

# PPC-07-IMX6

## User Manual

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## **1 PPC-07-IMX6 Product Summary**

### **1.1 Features**

- **Based System on Module Flexible Design**
  - **SoM-350ES Carrier with 314 Pin MXM EM4C G2 SOM Connector**
  - **SoM-IMX6M Module**
    - **Freescale/NXP/Qualcomm i.MX6 Microprocessor (Solo, Dual or Quad Core)**
    - **Up to 2 GB of DDR3 RAM**
    - **Up to 16 MB of Serial NOR Flash (not available on Standard Solo)**
    - **4 GB of Onboard eMMC**
- **Inexpensive Open-Frame Design**
- **1x 10/100/1000 BaseT Ethernet**
- **3x RS232 & 1 RS232/422/485 Port**
- **2x USB 2.0 (High Speed) Host Ports**
- **1x USB 2.0(High Speed) OTG Port**
- **1x CAN 2.0b Port**
- **Battery Backed Real Time Clock**
- **1x mini PCIe Slot**
- **1x SIM socket**
- **2x I2C Ports**
  - **1x I2C EEPROM (4K Bytes)**
- **2x SPI Ports**
- **1x mSATA Port**
- **1x HDMI Port**
- **1x Micro SD/MMC Flash Card Socket**
- **1x I2S Audio CODEC with Line-In/Line-Out**
- **1x Audio Beeper**
- **2x Timer/Counters/PWM**
- **4 Channels of 12-bit A/D (not available on Standard Solo)**
- **24-bit LVDS LCD interface**
- **High Brightness WVGA (800 x 480) Resolution LCD with LED Backlight**
- **4-wire Resistive Touchscreen Interface**
- **Wi-Fi/BLE wireless – 802.11 b/g/n & Bluetooth (optional)**
- **Software Controlled Backlight On/Off & Brightness**
- **FREE IDE with GCC & GDB development tools**

## 1.2 Standard PPC Specifications

- **CPU:** Single/Dual/Quad ARM™ Cortex™ -A9 MPcore with Cortex-A9 NEON MPE
- **Module:** SoM-iMX6M
- **Carrier Board:** SoM-350ES
- **Memory:**
  - **Flash:** 16 MB Serial NOR Flash
  - **RAM:** Up to 2 GB DDR3 @ 800Mhz
  - **eMMC:** Up to 4 GB of Onboard eMMC
- **Video:**
  - **LVDS:** 1-24bit, 165 Mpixels/sec, LVDS interface
  - **HDMI:** 1 HDMI 1.4 port
  - **MIPI/DSI:** 2 Lanes @ 1 Gbps
  - **MIPI/CSI:** 4 Lanes @ 1 Gbps
- **Flash Disk:** 4GB eMMC Resident Flash
- **System Reset:** MAX6747 Watchdog Timer and Reset Supervisor
- **RTC:** Battery backed Real Time Clock
- **Timers/Counters:** 1 General Purpose Timer Counter with Dedicated Clock Input
- **Watchdog Timer:** MAX6747 Watchdog Timer and Reset Supervisor
- **Digital I/O:** 22 General Purpose Input/Output lines
- **Analog I/O:** 4 Channel 12-bit Analog to Digital Converter
- **JTAG:** Processor JTAG Supporting Programming, Trace, and Boundary Scan

## 1.3 LCD

### LCD – 7” LCD (GM800480D-70-TTX2NLW-HTL):

- **Display Type:** 7” TFT Color LCD
- **Resolution:** 800 x 480 WVGA @ 262K Colors
- **Dot pitch:** 0.19mm x 0.19mm
- **Luminance:** High Brightness 800 cd/m<sup>2</sup> (1000 (cd/m<sup>2</sup>) without Touch Screen)
- **Viewing Angle:**
  - **Θ-right:** 65° (55° -min)
  - **Θ-left:** 65° (55° -min)
  - **Θ-up:** 55° (45° -min)
  - **Θ-down:** 65° (55° -min)
- **Brightness:** Software Controlled
- **Backlight:** White LED (39 LEDs)

## 1.4 Touchscreen

- **Type:** 4-Wire Resistive Touch Panel
- **Resolution:** 12-bit Continuous
- **Light Transparency:** 80%
- **Controller:** Built-In
- **Driver:** Linux
- **Durability:** Over One Million touches

### 1.5 Ethernet Interface

- **Ethernet MAC:** iMX6 MAC Utilizing RGMII Interface
- **Ethernet PHY:** Micrel KSZ9031 Gigabit Ethernet PHY
- **Ethernet Type:** 10/100/1000 Base-T Ethernet
- **Ethernet Interface:** Media Dependent Interface (MDI)

