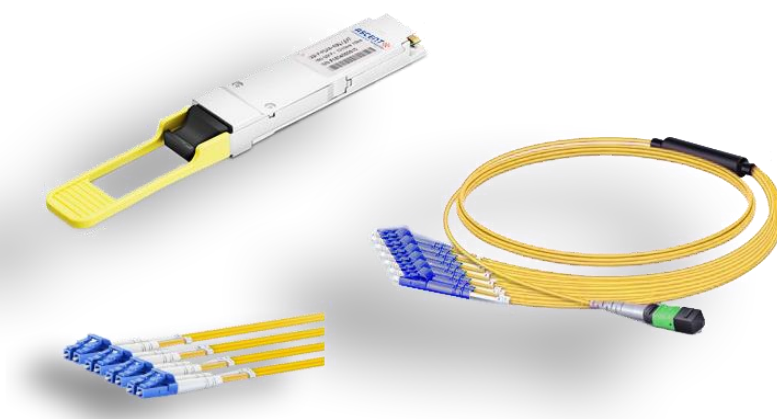


QSFP+ 4x10 Gb/s 1310 nm PLR4 10 km w/ MPO Transceiver Kit

QSFP+ Series



- **Supports 4 independent streams of 10G Ethernet or OTN data**
- **Up to 10 km transmission on SMF**
- **Electrically hot-pluggable**
- **Digital Diagnostics Monitoring Interface**
- **Hot-pluggable**
- **Compliant with QSFP+ MSA with LC connector**
- **Power dissipation < 2.5 W**

Ascent's QSFP-AQ-LP-31 QSFP+ 4x10GBase-LR 1310 nm transceiver module kits are designed for use in high density 10 Gigabit Ethernet links over single mode fiber.

They are compliant with the QSFP+ MSA, IEEE 802.3ae 10GBASE-LR/LW, and OTN data rates OTU2, OTU1e, and OTU2e per the ITU. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP+ MSA. The transceiver is RoHS compliant per Directive 2011/65/EU5.

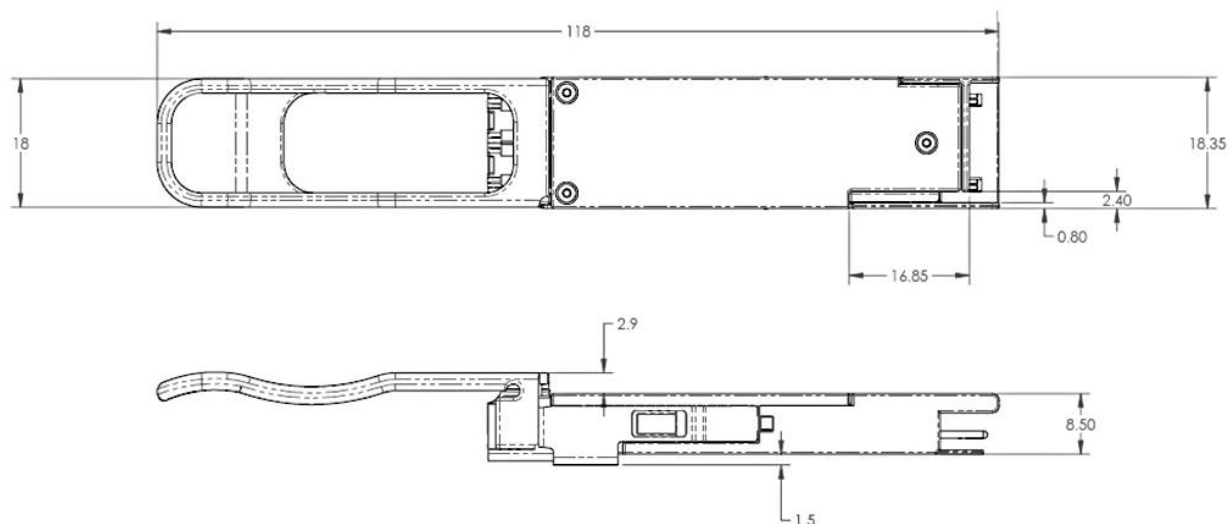
MPO breakout assemblies are used in parallel optics and duplex transmission cross connect systems to increase cable density between switch and server cabinets. Designed for high-density fiber patching in data centers, they ensure peak performance throughout your local area network. Allow for rapid deployment of high-density, multi-port patch field connectivity for Storage Area Network (SAN) applications.

