Micro-DPU Series
Single-Channel, Compact Distribution Point Unit

Feature Highlights:

- Data rates up to 2 Gbps, leveraging the latest 200 MHz G.hn band-plans standardized in ITU-T G.9960 Amendments 1 and 2
- Uplink and downlink interfaces implemented as INF-8074 compliant small form-factor (SFP) modules for complete modularity
- Downlink wireline options for G.hn over twisted-pair or coax and 1G/2.5G Ethernet over Cat-5e
- Operating temperature range -40°C to +65°C, 10W maximum power
- Flexible power options including both Reverse Power Feed compliant to RPF ETSI TS 101 548 over twisted pair or coax or local 12V DC power
- ITU-T K.21 over-voltage protection
- Automatic detection of neighbor µDPUs, with synchronization of TDD time slots to eliminate near-end cross-talk (NEXT)
- Compatible with MaxLinear cloud-based VectorBoost platform to eliminate far-end cross-talk (FEXT)
- Flexible bandwidth provisioning, supporting both fixed TDD ratios or dynamic time allocation (DTA) on both coax and twisted-pair
- Directly supported in mainline OpenWrt

Product Summary

The Methode micro-DPU (or µDPU) is a versatile, compact, single-channel distribution point unit (DPU) that can be deployed in a variety of FTTx situations for ultra-fast broadband service delivery. It is an SDN-ready solution with no dependency on proprietary vendor SDKs instead running a mainline distribution of OpenWRT that can be adapted and optimized for specific operator needs.

✓**ISO 9001 Certified**

METHODE ELECTRONICS, INC.

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Micro-DPU Functional Block diagram

The micro-DPU consists of a power supply system and a powerful dual core ARM cortex A53 embedded processor optimized for networking applications. The micro-DPU can be powered using a local 12V to 18V supply or reverse power fed from the customer premises using a compatible ETSI TS 101 548 power injector.
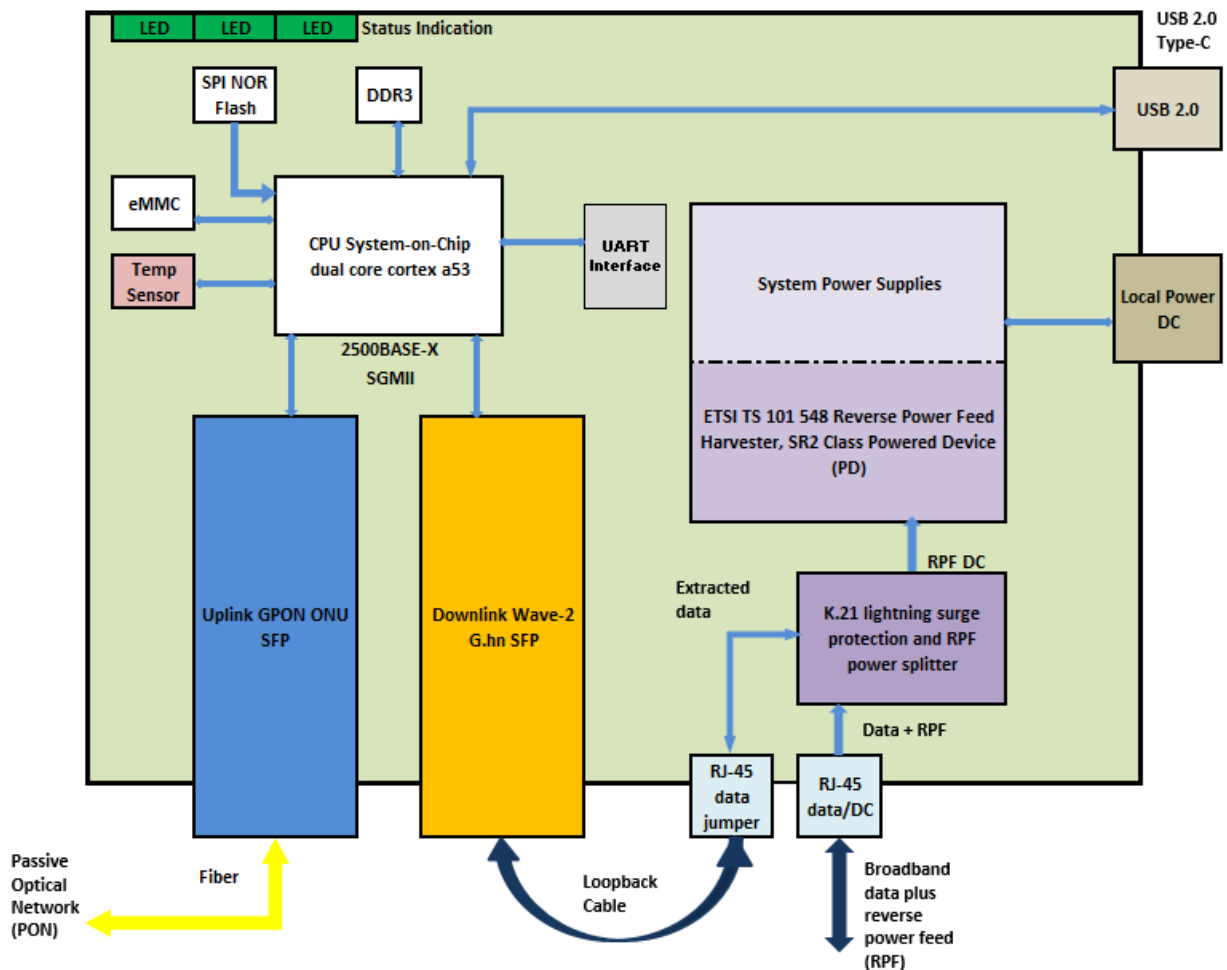

