EC1400 ~ EC1410

Hardware User Manual

EC1400 ➔ NO LCD, with HDMI
EC1403 ➔ 3.5” LCD with touch screen, NO HDMI
EC1404 ➔ 4.3” LCD with touch screen, NO HDMI
EC1407 ➔ 7” LCD and touch screen, NO HDMI
EC1408 ➔ 8” LCD and touch screen, NO HDMI
EC1410 ➔ 10.1” LCD and touch screen, NO HDMI

株式会社ロイノス

RELEASE NOTES

Version	Date	NOTES
1.00	Nov 1st, 2011	Initial release
1.10	July, 2012	Revised HW board (B300-SC) Add EC1408, EC1410
1.20	Dec, 2012	Add EC1404, EC1403

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Table of Content

1. Product Features and Specifications

1.1 Overview

EC1400 is a series of ARM11-based embedded computer products with a rich set of features. It is a flexible, high performance and inexpensive computer designed for multimedia applications especially in 1080p video decoding.

Each EC1400 device can be pre-installed with Windows CE 6.0, Linux 2.6 OS or Android 2.3 for immediate evaluation.

The EC1400 series of products include the following models:

- **EC1400**: no LCD, with HDMI output
- **EC1403**: with 3.5-inch (320x240) LCD and touch screen, NO HDMI
- **EC1404**: with 4.3-inch (480x272) LCD and touch screen, NO HDMI
- **EC1407**: with 7-inch (800x480) LCD and touch screen, NO HDMI
- **EC1408**: with 8-inch (800x600) LCD and touch screen, NO HDMI
- **EC1410**: with 10.1-inch (1024x600) LCD and touch screen, NO HDMI

EC1407 front panel (**HDMI is only for EC1400**):

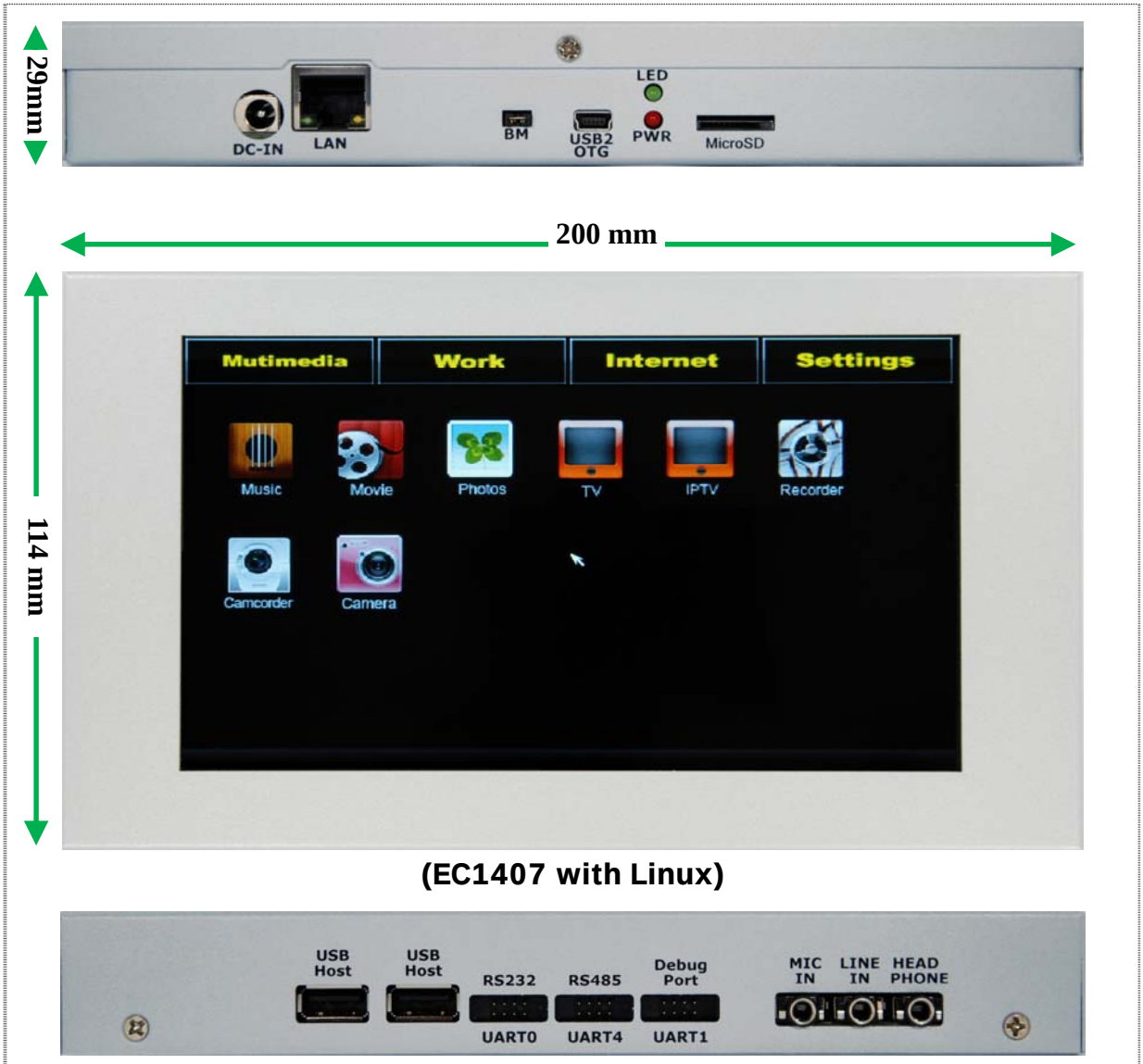


Figure 1- 1 EC1407 front panel photo

NOTE: EC1400 dimension is the same as EC1407, except that EC1400 has no front panel.

