ETH-1000-T1

Release 32deb2f

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Sep 23, 2025

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CHAPTER 1

Revision history

Table 1: Revision History

Revision	Date	Notes
1.0	Jul 25 2025	Initial release
1.1	Sep 22 2025	Documented new firmware revision (v1.2.0)

CHAPTER 2

Overview

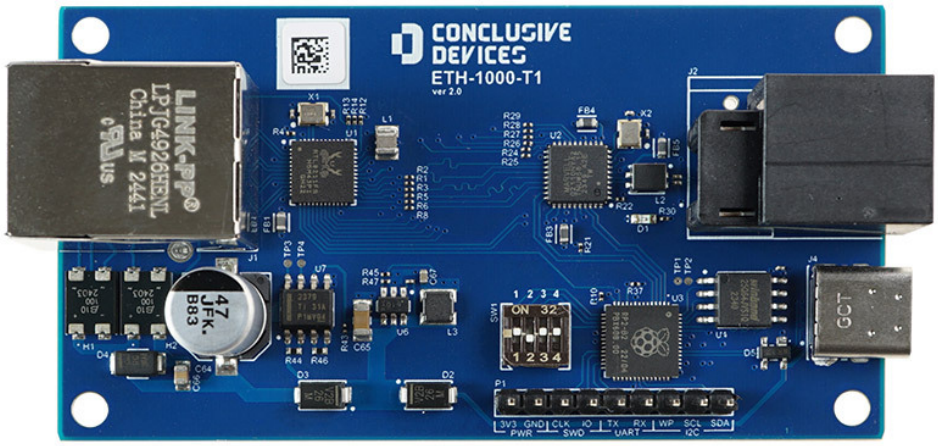

Fig. 1: ETH-1000-T1 with MATEnet connector

ETH-1000-T1 is a compact media converter device for automotive and industrial applications. It supports conversion between the 100BASE-TX/1000BASE-T Ethernet and the 1000BASE-T1 and 1000BASE-T1 Automotive Ethernet standards and can be powered either through the USB-C port or via Power over Ethernet (PoE) on the RJ-45 port.

It has the following features:

- 100BASE-TX and 1000BASE-T support on the RJ-45 port
- 100BASE-T1 and 1000BASE-T1 support on the MATEnet or Terminal Block port
- Support for IEEE 802.3 Clause 98 speed and role auto-negotiation
- Power over Ethernet (PoE) support on the RJ-45 port compliant with IEEE 802.3af/at
- USB-C port for power supply and device management
- Configuration via mode selection switches or USB interface
- Status indication via LEDs
- Virtual Cable Tester (VCT) functionality for cable diagnostics on the T1 port

2.1 Mode Selection Switches

Table 1: Mode Selection Switch Reference

Switch	Function Name	Function "on"	Function "off"
1	Auto-negotiation	Auto-negotiation enabled	Auto-negotiation disabled
2	Master/slave selection	T1 master or T1 force master	T1 slave or T1 force slave
3	Speed selection	1000BASE-T + 1000BASE-T1	100BASE-TX + 100BASE-T1
4	RFU	Reserved	Reserved

2.2 Power Input Options

- **USB** - 5V, 500mA USB Type-C Power Input
- **PoE - Active PoE** - IEEE 802.3af/at, 36V to 57V, Class 0
- **USB + PoE** - Active PoE as dominant function

2.3 Pinouts

2.3.1 Terminal Block Connector (ETH-1000-T1-B)

Table 2: Terminal Block Connector Pinout

Pin number	Function
1	Positive T1 data terminal
2	Negative T1 data terminal
3	Cable shield

2.3.2 MATEnet Connector (ETH-1000-T1-M)

Table 3: MATEnet Connector Pinout

Pin number	Function
1	Negative T1 data terminal
2	Positive T1 data terminal

CHAPTER 3

Functional Description

3.1 Mode Selection

Operational modes of the T1 port can be configured using the mode selection switches on the device.

