ES_PTN5110NTHQ

PTN5110NTHQ errata sheet

Rev. 1.0 — 19 October 2020   **Errata sheet**

Document information

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Keywords	PTN5110NTHQ errata
Abstract	Errata sheet for PTN5110NTHQ

1   PTN5110NTHQ errata #1: Device presents Rd when not powered

1.1   Introduction

Recently we discovered that PTN5110NTHQ failed Lecroy Type-C compliance test TD 4.1.2 (CC Unpowered Voltage Test).

TD 4.1.2 Unpowered CC Voltage Test	**Fail**	
Rp Default	Fail	The PUT's CC voltage is not in vOPEN range.
Rp 1.5A	Fail	The PUT's CC voltage is not in vOPEN range.
Rp 3A	Fail	The PUT's CC voltage is not in vOPEN range.

1.2   Investigation

During this test power is removed from the DUT (device under test), and the tester then presents Rp on CC1 and CC2. The tester then checks the DC voltage on CC1 and CC2, and if the DC voltage on CC1 or CC2 drops down to Vrd range then the test fails. If the DC voltage on CC1 and CC2 remains within Vopen then the test passes.

PTN5110NTHQ fails TD 4.1.2 because Rd is presented on both CC1 and CC2 when the device is not powered by either VBUS or VDD. During the test, Rd on CC1 or CC2 will pull the DC voltage down to within Vrd range.

PTN5110NTHQ is a DFP, power source Type-C/PD device and it should always present high impedance on CC1 and CC2 when it is not powered. But because of a design requirement to support dead battery in other devices in the PTN5110/PTN5110N family, PTN5110NTHQ would present Rd instead of high impedance when it is not powered.

1.3   Workaround

To workaround this issue, CC pins must be isolated from the Type-C connector whe n the device is not powered, and when the device is powered CC pins must be connected to the Type-C connector. The proposal is to insert one N-channel MOSFET between each CC pin and the Type-C connector. The N-channel MOSFETs would be off when the board is not powered and switches to on when the board is powered. Such a circuit is shown below:
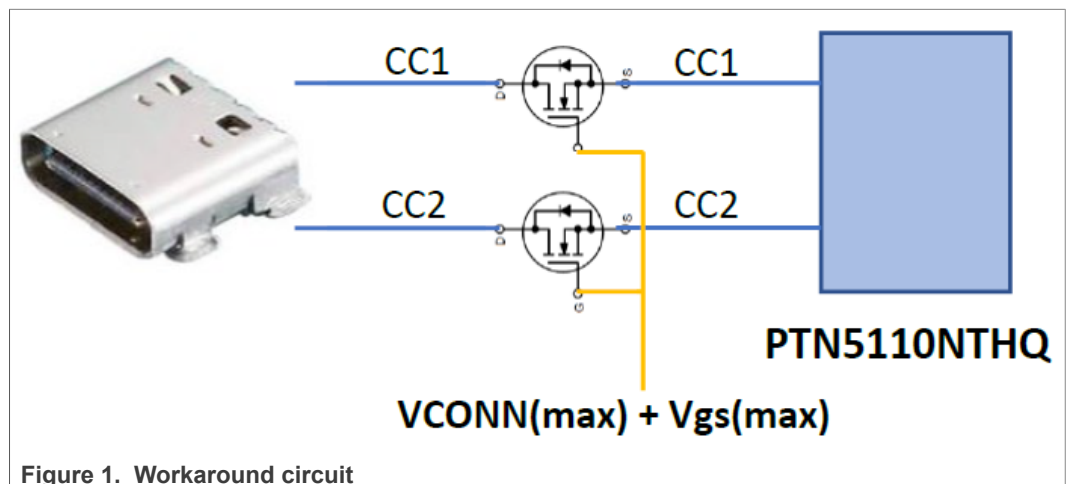

Figure 1. Workaround circuit

Since CC signals are use for communication between DFP and UFP, as well as to provide VCONN to accessory devices, the gate of the N-channel MOSFETs must be as least VCONN (max)+Vgs(th)(max) to pass VCONN through. Optimally, the gate voltage should be as high as possible to minimize Ron of the N-channel MOSFET. If VCONN is not supported by the design, then the gate can be connected to 3.3V if Vgs(max) is approximately 1V.

Choosing the right N-channel MOSFET is a trade-off between the maximum gate voltage, maximum drain continuous current, maximum Rds(on). The smaller package such as SOT-523 normally has lower Vgs and lower drain current as well as Rds(on). And if a smaller package is referred then drain current, Rds(on) and Vgs must be taken into consideration when selecting the N-channel MOSFET. For example, if the selected device has lower Vgs(max) than an available voltage rail to turn on the device, then a resistor divider can be used to bring Vgs to within an acceptable level.

Below are the recommended N-channel MOSFETs with a standard SOT-23 package and a smaller package. Similar devices can be chosen from a different manufacturer.

Manufacturer Part Number Vgs(th)(max) Ron @ Vgs Id (max) Vgs(max) Package

- MCC SI3134KE-TP 1.1V 0.380 @ 4.5V 0.75A +/-12V SOT-523
- On Semi MGSF1N03 2.4V 0.100 @ 10V 2.4A +/-20V SOT-23

1.4 Conclusion

Lecroy Type-C compliance test TD 4.1.2 (CC Unpowered Voltage Test) passes with the work-around implemented on the PTN5110NTHQ demo board.

Type C

Compliance Test	Result	Description
TD 4.1.2 Unpowered CC Voltage Test	Pass	
Rp Default	Pass	
Rp 1.5A	Pass	
Rp 3A	Pass	

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