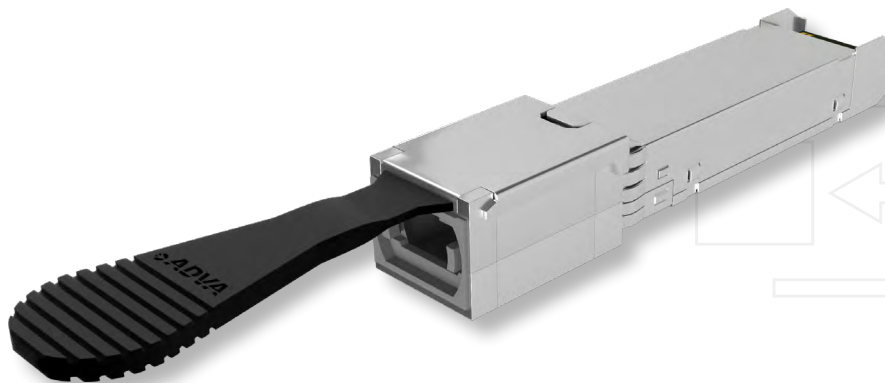


MicroMux™ Nano

Ten 1GbE to 10GbE packet multiplexer

The ever-increasing demand for bandwidth delivery in access networks is driving solution providers and network operators to deploy equipment supporting only 10GbE and higher services. Nevertheless, there's still huge demand for 1GbE services. Our MicroMux™ Nano solves this problem and creates new value in equipment designed only for 10GbE.

Our MicroMux™ Nano transforms a 10GbE port into ten independent 1GbE ports without the need for bulky and expensive pre-aggregation devices. Available for short-reach and long-reach applications, our MicroMux™ Nano features a small form-factor plug that fits into standard 10GbE SFP+ sockets. For use in Gigabit Ethernet routers, switches or any other device that accepts standard pluggable SFP+ interfaces, our MicroMux™ Nano has multiple applications. For example, using the MicroMux™ Nano, a 10GbE Carrier Ethernet NID becomes an aggregation Carrier Ethernet switch or a 10Gbit/s optical transponder becomes a 10x1GbE muxponder. With zero footprint increase and minimal power consumption, our MicroMux™ Nano brings new capabilities and value to the network edge without consuming rack space or unnecessary cost. What's more, operational cost and complexity are also minimized. Solution providers and network operators can focus on 10Gbit/s network infrastructure, while still being able to provide legacy 1GbE services.



Your benefits

- ✓ **Standard compliant SFP+ packaging**
Equivalent functionality of ten standard GbE small form-factor pluggables (SFPs) in a single standard-compliant SFP+ package
- ✓ **Higher 1GbE port density saves rack space**
By transforming each 10GbE port into ten 1GbE ports, MicroMux™ Nano offers higher port density than standard 10GbE pre-aggregation devices
- ✓ **Layer 2 Ethernet multiplexing technology**
Standard integration into Ethernet and transport networks. Includes integrated packet buffers with VLAN mapping, filtering and tagging
- ✓ **For MM and SM applications**
MicroMux™ Nano -SX and -LX variants for short-reach and long-reach applications
- ✓ **Transparent timing support**
Suitable for time-sensitive networks sourced from 10GbE interfaces and pass-through timing
- ✓ **Individual channel management**
Separate configuration, monitoring and diagnostics of individual 1GbE client channels

