Application Note

VIF Generation for USB Type-C® PD Compliance

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ABSTRACT

With the European Union mandate for USB Type-C® as the universal charging standard, manufacturers need to verify the conformity of products according to the USB-IF Compliance Program. A key element in the process is configuring the PD *Vendor Information File (VIF),* which outlines the capabilities of the end product. This application note explains the importance of a VIF, how to generate a VIF using Texas Instruments' (TI) GUI Tool, compliance-related JSON configuration, and how to map the product configuration to the VIF fields specifically for the TPS25751 and TPS26750.

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1 Introduction

The TPS25751 and TPS26750 are highly integrated stand-alone USB Type-C and Power Delivery (PD) controllers optimized for applications supporting USB Type-C PD Power. Both devices are certified by the USB-IF for PD3.2 specification, with TPS25751 supporting Standard Power Range (SPR) up to 100W and TPS26750 supporting Extended Power Range (EPR) up to 240W. End products integrating the TPS25751 or TPS26750 PD controllers for portable battery applications are required to be certified by the USB-IF Compliance Program.

TI's GUI Tool reduces the complexity associated with manual VIF generation by automatically generating a VIF based on the user's configuration. The generated VIF requires minimal changes, reducing common compliance failures related to PD configuration and VIF mismatch.

This application note explains the what VIF is, how VIF is used, how to generate a VIF using TI's GUI Tool, how to relate the product configuration to the VIF fields and how to configure a JSON that is ready for compliance.

2 VIF Overview

The USB Implementers Forum (USB-IF) defines the design target and test criteria used to evaluate a product. Products that pass the test criteria are considered USB-IF certified and have the right to license the USB-IF Logos. USB-IF compliance testing is highly recommended to make sure of product functionality, cross-device compatibility, and minimize risk against potential safety hazards.

Validating a system prior to testing for USB Power Delivery compliance is critical in preventing false failures due to underlying design limitations, reducing the number of iterations needed to achieve compliance, and avoiding delays in production schedules.

TI recommends to have the following completed *prior* to testing USB-PD compliance on end products:

- Validated hardware: this includes full design review on the schematic and layout, completed testing and validation, and anything else needed prior to shipping final product.
- The associated TPS25751 or TPS26750 JSON (Application Configuration) file that is loaded on the validated hardware.
- A completed Vendor Info File (VIF) based on the JSON (Application Configuration) file.
- The Test ID (TID) and Vendor ID (VID) provided by USB-IF.

2.1 VIF Generation using TI's Application Customization Tool

The *Vendor Information File* (VIF) defines the capabilities of the end product which testers use to determine the applicable procedures and tests required to achieve USB Type-C and PD certification. Typically, the VIF is configured manually in the USB-IF recommended VIF Editor Tool.

TI's Application Customization Tool simplifies VIF generation by automatically generating a VIF based on the user's configuration. The generated VIF requires minimal changes, reducing common compliance failures related to manual entry of the VIF fields.

To generate a VIF using TI's Application Customization Tool, click on the *Export* drop-down button on the top-right side of the tool and click on *Generate VIF file*. This automatically downloads a file in .XML format to the default save directory on the user's computer. Refer to Figure 2-1.

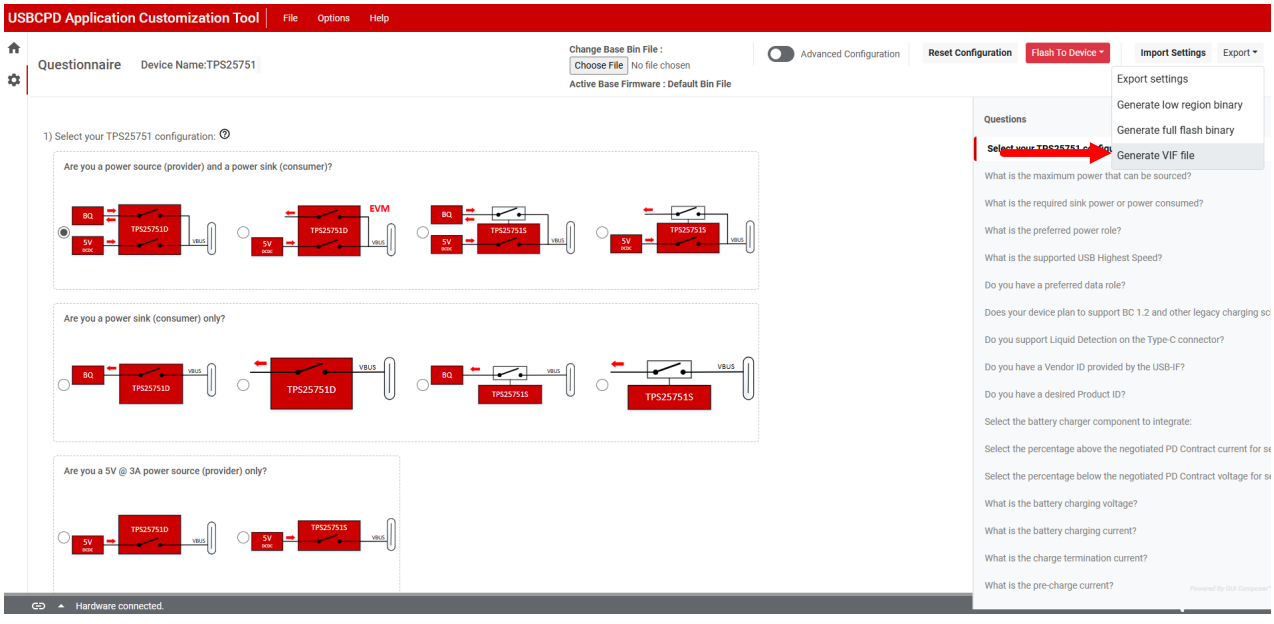

Figure 2-1. VIF Generation Using the Application Customization Tool

2.2 USB-IF VIF Editor Tool

TI recommends using the USB-IF Vendor Info File Editor (VIF Editor) tool to view and edit existing VIFs. VIFs can be opened and modified in generic file viewers that support .xml files, but the VIF Editor tool provides a GUI that makes sure valid values are entered for each of the fields and maintains the correct formatting of the VIF. The USB VIF Editor can be found at USB-IF, or by searching for USB Vendor Info File Generator in a browser. The download consists of the VIF Editor tool and the Vendor Info File Specification document, which contains additional information about the VIF and the settings. The VIF Editor tool is updated regularly, and users must generate VIFs using the latest version of the tool. TI's GUI VIF Generation Tool does not always generate VIFs according to the latest specification. When this is the case, users need to load the old VIF into the latest VIF Editor tool, make any necessary changes, and save the VIF from the latest tool to update to the latest specification. Figure 2-2 shows the USB IF VIF Editor front page and how to load a VIF generated from TI's Application Customization Tool into the VIF Editor Tool.

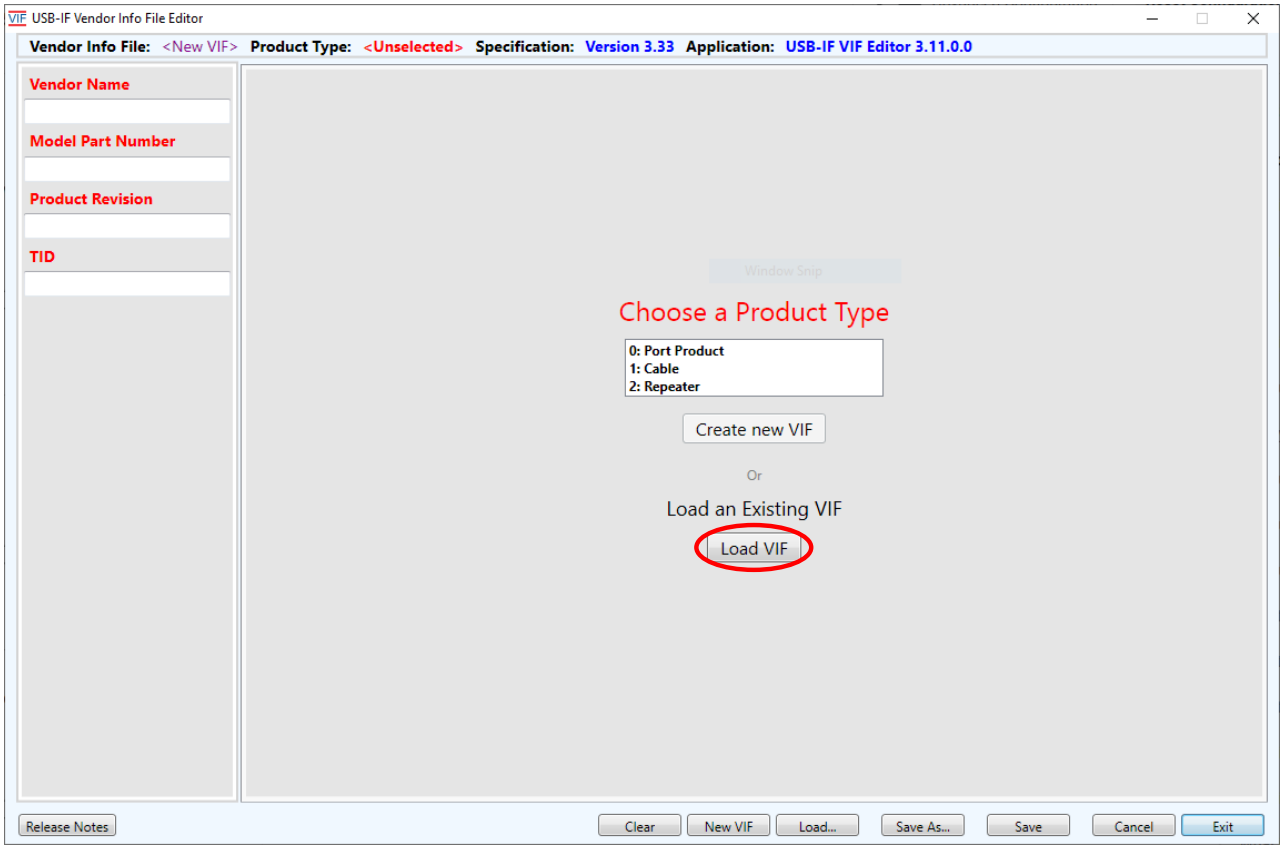

Figure 2-2. USB IF Vendor Info File Editor

Note

The VIF Editor tool highlights incorrect and empty fields in red. The user can hover over the field for more information that points to the Vendor Info File Specification document.

