

ModusToolbox™

EZ-PD[™] Configurator guide

About this document

Version

1.10

Scope and purpose

The EZ-PD[™] Configurator provides a user-friendly tool for selecting the features and configuring parameters of the power delivery stack (PDStack) middleware for PMG1 family of devices. The tool generates configuration code in c language which can be referenced in the PDStack middleware.

Intended audience

This document helps application developers understand how to use the EZ-PD™ Configurator as part of creating a ModusToolbox[™] application.

Document conventions

Convention	Explanation
Bold	Emphasizes heading levels, column headings, menus and sub-menus
Italics	Denotes file names and paths.
Courier New	Denotes APIs, functions, interrupt handlers, events, data types, error handlers, file/folder names, directories, command line inputs, code snippets
File > New	Indicates that a cascading sub-menu opens when you select a menu item

Supported Software

Name	Version	Link
PDStack Middleware Library	1.1.0	https://github.com/Infineon/pdstack

Abbreviations and definitions

The following define the abbreviations and terms used in this document:

- USB-PD Universal Serial Bus Power Delivery (See USB Power Deliver Specification Revision 3.0) •
- PMG1 Power Delivery Microcontroller Generation 1 •
- PDO Power Data Object .
- VDO – Vendor Data Object
- SCEDB Source Capabilities Extended Data Block .
- SKEDB Sink Capabilities Extended Data Block •
- **EPR Extended Power Range** •
- SVID Standard or Vendor ID .
- **BSP Board Support Package** •

User Guide

ModusToolbox[™] EZ-PD[™] Configurator guide



About this document

Reference documents

Refer to the following documents for more information, as needed:

- USB Power Deliver Specification Revision 3.0
- <u>PDStack middleware library</u>
- <u>ModusToolbox™ Device Configurator guide</u>
- <u>ModusToolbox[™] user guide</u>
- Eclipse IDE for ModusToolbox[™] user guide
- Device datasheets
- Device technical reference manuals



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1 Launch the EZ-PD[™] Configurator

There are numerous ways to launch the EZ-PD[™] Configurator, and those ways depend on how you use the various tools in ModusToolbox[™].

1.1 make command

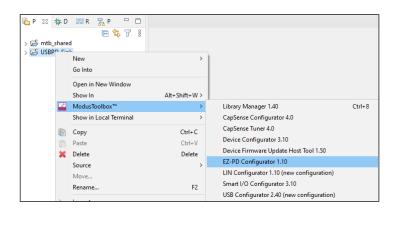
As described in the <u>ModusToolbox[™] user guide</u> build system chapter, you can run numerous make commands in the application directory, such as launching the EZ-PD[™] Configurator. After you have created a ModusToolbox[™] application, navigate to the application directory and type the following command in the appropriate bash terminal window:

```
make open CY_OPEN_TYPE=ez-pd-configurator
```

This command opens the EZ-PD[™] Configurator GUI for the specific application in which you are working.

1.2 Eclipse IDE

If you use the Eclipse IDE for ModusToolbox[™], you can launch the EZ-PD[™] Configurator for the selected application. In the Project Explorer, right-click on the project and select **ModusToolbox[™] > EZ-PD Configurator <version>**. You can also click the **EZ-PD Configurator** link in the IDE Quick Panel.





Similar to the make command method, launching the EZ-PD[™] Configurator using the Eclipse IDE opens the tool for the selected application. Refer to the <u>Eclipse IDE for ModusToolbox[™] user guide</u> for details about the IDE.

1.3 Executable (CLI)

The EZ-PD[™] Configurator executable can be run from the command line, and it also has a "cli" version of the executable as well. Running configurator executables from the command line can be useful as part of batch files or shell scripts to re-generate the source code based on the latest configuration settings. The exit code for the executable is zero if the operation is successful, or non-zero if the operation encounters an error. For more information about the command-line options, run the executable using the −h option.



