Armadillo-400 Series Hardware Manual

Version 1.3.0
2010/11/05

Atmark Techno, Inc.

Armadillo Developers Site

Armadillo-400 Series Hardware Manual

Atmark Techno, Inc.

060-0035 AFT Bldg. 6F, N5E2, Chuo-ku, Sapporo
TEL 011-207-6550 FAX 011-207-6570

Version 1.3.0
2010/11/05

1. Preface

The Armadillo Series are small high-performance low-power general purpose boards which incorporate ARM CPU cores. Linux (kernel 2.6) is employed as the standard operating system, providing access to a rich array of software resources and proven stability. All boards include network interfaces as standard which, combined with the Linux network protocol stack, enable simple development of network ready devices.

The Armadillo-400 Series models provide improved performance over existing products of the same class, while at the same time also offering even lower power consumption. The Armadillo-400 Series is comprised of two products, the low cost Armadillo-420 and the Armadillo-440 which can readily support multimedia functionality with the addition of an expansion board.

Armadillo-400 Series boards have interfaces which are often required for embedded devices, such as serial, Ethernet, USB, storage (microSD) and GPIO. In addition to these, multimedia functionality including LCD, touch screen and audio interfaces can be added to Armadillo-440 via an expansion board. Other functionality such as a real-time clock and wireless LAN can also be added with optional modules.

Armadillo-420 is available together with the RTC Option Module as the Armadillo-420 Basic Model. Armadillo-440 together with the LCD Expansion Board is known as the Armadillo-440 LCD Model.

This document covers the hardware specifications of the Armadillo-400 Series. For guidance on how to use the default software, please see the "Armadillo-420 Basic Model Development Set Start-up Guide" and the "Armadillo-440 LCD Model Development Set Start-up Guide". When customizing the software, please refer to the "Armadillo-400 Series Software Manual".

1.1. Document Structure

This document covers the following points of required information for using the Armadillo-400 Series boards.

- Hardware Overview
- Memory Map
- Interface Specifications
- Board Layout

1.2. Icons

Icons are used in the following way in this document.

This is used for precautions.

This is used for helpful information.

2. Precautions

2.1. Safety Precautions

In order to use this product safely, please take special note of the following precaution.

This product uses semiconductor components designed for generic electronics equipment such as office automation equipment, communications equipment, measurement equipment and machine tools. Do not incorporate the product into devices such as medical equipment, traffic control systems, combustion control systems, safety equipment and so on which can directly threaten human life or pose a hazard to the body or property due to malfunction or failure. Moreover, products incorporating semiconductor components can be caused to malfunction or fail due to foreign noise or surge. To ensure there will be no risk to life, the body or property even in the event of malfunction or failure, be sure to take all possible measures in safety system design, such as using protection circuits like limit switches or fuse breakers, or system redundancy.

2.2. Handling Precautions

Please pay attention to the following points when handling the product in order to avoid causing any irreversible damage.

Areas Easily Damaged	The microSD connector and its cover and the connectors of the flat cable connecting Armadillo-440 and the LCD Expansion Board can be easily damaged. Please be careful not to damage them by handling them with too much force.
Modifications To This Product	Please take note that any modifications[1] made to this product are not covered under warranty. Also, please ensure to undertake a full operational check of this product before carrying out any modifications or mounting connectors[2].
Mounting and Dismounting of Connectors While Powered On	Apart from hot-pluggable interfaces (LAN, USB, Mic, Headphone), do not under any circumstances add or remove connectors while power is supplied to this product or peripheral circuits.
Static Electricity	As CMOS devices are used in this product, please store it in antistatic packaging (such as that it was shipped in) until time of use.
Latch-up	Excessive noise or a surge from the power supply or input/output, or sharp voltage fluctuations can lead to the CMOS devices incorporated in the board causing a latch-up. Once the latch-up occurs, this situation continues until the power supply is disconnected, and therefore can damage the devices. Measures such as adding a protection circuit to noise-susceptible input/output lines or not sharing the power supply with devices that can be the cause of noise are highly recommended.
Physical Stress	Please avoid strong physical stress such as drops or other impacts.

[1] With the exception of adding connectors to unmounted interfaces.
[2] When mounting connectors, please ensure to apply masking, avoid solder residue coming in contact with surrounding parts and avoid creating solder balls.

2.3. Software Usage Precautions

About Software Contained In This Product	The software and documentation contained in this product is provided “AS IS” without warranty of any kind including warranty of merchantability or fitness for a particular purpose, reliability, correctness or accuracy. Furthermore, no guarantee is made in regard to any outcomes resulting from the use of this product.

2.4. Electromagnetic Interference

Both Armadillo-420 and Armadillo-440 have been recognized as Class A Information Technology Equipment[3] under VCCI Council standards. There are cases where this type of equipment can cause electromagnetic interference when used in home environments. In this situation, the user may be required to take appropriate measures to alleviate the problem.

The Armadillo-440 LCD Model (Armadillo-440 together with the LCD Expansion Board fixed on an acrylic board) does not meet the VCCI standard and can cause electromagnetic interference.

In order to clear Class A when using the LCD Expansion Board included in the Armadillo-440 LCD Model, it is necessary to strengthen the ground of the expansion board. For example, by using a metal instead of acrylic board or connecting the fixing holes of the Armadillo-440 and the LCD Expansion Board with a wide conducting line.

Please be aware of the following point when newly designing an expansion board which connects to the LCD interface on Armadillo-440.

With an expansion board that includes a device that has large power use fluctuations, such as with an audio amp, when only the GND line of the flexible flat cable (FCC) is connected the expansion board may produce electromagnetic noise. To mitigate the noise, strengthening of the expansion board's ground is recommended. For example, by connecting the fixing holes of the Armadillo-440 and expansion board by metal plate or wide conducting line.

2.5. Trademarks

Armadillo is a registered trademark of Atmark Techno, Inc. All other company names, product names and related trademarks are the property of their respective owners.

[3]This product cleared Class A when tested with the AC adapter included in the Development Set (UNIFIVE US300520).

3. Overview

3.1. Board Overview

The main specifications of the Armadillo-400 Series are as follows.

3.1 Armadillo-400 Series Board Specifications

	Armadillo-420	Armadillo-440
Processor	Freescale i.MX257 (MCIMX257)	
Processor Functions	ARM926EJ-S Core Instruction / Data Cache: 16KByte / 16KByte Internal SRAM: 128KByte Thumb code (16bit instruction set) support	
System Clock	CPU Core Clock: 400MHz BUS Clock: 133MHz Oscillator Clock: 32.768kHz, 24MHz	
SDRAM	LPDDR SDRAM: 64MByte (16bit width) Micron MT46H64M16LFCK-6 IT	LPDDR SDRAM: 128MByte (16bit width) Micron MT46H32M16LFBF-6 IT
Flash Memory	NOR Flash Memory: 16MByte (16bit width) Numonyx PC28F128P30BF Maximum Write Cycles: 100,000	NOR Flash Memory: 32MByte (16bit width) Numonyx PC28F256P30BF Maximum Write Cycles: 100,000
Ethernet	10BASE-T/100BASE-TX with AUTO-MDIX	
Serial (UART)	3 channels max[1] UART2: • RS232C level • flow control pins (CTS, RTS, DTR, DSR, DCD, RI) • Max baud rate: 230.4kbps UART3[2]/UART5[2]: • +3.3V CMOS levels • flow control pins (CTS, RTS) • Max baud rate: 4Mbps	4 channels max[1] UART2: • RS232C level • flow control pins (CTS, RTS, DTR, DSR, DCD, RI) • Max baud rate: 230.4kbps UART3[2]/UART4[3]/UART5[2]: • +3.3V CMOS levels • flow control pins (CTS, RTS) • Max baud rate: 4Mbps

	Armadillo-420	Armadillo-440
USB	2 channels (USB 2.0, Host) USBOTG (USBPHY1): • High Speed support • Type-A connector (lower port) USBHOST (USBPHY2): • Full Speed support • Type-A connector (upper port)	
SD/MMC	2 channels max[1] SDHC1: microSD slot SDHC2[2]: pin header	
LCD I/F		Max resolution: SVGA (800x600), 18bpp Connector Type: 50 pin FFC connector (0.5mm pitch)
Touch Panel I/F		4-Wire Resistive
Expansion I/F	Audio I2S: 1 channel max[1](AUD6[2]) I2C 1 channel max[1](I2C2[4]) SPI: 2 channels max[1](CSPI1[2], CSPI3[2]) GPIO: 24bit max[1]	Audio I2S: 2 channels max[1](AUD5[3], AUD6[2]) I2C: 2 channels max[1](I2C2[4], I2C3[3]) SPI: 2 channels max[1](CSPI1[2], CSPI3[2]) Keypad Interface: 4 x 6 matrix (24 keys) max[1][3] GPIO: 35bit max[1]
Switch	Tact Switch x1	
LED	Red LED (ϕ3mm) x 1 Green LED (ϕ3mm) x 1 Yellow LED (surface mount) x 1	
Debug I/F	8 pin (2.54mm pitch)[5]	
Board Size	75.0 x 50.0mm (excluding protrusions)	
Power Supply Voltage	DC3.1 - 5.25V[6]	
Power Consumption	1.2W approx.[7]	1.2W approx. (Armadillo-440 only)[7] 2.0W approx. (Armadillo-440 with LCD Expansion Board)[7]
Operating Temperature	-20 - 70 (with no condensation)	

[1]This is the number of channels available when the signal multiplex function on the i.MX257 is configured giving the most priority to this function.

[2]It is possible to assign this function to Expansion Interface 1 (CON9) with the signal multiplex function on i.MX257.

[3]It is possible to assign this function to the LCD Interface (CON11) with the signal multiplex function on i.MX257.

[4]It is possible to assign this function to Expansion Interface 2 (CON14) with the signal multiplex function on i.MX257.

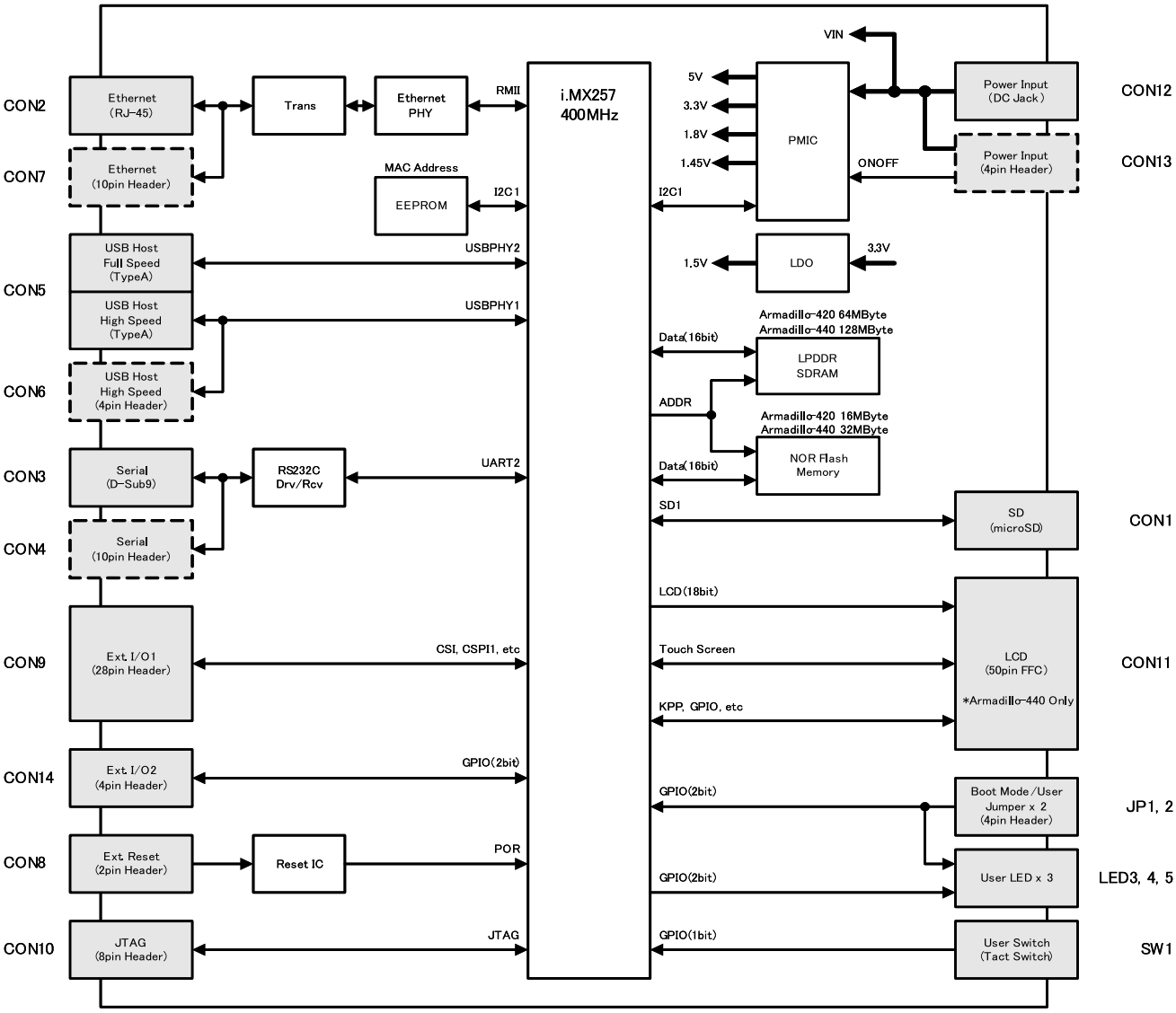
[5]It is possible to convert this interface to the standard ARM 20 pin layout with the JTAG Conversion Cable (OP-JC8P25-00) option. For details, please see A JTAG Conversion Cable (OP-JC8P25-00).

[6]There are certain limits to USB device supply current when operating on a voltage less than 4.75V. Please see 5.6. CON5, CON6 (USB Interface) for more details.

[7]Does not include USB and SD device power consumption.

3.2. Block Diagram

The Armadillo-400 Series block diagram is shown below.



3.1 Armadillo-400 Series Block Diagram

4. Memory Map

4.1. Physical Memory Map

The physical memory map of the Armadillo-400 Series is as shown.

4.1 Armadillo-400 Series Physical Memory Map

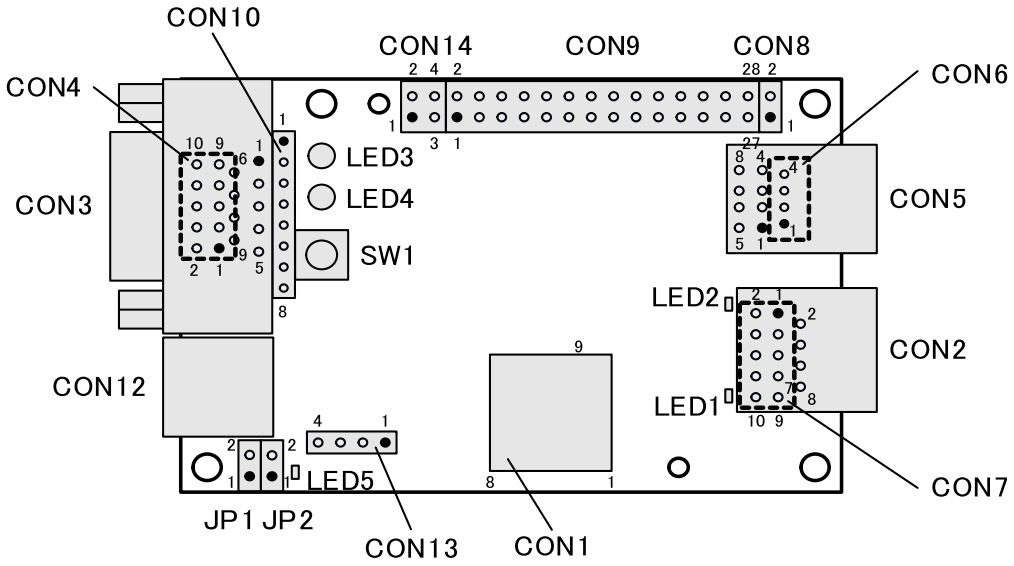
Start Address	End Address	Device		Memory Area	Data Port Width
		Armadillo-420	Armadillo-440		
0x0000 0000	0x0000 3FFF	i.MX257 Internal ROM (16KByte)			
0x0000 4000	0x0040 3FFF	Reserved			
0x0040 4000	0x0040 8FFF	i.MX257 Internal ROM (20KByte)			
0x0040 9000	0x3FFF FFFF	Reserved			
0x4000 0000	0x6FFF FFFF	i.MX257 Internal Register[1]			
0x7000 0000	0x77FF FFFF	Reserved			
0x7800 0000	0x7801 FFFF	i.MX257 Internal RAM (128KByte)			
0x7802 0000	0x7FFF FFFF	Reserved			
0x8000 0000	0x83FF FFFF	LPDDR SDRAM (64MByte)	LPDDR SDRAM (128MByte)	CSD0	16bit
0x8400 0000	0x87FF FFFF	Reserved			
0x8800 0000	0x8FFF FFFF	Reserved			
0x9000 0000	0x9FFF FFFF	Reserved		CSD1	
0xA000 0000	0xA0FF FFFF	Nor Flash Memory (16MByte)	Nor Flash Memory (32MByte)	CS0	16bit
0xA100 0000	0xA1FF FFFF	Reserved			
0xA200 0000	0xA7FF FFFF	Reserved			
0xA800 0000	0xAFFF FFFF	Reserved		CS1	
0xB00 0000	0xB1FF FFFF	Reserved		CS2	
0xB200 0000	0xB3FF FFFF	Reserved		CS3	
0xB400 0000	0xB5FF FFFF	Reserved		CS4	
0xB600 0000	0xB800 0FFF	Reserved			
0xB800 1000	0xBB00 1FFF	i.MX257 Internal Register[1]			
0xBB01 2000	0xBFFF FFFF	Reserved			
0xC000 0000	0xFFFF FFFF	Reserved			

[1]For details on the internal registers on the i.MX257, please refer to the "i.MX25 Multimedia Applications Processor Reference Manual" stored in the /document/datasheet directory on the included DVD.

