

How to Use TPS6598x I²C to Control TUSB564 in Monitor Design



Shang-Heng Hsieh, Dave Chang

ABSTRACT

The TPS65987D and SuperSpeed multiplexer TUSB564 design is common in UFP applications, such as a monitor and docking. The TPS65987 I²C1 and I²C3 ports can both work as an I²C controller directly to TUSB564 instead of using an external controller to do the same. This structure helps to design reliable systems without external MCU dependencies and the design reduces the system latencies in the different pin assignment selection. This application note demonstrates the settings on how to fill TUSB564 I²C indices into the *Application Customization Tool*.

Table of Contents

1 Introduction	2
2 How to set TUSB564 I²C in the Application Customization Tool	3
3 References	15

List of Figures

Figure 2-1. Power On Reset on Register 0x0A.....	3
Figure 2-2. Power On Reset on Register 0x13.....	3
Figure 2-3. Cable Attach CC_1 PD.....	4
Figure 2-4. Cable Attach CC_1 PD.....	4
Figure 2-5. Cable Attach CC_2_PD.....	5
Figure 2-6. Cable Attach CC_2_PD.....	5
Figure 2-7. DisplayPort Pin Config A, C or E CC_1 PD.....	6
Figure 2-8. DisplayPort Pin Config A, C or E CC_1 PD.....	6
Figure 2-9. DisplayPort Pin Config A, C or E CC_2 PD.....	7
Figure 2-10. DisplayPort Pin Config A, C or E CC_2 PD.....	7
Figure 2-11. DisplayPort Pin Config B, D or F CC_1 PD.....	8
Figure 2-12. DisplayPort Pin Config B,D or F CC_1 PD.....	8
Figure 2-13. DisplayPort Pin Config B,D or F CC_2PD.....	9
Figure 2-14. DisplayPort Pin Config B,D or F CC_2PD.....	9
Figure 2-15. DisplayPort Exited C CC_1 PD.....	10
Figure 2-16. DisplayPort Exited C CC_1 PD.....	10
Figure 2-17. DisplayPort Exited C CC_2 PD.....	11
Figure 2-18. DisplayPort Exited C CC_2 PD.....	11
Figure 2-19. Detach.....	12
Figure 2-20. Detach.....	12
Figure 2-21. DisplayPort Pin Config E CC_1 PD.....	13
Figure 2-22. DisplayPort Pin Config E CC_2 PD.....	13

List of Tables

Table 2-1. TUSB564 I ² C Command Index Summary Table.....	14
--	----

Trademarks

USB Type-C[®] is a registered trademark of USB Implementers Forum.
All trademarks are the property of their respective owners.

1 Introduction

The TPS65987D device contains several different digital interfaces which can communicate with other devices. The available interfaces include three I²C ports (I2C1 is a Controller|Target, I2C2 is a Target, and I2C3 is a Controller). The TUSB564 device is a VESA USB Type-C[®] alternate mode redriving switch supporting USB 3.1 and DisplayPort 1.4 for sink port. Two registers, 0x0A and 0a13, must be updated in different USB and DisplayPort assignments. The TUSB564 device does not natively support DisplayPort Sink assignment E, the AUX routing settings of TUSB564 are listed in Index 21 and 22. For more details about the registers, see the [TUSB564, HD3SS460 and TS3USBCA410 Pin Assignment C and E Implementation](#) application note.

2 How to set TUSB564 I²C in the Application Customization Tool

Configure a project and I²C controller background setting as discussed in the [Using I2C Master in TPS65987D and TPS65988 PD Controllers](#) application note. There are a total of 22 record indices in the *App Configuration Data Table* window as shown in the following images. During a Power On Reset event, the multiplexer is disabled. Therefore, data for the Record Indices 1 and 2 corresponding to these events have 0x000A and 0x8013.

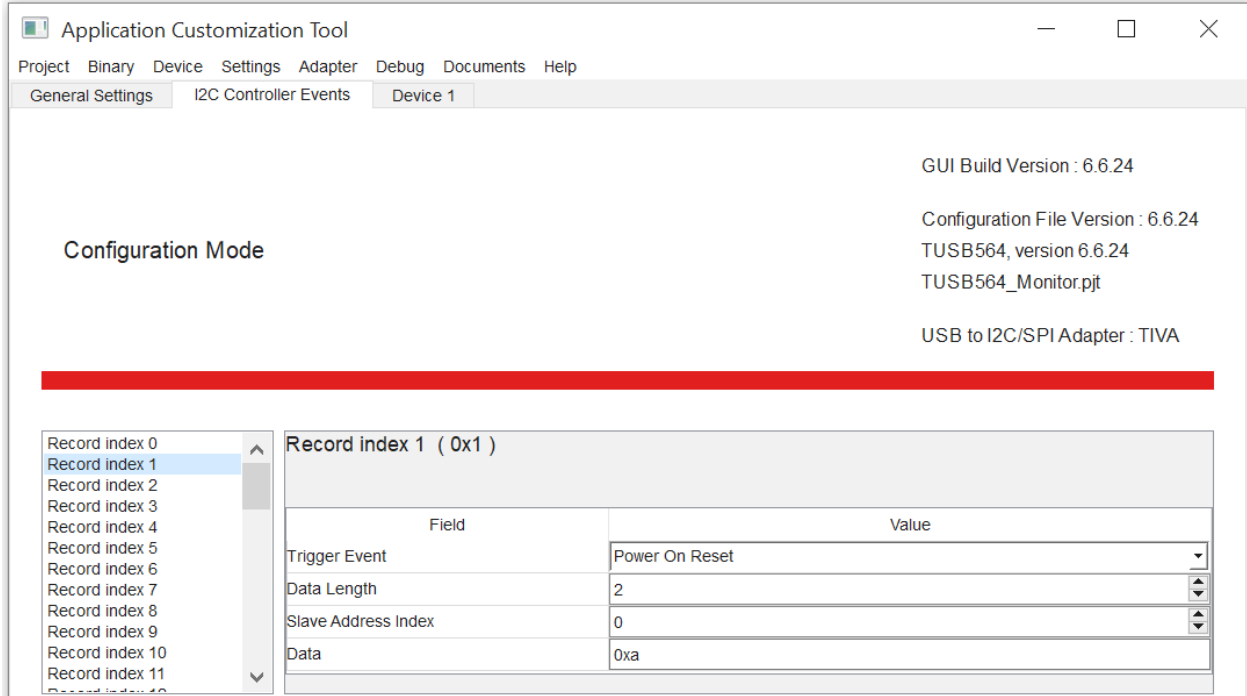


Figure 2-1. Power On Reset on Register 0x0A

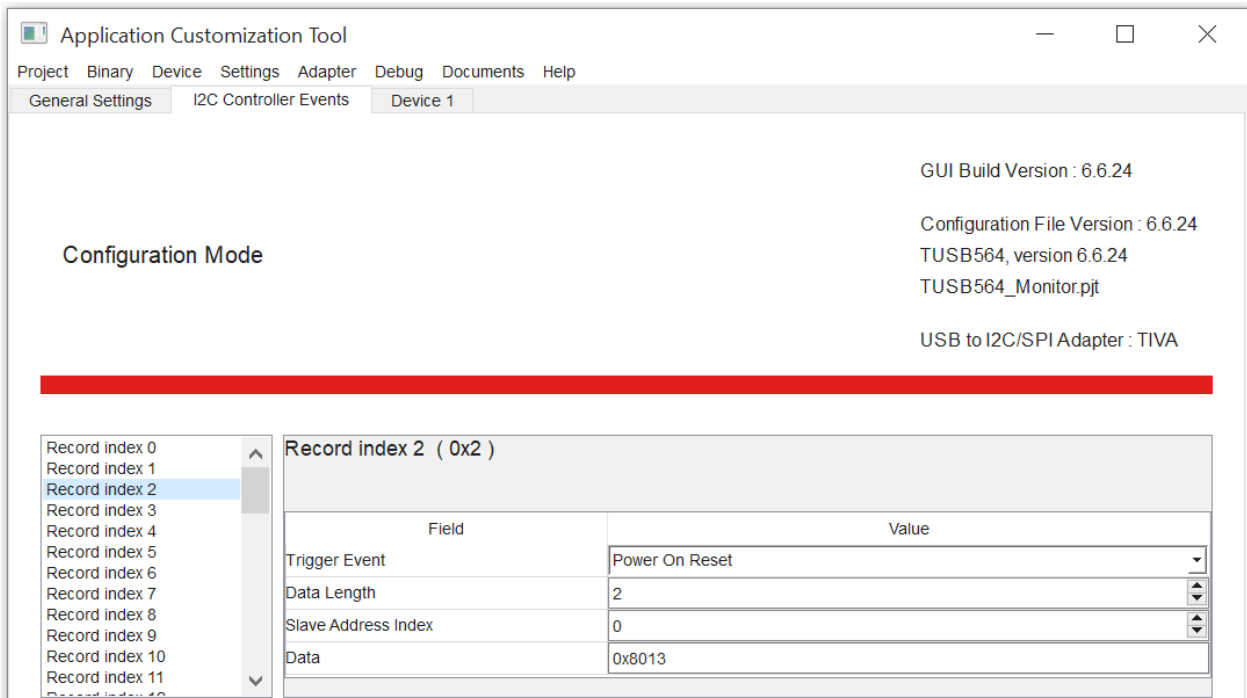


Figure 2-2. Power On Reset on Register 0x13

For Cable Attach CC_1 PD event data in the Record Indices 3 and 5 are 0x110A and 0x8013, respectively.