Ascent's QSFP+ module family comprises industry leading 10GE and 40GE technology and provide more flexible for data center operators with a MPO breakout assembly included.

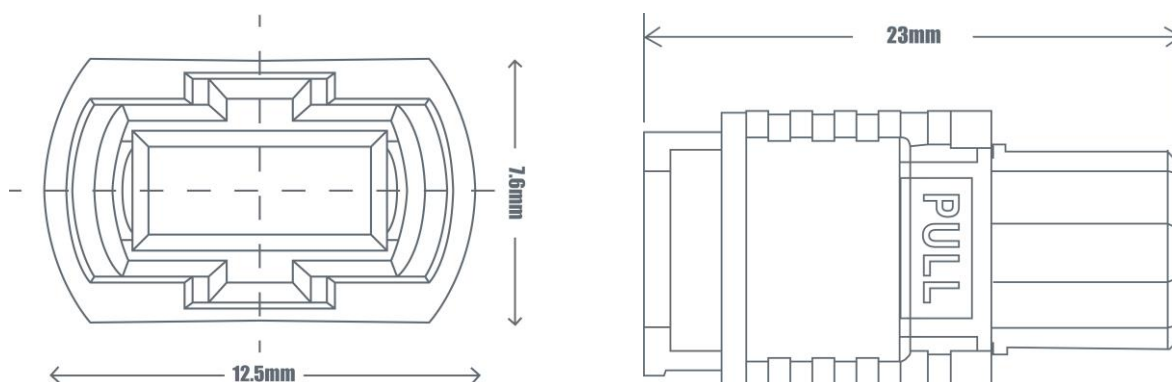
Key Features

- Hot-pluggable QSFP+ form factor
- Supports 4 independent streams of 10G Ethernet or OTN data
- Power dissipation < 2.5 W
- RoHS-6 compliant
- Commercial case temperature range 0°C to 70°C
- Single 3.3 V power supply
- Maximum link length of 10 km on single-mode fiber (SMF)
- XLPPi electrical interface
- MPO12 receptacle
- Built-in digital diagnostic functions, including Tx/Rx power monitoring

