Sixnet
Engineering Tech Note

ET-8MS-OEM
Board Level Managed Switch for Embedded OEM Applications

1.0 Abstract/Overview

This document defines the board level managed switch with part number ET-8MS-OEM. This board is designed for embedded OEM applications.

1.1 Glossary

OEM	Original Equipment Supplier
COTS	Commercial Off-The-Shelf – The ET-8MS-OEM is ideal for COTS applications
Board Level	The ET-8MS-OEM is a board level product meaning that it is supplied as fully populated and functional circuit board that is designed to be integrated into a final application. It does not come with any enclosure or mounting standoffs. It incorporates mounting holes to facilitate installation as a "piggy-back" board on another circuit board assembly.
SMI	Serial management interface
PHY	Physical interface for the Ethernet magnetics

1.2 References

Managed Switch Software User Manual:
http://www.sixnetio.com/html_files/manuals/managed%20switch%20software%20manual.pdf

The ET-8MS-OEM shares common firmware with SIXNET's standard packaged managed switches such as the SLX-5MS, SLX-8MG and SLX-10MG. Therefore, it supports the same advanced software features.

2.0 Product Brief

The ET-8MS-OEM is a board level managed Ethernet switch, suitable for incorporation into electronic assemblies for commercial, industrial or military OEM applications.

3.0 Technical Specifications

3.1 General Hardware Features

The ET-8MS-OEM has the following hardware features:

- IEEE 802.3 Switch IC (manageable) and CPU for network management functionality
- Eight available Ethernet ports with on-board PHYs and magnetics.
- Two available Ethernet ports which require external PHY and magnetics
- The J2 board-to-board connector also has these signals:
  - Port 1-8 Status LED signals
  - OK (alarm) output signal
  - Status LED output signal
  - 3.3VDC Power lines
- The J11 board-to-board connector has these signals:
  - RS232 serial management interface with LVTTL (3.3V) signals (TD and RD only)
  - USB device interface shared with Mini-B USB connector on-board.
  - Serial LED interface available for remote LED (Please contact Sixnet).
  - CPU reset line input/output
  - PHY reset Line output
  - OK (alarm) output signal
  - Status LED output signal
  - Power and GND lines
- Requires user supplied power of regulated 5VDC or 3.3 VDC at approximately 6 Watts
- Four #4 mounting holes connected to isolation guard rings and external connection to Earth ground
- Optional LEDs for each port for diagnostic purposes

3.1.1 Ordering information and board options

Orderable PN	Board to board connector	Molex wire connectors	5V operation only	3.3V operation only
ET-8MS-OEM-1	√	√	√	
ET-8MS-OEM-1-3	√	√		√
ET-8MS-OEM-2	√		√	
ET-8MS-OEM-2-3	√			√

3.2 General Software Features

The ET-8MS-OEM has all the following software capabilities:

- IEEE 802.3 (10 Mbps) and 802.3u (100 Mbps) compatible
- IEEE 802.3x for half/full duplex and flow control
- IEEE 802.1D-2004 - Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP)
    - Allows for ring, mesh and other redundant topologies
- IEEE 802.1p for priority queuing (QoS and CoS)
- IEEE 802.1Q for Virtual Local Area Networks (VLANs)
- SNMP and RMON for network management
- SNMPv3 for network management with security
- Port mirroring for diagnostics
- Management interfaces via web, terminal and telnet
- Web interface supports HTTPS security with SSL or TLS
- Command line interface for the following parameters:
    - Reset to factory defaults
    - DHCP enable / disable
    - Set IP address
    - Set subnet mask
    - Set default gateway
    - Set system name
    - RSTP enable / disable
    - Set bridge priority for RSTP
    - Set maximum age for RSTP
    - Set hello time for RSTP
    - Set forward delay for RSTP
    - Set transmission limit for RSTP
    - SNMP enable / disable
    - Telnet enable / disable
    - Other commands may be provided at SIXNET's discretion
- Other software features may be provided at SIXNET's discretion

Note: Other software features not listed

3.3 Firmware

The ET-8MS-OEM is pre-installed with SIXNET managed switch firmware which provides the software capabilities as previously described. SIXNET periodically releases firmware updates that may include performance improvements, bug fixes and/or new features.

These firmware updates are typically supplied in two formats:

1. **Full Firmware Image File** – This can be loaded from one of SIXNET's Microsoft Windows utilities. It will completely replace the operating system and firmware and set all parameters back to the factory defaults. This method requires both an Ethernet and serial connection to the switch.

2. **Firmware Update File** – This is a tarball (.tgz) file that can be loaded from the web or terminal interface's Update Firmware screen. It typically will update the switch firmware from one version to the next. It typically will retain the switches parameters so the switch configuration does not need to be reloaded afterwards.