3 Compliance-related JSON Configuration

The USB PD Specification defines the extended messages that must be supported depending on the capability of the port (DRP, source-only, sink-only). The TPS25751 and TPS26750 *PD3 Configuration* Register 42h contains the configuration to enable support for these required messages. An additional register also needs to be configured for each supported message. This section describes the required extended messages along with the associated TI register to enable support for the messages based on the capability of the port.

Note

Messages denoted with a * in this section are only required for battery powered systems.

Table 3-1. Extended Message Support based on Port Capability

USB-C PD Port Capability	Required Message Support	Description
Dual Role Power (DRP)	Support source extended message [8] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Source_Capabilities_Extended USB PD message with the contents of the TX_SCEDB register (0x77).
	*Support battery capabilities Message [10] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Battery_Capabilities USB PD message with the contents of the TX_BCDB register (0x7D).
	*Support battery status message [11] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Battery_Status USB PD message with the contents of the TX_BSDO register (0x7B).
	Support sink cap extended [17] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Sink_Capabilities_Extended message USB PD message with the contents of the TX_SKEDB register (0x7E).
	Support get source info [18] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Source_Info USB PD message with the contents of TX_Source_Info register (0x78).
Source-only	Support source extended message [8] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Source_Capabilities_Extended USB PD message with the contents of the TX_SCEDB register (0x77).
	*Support battery capabilities message [10] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Battery_Capabilities USB PD message with the contents of the TX_BCDB register (0x7D).
	*Support battery status message [11] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Battery_Status USB PD message with the contents of the TX_BSDO register (0x7B).
	Support get source info [18] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Source_Info USB PD message with the contents of TX_Source_Info register (0x78).
Sink-only	*Support battery capabilities message [10] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Battery_Capabilities USB PD message with the contents of the TX_BCDB register (0x7D).
	*Support battery status message [11] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Battery_Status USB PD message with the contents of the TX_BSDO register (0x7B).
	Support sink cap extended [17] = 0x1	If this bit is asserted, then the PD controller responds to a Get_Sink_Capabilities_Extended message USB PD message with the contents of the TX_SKEDB register (0x7E).

4 VIF Editor Specific Tabs

The VIF generated using the TI GUI VIF generation tool only populates fields specific to the PD controller. Some fields are intentionally left blank (denoted in red) for the user to configure according to system level requirements not managed solely by the PD controller. Table 4-1 highlights the remaining fields that need to be configured to have a completed VIF. Some of these VIF fields directly correspond to the PD controller registers which need to be set accordingly.

Table 4-1. Configurable VIF Fields

VIF Editor Tab	VIF Field	Description
General PD	Num_Fixed_Batteries *Only incomplete if system is battery powered. If not battery powered, skip	This value corresponds with the *Number of Fixed Batteries* [99:96] setting in Register 77h and *Number of Fixed Batteries* [51:48] setting in Register 7Eh. Configure the registers accordingly in json and regenerate VIF.
General PD	Num_Swappable_Battery_Slots *Only incomplete if system is battery powered. If not battery powered, skip	This value corresponds with the *Number of Hot Swappable Batteries* [103:110] setting in Register 77h and *Number of Hot Swappable Batteries* [55:52] setting in 7Eh. Configure the registers accordingly in json and regenerate VIF.
USB Type-C	Type_C_Power_Source	*0: Externally Powered* - the port is always powered from a power supply in the system, never from the USB Type-C port *1: UFP-powered* - the port is powered by the USB Type-C port, never from a power supply in the system *2: Both* - can operate as both
PD Source	Port_Managed_Guaranteed_Type	*0: Managed Capability* - port can change the offered PDOs. *1: Guaranteed Capability* - port is always capable of delivering the PD_Power_As_Source and advertised Source PDOs never changes This value corresponds with *Port Type* [31] in Register 78h.

5 TI Register Mapping to VIF Fields

The tables in sections Section 5.1 to Section 5.12 outline all VIF fields, default values for the VIF fields, and what PD controller registers and questionnaire responses map to the fields.

This section provides a detailed overview of all VIF fields to aid the user's understanding of how the TI VIF Generation Tool automatically configures the VIF fields. Table 4-1 provides the information needed to have a completed VIF.

5.1 Product and Product Details

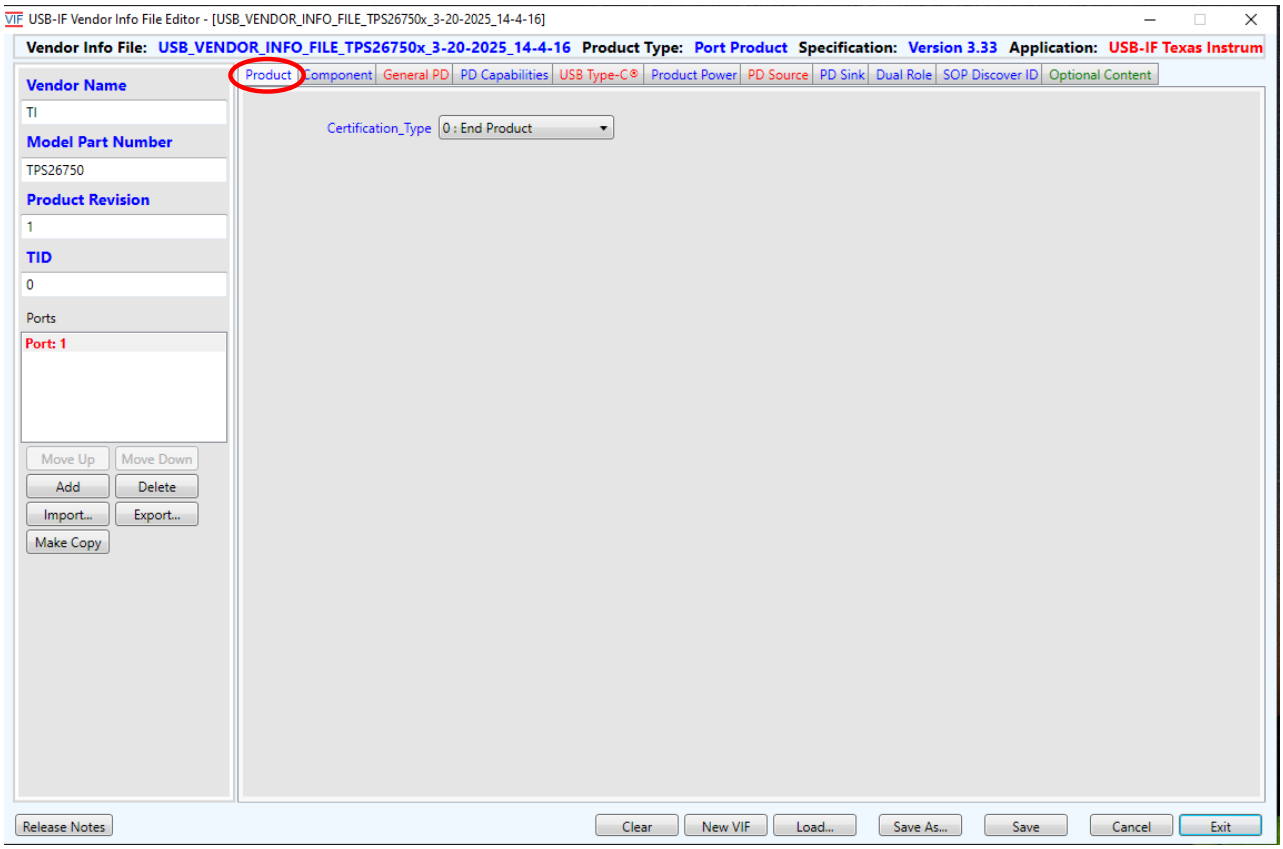

Figure 5-1. VIF Editor Product Tab

Table 5-1. Product Tab

VIF Field	Description
Vendor Name	Default set to *TI*. *Vendor can modify this value.*
Model Part Number	Default set to match device selection *TPS25751* or *TPS26750*
Product Revision	Default value set to *1*. *Vendor can modify this value.*
TID	Default value set to *0*. *Vendor can modify this value.*
Ports	Default value set to *1*.
Certification_Type	Default value set to *0 : End Product*.

