

ISIS

PC/104-PLUS SINGLE BOARD COMPUTER

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REVISION HISTORY

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For contact details, see page [59](#).

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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.

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 ISIS is classified as a component with regard to the European Community EMC regulations and it is your 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 ISIS is included as [Appendix E – RoHS Compliance](#), page 57. 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 ISIS is a PC/104-Plus single board computer based on the Intel® Atom™ Z5xx series processor and US15W System Controller Hub (SCH).

The ISIS contains the CPU module and the carrier board. The CPU module contains the Intel Atom Z5xx series processor, US15W System Controller Hub (SCH), DDR2 SDRAM, BIOS, TPM and JTAG support, with video, audio and I/O connectivity supported via a board-to-board connector.

The ISIS board supports the following features:

- PCI Express Mini Card socket.
- PC/104-Plus (PCI bus).
- PC/104 (ISA bus).
- 10/100 Ethernet with MDI/MDI-X support.
- 24-bit LVDS.
- Analogue VGA interface.
- Intel High Definition Audio.
- One parallel ATA (IDE) port.
- Eight USB 2.0 ports.
- Bootable PATA NAND Flash.
- GPS receiver (optional).
- Two serial ports.
- User definable GPIO.
- SMBUS/I2C.
- One SDIO socket.

The ISIS board is available in the following variants:

- ISIS-1.6-M1G-F2G-GPS
- ISIS-1.6-M1G-F2G
- ISIS-1.1-M512-F2G-GPS
- ISIS XL-1.33-M1G-F2G-GPS-I
- ISIS XL-1.33-M1G-F2G-I
- ISIS XL-1.1-M512-F2G-GPS-I
- ISIS XL-1.1-M512-F2G-I

ISIS P/N options	ISIS configuration
-1.6; -1.33; -1.1	Intel Atom Processor (1.6GHz; 1.33GHz; 1.1GHz)
-M512; -M1G	DDR2 SDRAM (512MB; 1GB)
-F2G	2GB Intel PATA Flash fitted
-GPS	GPS receiver fitted
-I	Industrial temperature range

ISIS features

CPU module

Processor

- Intel Atom processor (13x13mm BGA):
1.6GHz TDP: 2W, or
1.1GHz TDP: 2W.

Chipset

- Intel US15W SCH (22mmx22mm BGA):
Premium 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.

Test support

- JTAG interface (Intel XDP).

Stacking connectors

- Power connector.
- High Density board-to-board connector supporting:
Video ports(LVDS, SDVO).
Intel High Definition Audio.
I/O Connectivity (Eight USB 2.0, two PCIe(x1), LPC, PATA, three SD/MMC).

ISIS PC/104-Plus board

Expansion buses

- PC/104-Plus (32-bit PCI).
- PC/104 (16-bit ISA).
- PCI Express Mini Card socket.
- SDIO socket (4-bit).
- I²C/SMBus.

Graphics

- Analogue VGA interface.
- Single-channel LVDS 24-bit interface.

Audio

- HD Audio digital signals on a pin header.

USB support

- USB 2.0 supporting low/full/high speed modes.
- Eight user accessible ports (on pin headers).

Ethernet

- One fast Ethernet port supporting 10/100 BaseT.

SuperIO

- SMSC SCH3114 SuperIO device.
- Eight GPIO.
- Four high speed serial ports 16C550 compatible.
Two user accessible ports (one RS232/RS485/RS422 and one RS232).
Two ports used to connect to on-board GPS receiver.
- PS/2 keyboard and mouse support.

Flash

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

IDE support

- Parallel ATA interface – single channel (master/slave).

GPS receiver

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

Power supply

- 5V operation.
- Power consumption 7–8W (average per typical application).
- On-board voltage regulators and power management.
- Power LED's.
- Supercap or external battery for RTC backup.

Mechanical

- PC/104-Plus form factor, 96mm x 90mm.
- 17.5mm overall height (including heat spreader).

Environmental

- Operating temperature:
Commercial: 0°C to +70°C.
Industrial: -40°C to +85°C.
- RoHS directive: Lead-free.

Software specification

Operating system support

The ISIS is compatible with the following operating systems:

- Microsoft Windows XP, XP Embedded, and Vista.
- Linux.

Eurotech provides Windows XP Embedded and Linux development kits which can be booted from an on-board PATA Flash device.

Drivers

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

As explained in the [Expansion buses](#) section, page 21, the PC/104 drivers require modification to accommodate the I/O base address offset of 0x3000.

BIOS

The ISIS 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:

- Full legacy IO support.
- ACPI and APM support.
- SMBIOS.
- Boot support for IDE, NAND Flash, and USB.
- PCIe/PCI bridge support.
- PCI/ISA bridge configuration.

The BIOS also provides operating system support for, Windows XP Embedded, Vista and Linux. Utilities to update the BIOS are provided.

Getting started with your ISIS

Once you have a working ISIS system, you can start adding other peripherals to enable you to start development. This section guides you through setting up and using peripherals and some of the features of the ISIS.

The ISIS is based on the InsydeH2O BIOS to provide support for the board as standard. BIOS defaults have been selected to enable the board to operate with a minimum of devices connected. If you want to change these default settings, you can use the BIOS setup program.

The setup parameters are stored in the Flash device and are retained when the power is switched off. If you wish to restore the default BIOS settings, pressing the **F3** key at any time from keyboard initialization to OS load causes the BIOS to rewrite all stored settings and reboot.

Identifying your ISIS version

You can identify the version of your ISIS board visually. All ISIS PCBs are marked on the top side with the ISIS name, board version and issue. There is also a label on the side of the PC/104 connector containing the full part number and serial number of the board.

Connecting a hard disk drive

The ISIS provides a single primary IDE controller, with an on-board PATA Flash device connected to the IDE interface (2GB or 4GB depending on your board configuration). A 44-way 2mm header (J5) is provided on the ISIS enabling one external IDE device to be connected. For optimum performance, ATA66 drives and faster should use an 80-way IDE ribbon cable with 40-way connectors. An 80-way cable has additional ground lines to improve the signal integrity at the higher ATA66 and ATA100 operating speeds.

If you add an external drive in addition to an on-board PATA Flash, it is recommended for PATA Flash to be set up as a 'master' and the external drive as a 'slave'. The blue (host) side of the 80-way IDE ribbon cable should be connected to the ISIS connector. The BIOS automatically detects the IDE devices during the POST processes and configures the hardware correctly. The BIOS allows either a master or slave device to be the boot device. The BIOS also allows for manual selection of transfer modes (Fast PIO, and UDMA-1 to UDMA-5)^(*).

Jumper JP2 is used to configure the on-board PATA Flash device as a 'master' or 'slave'. See [JP2 - PATA Flash master/slave](#), page [47](#) for further details.

For further details about the [IDE support](#), see page [25](#).



^(*)Transfer modes UDMA-3 and faster require the use of an 80-way IDE ribbon cable for correct operation. Using a lower quality 40-way IDE ribbon cable may cause data corruption.

You can only connect ONE external IDE drive.

Connecting a SDIO card

The ISIS has a single SDIO[®] socket that supports MMC4.0 and SDIO1.1 specifications. This provides support for data storage and I/O cards such as Bluetooth and IEEE802.11b (WiFi). For more information see: www.sdcard.org/developers/tech/sdio/.

The SDIO card can only be inserted into the socket one way. The correct orientation is for the top of the card (i.e. the normal printed side) to be furthest from the PCB. SD memory card boot is not supported.

For further details about the [SDIO/MMC socket](#), see page [23](#).

Connecting a PS/2 keyboard and mouse

A PS/2 keyboard and mouse is supported on a multifunction 18-way boxed header (J4). Suitable cables and breakout board are provided in the development kit. The PS/2 interfaces are made available on the ISIS breakout board through the PS/2 MiniDIN connectors.

See page [38](#) for connector details.

Turning on your ISIS

In case you are using the ATX style power supply (via J9 power connector, with the use of +V5_STB and PSON# signals), a momentary ON push button switch is required to power the board. Yellow LED D30 should light to indicate the presence of the standby voltage +V5_STB. After pressing the power button, the green LED D7 should light to indicate that the ISIS power supplies are within regulation (PWRGOOD). To power off the board, press and hold the push button switch. The push button switch connection is available on a 11-way power connector J9. See [J9 - Auxiliary power connector](#), page [42](#).

If you are only using +5V power input (as from a brick power supply), the push button switch is not required. You can turn your power supply on to power the ISIS. In this case, both LED's D30 and D10 should light at the same time.

The ISIS development kit implements both of the above methods (depending on jumper selection). For more details, see the ISIS development kit documentation.



With ATX style method, standby voltage is constantly applied to the ISIS. Remove all the power and make sure the yellow LED D30 is not lit before any hardware (peripherals, keyboards, mice, monitors, accessories, add-in cards, etc) is added or removed from the board.

Using the battery or supercap

The external battery connection is provided on a 18-way connector ([J4 - Multifunction and VGA connector](#)). The battery is provided in the ISIS development kit.

An optional supercap is provided on-board in cases where the external battery is not available. To use the supercap, you need to short the jumper JP3, see page [47](#) for details.



JP3 must be open if an external battery is used.

Using the serial interfaces

The two serial port interfaces on the ISIS are fully PC compatible. COM1 and COM2 are decoded at standard PC address locations. PC applications can use these ports without any special configuration.

COM3 and COM4 are dedicated serial ports used to support an optional on-board GPS receiver, and as such are not available to you. The default baud rates of the GPS receiver are 4800Baud (COM3), and 57600Baud (COM4).

The BIOS setup screens are used to configure the operation of each of the serial ports. COM2 can be configured for RS232, RS422 or RS485 interface, while COM1 is RS232 only.

If RS422 or RS485 interface is selected, you can enable/disable the termination resistor within the BIOS setup. If RS485 mode is selected the Auto-RS485 feature is used. You can select either RTS# and DTR# signals for Auto-RS485 control.

Serial ports COM1 and COM2 support baud rates of up to 250KBaud.

Connections to COM1 and COM2 are via a 18-way boxed header (J17). The pin assignment of this header is arranged to enable two 9-way IDC D-Type plugs to be connected directly to pins 1-18 on the cable. See page [45](#) for connector details.

Suitable cables and breakout board are provided in the ISIS development kit. In the development kit, COM1 is normally used to control the touch screen interface. An alternative cable is provided in the development kit that makes COM1 available for you to use.

See [Serial ports](#), page [27](#) for further details about the serial port interface.

Using the audio features

The ISIS provides an HD audio digital interface on a multifunction 20-way boxed header (J14), see page [43](#) for connector details. A breakout board and a suitable cable are provided in the development kit.

A breakout board (ISIS-HDA) contains HD audio codec (Analogue Devices AD1986A). It supports standard line in, line out, mic in functionality, or alternatively can be configured in software to support the 5.1 speaker output format. The audio outputs are made available through board-mounted 3.5mm stereo jacks.

See [Audio support](#), page [24](#), for further details.

Using the flat panel interface

The ISIS provides a single channel LVDS LCD display header (J6) that can be used to directly interface to LVDS LCD displays up to a maximum resolution of 1366 x 768. The display type can be selected from the BIOS Intel IGD video setup menu and the OS driver setup menus. See page [40](#) for connector details.

The ISIS provides the backlight power supply (+5V) and backlight control signals on a 7-way boxed header (J22), see page [46](#) for connector details. L_BKLTCTL is a pulse width modulation (PWM) signal that controls the intensity of the backlight. L_BKLTEN turns power to the backlight on or off.

See [Graphics support](#), page [23](#), for further details.

Using the Analogue VGA interface

The ISIS provides an analogue VGA display interface on a multifunction 18-way boxed header (J4), see page [38](#) for connector details. This can be used to directly interface to analogue VGA displays up to a maximum resolution of 1280x1024. The display type can be selected from the BIOS Intel IGD video setup menu and the OS driver setup menus.

A suitable cable and breakout board are provided in the ISIS development kit. The ISIS breakout board contains a standard 15-way IDC D-Type VGA connector.

See [Graphics support](#), page [23](#), for further details.

