

PROTEUS

SINGLE BOARD COMPUTER

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DIGITAL TECHNOLOGIES FOR A BETTER WORLD
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REVISION HISTORY

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A		1 st October 2008	First full release of Manual.
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C		2 nd April 2009	Minor updates and new branding.

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For contact details, see page [75](#).

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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 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. Use only standard CR1220 button batteries.

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 73. 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.
	Caution – proceeding with a course of action may damage your equipment or result in loss of data.

Introduction

The PROTEUS is a single board computer primarily based on the Type-1 COM Express extended format CPU module. It also has a secondary build option which allows it to operate in a standalone (base-board free) operating mode.

The module provides the capability to support a combination of wireless standards including:

- 802.11a/b/g/n.
- Bluetooth.
- ZigBee.
- WiMAX.
- Cellular options including (EV-DO, HSUPA, HSDPA, UMTS, EDGE, GPRS, GSM).
- Support for a SiRFStar III based GPS module.

It also provides limited IO functionality including USB, LVDS, SATA and a resistive touch screen interface.

For applications requiring functionality beyond that provided by the standalone module a COM Express connector supporting PCI Express, LPC, USB, HD Audio, Gigabit Ethernet and SMBus interfaces is provided to allow expansion onto a carrier board.

The board is able to run all x86 operating systems including Windows XP/ XP Embedded, Vista, CE and Linux.

The PROTEUS board can currently be purchased in the following variants:

- PROTEUS-COM-1.6-M1G-F2G fitted with 1.6GHz Intel Atom Z530 Processor, US15W SCH, 1GB DDRII, 2GB FLASH and COM Express connector.
- PROTEUS-COM-1.6-M1G-F2G-GPS fitted with 1.6GHz Intel Atom Z530 Processor, US15W SCH, 1GB DDRII, 2GB FLASH, GPS and COM Express connector.
- PROTEUS-1.6-M1G-F2G fitted with 1.6GHz Intel Atom Z530 Processor, US15W SCH, 1GB DDRII, 2GB FLASH and standalone configuration.
- PROTEUS-1.6-M1G-F2G-GPS fitted with 1.6GHz Intel Atom Z530 Processor, US15W SCH, 1GB DDRII, 2GB FLASH, GPS and standalone configuration.

For different board configuration contact our sales department.

Features of standalone variants

Processor

- Intel® Atom™ processor options:
Z530 Processor 1.6GHz TDP: 2.3W, or
Z510 Processor 1.1GHz TDP: 2.0W.

Chipset

- Intel US15W chipset TDP: 2.3W.

System memory

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

Supported OS

- Windows XP, XP Embedded, CE.
- Embedded Linux.

BIOS

- Insyde H20 BIOS - EFI and legacy support.
- SPI Flash (proprietary interface).

On board flash

- Up to 4GB parallel ATA Thunderbolt Flash on board (2GB default).

Graphics

- Ultra low power integrated 3D Graphics.
- Two single-channel LVDS 24-bit interfaced to two connectors.
- One backlight connector.



PROTEUS V111 only supports one single-channel LVDS interface on the LVDS A connector.

Audio

- HD Audio CODEC and 2W audio amplifier supporting stereo speakers, line in, microphone and headphone.

Touch screen

- 4, 5 and 8 wire resistive touch screen support.

USB support

- USB 2.0 supporting low/full/high speed modes.
- Two ports connected to PCI Express MiniCard sockets.
- Two user accessible ports (Pin header, one client configurable).
- One port to board edge Type A connector.
- One port to ZIF connector.

Ethernet

- Gigabit Ethernet port supporting 10/100/1000 BaseT.
- Output to board edge RJ-45 connector.

Serial ATA

- One SATA connector.
- One power connector for SATA drive.

Serial ports

- One port used to connect to on-board GPS receiver OR ZIF connector (build option).
- One port used to connect to on-board Bluetooth module OR nanoZigBee OR ZIF connector (build option).
- One port used to connect touch screen controller.
- One port used for general purpose RS232 TX/RX port.

PCI Express

- Two PCIe MiniCard sockets (one with SIM card slot).

SDIO/MMC

- One MicroSD socket.
- One 8 bit SD on ZIF connector.

GPIO

- Eight GPIO on header.

TPM

- Atmel Trusted Platform Module Device, TCG v1.2 compatible.
- SMBUS interface.

GPS receiver (build option)

- 20-channel GPS receiver SirFStar III chipset module.

Bluetooth OR ZigBee (build option)

- Bluetooth wireless communication provided by on-board Bluetooth module.
- ZigBee interface provided by an on-board NanoZigBee module.

Test support

- JTAG Interface (Intel XDP).

Power requirements

- On-board voltage regulators and power management.
- Power / Sleep LED.
- +12V (optional: +5V standby, +3.3V battery).
- +8.5V DC to +24V DC (+12V nominal).

Physical/other

- 155mm x 110mm x 17.8mm.
- Commercial temperature range: 0°C to +70°C.
- RoHS Directive: Lead-free.

Features of COM Express variants

Processor

- Intel® Atom™ processor options:
Z530 Processor 1.6GHz TDP: 2.3W, or
Z510 Processor 1.1GHz TDP: 2.0W.

Chipset

- Intel US15W chipset TDP: 2.3W.

System memory

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

Supported OS

- Windows XP, XP Embedded, CE.
- Embedded Linux.

BIOS

- Insyde H20 BIOS - EFI and legacy support.
- SPI Flash (proprietary interface).

On board flash

- Up to 4GB parallel ATA Thunderbolt Flash on board (2GB default).

Graphics

- Ultra low power integrated 3D Graphics.
- One single-channel LVDS 24-bit interface to COM Express.
- One single-channel LVDS 24-bit interface to connector.



PROTEUS V111 supports two single-channel LVDS interfaces on COM Express connector and none on the Interface connector.

Audio

- HD Audio interface on board-to-board connector.

Touch screen

- 4, 5 and 8 wire resistive touch screen support.

USB support

- USB 2.0 supporting low/full/high speed modes.
- Two ports connected to PCI Express MiniCard socket.
- Two user accessible ports (Pin header, one client configurable).
- Four ports on board-to-board connector.

Ethernet

- Gigabit Ethernet port supporting 10/100/1000 BaseT.
- Output to board-to-board connector.

Serial ATA

- Two SATA outputs to board-to-board connector.

Serial Ports

- One port used to connect to on-board GPS receiver (build option).
- One port used to connect to on-board Bluetooth module OR nanoZigBee (build option).
- One port used to connect touch screen controller.
- One port used for general purpose RS232 TX/RX port.

PCI Express

- Two PCIe MiniCard sockets connected to PCIE switch (one with a SIM card slot).
- Four PCIe to COM Express board-to-board connectors (One from chipset, three from PCIE switch).

SDIO/MMC

- One MicroSD socket.

GPIO

- Eight GPIO on COM express connector.
- Eight GPIO on header

TPM

- Atmel Trusted Platform Module Device, TCG v1.2 compatible.
- SMBUS interface.

COM Express board-to-board connector

- Four PCI Express, LPC, four USB host, SMBus/I2C, HD Audio, one LVDS video output, Gigabit Ethernet, two SATA, system and control, Power.

GPS receiver (build option)

- 20-channel GPS receiver SirFStar III chipset module.

Bluetooth OR ZigBee (build option)

- Bluetooth wireless communication provided by on-board Bluetooth module.
- ZigBee interface provided by an on-board NanoZigBee module.

Test support

- JTAG Interface (Intel XDP).

Power requirements

- On-board voltage regulators and power management.
- Power LED.
- +12V (optional: +5V standby, +3.3V battery).

Physical/other

- 155mm x 110mm x 16.8mm.
- Commercial temperature range: 0°C to +70°C.
- RoHS Directive: Lead-free.
- COM Express connector Type 1, extended module mechanical footprint.

Comparison of PROTEUS variants

Features		COM Express	Standalone
Processor	Intel® Atom™ processor options: Z530 processor 1.6GHz TDP: 2.3W. Z510 processor 1.1GHz TDP: 2.0W.	✓	✓
Chipset	Intel US15W chipset: US15W TDP: 2.3W.	✓	✓
Supported OS	Windows XP, XP Embedded, CE, Embedded Linux.	✓	✓
	DDR2 SDRAM: up to 1GB (400/533MHz).	✓	✓
BIOS	Insyde H20 BIOS - EFI and legacy support. SPI Flash (proprietary interface).	✓	✓
Flash	Up to 4GB parallel ATA Thunderbolt Flash on board.	2GB	2GB
Graphics	Ultra low power integrated 3D graphics.	✓	✓
	One single-channel LVDS 24-bit interface to COM Express. One single-channel LVDS 24-bit interface to connector * (Note: for PROTEUS V111 see below)	✓	✗
	Two single-channel LVDS 24-bit interface to two connectors. One backlight connector. * (Note: for PROTEUS V111 see below)	✗	✓
	<i>PROTEUS V111</i> Two single-channel LVDS 24-bit interfaces to COM Express.	✓	✗
	<i>PROTEUS V111</i> One single-channel LVDS 24-bit interface. One backlight connector.	✗	✓
Audio	HD Audio interface on board-to-board connector.	✓	✗
	HD Audio CODEC and 2W audio amplifier supporting two speakers, line in, mic in and headphone.	✗	✓
Touch Screen	4, 5 and 8 wire resistive touch screen support.	✓	✓
USB Support	USB 2.0 supporting low/full/high speed modes. Two ports connected to PCI Express MiniCard socket. Two user accessible ports (Pin header, one client configurable).	✓	✓
	Four ports on board-to-board connector.	✓	✗
	One port to board edge Type A connector. One port to ZIF connector.	✗	✓

Features		COM Express	Standalone
Ethernet	Gigabit Ethernet port supporting 10/100/1000 BaseT.	✓	✓
	Output to board-to-board connector.	✓	✗
	Output to board edge RJ-45 connector.	✗	✓
Serial ATA	Supports two SATA output to board-to-board connector.	✓	✗
	Output to one SATA connector.	✗	✓
	One power connector for SATA drive.		
Serial ports	One port used to connect to on-board GPS receiver or ZIF connector	Optional	Optional
	One port used to connect to on-board Bluetooth module OR nanoZigBee OR ZIF connector (build options).	Optional	Optional
	One port used to connect touch screen controller.	✓	✓
	One port used for general purpose RS232 TX/RX port.	✓	✓
PCI Express	Two x1 PCIe MiniCard sockets (from PCIE switch).		
	Four x1 PCIe to COM Express board-to-board connector.(One from chipset, three from PCIE switch)	✓	✗
	x1 PCIe MiniCard socket (from PCIE switch).	✗	✓
	x1 PCIe MiniCard socket (from Poulsbo).		
SDIO/MMC	One MicroSD socket.	✓	✓
	One 8 bit SD on ZIF connector.	✗	✓
GPIO	Eight GPIO on COM express connector.	✓	✗
	Eight GPIO on header.	✓	✓
TPM	Atmel Trusted Platform Module Device, TCG v1.2 compatible SMBUS interface.	✓	✓
COM Express board-to-board connector	Four PCI Express, LPC, four USB host, SMBus/I2C, HD Audio, one LVDS video outputs, Gigabit Ethernet, two SATA, system and control, Power.	✓	✗
GPS Receiver	20-channel GPS receiver SirFStar III chipset module.	Optional	Optional
Bluetooth OR ZigBee (build option)	Bluetooth wireless communication provided by on-board WT11 Bluetooth module.	Optional	Optional
	ZigBee interface provided by an on-board NanoZigBee module.	Optional	Optional

Features		COM Express	Standalone
Test Support	JTAG Interface (Intel XDP).	✓	✓
	On-board voltage regulators and power management. Power / Sleep LED.	✓	✓
	+12V (optional: +5V standby, +3.3V Battery).	✓	✗
	+8.5V DC to +24V DC (+12V nominal).	✗	✓
Physical/other	155mm x 110mm.		
	Commercial: 0°C to +70°C	✓	✓
	RoHS Directive: Lead-free		
	COM Express Extended module mechanical footprint.		

Power consumption

HW / SW	Board power – VIN rail input voltage [V]	Board power – VIN rail current [mA]	Total board power [W]	Note
Board only / XPe, idle	19.99	437.50	8.75	
Board only / XPe, BurnIn test + video	20.05	487.50	9.77	Board only
Board, 8.4" display with backlight, keyboard, mouse, USB hub, Ethernet / XPe, BurnIn + video	20.00	937.50	18.75	Standard, no HDD
Board, 8.4" display with backlight, keyboard, mouse, USB hub, Ethernet, active hard disk drive / XPe, BurnIn + video	19.84	1075.00	21.33	Standard, with HDD
Board, 8.4" display with backlight, Ethernet, active hard disk drive, 3x full loaded USB (3x500mA), Wifi card, GSM card / XPe, BurnIn + video	19.95	1487.50	29.68	Heavy loaded
S3 – sleep, board only / sleep mode (suspend mode)	10.00	87.50	0.88	Board in sleep

Support products

The PROTEUS is supported by the following optional products:

- PROTEUS development kit. See below.
- PROTEUS ICE (Industrial Compact Enclosure). See below.
- Breakout boards. See the next page.
- LVDS to VGA adapter.

PROTEUS development kit:



PROTEUS ICE (Industrial Compact Enclosure):



Breakout boards

Four breakout boards are available:

- **System**
Buttons (on/off, Reset, user button) and LEDs (power, HDD activity, PCIE minicards activity, two user LEDs).



- **USB and serial:**
One DB9M RS232, one double USB A type connector



- **Audio:**
Mic input, line input, headphone, speaker jacks



- **GPIO:**
Eight general purpose input/output on screw terminal, eight line status LED



LVDS to VGA adapter



Getting started with your PROTEUS

What do need?

There are three basic configurations that can be used to access to your PROTEUS board:

- PROTEUS board, TFT LCD display kit, keyboard/mouse, USB hub, and power.
- PROTEUS board, LVDS to VGA adapter, monitor, keyboard/mouse, USB hub, and power.
- PROTEUS board with preinstalled remote access, Ethernet, and power.