### 1.6 Mechanical and Environmental

- **Dimensions:** 7.55" L x 4.31" W x 1.5"H
- **Power Supply Voltage:** +12 to 28 Vdc
- **Power Consumption (typical):** 1A @ 12 Vdc with LCD on
- **Operating Temperature:** 0 ~ 60° C (32 ~ 140° F), [-20 ~ 70° C optional]

### 1.7 Standard Parts Inventory

- PPC-07-IMX6 Assembly with 7" Touchscreen LCD
- Stainless Steel Mounting Bracket
- Resident on-board flash disk loaded with Operating System
- Three Serial Port cables

## 2 PPC- Product Details

### 2.1 Jumper Configuration & Connector Descriptions

The PPC-07-IMX6 comes factory configured. In the event that jumpers need to be verified or modified this section provides the information required, including instructions on setting jumpers and connecting peripherals, switches and indicators. Be sure to read all the safety precautions before you begin any configuration procedure. See Appendix A for connector pinouts and Appendix B for Jumper Setting descriptions.

**Table 1: Jumpers**

Label	Function	Default
JB1	Standby Battery	OFF
JB2	Boot0 Source Selection	Position A
JB3	Boot1 Source Selection	Position A
JB4	Flash Write Protect	Position B
JB5	Serial Port RS422/485 Tx Enable	422
JB6	Serial Port RS232 or 422/485	232

**Table 2: Connectors**

Label	Function
<b>ANT1</b>	Ultra-Small Coaxial Connector
<b>ANT2</b>	Ultra-Small Coaxial Connector
<b>CN1</b>	7" LCD Backlight Connector
<b>CN2</b>	Serial Port COM B
<b>CN3</b>	10" Touch Screen Connector
<b>CN4</b>	7" Touch Screen Connector
<b>HDR1</b>	Vin Power 3 Pin Header
<b>HDR2</b>	USB Host Port A & B Header
<b>HDR3</b>	CAN 2.0 Port
<b>HDR4</b>	Serial Port COM A
<b>HDR5</b>	Serial Port COM C
<b>HDR6</b>	Serial Port COM D
<b>HDR7</b>	DSI Header
<b>HDR8</b>	I/O Header 2
<b>HDR9</b>	I/O Header 1
<b>HDR10</b>	LVDS LCD Connector
<b>JK1</b>	Vin Power Barrel Jack
<b>JK2</b>	Dual Port Ethernet Connector
<b>JK3</b>	USB Host Port A & B
<b>JK4</b>	USB OTG Port
<b>JK5</b>	Audio Input Jack
<b>JK6</b>	Audio Output Jack
<b>JK7</b>	HDMI Connector
<b>SOK1</b>	314 Pin SoM Socket
<b>SOK2</b>	MicroSD Card Socket
<b>SOK3</b>	mSATA Socket
<b>SOK4</b>	mini-PCIe Socket
<b>SOK5</b>	SIM Card Socket



## 2.2 Power Connectors

The PPC-07-IMX6 provides two power connectors. HDR1 is an AMP/Tyco locking power connector (part# 640445-3), the three-pin type connector mates with the TE Connectivity power connector (part# 3-640600-3). This power input provides a more rugged/industrial locking connection with an operating temperature of -55 ~ 105° C. JK1 is a standard 5.5mm barrel jack with an inner diameter of 2.1mm with a center V+ connection and has an operating temperature of -25 ~ 85° C. This jack allows for easy connection to a wall mount power supply (EMAC part number PER-PWR-00035). The PPC-07-IMX6's power input uses a switching regulator and allows a voltage input of +9V DC to +28V DC.

**Table 3: Pinout for the HDR1 Power Connector**

Pin	Signal
1	+Vin (+9Vdc to 28Vdc)
2	Chassis GND
3	System GND

## 2.3 Ethernet

The PPC-07-IMX6 provides a 10/100/1000 Base-T full duplex Ethernet Port and uses a Dual Port RJ-45 LAN jack (JK2) with integrated magnetics (the bottom port is active). It can be connected straight to a hub, or another computer via Ethernet crossover cable. The Ethernet crossover cable can be replaced with a patch cable if the SoM processor module supports the Auto MDI-X capability. The Ethernet MAC & PHY are integrated into the SoM processor module. Activity and Link LEDs are integrated into the RJ45 connector.

## 2.4 Serial Ports

The PPC-07-IMX6 is equipped with four serial ports, one of which terminates to a male DB9 connector and the other three which terminate to 10-pin header connectors. Three 10-pin headers to male DB9 connector cables are provided, giving easy access to these ports. Baud Rate, stop bits, etc. are all programmable for each port via software.

COM A is a RS232 port. This port offers RTS/CTS handshake lines.

