

# ***PPC-E7***

## ***ARM9 Panel PC***

### **User Manual**

REV. 1.1

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# **1 PPC-E7 Product Summary**

## **1.1 Features**

- **Cirrus ARM9 EP9307 200Mhz Fanless Low Power Processor**
- **MaverickCrunch Hardware Floating Point Math Coprocessor**
- **Inexpensive Open-Frame Design**
- **10/100BaseT Ethernet with on-board PHY**
- **3 Serial ports with handshake**
- **3 USB 2.0 (Full Speed) Host ports**
- **Up to 128 MB of SDRAM**
- **Up to 64 MB of Flash**
- **128K Bytes of Serial Flash**
- **Battery backed Real Time Clock**
- **SD/MMC Flash Card Interface**
- **1 SPI port**
- **1 I<sup>2</sup>S Audio port with Line-In/Line-Out**
- **Timer/Counters and Pulse Width Modulation (PWM) ports**
- **4 Channel 12-bit Analog-to-Digital converter**
- **Graphic LCD Interface with 2D acceleration**
- **WVGA (800 x 480) Resolution with LED Backlight**
- **Soft LCD Brightness Control**
- **Touchscreen Interface**
- **JTAG for debug, including real-time trace**
- **PCD-E12 I/O Expansion Connector**
- **FREE Eclipse IDE with GCC & GDB development tools**
- **WinCE 6.0 BSP**

## 1.2 Standard PPC Specifications

- **CPU:** Embedded Cirrus EP9307 processor running at 200 MHz with Hardware Floating Point Math Engine
- **Flash:** 32 MB External NOR Intel P30 Flash & 128K of utility serial Flash.
- **RAM:** 32 MB 100 MHz SDRAM.
- **Video:** 2D Accelerated Video Interface
- **Touchscreen:** 12-Bit, 4 wire analog resistive Touchscreen
- **Flash Disk:** SPI serial SDHC/MMC interface.
- **System Reset:** Supervisor with external Reset Button provision.
- **RTC:** Battery backed Real Time Clock/Calendar.
- **Timers:** 2, general purpose 16-bit, 1 32-bit timer, & 2 16-bit PWMs.
- **Watchdog Timer:** Reset-on-Timeout
- **Analog I/O:** 4 channel, 12-bit Analog-to-Digital converter (ADC)
- **Expansion:** Provision for PCD-E12 I/O module

### LCD

- **Display Type:** 7" TFT Color LCD
- **Resolution:** 800 x 480 WVGA @ 256K Colors
- **Dot pitch:** 0.19mm x 0.19mm
- **Luminance:** 330 (cd/m<sup>2</sup>)
- **Viewing Angle:** 55°
- **Brightness:** Software controlled
- **Backlight:** White LED (33 LEDs)

### Touchscreen

- **Type:** 4 Wire Analog Resistive
- **Resolution:** Continuous
- **Light Transparency:** 79%
- **Controller:** Built-In
- **Driver:** WinCE, Linux
- **Durability:** Over one million touches

### Ethernet interface

- **Ethernet MAC:** Built-In
- **Ethernet PHY:** Intel/Cortina LXT927ALC with software PHY shutdown control
- **Ethernet Type:** 10/100 Base-T Ethernet
- **Ethernet Interface:** On-Board RJ-45 connector

## Solid-state Flash Disk

- **Resident:** up to 64 MB of on-board NOR flash
- **Removable:** up to 8 GB of SD, MMC, or SDHC Flash Disk
- **Utility:** 128 KB of serial on-board Flash

## Mechanical and environmental

- **Dimensions:** 7.55" L x 4.25" W x 1.5" H
- **Power supply voltage:** +12 to +26 Vdc
- **Power requirements:** ~200 mA @ 24 Vdc
- **Operating temperature:** 0 ~ 50° C (32 ~ 122° F)
- **Weight:** 1.06 lbs

## Standard Parts Inventory

- PPC-E7 Assembly with 7" Touchscreen
- Mounting Bracket attached to Printed Circuit Board
- Resident on-board flash disk loaded with Operating System
- Two Serial Port cables

## 2 PPC-E7 Product Details

### 2.1 Jumper Configuration & Connector Descriptions

The PPC-E7 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 Settings.