Connecting your PROTEUS

PROTEUS stand alone configuration

- 1 Connect display/adaptor cable to LVDS A connector ([J4](#)).
- 2 Connect USB hub to USB connector.
- 3 Connect keyboard and mouse to the USB hub.
- 4 Connect green power connector plug to a cable coming from a DC power supply. The power supply output voltage should be between +8.5 to +24V (+12V nominal). Check polarity.
- 5 Switch on display/monitor power.
- 6 Connect power cable to the PROTEUS board.
- 7 Switch on power supply.

The board starts with the Eurotech logo splash screen. If a device with booting capability is connected (or on board FLASH is preloaded with OS) then the board boots from this, if not the BIOS screen is shown.

Identifying your PROTEUS

You can identify the version of your PROTEUS board in two ways:

- Visually. All PROTEUS PCBs are marked on the top side with the PROTEUS name, board version and issue.
- Using the BIOS (see below).

To identify your PROTEUS from the BIOS follow the instructions below:

- 1 Boot the PROTEUS board.
- 2 Press **F2** as the Eurotech splash screen appears until the BIOS main screen is shown with the following details:.

BIOS version

BIOS version xx.xx.xx.xx

CPLD version

CPLD versionx.xx

Embedded controller firmware version

uCtrl version x.xx

Unique silicon ID number

System serial number xxxx-xxxx-xxxx

Connecting a SATA hard disk

PROTEUS stand alone

PROTEUS (stand alone) supports one SATA drive via a SATA cable. A 7-wire SATA cable is used to provide a direct connection between the PROTEUS board connector ([J3](#)) and the hard disk connector. Power for the hard drive is provided through [J23](#) and a 4-wire cable with a 4 pin Molex PicoBlade plug on one side and a standard SATA power connector on the other. This power cable carries 5V only and can be used with 2.5" HDD. Alternatively if the PROTEUS is powered from an ATX power supply then the standard SATA power cable can be used.

The BIOS automatically detects the hard disk drive and configures the hardware correctly.

PROTEUS COM Express

PROTEUS (COM Express) supports two SATA drives. For information on connecting a SATA hard drive see the COM Express base board manual.

Connecting a CD-ROM

If a CD-ROM drive is required in the system, it may be connected directly via the SATA interface or through a USB to IDE adapter. It is recommended to use the same power source (for example one ATX power supply) for the PROTEUS board and CD-ROM hard drive (especially when a USB to IDE adaptor is used).

Connecting a keyboard

A USB keyboard can be connected straight to the USB connector or via a USB hub.

Connecting a mouse

A USB mouse can be connected straight to the USB connector or via a USB hub.

Turning on/off your PROTEUS

Always ON configuration (default)

Power ON: PROTEUS board starts automatically after power is connected.

Power OFF: Use the Shut down option in the OS and then disconnect power cable.

Power button configuration

The PROTEUS board enters to a standby screen when power is connected. The operator must turn the unit ON via a remote switch connected to the board. The PROTEUS power button connection should be connected to a momentary ON push switch; this is described in [J6 - System connector](#), page [47](#).

Using the serial interface (RS232)

The COM1 port is decoded at the standard PC address location. PC applications can use this port without any special configuration.

The COM1 port is interfaced via a 10-way boxed header. A suitable breakout board is provided in the development kit.

See [J8 - RS232 header](#), page [50](#) for further details about the serial port interface.

Using the audio features

The PROTEUS Stand alone provides an HD Audio codec that supports standard mono mic input, stereo line input, stereo headphone and stereo speaker. Speaker outputs are connected via 2W audio amplifier.

See [J17 – Audio connector](#), page [55](#) for future details about the connection.

Using the on board FLASH

The PROTEUS provides on board FLASH memory. The memory is connected to IDE interface and for BIOS and system is visible as standard IDE hard disk drive.

Using the USB ports

The standard USB connector is a 4-way socket, which provides power and data signals to the USB peripheral. It is a USB Type A connector.

USB ports 0 and 2 are provided on a 10-way header (J7). USB port 2 can be configured as *device* (optional). In this case Pin 9 of connector J7 needs to be connected to +5V and USB client feature has to be enabled in BIOS.

See [J7 - USB0/2 header](#), page 50 for more information.

Proteus stand alone

USB port 1 is a standard USB Type A connector (J1). An additional USB port 3 can be found on FFC connector (J19).

See [J1 - USB Type A connector](#), page 43 and [J19 - Misc ZIF connector](#), page 67 for more information.

Proteus COM Express

Low/full/high speed USB ports 1, 3 and high speed USB ports 6, 7 are connected to the COM Express connector. See your COM Express base board manual for information on how to use them.

Using Ethernet interface

The PROTEUS board provides one 10/100/1000 Ethernet port as standard.

Proteus stand alone

One panel RJ-45 pin connector provides the Ethernet interface. To support Gigabit Ethernet capabilities, a cable rated to CAT5e or above with four signals pairs should be used.

PROTEUS COM Express

See your COM Express base board manual.

Using the flat panel interface

PROTEUS stand alone

The PROTEUS V111 stand alone provides one LVDS output. This is connected to LVDS A connector ([J4](#)). The LVDS connector pin out is compatible with most standard LVDS flat panel displays and direct cable connection is possible. Alternatively an [LVDS to VGA adapter](#) provided by Eurotech can be used.

See [J4 - LVDS A connector](#), page 45 for more information.

PROTEUS COM Express

The PROTEUS V111 COM Express provides two single-channel 24-bit LVDS interfaces to COM Express board to board connector. For more information how to use LVDS see your COM express base board manual.

Using the backlight connector

The PROTEUS provides one +5V backlight connector (J20).

See [J20 - Backlight](#), page [57](#) for more information.

Using the touchscreen interface

The PROTEUS provides a touchscreen interface. A touchscreen controller is placed on the PROTEUS board and uses Eurotech TSC1 firmware.

4-wire and 8-wire touchscreens are directly supported.

See [J18 – Touchscreen](#), page [55](#) for more information.

Using the PCIE minicard sockets

The PROTEUS provides two PCIE minicard sockets. PCIE minicard socket 0 also provides SIM card interface (J12).

See [J12 - SIM card socket](#), page [52](#) for more information.

PROTEUS stand alone

PCIE minicard socket 0 (J13) is connected directly to the Intel System Hub Controller US15W. Some cards may require direct PCIE connection to the controller and may not work via a switch. PCIE minicard socket 1 (J14) is connected to on board PCIE switch.

See [J13 - PCI Express Mini Card slot 0](#), page [53](#) and [J14 - PCI Express Mini Card slot 1](#), page [54](#) for more information.

COM Express

Both PCIE minicard sockets (J13, J14) are connected to the PCIE switch.

Using the micro SD

The PROTEUS provides one micro SD slot ([J24](#)). The slot supports micro SD cards with a capacity up to 2GB.

Using the general purpose inputs/outputs (GPIO)

PROTEUS stand alone

The PROTEUS provides eight GPIO pins. These are connected to I²C IO expander and connector J9.

See [J9 - GPIO header](#), page [51](#) for more information.

PROTEUS COM Express

The PROTEUS COM Express provides sixteen GPIO pins. Eight GPIO pins are connected to I²C IO expander and connector [J9](#). The other eight pins are connected between Super IO and COM Express connector (J22).

To control GPIO pins use the driver provided by Eurotech.

See [J22 - COM Express connector](#), page [59](#) for more information.

Using the GPS

The PROTEUS provides an on board GPS module. The GPS module is connected to COM4 port. The port needs to be set as follows: 4800bps, 8, N, 1, N. For proper functionality an external antenna should be connected to the GPS antenna connector (J25).

See [J25 - GPS antenna](#), page [63](#) for more information.

Using the ZigBee (optional)

The PROTEUS provides an optional on board ZigBee module.

Using the Bluetooth (optional)

The PROTEUS provides an optional on board Bluetooth module. For more information on how to use Bluetooth visit the module manufacturer web site www.bluegiga.com/WT11_Class_1_Bluetooth_Module

Software specification

Operating system support

The PROTEUS is compatible with the following operating systems:

- Microsoft Windows XP, XP Embedded, CE.
- Linux.
- Other x86 OS's however driver support may be limited

Drivers

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

BIOS

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

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

Hardware implementation

COM Express specification

The PCI Industrial Computer Manufacturers Group (PICMG) COM Express Module Base Specification Revision 1.0 is used to define the primary mechanical and electrical interconnects for the PROTEUS module design. A Type 1 connector pinout and an Extended module mechanical format are used.

The Extended module mechanical footprint is intended for mobile systems and space constrained stationary systems. Key features of the module include:

- 155mm x 110mm module size.
- 5mm and 8mm stack height options.
- 18mm 'z' height with heat spreader (with 5mm stack option).

Type 1 module pinout feature set

There are five connector pinout configurations defined in the COM Express Specification, Type 1 through to Type 5, each with increasing complexity. A Type 1 pinout has been selected as this best suits the functionality supported on the chipset.

A 220-pin high speed, high density, 0.5mm FH connector from Tyco Electronics is specified for the COM Express Type 1 interface to the carrier board.

The table below summarises the feature set of the PROTEUS module:

System I/O	Type 1 COM Express 220-pin connector (# ports)
PCI Express lanes 0-5	4
LVDS video – 24bit	1
SATA port	2
HD Audio Digital Interface	1
USB 2.0 ports	4
LAN0 (10/100 Base-T min)	1
Express card support	2
LPC Bus	1

The following system and power management functions are also interfaced via the Type 1 COM Express connector:

System management	Type 1 COM Express 220-pin connector (# ports)
General purpose inputs	4
General purpose outputs	4
SMBus	1
I ² C	1
Watch dog timer	1
Speaker out	1
External BIOS ROM support	1
Reset functions	1

Power management	Type 1 COM Express 220-pin connector (# ports)
Thermal protection	1
Battery low alarm	1
Suspend	1
Wake	1
Power button support	1
Power good	1

Power

The COM Express Type 1 module specifies three power rails, +12V, +5V standby and an RTC input all of which are provided via the board-to-board connector from the carrier board.

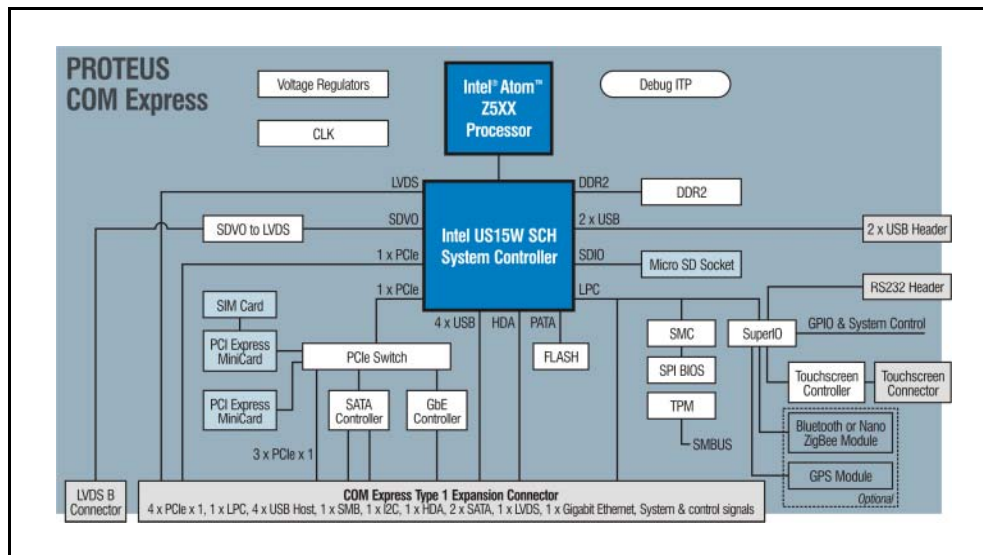
in the standalone implementation of the PROTEUS module the power rails are provided on a PCB mounted connector on the side of the module, input power is protected from over voltage and over current events.

On board backup battery used to power CMOS and RTC is available for both variants.

Block diagram

Type 1 COM Express implementation

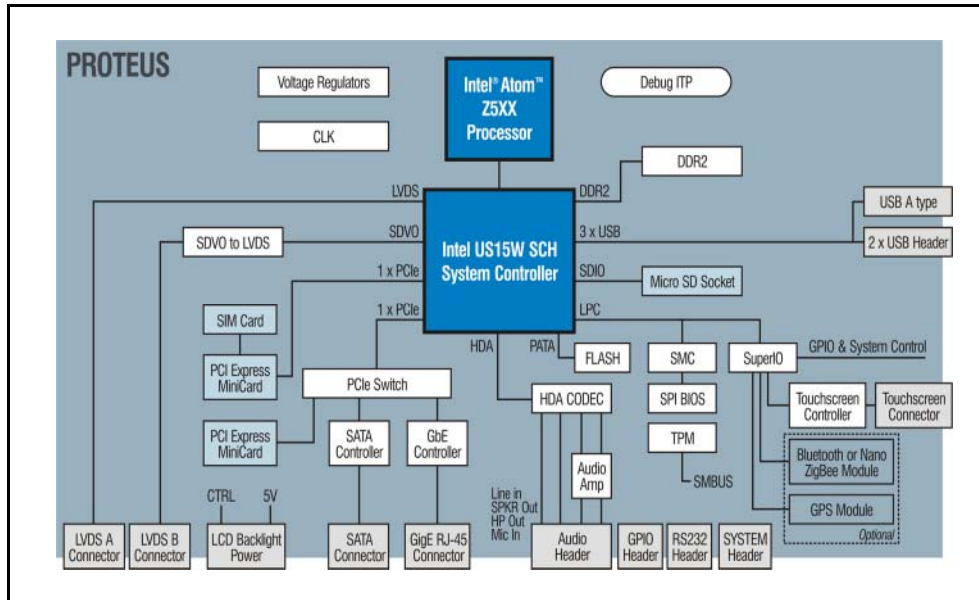
The following block diagram shows the COM Express Type 1 extended module implementation of the PROTEUS with connections to the COM Express board-to-board connector:



For PROTEUS V111 is LVDS interface from LVDS B connected as second LVDS interface on COM express connector. LVDS B is not fitted in this version.