COM B is a RS232 port with a full complement of handshaking lines allowing it to communicate with modems and other devices requiring hardware flow control.

COM C can be configured to RS232, RS422, or RS485 via two jumpers (JB6 & JB5). To select RS232 set jumper JB6 to 232 (this is the default). For RS422 set jumper JB6 to 4xx and jumper JB5 to 422. To select RS485, set jumper JB6 to 4xx and jumper JB5 to 485.

When using COM C in the RS422/485 mode, a terminating resistor (~120 Ohm) is recommended on the two far ends of the network.

COM D is an RS232 port. This port offers RTS/CTS handshake lines.

**Table 4: Serial Port COM A (HDR4)**

Pin	10-Pin Header: Description	DB9 Connector: Description
1	NC	NC
2	NC	RXD
3	RXD	TXD
4	RTS	NC
5	TXD	GND
6	CTS	NC
7	NC	RTS
8	NC	CTS
9	GND	NC
10	NC	N/A

**Table 5: Serial Port COM B (CN2)**

Pin	DB9 Connector: Description
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

**Table 6: Serial Port COM C (HDR5)**

Pin	10-Pin Header: Description	DB9 Connector: Description
1	422/485 TX-	422/485 TX-
2	NC	232 RX, 422/485 TX+
3	232 RX, 422/485 TX+	232 TX, 422/485 RX+
4	RTS	422/485 RX-
5	232 TX, 422/485 RX+	GND
6	CTS	NC
7	422/485 RX-	RTS
8	NC	CTS
9	GND	NC
10	NC	N/A

**Table 7: Serial Port COM D (HDR6)**

Pin	10-Pin Header: Description	DB9 Connector: Description
1	NC	NC
2	NC	RXD
3	RXD	TXD
4	RTS	NC
5	TXD	GND
6	CTS	NC
7	NC	RTS
8	NC	CTS
9	GND	NC
10	NC	N/A

## 2.5 USB Host Ports

The PPC-07-IMX6 provides for dual high speed (HS) USB 2.0 (480 Mbps) host ports (USB PortA & PortB). USB PortA and PortB are normally accessed via a dual USB Type A connector. Alternatively, USB PortA and PortB can be accessed from the bulkhead connector (HDR2). EMAC can provide a cable (CAB-40-004) to access these ports.

The USB host ports are fused with automatically resettable Polyfuses. If a USB device tries to draw more than 500 milliamps, the fuses will open. Once the drawing source is removed the fuses will automatically reset. The USB ports are pinned as standard USB host ports and thus should work with any standard USB mating device or host.

In addition to the two USB Host ports is a HS USB 2.0 OTG (Up to 480 Mbps) Host/Device port. This port can be used as either a USB Host or USB Device port and is also fused when used as a Host.

Note: When sizing a power supply, make sure to allow for USB Device consumption. A device can potentially draw 500mA, therefore these devices could use a total of up to 1.5 amp of power. USB ports must be supported by the SoM for the ports to operate.

## 2.6 Audio Port

The PPC-07-IMX6 provides Audio Line Out and Line In capabilities through two standard audio jacks (JK5 & JK6). Audio Jack JK5 is stereo line level input and Audio Jack JK6 is stereo line level output. The processor interfaces to the Audio CODEC through its I2S interface. Volume and Balance are controlled through software using the I2C interface lines SOM\_I2C\_B\_CLK & SOM\_I2C\_B\_DAT, which are accessible via HDR8.

The CODEC is the Texas Instruments TLV320AIC3204, which is a flexible, low-power, low-voltage stereo audio codec with programmable inputs and outputs, PowerTune capabilities, fixed predefined and parameterizable signal-processing blocks, integrated PLL, integrated LDOs and flexible digital interfaces.

## **2.7 LCD Brightness Control**

The PPC-07-IMX6 offers LCD brightness control that can change the brightness of the LCD via software. The LCD utilizes LED backlighting. The board provides the backlight with approximately 10 volts at about 500mA. The processor provides a PWM that is used to drive the LCD backlight. Changing the duty-cycle of the PWM directly affects the brightness of the LCD. In addition, the backlight can be turned off or on via SoM port line GPIO1\_IO30 (SoM pin#27). This allows screensaver software to automatically turn off the backlight when the unit is not being used and to automatically turn it back on when the touchscreen is touched.

## **2.8 MicroSD Card Socket**

The PPC-07-IMX6 provides a high capacity MicroSD socket. This socket is hot-swappable and can accept a wide variety of Flash Cards. A green activity LED (LD7) will be lit when the Flash card is accessed and the card should not be removed at this time. A card that is written to by the PPC-07-IMX6 can be read by another computer using a MicroSD card reader. The MicroSD interface is compatible with Standard and High Capacity MicroSD cards.