Table 1: Jumpers

Label	Function	Default
JP1	Battery ON / OFF	OFF
JP2	Boot Source Selection	NRML
JP3	Reserved	None
JP4	RS422 or RS485 Select	422
JP5	RS232 or RS422 / 485 Select	232

Table 2: Connectors

Label	Function
CN1	Touch Screen
CN2	COM0 Serial Port
CN3	Backlight
CN4	LCD
JK1	Ethernet RJ-45
JK2	USB Host – Port1 & Port2
JK3	Reserved
JK4	Audio Line In
JK5	Audio Line Out
JK6	Power Input
HDR1	Misc. I/O
HDR2	JTAG Debug
HDR3	COM1 Serial Port
HDR4	COM2 Serial Port
HDR5	Reserved
HDR6	USB Host – Port0 & Port2
J1	Alternate Power Input
ABJ1	PCD-E12 I/O Expansion

### 2.2 Power Connectors

The PPC-E7 provides two power connectors. (J1) is a Tyco/Amp (part# 640445) connector, three-pin latching type connector that mates with Tyco/Amp part# 640250-3. Using this power input provides for a more rugged/industrial locking connection. (JK6) is a standard 5.5mm barrel jack with an inner diameter of 2.1mm with a center V+ connection. This jack allows for easy connection to a wall type power supply. EMAC offers such a supply, its part number is PER-PWR-00032. The PPC-E7's power input uses a switching regulator and allows a voltage input range of +12 to +26 Vdc.

The pinout for the J1 power connector is as follows:

Pin	Signal
1	+Vin (12 to 26 Vdc)
2	Chassis GND
3	GND

Before powering up the PPC-E7, jumper JP1 should be moved to the ON position.

## 2.3 Ethernet

The PPC-E7 provides 10/100 Base-T full duplex Ethernet and uses a standard RJ-45 connector. It can be connected straight to a hub, or another computer via a crossover Ethernet cable. The Ethernet MAC is integrated into the EP9307 processor and the Cortina (formally Intel) LXT972ALC performs the PHY responsibilities. Activity and Link LEDs are integrated into the RJ45 connector.

## 2.4 Serial Ports

The PPC-E7 is equipped with three serial ports. COM0 terminates to DB9 male connector CN2. This is a RS232 compatible port with a full compliment of handshaking lines allowing it to communicate with modems and other devices requiring hardware flow control. Baud Rate, stop bits, etc. are all configured via software.

COM1 can be configured to RS232, RS422, and RS485 via jumpers JP4 and JP5. To select RS232 set JP5 to "232", JP4 can be ignored. To select RS422 set JP5 to "4XX" and JP4 to "422". To select RS485 set JP5 to "4XX" and JP4 to "485". When RS485 is selected the transmitter is automatically turned on when required, eliminating the need to manually control this line via RTS. Baud Rate, stop bits, etc. are all programmed via software. COM1 terminates to 10-pin header HDR3. A 10-pin header to male DB9 connector cable is provided for easy access to this port.

When using COM1 in the RS422/485 mode, a terminating resistor (~120 Ohm) is recommended on the two far ends of the network.

COM2 is a RS232 only port and terminates to 10-pin header HDR4. A 10-pin header to male DB9 connector cable is provided for easy access to this port. This port offers no handshake lines, just Tx and Rx. Baud Rate, stop bits, etc. are all programmed via software.

## 2.5 USB Host Ports

The PPC-E7 provides three, USB 2.0 full speed host ports. Port1 and Port2 can be accessed from the standard on-board Type A connector JK2. Port2, along with Port0, is also available on 10-pin header HDR6. Using the ports on HDR6 may make it easier for external access to these ports if required. EMAC provides an optional cable that connects to HDR6 and provides two host Jacks that can be mounted to a bulkhead.

All of the USB ports are equipped with 500mA re-settable Polyfuses. If a USB Device tries to draw more than 500mA from the port, the fuse will open until the device is unplugged or its current requirement is reduced. There is no software provision for shutting down power to the Ports or detecting when a port is drawing too much current.

**Note:** When sizing a power supply, make sure to allow for USB Device consumption. A Device can potentially draw 500mA, therefore three devices could use up to 1.5 amps!

## 2.6 Audio Port

The PPC-E7 provides Audio Line Out (JK5) and Line In (JK4) capability through miniature Jacks. The processor interfaces to the Audio CODEC through its I<sup>2</sup>S interface. Command control of the CODEC is done using the processor's SPI interface. The CODEC is the Cirrus CS4271, which is a high performance 24-bit Stereo CODEC offering superior sound quality.



