

PROTEUS Development Kit

single board computer

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Revision history

<i>Issue no.</i>	<i>PCB</i>	<i>Date</i>	<i>Comments</i>
A		18 th December 2008	First full release of manual.
B		26 th May 2009	Minor updates.

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For contact details, see page [31](#).

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Handling your board safely

Anti-static handling

This board contains CMOS devices that could be damaged in the event of static electricity being discharged through them. At all times, please observe anti-static precautions when handling the board. This includes storing the board in appropriate anti-static packaging and wearing a wrist strap when handling the board.

Battery

The PROTEUS board contains a lithium non-rechargeable battery. Do not short circuit the battery or place on a metal surface where the battery terminals could be shorted. When disposing of the board or battery, take appropriate care. Do not incinerate, crush or otherwise damage the battery. The battery is inserted in a socket and can be replaced with a 3.0V Lithium CR1220 Coin Cell.

Packaging

Please ensure that, should a board need to be returned to Eurotech, it is adequately packed, preferably in the original packing material.

Electromagnetic compatibility (EMC)

The PROTEUS is classified as a component with regard to the European Community EMC regulations and it is the user's responsibility to ensure that systems using the board are compliant with the appropriate EMC standards.





RoHS compliance

The European RoHS Directive (Restriction on the use of certain Hazardous Substances – Directive 2002/95/EC) limits the amount of 6 specific substances within the composition of the product.

A full *RoHS Compliance Materials Declaration Form* for the PROTEUS is included as [Appendix B – RoHS Compliance](#), page 29. Further information regarding RoHS compliance is available on the Eurotech web site at www.eurotech.com.

Conventions

The following symbols are used in this guide:

Symbol	Explanation
	Note - information that requires your attention.
	Warning - proceeding with a course of action may damage your equipment or result in loss of data.

Introduction

The PROTEUS development kit offers a ready-to-run, rapid application development environment which saves valuable engineering time.

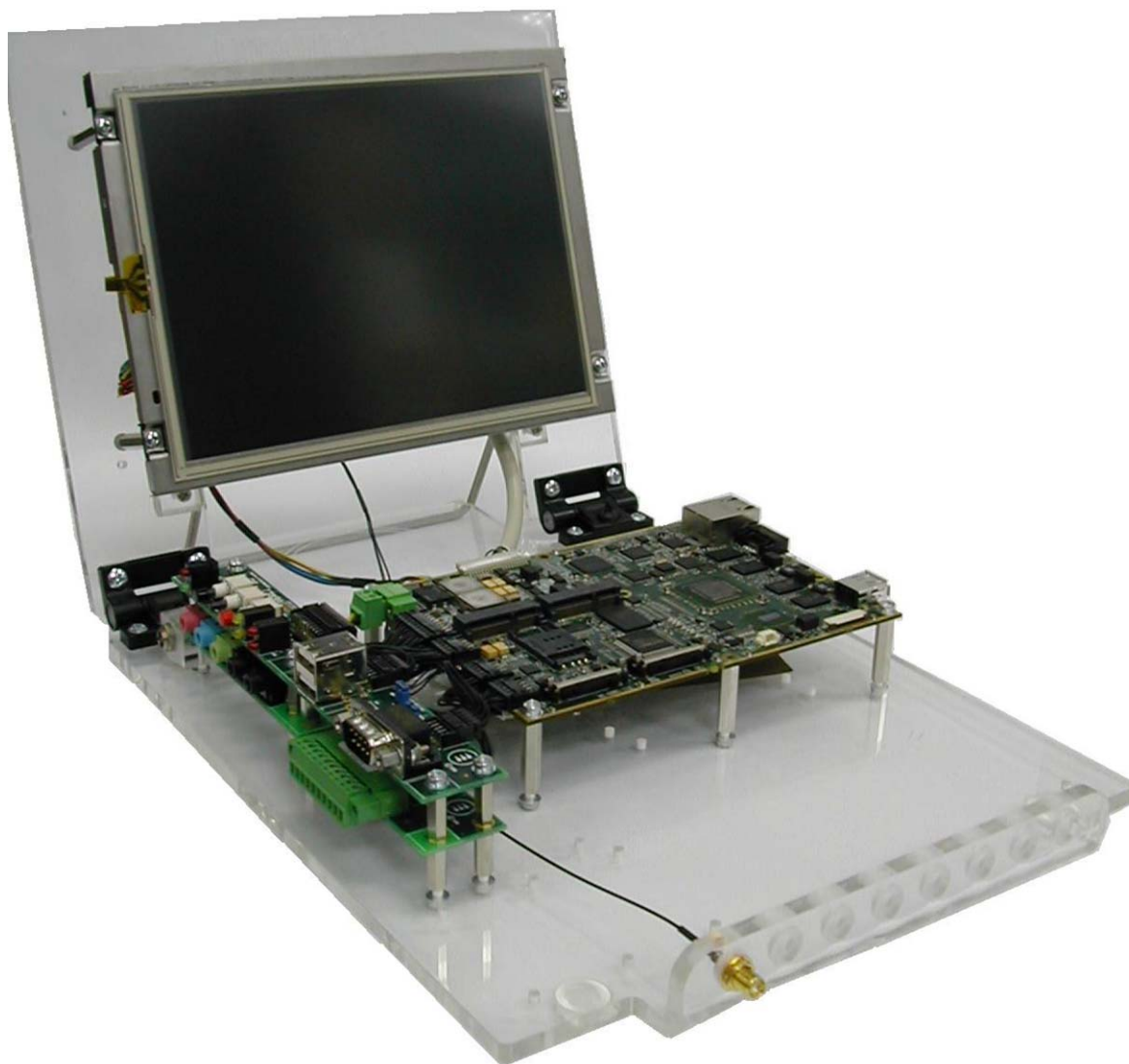
The kit contains the PROTEUS board, four I/O breakout boards, and an 8.4" FPD.