EC1408 front panel:

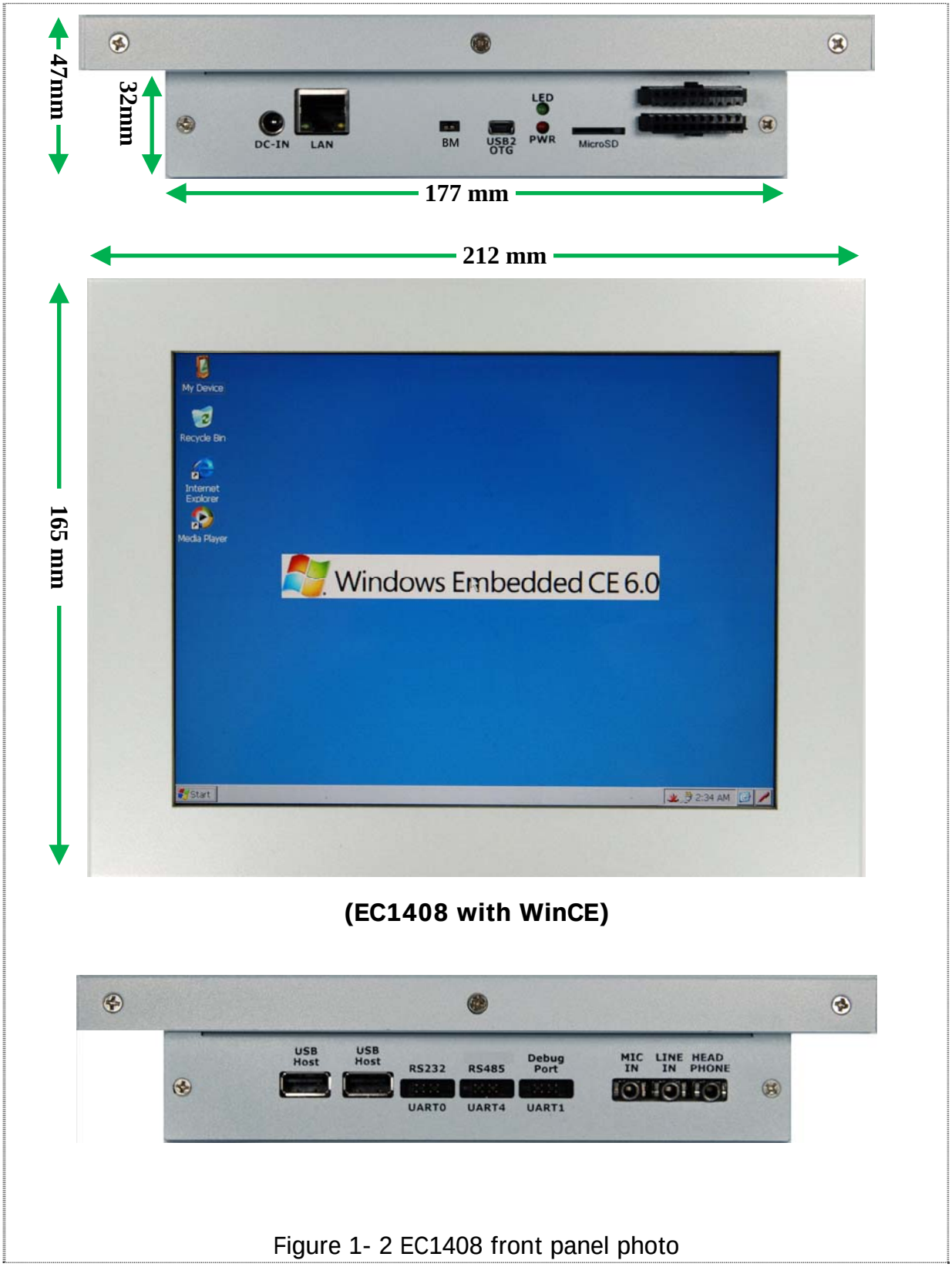
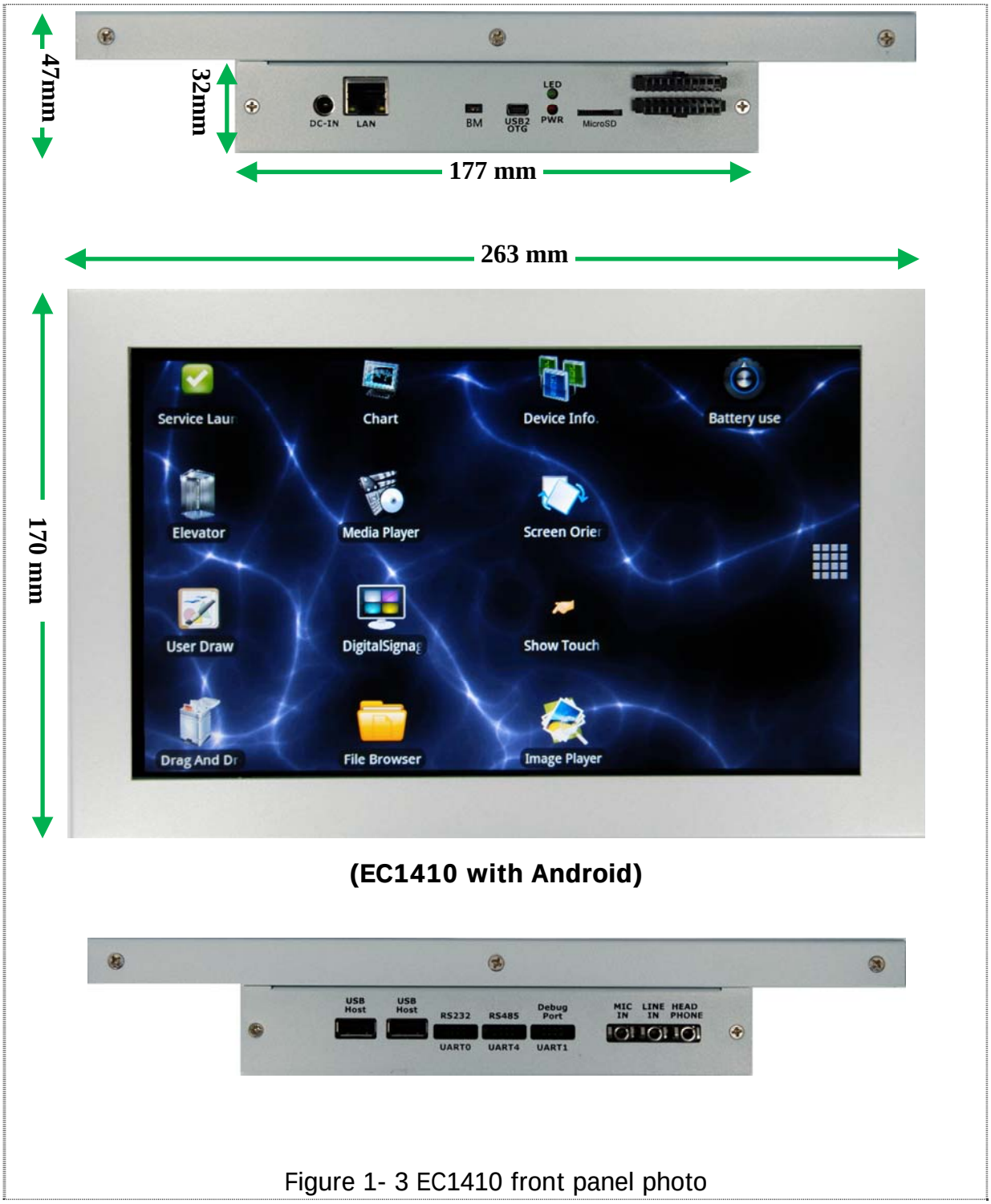


