VBUS Detection Using PMIC

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Qualcomm Technologies, Inc.

80-NH740-69 D

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Revision History

Revision	Date	Description
A	April 2014	Initial release
B	September 2015	Updated for PMD9x45
C	September 2015	Updated slide 11
D	February 2016	Updated for PMD9655 and PMD9607

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Overview

- Two methods to detect USB/VBUS on MDM9x30, MDM9x35, MDM9x45, MDM9x07, and MDM9x55 platforms:
  - SMB charger
  - PMIC GPIO/MPP(PMD9x35/PMD9x45/PMD9x07) or PMIC dedicated VBUS_DETECT pin (PMD9655) – Recommended for customers *not* using the SMB charger
- Qualcomm Technologies, Inc. (QTI) hardware reference designs and default Linux enabled (LE) software support VBUS detection using the SMB solution.
- This document describes hardware and software configurations required if the SMB charger is not used.
- This document is only applicable to LE software builds.

Note: The solution described in this document is for VBUS detection using PMIC only.

Hardware

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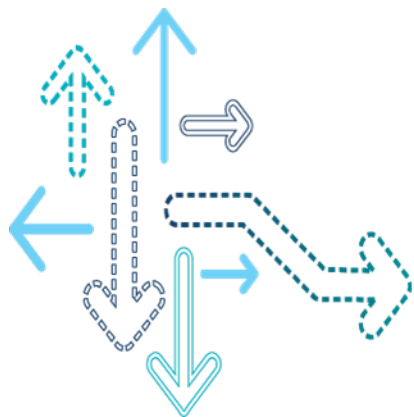
Hardware Changes

PMIC	PMIC pin for VBUS detection
PMD9645	MPP1
PMD9635 v1.1 or later	GPIO4
PMD9635 v1.0	MPP1
PMD9607	MPP2
PMD9655	VBUS_DETECT pin

- For implementation examples, refer to the following documents:
  - *MDM9x35M + PMD9635 Reference Schematic* (80-NH377-41)
  - *MDM9x30 + PMD9635 Reference Schematic* (80-NJ115-41)
  - *MDM9x40 + PMD9645 Reference Schematic* (80-NP506-41)
  - *MDM9x07/MDM8207/MDM9628 Reference Schematic* (80-P1511-41)
  - *MDM9x50 + PMD9655 Reference Schematic* (80-N0992-41)

Hardware Changes (cont.)

- Compatibility with the MPP/GPIO is achieved as follows:
  - For PMD9635/PMD9645/PMD9607, use a voltage divider circuit or Zener diode to divide down or clamp the USB VDD/VDD_DETECT voltage from 5 V/9 V to 1.8 V.
  - For PMD9655, there is a dedicated vbus_detect pin, which is 5 V compatible. A voltage divider circuit is only necessary if the VBUS is > 5 V.

MDM9x30/MDM9x35/MDM9x45/MDM9x07/MDM9x55

SS_TX_RX		SS_TX_RX
D+	——	D+
D-	——	D-

USB 3.0 connector

PMD9645/PMD9635/PMD9607

VBUS	5 V/9 V	Voltage divider and series OVP circuit	1.8 V	MPP1/GPIO4/MPP2 (Depending on chipset)

