



## HB5 Technical User Guide (Used in the Beta H Series)

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## Regulatory Statements

### **CE**

This product has been designed and assessed to meet the essential protection requirements of the European EMC Directive (2004/108/EC), the Low Voltage Directive (2006/95/EC), and the R&TTE Directive (1999/5/EC) when installed and used in conjunction with the guidelines provided within this document.

[Note that compliance with the R&TTE directive is only required for those versions of the product equipped with radio frequency interfaces].

### **FCC**

#### **NOTE:**

FCC compliance of product versions equipped with radio frequency interfaces may require specific approval for the finished products.

### **WARNING:**

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

## Safety Warning for North America

If the power lead (cord) is not supplied with the computer, select a power lead according to your local electrical regulations. In the USA use a 'UL listed' lead. In Canada use a CSA approved or 'cUL listed' lead.

Si le cordon secteur n'est pas livré avec l'ordinateur, utiliser un cordon secteur en accord avec votre code électrique nationale. En l'Etat Unis utiliser un cordon secteur 'UL listed'. En Canada utiliser un cordon secteur certifié CSA, ou 'cUL listed'.

## Technical User Guide Structure

This manual describes in detail the HB5 host board for use with the TMx range of processor modules.

However, it does not include the software aspects of the range which are covered in the following HB5 documents;

- HB5 Linux Reference Manual
- HB5 Android Reference Manual
- HB5 Windows Reference Manual

In this document we have tried to include as much information as possible but we have not duplicated information that is provided in other HB5 documents or standard Technical References, unless it proved to be necessary to aid in the understanding of the product.

The manual is sectioned as follows:

- Introduction
- Hardware interfaces & connectors
- Layout, showing where the various connectors are located, and their pin-out details;
- Overviews, showing outline dimensions and installation tips;
- Maintenance details

We strongly recommend that you study this manual carefully before attempting to interface with the HB5 or change the standard configurations. Whilst all the necessary information is available in this manual we would recommend that unless you are confident, you contact your supplier for guidance.

***IT IS PARTICULARLY IMPORTANT THAT YOU READ THE ESD SECTION BEFORE HANDLING ANY COMPONENTS INSIDE THE UNIT.***

If you have any suggestions or find any errors concerning this manual and want to inform us of these, please contact our Technical Services department with the relevant details.

## Introduction

The Blue Chip Technology HB5 Host Board is designed to support our TMx range of processor modules and supports a number of low cost, low power integrated touch screen computers. The LCD range includes screen sizes of 4.3" (480\*272), 7.1" (800\*480) and 9.7" (1024\*768) together with either resistive or projected capacitance touch screens. There is also a front panel/bezel available for each model, for further details please see our Beta range of products. If you do not require a touch screen then we recommend that you choose the resistive touch screen version if you require the lowest cost. Alternatively if you require the most resilient screen we recommend the projected capacitance version which has a glass top surface.

The HB5 Host Board supports a number of interfaces:

Standard connectivity includes LAN, Wifi, Bluetooth, USB Host, USB Device, RS232, RS422/485, Stereo Audio (input/output), General Purpose IO signals plus Real Time Clock and battery. Other options include CAN, camera inputs, 3G, GPS and accelerometer.

The HB5 range can also support a Lithium Battery via connector to keep the Real Time Clock alive and retain time when the unit is powered off.

The mechanical options include open frame operation to allow integration into customers own mechanical assembly or with an optional injection moulded rear cover to be used as a standalone device. Mounting Kits are also available and include VESA mount, panel mount, etc.

Operating Systems supported include Android 4.4.3 and Ubuntu Linux 14.04 LTS. If you require any other operating support please contact your sales person.

**NOTE:**

For the panel mount option, please ensure that the thickness of the panel is sufficient to prevent deforming of the panel when the unit is attached, or fit strengthening bars to prevent deforming.

## Functional Overview

As mentioned previously each HB5 supports Blue Chip Technology TMx processor modules. Whilst the TMx processor modules can support a wide range of interfaces the HB5 Host Board dictates the functionality available:

The standard features on each HB5 product are:

- TMx Processor Module socket
- General purpose IO
- Low power consumption
- LAN 10/100Mbit
- USB Host – HS, FS and LS modes
- USB Device – HS and FS modes
- Dual RS232
- Single RS232/422/485
- I2C
- SPI
- Stereo Audio inputs and outputs
- Mono Audio Amplifier
- Battery backed Real Time Clock
- Extended Temperature range

### Display Options

- 4.3" 480\*272 resolution
- 7.1" 800\*480 resolution
- 9.7" 1024\*768 resolution

### Touch Screen Options

- 4.3" – resistive
- 4.3" – projected capacitive
- 7.1" – resistive
- 7.1" – projected capacitive
- 9.7" – resistive
- 9.7" – projected capacitive

## Beta Model Range

| Model            | 432H | 712H | 432V | 712V | 432C | 712C | 432A | 712A | 972H | 972V | 972C | 972A |
|------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| LCD 4.3"         | ✓    |      | ✓    |      | ✓    |      | ✓    |      |      |      |      |      |
| LCD 7.1"         |      | ✓    |      | ✓    |      | ✓    |      | ✓    |      |      |      |      |
| LCD 9.7"         |      |      |      |      |      |      |      |      | ✓    | ✓    | ✓    | ✓    |
| Host Board       | HB5  | HB5  | HB6  | HB6  | HB7  | HB7  | HB8  | HB8  | HB5  | HB6  | HB7  | HB8  |
| Resistive Touch  | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    |
| Capacitive Touch | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    |
| LAN              | 1    | 1    | 1    | 1    |      |      | 1    | 1    | 1    | 1    |      | 1    |
| USB Host         | 1    | 1    | 1    | 1    | 2    | 2    | ✓    | ✓    | 1    | 1    | 2    | ✓    |
| USB Device       | 1    | 1    | 1    | 1    | 1    | 1    | ✓    | ✓    | 1    | 1    | 1    | ✓    |
| RS232            | 2    | 2    | 2    | 2    | 2    | 2    | ✓    | ✓    | 2    | 2    | 2    | ✓    |
| RS232/ 422/485   | 1    | 1    | 1    | 1    | 1    | 1    | ✓    | ✓    | 1    | 1    | 1    | ✓    |
| GPIO             | 12   | 12   | 12   | 12   | ✓    | ✓    | ✓    | ✓    | 12   | 12   | ✓    | ✓    |
| WiFi             | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    |
| Bluetooth        | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    |
| I2C              | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    |
| SPI              | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    |
| Class D          | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    |
| CAN              |      |      |      |      | 2    | 2    | 2    | 2    |      |      | 2    | 2    |
| 3G               |      |      |      |      | ✓    | ✓    |      |      |      |      | ✓    |      |
| GPS              |      |      |      |      | ✓    | ✓    |      |      |      |      | ✓    |      |
| Accelerometer    |      |      |      |      | ✓    | ✓    |      |      |      |      | ✓    |      |
| Light Sensor     |      |      |      |      | ✓    | ✓    |      |      |      |      | ✓    |      |
| ADC              |      |      |      |      |      |      | ✓    | ✓    |      |      |      | ✓    |
| DAC              |      |      |      |      |      |      | ✓    | ✓    |      |      |      | ✓    |
| IO               |      |      |      |      |      |      | ✓    | ✓    |      |      |      | ✓    |
| Relay            |      |      |      |      |      |      | ✓    | ✓    |      |      |      | ✓    |
| PWM              |      |      |      |      |      |      | ✓    | ✓    |      |      |      | ✓    |
| Battery          |      |      |      |      | ✓    | ✓    |      |      |      |      | ✓    |      |
| Automotive PSU   |      |      |      |      | ✓    | ✓    |      |      |      |      | ✓    |      |
| Rear Cover       |      |      | ✓    | ✓    | ✓    | ✓    | ✓    | ✓    |      |      | ✓    | ✓    |



| Legend | Meaning                      | Legend | Meaning  |
|--------|------------------------------|--------|--|
| ✓      | Standard                     | ✓      | Standard - to be confirmed                     |
| ✓      | Available - option           | ✓      | Available - option - to be confirmed           |
| 2      | Number available as standard | 2      | Number available as standard - to be confirmed |
| 2      | Number available - option    | 2      | Number available - option - to be confirmed    |

Please check the latest specifications with your sales contact as this document may not reflect the current situation.

## Please read this (even if you do not read any other part of this manual)

### Power Supply

The **HB5 H series** of Touch Computers requires a 5 volt DC power input  $\pm 0.25$  volts; so the voltage input range is 4.75 to 5.25 volts DC.

Your HB5 H series computer has protection for over voltage up to 24 volts.

It **does not have protection** for reverse polarity, so please take care when applying power. The reason it does not have reverse polarity protection is that we use the incoming 5 volts power for the USB circuitry, etc rather than creating another power supply to keep costs as low as possible.

Power can be applied through the following connectors:

1. Jack plug (2.5mm centre diameter which is the positive contact) with a 5.5mm overall diameter. See below:



2. Screw terminal connector when ordered instead of the Jack connector
3. If the Screw terminal PCB (as opposed to the screw terminal connector in 2 above) is fitted then power can be applied through pins **a** (5 volts) and **b**. Please note that these are lower case letters and **not A and B.**

### Serial Ports

Your HB5 H series Touch Computer has three asynchronous serial ports.

Ports 1 and 2 are fixed as RS232 ports and are both TX + RX only (i.e. no hardware handshaking – which is not usual an issue these days as the HB5 is fast enough to cope with most baud rates, etc).

The console port, which is the default communications port for Linux and Android, is COM 1 and is available on P2 on the Picoblade connector PCB. If you have the Screw Terminal PCB then the COM 1 port is on pins **n**, **o** and the ground is on pin **p**. If you don't know which connector PCB you have then sorry but you are going to have to read some more pages ☹.

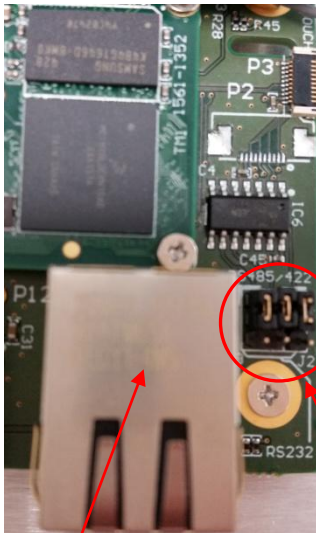
Unless we tell you otherwise or you change the settings the serial setup is as follows:

|             |         |
|-------------|---------|
| Baud Rate   | 115,200 |
| Data Bits   | 8       |
| Start Bits  | 1       |
| Stop Bits   | 1       |
| Parity      | None    |
| Handshaking | Off     |

We supply cable sets for the serial ports (and other interfaces) so if you want to buy them just contact your sales contact.