1.4 Executable (GUI)

If you don't have an application or if you just want to see what the configurator looks like, you can launch the EZ-PD[™] Configurator GUI by running its executable as appropriate for your operating system (for example, double-click it or select it using the Windows **Start** menu). By default, it is installed here:

<install_dir>/ModusToolbox/tools_<version>/ez-pd-configurator-<version>

When launched this way, the EZ-PD[™] Configurator opens without any settings configured. You can either open a specific configuration file or create a new one. See <u>Menus</u> for more information.



2 Quick start

This section provides an example workflow for how to use the EZ-PD[™] Configurator with the USBPD-Sink code example (<u>https://github.com/Infineon/mtb-example-pmg1-usbpd-sink</u>).

- 1. Create a new ModusToolbox[™] application. In this example, use the Project Creator tool:
 - a. Select the PMG1-CY7110 BSP.
 - b. Select the USBPD Sink application.
- 2. Build the application.

This generates *mtbcfg_ezpd.h* and *mtbcfg_ezpd.c* files in the *<application>/USBPD_CONFIG/TARGET_<kit-name>/GeneratedSource* directory. These files define the <u>PDSTACK Middleware configuration struct</u> *cy_stc_pdstack_port_cfg_t*, with the application's default configuration.

- 3. Follow the instructions in the application's *README.md* file for the correct placement of jumpers on the kit, and then program the kit.
- 4. Connect the kit to a power source that supports USB Power Delivery on the USB-PD port, **not** the USB-C port for KitProg) to a power source (for example, a charger or a laptop) using a USB-C-to-C cable.

Again, review the *README.md* file for proper jumper placement.

The kit's LED (LED3 of PMG1-CY7110) should blink at 5 Hz, indicating that the USB-PD operation is working.

- 5. <u>Launch the EZ-PD[™] Configurator</u> for the application that was just created.
 - a. Deselect the PD Operation Enable parameter under Port Information.
 - b. Save the configuration. This updates the *mtbcfg_ezpd.c* file with the changed configuration.
- 6. Disconnect the power source from the kit, re-program the application, then connect the power source to the kit.

The kit's Debug LED should blink at 1 Hz, indicating that USB-PD operation is **not** working since it was disabled in step 5.



3 GUI description

Untitled - EZ-PD Configurator 1.10		-		\times
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🗋 🖆 🔚 🕂 🗙 🖻 🖺 崎	(°I -			
Port 0				
	Enter filter text			
 Port 0 Configuration 	Name	Value		
Port Information	⑦ Manufacturer Vendor ID	0x4B4		
 PDO Sink PDOs 	⑦ Manufacturer Product ID	0xF500		
Sink PDOS Sink PDO 0 (Fixed Supply, Volt:5000)	⑦ Manufacturer Name	Infineon		
Sink PDO 1 (Variable Supply, Min Volt:7(? Port Role	Sink		-
▼ EPR Configuration	⑦ Default Port Role	Sink		-
 EPR Sink PDOs EPR Sink PDO 0 (Variable Supply, Min Venture) 	⑦ Current Level (mA)	3000		-
SKEDB Configuration	⑦ Cable Discover Count	0x14		
_	⑦ DRP Toggle Enable			
	⑦ Rp Supported (mA)	None		-
	PD Operation Enable	V		
•	2 Dreferred Dower Role	None		
Notice List				ß×
Fix Description			Lo	cation
P				
Ready				

3.1 Menus

3.1.1 File

- **New** Creates a new file with new configuration.
- **Open** Opens the configuration file.
- **Close** Closes the configuration file.
- Save Saves the existing file.
- Save As Saves the existing file under a different name.
- **Open in System Explorer** Opens your computer's file explorer tool to the directory that contains the **.mtbezpd* file.
- **Exit** Closes the configurator.

3.1.2 Edit

- Add Port Adds a new Port tab to configure parameters.
- **Remove Port** Removes the selected **Port** tab.
- **Copy Port** Copies port settings of the selected port to the clipboard.
- Paste Port Pastes port settings from the clipboard to the selected port; replaces current settings.
- **Undo** Undoes the previous change.
- **Redo** Redoes the last undone change.