5. Interface Specifications

5.1. Interface Layout

5.1.1. Armadillo-420 Interface Layout



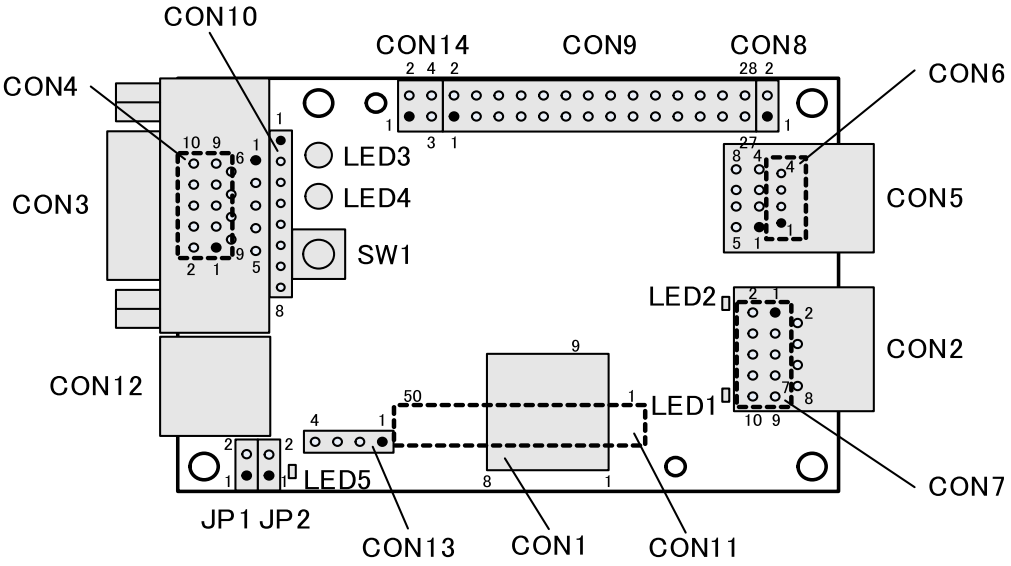
5.1 Armadillo-420 Interface Layout

5.1 Armadillo-420 Interfaces

Part Number	Interface	Shape	Notes
CON1	microSD slot	Hinge type	
CON2	LAN Interface	RJ-45	
CON3	Serial interface	D-Sub 9 pin (male)	
CON4	Serial interface	10 pin (2.54mm pitch)	Signal lines shared with CON3
CON5	USB interface	Type-A 2 port stack	
CON6	USB interface	4 pin (2mm pitch)	Signal lines shared with lower port of CON5
CON7	LAN Interface	10 pin (2.54mm pitch)	Some signal lines shared with CON2
CON8	Ext. reset terminal	2 pin (2.54mm pitch)	
CON9	Expansion Interface 1	28 pin (2.54mm pitch)	
CON10	i.MX257 JTAG interface	8 pin (2.54mm pitch)	
CON12	Power in connector	DC jack	
CON13	Power in connector	4 pin (2.54 mm pitch)	
CON14	Expansion Interface 2	4 pin (2.54 mm pitch)	
LED1	Link LED (green)	Surface mounted LCD	Shown on upper part of CON2
LED2	Activity LED (yellow)	Surface mounted LCD	Shown on upper part of CON2
LED3	User LED (red)	ϕ3mm LED	
LED4	User LED (green)	ϕ3mm LED	

Part Number	Interface	Shape	Notes
LED5	User LED (yellow)	Surface mounted LCD	
SW1	User switch	Tact Switch h=17mm	
JP1	Boot mode jumper	2 pin (2.54mm pitch)	
JP2	User jumper	2 pin (2.54mm pitch)	

5.1.2. Armadillo-440 Interface Layout



5.2 Armadillo-440 Interface Layout

5.2 Armadillo-440 Interfaces

Part Number	Interface	Shape	Notes
CON1	microSD slot	Hinge type	
CON2	LAN Interface	RJ-45	
CON3	Serial interface	D-Sub 9 pin (male)	
CON4	Serial interface	10 pin (2.54mm pitch)	Signal lines shared with CON3
CON5	USB interface	Type-A 2 port stack	
CON6	USB interface	4 pin (2mm pitch)	Signal lines shared with lower port of CON5
CON7	LAN Interface	10 pin (2.54mm pitch)	Some signal lines shared with CON2
CON8	Ext. reset terminal	2 pin (2.54mm pitch)	
CON9	Expansion Interface 1	28 pin (2.54mm pitch)	
CON10	i.MX257 JTAG interface	8 pin (2.54mm pitch)	
CON11	LCD Interface	50 pin (0.5mm pitch)	
CON12	Power in connector	DC jack	
CON13	Power in connector	4 pin (2.54 mm pitch)	
CON14	Expansion Interface 2	4 pin (2.54 mm pitch)	
LED1	Link LED (green)	Surface mounted LCD	Shown on upper part of CON2
LED2	Activity LED (yellow)	Surface mounted LCD	Shown on upper part of CON2
LED3	User LED (red)	ϕ3mm LED	
LED4	User LED (green)	ϕ3mm LED	

Part Number	Interface	Shape	Notes
LED5	User LED (yellow)	Surface mounted LCD	
SW1	User switch	Tact Switch h=17mm	
JP1	Boot mode jumper	2 pin (2.54mm pitch)	
JP2	User jumper	2 pin (2.54mm pitch)	

5.2. Electrical Specifications

The electrical specifications of the input/output interfaces are shown in 5.4. Input/Output Interface Electrical Specifications . With the Software Pad Control (SW_PAD_CTL) and Drive Voltage Select Group Control (SW_PAD_CTL_GRP_DVS) registers in i.MX257 it is possible to alter the output current (Std, High, Max), slew rate (Slow, Fast), and pull-up/pull-down.

5.3 Input/Output Interface Rated Absolute Maximum

Symbol	Parameter	Min	Max	Units
VImax	Input voltage range	–0.5	OVDD+0.3	V

5.4 Input/Output Interface Electrical Specifications

Symbol	Parameter	Min	Max	Units	Conditions
VIH	CMOS High-Level Input Voltage	0.7 x OVDD	OVDD	V	OVDD = +3.3V
VIL	CMOS Low-Level Input Voltage	-0.3	0.3 x OVDD	V	OVDD = +3.3V
VOH	CMOS High-Level Output Voltage	OVDD-0.15		V	IOH = -1mA
		0.8 x OVDD		V	IOH = Specified Drive
VOL	CMOS Low-Level Output Voltage		0.15	V	IOL = 1mA
			0.2 x OVDD	V	IOL = Specified Drive
IOH_S	High-Level Output Current, Slow Slew Rate	-2.0		mA	VOH = 0.8 x OVDD, Std Drive
		-4.0		mA	VOH = 0.8 x OVDD, High Drive
		-8.0		mA	VOH = 0.8 x OVDD, Max Drive
IOH_F	High-Level Output Current, Fast Slew Rate	-4.0		mA	VOH = 0.8 x OVDD, Std Drive
		-6.0		mA	VOH = 0.8 x OVDD, High Drive
		-8.0		mA	VOH = 0.8 x OVDD, Max Drive
IOL_S	Low-Level Output Current, Slow Slew Rate	2.0		mA	VOL = 0.2 x OVDD, Std Drive
		4.0		mA	VOL = 0.2 x OVDD, High Drive
		8.0		mA	VOL = 0.2 x OVDD, Max Drive

Symbol	Parameter	Min	Max	Units	Conditions
IOL_F	Low-Level Output Current, Fast Slew Rate	4.0		mA	VOH = 0.2 x OVDD, Std Drive
		6.0		mA	VOH = 0.2 x OVDD, High Drive
		8.0		mA	VOH = 0.2 x OVDD, Max Drive
IIN	Input Current (no PU/PD[1])		0.1	A	VI = 0
			0.06	A	VI = OVDD = +3.3V
	Input Current (22kPU)	117	184	A	VI = 0
		0.0001	0.0001	A	VI = OVDD = +3.3V
	Input Current (47kPU)	54	88	A	VI = 0
		0.0001	0.0001	A	VI = OVDD = +3.3V
	Input Current (100kPU)	25	42	A	VI = 0
		0.0001	0.0001	A	VI = OVDD = +3.3V
	Input Current (100kPD)	0.0001	0.0001	A	VI = 0
		25	42	A	VI = OVDD = +3.3V
ICC	High-impedance Supply Current		1.2	A	VI = 0
			1.2	A	VI = OVDD = +3.3V

[1]PU=Pull Up, PD=Pull Down

5.3. CON1 (microSD slot)

CON1 is a microSD/microMMC slot connected to a SD/MMC controller (SDHC1) in i.MX257. microSD card power supply can be controlled[1] with the NFRE_B (GPIO3_27) pin on i.MX257.

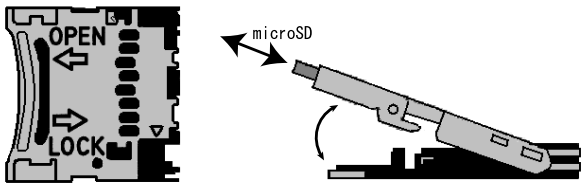
5.5 CON1 Signals

Pin Number	Signal Name	I/O	Function
1	SD1_DAT2	In/Out	Data bus (bit 2), connected to SD1_DATA2 pin on i.MX257
2	SD1_DAT3	In/Out	Data bus (bit 3), connected to SD1_DATA3 pin on i.MX257
3	SD1_CMD	In/Out	Command / Response, connected to SD1_CMD pin on i.MX257
4	VDD	Power	Power (+3.3V_CPU)[1]
5	SD1_CLK	Out	Clock, connected to SD1_CLK pin on i.MX257
6	VSS	Power	Power (GND)
7	SD1_DAT0	In/Out	Data bus (bit 0), connected to SD1_DATA0 pin on i.MX257
8	SD1_DAT1	In/Out	Data bus (bit 1), connected to SD1_DATA1 pin on i.MX257
9	SD1_CD*	In	Card detect (low: card inserted, high: card ejected) connected to NFRB (GPIO3_31) pin on i.MX257

[1]The combined maximum output current of CON1, CON4, CON7 and CON10 is 200mA.

[1]After the NFRE_B (GPIO3_27) pin on i.MX257 is set to GPIO output mode, power supply will start on a low signal and stop on a high signal.

CON1 is a hinge type connector. The cover on the connector must be opened in order to insert and remove the card. When opening, the cover should first be unlocked by sliding the upper part of the connector horizontally in the directory shown by the OPEN arrow.



5.3 microSD Card Insertion and Removal

CON1 is not hot-pluggable. Be sure to turn off the power supply before inserting or removing a microSD card.

Please ensure to leave the cover on CON1 in a locked state, regardless of whether a microSD card is inserted or not. If the cover is left unlocked when a microSD is not inserted, the internal contact of the connector may come into contact with the cover and cause the board to reset.

Information on tested microSD / microMMC cards is available on the Armadillo Developers Site and is updated regularly.

5.4. CON2, CON7 (LAN Interface)

CON2 and CON7 are a 10BASE-T/100BASE-TX LAN interface which can be used with Category 5 or above Ethernet cables. The interface includes AUTO-MDIX functionality allowing it to automatically detect straight or cross cable connections and swap the send and receive terminals accordingly.

5.6 CON2 Signals

Pin Number	Signal Name	I/O	Function
1	TX+	Out	Differential twisted pair transmit (+), signal line shared with CON7 (pin 1)
2	TX-	Out	Differential twisted pair transmit (-), signal line shared with CON7 (pin 4)
3	RX+	In	Differential twisted pair receive (+), signal line shared with CON7 (pin 3)
4	-	-	75 terminal after connection with CON2 (pin 5), signal line shared with CON7 (pin 5)
5	-	-	75 terminal after connection with CON2 (pin 4), signal line shared with CON7 (pin 5)

Pin Number	Signal Name	I/O	Function
6	RX-	In	Differential twisted pair receive (-), signal line shared with CON7 (pin 6)
7	-	-	75 terminal after connection with CON2 (pin 8), signal line shared with CON7 (pin 7)
8	-	-	75 terminal after connection with CON2 (pin 7), signal line shared with CON7 (pin 7)

5.7 CON7 Signals

Pin Number	Signal Name	I/O	Function
1	TX+	Out	Differential twisted pair transmit (+), signal line shared with CON2 (pin 1)
2	ACTIVITY_LED	Out	Activity indicator (low: data transmit/receive, high: no data)
3	RX+	In	Differential twisted pair receive (+), signal line shared with CON2 (pin 3)
4	TX-	Out	Differential twisted pair transmit (-), signal shared with CON2 (pin 2)
5	-	-	75 terminal, signal line shared with CON2 (pins 4, 5)
6	RX-	In	Differential twisted pair receive (-), signal line shared with CON2 (pin 6)
7	-	-	75 terminal, signal line shared with CON2 (pins 7, 8)
8	LINK_LED	-	Link indicator (low: link established, high: no link)
9	+3.3V_CPU	Power	Power (+3.3V_CPU)[1]
10	GND	Power	Power (GND)

[1]The combined maximum output current of CON1, CON4, CON7 and CON10 is 200mA.

As CON2 and CON7 share the same signal lines they cannot both be used at the same time. Please be sure to use only one of the connectors.

5.5. CON3, CON4 (Serial Interface)

CON3 and CON4 are an asynchronous serial interface connected to a UART controller in the i.MX257. Although CON3 and CON4 have differing connector types and pin layouts, they share the same serial signal lines.

- Signal input/output levels: RS232C levels
- Max data rate: 230.4kbps
- Flow control: CTS, RTS, DTR, DSR, DCD, RI
- Controller: i.MX257 internal UART controller (UART2)
- CON3 connector type: D-Sub 9 pin
- CON4 connector type: 10 pin (2x5, 2.54mm pitch)

It is possible to shut down the RS232C level conversion IC connected to CON3 and CON4 by controlling[2] the BOOT_MODE1 (GPIO4_31) pin on the i.MX257.

5.8 CON3 Signals

Pin Number	Signal Name	I/O	Function
1	DCD2	In	Carrier Detect, connected to the UART1_RTS pin on i.MX257, signal line shared with CON4 (pin 1)
2	RXD2	In	Receive Data, connected to the UART2_RXD pin on i.MX257, signal line shared with CON4 (pin 3)
3	TXD2	Out	Transmit Data, connected to UART2_TXD pin on i.MX257, signal line shared with CON4 (pin 5)
4	DTR2	Out	Data Terminal Ready, connected to UART1_RXD on i.MX257, signal line shared with CON4 (pin 7)
5	GND	Power	Power (GND)
6	DSR2	In	Data Set Ready, connected to UART1_TXD pin on i.MX257, signal line shared with CON4 (pin 2)
7	RTS2	Out	Request To Send, connected to UART2_CTS pin on i.MX257, signal line shared with CON4 (pin 4)
8	CTS2	In	Clear To Send, connected to UART2_RTS pin on i.MX257, signal line shared with CON4 (pin 6)
9	RI2	In	Ring Indicator, connected to UART1_CTS pin on i.MX257, signal line shared with CON4 (pin 8)

5.9 CON4 Signals

Pin Number	Signal Name	I/O	Function
1	DCD2	In	Carrier Detect, connected to the UART1_RTS pin on i.MX257, signal line shared with CON3 (pin 1)
2	DSR2	In	Data Set Ready, connected to UART1_TXD pin on i.MX257, signal line shared with CON3 (pin 6)
3	RXD2	In	Receive Data, connected to the UART2_RXD pin on i.MX257, signal line shared with CON3 (pin 2)
4	RTS2	Out	Request To Send, connected to UART2_CTS pin on i.MX257, signal line shared with CON3 (pin 7)
5	TXD2	Out	Transmit Data, connected to UART2_TXD pin on i.MX257, signal line shared with CON3 (pin 3)
6	CTS2	In	Clear To Send, connected to UART2_RTS pin on i.MX257, signal line shared with CON3 (pin 8)
7	DTR2	Out	Data Terminal Ready, connected to UART1_RXD on i.MX257, signal line shared with CON3 (pin 4)
8	RI2	In	Ring Indicator, connected to UART1_CTS pin on i.MX257, signal line shared with CON3 (pin 9)
9	GND	Power	Power (GND)
10	+3.3V_CPU	Power	Power (+3.3V_CPU)[1]

[1]The combined maximum output current of CON1, CON4, CON7 and CON10 is 200mA.

[2]After the BOOT_MODE1 (GPIO4_31) pin on i.MX257 is set to GPIO output mode, a low signal will activate shut-down mode and a high signal will return the IC to normal mode.

As CON3 and CON4 share the same signal lines they cannot both be used at the same time. Please be sure to use only one of the connectors.

5.6. CON5, CON6 (USB Interface)

CON5 is a USB interface connected to a USB controller in the i.MX257. Although the lower port of CON5 and CON6 have differing connector types and pin layouts, they share the same USB signal lines.