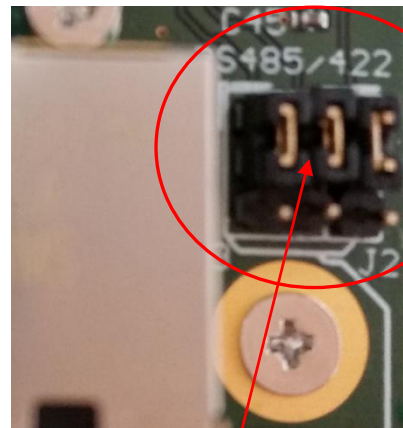
If you wish to switch off the console stream to COM 1, please see the relevant Operating System manual for your HB5.

Now, on COM 3, you can choose if you want it as another RS232 port or as a RS422 or RS485 port. You can make the selection (your HB5 will be delivered set to RS422/485 by default) by changing the links on the HB5 as follows:



LAN connector

Here are the links to set COM 3

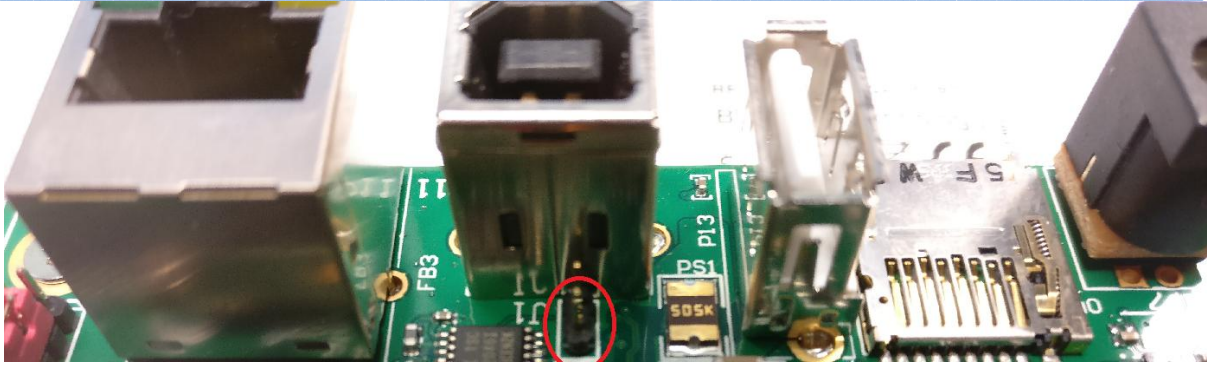


As you can see the three links are set to the RS485/422  
Move all three links to the lower position for RS232

## Touch Screen Selection

The HB5 has the ability to support either Resistive or Projected Capacitance touch screens. However there is a link on the HB5 that HAS to be configured to suit the touch screen fitted.

The link is J1 which is located immediately behind the USB Device connector P11 as shown in the photo below where J1 is circled in RED.

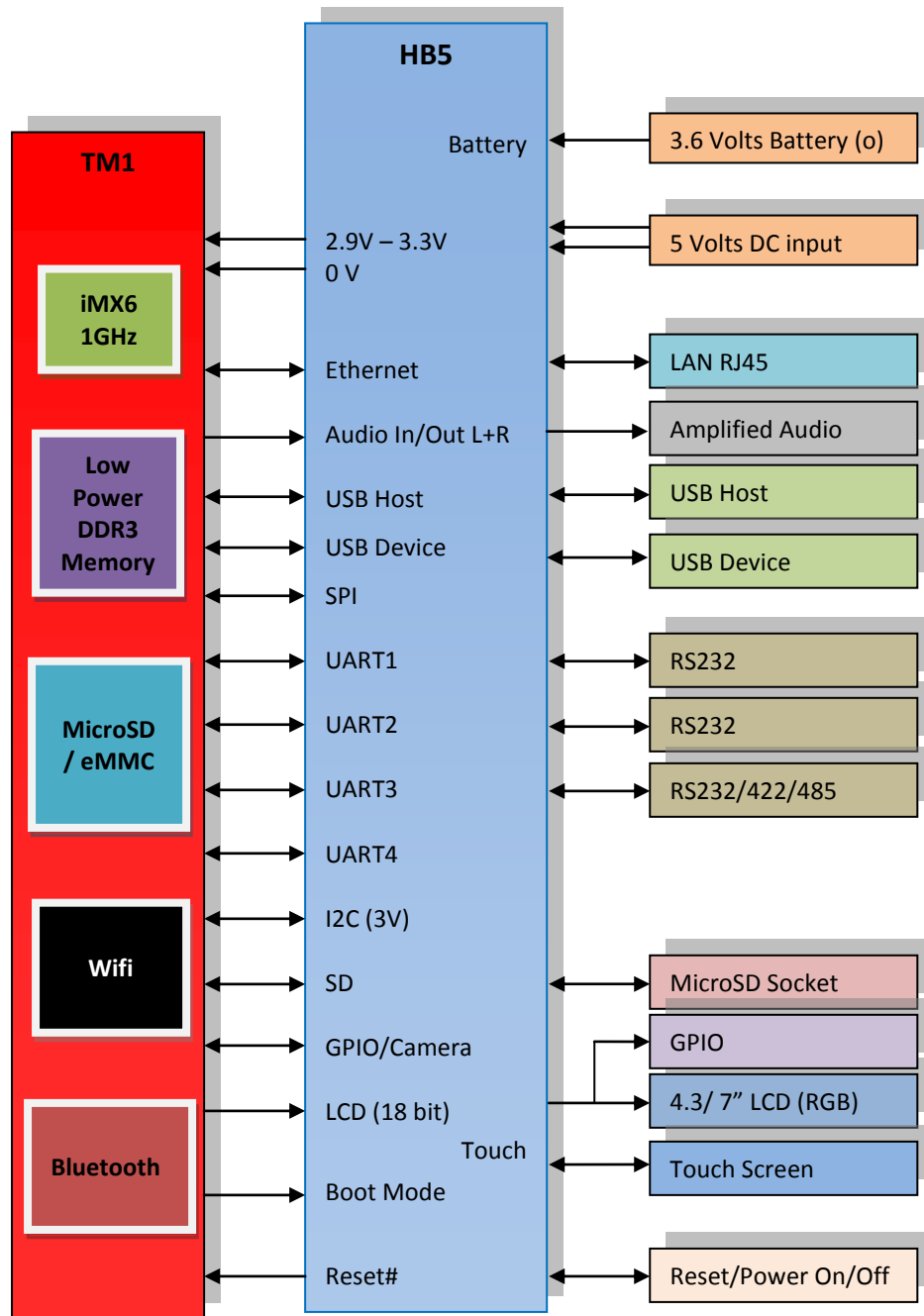


J1 MUST be configured as follows for reliable touch screen operation:

LINK FITTED TO BOTH PINS = RESISTIVE TOUCH SCREEN operation

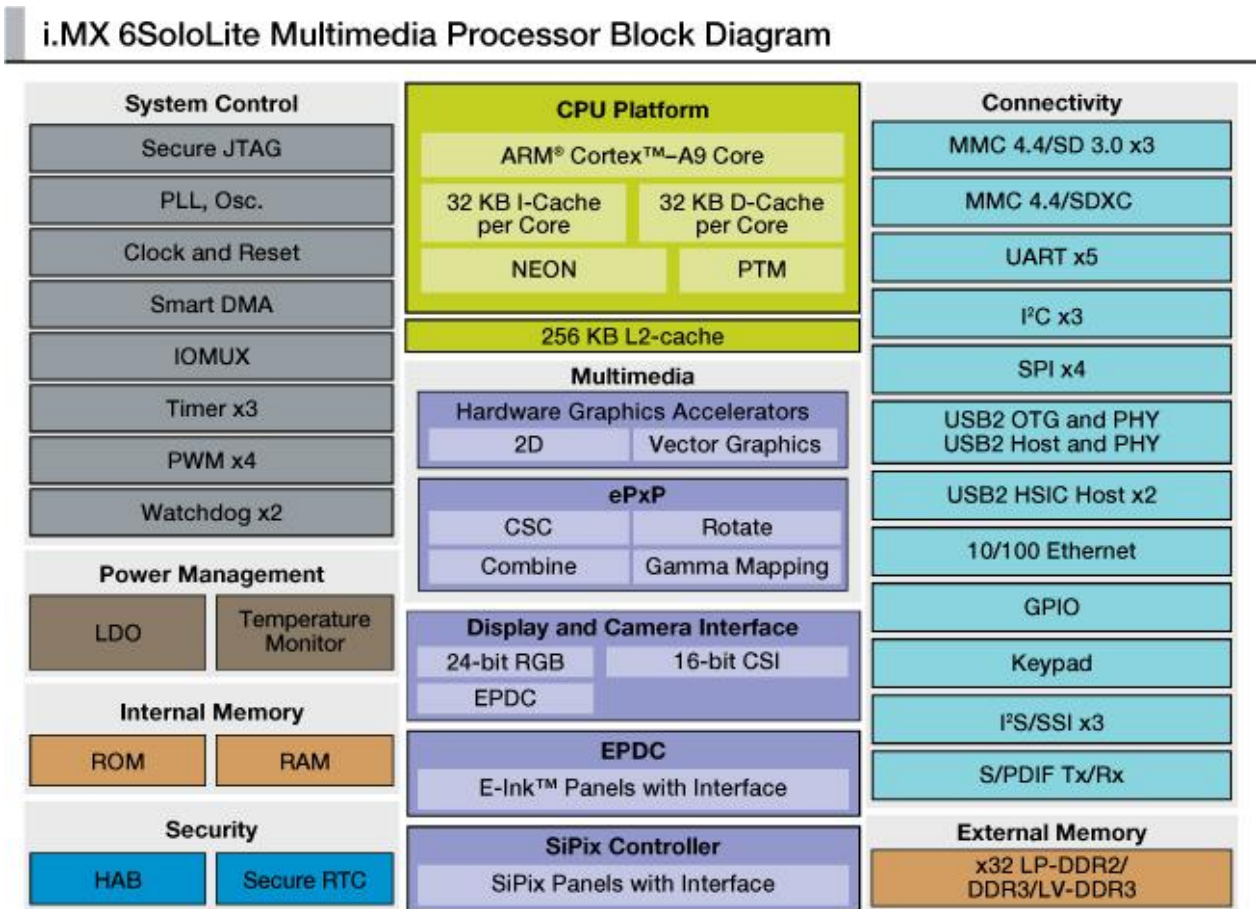
LINK FITTED TO ONE OR NO PINS = PROJECTED CAPACITANCE TOUCH SCREEN operation

Overview - Beta H Series Touch Computer



Your HB5 H series Touch Computer is based on the NXP iMX6 Sololite processor .