The PROTEUS development kit supports the following features:

- Two PCI Express Mini Card sockets.
- 10/100/1000 Ethernet.
- 24-bit LVDS (8.4" 800x600 FDP).
- Intel High Definition Audio.
- One Serial ATA port.
- Three USB 2.0 ports.
- Bootable PATA NAND Flash.
- GPS receiver (optional).
- Bluetooth OR nanoZigBee wireless module (optional).
- One RS232 serial port.
- Four wire resistive touchscreen.
- Eight GPIO's on screw terminals header.
- Atmel Trusted Platform Module Device.
- One MicroSD socket.

The PROTEUS board is available in the following variants:

- PROTEUS fitted with Z530 1.6GHz Intel ATOM Processor.
- PROTEUS fitted with Z510 1.1GHz Intel ATOM Processor.



PROTEUS development kit

PROTEUS Development Kit features

PROTEUS single board computer

Processor

- Intel ATOM processor:
 - Z530 processor: 1.6GHz TDP: 2W, or
 - Z510 processor: 1.1GHz TDP: 2W.

Chipset

- Intel US15W SCH TDP: 2.3W.

System memory

- DDR2 SDRAM: up to 1GB (400/533 MHz).

BIOS

- InsydeH2O.
- SPI Flash (proprietary).

TPM

- Atmel Trusted Platform Module device, TCG v1.2 compatible.

Expansion buses

- PCI Express Mini Card socket.
- MicroSD Card socket (4-bit).
- I²C/SMBus.

Flash

- 2GB or 4GB PATA solid state drive (on-board NAND Flash).

Ethernet

- One 10/100/1000 BaseT Ethernet port on RJ45 socket with LED indication.

Graphics

- 24 bit LVDS interface.

Touchscreen

- Touchscreen controller with support for 4, 5 and 8 wire resistive touchscreens.

SERIAL ATA support

- Single SATA port.

POWER

- +12V operation (Power brick supply input).
- On-board coin cell battery for RTC backup.

GPS receiver (Build Option)

- ITrax300 GPS receiver with full position/velocity/time functionality (20 tracking channels).

Wireless Module (Build Option)

- Bluetooth module (BlueGiga WT11).
- OR ZigBee module (Eurotech nanoZigBee).

PROTEUS-Breakout boards

SYSTEM

- On/off, reset and user buttons.
- Power, HDD access, user and PCIe access LEDs.
- SMBUS and power available on pin header.

Serial-USB

- One full RS-232 port (COM1) on DB9M.
- Two user accessible USB2.0 ports (USB0/2) on USB type A connectors.

Audio

- 2.0 sound on standard Mic/Line in/Line out 3.5mm jack connectors.

GPIO

- Eight GPIO's accessible on screw terminals connector with LED indication.

Display set

Flat panel display

- 8.4 inch LVDS 24bit FPD (800 x 600 pixels).

Inverter

- +5V operation FPD inverter.

Touchscreen

- 8.4 inch 4 wire resistive touchscreen.

Software specification

Operating system support

The PROTEUS is compatible with the following operating systems:

- Microsoft Windows XP and XP Embedded.
- Linux.

Drivers

All system components have drivers available for Windows XP and Linux.

Refer to the relevant Software manual for more information.

BIOS

The CPU module incorporates a custom system BIOS developed by Eurotech which is based on the InsydeH2O core from Insyde Software, www.insydesw.com/products/products-efi-h2o.htm.

The BIOS provides the standard functions as well as the following features:

- ACPI and APM support.
- SMBIOS.
- Boot support for NAND Flash, SATA, USB and Network/PXE.

The BIOS also provides operating system support for Windows XP Embedded and Linux. Utilities to update the BIOS are provided, as are utilities to update the LAN PXE boot ROM.

Hardware specification

What's in the Kit?

- Perspex base with the PROTEUS and the four breakout boards mounted on it.
- Perspex panel with the 8.4" flat panel display and backlight inverter mounted on it.
- All interconnecting cables.
- 12V output power brick supply.
- US, UK or European power cord.
- Touchscreen Stylus.
- Eurotech PROTEUS development kit DVD.
- 1GB USB memory stick.

What else do I need?

- A USB keyboard.
- A USB mouse.
- A development system with DVD-ROM drive.
- A Bluetooth antenna (If using the PROTEUS onboard Bluetooth or ZigBee module).
- A GPS antenna (If using the PROTEUS onboard GPS module).

