



OMAP35x Torpedo SOM to DM3730/AM3703 Torpedo SOM Migration

Application Note 495

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Abstract

This application note describes the differences between the OMAP35x Torpedo SOM and the DM3730/AM3703 Torpedo SOM.

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Revision History

REV	EDITOR	DESCRIPTION	APPROVAL	DATE
A	RAH, NJK, MB	-Initial release	RAH, NJK	08/19/11
B	RAH	-Section 3.1.1: Noted that LCD_D18 and LCD_D22 are tied to SYS_BOOT0 and SYS_BOOT5, respectively; -Section 3.1.4: Updated additional camera GPI signals to use Torpedo pin numbering; -Added Section 3.1.6: Series Termination Resistor; -Added Section 3.1.7: Analog to Digital Interface; -Section 3.2.4: Added routing information for USB1_VBUS; -Section 6.1: Cleaned up J1 connector table and added notes 1 through 4; -Section 6.2: Cleaned up J2 connector table and added notes 3 through 10.	NJK	10/19/11
C	SO, RAH	-Section 7.1: Added paragraph three regarding minimum pin configuration in LogicLoader v2.5	SO	03/05/12
D	SO, RAH	-Table 2.1: Updated available BSPs for DM3730/AM3703 Torpedo SOM; -Added Section 4 regarding baseboard differences; -Section 7.2: Changed Android BSP version to Gingerbread 2.3.4; changed Linux kernel version to 3.0; added link to release notes; -Section 7.3: Changed Linux kernel version to 3.0; added link to release notes; -Section 7.4: Added link to release notes	BSB	11/08/12

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1 Introduction

This application note describes the differences between the OMAP35x Torpedo SOM and the DM3730/AM3703 Torpedo SOM. The primary audience for this document is customers who currently use the OMAP35x Torpedo SOM in their design and are considering transitioning to the newer DM3730/AM3703 Torpedo SOM.

1.1 Scope of Document

Though this document addresses the differences between the two Torpedo SOMs, it is meant to be a high-level perspective. When it comes to designing in the DM3730/AM3703 Torpedo SOM, please review the appropriate schematics, hardware design files, and other applicable documents specific to the product. These documents are available on the [DM3730 Torpedo Development Kit downloads page](#).¹

2 Features Comparison

This section gives a general feature set description of each Torpedo SOM module. For more detailed information about the physical specification requirements of each product, please refer to the [OMAP35x Torpedo SOM Hardware Specification](#)² or the [DM3730/AM3703 Torpedo SOM Hardware Specification](#).³

Table 2.1: Torpedo SOM Features Comparison

Feature	OMAP35x Torpedo SOM	DM3730/AM3703 Torpedo SOM	Notes
Size	15 x 27 x 3.8 mm	15 x 27 x 3.8 mm	—
LogicLoader Version	LogicLoader v2.4	LogicLoader v2.5	—
Available OS BSPs	Linux kernel 2.6.32; Windows CE 6.0	Android Gingerbread 2.3.4; Linux kernel 3.0; Windows CE 6.0	—
Temperature Ranges	Commercial temp; Industrial temp	Commercial temp; Industrial temp	—
ARM Core	ARM Cortex-A8	ARM Cortex-A8	—
ARM Core Max Speed (MHz)	600*	1000	*720 MHz OMAP35x processor is available for custom configurations
DSP Core	TMS320C64x+ (OMAP3530 only)	TMS320C64x+ (DM3730 only)	—
DSP Core Max Speed (MHz)	430* (OMAP3530 only)	800 (DM3730 only)	*520 MHz DSP core is available for custom configurations
Mobile DDR SDRAM (MB) / NAND Flash (MB)	128/256*; 256/512	256/512	*128/256 is available only in commercial temp
SD/MMC	8-bit available on MMC1	8-bit mode de-featured	Development kit uses 4-bit mode
UART4	Not available	gpmc_wait3/uart4_rx	UART TX line not available
All other peripherals remain the same			