Standalone implementation

This format of the PROTEUS module removes the COM Express board-to-board connector and associated components and allows for a processor core with bootable storage, dual LVDS display support, touch screen, wireless connectivity, Ethernet, SATA and USB expansion:

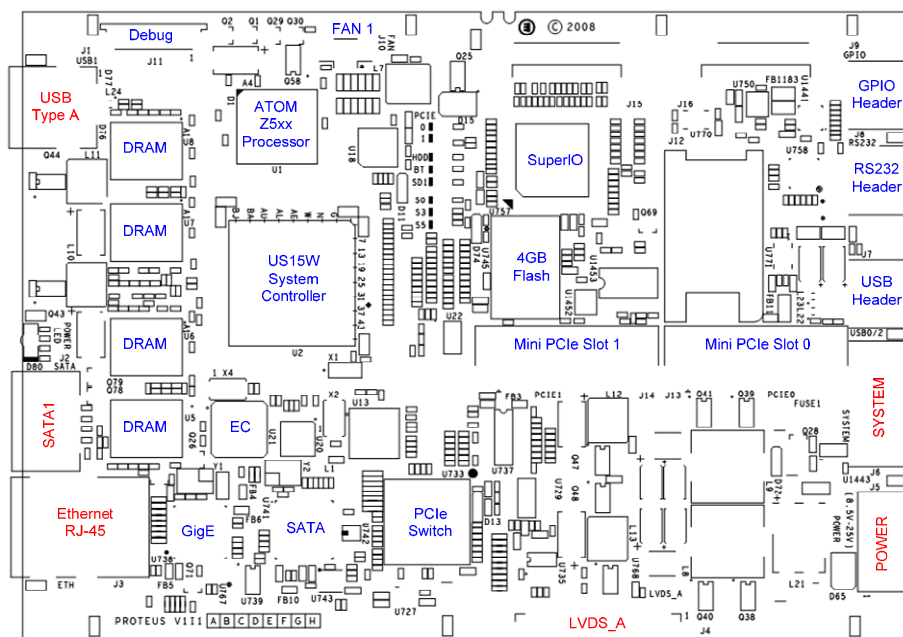
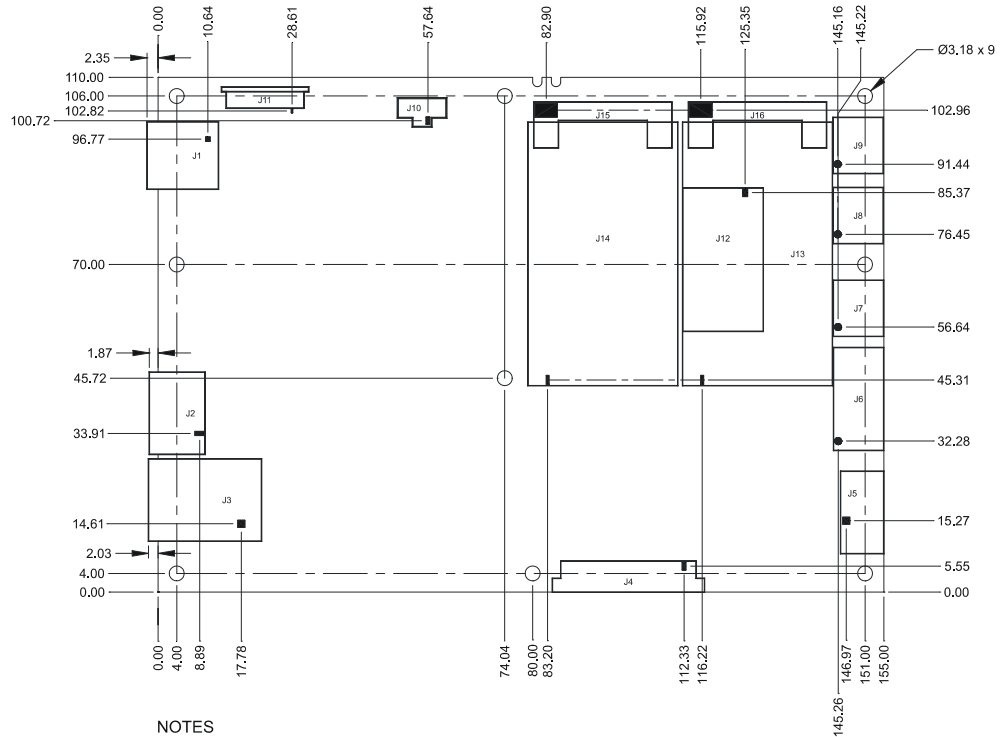


LVDS B connector is not fitted on PROTEUS V111.

Layout and dimensions

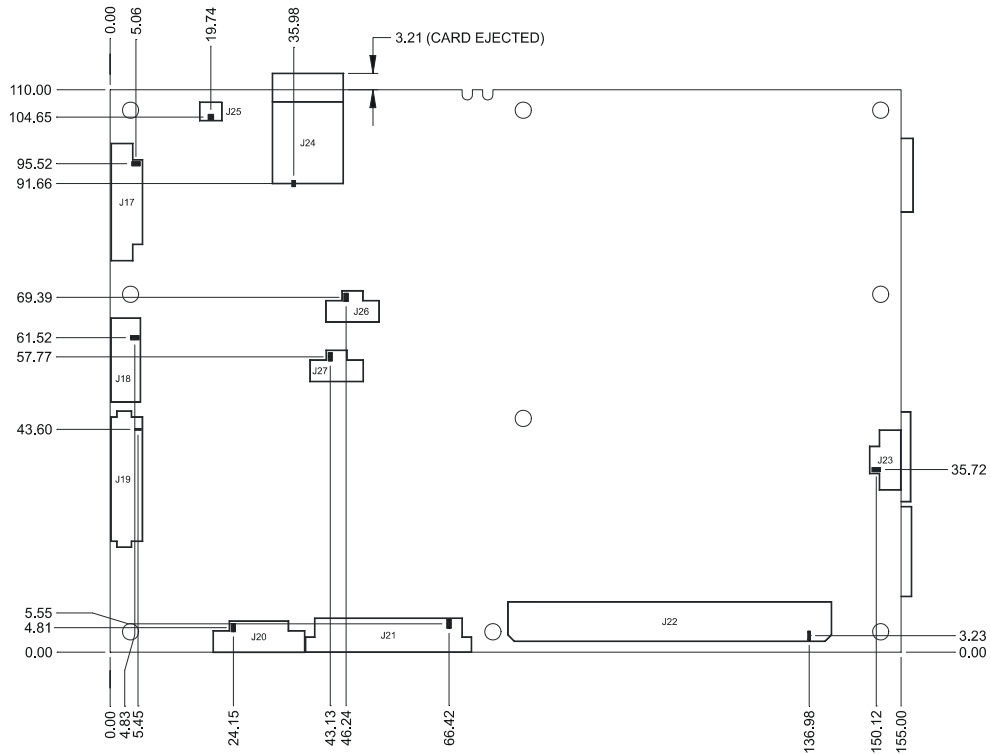
The following PROTEUS diagram show the connector placement for both COM Express and standalone implementations:

Primary side

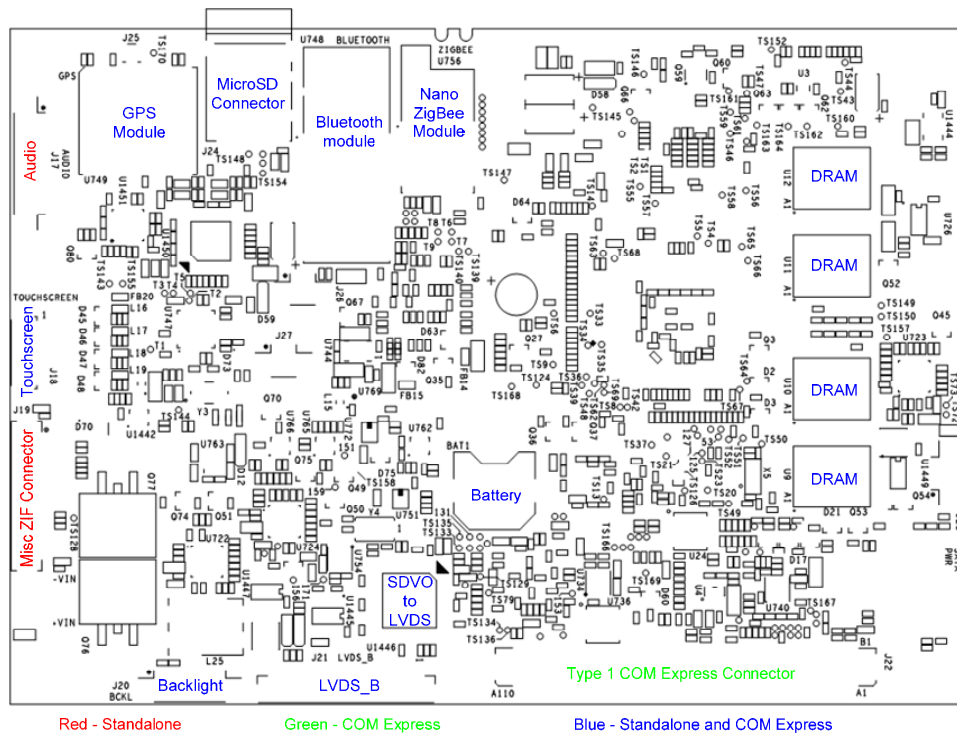


Red - Standalone Green - COM Express Blue - Standalone and COM Express

Secondary side



NOTES
1) ALL CONNECTOR DIMENSIONS ARE TAKEN FROM PIN 1



Red - Standalone Green - COM Express Blue - Standalone and COM Express

COM Express Type 1 carrier board expansion

in the COM Express carrier board implementation the external IO from the module is provided via the COM Express board-to-board connector. The carrier board can be implemented using a method that best suits your needs.

Processor and chipset

Intel ATOM processor

The Intel ATOM Z5xx series processor is a high-performance, ultra low power processor with several microarchitectural enhancements over existing Intel mobile processors. The ATOM Z5xx series offers the benefits of the following Intel architecture for small form factor, thermally constrained and fanless embedded systems:

- Intel's 45nm technology, based on a Hafnium, high-K metal gate formula, reduces power consumption, increases switching speed, and significantly increases transistor density over the previous 65nm technology.
- Multiple micro-ops per instruction are combined into a single micro-op and executed in a single cycle, resulting in improved performance and power savings.
- in-order execution core consumes less power than out-of-order execution.
- Hyper-Threading Technology (HT Technology; 1.6 GHz SKU only) provides high performance-per-watt efficiency in an in-order pipeline. HT Technology provides increased system responsiveness in multi-tasking environments. One execution core is seen as two logical processors, and parallel threads are executed on a single core with shared resources.

US15W System Controller Hub

The US15W is a single-chip System Controller Hub (SCH) that consists of an integrated graphics controller, a memory controller, and I/O controller. The SCH combines the functionality normally found in separate GMCH (front side bus interface, integrated graphics and memory controller) and ICH (platform I/O expansion) components, in a single device providing the functionality necessary to support fully featured operating systems.

The Intel® System Controller Hub US15W combines the Intel® Graphics Media Accelerator 500 (Intel® GMA 500), memory controller, and I/O controller in a single-chip solution. It also features advanced 3D graphics and extensive I/O capabilities such as USB 2.0, SDIO and PCI Express. Additionally, it supports Intel® High Definition Audio, hardware video decode acceleration, a 400/533 MHz CMOS front-side bus (FSB), dual independent display and 1 GB memory.

Graphics support

The IGD (Integrated Graphics Device) provides LVDS and Serial DVO (SDVO) display ports permitting simultaneous independent operation of two displays.

in the COM Express configuration SCH LVDS interface is connected directly to the board-to-board COM Express connector and SDVO interface is connected via a Chronitel CH7308B SDVO to LVDS converter to a edge connector. in the standalone configuration two LVDS onboard connectors are used.

Bandwidth limitations

The ATOM chipset has been optimized for low power operation and therefore has some limitations in terms of it's data throughput capabilities. The internal bus architecture has a maximum theoretical throughput of approximately 254MB/s. System IO devices are interfaced to the US15W backbone, so if the PCI Express controller has control of the backbone then no other devices are able to gain access.

The backbone does not allow peer-to-peer transactions, so if the incoming PCI Express data is being transferred to the PATA port, then the two devices have to share the backbone with PCI Express data being transferred to memory, and then from memory to the PATA port. in some usage models for the PROTEUS, full data bandwidth of devices is not available.

Main memory

The PROTEUS is populated with eight on-board 16-bit DDR-2 memory devices. The COM Express specification lists a SODIMM implementation for adding memory whilst the physical requirements for this are such that it limits the available area for wireless expansion. A decision was made to support only soldered down memory components.

Both industrial and commercial temperature range memory components are available as build options. These have a population option to run at either 400 MHz or 533 MHz. The chipset supports only non-ECC memory.

The system memory is shared with the video memory and therefore limits the maximum available system memory. The BIOS configuration allows for the default video memory size to be specified.

BIOS ROM memory

The PROTEUS module incorporates a minimum of 4Mb of FLASH memory with a default population of 8Mb of FLASH memory for support of the BIOS.

An external FWH, required by the COM Express specification, is supported and enabled as a boot ROM device via control signals available on the COM Express board-to-board connector.

Clock generation

A clock generator is used on the PROTEUS design to generate clocks required by system components. Additional zero delay clock buffers are added as required for PCI Express components.

Trusted platform module

The PROTEUS supports an Atmel AT97SC3203 trusted platform module (TPM), the TPM implements version 1.2 of the Trusted Computing Group (TCG) specification for TPMs. A Trusted Platform Module offers facilities for secure generation of cryptographic keys, the ability to limit the use of cryptographic keys, as well as a hardware random number generator. The TPM is interfaced via the System Management Bus (SMBUS).

Hardware monitoring and control

Circuitry is provided to monitor the PROTEUS modules voltage rails and temperatures with application software provided to access these readings.