3.4 Connectors

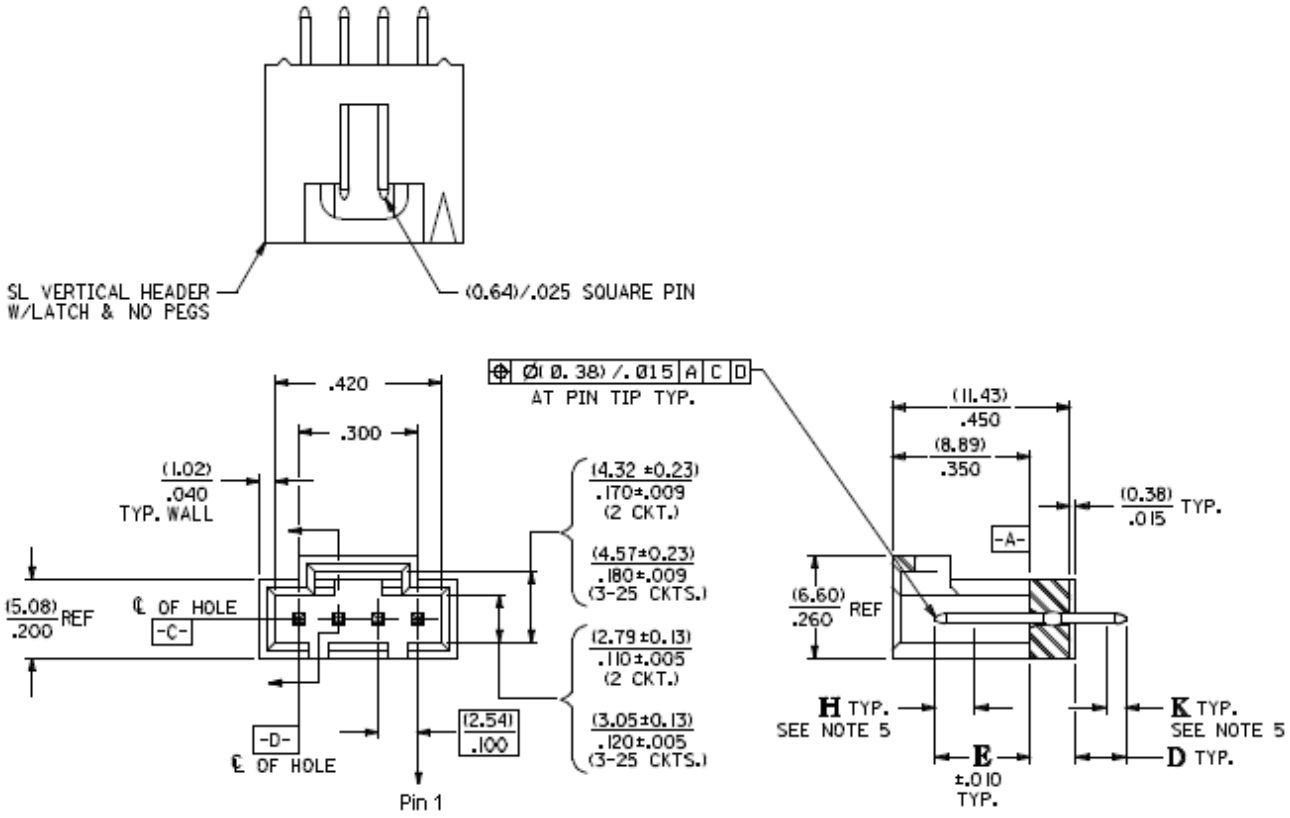
Ports 1-8 may be accessed either through individual 4 pin connectors named Port 1 to Port 8 or through the J2 Board-to-Board 0.8mm pitch 2x35 pin female header. See section 3.1.1 for orderable part numbers and options.

3.4.1 Port 1-8 Connectors pin designation

The Ethernet connectors consist of 4 pins. They are specified to be the **Molex 70543-0003.** There is one **Molex 70543-0003** connector for each port and the pin-out is as follows:

Pin #	Signal
1	TX+
2	TX-
3	RX+
4	RX-

Molex 70543-0003 Connector Description:
2.54mm (.100") Pitch SL™ Header, Single Row, Vertical, .120" Pocket, Shrouded, 4 Circuits, 0.38µm (15µ") Gold (Au) Selective Plating, Tin (Sn) PC Tail Plating, RoHS



