

英飞凌USB Billboard 控制器

特性

- USB 2.0 认证, 全速 (12 Mbps)
 - 支持原生Billboard设备类驱动程序
 - 集成了USB端接电阻
- CY7C65210/210A: 单通道I²C接口
 - Master频率最高可达 400 kHz
 - 每个发送和接收缓冲区 190 字节
- CY7C65217/217A: 双通道 UART/I²C 接口
 - UART接口
 - 支持2-pin
 - 数据速率高达 115200 bps
 - 每个发送和接收缓冲区 190 字节
 - 数据格式: 7或8个数据位, 1或2个停止位
 - 支持无校验、偶校验、奇校验、标记校验或空格校验
 - 支持奇偶校验、溢出和帧错误
 - 支持单通道RS-232和RS-422接口
 - I²C 接口
 - Master频率最高可达 400 kHz
 - 每个发送和接收缓冲区 190 字节
- 通用输入/输出 (GPIO) 引脚:
 - CY7C65210: 9
 - CY7C65217: 7
 - CY7C65210A: 11
 - CY7C65217A: 9
- 2560字节闪存用于存储配置参数
- Billboard设备类别特定描述符
- Billboard 设备的驱动程序支持
 - Windows 10 原生支持 Billboard Device Class
- 时钟: 集成 48 MHz 时钟振荡器
- 支持总线或自供电配置
- USB 低功耗挂起模式
- 工作电压: 1.71 V 至 5.5 V
- 工作温度
 - 商业级: 0 °C ~ +70 °C
 - 工业级: -40 °C ~ +85 °C
 - 车规级: -40 °C 至 +105 °C
- ESD保护: 2.2kV HBM
- 符合 RoHS 标准的封装
 - 24 引脚 QFN (4.0 毫米 × 4.0 毫米, 0.55 毫米, 0.5 毫米间距)

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.com 参考最新的英文版本 (控制文档)。

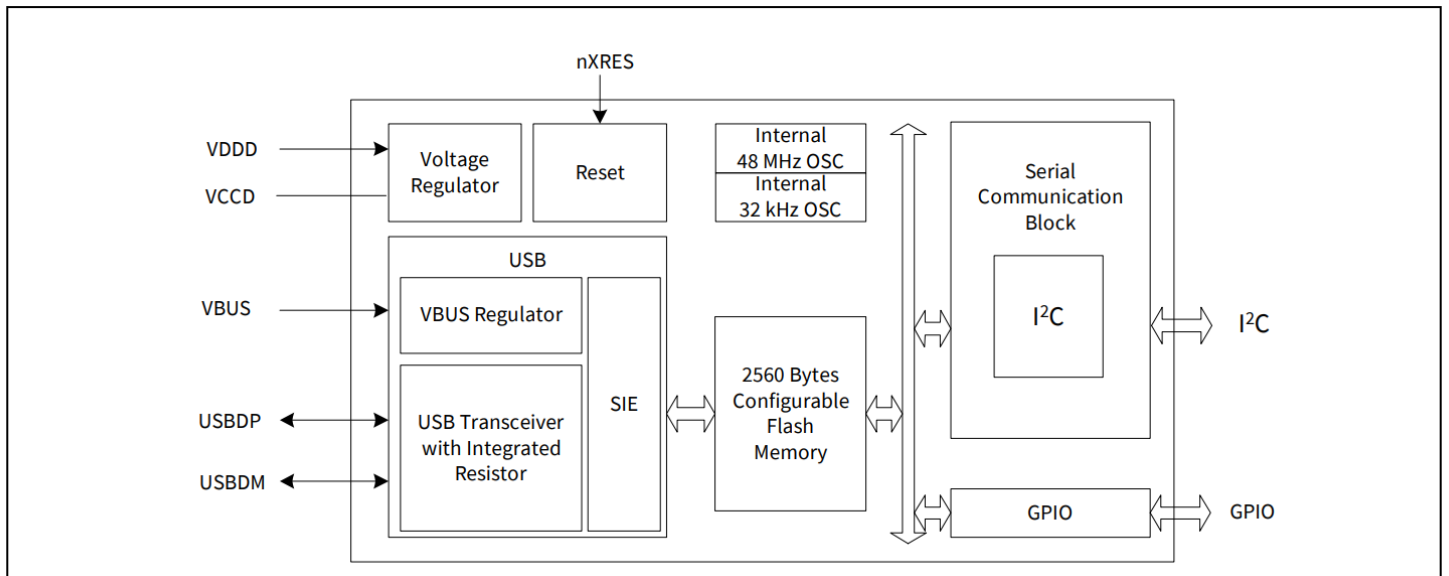
应用

应用

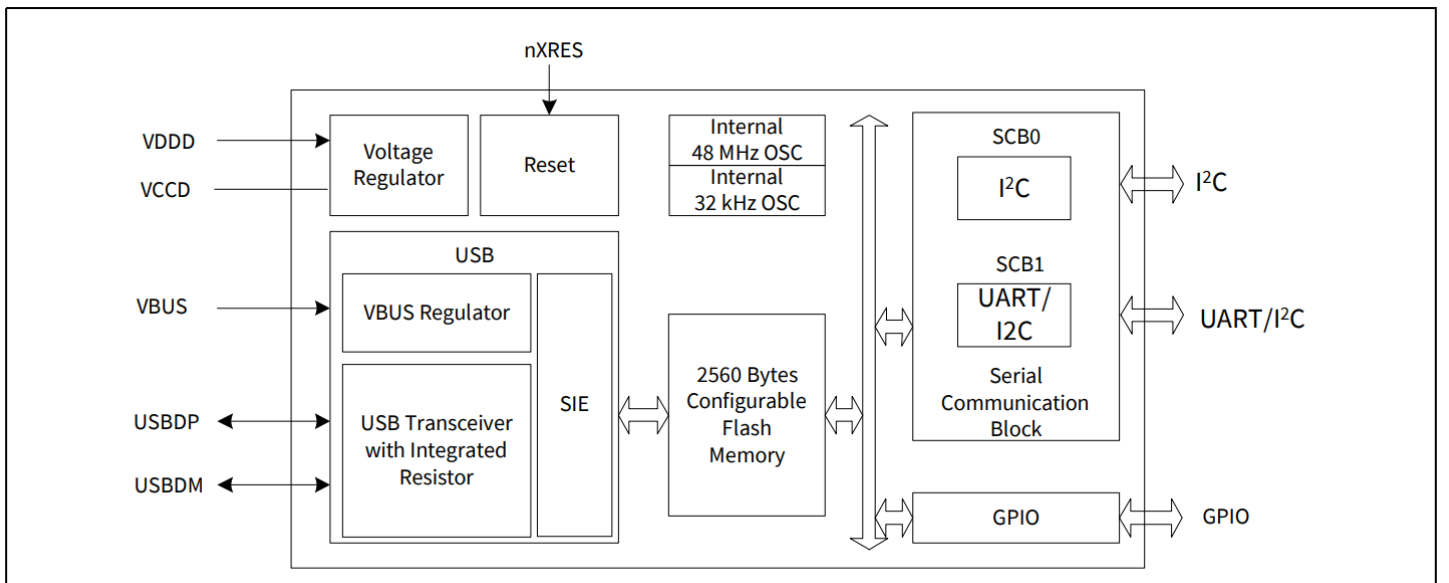
任何支持Alternate Mode的 Type-C 设备容器都需要 Billboard 设备支持，例如：

- 用于Type-C 型的适配器
- 扩展坞
- 监视器
- 汽车级

框图 - CY 7C65210/CY7C65210A



框图 - CY 7C65217/CY7C65217A



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1 功能说明

CY7C6521x^[1] 是一款全速 USB 控制器，可枚举为 Billboard 设备。它集成了稳压器、振荡器和用于存储配置参数的闪存，可提供经济高效的解决方案。CY7C6521x 支持总线供电模式，并通过挂起和远程唤醒信号实现高效的系统电源管理。它采用 24 引脚 QFN 封装。

请点击[这里](https://www.infineon.com/cms/en/product/universal-serial-bus/usb-2.0-peripheral-controllers/ez-usb-serial-bridge-controller/) <https://www.infineon.com/cms/en/product/universal-serial-bus/usb-2.0-peripheral-controllers/ez-usb-serial-bridge-controller/>，了解完整的相关资料

