EZ-PD™ PMG1-S3 Griffin Creek Dock solution release note

Version 1.0 build 110

About this document

Scope and purpose

This document contains release notes for the EZ-PD™ PMG1-S3-based Intel Griffin Creek reference platform firmware. It describes the key updates and known issues.

Intended audience

This document is intended for customers of EZ-PD™ PMG1-S3-based Dock solutions who intend to develop their own docks based on the reference designs.

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1 Introduction

EZ-PD™ PMG1-S3 Griffin Creek Dock is a self-powered dock that uses the EZ-PD™ PMG1-S3 as a Power Delivery (PD) controller and as a Dock management controller (DMC). It also contains Intel Goshen Ridge Thunderbolt/USB4 controller and Intel® Foxville ethernet controller.

EZ-PD™ PMG1-S3 Griffin Creek Dock features 2 USB-C Power Delivery ports, 1 USB Type-A port, 2 display ports, 1 HDMI port and 1 Gigabit ethernet port. The two USB-C PD ports (upstream and downstream) are controlled by EZ-PD™ PMG1-S3 and one Type-A port is controlled by the VL822 USB 3.1 Gen 2 hub controller.

The Goshen Ridge controller implements the Thunderbolt/USB4 base protocol functionality as defined by the Thunderbolt/USB4 protocol specification, includes the base protocol as well as the USB adapter, PCIe adapter and DisplayPort adapter. The Goshen Ridge controller also acts as a flexible re-driver, re-timer for DP protocol, or a USB3.1 Gen2 hub.

EZ-PD™ PMG1 (Power Delivery microcontroller Gen 1) is a family of high-voltage USB-C Power Delivery (PD) microcontrollers (MCU). These chips include an Arm® Cortex®-M0/M0+ CPU and USB-C PD controller along with analog and digital peripherals. PMG1-S3 expands the PMG1 family with 256 KB flash, 32-KB SRAM, 50 GPIOs, Full-speed USB device controller, a Crypto engine for authentication, an analog resource (ADC, opamp, comparators, CAPSENSE™), and dual Type-C PD ports. It is targeted for device, dock, and accessory applications and is available in QFN and BGA packages.

2 Firmware information

2.1 Firmware features

This version of the EZ-PD™ PMG1-S3 Griffin Creek Dock firmware is intended to be used on Intel Griffin Creek reference platforms which makes use of CYPM1322-97BZXIT device supporting the following key application-level features:

- Type-C port configuration and connection detection in Source, Sink, and Dual-role modes on Port 0 and source role on Port 1
- USB PD communication compliant with USB PD revision 3.1 v1.8 specification
- Supports extended power range (EPR) of 140 W in source role on Port 0
- Supports programmable power supply (PPS) voltage range from 5 V to 21 V on Port 0
- Supports VESA DisplayPort Alt mode on Type-C standard v1.0 compatible with DisplayPort specification v1.3 and v1.4
- Supports Thunderbolt (TBT) and USB4 Gen3 (with vPro support) alternate modes
- Supports USBFS device (Vendor and Billboard classes)
- Supports power protection mechanisms:
  - VBUS overvoltage protection (VBUS OVP)
  - VBUS overcurrent protection (VBUS OCP)
  - VBUS short-circuit protection (VBUS SCP)
  - VBUS undervoltage protection (VBUS UVP)
  - VCONN overcurrent protection (VCONN OCP)
- Dock management controller features such as the following:
  - Signed/unsigned offline firmware update for PMG1-S3 and onboard components such as Goshen Ridge and Foxville
  - Smart power management
  - Supports the exchange of US port capabilities on the DS ports
- Buck-boost controller driver for MP4247 regulator from Monolithic Power Systems
- UART and internal flash logging mechanism for debugging
- LED control (for example, ON, OFF, blink, breathe) driver for custom use cases in the Dock design
- Deep Sleep operation
- Supports PD Extended Alert events
- Supports configurability of USB Type C, Power Delivery and Dock management controller features through the EZ-PD™ Dock Tool

See the README.md file in the mtb-example-pmg1s3-griffin-creek-dock code example for more details about the above features.