Using the USB ports

The ISIS provides eight user accessible USB2.0 ports. They are available on boxed headers (J16 – ports 0/1/4/5, J7 – ports 2/3, J14 – ports 6A/6B). See pages [40](#), [43](#) and [45](#) for connector details.

USB port 2 can be configured as host or client port using the BIOS setup utility.

The OS boot from the USB mass storage devices is supported.

USB ports 0/1/4/5 are available in the development kit on the ISIS breakout board on a standard type-A USB connectors.

See [USB support](#), page [25](#), for further details.



Before connecting any USB devices that supply power to the port 2 (type-B USB connectors), you **MUST** ensure that port 2 is configured as a client (using the BIOS Setup utility).

Using the Ethernet interface

The ISIS provides one 10/100 Ethernet port, available on a 8-way boxed header (J20), see page [46](#), for connector details. A suitable cable and breakout board are provided in the ISIS development kit. The ISIS breakout board contains a standard RJ-45 connector with built-in transformer.

See [Ethernet interface](#), page [25](#), for further details.

Using the PC/104 expansion bus

PC/104 modules can be used with the ISIS to add extra functionality to the system. This interface supports 8/16 bit ISA bus style peripherals.

In order to use a PC/104 board with the ISIS it should be plugged into J1 for 8-bit cards and J1/J2 for 16-bit cards. Before you power up the system, check that the jumper settings on the add-on cards for I/O address and IRQ settings do not conflict with each other or with devices on the ISIS.

If you are using a PC/104 card that requires +5V, this is automatically supplied via the PC/104 header. +12V, -12V and -5V are only available if you connect the +12V, -12V and -5V pins on the power connector J9 to a supply; otherwise they must be supplied directly to the PC/104 stack.

The Intel Atom chipset does not support the legacy DMA, so the PC/104 expansion interface on the ISIS does not support DMA.

The Intel Atom chipset does not support the legacy ISA bus. Due to the specific implementation of the PC/104 bus, the I/O base address for the ISA peripherals has been set to 0x3000. The drivers for PC/104 modules have to be modified to accommodate for this.

For more information, see the [Expansion buses](#), page [21](#), or for connector pin details see page [36](#).

Using the PC/104-Plus expansion bus

PC/104-Plus modules can be used with the ISIS to add extra functionality to the system. This interface supports 5V and 3.3V signalling, 33MHz 32-bit PCI bus peripherals that conform to the PC/104-Plus specification.

To use a PC/104-Plus peripheral module with the ISIS, plug it into J3. Before powering up the system, please consult the user manual supplied with your peripheral module to ensure correct signalling voltage. To select the correct signalling on the ISIS, use jumper JP1 to set the correct VIO voltage (see page [48](#) for details).

The ISIS supplies only the selected VIO voltage to the PC/104-Plus stack, as defined by the *PC/104-Plus Specification Version 2.0*. +5V is also supplied to the stack directly from the input power connector J9.

+12V and -12V are only available if you connect the +12V and -12V pins on the power connector J9 to a supply, otherwise they must be supplied directly to the PC/104-Plus stack. If you require +3.3V, it must be supplied directly to the PC/104-Plus stack.

For more information, see [PC/104-Plus bus interface](#), page [21](#), or for connector pin details see page [36](#).

System resources

PCI Devices and functions

Bus	Device	Function	Function description
0	0	0	Host Bridge
	2	0	Integrated Graphics & Video Device
	26	0	USB Client
	27	0	HD Audio Controller
	28	0	PCI Express Port 1
		1	PCI Express Port 2
	29	0	USB Classic UHCI Controller 1
		1	USB Classic UHCI Controller 2
		2	USB Classic UHCI Controller 3
		7	USB2 EHCI Controller
	30	1	SDIO/MMC Port 1
	31	0	LPC Interface
		1	PATA Controller
	1	0	0
2		0	PC/104+ slot 0
3		0	PC/104+ slot 1
4		0	PC/104+ slot 2
5		0	PC/104+ slot 3
2	6	0	IT8888 ISA Bridge
	7	0	Intel 82551IT PCI Ethernet controller

I/O map

IO location	Functional block
[00000000 - 00000CF7]	PCI bus
[00000020 – 0000002D]	Programmable interrupt controller (8259)
[0000002E - 0000002F]	LPC SuperIO index registers
[00000030 – 0000003D]	Programmable interrupt controller (8259)
[00000040 - 00000043]	System timer (8254)
[0000004E - 0000004F]	Motherboard resources
[00000050 - 00000053]	System timer (8254)
[00000060 - 00000060]	PS/2 keyboard controller
[00000061 - 00000061]	Motherboard resources
[00000063 - 00000063]	Motherboard resources
[00000064 - 00000064]	PS/2 keyboard controller

continued...

IO location	Functional block
[00000065 - 00000065]	Motherboard resources
[00000067 - 00000067]	Motherboard resources
[00000070 - 00000077]	System CMOS/RTC
[00000080 - 00000083]	Motherboard resources
[00000092 - 00000092]	Motherboard resources
[000000A0 - 000000 B1]	Programmable interrupt controller (8259 slave)
[000000B2 - 000000B3]	Power management
[000000B4 - 000000 BD]	Programmable interrupt controller (8259 slave)
[00000170 – 00000177]	PATA controller
[000001F0 - 000001F7]	PATA controller
[00000274 - 00000277]	ISAPNP Read Data Port
[00000279 - 00000279]	ISAPNP Read data Port
[000002F8 - 000002FF]	COM2 (default)*
[000003B0 - 000003BB]	Intel Poulsbo Graphics Controller Function 0
[000003C0 - 000003DF]	Intel Poulsbo Graphics Controller Function 0
[000003E8 - 000003EF]	COM3 (default)*
[000003F6 - 000003F6]	PATA controller
[000003F8 - 000003FF]	COM1 (default)*
[00000400 - 0000040F]	Motherboard resources
[00000410 - 0000041F]	Motherboard resources
[000004D0 - 000004D1]	Programmable interrupt controller (8259)
[00000500 - 0000057F]	Motherboard resources
[00000580 - 000005FF]	SuperIO runtime registers
[00000600 - 0000063F]	Motherboard resources
[00000640 - 0000065F]	SuperIO security key
[00000A79 - 00000A79]	ISAPNP Read Data Port
[00000D00 - 0000FFFF]	PCI bus
[00002000 - 00005FFF]	Intel Poulsbo Family PCI Express Root Port 1 - 8110
[00002000 - 00004FFF]	Tundra Tsi381 PCIe-to-PCI bridge
[00003000 – 0000302F]	PC/104
[00004000 - 0000403F]	Intel 82551IT PCI Ethernet controller
[00006000 - 0000601F]	Intel Poulsbo USB UHC - 8116
[00006020 - 0000603F]	Intel Poulsbo USB UHC - 8115
[00006040 - 0000605F]	Intel Poulsbo USB UHC - 8114
[00006060 - 0000606F]	PATA controller (Bus master IDE)
[00006070 - 00006077]	Intel Poulsbo Graphics Controller Function 0



* The locations marked with an asterisk in the above table are based on the BIOS default settings; the IO location of these devices will change if the default BIOS options are modified.

System memory map

System memory segment	Description
[000A0000 - 000BFFFF]	Intel Poulsbo Graphics Controller Function 0
[000C0000 - 000DFFFF]	Expansion area
[000E0000 - 000EFFFF]	Extended BIOS (LPC)
[000F0000 - 000FFFFFF]	BIOS (LPC)
[3FC00000 - 3FFFFFFF]	PCI bus
[40000000 - FEBFFFFFF]	PCI bus
[40000000 - 7FFFFFFF]	Motherboard resources
[80000000 - 821FFFFFF]	Intel Poulsbo PCI Express Root Port 1 - 8110
[80000000 - 810FFFFFF]	Tundra Tsi381 PCIe-to-PCI bridge
[80000000 - 800FFFFFF]	PC/104
[81000000 - 8101FFFF]	Intel 82551IT PCI Ethernet controller
[81020000 - 81020FFF]	Intel 82551IT PCI Ethernet controller
[81100000 - 81100FFF]	Tundra Tsi381 PCIe-to-PCI bridge
[90000000 - 9FFFFFFF]	Intel Poulsbo Graphics Controller Function 0
[A0000000 - A0FFFFFF]	Intel Poulsbo PCI Express Root Port 1 - 8110
[A1000000 - A107FFFF]	Intel Poulsbo Graphics Controller Function 0
[A1080000 - A10BFFFF]	Intel Poulsbo Graphics Controller Function 0
[A10C0000 - A10CFFFF]	High Definition Audio
[A10C4000 - A10C43FF]	Intel Poulsbo USB2.0 EHCI - 8117
[A10C0400 - A10C04FF]	SDA Standard Compliant SD Host Controller
[A10C0500 - A10C05FF]	SDA Standard Compliant SD Host Controller
[A10C0600 - A10C06FF]	SDA Standard Compliant SD Host Controller
[E0000000 - EFFFFFFF]	Motherboard resources
[FEC00000 - FEC00FFF]	Motherboard resources
[FED00000 - FED003FF]	High precision event timer
[FED10000 - FED13FFF]	Motherboard resources
[FED40000 - FED4BFFF]	Motherboard resources
[FEE00000 - FEE00FFF]	Motherboard resources
[FF000000 - FFFFFFFF]	Intel 82802 Firmware Hub Device (LPC)
[FFC00000 - FFC3FFFF]	High BIOS (LPC)

Interrupts

IRQ	Interrupt source
0	System timer
1	PS/2 keyboard controller
3	COM2*
4	COM1*
6	COM3*
8	System CMOS/real time clock
9	ACPI subsystem interrupt*
12	PS/2 compatible mouse*
14	IDE controller
16	Intel Poulsbo Family PCI Express Root Port 1 - 8110
16	Intel 82551IT PCI Ethernet controller
18	Intel Poulsbo Family USB Universal Host Controller - 8114
19	Intel Poulsbo Family USB Universal Host Controller - 8115
20	Intel Poulsbo Family USB Universal Host Controller – 8116
20	High Definition Audio
21	Intel Poulsbo Family USB2 Enhanced Host Controller - 8117
22	SDA Standard Compliant SD Host Controller

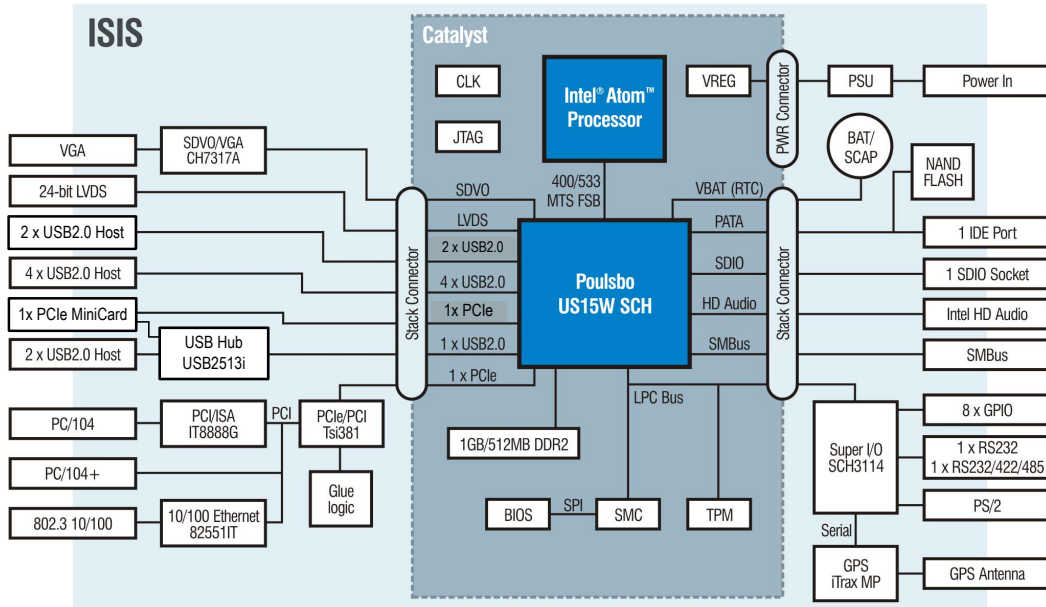


*The IRQ assignments for the devices marked with an asterisk are based on the BIOS default settings; they are therefore dependent on the BIOS configuration settings.

