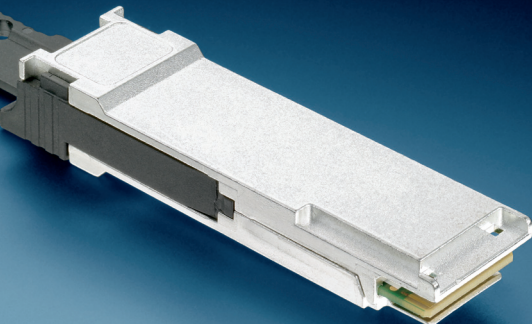


Introducing 40 Gb/s QSFP+ Optical Transceiver

The 40 Gb/s QSFP+ transceiver is a parallel fiber optical module with four independent optical transmit and receive channels. It combines the higher density attractions of parallel modules with some of the key advantages normally associated with SFP+ based modules.

It is intended for use in switches, routers and data center applications where it provides:

- Potential savings of greater than 60% in edge and board density as compared to the use of four SFP+ modules. This allows the end-user to shrink system size and lower overall costs.
- Simplified heat management through reduction in power consumption.
- z-axis electrical hot-pluggability allowing port population on demand and in the field.
- Digital diagnostic monitoring interface similar to that used by SFP+ modules. This allows customer access to key module parameters as well as providing alarm and warning flags, which may enhance customer system management capability.
- Suitable for 40GBASE-SR4, 10GBASE-SR ethernet and Infiniband applications. With appropriate splitter (fan out) cables, the modules can interface to up to four SFP+ transceivers.



KEY FEATURES

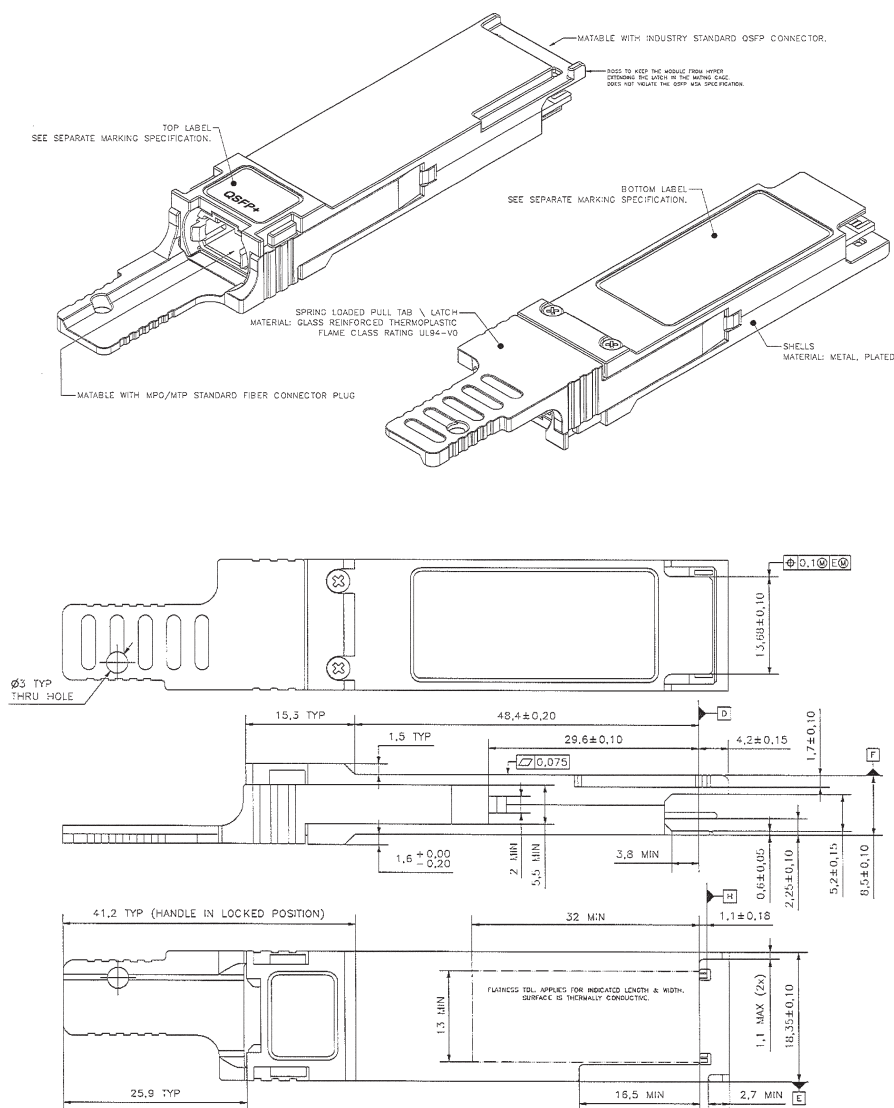
- QSFP+ MSA, SFF-8436 compatible
- Four independently addressable transmit and receive channels
- Highly compact: savings of 60% on edge and board usage compared to four comparable SFP+ modules
- Differential, internally AC-coupled data I/Os
- Electrically z-pluggable, allowing port population on demand
- Electrically hot-pluggable
- Digital diagnostics monitoring interface allows customer management and monitoring of key modules parameters, analogous to SFP+
- Optical connectivity via industry standard MPO/MTP terminated fiber ribbon