5.2 Component

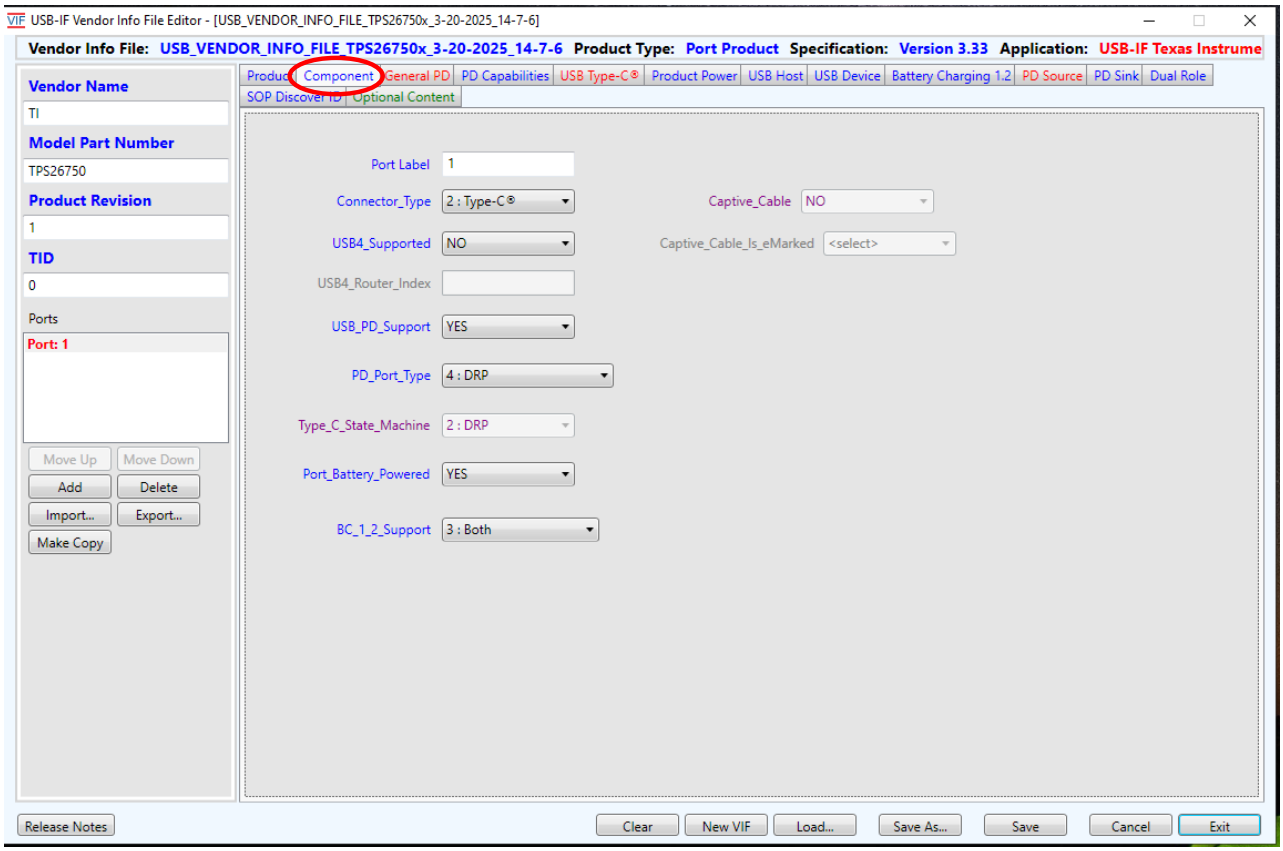

Figure 5-2. VIF Editor Component Tab

Table 5-2. Component Tab

VIF Field	Description
Port_Label	Default value set to *1*. *Vendor can modify this value.*
Connector_Type	Default value set to *2 : Type-C*.
USB4_Supported	Default set to *NO* and must not be modified. *Not supported by TPS25751 and TPS26750.*
USB4_Router_Index	Field is disabled. *Not supported by TPS25751 or TPS26750.*
USB_PD_Support	Set based on port config (0x28) • Disable PD [10]
PD_Port_Type	Set based on port config (0x28) • Type-C state machine [1:0] Port control (0x29) • Process swap to sink [4] • Process swap to source [6]
Type_C_State_Machine	Set based on port config (0x28) • Type-C state machine [1:0]
Port_Battery_Powered	Default set to *YES* if PD+BQ option is selected for Q1 in GUI. Otherwise, field is left empty to be configured by user.

Table 5-2. Component Tab (continued)

VIF Field	Description
BC_1_2_Support	Set based on port control (0x29) • Charger advertise enable [28:26] • Charger detect enable [31:30]
Captive Cable	Default set to *NO* and must not be modified. *Not supported by TPS25751 or TPS26750.*
Captive_Cable_Is_eMarked	Field is disabled. *Not supported by TPS25751 or TPS26750.*

Type-C State Machine	Process Swap to Sink	Process Swap to Source	PD_Port_Type
Sink	n/a	NO	*0: Consumer only*
Sink	n/a	YES	*1: Consumer or Provider*
Source	YES	n/a	*2: Provider or Consumer*
Source	NO	n/a	*3: Provider only*
DRP	n/a	n/a	*4: DRP*

5.3 General PD

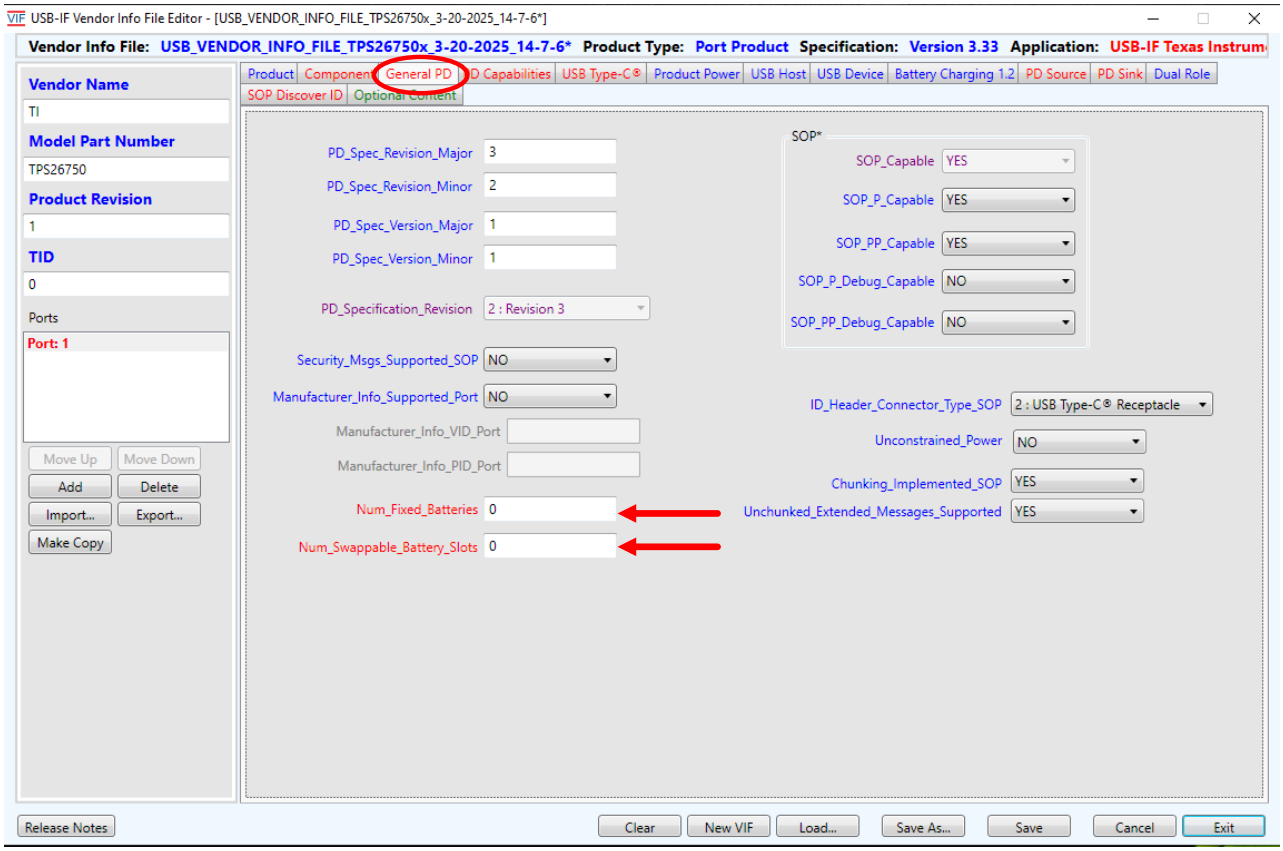

Figure 5-3. VIF Editor General PD Tab

Note

The red arrows in the figure above highlight fields that can be left intentionally blank for users to configure. Refer to Table 4-1 for more information.

Table 5-3. General PD Tab

VIF Field	Description
PD_Spec_Revision_Major	Default set to *3*
nPD_Spec_Revision_Minor	Default set to *2*
PD_Spec_Version_Major	Default set to *1*
PD_Spec_Version_Minor	Default set to *1*
PD_Specification_Revision	Default set to *2: Revision 3* and must not be modified.
Security_Msgs_Supported_SOP	Default set to *No* and must not be modified *Not supported by TPS25751 or TPS26750.*
Manufacturer_Info_Supported_Port	Default set to *No* and must not be modified *Not supported by TPS25751 or TPS26750.*
Manufacturer_Info_VID_Port	Field disabled. *Not supported by TPS25751 or TPS26750.*
Manufacturer_Info_PID_Port	Field disabled. *Not supported by TPS25751 or TPS26750.*
Num_Fixed_Batteries	Set based on Tx Source Capabilities Extended Data Block (0x77) • Number Fixed Batteries [99:96] The Source Capabilities (0x77) number of batteries fields configued on the PD controller applies for both source and sink devices.
Num_Swappable_Battery_Slots	Tx Source Capabilities Extended Data Block (0x77) • Number Hot Swappable Batteries [103:100] The Source Capabilities (0x77) number of batteries fields configured on the PD controller applies for both source and sink devices.
ID_Header_Connector_Type_SOP	Default set to *2: Type-C Receptacle*
Unconstrained_Power	Set based on Port Control (0x29) • Unconstrained Power [19] *NO*: for PD+BQ applications where there is no other external power source. This field must always be set to *No* as batteries can be depleted. *YES* for source-only applications when power is verified.
Chunking_Implemented_SOP	Default value set to *YES* and must not be modified.
Unchunked_Extended_Messages_Supported	PD3 Config (0x42) • Unchunked Supported [4]
SOP*	
SOP_Capable	Default set to "*YES*"
SOP_P_Capable	Default set to "*YES*"
SOP_PP_Capable	Default set to "*NO*"
SOP_P_Debug_Capable	Default set to "*NO*"
SOP_PP_Debug_Capable	Default set to "*NO*"

Note

For GUI Tool Build v1.0.x, the PD Specification supported is 3.1.1.8.

For GUI Tool Build v1.1.x, the PD Specification supported is 3.2.1.1.