The following graphic and description provides an overview of the processor.



## iMX6 Features

The i.MX 6 SoloLite processor features:

- Applications processor—The processor enhances the capabilities of high-tier portable applications by fulfilling the ever increasing MIPS needs of operating systems and games. Freescale’s Dynamic Voltage and Frequency Scaling (DVFS) provides significant power reduction, allowing the device to run at lower voltage and frequency with sufficient MIPS for tasks, such as audio decode.
- Multilevel memory system—The multilevel memory system of each processor is based on the L1 instruction and data caches, L2 cache, and internal and external memory. The processor supports many types of external memory devices, including DDR3, low voltage DDR3, LPDDR2, NOR Flash, PSRAM, cellular RAM, and managed NAND, including eMMC up to rev 4.4/4.41.
- Smart speed technology—The processor has power management throughout the IC that enables the rich suite of multimedia features and peripherals to consume minimum power in both active and various low power modes. Smart speed technology enables the designer to deliver a feature-rich product, requiring levels of power far lower than industry expectations.

- Dynamic voltage and frequency scaling—The processor improves the power efficiency of devices by scaling the voltage and frequency to optimize performance.
- Multimedia powerhouse—The multimedia performance of each processor is enhanced by a multilevel cache system, NEON™ MPE (Media Processor Engine) co-processor, and a programmable smart DMA (SDMA) controller.
- Powerful graphics acceleration—The processor provides three independent, integrated graphics processing units: 2D BLit engine, a 2D graphics accelerator, and dedicated OpenVG™ 1.1 accelerator.
- Interface flexibility—The processor supports connections to a variety of interfaces: LCD controller, CMOS sensor interface (parallel), high-speed USB on-the-go with PHY, high-speed USB host PHY, multiple expansion card ports (high-speed MMC/SDIO host and other), 10/100 Mbps Ethernet controller, and a variety of other popular interfaces (such as UART, I2C, and I2S serial audio).
- Electronic Paper Display Controller—The processor integrates EPD controller that supports E-INK color and monochrome with up to 2048 x 1536 resolution at 106 Hz refresh, 4096 x 4096 resolution at 20 Hz refresh and 5-bit grayscale (32-levels per color channel).
- Advanced security—The processor delivers hardware-enabled security features that enable secure e-commerce, digital rights management (DRM), information encryption, secure boot, and secure software downloads. The security features are discussed in detail in the i.MX 6SoloLite security reference manual (IMX6SLSRM).
- Integrated power management—The processor integrates linear regulators and generate internally all the voltage levels for different domains. This significantly simplifies system power management structure.
- GPIO with interrupt capabilities—The GPIO design supports configurable dual voltage rails at 1.8V and 3.06V supplies. The GPIO is configurable to interface at either voltage level.

The i.MX 6 SoloLite processor is based on ARM Cortex-A9 MP Core multicore processor, which has the following features:

- ARM Cortex-A9 MPCore CPU processor (with TrustZone)
- The core configuration is symmetric, where each core includes:
  - 32 KByte L1 Instruction Cache
  - 32 KByte L1 Data Cache
  - Private Timer and Watchdog
  - Cortex-A9 NEON MPE (Media Processing Engine) co-processor

The ARM Cortex-A9 MPCore complex includes:

- General Interrupt Controller (GIC) with 128 interrupt support
- Global Timer
- Snoop Control Unit (SCU)
- 256 KB unified I/D L2 cache
- Two Master AXI (64-bit) bus interfaces output of L2 cache
- Frequency of the core (including NEON and L1 cache)
- NEON MPE coprocessor
  - SIMD Media Processing Architecture
  - NEON register file with 32x64-bit general-purpose registers
  - NEON Integer execute pipeline (ALU, Shift, MAC)
  - NEON dual, single-precision floating point execute pipeline (FADD, FMUL)
  - NEON load/store and permute pipelineThe SoC-level memory system consists of the following additional components:

- Boot ROM, including HAB (96 KB)
- Internal multimedia / shared, fast access RAM (OCRAM, 128 KB)
- External memory interfaces:
  - 16-bit, and 32-bit DDR3-800, and LPDDR2-800 channels
  - 16/32-bit NOR Flash.
  - 16/32-bit PSRAM, Cellular RAM (32 bits or less)

Each i.MX 6 SoloLite processor enables the following interfaces to external devices (some of them are muxed and not available simultaneously):

- Displays—Total three interfaces are available.
  - LCD, 24bit display port, up to 225 Mpixels/sec (for example, WUXGA at 60 Hz)
  - EPDC, color, and monochrome E-INK, up to 1650x2332 resolution and 5-bit grayscale • Camera sensors:
    - Parallel Camera port (up to 16-bit and up to 66 MHz peak) • Expansion cards:
      - Four MMC/SD/SDIO card ports all supporting:
        - 1-bit or 4-bit transfer mode specifications for SD and SDIO cards up to UHS-I SDR-104 mode (104 MB/s max)
        - 1-bit, 4-bit, or 8-bit transfer mode specifications for MMC cards up to 52 MHz in both SDR and DDR modes (104 MB/s max)
- USB:
  - Two High Speed (HS) USB 2.0 OTG (Up to 480 Mbps), with integrated HS USB Phy
  - One USB 2.0 (480 Mbps) hosts:
    - One HS hosts with integrated HS-IC USB (High Speed Inter-Chip USB) Phy
- Miscellaneous IPs and interfaces:
  - SSI block—capable of supporting audio sample frequencies up to 192 kHz stereo inputs and outputs with I2 S mode
  - Five UARTs, up to 5.0 Mbps each:
    - Providing RS232 interface
    - Supporting 9-bit RS485 multidrop mode
    - One of the five UARTs (UART1) supports 8-wire while others four supports 4-wire. This is due to the SoC IOMUX limitation, since all UART IPs are identical.
    - Four eCSPI (Enhanced CSPI)
    - Three I2C, supporting 400 kbps
    - Ethernet Controller, 10/100 Mbps
    - Four Pulse Width Modulators (PWM)
    - System JTAG Controller (SJC)
    - GPIO with interrupt capabilities
    - 8x8 Key Pad Port (KPP)
    - Sony Philips Digital Interface (SPDIF), Rx and Tx
    - Two Watchdog timers (WDOG)
    - Audio MUX (AUDMUX)

The i.MX 6 SoloLite processor integrates advanced power management unit and controllers:

- Provide PMU, including LDO supplies, for on-chip resources
- Use Temperature Sensor for monitoring the die temperature
- Support DVFS techniques for low power modes
- Use Software State Retention and Power Gating for ARM and MPE
- Support various levels of system power modes
- Use flexible clock gating control scheme

The i.MX 6 SoloLite processor uses dedicated HW accelerators to meet the targeted multimedia performance. The use of HW accelerators is a key factor in obtaining high performance at low power consumption numbers, while having the CPU core relatively free for performing other tasks.

The i.MX 6SoloLite processor incorporates the following hardware accelerators:

- GPU2Dv2—2D Graphics Processing Unit (BitBlit).



- GPUVG—OpenVG 1.1 Graphics Processing Unit.
- PXP—PiXel Processing Pipeline. Off loading key pixel processing operations are required to support the EPD display applications.

Security functions are enabled and accelerated by the following hardware:

- ARM TrustZone including the TZ architecture (separation of interrupts, memory mapping, etc.)
- SJC—System JTAG Controller. Protecting JTAG from debug port attacks by regulating or blocking the access to the system debug features.
- SNVS—Secure Non-Volatile Storage, including Secure Real Time Clock.
- CSU—Central Security Unit. Enhancement for the IC Identification Module (IIM). Will be configured during boot and by eFUSES and will determine the security level operation mode as well as the TZ policy.
- A-HAB—Advanced High Assurance Boot—HABv4 with the new embedded enhancements: SHA-256, 2048-bit RSA key, version control mechanism, warm boot, CSU, and TZ initialization.

## Connectors

The HB5 has the following industry standard connectors:

### **Ethernet**

RJ45 – 10/100 Mbit

LEDs – The Green LED is controlled by the Kernel .

The Yellow LED is connected to an uncommitted GPIO line and the LED can be used by the application through the software provided.

### **USB Host**

Type A Connector

### **USB Device**

Mini Type B Connector

### **Touch Screen**

Jumper J1 is required to set the type of touch screen in use. J1 is located next to the MicroSD socket on the HB5 PCB.

Please see the table below for when the jumper should be fitted or not.

| <b>Jumper J1</b> | <b>Status</b>                     | <b>Comments</b>                        |
|------------------|-----------------------------------|--|
| NOT FITTED       | Resistive Touch Screen            | Connects an interrupt to show activity |
| FITTED           | Projected Capacitive Touch Screen | 0 volts                                |

The RTC Battery and Speaker connectors are not industry standard and the details are as follows:

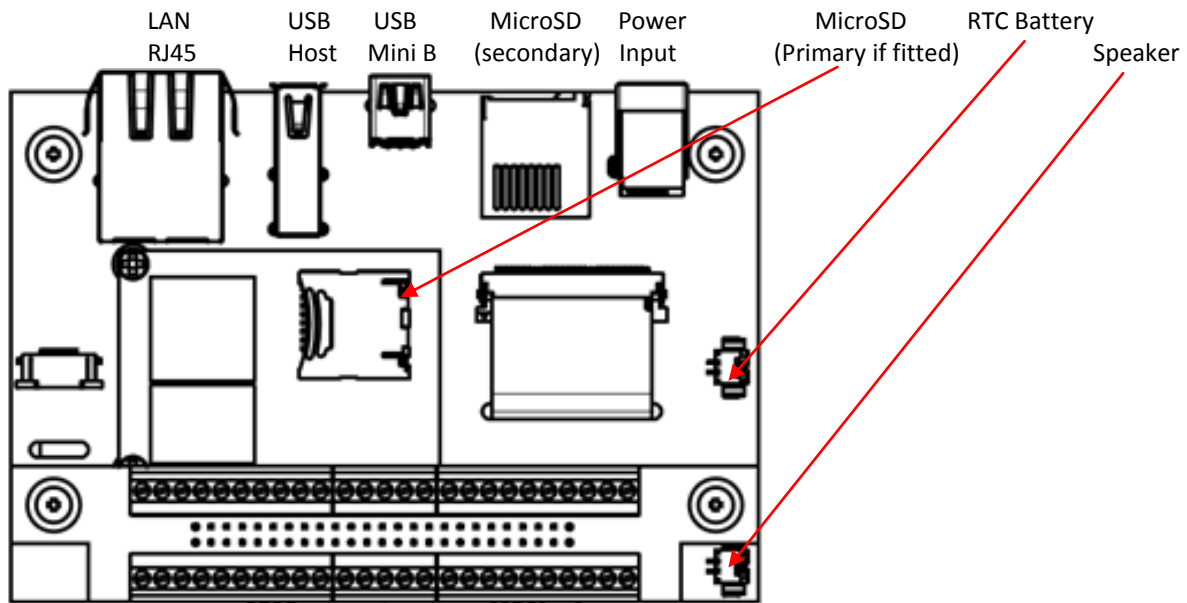
### **Connector P14 – Real Time Clock Battery**

| <b>Pin</b> | <b>Signal</b>    | <b>Comments</b>      | <b>Voltage</b>    |
|------------|------------------|----------------------|-------------------|
| 1          | Battery Positive | CR2032 or equivalent | Nominal 3.6 volts |
| 2          | Battery Negative | CR2032 or equivalent | 0 volts           |

### **Connector P15 – Audio Amplifier Output to Speaker**

| <b>Pin</b> | <b>Signal</b>    | <b>Comments</b>   |
|------------|------------------|---|
| 1          | Speaker Negative | Speaker load to be no lower than 4 ohms with 2 watts handling |
| 2          | Speaker Positive | Speaker load to be no lower than 4 ohms with 2 watts handling |

The connectors can be found here:



The HB5 H series is offered with two standard connector options, one provides screw terminals and the second provides Molex Picoblade connectors. However custom PCBs can be created. If you would like to design your own connector PCB for your new product then we are happy to supply HB5 units without a Connector PCB. If you would like us to design the connector PCB (with or without additional electronics) just contact us.