## **2.9 Keyboard/Mouse**

The PPC-07-IMX6 does not provide a PS/2 type keyboard/mouse interface. However, a USB keyboard and mouse can be used if required.

## **2.10 Analog Inputs**

The analog inputs are available on HDR9 (see table 9 below) and are labeled as ADC\_1, ADC\_2, ADC\_3, and ADC\_4. Voltages applied to the inputs must be in the range of 0V to 3.3V with reference to ground. See the operating system documentation for details.

## **2.11 Wi-Fi (Optional)**

The PPC-07-IMX6 provides two Wi-Fi/Bluetooth antenna jacks (JK11 & JK12) which utilizes the on-board Wi-Fi/Bluetooth/BLE module (WL1835MOD).

The antenna jacks, (U.FL-R-SMT (10)) offers high frequency performance from DC to 6GHz, with a V.S.W.R of 1.3 to 1.5 max. EMAC provides an antenna kit: 2.4GHz Duck Antenna RP-SMA and U.FL.(IPEX) to RP-SMA male pigtail cable that plugs into the SoM's antenna jack.

The TI WiLink 8 module (WL1835MOD) offers high throughput and extended range along with Wi-Fi and Bluetooth (BT) coexistence in a power-optimized design.

### WLAN Features:

- Integrated 2.4 GHz power amplifiers
- Baseband processor: 802.11 b/g/n data rates with 20 or 40 MHz SISO and 20 MHz MIMO
- 2.4 GHz radio: Internal LNA & PA, Standard 802.11 b/g/n (5 GHz radio optional)
- 4-bit SDIO interface, high speed (HS) and V3 modes

### Bluetooth (BT) Features:

- Bluetooth 4.1 & CSA2
- Audio processor: on-chip SBC encoding + A2DP
- Concurrent operation and prioritization of BT & BLE, audio processing, and WLAN
- Serial Port Interface COM D

Bluetooth Low Energy (BLE) Features:

- Bluetooth 4.0 LE dual-mode
- Up to 10 BLE connections
- Multiple connections with no effect on BR/EDR performance

## 2.12 I/O Expansion

The PPC-07-IMX6 provides access to a number of I/O lines on connectors HDR8 and HDR9. The 40-pin dual row headers contain GPIO lines, SPI bus, I2C bus, CAN bus, A/D lines, interrupts and power pins. In addition, the inputs (SPR\_MNO\_An & SPR\_MNO\_B) and outputs (SPR\_MNO\_Qn & SPR\_MNO\_Q; pins 34, 36, 38 & 40; CD74HC173) to the spare monostable (free for customer use) are accessible via header HDR8. Signal names listed in the tables below are the SoM names as defined in the SoM 314 pin specification.

**Table 8: I/O Header (HDR8)**

Pin	Signal	Pin	Signal
1	5V_VCC	2	5V_VCC
3	GND	4	GND
5	3V3_VCC	6	3V3_VCC
7	S3	8	ON_OFF
9	S5	10	GPIO2/PWM2
11	PMIC_BATLOW#	12	GPIO3/PWM3
13	PMIC_I2C_SDA	14	GPIO5/TC2
15	PMIC_I2C_SCL	16	GPIO13
17	PMIC_CHARGE#	18	GPIO14
19	PMIC_CHARGE_DET#	20	GPIO16
21	PMIC_TEST#	22	GPIO17
23	PMIC_SLEEP#	24	GPIO18
25	I2C_B_SCL	26	GPIO19
27	I2C_B_SDA	28	GPIO20
29	SPI_B_MOSI	30	GPIO21
31	SPI_B_MISO	32	GND
33	SPI_B_CLK	34	SPR_MNO_An
35	SPI_B_CS0#	36	SPR_MNO_B
37	SPI_B_CS1#	38	SPR_MNO_Q
39	SPI_B_CS2#	40	SPR_MNO_Qn

**Table 9: I/O Connector (HDR9)**

Pin	Signal	Pin	Signal
1	5V_VCC	2	5V_VCC
3	GND	4	GND
5	3V3_VCC	6	3V3_VCC
7	CAN_B_TX	8	CAN_B_RX
9	GND	10	ADC_VREF
11	ADC_3	12	ADC_4
13	ADC_1	14	ADC_2
15	GND	16	GPIO12
17	I2S_B_RXD	18	GPIO11
19	I2S_B_TXFS	20	GPIO4/TC1
21	I2S_B_TXD	22	GPIO1/PWM1
23	I2S_B_TXC	24	GPIO0/PWM0
25	I2S_B_CLK	26	SPI_A_CS2#
27	HSIC_A_STRB	28	SPI_A_CS1#
29	HSIC_A_DATA	30	SPI_A_CS0#
31	HSIC_B_STRB	32	SPI_A_CLK
33	HSIC_B_DATA	34	SPI_A_MISO
35	I2C_A_SCL	36	SPI_A_MOSI
37	I2C_A_SDA	38	GND
39	GPIO15	40	SPDIF_OUT

### 2.13 Real-Time Clock

The PPC-07-IMX6 is equipped with an external battery (BH1) for backing up the module's Real-Time Clock (RTC). Drivers to access the RTC are included in the operating systems. Jumper JB1 should be placed in the ON position in order to retain system time when powered down.