1.1 Billboard各部分比较

表1 Billboard各部分对比

Feature	CY7C65210	CY7C65217	CY7C65210A	CY7C65217A
Billboard spec	1.1	1.1	1.21	1.21
Number of GPIOs	9	7	11	9
Suspend/Wakeup support	Yes	Yes	No ^[2]	No ^[2]

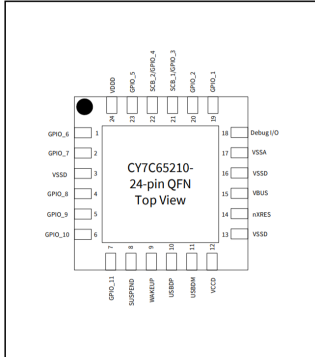
注：

1. CY7C6521x 指的是 CY7C65210、CY7C65217、CY7C65210A 和 CY7C65217A。
2. 由于这些功能与 Billboard 无关，因此删除了对这些功能的支持。

2 引脚描述 – CY7C65210/CY7C65210A

表 2 引脚描述 – CY7C65210/CY7C65210A

Pin ^[3]	Type	Name	Default	Description
1	GPIO	GPIO_6	Tristate	GPIO
2	GPIO	GPIO_7	Tristate	GPIO
3	Power	VSSD	–	Digital ground
4	GPIO	GPIO_8	Tristate	GPIO
5	GPIO	GPIO_9	Tristate	GPIO
6	GPIO	GPIO_10	Tristate	GPIO
7	GPIO	GPIO_11	POWER#	GPIO (CY7C65210)
	GPIO	GPIO_11	Tristate	GPIO (CY7C65210A)
8	Output	SUSPEND	–	On CY7C65210, this pin indicates that the device in Suspend mode. Can be configured as active LOW/HIGH using the configuration utility.
	GPIO	GPIO_12	Tristate	On CY7C65210A, this pin serves as GPIO
9	Input	WAKEUP	–	On CY7C65210, this pin is configured to wake up the device from Suspend mode. Can be configured as active LOW/HIGH using the configuration utility.
	GPIO	GPIO_13	Tristate	On CY7C65210A, this pin serves as GPIO
10	USBIO	USBDP	–	USB Data signal plus, integrates termination resistor and a 1.5 k Ω pull-up resistor
11	USBIO	USBDM	–	USB Data signal minus, integrates termination resistor

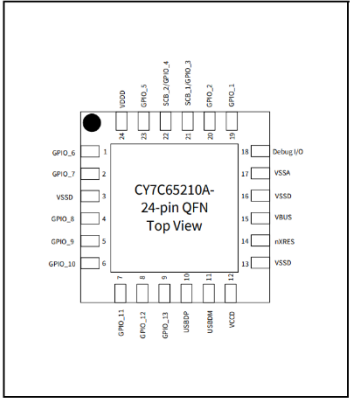


注:

3. 任何作为输入引脚的引脚都不应悬空。

引脚描述 – CY7C65210/CY7C65210A

表 2 引脚描述 – CY7C65210/CY7C65210A (续)

Pin ^[3]	Type	Name	Default	Description	
12	Power	VCCD	–	This pin should be decoupled to ground using a 1 μ F capacitor or by connecting a 1.8 V supply.	
13	Power	VSSD	–	Digital ground	
14	nXRES	nXRES	–	Chip reset, active LOW. Can be left unconnected or have a pull-up resistor connected if not used.	
15	Power	VBUS	–	VBUS supply, 3.15 V to 5.25 V	
16	Power	VSSD	–	Digital ground	
17	Power	VSSA	–	Analog ground	
18	Input	Debug I/O	–	Used for debug purpose. Should be left floating.	
19	GPIO	GPIO_1	Input	Can be used as wakeup source to wakeup device from Suspend mode.	
20	GPIO	GPIO_2	Tristate	GPIO	
21	SCB/GPIO	SCB_1/ GPIO_3	SCL	I ² C SCL	
22	SCB/GPIO	SCB_2/ GPIO_4	SDA	I ² C SDA	
23	GPIO	GPIO_5	Tristate	GPIO	
24	Power	VDDD	–	Supply to the device core and Interface, 1.71 V to 5.5 V	

注:

3. 任何作为输入引脚的引脚都不应悬空。

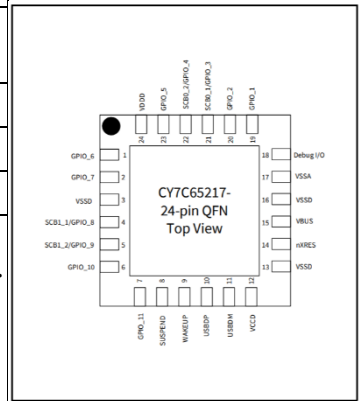
3 引脚描述 – CY7C65217/CY7C65217A

表 3 引脚描述 – CY7C65217/CY7C65217A

Pin ^[4]	Type	Name	Default	Description
1	GPIO	GPIO_6	Tristate	GPIO
2	GPIO	GPIO_7	Tristate	GPIO
3	Power	VSSD	–	Digital ground
4	SCB/GPIO	SCB1_0/ GPIO_8	RXD	UART RXD/I ² C SCL
5	SCB/GPIO	SCB1_1/ GPIO_9	TXD	UART TXD/I ² C SDA
6	GPIO	GPIO_10	Tristate	GPIO
7	GPIO	GPIO_11	POWER#	GPIO (CY7C65217)
	GPIO	GPIO_11	Tristate	GPIO (CY7C65217A)
8	Output	SUSPEND	–	On CY7C65217, this pin indicates that the device in Suspend mode. Can be configured as active LOW/HIGH using the configuration utility.
	GPIO	GPIO_12	Tristate	GPIO
9	Input	WAKEUP	–	On CY7C65217, this pin is configured to wake up the device from Suspend mode. Can be configured as active LOW/HIGH using the configuration utility.
	GPIO	GPIO_13	Tristate	On CY7C65217A, this pin serves as GPIO
10	USBIO	USBDP	–	USB Data signal plus, integrates termination resistor and a 1.5-k Ω pull-up resistor
11	USBIO	USBDM	–	USB Data signal minus, integrates termination resistor

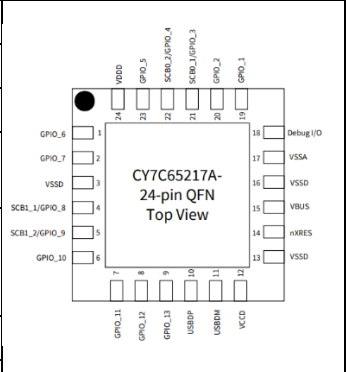
注：

4. 任何作为输入引脚的引脚都不应悬空。



引脚描述 – CY7C65217/CY7C65217A

表 3 引脚描述 – CY7C65217/CY7C65217A (续)

Pin ^[4]	Type	Name	Default	Description	
12	Power	VCCD	–	This pin should be decoupled to ground using a 1 μ F capacitor or by connecting a 1.8 V supply.	
13	Power	VSSD	–	Digital ground	
14	nXRES	nXRES	–	Chip reset, active LOW. Can be left unconnected or have a pull-up resistor connected if not used.	
15	Power	VBUS	–	VBUS supply, 3.15 V to 5.25 V	
16	Power	VSSD	–	Digital ground	
17	Power	VSSA	–	Analog ground	
18	Input	Debug I/O	–	Used for debug purpose. Should be left floating	
19	GPIO	GPIO_1	Input	Can be used as wakeup source to wakeup device from Suspend mode	
20	GPIO	GPIO_2	Tristate	GPIO	
21	SCB/GPIO	SCB0_1/ GPIO_3	SCL	SCB0 I ² C SCL	
22	SCB/GPIO	SCB0_2/ GPIO_4	SDA	SCB0 I ² C SDA	
23	GPIO	GPIO_5	Tristate	GPIO	
24	Power	VDDD	–	Supply to the device core and Interface, 1.71 V to 5.5 V	

注:

4. 任何作为输入引脚的引脚都不应悬空。

4 GPIO 配置

表4 GPIO 配置

GPIO configuration option	Description
INPUT	Input GPIO
POWER#	This active low output signal is used to control power to an external logic through a switch to cut power off during an Unconfigured USB device and USB suspend. 0 - USB device in Configured state 1 - USB device in Unconfigured state or during USB suspend mode Note: CY7C65210A and CY7C65217A do not support POWER#.
TRISTATE	I/O Tristated (Open-Drain)
OUTPUT	Drive LOW or HIGH

5 功能概述

5.1 USB 和 Billboard 设备功能

5.1.1 USB

CY7C6521x 内置 USB 2.0 全速收发器。该收发器在 USB 数据线上集成了内部 USB 串联终端电阻，并在 USB DP 上集成了 1.5 k Ω 上拉电阻。

5.1.2 Billboard 设备功能

CY7C6521x 用于将设备容器支持的 Alternate Mode 传达给 USB 主机系统。CY7C6521x 通过 BOS 描述符和字符串描述符以用户可读的格式发送此信息。CY7C6521x 支持 Billboard 描述符，并将其作为完整 BOS 描述符的一部分。CY7C65210/65217 支持 USB Billboard 设备类版本 1.1，而 CY7C65210A/65217A 支持 USB Billboard 设备类版本 1.21。有关设备类的更多详细信息，请参阅 [USB Billboard 设备类规范](#)。

5.2 串行通信

CY7C65210 和 CY7C65210A 具有一个串行通信模块 (SCB)，而 CY7C65217 和 CY7C65217A 具有两个可实现 UART 或 I²C 接口的 SCB。

5.2.1 I²C 接口

I²C 接口支持完整的多主模式，最高支持 400 kHz 的速率。有关该协议的更多详细信息，请参阅恩智浦 I²C 规范修订版 5。

注：

- I²C 端口无法承受更高的电压。因此，当芯片断电时，它们无法进行热插拔或独立上电。
- SCL 的最小下降时间满足（恩智浦 I²C 规范修订版 5）当 V_{DD} 介于 1.71 V 和 3.0 V。当 V_{DD} 在 3.0 V 至 3.6 V 范围内时，建议在 SCL 信号上添加一个 50 pF 电容。

5.3 UART 接口

仅 CY7C65217 和 CY7C65217A 的 SCB1 接口可以配置为 UART 接口。

引脚 2 UART 接口 (RXD 和 TXD) 提供与其他 UART 设备的异步串行通信，运行速度高达 115200。它支持七或八个数据位、一或两个停止位、奇数、偶数、标记、空格和无奇偶校验。UART 接口支持全双工通信，信令格式与标准 UART 协议兼容。UART 引脚可以与行业标准 RS-232/RS-422 收发器连接，用于管理不同的电压电平。支持常见的 UART 功能，例如奇偶校验错误^[5] 和帧错误^[6]。可以使用原生 API 设置 UART 参数。

注：

5. 当 UART 发送器设备配置为奇校验并且 UART 接收器设备配置为偶校验时，会检测到奇偶校验错误。
6. 当 UART 发送器设备配置为 7 位数据宽度和 1 个停止位，而 UART 接收器设备配置为 8 位数据宽度和 2 个停止位时，会检测到帧错误。

功能概述

5.4 GPIO接口

CY7C65210 有 9 个可配置 GPIO，而 CY7C65217 有 7 个可配置 GPIO。CY7C65210A 有 11 个可配置 GPIO，而 CY7C65217A 有 9 个可配置 GPIO。

可配置选项如下：

- 输入：输入GPIO
- POWER#：电源控制
- TRISTATE：I/O 三态
- 输出：驱动低或高

5.5 存储器

CY7C6521x 具有 2560 字节可配置闪存。闪存用于存储 USB 参数，例如 VID/PID、序列号、产品和制造商描述符以及 Billboard 设备类特定描述符。

5.6 系统资源

5.6.1 电源系统

CY7C6521x 支持 USB 挂起模式来控制电源使用。CY7C6521x 在 3.15 V 至 5.5 V 范围内以总线供电或自供电模式运行。

5.6.2 时钟系统

CY7C6521x 具有完全集成的时钟，无需任何外部组件。时钟系统负责为各个子系统提供时钟。

5.6.3 内部 48 MHz 振荡器

内部 48 MHz 振荡器是 CY7C6521x 内部时钟的主要来源。

5.6.4 内部32kHz振荡器

内部 32 kHz 振荡器主要用于在 USB 暂停模式下生成外设操作的时钟。

5.6.5 RESET (复位)

复位块提供可靠的上电复位并使设备恢复到默认已知状态。外部设备可以使用 nXRES（低电平有效）引脚来复位 CY7C6521x。

5.7 挂起和恢复

当 USB 总线进入挂起状态时，CY7C65210 和 CY7C65217 设备会置位 SUSPEND 引脚。这有助于在总线供电模式下使用该设备时满足 USB 2.0 规范的严格挂起电流要求。设备在下列任何一种情况下从挂起状态恢复：

- 在 USB 总线上检测到任何活动
- WAKEUP 引脚有效，可向主机产生远程唤醒

5.8 唤醒

CY7C65210 和 CY7C65217 上的 WAKEUP 引脚用于在 USB 总线上生成远程唤醒信号。仅当主机通过 SET_FEATURE 请求启用此功能时，才会发送远程唤醒信号。设备在 USB 枚举过程中通过配置描述符向主机传达对远程唤醒的支持。

功能概述

5.9 内部闪存配置

内部闪存可用于存储表 5 中提供的配置参数。

表 5 CY7C65210/CY7C65210A 的内部闪存配置

Parameter	Default value	Description
USB 配置		
USB Vendor ID (VID)	0x04B4	Default Cypress VID. Can be configured to customer VID.
USB Product ID (PID)	0x5210	Default Cypress PID. Can be configured to customer PID.
Manufacturer string	Infineon Technologies Semiconductor	Can be configured with any string up-to 126 characters ^[7]
Product string	Billboard device	Can be configured with any string up-to 126 characters ^[7]
Serial string	User-defined	Can be configured with any string up-to 126 characters ^[7] . If the serial string is not configured by the user, a unique serial number will be generated using the wafer die parameters.
Power mode	Bus powered	Can be configured to bus-powered or self-powered mode
Max current draw	100 mA	Can be configured to any value from 0 to 500 mA. The configuration descriptor will be updated based on this
Remote wakeup	Enabled	Can be disabled on CY7C65210. Remote wakeup is initiated by asserting the WAKEUP or GPIO_1 pin
	Disabled	On CY7C65210A, this feature is removed.
bcdDevice	0x00	Can be configured with specific binary coded decimal number

注：

- 7. 所有字符串描述符的最大可用配置空间为 1920 字节。每个字符串描述符最多可配置 126 个字符。
- 8. 这些 GPIO 仅在 CY7C65210A 上可用。

功能概述

表 5 CY7C65210/CY7C65210A 的内部闪存配置 (续)

Parameter	Default value	Description
GPIO配置		
GPIO_1	Input	GPIO can be configured as shown in “GPIO configuration” on page 9
GPIO_2	Tristate	
GPIO_3	I ² C SCL	
GPIO_4	I ² C SDA	
GPIO_5	Tristate	
GPIO_6	Tristate	
GPIO_7	Tristate	
GPIO_8	Tristate	
GPIO_9	Tristate	
GPIO_10	Tristate	
GPIO_11	Power# (CY7C65210)	
	Tristate (CY7C65210A)	
GPIO_12	Tristate ^[8]	
GPIO_13	Tristate ^[8]	

Billboard设备类描述符配置

iAdditionalInfoURL	USB-C Power Delivery Controllers	Can be configured with any string up-to 126 characters ^[7]
bNumberOfAlternateModes	0x01	Can be configured with any value from 0x01 to 0x08
bPreferredAlternateMode	0x00	Can be configured with any value from 0x00 to 0x07
VCONN Power	0x0000	Can be configured with any value from 0x0000 to 0x0006 or it can be configured with value 0x8000
SVID	0xFF01	Can be configured to specific SVID
bAlternateMode	0x01	Can be configured with any value from 0x01 to 0x08
iAlternateModeString	Type-C to Display adapter. For further assistance, see https://help.vesa.org/dp-usb-type-c	Can be configured with any string up-to 126 characters ^[7]
dwAlternateModeVdo	0x000C00C5	Can be configured with any 4-byte value (applicable only for CY7C65210A/CY7C65217A)