PCI Express Mini Card sockets

Two PCI Express Mini Card sockets are available on the PROTEUS. Slot 1 is dedicated for wireless connectivity and slot 2 for general purpose.

The primary PCI Express root port is directly interfaced to the WAN PCIe Mini Card socket (slot 0) and the secondary port to the other PCIe Mini Card socket (slot 1). The WAN PCIe Mini Card socket (slot 0) supports a SIM card socket which is located underneath the mini card.

USB 2.0 and SMBus interfaces are also routed to the PCIe Mini Card sockets.

Micro SD socket

A MicroSD socket is provided on the PROTEUS. It is connected to the US15W SDIO/MMC 4-bit port 1.

The US15W SDIO/MMC controller supports MMC4.0 and SDIO1.1 specifications.

MMC 4.0 transfer rates can be up to 48MHz; SDIO 1.1 supports transfer rates of up to 24MHz. The US15W SCH SDIO/MMC controller supports only flash cards using byte addressing limiting the maximum memory density to 2GB; sector based addressing is not supported.

Graphics support

The PROTEUS development kit supports a single display interfaced to the main 24 bit LVDS port.

Audio support

The PROTEUS supports an Intel High Definition Audio interface. The HD Audio digital bus is decoded onboard, supporting 2.0 sound on standard 3.5mm stereo jacks.

See PROTEUS audio breakout board for more information.

USB support

There are three user USB 2.0 high-speed root ports (0/1/2) accessible on USB A connectors. USB1 is present on the PROTEUS and USB 0 and 2 are located on the PROTEUS-Serial-USB-Breakout board. USB 2.0 allows data transfers up to 480 MB/s.

Ethernet

One 10/100/1000 Ethernet RJ45 socket is available on the PROTEUS-Breakout board. The Intel 82574L controller is a fully-integrated Gigabit Ethernet Media Access Control (MAC) and Physical Layer (PHY) device which is designed for server and client configurations.

Link and Activity LED's are built in the RJ45 socket and indicate the link/speed state and transfer activity of the PROTEUS over the network.

Serial ATA support

The SATA interface is directly accessible on the PROTEUS board through a standard SATA connector. There is also an onboard SATA power connector.

That gives the user the possibility to connect an external hard drive to the PROTEUS board.

LED's are present on both the PROTEUS and the PROTEUS-System-Breakout boards and signal access to the SATA and IDE bus.

Flash

The PROTEUS supports a soldered down solid state FLASH disk with boot support. This is interfaced to the internal IDE bus and provides options for 2GB and 4GB NAND flash. The Intel Z-P140 PATA solid state disk is used for this function.

Serial port

Serial port 1 is a full RS-232 interface and is connected to the SUBD9 male connector on the PROTEUS-Serial-USB-Breakout board.

GPS receiver

An optional GPS module is used on the PROTEUS to provide complete GPS functionality including position, velocity and time (PVT).

The Fastrax iTrax300 GPS module is based on SiRF GSC3e/LP single chip. More information on iTrax300 can be found at: [iTrax300 \(www.fastrax.fi\)](http://www.fastrax.fi).

Power requirements

The PROTEUS development kit system operates from a single +12V (+/-5%) power input on 2.1mm DC jack. All other required power rails are generated on-board.

A suitable +12V power supply is provided in the kit (auto-ranging 90-264VAC input, 12VDC 5Amps output switching power supply).

The typical power consumption of the development kit system with no extra device/add-on card is less than 25W.

A removable CR1220 coin cell battery is provided on the bottom side of the PROTEUS for RTC backup.

Connectors, jumpers, LEDs and buttons

The PROTEUS development kit has four main breakouts and a power input connector:

Connector type	Details in section
Power input	Power input , see below
System	PROTEUS-System-Breakout , page 14
Serial USB	PROTEUS-Serial-USB-Breakout , page 18
Audio	PROTEUS-Audio-Breakout , page 22
GPIO	PROTEUS-GPIO-Breakout , page 25

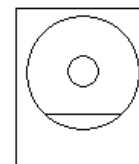
Power input

DC_IN

Socket: 2.1mm DC Jack socket.

Mating plug: 2.1mm DC Jack plug.

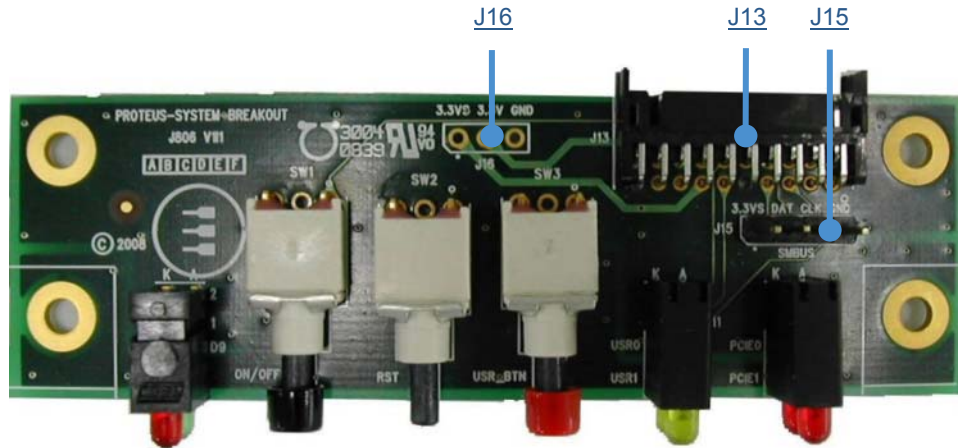
Pin	Signal name
Tip	Positive terminal (+12V)
Sleeve	Negative terminal (0V)