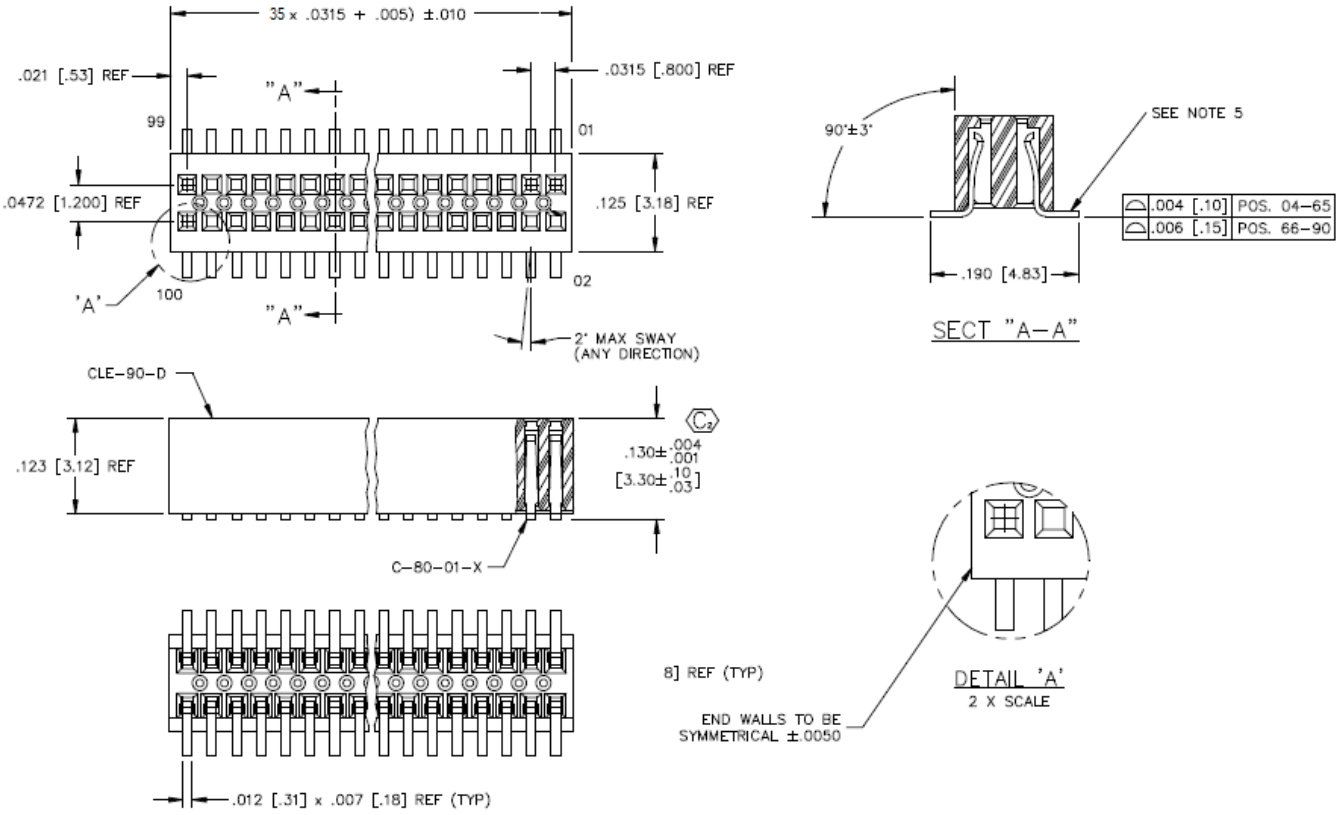
Molex 70543-0003 Mechanical

3.4.2 Board-to-Board J2 header connector pin designation

The 0.8mm pitch Ethernet connector consists of 70 pins (2 rows of 35 pins). It is specified to be the **Samtec CLE-135-01-G-DV-A.** The pin-out is as follows: (NC = no connection)

Pin #	Signal	Pin#	Signal	Reference
1	+3.3V	2	+3.3V	LED drive
3	OK LED / DO	4	STATUS LED	Status
5	SPEED100 LED	6	LINK/ACT LED	PORT 1
7	SPEED100 LED	8	LINK/ACT LED	PORT 2
9	SPEED100 LED	10	LINK/ACT LED	PORT 3
11	SPEED100 LED	12	LINK/ACT LED	PORT 4
13	SPEED100 LED	14	LINK/ACT LED	PORT 5
15	SPEED100 LED	16	LINK/ACT LED	PORT 6
17	SPEED100 LED	18	LINK/ACT LED	PORT 7
19	SPEED100 LED	20	LINK/ACT LED	PORT 8
21	NC	22	NC	
23	NC	24	NC	
25	RX+	26	TX+	PORT 1
27	RX-	28	TX-	PORT 1
29	NC	30	NC	
31	RX+	32	TX+	PORT 2
33	RX-	34	TX-	PORT 2
35	NC	36	NC	
37	RX+	38	TX+	PORT 3
39	RX-	40	TX-	PORT 3
41	NC	42	NC	
43	RX+	44	TX+	PORT 4
45	RX-	46	TX-	PORT 4
47	NC	48	NC	
49	RX+	50	TX+	PORT 5
51	RX-	52	TX-	PORT 5
53	NC	54	NC	
55	RX+	56	TX+	PORT 6
57	RX-	58	TX-	PORT 6
59	NC	60	NC	
61	RX+	62	TX+	PORT 7
63	RX-	64	TX-	PORT 7
65	NC	66	NC	
67	RX+	68	TX+	PORT 8
69	RX-	70	TX-	PORT 8

Samtec CLE-135-01-G-DV-A connector description:
0.80mm (.0315") pitch female connector, SMT, with alignment pins, 70 circuits, RoHS