注：

- 所有字符串描述符的最大可用配置空间为 1920 字节。每个字符串描述符最多可配置 126 个字符。
- 这些 GPIO 仅在 CY7C65210A 上可用。

功能概述

表 6 CY7C65217/CY7C65217A 的内部闪存配置

Parameter	Default value	Description
USB 配置		
USB Vendor ID (VID)	0x04B4	Default Infineon VID. Can be configured to customer VID
USB Product ID (PID)	0x5217	Default Infineon PID. Can be configured to customer PID
Manufacturer string	Infineon Technologies Semiconductor	Can be configured with any string up-to 126 characters ^[9]
Product string	Billboard device	Can be configured with any string up-to 126 characters ^[9]
Serial string	User-defined	Can be configured with any string up-to 126 characters ^[9] . If the Serial string is not configured by the user then a unique serial number will be generated using the wafer die parameters.
Power mode	Bus powered	Can be configured to bus-powered or self-powered mode
Max current draw	100 mA	Can be configured to any value from 0 to 500 mA. The configuration descriptor will be updated based on this
Remote wakeup	Enabled	Can be disabled on CY7C65217. Remote wakeup is initiated by asserting the WAKEUP or GPIO_1 pin.
	Disabled	On CY7C65217A, this feature is removed
bcdDevice	0x00	Can be configured with specific binary coded decimal number

注:

9. 所有字符串描述符的最大可用配置空间为 1920 字节。每个字符串描述符最多可配置 126 个字符。
10. 这些 GPIO 仅在 CY7C65217A 上可用。

功能概述

表 6 CY7C65217/CY7C65217A 的内部闪存配置 (续)

Parameter	Default value	Description
GPIO配置		
GPIO_1	Input	GPIO can be configured as shown in Table 4
GPIO_2	Tristate	
GPIO_3	SCB0 I ² C SCL	
GPIO_4	SCB0 I ² C SDA	
GPIO_5	Tristate	
GPIO_6	Tristate	
GPIO_7	Tristate	
GPIO_8	SCB1 UART RXD	
GPIO_9	SCB1 UART TXD	
GPIO_10	Tristate	
GPIO_11	Power#(CY7C65217)	
	Tristate(CY7C65217A)	
GPIO_12	Tristate ^[10]	
GPIO_13	Tristate ^[10]	

Billboard设备类描述符配置

iAdditionalInfoURL	USB-C Power Delivery Controllers	Can be configured with any string up-to 126 characters ^[9]
bNumberOfAlternate-Modes	0x01	Can be configured with any value from 0x01 to 0x08
bPreferredAlternateMode	0x00	Can be configured with any value from 0x00 to 0x07
VCONN Power	0x0000	Can be configured with any value from 0x0000 to 0x0006 or it can be configured with value 0x8000
SVID	0xFF01	Can be configured to specific SVID
bAlternateMode	0x01	Can be configured with any value from 0x01 to 0x08
iAlternateModeString	Type-C to Display adapter. For further assistance, see https://help.vesa.org/dp-usb-type-c	Can be configured with any string up-to 126 characters ^[9]
dwAlternateModeVdo	0x000C00C5	Can be configured with any 4-byte value (applicable only for CY7C65210A and CY7C65217A)

注:

9. 所有字符串描述符的最大可用配置空间为 1920 字节。每个字符串描述符最多可配置 126 个字符。
 10. 这些 GPIO 仅在 CY7C65217A 上可用。

6 电气规格参数

6.1 绝对最大额定值

超过最大额定值^[11]可能缩短器件的使用寿命。

表7 绝对最大额定值

Parameter	Maximum ratings
Storage temperature (Industrial, commercial)	–55°C to +100°C
Storage temperature (Automotive)	–55°C to +150°C
Ambient temperature with power supplied (Industrial, commercial)	–40°C to +85°C
Ambient temperature with power supplied (Automotive)	–40°C to +105°C
Supply voltage to ground potential	
V_{DD}	6.0 V
V_{BUS}	6.0 V
V_{CCD}	1.95 V
V_{GPIO}	$V_{DD} + 0.5 \text{ V}$
Static discharge voltage ESD protection levels:	
HBM per JESD22-A114	2.2-kV
Latch-up current	140 mA
Current per GPIO	25 mA

6.2 工作条件

表8 输入模式

Parameter	Operating conditions
T_A (ambient temperature under bias)	
Commercial	0°C to 70°C
Industrial	–40°C to +85°C
Automotive	–40°C to +105°C
V_{BUS} supply voltage	3.15 V to 5.50 V
V_{DD} supply voltage	1.71 V to 5.50 V
V_{CCD} supply voltage	1.71 V to 1.89 V

注：

- 器件在高于表中所列出的最大绝对值条件下使用可能会造成永久性的损害。长期在最大绝对值的条件下使用可能会影响器件的可靠性。如果在低于最大绝对值但高于正常值的条件下使用，器件可能无法达到规格要求。

6.3 器件级规范

表 9 直流参数

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
V_{BUS}	V_{BUS} supply voltage	3.15	3.30	3.45	V	Set and configure the correct voltage range using a configuration utility for V_{BUS} . Default 5 V
		4.35	5.00	5.5	V	
V_{DDD}	V_{DDD} supply voltage	1.71	1.80	1.89	V	Used to set I/O and core voltage. Set and configure the correct voltage range using a configuration utility for V_{DDD} . Default 3.3 V
		2.0	3.3	5.5	V	
V_{CCD}	Output voltage (for core logic)	–	1.80	–	V	Do not use this supply to drive the external device. • $1.71\text{ V} \leq V_{DDD} \leq 1.89\text{ V}$: Short the V_{CCD} pin with the V_{DDD} pin • $V_{DDD} > 2\text{ V}$ – Connect a 1-μF capacitor (Cefc) between the V_{CCD} pin and ground
Cefc	External regulator voltage bypass	1.00	1.30	1.60	μF	X5R ceramic or better
I_{DD1}	Operating supply current	–	20	–	mA	USB 2.0 FS, UART at 1-Mbps single channel, no GPIO switching
I_{DD2}	USB suspend supply current	–	5	–	μA	Does not include current through a pull-up resistor on USBDP

电气规格参数

表 10 交流规格

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
Fall Time_FS	FS USB fall Time	–	7.815	–	ns	90% to 10% of full swing, 50 pF load
Rise Time_FS	FS USB rise Time	–	8.367	–	ns	10% to 90% of full swing, 50 pF load
TRFM_FS	FS rise/fall matching	–	107.024	–	%	–
VCRS_FS	FS crossover voltage	–	1.797	–	V	–
TDJ1	FS driver jitter (next)	–	–0.339	–	ns	–
TDJ2	FS driver jitter (paired)	–	–0.285	–	ns	–
TFDEOP	FS differential to EOP Skew	–	–0.076	–	ns	–
F1	Frequency	47.04	48	48.96	MHz	Non-USB mode
F2		47.88	48	48.12	MHz	USB mode
Zout	USB driver output impedance	28	–	44	W	–
Twakeup	Wakeup from USB Suspend mode	–	25	–	μs	–

