NC ECC fault(s) pending in SRAM controller #0 is/are properly handled.
Workaround	If the NC ECC fault(s) are not due to HW malfunction (i.e. if the faults are due to usage of non-initialized SRAM or improper SRAM initialization), then clearing of these pending faults will resolve the issue.
Fix Status	No silicon fix planned. Reference manual was updated.

8. WDT reset causes loss of SRAM retention	
Problem Definition	Architecture TRM Table on “Reset Cause Distribution” shows that, the WDT reset can retain SRAM if there is an orderly shutdown of the SRAM only during a warning interrupt. However, this is wrong. WDT reset causes loss of SRAM retention.
Parameters Affected	NA
Trigger Condition(s)	WDT reset
Scope of Impact	WDT reset causes loss of SRAM retention.
Workaround	None
Fix Status	No silicon fix planned. Reference manual was updated.

9. RMII TX output maximum delay spec change for GPIO_STD	
Problem Definition	RMII TX output maximum delay specification has been changed from 14 ns to 14.6 ns for GPIO_STD. The HSIO_STD spec of 14 ns is unchanged.
Parameters Affected	SID393
Trigger Condition(s)	Using GPIO_STD as RMII
Scope of Impact	This spec change will cause the PCB delay budget between MCU and PHY to be cut down to 1.4 ns from 2 ns. [PCB delay budget = REF_CLK period (e.g. 20 ns) – SID393 (14.6 ns) – PHY RXD setup (e.g. 4 ns)]
Workaround	None
Fix Status	No silicon fix planned.

10. Crypto ECC errors may be set after boot with application authentication	
Problem Definition	Due to the improper initialization of the Crypto memory buffer, Crypto ECC errors may be set after boot with application authentication.
Parameters Affected	N/A
Trigger Condition(s)	Boot device with application authentication.
Scope of Impact	Crypto ECC errors may be set after boot with application authentication.
Workaround	Clear or ignore Crypto ECC errors which generated during boot with application authentication.

Fix Status	No silicon fix planned. Reference manual was updated.

11. Incomplete erase of Code Flash cells could happen Erase Suspend / Erase Resume is used along with Erase Sector operation in Non-Blocking mode	
Problem Definition	Code Flash memory can be erased in “Non-Blocking” mode; a Non-Blocking mode supported option allows users to suspend an ongoing erase sector operation. When an ongoing erase operation is interrupted using “Erase Suspend” and “Erase Resume”, Flash cells may not have been erased completely, even after the erase operation complete is indicated by FLASHC_STATUS register. Only Code Flash is impacted by this issue, Work Flash and Supervisory Flash (SFlash) are not impacted.
Parameters Affected	N/A
Trigger Condition(s)	Using EraseSector System Call in Non-Blocking mode for CM0+ to erase Code Flash and the ongoing erase operation is interrupted using EraseSuspend and EraseResume System calls.
Scope of Impact	When Code Flash sectors are erased in Non-Blocking mode and the ongoing erase operation is interrupted by Erase Suspend / Erase Resume, it cannot be guaranteed that the Code Flash cells are fully erased. Any read on the Code Flash area after the erase is complete or read on the programmed data after ProgramRow is complete can trigger ECC errors.
Workaround	Use any of the following: 1) Use Non-Blocking mode for EraseSector, but do not interrupt the erase operation using Erase Suspend / Erase Resume. 2) If a Code Flash sector erase operation is interrupted using Erase Suspend / Erase Resume, then erase the same sector again without Erase Suspend / Erase Resume before reading the sector or programming the sector.
Fix Status	Fixed to update the Flash settings from date code 312xxxxx.

12. Limitation for keeping the port state from peripheral IP after wakeup from	
Problem Definition	The port state is not retained when the port selects peripheral IP (except for LIN or CAN FD) and MCU wakes up from
Parameters Affected	N/A
Trigger Condition(s)	The port selects peripherals (except for LIN or CAN-FD) and MCU wakes up from .
Scope of Impact	Unexpected port output change might affect user system.
Workaround	If the port selects peripherals (except for LIN or CAN FD), and the port output value need to be maintained after wakeup from , set HSIOM_PRTx_PORT_SEL.IOy_SEL = 0 (GPIO) before and set the required output value in GPIO configuration registers. After wakeup, change HSIOM_PRTx_PORT_SEL.IOy_SEL back to the peripheral module as needed.
Fix Status	No silicon fix planned. Reference manual was updated.

