100/1000Base-T1-TX-HMTD User Manual



Data	Version	Description
2024/11/1	V10	
2025/06/12	V11	
2025/11/11	V12	

1 Introduction

1.1 Product Series

Product Name	T1 Interface	Power Supply	T1 Phy	Tx Phy	Size LxHxW(mm)
100/1000Base-T1-TX-E	15EDG3.81mm-2P MATENET Adapter Board HMTD Adapter Board	Type C DC Jack	Marvell 88Q2112	RTL8211FI	50 × 20× 83
100/1000Base-T1-TX-TE	TE MATENET Male	Type C DC Jack	Marvell 88Q2112	RTL8211FI	50 × 20× 83
100/1000Base-T1-TX-HMTD	HMTD Male	Type C DC Jack	Marvell 88Q2112	RTL8211FI	50 × 20× 83

1.2 Product Description

The BUELEC 100/1000Base-T1-TX- HMTD is a compact, high-performance media converter designed to bridge automotive single-pair Ethernet (100/1000BASE-T1) networks with standard twisted-pair Gigabit Ethernet (100/1000BASE-TX) infrastructure.

Utilizing the Marvell 88Q2112 PHY for T1 interface and Realtek RTL8211FI PHY for TX interface, this converter ensures seamless interoperability between modern automotive Ethernet systems and traditional IT/networking environments.

It is ideal for in-vehicle diagnostics (DoIP), smart cockpit domain controller flashing/upgrades, ADAS camera/radar development and debugging, industrial automation, and fleet management applications.

T1 Port update to (HMTD Male,E6S20A-40MT5-Z), Power update to support Both Type C and DC Jack(6-30V)