Samtec CLE-135-01-G-DV-A Mechanical

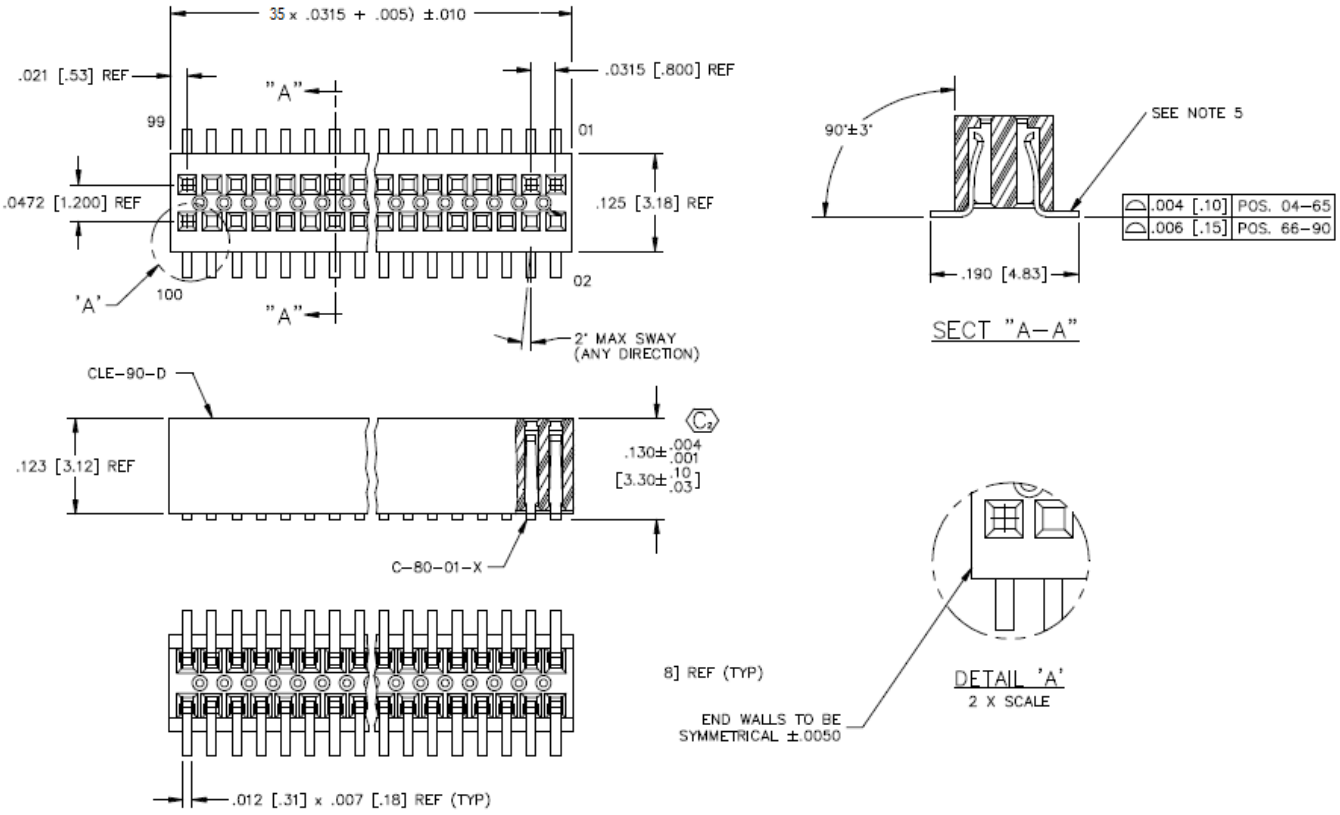
3.4.3 Board-to-Board J11 header connector pin designation

The 0.8mm pitch Ethernet connector consists of 70 pins (2 rows of 35 pins). It is specified to be the **Samtec CLE-135-01-G-DV-A.** The pin-out is as follows:

Note: RESERVED-NC = Reserved, do not connect, leave open.

Pin #	Signal	Pin#	Signal	Reference
1	+3.3V	2	GND	
3	RESERVED - NC	4	GND	
5	+3.3V	6	GND	
7	RESERVED - NC	8	RESERVED - NC	
9	+3.3V	10	GND	
11	RESERVED - NC	12	RESERVED - NC	
13	+3.3V	14	GND	
15	RESERVED - NC	16	RESERVED - NC	
17	RESERVED - NC	18	RESERVED - NC	
19	+3.3V	20	GND	
21	RESERVED - NC	22	RESERVED - NC	
23	RESERVED - NC	24	RESERVED - NC	
25	+3.3V	26	GND	
27	Pull-up to +3.3V through a 4.7K Ohm resistor	28	RESERVED - NC	
29	Pull-up to +3.3V through a 4.7K Ohm resistor	30	RESERVED - NC	
31	Pull-up to +3.3V through a 4.7K Ohm resistor	32	RESERVED - NC	
33	RESERVED - NC	34	RESERVED - NC	
35	+3.3V	36	GND	
37	RESERVED - NC	38	RESERVED - NC	
39	RESERVED - NC	40	RESERVED - NC	
41	RESERVED - NC	42	RESERVED - NC	
43	RESERVED - NC	44	RESERVED - NC	
45	+3.3V	46	GND	
47	RESERVED - NC	48	RESERVED - NC	
49	+3.3V	50	GND	
51	RESERVED - NC	52	RESERVED - NC	
53	+3.3V	54	GND	
55	RESERVED - NC	56	RESERVED - NC	
57	+3.3V	58	GND	
59	RESERVED - NC	60	RESERVED - NC	
61	RESERVED - NC	62	RESERVED - NC	
63	#CPURESET	64	RESERVED - NC	
65	RS232_TXD	66	RS232_RXD	
67	USB_DET	68	RESERVED - NC	
69	USB+	70	USB-	