High-level specifications

Parameters	MicroMux™ Nano-SX Multi-mode variant	MicroMux™ Nano-LX Single-mode variant
Operating wavelengths	850nm (typ.)	1310nm (typ.)
Optical output power per channel	-9.5dBm to 0dBm	-9dBm to -3dBm
Extinction ratio	9dB (min.)	9dB (min.)
Transmitter dispersion penalty		3.3dB (max.)
Side-mode suppression ratio	30dB (min.)	30dB (min.)
Optical return loss tolerance	12dB (max.)	12dB (max.)
Eye mask {X1, X2, X3, Y1, Y2, Y3} Hit ratio of 5e-5 per IEEE 802.ah	15% (min.)	15% (min.)
Receiver sensitivity per channel (BER 1e-12)	-17dB	-20dB
Received optical power range per channel (dBm)	-17dBm to 0dBm	-20dBm to 0dBm
Clock accuracy	+/-100ppm	+/-100ppm
Case temperature range	0°C to 70°C	0°C to 70°C
Power consumption	3W	3W
Optical interface	1xMPO24 MM	1xMPO24 MM
IEEE optical specification	1000Base-SX	1000Base-LX10

Applications in your network

Use your latest native 10GbE equipment to offer legacy 1GbE services when and where necessary without additional cards or shelves



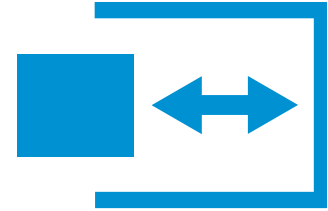
MicroMux™ Nano converts a 10GbE port into ten 1GbE ports with zero footprint increase



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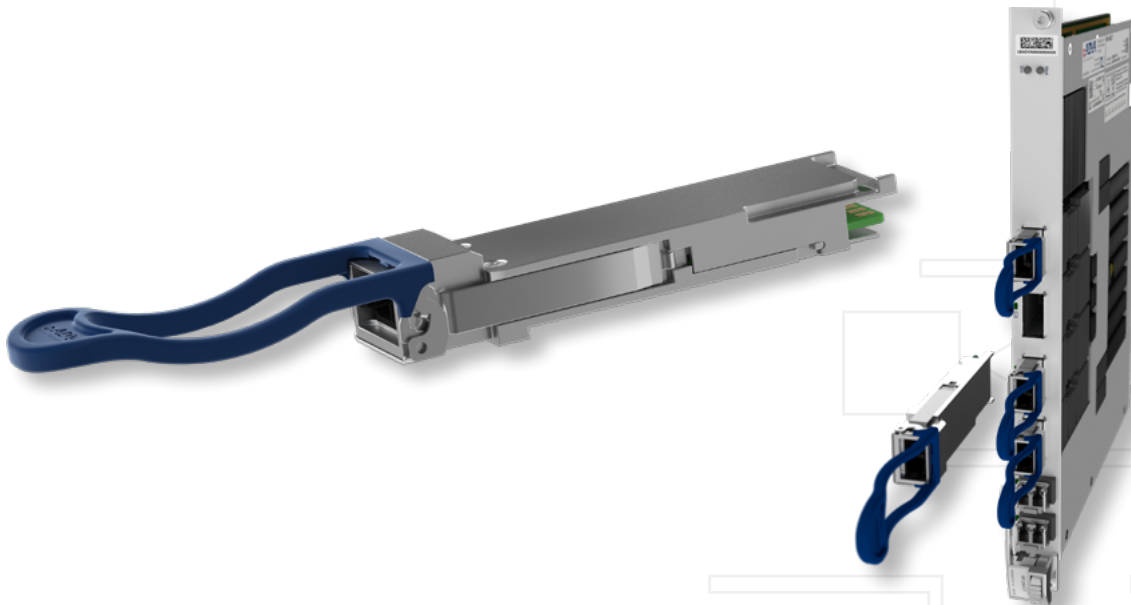


MicroMux™

Convert 100GbE ports into 10x 10GbE ports with zero footprint increase

With massive and ever-increasing traffic growth, network operators are having to upgrade transport network infrastructure to support data rates of 100Gbit/s and above. However, there is still a large demand for lower data rate services. Internet and cloud service providers are struggling to balance current need with future demand. Our MicroMux™ solves this problem.