¹ <http://support.logicpd.com/auth/downloads/DM3730-AM3703-Torpedo/>

² <http://support.logicpd.com/downloads/1196/>

³ <http://support.logicpd.com/downloads/1432/>

3 Electrical Comparison

3.1 Signal Differences

3.1.1 LCD Signals

The higher-order LCD data signals, LCD_D18 through LCD_D23, are now driven from the SYS_BOOT signals on the DM3730/AM3703 Torpedo SOM. If these signals are used as inputs, they must be floated during the reset sequence or the boot sequence will not be correctly executed. LCD_D18 and SYS_BOOT0 are now the same signal, as are signals LCD_D22 and SYS_BOOT5. These signals cannot be used as two separate inputs/outputs.

LCD_D0 through LCD_D5 are now connected to the DM3730/AM3703 processor where signals LCD_D18 through LCD_D23 were previously connected. Software must note this change and adjust the pinmux accordingly.

NOTE: The above changes do not affect the order of the signals as they are available on expansion connectors J1 and J2. For example, LCD_D0 is still in the same connector location on both versions of the Torpedo SOM; the only change is the pin of the processor that drives that signal.

3.1.2 Configuration Resistor Change

The LCD interface on the DM3730/AM3703 Torpedo SOM now defaults to 24-bits available. R86 is now the default population instead of R87. The default processor signals connected to CONFIG0 through CONFIG3 are different between the DM3730/AM3703 Torpedo SOM and the OMAP35x Torpedo SOM.

3.1.3 SD/MMC1 Signals

On the DM3730/AM3703 Torpedo SOM, SD/MMC1 signals only support 4-bit mode. Signals SD1_DATA4 through SD1_DATA7 are no longer supported. Instead, CSI_FLD and uP_GPIO_127 through uP_GPIO_129 are connected to J2.

3.1.4 Additional Camera GPI Only Signals

With the new camera configuration in the DM3730/AM3703 Torpedo SOM, the signals listed below are now additional input-only signals. Systems using these signals as outputs will need a redesign.

Table 3.1: DM3730/AM3703 Torpedo SOM Additional GPI Only Signals

GPI Signal	SOM Signal	SOM Pin
gpio_105	CSI_D6/CONFIG14	J2.57
gpio_106	CSI_D7/CONFIG15	J2.55
gpio_107 ¹	CSI_D8/CONFIG10	J1.78
gpio_108 ¹	CSI_D9/CONFIG11	J1.76

TABLE NOTES:

1. This signal is not available on standard DM3730/AM3703 Torpedo SOMs; it is only available if R91 is populated in place of R90.

3.1.5 Buffer Strength

The OMAP35x Torpedo SOM recommended series termination resistors for gpio_120 through gpio_129. For the DM3730/AM3703 Torpedo SOM, gpio_128 no longer needs a series termination resistor.

3.1.6 Series Termination Resistor

A 22 ohm series termination resistor, R105, has been added to uP_BUS_CLK.

3.1.7 Analog to Digital Interface

Four optional pull-down resistors have been added to signals ADCIN0 through ADCIN3. These resistors can be populated under an NPI when the ADCINx signal is not used.

3.2 Power and Performance Differences

3.2.1 Different VDD1 Operating Points

The DM3730/AM3703 Torpedo SOM supports different operating points for VDD1, shown in Table 3.2 below. Verify the maximum speed of the processor against the model number of the DM3730/AM3703 Torpedo SOM that is purchased.

Table 3.2: DM3730/AM3703 Torpedo SOM VDD1 Operating Points

Operating Point (OPP)	ARM Core Frequency (MHz)	DSP Core Frequency (MHz)	Voltage (V)
OPP1G	1000	800	1.35
OPP130	800	660	1.2
OPP100	600	520	1.1
OPP50	300	260	.9735

3.2.2 Different VDD2 Operating Points

The DM3730/AM3703 Torpedo SOM supports different operating points for VDD2, shown in Table 3.3 below.

