*The Embedded I/O Company*

**TEWS**

**T E C H N O L O G I E S**

# TCP886

## Four Channel 10/100 Mbit/s

## M12 Industrial Ethernet Adapter

Version 1.0

## User Manual

Issue 1.0.1

August 2014

## TCP886-10R

Four channel 10/100 Mbit/s M12 Industrial Ethernet interface front panel I/O, 32bit (cPCI Connector J1 only), extended temperature range (RoHS compliant)

## TCP886-20R

Four channel 10/100 Mbit/s M12 Industrial Ethernet interface front panel I/O, 64bit (cPCI Connector J1 and J2), extended temperature range
(RoHS compliant)

**Style Conventions**

Hexadecimal characters are specified with prefix 0x, i.e. 0x029E (that means hexadecimal value 029E).

For signals on hardware products, an ‚Active Low' is represented by the signal name with # following, i.e. IP_RESET#.

Access terms are described as:

| | |
|---|---|
| W | Write Only |
| R | Read Only |
| R/W | Read/Write |
| R/C | Read/Clear |
| R/S | Read/Set |

| Issue | Description | Date |
|-------|-------------|------|
| 1.0.0 | Initial issue | September 2012 |
| 1.0.1 | General revision | August 2014 |

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# 1  Product Description

The TCP886 is a 3U 32bit/64bit CompactPCI module providing a four channel M12 Industrial Ethernet 10BASE-T / 100BASE-TX interface.

The TCP886 is equipped with a transparent PCI/PCI-X to PCIe Bridge which is capable of performing data transfer with a bus width of up to 64 bit at bus frequencies of up to 133 MHz depending on the product order option and the system backplane configuration.

The Bridge and a PCIe Switch provide access to the Intel 82574IT Fast Ethernet controllers. Each Ethernet interface supports 10 and 100 Mbit/s transmission rates for full duplex and half duplex operation and is equipped with a 32 Kbit Serial EEPROM.

The four front panel D-coded M12 connector Ethernet interfaces of the TCP886 are capable of performing an auto negotiation algorithm which allows both link-partners to find out the best link-parameters by themselves.

The TCP886 is widely user configurable via configuration and status register access over the CompactPCI bus. All ports are galvanically isolated from the Ethernet controllers and LEDs indicate network activities.

On the TCP886-10R only CompactPCI connector J1 is fitted which means that the module is limited to 32bit PCI bus width.

The TCP886-20R is additionally equipped with CompactPCI connector J2 which allows 64bit data transfer in a corresponding backplane system configuration.