Samtec CLE-135-01-G-DV-A connector description:
0.80mm (.0315") pitch female connector, SMT, with alignment pins, 70 circuits, RoHS



Samtec CLE-135-01-G-DV-A Mechanical

3.4.4 Power Input

P12 connector is used to supply power to the board. The board supports 5VDC or 3.3VDC input (+/- 5%) on this connector depending on the model. The maximum current draw of the board is around 6 Watts @ 5VDC or 3.3VDC.
Note: Do not attempt to power 5VDC models using the 3.3V pins. Damage to the board may occur.
The P12 power input connector consists of 6 pins. It is specified to be the **Molex 70543-0005.** The pin-out is as follows:

Power input connector pin-out

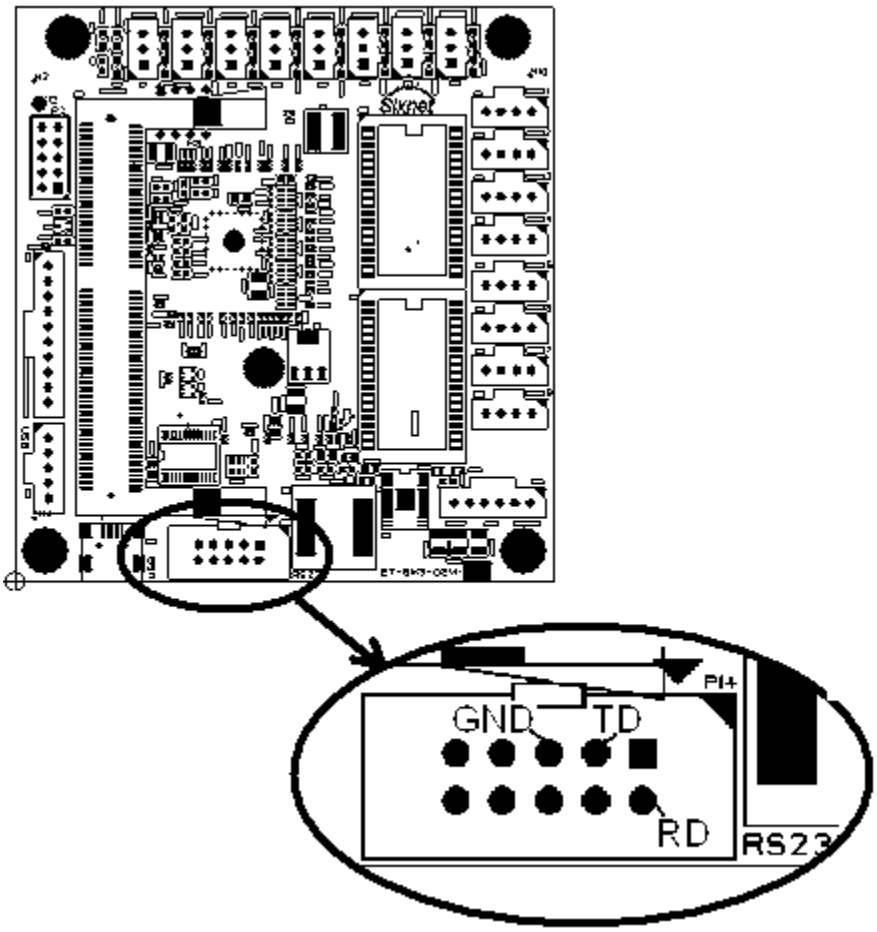
Signal name	Pin Number
+3.3V	1
+3.3V	2
GND	3
GND	4
+5V	5
+5V	6

On ET-8MS-OEM-2 models, the board-to-board connector J11 also has power pins that can be used to supply power using a 3.3VDC regulated Supply.

Note: When J11 board-to-board connector is used to power the ET-8MS-OEM-2, P12 must be left unconnected. 5VDC supply is not supported on the J11 board-to-board connector.

