

TM7000 Adaptor Cable

Usage Information

This cable aims at making a direct adaptation between SAMA5D4-XULT or SAMA5D2-XULT to the TM7000 display from PDA Inc.

Essential adaptation fulfilled:

- RGB lines matching¹
- 5Vcc to 3.3Vcc conversion

With this cable, the user no longer needs to do cumbersome hand modifications² to the TM7000 display to adapt to SAMA5D4/D2-XULT boards.

Important: this cable **must not** be used with former SAMA5D3-XPLD **nor** the sibling 4.3" display (a.k.a. TM430x) from PDA.

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¹ The LCD bussing scheme has changed from former SAMA5D3 product to newer SAMA5D4 and SAMA5D2, whereas the TM7000 display was designed for direct connection to the SAMA5D3.

² Which were described here: http://www.atmel.com/images/atmel-44019-cortex-a5-microcontroller-using-display-module-tm7000-on-sama5d4-xplained-ultra-board_application-note.pdf

1. Tables

Below are given two tables, defining entirely what the adaptor cable does.

First table essentially lists those pins having a direct match with their counterpart on the other side.

The second table explains the reassignment of signals (which change from default straight connection)

1.1 Direct connection table

From SAMA5D4/D2-XULT J2 pin (respectively)	To TM 7000 J6 pin (respectively)	Comment
1	1	ID_SYS
2, 7, 12, 17, 22, 27, 32, 50	2, 7, 12, 17, 22, 27, 32, 50	GND
33, 34, 35, 36	33, 34, 35, 36	LCD clocks, EN
37, 38, 39, 40	37, 38, 39, 40	SPI/ADC lines
41	41	DISP
42, 43, 44, 45,46, 47	42, 43, 44, 45,46, 47	Miscellaneous controls

1.2 No-connection table

on SAMA5D4/D2-XULT side	on TM 7000 side	Comment
	25, 26, 28, 29, 30, 31	LCDDAT[18..23]
3, 4, 13, 14, 23, 24		LCDDAT[0,1,8,9,16,17]

1.3 Translation table

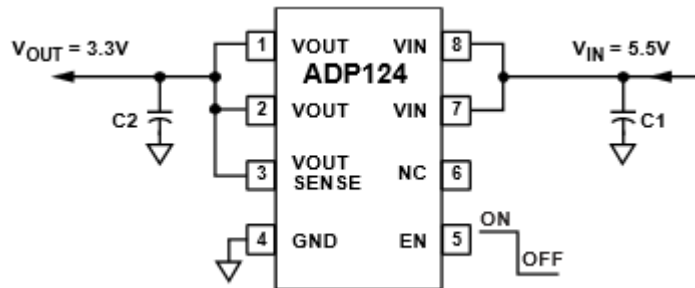
From SAMA5D4/D2-XULT J2 pin	To TM 7000 J6 pin	Comment
5 (LCDDAT2)	3 (LCDDAT0)	B0
6 (LCDDAT3)	4 (LCDDAT1)	B1
8 (LCDDAT4)	5 (LCDDAT2)	B2
9 (LCDDAT5)	6 (LCDDAT3)	B3
10 (LCDDAT6)	8 (LCDDAT4)	B4
11 (LCDDAT7)	9 (LCDDAT5)	B5
15 (LCDDAT10)	10 (LCDDAT6)	G0
16 (LCDDAT11)	11 (LCDDAT7)	G1
18 (LCDDAT12)	13 (LCDDAT8)	G2
19 (LCDDAT13)	14 (LCDDAT9)	G3
20 (LCDDAT14)	15 (LCDDAT10)	G4
21 (LCDDAT15)	16 (LCDDAT11)	G5
25 (LCDDAT18)	18 (LCDDAT12)	R0
26 (LCDDAT19)	19 (LCDDAT13)	R1
28 (LCDDAT20)	20 (LCDDAT14)	R2
29 (LCDDAT21)	21 (LCDDAT15)	R3
30 (LCDDAT22)	23 (LCDDAT16)	R4
31 (LCDDAT23)	24 (LCDDAT17)	R5
48, 49	48, 49	With 5Vcc->3.3Vcc LDO regulator inserted on the way (see text below)

2. Electrical

2.1 Voltage adaptation

5Vcc coming from pins 48, 49 of SAMA5D4/D2-XULT board must be converted into 3.3Vc and withstand a max current of 300mA and 510mW dissipation.

