User's Guide

USBCPD Application Customization Tool User Guide

ABSTRACT

This User Guide describes the functionality and capabilities of the USBCPD Application Customization Tool from Texas Instruments. This GUI tool is used for customizing the TPS257xx/TPS267xx Power Delivery Controllers for USB Type-C/PD systems, generating configuration images for EEPROM or Host Controllers, exporting settings and Vendor Info File (VIF), and debugging with compatible EVMs.

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1 Getting Started

The USBCPD Application Customization Tool supports many capabilties and features to allow the user to easily design and bring-up custom Power Delivery configurations for the TPS257xx/TPS267xx family of USB Type-C/PD Controllers. This user guide describes the installation process, using the tool to create a configuration, importing/exporting projects, and using Debug Mode with TPS257xx/TPS267xx EVMs.

Details regarding each configuration and register settings are not within the scope of this user's guide. For more information on register field details, refer to the corresponding TPS257xx/TPS267xx Host Interface Technical Reference Manual (TRM).

1.1 Supported Features

The USBCPD Application Customization Tool provides users with the follow features:

- Generating configuration files: binaries for EEPROM or source (C) for Host Controllers
- Exporting configuration settings in JSON, Binary/C, and Vendor Info File (VIF)
- Save and Load configuration files during development in JSON format
- Direct upload to EEPROM with supported TI USB Type-C/PD Evaluation Modules (EVMs)
- Runtime register access, Debug Mode, with supported TI USB Type-C/PD Evaluation Modules (EVMs)

2 Initialization and Launch

The required software is available at TI Gallery with options to operate from a web browser (i.e. Google Chrome, Firefox, or Safari) or a downloaded installation on the PC.

2.1 Web Browser

1. Navigate to USBCPD Application Customization Tool.
2. Click on the card corresponding to the correct tool version (2.x.x).
3. The application launches in a new tab. If TI Cloud Agent is not already installed or requires a new update, a prompt with instructions for installing the required software will appear.

2.2 Native Application

1. Navigate to USBCPD Application Customization Tool.
2. Click on the downwards-facing arrow on the bottom left side of the card.
3. Select the native operating system and open the installer.
4. Follow the prompt to complete installing the application.

3 Creating a New Project

3.1 Device Selection

Figure 3-1 is displayed after launching the USBCPD Application Customization tool. To create a new project, select a PD controller and refer to Section 3.2. To continue development on a previous project, refer to Section 5.

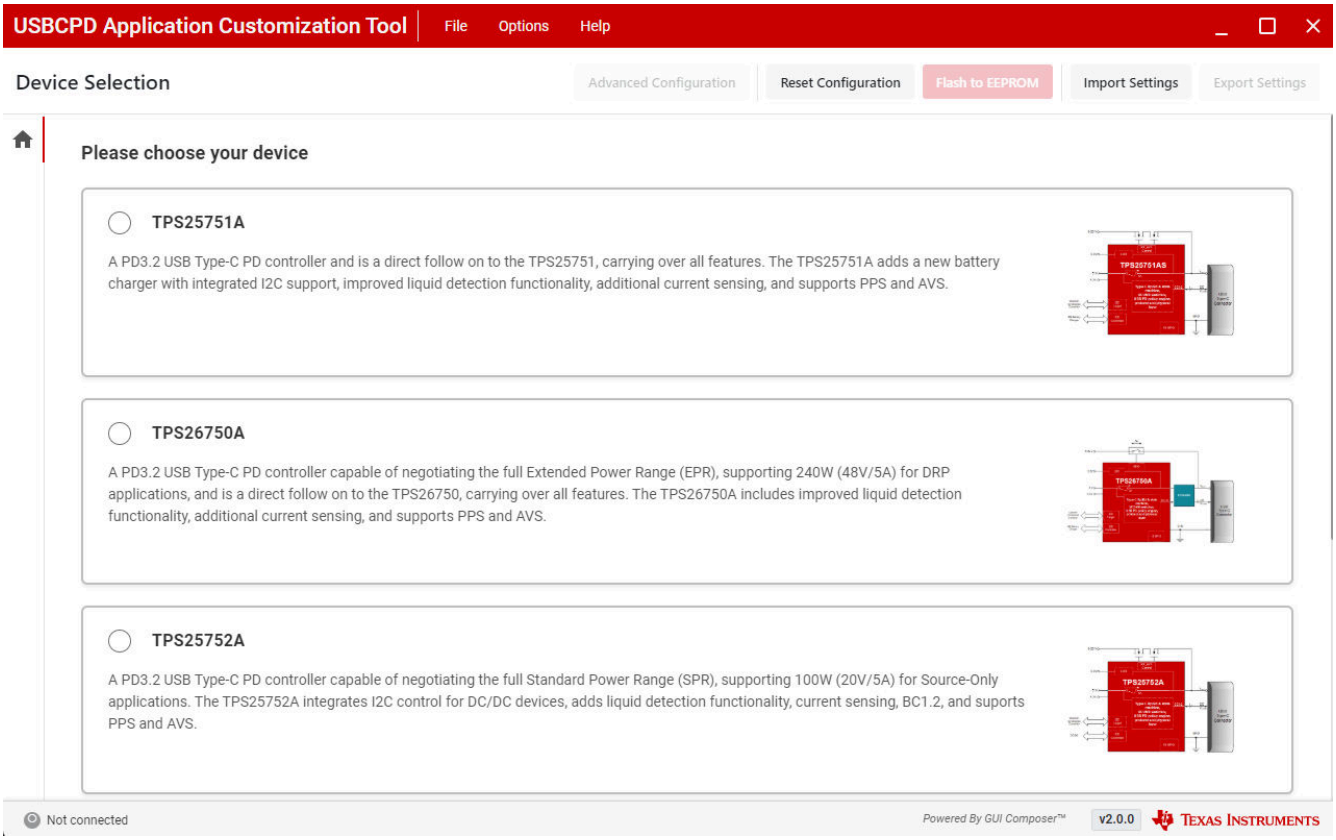


Figure 3-1. Landing Page - Device Selection

Once a selection has been made, the USBCPD Application Customization Tool is locked to the selected device. To select a new device, users can reload the interface (refresh web browser) or navigate to File → Start New Project. Refer to Figure 3-2 below.