13. A part of the PWR_CTL2.BGREF_LPMODE description is lacked in the existing register reference manual	
Problem Definition	The following is missing from the PWR_CTL2.BGREF_LPMODE description in the existing register TRM. This register will not set unless CLK_ILO0_CONFIG.ILO0_ENABLE = 1. When changing back to continuous operation, keep ILO0 enabled for at least 5 ILO0 cycles after clearing this bit to allow for internal synchro-nization.
Parameters Affected	N/A
Trigger Condition(s)	Using the PWR_CTL2.BGREF_LPMODE
Scope of Impact	PWR_CTL2.BGREF_LPMODE may not be set or cleared.
Workaround	Use the PWR_CTL2.BGREF_LPMODE according to the following description. This register will not set unless CLK_ILO0_CONFIG.ILO0_ENABLE==1. When changing back to continuous operation, keep ILO0 enabled for at least 5 ILO0 cycles after clearing this bit to allow for internal synchronization.
Fix Status	No silicon fix planned. Reference manual was updated.

14. Limitation of clock configuration before entering mode	
Problem Definition	should not be entered while any FLL/PLL is enabled and uses ECO as its reference clock. Since the unstable ECO clock after wakeup is outside the allowed reference clock limits for FLL/PLL, there is possibility of failing the wakeup.
Parameters Affected	N/A
Trigger Condition(s)	transition while any FLL/PLL is enabled and using ECO as its reference clock.
Scope of Impact	There is a possibility of wakeup failing.
Workaround	If any FLL/PLL is operating with the ECO as its reference clock, change the clock to either ECO direct or IMO direct or IMO with FLL/PLL before entering .
Fix Status	No silicon fix planned. Reference manual was updated.

15. Several data retention information in the register reference manual are incorrect	
Problem Definition	The following registers are described as 'Retained' in the Register TRM while it is not guaranteed that the value before entering mode is still readable from the register: - SARADC: PASSx_SARy_CHz_RESULT - SRSS: PWR_LVD_STATUS - SRSS: PWR_LVD_STATUS2 - SRSS: CLK_CAL_CNT1 - SRSS: CLK_CAL_CNT2 - SRSS: CLK_FLL_STATUS - SRSS: WDT_INTR - SRSS: WDT_INTR_MASKED - SRSS: CLK_PLL400Mx_STATUS"
Parameters Affected	N/A
Trigger Condition(s)	Use of the related function and wakeup from mode.
Scope of Impact	The values before entering are not retained.
Workaround	For PASSx_SARy_CHz_RESULT, any of following can be used as a workaround: 1) Store the conversion values at another memory location before entering mode 2) Restart the conversion after wakeup from mode For the other registers: Rewrite the register value or read the status flags again after wakeup.
Fix Status	No silicon fix planned. Reference manual was updated.

16. SCBx_INTR_TX.UNDERFLOW bit may be set unintentionally	
Problem Definition	There is a possibility of setting the SCBx_INTR_TX.UNDERFLOW bit even if the FIFO is not empty.
Parameters Affected	N/A
Trigger Condition(s)	Using the TX FIFO for SCB when the AHB-Lite interface clock (CLK_GR6) frequency of the AHB bus is greater than 3x the SCB functionality clock (PCLK_SCBx_CLOCK).
Scope of Impact	SCBx_INTR_TX.UNDERFLOW bit may be set unintentionally.
Workaround	Ignore the SCBx_INTR_TX.UNDERFLOW bit if the FIFO is not empty.
Fix Status	No silicon fix planned. Reference manual was updated.

17. Hardfault may occur when calling the SROM APIs listed below while executingw EraseSector or ProgramRow in non-blocking mode	
Problem Definition	The following SROM APIs read data from bank#0 (or bank#1 if dual bank mode with mapping B is used) in SFlash. While doing that, the check for active non-blocking erase or program of bank#0 (or bank#1 if dual bank mode with mapping B is used) is not performed. Therefore, reading bank#0 (or bank#1 if dual bank mode with mapping B is used) while there is an active erase/program operation triggers a bus error, which can result in a hardfault occurrence based on FLASHC_FLASH_CTL register settings. Affected SROM APIs: - ReadSWPU - WriteSWPU - GenerateHash - Checksum* - ComputeBasicHash* - CheckFactoryHash - ProgramWorkFlash** - SwitchOverRegulators - LoadRegulatorsTrims *: Do not call it to calculate on the bank where programming/erasing is in progress. **: Do not use it during non-blocking operation.
Parameters Affected	N/A
Trigger Condition(s)	Calling the affected SROM APIs while executing EraseSector or ProgramRow in non-blocking mode on bank#0 (or bank#1 if dual bank mode with mapping B is used).
Scope of Impact	The affected SROM APIs cannot be used while executing EraseSector or ProgramRow in non-blocking mode on bank#0 (or bank#1 if dual bank mode with mapping B is used).
Workaround	Do not use the affected SROM APIs while executing EraseSector or ProgramRow in non-blocking mode on bank#0 (or bank#1 if dual bank mode with mapping B is used).
Fix Status	No silicon fix planned. Reference manual will be updated.

