

**exeda**  
**Mobile Device**

**Reference Guide**

# **Table of Contents**

<b>1. Revision Notes .....</b>	<b>3</b>
<b>2. Overview.....</b>	<b>4</b>
2.1. HIGHLIGHTS .....	4
2.2. FEATURES.....	6
<b>3. Interface Connectors .....</b>	<b>8</b>
3.1. USB .....	8
3.2. HEADPHONE .....	8
3.3. MICRO SD .....	9
3.4. GPS ANTENNA .....	9
3.5. SIM .....	10
3.6. SERIAL.....	10
3.7. RESET .....	10
<b>4. ON/OFF Button and LED.....</b>	<b>11</b>
4.1. ON/OFF BUTTON.....	11
4.2. LED INDICATOR .....	11
<b>5. Managing the Battery.....</b>	<b>12</b>
5.1. CONNECTING THE BATTERY .....	12
5.2. CHARGING THE BATTERY .....	12
<b>6. Extension Board.....</b>	<b>13</b>
6.1. ETHERNET .....	13
6.2. SD SOCKET.....	13
6.3. JTAG .....	13
<b>7. Extension Board Development for Exeda.....</b>	<b>14</b>
7.1. INTRODUCTION .....	14
7.2. EXTENSION CONNECTOR .....	14
7.3. MECHANICAL DESIGN .....	18
7.4. DESIGN GUIDELINES.....	19

# 1. Revision Notes

<b>Date</b>	<b>Description</b>
01-Jun-2009	▪ First release
13-Sept-2009	▪ Added “Mechanical Design” section (7.3). ▪ Added “Design Guidelines” section (7.4).
10-May-2010	▪ Camera module support discontinued for new designs

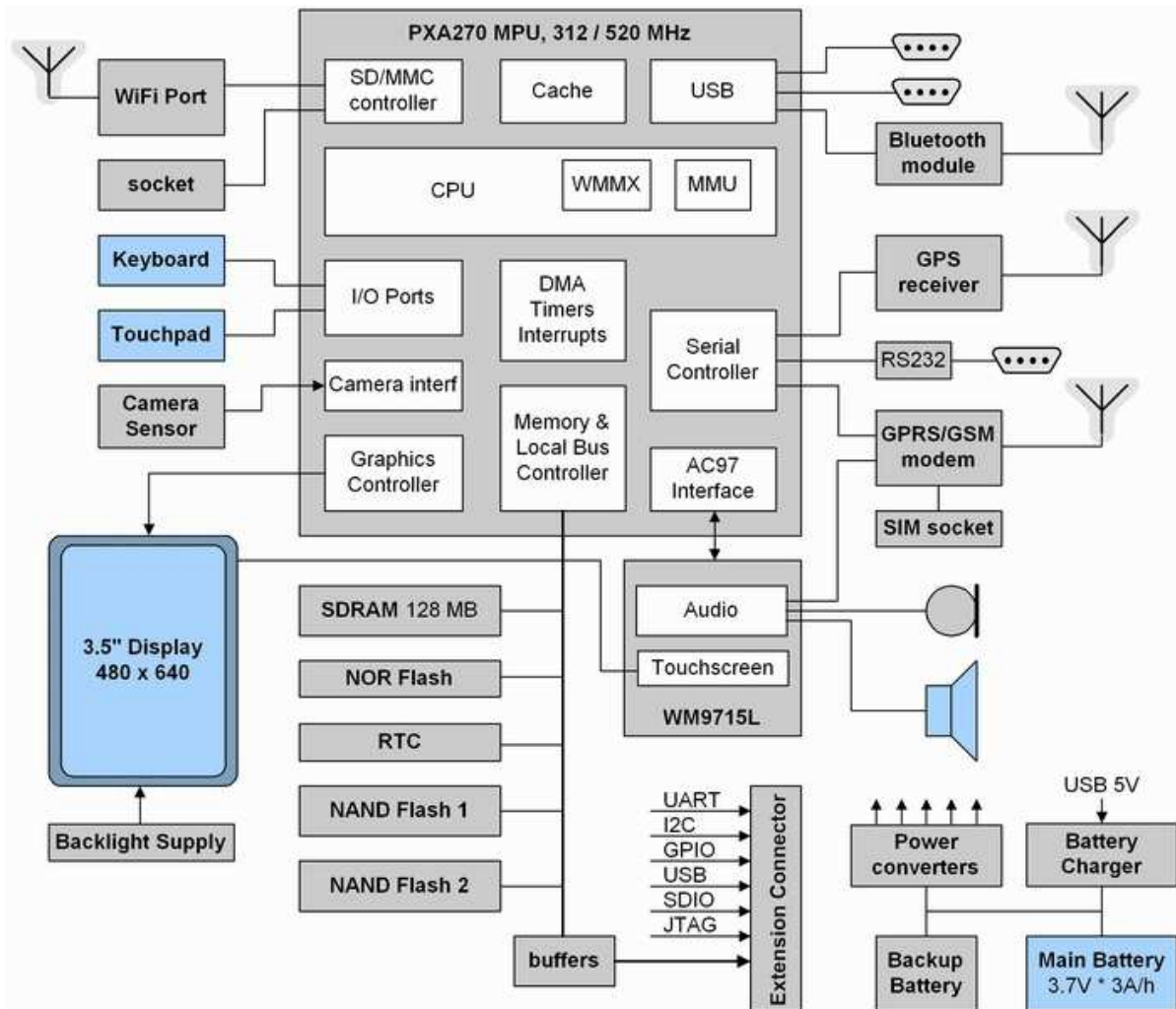
Please check for a newer revision of this manual in CompuLab's website - <http://www.compulab.co.il>, following [Products] >> [Developer] >> [exeda] links. Compare the revision notes of the updated manual from the website with those of the printed version you have.