Table 3.3: DM3730/AM3703 Torpedo SOM VDD2 Operating Points

Operating Point (OPP)	L3_ICLK frequency (MHz)	Voltage (V)
OPP100	200	1.15
OPP50	100	.9735

3.2.3 Current Requirements

The OMAP35x Torpedo SOM only supports a frequency of 600 MHz. The DM3730/AM3703 Torpedo SOM supports a frequency up to 1 GHz. Because of this, many of the typical current requirements have significantly increased and it is important to verify that your design can accommodate the additional current. Additional details can be found in Section 3 of the *DM3730/AM3703 Torpedo SOM Hardware Specification*.

3.2.4 Battery Charging

The DM3730/AM3703 Torpedo SOM does not support main battery charging. The 5V rail connections have become no-connects. USB1_VBUS is no longer routed to the charging circuitry.

Charging of a backup battery for the real-time clock (RTC) is still supported.

4 Baseboard Comparison

The new Torpedo Launcher 3 Baseboard that ships with the DM3730 Torpedo Development Kit is fully backwards compatible with the OMAP35x Torpedo SOM. However, there are some key differences between the original Torpedo Launcher Baseboard and the Torpedo Launcher 3 Baseboard that may require software modifications. These differences are described below.

4.1 Wattson Power Measurement

The Torpedo Launcher 3 Baseboard supports [Wattson](#)^{TM, 4} Logic PD's power measurement and performance monitoring application. Wattson delivers real-time graphical feedback and data-logging capabilities without the need for external oscilloscopes and meters, guiding you to the lowest power and highest performance software combination for your product.

Shunt resistors were added to various power planes on the Torpedo Launcher 3 Baseboard to support Wattson; however, they should have no impact on either the performance or the behavior of the Torpedo SOM.

MCSPi2_CS1 is used as an output to interrupt the FT2232 to allow software running on the Torpedo SOM to notify Wattson.

4.2 Additional Buttons and Capacitance

Two additional buttons were added to the Torpedo Launcher 3 Baseboard for improved Android support. These buttons are tied to MCSPi2_CS0 and MCSPi2_CLK.

In addition, 0.1uF capacitors were added to all the buttons. This can cause signal integrity problems if these signals are not used as buttons. Remove the capacitor to prevent any issues. The affected signals are MSTR_nRST, PWRON, SYS_BOOT0, SYS_BOOT5, MCSPi2_CS0, and MCSPi2_CLK.

4.3 Battery Charger

The DM3730/AM3703 Torpedo SOM no longer supports battery charging. The Torpedo Launcher 3 Baseboard has an external charging circuit reference design with an optional configuration for SOM-based battery charging.

There is an option using JP3 to allow software to place the baseboard into a low-power mode using uP_CLKOUT1_26MHz. JP3 is not populated by default.

4.4 Camera Output

The camera output on the original Torpedo Launcher Baseboard is referenced to 1.8V. The Torpedo Launcher 3 Baseboard references the camera output to 3.3V. The output voltage can be modified by replacing R194 and R195.

4.5 24-Bit HDMI Output

The Torpedo Launcher 3 Baseboard includes support for a 24-bit HDMI output. Users can choose between the LCD output and the HDMI output by using a jumper on the baseboard. All HDMI signals are sourced from the buffered side of the LCD interface and should have no impact on the Torpedo SOM.

4.6 USB High-Speed Interface

The Torpedo Launcher 3 Baseboard has two USB high-speed host ports, while the original Torpedo Launcher Baseboard has three.

⁴ <http://www.logicpd.com/products/software/wattson/>

In addition, the USB high-speed host chipset has changed from the ISP1760 to the ISP1763A. This change will require updated software for proper operation. The Logic PD DM37x Linux BSP supports the ISP1760 and ISP1763A host chipsets.

5 Mechanical Comparison

The OMAP35x Torpedo SOM and DM3730/AM3703 Torpedo SOM share the same physical connectors, PCB size, and overall baseboard footprint. The two Torpedo SOMs are physically equivalent.

6 Pin Comparison

6.1 J1 Connector 100-Pin Comparison

The J1 pinout differences between the OMAP35x Torpedo SOM and the DM3730/AM3703 Torpedo SOM can be seen in Table 6.1 below.