Intel HD Audio

The US15W SCH provides an Intel HD Audio digital interface which is made available via the COM Express board-to-board connector. An on-board audio codec is provided on the module in standalone mode only, this is interfaced to an onboard 2W audio amplifier for speakers and headphone functionality. The HDA audio codec also provides support for microphone and line in functions.

Further information on Intel High Definition Audio is available at:
www.intel.com/design/chipsets/hdaudio.htm.

USB

The US15W SCH contains one EHCI and three UHCI USB controllers to provide support for up to six USB 2.0 ports allowing high, full and low speed USB ports and two ports supporting high speed only operation.

USB ports 1, 3, 6 and 7 are made available on the COM Express board-to-board connector. Port 1 is connected to USB A type connector for standalone configuration. USB ports 6 and 7 operate as high speed only ports and as such do not support low and full speed USB operation. Care should be taken in base board applications to ensure these ports are only used to interface to USB high speed devices on the COM Express carrier board and not made available externally.

Ports 0 and 2 are connected via a pin header to allow for off module expansion. Port 2 can be reconfigured in software to be a USB client port allowing the PROTEUS to appear as a peripheral. Ports 4 and 5 are routed to the PCI Express Mini Card sockets.

The following table shows the USB 2.0 ports routing on the PROTEUS:

Port 1	Ports 3,6,7	Ports 0,2	Ports 4,5
USB A type connector (standalone)	Board-to-board connector	Pin header	PCIe Mini Cards
board-to-board Connector (COM Express)	High/full/low speed Port 6/7 high speed only	Port 2 (selectable client/host) High/full/low speed	

PCI Express interface

The US15W SCH has two PCI Express root ports supporting the PCI Express Base Specification, Revision 1.0a. Each root port supports 2.5-Gb/s bandwidth in each direction.

PROTEUS COM Express implementation

In the standard COM Express implementation PCI Express root port 1 is connected to a PLX Technology PEX8509 8-port PCI Express switch. Interfaced to the switch is a Gigabit Ethernet controller, Serial ATA controller, two PCI express Mini card sockets. The remaining ports are interfaced to the COM Express board-to-board connector to allow for carrier board expansion over PCI Express.

PCI Express root port 0 is connected to the COM Express board-to-board connector and used for custom requirements. As required by the COM Express specification the module provides additional logic to allow for the detection and control of PCMCIA ExpressCards.

PROTEUS standalone implementation

In the standalone PROTEUS implementation the primary PCI Express root port is interfaced to the WAN PCI Express mini card socket and the secondary port to a PEX8505 four port PCI Express switch. The PCI Express four port switch interfaces to the WLAN PCI Express mini card socket, the Gigabit Ethernet controller and to the serial ATA controller. IO connectors are fitted to the edge of the standalone PROTEUS module to allow these interfaces to be used on the module.

PCI Express Mini Card

Two PCI Express mini card sockets conforming to the PCI Express™ Mini Card Electromechanical Specification Revision 1.2 are provided on the COM Express module. One mini card socket also provides a SIM card interface to support cellular wireless mini cards.

Ethernet

An Intel 82574L Gigabit Ethernet controller is provided on the PROTEUS module which is interfaced via a x1 PCI Express channel to the PCI Express switch.

The 82574L is a fully-integrated Gigabit Ethernet Media Access Control (MAC) and Physical Layer (PHY) device that is designed for server and client configurations. The PHY interface signals are interfaced via the COM Express connector to a carrier board mounted Ethernet magnetic and an RJ-45 connector.

Serial ATA

Serial ATA (SATA) support is provided on the PROTEUS module using a Silicon Image (Sil3132) PCI Express SATA controller. The Sil3132 supports two independent Serial ATA ports with generation 2 transfer rates of 3.0GB/s and is compliant with the Serial ATA 1.0 specification. The Serial ATA ports are interfaced via the COM Express board-to-board connector. In the standalone implementation only port is available via a Serial ATA connector.

Solid state hard disk

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

LPC

The SCH implement an LPC interface which is routed to COM Express connector.

RTC

The SCH Real Time Clock (RTC) module provides a battery backed-up date and time keeping device. Three interrupt features are available: time of day alarm with once a second to once a month range, periodic rates of 122 ms to 500 ms, and end of update cycle notification. Backup power options for the RTC are described in [Power requirements](#) on page 9.

Serial ports

The SMSC SCH3114 provides four fully functional NS16C550 compatible serial ports on the PROTEUS board. It supports up to 1.5MBaud data rates and 16-Byte Send/Receive FIFO's.

The serial ports are used to interface to the Bluetooth module or NanoZigBee module, GPS module and touch screen controller. One serial port is used to provide RS232 interface on board header.

Port	Function
COM1	RS232
COM2	Touchscreen
COM3	Bluetooth OR ZigBee OR ZIF connector
COM4	GPS or ZIF connector

GPS receiver (Build option)

A GPS module is provided as a factory build option on the PROTEUS to allow complete GPS functionality including position, velocity and time (PVT).

A Fastrax iTrax300 GPS module is used, the iTrax300 is based on SiRF GSC3e/LP single chip. The GPS module uses a serial interface (Rx/Tx only) to communicate with a host, the SuperIO COM port 4 is used for this purpose.

More information on iTrax 300 Family can be found at www.fastrax.fi.

Bluetooth (Build option)

The PROTEUS supports an optional BlueGiga WT11 Bluetooth module. This module supports up to seven simultaneous data connections and one audio connection. The WT11 is interfaced via a high serial port connection and use HCI firmware to communicate with the host operating system running a BlueTooth stack. Bluetooth module is connected to the SuperIO COM port 3.

ZigBee (Build option)

An optional ZigBee interface is available using a Eurotech NanoZigBee module. This interface is provided instead of the Bluetooth module and interfaced via a COM port 3 to the host.

GPIO

Four general purpose inputs and four general purpose output pins are provided on the COM Express board-to-board connector. The GPIO is +5V tolerant +3.3V level signal and upon a hardware reset all outputs are low. Input pins are pulled high on the module to 3.3V.

Eight general purpose inputs/outputs are connected to GPIO header. An I²C GPIO expander is used for this function. All pins are set to be input after reset. The pins are 5V tolerant with 3.3V level output and they are pulled high.

Touch screen

A serial based resistive touch screen controller supporting 4, 5 and 8 wire resistive touch screens are provided on the PROTEUS module and interfaced via a pin header. The touchscreen controller is connected to the SuperIO COM port 2.

SMBus

A buffered version of the system management bus is interfaced via the COM Express board-to-board connector. The US15W SCH provides an SMBus 1.0-compliant host controller. Maximum operating frequency of SMBus is 100KHz.

The SMBus interface is also provided on a pin header during the standalone implementation of the PROTEUS board.

Micro SD socket

A MicroSD memory socket is provided on the PROTEUS module. The US15W SCH contains three SDIO/MMC ports. SDIO Port 1 is connected to a 4-bit MicroSD card socket. Port 2 is connected to a ZIF connector and port 0 is not used.

The 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 SDIO/MMC controller supports only flash cards using byte addressing limiting the maximum memory density to 2GB; sector based addressing is not supported.

Module power supply

The PROTEUS module supports a wide input voltage range from +8.5V to +24V DC with a nominal operating voltage of +12V. Over current and over voltage protection are provided on these main input rails. In the COM Express implementation an additional +5V standby rail is available with an input voltage range from 4.75V to 5.25V. Applications requiring Real Time Clock (RTC) backup support have the option of fitting a lithium battery or using a SuperCap. In standalone operation the power supply input is via a PCB mounted connector and via the 220-pin COM Express connector in the COM Express primary configuration.

Indicator LEDs

Indicator LEDs are provided on the module to indicate:

- PCIE express minicard slot 0 activity.
- PCIE express minicard slot 1 activity.
- Disk (FLASH and SATA) activity.
- Bluetooth activity.
- Micro SD card activity.
- Power states S0, S3 and S5.
- Additional dual state on board edge LED indicates sleep state (orange) and full power (green).

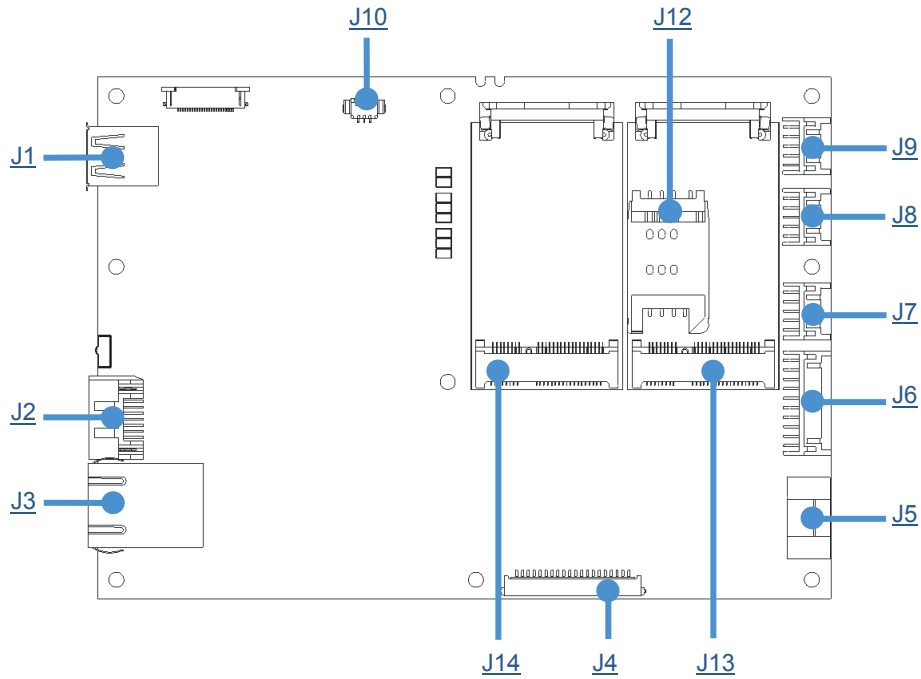
Connectors and LEDs

The PROTEUS has the following connectors:

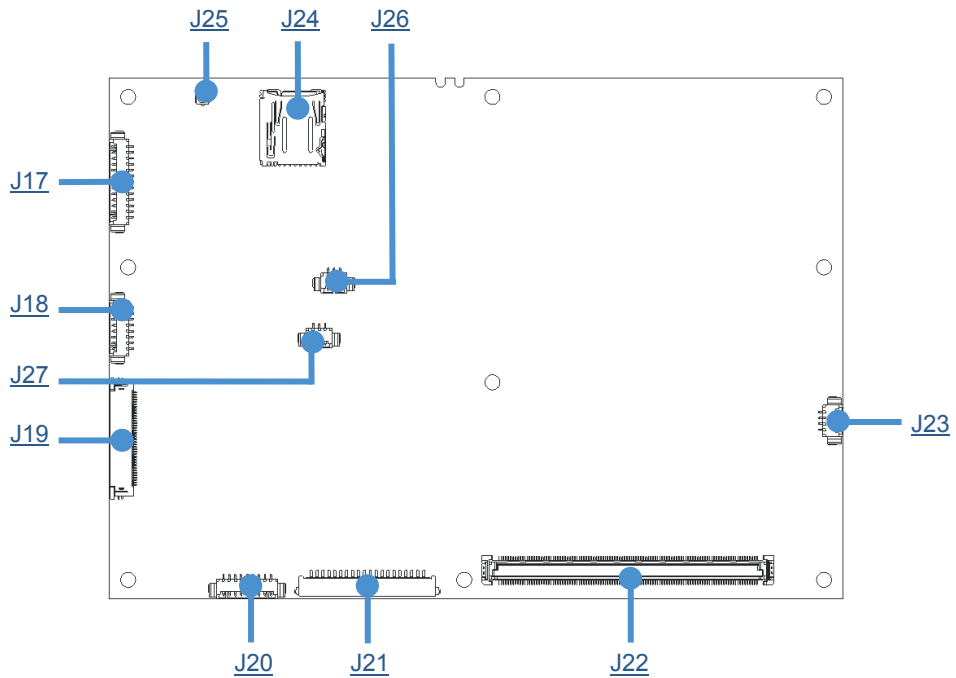
Connector	Function	Connector details in section
J1	USB 1, connector Type A	J1 - USB Type A connector, page 43
J2	SATA	J2 - SATA connector, page 43
J3	GBe Ethernet	J3 - GB Ethernet connector, page 44
J4	LVDS A	J4 - LVDS A connector, page 45
J5	Power	J5 - Power connector, page 46
J6	System	J6 - System connector, page 47
J7	USB 0/2	J7 - USB0/2 header, page 50
J8	RS232	J8 - RS232 header, page 50
J9	GPIO	J9 - GPIO header, page 51
J10	FAN 1	J10 - FAN 1 connector, page 51
J12	SIM	J12 - SIM card socket, page 52
J13	PCIe Minicard slot 0	J13 - PCI Express Mini Card slot 0, page 53
J14	PCIe Minicard slot 1	J14 - PCI Express Mini Card slot 1, page 53
J17	Audio	J17 - Audio connector, page 55
J18	Touchscreen	J18 - Touchscreen connector, page 55
J19	Misc ZIF connector	J19 - Misc ZIF connector, page 56
J20	Backlight	J20 - Backlight, page 57
J21	LVDS B	J21 - LVDS B connector, page 58
J22	COM express connector	J22 - COM Express connector, page 59
J23	SATA power connector	J23 - SATA power connector, page 62
J24	Micro SD slot	J24 - Micro SD slot, page 63
J25	GPS antenna connector	J25 - GPS antenna, page 63
J26	FAN 2	J26 - FAN 2 connector, page 64
J27	EC serial debug output	J27 - EC serial debug output, page 64

The diagrams on the following page show the location of the connectors on the PROTEUS.