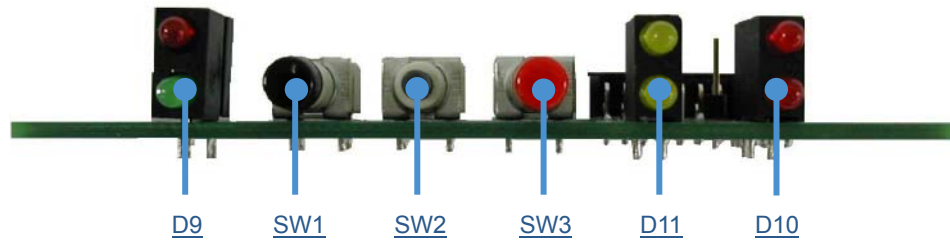
PROTEUS-System-Breakout

The following diagrams show the location of the connectors, LED's and buttons on the PROTEUS-System-Breakout.

Top view



Side view



The connectors on the following pages are shown in the same orientation as the picture above, unless otherwise stated.

Summary of connectors, Leds and buttons

The PROTEUS-System-Breakout has the following connectors:

Connector	Function	Details in section
J13	System header	J13 – System header , page 16
J15	SM Bus header	J15 – SM Bus header , page 16
J16	Power header	J16 – Power header (not fitted) , page 16

The PROTEUS-System-Breakout has the following LEDs:

LED	Function	Details in section
D9	HDD and power LEDs	D9 – HDD and power LEDs , page 17
D10	PCIE0 and PCIE1 LEDs	D10 – PCIE0 and PCIE1 LEDs , page 17
D11	USR0 and USR1 LEDs	D11 – USR0 and USR1 LEDs , page 17

The PROTEUS-System-Breakout has the following buttons:

Button	Function	Details in section
SW1	On/off	SW1– On/off , page 17
SW2	RST	SW2 – RST , page 17
SW3	USR_BTN	SW3 – USR_BTN , page 17

Connectors

There are three connectors on the PROTEUS-System-Breakout; the use of each one is explained below.

J13 – SYSTEM Header

Connector: HIROSE DF11-20DP-2DS(24).

Mating Housing: HIROSE DF11-20DS-2C or equivalent.

Crimps: HIROSE DF11-2428SCA or equivalent.

Pin	Signal name	Pin	Signal name
1	GND	2	RESET_BTN#
3	GND	4	POWER_BTN#
5	USR1 LED (cathode)	6	USR_BTN#
7	SMB DATA	8	SMB CLK
9	POWER LED (anode)	10	POWER LED (cathode)
11	USR0 LED (cathode)	12	USR0 LED (anode)
13	+3.3V (S0)	14	+3.3V (S3)
15	PCIE1 LED (anode)	16	PCIE1 LED (cathode)
17	PCIE0 LED (anode)	18	PCIE0 LED (cathode)
19	S/PATA LED (anode)	20	S/PATA LED (cathode)

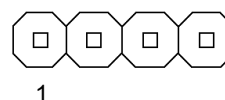
J15 – SM Bus Header

Connector: 4-way, 2.54mm (0.1") single row pin header.

Mating Housing: Harwin M20-1060400.

Crimps: Harwin M20-1180042.

Pin	Signal name
1	+3.3V (S0)
2	SMB_DATA
3	SMB_CLK
4	GND



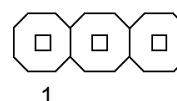
J16 – Power Header (not fitted)

Connector: 3-way, 2.54mm (0.1") single row pin header.

Mating Housing: Harwin M20-1060300.

Crimps: Harwin M20-1180042.

Pin	Signal name
1	+3.3V (S0)
2	+3.3V (S3)
3	GND



LEDS

There are three LEDS on the PROTEUS-System-Breakout; the use of each one is explained below.

D9 – HDD and Power LEDS

The top red LED HDD indicates the activity on both SATA and IDE buses.

The bottom green LED PWR indicates the PROTEUS power status (S0 state).

D10 – PCIE0 and PCIE1 LEDS

The top red LED indicates the activity on the WAN PCIe MiniCard socket 0.

The bottom red LED indicates the activity on the PCIe MiniCard socket 1.

D11 – USR0 and USR1 LEDS

The top yellow LED can be used for custom purpose. It is connected to GPIO P8 of the PROTEUS PCA9535 IO expander (I2C address 4Eh). It is active low.

The bottom yellow LED USR1 can be used for custom purpose. It is connected to GPIO9 (GP31) of the PROTEUS SCH3114 SIO. It is active low.

Buttons

There are three buttons on the PROTEUS-System-Breakout; the use of each one is explained below.

SW1 – ON/OFF

The on/off button is used to power up the PROTEUS board. (ACPI function).