Table 6.1: J1 Connector Differences

J1 Pin#	OMAP35x Torpedo SOM Signal Name	DM3730/AM3703 Torpedo SOM Signal Name	Notes
19	uP_BUS_CLK	uP_BUS_CLK	4
76	CONFIG11(ADCIN0)	CONFIG11(ADCIN0)	1
78	CONFIG10(ADCIN1)	CONFIG10(ADCIN1)	1
80	CONFIG9(ADCIN2)	CONFIG9(ADCIN2)	1
82	CONFIG8(ADCIN3)	CONFIG8(ADCIN3)	1
86	CONFIG1(MCSPI1_CS2)	CONFIG1(LCD_D17)	2
87	CONFIG2(SD3_CLK)	CONFIG2(LCD_D23)	2, 3
88	CONFIG3(MCSPI1_CS3)	CONFIG3(MCSPI3_CLK)	2
99	CONFIG0(SD3_CMD)	CONFIG0(LCD_D16)	2

TABLE NOTES:

1. Non-populated resistor to ground added for unused ADC inputs (requires NPI to populate).
2. R86 populated; R87 not populated. Default is now for 24-bit LCD.
3. Higher-order LCD signals now come off of SYS_BOOT signals on the DM3730/AM3703 Torpedo + Wireless SOM.
4. uP_BUS_CLK has a series termination resistor on the SOM.

6.2 J2 Connector 100-Pin Comparison

The J2 pinout differences between the OMAP35x Torpedo SOM and the DM3730/AM3703 Torpedo SOM can be seen in Table 6.2 below.

Table 6.2: J2 Connector Differences

J2 Pin#	OMAP35x Torpedo SOM Signal Name	DM3730/AM3703 Torpedo SOM Signal Name	Notes
11	USB1_VBUS	USB1_VBUS	8
13	USB1_VBUS	USB1_VBUS	8
19	5V	No Connect	3
20	LCD_20	LCD_20(SYS_BOOT3)	5
21	5V	No Connect	3
23	5V	No Connect	3
25	5V	No Connect	3
34	LCD_19	LCD_19(SYS_BOOT1)	5
36 ²	LCD_18	LCD_18 (SYS_BOOT0)	5, 6
40	LCD_21	LCD_21(SYS_BOOT4)	5
52	SD1_DATA4	CSI_FLD	4
54	SD1_DATA5	uP_GPIO_127 ¹	4
55	CONFIG15(CSI_D7)	CONFIG15(CSI_D7)	9
56	SD1_DATA6	uP_GPIO_128 ¹	4, 10
57	CONFIG14(CSI_D6)	CONFIG14(CSI_D6)	9
58	SD1_DATA7	uP_GPIO_129 ¹	4
79	LCD_D2	LCD_D2	7
80 ²	LCD_22	LCD_22 (SYS_BOOT5)	5, 6
81	LCD_D3	LCD_D3	7
83	LCD_D1	LCD_D1	7
89 ²	SYS_BOOT5	SYS_BOOT5 (LCD_22)	6
94	LCD_D4	LCD_D4	7
96	LCD_D5	LCD_D5	7
98	LCD_D0	LCD_D0	7
100 ²	SYS_BOOT0	SYS_BOOT0 (LCD_D18)	6

TABLE NOTES:

1. Same processor pin location.
2. J2.36 and J2.100 are connected on the SOM; J2.80 and J2.89 are connected on the SOM.
3. The DM3730/AM3703 Torpedo SOM de-features battery charging.

4. 8-bit MMC mode de-featured on the DM3730/AM3703 Torpedo SOM; signals replaced with others.
5. Higher-order LCD signals now come off of SYS_BOOT signals on the DM3730/AM3703 Torpedo SOM.
6. LCD_D18 and LCD_D22 are also connected as SYS_BOOT0 and SYS_BOOT5.
7. LCD_D0 through LCD_D5 are connected to different processor pins and must have their pinmux updated. Their functionality is the same.
8. USB charging de-featured.
9. CSI_D6 and CSI_D7 are now input-only signals.
10. uP_GPIO_128 no longer needs a series termination resistor.