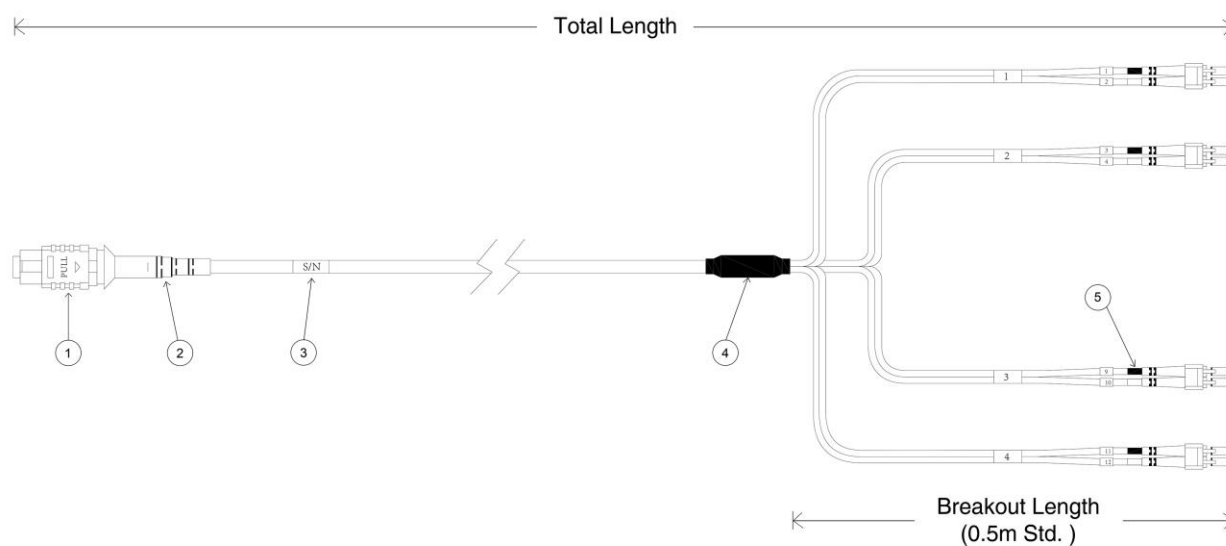
SFP Diagram



Cable Dimensions

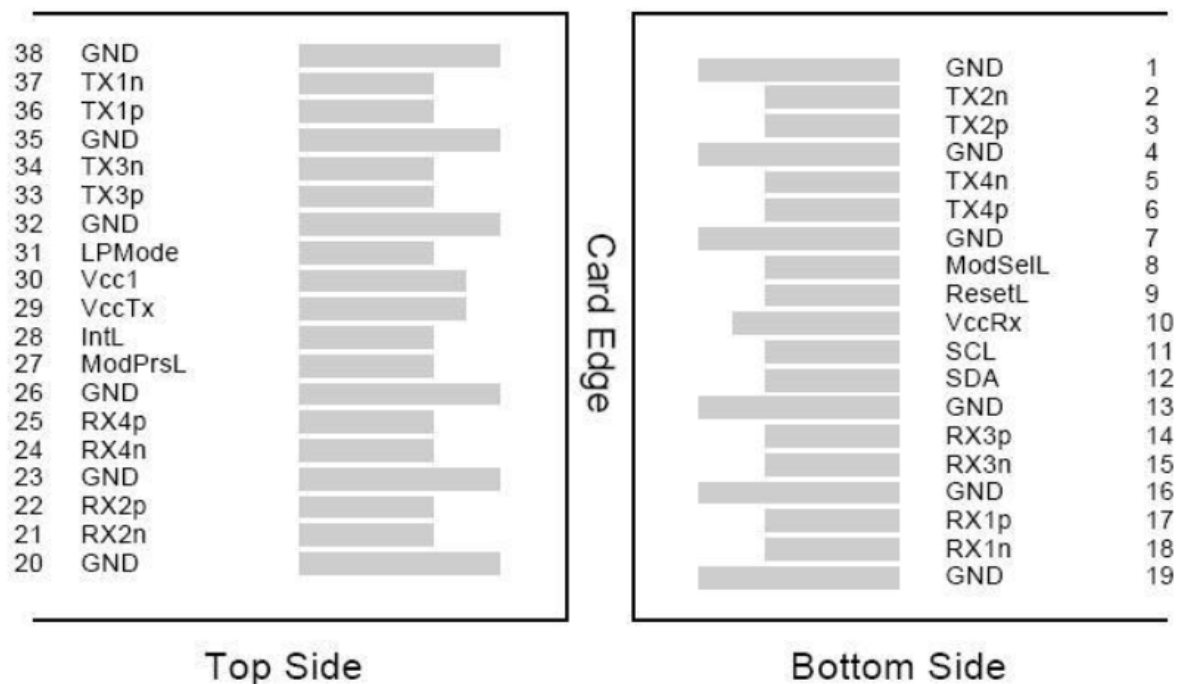


Cable Diagram



1. MPO Connector
2. Connector Boot
3. Serial Number Label
4. Fan Out Kit
5. LC Connector

Pin Assignment



Pin out of Connector Block on Host Board

Pin	Symbol	Name/Description	Note
1	GND	Transmitter Ground (Common with Receiver Ground)	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground (Common with Receiver Ground)	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground (Common with Receiver Ground)	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	3.3V Power Supply Receiver	2
11	SCL	2-Wire serial Interface Clock	
12	SDA	2-Wire serial Interface Data	
13	GND	Transmitter Ground (Common with Receiver Ground)	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Transmitter Ground (Common with Receiver Ground)	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Transmitter Ground (Common with Receiver Ground)	1
20	GND	Transmitter Ground (Common with Receiver Ground)	1

21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Transmitter Ground (Common with Receiver Ground)	1
24	Rx4n	Receiver Inverted Data Output	1
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground (Common with Receiver Ground)	1
27	ModPrsl	Module Present	
28	IntL	Interrupt	
29	VccTx	3.3V power supply transmitter	2
30	Vcc1	3.3V power supply	2
31	LPMODE	Low Power Mode	
32	GND	Transmitter Ground (Common with Receiver Ground)	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground (Common with Receiver Ground)	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.