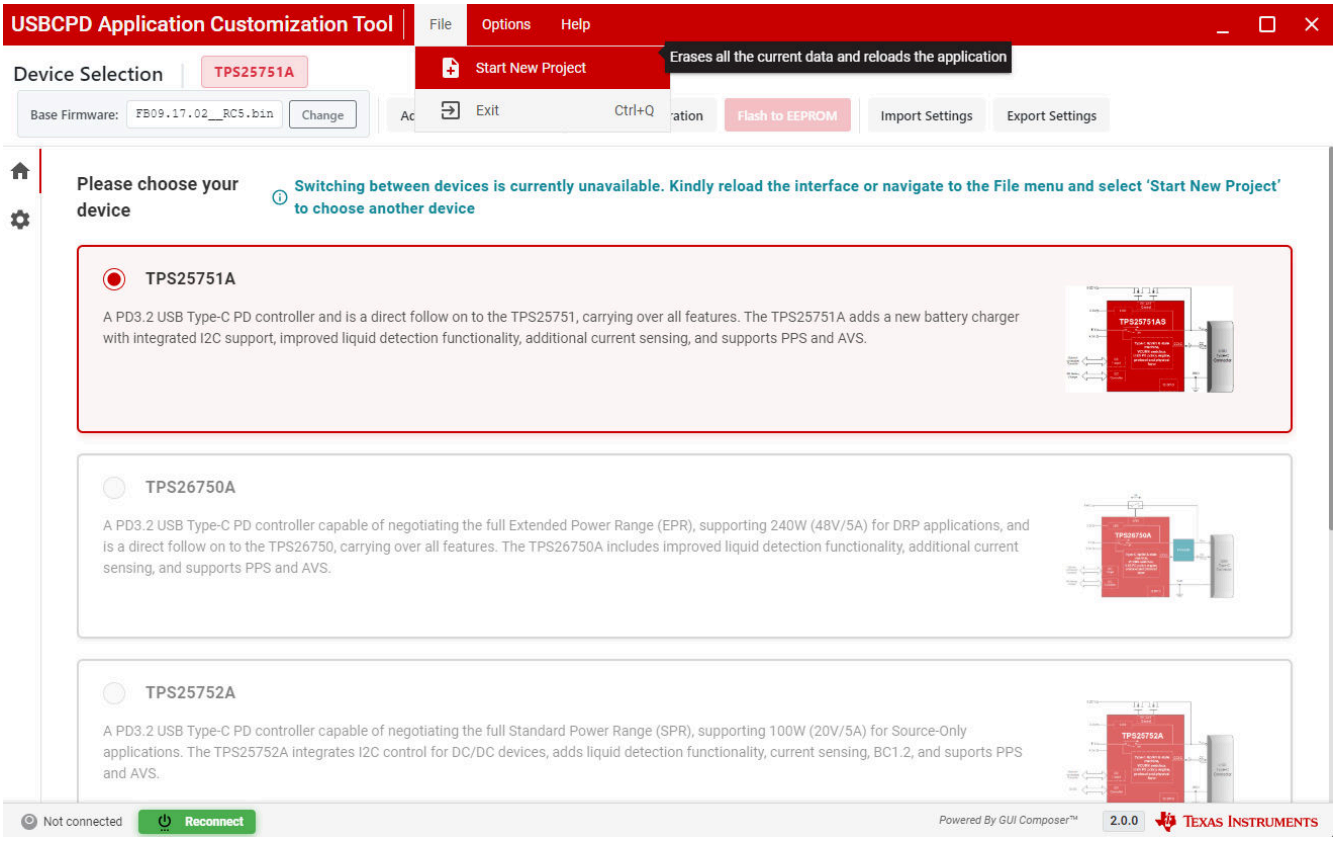


Figure 3-2. Switching Device Requires a Reset of All Settings

3.2 PD Configuration Walkthrough

The questionnaire section of the USBCPD Application Customization Tool provides several questions to quickly setup a working Power Delivery configuration without much complexity. By default, the questionaire is already completed based on the device's EVM out-of-the-box configuration. Review and/or modify the default selection to create a complete PD configuration based on the user's full system requirements before exporting or flashing the configuration.

Note

Refer to Section 4 for more information about the Advanced Configuration to directly access the configuration registers.

3.2.1 Question 1 - System Configuration

Select the system configuration that fits the PD controller application. Depending on the PD controller selected in Device Selection page, the number of configurations varies. Based on the configuration selected, certain questions are disabled or not applicable. See Table 3-1 and Table 3-2.

Table 3-1. TPS25751A/TPS26750A Configuration

Configuration Index	Power Role	BQ Support
1	DRP	Yes
2	DRP	No
3	Sink Only	Yes
4	Sink Only	No

Table 3-2. TPS25752A Configuration

Configuration Index	Power Role	DCDC Support
1	Source Only	Yes

Table 3-2. TPS25752A Configuration (continued)

Configuration Index	Power Role	DCDC Support
2	Source Only	No

3.2.2 Question 2 - Maximum Source Power

Select the maximum power the PD controller can advertise and output through the USB-C port.

Table 3-3. Default Source PDOs (SPR)

Power Selection	Num PDOs	PDO 1	PDO 2	PDO 3	PDO 4	PDO 5
15W (5V)	1	5V/3A	-	-	-	-
27W (9V)	2	5V/3A	9V/3A	-	-	-
45W (15V)	4	5V/3A	9V/3A	15V/3A	AVS: 9V-15V/3A	-
60W (20V)	5	5V/3A	9V/3A	15V/3A	20V/3A	AVS: 9V-15V/3A, 15V-20V/3A
100W (20V)	5	5V/3A	9V/3A	15V/3A	20V/5A	AVS: 9V-15V/3A, 15V-20V/5A

Table 3-4. Default Source PDOs (EPR)

Power Selection	Num EPR PDOs	EPR PDO 1	EPR PDO 2	EPR PDO 3	EPR PDO 4
140W (28V)	2	28V/5A	EPR AVS: 15V-28V/5A	-	-
180W (36V)	3	28V/5A	36V/5A	EPR AVS: 15V-36V/5A	-
240W (48V)	4	28V/5A	36V/5A	48V/5A	EPR AVS: 15V-48V/5A

Note

The default EPR PDOs is appended on top of the 100W (20V) Source PDOs option. For example, 140W (28V) option includes the following PDOs: 5V/3A, 9V/3A, 15V/3A, 20V/5A, SPR AVS, 28V/5A, and EPR AVS.

3.2.3 Question 3 - Maximum Sink Power

Select the maximum power the PD controller can request and consume through the USB-C port.

Table 3-5. Default Sink PDOs (SPR)

Power Selection	Num PDOs	PDO 1	PDO 2	PDO 3	PDO 4	PDO 5
15W (5V)	1	5V/3A	-	-	-	-
27W (9V)	2	5V/3A	9V/3A	-	-	-
45W (15V)	3	5V/3A	9V/3A	15V/3A	-	-
60W (20V)	4	5V/3A	9V/3A	15V/3A	20V/3A	-
100W (20V)	4	5V/3A	9V/3A	15V/3A	20V/5A	-

Table 3-6. Default Sink PDOs (EPR)

Power Selection	Num EPR PDOs	EPR PDO 1	EPR PDO 2	EPR PDO 3	EPR PDO 4
140W (28V)	2	28V/5A	EPR AVS: 15V-28V/140W	-	-
180W (36V)	3	28V/5A	36V/5A	EPR AVS: 15V-36V/180W	-
240W (48V)	4	28V/5A	36V/5A	48V/5A	EPR AVS: 15V-48V/240W

Note

The default EPR PDOs is appended on top of the 100W (20V) Sink PDOs option. For example, 140W (28V) option includes the following PDOs: 5V/3A, 9V/3A, 15V/3A, 20V/5A, 28V/5A, and EPR AVS.

3.2.4 Question 4 - Preferred Power Role

Select the preferred power role for DRP configurations. When selected, the PD controller will initiate a power role swap to become the preferred power role. This will not prevent the PD controller from accepting power role swaps which are not preferred. This question is disabled for sink-only or source-only configurations.

Table 3-7. Preferred Power Role

Selection	Initiate PR_Swap as Source	Initiate PR_Swap as Sink
Power Source (provider)	No	Yes
Power Sink (consumer)	Yes	No
No Preference	No	No

3.2.5 Question 5 - Supported USB Speed

Select the USB speed the PD system supports. This is used in conjunction with Q6 - Preferred Data Role, Q9 - Vendor ID, and Q10 - Product ID to construct the PD response message to the Discover_Identity message sent by the connected port partner.

Table 3-8. Supported USB Speed

Selection	Host/Device Speed
No USB data is being used	No USB data (power only)
USB 2	USB 2 (up to 480Mbps)
USB 3.2 Gen 1	USB 3.2 Gen 1 (up to 5Gbps)
USB 3.2 Gen 2	USB 3.2 Gen 2 (up to 10Gbps)

Note

The PD controller does not actively handle or communicate USB2.0/3.0 data protocol on the TX/RX pins, the PD only communicates with the connected port partner/PD regarding the whole system's capability.

3.2.6 Question 6 - Preferred Data Role

Select the preferred data role. When selected, the PD controller will initiate a data role swap to become the preferred data role. This will prevent the PD controller from accepting data role swaps which are not preferred.

This is used in conjunction with Q5 - Supported USB Speed, Q9 - Vendor ID, and Q10 - Product ID to construct the PD response message to the Discover_Identity message sent by the connected port partner.

Table 3-9. Supported USB Speed

Selection	DR_Swap to DFP	DR_Swap to UFP
No	No	No
Host	Yes	No
Device	No	Yes
Host & Device	Yes	Yes

3.2.7 Question 7 - BC1.2 and Legacy Charging

Select if the PD controller supports BC1.2 and legacy charging schemes. If BC1.2 support is not required, the PD controller only advertises USB Type-C (up to 15W) and Power Delivery (up to 100W/240W).

Table 3-10. Supported BC1.2/Legacy Options

Selection	Description
No	SDP (Standard Downstream Port) - 5V/900mA

Table 3-10. Supported BC1.2/Legacy Options (continued)

Selection	Description
BC1.2 CDP	CDP (Charging Downstream Port) - 5V/1.5A, supports USB data transmission on DP/DM
BC1.2 DCP	DCP (Dedicated Charging Port) - 5V/1.5A, charging-only (no USB data on DP/DM)
BC1.2 DCP, 1.2V and 2.7V	Divider 1.2V - 5V/2.0
	Divider 2.7V - 5V/2.4A

3.2.8 Question 8 - Liquid Detection

Select if the PD controller supports Liquid Detection and Corrosion Mitigation on the USB-C Port.

Table 3-11. Liquid Detection

Selection	Description
No	PD does not support Liquid Detection and Corrosion Mitigation.
Yes	PD supports Liquid Detection and Corrosion Mitigation. The PD disables the USB-C port if liquid is detected.

Note

For more details, refer to Section 4.7.

3.2.9 Question 9 - Vendor ID

Select the Vendor ID (VID) to be used by the PD controller. This is used in conjunction with Q5- Supported USB Speed, Q6 - Preferred Data Role, and Q10 - Product ID to construct the PD response message to the Discover_Identity message sent by the connected port partner.