Figure 1- 2 EC1408 front panel photo

EC1410 front panel:



(EC1410 with Android)

Figure 1- 3 EC1410 front panel photo

EC1403/EC1404 Photo:

Figure 1- 4 EC1403/EC1404 photos

1.2 Features and Specifications

Features:

- ARM1176JZF processor at high performance (>600Mhz) and low power consumption
- Dedicated hardware MPEG2/4/H.264 1920x1080 Full HD decoder
- Dedicated hardware H.264 1280x720 HD encoder
- Hardware 2D/3D graphic accelerator
- Pre-installed Windows CE 6.0, Linux 2.6 or Android 2.3 OS
- Rich set of peripherals (LCD, USB, HDMI, ...etc)

EC1400 Specifications:

- ARM1176JZF @ 700Mhz, 16KB/16KB cache, 16KB/16KB TCM
- 256MB DDR2 SDRAM (32-bit)
- 512MB NAND Flash (8-bit)
- Hardware Video Decoder:
  - H.264 HP @ Level 5.0 (up to 25Mbps)
  - MPEG 1/2 MP@HL (up to 40Mbps)
- Hardware Video Encoder:
  - MPEG 4 : up to 1280x720p (30fps)
  - H.264 : up to 1280x720p (24fps)
- 10/100 Mb Ethernet interface RJ-45 connector x1
- 3.5", 4.3", 7", 8" or 10.1" LCD panel with touch screen x1
- HDMI 1.3 transmitter connector x1 **(EC1400 only)**
- +12V DC power input connector x1 (EC1407/08/10 only)
- +5V DC power input connector x1 (EC1403/04 only)
- USB1.1 host connector x2
- USB2.0 OTG connector x1
- Micro SD card socket x1
- WM8731 Audio Codec , Amplifier circuit
- Line-in connector x1, Earphone connector x1 (EC1407/08/10 only)
- MIC-in connector x1
- Speaker connector x2 (EC1403/04 only)
- RS485 connector x1
- RS232 connector x2 (one for debug port) (EC1407, EC1408, EC1410)
- RS232 connector x3 (one for debug port) (EC1403, EC1404)

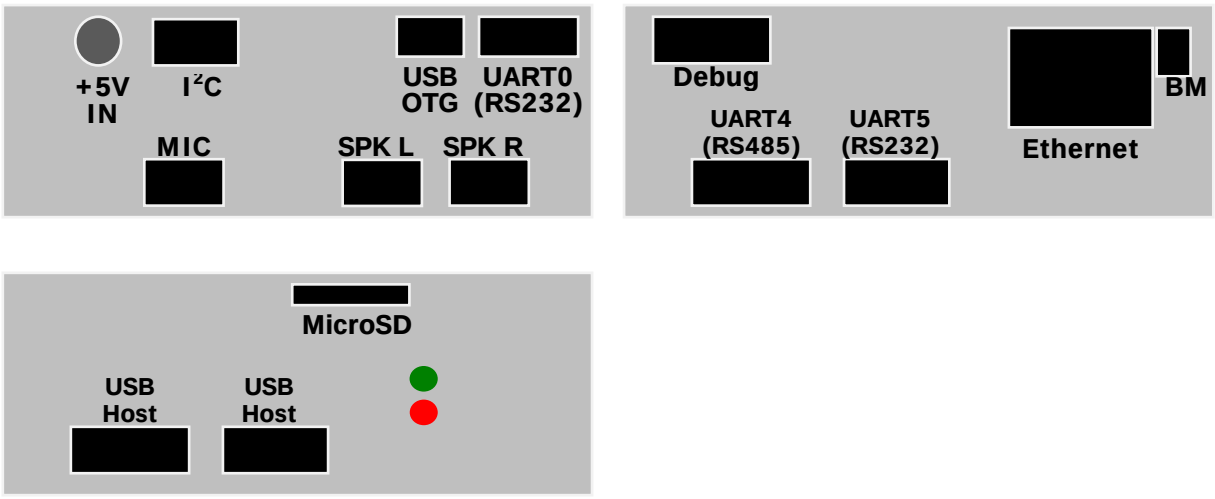
1.3 Outline Drawing and Dimension

<< TBD >>

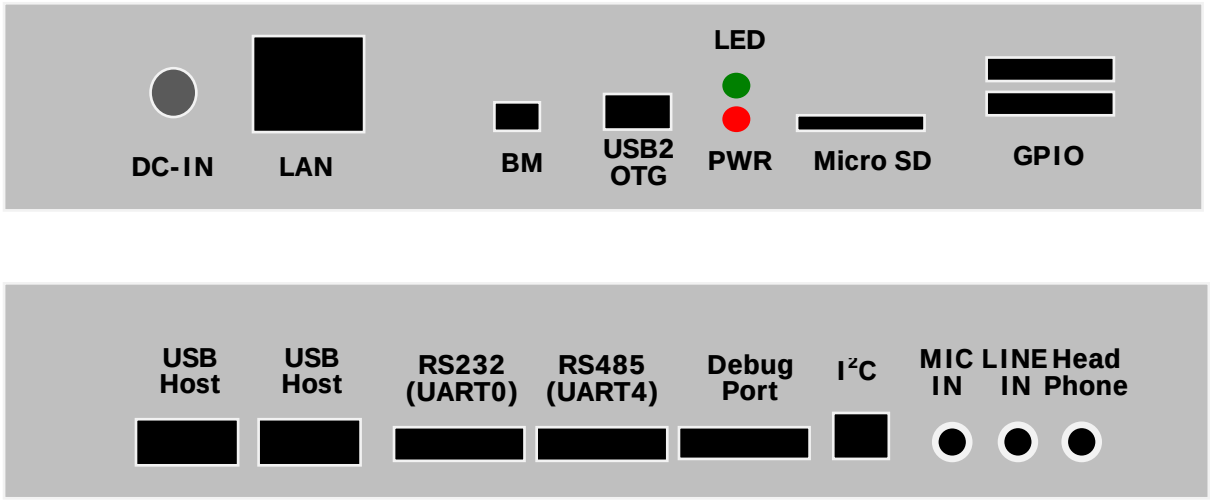
2.Function Descriptions

The following diagrams show connector positions on EC1400 series of products. The functional details of the connectors are described in subsequent sections.