3.4.5 On board serial port connector P14

P14 connector allows for an alternate access to the on board RS232 port. There are only three lines brought out to this connector as shown below:



3.5 Ports 1-8 description

Theses ports are 10/100BASE and have on-board magnetics. They can be directly interfaced to an RJ45 connector as follows:

Signal name	RJ45 pin
TX+	1
TX-	2
RX+	3
RX-	6

These ports can be accessed through J2 board-to-board connector or through on board Molex 4 pin connectors depending on the model.
Both connectors cannot be used at the same time for the same port number.

3.6 Status LED Output and ports 1-8 diagnostic LED's

These signals are active LOW outputs that can be tied to external LED's in a sinking configuration (3.3V → anode of LED → 220 ohm resistor → signal). The Status LED will generally be ON when operation is normal and flashes when a full firmware image is being loaded. Refer to the SIXNET managed switch software user manual for more details.

LED's for ports 1-8 will behave as follows:

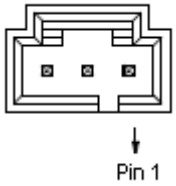
Speed LED: On indicates 100Mbps, Off indicates 10Mbps

Act/Link LED: On indicates link, Blink indicates activity

The LED connector pinout is as follows:

Signal name	Pin number
Link/Act	1
Speed	2
3.3V	3

Molex PN:70543-0002



3.7 OK LED / Output

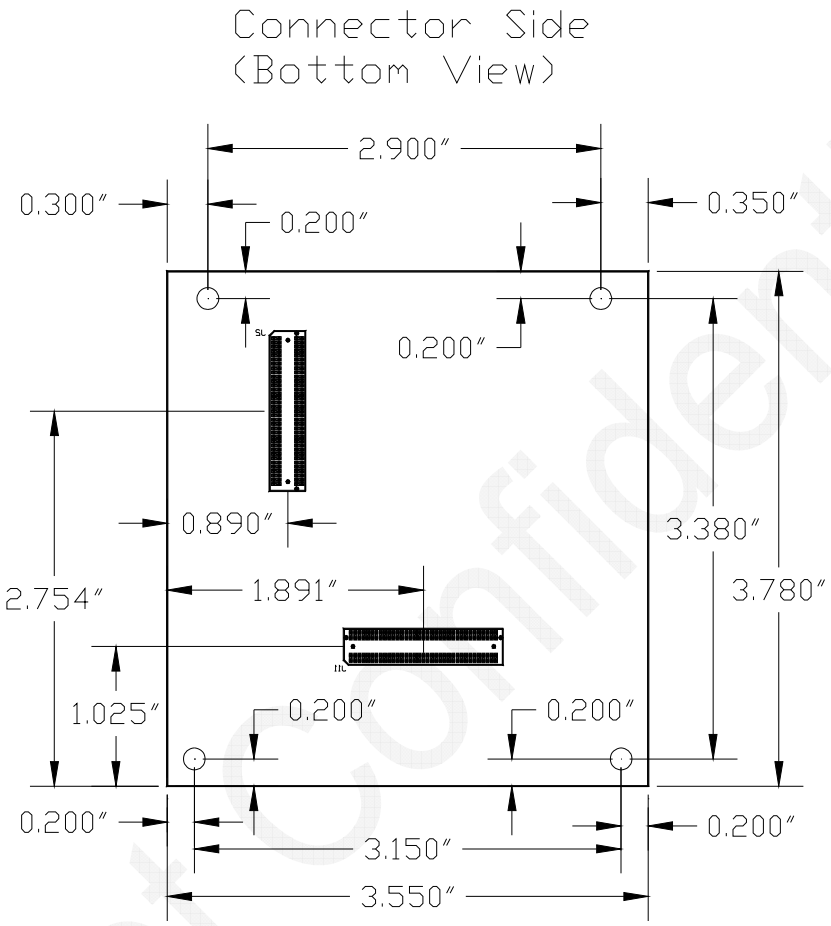
This signal is an active LOW output that can be tied to an external discrete output circuit, an external LED and/or an external input. It will be ON (supply 3.3V) when operation is normal and go OFF when there is a fault. Refer to the SIXNET managed switch software user manual for more details.

3.8 CPU Reset Input

This signal is an active low debounced manual reset input. If pulled low it will cause a full reset of the ET-8MS-OEM circuit board. The ET-8MS-OEM-2-1 has a built in reset, so this control line would only be used when another CPU needs to reset the entire ET-8MS-OEM-2-1 board. If this signal is not used, it should be left unconnected.