The module meets the requirements to operate in extended temperature range from -40° to +85°C.
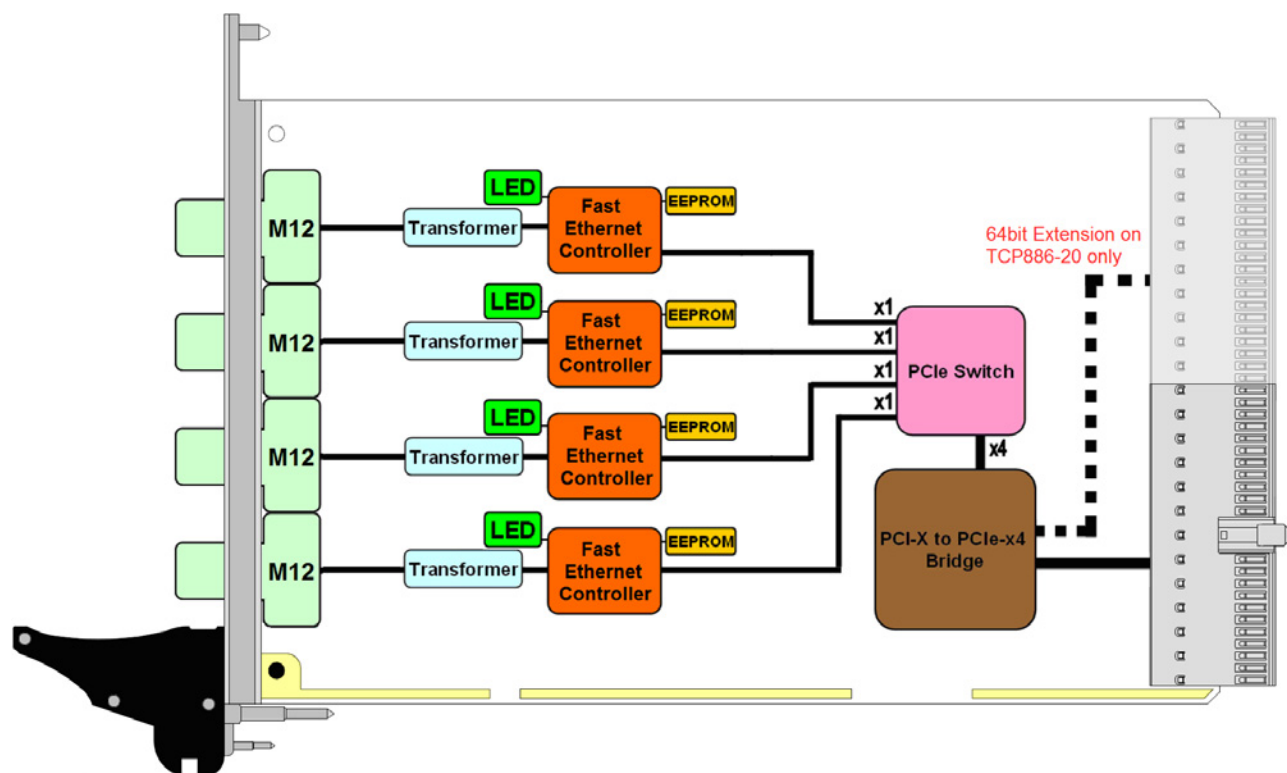


Figure 1-1 :  Block Diagram

# 2 Technical Specification

| PMC Interface | |
|---|---|
| **Mechanical Interface** | CompactPCI (cPCI) Interface conforming to PICMG 2.0 Revision 3.0 3U, 4HP |
| **Electrical Interface** | PCI Rev. 3.0 compliant and PCI-X Rev. 2.0a compliant<br>66 MHz / 32(64) bit PCI and 133 MHz / 32(64) bit PCI-X<br>3.3V PCI signaling with 5V I/O tolerance |
| | |

| On Board Devices | |
|---|---|
| **PCI/PCI-X to PCIe Bridge** | PI7C9X130 (Pericom) |
| **PCIe Switch** | 89HPES8T5A (IDT) |
| **Fast Ethernet Controller** | For each interface: 82574IT (Intel) |
| | |

| Ethernet Interface | | |
|---|---|---|
| **Number of Interfaces** | 4 | |
| **FIFO** | For each interface: Configurable receive and transmit data FIFO, programmable in 1 KB increments | |
| **Interrupts** | Using PCI INTA, INTB, INTC and INTD | |
| **I/O Connector** | D-coded M12 (Harting 21 03 381 4410 or compatible) | |
| | | |

| Physical Data | | |
|---|---|---|
| **Power Requirements** | 1500mA typical @ +3.3V DC (no link)<br>app. additional 70mA per 100Mbit/s link | |
| **Temperature Range** | Operating | -40°C to +85°C |
| | Storage | -40°C to +85°C |
| **MTBF** | TCP886-10R: 404000 h<br>TCP886-20R: 379000 h<br>MTBF values shown are based on calculation according to MIL-HDBK-217F and MIL-HDBK-217F Notice 2; Environment: $G_B$ 20°C.<br>The MTBF calculation is based on component FIT rates provided by the component suppliers. If FIT rates are not available, MIL-HDBK-217F and MIL-HDBK-217F Notice 2 formulas are used for FIT rate calculation. | |
| **Humidity** | 5 – 95 % non-condensing | |
| **Weight** | TCP886-10R: 204 g<br>TCP886-20R: 219 g | |