Connector - top view

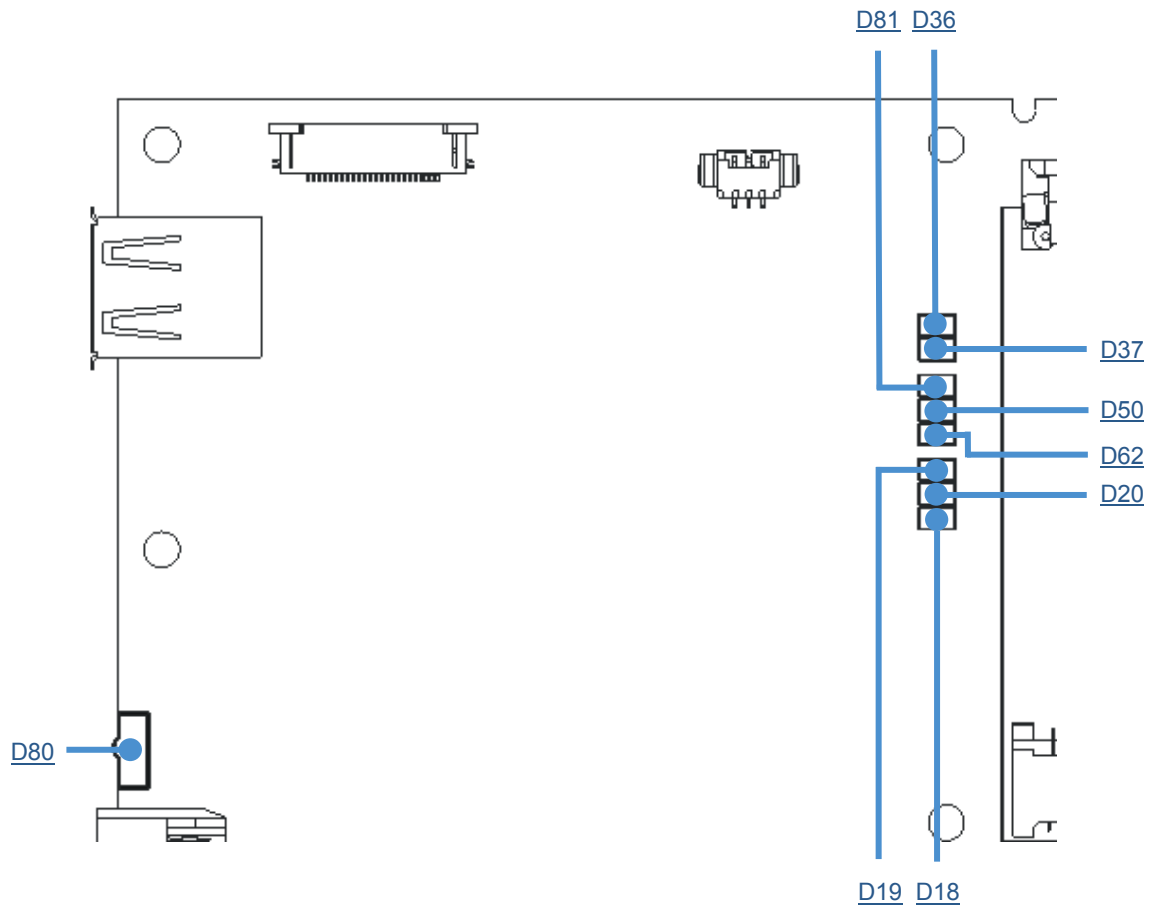


Connectors - bottom view



LEDs

The following diagram shows the location of the LEDs on the PROTEUS.



The PROTEUS has the following connectors LEDs:

LED	Function	LED details in section
D80	Power / sleep LED	D80 - Power / sleep LED, page 65
D36	PCIe Minicard slot 0 activity	D36 - PCIe Minicard slot 0 activity, page 65
D37	PCIe Minicard slot 1 activity	D37 - PCIe Minicard slot 1 activity, page 65
D81	Thunderbolt / SATA activity	D81 - Thunderbolt / SATA activity, page 66
D50	Bluetooth activity	D50 - Bluetooth activity, page 66
D62	Micro SD card activity	D62 - Micro SD card activity, page 66
D19	S3 power state indicator	D19 - S3 power state indicator, page 67
D20	S0 power state indicator	D20 - S0 power state indicator, page 67
D18	S5 power state indicator	D18 - S5 power state indicator, page 67

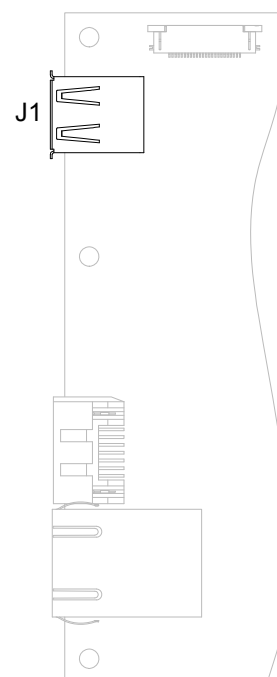
Connectors

J1 - USB Type A connector (stand alone only)

J1 is connected to SCH USB port 1.

Connector: EDAC 690-004-621-013.

Pin	Signal name
1	+5V
2	D- (USB port 1)
3	D+ (USB port 1)
4	GND

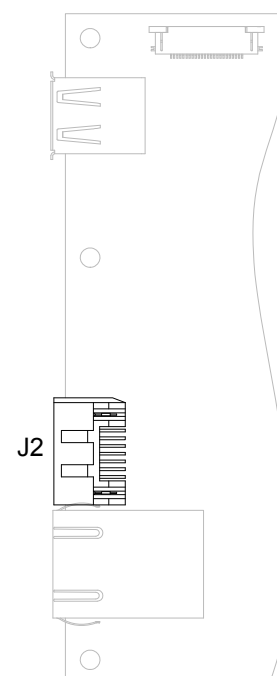


J2 - SATA connector (stand alone only)

J2 is connected to channel 1 of SATA controller.

Connector: MOLEX 470804001.

Pin	Signal name
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND

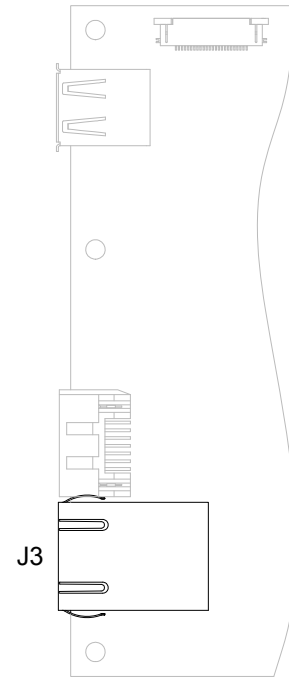


J3 - Gb Ethernet connector (stand alone only)

J3 is connected to GBe controller.

Connector: L829-1J1T-43 Gigabit Ethernet Ultra Low Profile Single Port MagJack® with LEDs.

Pin	Signal name
1	TRP1+
2	TRP1-
3	TRP2+
4	TRP3+
5	TRP3-
6	TRP2-
7	TRP4+
8	TRP4-



LED1 (orange):

- OFF: Not connected.
- ON: Link.
- BLINKING: Activity.

LED2 (orange/green):

- OFF: 10Mb.
- Green: 100Mb.
- Orange: 1Gb.

J4 - LVDS A connector (stand alone only)

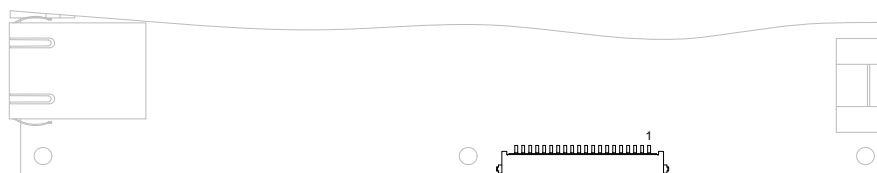
J4 is connected to SCH LVDS interface.

Connector: JAE FI-SE209-HFE, 20-way.

Housing: 20Way 1.25mm pitch single row housing Hirose, part number DF14-20S-1.25C.

Crimps: Gold 26-28 AWG crimps Hirose, part number DF14-2628SCFA.

Pin	Signal name
1	+3.3V
2	+3.3V
3	GND
4	GND
5	D0-
6	D0+
7	GND
8	D1-
9	D1+
10	GND
11	D2-
12	D2+
13	GND
14	CK-
15	CK+
16	GND
17	FRC (pulled high)
18	DPS (default pulled low)
19	D3-
20	D3+



J4

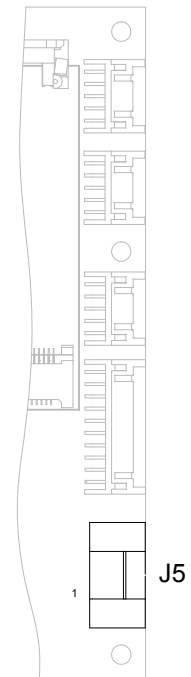
J5 - Power connector (stand alone only)

J5 is main power input connector (8.5V ~ 24V).

Connector: IMO PC 20.155MHF/2.

Mating socket: IMO PC 20.1550MF/2.

Pin	Signal name
1	VIN+ (Power in)
2	VIN- (Power in)



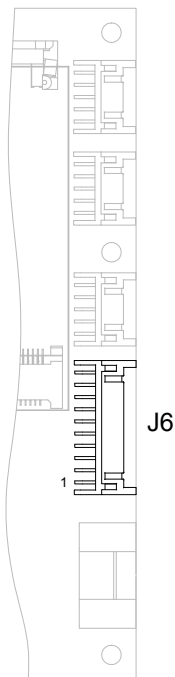
J6 - System connector (stand alone only)

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

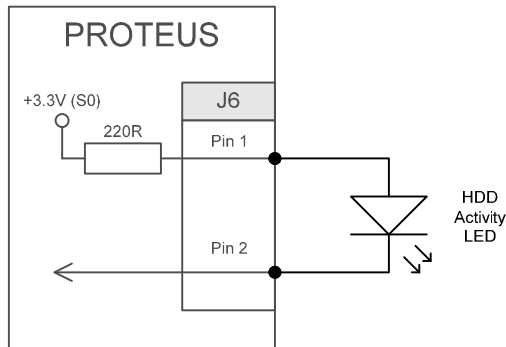
Housing: 20Way HIROSE Housing (DF11-20DS-2C) or equivalent.

Crimps: Crimps for Housing (DF11-2428SCA) or equivalent.

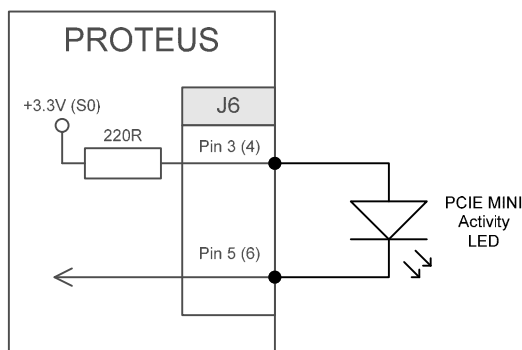
Pin	Signal name	Pin	Signal name	Description
1	HDD LED ANODE	2	HDD LED CATODE	HDD activity LED (220 Ω series resistor on board).
3	MINIO LED ANODE	4	MINIO LED CATODE	PCIe Minicard slot 0 activity LED (220 Ω series resistor on board).
5	MINI1 LED ANODE	6	MINI1 LED CATODE	PCIe Minicard slot 1 activity LED (220 Ω series resistor on board).
7	+3.3V (S0)	8	+3.3V (S3)	Power output.
9	I/O USER PIN	10	220 Ω series resistor to +3.3V (S3)	General purpose input/output user pin connected to I2C GPIO expander.
11	POWER LED ANODE	12	POWER LED CATODE	Power LED (220 Ω series resistor on board).
13	SMB DATA (in/out)	14	SMB CLK (out)	SMBUS.
15	GPIO9 (in/out)	16	GPIO10 (in/out)	General purpose GPIO pins from SUPER IO.
17	GND	18	ON/OFF# BUTTON (in)	Power button.
19	GND	20	RESET# (in)	Reset button.



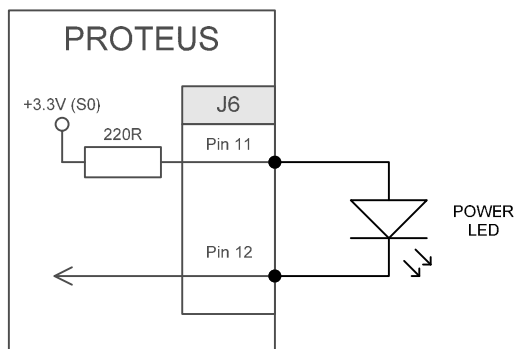
HDD LED connection example



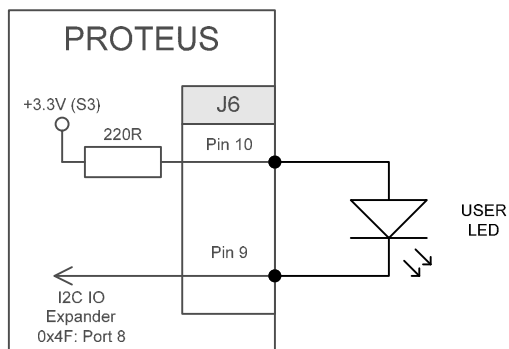
PCIE mini card LED connection example



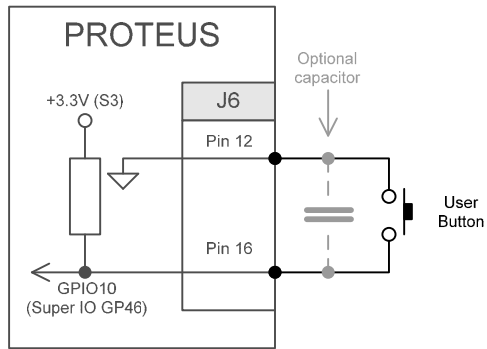
Power LED connection example



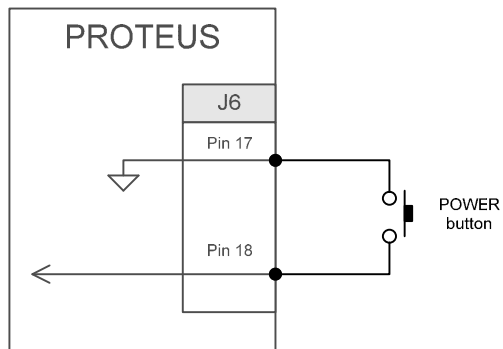
User LED connection example



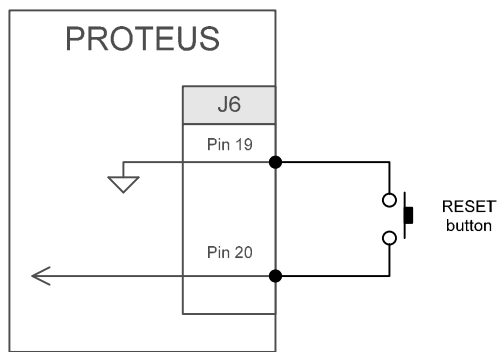
User button connection example



POWER button connection example



RESET button connection example



J7 - USB0/2 header

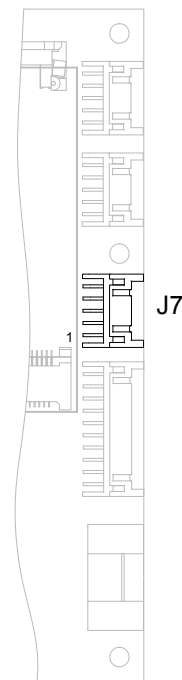
J7 is connected to SCH USB ports 0 and 2. High level on Pin 9 change HOST USB port 2 to USB CLIENT mode (The mode needs to be enabled in BIOS too). If Pin 9 is low then USB port 2 is running in HOST mode.