Table 3-12. Vendor ID (VID)

Selection	Description
Yes	Enter a 4-digit hexadecimal number assigned by USB-IF.
No	Use the TI default Vendor ID (0x0451).

3.2.10 Question 10 - Product ID

Enter the Product ID (PID) to be used by the PD controller. This is used in conjunction with Q5- Supported USB Speed, Q6 - Preferred Data Role, and Q9 - Vendor ID to construct the PD response message to the Discover_Identity message sent by the connected port partner.

Table 3-13. Product ID (PID)

Selection	Description
Yes	Enter a 4-digit hexadecimal number assigned by the vendor for a product (custom).
No	Use the TI default Product ID (0x0000).

3.3 Battery Charger and DCDC Configuration

Based on Section 3.2.1, users can select a companion Battery Charger (BQ) or DCDC device to enable the PD controller integrated I2C control for USB Type-C/PD applications. The USBCPD Application Customization Tool allows user to set BQ/DCDC settings and also enables the PD internal firmware to program the BQ/DCDC during operation such as setting output voltage/current based on the PD negotiation. Refer to Table 3-14 for details about the supported BQ/DCDC devices.

Table 3-14. Supported PD and BQ/DCDC Applications

PD Controller	BQ/DCDC	Description
TPS25751A	BQ25790/2/8	DRP or Sink Only 1S-4S battery applications supporting up to 45W (20V/2.25A) source, 60W (20V/3A) sink
	BQ25713	DRP or Sink Only 1S-4S battery applications supporting up to 60W (20V/3A)
	BQ25731	DRP or Sink Only 1S-5S battery applications supporting up to 100W (20V/5A)
	BQ25756	DRP or Sink Only 1S-14S battery applications supporting up to 100W (20V/5A)
	BQ25756E	DRP or Sink Only 1S-7S battery applications supporting up to 100W (20V/5A)
	BQ25690 (HW)	DRP or Sink Only 1S-7S battery charging applications supporting up to 60W (20V/3A). Charge Voltage/Current are configured via pin strapping on BQ25690.
TPS26750A	BQ25756	DRP or Sink Only 1S-14S battery charging applications supporting full EPR range 240W (48V/5A)
	BQ25756E	DRP or Sink Only 1S-7S battery charging applications supporting full EPR range 240W (48V/5A)
TPS25752A	TPS55288	Source Only supporting up to 100W (20V/5A)
	TPS55289	Source Only supporting up to 45W (20V/2.25A)
	LM251772	Source Only supporting up to 100W (20V/5A)

3.3.1 BQ Configuration Walkthrough

For TPS25751(A) and TPS26750(A) devices, user has the option to select a Battery Charger (BQ) device to pair with the PD controller based on the selection made in Table 3-1. The following questions (Q11-Q17) sets the BQ configuration upon boot-up as well as enabling the PD integrated I2C control during run-time.

3.3.1.1 Question 11 - BQ Selection

Select the BQ device to be paired with the PD controller. Depending on the PD controller selected (TPS25751(A) or TPS26750(A)), the number of BQ selections varies.

3.3.1.2 Question 12 - BQ Input Current Limit

Select the BQ input current limit (IIN_DPM) threshold the PD controller automatically sets based on the negotiated PD contract. For example, selecting the 5% option configures the BQ IIN_DPM to 3.15A for a 3A contract as a sink.

3.3.1.3 Question 13 - BQ Input Voltage Limit

Select the BQ input voltage limit (VIN_DPM) threshold the PD controller automatically sets based on the negotiated PD contract. For example, selecting the 5% option configures the BQ VIN_DPM to 4.75V for a 5V contract as a sink.

3.3.1.4 Question 14 - Battery Charge Voltage

Configure the BQ battery charge voltage. Refer to the specific BQ data sheets for details about the min-max limits and bit steps.

3.3.1.5 Question 15 - Battery Charge Current

Configure the BQ battery charge current. Refer to the specific BQ data sheets for details about the min-max limits and bit steps.

3.3.1.6 Question 16 - Battery Termination Current

Configure the BQ battery termination current. Refer to the specific BQ data sheets for details about the min-max limits and bit steps.

Note

This question is disabled for BQ25713 and BQ25731 since these devices do not support termination current.

3.3.1.7 Question 18 - Battery Pre-Charge Current

Configure the BQ battery pre-charge current. Refer to the specific BQ data sheets for details about the min-max limits and bit steps.

Note

This question is disabled for BQ25713 and BQ25731 since these devices do not support pre-charge current.

3.3.1.8 BQ Register Configuration

Table 3-15 shows the specific BQ257xx register configured based on the questionnaire selection. Refer to the specific BQ257xx data sheets for details about register mapping and field description.

Table 3-15. BQ Register Summary

BQ Device	Q12	Q13	Q14	Q15	Q16	Q17
BQ25790/2/8	0x06 - IINDPM	0x05 - VINDPM	0x01 - VREG	0x03 - ICHG	0x09 - ITERM	0x08 - IPRECHG
BQ25713	0x0F - IIN_HOST	0x0A - InputVoltage	0x04 - Max Charge Voltage	0x02 - Charge Current	N/A	N/A
BQ25731	0x0F - IINDPM	0x0A - VINDPM	0x04 - VREG	0x02 - ICHG	N/A	N/A
BQ25756(E)	0x06 - IAC_DPM	0x08 - VAC_DPM	0x00 - VFB_REG	0x02 - ICHG_REG	0x12 - ITERM	0x10 - IPRECHG
BQ25690	0x06 - IINDPM	0x08 - VINDPM	0x04 - VREG	0x02 - ICHG	0x0A - ITERM	0x06 - IPRECHG

3.3.2 DCDC Configuration

For TPS25752A , user has the option to select a DCDC device to pair with the PD controller based on the selection made in Table 3-2. The following questions (Q11-Q12) sets the DCDC configuration upon boot-up as well as enabling the PD integrated I2C control during run-time.

3.3.2.1 Question 11 - DCDC Selection

Select the DCDC device to be paired with the PD controller. This question only appears for TPS25752A.

3.3.2.2 Question 12 - DCDC Target Address

Select the I2C target address for the DCDC. This question only appears for TPS25752A and sets the I2C target address the PD controller communicates with on the PD I2Cc pins.

Table 3-16. DCDC I2C Target Address

DCDC Device	Valid I2C Address
TPS55288	0x74 or 0x75
TPS55289	0x74 or 0x75
LM251772	0x6A or 0x6B

Note

Verify the selected I2C target address matches the DCDC I2C address set. Configuring the incorrect I2C target address can result in a non-working configuration, for example using address 0x6A for TPS55288 (must be either 0x74 or 0x75).

4 Advanced Configuration

The PD configuration can be modified through the questionnaire page for basic system configurations. To configure additional fields and registers such as I2C Interrupt Masking, GPIO events, or customizaing specific PDOs, click on the Advanced Configuration button at the top of the tool. After clicking on the button, a message appears asking for confirmation before enabling Advanced Configuration as shown in Figure 4-1.