Both the input and output are line level. You will probably not be able to drive an unamplified speaker although standard headphones will work. Likewise, an un-amplified microphone probably will not work as an input although the line out of a CD player will work.

## **2.7 LCD Brightness Control**

The PPC-E7 offers LCD brightness control that can change the brightness of the LCD via software. The LCD utilizes LED backlighting. The backlight typically requires 9.5 volts at about 260mA. 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 on or off via a processor port line. 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 SD/MMC Card Socket**

The PPC-E7 provides a high capacity SDHC/SD/MMC socket. This socket is hot-swappable and can accept a wide variety of Flash Cards. There is not a native SD card interface on the Cirrus EP9307 processor so the SPI bus is utilized. A green activity light (LED LD3) is located towards the left side of the socket. When the processor is accessing the Flash card this LED will be lit and the card should not be removed at this time. A card that is written to by the PPC-E7 can be read by another computer using an SD card reader.

## **2.9 Keyboard/Mouse**

The PPC-E7 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 [HDR1](#) and are labeled as sX+, sX-, sY- and sY+. Voltages applied to the inputs must be in the range of 0V to 3.3V with reference to ground (note that the + and – in the names have nothing to do with polarity when used as analog inputs and neither should they be misunderstood as implying differential input capability). Different operating systems may provide access to the analog inputs differently or even not at all. See the operating system documentation for details.

## **2.11 I/O Expansion**

The Processor used by the PPC-E7 provides a number of unused I/O lines. The PPC-E7 provides access to these lines on connector HDR1. This 50-pin dual row header contains GPIO lines, keypad interface, SPI bus, I<sup>2</sup>C bus, A/D line, interrupts and power pins.

## **2.12 Real-Time Clock**

The PPC-E7 is equipped with an external, battery-backed, Real-Time Clock (RTC). The EP9307 processor provides an internal RTC but there is no provision for battery backing it. The external RTC is based on the I<sup>2</sup>CPCA8565TS chip from NXP. The EP9307 does not have a true I<sup>2</sup>C interface but does offer a couple of lines that can act in that capacity. These are referred to as EECLK and EEDAT. Since there is no I<sup>2</sup>C circuitry, bit-banging these two lines is required.

In order to have the system hold time through a loss of power, set JP1 in the ON position. This will provide battery power to the RTC. If the board is in storage for long periods of time, place JP1 in the OFF position to extend battery life.

In addition, processor line EGPIO[9]/RTC\_~INTRQ is connected to the IRQ line of the RTC. Using this line the RTC can wake the processor up from sleep modes on the second, minute, hour, day of the week, or month. The RTC also provides 32.768 kHz clock required by the processor. Do not change this frequency output in software or the processor will not run and power will need to be turned off and the battery will have to be removed to restore the system.

### **2.13 Serial Flash**

Also equipped on some models is 128K Bytes of SPI based serial flash. To select this device SFRM1 (SPI Frame) and EGPIO[7]/EE\_SEL are logically ORed together. The SFRM1 signal is automatically generated so control comes from the EGPIO[7]/EE\_SEL line. SO, SI, and SCLK of the serial flash are connected to SSPRX1, SSPTX1, and SSCLK1 respectively. The serial flash is a handy place to store non-volatile configuration data. The PPC-E7 is shipped with the ethernet MAC address stored in the serial flash. See the software drivers for details on accessing this

### **2.14 PCD-E12 Expansion**

If additional I/O is required the PCD-E12 daughter card can be utilized. This card connects to the PPC-E7 via SPI bus on connector ABJ1. The PCD-E12 features CAN, A/D, D/A, Serial Ports, and GPIO. For more info on the PCD-E12 go to:

[www.emacinc.com/sbc\\_pc\\_compatible/pcm\\_53e52.htm](http://www.emacinc.com/sbc_pc_compatible/pcm_53e52.htm).

### **2.15 Status LEDs and Reset**

The PPC-E7 provides two status LEDs, LD1 (Green) and LD2 (Red). These can be controlled independently via software. LD1 and LD2 are located just to the left of the SD/MMC socket. When power is applied or the PPC is reset the boot loader will light LD1 and LD1 will stay lit until turned off by the user.