Please note that the speaker fitted on the HB5 PCB (as shown above) is in parallel with the speaker connections on the Connector PCB. If you connect two low impedance speakers up in parallel then the audio amplifier will probably sense the low impedance and shut down. The HB5 unit will need to be powered off for a few seconds, one of the speakers removed and then powered on again to re-activate the audio amplifier.

If you would like to design your own Connector PCB you will need the pin out of the 50 way connector on our HB5 which provides the connector interface and therefore pin out which is as follows:

| Pin | Signal    | Comment                             | Pin | Signal   | Comment                     |
|-----|-----------|-------------------------------------|-----|----------|-----------------------------|
| 1   | 0 volts   |                                     | 2   | 0 volts  |                             |
| 3   | LINEOUT_R | Audio line out – right channel      | 4   | GPIO 12  | GPIO signal – 3 volts level |
| 5   | LINEOUT_L | Audio line out – left channel       | 6   | GPIO 11  | GPIO signal – 3 volts level |
| 7   | 0 volts   |                                     | 8   | GPIO 10  | GPIO signal – 3 volts level |
| 9   | LINEIN_R  | Audio line in – right channel       | 10  | GPIO 9   | GPIO signal – 3 volts level |
| 11  | LINEIN_L  | Audio line in – left channel        | 12  | GPIO 8   | GPIO signal – 3 volts level |
| 13  | 0 volts   |                                     | 14  | GPIO 7   | GPIO signal – 3 volts level |
| 15  | SPEAKER_H | Audio speaker output – Positive     | 16  | GPIO 6   | GPIO signal – 3 volts level |
| 17  | SPEAKER_L | Audio speaker output – Negative     | 18  | GPIO 5   | GPIO signal – 3 volts level |
| 19  | 0 volts   |                                     | 20  | GPIO 4   | GPIO signal – 3 volts level |
| 21  | COM1_TX   | RS232 Port 1 Transmit – RS232 level | 22  | GPIO 3   | GPIO signal – 3 volts level |
| 23  | COM1_RX   | RS232 Port 1 Receive – RS232 level  | 24  | GPIO 2   | GPIO signal – 3 volts level |
| 25  | 0 volts   |                                     | 26  | GPIO 1   | GPIO signal – 3 volts level |
| 27  | COM2_TX   | RS232 Port 2 Transmit – RS232 level | 28  | 0 volts  |                             |
| 29  | COM2_RX   | RS232 Port 2 Receive – RS232 level  | 30  | SPI SOMI | SPI – Input when Master     |

|    |         |  |    |            |   |
|----|---------|--|----|------------|---|
| 31 | 0 volts |  | 32 | SPI CLK    | SPI Clock   |
| 33 | CTX3_P  | COM Port 3 Transmit – Positive / COM 3 RS232 Transmit – 3volts level for RS422/485, RS232 levels for RS232 | 34 | SPI SIMO   | SPI – Output when Master  |
| 35 | CTX3_N  | COM Port 3 Transmit – Negative / COM 3 RS232 Receive – 3volts level for RS422/485, RS232 levels for RS232  | 36 | 0 volts    |   |
| 37 | CRX3_P  | COM Port 3 Receive – Positive – 3volts level for RS422/485, RS232 levels for RS232                         | 38 | PWROFF#    | Apply logic low to power down the unit  |
| 39 | CRX3_N  | COM Port 3 Receive – 3volts level for RS422/485, RS232 levels for RS232                                    | 40 | RESET#     | Apply logic low to reset the unit   |
| 41 | 0 volts |  | 42 | SLEEP RQ#  | Apply logic low while the system in operational to signal that the OS should go into suspend. Apply logic low while the system in suspend wake up the system. |
| 43 | I2C SCL | I2C Clock at a 3 volts level   | 44 | BOOT MODE# | Apply logic low during power up to put the unit into USB engineering mode.  |
| 45 | I2C SDA | I2C Data at a 3 volts level  | 46 | 0 volts    |   |
| 47 | 0 volts |  | 48 | VCC        | 3 volts   |
| 49 | VIN     | 5 volts Power INPUT – in parallel with the main power in connector on HB5                                  | 50 | RTC_BAT    | Nominal 3.6 volts DC for Real Time Clock  |

**Notes:**

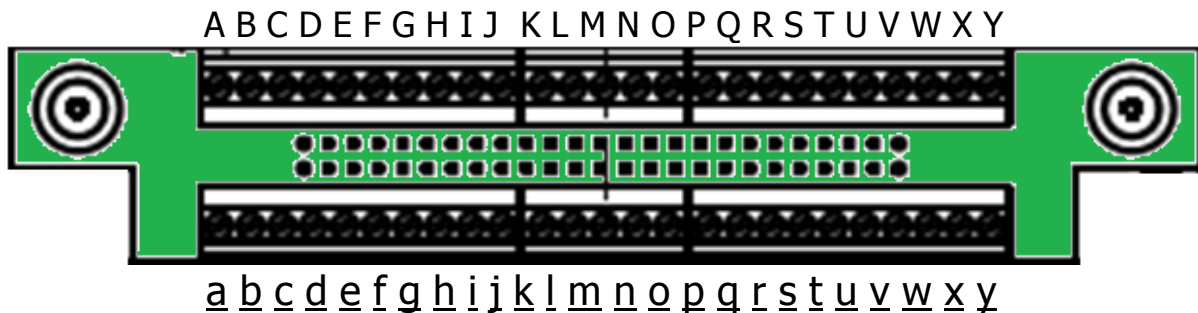
1. The details of the connector are:
  - a. 50 way 2mm pitch socket.
2. The voltage level of all the GPIO lines can be changed from 3 volts to 1.8 volts in the kernel.

## Standard Connector PCBs

### Screw Terminal Version

For users who prefer screw terminal connections we offer dual 25 way rows of 3.5mm pitch connectors. Due to the limited space available we have chosen to mark the connections using the upper and lower case alphabet rather than numbers.

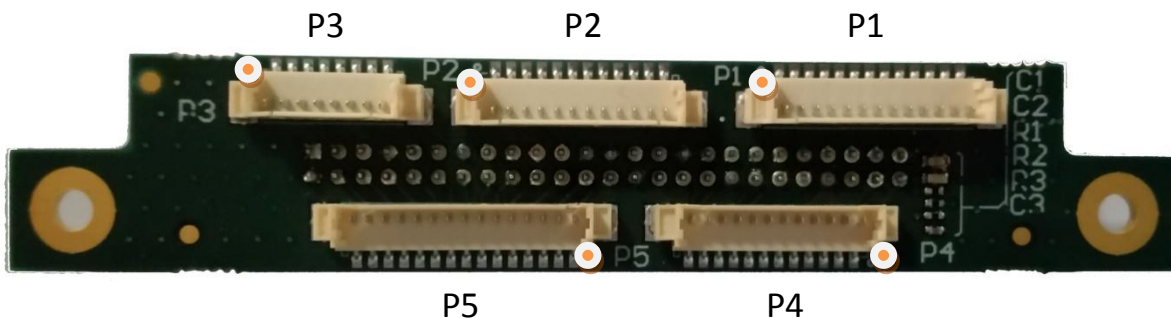
Please see below for the connection details (note that we have underlined the lower case characters to help identification):




| Pin | Signal     | Comment   | Pin      | Signal  | Comment  |
|-----|------------|---|----------|---------|--|
| A   | RTC_BAT    | Nominal 3.6 volts DC for Real Time Clock  | <u>a</u> | VIN     | 5 volts Power INPUT – in parallel with the main power in connector on HB5                                  |
| B   | VCC_3V     | 3 volts DC  | <u>b</u> | 0 volts |  |
| C   | 0 volts    |   | <u>c</u> | I2C SDA | I2C Data at a 3 volts level  |
| D   | BOOT_MODE# | Apply logic low during power up to put the unit into USB engineering mode.  | <u>d</u> | I2C SCL | I2C Clock at a 3 volts level   |
| E   | SLEEP_RQ#  | Apply logic low while the system in operational to signal that the OS should go into suspend. Apply logic low while the system in suspend wake up the system. | <u>e</u> | 0 volts |  |
| F   | RESET#     | Apply logic low to reset the unit   | <u>f</u> | CRX3_N  | COM Port 3 Receive – Negative – 3volts level for RS422/485, RS232 levels for RS232                         |
| G   | PWROFF#    | Apply logic low to power down the unit  | <u>g</u> | CRX3_P  | COM Port 3 Receive – Positive – 3volts level for RS422/485, RS232 levels for RS232                         |
| H   | 0 volts    |   | <u>h</u> | CTX3_N  | COM Port 3 Transmit – Negative / COM 3 RS232 Receive – 3volts level for RS422/485, RS232 levels for RS232  |
| I   | SPI_SIMO   | SPI – Output when Master  | <u>i</u> | CTX3_P  | COM Port 3 Transmit – Positive / COM 3 RS232 Transmit – 3volts level for RS422/485, RS232 levels for RS232 |
| J   | SPI_CLK    | SPI Clock   | <u>j</u> | 0 volts |  |
| K   | SPI SOMI   | SPI – Input when Master   | <u>k</u> | COM2_RX | RS232 Port 2 Receive – RS232 levels  |
| L   | 0 volts    |   | <u>l</u> | COM2_TX | RS232 Port 2 Transmit – RS232  |