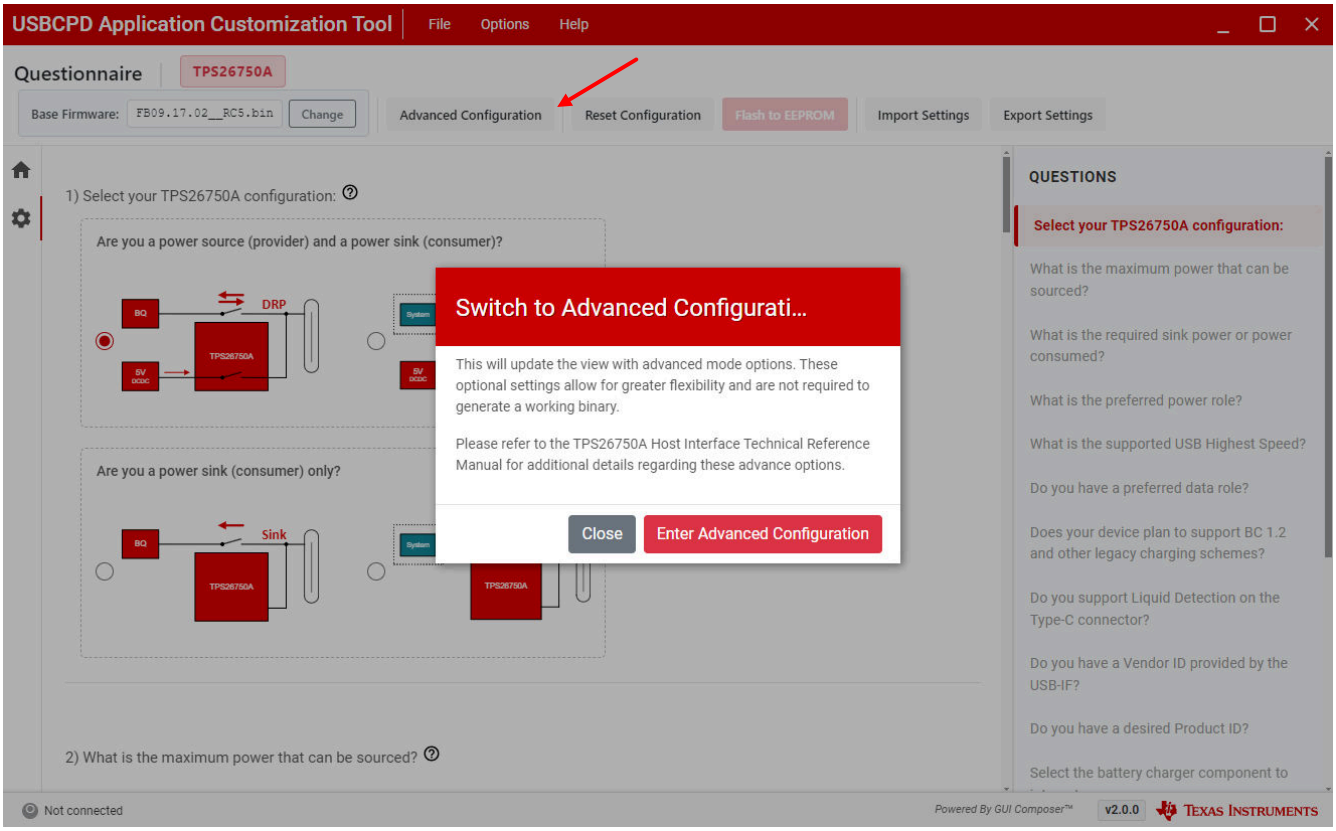


Figure 4-1. Switching to Advanced Configuration

Within the Advanced Configuration, users can configure the available registers documenteed in each specific device Technical Reference Manual (TRM). Some of the registers are already pre-configured based on the questionnaire settings. The following sections goes through the configured registers based on the questionnaire selection.

4.1 Advanced - System Configuration

Table 4-1 and Table 4-2 show the register and fields modified based on the Question 1 selection from Section 3.2.1. Refer to the device specific TRM for details about the register details.

Table 4-1. TPS25751A/TPS26750A Register Configuration

Register	Register Field	Index 1	Index 2	Index 3	Index 4
Global System Configuration (0x27)	PP Cable1 Switch Config [0]	PP Cable Switch as Output (0x1)	PP Cable Switch as Output (0x1)	PP Cable Switch Not Used (0x0)	PP Cable Switch Not Used (0x0)
	PP1 Config [10:8]	PP1 Configured as Source (0x1)	PP1 Configured as Source (0x1)	Disabled (0x0)	Disabled (0x0)
	PP3 Config [18:16]	PP3 Configured for Sink and Source (0x4)	PP3 Configured for Sink and Source (0x4)	PP3 Configured for Sink (0x2)	PP3 Configured for Sink (0x2)

Table 4-1. TPS25751A/TPS26750A Register Configuration (continued)

Register	Register Field	Index 1	Index 2	Index 3	Index 4
Port Control (0x29)	Process Swap to Sink [4]	Yes (0x1)	Yes (0x1)	Yes (0x1)	Yes (0x1)
	Process Swap to Source [6]	Yes (0x1)	Yes (0x1)	No (0x0)	No (0x0)
Transmit Source Capabilities (0x32)	Power Path for PDO 1 [9:8]	PP3 Source this PDO (0x2)	PP1 Source this PDO (0x0)	N/A	N/A
PD3 Configuration (0x42)	Support Source Extended Message [8]	Yes (0x1)	Yes (0x1)	No (0x0)	No (0x0)
	Support Battery Capabilities Message [10]	Yes (0x1)	No (0x0)	Yes (0x1)	No (0x0)
	Support Battery Status Message [11]	Yes (0x1)	No (0x0)	Yes (0x1)	No (0x0)
	Support Sink Cap Extended [17]	Yes (0x1)	Yes (0x1)	Yes (0x1)	Yes (0x1)
	Support Get Source Info [18]	Yes (0x1)	Yes (0x1)	No (0x0)	No (0x0)
Tx Source Capabilities Extended Data Block (0x77)	Number Fixed Batteries [99:96]	1 (0x1)	0 (0x0)	1 (0x1)	0 (0x0)
Transmitted Battery Status Data Objects (0x7B)	Battery 0 Battery Info [15:8]	0x02	0x0	0x02	0x0
	Battery 0 Present Capacity [31:16]	0xFFFF	0x0	0xFFFF	0x0
Tx Battery Capabilities (0x7D)	Battery Design Capacity [47:32]	0xFFFF	0x0	0xFFFF	0x0
	Battery Last Full Charge Capacity [63:48]	0xFFFF	0x0	0xFFFF	0x0

Table 4-2. TPS25752A Register Configuration

Register	Register Field	Index 1	Index 2
Global System Configuration (0x27)	PP Cable1 Switch Config [0]	PP Cable Switch as Output (0x1)	PP Cable Switch as Output (0x1)
	PP1 Config [10:8]	PP1 Configured as Source (0x1)	PP1 Configured as Source (0x1)
	PP3 Config [18:16]	PP3 Configured for Source (0x1)	PP3 Disabled (0x0)
Transmit Source Capabilities (0x32)	Power Path for PDO 1 [9:8]	PP3 Source this PDO (0x2)	PP1 Source this PDO (0x0)
PD3 Configuration (0x42)	Support Source Extended Message [8]	Yes (0x1)	Yes (0x1)
	Support Get Source Info [18]	Yes (0x1)	Yes (0x1)

4.2 Advanced - Maximum Source Power

The Source PDOs added in Section 3.2.2 are configured in register *Transmit Source Capabilities (0x32)*. In addition to the Source PDOs, the questionnaire also sets several compliance-related registers to reduce complexity for configuring a compliant-ready configuration.

Table 4-3. TPS25751A/TPS25752A Source PDP Configuration

Register	Register Field	15W	27W	45W	60W	100W
Tx Source Capabilities Extended Data Block (0x77)	Source PDP [110:104]	15W	27W	45W	60W	100W
Tx Source Info (0x78)	Port Maximum PDP [23:16]	15W	27W	45W	60W	100W

Table 4-4. TPS26750A Source PDP Configuration

Register	Register Field	140W	180W	240W
Transmit Source Capabilities (0x32)	TX Source Num Valid EPR PDOs [5:3]	2	3	4
Tx Source Capabilities Extended Data Block (0x77)	Source PDP [110:104]	100W	100W	100W
	Source EPR PDP [119:112]	140W	180W	240W
Tx Source Info (0x78)	Port Maximum PDP [23:16]	140W	180W	240W

4.3 Advanced - Maximum Sink Power

The Sink PDOs added in Section 3.2.3 are configured in register *Transmit Sink Capabilities (0x33)*. In addition to the Sink PDOs, the questionnaire also sets several compliance-related registers to reduce complexity for configuring a compliant-ready configuration.

Table 4-5. TPS25751A/TPS26750A Sink PDP Configuration

Register	Register Field	15W	27W	45W	60W	100W	140W	180W	240W
Transmit Sink Capabilities Extended Data Block (0x7E)	Sink Minimum PDP [71:64]	15W	27W	45W	60W	100W	100W	100W	100W
	Sink Operational PDP [79:72]	15W	27W	45W	60W	100W	100W	100W	100W
	Sink Maximum PDP [87:80]	15W	27W	45W	60W	100W	100W	100W	100W
	EPR Sink Minimum PDP [95:88]	N/A	N/A	N/A	N/A	N/A	140W	180W	240W
	EPR Sink Operational PDP [103:96]	N/A	N/A	N/A	N/A	N/A	140W	180W	240W
	EPR Sink Maximum PDP [111:104]	N/A	N/A	N/A	N/A	N/A	140W	180W	240W

4.4 Advanced - Preferred Power Role

Table 4-6 shows the register and field modified based on the questionnaire selection from Section 3.2.4.

Table 4-6. TPS25751A/TPS26750A Power Role Preference Configuration

Register	Field	Power Source (provider)	Power Sink (consumer)	No Preference
Port Control (0x29)	Process Swap to Sink [4]	Yes (0x1)	Yes (0x1)	Yes (0x1)
	Initiate Swap to Sink [5]	No (0x0)	Yes (0x1)	No (0x0)
	Process Swap to Source [6]	Yes (0x1)	Yes (0x1)	Yes (0x1)
	Initiate Swap to Source [7]	Yes (0x1)	No (0x0)	No (0x0)

Note

This questionnaire is only applicable for DRP applications and is disabled for source-only and sink-only configurations.

