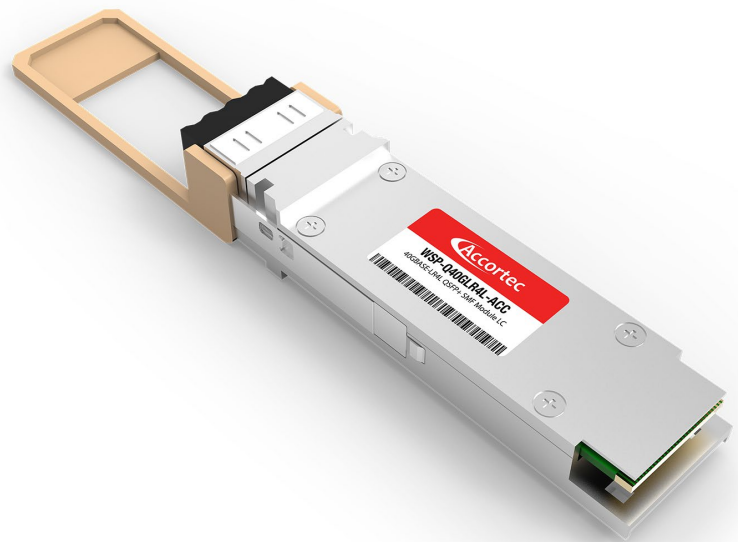


The **WSP-Q40GLR4L-ACC** is programmed to be fully compatible and functional with all intended Cisco switching devices. This QSFP+ optical transceiver is compliant with SFF-8436 and QSFP+ MSA standards. This module converts 4 input channels of 10Gb/s electrical data into 4 CWDM optical signals and multiplexes them into a single channel for 40Gb/s optical transmission. On the receiver side, this module optically de-multiplexes a 40Gb/s input into 4 CWDM channel signals and converts them to 4 channel output electrical data. This module is designed for single mode fiber using LC connection and operates at central wavelengths of 1271, 1291, 1311, 1331nm up to 2km over single mode fiber.

Features:

- Up to 11.2 Gb/s per wavelength
- 4 LAN-WDM lane MUX/DEMUX
- Hot-pluggable QSFP+ footprint
- Duplex LC connector
- Built-in digital diagnostic function
- Up to 2KM over SMF
- Single power supply 3.3V
- Operating temperature range
C-Temp: 0°C to 70°C



Compliance:

- QSFP+ MSA
- MSA SFF-8436
- IEEE 802.3ba
- RoHS Compliant

Applications:

- 40GB Ethernet
- Infiniband DDR and QDR

Warranty:

Lifetime Warranty

General Specifications - Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Storage Temperature	T_{STO}	-40		85	°C	Ambient Temperature
Power Supply Voltage	V_{CC}	-0.5		3.6	V	
Relative Humidity	RH	0		85	%	
Damage Threshold	TH_D	3.3			dBm	

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Data Rate	DR		10.31		Gbps	Each Lane
Control Input Voltage High		2		V_{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance	D	0.002		2	km	Singlemode G.652

Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	λ_c	1264.5	1271	1277.5	nm	L0 Lane
		1284.5	1291	1297.5	nm	L1 Lane
		1304.5	1311	1317.5	nm	L2 Lane
		1324.5	1331	1337.5	nm	L3 Lane

Optical Characteristics - Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Average Launch Power	P	-7		2.3	dBm	Each Lane
Total Average Launch Power	P_T			8.3	dBm	
Side Mode Suppression Ratio	$SMSR$	30			dB	
Optical Modulation Amp	$POMA$	-4		3.5	dB	Each Lane
Difference in Launch Power	$P_{TX-DIFF}$			6.5	dB	Between Lanes
Transmit Dispersion Penalty	TDP			2.6	dBm	Each Lane
Extinction Ratio	ER	3.5			dB	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	T_R			-12	dB	
Launch Power OFF Transmitter	P_{OUT_OFF}			-30	dBm	
Transmitter Eye Mask	Compliant to IEEE 802.3ba Standard					

Optical Characteristics - Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Average Receive Power		-13.7		2.3	dBm	Each Lane
Total Average Receive Power				8.3	dBm	Each Lane
Receiver Reflectance	R_R			-26	dB	
Receiver Power (OMA)				-3.5	dBm	Each Lane
Receiver Sensitivity in OMA	SEN			-11.5	dBm	Each Lane
Stressed Receiver Sensitivity				-8	dBm	Each Lane
Difference in Receive Power	$P_{RX-DIFF}$			7.5	dB	Between Lanes
LOS Assert	LOS_A	-28			dBm	
LOS De-Assert	LOS_D			-14	dBm	
LOS Hysteresis	LOS_H	0.5			dB	

Electrical Characteristics

<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Power Consumption				2.5	W	
Supply Current	I_{CC}			0.7	A	
Transceiver Power-on Initialization Time				2000	ms	

Electrical Characteristics- Transmitter (Each Lane)