3.2 USB Console

The device can be managed via a serial console over the USB-C port. A virtual COM port is created on the host computer after connecting the device via USB cable.

Link status changes on either RJ-45 or T1 port are reported on the console by default.

3.2.1 t1_default

Usage: `t1_default`

Resets the T1 runtime port configuration to the default values set on the mode selection switches.

3.2.2 t1_speed

Usage: `t1_speed [100|1000]`

Sets the speed of the T1 port to 100 Mbps or 1000 Mbps. This command is only effective when auto-negotiation is disabled.

3.2.3 t1_role

Usage: `t1_role [master|slave]`

Sets the role of the T1 port to master or slave. This command is only effective when auto-negotiation is enabled.

3.2.4 t1_autoneg

Usage: `t1_autoneg [on|off]`

Enables or disables auto-negotiation on the T1 port.

3.2.5 t1_configure

Usage: `t1_configure [override: on|off] [autoneg: on|off] [role: on|off] [1000: on|off]`

Where:

- *override*: Enables or disables runtime configuration override. When enabled, the T1 port configuration can be changed using the other parameters of this command. When disabled, the T1 port configuration is determined by the mode selection switches.
- *autoneg*: Enables or disables auto-negotiation on the T1 port.
- *role*: Sets the role of the T1 port to master or slave when auto-negotiation is enabled, or forces the T1 port to master or slave when auto-negotiation is disabled.
- *1000*: Sets the speed of the T1 port to 1000 Mbps when on, or to 100 Mbps when off.

Reconfigures the T1 port according to the specified parameters. It is equivalent to setting the mode selection switches. Using this command is equivalent to using a series of other `t1_*` commands, but all changes are applied at once.

3.2.6 t1_cable_test

Usage: `t1_cable_test`

Performs a Virtual Cable Test (VCT) on the T1 port. The test results are displayed on the console. The test checks for open or short circuits and attempts to estimate the distance to the fault.

Example output of a successful test:

```
ETH-1000-T1> t1_cable_test
Starting T1 cable test...
Cable test results:
Status: PASS
```

Example output of a failed test (open circuit):

```
ETH-1000-T1> t1_cable_test
Starting T1 cable test...
Cable test results:
Status: FAIL
Open: yes
Shorted: no
Length: 0.905170 m
Amplitude: 102 mV
```

3.2.7 t1_status

Usage: `t1_status`

Shows the status of the T1 port, including link state and speed.

3.2.8 rj45_status

Usage: `rj45_status`

Shows the status of the RJ-45 port including link state and speed.

3.2.9 bootloader

Usage: `bootloader`

Enters the USB bootloader mode for firmware update.

3.2.10 reset

Usage: `reset`

Resets both T1 and RJ-45 PHY chips.

> **Warning**
>
> PHYs are not automatically reconfigured after reset. Use the `t1_default` command to reapply PHY configuration from the mode selection switches or configure the T1 port manually using the other `t1_*` commands.

3.2.11 mdio_read

Usage: `mdio_read [phy_addr] [dev_addr] [reg_addr]`

Where:

- *phy_addr*: The address of the PHY device (0-31).
- *dev_addr*: The address of the device (0-31).
- *reg_addr*: The address of the register to read (0-0xffff).

Performs a Clause 45 MDIO read access to a given PHY.

3.2.12 mdio_write

Usage: `mdio_write [phy_addr] [dev_addr] [reg_addr] [data]`

Where:

- *phy_addr*: The address of the PHY device (0-31).
- *dev_addr*: The address of the device (0-31).
- *reg_addr*: The address of the register to write (0-0xffff).
- *data*: The data to write to the register (0-0xffff).

Performs a Clause 45 MDIO write access to a given PHY.

> **Note**
>
> RJ-45 PHY has address 1, T1 PHY has address 2.

CHAPTER 4

Firmware Update

The firmware of the ETH-1000-T1 can be updated via the USB Mass Storage Device interface. Before update process can be started, the device must be put into the bootloader mode.