4.5 Advanced - Preferred Data Role

Table 4-7 shows the register and field modified based on the questionnaire selection from Section 3.2.6.

Table 4-7. TPS25751A/TPS26750A/TPS25752A Data Role Preference Configuration

Register	Field	Host	Device	Host & Device	No Preference
Port Control (0x29)	Process Swap to UFP [12]	No (0x0)	Yes (0x1)	Yes (0x1)	No (0x0)
	Initiate Swap to UFP [13]	No (0x0)	Yes (0x1)	No (0x0)	No (0x0)
	Process Swap to DFP [14]	Yes (0x1)	No (0x0)	Yes (0x1)	No (0x0)
	Initiate Swap to DFP [15]	Yes (0x1)	No (0x0)	No (0x0)	No (0x0)

4.6 Advanced - BC1.2 Configuration

Table 4-8 shows the register and field modified based on the questionnaire selection from Section 3.2.7.

Table 4-8. BC1.2 Configuration

Register	Field	BC1.2 CDP	BC1.2 DCP Only	BC1.2 DCP, 1.2V, and 2.7V Charging	No Support
Port Control (0x29)	DCD Enable [25]	Yes (0x1)	Yes (0x1)	Yes (0x1)	No (0x0)
	Charger Advertise Enable [28:26]	BC1.2 CDP Only (0x1)	BC1.2 DCP Only (0x2)	DCP Auto 2 (0x6)	Do not emulate any legacy charger (0x0)
	Charger Detect Enable [31:30]	Detect BC1.2 and proprietary legacy chargers (0x3)	Detect BC1.2 and proprietary legacy chargers (0x3)	Detect BC1.2 and proprietary legacy chargers (0x3)	Do not detect any legacy chargers (0x0)
IO Config (0x5c)	Multiplexing for GPIO 4 Pin [1:0]	Pin Multiplexed to D+ (0x2)			Pin Multiplexed to GPIO (0x0)
	Multiplexing for GPIO 5 Pin [1:0]	Pin Multiplexed to D- (0x2)			Pin Multiplexed to GPIO (0x0)

4.7 Advanced - Liquid Detection

Table 4-6 shows the register and field modified based on the questionnaire selection from Section 3.2.4.

Table 4-9. Liquid Detection Configuration

Register	Field	Value
Interrupt Mask for I2Ct_IRQ (0x16)	Liquid Detection [60]	Enable (0x1)

Table 4-9. Liquid Detection Configuration (continued)

Register	Field	Value
IO Config (0x5c)	GPIO AI Enable GPIO 0 [224]	Pin to ADC (0x1)
	GPIO AI Enable GPIO 2 [226]	Pin to ADC (0x1)
	GPIO 6 Mapped Event [343:336]	liquid_detected (157)
	GPIO 7 Mapped Event [351:344]	liquid_control (155)
Liquid Detection Configuration (0x98)	Wait Time In Sec Non-Liquid [7:0]	11000ms (0xB)
	Wait Time In Sec Liquid [15:8]	10000ms (0xA)
	Sample Time in 10ms Non-Liquid [19:16]	50ms (0x5)
	Sample Time in 10ms Liquid [23:20]	40ms (0x4)
	Liquid Detection Retries Wait Time [27:24]	1100ms (0xB)
	Liquid Detection Retries [31:28]	10 (0xA)
	Number of Samples [39:32]	2 (0x2)
	Low Threshold ADC No Liquid [47:40]	504mV (0x24)
	High Threshold ADC No Liquid [55:48]	2002mV (0x8f)
	Low Threshold ADC Liquid [63:56]	504mV (0x24)
	High Threshold ADC Liquid [71:64]	2002mV (0x8f)
	Enable Liquid Detection [72]	Yes (0x1)
	Enable Corrosion Mitigation [73]	Yes (0x1)
	Monitor During Attach [74]	Yes (0x1)
	Monitor During Unattach [75]	Yes (0x1)
	Liquid Pins to Monitor [77:76]	0x0
	Pulldown Threshold ADC [87:80]	0x0

5 Additional Features

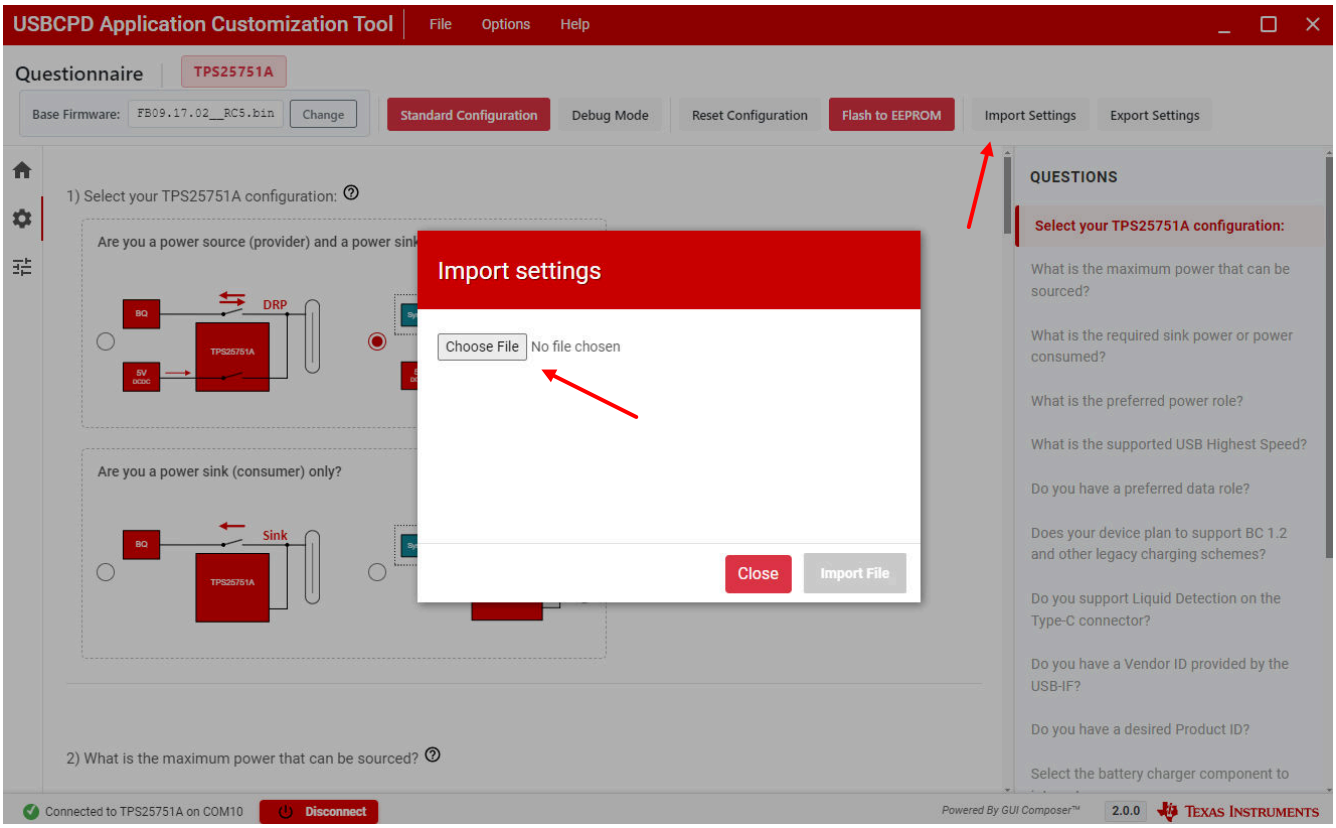
The USBCPD Application Customization Tool includes additional settings for creating new configurations, importing and exporting settings, generating binaries and VIF files.

5.1 Import Settings

To import an existing project, click the *Import Settings* button at the top-right side of the tool. Select from the directory where the JSON file is located and click *Import File* button. Once the JSON file is imported successfully, the settings (including questionnaire and register mapping) are restored in the USBCPD Application Customziation Tool.

Note

Import Settings only applies for JSON file type. Binary and C file types cannot be imported.