## 2. Overview

### 2.1. Highlights

<ul style="list-style-type: none"><li>• <b>Smart-phone / PDA / Mobile Office / Navigator</b></li><li>• <b>Designed specifically for enterprise applications</b></li><li>• <b>Large 3.5" 640 x 480 VGA display</b></li><li>• <b>Productivity ergonomics</b><ul style="list-style-type: none"><li>▪ <b>Touchscreen</b></li><li>▪ <b>Touchpad mouse</b></li><li>▪ <b>Full QWERTY keyboard</b></li></ul></li><li>• <b>Marvell PXA270 CPU @ 520 MHz</b></li><li>• <b>128 MB SDRAM</b></li><li>• <b>Up to 24 GB Flash Disk</b></li><li>• <b>GSM cellular phone with speaker and microphone</b></li><li>• <b>GPRS modem</b></li><li>• <b>802.11b/g WiFi</b></li><li>• <b>Bluetooth</b></li><li>• <b>GPS receiver, Sirf-III chipset</b></li><li>• <b>Custom expansion slot</b></li><li>• <b>microSD socket</b></li><li>• <b>USB OTG and host ports, serial port</b></li><li>• <b>High capacity battery with charger</b></li><li>• <b>Size - 126 x 96 x 16 mm</b></li><li>• <b>Ethernet port &amp; SDIO socket (on extension board)</b></li></ul>	<p><b>Exeda (Extensible EDA)</b> is a full-featured smartphone intended for enterprise applications, i.e. for any organization's specified use. Possible applications include news reporting, warehouse management, courier tracking and technician assistance. The Exeda is small enough to be considered a mobile phone, yet it boasts many properties of larger handheld devices, to satisfy a variety of business application requirements. The Exeda provides flexibility and features not available in regular smartphones:</p> <ul style="list-style-type: none"><li>• Internal expansion slot enabling the addition of application-specific hardware, such as barcode or RFID readers, radio modems, varied measurement instruments, etc.</li><li>• A choice of operating systems: Windows Mobile, Windows CE, Linux or Google Android</li><li>• Customizable technical spec and form factor</li><li>• Shock-resistant protection</li><li>• Guarantee of long-term availability (5 years)</li></ul> <p>The Exeda's functional content is identical to that of the latest generation of smartphones, including the wireless, satellite and cellular connectivity found in today's devices. On the other hand, since it is designed to serve custom implementations, the Exeda offers the level of flexibility expected in the industrial (rather than the consumer) market.</p>
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## 2.2. Block Diagram



## 2.3. Features

"Option" (last) column specifies the configuration code required to have the particular feature. "+" means that the feature is always available.