### 2.14 Serial Flash

In addition to the eMMC Resident Flash is 16MB of SPI based bootable serial NOR flash. Keep the Boot Jumper in their default positions in order to load the bootloader (from either Serial Flash or eMMC). The bootloader can be configured to boot the OS out of SD Card, Ethernet, SPI Serial Flash, or USB.

### 2.15 Status LEDs and Reset

The PPC-07-IMX6 provides a status LED on the SoM-iMX6M module. A green status LED (LD1) is active-high and is controlled by port line GPIO1\_IO26. The SoM-350ES provides a Reset Button (PB1). Pressing this button will cause the system to reset.

## 2.16 Can Port

The PPC-07-IMX6 provides a CAN 2.0 port utilizing the TI SN65HVD232 CAN Transceiver chip. The CAN port is accessible via a 3-pin header (HDR3).

**Table 10: Pinout for the Can 2.0 Port (HDR3)**

Pin	Signal
<b>1</b>	CAN_H
<b>2</b>	CAN_L
<b>3</b>	GND

## 3 Software

The PPC-07-IMX6 offers a wide variety of software support from both open source and proprietary sources. The hardware core utilizes the Freescale/NXP/Qualcomm i.MX6 microcontroller, which is supported by Linux.

For more information on Linux Software Support, please visit the EMAC Wiki Software Section at:

[http://wiki.emacinc.com/wiki/Product\\_wiki](http://wiki.emacinc.com/wiki/Product_wiki)

### 3.1 Das U-Boot

EMAC utilizes Das U-Boot for its ARM based products. U-Boot is an open source/cross-architecture platform independent bootloader. It supports reading and writing to the flash, auto-booting, environmental variables, and TFTP. Das U-boot can be used to upload and run and/or reflash the OS or to run stand-alone programs without an OS. Products are shipped with a valid MAC address installed in flash in the protected U-boot environmental variable “ethaddr”. At boot time U-Boot automatically stores this address in a register within the MAC, which effectively provides it to any OS loaded after that point.

### 3.2 Embedded Linux

EMAC Open Embedded Linux (EMAC OE Linux) is an open source Linux distribution for use in embedded systems. The EMAC OE Linux Build is based on the Open Embedded ([www.openembedded.org](http://www.openembedded.org)) and Yocto ([www.yoctoproject.org](http://www.yoctoproject.org)) Linux build systems. Open Embedded is a superior Linux distribution for embedded systems. Custom Linux builds are also available on request.

The distribution contains everything a user could expect from a standard Linux kernel: powerful networking features, advanced file system support, security, debugging utilities, and countless other features.

The basic root file system includes:

- Busybox
- Hotplugging support
- APM utilities for power management
- Openssh SSH server
- lighttpd HTTP server
- JFFS2 or EXT4 file system with utilities

#### 3.2.1 Linux with Xenomai Real Time Extensions

Xenomai provides real time extensions to the kernel and can be used to schedule tasks with hard deadlines and  $\mu$ s latencies. The Xenomai build is an additional module that can be added to the standard Linux kernel and is available for a one-time inexpensive support/installation fee.

<http://www.xenomai.org/>



### **3.2.2 Linux Packages**

EMAC provides support for many Linux Packages such as: PHP, SQLite, Perl, SNMP, DHCP Server, etc. As with the Xenomai Package, other Packages can be added to the standard Linux file system and are available for a one-time inexpensive support/installation fee.

### **3.2.3 Linux Patches**

In addition to standard Embedded Linux support, EMAC has released a number of patches and device drivers from the open source community and from internal EMAC engineering into its standard distribution. Along with kernel patches, EMAC provides the binaries for the kernel and root file system.

## **3.3 Qt Creator**

Qt Creator is a cross-platform IDE (Integrated Development Environment) tailored to the needs of Qt developers but works well for Headless applications as well. EMAC provides sample code as projects that can be imported into Qt Creator. Qt Creator supports remote deployment and source debugging.