18. CAN FD sporadic data corruption (payload) in case acceptance filtering does not finish before reception of data R3 (DB7..DB4) is complete

Problem definition

During frame reception the Rx Handler accesses the external Message RAM for acceptance filtering (read accesses) and for storing of the accepted messages (write accesses).
The time needed for acceptance filtering and for storing of a received message depends on

- The Host clock frequency
- The worst-case latency of the read and write accesses to the external Message RAM
- The number of configured filter elements
- The workload of the transmit message (Tx) handler in parallel to the receive message (RX) handler

Received data bytes (DB0..DBm) from the CAN Core are buffered in the cache of the Rx Handler before they are written to the Message RAM (in words of 4 byte). Data words inside the Message RAM are numbered from R2 to Rn (n ≤ 17).

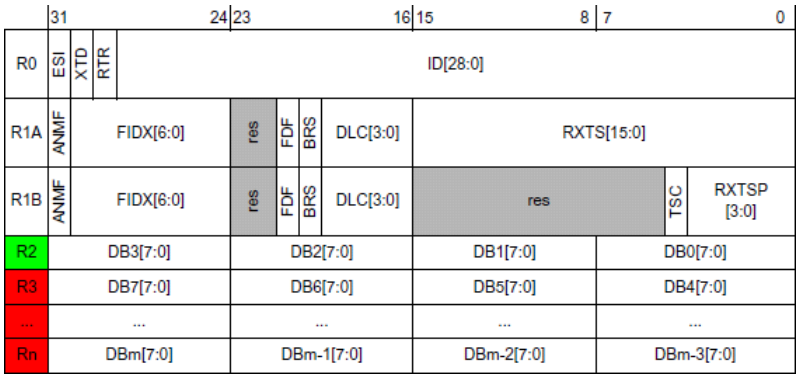


Figure 63 RX buffer and FIFO element

Under the following conditions, a received message has corrupted data while the received message is signaled as valid to the host.
1) The data length code (DLC) of the received Message is greater than 4 (DLC > 4)
2) The storage of Ri of a received message into the Message RAM (after acceptance filtering is done) has not completed before R(i+1) is transferred from the CAN Core into the cache of the Rx Handler (where 2 ≤ i ≤ 5).
3) While condition 1) and 2) apply, a concurrent read of data word Ri from the cache and write of data word R(i+1) into the cache of the Rx handler happens.
The data will be corrupted in a way, that in the Message RAM R(i+1) has the same content as Ri.
Despite the corrupted data, the M_TTCAN signals the storage of a valid frame in the Message RAM:
• Rx FIFO: FIFO put index RXFnS.FnPI is updated.
• Dedicated Rx Buffer: New Data flag NDATn.NDxx is set.
• Interrupt flag IR.MRAF is not set.
The issue may occur in the FD Frame Format as well as in the Classic Frame Format.
Figure 64 shows how the available time for acceptance filtering and storage is reduced.

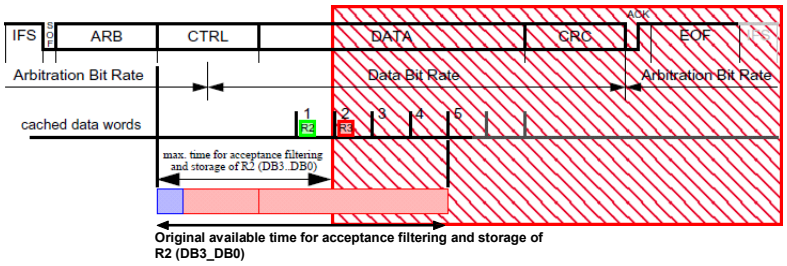


Figure 64 CAN Frame with DLC>4

18. CAN FD sporadic data corruption (payload) in case acceptance filtering does not finish before reception of data R3 (DB7..DB4) is complete