Hardware specification

Block diagram

The following block diagram shows the implementation of the ISIS PC/104-Plus SBC:



Core processor/chipset module

The ISIS is based on the Intel Atom Z5xx series processor and US15W System Controller Hub (SCH). It supports up to 1GB of DDR2 SDRAM, BIOS, TPM and JTAG. The ISIS PC/104-Plus board interfaces to the CPU module via a board-to-board connector to provide video, audio and I/O connectivity.

The Intel Atom Z5xx series processor is a high-performance, ultra low power processor with several microarchitectural enhancements over existing Intel mobile processors. US15W SCH is a single-chip system controller hub (SCH) that consists of an integrated graphics controller, a memory controller, and an I/O controller. The SCH combines the functionality normally found in a 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 for fully featured operating systems.

The Atom processor/US15W SCH platform is designed to support very low power applications (<5W for CPU+Chipset). Intel Atom is available in two frequency SKUs of 1.6GHz (2W) and 1.1GHz (1W). Parts are available in commercial temperature range (0°C to +70°C), and industrial temperature range (-40°C to +85°C).

Intel Atom processor is available in the following frequency SKU's:

Product Name	Frequency	TDP	Temperature range	Package	Chipset Pairing
Z530	1.6GHz	2.2W	0C to +70C	BGA-441 13x14mm	US15W (2.3W)
Z510	1.1GHz	2W	0C to +70C	BGA-441 13x14mm	BGA-1249 22x22mm
Z530P	1.6GHz	2.2W	0C to +70C	XL BGA-437 22x22mm	US15WP (2.3W)
Z510P	1.1GHz	2.2W	0C to +70C	XL BGA-437 22x22mm	BGA-1295 37.5x37.5mm
Z520PT	1.3GHz	2.2W	-40C to +80C	XL BGA-437 22x22mm	US15WPT (2.3W)
Z510PT	1.1GHz	2.2W	-40C to +80C	XL BGA-437 22x22mm	BGA-1295 37.5x37.5mm

Expansion buses

PC/104-Plus bus interface

The PC/104-Plus bus interface on ISIS supports PCI local bus compatible peripherals, as defined in the *PCI Local Bus Specification Revision 2.2*. This version of the PCI bus is intended as a 32-bit bus running at 33MHz (as specified in the *PC/104-Plus Specification Version 2.0*).

A Tundra Tsi381 PCI Express (PCIe) to PCI bridge IC is used to implement the PCI bus on the ISIS. The Tundra Semiconductor Tsi381 is a high-performance bridge that connects the serialized PCIe protocol to the parallel PCI bus standard. It connects directly to the PCIe x1 Port 1 provided by the US15W SCH on the CPU module.

Some additional glue logic is required to expand the PCI REQ#/GNT# capability. Four REQ#/GNT# signal pairs are supported by Tundra Tsi381 device, and ISIS supports six PCI devices (Ethernet controller, PCI/ISA bridge and four PC/104-Plus slots). The glue logic is implemented in a CPLD.

A standard stack through connector for the PCI bus (4x30-pin, 2mm pitch) is used for this interface (as specified in the *PC/104-Plus Specification Version 2.0*). See page [36](#) for connector pin details.

A shrouded connector is used on the bottom side of the PCB. The CPU module is fitted on the top side of the ISIS PCB with 8mm standoffs, and uses the heat spreader to support the module. In standard operation the ISIS is used on top of the PC/104-Plus stack, however PC/104-Plus and PC/104 connectors on ISIS are accessible from the topline if a PC/104-Plus extender standoff solution is used.

The ISIS supplies only the selected VIO voltage to the PC/104-Plus stack, as defined by the *PC/104-Plus Specification Version 2.0*. +5V is also supplied to the stack directly from the input power connector J9.

+12V and -12V are only available if you connect the +12V and -12V pins on the power connector J9 to a supply, otherwise they must be supplied directly to the PC/104-Plus stack. If you require +3.3V, it must be supplied directly to the PC/104-Plus stack.

PC/104 bus interface

PC/104 bus interface (www.pc104.org) supports 16-bit ISA compatible peripherals. Standard 64+40 way 0.1" stack-through connectors are used. See page 36 for connector pin details.

If you are using a PC/104 card that requires +5V, this is automatically supplied via the PC/104 header. +12V, -12V and -5V are only available if you connect the +12V, -12V and -5V pins on the power connector J9 to a supply; otherwise they must be supplied directly to the PC/104 stack.

An ISA compatible bus is implemented using the ITE IT8888G PCI/ISA bridge connected to the Tundra Tsi381 PCIe/PCI bridge. As Tsi381 does not support a subtractive decode option, positive decode for ISA address space has been used. This means that memory and IO windows within PCI/ISA bridge and US15W SCH have to be configured.

Due to this specific implementation of the PC/104 bus, the I/O base address for the ISA peripherals has been set by BIOS to 0x3000 and the accessible I/O range is 768 bytes. The drivers for PC/104 modules have to be modified to accommodate for this. For example, if PC/104 module uses the IO address 0x240, the driver will have to use the base address 0x3240.

The ISA memory range of 1MB is configured by BIOS at the base address 0x08000000.

As the US15W SCH does not support legacy DMA, so there is no DMA support on the ISA bus. Only 8/16-bit memory and IO PC/104 cards are supported.

PCI Express Mini Card socket

A PCI Express Mini Card socket is available on the ISIS for wireless connectivity or other functionality.

There are two PCI Express root ports available from the CPU module's interface connector. Port 1 is used on the ISIS to implement a parallel PCI bus (through a PCIe/PCI bridge), and Port 2 is used to connect directly to the PCIe Mini Card socket.

USB 2.0 port 6C (via USB2513i USB Hub) and SMBus (supported by US15W SCH) are also routed to the PCIe Mini Card socket. The required signals from a SIM card socket mounted onto the ISIS board are also routed to the PCIe Mini Card socket. A +3.3V and +1.5V power supply lines are routed to the PCIe Mini Card socket to provide power to the card.

For more information on PCI Express Mini Cards, see www.pcisig.com.

For socket pinout details, see page [41](#).

Pin 20 of the PCI Express Mini Card socket is connected to SuperIO (GP55) for use with wireless modems (W_DISABLE# signal). Some wireless modems require that you toggle this signal to enable normal operation.

SDIO/MMC socket

An SDIO bus socket is provided on the ISIS. The US15W SCH contains three SDIO/MMC ports. Ports 0 and 2 are 8-bits wide, while Port 1 is 4 bits wide. Port 1 is connected directly to the SDIO socket on the ISIS. The SDIO/MMC controller supports MMC4.0 and SDIO1.1 specifications. The MMC 4.0 specification is available from the MultitMediaCard Association at www.mmca.org. A simplified version of the SDIO specification is available from the SD Card Association at www.sdcard.org.

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.

For socket pinout details, see page [43](#).

Graphics support

The integrated 2D/3D graphics controller supports hardware accelerated graphics display and video processing capabilities. The IGD (Integrated Graphics Device) provides LVDS and Serial DVO (SDVO) display ports permitting simultaneous independent operation of two displays. A 24-bit LVDS video interface drives the primary display, while a Serial Digital Video (SDVO) interface drives a secondary display.

The US15W SCH includes a graphics controller that supports hardware accelerated graphics display and video processing capabilities, including full HD video decode and ultra low power integrated 3D graphics.

The ISIS provides a single channel 24-bit LVDS interface on a 20-pin header connector (J6). See page [40](#) for LVDS connector details.

An analogue VGA interface is provided on a 18-pin multifunction header (J4) using a Chrontel CH7317A device connected to the SDVO interface. See page [38](#) for analogue VGA connector details.

The following sections specify display resolutions at the maximum refresh rate and colour depth. The graphics display processing performance, as measured by refresh rate, is expected to be roughly inversely proportional to the display resolution and to the dual display output modes. Higher resolutions may be possible at lower refresh rates and colour depths. This relationship is due primarily to the increased processing bandwidth required at higher output resolutions.

LVDS Video Interface

The Intel SCH US15W supplies a LVDS video interface to drive a primary display.

The following table summarises the LVDS video interface capabilities.

Feature	LVDS Interface
Resolution	Single display up to 1366 x 768 at 85 Hz, 8-bit per lane or dual display up to 1280 x 768 at 85 Hz, 8-bit per lane.
Operation	Extended desktop or clone mode.
Display parameter	Centering, scaling, and rotation.

Analogue VGA

In addition to the LVDS video, the Intel SCH US15W drives a secondary display on the SDVO interface. On the ISIS, this secondary interface provides analogue VGA interface through a Chrontel CH7317A device. The following table summarises the SDVO interface capabilities.

Feature	SDVO Interface
Resolution	Single display up to 1280 x 1024 at 85 Hz, full colour or dual display up to 1280 x 768 at 85 Hz, full colour.
Configurations	EDID and non-EDID.
Operation	Extended desktop or clone mode.

Backlight

Most LCDs include one or more cold-cathode fluorescent lamp (CCFL) tubes to backlight the displays. Backlight inverters drive the panel backlights. These circuits are typically external to the display and generate the several hundred volts required to drive the CCFL tubes. Backlights can easily become the greatest source of power consumption in a portable system. Most backlight inverters include control signals to dim and turn off the backlight.

The ISIS provides the backlight power supply (+5V) and backlight control signals on a 7-way boxed header (J22). L_BKLTCTL is a pulse width modulation (PWM) signal that controls the intensity of the backlight. L_BKLTEN turns power to the backlight on or off. See page [46](#) for backlight connector details.

Audio support

The ISIS supports an Intel High Definition Audio interface. HD Audio digital interface is provided on a 20-pin header (J14), and an external adaptor board with the HD audio CODEC is required. A breakout board (ISIS-HDA) that contains HD audio codec (Analogue Devices AD1986A) is available from Eurotech, contact the sales team for details.

See page [43](#) for HD audio connector details.

Intel HD Audio delivers significant improvements over the previous generation AC'97 audio interface. Intel HD Audio hardware is capable of delivering the support and sound quality for up to eight channels at 192 kHz/32-bit quality, while the AC'97 specification can only support six channels at 48 kHz/20-bit. While HD and AC'97 interface signal sets are the same, the two protocols are not compatible with each other.

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

USB support

The US15W SCH contains an Enhanced Host Controller Interface (EHCI) host controller, which supports up to eight USB 2.0 high-speed root ports (0 to 7). USB 2.0 allows data transfers up to 480 Mb/s.

USB 2.0 ports 0-6 are available on three headers on the ISIS board. Port 6 is used in conjunction with the SMSC USB2513i USB 2.0 hub for an additional three downstream ports. Two downstream ports of the hub are routed to a header, the third one is routed to the PCIe Mini Card socket. The following table shows the USB 2.0 ports routing on the ISIS:

US15W ports 0/1/4/5	US15W ports 2-3	US15W port 6	US15W port 6
Header J16	Header J7	Header J14 (Two downstream ports of a USB 2.0 hub)	PCIe Mini Card (3 rd downstream port of a USB 2.0 hub)

Common mode choke coils and ESD suppression are added to the USB data lines to improve signal integrity and provide ESD protection. Power-distribution switches are used to provide 500mA current-limited power supply to all eight user accessible USB2.0 ports.

USB port 2 can be configured as host or client port using the BIOS setup utility.

The OS boot from the USB mass storage devices is supported. See pages [40](#), [43](#) and [45](#) for connector details.



Before connecting any USB devices that supply power to the port 2 (type-B USB connectors), you MUST ensure that port 2 is configured as a client (via a BIOS setup utility).

Ethernet interface

A 10/100 Ethernet interface is available on the ISIS board. This is implemented using an Intel 82551IT Fast Ethernet Controller. The Intel 82551IT is interfaced to the PCI local bus provided by the Tundra Tsi381 PCIe/PCI bridge.