ModusToolbox[™] EZ-PD[™] Configurator guide GUI description



3.1.3 View

- **Notice List** Shows/hides Notice List. Refer to the <u>Device Configurator guide</u> for more information.
- **Toolbar** Shows/hides the toolbar.
- **Reset View** Resets the view to the default.

3.1.4 Help

- View Help Opens this document.
- **About** Opens the About box for version information.

3.2 Toolbar



The toolbar contains common commands from the **File** and **Edit** menus, such as **New**, **Open**, and **Save**. Use the check box under the **View** menu to show or hide the toolbar.

3.3 Port tabs

Port 0 Port 1			
+ X		-	Ē

This area contains one or two tabs to configure various parameters. Each tab includes a toolbar with the following commands:

- Add/Remove PDO Adds or removes a PDO from the selected list.
- **Sort PDOs** Toggles **Sort** on and off. When enabled, this reorders the PDOs by type and voltage.
- Move Up/Down When Sort is disabled, these move the selected PDO up or down in the list.
- **Expand/Collapse All** Expands or collapses the entire tree of items in the **Port** tab.

3.4 Parameter categories

The left side of the EZ-PD[™] Configurator shows several parameter categories, as follows:

- Port Information
- Source PDOs
- Sink PDOs
- EPR Configuration
- Source Capabilities Extended Data Block (SCEDB) Configuration
- Sink Capabilities Extended Data Block (SKEDB) Configuration



3.5 Parameters and values

When you select a parameter category, the right side of the EZ-PD[™] Configurator displays that category's individual parameters and values, as appropriate. The following sections describe the parameters available for each category.

3.5.1 Port Information

The Port Information node consists of the following parameters.

Port 0			
+ 🗙 🚺 🛊 🖷 🖻	Enter filter text		
 Port 1 Configuration 	Name	Value	
Port Information	⑦ Manufacturer Vendor ID	0x4B4	
▼ PDO	⑦ Manufacturer Product ID	0xF500	
Sink PDOs	(?) Manufacturer Name	Infineon	
 EPR Configuration 	Port Role	Sink	*
EPR Sink PDOs	Default Port Role	Sink	*
SKEDB Configuration	(?) Current Level (mA)	3000	
	Cable Discover Count	0x14	
	ORP Toggle Enable	0.000	
	(?) Rp Supported (mA)	None	*
	PD Operation Enable	V	
	Preferred Power Role	None	*
	Port Disable		
	Cable Discovery Enable		
	⑦ Dead Battery Support	✓	
	② Error Recovery Enable	✓	
	? FRS Configuration	None	*
	? VCONN Retain		
	? Accessory Mode Enable	✓	
	? Rp Detach Enable	✓	
	? Port Type	Shared Capacity Port	
	? Port Maximum PDP	0x3C	
	Port Present PDP	0x3C	
	Port Reported PDP	0x3C	
	PD Revision Major	3	
	PD Revision Minor	1	
	PD Version Major	1	
	PD Version Minor	0	

Field name	Description	Valid range	
Manufacturer Vendor ID (0x)	Vendor ID assigned to manufacturer by USB-IF	0x0000 – 0xFFFF	
Manufacturer Product ID (0x)	16-bit Product ID that identifies the product	0x0000 – 0xFFFF	
Manufacturer Name	Manufacturer name string	Maximum 21 ASCII Characters	
		0 -> Sink	
Port Role	Power handling role of the device	1 ->Source	
		2 -> Dual Role	
Defeult Deut Dele		0 -> Sink	
Default Port Role	Default power handling role of the device 1 -> Source		
		0 -> 900 mA	
Current Level (mA)	Operating current range for the device	1 -> 1.5 A	
urrent Level (mA) Operating current range for the device		2 -> 3 A	
Cable Discover Count	Number of cable discovery attempts to be made	0x00 - 0x14	
DRP Toggle Enable	Whether Rp-Rd toggle is enabled in unattached state	Check box enabled or not.	
		Bit Mask	
		Bit 0 -> 900 mA Rp	
Rp Supported (mA)	Rp values supported by the device	Bit 1 -> 1.5 A Rp	
		Bit 2 -> 3 A Rp	