5.4 PD Capabilities

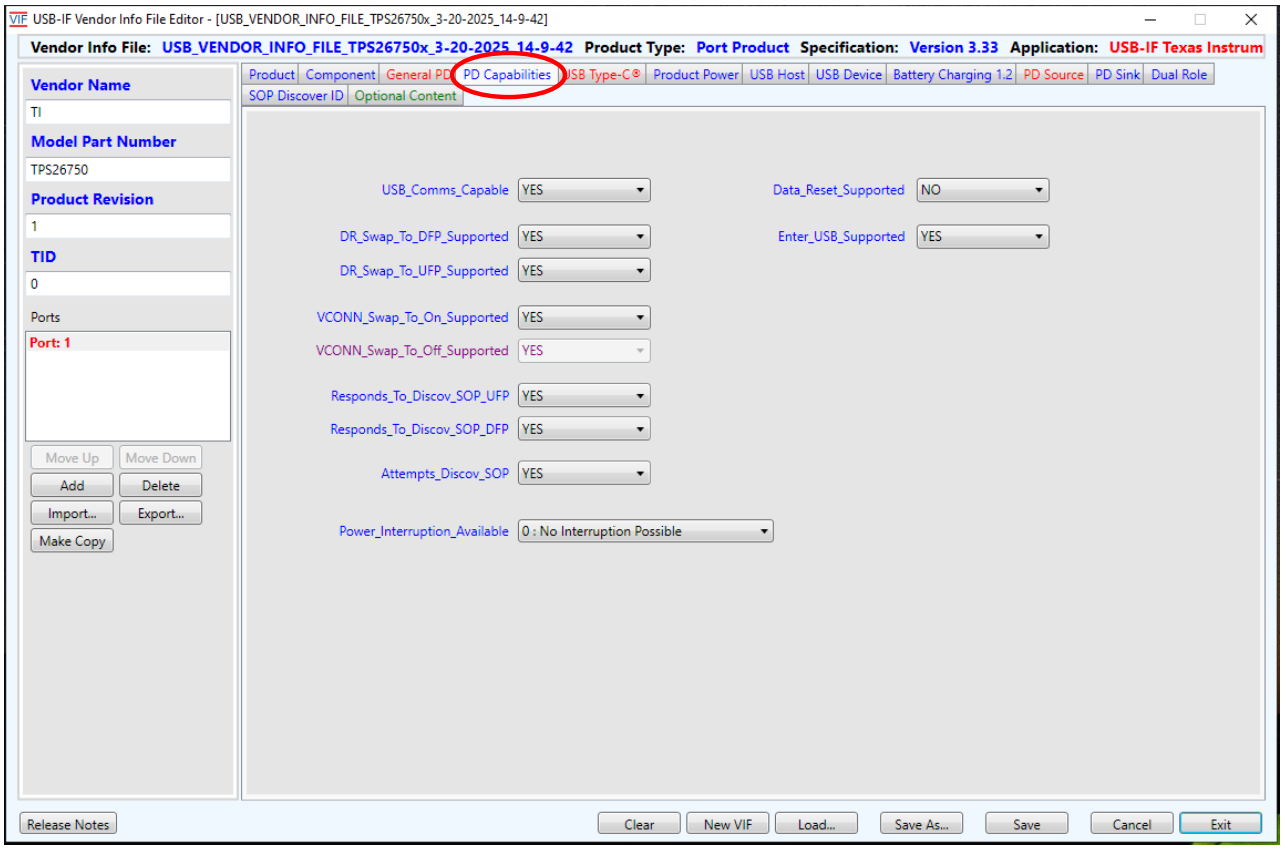

Figure 5-4. VIF Editor PD Capabilities Tab

Table 5-4. PD Capabilities Tab

VIF Field	Description
USB_Comms_Capable	Set based on port configuration (0x28) • USB communications capable [11]
DR_Swap_To_DFP_Supported	Set based on port control (0x29) • Process swap to DFP [14]
DR_Swap_To_UFP_Supported	Set based on port control (0x29) • Process swap to UFP [12]
VCONN_Swap_To_On_Supported	*YES* for DRP and source-only applications. *No* for sink-only applications.
VCONN_Swap_To_Off_Supported	*YES* for DRP and source-only applications. *No* for sink-only applications.
Responds_To_Discov_SOP_UFP	*YES* for DRP and UFP-only applications. *NO* for DFP-only applications.

Table 5-4. PD Capabilities Tab (continued)

VIF Field	Description
Responds_To_Discov_SOP_DFP	*YES* for DRP and DFP-only applications. *NO* for UFP-only applications.
Attempts_Discov_SOP	Set based on port control (0x29) • Automatic ID request [16]
Power_Interruption_Available	Default set to *0: No interruption possible*.
Data_Reset_Supported	Default set to *NO* and must not be modified.
Enter_USB_Supported	Set based on port configuration (0x28) • USB communications capable [11] • USB3 rate [14:13] *Yes* if *USB communication Capable* is *1* and *USB3 rate* is supported. *No* for otherwise.

5.5 USB Type-C

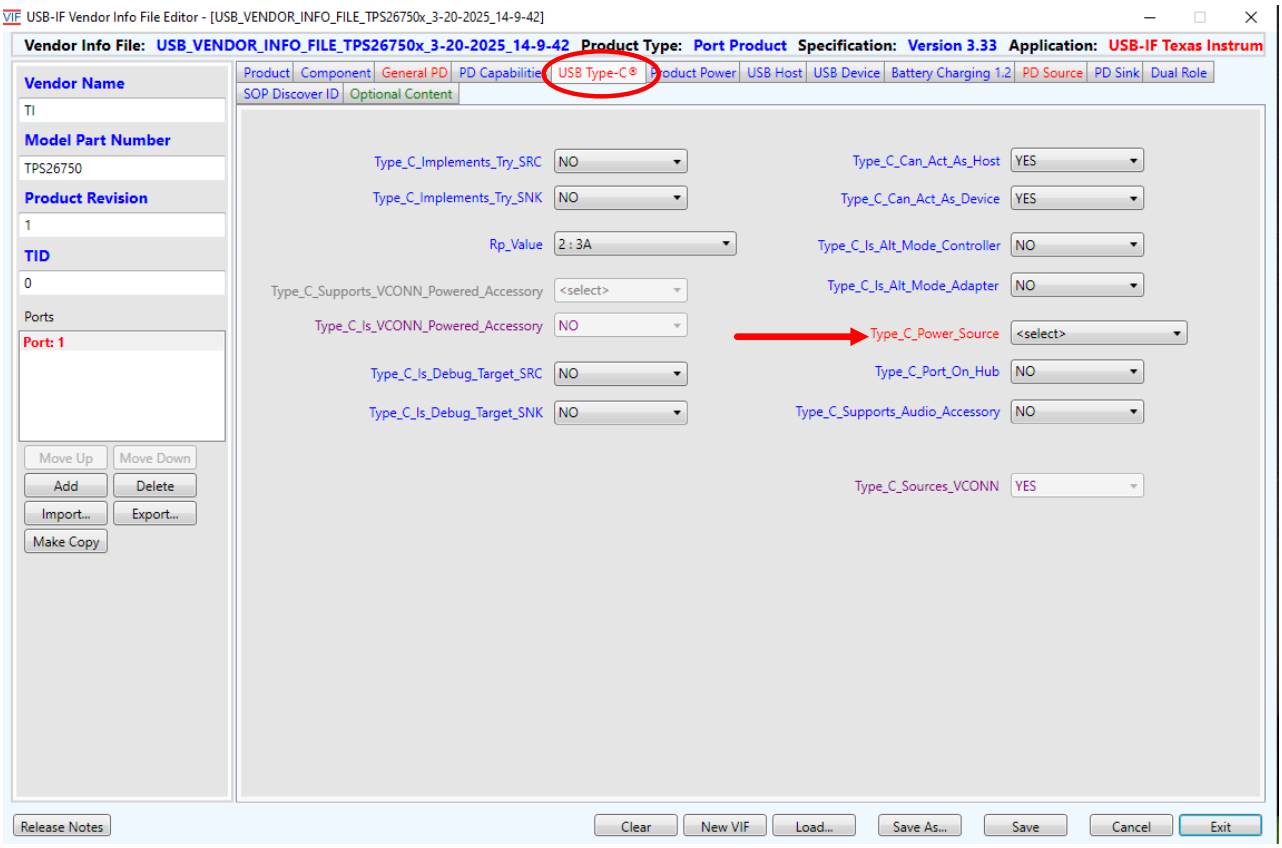

Figure 5-5. VIF Editor USB Type-C Tab

Note

The red arrows in the figure above highlight fields that can be left intentionally blank for users to configure. Refer to Table 4-1 for more information.

Table 5-5. USB Type-C Tab

VIF Field	Description
Type_C_Implements_Try_SRC	Set based on port config (0x28) • Type-C support options [9:8]
Type_C_Implements_Try_SNK	Set based on port config (0x28) • Type-C support options [9:8]
Rp_Value	Set based on port control (0x29) • Type-C current [1:0]
Type_C_Supports_VCONN_Powered_Accessory	Field disabled. *Not supported by TPS25751 or TPS26750.*
Type_C_Is_VCONN_Powered_Accessory	Field disabled, *Not supported by TPS25751 or TPS26750.*
Type_C_Is_Debug_Target_SRC	Default set to *NO*.
Type_C_Is_Debug_Target_SNK	Default set to *NO*.
Type_C_Can_Act_As_Host	Set based on port config (0x28) • Type-C state machine [1:0] • USB communication capable [11] Port control (0x29) • Process swap to DFP [14] • Initiate swap to DFP [15] Must match GUI Q6
Type_C_Can_Act_As_Device	Set based on port config (0x28) • Type-C state machine (1:0) • USB communication capable [11] Port control (0x29) • Process swap to UFP [12] • Initiate swap to UFP [13] Must match GUI Q6
Type_C_Is_Alt_Mode_Controller	Default set to *NO*. *Not supported by TPS25751 or TPS26750.*
Type_C_Is_Alt_Mode_Adapter	Default set to *NO*. *Not supported by TPS25751 or TPS26750.*
Type_C_Power_Source	Field is left empty for user to configure according to system. *0: Externally Powered* - the port is always powered from a power supply in the system, never from the USB Type-C port *1: UFP-powered* - the port is powered by the USB Type-C port, never from a power supply in the system *2: Both* - can operate as both
Type_C_Port_On_Hub	Default set to *NO*.
Type_C_Supports_Audio_Accessory	Default set to *NO*.
Type_C_Sources_VCONN	Default set to *YES* for DRP and source-only applications. *NO* for sink-only applications.