Connector Positions for EC1403 and EC1404:



Connector Positions for EC1407, EC1408 and EC1410:



2.1 HDMI Connector (EC1400 only)

The HDMI receptacle connector supports standard HDMI interface.
The brief features of the HDMI interface are:

- HDMI 1.3, HDCP 1.1, DVI 1.0 compliant
- Supported video format:
  - 480p @59.94Hz/60Hz, 576p@50Hz
  - 720p @50Hz/59.94Hz/60Hz
  - 1080i @50Hz/59.94Hz/60Hz
  - 1080p @50Hz/59.94Hz/60Hz
- Supported color format: 4:4:4 RGB/YCbCr, 4:2:2 YCbCr 12-bit mode
- Integrated HDCP Encryption Engine for Video/Audio content protection

2.2 MicroSD Host Connector

The microSD host connector complies with the following versions of specifications:

- SD Host Controller Specification Version 2.0
- SDIO Card Specification Version 2.0
- SD Memory Card Specification Draft Version 2.0
- SD Memory Card Security Specification Version 1.0

The microSD interface supports 4-bit data bus.

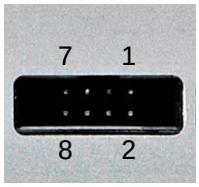
2.3 UART Connectors & Debug Port

There are 3 UART ports (UART0, 4, 5) on EC1403/04 and 2 UART ports (UART0, UART4) on EC1407/08/10. The connector type and functions are described in the table below:

UART No	Connector Type	Available Signals	Note
UART0	2x4 box header	RS232 signal level (TX, RX, RTS, CTS)	RS232 port.
UART4	2x4 box header	RS485 signal level (485+, 485-)	RS485 port. **Note: RS485 port works only in HALF Duplex mode.**
UART5	2x4 box header	RS232 signal level (TX, RX, RTS, CTS)	RS232 port. **Note: EC1403/EC1404 only.**

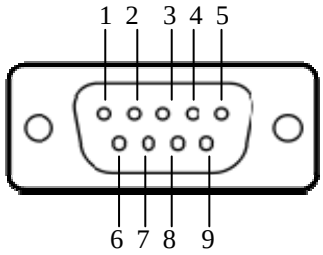
One 2x4 box header to DB9 cable is included in the product package. See **Appendix A** for the detailed info of cable pin assignment.

2x4 Box Header:

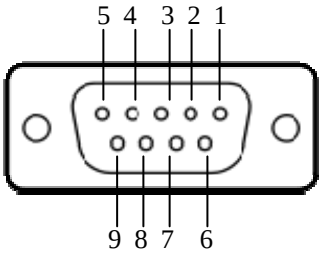


DB9 Pin	2x4 header	RS232	RS485
1	--	---	---
2	4	RxD	485+
3	6	TxD	485-
4	1	---	---
5	5	GND	GND
6	7	---	---
7	8	RTS	---
8	2	CTS	---
9	--	---	---

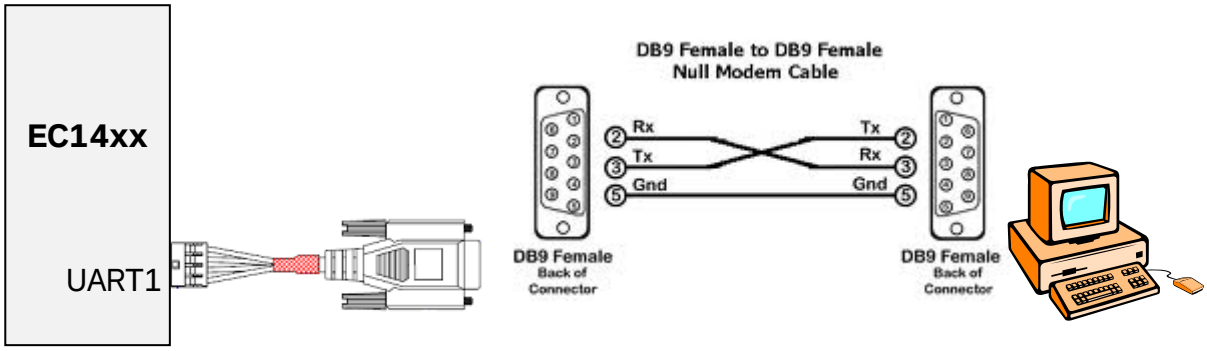
DB9 Male Connector



DB9 Female Connector

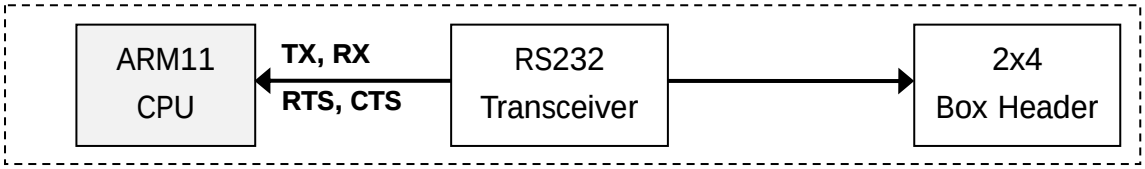


UART1 connection diagram:



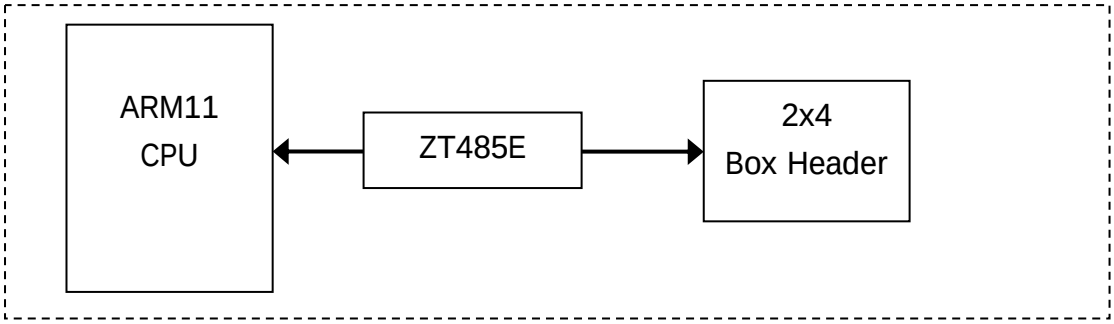
UART1 (only TX, RX signals) is dedicated as a debug port.
The default setting of UART1 is: **115200 baud rate, 8 data bit, no parity, 1 stop bit and no flow control**.
A DB9 **null modem cable** (or adapter) is required when you would like to connect UART1 to a PC that runs terminal emulation software such as TeraTerm.

