TECHNICAL DATASHEET #TDAX141560A

Gigabit Ethernet / Gigabit Automotive Ethernet Converter

100 or 1000 Mbps Ethernet
100 or 1000 Mbps (Single Pair) Automotive Ethernet
RS-232 Interface
P/N: AX141560A

Features

- 12V, 24Vdc input power (nominal) for connection to a battery
- 1 gigabit/standard Ethernet port (100 Mbps or 1000 Mbps)
- 1 gigabit/standard Automotive Ethernet port (100 Mbps or 1000 Mbps)
- Surge, reverse polarity, input overvoltage, and input undervoltage protection
- Master or Slave functionality and speed/bitrate configuration via RS-232 interface
- 3 LED indicators for Power, Ethernet, and Automotive Ethernet
- 1x 4-pin and 2x 8-pin M12 connectors
- Compact
- IP67

Applications

Off-highway equipment, mining equipment, industrial trucks

Ordering Part Number:

Gigabit Ethernet / Gigabit Automotive Ethernet Converter: **AX141560A**

Description

The Axiomatic Gigabit Automotive Ethernet to Gigabit Ethernet Converter provides a purely physical, bi-directional conversion between Gigabit Automotive Ethernet (1000BASE-T1) and Gigabit Ethernet (1000BASE-T) via PHY transceivers. No packets are stored or modified in this device. The converter supports a baud rate of 100 Mbit/s and 1000 Mbit/s. Status LEDs provide information on connection link and communication. The converter is designed for the harsh environments of off-highway or industrial equipment.

The unit is configured via the RS-232 port to act as a Master or Slave for Automotive Ethernet. The Master mode works if the connected device has its transceiver set to slave mode. The Slave mode works when the connected device has its transceiver set to master mode. Hard setting the master/slave relationship saves on setup-time costs and ensures that the Automotive Ethernet link is established quickly. As a comparison, regular Ethernet converters rely on auto-negotiation to determine master and slave.

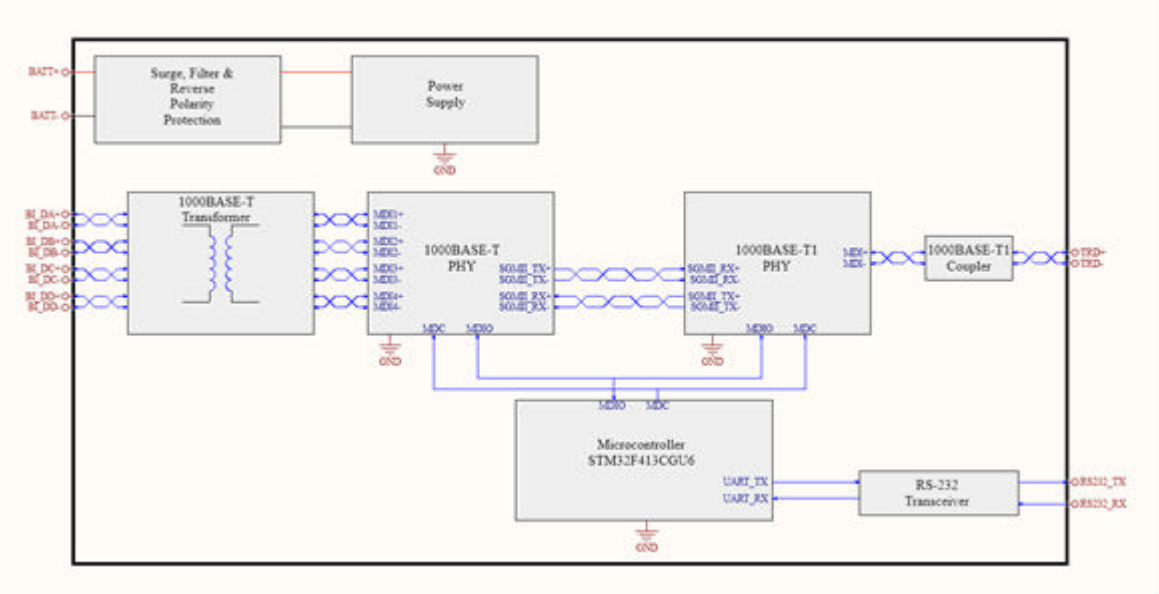
The speed/bitrate of the end-to-end communication through the device can also be set through the RS-232 interface. It can either be 100 Mbps or 1000 Mbps.

The Institute of Electrical and Electronic Engineers (IEEE) 802.3bp standard (also known as 1000BASE-T1) is a 1000 Mbps Automotive Ethernet standard aimed at increasing data throughput, meeting strong automotive emissions standards, and reducing cabling weight and cost in automotive networking. Automotive Ethernet networks use a 2-wire twisted pair cable.