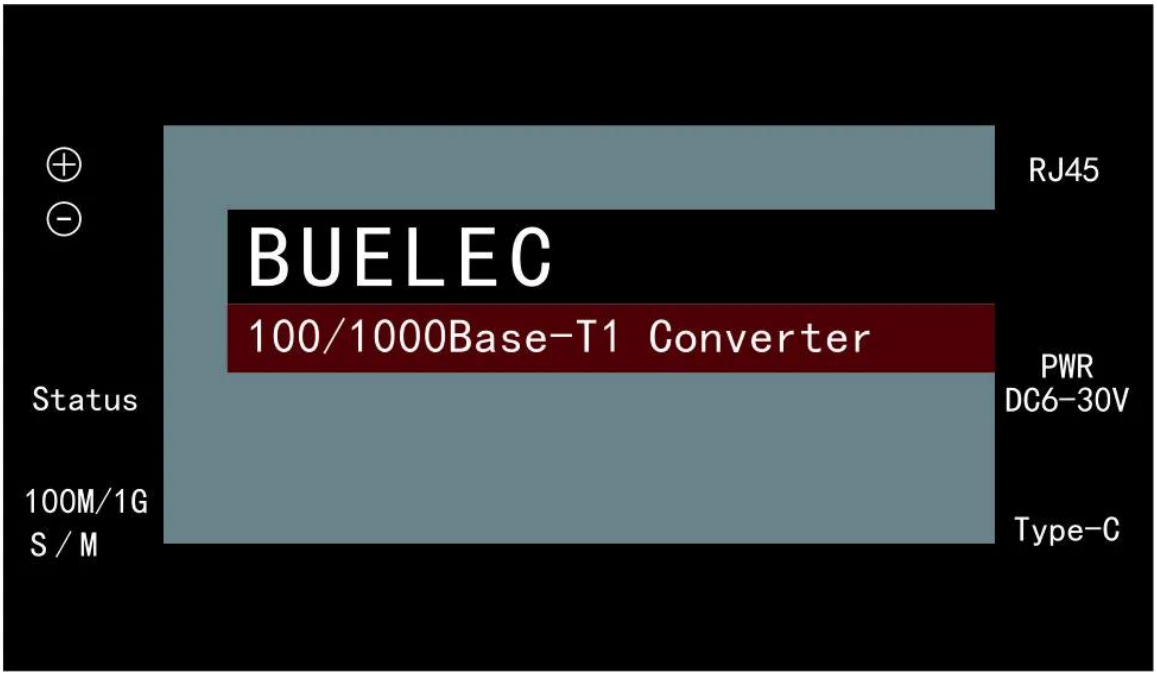
1.3 Product Features

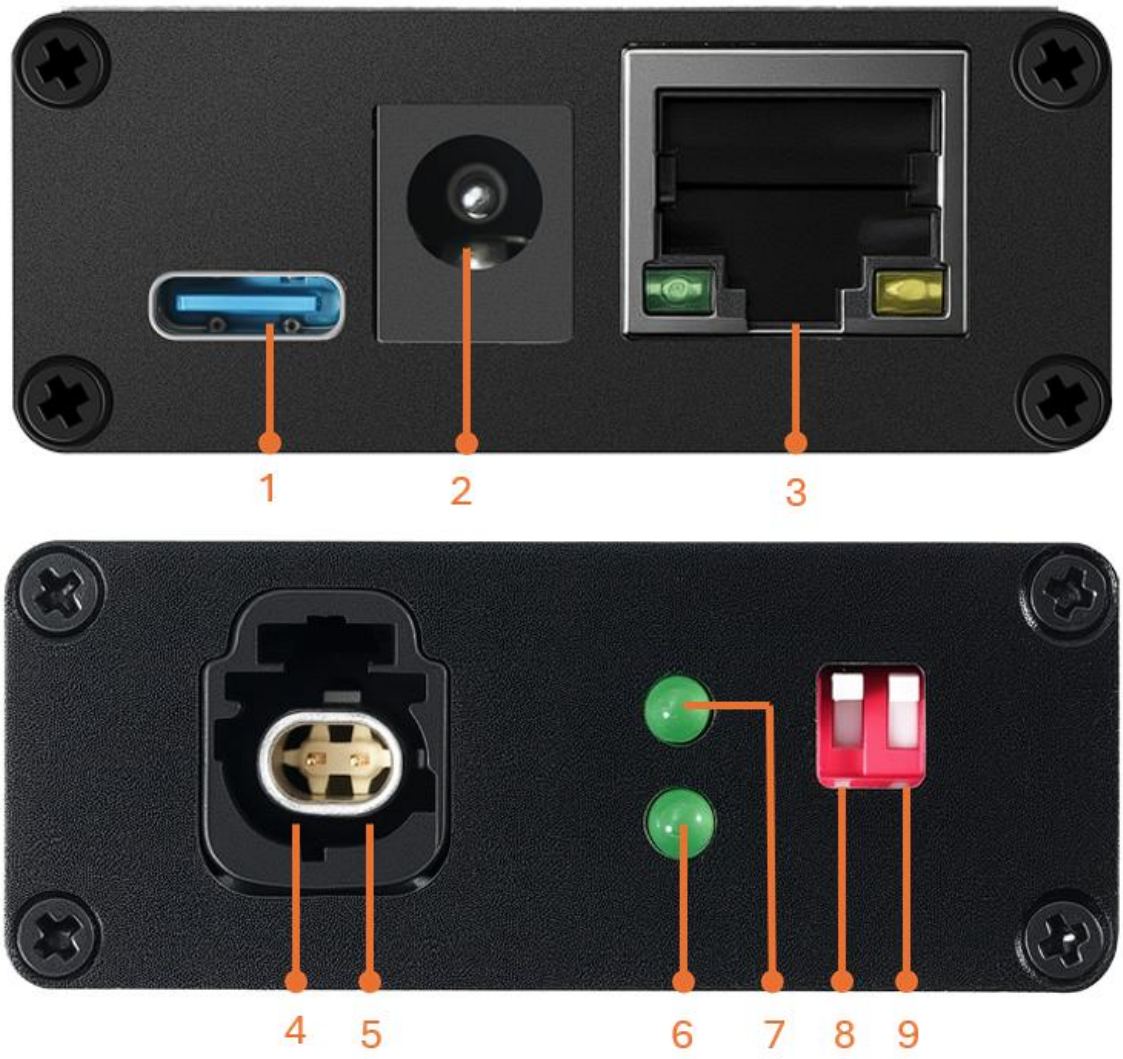
- **Protocol Compliance:** Fully supports IEEE 802.3bw (100BASE-T1) / Fully supports IEEE 802.3bp (1000BASE-T1) for automotive single-pair Ethernet and IEEE 802.3ab (1000BASE-T) for traditional Gigabit Ethernet, enabling reliable data transmission in mixed-network setups.
- **High-Speed Performance:** Delivers up to 1 Gbps full-duplex transmission rates over both T1 (single twisted pair) and TX (RJ45) interfaces, with auto-negotiation for 100/1000 Mbps compatibility and low-latency forwarding.