### CPU, Memory and Busses

CPU	Marvell XScale PXA270, 312 / 520 MHz, WMMX 32 KB I-cache and 32 KB D-cache	C
RAM	128 MB, SDRAM, 100 MHz, 32-bit	D
NAND Flash Disk	Can be assembled starting with a single 512 Mbyte NAND, and up to two 8 GB NAND chips plus an 8 GB SD card, for a total of 24 GB flash storage.	N
Extension bus	Local bus - 16bit data, 20-bit address, variable rate up to 100 MHz. Also - UART, SDIO, USB, I2C, JTAG and two GPIO lines. Assembled in combination with an extended back-panel for customized cards.	Y
GPRS / GSM and cellular phone	Telit GC864 module. GSM 850, 900, DCS 1800 or PCS 1900 network communication services. GPRS Class 10, Voice, Circuit Switched Data transfer, Fax, Phone book and SMS. On-board SIM card socket.	K
WiFi Interface	802.11 b/g capabilities, Wi2Wi W2CBW003 controller module based on the Marvell's 88W8686 chipset. Up to 54 Mbps, 2.4 GHz band.	W
Bluetooth	Bluetooth V2.0+EDR system. CSR BlueCore4-ROM chipset, 2.4GHz band, up to 3Mbps. Integrated with WiFi in a common module.	W
GPS	Sirf-III chipset. Supports the NMEA data messages protocol. Connector for an external antenna.	H
Camera module	2Mpixel arranged as 1600x1200, YUV, preview, stills and video capture. Flash LED. Not supported for new designs.	V
USB	One USB OTG and one Host port, 12 Mbps, 24-endpoints, OHCI v1.1	+
Serial Port (UART)	16550 compatible, max 921 kbps, RS-232, including CTS/RTS	+
Audio codec	Wolfson WM9715L, AC97 interface. On-board microphone and speaker.	AT
Touchscreen ctrl.	A part of the Wolfson WM9715L chip. Supports a resistive touch panel.	AT
MicroSD socket	Supports Multimedia Card, Secure Digital and Secure Digital I/O communications protocols. Data-transfer rates up to 19.5 Mbps for MMC and 1-bit SD/SDIO, and up to 78 Mbps for 4-	+

	bit SD/SDIO transfers. Supports SDHC - high capacity flash cards.	
RTC	Real Time Clock	+
LCD Panel	TPO/Philips TD035STEE1 - 3.5" TFT, 640 x 480 VGA, 16-bit parallel RGB interface, transfective, LED backlight	+
Touchscreen	Resistive touchscreen, integral part of TD035STEE1 LCD	+
Battery & charger	Lithium polymer, 3.7V x 3000 mAh. Sufficient for 8-10 hours of continuous operation under normal conditions or 300 hours standby. Charger powered from a 5V source via the USB connector.	+
Keyboard	50 full QWERTY keyboard, customizable text. 10 auxiliary buttons.	+
Touchpad	Capacitive touchpad, full mouse emulation, including tapping and right/left buttons	+
Ethernet port	100 Mb Ethernet port, RJ-45 connector on extension card	Y
SDIO socket	SDIO socket on extension card, replacing internal microSD socket	Y

### Electrical, Mechanical and Environmental Specifications

Active consumption	All contents, excluding GPRS: 0.2 - 2 W. GPRS: 1-2 W
Sleep consumption	10 - 20 mW, depending on configuration and mode
Dimensions	126 x 96 x 16mm
Weight	250 gram
MTBF	> 100,000 hours
Operation temperature	Commercial: 0° to 70° C
Storage temperature	-40° to 85° C
Relative humidity	10% to 90% (operation) 05% to 95% (storage)
Shock resistance (with silicone jacket)	Passed drop test on concrete from a height of 6 feet

## 3. Interface Connectors

### 3.1. USB

#### USB OTG (primary)

The USB OTG interface is used to connect a USB host and peripheral devices to the Exeda.