Figure 1 micro-DPU block diagram

micro-DPU Overview

The micro-DPU was originally conceived as a reverse power fed, network managed, GPON fiber link extender. The uplink SFP cage accepts a GPON ONT SFP module with a standard SGMII interface. However, depending on the case use scenario, the uplink can accept any optical or copper SFP module rated up to a link 2.5Gbps with a standard SGMII or 1000BASE-X electrical interface on the SFP 20-pin connector. The downlink SFP cage can be populated with one of several supported G.hn SFP modules, including variants for single-pair SISO, 2-pair MIMO and F-type for coax, or it can be populated with a 1000BASE-T or 2500BASE-T SFP module for downlinks cabled with CAT-5e. For SISO and MIMO phone line connections the micro-DPU can be reverse powered from the customer premises. For Ethernet over CAT 5e or coax case uses, the micro-DPU can be locally powered using a DC-supply between 12V and 18V. When reverse powered, a small patch cable is needed to jump data between the downlink wireline SFP module and the power splitter built into the micro-DPU. This is why the micro-DPU front bezel includes a dual-RJ connector interface. Viewed from the front, the right-hand most RJ connector is for RPF DC-power and data combined while the left-hand RJ connector is for data only. If the micro-DPU is locally powered, the copper media cable must be connected directly to the input of the downlink SFP modules.
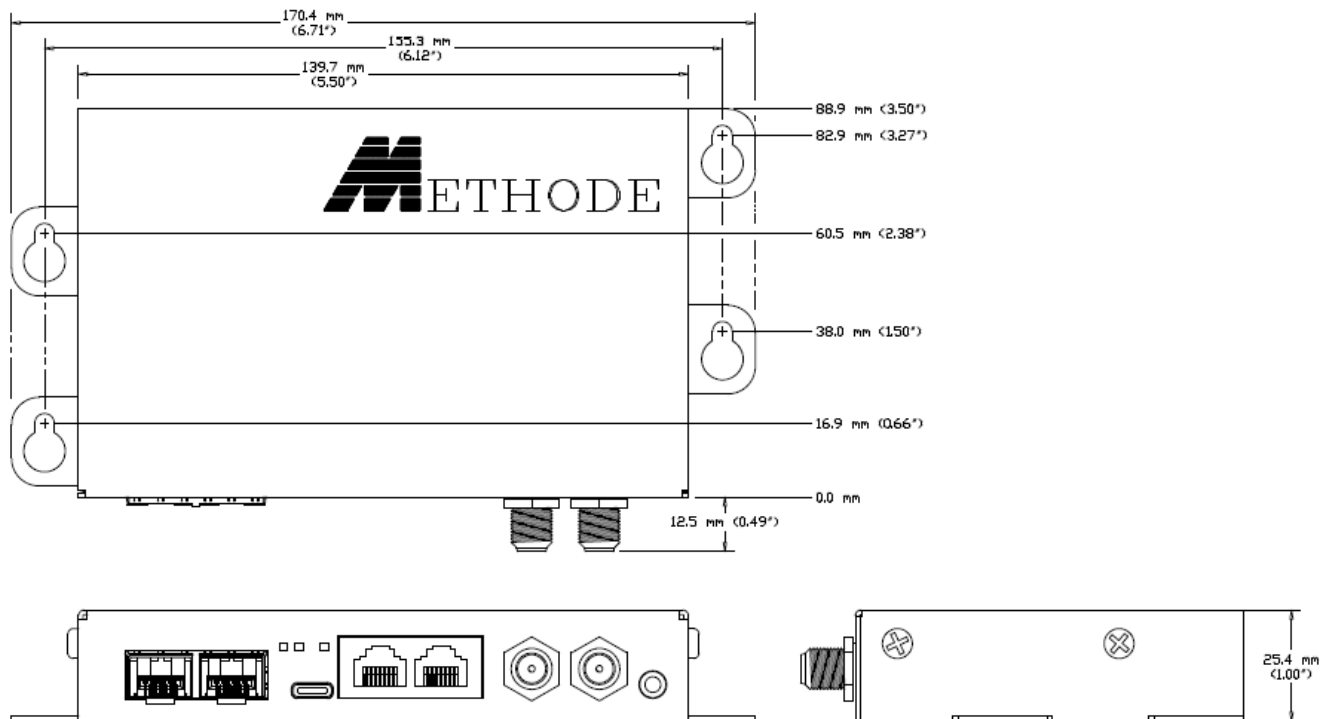
Mechanical Dimensions

Figure 2: Mechanical Dimensions

Product Features and Specifications

General Specifications