5.6 Product Power

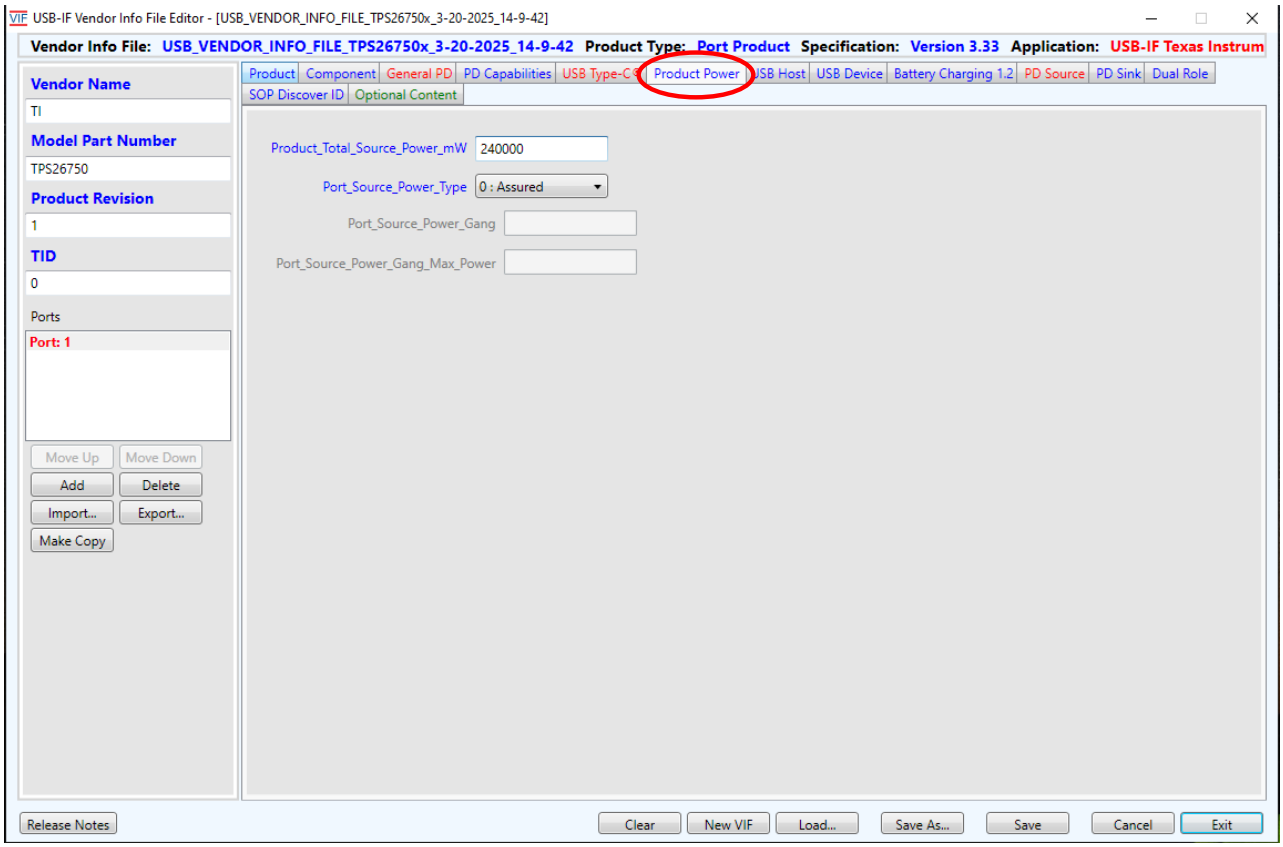

Figure 5-6. VIF Editor Product Power Tab

Table 5-6. Product Power Tab

VIF Field	Description
Product_Total_Source_Power_mW	Set based on transmit source capabilities (0x32) • Calculated based on the source power in milliwatts (mW) from the largest Source PDO.
Port_Source_Power_Type	Default set to *0: Assured*. Value can be modified for multiport designs.

5.7 USB Host and USB Device

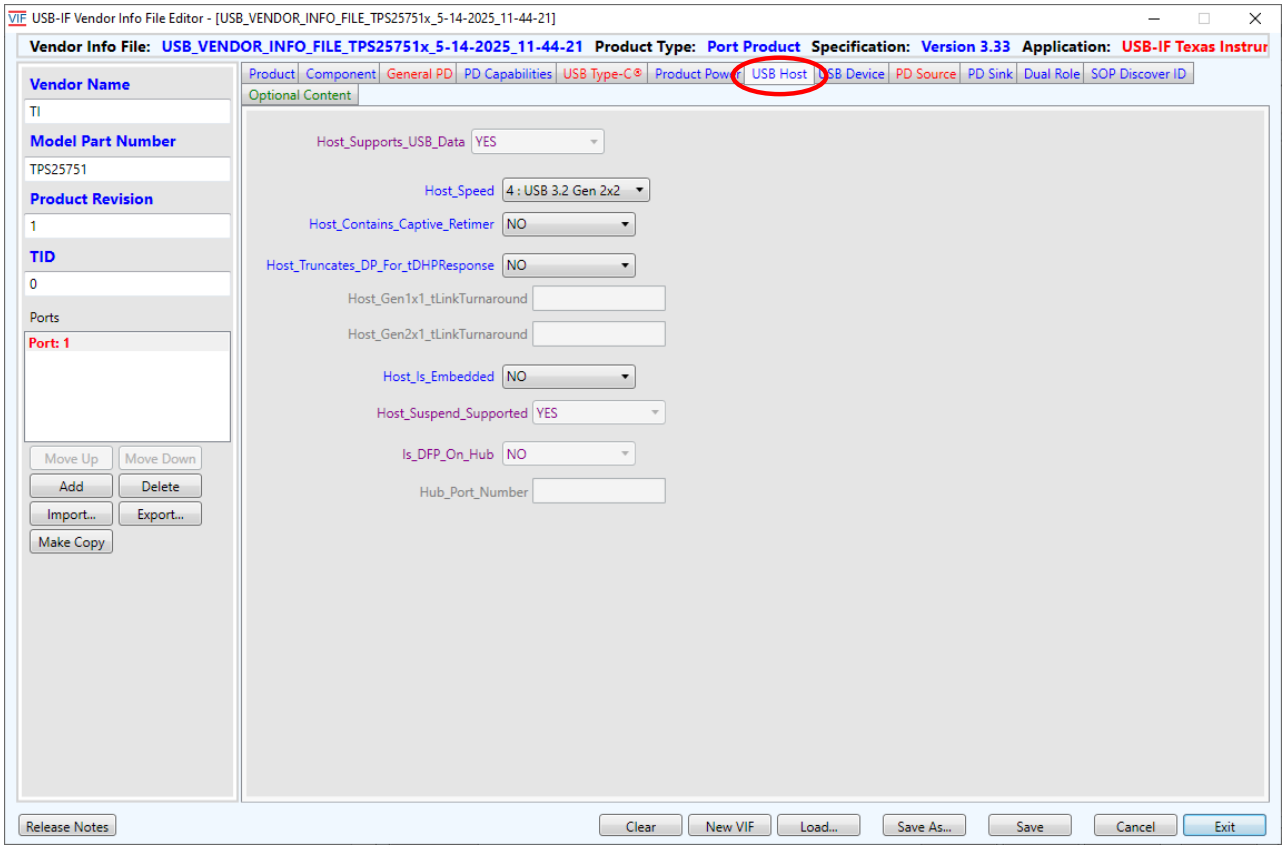

Figure 5-7. VIF Editor USB Host Tab

Table 5-7. USB Host Tab

VIF Field	Description
Host_Supports_USB_Data	Default set to *YES* when Type_C_Can_Act_As_Host is set to *YES*.
Host_Speed	Set based on port configuration (0x28) • USB communication capable [11] • USB3 rate [14:13]
Host_Contains_Captive_Retimer	Default set to *NO*.
Host_Truncates_DP_For_tDHPResponse	Field disabled.
Host_Gen1x1_tlLinkTurnaround	Field disabled.
Host_Gen2x1_tlLinkTurnaround	Field disabled.
Host_Is_Embedded	Default set to *NO*.
Host_Suspend_Supported	Field disabled.
Is_DFP_On_Hub	Field disabled.
Hub_Port_Number	Field disabled.

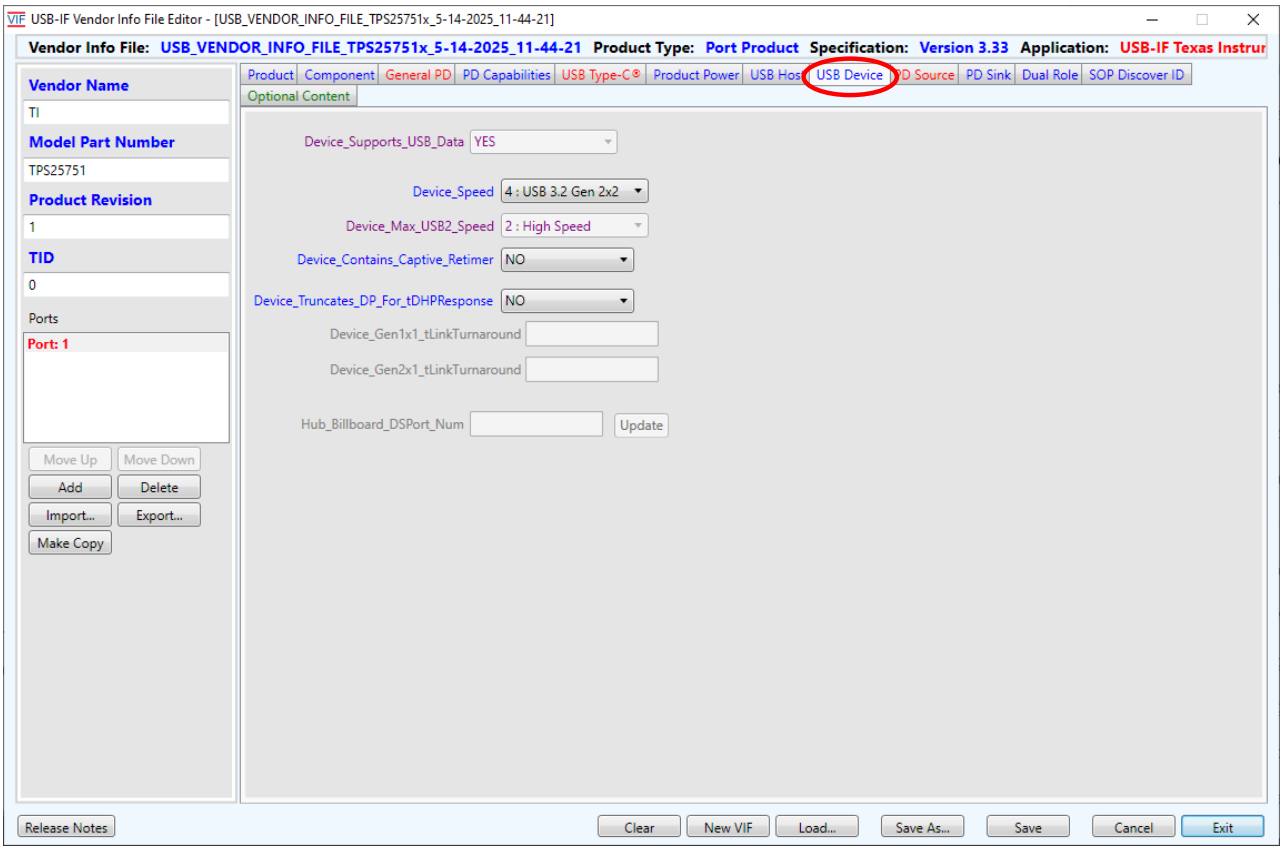

Figure 5-8. VIF Editor USB Device Tab

Table 5-8. USB Device Tab

VIF Field	Description
Device_Supports_USB_Data	Default set to *YES* when Type_C_Can_Act_As_Device is set to *YES*.
Device_Speed	Set based on port configuration (0x28) • USB communication capable [11] • USB3 rate [14:13]
Device_Max_USB2_Speed	Default set to *2: High Speed*.
Device_Contains_Captive_Retimer	Default set to *NO*.
Device_Truncates_DP_For_tDHPResponse	Default set to *NO*.
Device_Gen1x1_tlLinkTurnaround	Field disabled.
Device_Gen2x1_tlLinkTurnaround	Field disabled.
Hub_Billboard_DSPort_Num	Field disabled.