ModusToolbox™ EZ-PD™ Configurator guide GUI description



Field name	Description	Valid range
PD Operation Enable	Whether USB-PD operation is supported on the port	0 -> No 1 -> Yes
Preferred Power Role	Whether Try.Src or Try.Sink is enabled for the port	0 -> No Try.Src or Try.Sink supported 1 -> Try.Src supported 2 -> Try.Sink supported
Port Disable	Whether the PD port is to be disabled at start-up	Check box enabled or not.
Cable Discovery Enable	Whether cable discovery is enabled as part of the source state machine	Check box enabled or not.
Dead Battery Support	Whether dead battery operation is supported	Check box enabled or not.
Error Recovery Enable	Whether Type-C error recovery is enabled for this port	Check box enabled or not.
FRS Config	Fast Role Swap feature enabled flags	0 -> None 1 -> FRS receive enable 2 -> FRS transmit enable
VCONN Retain	Whether Vconn supply should be left enabled even if the EMCA's cable VDO indicates that Vconn is not required.	Check box enabled or not.
Accessory Mode Enable	Whether accessory mode is to be enabled	Check box enabled or not.
Rp Detach Enable	Option to enable/disable disconnect detect mechanism using Rp in Sink role	Check box enabled or not.
Port Type	Port type in Source_Info data object. Indicates whether the amount of power the port can provide is fixed or can change dynamically	0 -> Shared Capacity Port 1 -> Assured Capacity Port
Port Maximum PDP	The maximum amount of power the port is designed to deliver	0x00 – 0xFF
Port Present PDP	The amount of power the port is presently capable of offering	0x00 – 0xFF
Port Reported PDP	The amount of power the port offering in its Source_Capabilities or EPR_Source_Capabilities message.	0x00 – 0xFF
PD Revision Major	PD revision major	0x0 – 0xF
PD Revision Minor	PD revision minor	0x0 – 0xF
PD Version Major	PD version major	0x0 – 0xF
PD Version Major	PD version major	0x0 – 0xF

3.5.2 PDO

This node represents the set of Power Data Objects (PDOs) for the selected device. The PDOs supported by the device are arranged hierarchically. PDOs can be Source PDOs or Sink PDOs, depending on whether they describe the power sourcing or sinking capabilities of the USB-PD device. All fields listed under the **Source PDOs** and **Sink PDOs** nodes are defined in the USB-PD specification, revision 3, and they are classified as follows:

- Fixed Supply
- Battery
- Variable Supply

ModusToolbox[™] EZ-PD[™] Configurator guide GUI description



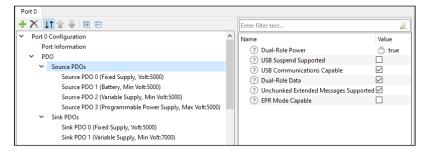
• Programmable Power Supply

You can add or remove PDOs using **Add/Remove PDO** buttons available in <u>Port tab toolbar</u>. Each PDO contains an **Enable** check box, which specifies whether the PDO is enabled at system start-up.

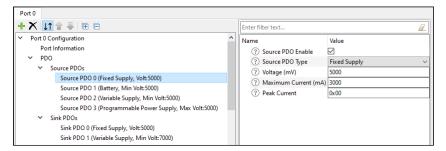
3.5.2.1 Source PDOs

The Source PDOs node displays only when the value of **Port Role** parameter is set to Source or Dual Role in <u>Port Information</u> node.