Also provided is a Reset Button (PB1). Pressing this button will cause the system to reset.

## 3 Software

### 3.1 Introduction

The PPC-E7 can be programmed in a variety of languages and utilize a variety of Operating Systems. There are a number of Free compilers, interpreters, and assemblers available allowing the PPC-E7 to be programmed in C, BASIC or Assembly languages. EMAC has Board Support Packages available for Linux and Windows CE. For more information on these particular Operating Systems, contact EMAC, Inc.

### 3.2 Loading Your Software

The resident flash on the PPC-E7 can be programmed via the JTAG or by the following methods:

#### 3.2.1 DOWNLOAD.EXE

Cirrus Logic provides a PC based utility, download.exe, which allows you to download code to on-board flash via COM0. Instructions for its use and the actual application source code are available on the Cirrus website. This requires the jumper at JP2 is set to SER. This application is normally used for programming the bootloader and setting the MAC address in the EEPROM.

#### 3.2.2 EBOOT.NB0

This is a bootloader that is included with the Windows CE BSP. If it is loaded in the on-board flash, it allows you to quickly download CE builds to the PPC's RAM or flash via Ethernet. This bootloader can be loaded to the board using the download.exe utility.

#### 3.2.3 RedBoot

Cirrus Logic provides a port of the eCos-2.0 RedBoot bootloader [9] for the EP9307. This bootloader, included with the Linux support option, is capable of booting both Linux and Windows CE, and can execute independently of user intervention through a scripted flash interface. This bootloader can be loaded to the board using the download.exe utility.

RedBoot™ is an acronym for "Red Hat Embedded Debug and Bootstrap", and is the standard embedded system debug/bootstrap environment from Red Hat, replacing the previous generation of debug firmware: CygMon and GDB stubs. It provides a complete bootstrap environment for a range of embedded operating systems, such as embedded Linux™ and eCos™, and includes facilities such as network downloading and debugging. It also provides a simple flash file system for boot images.

RedBoot provides a wide set of tools for downloading and executing programs on embedded target systems, as well as tools for manipulating the target system's environment. It can be used for both product development (debug support) and for end product deployment (flash and network booting).

Here are some highlights of RedBoot's capabilities:

- Boot scripting support
- Simple command line interface for RedBoot configuration and management, accessible via serial (terminal) or Ethernet (telnet)
- Integrated GDB stubs for connection to a host-based debugger via serial or ethernet. (Ethernet connectivity is limited to local network only)
- Attribute Configuration - user control of aspects such as system time and date (if applicable), default Flash image to boot from, default failsafe image, static IP address, etc.
- Configurable and extensible, specifically adapted to the target environment
- Network bootstrap support including setup and download, via BOOTP, DHCP and TFTP

- X/YModem support for image download via serial
- Power On Self Test

Although RedBoot is derived from eCos, it may be used as a generalized system debug and bootstrap control software for any embedded system and any operating system. For example, with appropriate additions, RedBoot could replace the commonly used BIOS of PC (and certain other) architectures. Red Hat is currently installing RedBoot on all embedded platforms as a standard practice, and RedBoot is now generally included as part of all Red Hat Embedded Linux and eCos ports. Users who specifically wish to use RedBoot with the eCos operating system should refer to the Getting Started with eCos document, which provides information about the portability and extendibility of RedBoot in an eCos environment.

### **3.3 Linux Tools**

#### **3.3.1 Eclipse**

EMAC provides sample code for the PPC-E7 as CDT projects within the free Eclipse IDE. Eclipse is a powerful open-source Java based IDE. It has plug-ins for development and debugging in Java and C, as well as several other languages.

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

EMAC offers a free download of Eclipse pre-integrated with the CDT plug-in and plug-ins for remote debugging, SVN, and other purposes. Eclipse requires the Java Runtime Environment to be installed on the development system. Currently EMAC only supports the use of Eclipse under the Linux environment for the PPC-E7. The Eclipse environment and JRE for Linux are available online along with user manuals.

[ftp://ftp.emacinc.com/PCSBK/Development\\_Kits/EMAC\\_Open\\_Tools/](ftp://ftp.emacinc.com/PCSBK/Development_Kits/EMAC_Open_Tools/)

#### **3.3.2 Eclipse CDT plug-in**

The Eclipse CDT plug-in provides a powerful graphical IDE for C development. This plug-in relies on GNU Make to build its files, so its projects are highly portable to other IDE's (or lack of them completely). It also offers a MI based debugger, for plugging into newer gdb's.