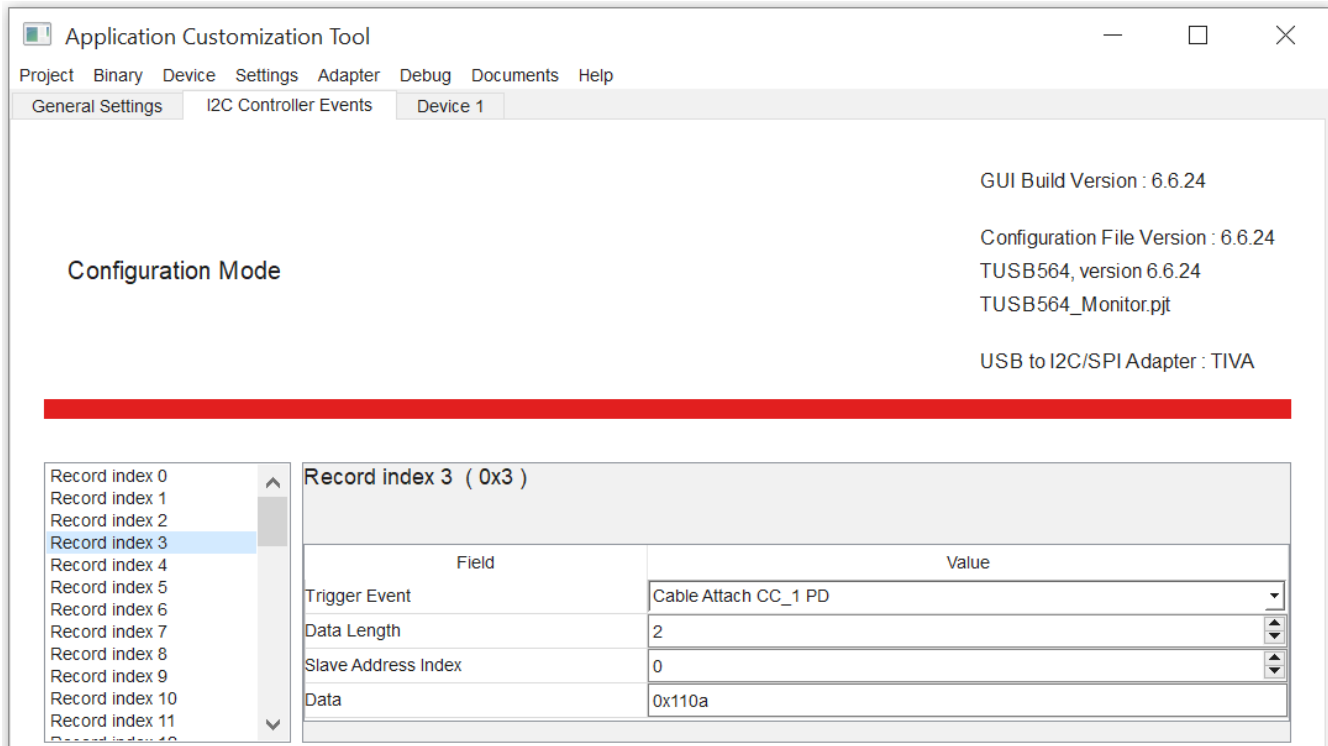


Figure 2-3. Cable Attach CC_1 PD

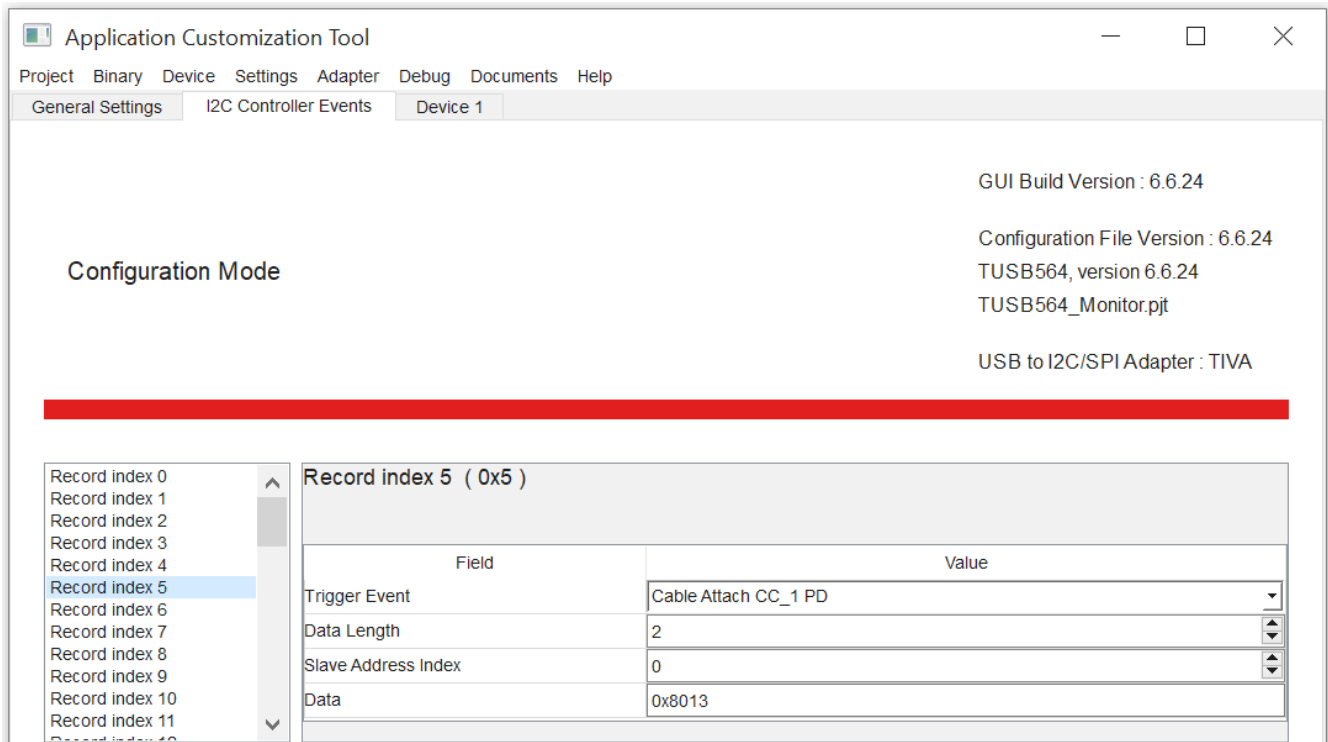


Figure 2-4. Cable Attach CC_1 PD

For Cable Attach CC_2 PD event data in the Record Indices 4 and 6 are 0x150A and 0x8013, respectively.