UART0 connection diagram:



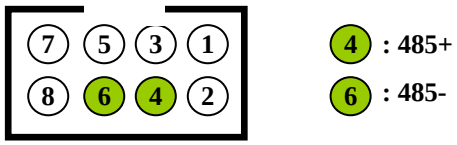
UART0 (with TX, RX, RTS, CTS signals) works as a regular RS232 port.

UART4 connection diagram:

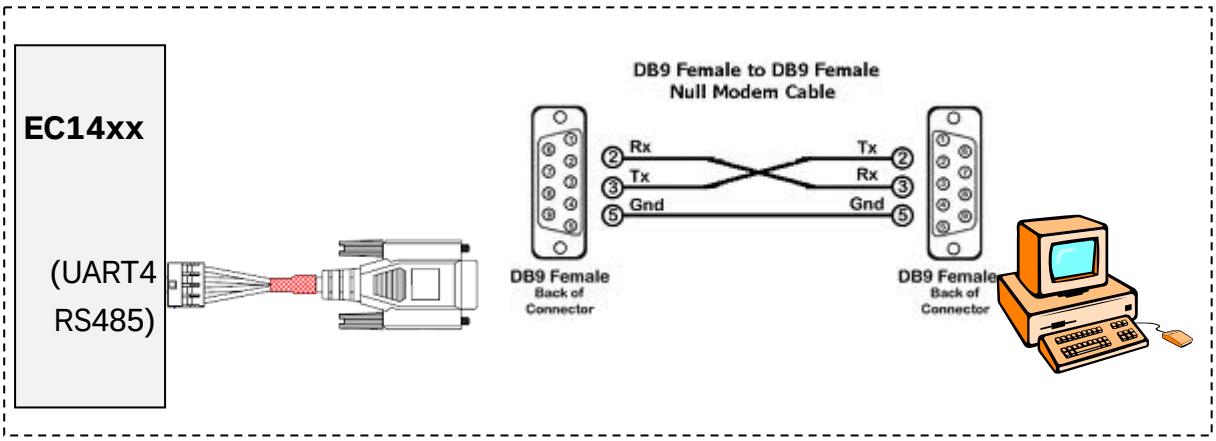


ZT485E: RS485 transceiver. RS485 works in half duplex mode.

UART Box Header (CN16 on PCB) Pin assignment:



If you are using an RS232 cable in RS485 connection, please make sure the pin2 and pin 3 are cross connected. See the sample cable wiring diagram below:



Debug Port Connector:

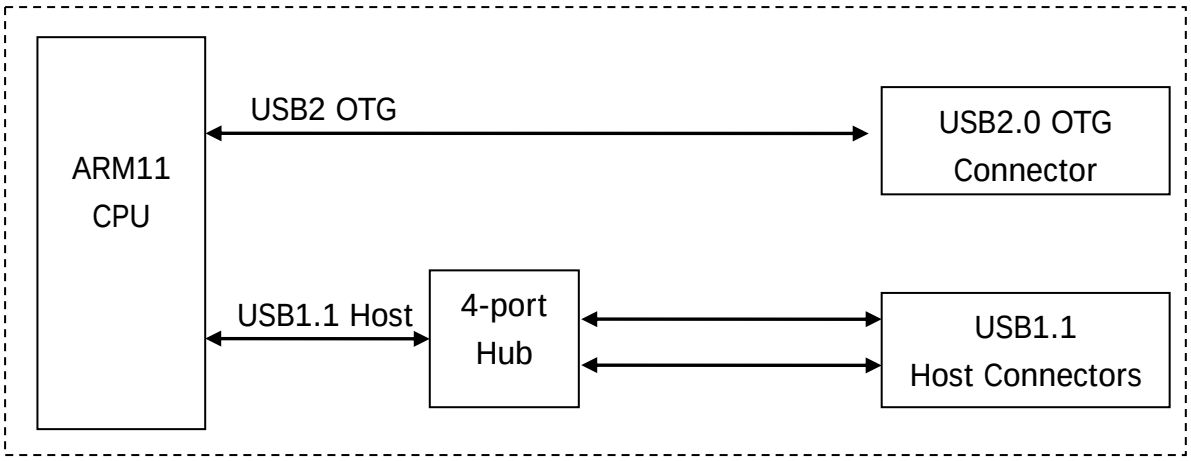
The debug port on EC1400 device is a RS232 port for software development or for Linux console port. Note that EC1403 and EC1404 debug port require a dedicated debug cable which is included in the EC1403/EC1404 product package. See table below:

Device	UART No	Connector Type	Available Signals	Note
EC1407 EC1408 EC1410	UART1	2x4 box header	RS232 (TX, RX)	**Use the cable as in Appendix A.**
EC1403 EC1404	UART1	1x5 box header	RS232 (TX, RX)	**Use a dedicated debug cable for this port.**

2.4 USB Connectors

The USB interfaces on EC1400 include a USB 2.0 OTG port (support 480Mbps speed) and 2x USB1.1 host ports.
The USB1.1 host interface is connected to a hub controller to extend host ports.
2 of the USB1.1 hub ports are available for users.

USB Port:



NOTE: The USB2.0 OTG can be used in host mode or device mode. If you would like to use it in host mode, a separate OTG-to-host cable is required.

The USB1.1 host connector is a regular USB type A connector that can be connected to **+5V USB storage device**. This port is mainly used to connect to USB flash drive.