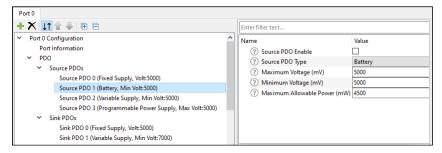
The parent Source PDOs node contains following parameters from 5V Fixed Supply Source PDO:



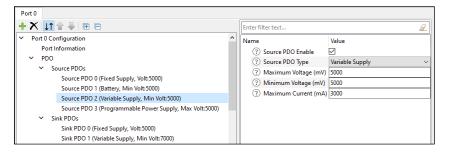
The follows shows Fixed Supply Source PDO configuration parameters:



The following shows Battery Source PDO configuration parameters:



The following shows Variable Supply Source PDO configuration parameters:





The following shows Programmable Power Supply Source PDO configuration parameters:

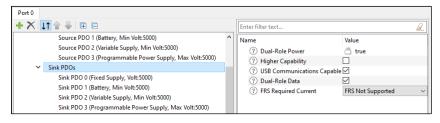
Port 0		
	Enter filter text	
Port 0 Configuration Port 0 Configuration Pot Information PD0 Source PD0s Source PD0 0 (Fixed Supply, Volt:5000) Source PD0 1 (Battery, Min Volt:5000) Source PD0 2 (Variable Supply, Min Volt:5000) Source PD0 3 (Programmable Power Supply, Max Volt:5000) Sink PD0 (Fixed Supply, Volt:5000) Sink PD0 1 (Variable Supply, Min Volt:7000)	Name Value ? Source PDO Enable ////////////////////////////////////	~

3.5.2.2 Sink PDOs

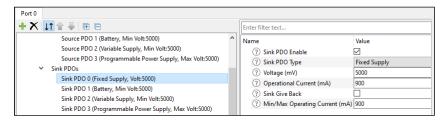
The Sink PDOs node displays only when the value of the **Port Role** parameter is set to Sink or Dual Role in the <u>Port Information</u> node. Sink PDO configuration includes two additional parameters:

- The **Sink Give Back** parameter specifies whether the feature is enabled for this PDO.
- The **Min/Max Operating Current** parameter specifies the minimum current required for device operation if give back is enabled. If give back is disabled, this field specifies the maximum operating current that may be required.

The parent Sink PDOs node contains following parameters from 5V Fixed Supply Sink PDO:



The following shows Fixed Supply Sink PDO configuration parameters:

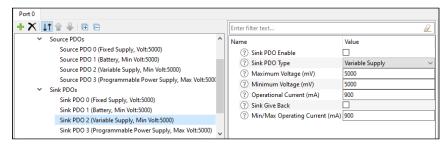


The following shows Battery Sink PDO configuration parameters:

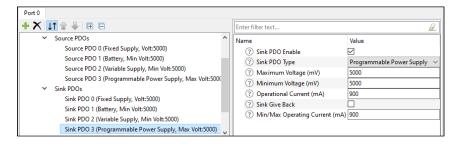
Port 0		
+ 🗙 💵 🖶 🖽 🖻	Enter filter text	R
Source PDOs Source PDO 0 (Fixed Supply, Volt:5000) Source PDO 1 (Battery, Min Volt:5000) Source PDO 2 (Variable Supply, Min Volt:5000) Source PDO 3 (Programmable Power Supply, Max Volt:5000 Sink PDO 3 (Fixed Supply, Volt:5000) Sink PDO 4 (Fixed Supply, Volt:5000) Sink PDO 4 (Variable Supply, Min Volt:5000) Sink PDO 4 (Variable Supply, Min Volt:5000)	Name Value ⑦ Sink PDO Enable	
Sink PDO 3 (Programmable Power Supply, Max Volt:5000)		



The following shows Variable Sink Source PDO configuration parameters:

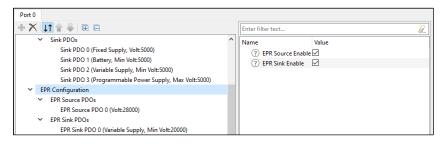


The following shows Programmable Power Supply Sink PDO configuration parameters:



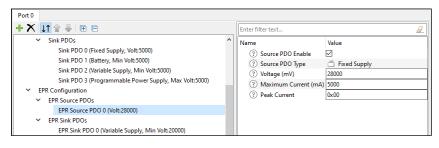
3.5.3 EPR Configuration

This contains a check box to enable or disable Extended Power Range (EPR) configuration.