Our MicroMux™ is an active QSFP28 interface that converts 100 Gigabit Ethernet (GbE) client ports into ten 10GbE ports without compromising power, space or spectral efficiency. By simply adding this small form-factor pluggable, a 100Gbit/s-based device can support 10GbE services. There's no need for additional costly aggregation devices that add operational complexity and consume rack space. Our MicroMux™ also increases flexibility. Service providers can seamlessly mix 10GbE and 100GbE clients into 100Gbit/s-based switches, routers or optical terminals without any footprint increase. Our MicroMux™ module provides highest client port flexibility with minimum operational complexity.



Your benefits

- ✔ **Support 10GbE on 100GbE ports**

Convert a 100GbE QSFP28 client port into ten 10GbE ports with just a pluggable QSFP28

- ✔ **Zero footprint increase**

MicroMux™ fits existing QSFP28 cages without modification and with unchanged energy efficiency

- ✔ **Support legacy infrastructure**

Serve legacy 10GbE links with your newest 100Gbit/s-based infrastructure without additional aggregation devices

- ✔ **Highest flexibility**

Single-mode and multi-mode variants; configurable for 100GBase-SR10 or breakout into ten 10GBase-SR

- ✔ **Save cost and operational complexity**

Reduce cost, points of failure and operational complexity with less equipment in the network

- ✔ **10GbE services on demand**

Easily increase or decrease the number of 10GbE ports in your 100Gbit/s-based switch, router or optical terminal

High-level specifications

Parameters	Multi-mode variant	Single-mode variant
Operating wavelengths	840nm to 860nm	1260nm to 1355nm
Optical output power per channel	-7.3dBm to -1dBm	-8.2dBm to 0.5dBm
Extinction ratio	3dB	4dB
Transmitter dispersion penalty	3.9dB	3.2dB
Side-mode suppression ratio	N/A	30dB
Eye mask {X1, X2, X3, Y1, Y2, Y3} Hit ratio of 5e-5 per IEEE	{0.25, 0.4, 0.45, 0.25, 0.28, 0.40}	{0.25, 0.4, 0.45, 0.25, 0.28, 0.40}
Receiver sensitivity per channel (BER 5e-5)	-9.9dBm	-14.4dBm
Maximum receiver input	3.4dBm	1dBm
Clock accuracy	+/-100ppm	+/-100ppm
Maximum link length	150m OM4 for 100GBase-SR10 400m OM4 for 10GBase-SR	10Km
Case temperature range	0°C to 70°C	0°C to 70°C
Power consumption	6W	6W
Optical interface	MPO24 MM	MPO24 SM
Electrical interface	CAUI-4	CAUI-4

Applications in your network

Enable 10Gbit/s client support to 100Gbit/s-based switches, routers or optical terminals



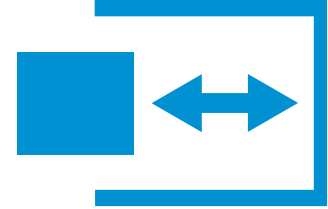
MicroMux™ converts a 100GbE port into ten 10GbE ports with zero footprint increase



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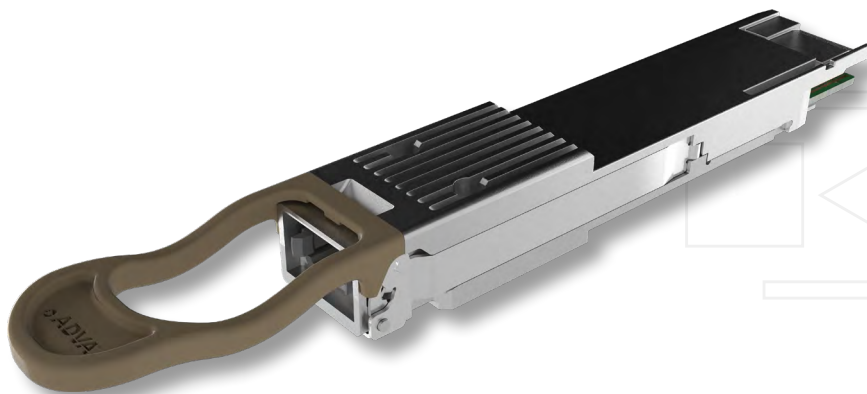


MicroMux Quattro™

100GbE and 200GbE support in 400GbE slots without additional rack space

The growth of bandwidth demand has prompted network operators to introduce 400Gbit/s Ethernet-based connectivity. But this next-generation equipment offers little or no support for 100Gbit/s services. 100GbE services require additional costly equipment that also adds complexity, footprint and power consumption to the node. Our MicroMux™ Quattro plug solves this problem by transforming each 400GbE port into four 100GbE ports or two 200GbE ports with zero footprint increase.