Table 71 TRAVEO™ T2G: Minimum host clock frequency for CAN FD when DLC = 5

Number of configured active filter element 11-bit IDs / 29-bit IDs [1,2]	Number of active CAN channels in an instance	Arbitration bit rate = 0.5 Mbps				Arbitration bit rate = 1 Mbps			
		Data bit rate = 0.5 Mbps	Data bit rate = 1 Mbps	Data bit rate = 2 Mbps	Data bit rate = 4 Mbps	Data bit rate = 1 Mbps	Data bit rate = 2 Mbps	Data bit rate = 4 Mbps	Data bit rate = 5 Mbps
32 / 16	2	3.9 MHz	7.1 MHz	13.1 MHz	22.8 MHz	7.7 MHz	14.1 MHz	26.1 MHz	31.5 MHz
	3	5.4 MHz	9.9 MHz	18.3 MHz	31.8 MHz	10.7 MHz	19.7 MHz	36.5 MHz	44.0 MHz
	4	6.9 MHz	12.7 MHz	23.5 MHz	40.8 MHz	13.8 MHz	25.3 MHz	46.9 MHz	56.5 MHz
	5	8.4 MHz	15.5 MHz	28.6 MHz	49.9 MHz	16.8 MHz	30.9 MHz	57.2 MHz	69.0 MHz
64 / 32	2	7.4 MHz	13.5 MHz	24.9 MHz	43.4 MHz	14.7 MHz	26.9 MHz	49.8 MHz	60.0 MHz
	3	10.3 MHz	18.8 MHz	34.9 MHz	60.7 MHz	20.5 MHz	37.6 MHz	69.7 MHz	84.0 MHz [3]
	4	13.2 MHz	24.2 MHz	44.8 MHz	78.0 MHz	26.3 MHz	48.4 MHz	89.5 MHz	107.9 MHz
	5	16.1 MHz	29.6 MHz	54.7 MHz	95.3 MHz	32.1 MHz	59.1 MHz	109.4 MHz [3]	131.8 MHz [3]
96 / 48	2	10. 8 MHz	19.9 MHz	36.8 MHz	64.0 MHz	21.6 MHz	39.7 MHz	73.5 MHz	88.6 MHz
	3	15.1 MHz	27.8 MHz	51.5 MHz	89.6 MHz	30.2 MHz	55.6 MHz	102.9 MHz [3]	124.0 MHz [3]
	4	19.4 MHz	35.7 MHz	66.1 MHz	115.1 MHz [3]	38.8 MHz	71.4 MHz	132.2 MHz [3]	159.3 MHz [3]
	5	23.7 MHz	43.6 MHz	80.8 MHz	140.7 MHz [3]	47.4 MHz	87.2 MHz	161.5 MHz [3]	194.7 MHz [3]
128 / 64	2	14.3 MHz	26.3 MHz	48.6 MHz	84.7 MHz	28.4 MHz	52.5 MHz	97.2 MHz	117.2 MHz [3]
	3	20.0 MHz	36.8 MHz	68.0 MHz	118.5 MHz [3]	40.0 MHz	73.5 MHz	136.0 MHz [3]	164.0 MHz [3]
	4	25.7 MHz	47.2 MHz	87.5 MHz	152.3 MHz [3]	51.4 MHz	94.4 MHz	174.9 MHz [3]	210.8 MHz [3]
	5	31.4 MHz	57.7 MHz	106.9 MHz [3]	186.1 MHz [3]	62.7 MHz	115.4 MHz [3]	213.7 MHz [3]	257.5 MHz [3]

1. M_TTCAN always starts at filter element #0 and proceeds through the filter list to find a matching element. Acceptance filtering stops at the first matching element and the following filter elements are not evaluated for this message. Therefore, the sequence of configured filter elements has a significant impact on the perfor-mance of the filtering process.
2. Acceptance filtering search for 11-bit IDs and 29-bit IDs filter element runs separately; only one configured filter setting should be considered. Searching for one 29-bit filter element requires approximately double cycles for one 11-bit filter element.
3. Frequency is not reachable since the maximum host clock frequency for M_TTCAN in TRAVEO™ T2G is 100 MHz.

Parameters affected	N/A
Trigger condition(s)	Under the following conditions a received message has corrupted data while the received message is signaled as valid to the host: 1) The data length code (DLC) of the received message is greater than 4 (DLC > 4) 2) The storage of Ri of a received message into the Message RAM (after acceptance filtering is done) has not completed before R(i+1) is transferred from the CAN Core into the cache of the Rx Handler (where 2 ≤ i ≤ 5). 3) While condition 1) and 2) apply, a concurrent read of data word Ri from the cache and write of data word R(i+1) into the cache of the RX handler happens.
Scope of impact	The erratum is limited to the case when the Host clock frequency used in the actual device is below the limit shown in **Table 71**. Corrupted data is written to the RX FIFO element from the respective dedicated RX Buffer. The received frame is nevertheless signaled as valid.