|   |         |                             |          |           |                                      |
|---|---------|-----------------------------|----------|-----------|--------------------------------------|
|   |         |                             |          |           | levels                               |
| M | GPIO 1  | GPIO signal – 3 volts level | <u>m</u> | 0 volts   |                                      |
| N | GPIO 2  | GPIO signal – 3 volts level | <u>n</u> | COM1_RX   | RS232 Port 1 Receive – RS232 levels  |
| O | GPIO 3  | GPIO signal – 3 volts level | <u>o</u> | COM1_TX   | RS232 Port 1 Transmit – RS232 levels |
| P | GPIO 4  | GPIO signal – 3 volts level | <u>p</u> | 0 volts   |                                      |
| Q | GPIO 5  | GPIO signal – 3 volts level | <u>q</u> | SPEAKER_L | Audio speaker output – Negative      |
| R | GPIO 6  | GPIO signal – 3 volts level | <u>r</u> | SPEAKER_H | Audio speaker output – Positive      |
| S | GPIO 7  | GPIO signal – 3 volts level | <u>s</u> | 0 volts   |                                      |
| T | GPIO 8  | GPIO signal – 3 volts level | <u>t</u> | LINEIN_L  | Audio line in – left channel         |
| U | GPIO 9  | GPIO signal – 3 volts level | <u>u</u> | LINEIN_R  | Audio line in – right channel        |
| V | GPIO 10 | GPIO signal – 3 volts level | <u>v</u> | 0 volts   |                                      |
| W | GPIO 11 | GPIO signal – 3 volts level | <u>w</u> | LINEOUT_L | Audio line out – left channel        |
| X | GPIO 12 | GPIO signal – 3 volts level | <u>x</u> | LINEOUT_R | Audio line out – right channel       |
| Y | 0 volts |                             | <u>y</u> | 0 volts   |                                      |

### Picoblade Version



 Denotes pin 1 on each connector

#### Connector P1 - Utilities

| Pin | Signal     | Comments  |
|-----|------------|---|
| 1   | PWROFF#    | Apply logic low to power down the unit  |
| 2   | 0 volts    |   |
| 3   | RESET#     | Apply logic low to reset the unit   |
| 4   | 0 volts    |   |
| 5   | I2C SCL    | I2C Clock at a 3 volts level  |
| 6   | I2C SDA    | I2C Data at a 3 volts level   |
| 7   | 0 volts    |   |
| 8   | SLEEP RQ#  | Apply logic low while the system in operational to signal that the OS should go into suspend. Apply logic low while the system in suspend wake up the system. |
| 9   | 0 volts    |   |
| 10  | Reserved   |   |
| 11  | 0 volts    |   |
| 12  | BOOT MODE# | Apply logic low during power up to put the unit into USB engineering mode.  |
| 13  | 0 volts    |   |

**Connector P2 - RS232**

| Pin | Signal   | Comments   |
|-----|----------|--|
| 1   | 0 volts  | Ground for COM 1 RS232 channel                       |
| 2   | COM 1 RX | RS232 receive channel – console for Linux & Android  |
| 3   | COM 1 TX | RS232 transmit channel – console for Linux & Android |
| 4   | Reserved |  |
| 5   | Reserved |  |
| 6   | Reserved |  |
| 7   | Reserved |  |
| 8   | Reserved |  |
| 9   | Reserved |  |
| 10  | Reserved |  |
| 11  | Reserved |  |
| 12  | Reserved |  |

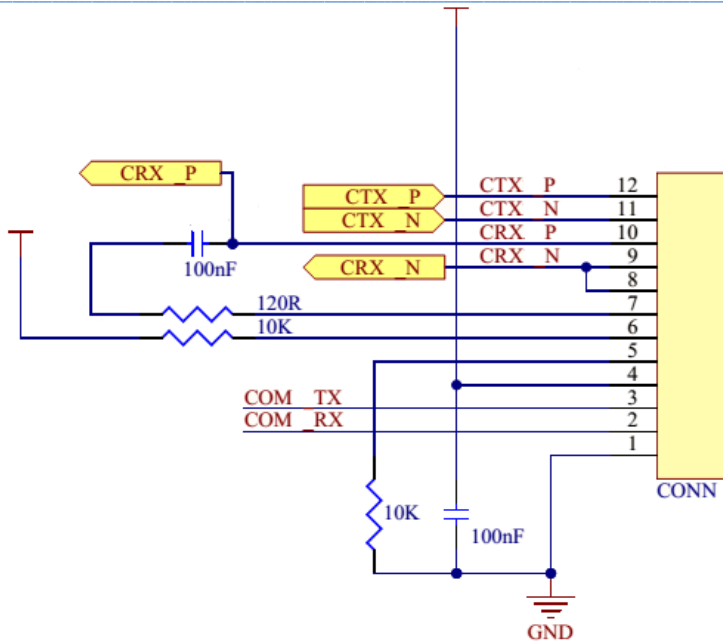
**Connector P3 - Audio**

| Pin | Signal                 | Comments  |
|-----|------------------------|---|
| 1   | Line out right channel | Audio line level signal   |
| 2   | Line out left channel  | Audio line level signal   |
| 3   | 0 volts                | Audio ground  |
| 4   | Line in left channel   | Audio line level signal   |
| 5   | Line in right channel  | Audio line level signal   |
| 6   | 0 volts                | Audio ground  |
| 7   | Speaker negative       | Combined left and right audio channels amplified – Negative (not 0 volts) |
| 8   | Speaker positive       | Combined left and right audio channels amplified - Positive               |

**Connector – P4 – RS232 & RS232/422/485**

| Pin | Signal               | Comments   |
|-----|----------------------|--|
| 1   | 0 volts              | Ground for COM 2 RS232 channel   |
| 2   | COM 2 RX             | RS232 receive channel  |
| 3   | COM 2 TX             | RS232 transmit channel   |
| 4   | VCC                  | 3 Volts  |
| 5   | Termination – low    | 10K ohm to 0 volts   |
| 6   | Termination – high   | 10K ohm to 3 volts   |
| 7   | Termination – signal | 120 ohm and 100nF in series and then pin 10 (COM 3 RX +ve)   |
| 8   | COM 3 Receive –ve    | Differential signal – negative. Connected to pin 9 to allow termination to be connected in circuit |
| 9   | COM 3 Receive –ve    | Differential signal – negative. Connected to pin 8 to allow termination to be connected in circuit |
| 10  | COM 3 Receive +ve    | Differential signal – positive. Connected to 100nF and 120 ohm then pin 7                          |
| 11  | COM 3 Transmit –ve   | RS422/485 Differential signal – negative.<br>COM 3 RS232 Receive                                   |
| 12  | COM 3 Transmit +ve   | RS422/485 Differential signal – positive.<br>COM 3 RS232 Transmit                                  |

For those of you who may be puzzled by the termination options; well they say that a picture speaks a thousand words....



### RS422 & RS485 Operation

RS422 is a four wire interface and supports full duplex (both transmit and receive active at the same time) communications.

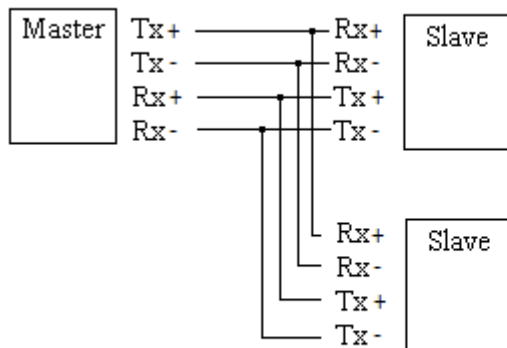
RS485 is a two wire interface and therefore supports half duplex operation. Therefore you need to connect the Transmit +ve and Receive +ve signals together and the Transmit -ve and Receive -ve signals together to thereby create the two wire interface required to connect to RS485 devices.

RS485 requires one device on the network to be the master and to set the protocol.

Remember that by connecting the Transmit and Receive differential pairs together (as above) then when you transmit you will effectively place the transmit data into your receive buffer! So you need to ensure that you discard this data before you look for data in your receive buffer.

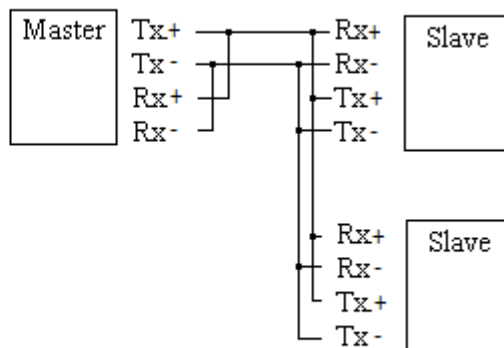
#### RS422

Full Duplex



#### RS485

Half Duplex





## Connector – P5 – GPIO

| Pin | Signal   | Comments                                       |
|-----|----------|--|
| 1   | 3 volts  | 3 volts DC source for GPIO signal pull ups etc |
| 2   | GPIO 1   | GPIO signal – 3 volts level                    |
| 3   | GPIO 2   | GPIO signal – 3 volts level                    |
| 4   | GPIO 3   | GPIO signal – 3 volts level                    |
| 5   | GPIO 4   | GPIO signal – 3 volts level                    |
| 6   | GPIO 5   | GPIO signal – 3 volts level                    |
| 7   | GPIO 6   | GPIO signal – 3 volts level                    |
| 8   | GPIO 7   | GPIO signal – 3 volts level                    |
| 9   | GPIO 8   | GPIO signal – 3 volts level                    |
| 10  | GPIO 9   | GPIO signal – 3 volts level                    |
| 11  | GPIO 10  | GPIO signal – 3 volts level                    |
| 12  | GPIO 11  | GPIO signal – 3 volts level                    |
| 13  | GPIO 12  | GPIO signal – 3 volts level                    |
| 14  | Reserved |  |
| 15  | 0 volts  | 0 volt reference for GPIO signals              |

**Note:**

The voltage level of all the GPIO lines can be changed from 3 volts to 1.8 volts in the kernel. This is not a standard configuration and changing the kernel setting will not change the 3 volts present on pin 1.

## Updating the Operating System on your Beta/TM1/HB5

### Beta/TM1/HB5 update utility operation

The update utility is a Windows based tool that provisions for programming operating system firmware into the onboard storage of TMx processor board. The utility can be downloaded and installed from the Blue Chip Technology website. See the following link for the latest version of the utility. At time of writing V1.13 is the latest version.