It is possible to select between the power in (VIN) of CON12 (or CON13) and the +5V power generated by the power management IC (PMIC) as the source of power provided to USB devices from CON5 and CON6 by controlling[3] the NFWE_B (GPIO3_26) pin on the i.MX257. When using a power input of less than 4.75V while connecting USB devices, please select the PMIC generated +5V power source. Please be aware that the total maximum current that can be supplied to the two USB channels is 300mA when using the PMIC generated +5V power source. [4]

CON5 Upper Port:

- Data transmission modes: USB 2.0 Full Speed (12Mbps), Low Speed (1.5Mbps)
- Controller: i.MX257 internal USB controller (HOST)
- PHY: i.MX257 internal USB PHY (USBPHY2)

CON5 Lower Port, CON6:

- Data transmission modesUSB 2.0 High Speed (480Mbps), Full Speed (12Mbps), Low Speed (1.5Mbps)
- Controller: i.MX257 internal USB controller (OTG)
- PHY: i.MX257 internal USB PHY (USBPHY1)

5.10 CON5 Signals

Pin Number	Signal Name	I/O	Function
1	+5V_USB	Power	Selection between USB power and power in VIN (when above 4.75V) providing for a max 500mA supply
2	USB1-	In/Out	USB1 minus side signal, i.MX257 USBPHY1_DM pin connection, signal line shared with CON6 (pin 2)
3	USB1+	In/Out	USB1 plus side signal, i.MX257 USBPHY1_DP pin connection, signal line shared with CON6 (pin 3)
4	GND	Power	Power (GND)
5	+5V_USB	Power	Selection between USB power and power in VIN (when above 4.75V) providing for a max 500mA supply
6	USB2-	In/Out	USB2 minus side signal, i.MX257 USBPHY2_DM pin connection
7	USB2+	In/Out	USB2 plus side connection, i.MX257 USBPHY2_DP pin connection
8	GND	Power	Power (GND)

[3]The power in (VIN) source will be used when the NFWE_B (GPIO3_26) pin is low, and the power management IC generated +5V will be used when the pin is high.
[4]Please refer to 5.18. Power Circuit Make-up for the power circuit make-up.

5.11 CON6 Signals

Pin Number	Signal Name	I/O	Function
1	+5V_USB	Power	Selection between USB power and power in VIN (when above 4.75V) providing for a max 500mA supply
2	USB1-	In/Out	USB1 minus side signal, i.MX257 USBPHY1_DM pin connection, signal line shared with CON5 (pin 2)
3	USB1+	In/Out	USB1 plus side signal, i.MX257 USBPHY1_DP pin connection, signal line shared with CON5 (pin 3)
4	GND	Power	Power (GND)

As the lower port on CON5 and CON6 share the same signal lines they cannot both be used at the same time. Please be sure to use only one of the connectors.

Information on tested USB devices is available on the Armadillo Developers Site and is updated regularly.

5.7. CON8 (External Reset Terminal)

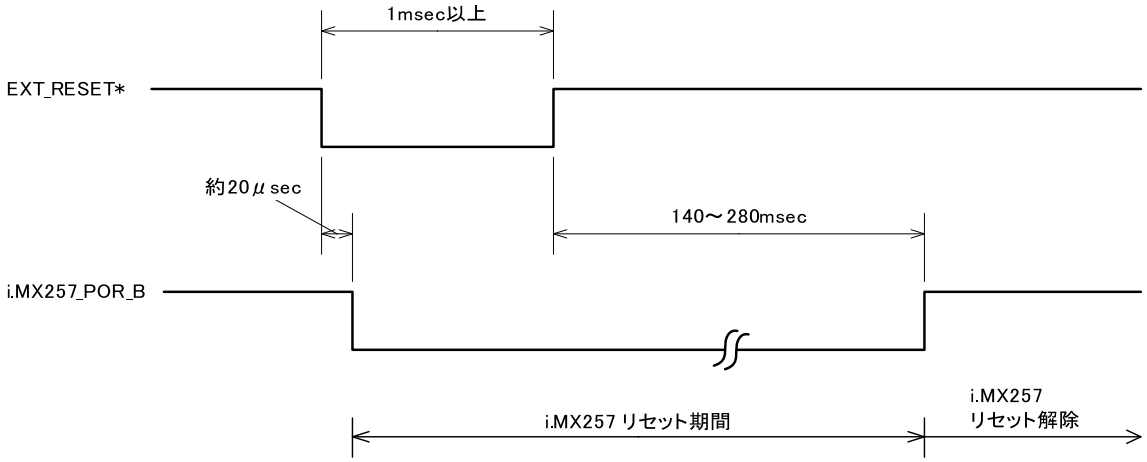
CON8 is an external reset terminal. CON8 (pin 1) is connected to the reset IC incorporated on the board, and while this signal is low the board will be placed in a reset state.

5.12 CON8 Signals

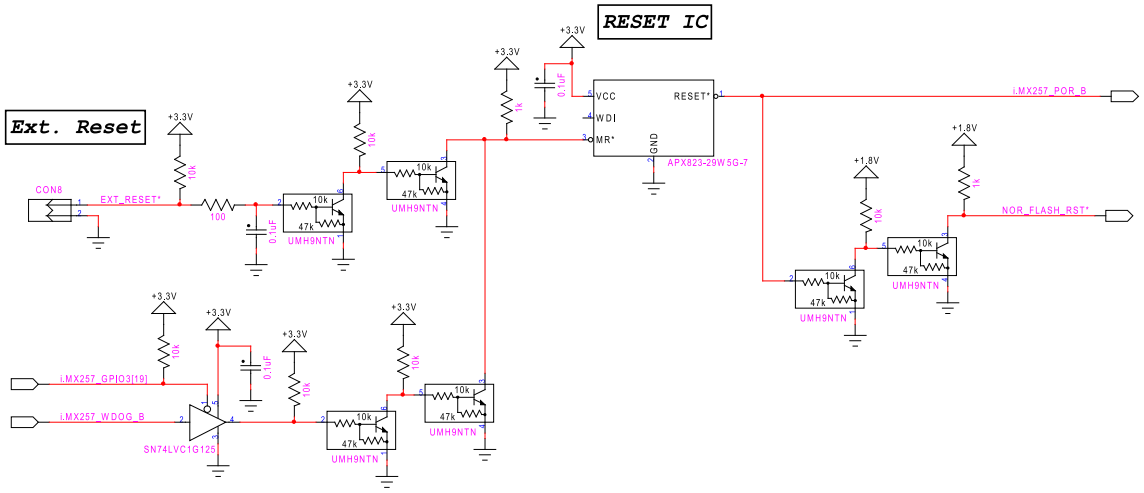
Pin Number	Signal Name	I/O	Function
1	EXT_RESET*	In	External Reset (low[1]: reset state, high[2]: no reset)
2	GND	Power	Power (GND)

[1]In order to ensure a reset takes place, hold the signal low for at least 1msec.

[2]Pin 1 on CON8 is internally pulled up to +3.3V and can accept input from other open collector or open drain signals.



5.4 EXT_RESET* Timing Chart



5.5 EXT_RESET* Circuit Make-up

5.8. CON9 (Expansion Interface 1)

CON9 is an expansion input/output interface. The line signals of the internal controllers in the i.MX257 can be used by configuring the i.MX257 multiplex function. For the initial state of each signal pin, please refer to B Initial Configuration State of Expansion Interfaces.

5.13 CON9 Signals

Pin Number	Signal Name	I/O	Function
1	EXT_IO0	In/Out	Expansion I/O 0, connected to VSTBY_REQ pin on i.MX257
2	EXT_IO1	In/Out	Expansion I/O 1, connected to RTCK pin on i.MX257
3	EXT_IO2	In/Out	Expansion I/O 2, connected to CSPI1_MOSI pin on i.MX257
4	EXT_IO3	In/Out	Expansion I/O 3, connected to CSI_D2 pin on i.MX257
5	EXT_IO4	In/Out	Expansion I/O 4, connected to CSPI1_MISO pin on i.MX257
6	EXT_IO5	In/Out	Expansion I/O 5, connected to CSI_D3 pin on i.MX257
7	+3.3V_IO	Power	Power (+3.3V_IO)
8	+3.3V_IO	Power	Power (+3.3V_IO)
9	GND	Power	Power (GND)
10	GND	Power	Power (GND)
11	EXT_IO6	In/Out	Expansion I/O 6, connected to CSPI1_SS1 pin on i.MX257
12	EXT_IO7	In/Out	Expansion I/O 7, connected to CSI_D4 pin on i.MX257
13	EXT_IO8	In/Out	Expansion I/O 8, connected to CSPI1_SCLK pin on i.MX257
14	EXT_IO9	In/Out	Expansion I/O 9, connected to CSI_D5 pin on i.MX257
15	EXT_IO10	In/Out	Expansion I/O 10, connected to CSI_D8 pin on i.MX257
16	EXT_IO11	In/Out	Expansion I/O 11, connected to CSI_D6 pin on i.MX257
17	EXT_IO12	In/Out	Expansion I/O 12, connected to CSI_D9 pin on i.MX257
18	EXT_IO13	In/Out	Expansion I/O 13, connected to CSI_D7 pin on i.MX257
19	GND	Power	Power (GND)
20	+3.3V_IO	Power	Power (+3.3V_IO)
21	EXT_IO14	In/Out	Expansion I/O 14, connected to CSI_MCLK pin on i.MX257
22	EXT_IO15	In/Out	Expansion I/O 15, connected to CSI_VSYNC pin on i.MX257
23	EXT_IO16	In/Out	Expansion I/O 16, connected to CSI_HSYNC pin on i.MX257

Pin Number	Signal Name	I/O	Function
24	EXT_IO17	In/Out	Expansion I/O 17, connected to CSI_PIXCLK pin on i.MX257
25	EXT_IO18	In/Out	Expansion I/O 18, connected to CSPI1_SS0 pin on i.MX257
26	EXT_IO19	In/Out	Expansion I/O 19, connected to CSPI1_RDY pin on i.MX257
27	EXT_IO20	In/Out	Expansion I/O 20, connected to CLKO pin on i.MX257
28	EXT_IO21	In/Out	Expansion I/O 21, connected to EXT_ARMCLK pin on i.MX257

5.14 CON9 Signal Multiplex

Pin Number	Signal Name	Multiplex Modes[1]				
		ALT0	ALT1	ALT2	ALT5	ALT7
1	EXT_IO0				GPIO3_17	
2	EXT_IO1		1-WIRE		GPIO3_14	
3	EXT_IO2	CSPI1_MOSI		UART3_RXD	GPIO1_14	
4	EXT_IO3	CSI_D2	UART5_RXD	SD2_DAT4	GPIO1_27	CSPI3_MOSI
5	EXT_IO4	CSPI1_MISO		UART3_TXD	GPIO1_15	
6	EXT_IO5	CSI_D3	UART5_TXD	SD2_DAT5	GPIO1_28	CSPI3_MISO
7	+3.3V_IO					
8	+3.3V_IO					
9	GND					
10	GND					
11	EXT_IO6	CSPI1_SS1		UART3_RTS	GPIO1_17	
12	EXT_IO7	CSI_D4	UART5_RTS	SD2_DAT6	GPIO1_29	CSPI3_SCLK
13	EXT_IO8	CSPI1_SCLK		UART3_CTS	GPIO1_18	
14	EXT_IO9	CSI_D5	UART5_CTS	SD2_DAT7	GPIO1_30	CSPI3_RDY
15	EXT_IO10	CSI_D8		AUD6_RXC	GPIO1_7	CSPI3_SS2
16	EXT_IO11	CSI_D6		SD2_CMD	GPIO1_31	CSPI3_SS0
17	EXT_IO12	CSI_D9		AUD6_RXFS	GPIO4_21	CSPI3_SS3
18	EXT_IO13	CSI_D7		SD2_CLK	GPIO1_6	CSPI3_SS1
19	GND					
20	+3.3V_IO					
21	EXT_IO14	CSI_MCLK	AUD6_TXD	SD2_DAT0	GPIO1_8	
22	EXT_IO15	CSI_VSYNC	AUD6_RXD	SD2_DAT1	GPIO1_9	
23	EXT_IO16	CSI_HSYNC	AUD6_TXC	SD2_DAT2	GPIO1_10	
24	EXT_IO17	CSI_PIXCLK	AUD6_TXFS	SD2_DAT3	GPIO1_11	
25	EXT_IO18	CSPI1_SS0		PWMO2	GPIO1_16	
26	EXT_IO19	CSPI1_RDY			GPIO2_22	
27	EXT_IO20	CLKO			GPIO2_21	
28	EXT_IO21				GPIO3_15	

[1]For details on the multiplex modes of the i.MX257, please refer to the "i.MX25 Multimedia Applications Processor Reference Manual" stored in the /document/datasheet directory on the included DVD.

5.9. CON10 (i.MX257 JTAG Interface)

CON10 is an interface for connecting JTAG debuggers. It is connected to the JTAG Controller in the i.MX257.

It is possible to convert this interface to the standard ARM 20 pin layout with the JTAG Conversion Cable (OP-JC8P25-00) option. For details, please see A JTAG Conversion Cable (OP-JC8P25-00).

5.15 CON10 Signals

Pin Number	Signal Name	I/O	Function
1	+3.3V_CPU	Power	Power (+3.3V_CPU)[1]
2	JTAG_TRST*	In	Test Reset, connected to TRSTB pin on i.MX257
3	JTAG_TDI	In	Test Data In, connected to TDI pin on i.MX257
4	JTAG_TMS	In	Test Mode Select, connected to TMS pin on i.MX257
5	JTAG_TCK	In	Test Clock, connected to TCK pin on i.MX257
6	JTAG_TDO	Out	Test Data Out, connected to TDO pin on i.MX257
7	CPU_RESET*	In	i.MX257 reset[2], connected to RESET_B pin on i.MX257
8	GND	Power	Power (GND)

[1]The combined maximum output current of CON1, CON4, CON7 and CON10 is 200mA.

[2]Only i.MX257 is reset with the CPU_RESET* pin. If a full board reset is required, please use the EXT_RESET* pin on CON8.

5.10. CON11 (LCD Interface)

CON11 is a LCD interface which connects to LCD modules with digital RGB inputs. It has connections to a number of functions in the i.MX257, including the LCD controller and touch screen controller. For the initial state of each signal pin, please refer to B Initial Configuration State of Expansion Interfaces.

- Max resolution: 800x600 (18bit)
- Supported touch screens: 4-Wire Resistive
- Connector Type: 50 pin FFC connector (0.5mm pitch)

5.16 CON11 Signals

Pin Number	Signal Name	I/O	Function
1	VIN	Power	Power (CON12 or CON13 power in)
2	VIN	Power	Power (CON12 or CON13 power in)
3	VIN	Power	Power (CON12 or CON13 power in)
4	+3.3V_IO	Power	Power (+3.3V_IO)
5	+3.3V_IO	Power	Power (+3.3V_IO)
6	GND	Power	Power (GND)
7	GND	Power	Power (GND)
8	LCD_LSCLK	Out	Connected to LSCLK pin on i.MX257
9	LCD_HSYN	Out	Connected to HSYNC pin on i.MX257
10	LCD_VSYN	Out	Connected to VSYNC pin on i.MX257
11	LCD_OE_ACD	Out	Connected to OE_ACD pin on i.MX257
12	PWMO1	Out	Connected to PWM pin on i.MX257
13	LCD_LD0	Out	Connected to LD0 pin on i.MX257
14	LCD_LD1	Out	Connected to LD1 pin on i.MX257
15	LCD_LD2	Out	Connected to LD2 pin on i.MX257
16	LCD_LD3	Out	Connected to LD3 pin on i.MX257
17	LCD_LD4	Out	Connected to LD4 pin on i.MX257
18	LCD_LD5	Out	Connected to LD5 pin on i.MX257
19	GND	Power	Power (GND)
20	LCD_LD6	Out	Connected to LD6 pin on i.MX257

Pin Number	Signal Name	I/O	Function
21	LCD_LD7	Out	Connected to LD7 pin on i.MX257
22	LCD_LD8	Out	Connected to LD8 pin on i.MX257
23	LCD_LD9	Out	Connected to LD9 pin on i.MX257
24	LCD_LD10	Out	Connected to LD10 pin on i.MX257
25	LCD_LD11	Out	Connected to LD11 pin on i.MX257
26	GND	Power	Power (GND)
27	LCD_LD12	Out	Connected to LD12 pin on i.MX257
28	LCD_LD13	Out	Connected to LD13 pin on i.MX257
29	LCD_LD14	Out	Connected to LD14 pin on i.MX257
30	LCD_LD15	Out	Connected to LD15 pin on i.MX257
31	LCD_LD16	Out	Connected to GPIO_E pin on i.MX257
32	LCD_LD17	Out	Connected to GPIO_F pin on i.MX257
33	GND	Power	Power (GND)
34	TOUCH_XP	In/Out	Connected to XP pin on i.MX257
35	TOUCH_XN	In/Out	Connected to XN pin on i.MX257
36	TOUCH_YP	In/Out	Connected to YP pin on i.MX257
37	TOUCH_YN	In/Out	Connected to YN pin on i.MX257
38	GND	Power	Power (GND)
39	EXT_IO24	In/Out	Expansion I/O 24, connected to DE_B pin on i.MX257
40	EXT_IO25	In/Out	Expansion I/O 25, connected to KPP_ROW0 pin on i.MX257
41	EXT_IO26	In/Out	Expansion I/O 26, connected to KPP_ROW1 pin on i.MX257
42	EXT_IO27	In/Out	Expansion I/O 27, connected to KPP_ROW2 pin on i.MX257
43	EXT_IO28	In/Out	Expansion I/O 28, connected to KPP_ROW3 pin on i.MX257
44	EXT_IO29	In/Out	Expansion I/O 29, connected to KPP_COL0 pin on i.MX257
45	EXT_IO30	In/Out	Expansion I/O 30, connected to KPP_COL1 pin on i.MX257
46	EXT_IO31	In/Out	Expansion I/O 31, connected to KPP_COL2 pin on i.MX257
47	EXT_IO32	In/Out	Expansion I/O 32, connected to KPP_COL3 pin on i.MX257
48	EXT_IO33	In/Out	Expansion I/O 33, connected to GPIO_A pin on i.MX257
49	EXT_IO34	In/Out	Expansion I/O 34, connected to GPIO_B pin on i.MX257
50	GND	Power	Power (GND)