Software – LE

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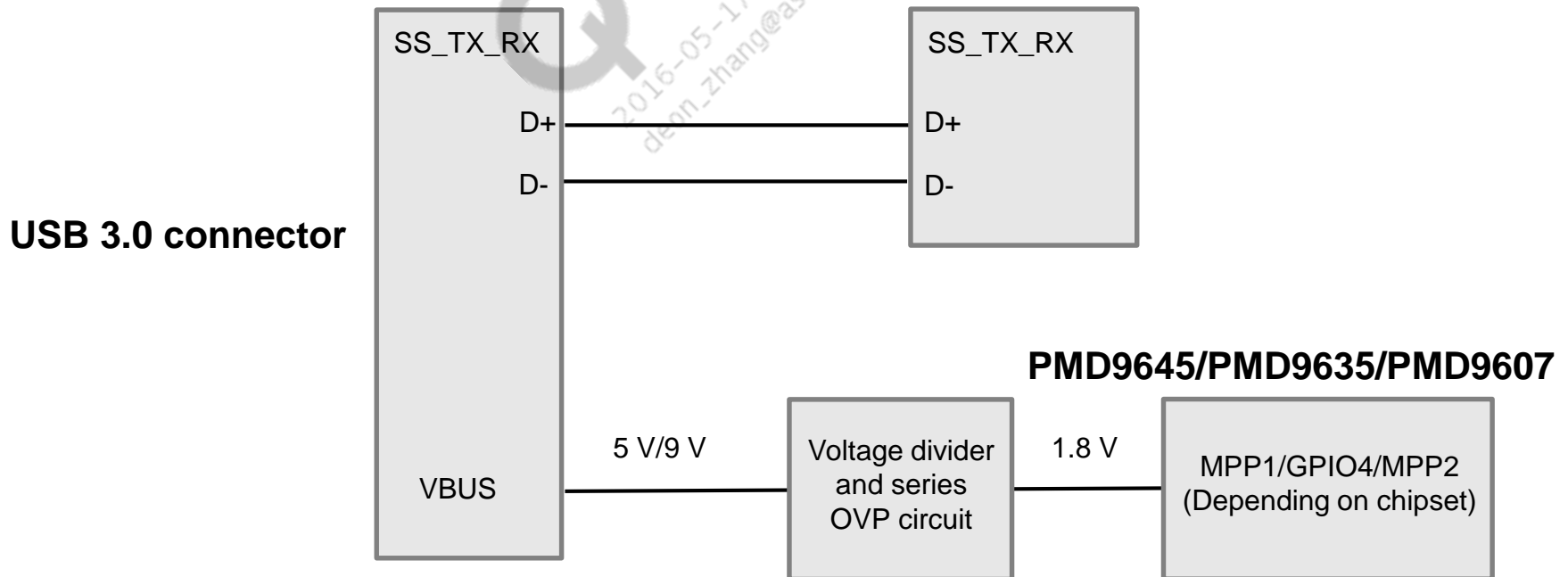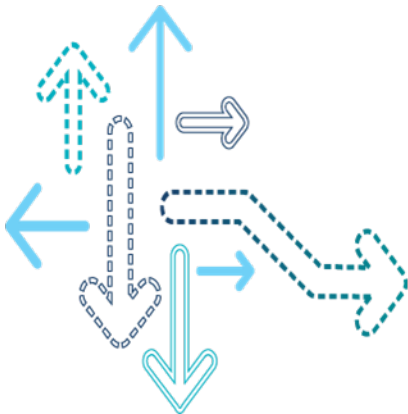
LE Changes – PMD9635/PMD9645

- File – arch/arm/configs/mdm9630_defconfig (or mdm9640_defconfig)
  - Verify that the qpnp-usbdetect driver is enabled for USB VBUS notifications using GPIOS and MPPS (instead of the SMB charger)

    ```
    CONFIG_QPNP_USB_DETECT=y
    ```

- File – arch/arm/boot/dts/qcom/mdm9630-mtp.dtsi (or mdm9640-mtp.dtsi)
  - If the qpnp-usbdetect driver is used for VBUS notifications, disable the SMB13xx driver

    ```
    smb1357_otg_supply: smb1357-charger@1c {
                status = "disabled";
                ...
    ```

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LE Changes – PMD9635/PMD9645 (cont.)

- File – arch/arm/boot/dts/qcom/mdm9630-mtp.dtsi (or mdm9640-mtp.dtsi) (cont.)

  - For PMD9635 v1.0 and PMD9645, use MPP1 for VBUS notifications using the qpnp-usbdetect driver

    ```
    usb_detect {
                compatible = "qcom,qpnp-usbdetect";
                interrupt-parent = <&spmi_bus>;
                interrupts = <0x0 0xa0 0x0>;  /* PMD MPP 1 */
                interrupt-names = "vbus_det_irq";
                };
    ```

  - For PMD9635 v1.1, use GPIO4 for VBUS notifications using the qpnp-usbdetect driver

    ```
    usb_detect {
                compatible = "qcom,qpnp-usbdetect";
                interrupt-parent = <&spmi_bus>;
                interrupts = <0x0 0xC3 0x0>;  /* PMD GPIO4 */
                interrupt-names = "vbus_det_irq";
                };
    ```

LE Changes – PMD9635/PMD9645 (cont.)