3.9 Mechanical and Mounting

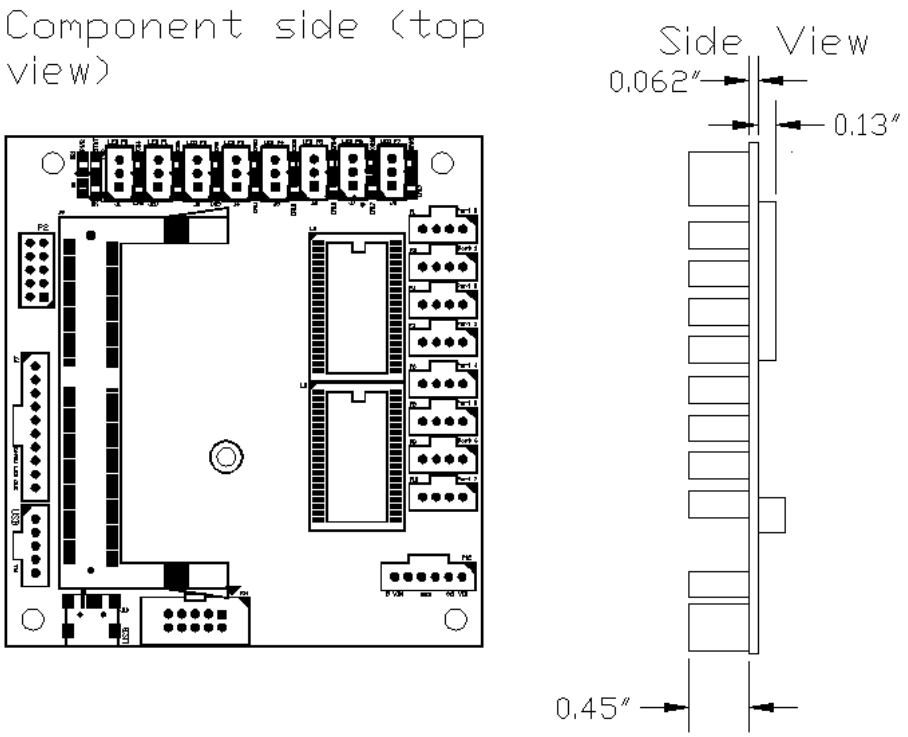
The ET-8MS-OEM has four mounting holes for #4 screws. Refer to the following mechanical diagrams for board size, connector positions and component heights.



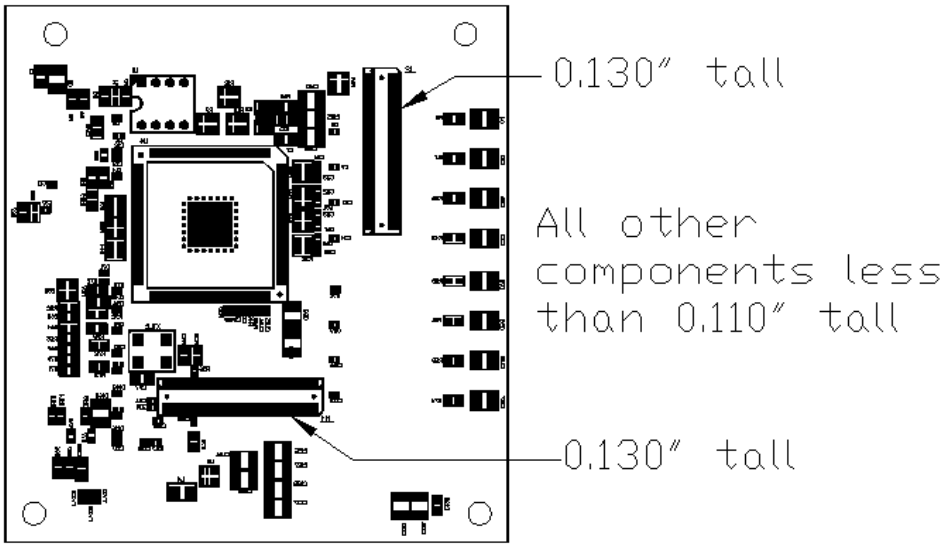
Circuit Board Tolerances:

a) Drill sizes on 0.062" thick boards: plated +0.003/-0.002"; non-plated +0.002/-0.000"
b) Minimum trace width and spacing 0.008 / 0.008 +/- 0.001"
c) Overall board dimensions: +/-0.005"
d) Build specifications in accordance with IPC-600
e) Registration accuracy, layer to layer: +/- 0.003"