The Intel 82551IT Fast Ethernet Controller integrates Ethernet MAC and PHY layer functions in a single, compact component. The Intel 82551IT combines Intel's fourth generation MAC design, with fully integrated, physical-layer circuitry to provide a standard IEEE 802.3 Ethernet interface for 100BASE-TX and 10BASE-T applications (802.3, 802.3u). Intel 82551IT supports MDI/MDI-X feature, providing the ability to automatically detect the required cable connection type and configure the MDI port to the cable type. This feature enables auto-correction of incorrect cabling with respect to cross-over versus straight-through cables.

Ethernet interface and LED's are available on an 8-way header ([J20 - 10/100 Ethernet](#)). See page [46](#), for connector details.

An external adaptor board with magnetics is required for operation of the Ethernet interface. An ACS-9095-05 adaptor is available from Eurotech. For more details, see [Appendix B – ISIS cable kit](#), page [50](#).

In case you wish to design your own adaptor board, the example of an Ethernet adaptor schematic is provided in [Appendix C – Ethernet adaptor schematic](#), page [55](#).

IDE support

The US15W SCH parallel ATA/IDE interface is routed from the CPU module interface to a 44-pin header (J5) on the ISIS board.

The US15W SCH's PATA interface supports only the primary channel, with one master and one slave device.

The following table lists supported IDE/PATA standards and modes.

IDE/PATA standard	Transfer modes supported	Transfer rate (Mbps)
ATA-1 (ATA, IDE)	PIO modes 0, 1, 2 Single-word DMA modes 0, 1, 2 Multi-word DMA mode 0	3.3, 5.2, 8.3 2.1, 4.2, 8.3 4.2
ATA-2, ATA-3 (EIDE, Fast ATA)	PIO modes 3, 4 Multi-word DMA modes 1, 2	11.1, 16.6 13.3, 16.6
ATA/ATAPI-4 (Ultra DMA, Ultra ATA)	Ultra DMA modes 0, 1, 2 (a.k.a. Ultra DMA/33)	16.7, 25.0, 33.3
ATA/ATAPI-5 (Ultra-DMA, Ultra ATA)	Ultra DMA modes 3, 4 (a.k.a. Ultra DMA/66)	44.4, 66.7
ATA/ATAPI-6 (Ultra-DMA, Ultra ATA)	Ultra-DMA mode 5 (a.k.a. Ultra DMA/100)	100 (reads), 89 (writes)

The primary IDE interface is made available to you through a 44-way 2mm pitch pin header. A common application is to connect this interface to a 2.5-inch ATA/IDE disk drive. For connector details, see page [38](#).



To improve signal integrity an 80-way IDE cable with 40-way connectors should be used with devices supporting Ultra ATA/66 and above.

PATA Flash

The ISIS 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. The Intel Z-P140 PATA solid state disk is used for this function.

Jumper JP2 is used to configure the on-board PATA Flash device as a 'master' or 'slave'. See [JP2 - PATA Flash master/slave](#), page [47](#), for further details.

SuperIO

An SMSC SCH3114 SuperIO controller is used to provide legacy IO support for the ISIS board. The SCH3114 SuperIO resides on the LPC bus and provides four serial ports and general purpose IO on the ISIS. Legacy keyboard/mouse is also supported.

Serial ports

The SMSC SCH3114 SuperIO provides four fully functional NS16C550 compatible serial ports on the ISIS board. It supports up to 115KBaud data rates and 16-Byte Send/Receive FIFO's. RS-485 Auto Direction flow control mode is also supported.

Serial port 1 is made available as a full RS-232 interface supporting all modem control lines, with a factory build option for TTL level signalling. Serial port 2 is a BIOS selectable RS232/485/422 port; all modem control lines are supported under RS-232. When in RS-485 mode, Auto-RS485 flow control is also available. Fail-safe circuitry is fitted as standard to the RS485/422 interface, and line termination resistors are selectable via the BIOS setup. Serial ports are available on an 18-pin header J17 (see page [45](#) for connector details). All ports use ESD protected components.

The serial ports 3 and 4 are available to interface to the on-board GPS receiver.

GPS receiver

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

Fastrax iTrax300 GPS module is used. 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 module provides complete signal processing from antenna to serial data output in either NMEA messages (COM3) or in SiRF binary protocol (COM4). The default serial port configuration on the GPS module is shown in the following table:

Serial data output	Serial data format	Serial data speed (default)
COM3: NMEA	8 bits, no parity, 1 stop bit	NMEA: 4800 baud
COM4: SiRF binary	8 bits, no parity, 1 stop bit	SiRF binary: 57600 baud

The GPS module also provides a PPS (1 pulse per second) signal that is connected to a GPIO with interrupt capabilities (GP27 on the SMSC SCH3114 SuperIO device).

More information on iTrax300 module can be found at: www.fastrax.fi.

GPIO

Eight general purpose IO's are provided via a 12-way header (J15), these are individually configurable as inputs or outputs. GPIO1 and GPIO2 are 3.3V CMOS signals, derived from CPU module's CPLD. The other six GPIO's are derived from GPIO pins of a SuperIO device SCH3114. These six GPIO's are 3.3V signalling, 5V tolerant signals. The following table shows the GPIO port mapping.

Signal name	GPIO Mapping	Type
GPIO1	CPLD GPIO1	3.3V CMOS
GPIO2	CPLD GPIO2	3.3V CMOS
GPIO3	SuperIO GP61	3.3V CMOS ^(*)
GPIO4	SuperIO GP54	3.3V CMOS ^(*)
GPIO5	SuperIO GP56	3.3V CMOS ^(*)
GPIO6	SuperIO GP57	3.3V CMOS ^(*)
GPIO7	SuperIO GP50	3.3V CMOS ^(*)
GPIO8	SuperIO GP51	3.3V CMOS ^(*)

(*)5V tolerant

For GPIO connector details see page [44](#).

SMBus

A system management bus is made available for customer use via a GPIO header (J15). The US15W SCH provides an SMBus Rev1.0 compliant host controller. Maximum operating frequency of SMBus as specified in *System Management Bus Specification Rev1.0* is 100KHz.

The I²C bus and the SMBus are essentially compatible with each other. Normally devices, both masters and slaves, are freely interchangeable between both buses. Both buses feature addressable slaves (although specific address allocations can vary between the two buses). The buses operate at the same speed, up to 100KHz, but the I²C bus has both 400kHz and 2MHz versions. Obviously, complete compatibility between both buses using all devices is ensured only below 100kHz.

For SMBus connector details see page [44](#).

Power requirements

The ISIS operates from +5V (+/-5%) power input. All other supply rails are generated on-board.

A +12V supply connection is provided through J9, however the ISIS does not use this. The +12V and -12V rails are routed to PC/104-Plus and PC/104 connectors and can be used by other devices or modules that are stacked onto the ISIS module. -5V supply connection is also provided at the power input connector ([J9 - Auxiliary power connector](#)), and is only routed to the PC/104 connector for use by PC/104 add-on modules.

An external coin cell battery input is available through an 18-way header ([J4 - Multifunction and VGA connector](#)). An optional on-board SuperCap is provided. Jumper JP3 is used to connect an on-board SuperCap (see page [47](#) for details).

Power consumption

The power consumption of the ISIS is 7–8W (average per typical application).

The following table shows some power consumption measurements taken on the ISIS board.

Hardware	OS/Activity	Total board power	
		Atom 1.6GHz	Atom 1.1GHz
ISIS board + PS/2 key + USB mouse + Ethernet	XPe/ Idle	7.1W	6.6W
ISIS board + PS/2 key + USB mouse	XPe/BurnIn	8.7W	8.0W
ISIS board + PS/2 key + USB mouse	XPe/BurnIn + Video playing	8.7W	8.0W
Board + PS/2 key + USB mouse + USB test + Eth + GPS	XPe/BurnIn + Video playing	10.4W	9.0W
ISIS board + PS/2 key + USB mouse + Ethernet	XPe + Internet Video playing	7.8W	7.0W



The details in the table above were recorded when Windows XP Embedded was running from on-board PATA Flash and VGA display was used at 1024x768 resolution. PassMark® BurnIn test software was used in some of the measurements.

Mechanical

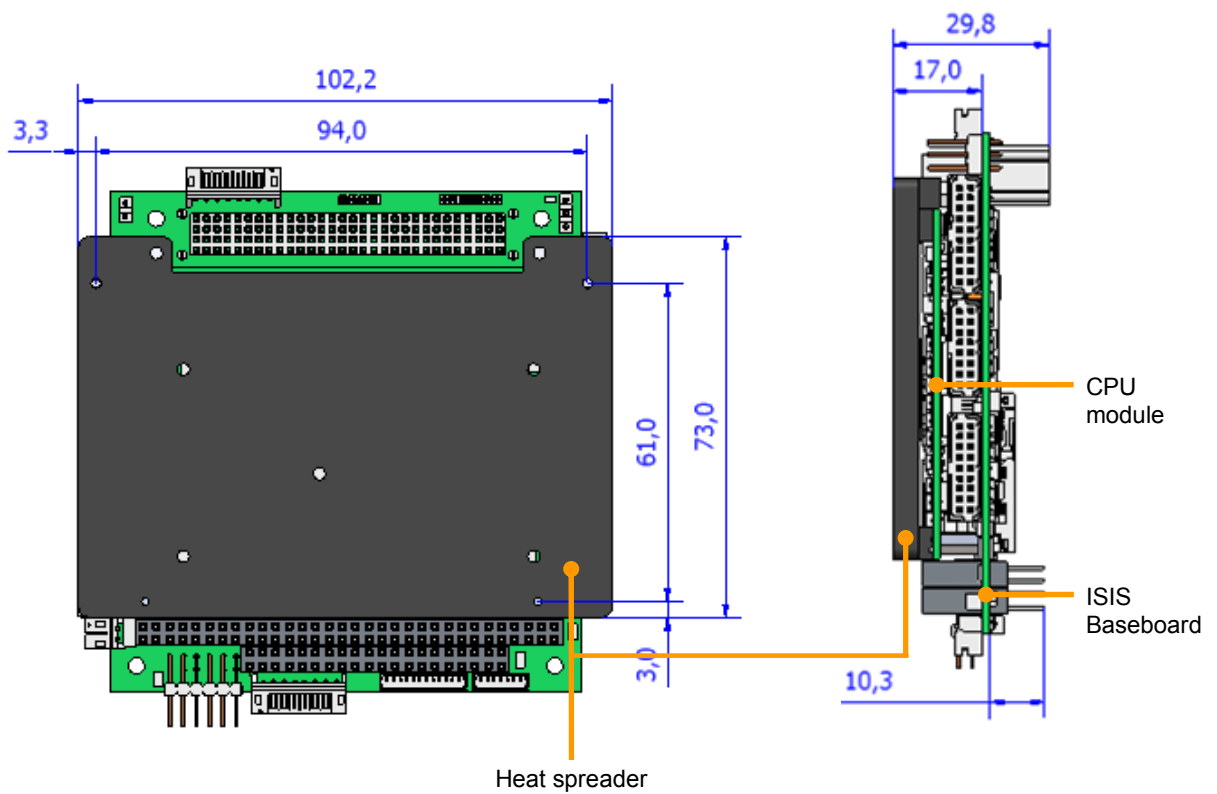
The ISIS is based on PC/104-Plus form factor standard.

The CPU module is mounted via a 220-pin stacking interface connector to the ISIS board. An 8mm stacking height is used in order to accommodate PCI Express Mini Card heights of up to 5mm. The vertical height of the ISIS does not fully comply with the PC/104-Plus specification; however access to the top side PC/104 and PC/104-Plus connectors is still possible.