SW2 – RST

The reset button is used to reset the PROTEUS board.

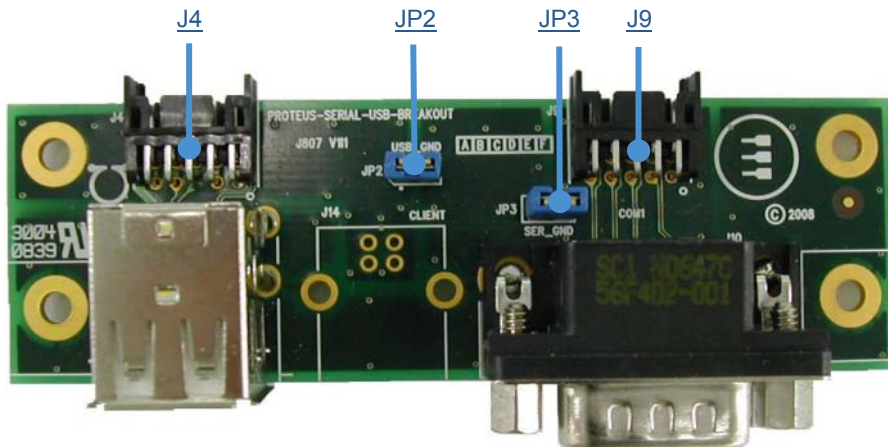
SW3 – USR_BTN

The user button can be used for custom purpose. It is connected to GPIO10 (GP46) of the PROTEUS SCH3114 SIO. It is active low.

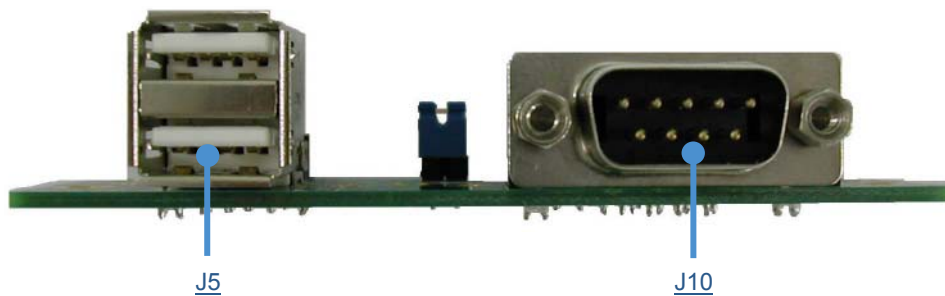
PROTEUS-Serial-USB-Breakout

The following diagrams show the location of the connectors and jumpers on the PROTEUS-Serial-USB-Breakout.

Top view



Side view



The connectors on the following pages are shown in the same orientation as the picture above, unless otherwise stated.

Summary of connectors and jumpers

The PROTEUS-Serial-USB-Breakout has the following connectors:

Connector	Function	Details in section
J4	USB0/USB2 header	J4 – USB0/USB2 header , page 19
J5	USB0/USB2	J5 – USB0/USB2 , page 20
J9	COM1 header	J9 – COM1 header , page 20
J10	COM1	J10 - COM1 , page 20

The PROTEUS-Serial-USB-Breakout has the following jumpers:

Jumper	Function	Details in section
JP2	USB_GND	JP2 – USB GND , page 21
JP3	SER_GND	JP3 – SER GND , page 21

Connectors

There are four connectors on the PROTEUS-Serial-USB-Breakout; the use of each one is explained below.

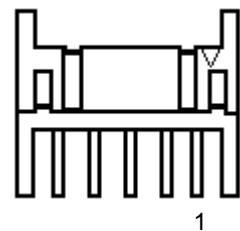
J4 – USB0/USB2 Header

Connector: HIROSE DF11-10DP-2DS(24).

Mating Housing: HIROSE DF11-10DS-2C or equivalent.

Crimps: HIROSE DF11-2428SCA or equivalent.

Pin	Signal name	Pin	Signal name
1	USB_DETECT	2	GND
3	GND	4	GND
5	USB_D0+	6	USB_D2+
7	USB_D0-	8	USB_D2-
9	+5V_USB0	10	+5V_USB2

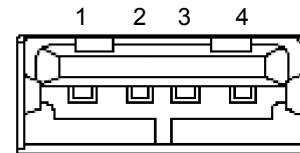


J5 – USB0/USB2

Connector: Dual stacked USB type A.

Mating plug: USB type A plug.

Pin (top)	Signal name	Pin (bottom)	Signal name
1	+5V_USB2	1	+5V_USB0
2	USB_D2-	2	USB_D0-
3	USB_D2+	3	USB_D0+
4	GND	4	GND



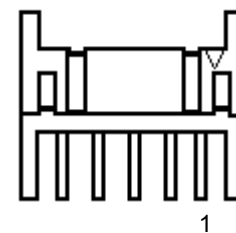
J9 – COM1 Header

Connector: HIROSE DF11-10DP-2DS(24).

Mating Housing: HIROSE DF11-10DS-2C or equivalent.

Crimps: HIROSE DF11-2428SCA or equivalent.