<http://wiki.qt.io/Main>

## **3.4 ARM EABI Cross Compiler**

The popular open source gcc compiler has a stable build for the ARM family. EMAC uses the 4.9.1 version of the ARM EABI compiler. The Embedded Linux kernel and EMAC Qt Creator projects use this compiler for building ARM stand alone, and OS specific binaries. The EMAC Qt Creator provides source level debugging over Ethernet or serial using gdbserver. The Linux binaries for the ARM EABI cross compiler are available online along with the SDK. See the EMAC wiki for further information.

## 4 Appendix A: Connector Pinouts

### 4.1 7" LCD Back-Light Connector (CN1)

Pin	Signal
1	Vin
2	GND

### 4.2 Serial Port COM B (CN2)

Pin	DB9 Connector: Description
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

### 4.3 10" Touch Screen Connector (CN3)

Pin	Signal
1	TOUCH_X-
2	TOUCH_Y-
3	TOUCH_X+
4	TOUCH_Y+
5	GND
6	GND

### 4.4 7" Touch Screen Connector (CN4)

Pin	Signal
1	TOUCH_X-
2	TOUCH_Y-
3	TOUCH_X+
4	TOUCH_Y+
5	GND
6	GND

**4.5 Vin Power Header (HDR1)**

Pin	Signal
1	Vin
2	GND_FRM
3	GND

**4.6 USB Host Port A & B Header (HDR2)**

Pin	Signal	Pin	Signal
1	5V0_VCC	2	5V0_VCC
3	USBA_D-	4	USBB_D-
5	USBA_D+	6	USBB_D+
7	GND	8	GND
9	GND_FRM	10	GND_FRM

**4.7 CAN 2.0 Port (HDR3)**

Pin	Signal
1	CANH
2	CANL
3	GND

**4.8 Serial Port COM A (HDR4)**

Pin	10-Pin Header: Description	DB9 Connector: Description
1	NC	NC
2	NC	RXD
3	RXD	TXD
4	RTS	NC
5	TXD	GND
6	CTS	NC
7	NC	RTS
8	NC	CTS
9	GND	NC
10	NC	N/A

**4.9 Serial Port COM C (HDR5)**

Pin	10-Pin Header: Description	DB9 Connector: Description
1	422/485 TX-	422/485 TX-
2	NC	232 RX, 422/485 TX+
3	232 RX, 422/485 TX+	232 TX, 422/485 RX+
4	RTS	422/485 RX-
5	232 TX, 422/485 RX+	GND
6	CTS	NC
7	422/485 RX-	RTS
8	NC	CTS
9	GND	NC
10	NC	N/A

**4.10 Serial Port COM D (HDR6)**

Pin	10-Pin Header: Description	DB9 Connector: Description
1	NC	NC
2	NC	RXD
3	RXD	TXD
4	RTS	NC
5	TXD	GND
6	CTS	NC
7	NC	RTS
8	NC	CTS
9	GND	NC
10	NC	N/A

**4.11 DSI Header (HDR7)**

Pin	Signal	Pin	Signal
1	GND	2	GND
3	DSI_D0-	4	DSI_D0+
5	GND	6	GND
7	DSI_CLK-	8	DSI_CLK+
9	GND	10	GND
11	DSI_D1-	12	DSI_D1+
13	GND	14	GND
15	3V3_VCC	16	3V3_VCC

**4.12 I/O Header (HDR8)**

Pin	Signal	Pin	Signal
1	5V_VCC	2	5V_VCC
3	GND	4	GND
5	3V3_VCC	6	3V3_VCC
7	S3	8	ON_OFF
9	S5	10	GPIO2/PWM2
11	PMIC_BATLOW#	12	GPIO3/PWM3
13	PMIC_I2C_SDA	14	GPIO5/TC2
15	PMIC_I2C_SCL	16	GPIO13
17	PMIC_CHARGE#	18	GPIO14
19	PMIC_CHARGE_DET#	20	GPIO16
21	PMIC_TEST#	22	GPIO17
23	PMIC_SLEEP#	24	GPIO18
25	I2C_B_SCL	26	GPIO19
27	I2C_B_SDA	28	GPIO20
29	SPI_B_MOSI	30	GPIO21
31	SPI_B_MISO	32	GND
33	SPI_B_CLK	34	SPR_MNO_An
35	SPI_B_CS0#	36	SPR_MNO_B
37	SPI_B_CS1#	38	SPR_MNO_Q
39	SPI_B_CS2#	40	SPR_MNO_Qn