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

Housing: 10Way HIROSE Housing (DF11-10DS-2C) or equivalent.

Crimps: Crimps for HIROSE Housing (DF11-2428SCA) or equivalent.

Pin	Signal name	Pin	Signal name
1	+5V USB0	2	+5V USB2
3	D- (USB port 0)	4	D- (USB port 2)
5	D+ (USB port 0)	6	D+ (USB port 2)
7	GND	8	GND
9	Port 2: Host/Client#	10	GND



J8 - RS232 header

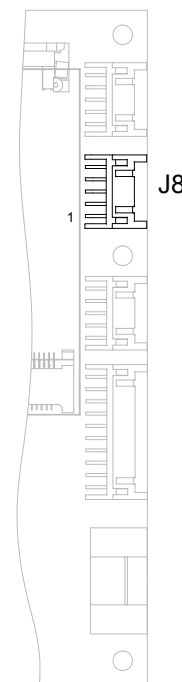
J8 is connected to COM1 serial port via an RS232 transceiver.

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

Housing: 10Way HIROSE Housing (DF11-10DS-2C) or equivalent.

Crimps: Crimps for HIROSE Housing (DF11-2428SCA) or equivalent.

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



J9 - GPIO header

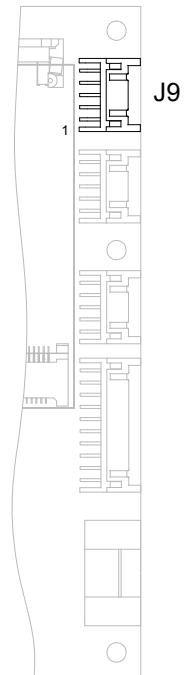
J9 is connected to I2C GPIO expander. Each GPIO line has 100KΩ pull up to 3.3V. The GPIO pins are 5V tolerant.

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

Housing: 10Way HIROSE Housing (DF11-10DS-2C) or equivalent.

Crimps: Crimps for HIROSE Housing (DF11-2428SCA) or equivalent.

Pin	Signal name	Pin	Signal name
1	GPIO0 (in/out)	2	+3.3V
3	GPIO1 (in/out)	4	GPIO2 (in/out)
5	GPIO3 (in/out)	6	GPIO4 (in/out)
7	GPIO5 (in/out)	8	GPIO6 (in/out)
9	GPIO7 (in/out)	10	GND



J10 - FAN 1 connector

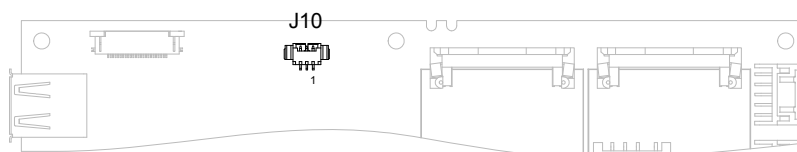
J10 is connected to Super IO FAN 1 control pins.

Connector: MOLEX 53261-0371.

Housing: 3Way MOLEX Housing (51021-0300) or equivalent.

Crimps: Crimps for MOLEX Housing (50058-8000) or equivalent.

Pin	Signal name	Description
1	FANTACH1 (in)	RPM input from FAN1
2	+5V	FAN1 power
3	GND (PWM)	FAN1 ground

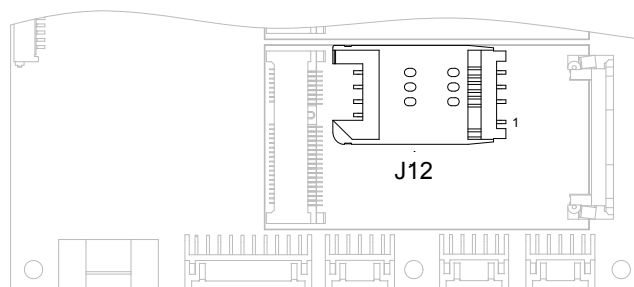


J12 - SIM card socket

J12 is a SIM card socket connected to J13 PCIe Minicard slot 0.

Connector: JAE SF7W008S1AE900.

Pin	Signal name
C1	VCC (out)
C2	RESET (out)
C3	CLK (out)
C5	GND
C6	VPP (out)
C7	IO (in/out)
S1	CD1 (default NC)
S2	CD2 (default NC)



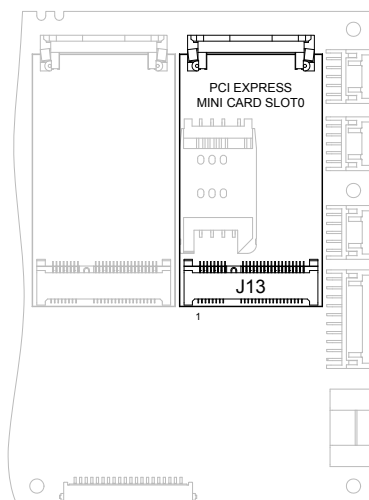
J13 - PCI Express Mini Card slot 0

Stand alone: J13 is connected to PCI Express channel 0 of SCH.

COM Express: J13 is connected to PCI Express switch port 3.

Connector: FOXCONN AS0B226-S68N-7F, MINIPCI express, 52.SMT, 0.7, 6.8mm, STD, 25.

Pin	Signal name	Pin	Signal name
1	WAKE# (in)	2	+3.3V
3	N.C.	4	GND
5	N.C.	6	+1.5V
7	CLKREQ# (in)	8	UIM_PWR (out)
9	GND	10	UIM_DATA (in/out)
11	REFCLK- (out)	12	UIM_CLK (out)
13	REFCLK+ (out)	14	UIM_RST# (out)
15	GND	16	UIM_VPP (out)
17	N.C. (Optional J12.CD2)	18	GND
19	N.C. (Optional J12.CD1)	20	W_DIS# (out)
21	GND	22	PERST# (out)
23	PCIE_RXD2- (in)	24	+3.3Vaux (default S3/ optional S5)
25	PCIE_RXD2+ (in)	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK (out)
31	PCIE_TXD2- (out)	32	SMB_DATA (in/out)
33	PCIE_TXD2+ (out)	34	GND
35	GND	36	USB_D7- (in/out)
37	N.C.	38	USB_D7+ (in/out)
39	N.C.	40	GND
41	N.C.	42	LED_WWAN# (in)
43	N.C.	44	LED_WLAN# (in)
45	N.C.	46	LED_WPAN# (in)
47	N.C.	48	+1.5V
49	N.C.	50	GND
51	N.C.	52	+3.3V

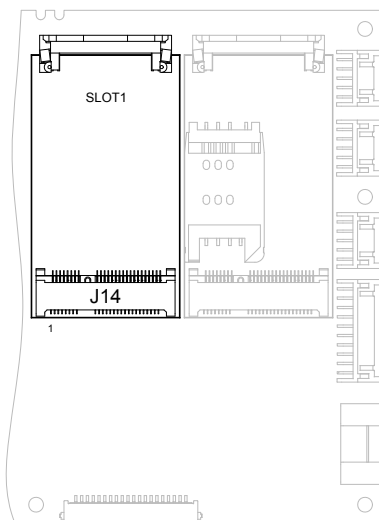


J14 - PCI Express Mini Card slot 1

J14 is connected to PCI Express switch port 4.

Connector: FOXCONN AS0B226-S68N-7F, MINIPCI express, 52.SMT, 0.7, 6.8mm, STD, 25.

Pin	Signal name	Pin	Signal name
1	WAKE# (in)	2	+3.3V
3	N.C.	4	GND
5	N.C.	6	+1.5V
7	CLKREQ# (in)	8	N.C.
9	GND	10	N.C.
11	REFCLK- (out)	12	N.C.
13	REFCLK+ (out)	14	N.C.
15	GND	16	N.C.
17	N.C.	18	GND
19	N.C.	20	W_DIS# (out)
21	GND	22	PERST# (out)
23	PCIE_RXD2- (in)	24	+3.3Vaux (default S3 / optional S5)
25	PCIE_RXD2+ (in)	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK (out)
31	PCIE_TXD2- (out)	32	SMB_DATA (in/out)
33	PCIE_TXD2+ (out)	34	GND
35	GND	36	USB_D7- (in/out)
37	N.C.	38	USB_D7+ (in/out)
39	N.C.	40	GND
41	N.C.	42	LED_WWAN# (in)
43	N.C.	44	LED_WLAN# (in)
45	N.C.	46	LED_WPAN# (in)
47	N.C.	48	+1.5V
49	N.C.	50	GND
51	N.C.	52	+3.3V



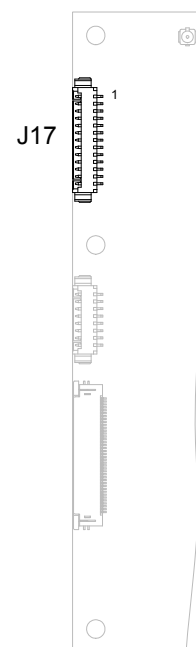
J17 - Audio connector (stand alone only)

Connector: MOLEX 53261-137.

Housing: 3Way MOLEX Housing (51021-1300) or equivalent.

Crimps: Crimps for MOLEX Housing (50058-8000) or equivalent.

Pin	Signal name	Description
1	FMIC_IN (in)	Microphone input
2	FMIC_BIAS (out)	Microphone bias
3	GND	Analogue ground
4	FLINEIN_R (in)	Line input (right)
5	FLINEIN_L (in)	Line input (left)
6	GND	Analogue ground
7	NC	Not connected
8	HP_OUTL (out)	Headphones out (left)
9	HP_OUTR (out)	Headphones out (right)
10	ROUT+ (out)	+ive speaker differential output (right)
11	ROUT- (out)	-ive speaker differential output (right)
12	LOUT+ (out)	+ive speaker differential output (left)
13	LOUT- (out)	-ive speaker differential output (left)



J18 - Touchscreen connector

Connector: MOLEX 53261-0871.

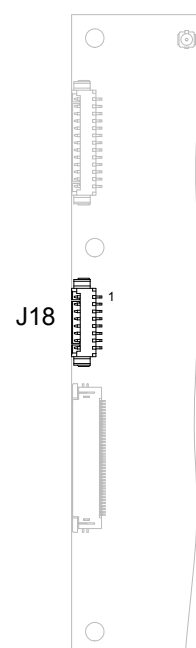
Housing: 3Way MOLEX Housing (51021-0800) or equivalent.

Crimps: Crimps for MOLEX Housing (50058-8000) or equivalent.

Pin	Signal name	Pin	Signal name
1	Left (X-)	1	Left excite
2	Right (X+)	2	Right excite
3	Bottom (Y-)	3	Bottom excite
4	TOP (Y+)	4	Top excite
5	Connect to Pin 4	5	Top sense
6	Connect to Pin 3	6	Bottom sense
7	Connect to Pin 2	7	Right sense
8	Connect to Pin 1	8	Left sense

4 wire mode

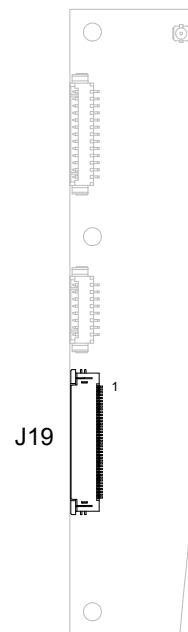
8 wire mode



J19 - Misc ZIF connector (stand alone only)

Connector: MOLEX 54104-4096.

Pin	Signal name	Pin	Signal name
1	3.3V (S3)	2	3.3V (S3)
3	3.3V (S3)	4	SDIO2_DATA0
5	SDIO2_DATA1	6	SDIO2_DATA2
7	SDIO2_DATA3	8	SDIO2_DATA4
9	SDIO2_DATA5	10	SDIO2_DATA6
11	SDIO2_DATA7	12	GND
13	SDIO2_PWR	14	SDIO2_CMD
15	SDIO2_CLK	16	SDIO2_CD
17	SDIO2_WP (pulled up)	18	SLOT2_LED (220Ω series resistor)
19	GND	20	SMB_CLK (out)
21	SMB_DATA (in)	22	GND
23	NC (COM4_RXD (in) ¹)	24	COM4_TXD (out)
25	GND	26	NC (COM3_RXD (in) ²)
27	COM3_TXD (out)	28	NC (COM3_RTS (in) ²)
29	COM3_CTS (out)	30	GND
31	EXT_PRPH_RST# (out)	32	WAKE_PRPH_3V3# (in)
33	GND	34	D- (USB SCH Port 3) ³
35	D+ (USB SCH Port 3) ³	36	GND
37	Reserved	38	+5V (S3)
39	+5V (S3)	40	+5V (S3)



¹ If GPS is not fitted this is a build option.