电气规格参数

6.4 GPIO

表 11 GPIO直流规格

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
$V_{IH}^{[12]}$	Input voltage HIGH threshold	$0.7 \times V_{DDD}$	–	–	V	CMOS Input
V_{IL}	Input voltage LOW threshold	–	–	$0.3 \times V_{DDD}$	V	CMOS Input
$V_{IH}^{[12]}$	LVTTL input, $V_{DDD} < 2.7\text{ V}$	$0.7 \times V_{DDD}$	–	–	V	–
V_{IL}	LVTTL input, $V_{DDD} < 2.7\text{ V}$	–	–	$0.3 \times V_{DDD}$	V	–
$V_{IH}^{[12]}$	LVTTL input, $V_{DDD} \geq 2.7\text{ V}$	2	–	–	V	–
V_{IL}	LVTTL input, $V_{DDD} \geq 2.7\text{ V}$	–	–	0.8	V	–
V_{OH}	CMOS output voltage HIGH level	$V_{DDD} - 0.4$	–	–	V	$I_{OH} = 4\text{ mA}$, $V_{DDD} = 5\text{ V} \pm 10\%$
V_{OH}	CMOS output voltage HIGH level	$V_{DDD} - 0.6$	–	–	V	$I_{OH} = 4\text{ mA}$, $V_{DDD} = 3.3\text{ V} \pm 10\%$
V_{OH}	CMOS output voltage HIGH level	$V_{DDD} - 0.5$	–	–	V	$I_{OH} = 1\text{ mA}$, $V_{DDD} = 1.8\text{ V} \pm 5\%$
V_{OL}	CMOS output voltage LOW level	–	–	0.4	V	$I_{OL} = 8\text{ mA}$, $V_{DDD} = 5\text{ V} \pm 10\%$
V_{OL}	CMOS output voltage LOW level	–	–	0.6	V	$I_{OL} = 8\text{ mA}$, $V_{DDD} = 3.3\text{ V} \pm 10\%$
V_{OL}	CMOS output voltage LOW level	–	–	0.6	V	$I_{OL} = 4\text{ mA}$, $V_{DDD} = 1.8\text{ V} \pm 5\%$
Rpullup	Pull-up resistor	3.5	5.6	8.5	k Ω	–
Rpulldown	Pull-down resistor	3.5	5.6	8.5	k Ω	–
I_{IL}	Input leakage current (absolute value)	–	–	2	nA	25°C , $V_{DDD} = 3.0\text{ V}$
C_{IN}	Input capacitance	–	–	7	pF	–
Vhysttl	Input hysteresis LVTTL; $V_{DDD} > 2.7\text{ V}$	25	40	C	mV	–
Vhyscmos	Input hysteresis CMOS	$0.05 \times V_{DDD}$	–	–	mV	–

注：

12. V_{IH} 不能超过 $V_{DDD} + 0.2\text{ V}$ 。

电气规格参数

表 12 GPIO交流规格

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
$T_{\text{RiseFast1}}$	Rise Time in Fast mode	2	–	12	ns	$V_{\text{DDD}} = 3.3 \text{ V} / 5.5 \text{ V}$, Clod = 25 pF
$T_{\text{FallFast1}}$	Fall Time in Fast mode	2	–	12	ns	$V_{\text{DDD}} = 3.3 \text{ V} / 5.5 \text{ V}$, Clod = 25 pF
$T_{\text{RiseSlow1}}$	Rise Time in Slow mode	10	–	60	ns	$V_{\text{DDD}} = 3.3 \text{ V} / 5.5 \text{ V}$, Clod = 25 pF
$T_{\text{FallSlow1}}$	Fall Time in Slow mode	10	–	60	ns	$V_{\text{DDD}} = 3.3 \text{ V} / 5.5 \text{ V}$, Clod = 25 pF
$T_{\text{RiseFast2}}$	Rise Time in Fast mode	2	–	20	ns	$V_{\text{DDD}} = 1.8 \text{ V}$, Clod = 25 pF
$T_{\text{FallFast2}}$	Fall Time in Fast mode	20	–	100	ns	$V_{\text{DDD}} = 1.8 \text{ V}$, Clod = 25 pF
$T_{\text{RiseSlow2}}$	Rise Time in Slow mode	2	–	20	ns	$V_{\text{DDD}} = 1.8 \text{ V}$, Clod = 25 pF
$T_{\text{FallSlow2}}$	Fall Time in Slow mode	20	–	100	ns	$V_{\text{DDD}} = 1.8 \text{ V}$, Clod = 25 pF

电气规格参数

6.5 nXRES

表 13 nXRES直流规格

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
V_{IH}	Input voltage HIGH threshold	$0.7 \times V_{DDD}$	–	–	V	–
V_{IL}	Input voltage LOW threshold	–	–	$0.3 \times V_{DDD}$	V	–
Rpullup	Pull-up resistor	3.5	5.6	8.5	k Ω	–
C_{IN}	Input capacitance	–	5	–	pF	–
Vhysxres	Input voltage hysteresis	–	100	–	mV	–

表 14 nXRES 交流规格

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
Tresetwidth	Reset pulse width	1	–	–	μ s	–

6.6 UART 规格

表15 UART交流规格

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
F_{UART}	UART bit rate	0.3	–	3000	kbps	Single SCB: TX + RX Dual SCB: TX or RX

6.7 I²C 规格

表16 I²C AC 规格

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
F_{I2C}	I ² C frequency	1	–	400	kHz	–

6.8 闪存规格

表 17 闪存规格

Parameter	Description	Min	Typ	Max	Unit	Details/conditions
Fend	Flash endurance	100K	–	–	cycles	–
Fret	Flash retention. $T_A \leq 85^\circ\text{C}$, 10K program/erase cycles	10	–	–	years	–

7 应用示意图

图 1 显示了 CY7C65210 的应用原理图。请参阅“[引脚描述 - CY7C65210/CY7C65210A](#)”（在第 5 页）了解信号详情。

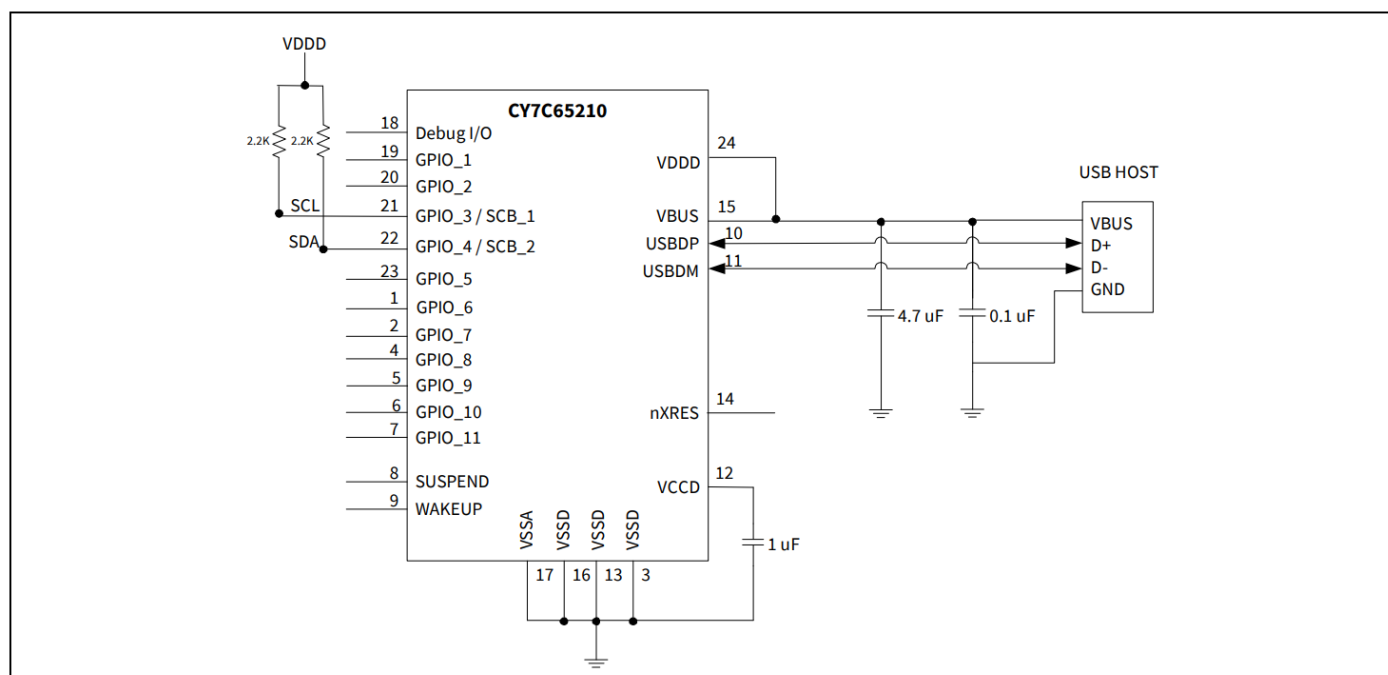


图 1 **CY7C65210 应用原理图**

图 2 显示了 CY7C65210A 的应用原理图。请参阅“引脚 [描述](#) - 获取有关信号的详细信息（第 5 页上的“CY7C65210/CY7C65210A”）。