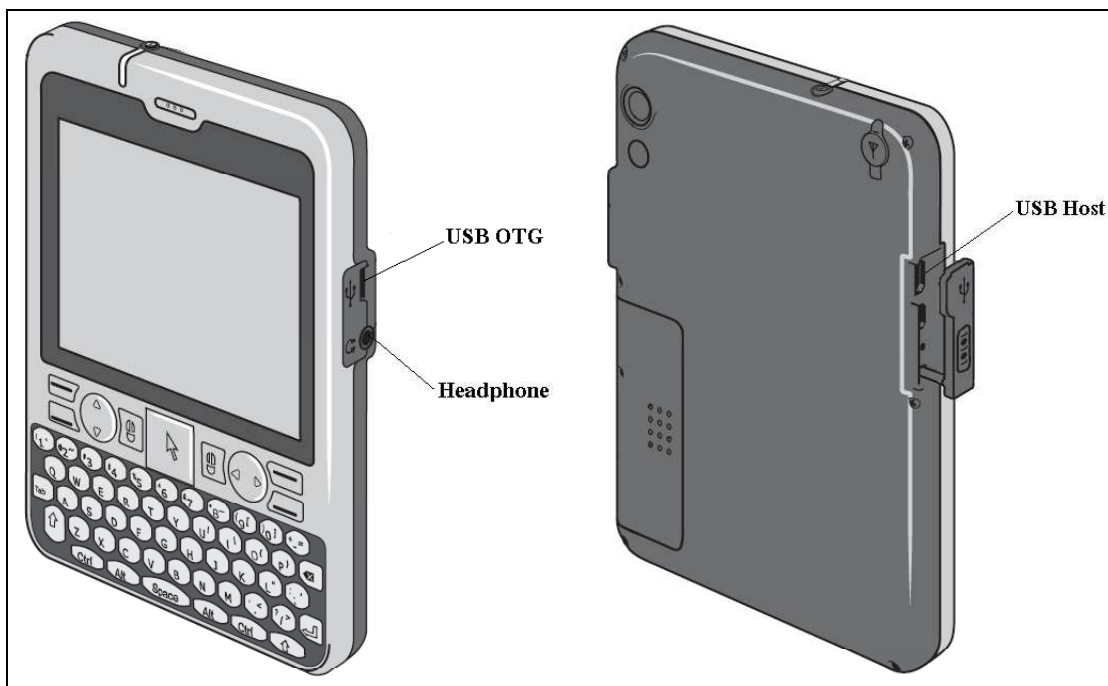
- USB OTG should be used for battery charging.
- USB OTG should be used for ActiveSync connection.
- USB OTG is also used for software package updates. Refer to OS development documentation for more details.

#### USB Host (secondary)

- USB Host should be used only for connecting USB peripheral devices to the Exeda.
- USB Host cannot be used for battery charging.

### 3.2. Headphone

The headphone connector allows connecting standard stereo headphones to the Exeda.





### 3.3. Micro SD

The micro SD slot allows expanding the Exeda's non-volatile memory with a standard micro SD memory card. The slot is located under the SIM/SD cover.

To install a micro SD memory card:

- Remove the SIM/SD cover.
- Open the micro SD slot and insert the card.
- Close and lock the micro SD slot.
- Assemble the SIM/SD cover.
- Reset the Exeda.

### 3.4. GPS antenna

An external GPS antenna needs to be connected to the GPS antenna connector.

An off-the-shelf, commercially available external antenna with an MCX type connector should be used. Recommended antenna gain is between 20dB and 50dB.



### 3.5. SIM

The SIM socket is located under the SIM/SD cover.  
To install a SIM card:

- Remove the SIM/SD cover.
- Open the SIM socket and insert the card.
- Close and lock the SIM socket.
- Assemble the SIM/SD cover.
- Reset the Exeda.

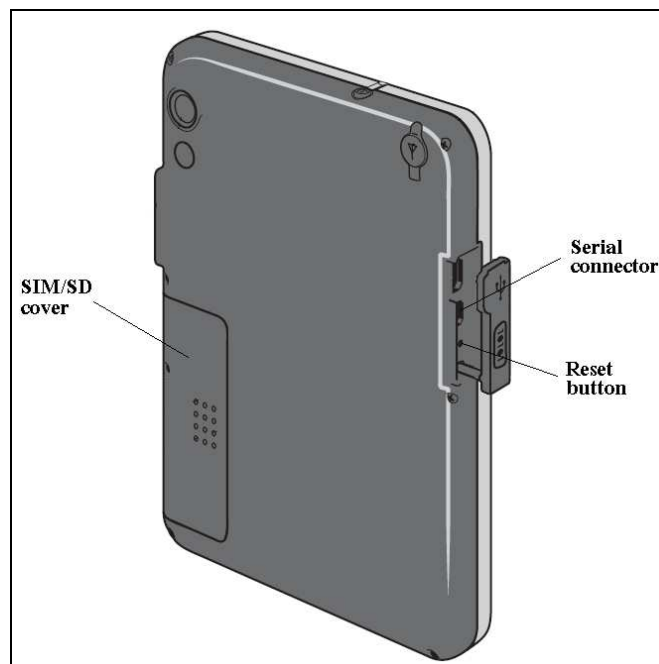
### 3.6. Serial

The RS232 serial port allows connecting the Exeda to a serial terminal and is intended for software development. The “DB9-F to Ultra Mini Plug” cable (P/N CABDB9UMP), available from Compulab, should be used. Refer to OS development documentation for more details.