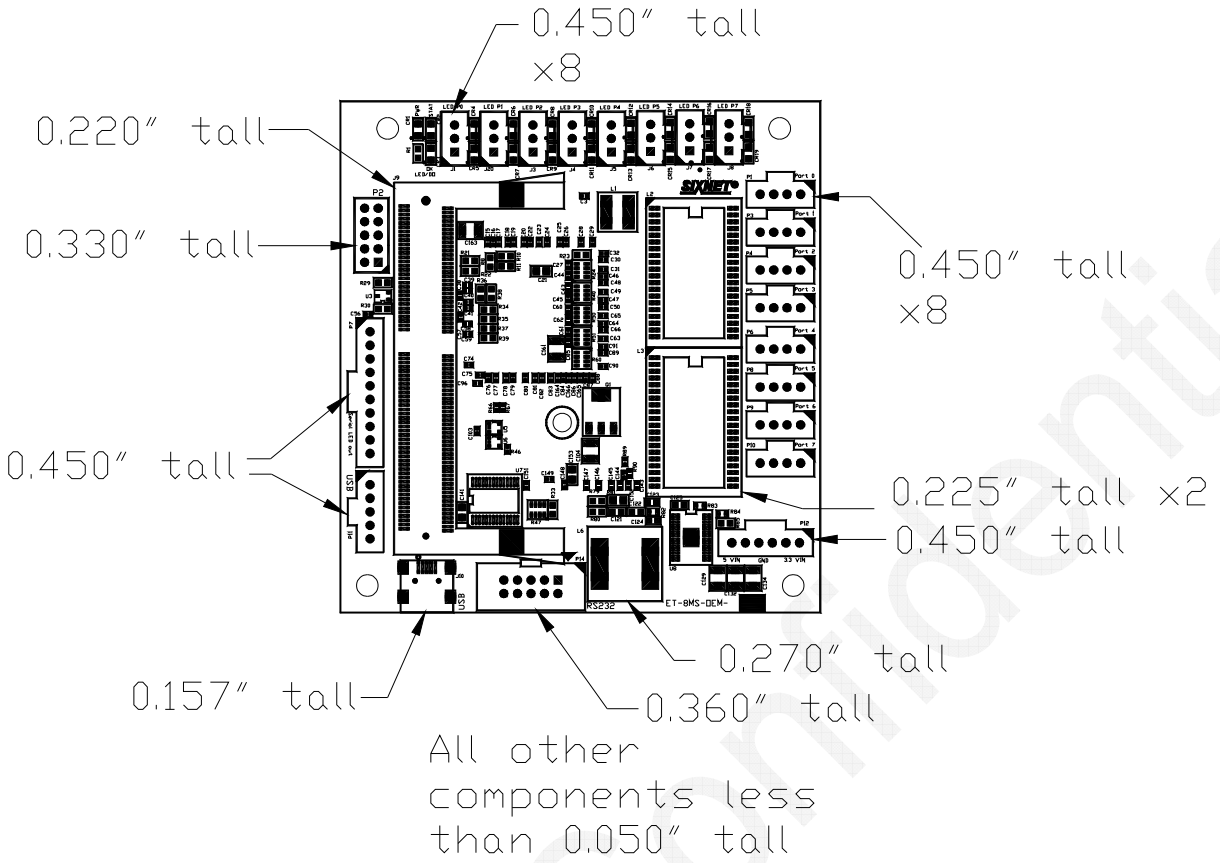
Side View



Bottom Side Height (though view)



Component Height on Top side



3.10 Temperature

The ET-8MS-OEM has been designed to operate continuously at an ambient temperature of -40 to +75º C or better.

The ET-8MS-OEM has been designed for full operation after being stored at -40 to 85º C or better.

3.11 Power

The ET-8MS-OEM requires a regulated 3.3 VDC or 5VDC (+/- 5%) to be supplied to the P12 connector. Alternately, J11 can be used to power the board at 3.3VDC if desired. All 3.3VDC and GND pins must be connected. Do not supply power to P12 and J11 at the same time.

The ET-8MS-OEM is designed to draw 6 Watts (or less) at 3.3 VDC or 5VDC with ports 1-8 linked at 100 Mbps.
The ET-8MS-OEM will automatically draw less power when ports are not used.

3.12 Electrical Shielding

The ET-8MS-OEM is designed to meet the CE and FCC requirements for emissions and immunity when properly installed in an appropriate package. Some of the techniques used to insure this performance are as follows:

- Chassis ground around perimeter of all layers
- Chassis ground tied to all four mounting holes for grounding to other board or chassis
- Chassis ground tied to Ethernet interface for connection to connectors and/or enclosure
- Separate ground layer
- Separate power layer
- Via fences where necessary
- No digital signals between PHY and Ethernet interface
- No power and ground planes under magnetics

3.13 Maintainability and Reliability

The ET-8MS-OEM is designed using common components and design techniques as other SIXNET industrial Ethernet switches that have a Mean Time Between Failure (MTBF) of over 1,000,000 hours. This is based on actual performance numbers of units already in the field. The ET-8MS-OEM is expected to have a similar reliability. At the time of this writing, insufficient field data exists to certify this in any manner other than "Type Certification" based upon history of similar products.

The ET-8MS-OEM is not designed to be repaired in the field. The board can be swapped out by unplugging the Ethernet connector and removing the four mounting screws.

4.0 Production Testing

The ET-8MS-OEM will be delivered fully initialized and tested. All signal lines will be tested on each unit for proper functionality. This includes:

- The eight Ethernet ports connectors
- Ethernet port on the board-to-board connector
- General switch IC and CPU functionality

5.0 Items Delivered

The ET-8MS-OEM is not delivered with any standoffs or other mounting hardware. The board is the only deliverable item.

6.0 Revision History of this Document

Revision	Changes
01	Released, 30-June-09
02	Update section 3.6. Other corrections. Released, 10/22/09
03	- Updated ordering and max height information. - Updated input power options and voltage tolerance - Added section 3.4.5, RS232 on board connector pinout Released 12/21/2010