Bootloader can be entered in two ways:

- By issuing the `bootloader` command in the command line interface. Only supported in firmware versions 1.1.0 and later.
- By shorting the *TP1* and *TP2* test points on the PCB while powering on the device

When the bootloader is entered successfully, the device will disconnect from the USB console and reappear as a USB Mass Storage Device. To update the firmware, copy the new firmware file with the *.uf2* extension to the USB device filesystem. The device will automatically reboot and start running the new firmware.

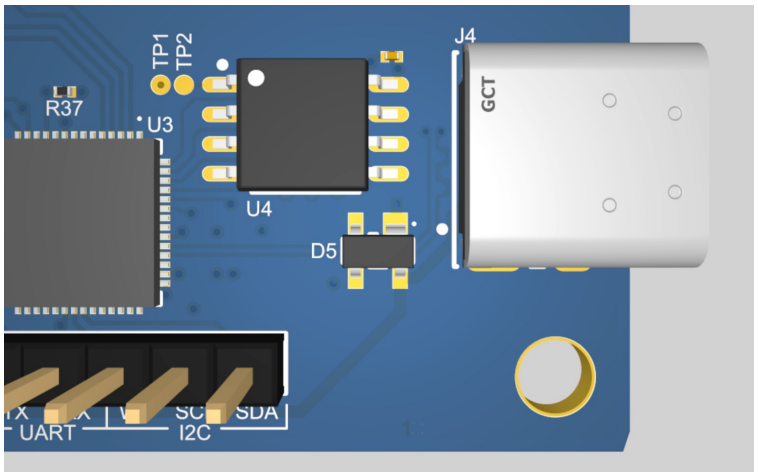

Fig. 1: Test Points TP1 and TP2 location on the PCB

CHAPTER 5

Electrical Characteristics

Table 1: Electrical Characteristics

Parameter	Min	Typ	Max	Notes
Input Voltage (USB)	4.75	5	5.25	V
Input Voltage (IEEE 802.3af)	48	54	57	V
Operating Temperature	-20	—	85	°C