⇒ Use is made of an Analog Device **AD124ARHZ-3.3** with following connection scheme:



C1 and C2 are not needed/not implemented

Pin 5, 7, 8 connected to pin 48, 49 on SAMA5D4/D2-XULT side

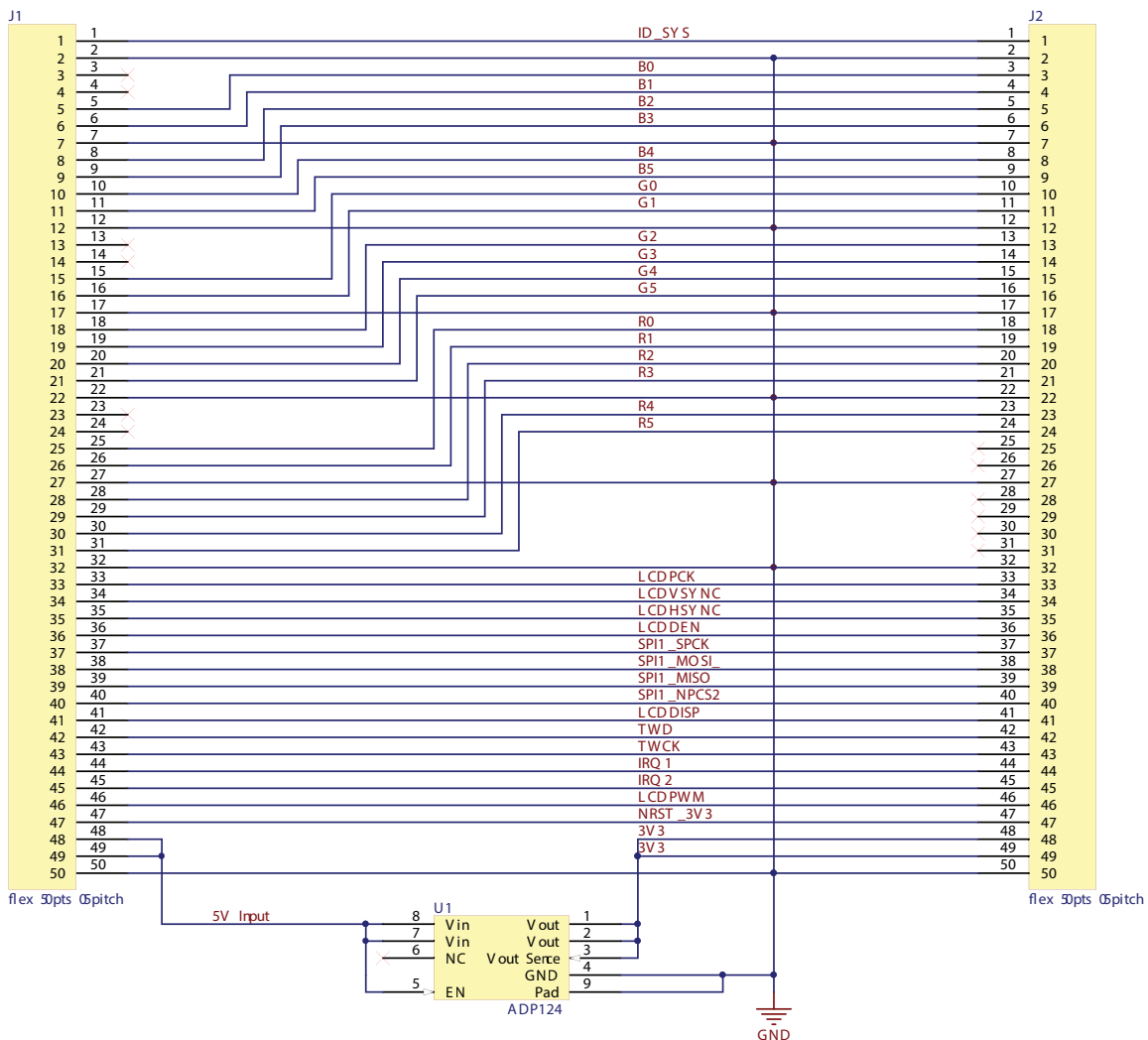
Pin 4 connected to GND

Pin 1, 2, 3 connected to pin 48, 49 on TM7000 side

2.2 Schematics

board side

Display side

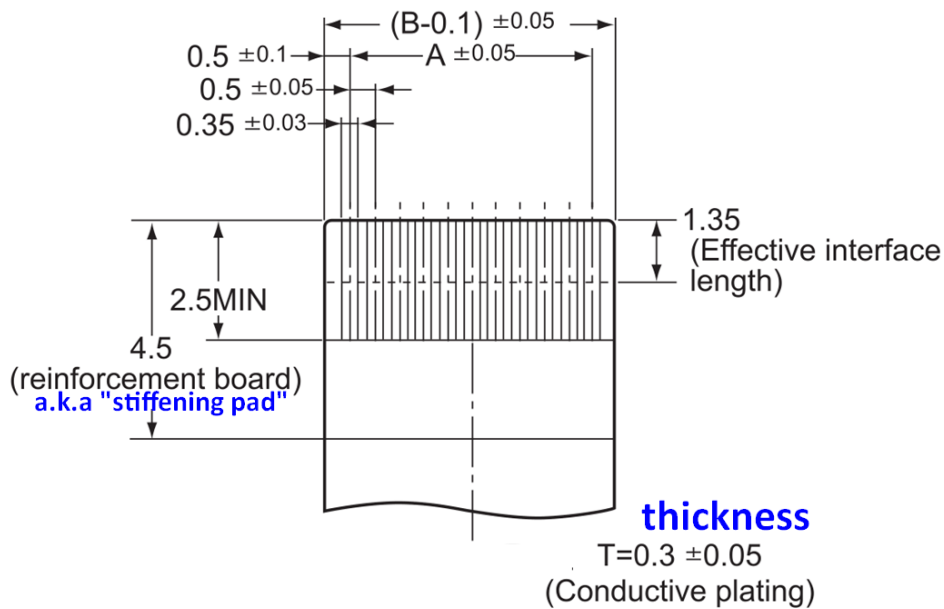


3. Mechanical

3.1 Photo



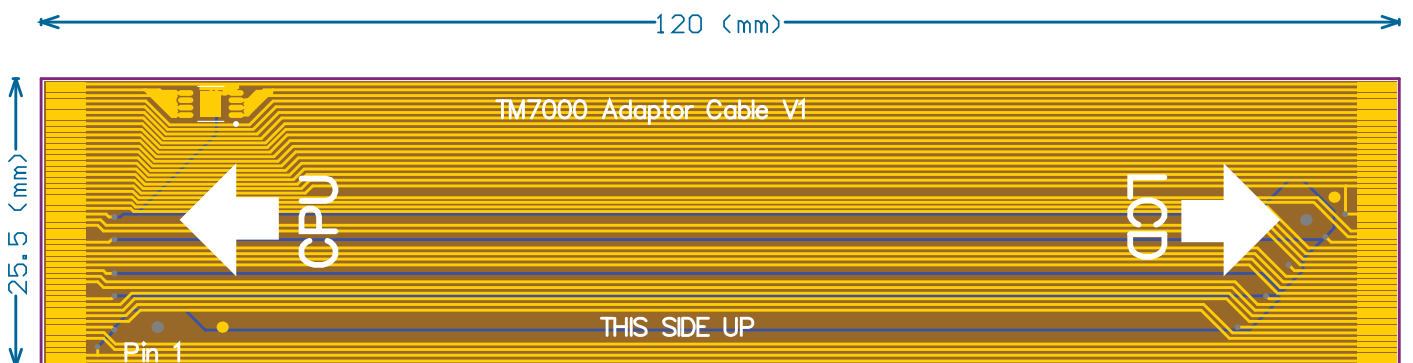
3.2 FPC parameters



Note:

$$A = (50-1) \times 0.5$$

$$B = 25.6$$



4. Adaptation insights

Some explanations why this is made:

The LCD display device featured on the TM7000 display module has an 18-bit RGB parallel data interface. By default, this display module is configured to interface with boards such as SAMA5D3x-EK and SAMA5D3 Xplained.

However, the pin assignment of the RGB bus as a function of the bus width (24-, 18-, 16- or 12-bit mode) differs between SAMA5D3 and SAMA5D4/D2.

