



DM3730/AM3703 Torpedo + Wireless SOM

Power Management

Application Note 528

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Abstract

This application note provides a high-level explanation of power-management schemes available on the DM3730/AM3703 Torpedo + Wireless SOM.

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Revision History

REV	EDITOR	DESCRIPTION	APPROVAL	DATE
A	NJK	-Initial release	SO	03/27/12
B	SO	-Throughout: Added language for AM3703 configuration of the Torpedo + Wireless SOM	SO	06/14/12
C	NJK	-Section 3.1: Added note that BQ27000 requires 21V to program certain registers; added link to BQ27000 product web page; -Section 3.2: Added note that TPS65950 supports backup battery charging; -Added Section 3.2.1, 3.2.2, and 3.2.3	RAH, SO	01/17/13

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1 Introduction

This document summarizes how power management is handled on the DM3730/AM3703 Torpedo + Wireless SOM. It also offers different approaches for implementing power management schemes in custom applications.

2 DM3730/AM3703 Torpedo + Wireless SOM Power

The DM3730/AM3703 Torpedo + Wireless SOM requires only one power source for proper operation. Providing a backup power source to maintain the real-time clock (RTC) when other sources are not available is also an option. Table 2.1 below identifies the available power sources and provides a brief description of each.

Table 2.1: DM3730/AM3703 Torpedo + Wireless SOM Power Sources

Power Source	Description
MAIN_BATTERY	External power source input. This signal should be driven directly by a single-cell lithium-ion battery or a fixed, regulated power source. Connecting a minimum 80 uF capacitor to this rail on the baseboard is recommended.
BACKUP_BATT	External input that supplies power to the on-board power management controller and RTC interface. This signal should be powered by a coin-cell type battery or an always-on power source. If not used, connect to GND.

2.1 Powering On the SOM

The DM3730/AM3703 Torpedo + Wireless SOM will power on when MAIN_BATTERY is supplied to the SOM; all other signals may remain in their default state.

The PWRON signal may be used to power on/off the SOM only after MAIN_BATTERY has been supplied to the SOM; software must set up the signal before it becomes a valid power switch. MAIN_BATTERY must be supplied to the SOM at all times when using the PWRON signal to power on/off the SOM. For more information, please see the Texas Instruments (TI) [TPS65950 OMAP Power Management and System Companion Device ES 1.2 Technical Reference Manual \(TRM\)](#).¹

3 External Battery Charging

3.1 Main Battery

If using a single-cell Li-ion- or Li-polymer-based battery to power the DM3730/AM3703 Torpedo + Wireless SOM, Logic PD has provided a reference battery charging design on the Torpedo Launcher 3 Baseboard. The reference design is based on a TI BQ24032A power management chip. **NOTE:** The battery fuel gauge shown in the reference design, a TI BQ27000, requires 21V to program some of the registers for the best performance. There is currently no software support for this fuel gauge in Logic PD's board support packages (BSPs). Please refer to TI's [BQ27000 product page](#)² for more information on this fuel gauge.

Please [contact Logic PD](#)³ if you need any assistance in battery-charging design considerations.

¹ <http://focus.ti.com/docs/prod/folders/print/tps65950.html#technicaldocuments>

² <http://www.ti.com/product/bq27000>

³ <http://support.logicpd.com/support/askaquestion.php>

3.2 Backup Battery

The backup battery may be connected in different configurations depending on the system power setup. The TPS65950 supports backup battery charging through the BB_CFG register. For more information, please see TI's *TPS65950 OMAP Power Management and System Companion Device ES 1.2 TRM*.

3.2.1 Rechargeable or Non-rechargeable Backup Battery; MAIN_BATTERY Not Switched

If MAIN_BATTERY is not controlled by a switch before the SOM and is instead left on at all times, the backup battery should be connected as shown in Figure 3.1 below. Software must be configured to control the backup battery charging enable bit of the TPS65950 depending on whether the backup battery is rechargeable or non-rechargeable.



Figure 3.1: Backup Battery Configuration for MAIN_BATTERY without Switch

3.2.2 Non-rechargeable Backup Battery; MAIN_BATTERY Switched

If using a non-rechargeable backup battery when MAIN_BATTERY is controlled by a switch before the SOM, the backup battery should be connected as shown in Figure 3.2 below. Software must not enable backup battery charging in the TPS65950.

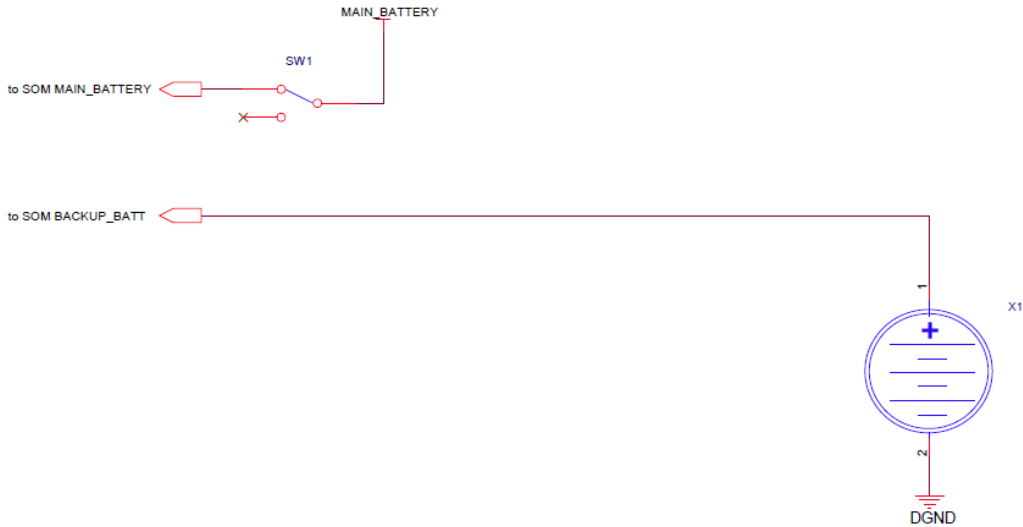


Figure 3.2: Non-rechargeable Backup Battery Configuration for MAIN_BATTERY with Switch