5.17 CON11 Signal Multiplex

Pin Number	Signal Name	Multiplex Modes[1]					
		ALT0	ALT1	ALT2	ALT3	ALT4	ALT5
1	VIN						
2	VIN						
3	VIN						
4	+3.3V_IO						
5	+3.3V_IO						
6	GND						
7	GND						
8	LCD_LSCLK	LSCLK	SLCDC_CS				
9	LCD_HSYN	HSYN					
10	LCD_VSYN	VSYN					

Pin Number	Signal Name	Multiplex Modes[1]					
		ALT0	ALT1	ALT2	ALT3	ALT4	ALT5
11	LCD_OE_ACD	OE_ACD	SLCDC_RS				
12	PWMO1						
13	LCD_LD0	LD0	SLCDC_D0				
14	LCD_LD1	LD1	SLCDC_D1				
15	LCD_LD2	LD2	SLCDC_D2				
16	LCD_LD3	LD3	SLCDC_D3				
17	LCD_LD4	LD4	SLCDC_D4				
18	LCD_LD5	LD5	SLCDC_D5				
19	GND						
20	LCD_LD6	LD6	SLCDC_D6				
21	LCD_LD7	LD7	c				
22	LCD_LD8	LD8	SLCDC_D8				
23	LCD_LD9	LD9	SLCDC_D9				
24	LCD_LD10	LD10	SLCDC_D10				
25	LCD_LD11	LD11	SLCDC_D11				
26	GND						
27	LCD_LD12	LD12	SLCDC_D12				
28	LCD_LD13	LD13	SLCDC_D13				
29	LCD_LD14	LD14	SLCDC_D14				
30	LCD_LD15	LD15	SLCDC_D15				
31	LCD_LD16			LD16			
32	LCD_LD17			LD17			
33	GND						
34	TOUCH_XP	XP					
35	TOUCH_XN	XN					
36	TOUCH_YP	YP					
37	TOUCH_YN	XN					
38	GND						
39	EXT_IO24						GPIO2_20
40	EXT_IO25	ROW0	UART3_RXD				GPIO2_29
41	EXT_IO26	ROW1	UART3_TXD				GPIO2_30
42	EXT_IO27	ROW2	UART3_RTS	AUD5_RXC			GPIO2_31
43	EXT_IO28	ROW3	UART3_CTS	AUD5_RXFS			GPIO3_0
44	EXT_IO29	COL0	UART4_RXD	AUD5_TXD			GPIO3_1
45	EXT_IO30	COL1	UART4_TXD	AUD5_RXD			GPIO3_2
46	EXT_IO31	COL2	UART4_RTS	AUD5_TXC			GPIO3_3
47	EXT_IO32	COL3	UART4_CTS	AUD5_TXFS			GPIO3_4
48	EXT_IO33	GPIO1_0	PWMO2		ROW4	I2C3_SCL	
49	EXT_IO34	GPIO1_1	PWMO3		ROW5	I2C3_SDA	
50	GND						

[1]For details on the multiplex modes of the i.MX257, please refer to the "i.MX25 Multimedia Applications Processor Reference Manual" stored in the /document/datasheet directory on the included DVD.

5.11. CON12, CON13 (Power In Connector)

CON12 is a DC jack which supplies power to the board. The AC adapter jack type is EIAJ RC-5320A compliant (voltage classification 2). Jacks with the same polarity mark as 5.6. AC Adapter Polarity Mark can be used.

5.6 AC Adapter Polarity Mark

CON13 is a connector which supplies power to the board. Signal lines to control the power management IC (PMIC) on/off are included in this connector.

5.18 CON13 Signals

Pin Number	Signal Name	I/O	Function
1	GND	Power	Power (GND)
2	VIN	Power	Power in terminal, line shared with center pin of CON12
3	GND	Power	Power (GND)
4	PMIC_ONOFF*	In	PMIC ON/OFF control (2sec or longer GND short to power off, GND short again to power back on)[1]

[1]PMIC_ONOFF* has a 10k pull-up from power in VIN

CON12 and CON13 accept a power in voltage range of DC3.1V to 5.25V. Do not apply a voltage higher than 5.25V as this may damage the internal devices.

As the power lines of CON12 and CON13 are connected they cannot both be used at the same time. Please be sure to only supply power with one of the connectors.

5.12. CON14 (Expansion Interface 2)

CON14 is an expansion input/output interface. The line signals of the internal controllers in the i.MX257 can be used by configuring the i.MX257 multiplex function. For the initial state of each signal pin, please refer to B Initial Configuration State of Expansion Interfaces.

5.19 CON14 Signals

Pin Number	Signal Name	I/O	Function
1	+3.3V_IO	Power	Power (+3.3V_IO)
2	GND	Power	Power (GND)
3	EXT_IO22	In/Out	Expansion I/O 22, connected to GPIO_C pin on i.MX257
4	EXT_IO23	In/Out	Expansion I/O 23, connected to GPIO_D pin on i.MX257

5.20 CON14 Signal Multiplex

Pin Number	Signal Name	Multiplex Modes[1]				
		ALT0	ALT1	ALT2	ALT5	ALT6
1	+3.3V_IO					
2	GND					
3	EXT_IO22	GPIO1_2	PWMO4	I2C2_SCL	CSPI1_SS2	CAN2_TX
4	EXT_IO23	GPIO1_3		I2C2_SDA		CAN2_RX

[1]For details on the multiplex modes of the i.MX257, please refer to the "i.MX25 Multimedia Applications Processor Reference Manual" stored in the /document/datasheet directory on the included DVD.

5.13. LED1, LED2 (LAN LEDs)

LED1 and LED2 are the LAN interface status LEDs. They are shown on the upper part of CON2.

5.21 LAN LED Meanings

LED	Name (color)	On	Off
LED1	Link LED (green)	A LAN cable is connected and a 10BASE-T or 100BASE-TX link has been established.	A LAN cable is not connected or the LAN status of the connected device is not active.
LED2	Activity LED (yellow)	Data transmit/receive	No data

5.14. LED3, LED4, LED5 (User LEDs)

LED3, LED4 and LED5 are LEDs which can be used freely by the user. They can be controlled once the i.MX257 signals to which the LEDs are connected to are set to GPIO output mode.

5.22 User LED Functions

LED	Name (color)	Function
LED3	User LED (red)	Connected to NFALE (GPIO3_28) pin on i.MX257 (low: off, high: on)
LED4	User LED (green)	Connected to NFCLE (GPIO3_29) pin on i.MX257 (low: off, high: on)
LED5	User LED (yellow)	Connected to BOOT_MODE0 (GPIO4_30) pin on i.MX257 (low: off, high: on)

LED5 is connected to the same signal as JP1. LED5 cannot be controlled while JP1 is shorted.

5.15. SW1 (User Switch)

SW1 is a switch which can be freely used by the user. The switch status can be obtained once the i.MX257 signal it is connected to is set to GPIO input mode.

5.23 User Switch Function

SW	Function
SW1	Connected to NFWP_B (GPIO3_30) pin on i.MX257 (low: switch pressed, high: switch not pressed)

5.16. JP1 (Boot Mode Configuration Jumper)

The JP1 jumper is used to configure the board's boot mode. The boot mode is determined at power on time according to the jumper state.

5.24 Boot Mode Configuration Jumper Behavior

JP1	Behavior
Open	On-board flash memory boot
Shorted	UART boot: UART2 (CON3 or CON4)

JP1 is connected to the same signal as LED5. Please do not use JP1 in a shorted state after booting to on-board flash memory.

5.17. JP2 (User Jumper)

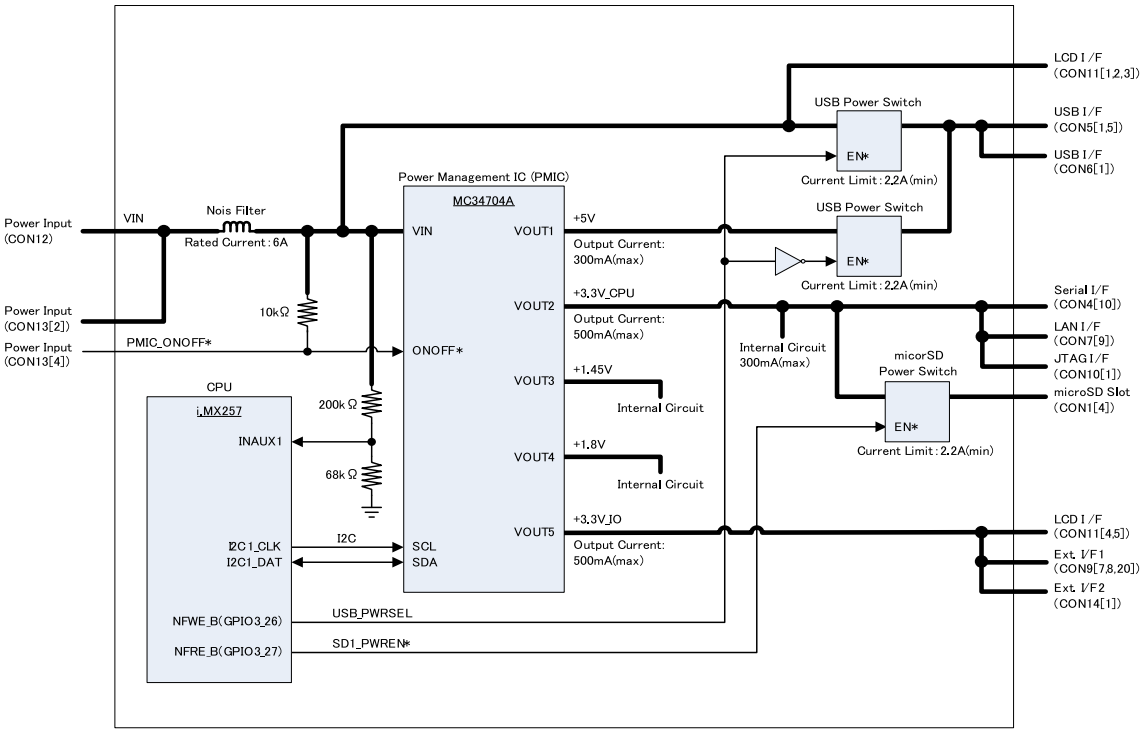
The JP2 jumper can be used freely by the user. The jumper status can be obtained once the i.MX257 signal it is connected to is set to GPIO input mode.

5.25 User Jumper Function

JP	Function
JP2	Connected to NF_CE0 (GPIO3_22) on i.MX257 (low: shorted, high: open)

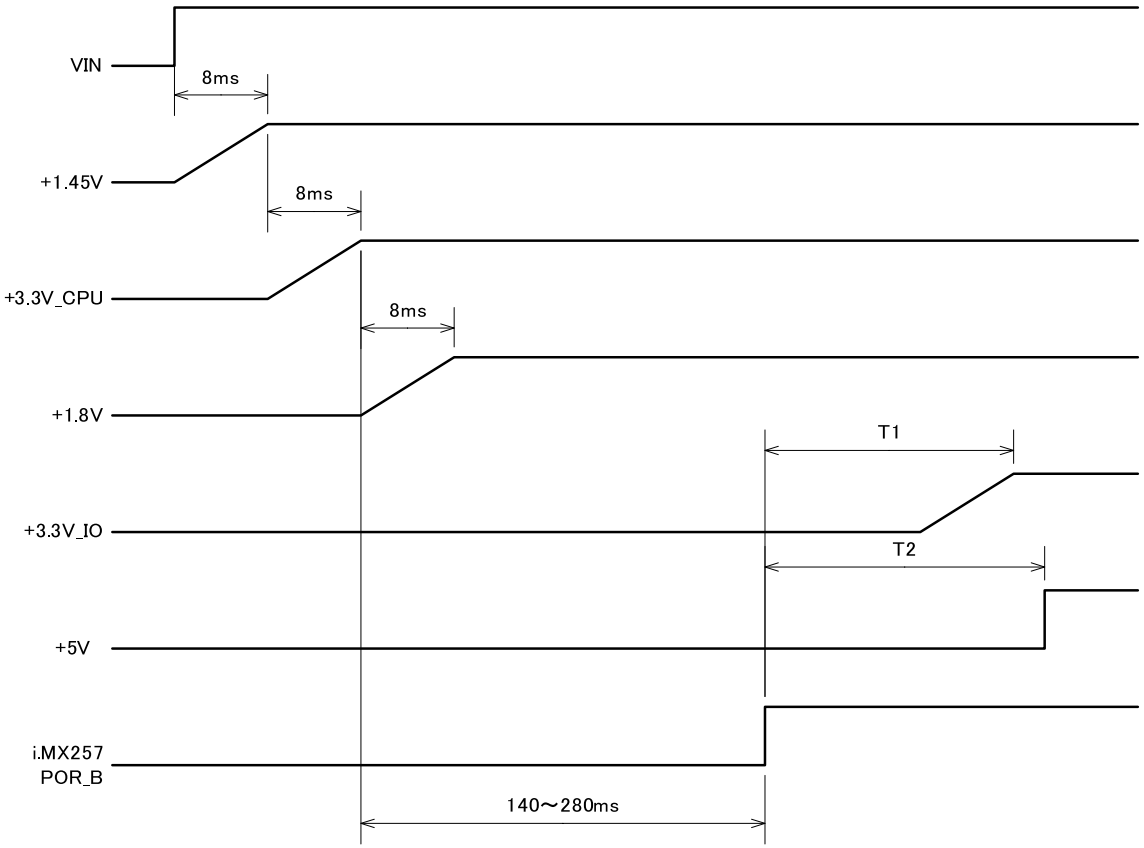
5.18. Power Circuit Make-up

The power circuit make-up of the board is shown in 5.7. Armadillo-400 Series Power Circuit Make-up Diagram. Be sure to configure external device connections and power supply so that the current capacity limit of each device is not exceeded.



5.7 Armadillo-400 Series Power Circuit Make-up Diagram

The power sequence of the board is shown in 5.8. Armadillo-400 Series Power Sequence.

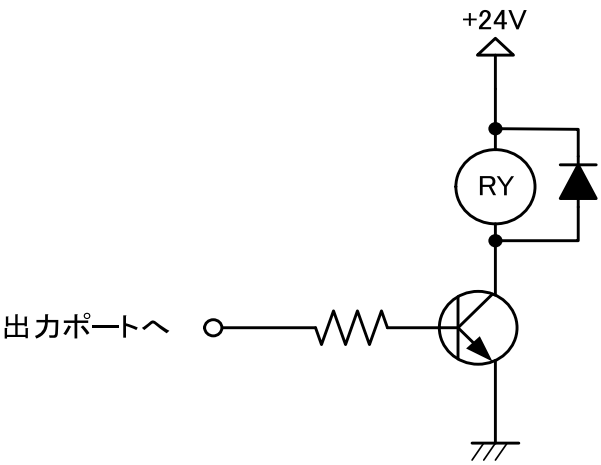


5.8 Armadillo-400 Series Power Sequence

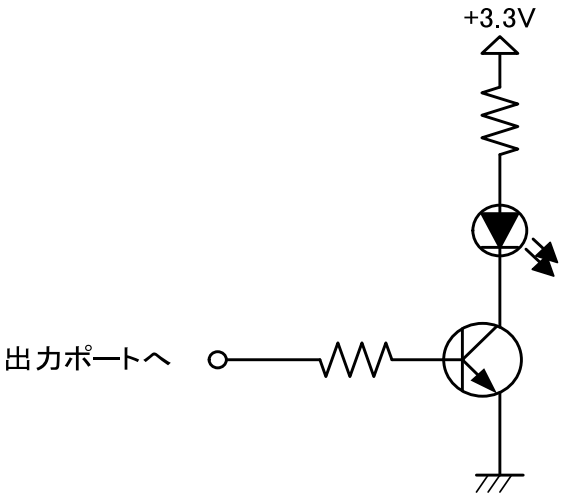
The power on timing of the +3.3V_IO and +5V lines can be determined by controlling the power management IC (PMIC) via I2C.

6. Reference Circuits

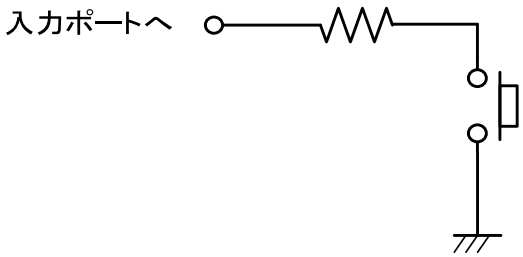
Reference circuits for when CON9, CON11 (Armadillo-440 only) and CON14 signals are used as GPIO are shown in Diagram 6-1.