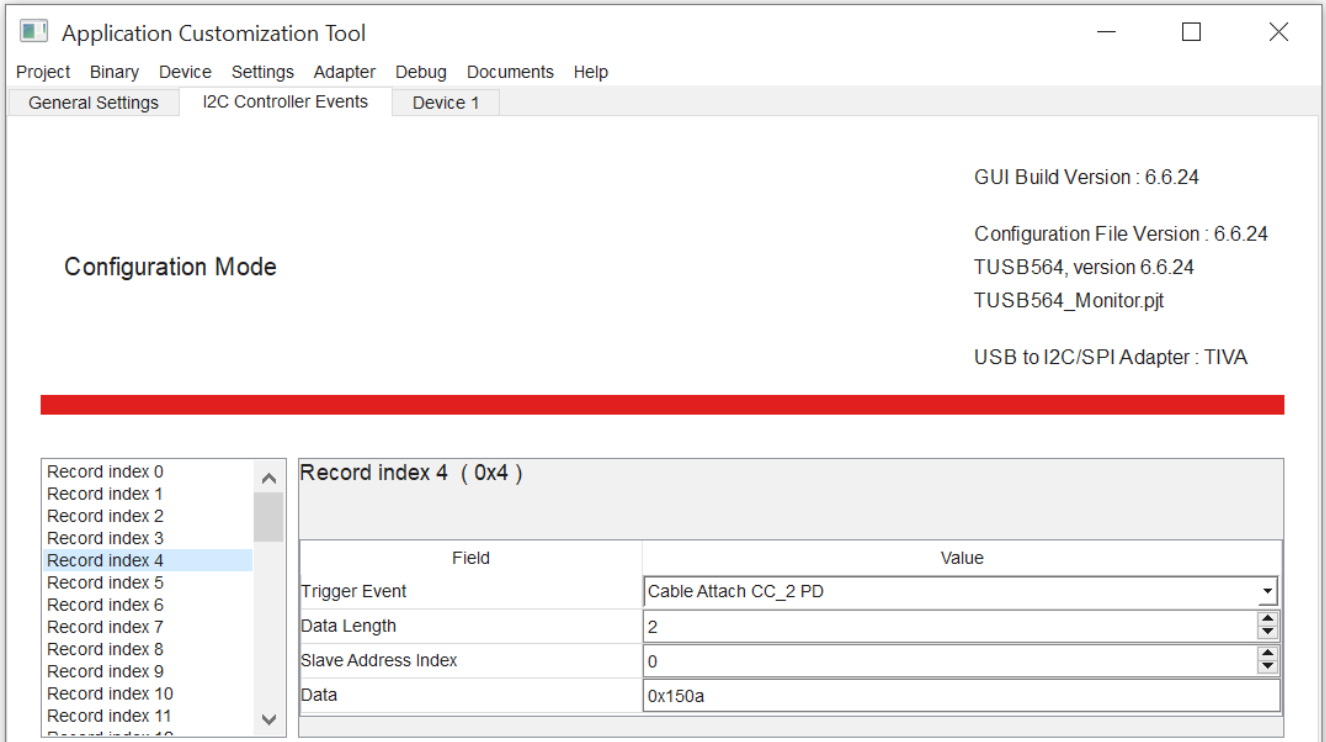


Figure 2-5. Cable Attach CC_2_PD

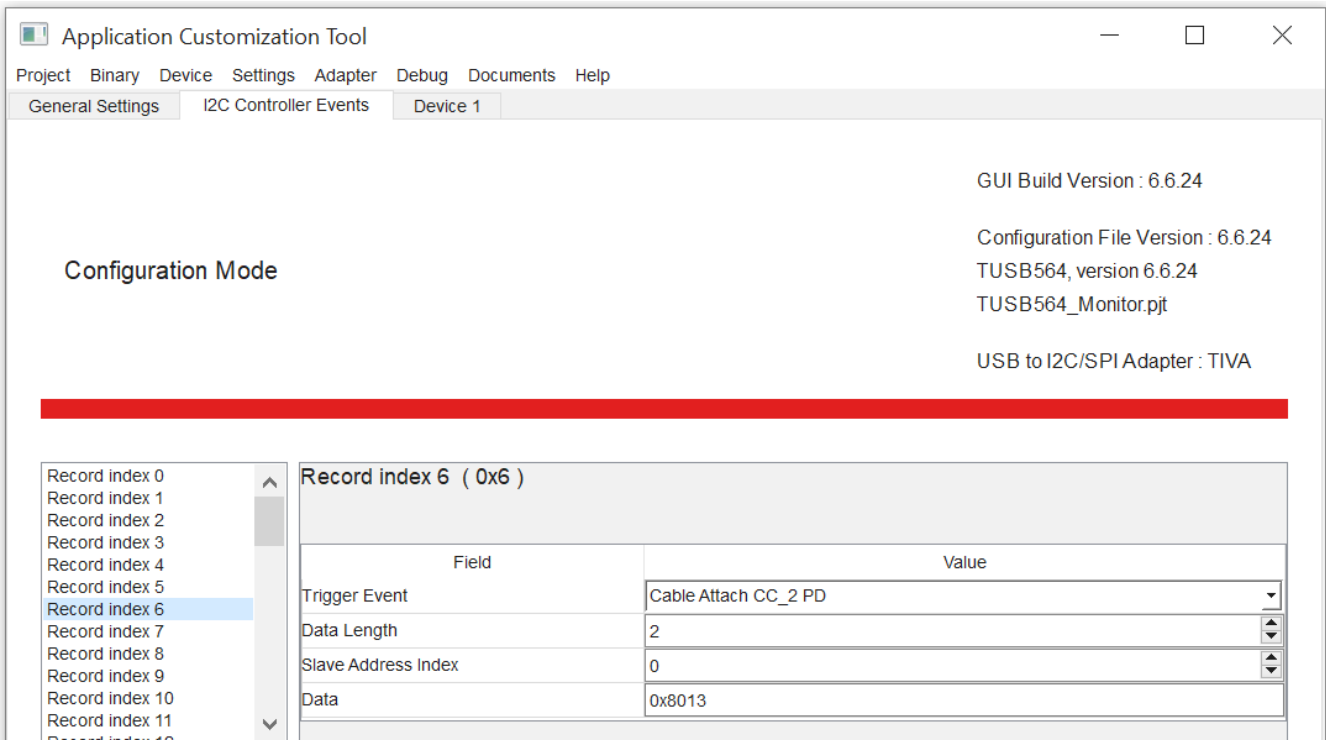


Figure 2-6. Cable Attach CC_2_PD

For DisplayPort Pin Configuration A, C or E CC_1 PD event the data sent to the MUX in the Record Indices 7 and 8 are 0x120A and 0x8013, respectively.

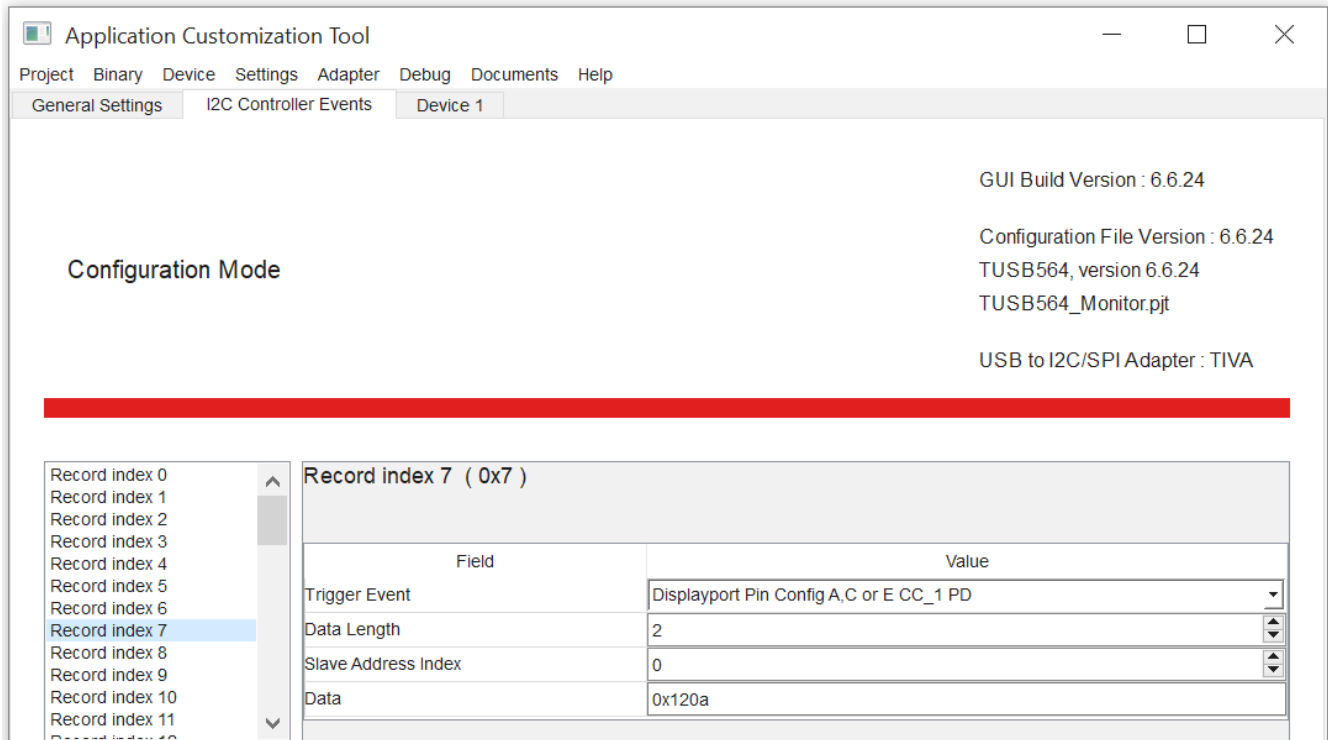


Figure 2-7. DisplayPort Pin Config A, C or E CC_1 PD

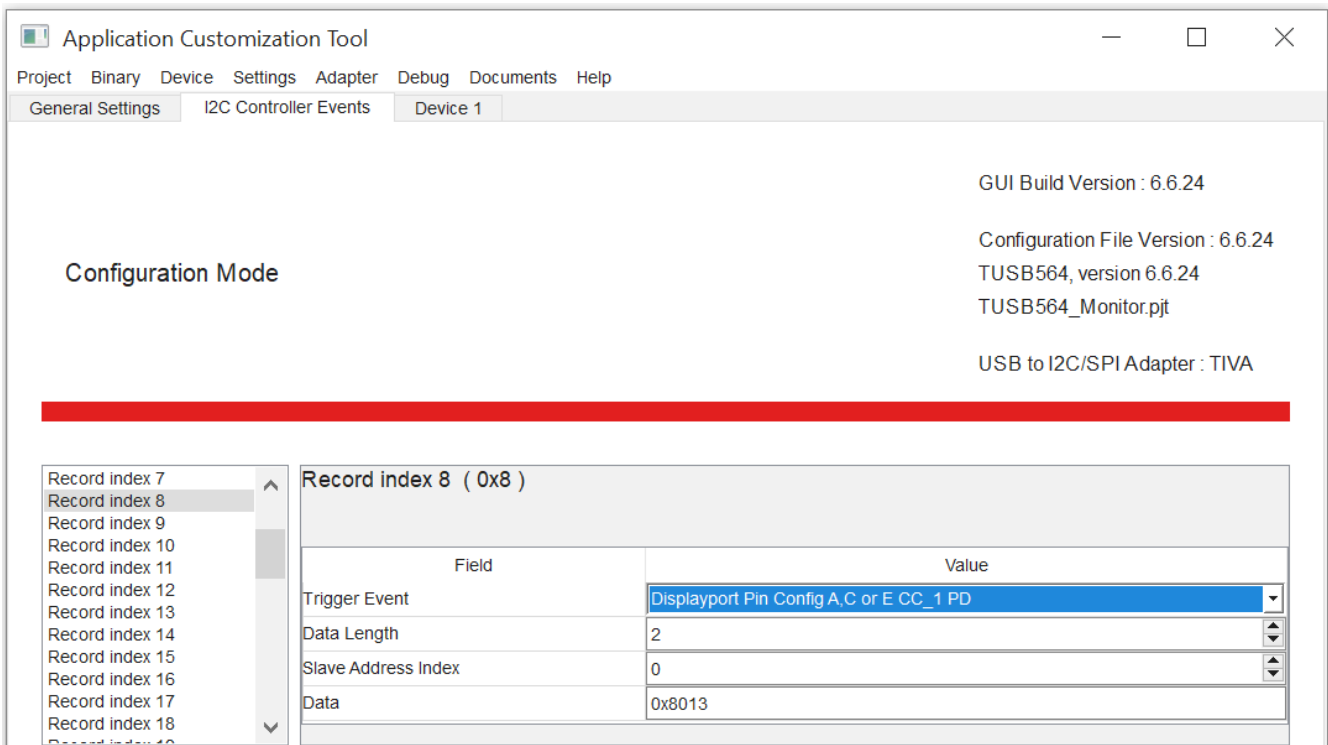


Figure 2-8. DisplayPort Pin Config A, C or E CC_1 PD

For DisplayPort Pin Configuration A, C or E CC_2 PD event the data sent to the MUX in the Record Indices 9 and 10 are 0x160A and 0x8013, respectively.