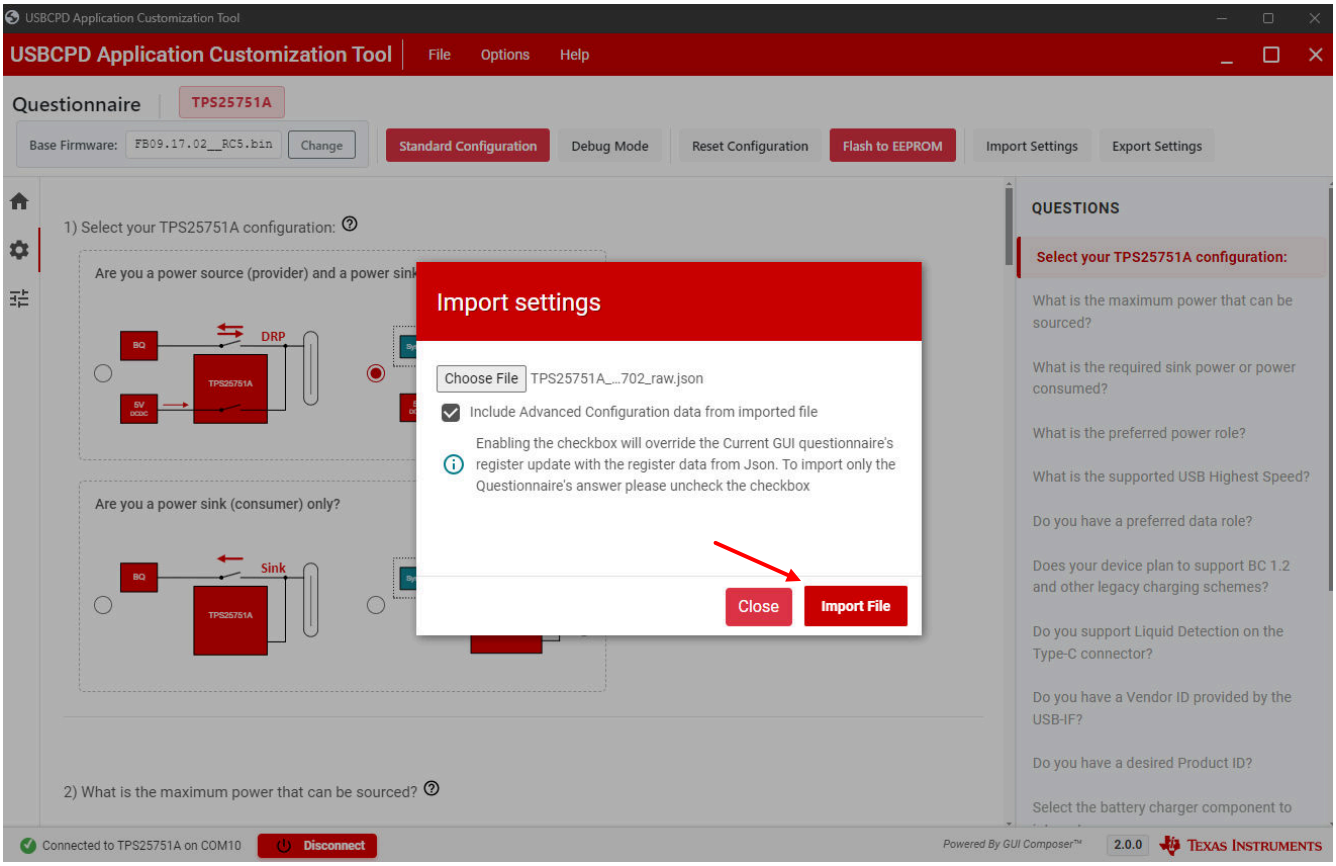


Figure 5-1. Import JSON File

Note

To keep any previous changes done in Advanced Configuration, make sure the check box is set as shown in Import File, otherwise only the questionnaire configuration is retained.

5.2 Export Settings

To save/export the current project, navigate to the top-right of the tool and click on *Export Settings* button. This brings up the *Export Settings* menu with the following options:

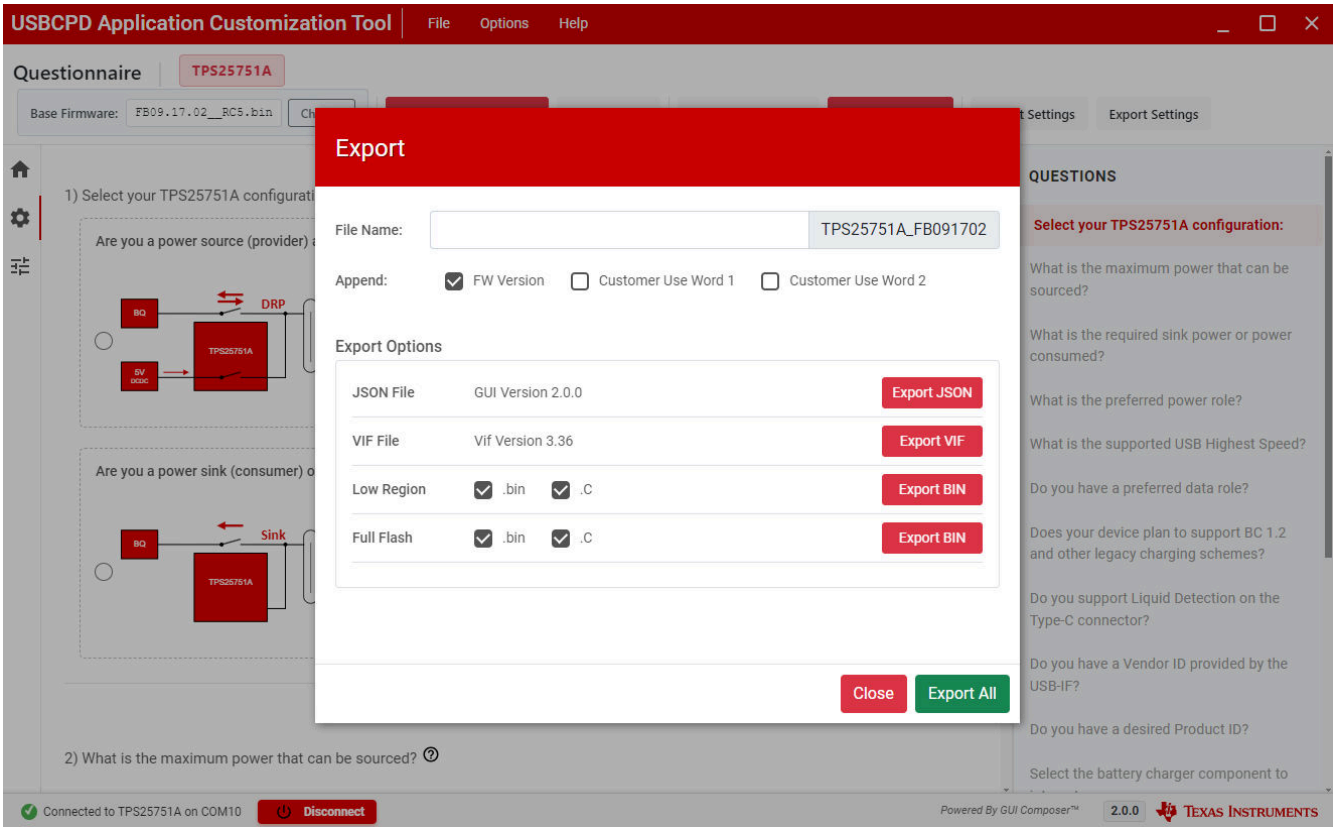


Figure 5-2. Export Settings Menu

Table 5-1. Export Settings Options

Option	Description
File Name	Enter the file name to be saved as. The file name is used for all file types exported. The device name is automatically appended to the end of the entered file name.
FW Version	Appends the PD Firmware Version number at the end of the file name. By default, this is enabled for version tracking.
Customer Use Word 1/2	Appends the Customer Use Word from register 0x06 at the end of the file name. By default, this is disabled.
JSON File	Exports the current configuration in JSON file format. The JSON file is used by the Application Customization Tool when re-importing the configuration (refer to Import Settings).
VIF File	Exports the Vendor Info File (VIF) based on the current configuration. The VIF is required for USB Type-C/PD compliance testing for USB-IF. Refer to VIF Generation for USB Type-C PD Compliance application note for more details.
Low Region (.bin/.C)	Exports the Low Region configuration in Binary and/or C array file type. Low Region configuration is used for MCU loading the PD configuration via PBMx or when updating an on-board EEPROM.
Full Flash (.bin/.C)	Exports the Full Flash configuraiton in Binary and/or C array file type. Full Flash configuration is loaded into an on-board EEPROM.
Export All	Exports all of the file types (JSON, VIF, Low Region,and Full Flash) into a ZIP folder with the entered file name.

Note

When submitting a question on the E2E Design Support Forums, we recommend to provide the ZIP folder from the *Export All* option with *FW Version* enabled so that the TI engineers can provide quicker support.

5.3 Reset Configuration

To reset the questionnaire configurations back to the default, click on the *Reset Configuration* button located at the top-right side of the tool next to the Import/Export settings. This resets the questionnaire selection as well as any changes made in the Advanced Configuration tab.