- **Robust Protection:** Integrated over-voltage, over-current, and ESD (electrostatic discharge) protection safeguards against electrical surges, meeting automotive-grade reliability standards.
- **Industrial-Grade Durability:** Engineered to industrial standards with a wide operating temperature range (-40°C to +85°C), humidity tolerance (0-95% RH non-condensing), vibration resistance, and EMI shielding, making it suitable for harsh environments like vehicles, factories, and outdoor installations.
- **Advanced Networking Support:** Includes IEEE 802.1Q VLAN tagging for traffic segmentation, QoS prioritization, and enhanced security in multi-device ecosystems.
- **Plug-and-Play Design:** Compact form factor (50mm x 20mm x 83mm) with standard T1 **(HMTD Male,E6S20A-40MT5-Z)** on one side and RJ45 port on the other; Selected powered via **USB Type-C (DC 5V ± 0.5V, ≤355mA) Or DC-Jack (6-30V)** for flexible deployment.

2 Hardware

2.1 Interfaces and Indicators (Detailed Description)





	Interface	Description
(1)	**Power**	(DC 5V).
(2)	**Power**	DC Jack (6-30V)
(3)	**RJ45**	100/1000BASE-T Ethernet port. Connects to PCs, switches, or other network devices using **4 standard** twisted-pair cable (CAT6

		recommended).
(4)	**HMTD T1 +**	100/1000Base-T1 Port TRX_P +
(5)	**HMTD T1 -**	100/1000Base-T1 Port TRX_N -
(6)	**Status LED**	Dual-function system and link/activity indicator: • **Solid Green**: System self-test passed and device is operating normally.
(7)	**Status LED**	• **Solid (T1 Link)**: 100/1000BASE-T1 link established. • **Blinking**: Data transmission/reception in progress on T1 interface.
(8)	**100M/1000M Switch**	UP: 1000M Down:100M
(9)	**Slave/Master Switch**	UP:Master Down:Slave

2.2 Typical Applications

PC/ARM ↔ RJ45 ↔ [1000BASE-T1-TX-E] ↔ Automotive Device / Network

Input Protocol	Output Protocol	Applications
100BASE-Tx	100BASE-T1	Vehicle diagnostics (DoIP), smart cockpit flashing, ADAS sensor debugging
1000BASE-Tx	1000BASE-T1	High-speed camera/radar data, ECU programming, R&D testing

The 1000BASE-T1-TX-E enables seamless conversion between industrial Ethernet and automotive single-pair Ethernet networks.