5.8 Battery Charging 1.2

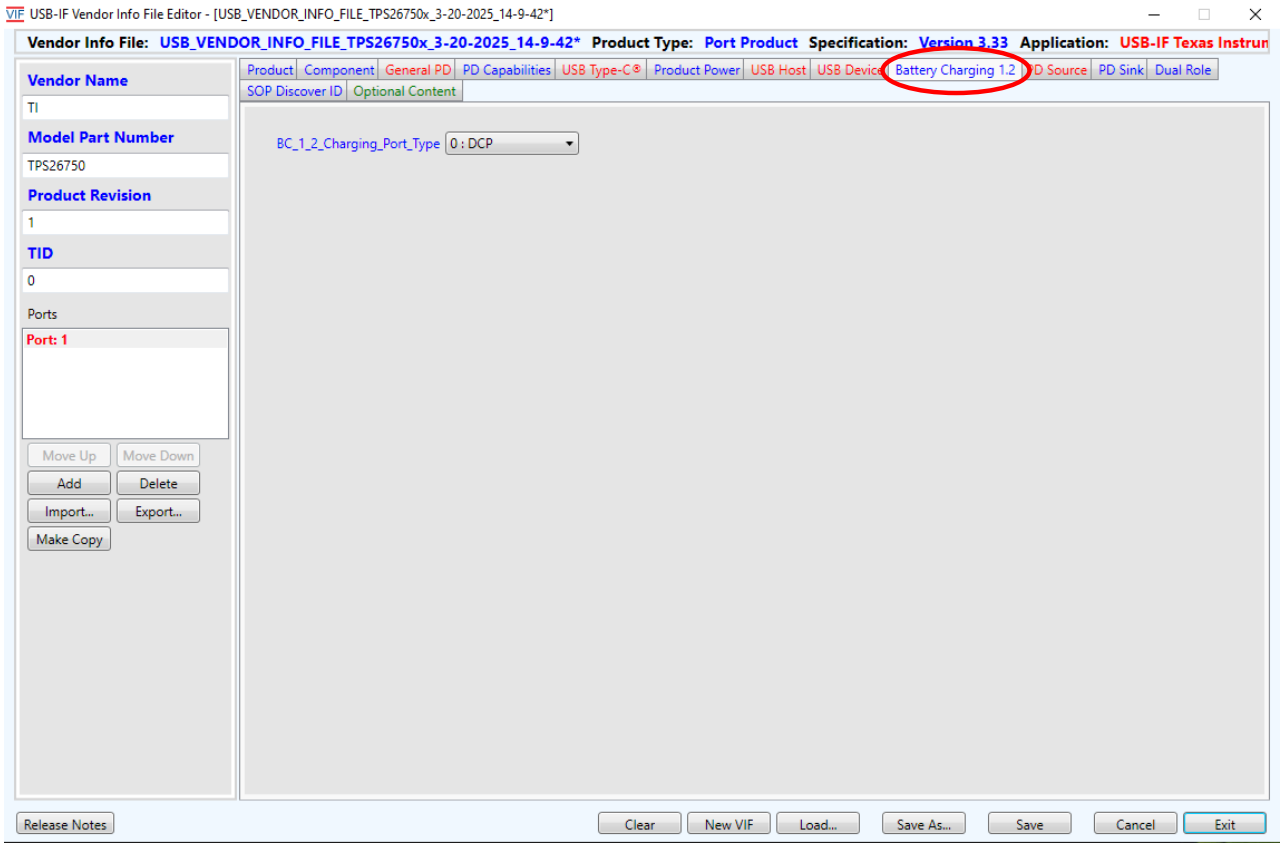

Figure 5-9. VIF Editor Battery Charging 1.2 Tab

Table 5-9. Battery Charging 1.2 Tab

VIF Field	Description
BC_1_2_Charging_Port_Type	Set based on port control (0x29) • Charger advertise enable [28:26]

5.9 PD Source

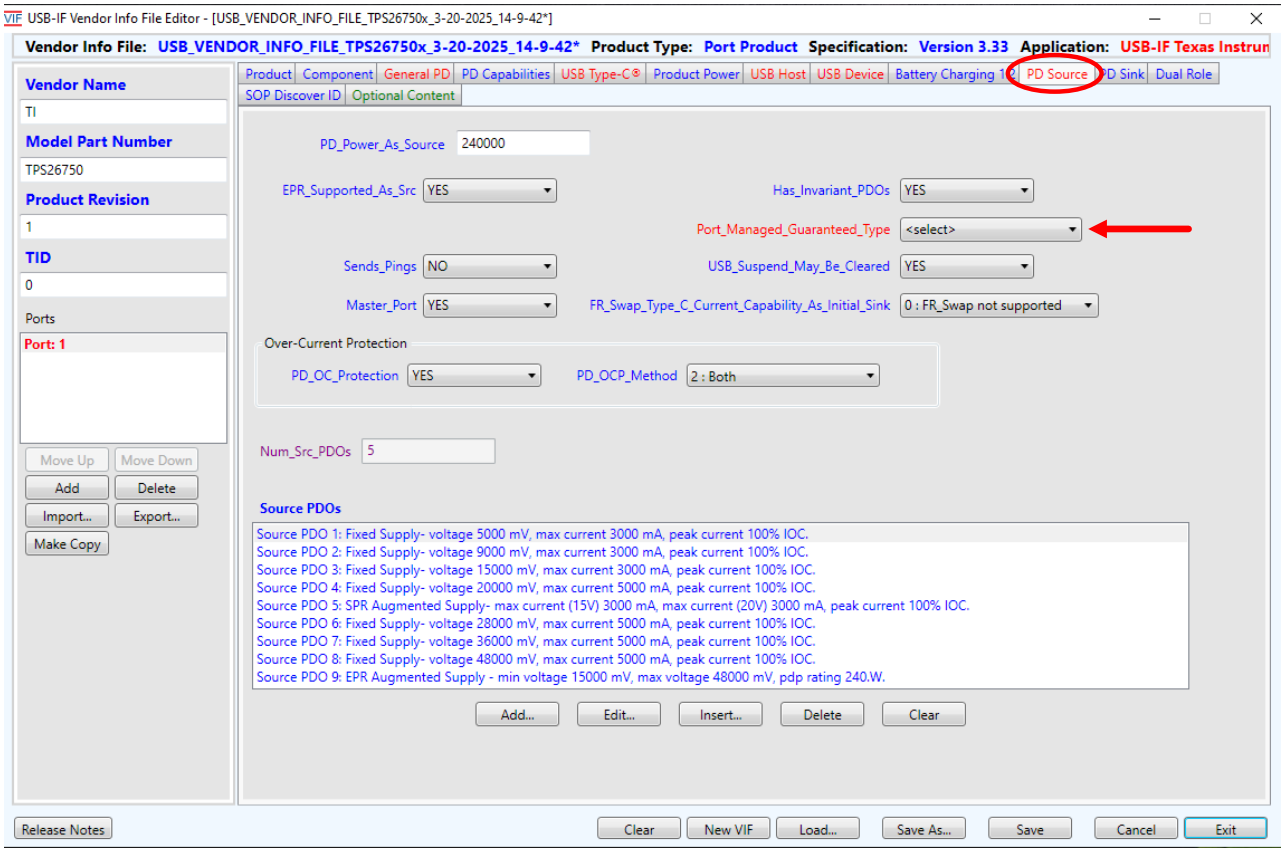

Figure 5-10. VIF Editor PD Source Tab

Note

The red arrows in Figure 5-10 highlight fields that can be left intentionally blank for the user to configure. Refer to Table 4-1 for more information.

Table 5-10. PD Source Tab

VIF Field	Description
PD_Power_As_Source	Set based on transmit source capabilities (0x32) • Calculate the source power in milliwatts (mW) from the largest source PDO.
EPR_Supported_As_Source	Set based on transmit source capabilities (0x32) • TX source num valid EPR PDOs [5:3] *YES* if EPR source is supported and *TX Source Num Valid EPR PDOs* is non-zero.
Has_Invariant_PDOs	Default set to *YES* and can be modified based on system. A port has invariant PDOs if the port always advertises the same PDOs except when limited by the cable.

Table 5-10. PD Source Tab (continued)

VIF Field	Description
Port_Managed_Guaranteed_Type	Set based on Tx source info (0x78) • Port Type Shared Assured [31] A port is *guaranteed* or *assured* if the power provided by the port is fixed. A port is *managed* or not *assured* if the port power can change dynamically.
Send_Pings	Default set to *NO* and must not be modified. *Not supported by TPS25751 or TPS26750.*
Master_Port	Default set to *YES* and must not be modified.
USB_Suspend_Can_Be_Cleared	Default set to *YES*.
FR_Swap_Type_C_Current_Capability_As_Initial_Sink	Default set to *0: FR_Swap not supported*. *Not supported by TPS25751 or TPS26750.*
PD_OC_Protection	Default set to *YES* if a TI integrated PD + BQ option is selected in Q1 in GUI. Otherwise set to *NO*.
PD_OCP_Method	Set to *2: Both* if user selects integrated PD+BQ option for Q1 in GUI. The field is ignored otherwise. • For non-integrated PD+BQ system, users need to determine what kind of OC the system implements (is set to <select> for non PD+BQ option).
Num_Src_PDOs	Set based on transmit source capabilities (0x32) • Number of valid PDOs [2:0] **Note** This field only applies for SPR PDOs; EPR PDOs do not apply towards this field.

Table 5-11. PD Source Tab - Supply Type: Fixed

PDO Type: Fixed Type	
VIF Field	**Description**
Src_PDO_Supply_Type	Set based on transmit source capabilities (0x32) • PDO – Supply type [31:30]
SPR_PDO_Peak_Current	Set based on transmit source capabilities (0x32) • PDO – Peak current [21:20]
Src_PDO_Voltage	Set based on transmit source capabilities (0x32) • PDO – Voltage [19:10]
Src_PDO_Max_Current	Set based on transmit source capabilities (0x32) • PDO – Maximum current [9:0]
Src_PD_OCP_OC_Debounce	Default set to *10* if PD + BQ option is selected in Q1 in GUI.
Src_PD_OCP_OC_Threshold	Default set if PD + BQ option is selected in Q1 in GUI.
Src_PD_OCP_UV_Debounce	Default set to *10* if PD + BQ option is selected in Q1 in GUI.
Src_PD_OCP_UV_Threshold_Type	Default set to *1: Percentage* if PD + BQ option is selected in Q1 in GUI.
Src_PD_OCP_UV_Threshold	Default set to *70* if PD + BQ option is selected in Q1 in GUI.