3.5.3.1 EPR Source PDOs

If EPR Source enabled, this contains one or more EPR Source PDOs. The configurator supports only Fixed Supply EPR Source PDOs.





GUI description

3.5.3.2 EPR Sink PDOs

If EPR Sink enabled, this contains one or more EPR Sink PDOs.

Port 0				
		Enter filter text		
 Sink PDOs Sink PDO 1 (Fixed Supply, Volt:5000) Sink PDO 1 (Battery, Min Volt:5000) Sink PDO 2 (Variable Supply, Min Volt:5000) Sink PDO 3 (Programmable Power Supply, Max Volt:5000) EPR Configuration EPR Source PDOs EPR Source PDO 0 (Volt:28000) EPR Sink PDOs EPR Sink PDO 0 (Variable Supply, Min Volt:20000) 	^	Name ? Sink PDO Enable ? ? Sink PDO Type ? ? Maximum Voltage (mV) ? ? Minimum Voltage (mV) ? ? Operational Current (mA) ?	Value Variable Supply 28000 20000 5000	~

3.5.4 SCEDB Configuration

This contains a check box to enable or disable Source Capabilities Extended Data Block (SCEDB) parameters. These are based on the USB-PD specification, revision 3, section 6.5.1.

Port 0		
	Enter filter text	
 Port 0 Configuration 	Name	Value
Port Information PDO	? Percent Overload (%)	0
> EPR Configuration	Overload Period (ms) Duty Cycle (%) Duty Cycle (%)	0
 ✓ SCEDB Configuration 		0
Peak Current 1	? VBUS Voltage Droop	
Peak Current 2		
Peak Current 3		
SKEDB Configuration		



GUI description

3.5.5 SKEDB Configuration

This contains a check box to enable or disable Sink Capabilities Extended Data Block (SKEDB) parameters. These are based on the USB-PD specification, revision 3, Section 6.5.13.

Port 0		
+ 🗙 💵 🛊 🖶 🖻	Enter filter text	R
 Port 0 Configuration Port Information PDO EPR Configuration SEDB Configuration Peak Current 1 Peak Current 2 Peak Current 3 SKEDB Configuration 	Name SKEDB Enable ② VID ③ VID ③ VID ③ XID ③ KEDB Version ③ HW Version ③ KEDB Version ③ Load Step Slew Rate (mA/µs) ⑦ Percent Overload ③ Overload Period (ms) ④ Duty Cycle ③ VBV Soltage Droop Tolerance ② VSV Soltage Droop Tolerance ③ PS1 Compliant ③ Fixed Batteries ③ Fixed Batteries ④ PS Charging Supported ④ WBUS Powered ③ Mains Powered ④ Battery Powered ④ Sink Minimum PDP	Value Value Cx4B4 Cx4B4 Cx5500 Cx60000000 1 1 1 1 1 0 0 0 0 0 0
	 Battery Powered Unlimited Battery Powered 	

3.6 Notice List

The Notice List pane combines notices (errors, warnings, tasks, and notes) from many places in the configuration into a centralized list. If a notice shows a location, you can double-click the entry to edit the parameter. The Notice List pane contains the following columns:

- Icon Displays the icons for the error, warning, task, or note.
- Fix This may display a wrench icon that can be used to automatically address the required notice.
- Description Displays a brief description of the notice.
- Location Displays the specific tab of the message, when applicable.

For more information about the Notice List, refer to the <u>Device Configurator guide</u>.



4 Version changes

This section lists and describes the changes for each version of this tool.

Version	Change Descriptions	
1.0	New tool.	
1.10	Added open in System Explorer command to File menu.	
	Added Add/Remove Port commands.	
	Added Copy/Paste Port commands.	
	Added separate Port tabs.	
	Added Port tab toolbar.	
	Reorganized parameter settings based on Source PDO versus Sink PDO.	



Revision history

Revision	Date	Description
**	02/12/2021	New document.
*A	09/20/2021	Updated to version 1.10. Updated the Quick start section with information from the USBPD-Sink code example.

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