2.3 Product Specifications

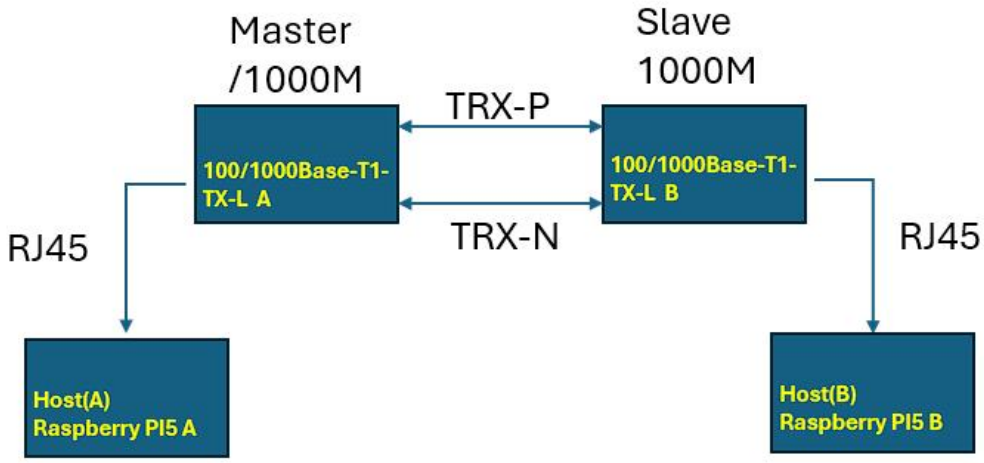
Parameter	Specification
Input Voltage	5V ± 0.5V

Operating Current	≤ 355mA
Operating Temperature	-40°C to +85°C
Operating Humidity	0~95% RH (non-condensing)
Dimensions LxHxW	50mm × 20mm × 83mm

2.4 Automotive Ethernet Transmission Distance

T1 Speed Mode	Cable Type	Max Distance
100BASE-T1	Unshielded Twisted Pair (UTP)	20 m
100BASE-T1	Shielded Twisted Pair (STP)	50 m
1000BASE-T1	Unshielded Twisted Pair (UTP)	15 m
1000BASE-T1	Shielded Twisted Pair (STP)	40 m

3 Connection Diagram



Note:
There must be one device set as Master, Another One set as Slave.
Both of the devices should set to the same Speed.

4 User Guide for Linux Os

We use 2 Raspberry PI5, one as client(Master) and one as server(Slave)

Hardware connection as chapter 3.

4.1 Install iperf3

Open terminal window of both raspberry pi5.

```
sudo apt-get install iperf3
```

Note: Do not choose iperf3 as a daemon automatically.
Or it will fail when *you run next boot.*

Download python scripts from our github.

```
sudo git clone https://github.com/buelec-tech/100-1000Base-T1-TX-L
```

4.2 Turn off WI-FI

4.3 Set IP And Ping

Host A As Client (190.19.1.9**), Host B As Server (**190.19.1.90**)**

Host A (Raspberry PI5 A), Client	Host B (Raspberry PI5 B), Server
sudo ifconfig eth0 down sudo ifconfig eth0 190.19.1.9 sudo ifconfig eth0 up	sudo ifconfig eth0 down sudo ifconfig eth0 190.19.1.90 sudo ifconfig eth0 up

Open **Host A** Terminal window, run below command check if network connected.

```
sudo ping eth0 -i 190.19.1.90
```

- If work, then go ahead with chapter 4.4
- If it does not work, re-check connection follow chapter3

4.4 TCP Test

Open Host B (190.19.1.90) Terminal, Set as server

```
sudo iperf3 -s
```

Note: if your system does not install iperf3, follow chapter 4.1

Open Host A (190.19.1.9) Terminal, send data.

```
sudo iperf3 -c 190.19.1.90 -n 8000M -i 30
```

```
Connecting to host 190.19.1.90, port 5201
[  5] local 190.19.1.9 port 48790 connected to 190.19.1.90 port 5201
[ ID] Interval           Transfer     Bitrate         Retr  Cwnd
[  5]   0.00-30.00  sec  3.27 GBytes   937 Mbits/sec    0    518 KBytes
[  5]  30.00-60.00  sec  3.27 GBytes   936 Mbits/sec    0    518 KBytes
[  5]  60.00-71.63  sec  1.27 GBytes   937 Mbits/sec    0    518 KBytes
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate         Retr
[  5]   0.00-71.63  sec  7.81 GBytes   937 Mbits/sec    0             sender
[  5]   0.00-71.64  sec  7.81 GBytes   937 Mbits/sec                  receiver
```