<http://www.eclipse.org/cdt/>

#### **3.3.3 ARM EABI Cross Compiler**

The popular open source gcc compiler has a stable build for the ARM family. The Embedded Linux kernel and EMAC Eclipse CDT projects use this compiler for building ARM stand alone, and OS specific binaries. The EMAC Eclipse SDK provides source level debugging over either the JTAG port or over Ethernet or serial using gdbserver. The Linux binaries for the ARM EABI cross compiler are available online along with the SDK for the PPC-E7 at the following location.

<ftp://ftp.emacinc.com/PPC/PPC-E7/Tools/>

#### **3.3.4 EMAC's LDC**

EMAC also offers a pre-configured Linux Development Computer (LDC) which allows the user to hit the ground running and not have to worry about setting up Linux Machine with the Eclipse development environment. This is an ideal solution for Windows users who are not familiar with Embedded Linux.

[http://www.emacinc.com/operating\\_systems/linux\\_ldc.htm](http://www.emacinc.com/operating_systems/linux_ldc.htm)

## **3.4 Linux Operating System**

### **3.4.1 Embedded Linux**

EMAC Open Embedded Linux is an open source Linux distribution for use in embedded systems. The current PPC-E7 build uses a Linux 2.6 kernel.

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 PPC-E7 will work out of the box with EMAC's Embedded Linux distribution, and EMAC provides the most up to date distribution via ftp. It comes preinstalled with a 2.6.20 or later Linux kernel.

### **3.4.2 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/>

### **3.4.3 Linux Modules**

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

### **3.4.4 Linux 2.6 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. Currently, the kernel patches and some useful scripts may be downloaded from EMAC's SoM ftp site at:

<ftp://ftp.emacinc.com/PPC/PPC-E7/Software/Linux-Kernel>

Along with kernel patches, EMAC provides the binaries for the kernel and root file system.

### **3.4.5 Open Embedded**

The Linux build for the PPC-E7 is based on the Open Embedded ([www.openembedded.org](http://www.openembedded.org)) Linux build system. The current kernel is Linux 2.6.20 or higher patched to support the PPC-E7. Open Embedded is a superior Linux distribution for embedded systems. Custom Linux builds are also available on request.

The basic root filesystem includes:

- Busybox 1.11.1 or higher
- Hotplugging support
- SSH server
- Telnet/FTP support running under inetd
- busybox-httpd HTTP server
- JFFS2 filesystem with utilities

### **3.5 Windows CE 6.0**

In addition to EMAC's Linux distribution, a Windows CE 6.0 BSP for the PPC-E7 is available. When using Windows CE 6.0, development and debugging can be done using Visual Studio.

**Note:** All of the links in this document are subject to change. Please contact EMAC for updated link locations if necessary.

## 4 Appendix A: *Connector Pinouts*

### 4.1 Ethernet 10/100 Base-T connector (JK1)

Pin	Signal
1	XMT+
2	XMT-
3	RCV+
4	N/C
5	N/C
6	RCV-
7	N/C
8	N/C

### 4.2 USB Host connector (JK2)

#### 4.2.1 Port1 (top)

Pin	Signal
1	USB_PWR (5Vdc)
2	USB_Data-
3	USB_Data+
4	GND

#### 4.2.2 Port2 (bottom)

Pin	Signal
1	USB_PWR (5Vdc)
2	USB_Data-
3	USB_Data+
4	GND

### 4.3 SD/MMC socket (SOK1)

Pin	Signal
1	Chip Select
2	MOSI
3	GND
4	VCC (3.3V)
5	SCLK
6	GND
7	MISO
8	NC
9	NC
10	Card Present
11	Write Protect Switch
12	GND

#### 4.4 Touch Screen (CN1) (Resistive Touch Screen)

Pin	Signal
1	Vertical Resistance +
2	Horizontal Resistance +
3	Vertical Resistance -
4	Horizontal Resistance -

#### 4.5 Backlight Power (CN3)

Pin	Signal
1	GND (PWM Control)
2	V+ (ON/OFF Control)