Table 5-12. PD Source Tab - Supply Type: Battery

PDO Type: Battery Type	
VIF Field	**Description**
Src_PDO_Supply_Type	Set based on transmit source capabilities (0x32) • PDO – Supply type [31:30]
Src_PDO_Max_Power	Set based on transmit source capabilities (0x32) • PDO – Maximum power [9:0]
Src_PDO_Min_Voltage	Set based on transmit source capabilities (0x32) • PDO – Minimum voltage [19:10]
Src_PDO_Max_Voltage	Set based on transmit source capabilities (0x32) • PDO – Maximum voltage [29:20]

Table 5-13. PD Source Tab - Supply Type: Variable

PDO Type: Variable Type	
VIF Field	**Description**
Src_PDO_Supply_Type	Set based on transmit source capabilities (0x32) • PDO – Supply type [31:30]
Src_PDO_Max_Current	Set based on transmit source capabilities (0x32) • PDO – Maximum current [9:0]
Src_PDO_Min_Voltage	Set based on transmit source capabilities (0x32) • PDO – Minimum voltage [19:10]
Src_PDO_Max_Voltage	Set based on transmit source capabilities (0x32) • PDO – Maximum voltage [29:20]

Table 5-14. PD Source Tab - Supply Type: SPR PPS

PDO Type: APDO APDO Type: Programmable Power Supply (SPR)	
VIF Field	**Description**
Src_PDO_Supply_Type	Set based on transmit source capabilities (0x32) • PDO – Supply type [31:30]
Src_PDO_APDO_Type	Set based on transmit source capabilities (0x32) • PDO – APDO type [29:28]
Src_PDO_Max_Current	Set based on transmit source capabilities (0x32) • PDO – Maximum current [6:0]

Table 5-14. PD Source Tab - Supply Type: SPR PPS (continued)

PDO Type: APDO APDO Type: Programmable Power Supply (SPR)	
VIF Field	**Description**
Src_PDO_Min_Voltage	Set based on transmit source capabilities (0x32) • PDO – Minimum voltage [15:8]
Src_PDO_Max_Voltage	Set based on transmit source capabilities (0x32) • PDO – Maximum voltage [24:17]

Table 5-15. PD Source Tab - Supply Type: EPR AVS

PDO Type: APDO APDO Type: EPR Adjustable Voltage Supply (EPR AVS)	
VIF Fields	**Description**
Src_PDO_Supply_Type	Set based on transmit source capabilities (0x32) • PDO – Supply type [31:30]
Src_PDO_APDO_Type	Set based on transmit source capabilities (0x32) • PDO – EPR adjustable voltage supply [29:28]
Src_PDO_Peak_Current	Set based on transmit source capabilities (0x32) • PDO – Peak current [27:26]
Src_PDO_Min_Voltage	Set based on transmit source capabilities (0x32) • PDO – Minimum voltage [15:8]
Src_PDO_Max_Voltage	Set based on transmit source capabilities (0x32) • PDO – Maximum voltage [25:17]
Src_PDO_PDP_Rating	Set based on transmit source capabilities (0x32) • PDO – PDP [7:0]

Table 5-16. PD Source Tab - Supply Type: SPR AVS

PDO Type: APDO APDO Type: SPR Adjustable Voltage Supply (SPR AVS)	
VIF Fields	**Description**
Src_PDO_Supply_Type	Set based on transmit source capabilities (0x32) • PDO – Supply type [31:30]
Src_PDO_APDO_Type	Set based on transmit source capabilities (0x32) • PDO – APDO type [29:28]

Table 5-16. PD Source Tab - Supply Type: SPR AVS (continued)

PDO Type: APDO APDO Type: SPR Adjustable Voltage Supply (SPR AVS)	
VIF Fields	**Description**
Src_PDO_Peak_Current	Set based on transmit source capabilities (0x32) • PDO – Peak current [27:26]
Src_PDO_Max_Current_9V_To_15V	Set based on transmit source capabilities (0x32) • PDO – Maximum current for 9V-15V [19:10]
Src_PDO_Max_Current_15V_To_20V	Set based on transmit source capabilities (0x32) • PDO – Maximum current for 15V-20V [9:0]

5.10 PD Sink

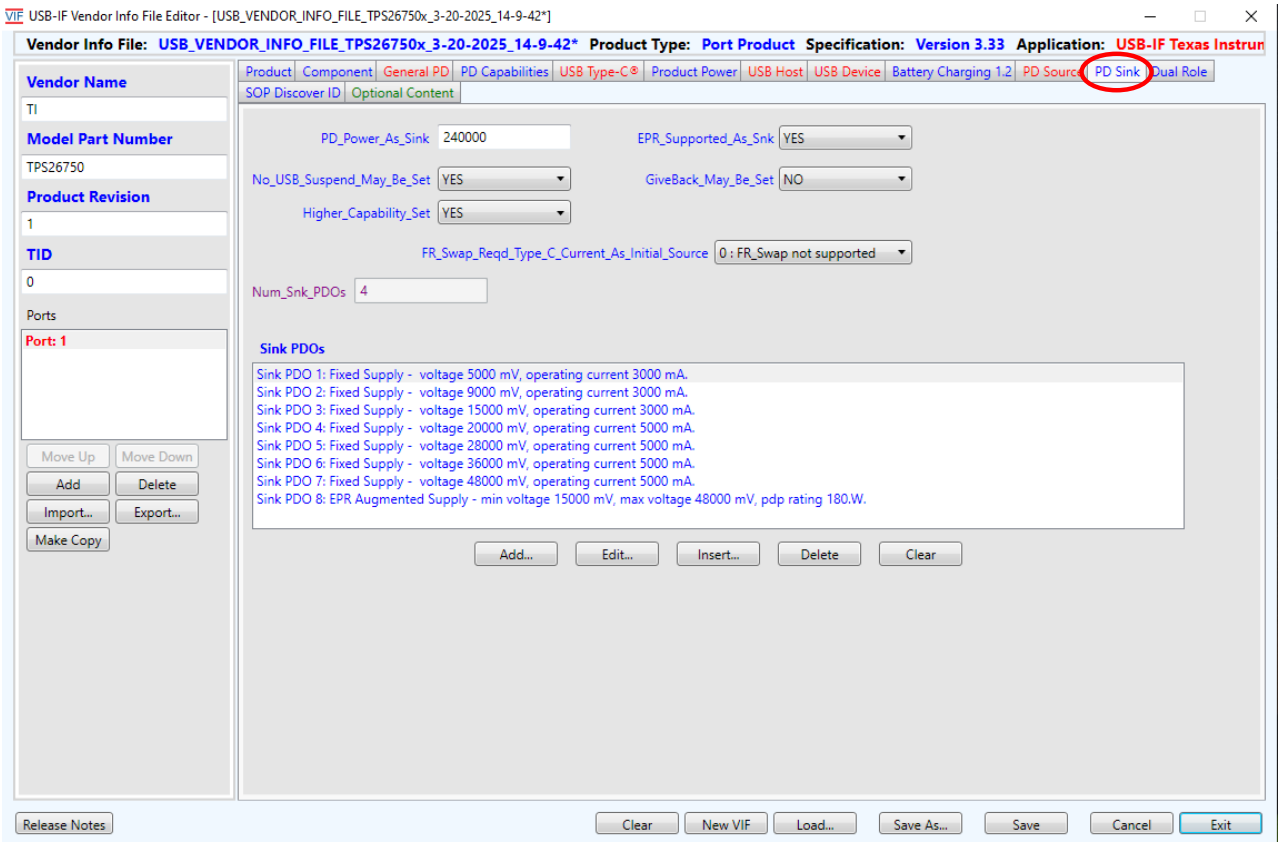

Figure 5-11. VIF Editor PD Sink Tab

Table 5-17. PD Sink Tab

VIF Field	Description
PD_Power_As_Sink	Set based on transmit sink capabilities (0x33) • Calculate the sink power in milliwatts (mW) from the largest Sink PDO.
No_USB_Suspend_Can_Be_Set	Set based on autonegotiate sink (0x37) • No USB suspend [1]
Higher_Capability_Set	Set based on transmit sink capabilities (0x33) • Sink PDO 1 – Higher capability [36]
EPR_Supported_As_Snk	Set based on transmit sink capabilities (0x33) • TX sink Num Valid EPR PDOs [5:3] *Yes* if EPR sink is supported and *TX sink Num Valid EPR PDOs* is non-zero.
GiveBack_Can_Be_Set	Default set to *NO* and must not be modified.
FR_Swap_Reqd_Type_C_Current_As_Initial_Source	Default set to *NO* and must not be modified. *Not Supported by TPS25751 or TPS26750.*
Num_Snk_PDOs	Set based on transmit sink capabilities (0x33) • Number valid PDOs [2:0] **Note** This field only applies for SPR PDOs. EPR PDOs **do not** apply towards this field.

Table 5-18. PD Sink Tab - Supply Type: Fixed

PDO Type: Fixed Supply	
VIF Field	**Description**
Snk_PDO_Supply_Type	Set based on transmit sink capabilities (0x33) • PDO – Supply type [31:30]
Snk_PDO_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Voltage [19:10]
Snk_PDO_Op_Current	Set based on transmit sink capabilities (0x33) • PDO – Operating current [9:0]

Table 5-19. PD Sink Tab - Supply Type: Battery

PDO Type: Battery Type	
VIF Field	**Description**
Snk_PDO_Supply_Type	Set based on transmit sink capabilities (0x33) • PDO – Supply type [31:30]
Snk_PDO_Op_Power	Set based on transmit sink capabilities (0x33) • PDO – Maximum power [9:0]
Snk_PDO_Min_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Minimum voltage [19:10]
Snk_PDO_Max_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Maximum voltage [29:20]

Table 5-20. PD Sink Tab - Supply Type: Variable

PDO Type: Variable Type	
VIF Field	**Description**
Snk_PDO_Supply_Type	Set based on transmit sink capabilities (0x33) • PDO – Supply type [31:30]
Snk_PDO_Op_Current	Set based on transmit sink capabilities (0x33) • PDO – Maximum current [9:0]
Snk_PDO_Min_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Minimum voltage [19:10]
Snk_PDO_Max_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Maximum voltage [29:20]

Table 5-21. PD Sink Tab - Supply Type: SPR PPS

PDO Type: APDO APDO Type: Programmable Power Supply (SPR)	
VIF Field	**Description**
Snk_PDO_Supply_Type	Set based on transmit sink capabilities (0x33) • PDO – Supply type [31:30]
Snk_PDO_APDO_Type	Set based on transmit sink capabilities (0x33) • PDO – APDO type [29:28]
Snk_PDO_Op_Current	Set based on transmit sink capabilities (0x33) • PDO – Maximum current [6:0]

Table 5-21. PD Sink Tab - Supply Type: SPR PPS (continued)

PDO Type: APDO APDO Type: Programmable Power Supply (SPR)	
VIF Field	**Description**
Snk_PDO_Min_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Minimum voltage [15:8]
Snk_PDO_Max_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Maximum voltage [24:17]