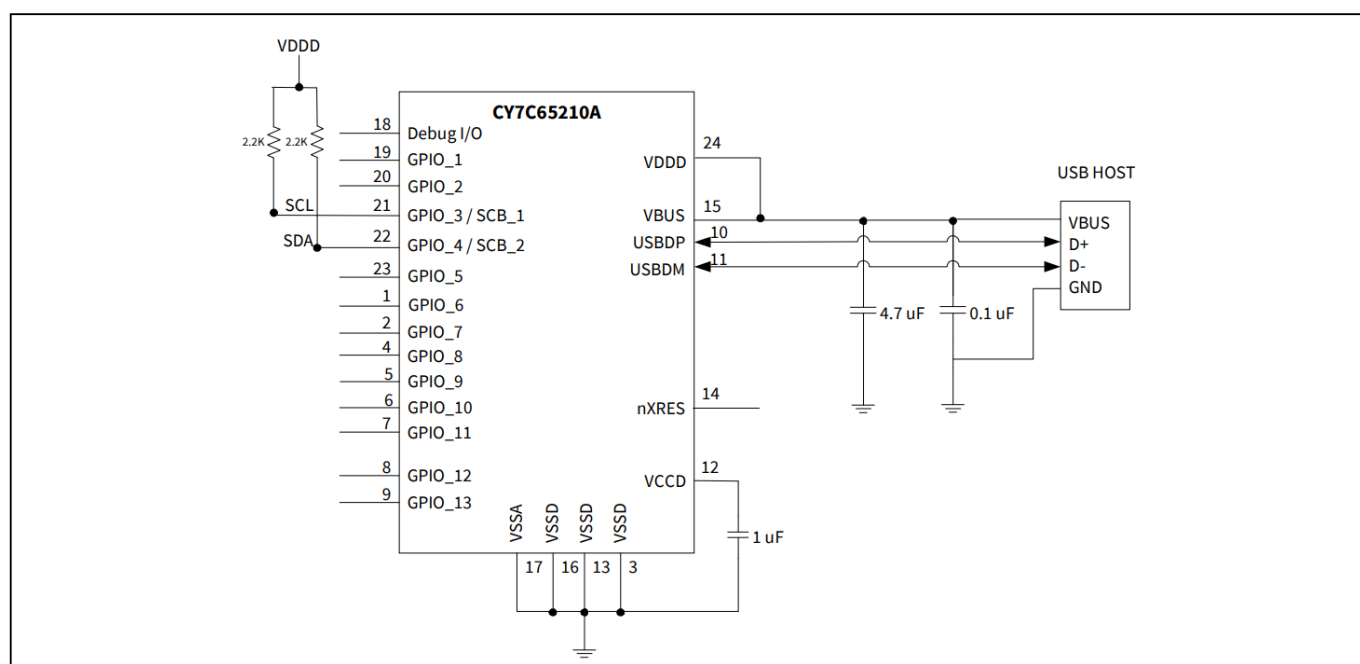


图 2 **CY7C65210A 应用原理图**

应用原理图

图 3 显示了 CY7C65217 的应用原理图。请参阅“引脚描述 - CY7C65217/CY7C65217A”（在 页 7）了解信号详情。

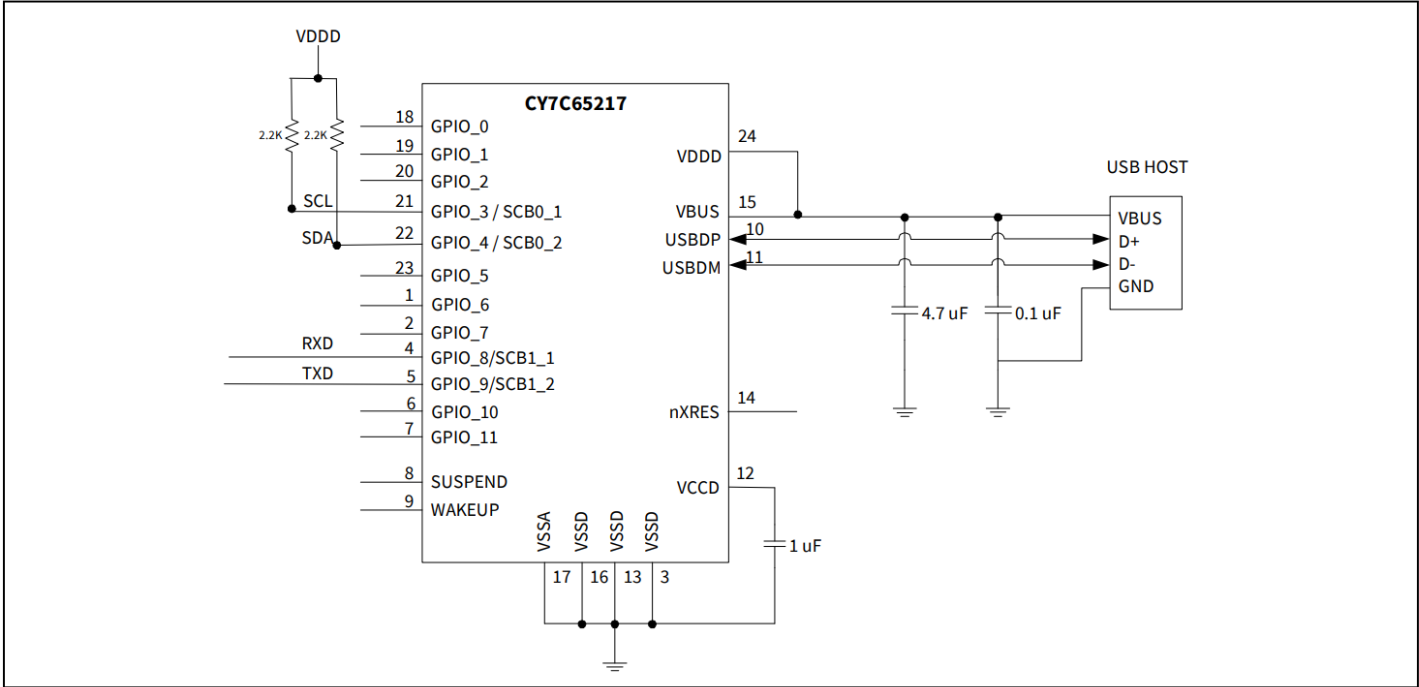


图 3 CY7C65217 应用原理图

图 4 显示了 CY7C65217A 的应用原理图。请参阅“引脚描述 - CY7C65217/CY7C65217A” 获取有关信号详细信息（第 7 页上）。

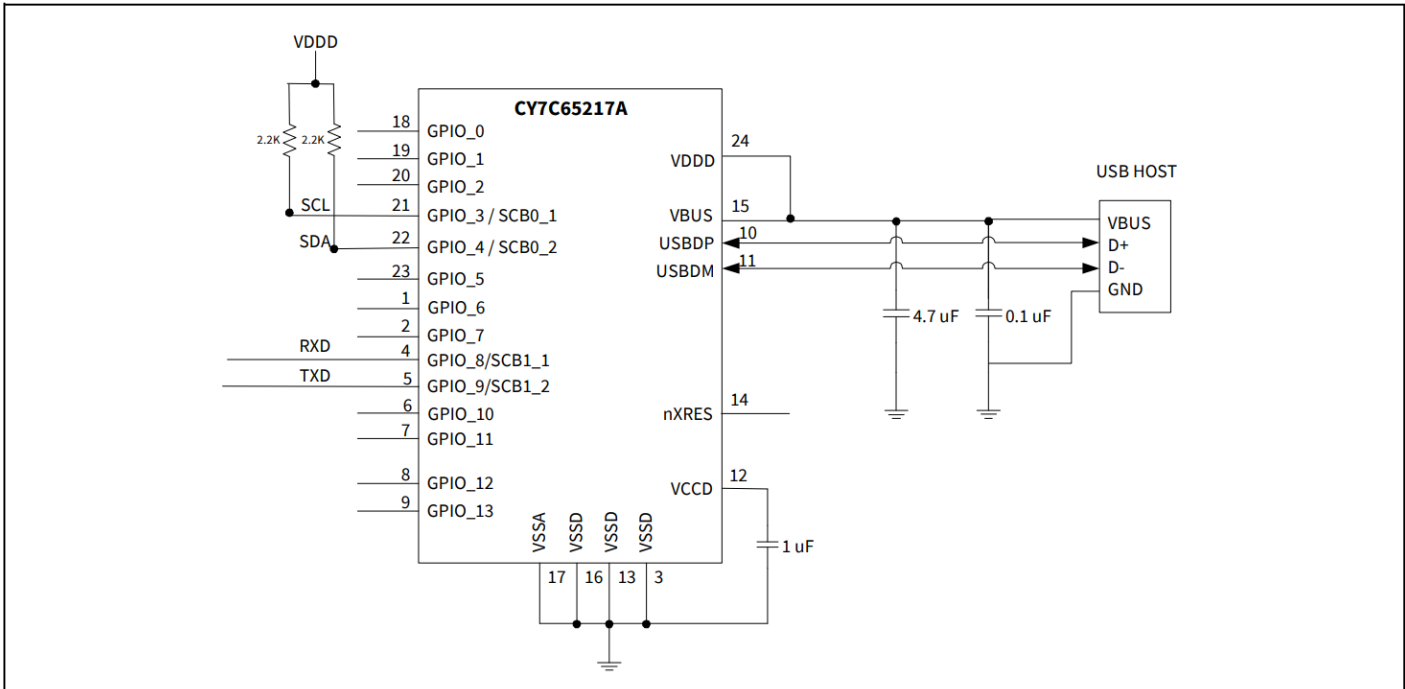


图4 CY7C65217A应用原理图

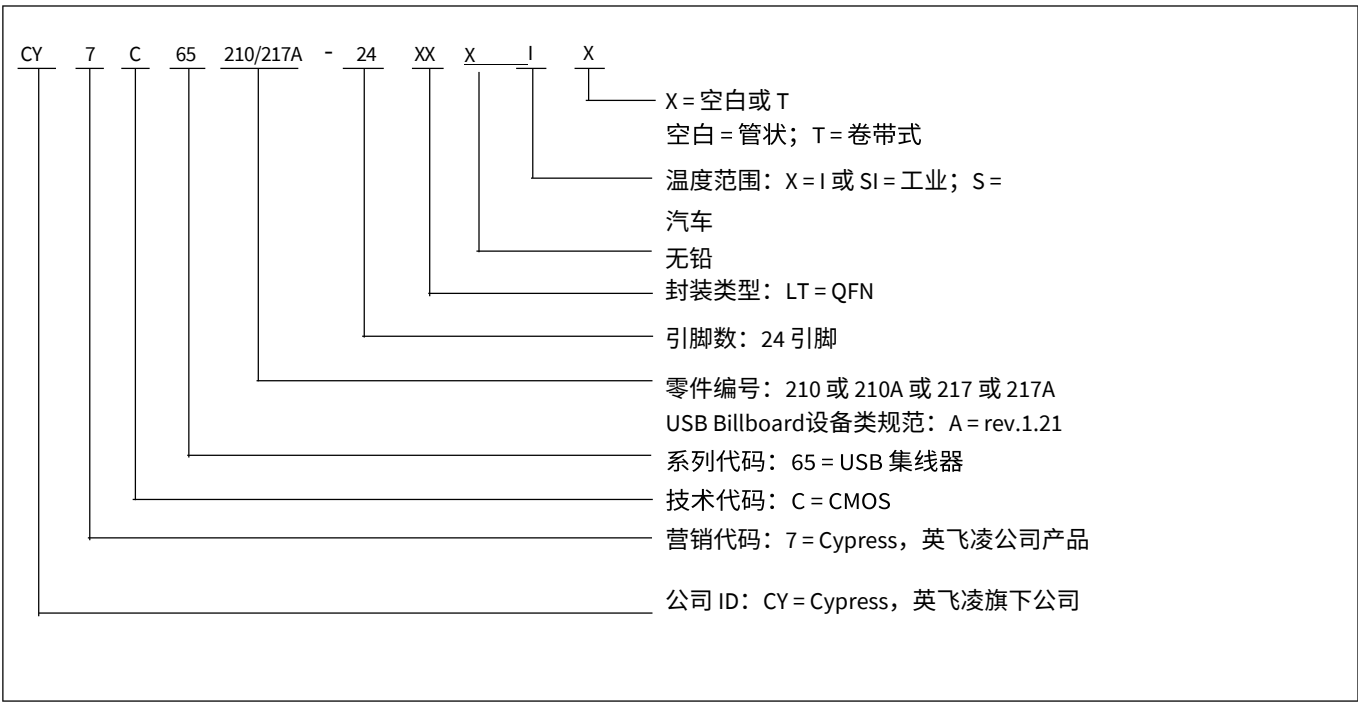
8 订购信息

表 18 列出了 CY7C65210、CY7C65217、CY7C65210A 和 CY7C65217A 的主要封装特性和订购代码。如需了解更多信息，请联系您当地的销售代表。

表 18 主要特性和订购信息

Product	Package	Temperature range
CY7C65210-24LTXI	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free)	Industrial
CY7C65210-24LTXIT	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free) – tape and reel	Industrial
CY7C65210A-24LTXI	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free)	Industrial
CY7C65210A-24LTXIT	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free) – tape and reel	Industrial
CY7C65217-24LTXI	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free)	Industrial
CY7C65217-24LTXIT	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free) – tape and reel	Industrial
CY7C65217A-24LTXI	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free)	Industrial
CY7C65217A-24LTXIT	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free)	Industrial
CY7C65210A-24LQXS	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free)	Automotive
CY7C65210A-24LQXST	24-lead QFN (4.00 × 4.00 × 0.55 mm, 0.5 mm pitch) (Pb-free) – tape and reel	Automotive

