

USB ISSUE CASE STUDY: PLUG DETECT THRESHOLD

I.MX CAS
2023/05



EXTERNAL USE



SECURE CONNECTIONS
FOR A SMARTER WORLD

Issue Description

- SoC Platform: i.MX8QXP C0
- BSP version: all version before L5.10.9.
- USB design:
 - USB3 (OTG2) port used as USB2.0 in host mode.
- Issue Description:
 - Very limited units will fail to detect a USB device when the device is plugged in.
 - When issue happens, there will be totally no USB related log when device plug in.
- After some analysis, the issue is clarified to have connection with an errata:
ERR051407



Errata: ERR051407 (USB3: USB full speed mode may fail to work)

- **Description:** USB3 module supports USB3 .0 PHY and USB2.0 PHY. Very limited parts may fail to work on full speed mode (both host and device modes) for USB3 port due to higher threshold in full speed receiver of USB2.0 PHY. One example failure symptom is, the enumeration is failed when connecting full speed USB mouse to USB3 port, especially under high temperature.
- **Workaround:** The recommended workaround is to configure threshold voltage value of single ended receiver by setting USB2.0 PHY register AFE_RX_REG5[2:0] to 3'b101 (Register Address is 0x5B198048). The workaround has been integrated to Linux BSP release starting from L5.10.9_1.0.0.

Why high-speed device was impacted?

Universal Serial Bus Specification Revision 2.0

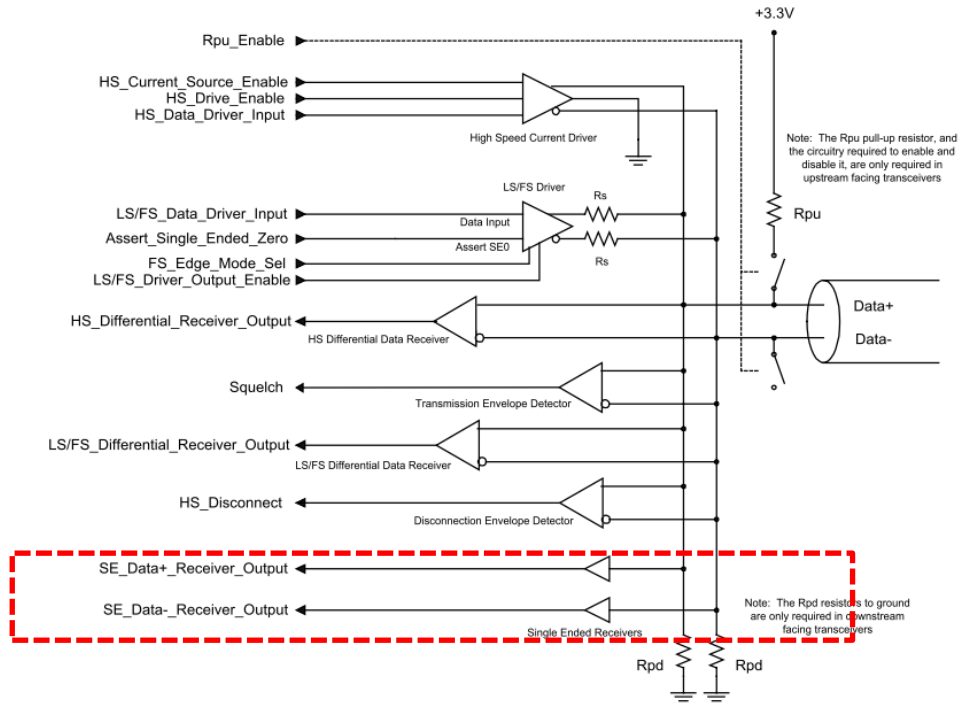


Figure 7-1. Example High-speed Capable Transceiver Circuit

Even the issue was clarified to happen on full-speed related circuit, we still found some failure cases on high-speed devices.

To maintain the required compatibility, a high speed device will always present itself initially as a Full Speed device (by a 1.5K pullup resistor on D+) during plugged-in.

The single ended receiver is used to detect the attachment of device, to tell whether a device is HS/FS or LS. SE_Data+_Receiver_Output will be high if HS/FS device attached, SE_Data-_Receiver_Output will be high if LS device attached.



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