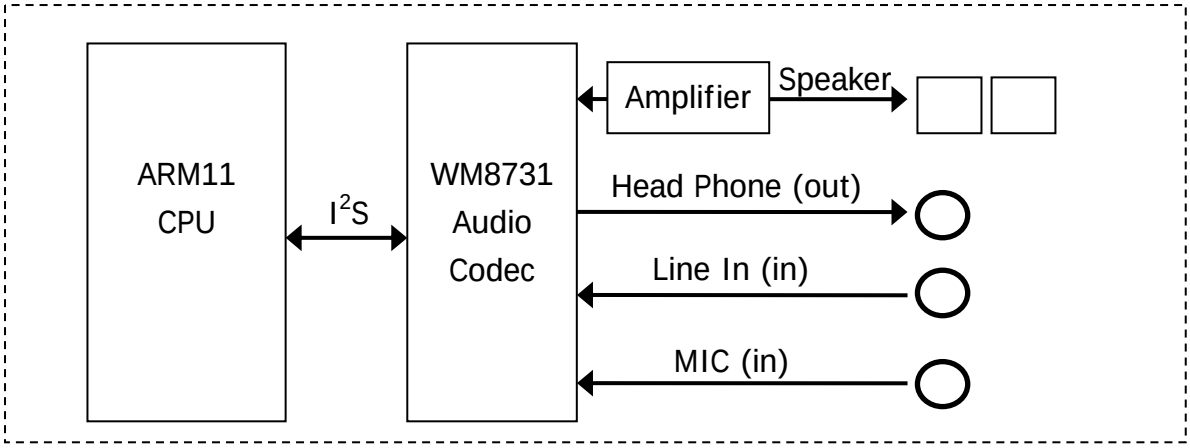
2.5 Audio Interface

The EC1400 audio interface is implemented by a WM8731 audio codec. The data and control interface between CPU and WM8731 is I^2S.

On EC1407/EC1408/EC1410, the available audio connectors are head phone, line in and MIC. The speaker connectors (left, right) are not available for external connection.

On EC1403/EC1404, the available audio connectors are MIC, speaker Left and speaker Right.

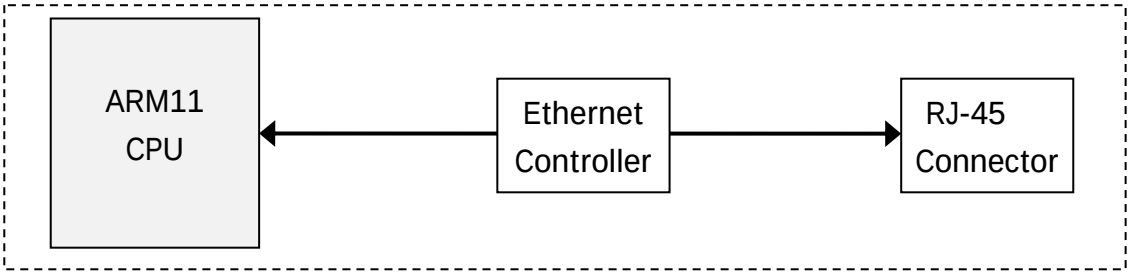
Audio Interfaces:



2.6 Ethernet Interface

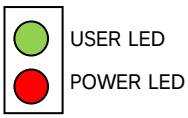
The 10/100Mbps Ethernet interface is available at the standard RJ-45 connector.

Ethernet:

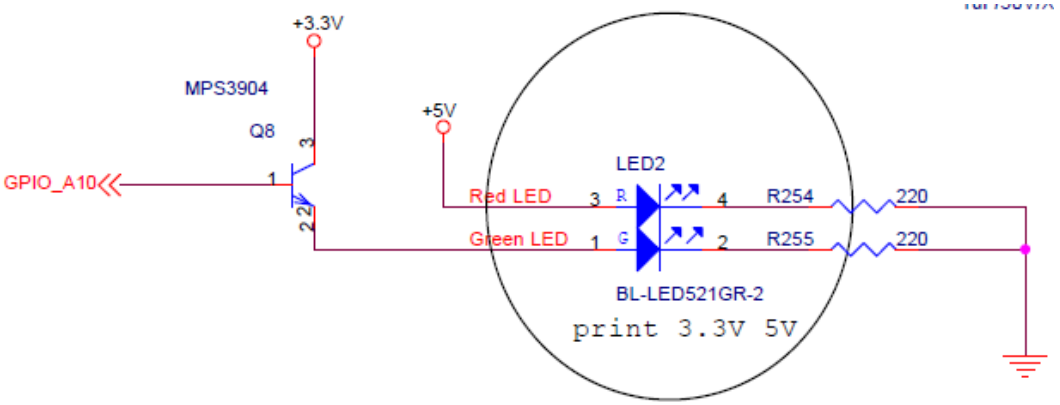


2.7 LED

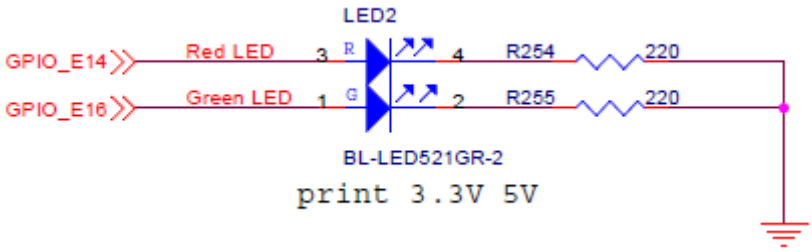
On EC1407/EC1408/EC1410, the red LED is connected to 5V power. It is turned on when 5V power is properly supplied. The green LED is user programmable and can be turned on/off by GPIO_A10.



The schematic of LEDs is as below:



On EC1403/EC1404, the red and green LEDs are connected to user programmable GPIO_E14 and GPIO_E16:



2.8 Power Supply (DC-IN connector)

The standard DC power adapter included with EC1407/EC1408/EC1410 is +12V at 1.5A or higher.

The DC power adapter for EC1403/EC1404 is +5V at 2A.

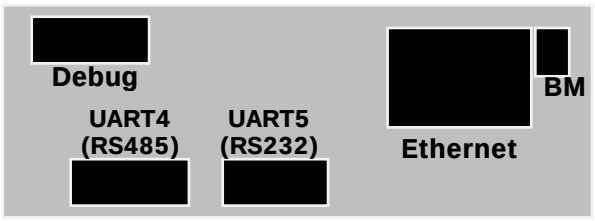
Power input should be applied to the DC-IN connector.

2.9 BM Header

The BM header is a 2-pin jumper to be used in EC14xx product firmware update. In normal EC14xx operation, the jumper cap MUST be put on the jumper (that is, 2-pin jumper is short).

In firmware update mode, the jumper cap MUST be removed from the jumper. For further information about firmware update on EC14 series product, please refer to a separate firmware update document.