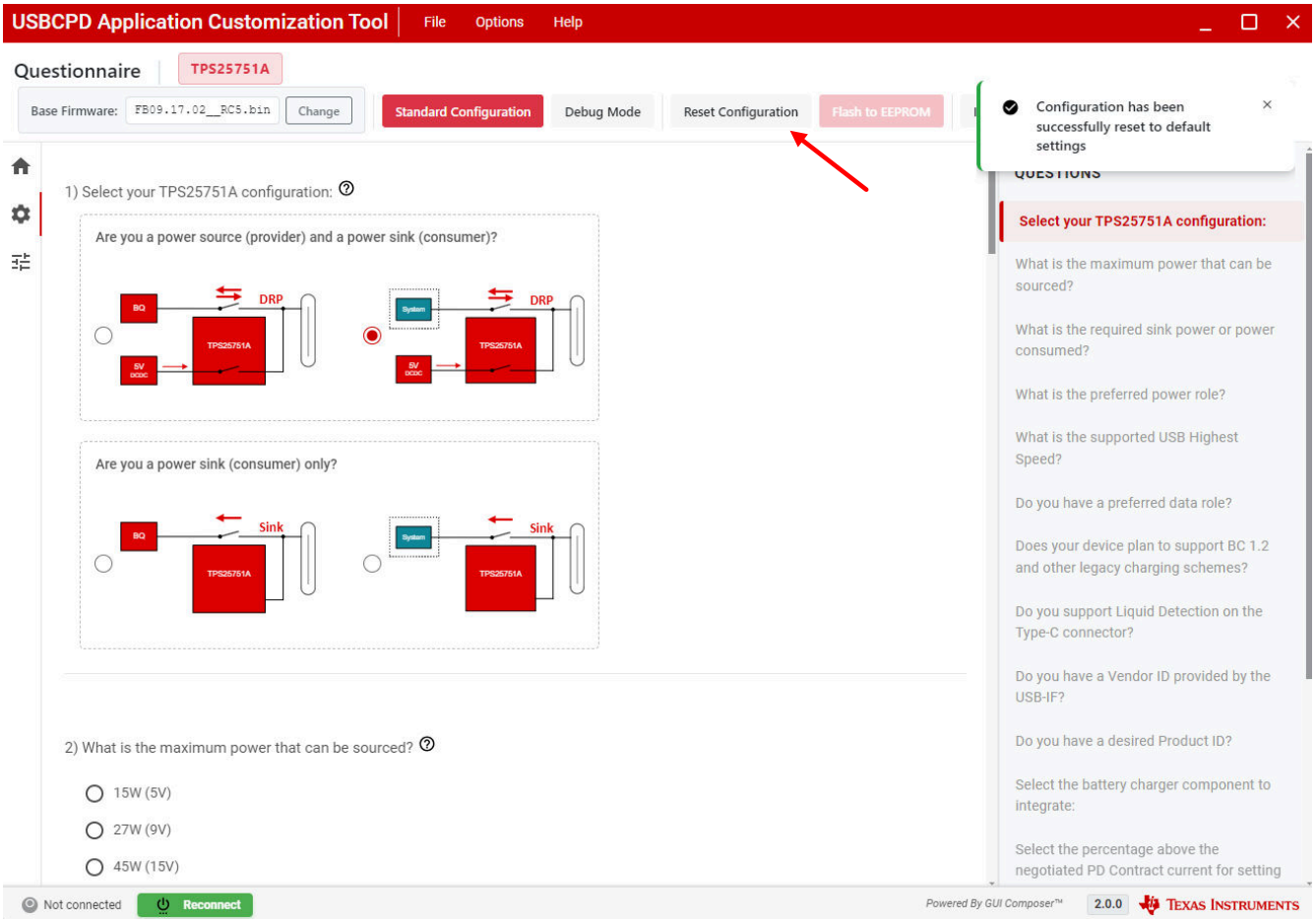


Figure 5-3. Reset Configuration

6 EVM Features

6.1 Serial Port Connections

The USBCPD Application Customziation Tool can automatically detect when a Texas Instruments PD Evaluation Module (EVM) is attached. See #none# below for an example of TPS25751AEVM connected.

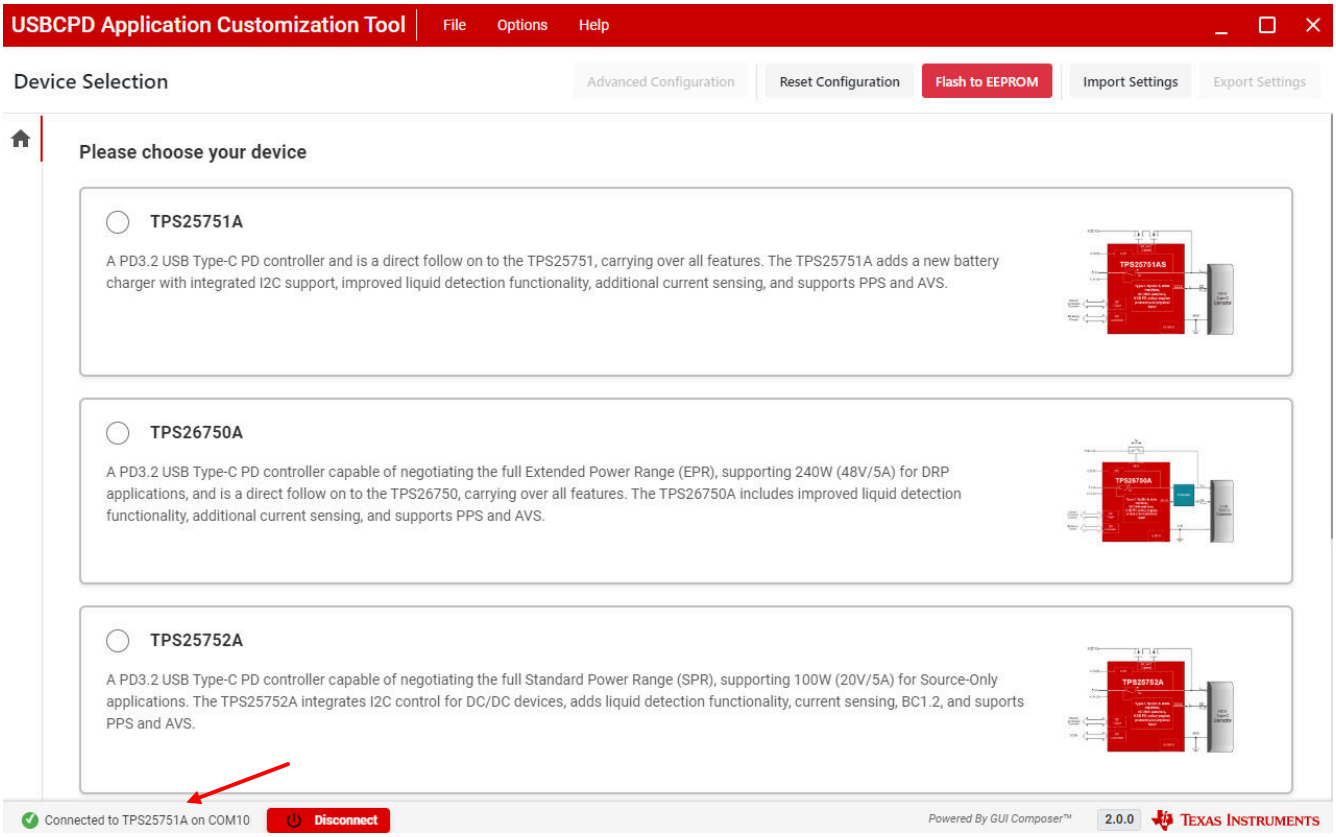


Figure 6-1. EVM Detected

In case connection is not automatically established by the USBCPD Application Customization Tool, click on *Options → USB to I2C Adapter Settings*. The pop-up menu includes several options to help establish connection.

Table 6-1. USB to I2C Adapter Settings

Section	Options	Description
Connection Configuration	Serial Port → Refresh	Click *Refresh* to sweep the COM ports for a EVM. Refer to
	Serial Port → Dropdown	Click the drop-down to manually select a COM port.
I2C Address Configuration	Auto-Detect I2C Address	Click here to automatically sweep for a valid I2C address. This checks for the PD controller I2Ct address (0x20 through 0x23).
	Manual Configuration	Manually enter a hex address to check for.
Device Information	Identify	Click here to read back the PD controller register for information including Version (0x0F) and Mode (0x03).
GUI Detected Settings	Detected Device	This is automatically reported by the tool based on the register read back from the PD controller.