<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Single-ended Input Voltage Tolerance		-0.3		4.0	V	TP1 Signal
AC Common Mode Input Voltage		15			mV	RMS
Differential Input Voltage Swing Threshold		50			mVpp	LOSA Threshold
Differential Input Voltage Swing	$V_{IN,PP}$	190		700	mVpp	
Differential Input Impedance	Z_{IN}	90	100	110	ohm	
Differential Input Return Loss		See IEEE 802.3ba 86A.4.11			dB	10MHz- 11.1GHz
J2 Jitter Tolerance	J_{T2}	0.17			UI	
J9 Jitter Tolerance	J_{T9}	0.29			UI	
Data Dependent Pulse Width Shrinkage (DDPWS) Tolerance		0.07			UI	
Eye Mask Coordinates {X1, X2, Y1, Y2}		0.11, 0.31, 95, 350			UI/mV	Hit Ratio = 5×10^{-5}

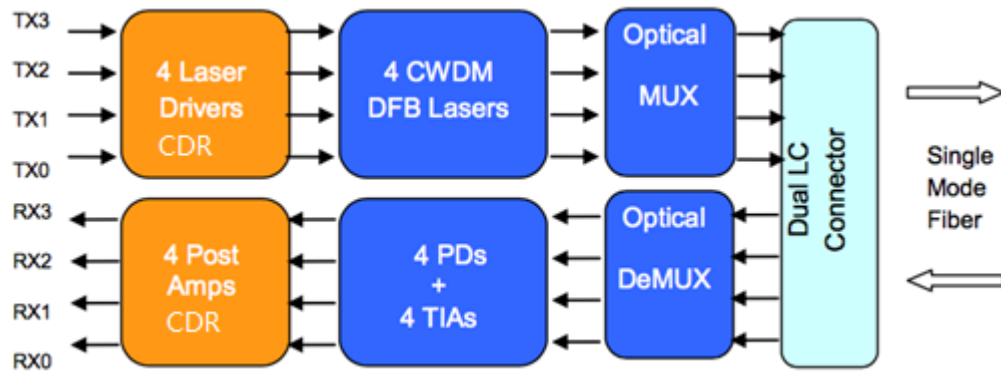
Electrical Characteristics- Receiver (Each Lane)

<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Single-ended Output Voltage Tolerance		-0.3		4.0	V	Refer to Signal Common
AC Common Mode Output Voltage				7.5	mV	RMS
Differential Output Voltage Swing	$V_{OUT,PP}$	300		850	mVpp	
Differential Output Impedance	Z_{OUT}	90	100	110	ohm	
Termination Mismatch at 1MHz				5	%	
Differential Output Return Loss		See IEEE 802.3ba 86A.4.2.1			dB	10MHz- 11.1GHz
Common Mode Output Return Loss		See IEEE 802.3ba 86A.4.2.2			dB	10MHz- 11.1GHz
Output Transition Time		28			Ps	20% to 80%
J2 Jitter Output	J_{O2}			0.42	UI	
J9 Jitter Output	J_{O9}			0.65	UI	
Data Dependent Pulse Width Shrinkage (DDPWS) Tolerance		0.07			UI	
Eye Mask Coordinates {X1, X2, Y1, Y2}		0.29, 0.5, 150, 425			UI/mV	Hit Ratio = 5×10^{-5}

Digital Diagnostic Functions

<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Temperature Monitor Absolute Error	DMI_Temp	-3	+3	C	Over Temp Range
Supply Voltage Monitor Absolute Error	DMI_VCC	-0.1	+0.1	V	Over Full Range
Channel RX Power Monitor Absolute Error	DMI_RX_Ch	-2	+2	dB	
Channel Bias Current Monitor	DMI_Ibias_Ch	-10%	+10%	mA	
Channel TX Power Monitor Absolute Error	DMI_TX_Ch	-2	+2	dB	

Block Diagram of Transceiver



This product converts the 4-channel 11Gb/s electrical input data into LAN WDM optical signals, by a driven 4-wavelength Distributed Feedback Laser (DFB) array. The light is combined by the MUX as 40Gb/s data, propagating out of the transmitter module from the SMF. The receiver module accepts the 40Gb/s LAN WDM optical signals input, and de-multiplexes it into 4 individual 11Gb/s channels with different wavelength. Each wavelength light is collected by a discrete photo diode, and then outputted as electric data after amplified by a TIA.