**4.13 I/O Header (HDR9)**

Pin	Signal	Pin	Signal
1	5V_VCC	2	5V_VCC
3	GND	4	GND
5	3V3_VCC	6	3V3_VCC
7	CAN_B_TX	8	CAN_B_RX
9	GND	10	ADC_VREF
11	ADC_3	12	ADC_4
13	ADC_1	14	ADC_2
15	GND	16	GPIO12
17	I2S_B_RXD	18	GPIO11
19	I2S_B_TXFS	20	GPIO4/TC1
21	I2S_B_TXD	22	GPIO1/PWM1
23	I2S_B_TXC	24	GPIO0/PWM0
25	I2S_B_CLK	26	SPI_A_CS2#
27	HSIC_A_STRB	28	SPI_A_CS1#
29	HSIC_A_DATA	30	SPI_A_CS0#
31	HSIC_B_STRB	32	SPI_A_CLK
33	HSIC_B_DATA	34	SPI_A_MISO
35	I2C_A_SCL	36	SPI_A_MOSI
37	I2C_A_SDA	38	GND
39	GPIO15	40	SPDIF_OUT

**4.14 LVDS LCD Connector (HDR10)**

Pin	Signal	Pin	Signal
1	GND_FRM	2	GND_FRM
3	LVDS_3V3	4	LVDS_3V3
5	LVDS_A0-	6	LVDS_A0+
7	GND	8	GND
9	LVDS_A1-	10	LVDS_A1+
11	GND	12	GND
13	LVDS_A2-	14	LVDS_A2+
15	GND	16	GND
17	LVDS_CLK-	18	LVDS_CLK+
19	LVDS_5V0	20	LVDS_5V0
21	LVDS_ABL	22	GND
23	LVDS_SDA	24	LVDS_SCL
25	LVDS_3V3	26	LVDS_5V0
27	NC	28	NC
29	NC	30	NC
31	GND	32	GND
33	NC	34	NC

**4.15 Vin Power Barrel Jack (JK1)**

Pin	Signal
<b>1</b>	Vin
<b>2</b>	GND
<b>3</b>	NC

**4.16 Dual Port Ethernet Connector (JK2)**

Pin	Signal
<b>T1</b>	GND
<b>T2</b>	GBE2_MDI0+
<b>T3</b>	GBE2_MDI0-
<b>T4</b>	GBE2_MDI1+
<b>T5</b>	GBE2_MDI2+
<b>T6</b>	GBE2_MDI2-
<b>T7</b>	GBE2_MDI1-
<b>T8</b>	GBE2_MDI3+
<b>T9</b>	GBE2_MDI3-
<b>T10</b>	NC
<b>T11</b>	3V3_VCC
<b>T12</b>	ACT2#
<b>T13</b>	LINK2#1K/LINK2#100
<b>T14</b>	3V3_VCC
<b>B1</b>	GND
<b>B2</b>	GBE1_MDI0+
<b>B3</b>	GBE1_MDI0-
<b>B4</b>	GBE1_MDI1+
<b>B5</b>	GBE1_MDI2+
<b>B6</b>	GBE1_MDI2-
<b>B7</b>	GBE1_MDI1-
<b>B8</b>	GBE1_MDI3+
<b>B9</b>	GBE1_MDI3-
<b>B10</b>	NC
<b>B11</b>	3V3_VCC
<b>B12</b>	ACT1#
<b>B13</b>	LINK1#1K/LINK1#100
<b>B14</b>	3V3_VCC

**4.17 USB Host Port A & B (JK3)**

Pin	Signal
<b>T1</b>	5V0_VCC
<b>T2</b>	USBA_D-
<b>T3</b>	USBA_D+
<b>T4</b>	GND
<b>B1</b>	5V0_VCC
<b>B2</b>	USBB_D-
<b>B3</b>	USBB_D+
<b>B4</b>	GND
<b>9</b>	GND_FRM
<b>10</b>	GND_FRM
<b>11</b>	GND_FRM
<b>12</b>	GND_FRM
<b>13</b>	GND_FRM

**4.18 USB OTG Port (JK4)**

Pin	Signal
<b>1</b>	USB_OTG_VBUS
<b>2</b>	USB_OTG_D-
<b>3</b>	USB_OTG_D+
<b>4</b>	USB_OTG_ID
<b>5</b>	GND
<b>6</b>	GND_FRM
<b>7</b>	GND_FRM

**4.19 Audio Input Jack (JK5)**

Pin	Signal
<b>1</b>	GND
<b>2</b>	IN1_L
<b>3</b>	IN1_R

**4.20 Audio Output Jack (JK6)**

Pin	Signal
<b>1</b>	GND
<b>2</b>	HPL
<b>3</b>	HPR



**4.21 HDMI Connector (JK7)**

Pin	Signal
1	HDMI_D2+
2	GND
3	HDMI_D2-
4	HDMI_D1+
5	GND
6	HDMI_D1-
7	HDMI_D0+
8	GND
9	HDMI_D0-
10	HDMI_CLK+
11	GND
12	HDMI_CLK-
13	HDMI_CEC
14	NC
15	HDMI_SCL
16	HDMI_SDA
17	GND
18	5V0_VCC
19	HDMI_HPD
20	GND_FRM
21	GND_FRM
22	GND_FRM
23	GND_FRM