18. **CAN FD sporadic data corruption (payload) in case acceptance filtering does not finish before reception of data R3 (DB7..DB4) is complete**	
Workaround	Check whether the minimum Host clock frequency (shown in **Table 71**) is below the Host clock frequency used in the actual device. If yes, there is no problem with the selected configuration. If no, use one of the following two workarounds. **1)** Try a different configuration by changing the following parameters until the actual Host clock frequency (CLK_GR5) is above the minimum host frequency shown in **Table 71**: • Increase the CLK_GR5 frequency in the actual device • Reduce the CAN-FD data bit rate • Reduce the number of configured filter elements • Reduce the number of active CAN channels in an instance Also, use DLC ≥ 8 instead of DLCs 5, 6, and 7 in the CAN environment/system, as they place higher demands on the minimum Host clock frequency (the worst case is DLC = 5) or restrict your CAN environment/system to DLC 4. **Note:** While changing the actual host clock frequency, CLK_GR5 must always be equal to or higher than PCLK_-CANFD[x]_CLOCK_CAN[y] for all configurations. **2)** Due to condition 3) listed in **"Trigger Conditions"**, the issue occurs only sporadically. Use an end-to-end (E2E) protection (for example, checksum or CRC covering the data field) and add it to all messages in the CAN system, to detect data corruption in the received frames.
Fix Status	No silicon fix planned. Use workaround.

19. Description for PASS SARx to TCPWMx direct connect triggers one-to-one is incorrect in datasheet	
Problem Definition	The existing datasheet shows the incorrect TCPWM input trigger selection (TR_IN_SEL) value,'trig=2', in the description for PASS SARx to TCPWMx direct connect triggers one-to-one. The correct value to calculate is '4' as shown in the architecture TRM chapter 25 descriptions and table 25-2.
Parameters Affected	N/A
Trigger Condition(s)	Using the triggers one-to-one for PASS SARx to TCPWMx direct connect
Scope of Impact	The triggers one-to-one for PASS SARx to TCPWMx direct connect cannot work if TCPWM's input trigger selection is not correct.
Workaround	Use '4' as TCPWM's input trigger selection (TR_IN_SEL) value for PASS SARx to TCPWMx direct connect
Fix Status	No silicon fix planned. Datasheet was updated.

修订记录

Document revision	Date	Description of changes
**	2021-11-12	New datasheet.
*A	2022-08-11	Updated **Features**. Updated **System resources** and **Peripherals**. Updated **I/Os**. Updated **Figure 1**. Updated DMA controller names. Corrected wake-up pin numbers Updated **High-speed I/O matrix connections**. Updated **Peripheral interrupt assignments and wake-up sources**. Updated **Fault assignments**. Removed Smoothing Capacitor Connections table. Updated **DC specifications**. Updated **I/O specifications**. Updated **Temperature sensor specifications**. Updated description for CLK_HF3. Updated SID310. Updated **ECO specifications** and **PLL specifications**. Updated conditions for SID362E. Updated typ value and conditions for SID414. Updated **Ethernet specifications [Conditions: drive_sel<1:0>= 00]**. Updated **SMIF specifications**. Updated **HYPERBUS™ timing diagram**. Updated **Table 63**.
*B	2022-10-21	Updated **Block diagram**. Updated **Ordering information**.

Document revision	Date	Description of changes
*C	2024-12-05	Updated **Table 1**. Updated **"Peripheral I/O map"** on page 25. Updated **"XMC7200 clock diagram"** on page 27. Updated **"HSIOM connections reference"** on page 32. Updated **"Package pin list and alternate functions"** on page 33. Updated **"Power pin assignments"** on page 42. Updated **"Alternate function pin assignments"** on page 43. Updated **Table 18**. Updated **"Interrupts and wake-up assignments"** on page 56. Updated **"Faults"** on page 90. Updated **"Miscellaneous configuration"** on page 112. Updated **Table 35**, **Table 47**, and **Table 52**. Updated **"Errata"** on page 203. Updated **"Ethernet MAC"** on page 19. Updated **Table 23**. Updated **Figure 51** through **Figure 56**. Updated Watchdog timer in **Table 1**. Added **Figure 46** to **Figure 50**. Updated **Figure 4**. Updated the thermal resistance max. value for RθJA, RθJB, and RθJC in **Table 66**. Added Infineon Package code and updated the title in **Figure 59** and **Figure 60**. Updated the Package diagram: • 002-25324 to Z8B00254426 • 002-24865 to Z8B00251526 Updated all the Figures to reflect Infineon Guidelines. Updated the content, disclaimer and copyright year to align with the latest Infineon template.

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