NOTE: The signals are at RS232 levels.

### 3.7. Reset

A soft reset stops all running applications, but does not erase any programs or data. The recessed reset button is located under the I/O cover. Quickly press the reset button to perform a soft reset.



## 4. ON/OFF Button and LED

### 4.1. ON/OFF Button

The ON/OFF button controls Exeda operation modes.

- When in active mode, press the button to enter sleep mode.
- When in sleep mode, press the button to resume active mode.
- When in active mode, hold down the button for 5 seconds to perform hardware shutdown.
- The ON/OFF button is also used for software package updates. Refer to OS development documentation for more details.

### 4.2. LED indicator

The LED indicates Exeda operation mode and battery charging status.

- The LED blinks green when the device is in active mode.
- The LED is red during battery charging.

LED functionality may be altered. Refer to OS development documentation for more details.



## 5. Managing the Battery

The Exeda is shipped with a rechargeable battery disconnected and partially charged. Please connect the battery as described below.

It is recommended that you fully charge the Exeda battery before setting up the unit.

### 5.1. Connecting the Battery

The battery connector is located under the SIM/SD cover. To connect the battery:

- Remove the SIM/SD cover.
- Connect the battery connector.
- Assemble the SIM/SD cover.
- Press the ON/OFF button to turn on the device.

### 5.2. Charging the Battery

- The Exeda is charged via the USB OTG (primary) connector only.
- The indicator LED is red while the battery is being charged.
- The Exeda can be charged with either the Compulab-supplied AC adapter or over a USB connection to a personal computer.
- For best charging performance, use the Compulab-supplied AC adapter.

NOTE: When charging a completely depleted battery, the Exeda enters pre-charge mode. The device will trickle charge the battery for approximately 25 minutes and will proceed with normal boot sequence only after pre-charge is complete. If the charger is removed during pre-charge, the device will shutdown automatically.

## 6. Extension Board

NOTE: This section refers to devices featuring the optional extension board (“Y” option).

### 6.1. Ethernet

The 100 Mbit Ethernet port is available via a standard RJ45 connector and allows connecting the Exeda to Ethernet networks.

### 6.2. SD socket

The SD socket allows expanding the Exeda with full-size SD/SDIO cards.

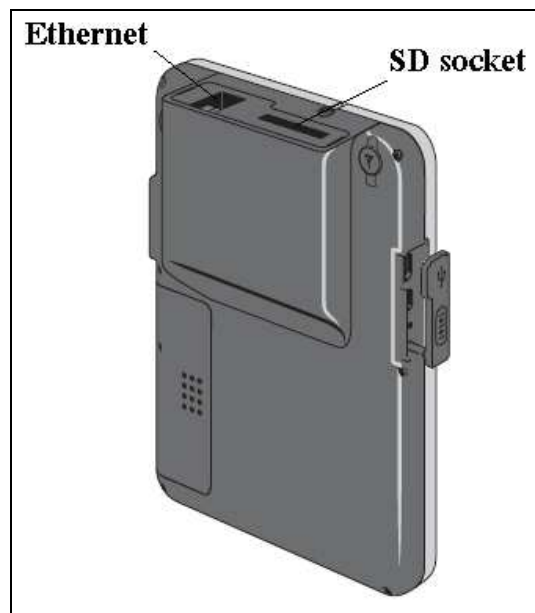
NOTE: The extension SD socket replaces the internal micro SD socket. The two sockets cannot be used at the same time.

### 6.3. JTAG

The JTAG interface is intended for software debug and development.

The JTAG interface is not accessible externally – in order to access the JTAG connector, the back panel must be removed.

The JTAG signals are available on a 14pin header compatible with the standard ARM14 JTAG pin-out.