<http://dl.bluechiptechnology.com/dl/tm1/software/TMx-programming-UtilityV1.13.exe>

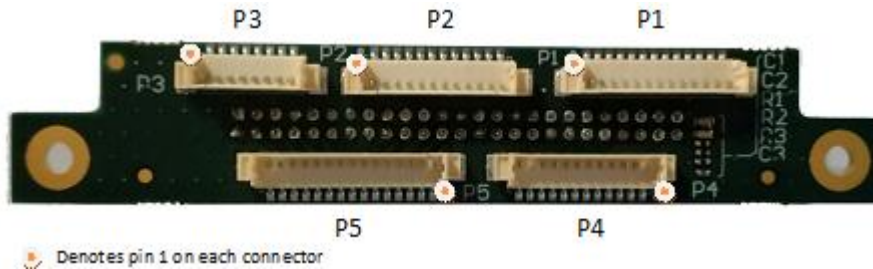
To update a TMx processor module firmware using this utility, follow the below steps:

1. Launch the utility on your PC using either the desktop or start menu shortcut
2. Select module type. Note: TM1 emmc / uSD options refer solely to the storage media populated on the TM1 module. If you have a MicroSD socket then select uSD, if not select eMMC.
3. Select host board type - chose HB5/6
4. Select LCD and touch screen type - the options are 4.3" or 7" LCDs and Resistive or Capacitive Touch
5. Select desired operating system - select the operating system you require.
6. Press the start button
7. Attach a USB A -> mini B cable between your PC and the mini USB connector on the Beta
8. Power on the hardware with the BOOT\_MODE# pin shorted to ground - where this is will depend on the connector board.

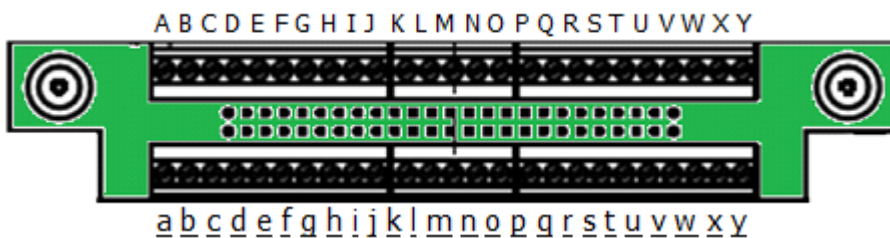
**If you have a Picoblade connector board and the Utilities cable then:**

Short the two pins on the two pin connector with a black heatshrink on one of the cables.

**If you have a Picoblade connector board and no Utilities cable then short out the pins 12 & 13 on P1:**



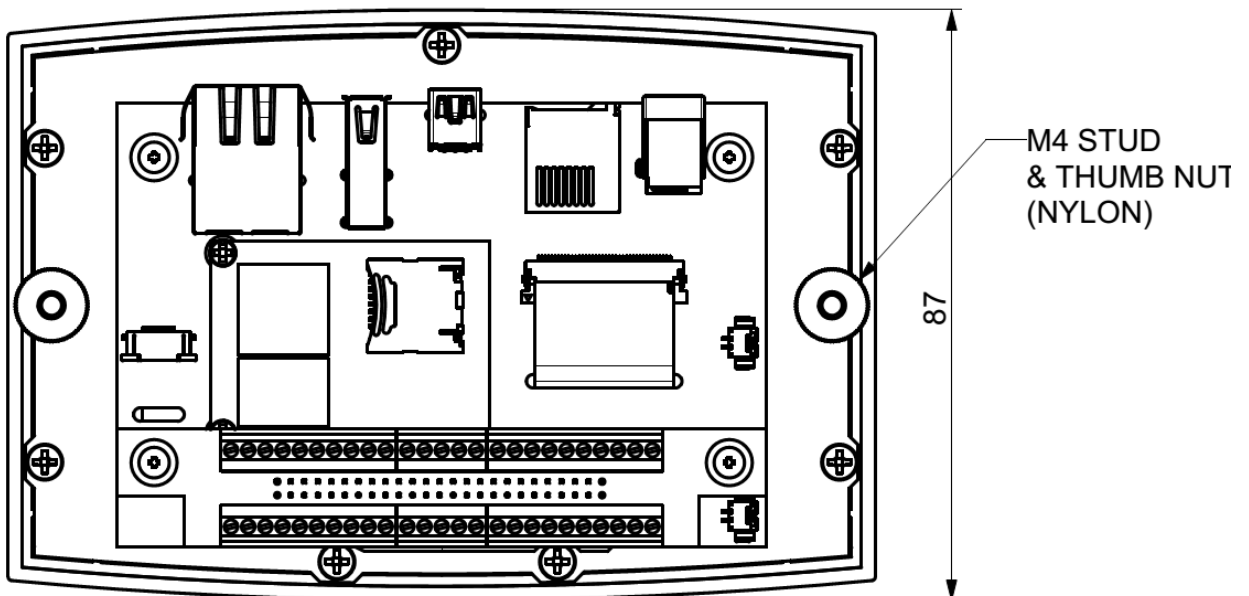
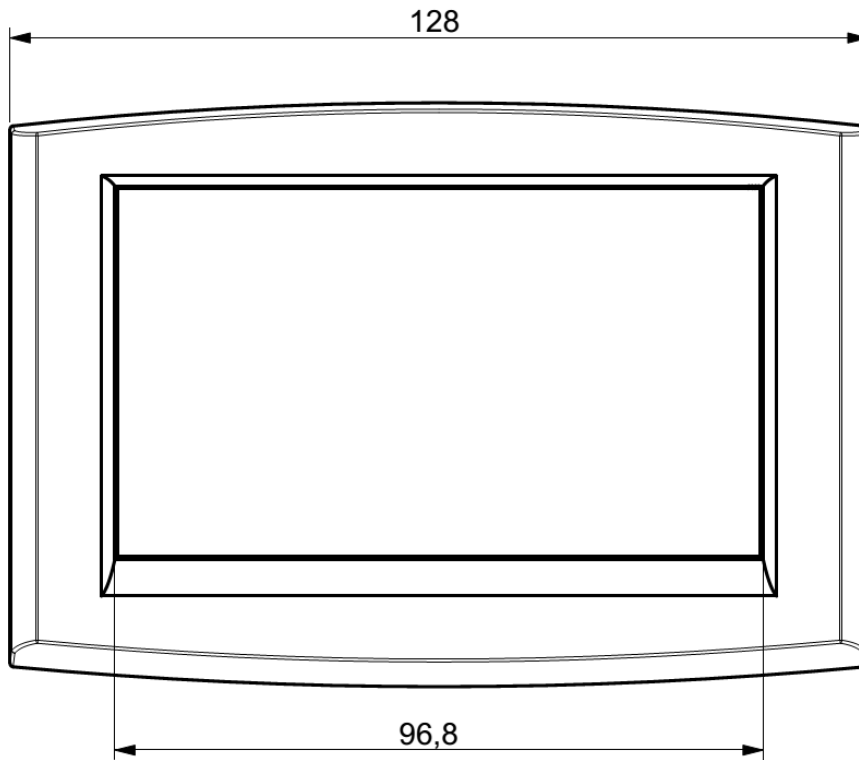
**If you have the Screw Terminal Connector board then short out the C & D contacts (note: not the c & d contacts):**