Pin	Signal name	Pin	Signal name
1	GND	2	GND
3	DTR	4	RI
5	TXD	6	CTS
7	RXD	8	RTS
9	DCD	10	DSR

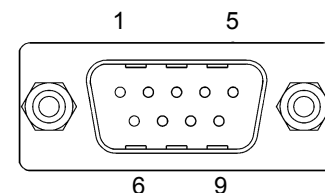


J10 – COM1

Connector: SUB D9 male.

Mating socket: SUB D9 female

Pin	Signal name
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI



Jumpers

There are two jumpers on the PROTEUS-Serial-USB-Breakout; their use is explained below.

JP2 – USB_GND

JP2 function table:

Position	Function
Open	USB connector shell (chassis) is isolated from to the system ground.
Closed (default)	USB connector shell (chassis) is connected to the system ground.

JP3 – SER_GND

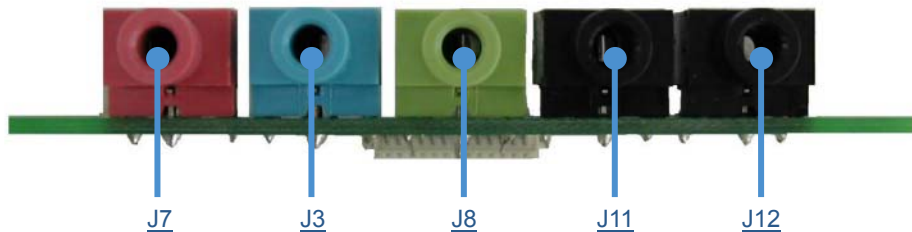
JP3 function table:

Position	Function
Open	COM1 connector shell (chassis) is isolated from to the system ground.
Closed (default)	COM1 connector shell (chassis) is connected to the system ground.

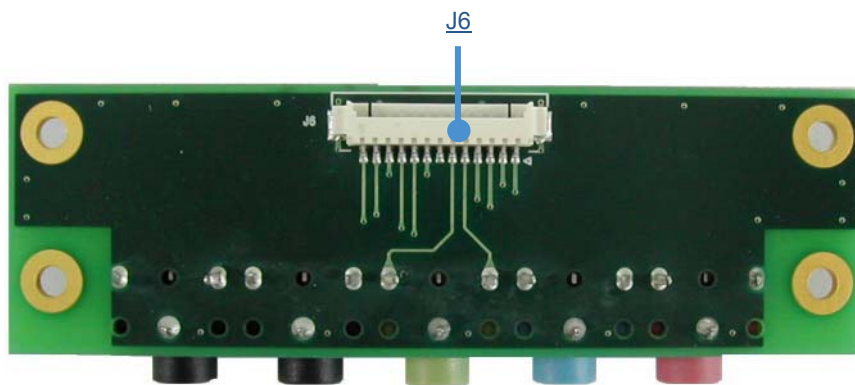
PROTEUS-Audio-Breakout

The following diagrams show the location of the connectors on the PROTEUS-Audio-Breakout.

Side view



Bottom view



The connectors on the following pages are shown in the same orientation as the picture above, unless otherwise stated.

Summary of connectors

The PROTEUS-Audio-Breakout has the following connectors:

Connector	Function	Details in section
J3	Line in	J3 – Line in, page 23
J6	Audio header	J6 – Audio header, page 23
J7	MIC	J7 – MIC, page 23
J8	Line out	J8 – Line out, page 24
J11	Speaker right	J11 – Speaker right, page 24
J12	Speaker left	J12 – Speaker left, page 24

Connectors

There are six connectors on the PROTEUS-Audio-Breakout; the use of each one is explained below.

J3 – LINE IN

Socket: Blue 3.5mm stereo jack.

Mating plug: 3.5mm stereo plug.

Pin	Signal name
Tip	Line in left
Ring	Line in right
Sleeve	Ground

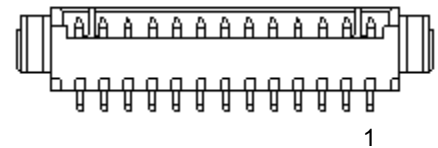
J6 – Audio Header

Connector: MOLEX 53261-137.

Housing: MOLEX Housing 51021-1300 or equivalent.

Crimps: MOLEX 50058-8000 or equivalent.

Pin	Signal name	Description
1	L OUT-	- speaker differential left
2	L OUT+	+ speaker differential left
3	R OUT-	- speaker differential right
4	R OUT+	+ speaker differential right
5	HP_OUT R	Headphone right
6	HP_OUT L	Headphone left
7	GND	Ground
8	GND	Ground
9	LINE-IN L	Line input left
10	LINE-IN R	Line input right
11	GND	Ground
12	MIC_BIAS	Microphone bias
13	MIC	Microphone



J7 – MIC

Socket: Pink 3.5mm stereo jack.

Mating plug: 3.5mm stereo plug.

Pin	Signal name
Tip	Microphone
Ring	Microphone Bias
Sleeve	Ground

J8 – LINE OUT

Socket: Green 3.5mm stereo jack.

Mating plug: 3.5mm stereo plug.

Pin	Signal name
Tip	Line out left
Ring	Line out right
Sleeve	Ground

J11 – SPEAKER RIGHT

Socket: Black 3.5mm mono jack.