Operating Conditions

Parameter	Minimum	Typical	Maximum	Notes
Storage Temperature	-40°C		85°C	Ambient
Operating Temperature	-40°C		65°C	Ambient
Operating Humidity			95%	Relative

Power supply

Parameter	Minimum	Typical	Maximum	Notes
RPF		57V DC		250m max loop length
Local Power	12V DC [1,2]		18V DC [1,2]	20W rating recommended
Micro-DPU power dissipation			10W	

Notes: [1] ±10%
[2] barrel plug, 2.5mm ID, center positive polarity

SFP Module Interfaces

- Supports SFP modules compliant to INF-074i
- 1000BASE-x, SGMII electrical interface (on 20-pin electrical interface)
- Line rate up to 2.5Gbps

USB Port

- Type-C connector interface running USB 2.0

Management, control and protocols

- IPv4/Ipv6 dual stack concurrent
- DHCP/TFTP

LED Indication

LED#/LED color	Off	Green	Green-Flashing	Red	Red-Flashing
LED #1	micro-DPU has no power input	micro-DPU powered via RFP or local DC	micro-DPU software update started	micro-DPU software update failed	n/a
LED #2	micro-DPU has no power input	micro-DPU has an IP/IPv6 address and Wireguard VPN connection	micro-DPU has an IP/IPv6 address, but no Wireguard VPN connection	micro-DPU has no IP/IPv6 address	micro-DPU is trying to get an IP/IPv6 address.
LED #3	micro-DPU has no power input	micro-DPU has no active alarms	micro-DPU high CPU or MEM threshold	micro-DPU over-temperature alarm	n/a

Software: OS and File System

- OS/Kernel OpenWrt embedded Linux with mainline Linux kernel
- F2FS RootFile system

Software: Tools, Utilities and Features

- sysupgrade – used to remotely replace the entire current OpenWrt installation with a new version.