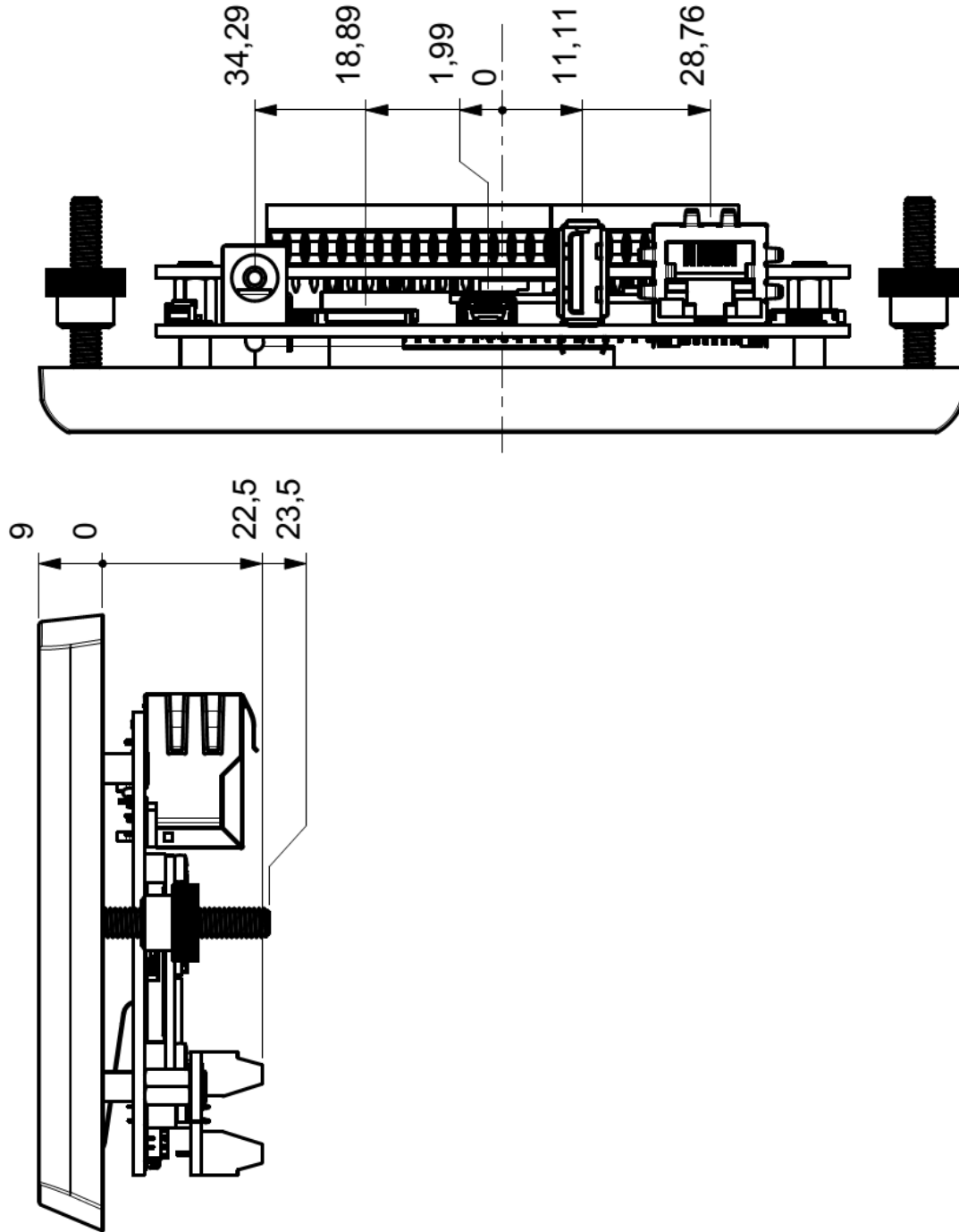


9. Follow the onscreen messages and wait for completion
10. Reboot the unit to try out the new operating system.

## Mechanical Specifications

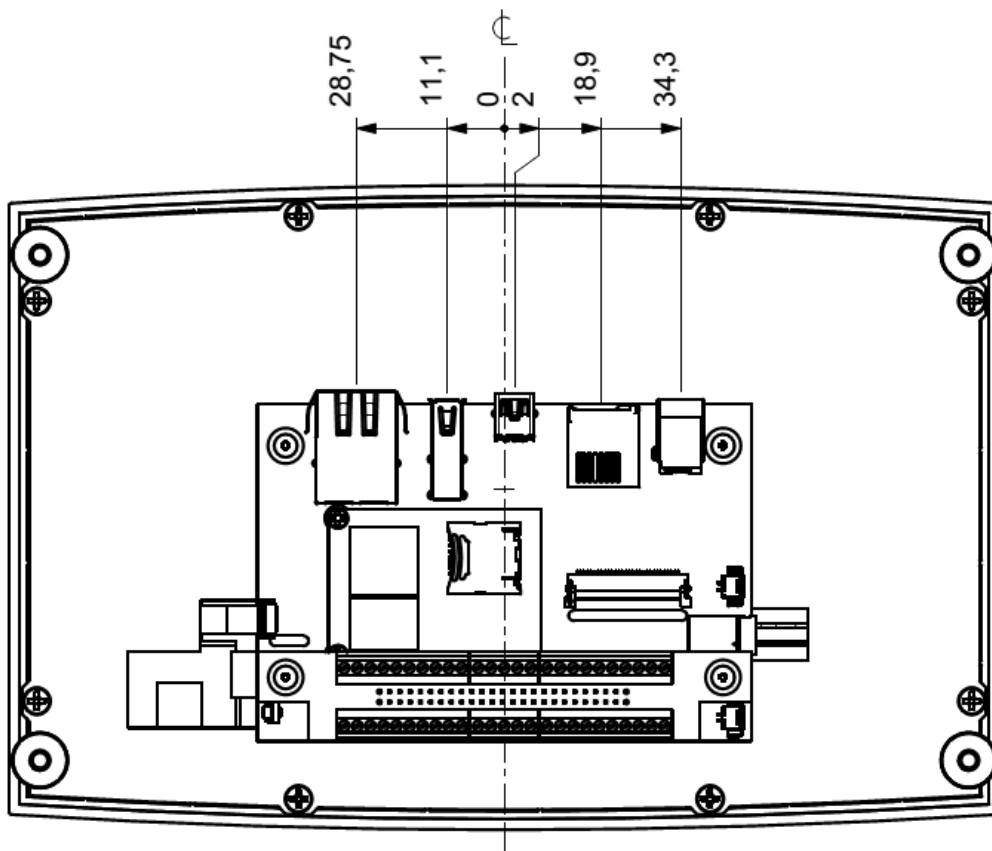
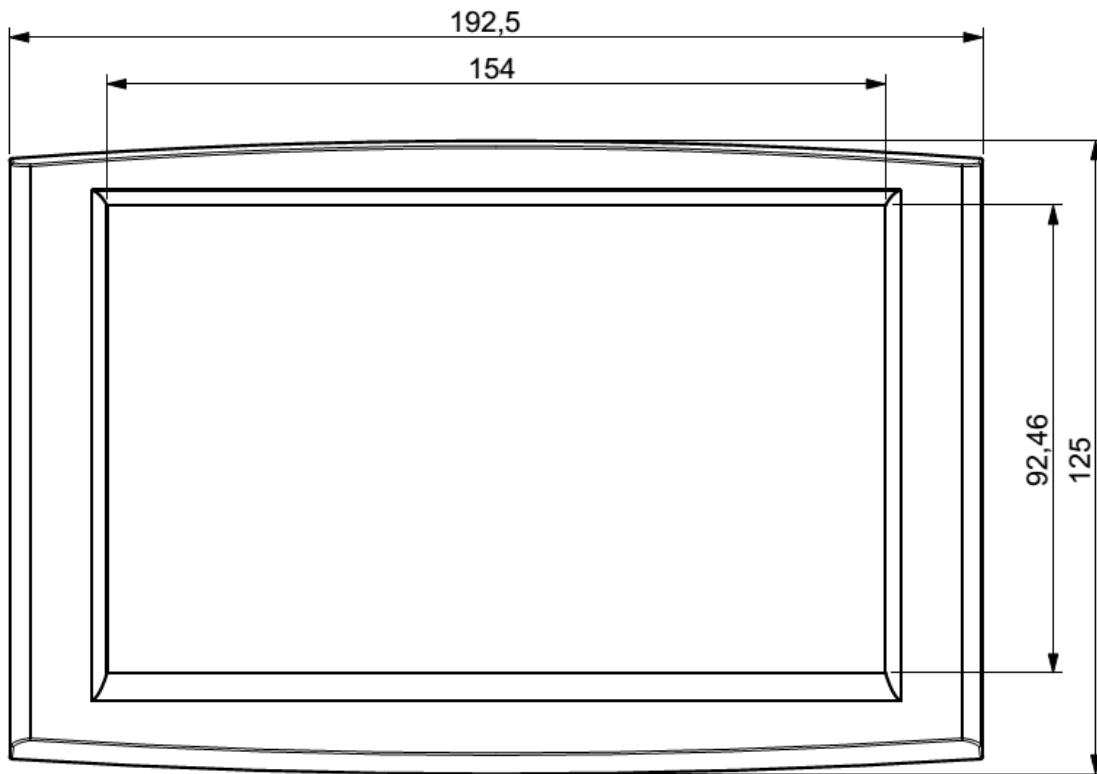
### Outline Dimensions - Beta 432H

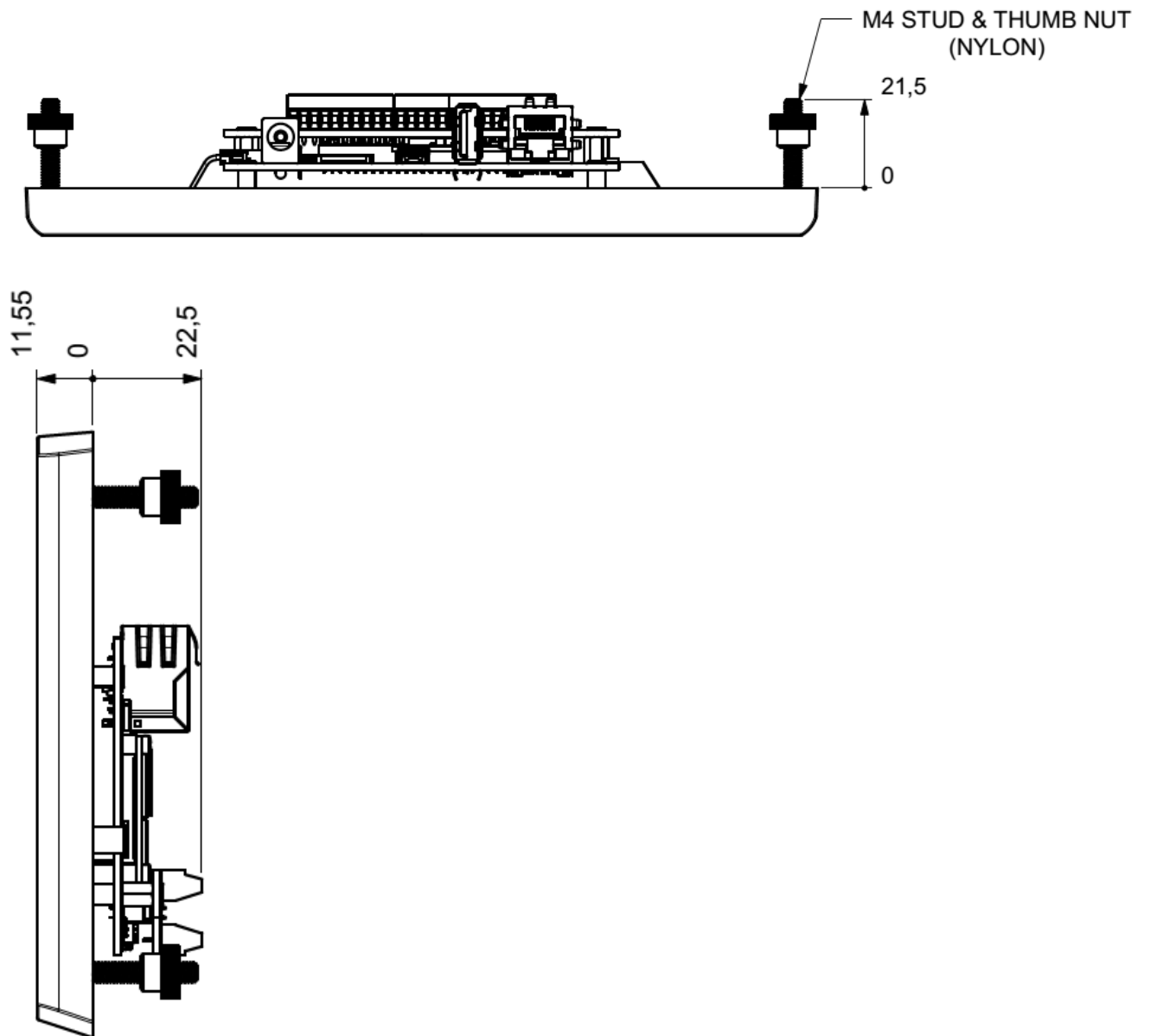




All dimensions are shown in millimetres.