Mating plug: 3.5mm mono plug.

Pin	Signal name
Tip	Speaker right +
Sleeve	Speaker right -

J12 – SPEAKER LEFT

Socket: Black 3.5mm mono jack.

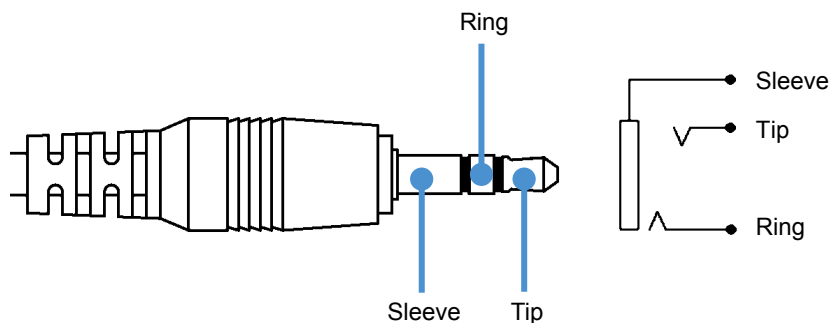
Mating plug: 3.5mm mono plug.

Pin	Signal name
Tip	Speaker left +
Sleeve	Speaker left -

MIC , LINE IN, LINE OUT – Audio connectors

3.5mm stereo audio jacks are used for audio connection. The audio codec operates in 2.0 mode, which allows for microphone, line in and line out operation.

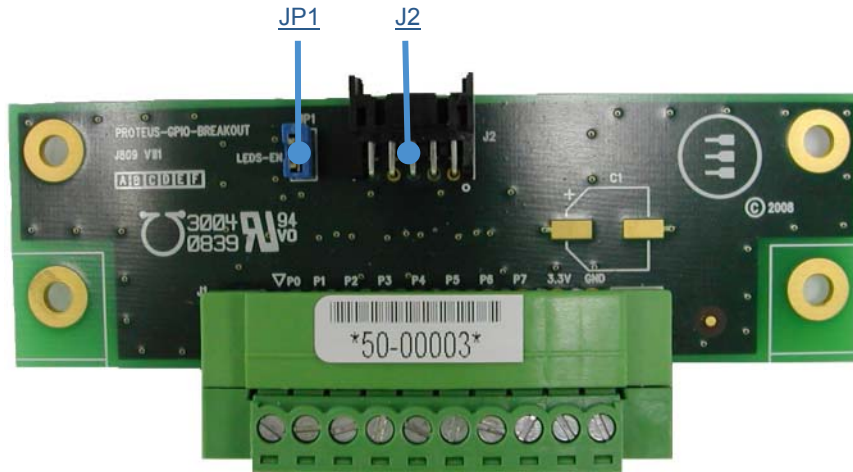
The audio connectors are illustrated in the following diagram:



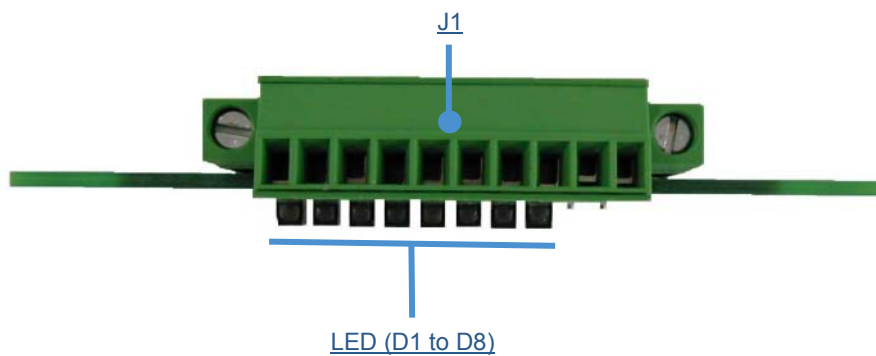
PROTEUS-GPIO-Breakout

The following diagrams show the location of the connectors, jumpers and LED's on the PROTEUS-GPIO-Breakout.

Top view



SIDE view



The connectors on the following pages are shown in the same orientation as the picture above, unless otherwise stated.

Summary of connectors

The PROTEUS-GPIO-Breakout has the following connectors:

Connector	Function	Details in section
J1	GPIOs	J1 – GPIOs, page 26
J2	GPIOs header	J2 –GPIOs header, page 27

The PROTEUS-GPIO-Breakout has the following jumpers.

Jumper	Function	Details in section
JP1	LEDS-EN	JP1 – LEDS-EN, page 27

The PROTEUS-GPIO-Breakout has the following LEDs.

LED	Function	Details in section
D1 to D8	GPIO state LEDs	D1 to D8 – GPIO state LEDs, page 27

Connectors

There are two connectors on the PROTEUS-GPIO-Breakout; the use of each one is explained below.

J1 – GPIOs

Connector: IMOPC 20.155MHF/10.

Mating Housing: FCI IMOPC 20.1550MF/10.