The tables below show the LCD data bus mapping schemes of SAMA5D3 and SAMA5D4/D2, respectively.

Active Mode Output Pin Assignment with **SAMA5D3**

Pin ID	TFT 24 bits	TFT 18 bits	TFT 16 bits	TFT 12 bits
LCD_DAT[23]	R[7]	-	-	-
LCD_DAT[22]	R[6]	-	-	-
LCD_DAT[21]	R[5]	-	-	-
LCD_DAT[20]	R[4]	-	-	-
LCD_DAT[19]	R[3]	-	-	-
LCD_DAT[18]	R[2]	-	-	-
LCD_DAT[17]	R[1]	R[5]	-	-
LCD_DAT[16]	R[0]	R[4]	-	-
LCD_DAT[15]	G[7]	R[3]	R[4]	-
LCD_DAT[14]	G[6]	R[2]	R[3]	-
LCD_DAT[13]	G[5]	R[1]	R[2]	-
LCD_DAT[12]	G[4]	R[0]	R[1]	-
LCD_DAT[11]	G[3]	G[5]	R[0]	R[3]
LCD_DAT[10]	G[2]	G[4]	G[5]	R[2]
LCD_DAT[9]	G[1]	G[3]	G[4]	R[1]
LCD_DAT[8]	G[0]	G[2]	G[3]	R[0]
LCD_DAT[7]	B[7]	G[1]	G[2]	G[3]
LCD_DAT[6]	B[6]	G[0]	G[1]	G[2]
LCD_DAT[5]	B[5]	B[5]	G[0]	G[1]
LCD_DAT[4]	B[4]	B[4]	B[4]	G[0]
LCD_DAT[3]	B[3]	B[3]	B[3]	B[3]
LCD_DAT[2]	B[2]	B[2]	B[2]	B[2]
LCD_DAT[1]	B[1]	B[1]	B[1]	B[1]
LCD_DAT[0]	B[0]	B[0]	B[0]	B[0]

Active Mode Output Pin Assignment with **SAMA5D4/D2**

Pin ID	TFT 24 bits	TFT 18 bits	TFT 16 bits	TFT 12 bits
LCD_DAT[23]	R[7]	R[5]	R[4]	R[3]
LCD_DAT[22]	R[6]	R[4]	R[3]	R[2]
LCD_DAT[21]	R[5]	R[3]	R[2]	R[1]
LCD_DAT[20]	R[4]	R[2]	R[1]	R[0]
LCD_DAT[19]	R[3]	R[1]	R[0]	-
LCD_DAT[18]	R[2]	R[0]	-	-
LCD_DAT[17]	R[1]	-	-	-
LCD_DAT[16]	R[0]	-	-	-
LCD_DAT[15]	G[7]	G[5]	G[5]	G[3]
LCD_DAT[14]	G[6]	G[4]	G[4]	G[2]
LCD_DAT[13]	G[5]	G[3]	G[3]	G[1]
LCD_DAT[12]	G[4]	G[2]	G[2]	G[0]
LCD_DAT[11]	G[3]	G[1]	G[1]	-
LCD_DAT[10]	G[2]	G[0]	G[0]	-
LCD_DAT[9]	G[1]	-	-	-
LCD_DAT[8]	G[0]	-	-	-
LCD_DAT[7]	B[7]	B[5]	B[4]	B[3]
LCD_DAT[6]	B[6]	B[4]	B[3]	B[2]
LCD_DAT[5]	B[5]	B[3]	B[2]	B[1]
LCD_DAT[4]	B[4]	B[2]	B[1]	B[0]
LCD_DAT[3]	B[3]	B[1]	B[0]	-
LCD_DAT[2]	B[2]	B[0]	-	-
LCD_DAT[1]	B[1]	-	-	-
LCD_DAT[0]	B[0]	-	-	-

As shown in the above tables, in 18-bit mode (necessary to correctly drive the TM7000 LCD display) the **SAMA5D3 routes the LCD RGB color bits to LCDDAT[0..17], whereas the SAMA5D4/D2 routes them to LCDDAT[2..7,10..15, 18..23]**. Therefore, a rerouting needs to be done before reaching the TM7000 module to ensure a correct LCD bus mapping from SAMA5D4/D2.