Table 2-1 : Technical Specification

# 3 PCI Device Topology on TCP886

The TCP886 uses four Fast Ethernet Controllers (Intel 82574IT) each communicating via a PCIe Rev. 1.1 compliant x1 Interface. To be able to access the Ethernet controllers they are connected to the x1 Downstream Ports of a PCIe Switch (IDT 89HPES8T5A). The x4 Upstream Port of the Switch is connected to a PCI/PCI-X to PCIe Bridge (Pericom PI7C9X130) which communicates with the host system.
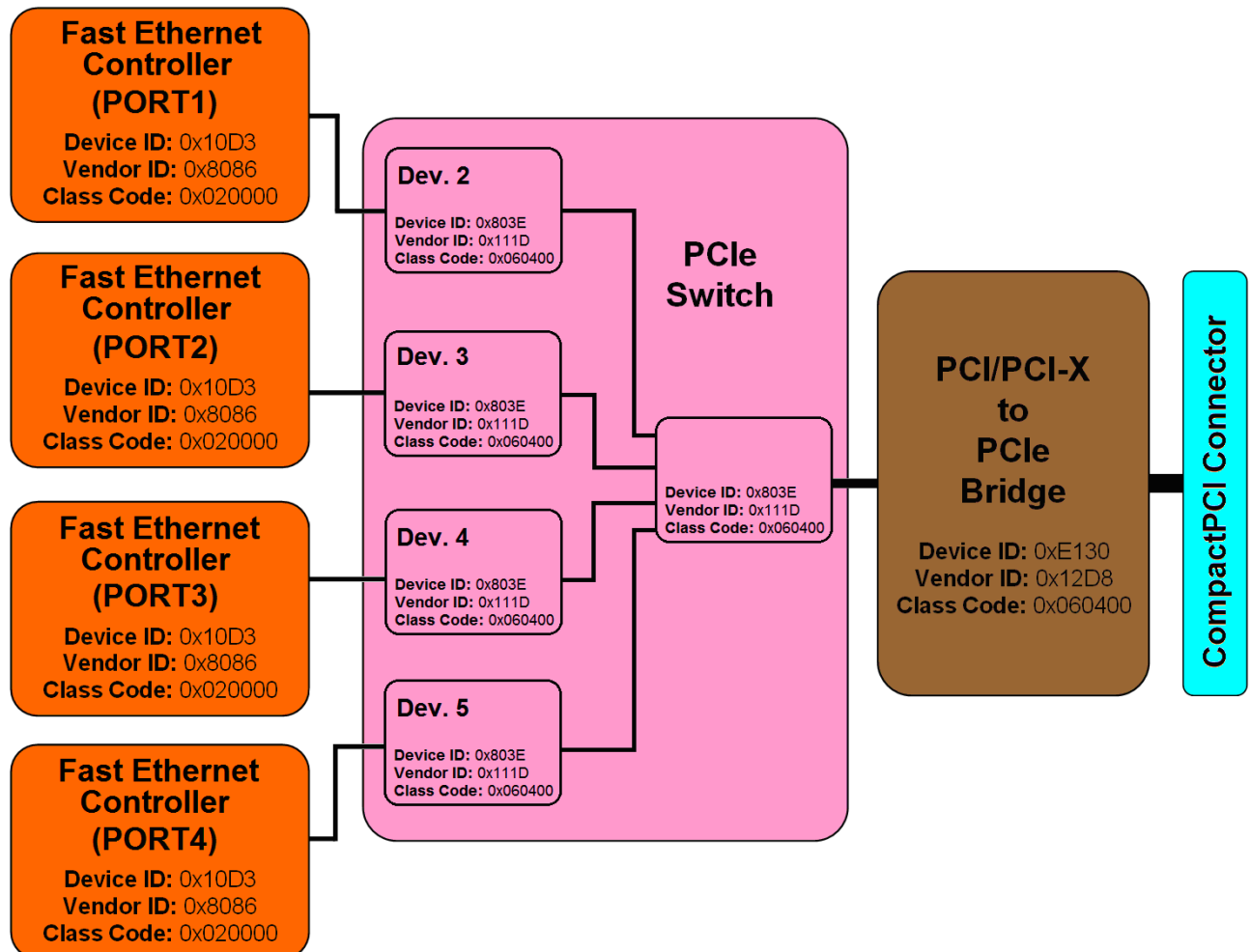