3.2.3 Rechargeable Backup Battery; MAIN_BATTERY Switched

If using a rechargeable backup battery when MAIN_BATTERY is controlled by a switch before the SOM, the backup battery should be connected as shown in Figure 3.3 below. Software should enable backup battery charging in the TPS65950 to ensure the backup battery is fully charged while the system is on. D1 must be chosen so that the voltage to the backup battery is within its charging specifications; this may require adding more diodes in series to increase the voltage drop. Rx must also be chosen to limit the charging current to the backup battery.

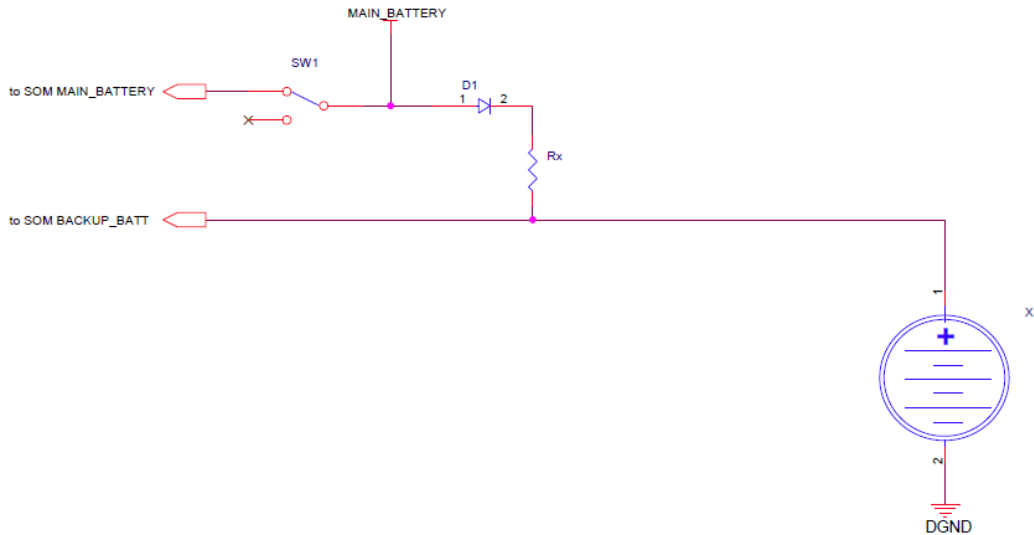


Figure 3.3: Rechargeable Backup Battery Configuration for MAIN_BATTERY with Switch

4 Reference Voltages

Several voltages are available on the high-density connectors for use as reference voltages. While the intent of these voltages is strictly as a reference level, some of the supplies may be connected on custom baseboards to supply low-current devices. Table 4.1 provides the recommended maximum current for each reference voltage.

IMPORTANT NOTE: These values are only suggestions. Please verify supply voltage current limits of the TPS65950 in custom designs.

Table 4.1: Reference Voltage Usage Descriptions

Reference Voltage	Usage
VIO_1V8	Used to power most peripherals on the SOM. Can supply up to 200 mA of power, but it is recommended to use an external supply.
VMMC1	Can supply up to 200 mA off-board.

5 Power Supplies

5.1 VAUX4

VAUX4 is disabled by default on the TPS65950. If using one of the camera GPI signals, this supply must be turned on by software. There are two key registers for setting and enabling the VAUX4 voltage. Details can be found in TI's *TPS65950 OMAP Power Management and System Companion Device ES 1.2 TRM*.

Table 5.1: VAUX4 Register Descriptions

Register	Description
VAUX4_DEDICATED	This register controls the voltage for VAUX4 and must be configured first.
VAUX4_DEV_GRP	This register controls when VAUX4 is enabled and must be configured second.

NOTE: The voltage range for this power supply is 1.71V to 1.89V. Operation outside this range is not recommended.

5.1.1 Sample LogicLoader Instructions to Enable VAUX4

Sample LogicLoader instructions to enable VAUX4 are provided below. LogicLoader v2.5 can use the *w* command to write to the I2C port and the *x* command to read from the I2C port on the PMIC.

```

losh> w /b 0x004b0081 0x05 /dev/pm0
#0x4b is the address inside the TPS65950 for the PM_RECEIVER module
#0x81 is the VAUX4_DEDICATED register
#0x05 sets the voltage on VAUX4 to 1.8V

losh> w /b 0x004b007e 0xe0 /dev/pm0
#0x4b is the address inside the TPS65950 for the PM_RECEIVER module
#0x7e is the VAUX_DEV_GRP register
#0xe0 enables VAUX4 to all device groups. Causes VAUX4 to turn on

```


5.1.2 Sample Linux Instructions to Enable VAUX4

Sample Linux instructions using the *i2cset* and *i2cget* commands to enable VAUX4 are provided below.

```
DM-37x# i2cset -f -y 1 0x4b 0x81 0x05  
DM-37x# i2cset -f -y 1 0x4b 0x7e 0xe0
```

6 Summary

The DM3730/AM3703 Torpedo + Wireless SOM requires only one power supply for normal operation and one additional supply for low-power backup. This document has provided a high-level perspective of the different power supplies available for custom applications.