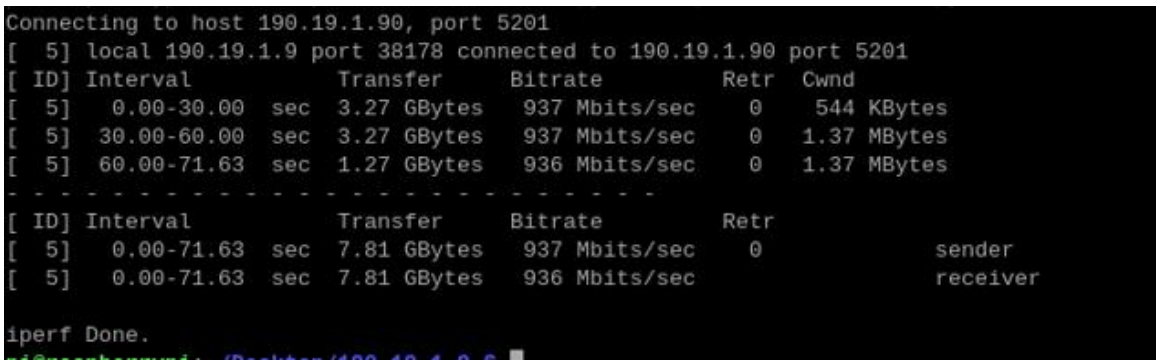
4.4 UDP Test

Open Host B (190.19.1.90) Terminal, Set as server

```
sudo iperf3 -s
```

Open Host A (190.19.1.9) Terminal , Set as client and send data.

```
sudo iperf3 -c 190.19.1.90 -u -b 8000M -l 8k -n 1000M
```



5 User Guide for Windows

We use 2 windows computers, one as client(Master) and one as server(Slave)

Hardware connection as chapter 3.

5.1 Install iperf3

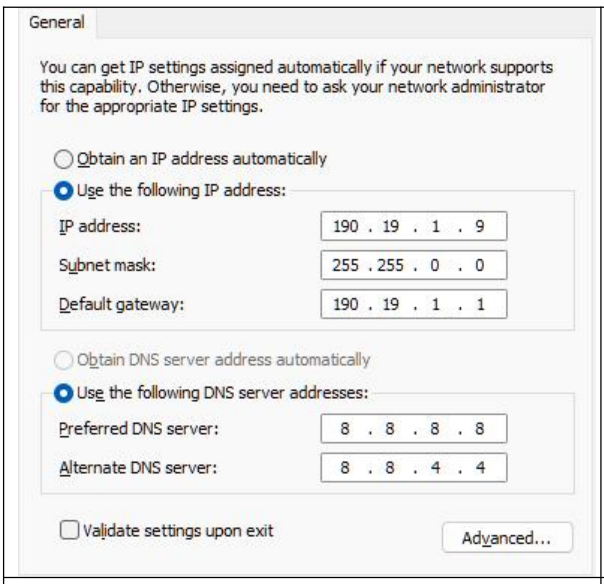
Download from our github link:

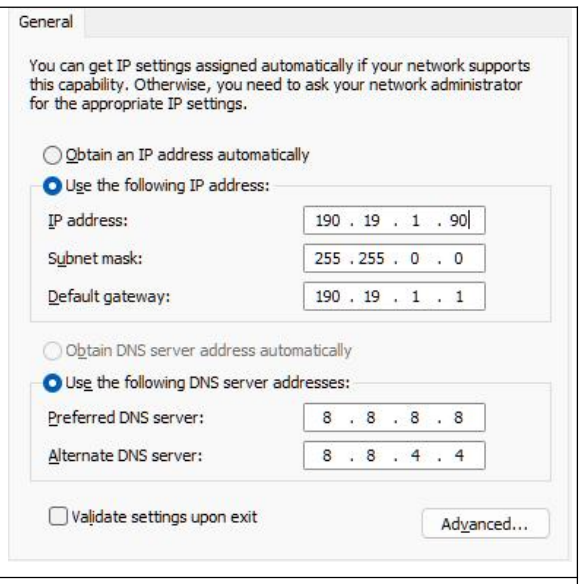
https://github.com/buelec-tech/100-1000Base-T1-TX-L unzip iperf3.6_64bit.zip