Specifications

General Product Characteristics

Parameter	Value	Unit	Notes
Module Form Factor	QSFP+		
Maximum Aggregate Data Rate	44.4	Gb/s	
Maximum Data Rate per Lane	11.095	Gb/s	
Protocols Supported	10G Ethernet		This module is not retimed
Electrical Interface and Pin-out	38-pin edge connector		Pin-out as defined by the QSFP+ MSA
Maximum Power Consumption	2.5	W	
Management Interface	Serial, I2C-based, 400 kHz maximum frequency		As defined by the QSFP+ MSA
Bit Rate per Lane	BR	9.95	
Bit Error Ratio	BER		
Link Distance on SMF-28	d		
Bit Rate per Lane	BR	9.95	

Notes:

1. Compliant with 10GBASE-LR/LW, OTU2, OTU1e, and OTU2e and XLPPI.
2. Tested with a PRBS 2-1 test pattern.

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Maximum Supply Voltage	Vcc1, VccTx, VccRx	-0.5		3.6	V	
Storage Temperature	Ts	-40		85	°C	
Case Operating Temperature	Top	0		70	°C	
Relative Humidity	RH	0		85	%	Non-condensing
Damage Threshold, per Lane	DT	3.4			dBm	

Electrical Characteristics (TOP = 0 °C to 70 °C, VCC = 3.1 V to 3.47 V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	Vcc1, VccTx, VccRx	3.1		3.47	V	
Supply Current	Icc			1.13	A	
Transmitter Turn-On Time				2000	ms	2
Transmitter (per Lane)						
Single Ended Input Voltage Tolerance	VinT	-0.3		4.0	V	
Differential Data Input Swing	Vin,pp	120		1200	mVpp	3
Differential Input Threshold			50		mV	
AC Common Mode Input Voltage Tolerance (RMS)		15			mV	
Differential Input Return Loss		Per IEEE P802.3ba, Section 86A.4.1.1			dB	4
J2 Jitter Tolerance	Jt2	0.17			UI	
J9 Jitter Tolerance	Jt9	0.29			UI	
Data Dependent Pulse Width Shrinkage	DDPWS	0.07			UI	
Eye Mask Coordinates {X1, X2, Y1, Y2}		0.11, 0.31 95, 350			UI mV	5
Receiver (per Lane)						
Single-Ended Output Voltage		-0.3		4.0	V	
Differential Data Output Swing	Vout,pp	200 300 400 600		400 600 800 1200	mVpp	6,7
AC Common Mode Output Voltage (RMS)				7.5	mV	
Termination Mismatch at 1 MHz				5	%	
Differential Output Return Loss		Per IEEE P802.3ba, Section 86A.4.2.1			dB	4
Common Mode Output Return Loss		Per IEEE P802.3ba, Section 86A.4.2.2			dB	4
Output Transition Time, 20 % To 80 %		28			ps	

J2 Jitter Output	Jo2	0.42	UI	
J9 Jitter Output	Jo9	0.65	UI	
Eye Mask Coordinates #1 {X1, X2, Y1, Y2}		0.29, 0.5 150, 425	UI	5
Power Supply Ripple Tolerance	PSR	50	mV mVpp	

Notes:

1. Maximum total power value is specified across the full temperature and voltage range
2. From power-on and end of any fault conditions.
3. After internal AC coupling. Self-biasing 100Ω differential input.
4. 10 MHz to 11.1 GHz range
5. Hit ratio = 5×10^{-5} .
6. AC coupled with 100 Ω differential output impedance.
7. Output voltage settable in four discrete ranges via I2C command.