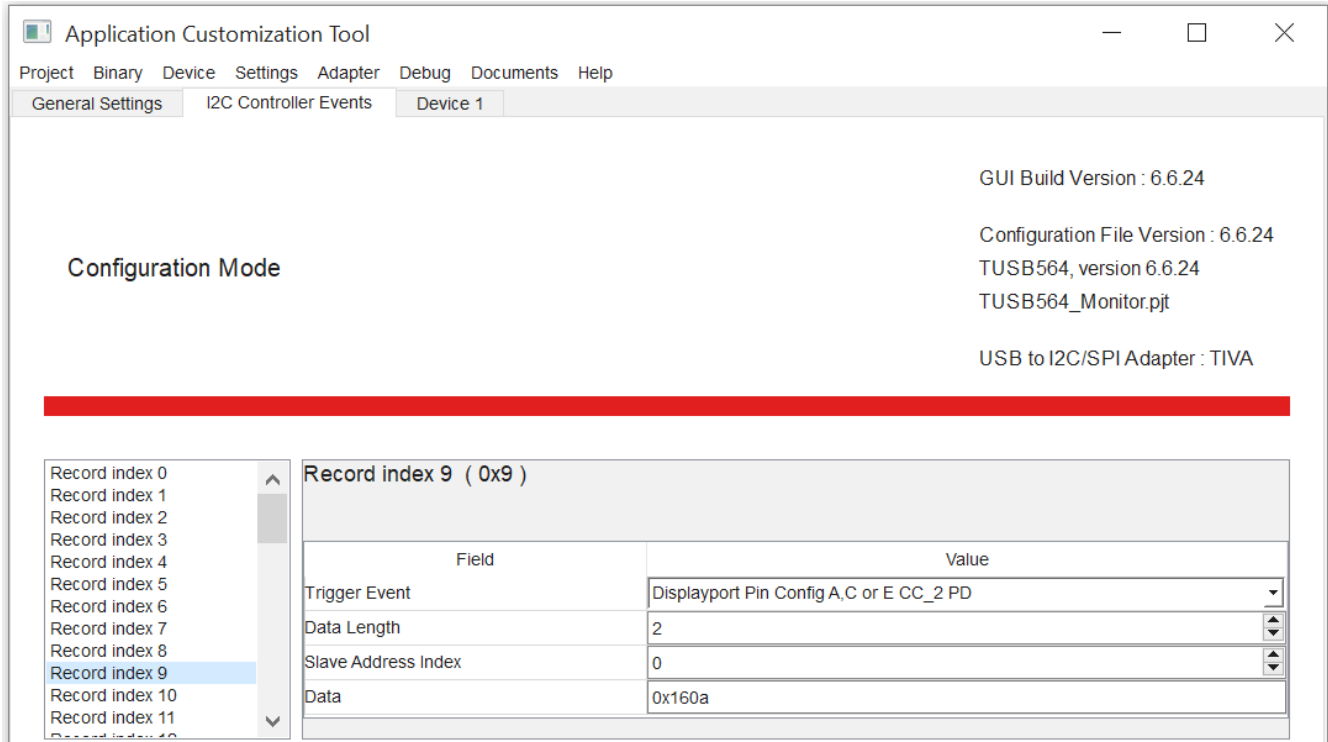


Figure 2-9. DisplayPort Pin Config A, C or E CC_2 PD

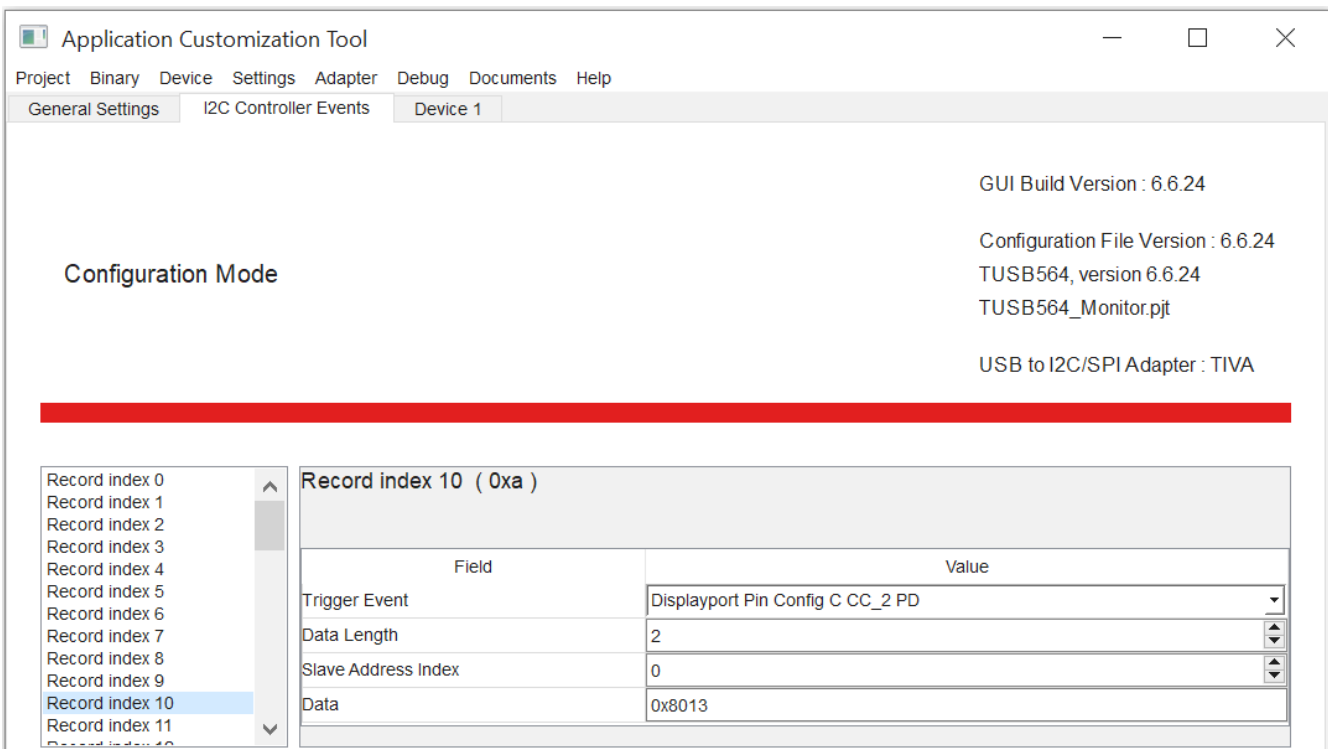


Figure 2-10. DisplayPort Pin Config A, C or E CC_2 PD

For DisplayPort Pin Configuration B, D or F CC_1 PD event the data sent to the MUX in the Record Indices 11 and 12 can be 0x030A and 0x8013, respectively.