5.2 Turn off firewalls

5.3 Set IP And Ping

Computer A IP,Client	Computer B IP ,Server





190.19.1.9 255.255.0.0 190.19.1.1 8.8.8.8 8.8.4.4	190.19.1.90 255.255.0.0 190.19.1.1 8.8.8.8 8.8.4.4

Open Terminal (Admin) on Computer A, Switch to the iperf3 directory



ping -i 190.19.1.9 190.19.1.90 # ping from 190.19.1.9(client)

```
PS F:\iperf3.6_64bit> ping -i 190.19.1.9  190.19.1.90

Pinging 190.19.1.90 with 32 bytes of data:
Reply from 190.19.1.90: bytes=32 time=2ms TTL=128
Reply from 190.19.1.90: bytes=32 time=2ms TTL=128
Reply from 190.19.1.90: bytes=32 time=2ms TTL=128
Reply from 190.19.1.90: bytes=32 time=3ms TTL=128

Ping statistics for 190.19.1.90:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 3ms, Average = 2ms
```

5.4 100M Test

Open Host B (190.19.1.90) Terminal, Set as server

```
.\iperf3.exe -B 190.19.1.90 -s                    # Host B listen
```

Open Host A (190.19.1.9) Terminal, Set as client and send data.

```
.\iperf3.exe -c 190.19.1.90 -B 190.19.1.9 -w 100M -t 10      # Host A send data
```

```
PS F:\iperf3.6_64bit> .\iperf3.exe -c 190.19.1.90 -B 190.19.1.9 -w 100M -t 10
warning: Ignoring nonsense TCP MSS 0
Connecting to host 190.19.1.90, port 5201
[  5] local 190.19.1.9 port 9557 connected to 190.19.1.90 port 5201
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-1.00   sec   111 MBytes   933 Mbits/sec
[  5]   1.00-2.00   sec  11.2 MBytes  94.4 Mbits/sec
[  5]   2.00-3.00   sec  11.4 MBytes  95.3 Mbits/sec
[  5]   3.00-4.00   sec  11.4 MBytes  95.5 Mbits/sec
[  5]   4.00-5.00   sec  11.2 MBytes  94.4 Mbits/sec
[  5]   5.00-6.00   sec  11.4 MBytes  95.3 Mbits/sec
[  5]   6.00-7.00   sec  11.2 MBytes  94.4 Mbits/sec
[  5]   7.00-8.00   sec  11.4 MBytes  95.5 Mbits/sec
[  5]   8.00-9.00   sec  11.2 MBytes  94.4 Mbits/sec
[  5]   9.00-10.00  sec  11.4 MBytes  95.4 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-10.00  sec   213 MBytes   179 Mbits/sec                  sender
[  5]   0.00-10.13  sec   114 MBytes  94.6 Mbits/sec                  receiver
```

5.4 1000M Test

Open Host B (190.19.1.90) Terminal, Set as server

```
.\iperf3.exe -B 190.19.1.90 -s                    # Host B listen
```

Open Host A (190.19.1.9) Terminal, Set as client and send data.

```
.\iperf3.exe -c 190.19.1.90 -B 190.19.1.9 -w 100M -t 1
 # -c <host address> ,-B <Client address >
```

6 Packing List

No.	Item	Quantity	Unit
1	1000BASE-T1-TX-HMTD Converter	1	pcs
2	Type-C USB Power Cable	1	pcs
3	CAT6 Ethernet Cable	1	pcs
4	12V Power Adapter	1	pcs

6.1 Accessories Recommend

https://www.buelec-tech.com/product/1000base-t1-cable-h-mdt/