- WireGuard® - a convenient to use, encryption secure VPN: https://www.wireguard.com/

- Open vSwitch – a multilayer virtual switch: https://www.openvswitch.org/ . The micro-DPU incorporates the main user space components required for Open vSwitch to function however the main OVS tools (ovs-vsctl, ovs-ofctl, etc) are packaged separately to conserve some room in memory and to allow more configurability.

- Zabbix - Zabbix agent for network monitoring: https://www.zabbix.com/

- Chrony – an implementation of the Network time Protocol (NTP) for synchronizing the system clock with that of an NTP server: https://chrony.tuxfamily.org/

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- linuxptp - The PTP daemon implements version 2 of the Precision Time Protocol (PTP) as defined by the IEEE 1588-2008 standard for hardware and software time stamping: http://linuxptp.sourceforge.net/

- gpsd - a service daemon that acts as a translator between GPS and AIS receivers and their clients: http://catb.org/gpsd/

- brctl – bridge control command used to create and manage Ethernet Bridges. Supports addbr/delbr and addif/delif: https://linux.die.net/man/8/brctl

- DHCP – (udhcpc) is a Dynamic Host Configuration Protocol client geared primarily toward embedded systems, while striving to be fully functional and RFC compliant. The udhcp client negotiates a lease with the DHCP server and runs a script when a lease is obtained or lost.

- iperf3 - for measuring and tuning TCP and UDP bandwidth performance.

- tcpdump – a command line packet analyzer: https://www.tcpdump.org/

- GPIOs – to configure and control peripherals such as the SFP ports and status indication LEDs.

- i2c-tools – a set of I2C tools for Linux. These tools were originally part of the lm-sensors package.

- ifstat - a tool used to report network interfaces bandwidth.

Other packages required by the customer can be installed but must be compatible and available with openWrt kernel.

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Certification Compliance

UL listed and evaluated per UL/IEC 60950 and UL/IEC 62368.

- FCC Part 15 Subpart B
- IECS 003
- Radiated Emission per CISPR 32 (EN55032)
- EU: Conducted Emissions per CISPR 32 (EN55032)
- EU: Radiated Immunity per CISPR 35 (EN55035)
- EU: ESD per CISPR 35 (EN55035)
- EU: Magnetic Immunity per CISPR 35 (EN55035)
- Recommendation ITU-T K.21 enhanced test levels
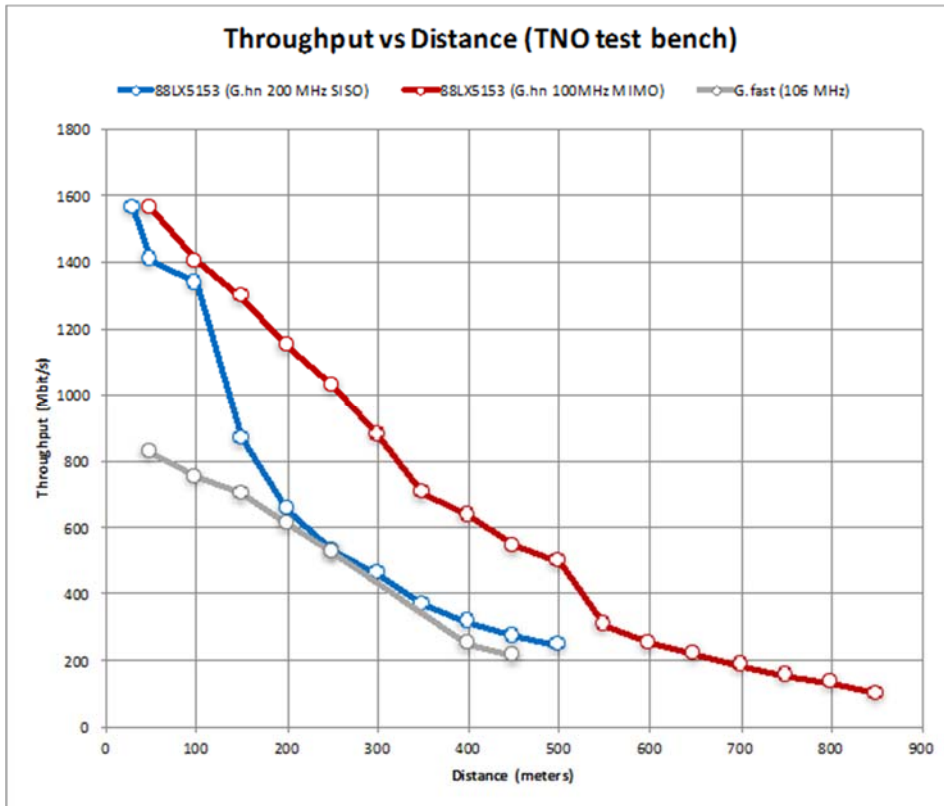- RoHS 6 of 6