24Vリレー駆動回路



LED点灯回路

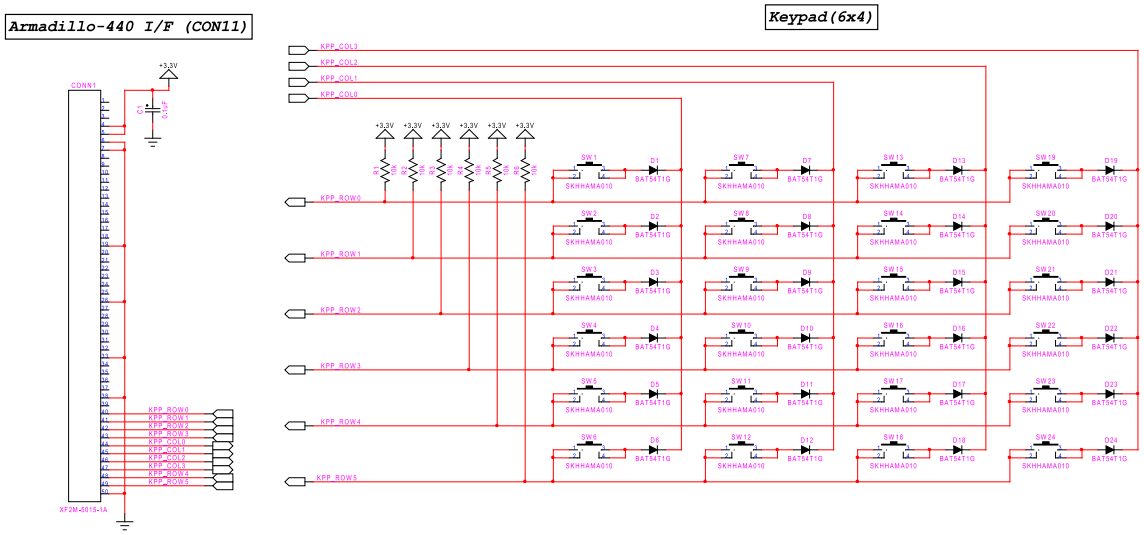


押しボタンスイッチ入力回路

6.1 GPIO Reference Circuits

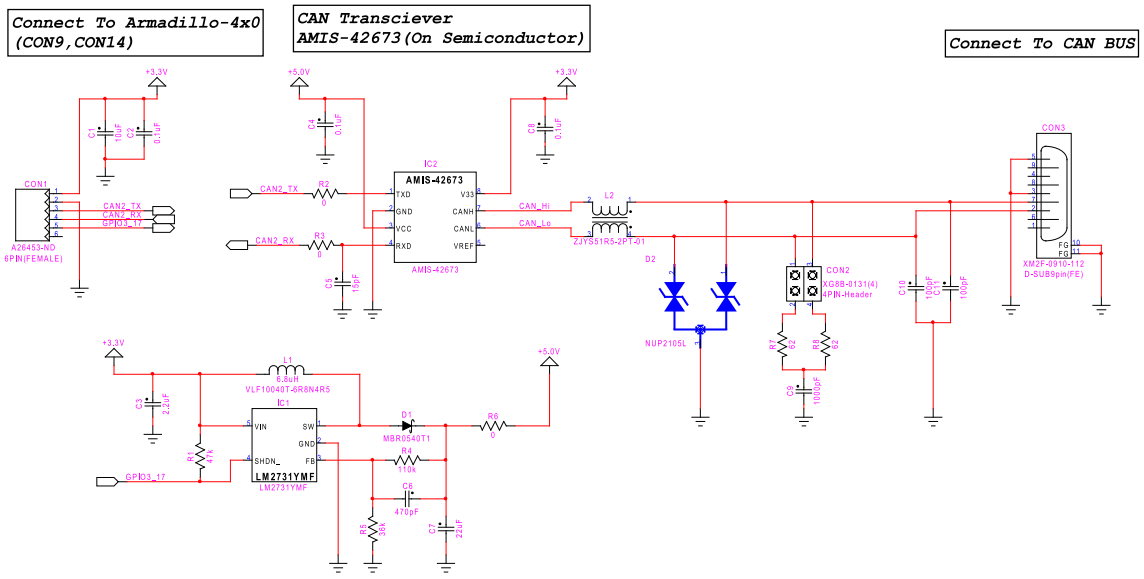
A reference circuit[1] for when using the CON11 keypad signals is shown in Diagram 6-2.

[1]The operation of the reference circuits is not guaranteed in any form. When applying the circuits, please ensure to choose appropriate values after carrying out a thorough evaluation.



6.2 Keypad Signals Reference Circuit

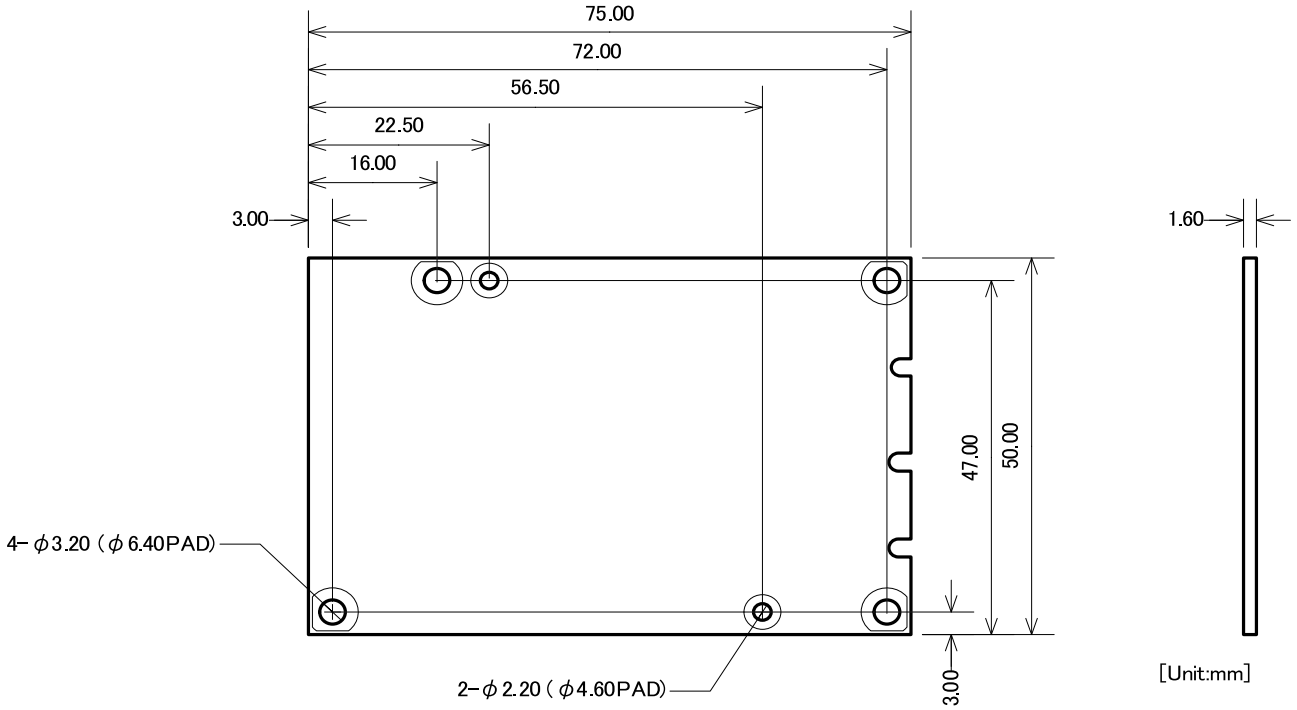
A reference circuit[1] for when using the CON9 CAN2 signals is shown in Diagram 6-3.



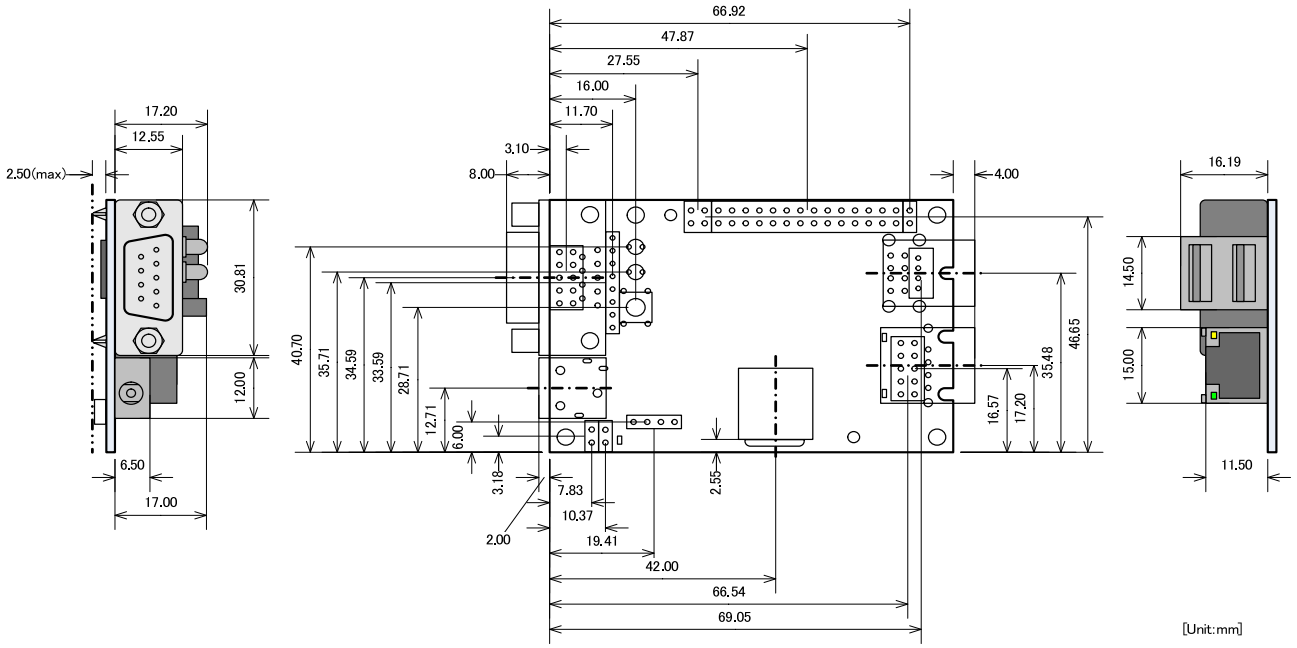
6.3 CAN Signals Reference Circuit

7. Board Outline Diagrams

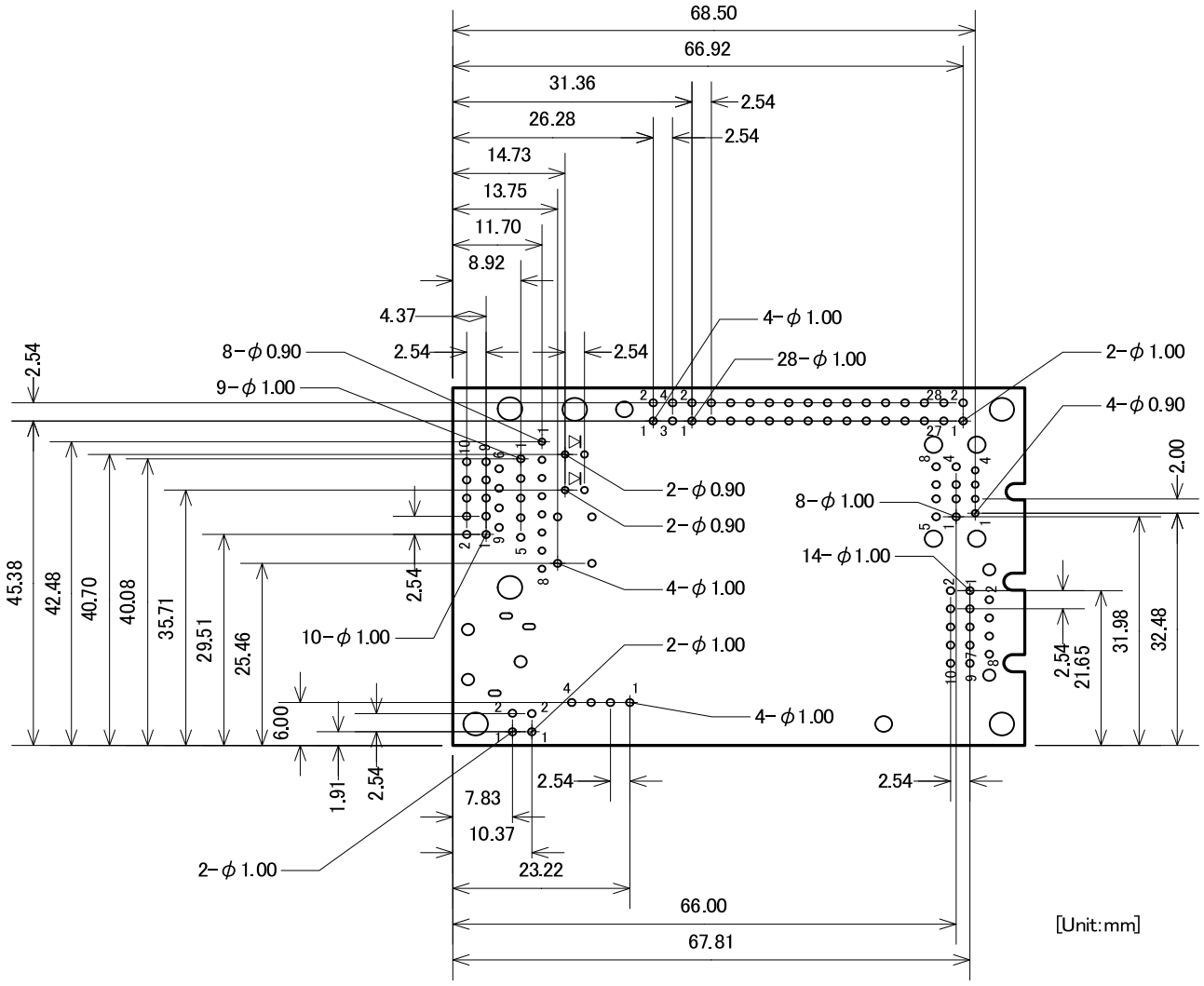
7.1. Armadillo-420 Board Outline Diagrams