APPLICATIONS

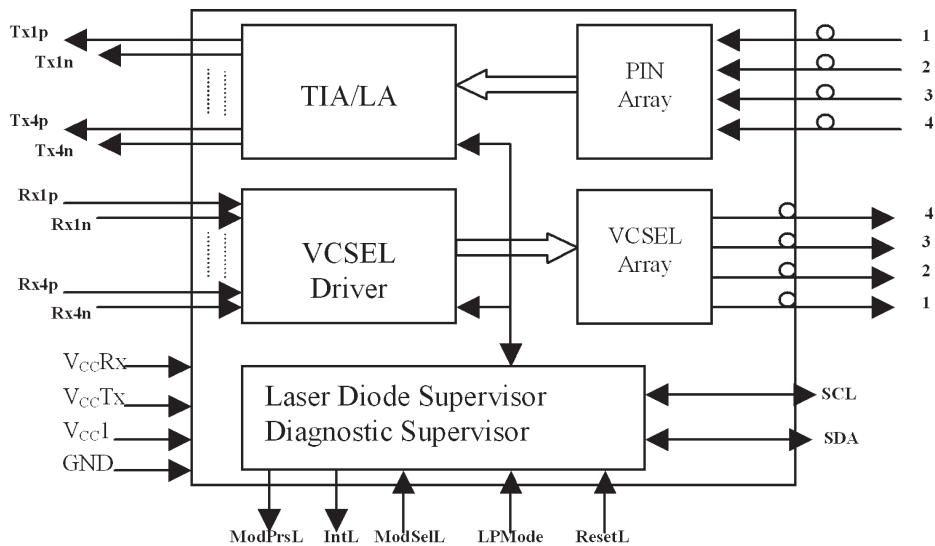
- High-speed interconnects within and between switches, routers and transport equipment
- Server-server clusters, super-computing interconnections
- Proprietary backplanes
- Interconnects rack-to-rack, shelf-to-shelf, board-to-board, board-to-optical backplane
- 10GBASE-SR applications
- 40GBASE-SR4 applications
- InfiniBand SDR, DDR and QDR applications

Part Number	Description
2156043-1	40 Gb/s QSFP+ Transceiver (4 channels x 10.3125 Gbps)

PRODUCT DIMENSIONS



BLOCK DIAGRAM



REGULATORY COMPLIANCE

When released, the product will be compliant with the standards listed in the table below.

Compliance Area	Standard / Classification
Safety of Information Technology Equipment	ANS/UL 60950-1; CAN/CSA-C22.2 No.60950-1-07; CB Certificate: IEC 60950-1
Laser safety classification	IEC60825-1:2007; CDRH Laser Notice No. 50, Laser Class 1M, Emitting Invisible laser radiation at 850 nm Maximum captured power, measured according to IEC60825-1:2007 at certification was < 500µW
Electromagnetic Interference (EMI)	IEC/EN 55022; FCC Part 15: Class B digital device
Electrostatic Discharge Immunity (external)	EN 55024/EN 61000-4-2: Tested to sustain 4kV contact discharge and 8kV air discharge
Electrostatic Discharge Immunity (connector pads)	Human Body Model (JESD22-A114-D): sustains 500V. No degradation after additional 1000h HTOL test for latent failures.
Radiated Electromagnetic Field Immunity	EN 55024/EN 61000-4-3: Tested to be immune to 10V/m field in the frequency range 80-2700MHz
Recognition by Nationally Recognized Testing Laboratories (NRTL)	TÜV Recognized component
RoHS Compliance	Compliant with EU Directive 2002/95/EC (RoHS)

ABSOLUTE MAXIMUM RATINGS

Not necessarily applied together. Exceeding these values may cause permanent damage. Functional operation under these conditions is not implied.