Product applicable standards

- ITU-T Recommendation G.984 family for GPON
- ITU-T G.99664 Unified high-speed wireline-based home networking transceivers – Power spectral density specification
- ITU-T G.9961 Unified high-speed wireline-based home networking transceivers – Data link layer specification
- ITU-T G.9960 Unified high-speed wireline-based home networking transceivers – System architecture and physical layer specification
- ETSI TS 101 548 for reverse power feed
- INF-8074i Specification for SFP (Small Form-factor Pluggable) Transceiver
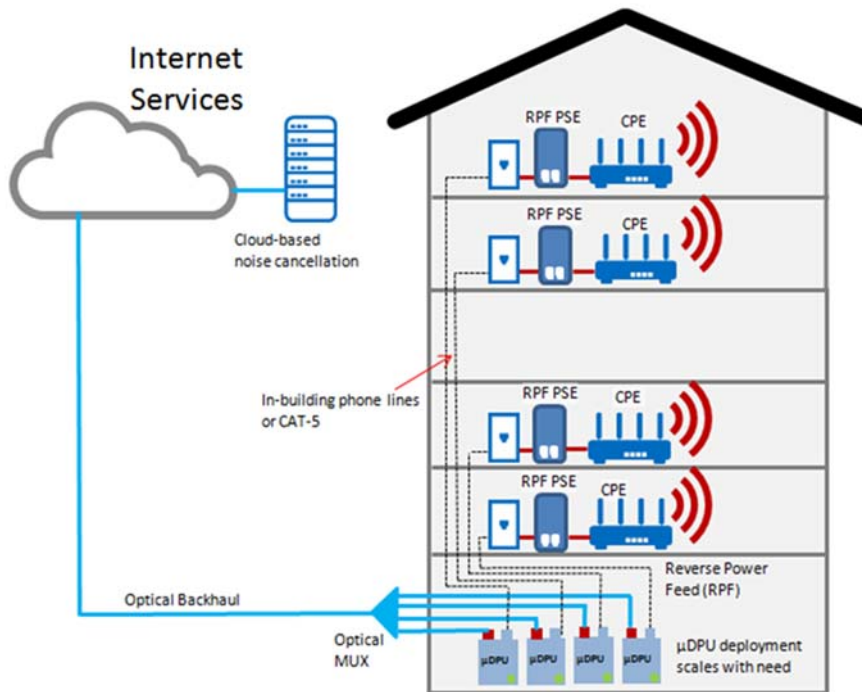
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Speed and Reach

Throughput vs Distance (TNO test bench)

Case Use Scenarios

MDU FTTx
Point-to-Point over Phone Line with RPF

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MDU FTTx Point-to-Multipoint Over Coax

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