Table 5-22. PD Sink Tab - Supply Type: EPR AVS

PDO Type: APDO APDO Type: EPR Adjustable Voltage Supply (EPR AVS)	
VIF Field	**Description**
Snk_PDO_Supply_Type	Set based on transmit sink capabilities (0x33) • PDO – Supply type [31:30]
Snk_PDO_APDO_Type	Set based on transmit sink capabilities (0x33) • PDO – EPR adjustable voltage supply [29:28]
Src_PDO_Min_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Minimum voltage [15:8]
Src_PDO_Max_Voltage	Set based on transmit sink capabilities (0x33) • PDO – Maximum voltage [25:17]
Src_PDO_PDP_Rating	Set based on transmit sink capabilities (0x33) • PDO – PDP [7:0]

5.11 Dual Role

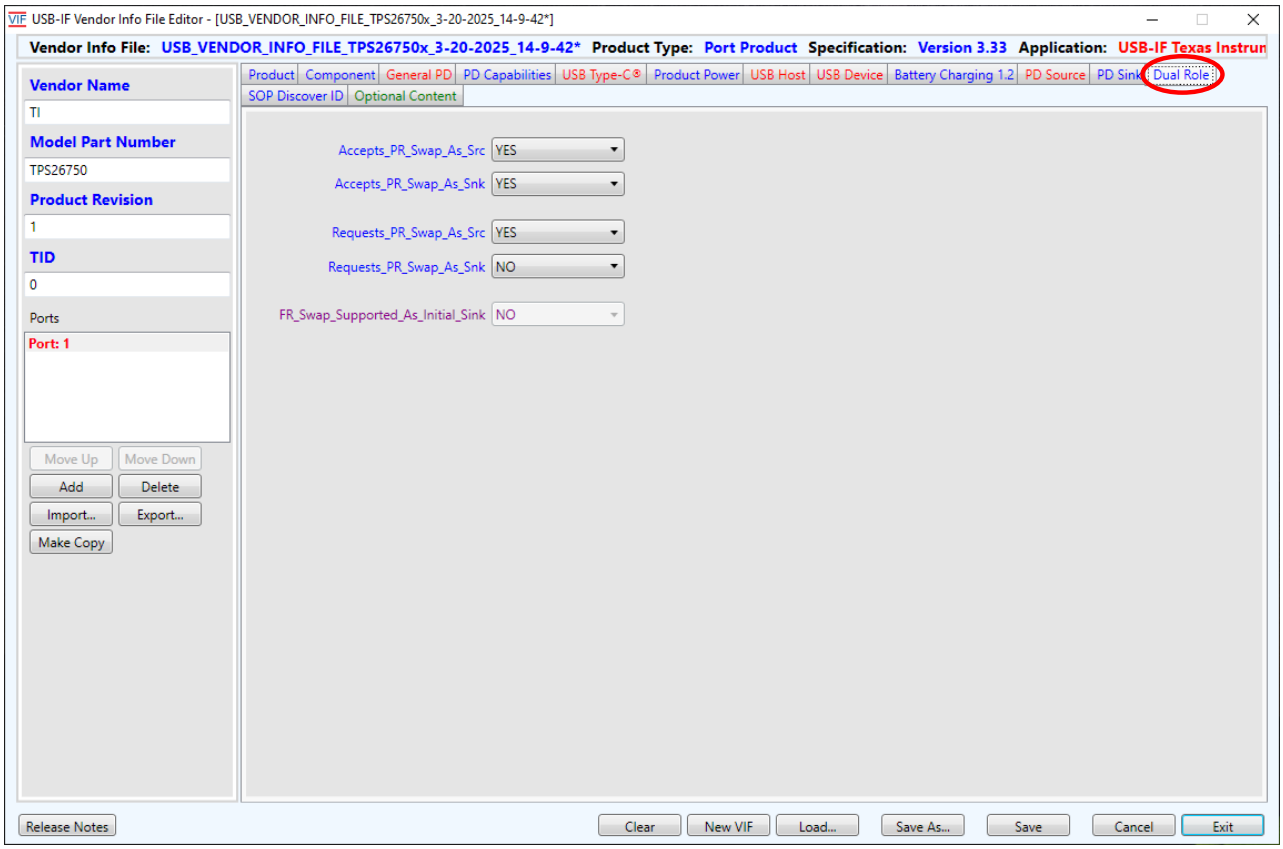

Figure 5-12. VIF Editor Dual Role Tab

Table 5-23. Dual Role Tab

VIF Field	Description
Accepts_PR_Swap_As_Src	Set based on port control (0x29) • Process swap to sink [4]
Accepts_PR_Swap_As_Snk	Set based on port control (0x29) • Process swap to source [6]
Requests_PR_Swap_As_Src	Set based on port control (0x29) • Initiate swap to sink [5]
Requests_PR_Swap_As_Snk	Set based on port control (0x29) • Initiate swap to source [7]
FR_Swap_Supported_As_Initial_Sink	Field disabled. *Not supported by TPS25751 or TPS26750.*

5.12 SOP Discover ID

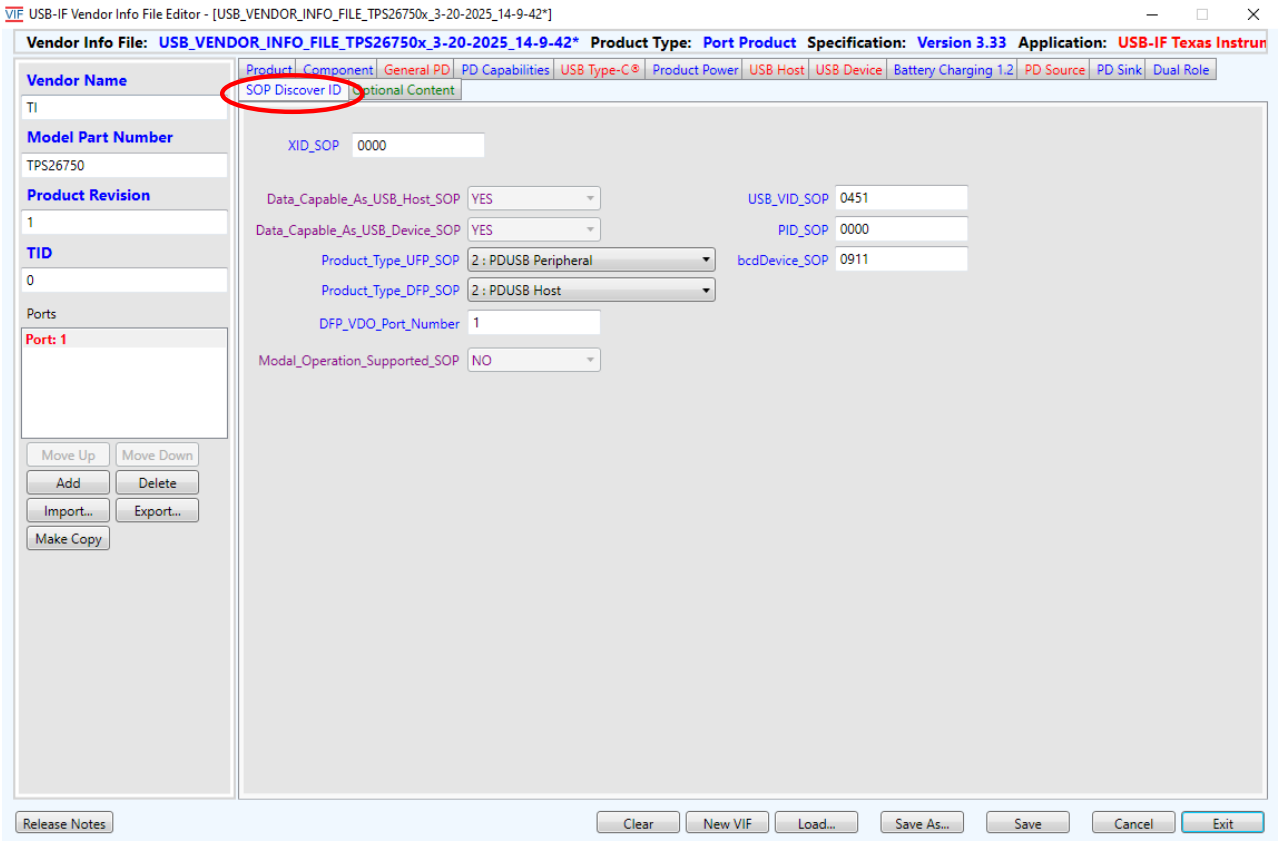

Figure 5-13. VIF Editor SOP Discover ID Tab

Table 5-24. SOP Discover ID Tab

VIF Field	Description
XID_SOP	Default set to *0x0000*. *Vendor can modify this value.*
Data_Capable_As_USB_Host_SOP	Set to based on *Type_C_Can_Act_As_Host* field in USB Type-C tab.
Data_Capable_As_USB_Device_SOP	Set to based on *Type_C_Can_Act_As_Device* field in USB Type-C tab.
Product_Type_UFP_SOP	Set based on Q6 in GUI. *0: Undefined* if *No* or *Host* selected for Q6. *2: PDUSB Peripheral* if *Device* or *Host and Device* selected for Q6.
Product_Type_DFP_SOP	Set based on Q6 in GUI. *0 : Undefined* if *No* or *Device* selected for Q6. *2: PDUSB Host* if *Host* or *Host and Device* selected for Q6,
DFP_VDO_Port_Number	Must match the value of *Port Label* field in Component tab.
Modal_Operation_Supported_SOP	Default set to *NO* and must not be modified. *Not Supported by TPS25751 or TPS26750.*
USB_VID_SOP	Set based on Q9 in GUI.
PID_SOP	Set based on Q10 in GUI.
bcdDevice_SOP	Default set to *0911* and must not be modified.

6 Summary

VIF generation is a vital step to obtain USB Type-C® PD compliance. TI VIF Generation Tool simplifies this step by generating a VIF from a user's configuration and populates the majority of the VIF. This saves users from manually generating a VIF file, accelerating compliance testing by lowering the barrier to entry for generating VIFs and reducing the number of compliance testing cycles. Users can leverage this application note to learn how to use the TI VIF Generation Tool and to obtain guidance on the configuration of the VIF fields in regards to PD controller configuration.

7 References

- USB, *USB-IF Compliance Updates*
- USB, *USB Vendor Info File Generator*
- USB, USB Power Delivery Compliance Test Specification
- USB, USB Type-C Functional Test Specification
- European Parliament, *EU Mandate for USB-C*
- Texas Instruments, USBCPD-APPLICATION-CUSTOMIZATION-TOOL
- Texas Instruments, *TPS25751 Technical Reference Manual*, technical reference manual
- Texas Instruments, *TPS26750 Technical Reference Manual*, technical reference manual

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