7.1 Armadillo-420 Board Outline and Fixing Hole Measurements

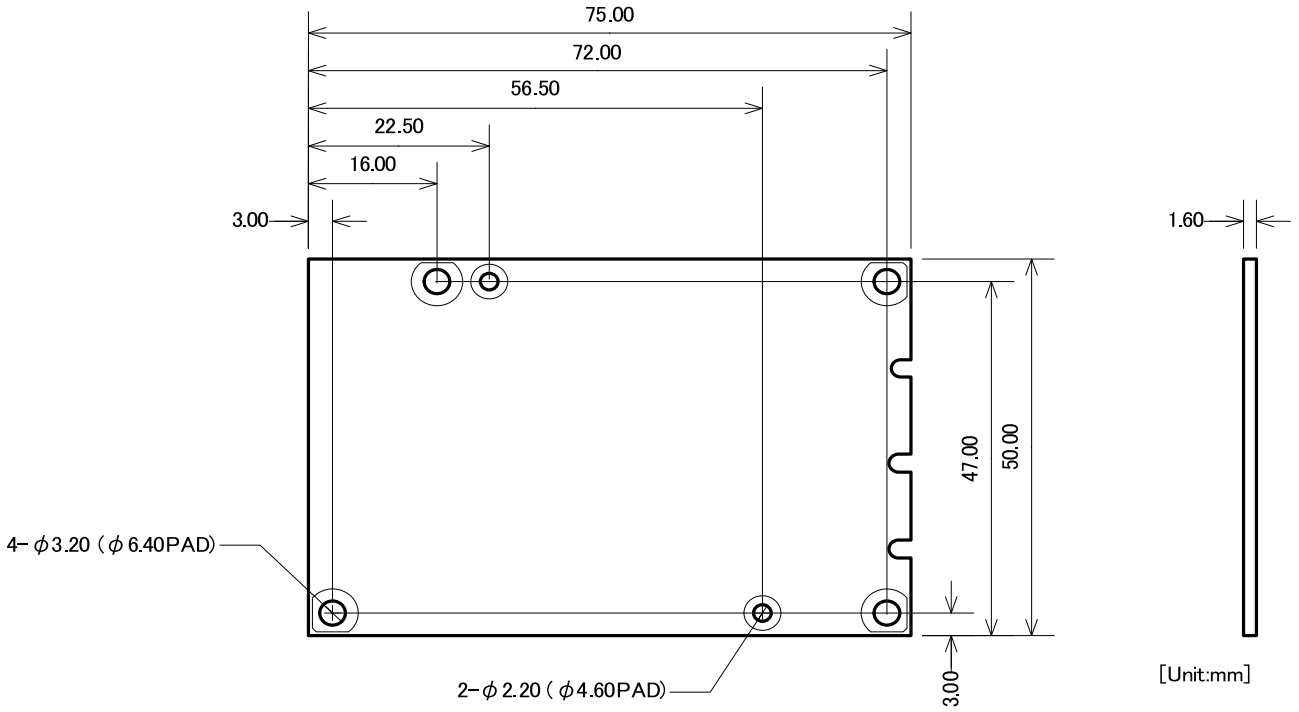


7.2 Armadillo-420 Connector Center Measurements

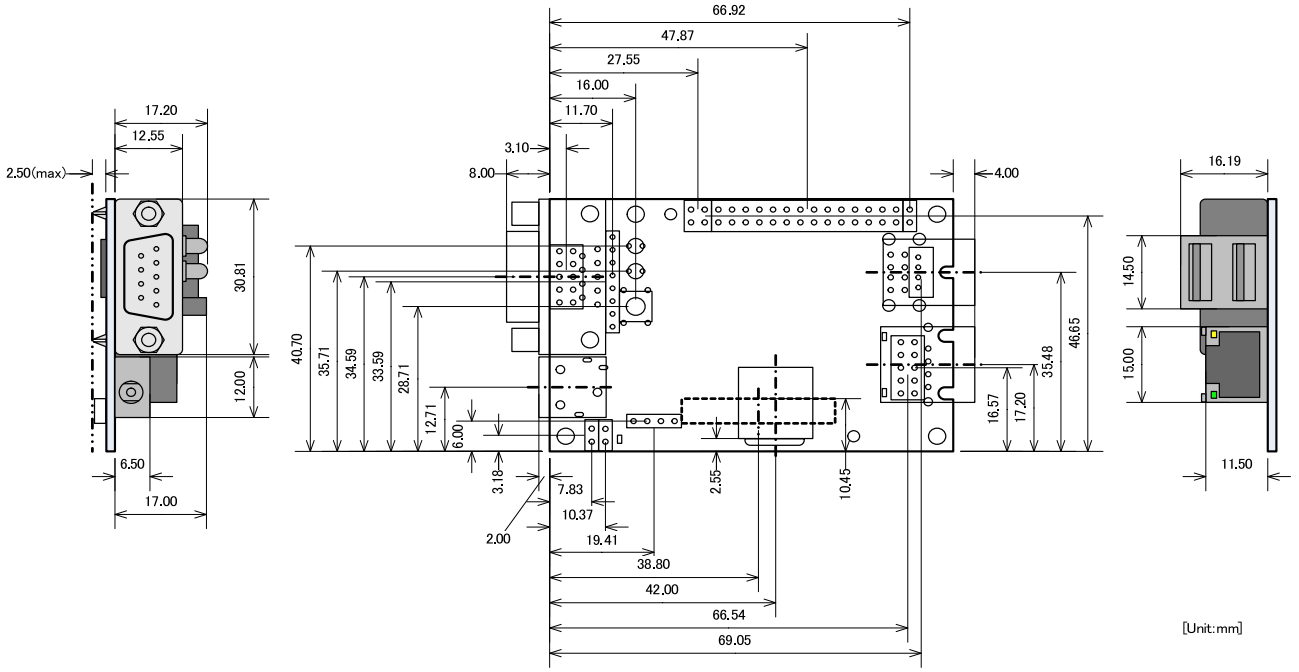


7.3 Armadillo-420 Connector Hole Measurements

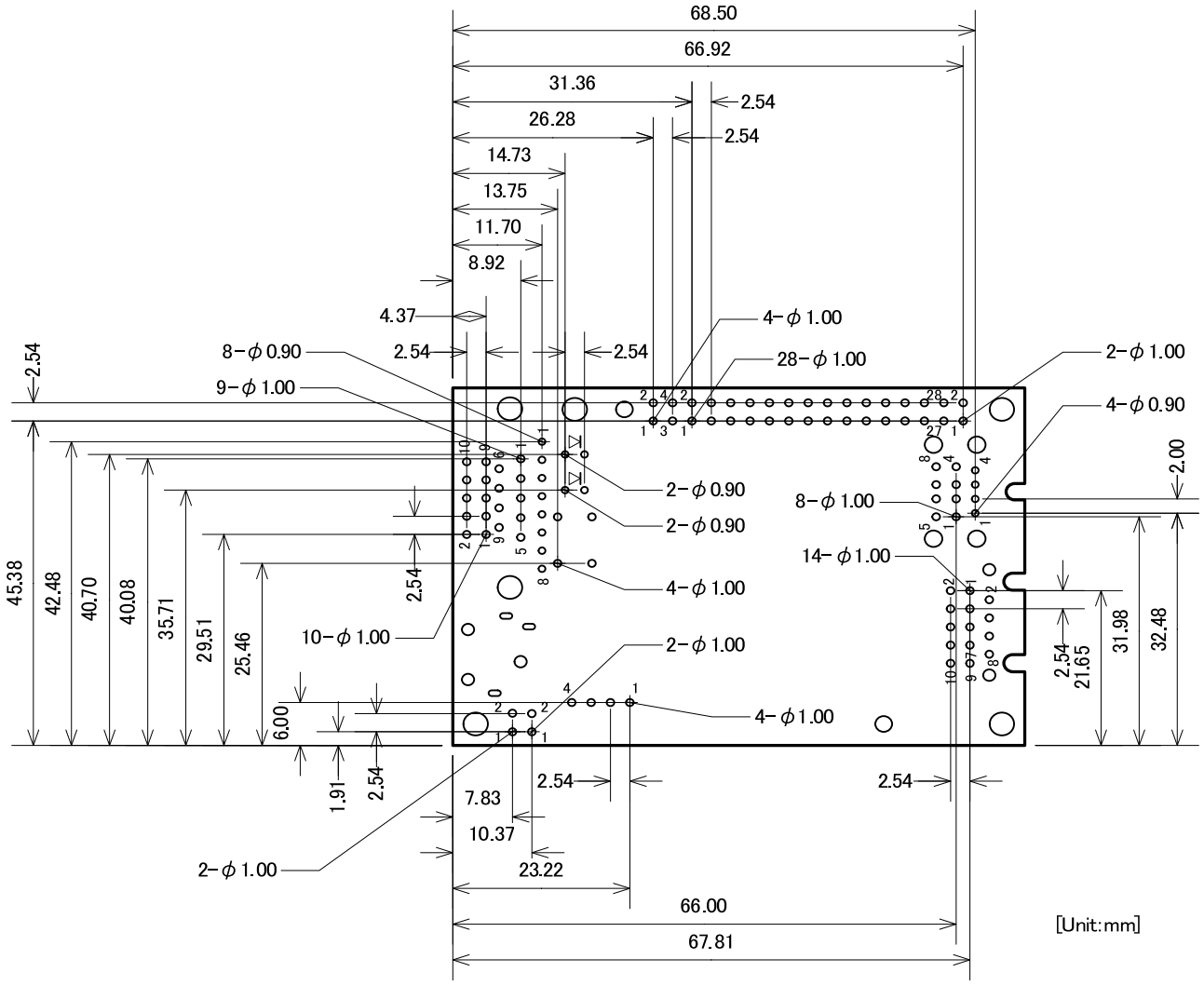
7.2. Armadillo-440 Board Outline Diagrams



7.4 Armadillo-440 Board Outline and Fixing Hole Measurements



7.5 Armadillo-440 Connector Center Measurements



7.6 Armadillo-440 Connector Hole Measurements

8. Armadillo-440 LCD Expansion Board

The following provides details on the Armadillo-440 LCD Expansion Board hardware.

8.1. Board Overview

The Armadillo-440 LCD Expansion Board connects to the LCD interface on Armadillo-440 and includes a touch-screen LCD module, audio codec and real-time clock. The main specifications of the LCD Expansion Board and the LCD module itself are as follows.

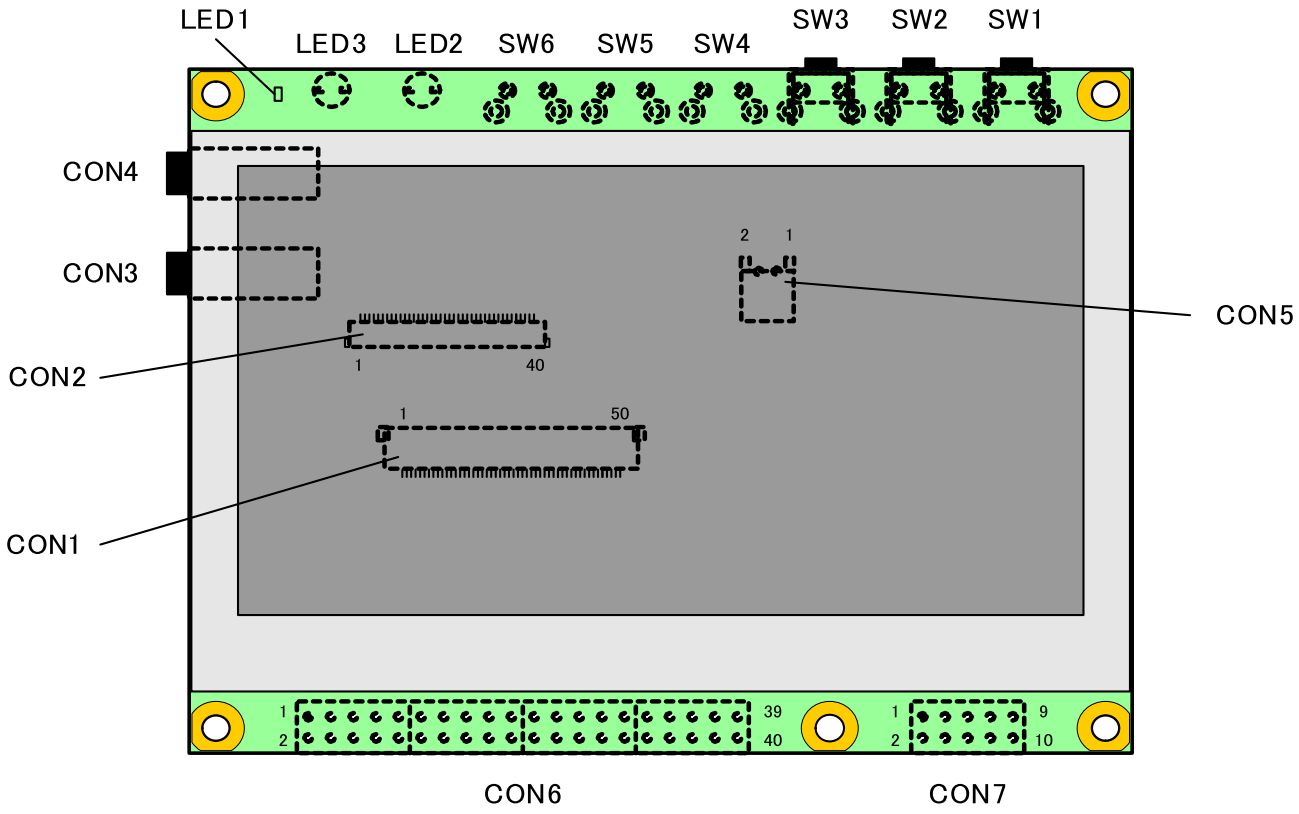
8.1 Armadillo-400 LCD Expansion Board Specifications

LCD I/F	General purpose LCD I/F connector x1 Data Image, Inc LCD (FG040360DSSWBG03) connector Back-light LED driver
Audio	Wolfson codec (WM8978GEFL/V) Stereo headphone output jack x1 Mono mic input jack x1
Calendar Clock	Seiko Instruments RTC (S-35390A) with backup functionality
LED / Switch	Tact Switch x 3 Power LED (green) x1
Board Size	106.0 × 82.0 mm (not including protrusions)
Power Supply Voltage	Main power: DC3.3V LCD back-light: DC2.8 - 5.5V
Power Consumption	Approx. 0.8W (including LCD module)
Operating Temperature	-10 - 60 (with no condensation)

8.2 Compatible LCD Module Specifications

Type	FG040360DSSWBG03
Maker	Data Image, Inc
Type	TFT
Colors	24bit
Screen Size	4.3 inch
Backlight	LED (VL=15 - 18V, IL=40mA)
Touch Panel	4-Wire Resistive
Dimensions	105.5(W) x 67.2(H) x 4.2(D) mm
Active Area	95.04(W) x 53.856(H) mm
Dot Pattern	480 x (R, G, B) x 272 dots
Dot Pitch	0.066(W) x 0.198(H) mm
Operating Temperature	-20 - 70

8.2. Interface Layout



8.1 LCD Expansion Board Interface Layout

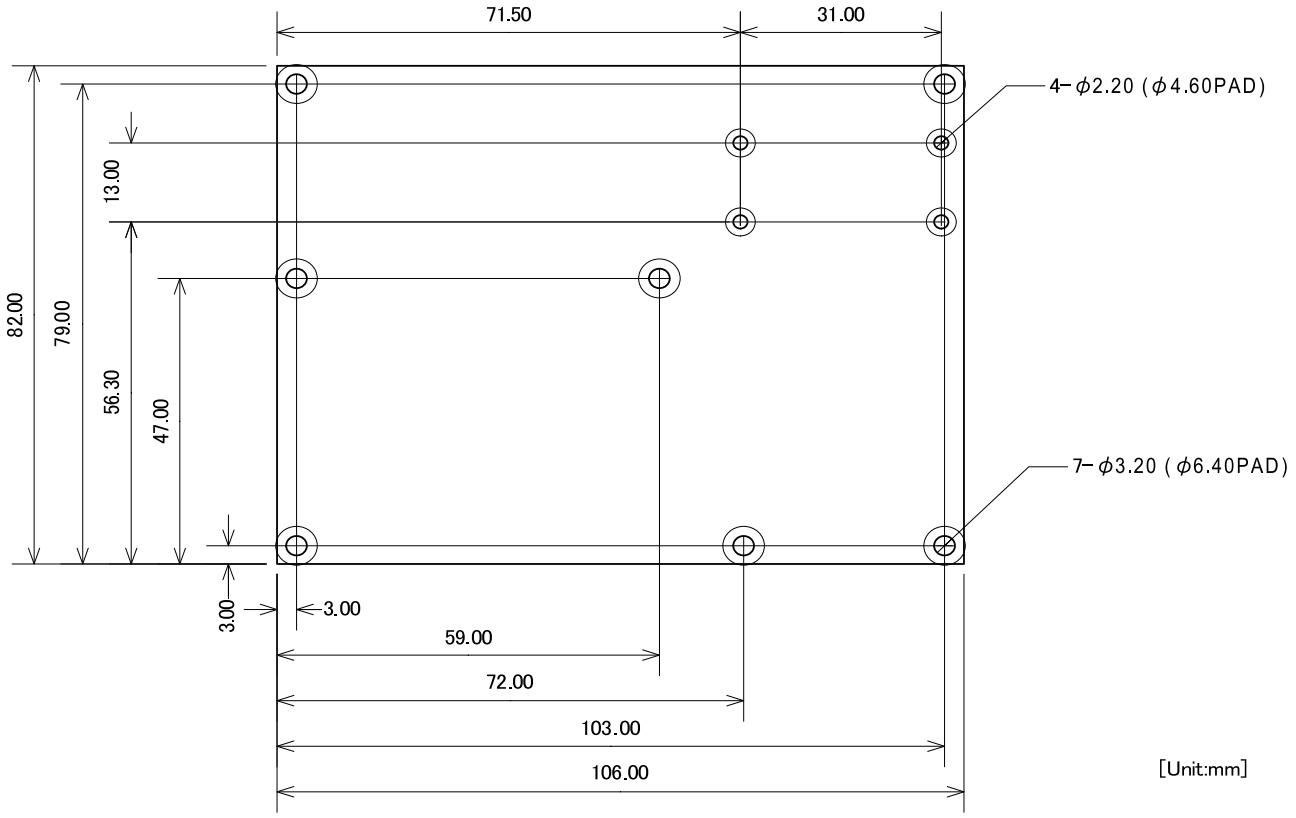
8.3 LCD Expansion Board Interface Details

Part Number	Interface	Shape	Notes
CON1	Armadillo-440 Connection Interface	FFC Connector 50 pin (0.5mm pitch)	
CON2	Data Image, Inc LCD Interface	FFC Connector 40 pin (0.5mm pitch)	
CON3	Mono mic input jack	ϕ3.5mm mini jack	
CON4	Stereo headphone output jack	ϕ3.5mm mini jack	
CON5	Reserve terminal	2 pin (2mm pitch)	Connector not mounted
CON6	General Purpose LCD Interface[1]	40 pin (2.54mm pitch)	
CON7	Reserve terminal	10 pin (2.54mm pitch)	Connector not mounted
SW1, SW2, SW3	User switch	Tact switch	
SW4, SW5, SW6	Reserve switch	Tact switch	Switch not mounted
LED1	Power LED (green)	Surface mounted LCD	
LED2, LED3	Reserve LED	ϕ3mm LED	LED not mounted

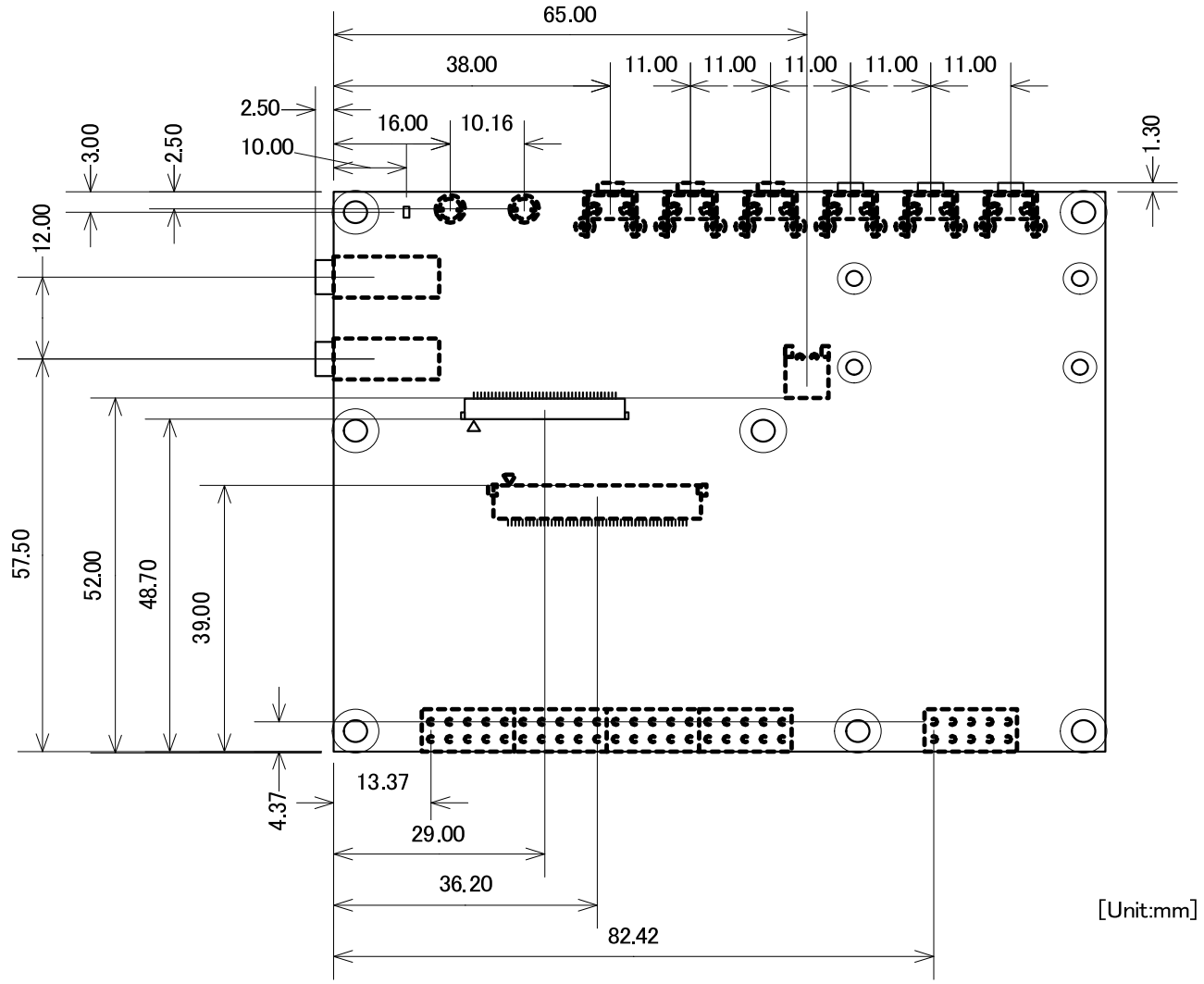
[1]For the circuit layout of the General Purpose LCD Interface (CON6), please refer to the "Armadillo-440 LCD Expansion Board Circuit Diagram" stored in the /document/hardware directory on the included DVD.