Parameter	Symbol	Min.	Max.	Unit
Supply voltage ¹	VCC	-0.5	3.63	V
Differential input voltage amplitude ²	ΔV		1600	mV _{p-p}
Voltage on any pin	VPIN	-0.3	VCC + 0.5	V
Relative humidity (non-condensing)	MOS	5	95	%
Operating case temperature	TCASE	-5	75	°C
Storage temperature	TSTG	-40	100	°C
ESD resistance ³	VESD		± 500	V

1. Applies to all input supply voltages. Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the devices at those or any other conditions above those indicated in the Recommended Operating Conditions of this specification is NOT implied. Also note that exposure to maximum rating conditions for extended periods of time may affect device reliability.
2. Differential input voltage amplitude is peak to peak value.
3. All pins withstand 500V based on Human Body Model, JEDEC JESD22-A114-D.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Type.	Max.	Unit
Power Supply voltage ¹	VCC	3.135	3.3	3.465	V
Module Power Consumption	P _D		0.8	1.5W	w
Operating case temperature	TCASE	0		70	°C
Signaling rate (per channel) ²	fD	2.5		10.3125	Gbps
Differential input voltage amplitude	ΔV	200		1200	mVp-p
Power supply noise ³	VNPS			50	mVp-p

1. Applies to all input supply voltages.
2. Data patterns are to have maximum run lengths and DC balance shifts no worse than that of a pseudo random bit sequence of length 2³¹-1 (PRBS-31).
3. Power supply noise is defined at the supply side of the recommended filter for all VCC supplies over the frequency range of 1 kHz to 10.3125 GHz with the recommended power supply filter in place.

TRANSMITTER SPECIFICATIONS

All parameters below require operating conditions according to “Recommended Operating Conditions”.

Parameter	Symbol	Min.	Max.	Unit
Optical Parameters				
Launch power (50/125 Qm MMF) ¹	P _{OUT}		-1	dBm
Extinguished output power	P _{OFF}		-30	dBm
Extinction ratio	ER	3		dB
Optical modulation amplitude ²	OMA	-5.6		dBm
Center wavelength	λ _C	840	860	nm
Spectral width ³	Δλ _{rms}		0.65	nm
Relative intensity noise OMA	RIN _{OMA}		-130	dB/Hz
Optical eye mask	Compliant to standard ⁴			
Electrical Parameters				
Differential input return loss	S _{DD11}	Compliant to standard ⁵		dB
Differential input voltage amplitude (peak to peak) ⁶	ΔV _{IN}	200	1200	mVp-p
Differential input impedance ⁷	Z _{IN}	80	120	Ω

1. The output optical power is compliant with IEC 60825-1 Amendment 2, Class 1M Accessible Emission Limits.
2. OMA are peak to peak values.
3. Spectral width is measured as defined in EIA/TIA-455-127 Spectral Characterization of Multimode Laser Diodes.
4. Mask is compliant to IEEE 802.3ba: (X1, X2, X3) = (0.23, 0.34, 0.43), (Y1, Y2, Y3) = (0.27, 0.35, 0.4) with a hit ratio of 5.0x10⁻⁵ per sample.
5. Input differential return loss is compliant to IEEE 802.3ba: Return Loss(f) > 12 - 2xsqrt(f); 0.01<f<4.11 and 6.3-13log₁₀(f/5.5); 4.11<f<11.1
6. Differential input voltage is defined as the peak to peak value of the differential voltage between TxNp and TxNn. Data inputs are CML compatible.
7. Differential input impedance is measured between TxNp and TxNn.

RECEIVER SPECIFICATIONS

All parameters below require operating conditions according to “Recommended Operating Conditions” and a termination load of 100 Ω differential at the electrical output.

Parameter	Symbol	Min.	Max.	Unit
Optical Parameters				
Average optical input power ¹	S		2.4	dBm
Center wavelength	λ _C	840	860	nm
Optical return loss ²	O _{RL}		12	dB
Signal detect assert	P _{SA}		-10	dBm
Signal detect de-assert	P _{SD}	-30		dBm
Electrical Parameters				
Receiver J2 Jitter	J2 _{Rx}		0.42	UI
Receiver J9 Jitter	J9 _{Rx}		0.65	UI
Receiver mask compliance		Compliant to standard ³		
Output differential load impedance	Z _L	80	120	Ω
Output differential return loss	S _{DD22}	Compliant to standard ⁴		dB

1. Average optical input power for a channel is measured for a BER of 10⁻¹². The BER is measured using a fast rise/fall time source with low RIN and the other channels operating with incident power of > 1 dBm average power.
2. Return loss is measured as defined in TIA/EIA-455-107A Determination of Component Reflectance or Link/System Return Loss Using a Loss Test Set.
3. Eye Mask is compliant to IEEE 802.3ba: (X1, X2) = (0.29, 0.5) UI, (Y1, Y2) = (150, 425) mV with a hit ratio of 5.0x10⁻⁵ per sample
4. Output differential return loss is compliant to IEEE 802.3ba: Return Loss(f) > 12 - 2xsqrt(f); 0.01<f<4.11 and 6.3-13log₁₀(f/5.5); 4.11<f<11.1

FOR MORE INFORMATION

te.com/products/QSFPplus-Transceivers

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*as defined www.te.com/leadfree

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