Axiomatic Technologies Oy
Höytämöntie 6
33880 LEMPÄÄLÄ, Finland
Tel. +358 103 375 750
salesfinland@axiomatic.com
www.axiomatic.fi

Axiomatic Technologies Corporation
1445 Courtneypark Dr. E.
Mississauga, ON Canada L5T 2E3
Tel. 1 905 602 9270
sales@axiomatic.com
www.axiomatic.com

Functional Block Diagram



Technical Specifications

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Limitations & Return Materials Process as described on https://www.axiomatic.com/service/.

All specifications are typical at nominal input voltage and 25°C unless otherwise specified.

Input

Power Supply Input	12 Vdc, 24 Vdc nominal (9 Vdc to 36 Vdc power supply range)
Quiescent Current	99 mA @ 12 Vdc; 52 mA @ 24 Vdc
Protections	Surge protection is provided. Reverse polarity protection up to Vps is provided. Overvoltage protection provided. Shutdown at 38.6 V. Undervoltage protection provided. Shutdown at 5.4 V.

Automotive Ethernet

Port Type	1 port 1000BASE-T1 (IEEE 802.3bp compliant) Automatic Polarity Correction (for 1000 Mbps mode) Note: For 100 Mbps mode, polarity correction is not functional. Default configuration: Slave (Master mode is configurable via RS-232 interface)
PHY	Marvell 88Q2112 (100BASE-T1 / 1000BASE-T1)
Protection	ESD protection for signal lines
Protocol	Automotive Ethernet IEEE 802.3bw for 100BASE-T1 (previously known as BroadR-Reach) Automotive Ethernet IEEE 802.3bp for 1000BASE-T1

Ethernet Port

Port Type	1 port 1000BASE-T Auto-Negotiation Automatic Polarity Correction
MDIX	Auto-MDI/MDIX (crossover)
PHY	Marvell 88EA1512 (100BASE-TX, 1000BASE-T)
Protocol	Ethernet IEEE 802.3
Protection	ESD protection for signal lines

Interfaces

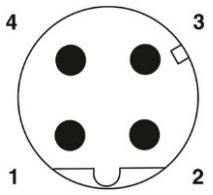
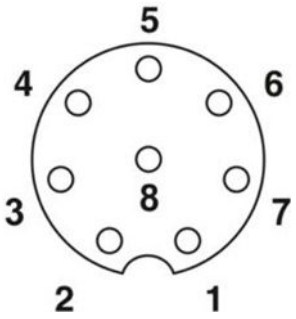
RS-232	1x 3-wire RS-232 port Baud rate: 115200 bit/s User interface for configuration ESD and EFT protection for signal lines
User Interface	Any terminal emulator that supports serial communication.

General Specifications

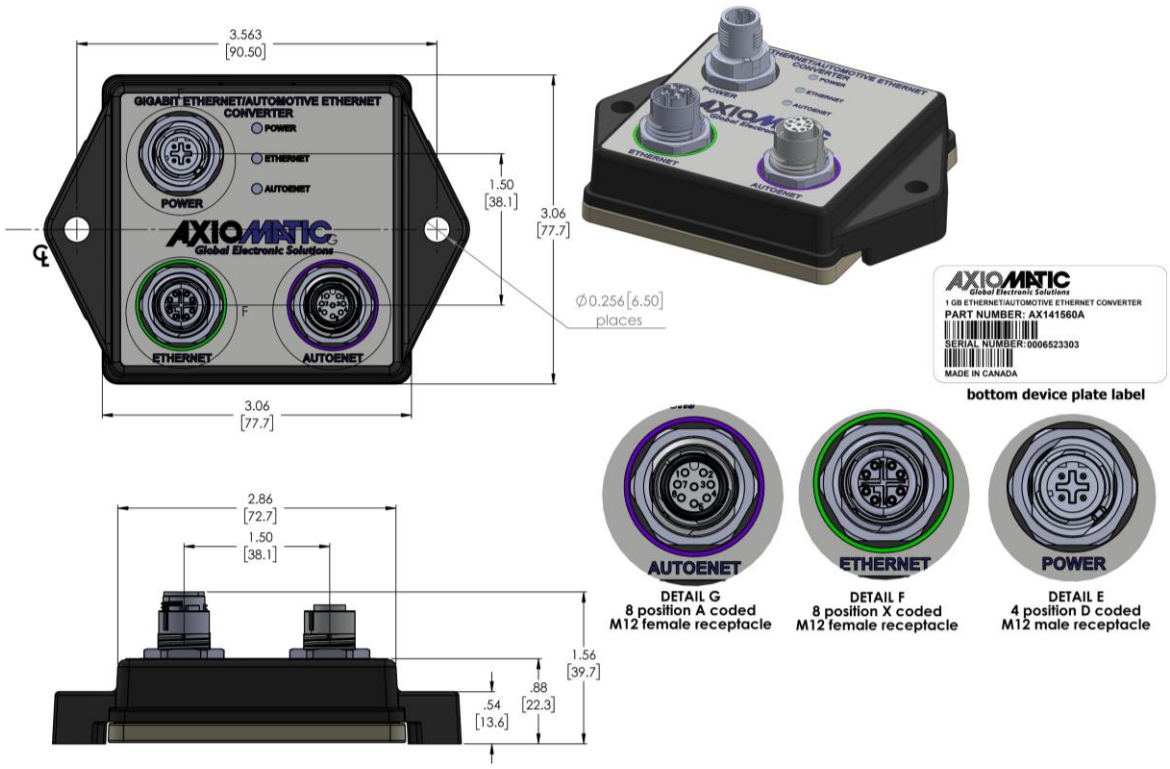
Microcontroller	STM32F413CGU6
Functionality	Can be configured to acts as a master or a slave
LEDs	3 GREEN LEDs