Figure 3-1 : PCI Device Topology

# 4 Fast Ethernet Controller

## 4.1 Intel 82574IT PCI Header

| PCI CFG Register Address | Write '0' to all unused (Reserved) bits | | | | Initial Values (Hex Values) |
|---|---|---|---|---|---|
| | 31            24 | 23            16 | 15             8 | 7             0 | |
| 0x00 | Device ID | | Vendor ID | | 10D3  8086 |
| 0x04 | Status Register | | Command Register | | 0010  0000 |
| 0x08 | Class Code | | | Revision ID | 020000  00 |
| 0x0C | BIST | Header Type | Latency Timer | Cache Line Size | 00 00 00 10 |
| 0x10 | Base Address 0 (Memory BAR) | | | | FFFE0000 (128 KByte) |
| 0x14 | Base Address 1 (Flash BAR) | | | | 00000000 |
| 0x18 | Base Address 2 (IO BAR) | | | | FFFFFFE1 (32 Byte) |
| 0x1C | Base Address 3 (MSI-X BAR) | | | | FFFFC000 (16 KByte) |
| 0x20 | Base Address 4 | | | | 00000000 |
| 0x24 | Base Address 5 | | | | 00000000 |
| 0x28 | CardBus CIS Pointer | | | | 00000000 |
| 0x2C | Subsystem ID | | Subsystem Vendor ID | | 0000 8086 |
| 0x30 | Expansion ROM Base Address | | | | 00000000 |
| 0x34 | Reserved | | | Cap_Ptr | 000000 C8 |
| 0x38 | Reserved | | | | 00000000 |
| 0x3C | Max_Latency | Min_Grant | Interrupt Pin | Interrupt Line | 00 00 01 00 |

Table 4-1 :  Intel 82574IT PCI Header

# 5 LEDs

The TCP886 provides four Status LEDs for quick visual inspection and debugging. A marking is placed close to each LED, to indicate the Ethernet Port the LED corresponds to.

Each Ethernet Port has one LED indicator. See figures below for more details:

| LED Status | Description |
|---|---|
| OFF | No cable is connected or no link is established |
| ON | A link is established at the corresponding Ethernet Port |
| BLINKING | Indicates activity: The Ethernet Port transmits or receives data |

Table 5-1 :  LED Status

# 6 Pin Assignment – I/O Connectors

On the TCP886 the Ethernet signals are accessible by four D-coded M12 Connectors. The connectors are located in the CompactPCI front panel.

For pin assignment, see the figures below.

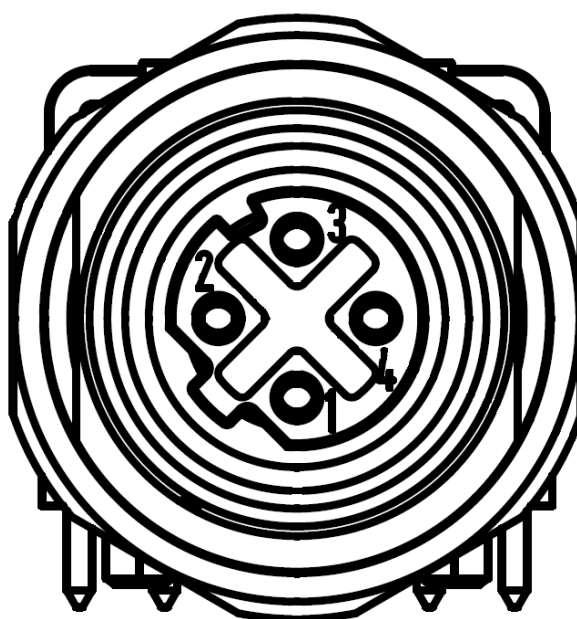| Pin | Signal |
|-----|--------|
| 1 | TX+ |
| 2 | RX+ |
| 3 | TX- |
| 4 | RX- |

Table 6-1 : Front I/O pin assignment



Figure 6-1 : D-coded M12 Connector front view