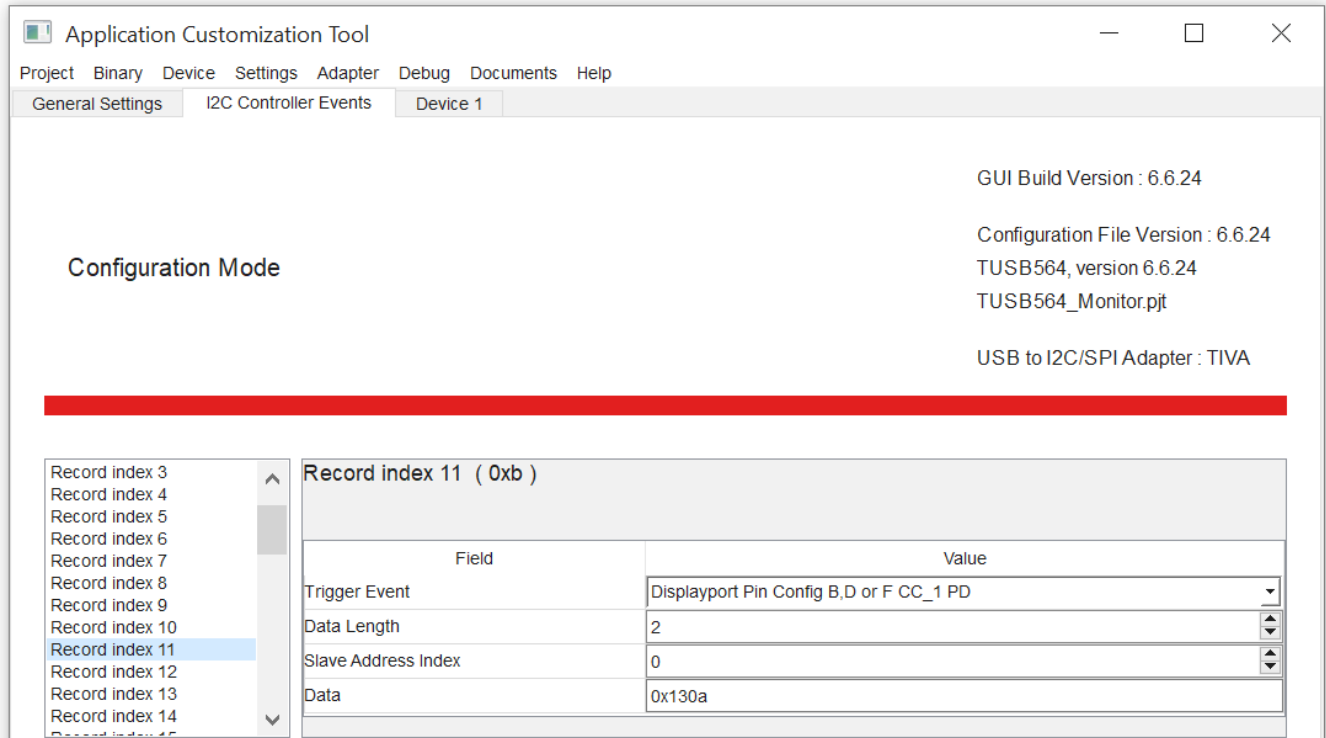


Figure 2-11. DisplayPort Pin Config B, D or F CC_1 PD

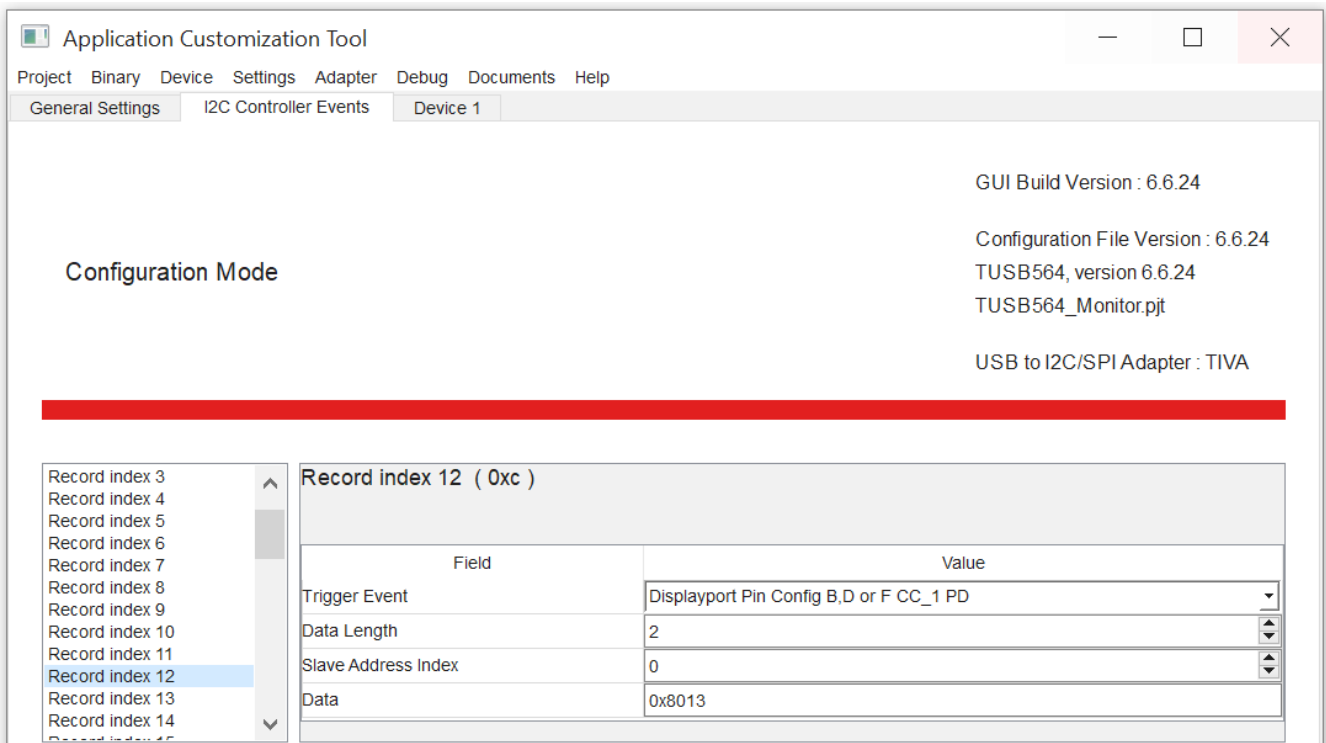


Figure 2-12. DisplayPort Pin Config B,D or F CC_1 PD

For DisplayPort Pin Configuration B, D or F CC_2 PD event the data sent to the MUX in the Record Indices 13 and 14 are 0x070A and 0x8013, respectively.

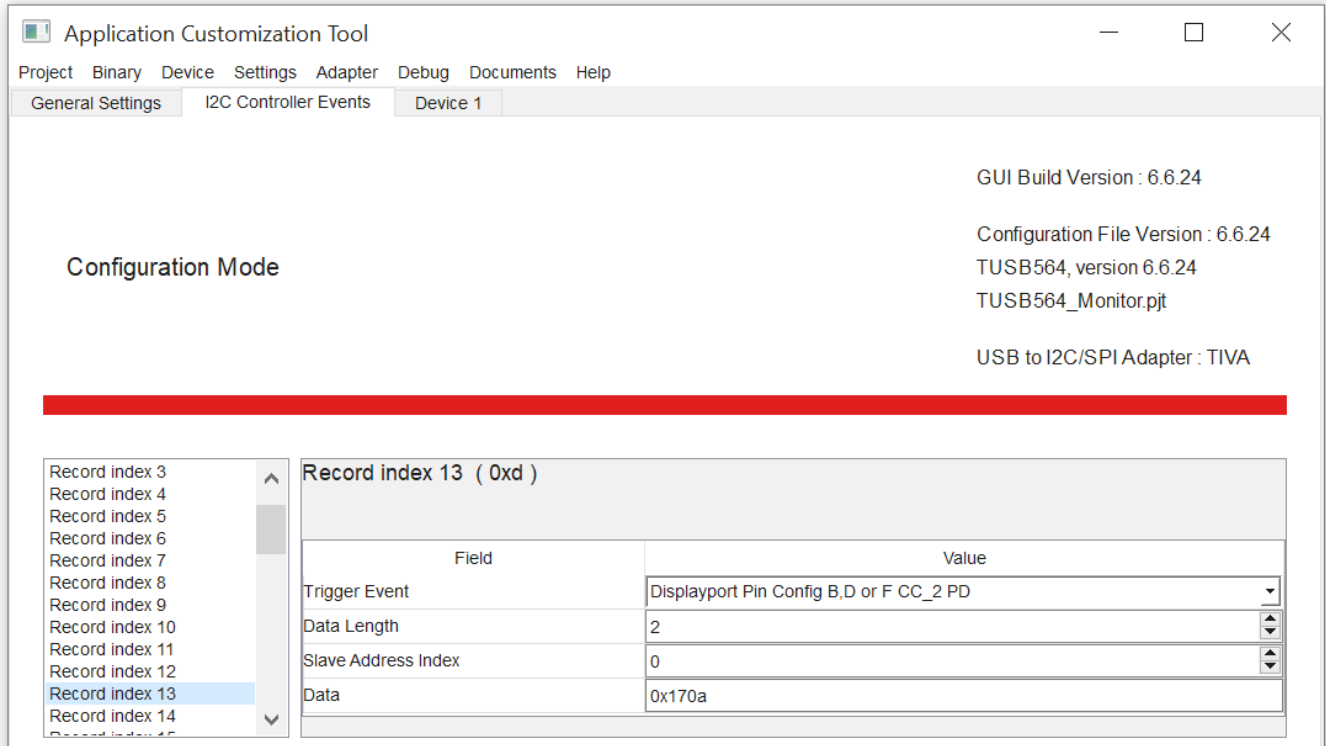


Figure 2-13. DisplayPort Pin Config B,D or F CC_2PD

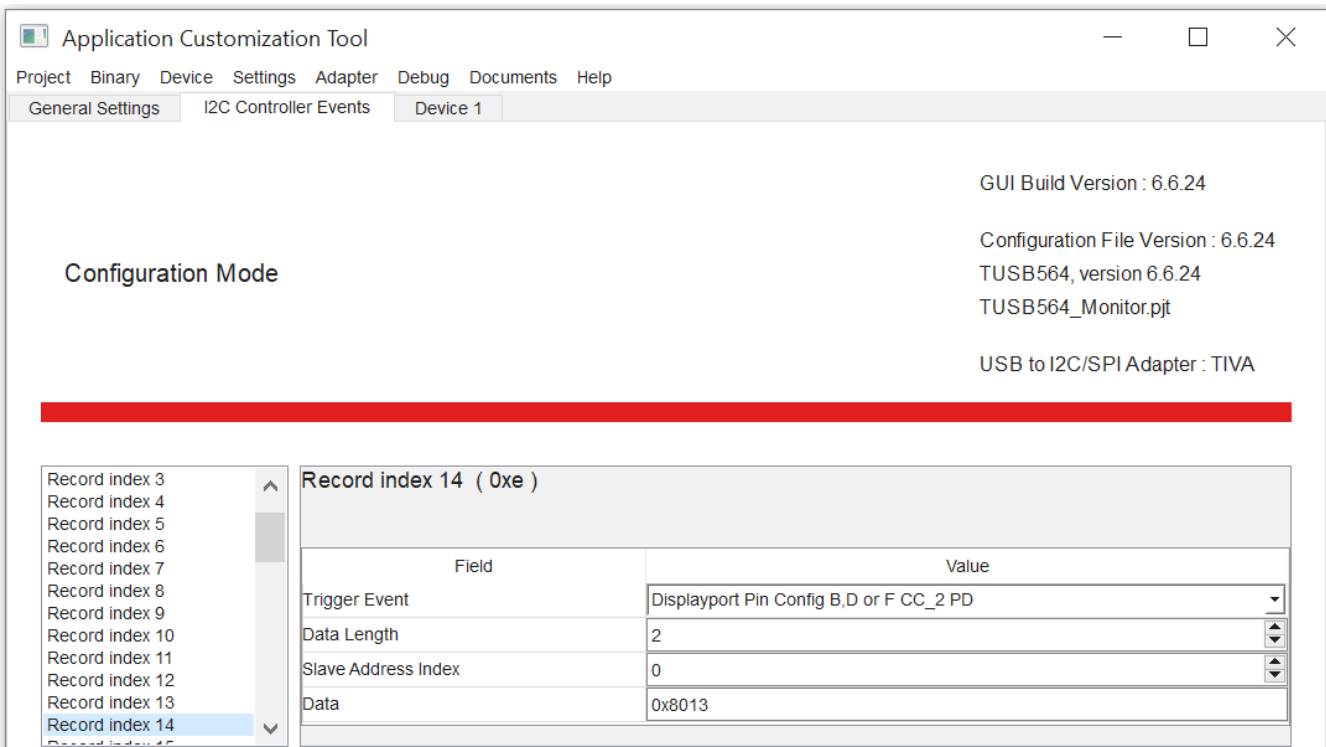


Figure 2-14. DisplayPort Pin Config B,D or F CC_2PD

For DisplayPort Exited CC_1 PD event data in the Record Indices 15 and 16 can be 0x110A and 0x8013, respectively.