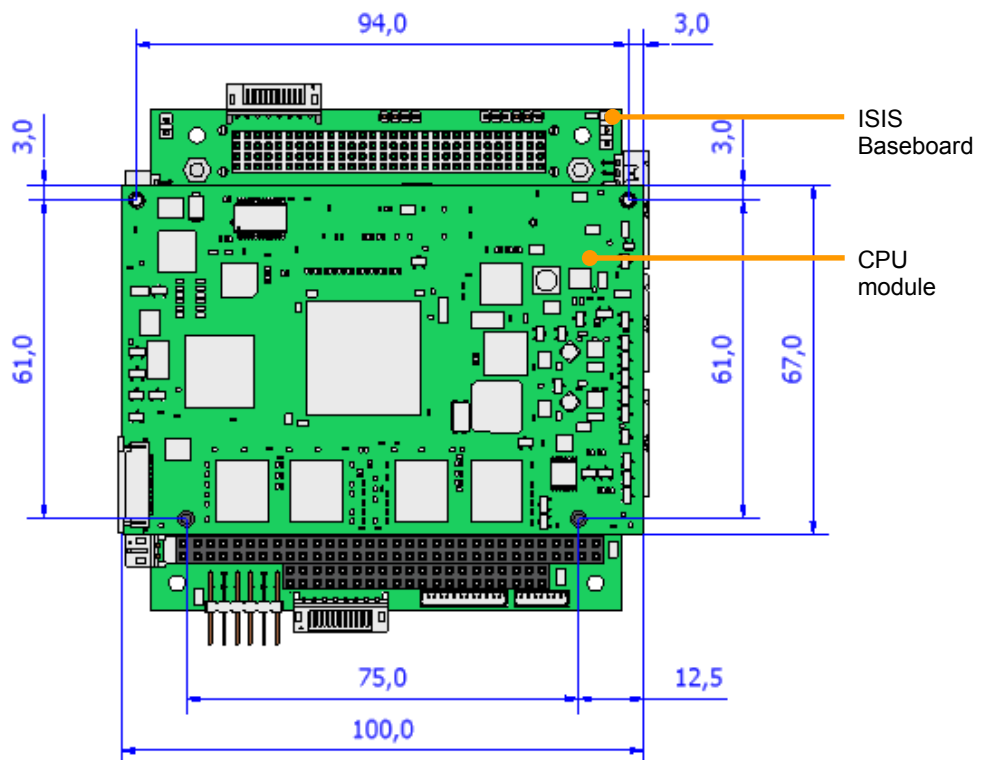
A custom designed heat spreader is required for the processor and chipset. The heat spreader is used on top of the CPU module. It connects to the ISIS through 4 spacers, two of which go through the CPU module, and two mount directly to the ISIS. Another two mounting holes on the CPU module are used to connect to the heat spreader.

Mechanical drawings are shown on the following page.

Top and side view



Top view (heat spreader not fitted)



Connectors, jumpers and LEDs

The ISIS has the following connectors:

Connector	Function	Connector details in section
J1	ISA Bus	J1, J2 and J3 - Buses for PC/104-Plus connectivity, page 36.
J2	ISA Bus	J1, J2 and J3 - Buses for PC/104-Plus connectivity, page 36.
J3	PCI Bus	J1, J2 and J3 - Buses for PC/104-Plus connectivity, page 36.
J4	Multifunction, VGA	J4 - Multifunction and VGA, page 38.
J5	IDE	J5 - IDE connector, page 38.
J6	Video (24-bit LVDS)	J6 - 24-bit LVDS video, page 40.
J7	USB 2.0 (Ports 2 and 3)	J7 - USB 2.0 (ports 2 and 3), page 40.
J8	PCI Express Mini Card	J8 - PCI Express Mini Card, page 41.
J9	Aux. power	J9 - Auxiliary power connector, page 42.
J11	SIM card	J11 - SIM card, page 42.
J12	SD/SDIO/MMC	J12 - SD/SDIO/MMC, page 43.
J13	IDE activity LED	J13 - IDE activity LED, page 43.
J14	USB 2.0 (ports 6A and 6B), and HD AUDIO	J14 - USB 2.0 (ports 6A and 6B) and HD audio, page 43.
J15	GPIO and SM bus	J15 - GPIO and SM Bus, page 44
J16	USB 2.0 (ports 0,1,4,5)	J16 - USB 2.0 (ports 0, 1, 4, 5), page 45.
J17	Serial ports 1 and 3	J17 - COM1 and COM2, page 45.
J18	GPS RF connector	J18 - GPS RF, page 45.
J20	10/100 Ethernet	J20 - 10/100 Ethernet , page 46.
J22	Backlight Inverter control	J22 - Backlight inverter control, page 46.
J24	Remote SIM card (optional)	J24 – Remote SIM card, page 46.

The ISIS has the following jumpers:

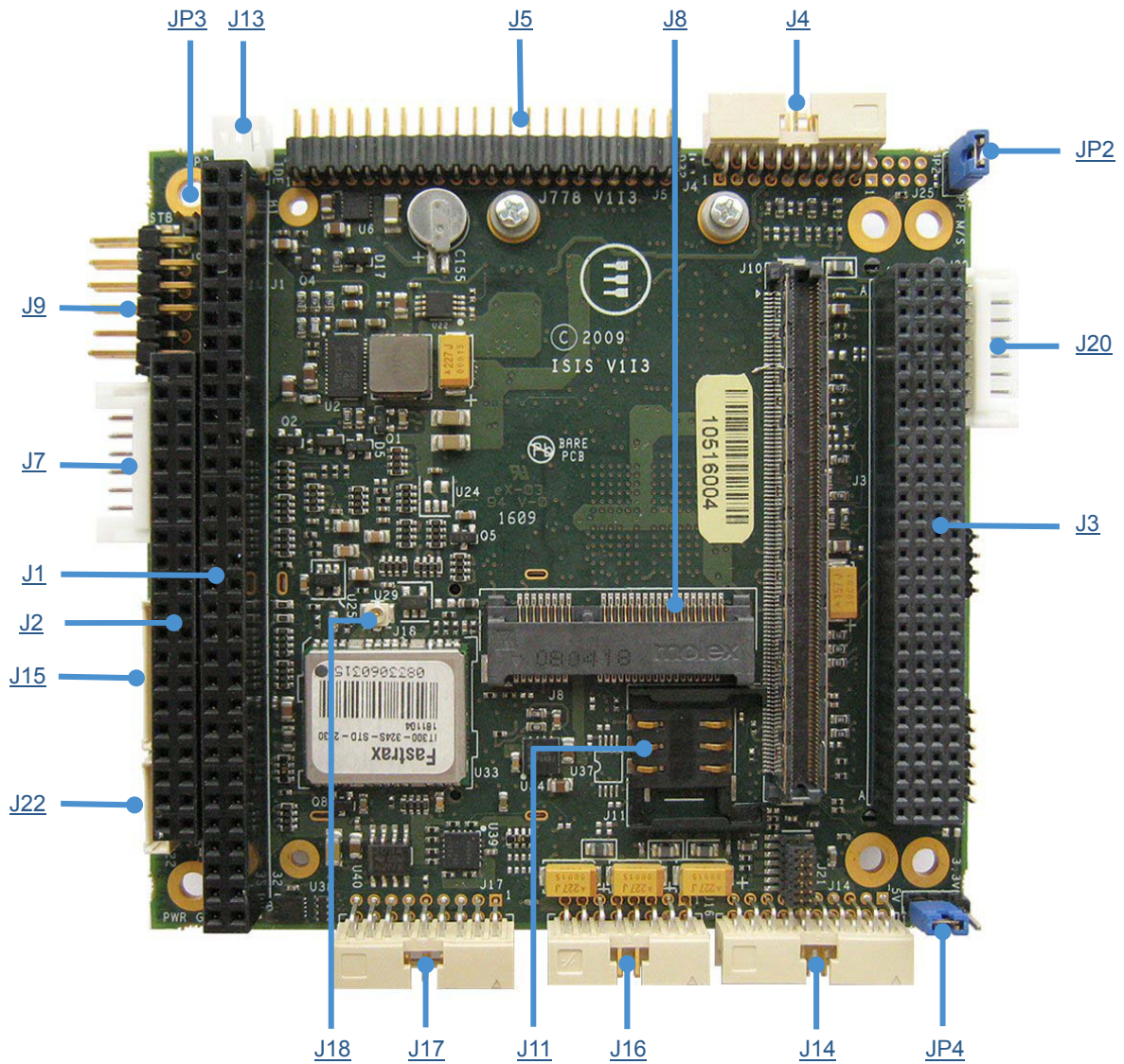
Jumper	Function	Jumper details in section
JP2	PATA Flash master/slave. Default: closed (master)	JP2 - PATA Flash master/slave, page 47.
JP3	Supercap enable Default: open (disable)	JP3 - On-board supercap selection, page 47.
JP4	PC/104-Plus signalling Default: 1-2 (+5V)	JP4 - PC/104-Plus signalling selection, page 48.

The ISIS has the following LEDs:

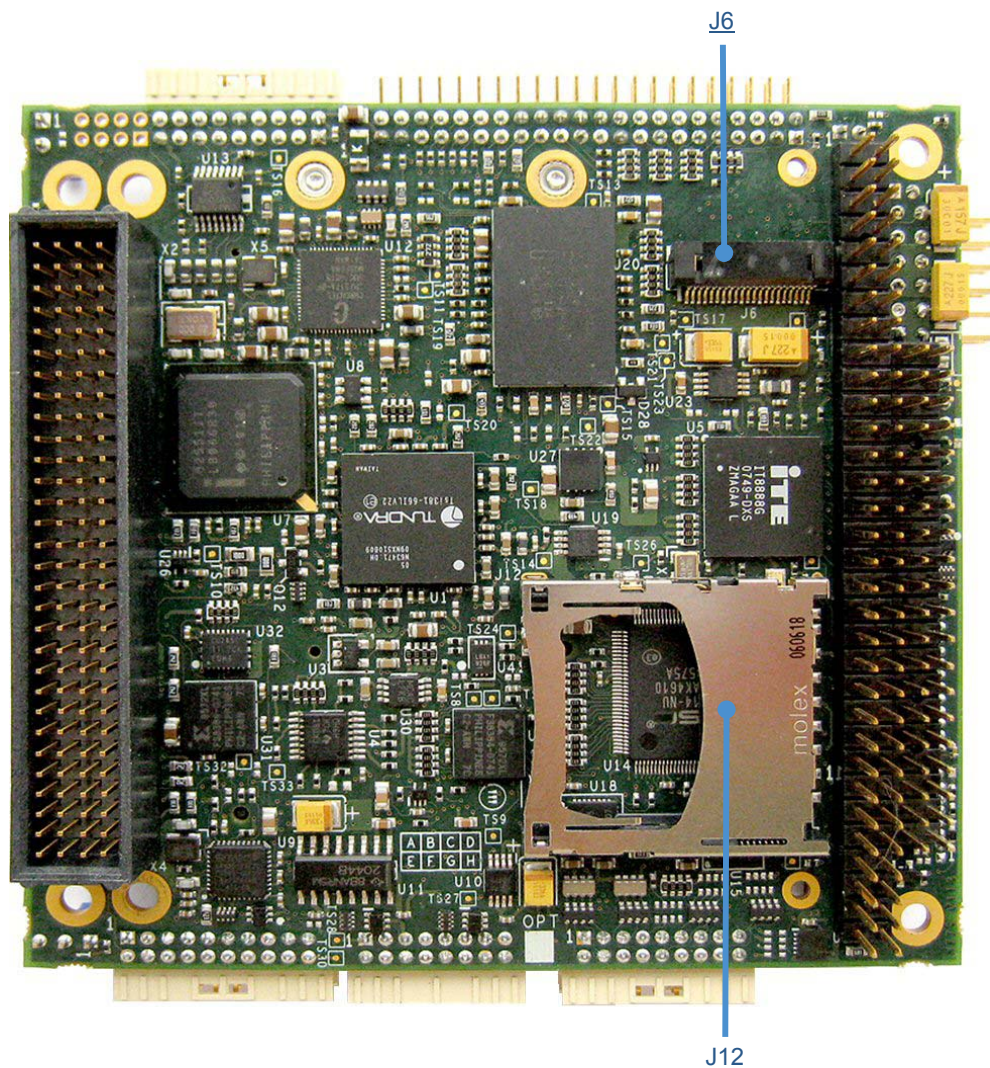
LED	Function	LED details in section
D6	SDIO access LED	D6 – SDIO access LED, page 48.
D7	Power LED	D7 - Power LED, page 48.
D30	Standby LED	D30 - Standby LED, page 48.

The following diagrams show the location of the connectors, jumpers and LEDs on the ISIS.