## 7. Extension Board Development for Exeda

### 7.1. Introduction

The Exeda's extended back panel is designed to house an internal custom extension board allowing expansion of Exeda functionality with application-specific hardware. The following sections provide electrical and mechanical data and design guidelines necessary for custom extension board development.

### 7.2. Extension Connector

The Exeda extension connector outputs the most significant internal interfaces of the system.

#### PXA270 Local Bus

The Exeda local bus is derived from the PXA270 processor's memory interface bus. The local bus implements access to various types of devices sharing the same interface lines.

Please refer to the PXA270 Processors Design Guide, "Processor Block Diagram" for the block diagram of the Memory Controller configuration. Refer to the "Memory Address Map" for the processor memory map. Refer to "Normal Mode Memory Address Mapping" for alternate mode address mapping.

#### Local Bus Signals

Exeda Name	PXA270 Name	Volt. Level	Type	Description
LB_D[15-0]	MD[15-0]	3V	I/O	Local bus data, lower 16 bits
LB_A[9-0]	MA[9-0]	3V	Output	Local bus address, lower 10 bits
LB_A[20-15] / JTAG_***	MA[20-15]	3V	Output	Local bus address, upper 6 bits. Multiplexed with JTAG lines.
LB_WE#	nWE	3V	Output	Local bus Write Control
LB_OE#	nOE	3V	Output	Local bus Read Control
LB_PWE#	nPWE	3V	Output	Local bus VLIO Write Control
LB_RDY	RDY	3V	Input	Local bus I/O Ready input
LB_CS2#	nCS<2>	3V	Output	Chip select for static memory range 0x08000000-0x0C000000 This range is dedicated to extender board devices.

## USB

The PXA270 USB host port is routed to the extender board connector through the on-board USB hub.

<b>Exeda Name</b>	<b>Type</b>	<b>Description</b>
EXT_USB_DP	I/O	USB differential data plus.
EXT_USB_DM	I/O	USB differential data minus.

## UART

The PXA270 FF-UART signals are routed to the extender board connector.

NOTE: The signals are at 3V levels.

<b>Exeda Name</b>	<b>PXA270 Name</b>	<b>Type</b>	<b>Description</b>
FFUART_TXD	FF_TXD	Output	Serial data output
FFUART_RXD	FF_RXD	Input	Serial data input
FFUART_RTS	FF_nRTS	Output	Request to send signal
FFUART_CTS	FF_nCTS	Input	Clear to send signal

## MMC/SDIO

The PXA270 MMC/SDIO controller signals are routed to the extender board connector.

All signals are at 3V levels.

<b>Exeda Name</b>	<b>PXA270 Name</b>	<b>Type</b>	<b>Description</b>
MMCMD	MMCMD	I/O	MMC/SDIO command signal
MMCLK	MMCLK	Output	MMC/SDIO clock signal
MMDAT0	MMDAT0	I/O	MMC/SDIO data<0> signal
MMDAT1	MMDAT1	I/O	MMC/SDIO data<1> signal
MMDAT2	MMDAT2	I/O	MMC/SDIO data<2> signal
MMDAT3	MMDAT3	I/O	MMC/SDIO data<3> signal

## I2C

The PXA270 standard I2C bus is routed to the extender board connector. All signals are at 3V levels.

Exeda Name	PXA270 Name	Type	Description
SDA	SDA_GPIO_118	I/O	I2C serial data/address signal
SCL	SCL_GPIO_117	I/O	I2C serial clock line signal

## Power Signals

The DC\_VBAT line is connected directly to the Exeda's main battery positive terminal.

**IMPORTANT NOTE:** Maximal current drawn from the DC\_VBAT power line should not exceed 0.5A continuous current and 1A at peak level.

**IMPORTANT NOTE:** The DC\_VBAT power line is not intended to supply power to the Exeda from the extension board.

The GND line is connected to the general ground plane of the Exeda. Connect these signals to the extender board ground. All GND pins must be connected.