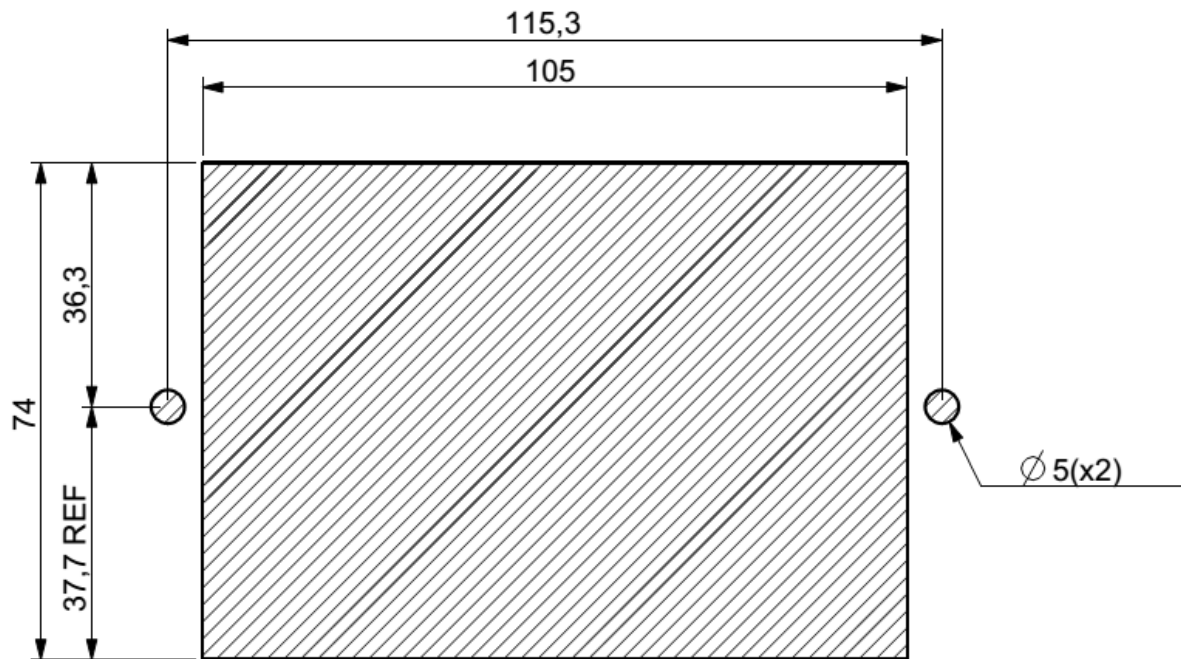
### Outline Dimensions - Beta 712H





All dimensions are shown in millimetres.

## Mounting Outline - Beta 432H

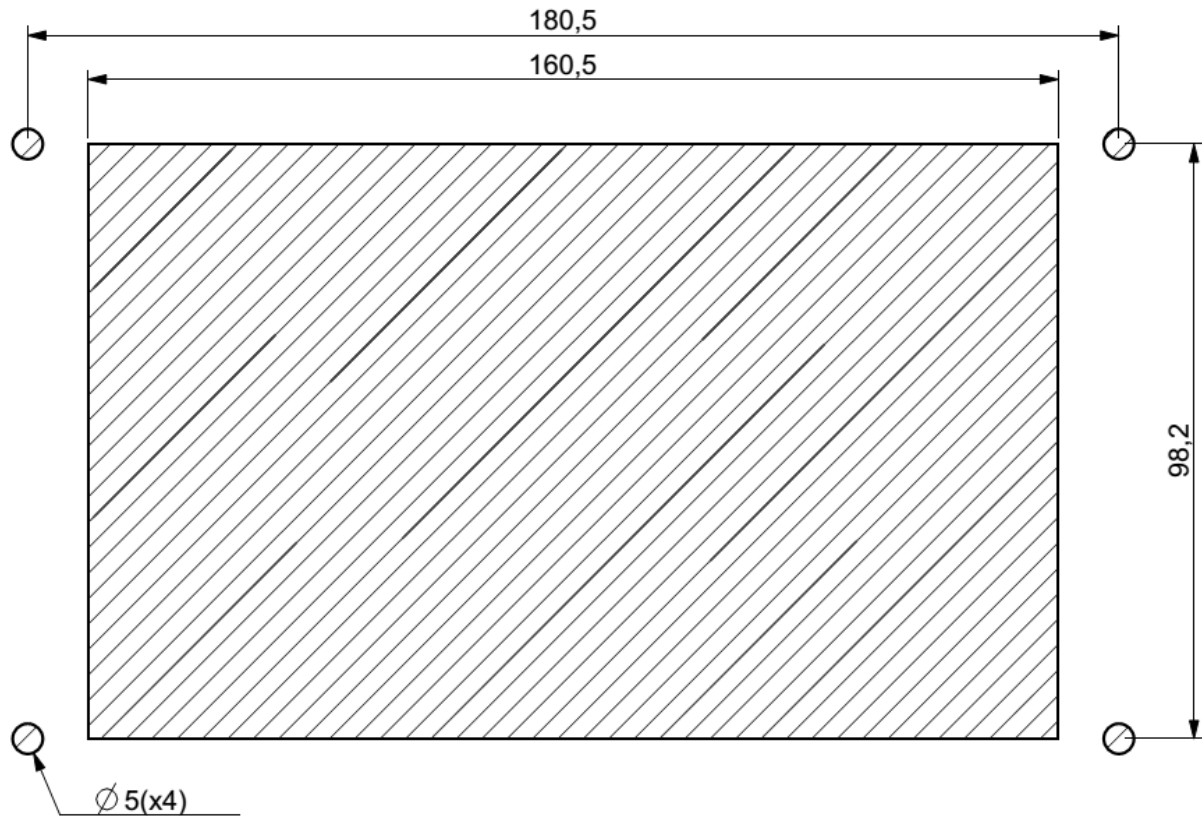


Your Beta 432H is supplied with two threaded nylon studs which are to be screwed into the rear of the Beta 432H in the two M4 brass inserts.

Once located you can mount your Beta 432H into the outline (as above) and then attach the supplied two thumb nuts screws onto the nylon studs with your fingers. When the thumb nuts are finger tight the HB5 432H is mounted into your unit.

Please do not use pliers or any other tool to increase the tightness on the thumb nuts as this may cause the nylon studs to break.

## Mounting Outline - HB5 712H



All dimensions are shown in millimetres.

Your Beta 712H is supplied with four threaded nylon studs which are to be screwed into the rear of the Beta 712H in the four M4 brass inserts.

Once located you can mount your Beta 712H into the outline (as above) and then attach the supplied four thumb nuts screws onto the nylon studs with your fingers. When the thumb nuts are finger tight the Beta 712H is mounted into your unit.

Please do not use pliers or any other tool to increase the tightness on the thumb nuts as this may cause the nylon studs to break.



## General Precautions

Your Beta H series Touch Computer is susceptible to damage by electrostatic discharges. In order to avoid damage, you should work at an anti-static bench and observe normal anti-static precautions. Wear an anti-static wrist strap connected to an earth point *before* opening any packaging.

Where a wrist strap is not available, discharge any static charge you may have built-up by touching an earth point. Avoid any further movement that could build up another static charge. Touch an earth point from time to time to avoid further build-up, and remove the items from their anti-static bags only when required

## Electro-Static Discharges

If you are going to open up the unit, it is important to realise that the devices on the cards within this unit can be damaged by static electricity. Bear in mind that the damage caused by static electricity may vary from total destruction to partial damage, which may not be immediately obvious. This could have an effect on the product's reliability and warranty. Before opening the chassis, ensure that you take necessary static precautions. Ideally you should work at an anti-static bench and wear an approved wrist strap or if that is not possible, touch a suitable ground to discharge any static build up before touching the electronics. This should be repeated if the handling continues for any length of time.

If it is necessary to remove a board or electronic assembly, place it into an anti-static bag. This will prevent any static electricity build up damaging the board. Metallised bags are preferred. Do not use black anti-static bags for any item containing a battery because these tend to be conductive and will discharge the battery.

## On-Board Battery

The processor board Real time Clock can be fed from an external Lithium battery. Great care should be taken with this type of battery. If the battery is mistreated in any way there is a very real possibility of fire, explosion, and personal harm. Under NO circumstances should it be short-circuited, exposed to temperatures in excess of 100°C or burnt, immersed in water, recharged or disassembled.

Expired batteries remain hazardous and must be disposed of in a safe manner, according to local regulations.

Le panneau de processeur est équipé d'une batterie de lithium. Le grand soin devrait être pris avec ce type de batterie. Si la batterie est mistreated il y a de dans de toute façon un possibility très vrai du feu, d'explosion et de mal personnel. Dans au cunes circonstances il est sous peu circuité, exposé aux températures au dessus de 100 degrés de centigrade ou brûlé, immergé dans l'eau, rechargée ou dissassembled.

Les batteries expirées restent dazaedous et doivent être reejetées d'une façon sûre, selon des règlements locaux.

## Electromagnetic Compatibility

This product has been assessed operating in representative, standard configurations. As with any computer product, however, final installation & configuration can vary significantly, and so the following guidelines are offered to help ensure that compatibility is maintained.

- All components added to a system should either carry appropriate equivalent levels of compliance, or be tested for compliance as part of the final system, and should be installed in accordance with supplier recommendations.
- The external enclosure should be securely fastened (with standard lids and covers in place) to ensure good metal-to-metal contact around the internal electronics
- Any metal back plate must be securely screwed to the chassis of the computer to ensure good metal-to-metal (i.e. earth) contact.
- Any metal, screened, connector bodies should be securely connected to the enclosure.
- The external cabling to boards causes most EMC problems. It is recommended that any external cabling to the board be totally screened, and that the screen of the cable connects to the metal end bracket of the board or the enclosure and hence to earth. Round, screened cables with a braided wire screen are used in preference to those with a foil screen and drain wire. Wherever possible, use metal connector shells that connect around the full circumference of the cable screen: they are far superior to those that earth the screen by a simple "pig-tail".
- If used, a keyboard or mouse will play an important part in the compatibility of the processor card since they are ports into the board. Similarly, they will affect the compatibility of the complete system. Fully compatible peripherals must be used otherwise the complete system could be degraded. They may radiate or behave as if keys/buttons are pressed when subject to interference. Under these circumstances it may be beneficial to add a ferrite clamp on the leads as close as possible to the connector. A suitable type is the Chomerics type H8FE-1004-AS.
- USB cables should be high quality screened types.
- Ensure that the screens of any external cables are bonded to a good RF earth at the remote end of the cable.

Failure to observe these recommendations may invalidate the EMC compliance

## Amendment History

| Issue Level | Issue Date | Author | Amendment Details   |
|-------------|------------|--------|---|
| 1.0         | 28/01/2016 | BH     | Initial release   |
| 1.1         | 05/02/2016 | BH     | Reference to high brightness panel removed  |
| 1.2         | 11/02/2016 | BH     | RS422 & RS485 connectivity explained  |
| 1.3         | 21/03/2016 | BH     | Battery added to C and A series matrix information<br><br>RS232/422/485 level information added to tables |
| 1.4         | 09/05/2016 | BH     | Boot Mode pin description added.  |
| 1.5         | 23/05/2016 | BH     | Jumper J1 description added.  |
| 1.6         | 25/05/2016 | BH     | Model range matrix updated  |
| 1.7         | 27/03/2017 | BH     | Model range matrix updated, Added TMx Programming Guide, minor corrections.                               |
| 1.8         | 25/10/2017 | BH     | J1 configuration included<br><br>9.7" details included  |

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\* To use the Support email address requires the sender to be first registered on the Support Web site at

<http://support.bluechiptechnology.co.uk/>

\*\*To request a Returns Authorisation number, use the RMA portal at  
<http://rma.bluechiptechnology.co.uk>