LED	ON	BLINK	OFF
POWER	Power On		Power Off or Overvoltage/ Undervoltage Condition
ETHERNET	Ethernet Link Up	Ethernet Activity	Ethernet Link Down
AUTOENET	Automotive Ethernet Link Up	Automotive Ethernet Activity	Automotive Ethernet Link Down

Compliance	RoHS
Operating Conditions	-40°C to 80°C (-40°F to 176°F) Please see temperature ratings of cables under Mating Wire Harnesses.
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Protection	IP67
Vibration	MIL-STD-202H, method 204D, test condition C 10g peak (Sine) MIL-STD-202H, method 214A, test condition I/B 7.56 Grms (Random)
Shock	MIL-STD-202H, method 213B, test condition A 50g peak
Enclosure and Dimensions	Injection molded enclosure and cover. Laser welded. PA66, 30% glass fiber reinforced 4.21 in x 3.06 in x 1.56 in (106.8 mm x 77.7 mm x 39.7 mm) L x W x H including connectors. See dimensional drawing. Flammability Rating: UL 94 HB
Weight	0.276 lb. (0.125 kg)
Installation	The typical maximum wire harness length for Automotive Ethernet cabling is 15 m.

<table>
<tr>
<td>Electrical Connections</td>
<td>
Power Connector
4-pin M12 Phoenix Contact connector (D-coded), Male, P/N: 1441862
<table>
<tr><th>Pin #</th><th>Description</th><td rowspan="5"> 
</td></tr>
<tr><td>1</td><td>Power +</td></tr>
<tr><td>2</td><td>Power -</td></tr>
<tr><td>3</td><td>Shield (Connected to M12 Shell)</td></tr>
<tr><td>4</td><td>Shiels (Connected to M12 Shell)</td></tr>
</table>
Ethernet Connector
8-pin M12 Phoenix Contact connector (X-coded), Female P/N: 1237405
<table>
<tr><th>Pin #</th><th>Description</th><td rowspan="9"> 
</td></tr>
<tr><td>1</td><td>DA +</td></tr>
<tr><td>2</td><td>DA -</td></tr>
<tr><td>3</td><td>DB +</td></tr>
<tr><td>4</td><td>DB -</td></tr>
<tr><td>5</td><td>DD +</td></tr>
<tr><td>6</td><td>DD -</td></tr>
<tr><td>7</td><td>DC -</td></tr>
<tr><td>8</td><td>DC +</td></tr>
</table>
Automotive Ethernet / RS-232 Connector
8-pin M12 Phoenix Contact connector (A-coded), Female P/N: 1456543
<table>
<tr><th>Pin #</th><th>Description</th><td rowspan="9"> 
</td></tr>
<tr><td>1</td><td>TRD -</td></tr>
<tr><td>2</td><td>Do not connect</td></tr>
<tr><td>3</td><td>RS232 GND</td></tr>
<tr><td>4</td><td>RS232 RX</td></tr>
<tr><td>5</td><td>RS232 TX</td></tr>
<tr><td>6</td><td>Do not connect</td></tr>
<tr><td>7</td><td>TRD +</td></tr>
<tr><td>8</td><td>Do not connect</td></tr>
</table>
</td>
</tr>
<tr>
<td>Mating Connectors</td>
<td>Mating connectors should meet the following standard for M12 Connectors, IEC 61076-2-101:2012. The 4-pin connector should be D-coded. The 8-pin Ethernet connector should be X-coded, and the 8-pin Automotive Ethernet / RS-232 connector should be A-coded.</td>
</tr>
</table>

Dimensional Drawing



Form: TDAX141560A-03/13/2025