## Miscellaneous Signals

Exeda Name	PXA270 Name	Volt. Level	Type	Description
EXT_PWR_EN	GPIO_97	3V	I/O	PXA270 GPIO line. Should be used as a power enable line for the extender board's circuitry. Pulled down with 100k on the Exeda main-board.
EXT_GPIO0	GPIO_38	3V	I/O	PXA270 GPIO line. Can be used as a general-purpose signal.
EXT_GPIO1	GPIO_114	3V	I/O	PXA270 GPIO line. Pulled up with 100k on the Exeda main-board. Can be used as a general-purpose signal.
EXT_GPIO2	GPIO_41	3V	Output	PXA270 GPIO line. Pulled down with 100k on the Exeda main-board. Can be used as a general-purpose signal.
ADD15-20_EN	-	3V	Input	Address / JTAG mux control signal. Should be pulled down if ADD[15-20] are used. For JTAG, should be left unconnected.



**Extension Connector Pin-out:**

<b>Pin</b>	<b>Signal Name</b>	<b>Pin</b>	<b>Signal Name</b>
1	LB_D0	2	GND
3	LB_D1	4	MMCMD
5	LB_D2	6	MMCLK
7	GND	8	MMDAT3
9	LB_D3	10	MMDAT2
11	LB_D4	12	MMDAT1
13	LB_D5	14	GND
15	LB_D6	16	MMDAT0
17	LB_D7	18	reserved
19	GND	20	reserved
21	LB_D8	22	ADD15-20_EN
23	LB_D9	24	reserved
25	LB_D10	26	GND
27	LB_D11	28	DC_VBAT
29	LB_D12	30	DC_VBAT
31	GND	32	EXT_GPIO2
33	LB_D13	34	EXT_GPIO1
35	LB_D14	36	EXT_PWR_EN
37	LB_D15	38	GND
39	LB_PWE#	40	EXT_GPIO0
41	LB_CS2#	42	SDA
43	GND	44	SCL
45	LB_OE#	46	EXT_USB_DM
47	LB_WE#	48	EXT_USB_DP
49	LB_RDY	50	GND
51	LB_A0	52	FFUART_CTS
53	LB_A1	54	FFUART_RTS
55	GND	56	FFUART_RXD
57	LB_A2	58	FFUART_TXD
59	LB_A3	60	LB_A20/BUT_RST#
61	LB_A4	62	GND
63	LB_A5	64	LB_A19/JTAG_nTRST
65	LB_A6	66	LB_A18/JTAG_TDI
67	GND	68	LB_A17/JTAG_TDO
69	LB_A7	70	LB_A16/JTAG_TMS
71	LB_A8	72	LB_A15/JTAG_TCK
73	LB_A9	74	GND
75	LB_A10	76	LB_A14
77	LB_A11	78	LB_A13
79	GND	80	LB_A12

**Connector:**

Manufacturer	Mfg P/N	Mating Connector
AMP	5177985-3	1-5177986-3

### 7.3. Mechanical Design

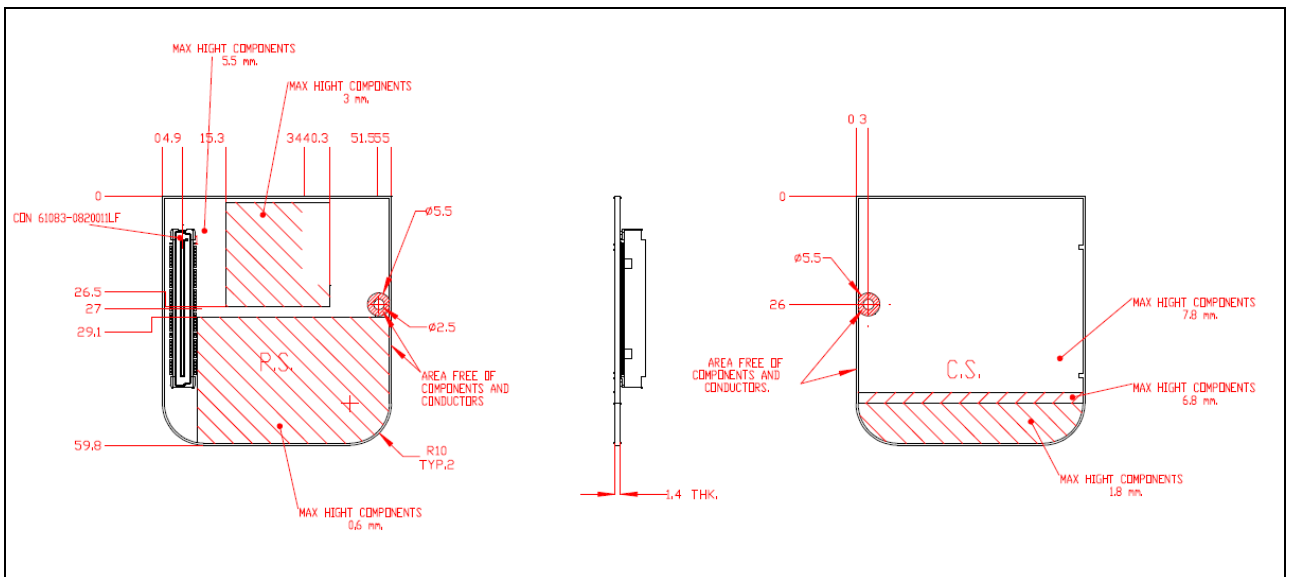
Development of a custom extension board requires mechanical design of the extension PCB and the connector panel.