Top view



Bottom view



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

Connectors

J1, J2 and J3 - Buses for PC/104-Plus connectivity

Connector J1: Astron 25-1201-232-2G-R, 64-way, 2.54mm (0.1") x 2.54mm (0.1") stackthrough PC/104 compatible connector (Row A and B).

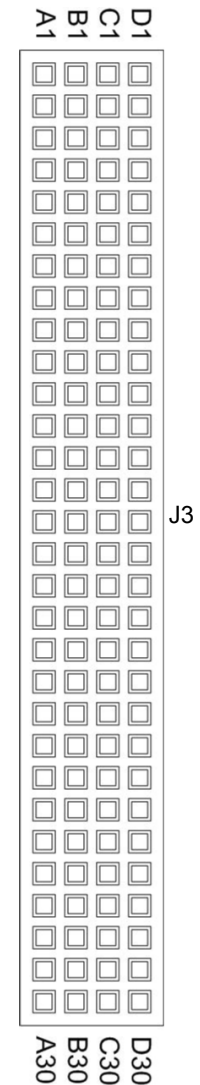
Connector J2: Astron 25-1201-220-2G-R, 40-way, 2.54mm (0.1") x 2.54mm (0.1") stackthrough PC/104 compatible connector (Row C and D).

Pin	Row D	Row C	Pin	Row A	Row B
			1	IOCHCHK	GND2
			2	SD7	RESETDRV
			3	SD6	VCC1
			4	SD5	IRQ9
			5	SD4	-5V
			6	SD3	DRQ2*
			7	SD2	-12V
			8	SD1	ZEROWS
0	GND2	GND1	9	SD0	+12V
1	MEMCS16	SBHE	10	IOCHRDY	KEY
2	IOCS16	LA23	11	AEN	SMEMW
3	IRQ10	LA22	12	SA19	SMEMR
4	IRQ11	LA21	13	SA18	IOW
5	IRQ12	LA20	14	SA17	IOR
6	IRQ15	LA19	15	SA16	DACK3*
7	IRQ14	LA18	16	SA15	DRQ3*
8	DACK0*	LA17	17	SA14	DACK1*
9	DRQ	MEMR	18	SA13	DRQ1*
10	DACK5*	MEMW	19	SA12	REFRESH
11	DRQ5*	SD8	20	SA11	SYSCLK
12	DACK6*	SD9	21	SA10	IRQ7
13	DRQ6*	SD10	22	SA9	IRQ6
14	DACK7*	SD11	23	SA8	IRQ5
15	DRQ7*	SD12	24	SA7	IRQ4
16	+5V	SD13	25	SA6	IRQ3
17	MASTER	SD14	26	SA5	DACK2*
18	GND3	SD15	27	SA4	TC*
19	GND4	KEY	28	SA3	BALE
			29	SA2	VCC2
			30	SA1	OSC
			31	SA0	GND3
			32	GND1	GND4

* No DMA support

Connector J3: Samtec ESQT-130-02-MQ-368, 120-way, 2mm (.0787") stackthrough PC/104-Plus compatible socket.

Pin	Row A	Row B	Row C	Row D
1	GND	RSVD	+5V	AD0
2	VIO	AD2	AD1	+5V
3	AD5	GND	AD4	AD3
4	C/BE0#	AD7	GND	AD6
5	GND	AD9	AD8	GND
6	AD11	VIO	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1#	AD15	+3.3V
9	SERR#	GND	SB0#	PAR
10	GND	PERR#	+3.3V	SDONE
11	STOP#	+3.3V	LOCK#	GND
12	+3.3V	TRDY#	GND	DEVSEL#
13	FRAME#	GND	IRDY#	+3.3V
14	GND	AD16	+3.3V	C/BE2#
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3#	VIO	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0#	GND	REQ1#	VIO
24	GND	REQ2#	+5V	GNT0#
25	GNT1#	VIO	GNT2#	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD#	+5V	RST#
29	+12V	INTA#	INTB#	INTC#
30	-12V	REQ3#	GNT3#	GND

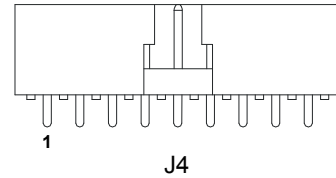


J4 - Multifunction and VGA connector

Connector: FCI Minitek 98464-G61-18ULF, 18-way, 2mm (.0787"), shrouded header.

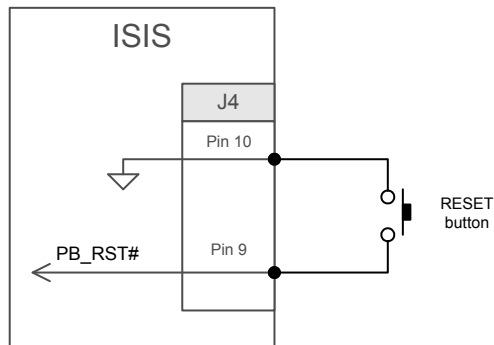
Mating socket: FCI Minitek 90311-018LF.

Pin	Signal name	Pin	Signal name
1	GND	2	+5V
3	KBDATA	4	KBCLK
5	MSDATA	6	MSCLK
7	BAT_IN	8	PC_BEEP
9	PB_RST#	10	GND
11	MON_HSYNC	12	MON_VSYNC
13	MON_RED	14	MON_GREEN
15	MON_SCL ^(*)	16	MON_SDA ^(*)
17	GND	18	MON_BLUE



(*) ISIS V1I2 has SCL/SDA pins reversed

Reset button connection example

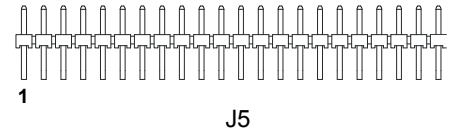


J5 - IDE connector

Connector: OUPIIN 2111-2X22-G-R, 44-way, 2mm (.0787"), header.

Mating socket: FCI Minitek 89947-144LF 44-way (22x2), 2mm (.0787") IDC receptacle.

Pin	Signal name	Pin	Signal name
1	RST#	2	GND
3	DD7	4	DD8
5	DD6	6	DD9
7	DD5	8	DD10
9	DD4	10	DD11
11	DD3	12	DD12
13	DD2	14	DD13
15	DD1	16	DD14
17	DD0	18	DD15
19	GND	20	KEY20
21	DDREQ	22	GND
23	DIOW#	24	GND
25	DIOR#	26	GND
27	IOCHRDY	28	GND (ALE)
29	DDACK#	30	GND
31	IRQ14	32	N.C.
33	DA1	34	PDIAG#
35	DA0	36	DA2
37	DCS1#	38	DCS3#
39	LED#	40	GND
41	+5V	42	+5V
43	GND	44	N.C.

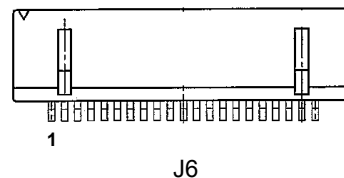


J6 - 24-bit LVDS video

Connector: JST FI-W21P-HFE, 21-way 1.25mm (0.05") header.

Mating socket: JST FI-WE21S.

Pin	Signal name	Pin	Signal name
1	+3.3V	2	+3.3V
3	GND	4	GND
5	LA_DATA0	6	LA_DATA0+
7	GND	8	LA_DATA1-
9	LA_DATA1+	10	GND
11	LA_DATA2-	12	LA_DATA2+
13	GND	14	LA_CLK-
15	LA_CLK+	16	GND
17	LA_DATA3-	18	LA_DATA3+
19	GND	20	LVDS_MSEL *
21	N.C.		



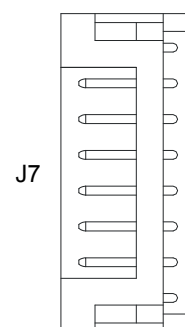
* Mode Select pin on some LVDS panels

J7 - USB 2.0 (ports 2 and 3)

Connector: JST S8B-PH-K-S, 8-way, 2mm (.0787"), shrouded header.

Mating socket: JST PHR-8.

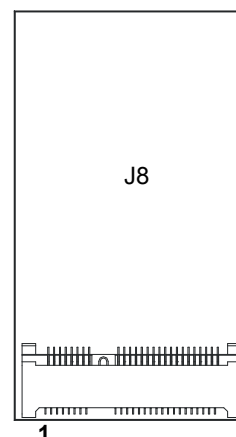
Pin	Signal name
1	+V5_USB23
2	USB_D2-
3	USB_D2+
4	GND
5	+V5_USB23
6	USB_D3-
7	USB_D3+
8	GND



J8 - PCI Express Mini Card

Connector: MOLEX 67910-0001, 52-way, 0.80mm (.310") PCI Express Mini Card connector.

Pin	Signal name	Pin	Signal name
1	N.C.	2	+3.3V
3	N.C.	4	GND
5	N.C.	6	+1.5V
7	CLKREQ#	8	UIM_PWR
9	GND	10	UIM_DATA
11	REFCLK-	12	UIM_CLK
13	REFCLK+	14	UIM_RST#
15	GND	16	UIM_VPP
17	N.C.	18	GND
19	N.C.	20	W_DIS#
21	GND	22	PERST#
23	PCIE_RXD2-	24	+3.3Vaux
25	PCIE_RXD2+	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PCIE_TXD2-	32	SMB_DATA
33	PCIE_TXD2+	34	GND
35	GND	36	USB_D6C-
37	GND	38	USB_D6C+
39	+3.3V	40	GND
41	+3.3V	42	N.C.
43	GND	44	N.C.
45	N.C.	46	N.C.
47	N.C.	48	+1.5V
49	N.C.	50	GND
51	N.C.	52	+3.3V



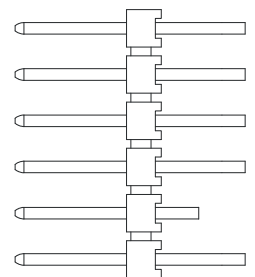
J9 - Auxiliary power connector

J9 is an auxiliary power connector and can be used to power the module as an alternative to the PC/104-Plus bus.

Connector: SAMTEC 2TSW-106-08-G-D-RA, 12-way, 2.54mm (0.1"), header.

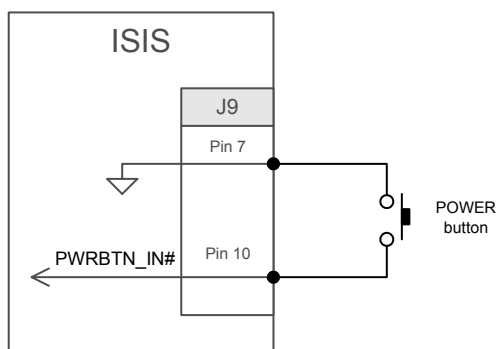
Mating connector: FCI 65043-031LF - 2.54mm receptacle housing.
Crimp FCI 47750-000LF (22AWG wire).

Pin	Signal name	Pin	Signal name
1	GND	2	VCC5_IN
3	N.C.	4	+12V
5	-5V	6	-12V
7	GND	8	VCC5_IN
9	N.C.	10	PWRBTN_IN#
11	+V5_STB	12	PS_ON#

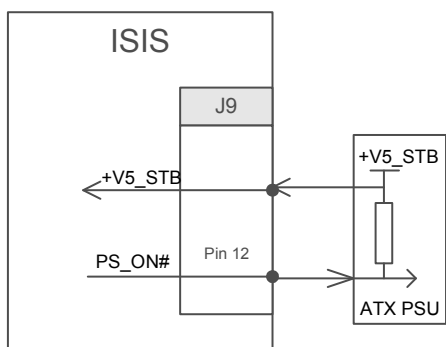


J9

POWER button connection example



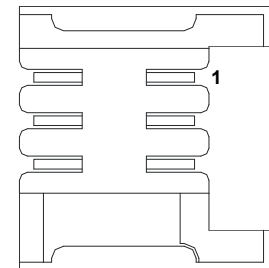
PS_ON# connection example



J11 - SIM card

Connector: AVX 00-9162-006-206-175, 6-way SIM card connector.