Optical Characteristics (TOP = 0 °C to 70 °C, VCC = 3.1 V to 3.47 V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Signaling Speed per Lane		9.95		10.095	GBd	1
Lane Center Wavelength	λ	1290		1330		
Average Launch Power per Lane	TXPx	-6.0		-1.0	dBm	2
Transmit OMA per Lane	TxOMA	-5.2		3.0	dBm	
Transmitter and Dispersion Penalty	TDP			3.2	dB	
Transmit OMA per Lane Minus TDP		-6.2			m	
Optical Extinction Ratio	ER	6.0			dB	
Sidemode Suppression ratio	SSRmin	30			dB	
Average Launch Power of OFF Transmitter, per Lane				-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	3
Tx Jitter	Txj			-20	dB	
Transmitter Reflectance				-12		
Transmitter Eye Mask Definition		Per 802.3ae, G.693, and G.691				
Receiver						
Signaling Speed per Lane		9.95		10.095	GBd	4
Lane Center Wavelength	λ	1260		1355		
Damage Threshold per Lane	PMAX			1.5	dBm	
Average Receive Power per Lane	RXPx	-14.4		0.5	dBm	5
Receiver Sensitivity (OMA) per Lane	Rxsens			-12.6	dBm	
Stressed Receiver Sensitivity (OMA) per Lane	SRS			-10.3	dBm	
Return Loss	RL			-14	dBm	

Receive Electrical 3 dB Upper Cutoff Frequency, per Lane		12.3	GHz
LOS De-Assert	LOSD	-14	dBm
LOS Assert	LOSA -30	-17	dBm
LOS Hysteresis		0.5	dB

Notes:

1. Transmitter consists of 4 lasers operating between 9.95 Gb/s and 11.10 Gb/s each.
2. Minimum value is informative.
3. RIN is scaled by $10 \cdot \log(10/4)$ to maintain SNR outside of transmitter.
4. Receiver consists of 4 photodetectors operating between 9.95 and 11.10 Gb/s each.
5. Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.

MPO Breakout Cable

Construction

Fiber Count	8-144 Fibers
Fiber Mode	Single mode: OS2 9/125 μ m
Fiber Brand	SMF-28® Ultra optical fiber
Connector A	MPO Female, Male
Connector Brand	Senko MPO
Connector B	LC, SC, FC, ST
Polarity	Type A, Type B, Type C
Cable Jacket Ratings	Plenum (OFNP) Low Smoke Zero Halogen (LSZH) Riser (PVC)

Color Codes

Cable Jackets	MPO OS2: Yellow	LC OS2: Yellow
Connectors	OS2: Green	Single Mode: UPC Blue, APC Green Multimode: Beige
Boots	8/12/24 Fibers: Black	Single Mode: UPC Blue, APC Green Multimode: Beige

Physical Properties

Cable Diameter	3.0 mm
Breakout Leg	2.0/0.9 mm
Breakout Length	0.5/0.3 m
Minimum Bend Radius	Single Mode: 10.0mm, Multimode: 7.5mm
Operating Temperature	-10°C to +70°C
Storage Temperature	-40°C to +85°C

Construction

Wavelength (nm)
Connector
Fiber Mode
Attenuation (dB/km)

Description

Single Mode: 1310/1550
MPO
Single Mode
≤0.32 at 1310nm
≤0.18 at 1550nm
≤0.35
APC: ≥60, UPC: ≥50
LC/SC/FC/ST
Single Mode
APC: ≤0.3, UPC: ≤0.2
APC: ≥65, UPC: ≥50

Ordering Information

Master Part Number

QSFP-AQ-LP-31-10-MPO3

Component Part Number

QSFP-AQ-LP-31-10

MPO-LC-OS2-8LSZH-B-03-B05

Master Product Description

QSFP+ transceiver and breakout cable assembly.

Component Product Description

QSFP+ Plug-in, 4x10Gbps, PLR4, 10km, 1310nm on single mode fiber, MPO-12.

MPO Female to 4 LC UPC Duplex 8 Fibers Type B LSZH OS2 9/125 μm
single-mode elite HD BIF breakout cable, 3 m, breakout length: 0.5m

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