As CON1 and CON6 are connected to the same signal lines they cannot be used at the same time. Please disconnect the Data Image LCD from CON1 when connecting another LCD module to CON6.

8.3. Board Outline Diagrams



8.2 LCD Expansion Board Dimensions and Fixing Hole Measurements



8.3 LCD Expansion Board Connector Locations

8.4. About Defective LCD Pixels

Defective pixels occur at a certain rate due to the fundamental properties of LCD panels. The tolerance range of defective pixels in panels used on the Armadillo-440 LCD Expansion Board follow the standards set out below.

8.4.1. Pixel Defect Definitions

Bright Dots	Pixels which appear brighter than surrounding pixels of the same color on an all-black screen display.
Dark Dots	Pixels which appear darker than surrounding pixels of the same color on an all-white screen display.
Continuous Dot Defects	Where multiple bright or dark dot defects occur continuously in one physical area. This applies to both bright-bright and dark-dark dot defects.

8.4.2. Examination Standard

8.4 Defect Tolerance Range

Defect	Tolerance Range
Bright Dot Defects	4
Dark Dot Defects	5
2 Dot Continuous Defects	2 groups (bright dots) 3 groups (dark dots)
3 Or More Dot Continuous Defects	0 (bright or dark dots)
Total Defects	5

9. RTC Option Module

The following provides details on the Armadillo-400 Series RTC Option Module hardware.

9.1. Board Overview

The RTC Option Module is a board that connects to Expansion Interface 2 (CON14)[1] on the Armadillo-400 Series. The board incorporates a Seiko Instruments Inc. real-time clock. An electric double-layer capacitor provides backup power to the real-time clock allowing it to function for a period of time even after power to the board has been cut. It is possible to connect a separate external battery in order to maintain time data during extended periods of no power supply.

The RTC Option Module is included in the Armadillo-420 Basic Model Development Set and is also available for sale separately.

The main specifications of the RTC Option Module are as follows.

9.1 RTC Option Module Specifications

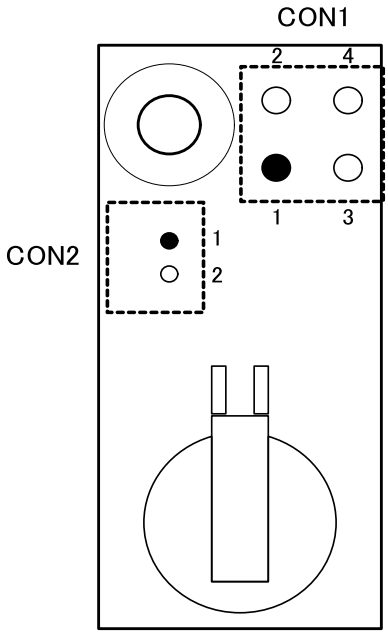
Calendar Clock	S-35390A (Seiko Instruments Inc.) [1]
Backup	EECEN0F204RK (Panasonic) mounted[2], additional battery can be connected to External Backup Connector (CON2)
Board Size	10.0 x 22.0 mm
Power Supply Voltage	DC3.3V
Operating Temperature	-10 - 60 (with no condensation)

[1]The time accuracy is approximately ±30 seconds per month average at an environment temperature of 25 (reference value only). As the accuracy is highly dependent on environmental temperature, please make sure to check all relevant characteristics before use.

[2]The backup time is approximately five days at an environment temperature of 25 (reference value only). As backup time is highly dependent on environmental temperature and length of voltage supply etc, please make sure to check all relevant characteristics before use.

[1]The CON14 signal can be used for transmission when it is set to I2C2 in i.MX257's multiplex function.

9.2. Interface Layout



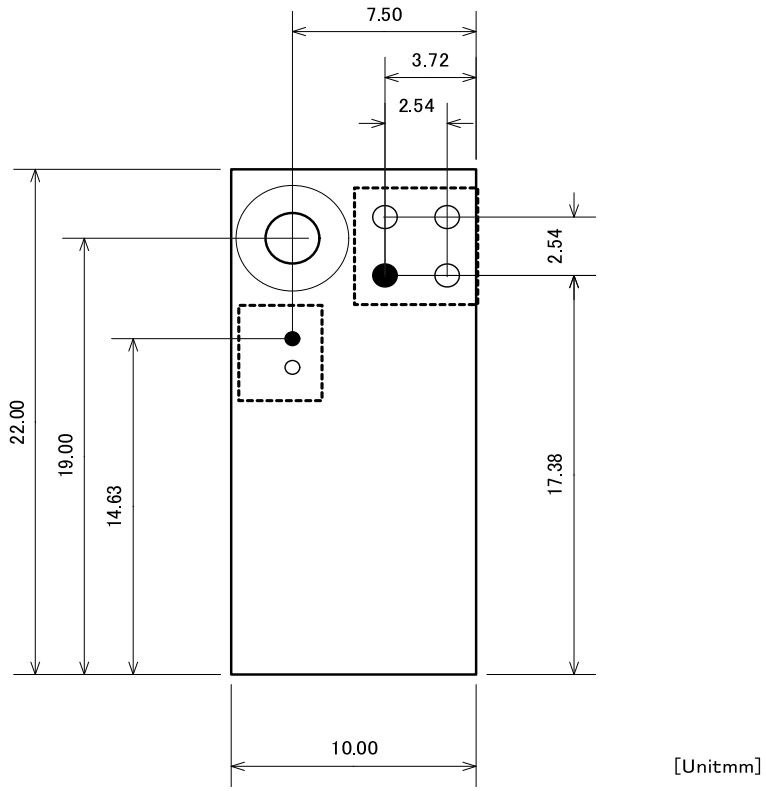
9.1 RTC Option Module Interface Layout

9.2 RTC Option Module Interface Details

Part Number	Interface	Shape	Notes
CON1	Armadillo-400 Series Connector	4 pin (2.54 mm pitch)	
CON2	External Backup Connector[1]	DF13-2P-1.25DSA (Hirose Electric Co.)	Supported battery: CR2032WK11 (Hitachi Maxell or similar)

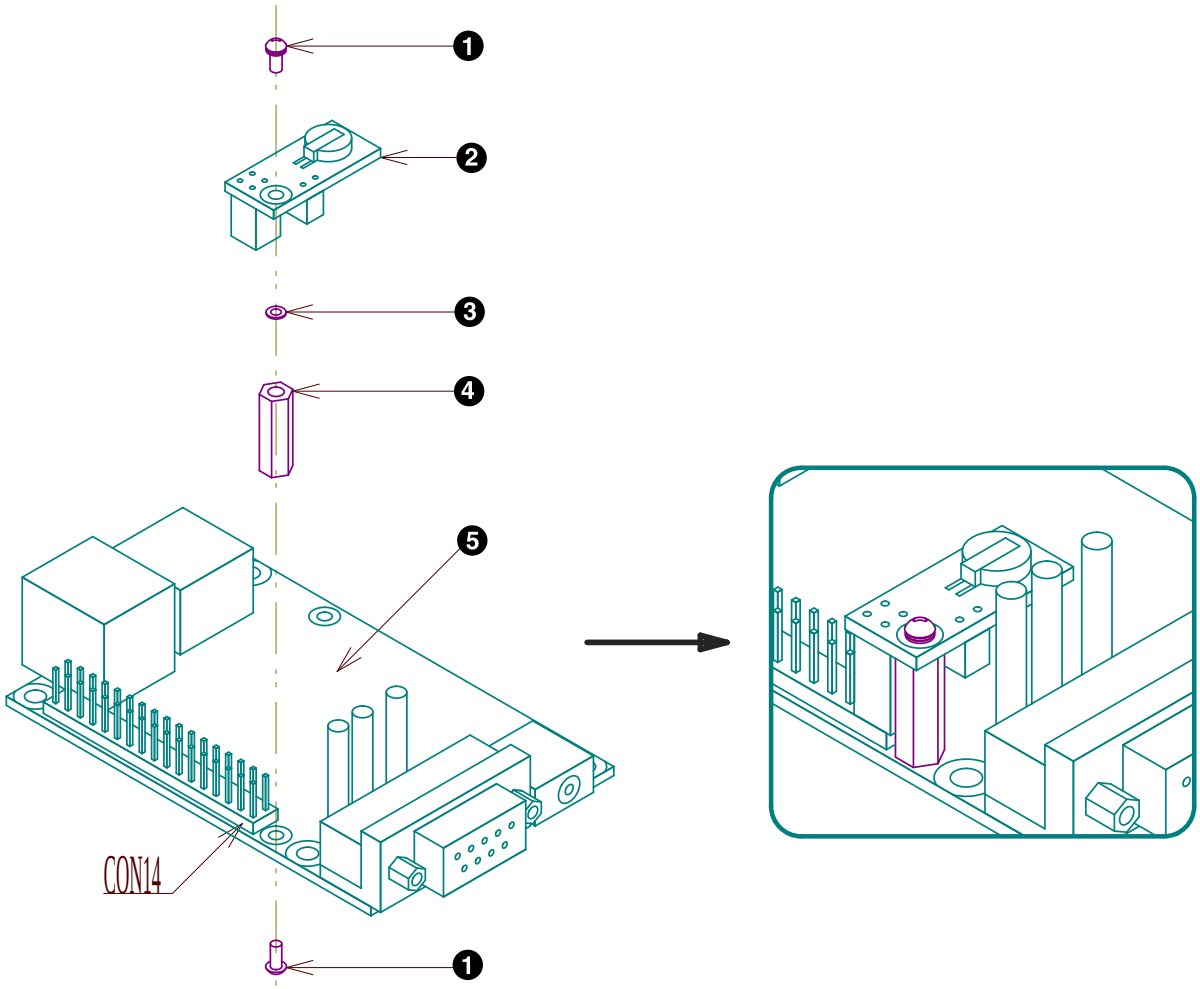
[1]For the circuit layout of the External Backup Connector (CON2), please refer to the "Armadillo-400 RTC Option Module Circuit Diagram" stored in the /document/hardware directory on the included DVD.

9.3. Board Outline Diagrams



9.2 RTC Option Module Dimensions

9.4. RTC Module Assembly



9.3 RTC Module Assembly Diagram

1. Round head screw (M2, L=6mm, spring washer + small washer)
2. RTC Option Module
3. Flat washer
4. Metal spacer (M2, L=11mm, D=4mm)
5. Armadillo-420, Armadillo-440

10. Case

The following provides details on the Armadillo-400 case.

10.1. Case Details

The Armadillo-400 case is a small plastic case. When an Armadillo-400 board is placed in the case, the DC jack, serial interface (D-Sub 9 pin), USB interface, and LAN interface are accessible. The case also has a removable cover to provide an opening for accessing CON9 (Expansion Interface 1).

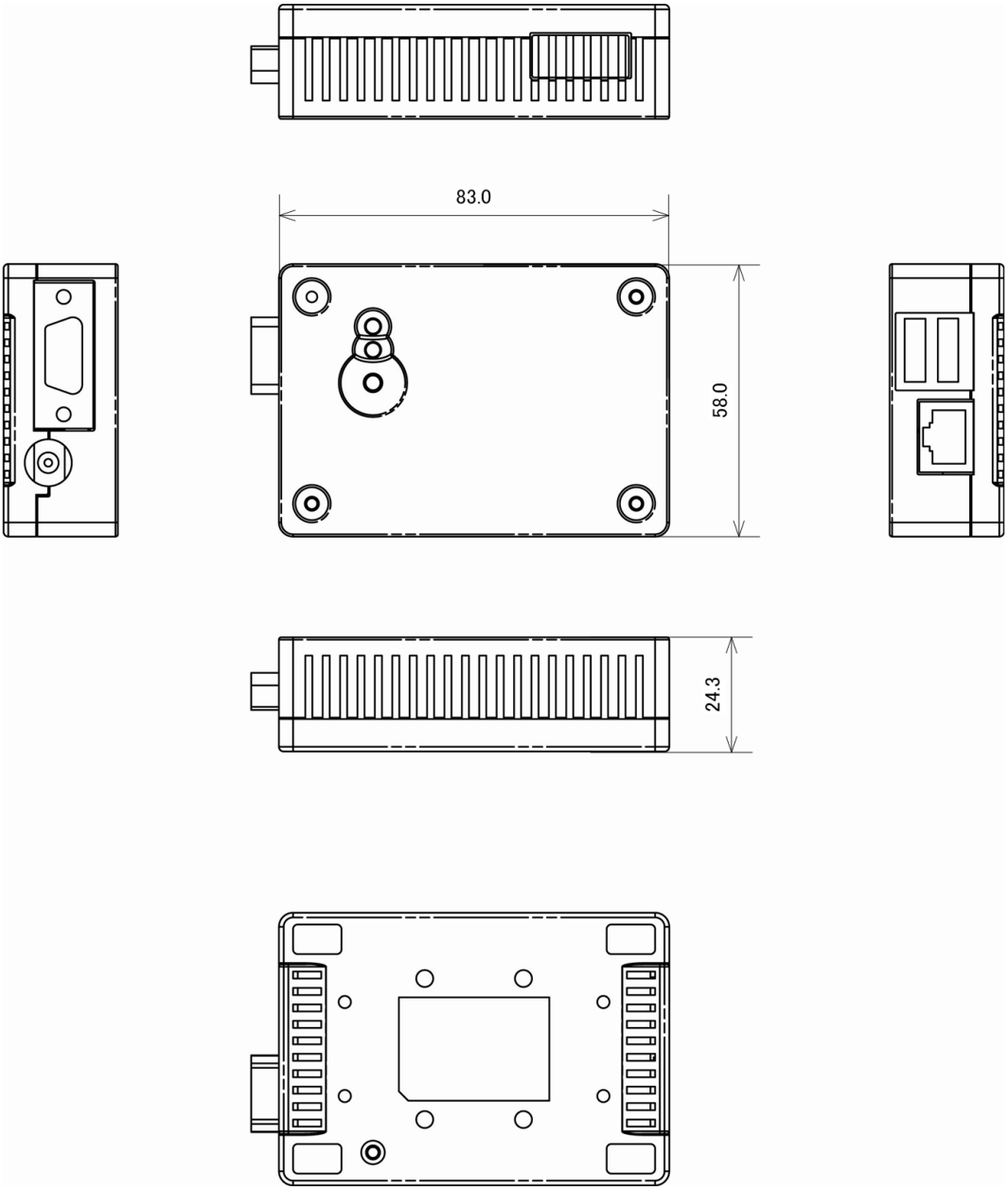
The case is included in the Armadillo-420 Basic Model Development Set and is also available for sale separately.

10.1 Armadillo-400 Case Set Details

Product Name	Armadillo-400 Case Set
Product Number	OP-CASE200-00
Contents	1 case, screws and rubber feet

10.2. Case Dimensions

(Unit: mm)

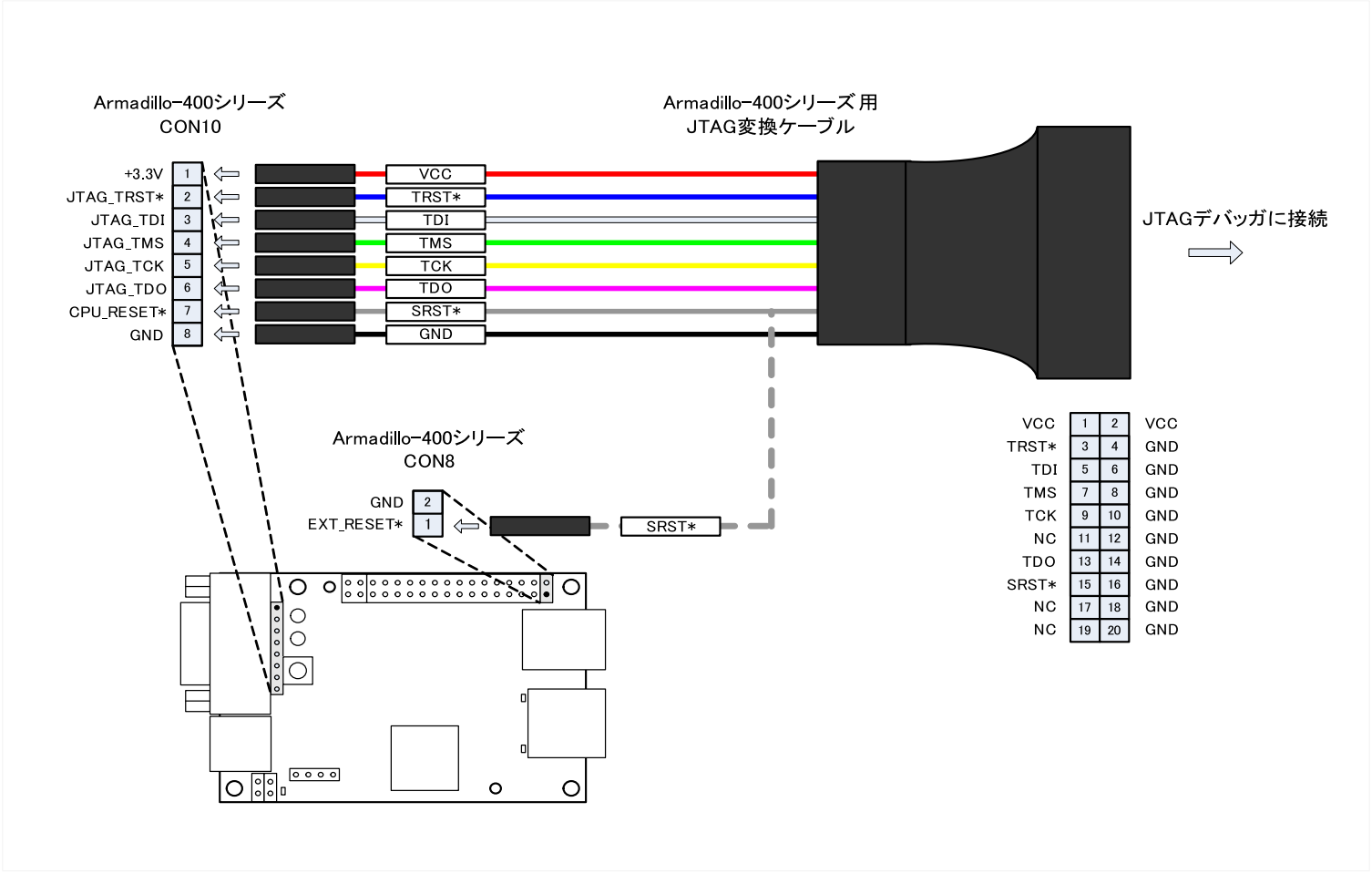


10.1 Armadillo-400 Case Dimensions

A JTAG Conversion Cable (OP-JC8P25-00)