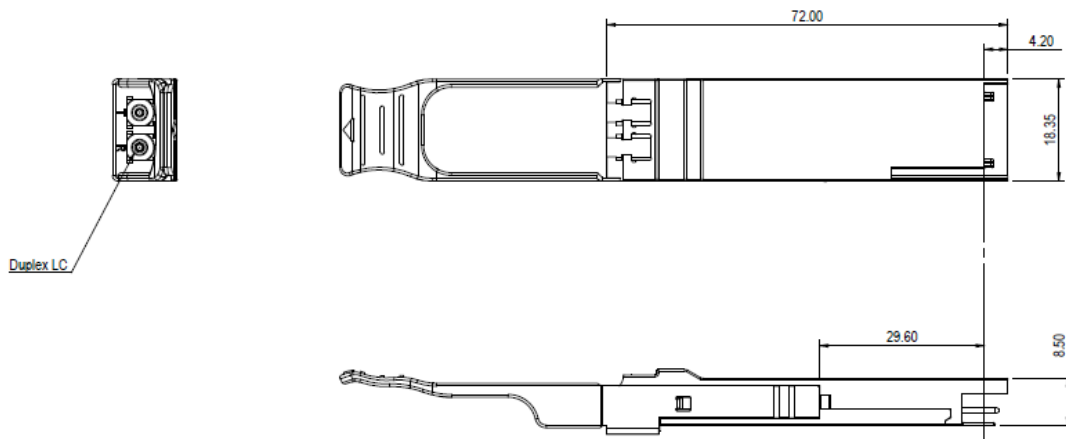
ESD

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

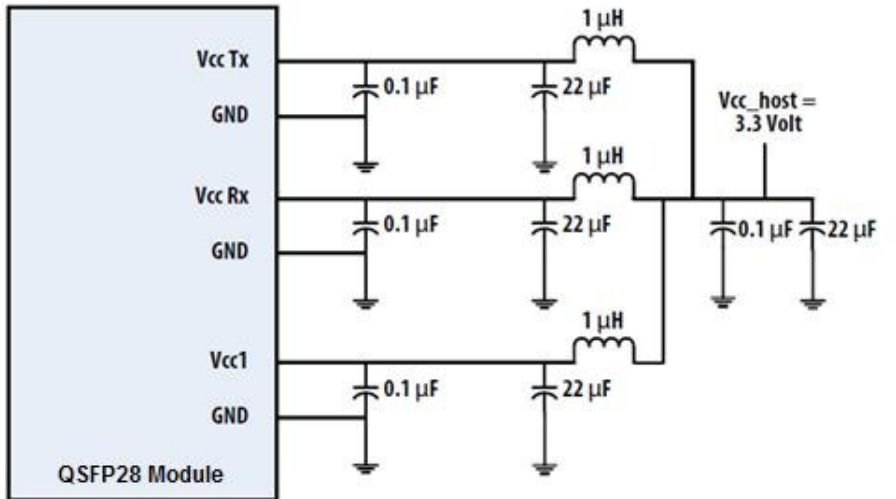
This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Dimensions

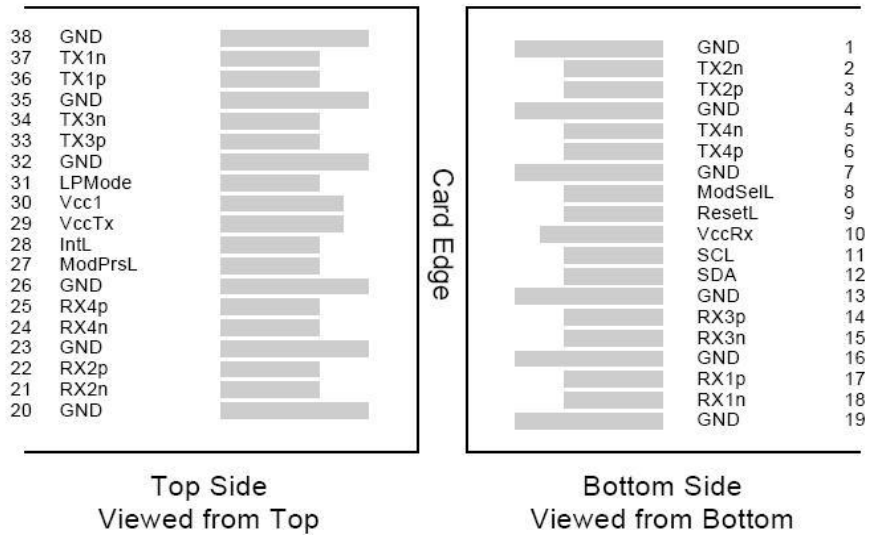


ALL DIMENSIONS ARE $\pm 0.2\text{mm}$ UNLESS OTHERWISE SPECIFIED UNIT: mm

Recommended Power Supply Filter



Electrical Pad Layout



Pin Assignment

<i>PIN #</i>	<i>Symbol</i>	<i>Description</i>	<i>Remarks</i>
1	GND	Ground	
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc RX	+3.3V Power Supply Receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	
20	GND	Ground	
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc TX	+3.3V Power Supply transmitter	
30	Vcc1	+3.3V Power Supply	
31	LPMODE	Low Power Mode	
32	GND	Ground	
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	

References

1. IEEE standard 802.3ba. IEEE Standard Department.
2. QSFP+ 10Gbs 4X PLUGGABLE TRANSCEIVER – SFF-8436