**4.22 MicroSD Card Socket (SOK2)**

Pin	Signal
1	SDIO_A_DAT2
2	SDIO_A_DAT3
3	SDIO_A_CMD
4	3V3_VCC
5	SDIO_A_CLK
6	GND
7	SDIO_A_DAT0
8	SDIO_A_DAT1
9	SDIO_A_CD
10	GND

**4.23 mSATA Socket (SOK3)**

Pin	Signal	Pin	Signal
1	NC	2	3V3_VCC
3	NC	4	GND
5	NC	6	NC
7	NC	8	NC
9	GND	10	NC
11	NC	12	NC
13	NC	14	NC
15	GND	16	NC
17	NC	18	GND
19	NC	20	NC
21	GND	22	NC
23	SATA_RXP	24	3V3_VCC
25	SATA_RXN	26	GND
27	GND	28	NC
29	GND	30	SOM_I2C_A_CLK
31	SATA_TXN	32	SOM_I2C_A_DAT
33	SATA_TXP	34	GND
35	GND	36	NC
37	GND	38	NC
39	3V3_VCC	40	GND
41	3V3_VCC	42	NC
43	GND	44	NC
45	NC	46	NC
47	NC	48	NC
49	NC	50	GND
51	NC	52	3V3_VCC

**4.24 Mini-PCIe Socket (SOK4)**

Pin	Signal	Pin	Signal
1	NC	2	3V3_VCC
3	NC	4	GND
5	NC	6	1V5_VCC
7	NC	8	UIM_PWR
9	GND	10	UIM_DATA
11	PCIEA_CLK-	12	UIM_CLK
13	PCIEA_CLK+	14	UIM_RESET
15	GND	16	UIM_VPP
17	NC	18	GND
19	NC	20	SOM_GPIO_10
21	GND	22	NC
23	PCIEA_RX+	24	3V3_VCC
25	PCIEA_RX-	26	GND
27	GND	28	1V5_VCC
29	GND	30	SOM_I2C_B_CLK
31	PCIEA_TX-	32	SOM_I2C_B_DAT
33	PCIEA_TX+	34	GND
35	GND	36	NC
37	GND	38	NC
39	3V3_VCC	40	GND
41	3V3_VCC	42	LED_WWAN#
43	GND	44	LED_WLAN#
45	NC	46	LED_WPAN#
47	NC	48	1V5_VCC
49	NC	50	GND
51	NC	52	3V3_VCC

**4.25 SIM Card Socket (SOK5)**

Pin	Signal
1	VCC
2	RST
3	CLK
5	GND
6	VPP
7	I/O

## 5 Appendix B: Jumper Settings

### 5.1 JB1 (RTC Battery Enable)

Jumper	Position	Setting
<b>Pins 1 &amp; 2*</b>	OFF	Disable Battery Backup
<b>Pins 2 &amp; 3</b>	ON	Enable Battery Backup

\*Default Setting

### 5.2 JB2 (Boot Mode 0 Selection)

Jumper	Position	Setting
<b>Pins 1 &amp; 2*</b>	A	Line Pulled HIGH
<b>Pins 2 &amp; 3</b>	B	Line Pulled LOW

\*Default Setting

### 5.3 JB3 (Boot Mode 1 Selection)

Jumper	Position	Setting
<b>Pins 1 &amp; 2*</b>	A	Line Pulled HIGH
<b>Pins 2 &amp; 3</b>	B	Line Pulled LOW

\*Default Setting

### 5.4 JB4 (Flash Write Protect)

Jumper	Position	Setting
<b>Pins 1 &amp; 2</b>	A (OFF)	Resident Flash Disable
<b>Pins 2 &amp; 3*</b>	B (ON)	Resident Flash Enable

\*Default Setting

### 5.5 JB5 (RS485/RS422 Select)

Jumper	Position	Setting
<b>Pins 1 &amp; 2</b>	485	Select RS485
<b>Pins 2 &amp; 3 *</b>	422	Select RS422

\*Default Setting

### 5.6 JB6 (RS232/RS4XX Select)

Jumper	Position	Setting
<b>Pins 1 &amp; 2*</b>	232	Select RS232
<b>Pins 2 &amp; 3</b>	4XX	Select RS422/RS485 via JB5

\*Default Setting

**6 Appendix C: Mechanical Drawing of Mounting Plate with Dimensions**