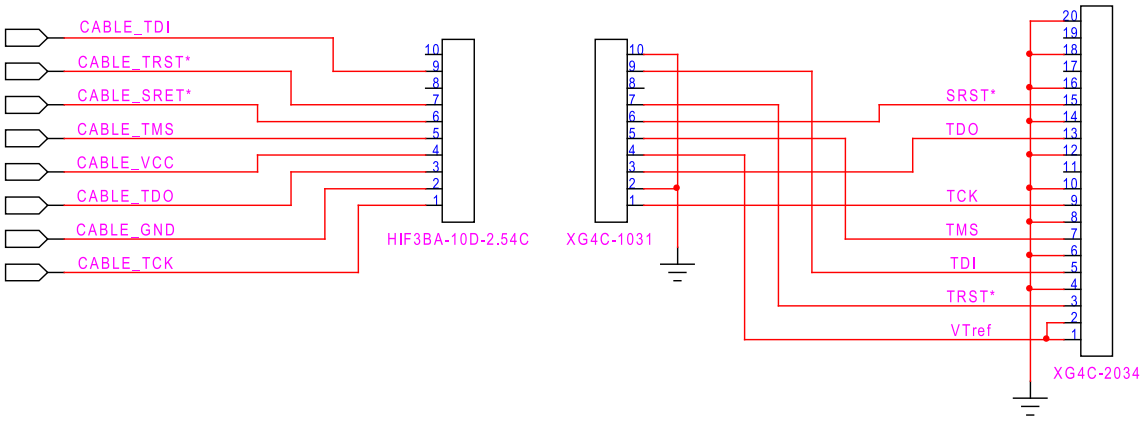
The Armadillo-400 Series option "Armadillo-400 JTAG Conversion Cable" (model no.: OP-JC8P25-00) is used to convert the i.MX257 JTAG Interface (CON10) to the standard ARM connector (20 pin, 2.54mm pitch).

A connection diagram and reference circuit for the JTAG Conversion Cable are shown below.



A.1 JTAG Conversion Cable Connection Diagram

When the SRST* signal on the JTAG Conversion Cable is connected to the CPU_RESET* pin on CON10, only i.MX257 is reset. To reset the full board using a JTAG debugger, please connect the SRST* signal to the EXT_RESET* pin on CON8.



A.2 JTAG Conversion Cable Reference Circuit

B Initial Configuration State of Expansion Interfaces

The initial states of the signal pins and pad configuration of the CON9, CON11 (Armadillo-440 only) and CON14 expansion interfaces are shown below.

B.1 Signal State of Expansion Interfaces (After i.MX257 Reset)

Connector	Pin Number	Signal Name	Signal State After Reset				On-board Pull-up
			I/O	Pin State	Open Drain	Pull/ Keeper	
CON14	3	EXT_IO22	In	-	Disable	100kPD[1]	-
	4	EXT_IO23	In	-	Disable	Disable	-
CON9	1	EXT_IO0	Out	Low	Disable	Disable	-
	2	EXT_IO1	Out	Low	Disable	Disable	-
	3	EXT_IO2	In	-	Disable	100kPU[1]	-
	4	EXT_IO3	In	-	Disable	Keeper	-
	5	EXT_IO4	Out	Low	Disable	100kPU	-
	6	EXT_IO5	In	-	Disable	Keeper	-
	11	EXT_IO6	In	-	Disable	100kPU	-
	12	EXT_IO7	In	-	Disable	Keeper	-
	13	EXT_IO8	In	-	Disable	100kPU	-
	14	EXT_IO9	In	-	Disable	Keeper	-
	15	EXT_IO10	In	-	Disable	Keeper	-
	16	EXT_IO11	In	-	Disable	Keeper	-
	17	EXT_IO12	In	-	Disable	Keeper	-
	18	EXT_IO13	In	-	Disable	Keeper	-
	21	EXT_IO14	Out	Low	Disable	Disable	-
	22	EXT_IO15	In	-	Disable	Keeper	-
	23	EXT_IO16	In	-	Disable	Keeper	-
	24	EXT_IO17	In	-	Disable	Keeper	-
	25	EXT_IO18	In	-	Disable	100kPU	-
	26	EXT_IO19	In	-	Disable	100kPU	-
	27	EXT_IO20	Out	Low	Disable	Disable	-
	28	EXT_IO21	In	-	Disable	Disable	-

Connector	Pin Number	Signal Name	Signal State After Reset				On-board Pull-up
			I/O	Pin State	Open Drain	Pull/ Keeper	
CON11	8	LCD_LSCLK	Out	Low	Disable	Disable	47kPD
	9	LCD_HSYN	Out	Low	Disable	Disable	47kPD
	10	LCD_VSYN	Out	Low	Disable	Disable	47kPD
	11	LCD_OE_ACD	Out	Low	Disable	Disable	47kPD
	12	PWMO1	In	-	Disable	100kPD	47kPD
	13	LCD_LD0	Out	Low	Disable	Disable	47kPD
	14	LCD_LD1	Out	Low	Disable	Disable	47kPD
	15	LCD_LD2	Out	Low	Disable	Disable	47kPD
	16	LCD_LD3	Out	Low	Disable	Disable	47kPD
	17	LCD_LD4	Out	Low	Disable	Disable	47kPD
	18	LCD_LD5	Out	Low	Disable	Disable	47kPD
	20	LCD_LD6	Out	Low	Disable	Disable	47kPU
	21	LCD_LD7	Out	Low	Disable	Disable	47kPD
	22	LCD_LD8	Out	Low	Disable	Disable	47kPD
	23	LCD_LD9	Out	Low	Disable	Disable	47kPD
	24	LCD_LD10	Out	Low	Disable	Disable	47kPD
	25	LCD_LD11	Out	Low	Disable	Disable	47kPD
	27	LCD_LD12	Out	Low	Disable	Disable	47kPD
	28	LCD_LD13	Out	Low	Disable	Disable	47kPD
	29	LCD_LD14	Out	Low	Disable	Disable	47kPU
	30	LCD_LD15	Out	Low	Disable	Disable	47kPU
	31	LCD_LD16	In	-	Enable	100kPU	-
	32	LCD_LD17	In	-	Disable	Disable	-
	39	EXT_IO24	In	-	Disable	47kPU	-
	40	EXT_IO25	In	-	Disable	100kPU	-
	41	EXT_IO26	In	-	Disable	100kPU	-
	42	EXT_IO27	In	-	Disable	100kPU	-
	43	EXT_IO28	In	-	Disable	100kPU	-
	44	EXT_IO29	In	-	Enable	100kPU	-
	45	EXT_IO30	In	-	Enable	100kPU	-
	46	EXT_IO31	In	-	Enable	100kPU	-
	47	EXT_IO32	In	-	Enable	100kPU	-
	48	EXT_IO33	In	-	Disable	Disable	-
	49	EXT_IO34	In	-	Disable	100kPD	-

[1]PD=Pull Down, PU=Pull Up

B.2 Signal State of Expansion Interfaces (After Bootloader Configuration)

Connector	Pin Number	Signal Name	Signal State After Bootloader Boot[1]					
			Mux Mode	I/O	Pin State	Open Drain	Pull/ Keeper	Slew Rate
CON14	3	EXT_IO22	GPIO	In	-	Disable	100kPU	Slow
	4	EXT_IO23	GPIO	In	-	Disable	100kPU	Slow

Connector	Pin Number	Signal Name	Signal State After Bootloader Boot[1]					
			Mux Mode	I/O	Pin State	Open Drain	Pull/ Keeper	Slew Rate
CON9	1	EXT_IO0	GPIO	In	-	Disable	100kPU	Slow
	2	EXT_IO1	GPIO	In	-	Disable	100kPU	Slow
	3	EXT_IO2	GPIO	In	-	Disable	100kPU	Slow
	4	EXT_IO3	GPIO	In	-	Disable	100kPU	Slow
	5	EXT_IO4	GPIO	In	-	Disable	100kPU	Slow
	6	EXT_IO5	GPIO	In	-	Disable	100kPU	Slow
	11	EXT_IO6	GPIO	In	-	Disable	100kPU	Slow
	12	EXT_IO7	GPIO	In	-	Disable	100kPU	Slow
	13	EXT_IO8	GPIO	In	-	Disable	100kPU	Slow
	14	EXT_IO9	GPIO	In	-	Disable	100kPU	Slow
	15	EXT_IO10	GPIO	In	-	Disable	100kPU	Slow
	16	EXT_IO11	GPIO	In	-	Disable	100kPU	Slow
	17	EXT_IO12	GPIO	In	-	Disable	100kPU	Slow
	18	EXT_IO13	GPIO	In	-	Disable	100kPU	Slow
	21	EXT_IO14	GPIO	In	-	Disable	100kPU	Slow
	22	EXT_IO15	GPIO	In	-	Disable	100kPU	Slow
	23	EXT_IO16	GPIO	In	-	Disable	100kPU	Slow
	24	EXT_IO17	GPIO	In	-	Disable	100kPU	Slow
	25	EXT_IO18	GPIO	In	-	Disable	100kPU	Slow
	26	EXT_IO19	GPIO	In	-	Disable	100kPU	Slow
	27	EXT_IO20	GPIO	Out	Low	Disable	Disable	Fast
	28	EXT_IO21	GPIO	Out	Low	Disable	Disable	Fast

Connector	Pin Number	Signal Name	Signal State After Bootloader Boot[1]					
			Mux Mode	I/O	Pin State	Open Drain	Pull/ Keeper	Slew Rate
CON11	8	LCD_LSCLK	LCD	Out	Low	Disable	Disable	Fast
	9	LCD_HSYN	LCD	Out	Low	Disable	Disable	Slow
	10	LCD_VSYN	LCD	Out	Low	Disable	Disable	Slow
	11	LCD_OE_ACD	LCD	Out	Low	Disable	Disable	Slow
	12	PWMO1	PWMO1	Out	Low	Disable	100kPU	Slow
	13	LCD_LD0	LCD	Out	Low	Disable	Disable	Slow
	14	LCD_LD1	LCD	Out	Low	Disable	Disable	Slow
	15	LCD_LD2	LCD	Out	Low	Disable	Disable	Slow
	16	LCD_LD3	LCD	Out	Low	Disable	Disable	Slow
	17	LCD_LD4	LCD	Out	Low	Disable	Disable	Slow
	18	LCD_LD5	LCD	Out	Low	Disable	Disable	Slow
	20	LCD_LD6	LCD	Out	Low	Disable	Disable	Slow
	21	LCD_LD7	LCD	Out	Low	Disable	Disable	Slow
	22	LCD_LD8	LCD	Out	Low	Disable	Disable	Slow
	23	LCD_LD9	LCD	Out	Low	Disable	Disable	Slow
	24	LCD_LD10	LCD	Out	Low	Disable	Disable	Slow
	25	LCD_LD11	LCD	Out	Low	Disable	Disable	Slow
	27	LCD_LD12	LCD	Out	Low	Disable	Disable	Slow
	28	LCD_LD13	LCD	Out	Low	Disable	Disable	Slow
	29	LCD_LD14	LCD	Out	Low	Disable	Disable	Slow
	30	LCD_LD15	LCD	Out	Low	Disable	Disable	Slow
	31	LCD_LD16	LCD	Out	Low	Disable	100kPU	Slow
	32	LCD_LD17	LCD	Out	Low	Disable	100kPU	Slow
	39	EXT_IO24	GPIO	In	-	Disable	47kPU	Slow
	40	EXT_IO25	GPIO	In	-	Disable	100kPU	Slow
	41	EXT_IO26	GPIO	In	-	Disable	100kPU	Slow
	42	EXT_IO27	GPIO	In	-	Disable	100kPU	Slow
	43	EXT_IO28	GPIO	In	-	Disable	100kPU	Slow
	44	EXT_IO29	GPIO	In	-	Disable	100kPU	Slow
	45	EXT_IO30	GPIO	In	-	Disable	100kPU	Slow
	46	EXT_IO31	GPIO	In	-	Disable	100kPU	Slow
	47	EXT_IO32	GPIO	In	-	Disable	100kPU	Slow
	48	EXT_IO33	GPIO	In	-	Disable	100kPU	Slow
	49	EXT_IO34	GPIO	In	-	Disable	100kPU	Slow

[1]Current output set to "Std" on all signals.

C Connector Information

Information on the Armadillo-400 Series connectors is shown below.

C.1 Connector Product Numbers List

Part Number	Interface	Shape	Board Side Connector		Corresponding Connector (Reference)	
			Product Number	Maker	Product Number	Maker
CON1	microSD slot	Hinge type	DM3C-SF	HIROSE	-	-
CON2	LAN Interface	RJ-45	TM11R-5M2-88-LP	HIROSE	-	-
CON3	Serial interface	D-Sub 9 pin (male)	DEL09PBTK1YS-F	GTK	-	-
CON4	Serial interface	10 pin (2.54mm pitch)	A1-10PA-2.54DSA(71)	HIROSE	A1-10D-2.54C	HIROSE
CON5	USB interface	Type-A 2 port stack	UBA-4RS-D14T-4D(LF)(SN)	JST	-	-
CON6	USB interface	4 pin (2mm pitch)	B4B-PH-K-S(LF)(SN)	JST	PHR-4	JST
CON7	LAN Interface	10 pin (2.54mm pitch)	A1-10PA-2.54DSA(71)	HIROSE	A1-10D-2.54C	HIROSE
CON8	Ext. reset terminal	2 pin (2.54mm pitch)	A1-34PA-2.54DSA(71)	HIROSE	RE-02	JST
CON9	Expansion Interface 1	28 pin (2.54mm pitch)			RF-28	JST
CON14	Expansion Interface 2	28 pin (2.54mm pitch)			PS-4SLA-D4C2	JAE
CON10	i.MX257 JTAG interface	8 pin (2.54mm pitch)	A2-8PA-2.54DSA(71)	HIROSE	RE-08	JST
CON12	Power in connector	DC jack	HEC3690-015210	HOSHIDEN	-	-
CON13	Power in connector	4 pin (2.54 mm pitch)	A2-4PA-2.54DSA(71)	HIROSE	RE-04	JST

1.0.0	2010.3.12	• Initial Release
1.1.0	2010.4.30	• Added explanation of Armadillo-400 Series to 1. Preface • Added 1.2. Icons • Added 2.4. Electromagnetic Interference • Added "Armadillo-420" to 3.1. Armadillo-400 Series Board Specifications • Made corrections to 3.1. Armadillo-400 Series Block Diagram • Added "Armadillo-420" to 4.1. Armadillo-400 Series Physical Memory Map • Added 5.1.1. Armadillo-420 Interface Layout • Added precaution note to 5.3. CON1 (microSD slot) • Added 7.1. Armadillo-420 Board Outline Diagrams • Added 9. RTC Option Module • Added A JTAG Conversion Cable (OP-JC8P25-00)
1.2.0	2010.6.8	• Added explanation of GPIO control of supply power to 5.3. CON1 (microSD slot) • Added 5.4. EXT_RESET* Timing Chart • Added 5.5. EXT_RESET* Circuit Make-up • Added 5.14. CON9 Signal Multiplex • Added 5.17. CON11 Signal Multiplex • Added 5.20. CON14 Signal Multiplex • Added explanation of JTAG Conversion Cable option to 5.9. CON10 (i.MX257 JTAG Interface) • Added 5.18. Power Circuit Make-up • Added 6.2. Keypad Signals Reference Circuit • Added 6.3. CAN Signals Reference Circuit • Added annotation to 9.1. RTC Option Module Specifications • Added B Initial Configuration State of Expansion Interfaces
1.3.0	2010.08.20	• Added C Connector Information • Added 5.3. Input/Output Interface Rated Absolute Maximum • Added product number and write cycle information of flash memory to 3.1. Armadillo-400 Series Board Specifications • Added information on internal circuit current consumption to 5.7. Armadillo-400 Series Power Circuit Make-up Diagram • Changed A.2. JTAG Conversion Cable Reference Circuit to a more readable diagram • Changed 5.5. EXT_RESET* Circuit Make-up to a more readable diagram • Changed 6.2. Keypad Signals Reference Circuit to a more readable diagram • Changed 6.3. CAN Signals Reference Circuit to a more readable diagram • Added 9.4. RTC Module Assembly • Added 10. Case • Added explanation to 9.1. Board Overview

Armadillo-400 Series Hardware Manual
Version 1.3.0
2010/11/05

Atmark Techno, Inc.
060-0035 AFT Bldg. 6F, N5E2, Chuo-ku, Sapporo TEL 011-207-6550 FAX 011-207-6570