#### Extension PCB

The figure below illustrates the form factor for a generic extension board. External PCB dimensions, connector location and maximal component height requirements must be met in order to design a custom extension board for use with the standard Exeda enclosure.

The DXF version of the figure below is provided with the “extension board design” package available at the “Developer Resources for Exeda” web-page.

**IMPORTANT NOTE:** It is highly recommended that the generic form factor DXF should be used as the basis of any custom extension PCB design.

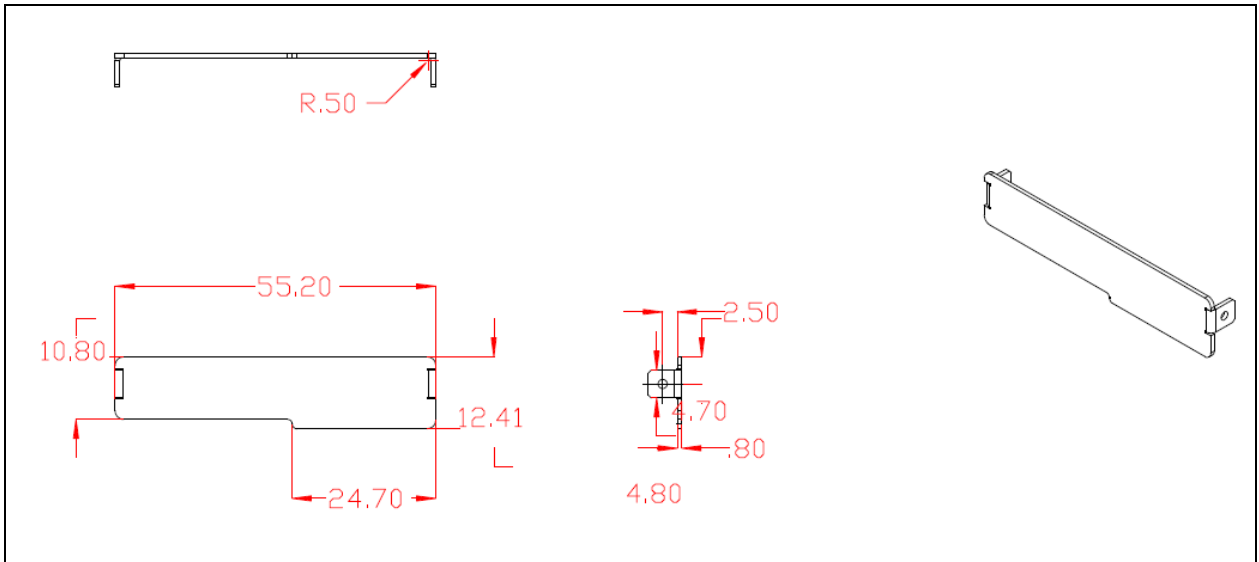


## Connector Panel

The figure below illustrates the form factor for a generic connector panel.

The Exeda back panel and the connector panel are designed to be fastened with two M1.6 DIN963A flat head 3.5mm screws.

The DXF version of the figure below is provided with the “extension board design” package available at the “Developer Resources for Exeda” web-page.



## 7.4. Design Guidelines

- The SP-EDB extension board should be used as reference. The SP-EDB design files are provided with the “extension board design” package available at the “Developer Resources for Exeda” web-page.
- USB signals should be routed as differential pairs.
- The EXT\_PWR\_EN signal should be used as a power enable line for the extension board circuitry.