² If Bluetooth and ZigBee are not fitted this is a build option.

³ Standalone only.

J20 - Backlight

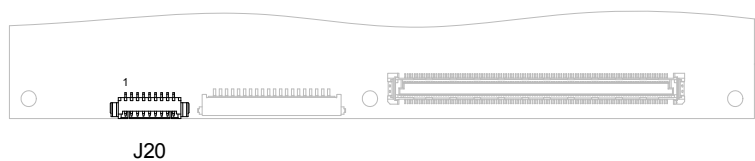
J20 is backlight connector for LVDS_A (J4).

Connector: MOLEX 53261-0971.

Housing: 3Way MOLEX Housing (51021-0900) or equivalent.

Crimps: Crimps for MOLEX Housing (50058-8000) or equivalent.

Pin	Signal name
1	SMB DATA
2	SMB CLK
3	GND
4	BRTH – pulled to +3.3V / pulled down not fitted
5	BRTI – pulled to +3.3V
6	+5V
7	+5V
8	GND
9	GND



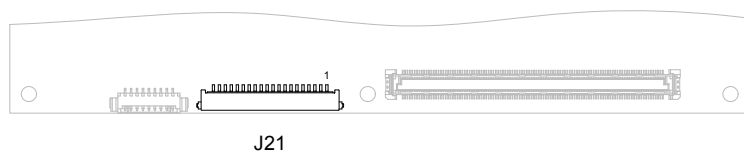
J21 - LVDS B connector (not supported by PROTEUS V111)

J21 is connected to CH7308 SDVO LVDS Transmitter.

Connector: JAE FI-SE209-HFE, 20-way.

Mating socket: 2 off 20Way 1.25mm pitch single row housing.
 Manufacturer: Hirose, part number DF14-20S-1.25C.
 40 off gold 26-28 AWG crimps.
 Manufacturer: Hirose, part number DF14-2628SCFA.

Pin	Signal name
1	+3.3V
2	+3.3V
3	GND
4	GND
5	D0-
6	D0+
7	GND
8	D1-
9	D1+
10	GND
11	D2-
12	D2+
13	GND
14	CK-
15	CK+
16	GND
17	FRC (pulled high)
18	DPS (default pulled low)
19	D3-
20	D3+



J22 - COM Express connector (COM Express only)

Connector: TYCO 3-1318490-6.

Mating socket: 5mm: TYCO 3-1827253-6, 8mm: TYCO 3-1318491-6.

Pin	Signal name	Pin	Signal name
A1	GND	B1	GND
A2	GBE0_MDI3-	B2	GBE0_ACT# (out) (160R series resistor)
A3	GBE0_MDI3+	B3	LPC_FRAME# (out)
A4	GBE0_LINK100# (out) (160R series resistor)	B4	LPC_AD0 (in/out)
A5	GBE0_LINK1000# (out) (160R series resistor)	B5	LPC_AD1 (in/out)
A6	GBE0_MDI2-	B6	LPC_AD2 (in/out)
A7	GBE0_MDI2+	B7	LPC_AD3 (in/out)
A8	GBE0_LINK# (220R pull down)	B8	LPC_DRQ0# (in)
A9	GBE0_MDI1-	B9	LPC_DRQ1# (in)
A10	GBE0_MDI1+	B10	LPC_CLK (out)
A11	GND	B11	GND
A12	GBE0_MDI0-	B12	PWRBTN# (in)
A13	GBE0_MDI0+	B13	SMB_CK (out) (SCH US15W)
A14	GBE0_CTREF (Power out)	B14	SMB_DAT (in/out) (SCH US15W)
A15	SUS_S3# (out)	B15	SMB_ALERT# (in)
A16	SATA0_TX+	B16	SATA1_TX+
A17	SATA0_TX-	B17	SATA1_TX-
A18	SUS_S4# ⁴ (out)	B18	SUS_STAT# (out) (LPCPD#)
A19	SATA0_RX+	B19	SATA1_RX+
A20	SATA0_RX-	B20	SATA1_RX-
A21	GND	B21	GND
A22	NC	B22	NC
A23	NC	B23	NC
A24	SUS_S5# (out)	B24	PWR_OK (in)
A25	NC	B25	NC
A26	NC	B26	NC
A27	BATLOW# (in) (SuperIO: GP14)	B27	WDT (out) (SuperIO: GP60)
A28	ATA_ACT# (out)	B28	NC

continued...

⁴ Connected to I2C expander PCA9535 port P13.

Pin	Signal name	Pin	Signal name
A29	AC_SYNC (out)	B29	NC
A30	AC_RST# (out)	B30	AC_SDIN0 (in)
A31	GND	B31	GND
A32	AC_BITCLK (out)	B32	SPKR (out) (220R series resistor)
A33	AC_SDOOUT (out)	B33	I2C_CK (out) (EC LPC2132)
A34	BIOS_DISABLE# (in) (CPLD)	B34	I2C_DAT (in/out) (EC LPC2132)
A35	THRMTRIP# (in) (CPLD)	B35	THRM# (in) (CPLD)
A36	NC	B36	NC
A37	NC	B37	NC
A38	NC	B38	NC
A39	NC	B39	NC
A40	NC	B40	NC
A41	GND	B41	GND
A42	USB2- (SCH US15W port 6 - high speed only!)	B42	USB3- (SCH US15W port 7 - high speed only!)
A43	USB2+ (SCH US15W port 6 - high speed only!)	B43	USB3+ (SCH US15W port 7 - high speed only!)
A44	USB_2_3_OC# (in) (SCH US15W port 6 and 7 overcurrent)	B44	USB_0_1_OC# (in) (SCH US15W port 1 and 3 overcurrent)
A45	USB0- (SCH US15W port 1)	B45	USB1- (SCH US15W port 3)
A46	USB0+ (SCH US15W port 1)	B46	USB1+ (SCH US15W port 3)
A47	VCC_RTC	B47	EXCD1_PERST# (out)
A48	EXCD0_PERST# ⁵ (out)	B48	EXCD1_CPPE# (in) (SuperIO: GP37)
A49	EXCD0_CPPE# (in) (SuperIO: GP34)	B49	SYS_RESET# (in)
A50	LPC_SERIRQ (in)	B50	CB_RESET# (out)
A51	GND	B51	GND
A52	NC	B52	NC
A53	NC	B53	NC
A54	GPIO (CPLD)	B54	GPO1 (SuperIO: GP57)
A55	NC	B55	NC
A56	NC	B56	NC
A57	GND	B57	GPO2 (SuperIO: GP50)

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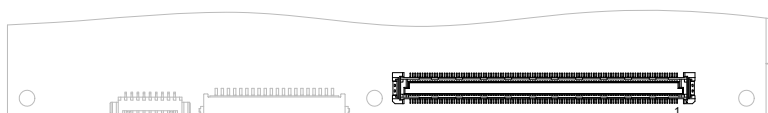
⁵ Connected to EXT_PRPH_RST# = Board reset (RST#) AND MANUAL_EXT_AND_CB_RST# (I2C expander PCA9535 port P11) This pin can be controlled by writing to I2C expander chip.

Pin	Signal name	Pin	Signal name
A58	PCIE_TX3+ (PCIE switch port 7)	B58	PCIE_RX3+ (PCIE switch port 7)
A59	PCIE_TX3- (PCIE switch port 7)	B59	PCIE_RX3- (PCIE switch port 7)
A60	GND	B60	GND
A61	PCIE_TX2+ (PCIE switch port 6)	B61	PCIE_RX2+ (PCIE switch port 6)
A62	PCIE_TX2- (PCIE switch port 6)	B62	PCIE_RX2- (PCIE switch port 6)
A63	GPI1(CPLD)	B63	GPO3 (SuperIO: GP51)
A64	PCIE_TX1+ (PCIE switch port 5)	B64	PCIE_RX1+ (PCIE switch port 5)
A65	PCIE_TX1- (PCIE switch port 5)	B65	PCIE_RX1- (PCIE switch port 5)
A66	GND	B66	WAKE0# ⁶ (in)
A67	GPI2 (SuperIO: GP61)	B67	WAKE1# ⁶ (in)
A68	PCIE_TX0+ (SCH US15W port 1)	B68	PCIE_RX0+ (SCH US15W port 1)
A69	PCIE_TX0- (SCH US15W port 1)	B69	PCIE_RX0- (SCH US15W port 1)
A70	GND	B70	GND
A71	LVDS_A0+ (SCH US15W LVDS)	B71	NC (PROTEUS V111: LVDS_B0+)
A72	LVDS_A0- (SCH US15W LVDS)	B72	NC (PROTEUS V111: LVDS_B0-)
A73	LVDS_A1+ (SCH US15W LVDS)	B73	NC (PROTEUS V111: LVDS_B1+)
A74	LVDS_A1- (SCH US15W LVDS)	B74	NC (PROTEUS V111: LVDS_B1-)
A75	LVDS_A2+ (SCH US15W LVDS)	B75	NC (PROTEUS V111: LVDS_B2+)
A76	LVDS_A2- (SCH US15W LVDS)	B76	NC (PROTEUS V111: LVDS_B2-)
A77	LVDS_VDD_EN (SCH US15W LVDS)	B77	NC (PROTEUS V111: LVDS_B3+)
A78	LVDS_A3+ (SCH US15W LVDS)	B78	NC (PROTEUS V111: LVDS_B3-)
A79	LVDS_A3- (SCH US15W LVDS)	B79	LVDS_BKLT_EN (out) (SCH US15W LVDS)
A80	GND	B80	GND
A81	LVDS_A_CK+ (SCH US15W LVDS)	B81	NC (PROTEUS V111: LVDS_B_CK+)
A82	LVDS_A_CK- (SCH US15W LVDS)	B82	NC (PROTEUS V111: LVDS_B_CK-)
A83	LVDS_I2C_CK (out) (SCH US15W LVDS)	B83	LVDS_BKLT_CTRL (out) (SCH US15W LVDS)
A84	LVDS_I2C_DAT (in/out) (SCH US15W LVDS)	B84	VCC_5V_SBY (+5V standby power)

continued...

⁶ PCIE_WAKE_MINI# = WAKE0# AND WAKE1# PCIE_WAKE_MINI# is connected to SCH US15W WAKE# or EC LPC2132 (build option).

Pin	Signal name	Pin	Signal name
A85	GPI3 (SuperIO: GP54)	B85	VCC_5V_SBY (+5V standby power)
A86	NC	B86	VCC_5V_SBY (+5V standby power)
A87	NC	B87	VCC_5V_SBY (+5V standby power)
A88	PCIE0_CK_REF+ (out)	B88	NC
A89	PCIE0_CK_REF- (out)	B89	NC
A90	GND	B90	GND
A91	NC	B91	NC
A92	NC	B92	NC
A93	GPO0 (SuperIO: GP56)	B93	NC
A94	NC	B94	NC
A95	NC	B95	NC
A96	GND	B96	NC
A97	VCC_12V (input power +12V)	B97	NC
A98	VCC_12V (input power +12V)	B98	NC
A99	VCC_12V (input power +12V)	B99	NC
A100	GND	B100	GND
A101	VCC_12V (input power +12V)	B101	VCC_12V (input power +12V)
A102	VCC_12V (input power +12V)	B102	VCC_12V (input power +12V)
A103	VCC_12V (input power +12V)	B103	VCC_12V (input power +12V)
A104	VCC_12V (input power +12V)	B104	VCC_12V (input power +12V)
A105	VCC_12V (input power +12V)	B105	VCC_12V (input power +12V)
A106	VCC_12V (input power +12V)	B106	VCC_12V (input power +12V)
A107	VCC_12V (input power +12V)	B107	VCC_12V (input power +12V)
A108	VCC_12V (input power +12V)	B108	VCC_12V (input power +12V)
A109	VCC_12V (input power +12V)	B109	VCC_12V (input power +12V)
A110	GND	B110	GND



J22

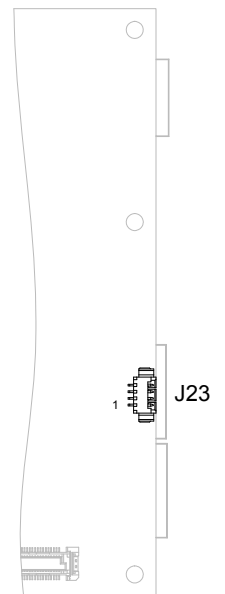
J23 - SATA power connector (stand alone only)

Connector: MOLEX 53261-0471.

Housing: 3Way MOLEX Housing (51021-0400) or equivalent.

Crimps: Crimps for MOLEX Housing (50058-8000) or equivalent.

Pin	Pin name
1	+5V
2	GND
3	GND
4	+5V

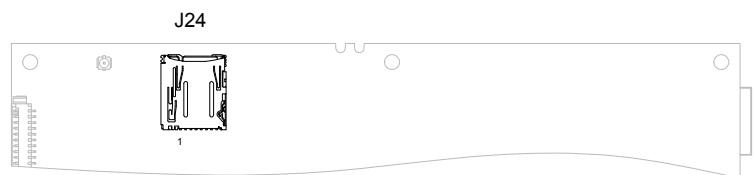


J24 - Micro SD slot

J24 is connected to SCH SDIO slot 1.

Connector: HIROSE DM3AT-SF-PEJ.

Pin	Pin name
1	DAT2
2	CD/DAT3
3	CMD
4	VDD
5	CLK
6	VSS
7	DAT0
8	DAT1
9	SW1 (CD#)
10	GND



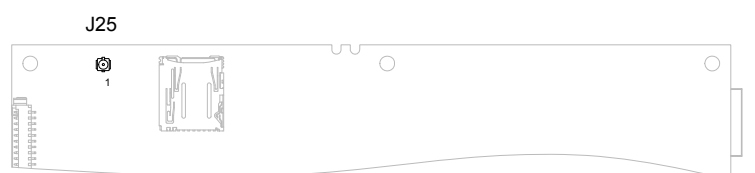
J25 - GPS antenna

J25 is connected to GPS module.