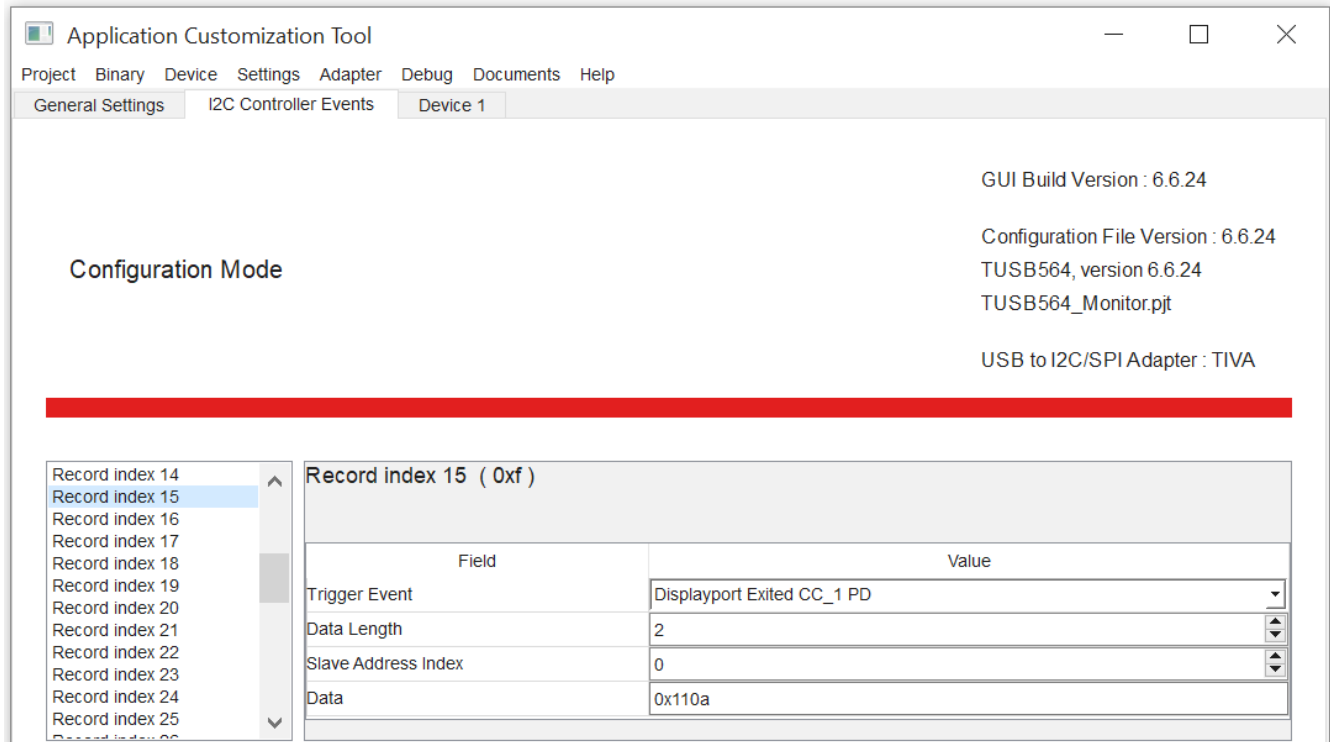


Figure 2-15. DisplayPort Exited C CC_1 PD

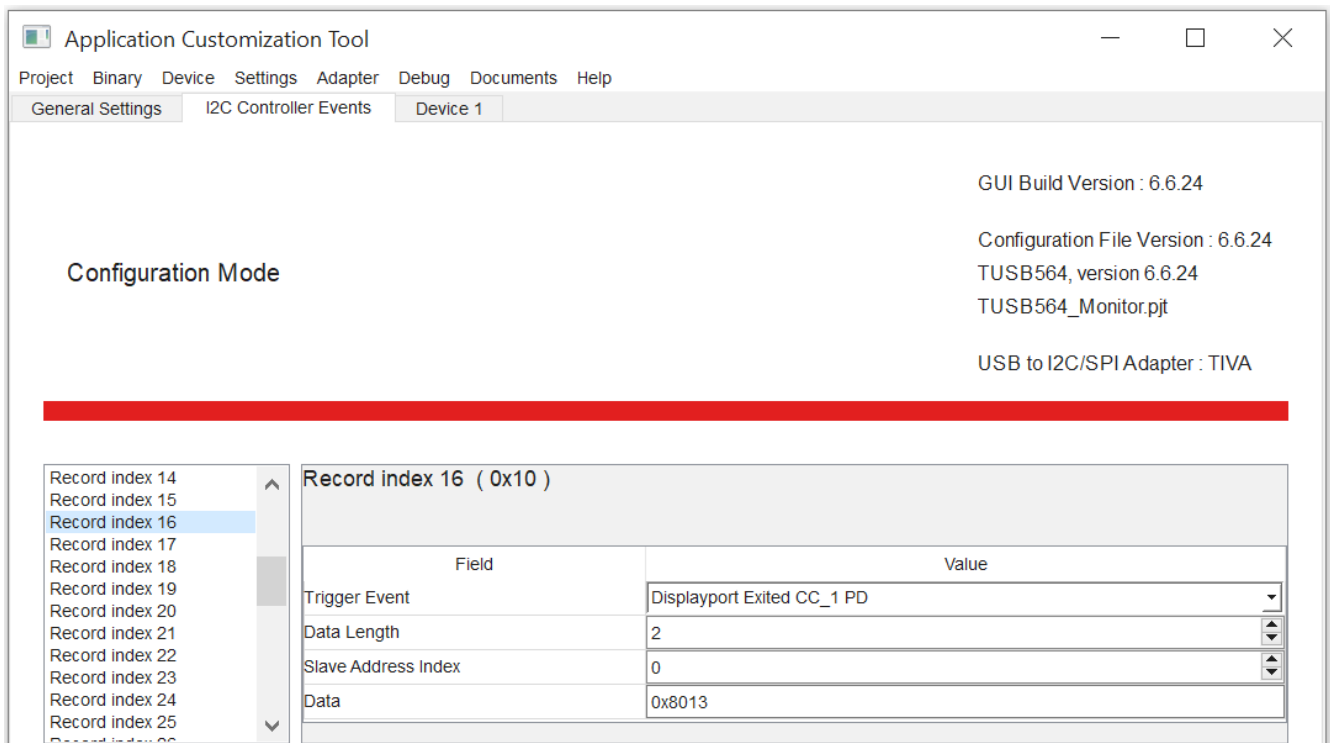


Figure 2-16. DisplayPort Exited C CC_1 PD

For DisplayPort Exited CC_2 PD event data in the Record Indices 17 and 18 can be 0x150A and 0x8013, respectively.