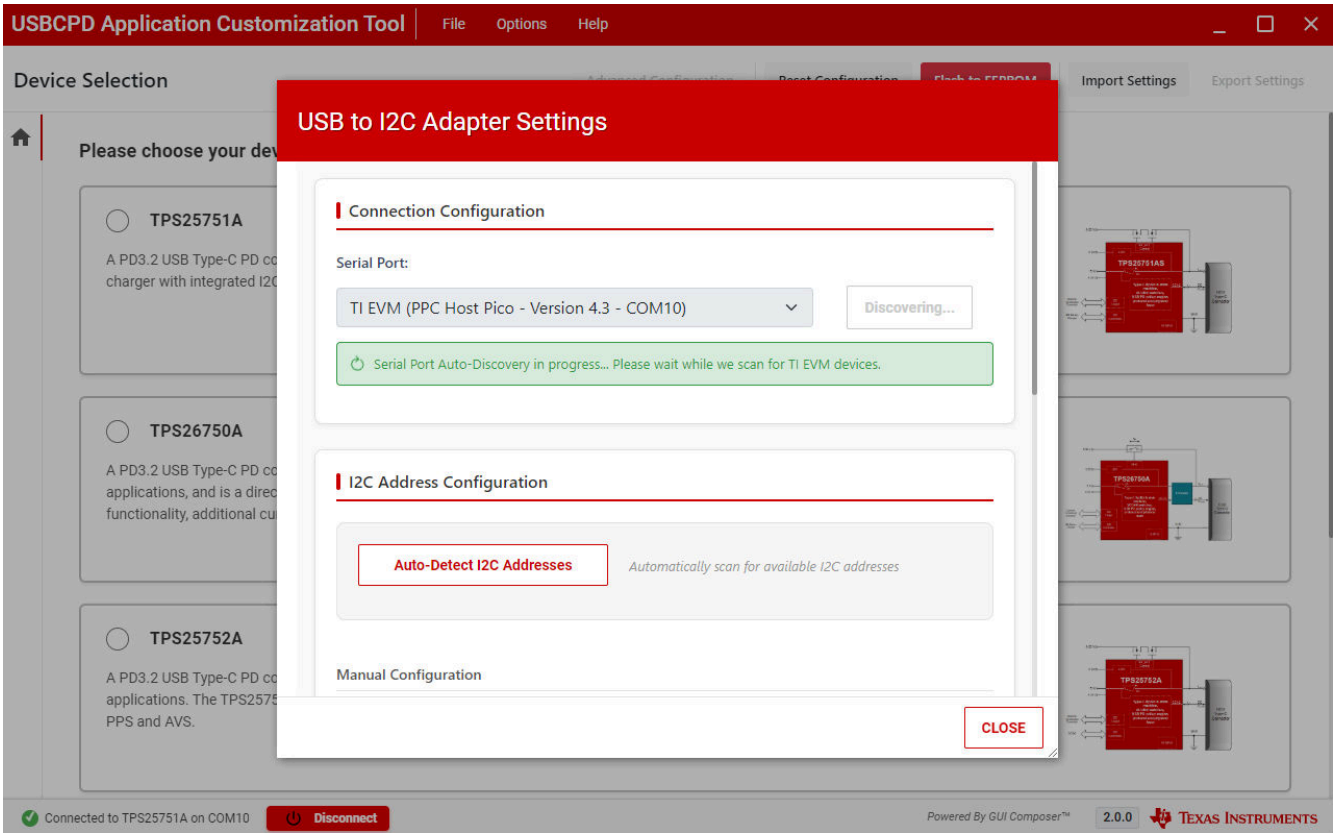


Figure 6-2. Serial Port Refresh

6.2 Flash to EEPROM

The *Flash to EEPROM* setting allows the user to easily load the current configuration or a previously generated full-flash binary onto the EVM to evaluate. To flash the configuration onto the EVM EEPROM, follow the procedure below:

1. Connect the communication port on a TI-PD EVM to a computer with USBCPD Application Customization Tool
2. Check and see if the USBCPD Application Customization Tool is connected to the TI-PD EVM, refer to Section 6.1
3. Click the *Flash to EEPROM* button located between *Reset Configuration* and *Import Settings*
4. In the pop-up menu, click the *Flash to EEPROM* button at the bottom-right to flash the current configuration onto the EVM. To load a previously saved full-flash binary, click on *Binary File* and select the correct file
5. Once the Flash Progress is completed, user can start evaluating the TI-PD EVM with the new configuration loaded.

Table 6-2. Flash to EEPROM Settings

Section	Field/Button	Description
Flash to EEPROM	Close	Closes the *Flash to EEPROM* menu.
	Read Device Info	Reads PD registers and populates the *Device Information* section.
	Flash to EEPROM	Loads the configuration option (current configuration or full flash) onto the TI-PD EVM.

Table 6-2. Flash to EEPROM Settings (continued)

Section	Field/Button	Description
Flash Configuration Options	Current Configuration	Select this option to use the current configuration in the USBCPD Application Customization Tool to load into the TI-PD EVM
	Binary File	Select this option to use a previously saved full-flash binary to load into the TI-PD EVM. Only .bin files are accepted.
	EEPROM I2C address used for programming	The target I2C address of the EEPROM. This is lock to address 0x50.
Device Information	Version (0x0F)	Reads back register 0x0F. This reports the FW version of the PD device currently loaded on the TI-PD EVM.
	Mode (0x03)	Reads back register 0x03 of the PD device. This reports if the PD device is in APP (config loaded) or PTCH (no config loaded).
	Customer Use Word 1 (0x06)	Reads back the first 4 bytes of register 0x06. This field is customizable in Advanced Configuration.
	Customer Use Word 2 (0x06)	Reads back the last 4 bytes of register 0x06. This field is customizable in Advanced Configuration.
Flash Progress	Erase EEPROM	Status bar for erasing the EEPROM before loading with a new configuration.
	Write EEPROM	Status bar for writing/loading the EEPROM with the a new configuration.
	Verify EEPROM	Status bar for verifying the configuration loaded in the EEPROM is valid.

Note

The USBCPD Application Customization Tool automatically resets the TI-PD EVM after the flashing is successful to reset the device with the new configuration.

Note

During the flashing sequence, DO NOT remove power to the TI-PD EVM, close the USBCPD Application Customization Tool, plug/un-plug any USB-C connection, or cause any interruptions to the PD controller. Any interrupts can distrupt the flashing sequence and requires a restart to the flashing progress.

6.3 Debug Mode

The USBCPD Application Customization Tool allows for easy debugging with a connected TI-PD EVM to be able to perform I2C write/read to the PD registers through Debug Mode. To write/read the registers, follow the procedure below:

1. Connect a TI-PD EVM to a computer with USBCPD Application Customization Tool
2. Check and see if the USBCPD Application Customizatio Tool is connected to the TI-PD EVM, refer to Section 6.1
3. Click on *Advanced Configuration* to enable the *Debug Mode* button
4. Click on *Debug Mode* button located between *Standard Configuration* and *Reset Configuration*
5. Click on a register to open up the fields.
6. Click on *Read* to perform an I2C read of the register. The read-back data populates in both the field and raw view.
7. To do an I2C write, modify the registers through the field view or raw view. After making the modification, click on *Write*.
8. To exit *Debug Mode*, click on *Config Mode* at the top next to *Reset Configuration*

Note

Some registers are Read Only while others are R/W. Refer to the specific PD device TRM for more details.

Note

Any changes made in *Debug Mode* is retained when entering back into *Config Mode*. Verify a copy of the original configuration is saved prior to entering *Debug Mode*.

7 GUI Revision History

This section details the updates with each release of the USBCPD Application Customization Tool.

Table 7-1. GUI Revisions

Revision	Release Date	Device Supported	Feature Updates and Additions
0.6.0	March 2024	• TPS25751 (New) • TPS25750 (NRND)	Initial release of USBCPD Application Customization Tool: • Added device selection page • Added TPS25751 • Added features for BQ25756, Liquid Detection, and PPS
1.0.x → 1.1.1	Oct 2024 → Sept 2025	1. TPS25751 2. TPS26750 (New) 3. TPS25750 (NRND)	Official release summaries: • Added TPS26750 (1.0.0) • Improved BQ257xx configs (1.0.0 → 1.0.1) • Maintenance release (1.0.2) • Updated VIF generation feature for PD3.1 and PD3.2 (1.1.0 and 1.0.3) • Updated firmware for PD3.2 compliance (1.1.1)
2.0.0	March 2026	• TPS25751A (New) • TPS26750A (New) • TPS25752A (New) • TPS25751 • TPS26750 • TPS25750 (Removed)	Official release for A variants: • Added TPS25751A, TPS26750A, and TPS25752A • Removed TPS25750 (NRND) from device selection • TPS25751A: – Added BQ25690 • TPS25752A: – Added TPS55288 – Added TPS55289 – Added LM251772 • TPS26750A: – Added Liquid Detection • Updated Export setting menu • Added Debug Mode feature (EVMs only)

8 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
June 2026	*	Initial Release

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