Connector: HIROSE U.FL-R-SMT.

Mating sockets: HIROSE U.FL-LP-040 or U.FL-LP-066 or U.FL-LP-062 or U.FL-LP-088 or equivalent.

Pin	Pin name
1	GPS RF IN (in)
2	GND
3	GND



J26 - FAN 2 connector (optional)

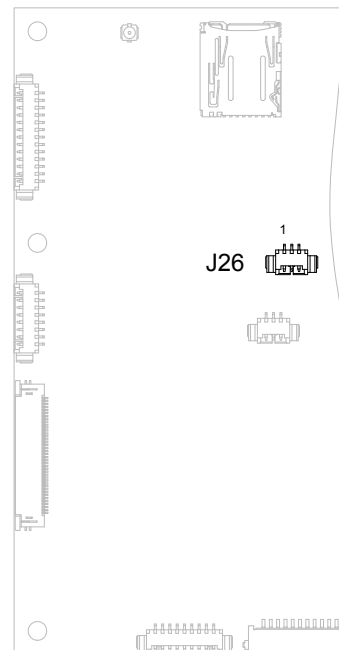
J26 is connected to Super IO FAN 2 control pins.

Connector: MOLEX 53261-0371.

Housing: 3Way MOLEX Housing (51021-0300) or equivalent.

Crimps: Crimps for MOLEX Housing (50058-8000) or equivalent.

Pin	Signal name	Description
1	FANTACH2 (in)	RPM input from FAN2
2	+5V	FAN2 power
3	GND (PWM)	FAN2 ground



J27 - EC serial debug output (for debugging purpose only)

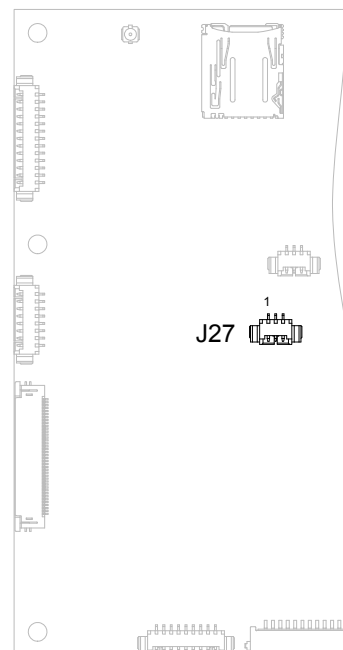
J27 is connected to Embedded controller serial line interface.

Connector: MOLEX 53261-0371.

Housing: 3Way MOLEX Housing (51021-0300) or equivalent.

Crimps: Crimps for MOLEX Housing (50058-8000) or equivalent.

Pin	Signal name	Description
1	EC_RX (in)	Embedded controller RX signal
2	EC_TX (out)	Embedded controller TX signal
3	GND	Ground

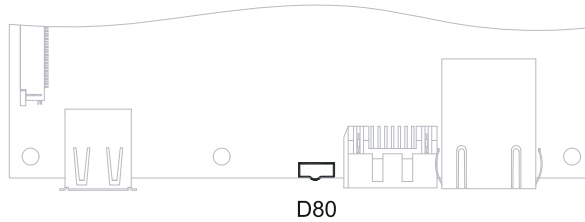


LEDs

D80 - Power / Sleep LED

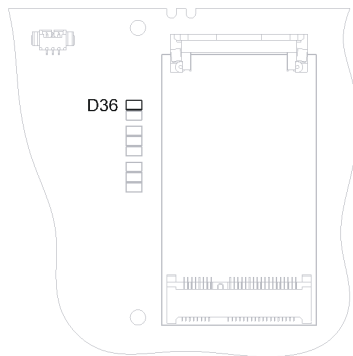
D80 is dual colour LED:

- Green colour indicates S0 state. in this state the board is fully running.
- Orange colour indicates S3 state. in this state the board is in sleep mode.



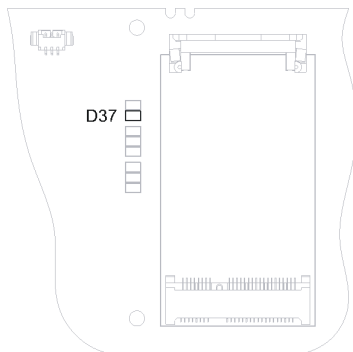
D36 - PCIe Minicard slot 0 activity

D36 indicates PCIe Minicard slot 0 activity. This signal is AND of WPAN, WLAN and WWAN signals coming from PCIE minicard 0 and depends on card setting.



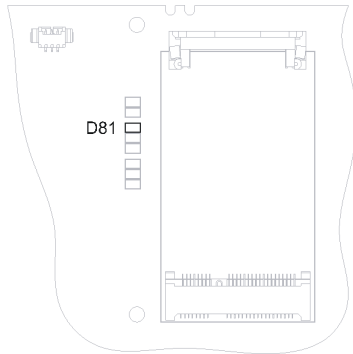
D37 - PCIe Minicard slot 1 activity

D37 indicates PCIe Minicard slot 1 activity. This signal is AND of WPAN, WLAN and WWAN signals coming from PCIE minicard 1 and depends on card setting.



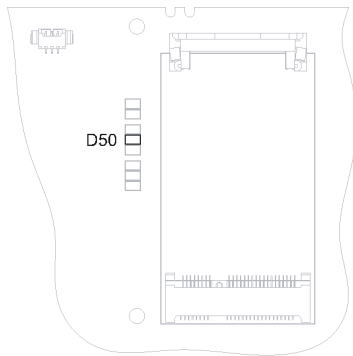
D81 - Thunderbolt / SATA activity

D81 indicates access to Thunderbolt or SATA drive.



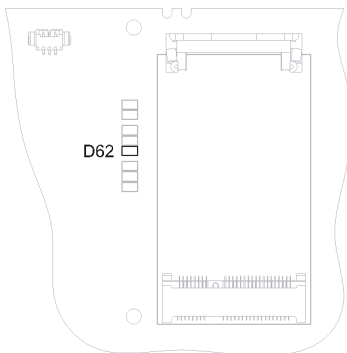
D50 - Bluetooth activity

D50 indicates Bluetooth activity and depends on WT11 module settings.



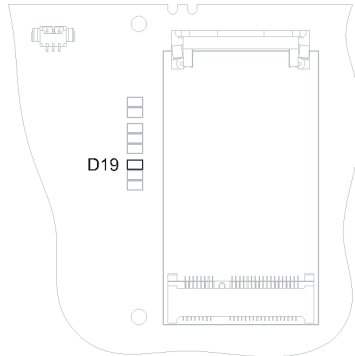
D62 - Micro SD card activity

D62 indicates access to micro SD card.

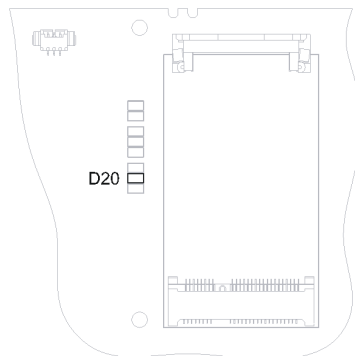


D19 - S3 power state indicator

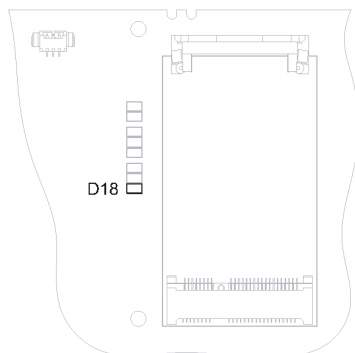
If D19 is ON all S3 power supplies are switched ON and output voltages / currents are in allowed tolerance.

**D20 - S0 power state indicator**

If D20 is ON all S0 power supplies are switched ON and output voltages / currents are in allowed tolerance.

**D18 - S5 power state indicator**

If D18 is ON all S5 power supplies are switched ON and output voltages / currents are in allowed tolerance.



GPIO mapping

There are three groups of GPIO pins on PROTEUS. First group is connected between I2C GPIO expander and connector J9. The second group is connected between SUPERIO and COM express connector (J22) and the third group is connected between CPLD and J22.

I2C GPIO pin mapping

PCA9535 I2C GPIO expander is mapped to I2C address 0x4E/0x4F (Read/Write). Following table shows GPIO expander port connections.

PCA9535 port number	Signal	Description
P0	GPIO_P0	Connected to J9 pin 1
P1	GPIO_P1	Connected to J9 pin 3
P2	GPIO_P2	Connected to J9 pin 4
P3	GPIO_P3	Connected to J9 pin 5
P4	GPIO_P4	Connected to J9 pin 6
P5	GPIO_P5	Connected to J9 pin 7
P6	GPIO_P6	Connected to J9 pin 8
P7	GPIO_P7	Connected to J9 pin 9
P8	I2C_USER_LED	Connected to J6 pin 9
P9	USBPWR_02_EN#	USB power enable for ports 0 and 2
P10	USBPWR_1_EN#	USB power enable for port 1
P11	NC	Not connected
P12	-	DO NOT USE, DO NOT CHANGE
P13	-	DO NOT USE, DO NOT CHANGE
P14	NC	Not connected
P15	I2C_SATA_VDD_EN	SATA power enable

SUPER IO pin mapping

There is SCH3114 super IO used on PROTEUS. Following table shows connection some of the SUPER IO pins.

SUPER IO GP pin number	Signal	Description
GP61	GPIO3	Connected to J22 pin A67
GP54	GPIO4	Connected to J22 pin A85
GP56	GPIO5	Connected to J22 pin A93
GP57	GPIO6	Connected to J22 pin B54
GP50	GPIO7	Connected to J22 pin B57
GP51	GPIO8	Connected to J22 pin B63
GP31	GPIO9	Connected to J6 pin 15
GP46	GPIO10	Connected to J6 pin 16
GP14	COM_BATLOW#	Connected to J22 pin A27
GP60	COM_WDT	Connected to J22 pin B27
GP67	GPS_SHDN#	GPS power shutdown
GP62	UART1_SHDN#	RS232 transceiver shutdown
GP34	SIO_SLOT0_PRESENT#	Connected to J22 pin A49
GP37	SIO_SLOT1_PRESENT#	Connected to J22 pin B48

CPLD pin mapping

Some of GPIO pins are controlled through CPLD. Control these pins use register mapped to I/O address 0x5A. Other registers can be found on 0x5B and 0x5C. See following tables with detailed description.

Address: 0x5A (Read/Write)

Bit	Description	Note
0	GPIO0 Data	Connected to J22 pin B35
1	GPIO1 Data	Reserved
2	GPIO0 Direction	1 – Output / 0 – Input
3	GPIO1 Direction	1 – Output / 0 – Input
4	GPIO0 Enable	1 – Enabled / 0 - Disabled
5	GPIO1 Enable	1 – Enabled / 0 - Disabled
6	-	Reserved
7	-	Reserved

Address: 0x5B (Read only)

Bit	Signal	Description
0	COM_THRM#	Connected to J22 pin B35
1	-	Reserved
2	-	Reserved
3	-	Reserved
4	-	Reserved
5	-	Reserved
6	-	Reserved
7	LVDS_OC#	LVDS A or B display power over current flag

Address: 0x5C (Read only)

Bit	Signal	Description
0	SDIO_SLOT1_OC#	SDIO card over current flag
1	PCIE_MINI0_OC#	PCIE mini card slot 0: +3.3V over current flag
2	PCIE_MINI1_OC#	PCIE mini card slot 1: +3.3V over current flag
3	-	Reserved
4	-	Reserved
5	-	Reserved
6	-	Reserved
7	-	Reserved

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

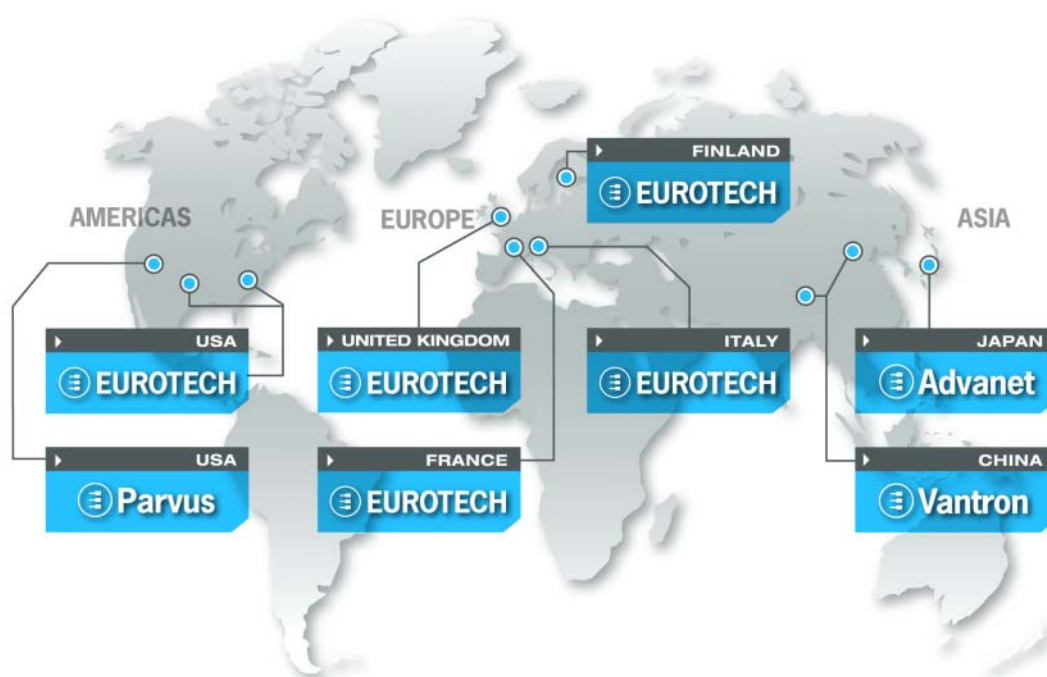


The Restriction of the use of certain Hazardous Substances (RoHS) Directive came into force on 1st July 2006. The PROTEUS board is designed using RoHS compliant components, and manufactured to comply with the RoHS Directive.

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 100 ppm.

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