#### 4.6 LCD (CN4) (18 Bit, TFT, 800x480, PM070WT3 LCD)

Pin	Signal
1	CLK
2	HSYNC
3	VSYNC
4	GND
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	GND
12	G0
13	G1
14	G2
15	G3
16	G4
17	G5
18	GND
19	B0
20	B1
21	B2
22	B3
23	B4
24	B5
25	GND
26	DENB
27	VCC (3.3V)
28	VCC (3.3V)
29	R/L
30	U/D

#### 4.7 Alternate Power Connector (J1)

Pin	Signal
1	Vin (+12V to +26V)
2	Chassis GND
3	GND



#### 4.8 PCD-E12 Expansion connector (ABJ1)

Pin	Signal
1	Vin
2	Reset
3	GND
4	SPI_MOSI
5	IRQ
6	SPI_MISO
7	SPI_SEL
8	SPI_CLK
9	VCC (5V)
10	GND

**Note:** The PCD-E12 is a 5V powered board. As such, logic signals are transferred from 3V to 5V and 5V to 3V for communication between the PPC-E7 and the PCD-E12.

#### 4.9 COM0 RS-232 serial port (CN2)

Pin	DB9 Signal
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

#### 4.10 COM1 RS-232/422/485 serial port (HDR3)

Pin	HD3 Signal	DB9 Signal
1	Rx-(B) & 485 Tx-(B)	Rx-(B) & 485 Tx-(B)
2	Rx+(A) & 485 Tx+(A)	RxD
3	RxD	TxD
4	422 Tx+(A)	422 Tx-(B)
5	TxD	GND
6	NC	Rx+(A) & 485 Tx+(A)
7	422 Tx-(B)	422 Tx+(A)
8	NC	NC
9	GND	NC
10	NC	--

#### 4.11 COM2 RS-232 serial port (HDR4)

Pin	HD3 Signal	DB9 Signal
1	NC	NC
2	NC	RxD
3	RxD	TxD
4	NC	NC
5	TxD	GND
6	NC	NC
7	NC	NC
8	NC	NC
9	GND	NC
10	NC	--

#### 4.12 JTAG connector (HDR2)

Pin	Signal	Pin	Signal
1	VCC (3V)	2	GND
3	TRST	4	GND
5	TDI	6	NC
7	TMS	8	NC
9	TCK	10	NC
11	TDO	12	NC
13	NC	14	NC

#### 4.13 Misc. I/O (HDR1)

Pin	Signal	Pin	Signal
1	VCC (3V)	2	VCC (3V)
3	INT0	4	EGPIO[6]
5	INT1	6	EGPIO[10]
7	INT2	8	EGPIO[11]
9	PWMOUT	10	EGPIO[12]
11	sX+	12	EGPIO[13]
13	sX-	14	HGPIO[2]
15	sY-	16	HGPIO[3]
17	sY+	18	HGPIO[4]
19	EECLK	20	HGPIO[5]
21	EEDAT	22	HGPIO[6]
23	RTCK	24	HGPIO[7]
25	ROW_0	26	GGPIO[2]
27	ROW_1	28	FGPIO[7]
29	ROW_2	30	GND
31	ROW_3	32	GND
33	COL_0	34	SFRM1
35	COL_1	36	SCLK1
37	COL_2	38	SSPMOSI
39	COL_3	40	SSPMISO
41	COL_4	42	SPI_CS0
43	GND	44	SPI_CS1
45	GND	46	SPI_CS2
47	VCC (5V)	48	VCC (5V)
49	GND	50	GND

## 5 Appendix B: *Jumper Settings*

JP1	Battery	
	<b>Jumper</b>	<b>Setting</b>
	Pins 1 & 2	Battery connected
	Pins 2 & 3*	Battery not connected
	* Default setting	
JP2	Boot Source Selection	
	<b>Jumper</b>	<b>Setting</b>
	Pins 1 & 2	Serial Boot Loader Download
	Pins 2 & 3*	Normal Boot
	* Default setting	
JP4	Serial RS422 or RS485 Select	
	<b>Jumper</b>	<b>Setting</b>
	Pins 1 & 2	RS485
	Pins 2 & 3*	RS422
	* Default Setting	
JP5	Serial Port COM3 Configuration	
	<b>Jumper</b>	<b>Setting</b>
	Pins 1 & 2	RS422 or RS485
	Pins 2 & 3*	RS232
	* Default setting	

# **6 Appendix C: Mechanical drawing of Mounting Plate with dimensions**