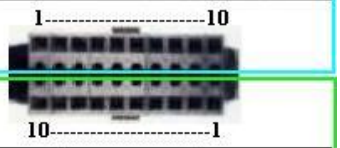
On EC1403/EC1404, the BM header is beside RJ-45 Ethernet connector as shown below:



2.10 GPIO Connector (EC1407/08/10 only)

The GPIO connector (note that GPIO connector is available only in certain EC14 models) provides user to connect up to 16 GPIO devices (+3.3V signal level). For further information about the use of GPIO, please refer to the “EC14xx GPIO Application note”.

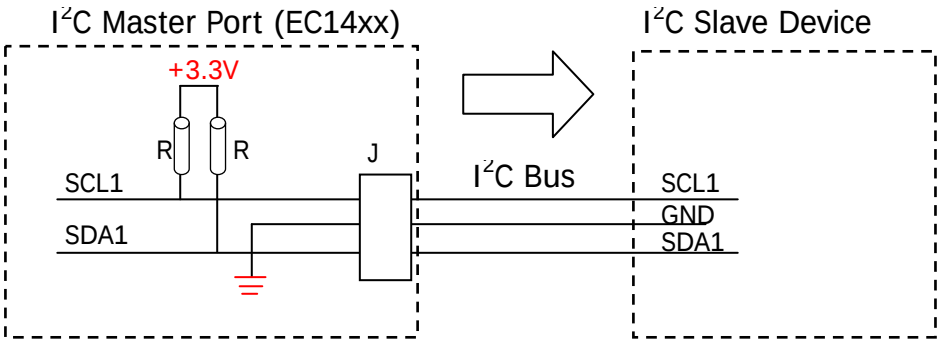
SBC1400 J9	signal	front panel
2	+3.3V	1
5	GPIO_B12	2
7	GPIO_B13	3
9	GPIO_B14	4
11	GPIO_B15	5
6	GPIO_E24	6
8	GPIO_E25	7
10	GPIO_E26	8
12	GPIO_E27	9
14	GND	10



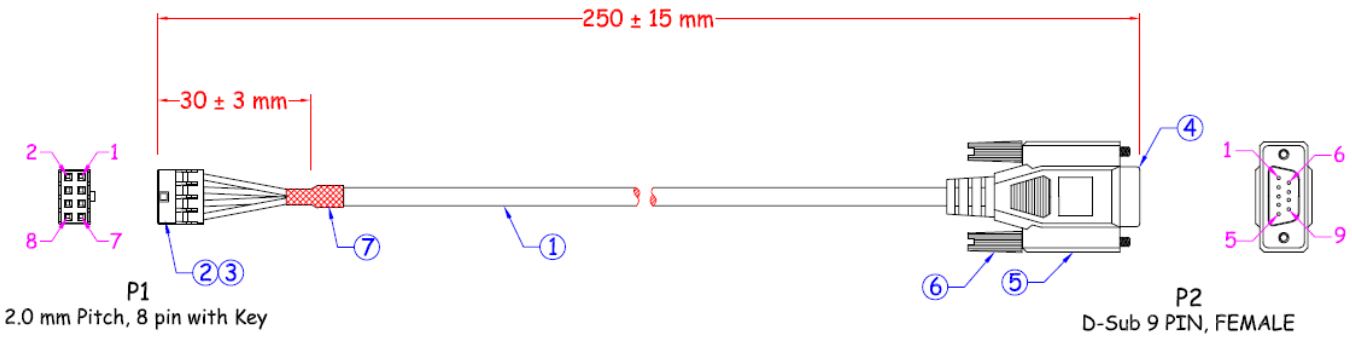
SBC1400 J7	signal	front panel
2	3.3V_CIM	1
14	GPIO_E12	2
16	GPIO_E14	3
18	GPIO_E16	4
20	GPIO_E18	5
13	GPIO_E13	6
15	GPIO_E15	7
17	GPIO_E17	8
19	GPIO_E19	9
23	GND	10

2.11 I²C Interface

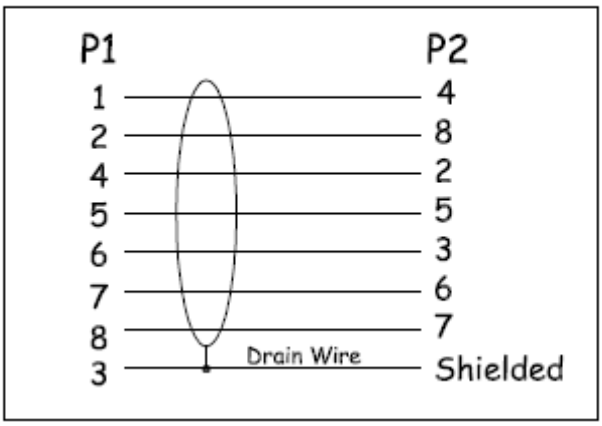
The I²C works as a master port by default: The master port is pulled high to +3.3V with 2 resistors internally. The slave devices have to be connected directly without additional power supply on I²C bus.



Appendix A: Box Header to DB9 Cable



WIRE TERMINATIONS



Appendix B: 7-inch LCD Brief

General Features:

The 7-inch LCD panel is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit, touch Panel and a back-light unit. Graphics and texts can be displayed on a WVGA 800 (W) x 3 x 480 (H) dots (16:9 aspect ratio) with 262,144 colors by supplying 18 bits data signal (6bits/each color).

The brief features of LCD module are:

- Transmissive and back-light with 27 LEDs are available.
- TN (Twisted Nematic) mode.
- Digital RGB (6bits/color) data transfer.
- Data enable mode.
- Back-light Dimming control

LCD Module Specifications:

Item	Specification	Unit
Screen Size	7.0 inches	Diagonal
Display Resolution	800 (H) x 480 (V)	Pixel
Active Area	153.6 (H) x 86.64 (V)	mm
Outline Dimension	165.00 (H) x 104.00 (V) x 6.5 (T)	mm
Display Mode	Normally white mode/ Transmissive	--
Surface Treatment	Anti-glare(AG)	--
Pixel Arrangement	RGB Vertical Stripe	--
Pixel Size	192 x 180.5	um
Display Color	262K	--
Viewing Direction	6 o'clock	--
Input Interface	Digital RGB (6bits/color) Data Transfer	--

Mechanical Data

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	165.00	--	mm	
	Vertical (V)	--	104.00	--	mm	
	Thickness (T)	--	6.5	--	mm	(1)
Weight		--	(165)	--	g	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

Environment Rating

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T_{STG}	-20	70	^{o}C	
Operating Temperature	T_{OPR}	-10	60	^{o}C	

Optical Characteristics

Item	Symbol	Min.	Typ.	Unit	Note
Brightness	B	(380)	(440)	cd/m^2	
Contrast Ratio	CR	(400)	(500)	--	

Appendix C: 8-inch LCD Brief

General Features:

The 8-inch LCD panel is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit, touch Panel and a back-light unit. Graphics and texts can be displayed on a SVGA 800 (W) x RGB x 600 (H) dots (4:3 aspect ratio) with 262,144 colors by supplying 18 bits data signal (6bits/each color).