The Thunderbolt (TBT) Dock solution supports a dual asymmetric image, with a full featured primary firmware and a reduced feature backup firmware. The solution uses a bootstrap to determine the image to be loaded during boot.

Table 1 Supported features in primary and backup firmware

Feature	Support in primary firmware	Support in backup firmware
USBPD communication with USB PD revision 3.1 v1.8 compliance	Yes	No
Support for DP alternate mode v1.0, compatible with DisplayPort specifications 1.3 and 1.4	Yes	No
Thunderbolt (TBT) and USB4 Gen3 (with vPro support) alternate modes	Yes	No
Supports VBUS OVP	Yes	No
Supports VBUS OCP	Yes	No
Supports VBUS UVP	Yes	No
Supports VBUS SCP	Yes	No
Supports VCONN OCP	Yes	No
USBFS vendor class	Yes	No
USBFS Billboard class	Yes	No
UART logging	Yes	Yes
Flash logging	Yes	No
LED control	Yes	Yes
Smart power management	Yes	No
Offline firmware update	Yes	Yes (Phase 2 only)
Deep Sleep operation	Yes	No
Exchange capability	Yes	No

2.2 Default device configuration

Table 2 Default device configuration Port 0

Parameter	Supported settings
Source PDOs	5V @ 3A, 9V @ 3A, 15V @ 3A, 20V @ 5A, (5V-21V) @ 5A (PPS), 28V @ 5A(EPR), (15V-28V) @ 5A (AVS)
Sink PDOs	5V @ 0A

Table 3 Default device configuration Port 1

Parameter	Supported settings
Source PDOs	5 V @ 3 A
Sink PDOs	N/A

2.3 Default SVDM response

The CYPM1322-97BZXIT device functions as a UFP on Port-0 and as DFP on Port 1.

2.3.1 UFP (Port 0)

2.3.1.1 DISCOVER_ID response

The device reports PDUSB hub as UFP.

Response data: 0xFF00A841, 0x4C4004B4, 0x00, 0xF5050000, 0x6D00003B

Table 4 DISCOVER_ID response

VDM header		
B31..16	Standard or vendor ID (SVID)	0xFF00
B15	VDM type	1b
B14..13	Structured VDM version (major)	01b
B12..11	Structured VDM version (minor)	01b
B10..8	Object position	000b
B7..6	Command type	01b
B5	Reserved	0b
B4..0	Command	00001b
ID header		
B31	Data capable as USB host	0b
B30	Data capable as a USB device	1b
B29..27	Product type (UFP) is PD USB hub	001b
B26	Modal operation supported	1b
B25..23	Product type (DFP) is not a DFP	000b
B22..21	Connector type (receptacle)	10b
B20..16	Reserved. Shall be set to ‘0’	00000b
B15..0	16-bit USB vendor ID	0x04B4
Cert stat VDO		
B31..0	32-bit unsigned integer, XID	0
Product VDO		
B31..16	USB product ID	0xF505
B15..0	BCD device	0x0000
UFP VDO		
B31..29	UFP VDO v1.3	011b
B28	Reserved	0b
B27..24	Device capability (USB 4.0, USB 3.2 and USB 2.0 device capable)	1101b
B23..22	Connector type (legacy)	00b
B21..11	Reserved	0

B10..8	VCONN power	000b
B7	VCONN required	0
B6	VBUS required	0
B5..3	Alternate modes (TBT3 alternate mode)	111b
B2..0	USB High-speed (USB4Gen3)	011b