Pin	Signal name
1	UIM_PWR
2	UIM_RST#
3	UIM_CLK
4	GND
5	UIM_VPP
6	UIM_DATA

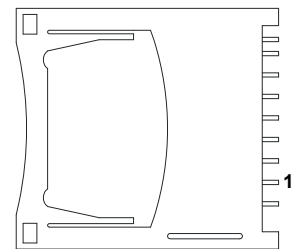


J11

J12 - SD/SDIO/MMC

Connector: MOLEX 67840-8001, 2.5mm (.098") SDIO memory card connector.

Pin	Signal name
1	SD1_DATA3
2	SD1_CMD
3	GND
4	+3.3V
5	SD1_CLK
6	GND
7	SD1_DATA0
8	SD1_DATA1
9	SD1_DATA2



J12

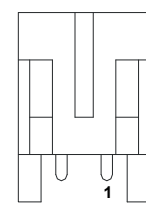
J13 - IDE activity LED

Connector: JST S2B-PH-K-S, 2-way 2mm (.0787"), shrouded header.

Mating socket: JST PHR-2.

Pin	Signal name
1	+5V (anode)
2	IDE_LED# (cathode) *

* 220Ω series resistor included



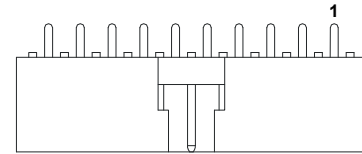
J13

J14 - USB 2.0 (ports 6A and 6B) and HD audio

Connector: FCI Minitek 98464-G61-20ULF, 20-way 2mm (.0787") shrouded header.

Mating socket: FCI Minitek 90311-020LF.

Pin	Signal name	Pin	Signal name
1	HDA_SPKR	2	HDA_SDI1
3	HDA_SDO	4	CDC_EN#
5	GND	6	+5V
7	HDA_SDI0	8	HDA_CLK
9	HDA_RST#	10	HDA_SYNC
11	GND	12	N.C.
13	USB_D6B-	14	USB_D6A-
15	USB_D6B+	16	USB_D6A+
17	GND	18	+V5_USB6
19	GND	20	+V5_USB6



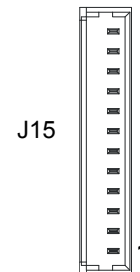
J14

J15 - GPIO and SM Bus

Connector: MOLEX 53047-1210, 12-way 1.25mm (.049"), shrouded header.

Mating socket: MOLEX 51021-1200.

Pin	Signal name
1	GPIO1
2	GPIO2
3	GPIO3
4	GPIO4
5	GPIO5
6	GPIO6
7	GPIO7
8	GPIO8
9	GND
10	+3.3V
11	SMB_CLK
12	SMB_DATA



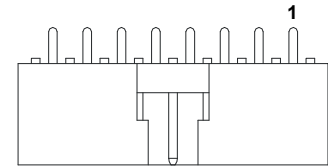
J15

J16 - USB 2.0 (ports 0, 1, 4, 5)

Connector: FCI Minitek 98464-G61-16ULF, 16-way 2mm (.0787") shrouded header.

Mating socket: FCI Minitek 90311-016LF.

Pin	Signal name	Pin	Signal name
1	+V5_USB45	2	GND
3	USB_D5-	4	USB_D5+
5	+V5_USB45	6	GND
7	USB_D4-	8	USB_D4+
9	+V5_USB01	10	GND
11	USB_D1-	12	USB_D1+
13	+V5_USB01	14	GND
15	USB_D0-	16	USB_D0+



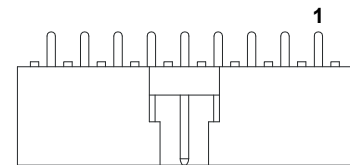
J16

J17 - COM1 and COM2

Connector: FCI Minitek 98464-G61-18ULF, 18-way, 2mm (.0787"), shrouded header.

Mating socket: FCI Minitek 90311-018LF.

Pin	Signal name	Pin	Signal name
1	DCD1	2	DSR1
3	RX1	4	RTS1
5	TX1	6	CTS1
7	DTR1	8	RI1
9	GND	10	DCD2 (*RX2/TX2-)
11	DSR2	12	RX2 (*RX2/TX2+)
13	RTS2	14	TX2 (*RX2-)
15	CTS2	16	DTR2 (*RX2+)
17	RI2	18	GND



J17

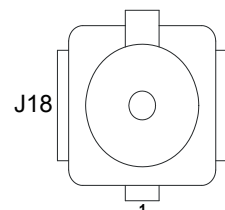
*COM2 RS422/485 option (BIOS selectable)

J18 - GPS RF

Connector: HIROSE U.FL-R-SMT, UFL surface mount, coaxial receptacle.

Mating plug: HIROSE U.FL-LP-0xx plugs with suitable coaxial cable.

Pin	Signal name
1	GPS_RFIN
2	GND
3	GND



J18

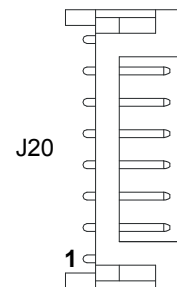
J20 - 10/100 Ethernet

Connector: JST S8B-PH-K-S, 8-way, 2mm (.0787"), shrouded header.

Mating socket: JST PHR-8.

Pin	Signal name
1	TX-
2	TX+
3	GND
4	LINK LED *
5	RX-
6	RX+
7	ACTIVITY LED *
8	+3.3V

* 100Ω series resistors included

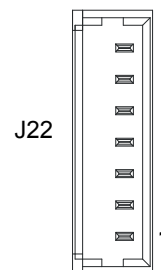


J22 - Backlight inverter control

Connector: MOLEX 53047-0710, 7-way 1.25mm (.049"), shrouded header.

Mating socket: MOLEX 51021-0700.

Pin	Signal name	(Factory fit option)
1	VCC5_BKL	
2	VCC5_BKL	
3	GND	
4	GND	
5	L_BKLTEN	(L_DDC_CLK)
6	L_BKLTCTL	(L_DDC_DATA)
7	GND	



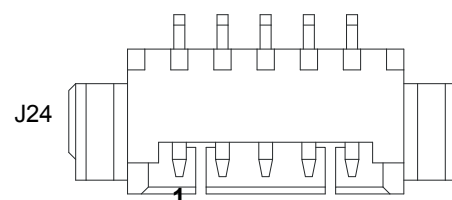
J24 – Remote SIM card

Connector: MOLEX 53261-0571, 5-way 1.25mm (.049") PicoBlade™ header.

Mating socket: MOLEX 51021-0500.

This is a build option, J24 can be fitted instead of J11 (SIM card socket).

Pin	Signal name
1	UIM_PWR
2	GND
3	UIM_RST#
4	UIM_CLK
5	UIM_DATA



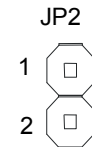
Jumpers

There are three jumpers on the ISIS; the use of each one is explained below.

JP2 - PATA Flash master/slave

JP2 pinout table:

Pin	Signal name
1	GND
2	TB_CSEL#



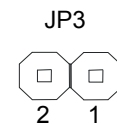
JP2 function table:

Position	Function
Open	PATA Flash is slave
Closed (default)	PATA Flash is master

JP3 - On-board supercap selection

JP3 pinout table:

Pin	Signal name
1	SCAP_IN
2	+VBAT_IN



JP3 function table:

Position	Function
Open (default)	On-board Supercap disconnected
Closed	On-board supercap connected

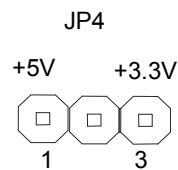


JP3 MUST be open if external battery is used.

JP4 - PC/104-Plus signalling selection

JP4 pinout table:

Pin	Signal name
1	+5V
2	+VIO_PCI
3	+3.3V



JP4 function table:

Position	Function
1-2 (Default)	5V PC/104-Plus signalling
2-3	3.3V PC/104-Plus signalling



Check your PC104-Plus peripheral module's manual for correct VIO voltage.

LEDs

D6 – SDIO access LED

The SDIO access LED D6 (red) indicates the access to the SDIO card.

D7 - Power LED

The power LED D7 (green) indicates that the input voltage (VCC5_IN) and on-board voltage +3.3V are above the minimum threshold.

D30 - Standby LED

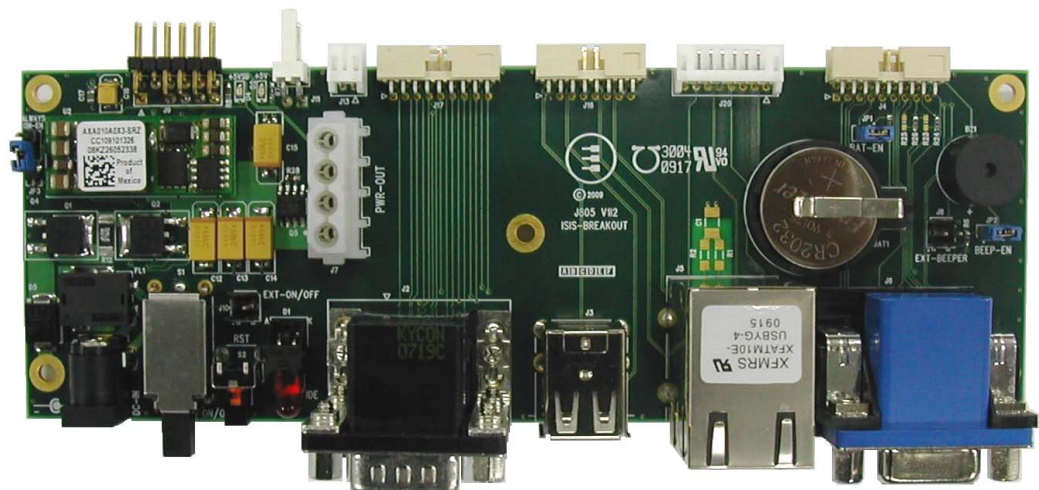
The standby LED D30 (yellow) indicates the presence of the input standby voltage (+V5_STB).

Appendix A – ISIS Breakout board

The ISIS-Breakout board is available for use with the ISIS. The ISIS-Breakout board supports the following:

- Power supply.
- Coin cell battery.
- PS/2 mouse and keyboard.
- 2 COM ports.
- 4 USB ports.
- Ethernet.
- VGA video output.

The photo of the ISIS-Breakout board is shown below, for more details see the ISIS development kit documentation.



Appendix B – ISIS cable kit

A cable kit has been created allowing you to connect peripherals to the ISIS using more standard and readily available connectors. It is intended to enable customers to start rapidly developing solutions using the ISIS.

The ISIS cable kit contains adapters and cables, details of which are shown below.

Adapter boards

The ISIS cable kit contains the following adapter boards:

- Four Dual USB A adapter boards with connecting cables.
- One Ethernet adapter board with connecting cable.
- One ISIS-HDA board with connecting cable.
- One multifunction adapter board with connecting cable.

Dual USB type A

The ACS-9092 is an adapter board that has been developed by Eurotech to simplify the interfacing of USB peripherals with Eurotech CPU modules.



For more details about this board, see www.eurotech.com/DLA/AN/Td0002.pdf.

Ethernet

The ACS-9095 is an adapter board that has been developed by Eurotech to simplify the connection of Eurotech CPU modules to a LAN network.

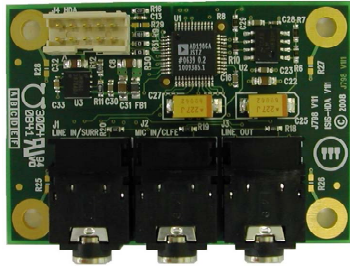


The three jumpers JP1, JP2 and JP3 need to be removed for the adapter to work with the ISIS.

For more details about this board, see www.eurotech.com/DLA/AN/Td0004.pdf.

Audio

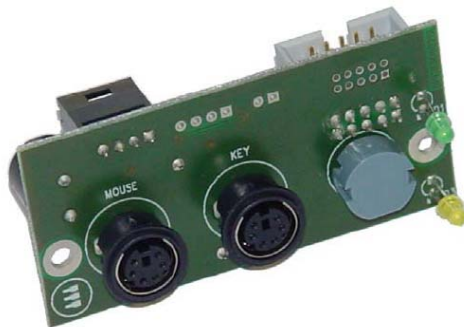
The ISIS-HDA is an adapter board that has been developed by Eurotech to simplify the interfacing of Audio peripherals with the ISIS. The ISIS-HDA board contains the HD audio codec Analogue Devices AD1986A and supports standard line in, line out and microphone functionality or alternatively 5.1 surround sound on three board-mounted 3.5mm stereo jack connectors.