Pin	Signal name
1	GPIO_P0
2	GPIO_P1
3	GPIO_P2
4	GPIO_P3
5	GPIO_P4
6	GPIO_P5
7	GPIO_P6
8	GPIO_P7
9	+3V3 (S3)
10	GND

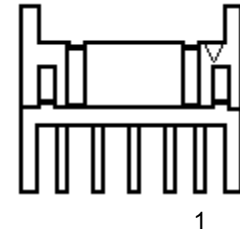
J2 – GPIOs Header

Connector: HIROSE DF11-10DP-2DS(24).

Mating Housing: HIROSE DF11-10DS-2C or equivalent.

Crimps: HIROSE DF11-2428SCA or equivalent.

Pin	Signal name	Pin	Signal name
1	GPIO_P7	2	GND
3	GPIO_P5	4	GPIO_P6
5	GPIO_P3	6	GPIO_P4
7	GPIO_P1	8	GPIO_P2
9	GPIO_P0	10	+3V3 (S3)

**Jumper**

There is one jumper on the PROTEUS-GPIO-Breakout; the use of it is explained below.

JP1 – LEDS-EN

JP1 function table:

Position	Function
Open	LEDs are disabled
Closed (default)	LEDs are enabled

LEDs

There are eight LEDs on the PROTEUS-GPIO-Breakout (located on the bottom side); the use of them is explained below.

D1 to D8 – GPIO STATE LEDs

Each diode shows the respective state of each GPIO. They are active high.

Appendix A – Reference information

Product information

Product notices, updated drivers, support material:

www.eurotech.com

PCI special interest group

PCI Bus specification and list of manufacturers:

www.pcisig.org

USB information

Universal Serial Bus (USB) specification and product information:

www.usb.org

Intel

Information about Pentium M and Celeron M processors:

developer.intel.com

PCI SIG

Information about PCI development:

www.pcisig.com

Digital Display Working Group

Information about developing a digital connectivity specification for high-performance PCs and digital displays:

www.ddwg.com

IEEE Specifications

Information about wired and wireless communication:

www.ieee.org

Trusted Computing Group

Information about TCG open specifications:

www.trustedcomputinggroup.org

Trusted Computing Platform Alliance

Information about Trusted Platform:

www.trustedcomputing.org

Appendix B – RoHS Compliance

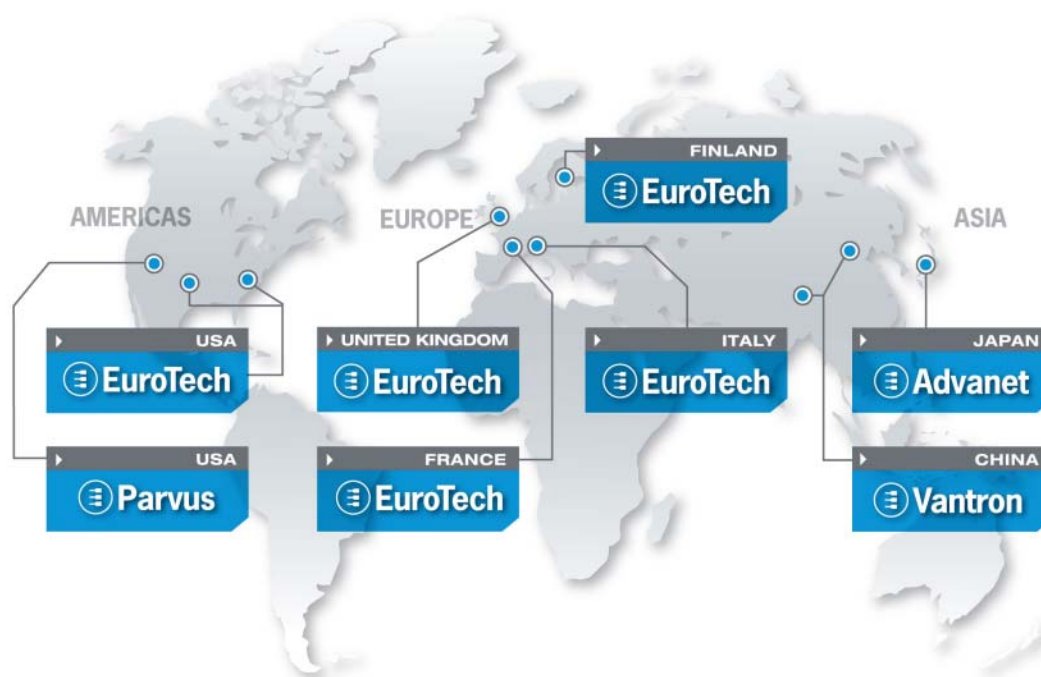


The Restriction of the use of certain Hazardous Substances (RoHS) Directive came into force on 1st July 2006. The PROTEUS board shall be designed using RoHS compliant components, and manufactured to comply with the RoHS Directive.

Eurotech has based its material content knowledge on a combination of information provided by third parties and auditing our suppliers and sub-contractor's operational activities and arrangements. This information is archived within the associated Technical Construction File. Eurotech has taken reasonable steps to provide representative and accurate information, though may not have conducted destructive testing or chemical analysis on incoming components and materials.

Additionally, packaging used by Eurotech for its products complies with the EU Directive 2004/12/EC in that the total concentration of the heavy metals cadmium, hexavalent chromium, lead and mercury do not exceed 100ppm.

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