The brief features of LCD module are:

- Transmissive and back-light with 27 LEDs are available.
- TN (Twisted Nematic) mode.
- Digital RGB (6bits/color) data transfer.
- ROHS Compliance

LCD Module Specifications:

Item	Specification	Unit
Screen Size	8.0 inches	Diagonal
Display Resolution	800 (H) x 600 (V)	Pixel
Active Area	162 (H) x 121.5 (V)	mm
Outline Dimension	183 (H) x 141 (V) x 7.3 (T)	mm
Display Mode	Normally white mode/ Transmissive	--
Pixel Arrangement	RGB Vertical Stripe	--
Pixel Size	0.2025 x 0.2025	Mm
Display Color	262K	--
Surface Treatment	Anti-Glare and Hard Coating (3H)	
Viewing Direction	6 o'clock	--
Input Interface	LVDS Receiver 6 bit Interface	--

Mechanical Data

Item	Min.	Typ.	Max.	Unit	Note

Module Size	Horizontal (H)	--	183	--	mm	
	Vertical (V)	--	141	--	mm	
	Thickness (T)	--	7.3	--	mm	(1)
Weight		--	(330)	--	g	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

Environment Rating

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T_{STG}	-30	80	^{o}C	
Operating Temperature	T_{OPR}	-20	70	^{o}C	

Optical Characteristics

Item	Symbol	Min.	Typ.	Unit	Note
Brightness	B	(250)	(320)	cd/m^2	
Contrast Ratio	CR	(400)	(500)	--	

Appendix D: 10.1-inch LCD Brief

General Features:

The 10.1-inch LCD panel is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit, touch panel and a back-light unit. The resolution of a 10.1" contains 1024 (W) x RGB x 600 (H) dots and can display up to 262K colors.

The brief features of LCD module are:

- Transmissive and back-light with LEDs are available.
- TN (Twisted Nematic) mode.
- One channel LVDS interface.
- ROHS Compliance

LCD Module Specifications:

Item	Specification	Unit
Screen Size	10.1 inches	Diagonal
Display Resolution	1024 x RGB x 600	Pixel
Active Area	220.416 (H) x 129.15 (V)	mm
Outline Dimension	235 (H) x 145.8 (H) x 7.0 (D)	mm
Display Mode	Normally white mode	--
Pixel Arrangement	RGB Stripe	--
Pixel Size	0.21525 x 0.21525	mm
Display Color	262K	--
Surface Treatment	Anti-Glare	
Viewing Direction	12 o'clock	--
Input Interface	LVDS Interface	--

Environment Rating

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T_{STG}	-20	60	^{o}C	
Operating Temperature	T_{OPR}	0	50	^{o}C	

Optical Characteristics

Item	Symbol	Min.	Typ.	Unit	Note
Brightness	--	128	160	cd/m^2	
Contrast Ratio	CR	400	500	--	

Appendix E: 3.5-inch LCD Brief

General Features:

The 3.5-inch LCD panel is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit, a back-light unit and a touch screen panel (TSP).
The resolution of a 3.5-inch contains 320RGBx240 dots and can display up to 16.7M colors. The brief features of LCD module are:

- Transmissive and back-light with six LEDs.
- TN (Twisted Nematic) mode.
- Programmable Frame & N-line polarity inversion.
- Using the Touch Screen Panel (Film to Glass type).
- DEN (Data Enable Input) mode, SYNC mode

LCD Module Specifications:

Item	Specification	Unit
Screen Size	3.5 inches	Diagonal
Display Resolution	320 (H) x 240 (V)	Pixel
Active Area	70.08 (H) x 52.56 (V)	mm
Outline Dimension	76.9 (W) x 63.9 (H) x 4.4 (D)	mm
Display Mode	Normally white mode/ Transmissive	--
Surface Treatment	Anti-glare(AG)	--
Pixel Arrangement	RGB Vertical Stripe	--
Display Color	16.7M	--
Viewing Direction	6 o'clock	--
Input Interface	Digital RGB (8bits/color)	--

Environment Rating

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T_{STG}	-20	70	^{o}C	
Operating Temperature	T_{OPR}	-10	60	^{o}C	

Optical Characteristics

Item	Symbol	Min.	Typ.	Unit	Note
Brightness	B	200	250	cd/m^2	
Contrast Ratio	CR	240	300	--	

Appendix F: 4.3-inch LCD Brief

General Features:

The 4.3-inch LCD panel is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit, a back-light unit and a touch screen panel (TSP).
The resolution of a 4.3-inch contains 480RGBx272 dots and can display up to 16.7M colors. The brief features of LCD module are:

- Transmissive and back-light with 7 LEDs.
- TN (Twisted Nematic) mode.
- 4-wire Touch Screen Panel (Film to Glass type).
- ROHS Compliance

LCD Module Specifications:

Item	Specification	Unit
Screen Size	4.3 inches	Diagonal
Display Resolution	480 (H) x 272 (V)	Pixel
Active Area	95.04 (H) x 53.86 (V)	mm
Outline Dimension	105.5 (W) x 67.2 (H) x 5.05 (D)	mm
Display Mode	Normally white / Transmissive	--
Surface Treatment	Anti-glare(AG)	--
Pixel Arrangement	RGB Vertical Stripe	--
Display Color	16.7M	--
Viewing Direction	6 o'clock	--
Input Interface	Digital RGB (8bits/color)	--

Environment Rating

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T_{STG}	-30	80	^{o}C	
Operating Temperature	T_{OPR}	-20	70	^{o}C	

Optical Characteristics

Item	Symbol	Min.	Typ.	Unit	Note
Brightness	B	(350)	(400)	cd/m^2	
Contrast Ratio	CR	(250)	(350)	--	