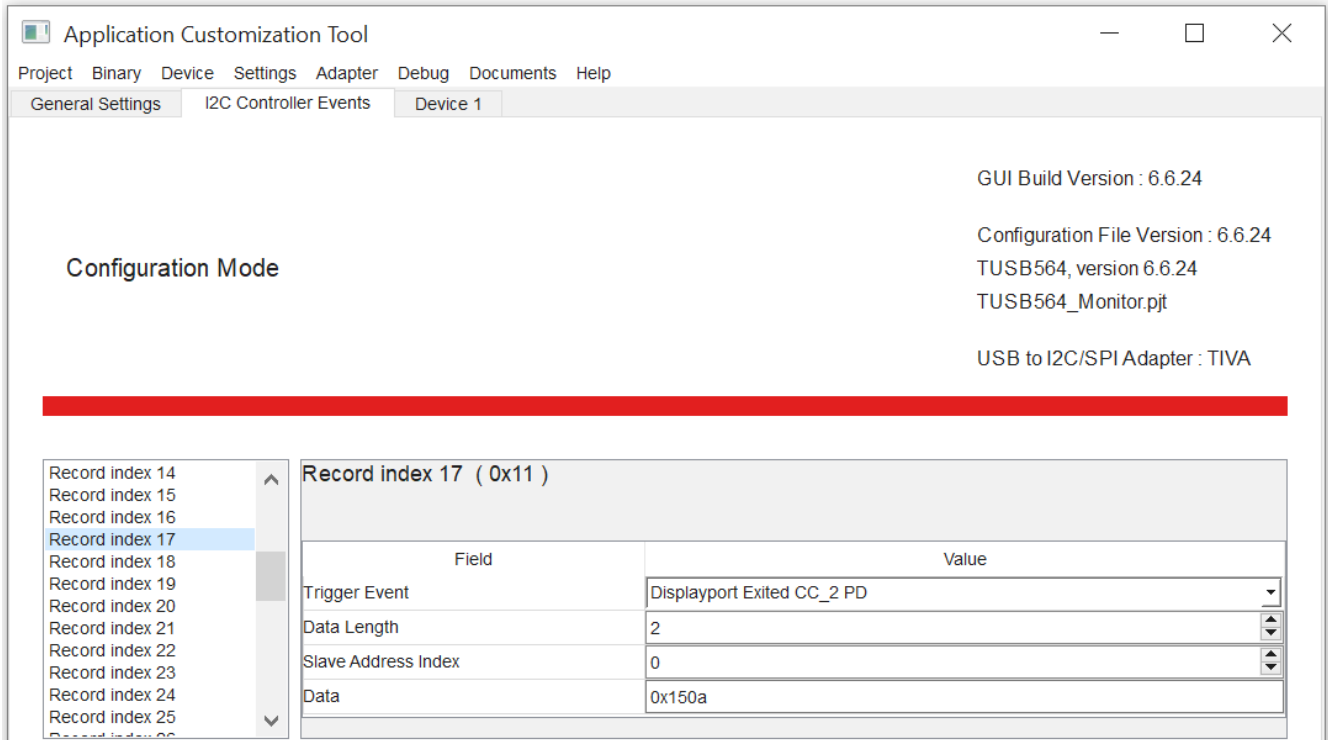


Figure 2-17. DisplayPort Exited C CC_2 PD

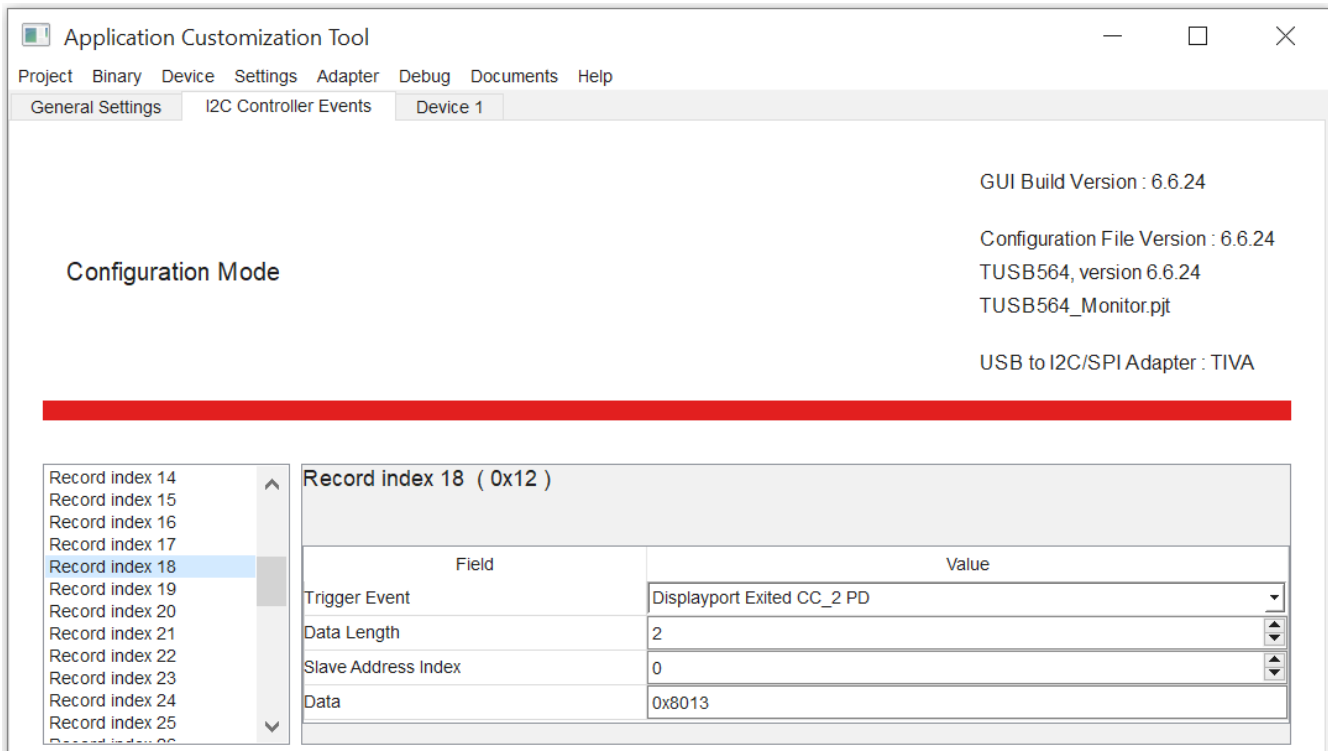


Figure 2-18. DisplayPort Exited C CC_2 PD

For Detach and Hard Reset event, disable the multiplexer. Therefore, data for the Record Indices 19 and 20 corresponding to these events are 0x000A and 0x8013, respectively.

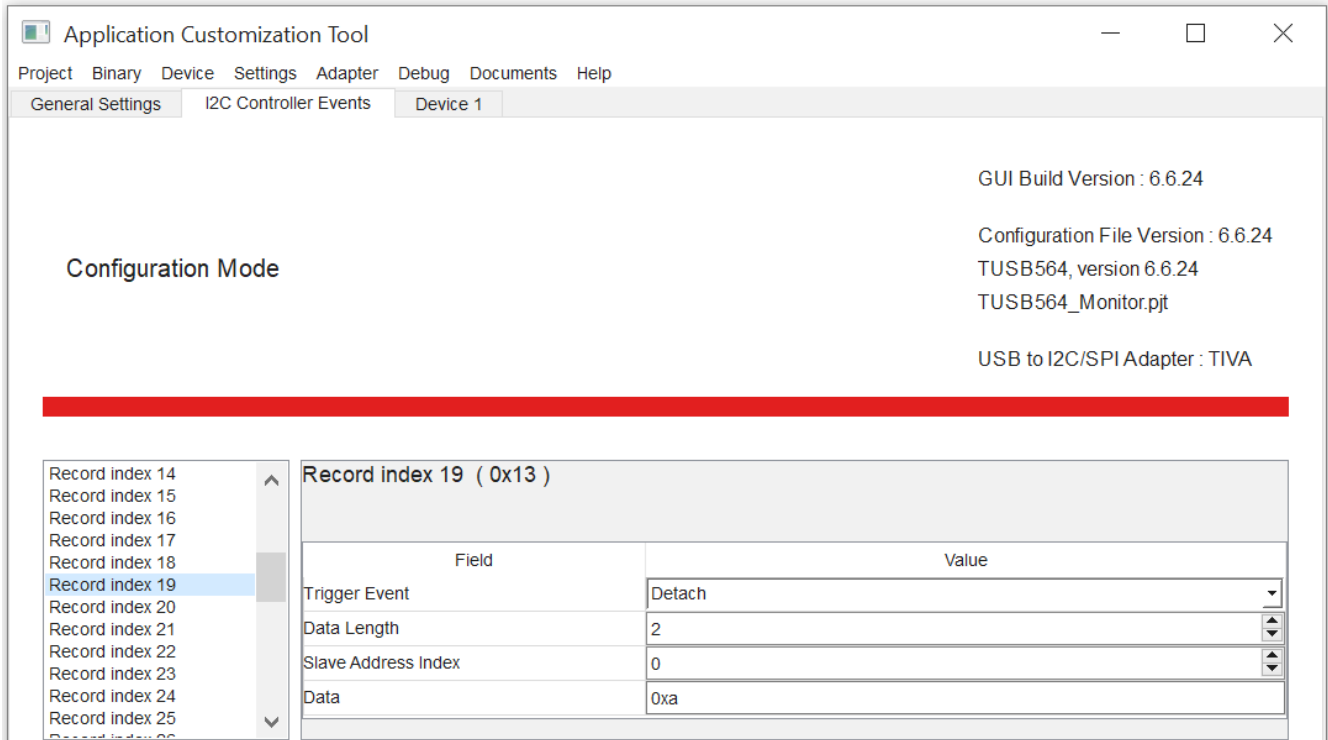


Figure 2-19. Detach

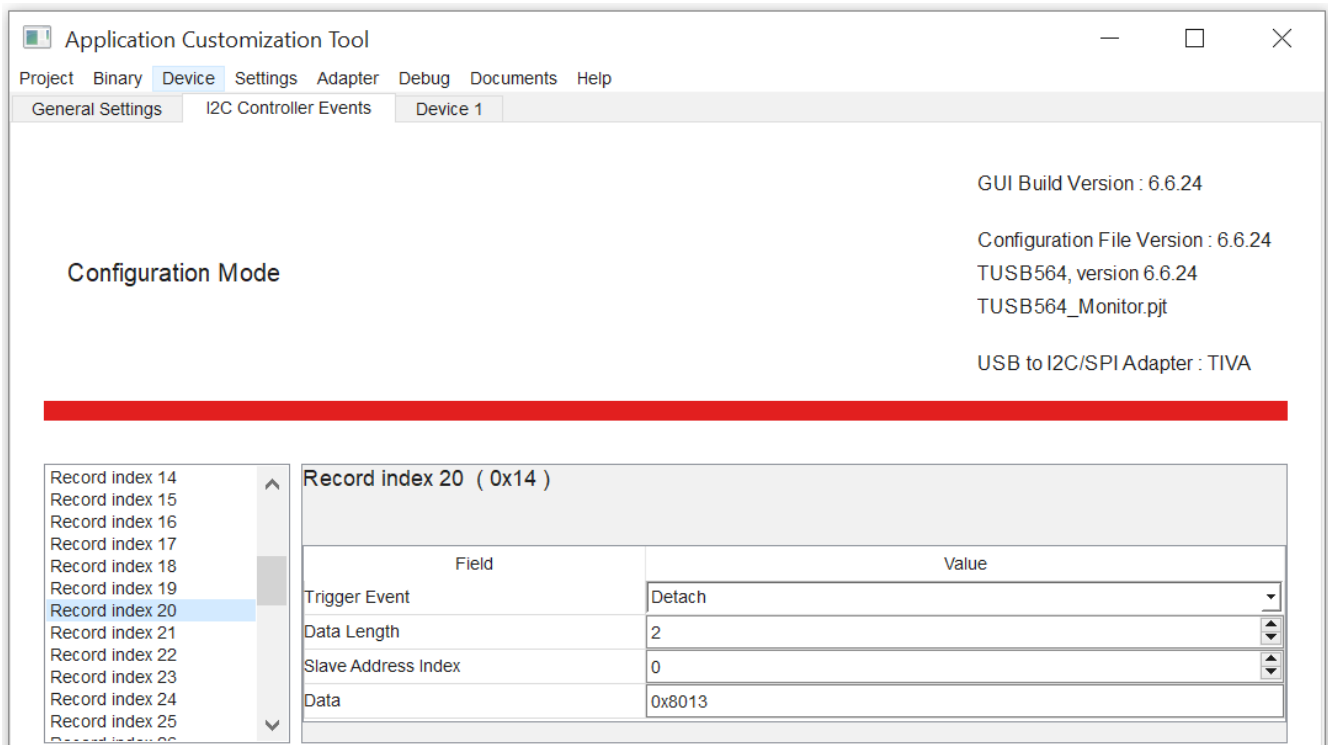


Figure 2-20. Detach

For DisplayPort Pin Configuration E CC_1 PD event, the data sent to the MUX in the Record Indices 21 is 0xa013.