8.1 订购代码定义



9 封装信息

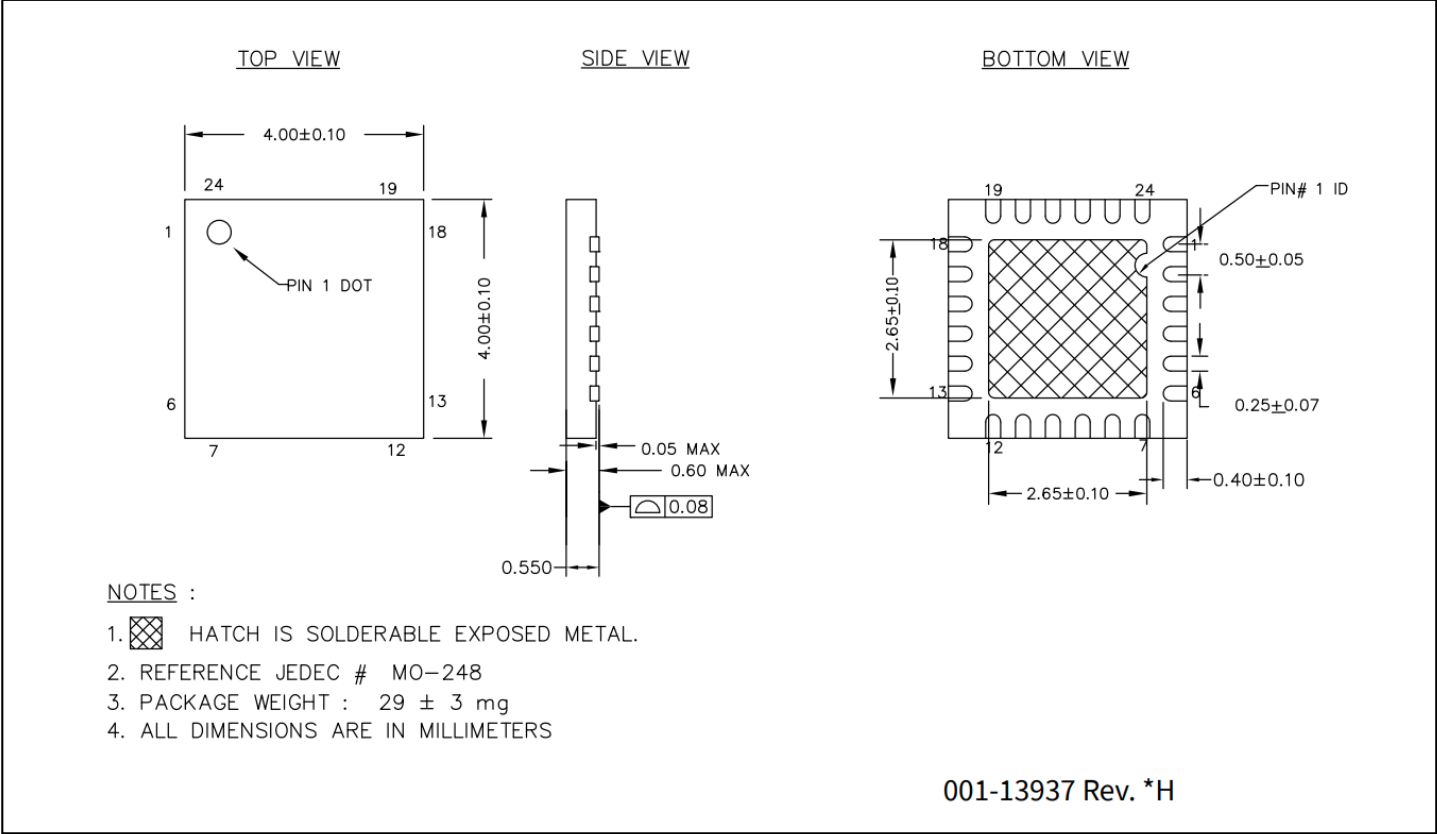


图5 24引脚QFN ((4×4×0.6毫米) LQ24A/LQ24B 2.65×2.65 E-Pad (Sawn)) 封装外形 (PG-VQFN-24) , 001-13937

表 19 封装参数

Parameter	Description	Min	Typ	Max	Unit
T _A	Operating ambient temperature (Industrial)	-40	25	85	°C
T _A	Operating ambient temperature (Automotive)	-40	25	105	°C
THJ	Package θ _{JA}	-	18.4	-	°C/W
THJ	Package θ _{JC}	-	3.5	-	°C/W

表20 回流焊峰值温度

Package	Maximum peak temperature	Maximum time at peak temperature
24-pin QFN	260°C	30 s

表21 封装潮敏等级 (MSL), IPC/JEDEC J-STD-2

Package	MSL
24-pin QFN	MSL 3

缩略语

10 缩略语

表22 本文档中使用的缩略语

Acronym	Description
BOS	binary device object store
ESD	electrostatic discharge
GPIO	general purpose input/output
HBM	Human-body model
I ² C	inter-integrated circuit
MCU	microcontroller unit
OSC	oscillator
PID	product identification
SCB	Serial Communication block
SCL	I ² C serial clock
SDA	I ² C serial data
SIE	serial interface engine
SVID	standard or vendor ID
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
VID	Vendor Identification

更多信息

11 更多信息

英飞凌的网站www.infineon.com上提供了大量资料，有助于正确选择您设计的器件，并允许您能够快速和有效地将器件集成到设计中。

- 概述: [USB 组合](#), [USB 路线图](#)
- USB 2.0 产品选择器: [USB 2.0 外设 控制器](#), [EZ-USB™ 串行 桥接 控制器](#), [EZ-USB™ encore](#)
- 代码示例: [USB 全速](#)
- 模式: [IBIS](#)

12 文档惯例

12.1 测量单位

表 23 计量单位

Symbol	Unit of measure
°C	degree celsius
DMIPS	Dhrystone million instructions per second
kΩ	kilo-ohm
KB	kilobyte
kHz	kilohertz
kV	kilovolt
Mbps	megabits per second
MHz	megahertz
mm	millimeter
V	volt

修订记录

修订记录

Document revision	Date	Description of changes
**	2015-04-10	New data sheet.
*A	2015-07-22	Updated Features: Replaced 10 with 9 under “General-purpose input/output (GPIO) pins”. Replaced “1536 bytes flash for storing configuration parameters” with “2560 bytes flash for storing configuration parameters”. Updated “Pin Description – CY7C65210”: Updated details corresponding to pins 18, 19, 21 and 22. Updated Functional overview: Updated GPIO interface: Updated description. Updated Memory: Updated description. Updated Internal flash configuration: Updated Table 5: Updated details corresponding to Serial string, and Remote wakeup parameters under “USB Configuration”. Removed GPIO_0 parameter and its details under “GPIO Configuration”. Updated details corresponding to iAdditionalInfoURL, and iAlternateModeString parameters under “Billboard Device class Descriptor Configuration”. Updated Packaging information: spec 001-13937 – Changed revision from *E to *F.
*B	2015-08-13	Updated Document Title to read as “CY7C65210/CY7C65217, USB Billboard Controller”. Added CY7C65217 part related information in all instances across the document. Replaced CY7C65210 with CY7C6521x in the required instances across the document. Updated Features: Updated details under “I²C interface”. Updated Functional description: Added Note 1 and referred the same note in CY7C6521x. Added “Block Diagram – CY7C65217”. Added “Pin Description – CY7C65217”. Updated Functional overview: Added UART interface. Updated Internal flash configuration: Updated Table 5: Updated details corresponding to GPIO_3, and GPIO_4 parameters under “GPIO Configuration”. Added Table 6. Updated Serial communication: Updated description. Updated GPIO interface: Updated description. Updated Application schematic: Added Figure 3. Updated Ordering information: Updated part numbers.

修订记录

Document revision	Date	Description of changes
*C	2016-06-16	Updated Features: Updated details under “Driver support for Billboard Device”. Updated “Pin Description – CY7C65217”: No changes in detail. Removed all existing shades. Updated GPIO configuration: Added “TRISTATE” and “OUTPUT” options. Updated Functional overview: Updated USB and Billboard device functionality: Updated Billboard device functionality: Updated description. Updated UART interface: Added Note 5 and referred the same note in “parity error”. Added Note 6 and referred the same note in “frame error”. Updated GPIO interface: Updated description. Updated Internal flash configuration: Updated Table 6: Updated details corresponding to GPIO_8 and GPIO_9 parameters under “GPIO Configuration”. Updated Electrical specifications: Added UART specifications. Updated Application schematic: Updated Figure 3.
*D	2017-06-09	Updated Cypress Logo and Copyright.

修订记录

Document revision	Date	Description of changes
*E	2017-10-13	Updated Document Title to read as “CY7C65210/CY7C65217/CY7C65210A/CY7C65217A, USB Billboard Controller”. Added CY7C65210A, CY7C65217A parts related information in all instances across the document. Updated Pin Description – CY7C65210/CY7C65210A: Replaced “CY7C65210” with “CY7C65210/CY7C65210A” in heading. Updated details corresponding to pins 7, 8 and 9. Updated Pin Description – CY7C65217/CY7C65217A: Replaced “CY7C65217” with “CY7C65217/CY7C65217A” in heading. Updated details corresponding to pins 7, 8 and 9. Updated GPIO configuration: Updated details in “Description” column corresponding to POWER# option. Updated Functional overview: Updated USB and Billboard device functionality: Updated Billboard device functionality: Updated description. Updated Internal flash configuration: Updated Table 5: Updated details corresponding to Serial string, and Remote wakeup parameters under “USB Configuration”. Updated details corresponding to GPIO_11 parameter under “GPIO Configuration”. Added GPIO_12, GPIO_13 parameters and their details under “GPIO Configuration”. Added dwAlternateModeVdo parameter and its details under “Billboard Device Class Descriptor Configuration”. Updated Table 6: Updated details corresponding to Serial string, and Remote wakeup parameters under “USB Configuration”. Updated details corresponding to GPIO_11 parameter under “GPIO Configuration”. Added GPIO_12, GPIO_13 parameters and their details under “GPIO Configuration”. Added dwAlternateModeVdo parameter and its details under “Billboard Device Class Descriptor Configuration”. Updated Application schematic: Added Figure 2. Added Figure 4. Updated Ordering information: Updated part numbers.
*F	2018-04-02	Updated to new template. Completing Sunset Review.
*G	2024-05-07	Added Automotive Temperature Range related information in all instances across the document. Updated Electrical specifications: Updated Operating conditions: Updated Table 8. Updated Device-level specifications: Removed description below heading. Updated Ordering information: Updated part numbers. Updated Ordering code definitions. Updated Packaging information: Spec 001-13937 – Changed revision from *F to *H. Migrated to Infineon template. Updated metadata. Completing Sunset Review.

修订记录

Document revision	Date	Description of changes
*H	2024-09-09	Updated Packaging information : No change in revisions. Updated Table 19 .

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