7 Software Comparison

7.1 LogicLoader Bootloader

The DM3730/AM3703 Torpedo SOM requires LogicLoader v2.5 for Windows CE. Please note that LogicLoader v2.5 is not available for the OMAP35x Torpedo SOM.

The main difference between the two versions of LogicLoader is that LogicLoader v2.5 no longer includes a config block. In lieu of the config block, LogicLoader v2.5 uses a set of files in the */lboot* partition (*lboot.lol*, *lboot.var*, *lboot.sup*).

Also, LogicLoader v2.5 now does minimal pin configuration. Any pin not directly used by LogicLoader v2.5 is left in its default boot state. If previous software required pin configurations done in LogicLoader v2.4, that configuration must now be done in the *lboot.sup* or *lboot.lol* scripts.

Please see the [LogicLoader v2.5 User Guide](#)⁵ and the [LogicLoader v2.5 Command Description Manual](#)⁶ for specific details about this new set of files and additional information about the changes that exist between the two versions. The introductions of each document contain a list of changes and a description of where to find information about those changes within the document.

7.2 Android Gingerbread 2.3.4 BSP

An Android Gingerbread 2.3.4 BSP is only available for the DM3730/AM3703 Torpedo SOM. The Linux kernel that comes with the DM3730/AM3703 Android Gingerbread 2.3.4 BSP is based on version 3.0.

Please see the [DM3730/AM3703 Android Gingerbread 2.3.4 BSP Release Notes](#)⁷ or the [DM3730/AM3703 Android Gingerbread 2.3.4 BSP User Guide](#)⁸ for further details.

7.3 Linux BSP

The Linux BSP kernel version has been updated to 3.0 for the DM3730/AM3703 Torpedo SOM.

Please see the [DM37x Linux BSP Release Notes](#)⁹ or the [DM37x Linux BSP User Guide](#)¹⁰ for further details.

⁵ <http://support.logicpd.com/downloads/1428/>

⁶ <http://support.logicpd.com/downloads/1440/>

⁷ <http://support.logicpd.com/downloads/1541/>

⁸ <http://support.logicpd.com/downloads/1517/>

⁹ <http://support.logicpd.com/downloads/1504/>

¹⁰ <http://support.logicpd.com/downloads/1431/>

7.4 Windows Embedded CE

The DM37x Windows Embedded CE 6.0 BSP closely resembles the OMAP35x Windows Embedded CE 6.0 BSP. Structurally, the two BSPs are equivalent; however, the following differences should be taken into consideration:

- OSDesign has been changed from *LOGIC_SOM_OMAP35x_SHOW* to *LOGIC_SOM_ARM_A8*
- Platform has been changed from *LOGIC_SOM_OMAP35x* to *LOGIC_ARM_A8*
- SOC has been changed from *OMAP35XX_TPS659XX_TI_V1* to *ARM_A8_TPS659XX_TI_V1*

Please see the [DM37x Windows Embedded CE 6.0 BSP Release Notes](#)¹¹ or the [DM37x Windows Embedded CE 6.0 BPS User Guide](#)¹² for further details.

8 Summary

From a hardware perspective, the OMAP35x Torpedo SOM and the DM3730/AM3703 Torpedo SOM are almost identical. When migrating from the OMAP35x Torpedo SOM to the DM3730/AM3703 Torpedo SOM, be sure to take into account the pin changes on the J1 and J2 connectors and the GPIO changes that were enacted at the processor level.

From a bootloader perspective, the DM3730/AM3703 Torpedo SOM requires the latest LogicLoader v2.5.x for Windows CE 6.0 and X-Loader for Linux and Android.

From an operating system perspective, the two Torpedo SOMs require different BSPs, although the DM3730/AM3703 Torpedo SOM BSPs started with the OMAP35x Torpedo SOM BSPs as their base.

¹¹ <http://support.logicpd.com/downloads/1500/>

¹² <http://support.logicpd.com/downloads/1423/>