CHAPTER 6

Mechanical drawings

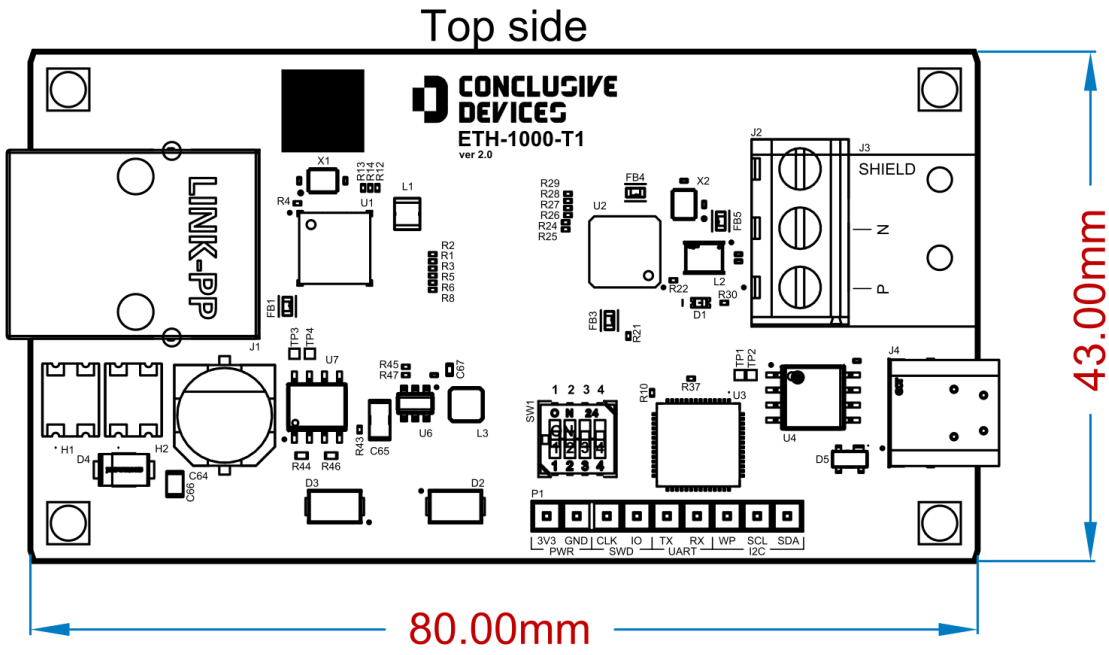

Fig. 1: Top view

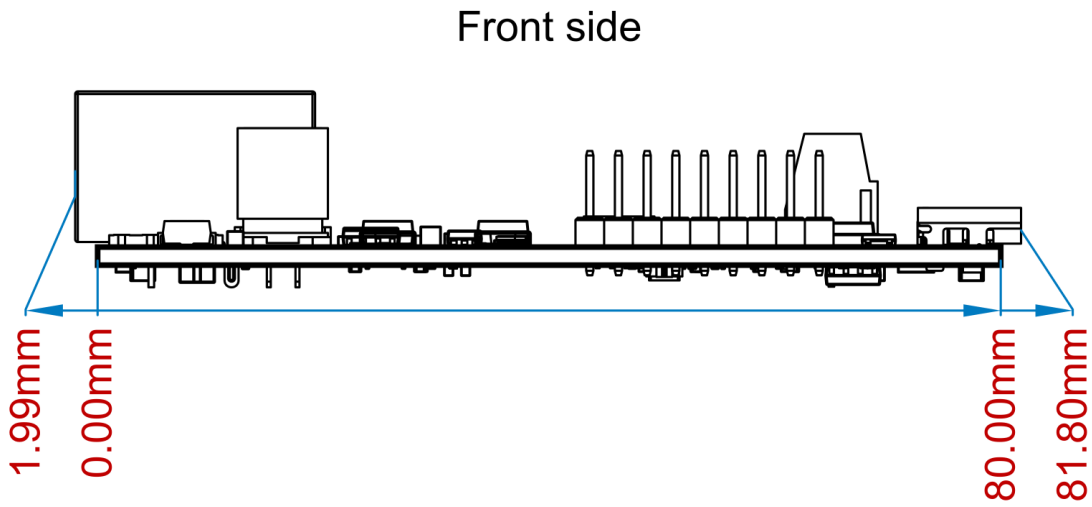

Fig. 2: Front side

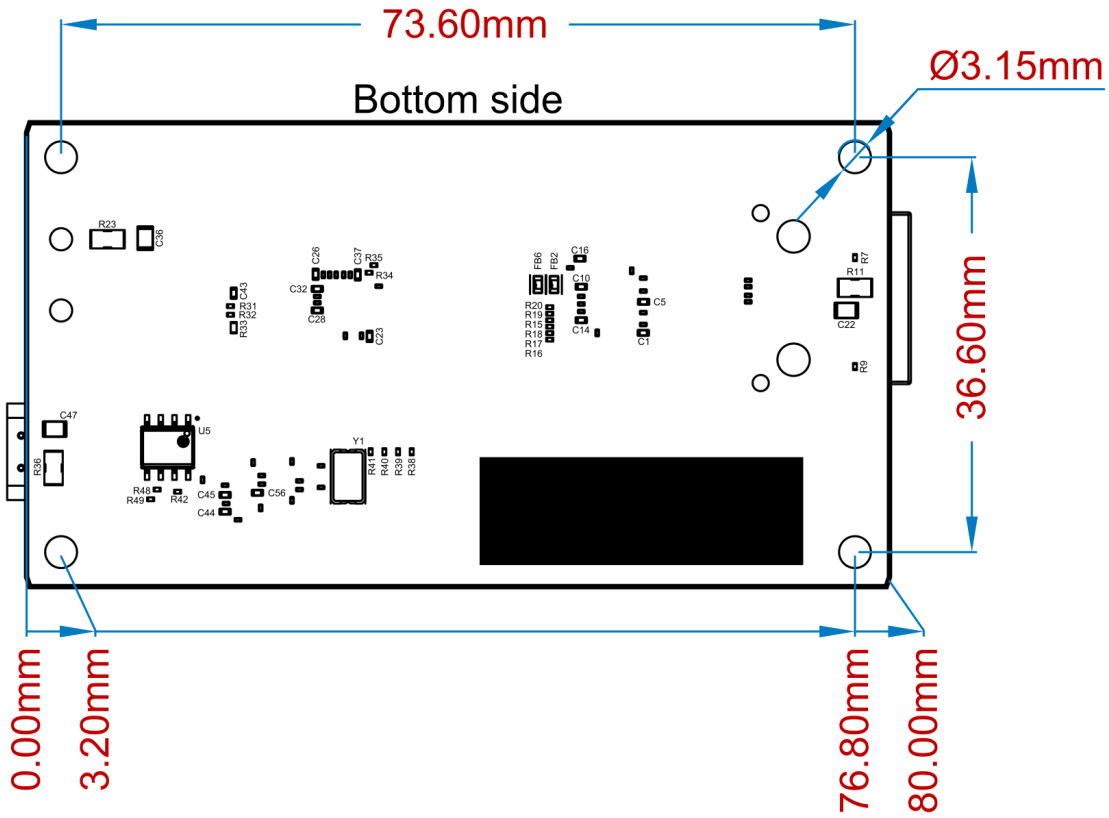

Fig. 3: Bottom side

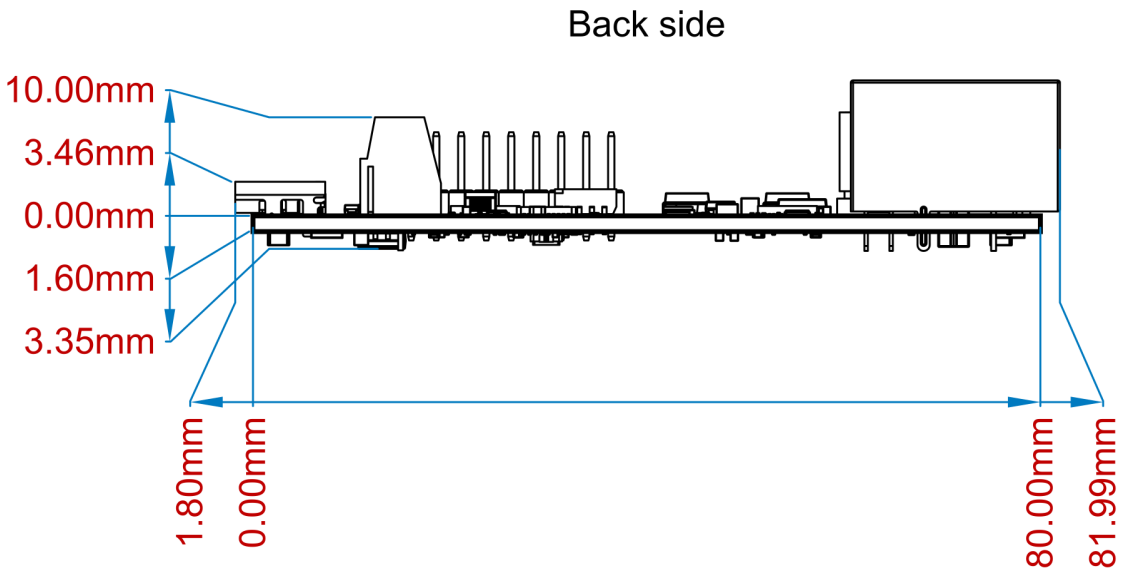

Fig. 4: Back side

CHAPTER 7

Ordering Information

The ETH-1000-T1 is available in two variants, with a terminal block connector or with a MATEnet connector. The ordering options are summarized in the table below.

Table 1: ETH-1000-T1 Ordering Options

Part Number	Description
ETH-1000-T1-B	ETH-1000-T1 with Terminal Block Connector
ETH-1000-T1-M	ETH-1000-T1 with MATEnet Connector

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