- PMD9645/PMD9635 v1.0:
  - Files – arch/arm/boot/dts/qcom/mdm9630-mtp.dtsi or arch/arm/boot/dts/qcom/mdm9640-mtp.dtsi
    - Verify that the MPP1 is configured as a digital input with no pull

```
mpp@a000 { /* MPP 1 */
          qcom,mode = <0>; /* Digital Input */
          qcom,pull = <1>; /* No Pull */
          qcom,vin-sel = <2>; /* 1.8V */
          qcom,master-en = <1>; /* Enable GPIO */
          status = "ok";
      };
```

- PMD9635 v1.1 or later:
  - File – arch/arm/boot/dts/qcom/mdm9630-mtp.dtsi
    - Verify that the GPIO_04 is configured as a digital input with a 1.5 µA pullup

```
gpio@c300 { /* GPIO 4 */
          qcom,mode = <0>; /* Digital Input */
          qcom,pull = <1>; /* Pull up 1.5 uA */
          qcom,vin-sel = <2>; /* 1.8V */
          qcom,master-en = <1>; /* Enable GPIO */
          status = "ok";
      };
```

LE Changes – PMD9607

- File – kernel/arch/arm/configs/mdm9607_defconfig

```
<SNIP>
  CONFIG_GPIO_QPNP_PIN=y
 +CONFIG_GPIO_USB_DETECT=y
  CONFIG_POWER_SUPPLY=y
<SNIP>
```

- File – /kernel_msm-3.18/arch/arm/boot/dts/qcom/mdm9607-mtp.dtsi

```
/* MPP pin 2 config for VBUS_DETECT interrupt line */
&pm8019_mpps {
mpp@a100 {
        qcom,mode = <0>;      /* Digital input */
        qcom,vin-sel = <3>;   /* 1.8V (L11) */
        qcom,src-sel = <0>;   /*  QPNP_PIN_SEL_FUNC_CONSTANT */
        qcom,pull = <1>;                  /* No Pull */
        qcom,master-en = <1>; /*Enable GPIO*/
        status = "ok";
        };
    };
```

LE Changes – PMD9607 (cont.)

- File – /kernel_msm-3.18/arch/arm/boot/dts/qcom/mdm9607-mtp.dtsi
  - To disable the SMB358 driver:

```
/* SMB358 charger configuration */
smb358_otg_vreg: smb358-charger@57 {
                                status = "disabled";
```

- Add USB VBUS detection via MPP2

```
+ usb_detect {
+ compatible = "qcom,gpio-usbdetect";
+ interrupt-parent = <&spmi_bus>;
+ interrupts = <0x0 0xA1 0x0>; /* PMD9607 MPP 2 */
+ interrupt-names = "vbus_det_irq";
+ };
```

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LE Changes – PMD9655

- File – kernel/arch/arm/configs/mdm9655_defconfig
  - Verify that the qpnp-usbdetect driver is enabled for USB VBUS notification using the VBUS_DETECT pin instead of the SMB charger.

  ```
  CONFIG_QPNP_USB_DETECT=y
  ```

- File – arch/arm/boot/dts/qcom/mdmcalifornium-mtp.dtsi
  - If the qpnp-usbdetect driver is used for VBUS notifications, disable the SMB13xx driver.

  ```
  smb1357_otg_supply: smb1357-charger@1c {
              status = "disabled";

              ...
  ```

- Add USB VBUS detection via VBUS DETECT pin

  ```
  + usb_detect {
  + compatible = "qcom,gpio-usbdetect";
  + interrupt-parent = <&spmi_bus>;
  + interrupts = <0x0 0xd0 0x0>; /* PMD9655 VBUS DETECT */
  + interrupt-names = "vbus_det_irq";
  + };
  ```

References

Documents	
Qualcomm Technologies, Inc.	
MDM9x35M + PMD9635 Reference Schematic	80-NH377-41
MDM9x30 + PMD9635 Reference Schematic	80-NJ115-41
MDM9x40 + PMD9645 Reference Schematic	80-NP506-41
MDM9x07/MDM8207/MDM962 Reference Schematic	80-P1511-41
MDM9x50 + PMD9655 Reference Schematic	80-N0992-41

Questions?

https://createpoint.qti.qualcomm.com

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