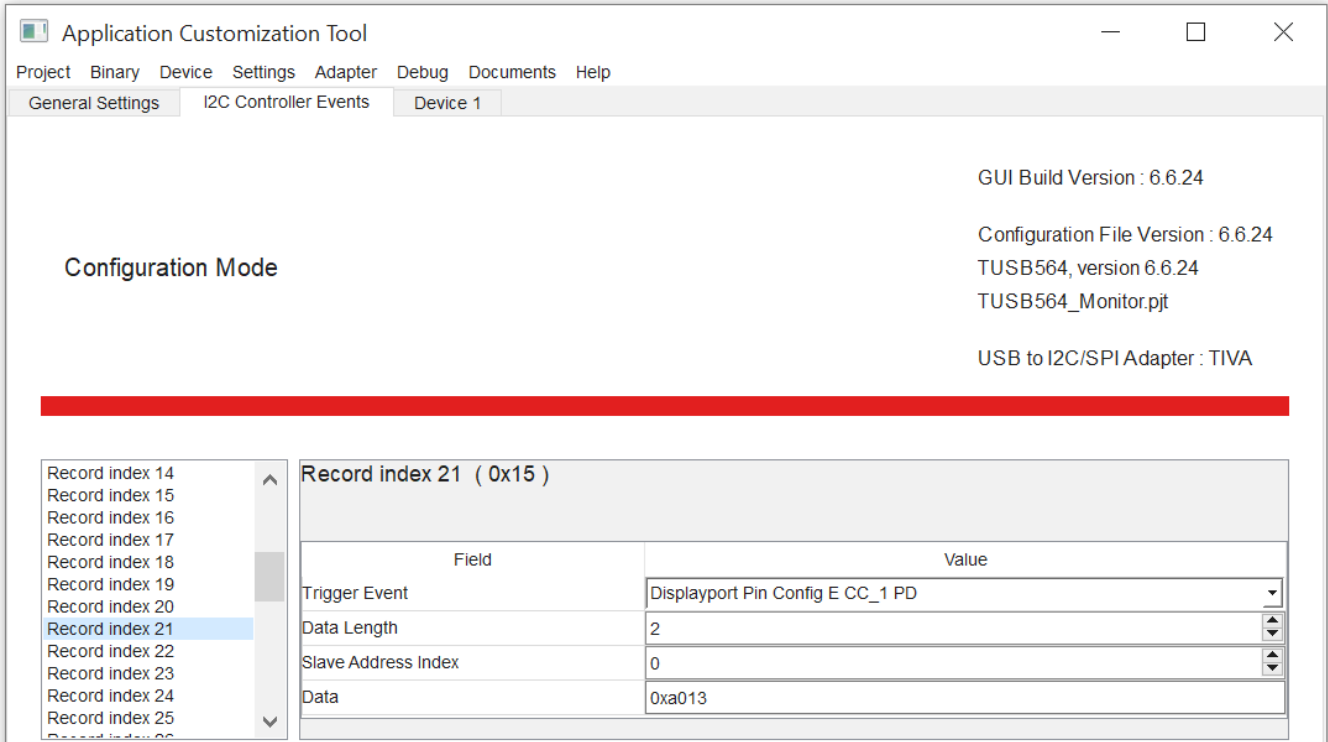


Figure 2-21. DisplayPort Pin Config E CC_1 PD

For DisplayPort Pin Configuration E CC_2 PD event, the data sent to the MUX in the Record Indices 21 is 0x9013.

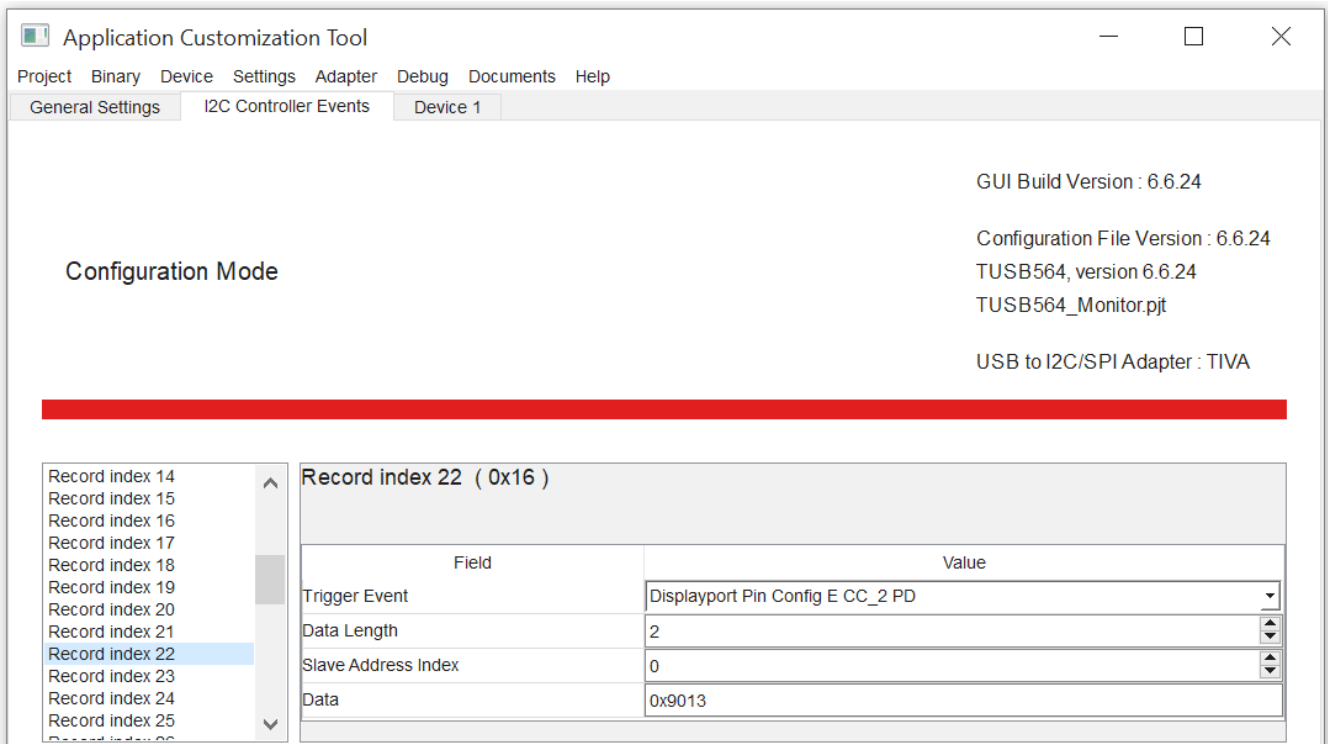


Figure 2-22. DisplayPort Pin Config E CC_2 PD

Table 2-1 displays the summary on the 22 index settings in the I2C table.

Table 2-1. TUSB564 I2C Command Index Summary Table

	Trigger Event	Register	Value
Index1	Power On Reset	A	0
Index2	Power On Reset	13	80
Index3	Cable Attach CC_1 PD	0A	11
Index4	Cable Attach CC_2_PD	0A	15
Index5	Cable Attach CC_1 PD	13	80
Index6	Cable Attach CC_2_PD	13	80
Index7	DisplayPort Pin Config A, C or E CC_1 PD	0A	12
Index8	DisplayPort Pin Config A, C or E CC_1 PD	13	80
Index9	DisplayPort Pin Config A, C or E CC_2 PD	0A	16
Index10	DisplayPort Pin Config A, C or E CC_2 PD	13	80
Index11	DisplayPort Pin Config B, D or F CC_1 PD	0A	13
Index12	DisplayPort Pin Config B, D or F CC_1 PD	13	80
Index13	DisplayPort Pin Config B, D or F CC_2PD	0A	17
Index14	DisplayPort Pin Config B, D or F CC_2PD	13	80
Index15	DisplayPort Exited C CC_1 PD	0A	11
Index16	DisplayPort Exited C CC_1 PD	13	80
Index17	DisplayPort Exited C CC_2 PD	0A	15
Index18	DisplayPort Exited C CC_2 PD	13	80
Index19	Detach	A	0
Index20	Detach	13	80
Index21	DisplayPort Pin Config E CC_1 PD	13	A0
Index22	DisplayPort Pin Config E CC_2 PD	13	90

3 References

- Texas Instruments, [TPS65987D USB Type-C® and USB PD Controller with Integrated Source and Sink Power Path Supporting USB3 and Alternate Mode](#) data sheet
- Texas Instruments, [TUSB564 USB Type-C DP Alt Mode 8.1 Gbps Sink-Side Linear Redriver Crosspoint Switch](#) data sheet
- Texas Instruments, [Using I2C Master in TPS65987D and TPS65988 PD Controllers](#) application note
- Texas Instruments, [PD Alternate Mode: DisplayPort](#) application note

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](#) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2022, Texas Instruments Incorporated