Built as a standard-compliant QSFP-DD form factor, our MicroMux™ Quattro offers a simple and innovative solution to support 100GbE or 200GbE services where the deployed infrastructure is designed for 400GbE only. It packs the functionality of four independent 100GBase-SR4 or CWDM4 interfaces or two independent 200GBase-SR8 interfaces into a single QSFP-DD housing. Since there's no need for other expensive aggregation devices, MicroMux™ Quattro saves cost, rack space and power consumption. What's more, with less equipment and interconnecting points in the network, MicroMux™ Quattro significantly reduces operational complexity. Whether in data center, enterprise or service provider applications, our MicroMux™ Quattro helps you maximize the use of your existing hardware.



Your benefits

- ✔ **Support 100GbE on 400GbE ports**
 Converts a 400GbE QSFP-DD port into four independent 100GbE or two 200GbE ports
- ✔ **Flexible, software configurable**
 Enables four 100GBase-SR4/CWDM4, two 200GBase-SR8 or one 400GBase-SR16 from a single 400GbE QSFP-DD slot
- ✔ **Save cost and operational complexity**
 Eliminates the need for costly aggregation devices that also increase rack space and points of failure
- ✔ **Four times higher density of 100GbE ports**
 By transforming each 400GbE port into four 100GbE ports, MicroMux™ Quattro offers higher port density than standard 100GbE pre-aggregation devices
- ✔ **Standard-compliant plug-and-play QSFP-DD**
 Electrically and mechanical compliant to QSFP-DD standard cages; CMIS-Rev 3.0 compliant
- ✔ **FEC termination/creation**
 KP2 FEC for 100GAUI-2 electrical interfaces and KR4 FEC for SR4 optical interfaces

High-level technical specifications

Parameter	MicroMux Quattro™ SR4	MicroMux Quattro™ CWDM variant
Operating wavelengths	840nm (min.) to 860nm (max.)	1264.5nm (min.) to 1277.5nm (max.) 1284.5nm (min.) to 1297.5nm (max.) 1304.5nm (min.) to 1317.5nm (max.) 1324.5nm (min.) to 1337.5nm (max.)
Optical output power per channel	-8.4dBm (min.) to 2.4dBm (max.)	-6.5dBm (min.) to 2.5dBm (max.)
Extinction ratio	2dB	3.5dB
Transmitter dispersion penalty	4.4dB	3dB
Side-mode suppression ratio	N/A	30dB
Optical return loss tolerance	12dB	20dB
Eye mask {X1, X2, X3, Y1, Y2, Y3} Hit ratio of 5e-5 per IEEE	{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}
Receiver sensitivity per channel (BER 5e-5) (dBm)	-10dBm	-10dBm
Received optical power range per channel (dBm)	-10.3dBm (min.) to 2.4dBm (max.)	--11.5dBm (min.) to 2.5dBm (max.)
Clock accuracy	+/-100ppm	+/-100ppm
Case temperature range	0°C to 70°C	0°C to 70°C
Power consumption	14W	17W
Optical interface	MPO32	MPO12
Electrical interface	Standard-compliant QSFP-DD	Standard-compliant QSFP-DD

Applications in your network

Enables 100GbE and 200GbE ports in latest 400GbE devices with just a hot-swappable QSFP-DD plug



MicroMux™ Quattro converts a 400GbE port into four 100GbE or two 200GbE ports with zero footprint increase



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