2.3.1.2 DISCOVER_SVID response

Response data: 0xFF00A842, 0x8087FF01, 0x00000000

Table 5 DISCOVER_SVID response

VDM header		
B31..16	Standard or vendor ID (SVID)	0xFF00
B15	VDM type	1b
B14..13	Structured VDM version (major)	01b
B12..11	Structured VDM version (minor)	01b
B10..8	Object position	000b
B7..6	Command type	01b
B5	Reserved	0b
B4..0	Command	00010b
VDO 1		
B31..16	SVID0	0x8087
B15..0	SVID1	0xFF01
VDO 2		
B31..16	SVID2	0x0000
B15..0	SVID3	0x0000

2.3.1.3 DISCOVER_MODES response

The mode response associated with DisplayPort Alt Mode and Thunderbolt (TBT). See the Thunderbolt documentation from Intel and VESA DisplayPort Alt Mode documentation for more details.

Response data:

- 0x8087A843, 0x00000001 (TBT Alternate mode)
- 0xFF01A843, 0x001C0045 (DisplayPort Alternate mode)

2.3.2 DFP (Port 1)

2.3.2.1 DISCOVER_ID response

The device reports as a PDUSB Hub.

Response data: 0xFF00A841, 0x80C004B4, 0x00, 0xF5050000, 0x47000001

Table 6 DISCOVER_ID response

VDM header		
B31..16	Standard or vendor ID (SVID)	0xFF00
B15	VDM type	1b
B14..13	Structured VDM version	01b
B12..11	Reserved	01b
B10..8	Object position	000b
B7..6	Command type	01b
B5	Reserved	0b
B4..0	Command	00001b
ID header		
B31	Data capable as USB host	1b
B30	Data capable as a USB device	0b
B29..27	Product type (UFP) is undefined	000b
B26	Modal operation supported	0b
B25..23	Product type (DFP) is PDUSB hub	001b
B22..21	Connector type (receptacle)	10b
B20..16	Reserved. Shall be set to ‘0’	0x0
B15..0	16-bit USB vendor ID	0x04B4
Cert Stat VDO		
B31..0	32-bit unsigned integer, XID	0
Product VDO		
B31..16	USB product ID	0xF505
B15..0	BCD device	0x0000
DFP VDO		
B31…29	DFP VDO v1.2	010b
B28…27	Reserved	0
B26…24	Host capability (USB2.0, USB3.2 and USB4 host capable)	111b
B23…22	Connector type (Legacy)	0
B21…5	Reserved	0
B4…0	Port number	00001b

2.3.2.2 DISCOVER_SVID Response

No SVIDs supported. NAK response shall be provided.

2.3.2.3 DISCOVER_MODES Response

No SVIDs supported. NAK response shall be provided.

3 Limitations and known issues

1. This version of the EZ-PD™ PMG1-S3 Griffin Creek solution has been built with GCC ARM toolchain only. See README.md of the code example for toolchain version details.
2. A few failures related to USB 3.1 terminations not being present were seen in the compliance tests. These failures were due to Compliance Tester not issuing the appropriate USB requests to the hub.
3. Overcurrent protection (OCP) and short-circuit protection (SCP) faults get triggered at a lower current than the configured value. This is due to a layout issue present in between the sense resistor and the CSP/CSN in the Griffin Creek RDK board.
4. An issue has been observed in the PMG1-S3 where it does not detect the disconnect of the port partner when there is a collision on the CC lines. This occurs when PMG1S3 is retrying a failed message at which time a PD packet is received from the port partner. However, the occurrence of this is very LOW.
5. A few failures due to the Goshen Ridge controller have been observed during the Interop testing. These failures cause the display mirroring to fail however the PD communication appears to be clean.
6. The Foxville firmware update with OROM module enabled will not work due to SPI flash size (8 MB) limitation.

4 Technical support

For assistance and reference design kit information, go to www.infineon.com/support for support.

4.1 Additional information

For more information about the Infineon Type-C controller family, go to USB-C High-voltage microcontrollers.

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