For more details about this board, see the ISIS development kit documentation.

Multifunction

The ACS-9079 is an adapter board that has been developed by Eurotech to simplify the interfacing of PS/2 keyboard and mouse with Eurotech CPU modules. It also provides a PC speaker, a backup battery, a reset push button and a power LED.



For more details about this board, see www.eurotech.com/DLA/AN/Td0025.pdf

Cables

The ISIS cable kit contains the following cables:

- One power cable.
- One serial cable.
- One VGA cable.
- One GPIO cable.
- One IDE cable.
- One LVDS cable.
- One backlight inverter cable.
- One GPS (UFL to SMA) adapter cable.

Power

The power cable 7020000011L provides unterminated colour coded wires allowing easy connection of the ISIS to the power supply.

For more details about this cable, see www.eurotech.com/DLA/AN/Td0025.pdf

Serial

The serial cable 7000000074L provides two DB9-M connectors for interfacing with standard RS232 cables.

For more details about this cable, see www.eurotech.com/DLA/AN/Td0025.pdf

VGA

The cable 7000000124L provides a HD-DB15-F VGA connector for interfacing with an analogue monitor.

The same cable is used to connect to the Multifunction adapter board. (Y cable)

For more details about this cable, see www.eurotech.com/DLA/AN/Td0025.pdf

GPIO

The GPIO cable 2040-53959-000-000 provides unterminated colour coded wires allowing easy connection of the ISIS to the system.

12 Way Housing	Description	Colour
Pin 1	GPIO1	Orange
Pin 2	GPIO2	Yellow
Pin 3	GPIO3	Green
Pin 4	GPIO4	Blue
Pin 5	GPIO5	Purple
Pin 6	GPIO6	Grey
Pin 7	GPIO7	Pink
Pin 8	GPIO8	Brown
Pin 9	GND	Black
Pin 10	+3.3V	Red
Pin 11	SMB_CLK	White
Pin 12	SMB_DATA	Cyan

IDE

The IDE cable 2040-53971-000-000 allows for a single 44-pin connector drive (typically a 2.5" hard drive) to be connected to the ISIS IDE bus. The power is supplied to the drive through the cable.

LVDS

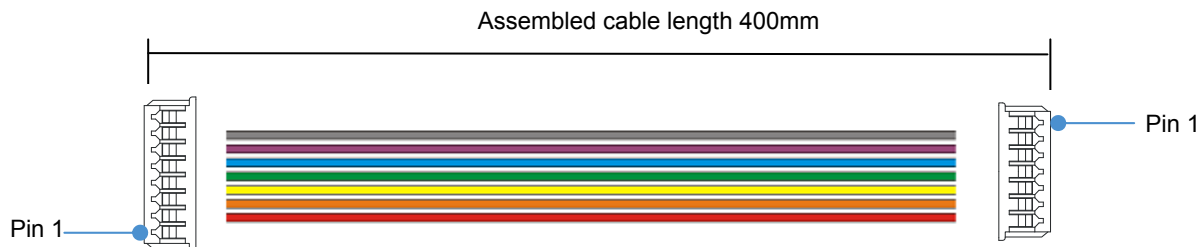
The LVDS cable (2042-53684-000-000 for ISIS v1i2, 2042-54022-000-000 for ISIS v1i3) allows for a straight connection of the ISIS to the 20-way connector of a NEC LVDS flat panel display (NL8060BC21-02).

21w double socket (ISIS)	Signal name	20w single socket (LVDS Display)	Cable		
			Pair	Wire colour	
				Solid	Band
Pin 1	LCDVCC	Pin 20	1	Red	Black
Pin 2	LCDVCC	Pin 19	2	White	Black
Pin 3	GND	Pin 18	1	Black	Red
Pin 4	GND	Pin 17	2	Black	White
Pin 5	ATX0-	Pin 16	3	Black	Green
Pin 6	ATX0+	Pin 15	3	Green	Black
Pin 7	GND	Pin 14	4	Blue	Black
Pin 8	ATX1-	Pin 13	5	Black	Yellow
Pin 9	ATX1+	Pin 12	5	Yellow	Black
Pin 10	GND	Pin 11	4	Black	Blue
Pin 11	ATX2-	Pin 10	6	Black	Brown
Pin 12	ATX2+	Pin 9	6	Brown	Black
Pin 13	GND	Pin 8	7	Orange	Black
Pin 14	ACLK-	Pin 7	8	Red	White
Pin 15	ACLK+	Pin 6	8	White	Red
Pin 16	GND	Pin 5	7	Black	Orange
Pin 17	ATX3-	Pin 2	9	Red	Green
Pin 18	ATX3+	Pin 1	9	Green	Red
Pin 19	GND	Pin 3	10	Blue	Red
Pin 20	MSEL	Pin 4	10	Red	Blue
Pin21	N.C.	NA	NA	NA	NA

You can either use the existing LVDS cable's end socket or replace it to accommodate the cable for your own display.

Backlight inverter

The Backlight inverter cable (2042-53685-000-000) allows for a straight connection of the ISIS to the 8way connector of a +5V NEC backlight inverter. You can either use the existing inverter cable's end socket or replace it to accommodate the cable for your own inverter.



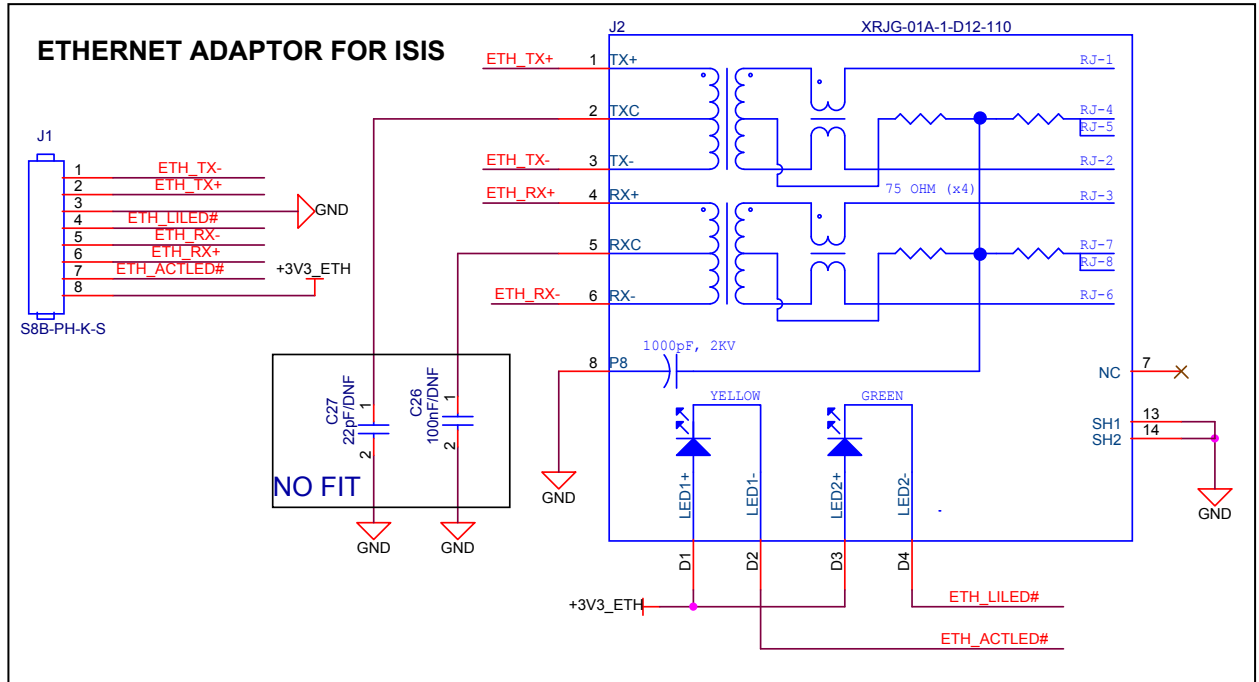
8 Way Socket (Inverter)	Signal name	7 Way Socket (ISIS)	Wire colour
Pin 1	VDDDB	PIN 1	Red
Pin 2	VDDDB	PIN 2	Orange
Pin 3	GNDB	PIN 3	Yellow
Pin 4	GNDB	PIN 4	Green
Pin 5	BRTC	PIN 5	Blue
Pin 6	BRTI	PIN 6	Purple
Pin 7	BRTH	PIN 7	Grey
Pin 8	N/C	N/C	N/C

GPS adapter

The GPS adapter cable (2042-53713-000-000) breaks out the UFL connection of the ISIS onboard GPS module to a SMA socket allowing for standard GPS antenna use.

Appendix C – Ethernet adaptor schematic

This schematic, with the use of symmetrical RJ-45 Magjack (Xmultiple XRJG-01A-1-D12-110) enables the Auto-MDIX capability of the Intel 82551IT Ethernet controller.



Appendix D – 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 ATOM processors:

www.intel.com

PC/104 consortium

PC/104 specifications, vendor information and available add-on products:

www.PC/104.org

SDIO card information

SD Card Association and product Information:

www.sdcard.org

IEEE Specifications

Information about wired and wireless communication:

www.ieee.org

Trusted Computing Platform Alliance

Information about Trusted Platform:

www.trustedcomputing.org

Appendix E – RoHS Compliance

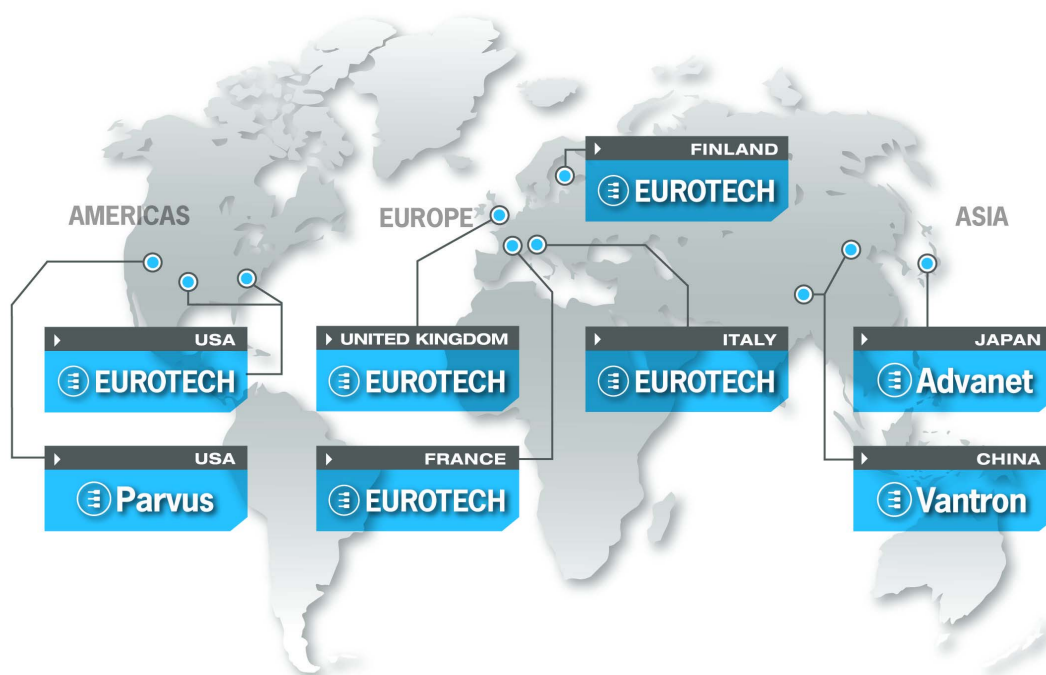


The Restriction of the use of certain Hazardous Substances (RoHS) Directive came into force on 1st July 2006. The ISIS board shall be designed using RoHS compliant components, and manufactured to comply with the RoHS Directive.

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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