



## Features

- Compliant with QSFP+ MSA
- IEEE 802.3ba Electrical Interface
- Optical link budget: 9.5dB
- 4 CWDM Lanes MUX/DEMUX design
- Up to 12.5Gbps data rate per wavelength
- Up to 2km transmission
- Maximum 3.5W operation power
- SMF LC duplex connector
- RoHS Compliant

## Applications

- 40G Ethernet
- Data Center Interconnect
- Infiniband QDR
- 40G Campus Link

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units	Note
Storage Temperature	T <sub>s</sub>	-20	85	°C	
Supply Voltage	V <sub>CC</sub>	3.15	3.47	V	
Operating Case Temperature	T <sub>opc</sub>	20	65	°C	
Operating Range		0.002	2	km	

## Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Supply Voltage	V <sub>cc1</sub> , V <sub>ccTx</sub> , V <sub>ccRx</sub>	-0.5		3.6	V	

## Transmitter Electro-optical Characteristics

$T_c = 0^\circ\text{C to } 70^\circ\text{C}$

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes	
Wavelength Assignment	L0	1264.5	1271	1277.5	nm		
	L1	1284.5	1291	1297.5			
	L2	1304.5	1311	1317.5			
	L3	1324.5	1331	1337.5			
Data Rate, each lane			10.3125	11.2	Gbps		
Side-mode Suppression Ratio	SMSR	30			dB		
Total Average launch Power	Pr			8.3	dBm		
Optical Modulation Amplitude ,each lane	OMA	-2		+3.5	dBm		
Difference in Launch Power between any two lanes (OMA)				5	dB		
Extinction Ratio	ER	3.5	-	-	dB		
Relative Intensity Noise	Rin			-128	dB/Hz	12dB reflection	
Total Jitter				0.2	UI		
Spectral Width (-20dB)				1	nm	Modulated	
Transmitter Reflectance	Rr			-12	dB		
Transmitter Eye Mask Definition {X1,X2,X3,Y1,Y2,Y3}		{0.25,0.4,0.45,0.25,0.28,0.4}					
Transmitter Output Power Monitoring Accuracy	OPMA	-2		2	dB		
Differential Input Impedance		85	100	115	Ohm		
Differential Input Swing		150		1200	mV		
Differential Return Loss		Compliant to IEEE 802.3ba			dB		

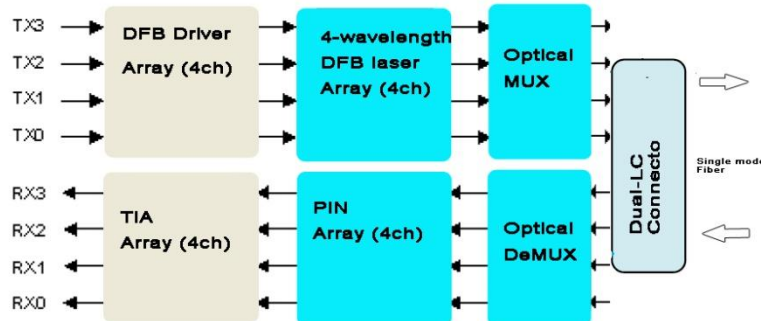
### Receiver Electro-optical Characteristics

$T_c = 0^\circ\text{C to } 70^\circ\text{C}$

<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Damage Threshold	THd	3.5			dBm	1
Receiver Sensitivity, each lane	$S_R$			-11.5	dBm	
Difference in Receive Power between any two Lanes (OMA)				7.5	dBm	
Receive Electrical 3dB upper Cutoff Frequency, each Lane				12.3	GHz	
RSSI Accuracy		-2		2	dB	
Differential Output Impedance		85	100	115	ohm	
Differential Output Swing		370		950	mV	
Receiver J9 Jitter				0.65	UI	
Receiver electrical mask		Compliant to IEEE 802.3ba				
Output differential return Loss		Compliant to IEEE 802.3ba				dB

Note 1: The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.

### Block Diagram of Transceiver



This product converts the 4-channel 10Gb/s electrical input data into CWDM optical signals (light), by a 4-wavelength Distributed Feedback Laser (DFB) array. The 4 wavelengths are multiplexed into a single 40Gb/s data, propagating out of the transmitter module via the SMF. The receiver module accepts the 40Gb/s optical signals input, and de-multiplexes it into 4 CWDM 10Gb/s channels. Each wavelength light is collected by a discrete photo diode, and then outputted as electric data after amplified by a TIA. Figure 1 shows the functional block diagram of this product.

A single +3.3V power supply is required to power up this product. Both power supply pins VccTx and VccRx are internally connected and should be applied concurrently. As per MSA specifications the module offers 7 low speed hardware control pins (including the 2-wire serial interface): ModSelL, SCL, SDA, ResetL, LPMode, ModPrsL and IntL.

Module Select (ModSelL) is an input pin. When held low by the host, this product responds to 2-wire serial communication commands. The ModSelL allows the use of this product on a single 2-wire interface bus – individual ModSelL lines must be used.

Serial Clock (SCL) and Serial Data (SDA) are required for the 2-wire serial bus communication interface and enable the host to access the QSFP memory map.

The ResetL pin enables a complete reset, returning the settings to their default state, when a low level on the ResetL pin is held for longer than the minimum pulse length. During the execution of a reset the host shall disregard all status bits until it indicates a completion of the reset interrupt. The product indicates this by posting an IntL (Interrupt) signal with the Data\_Not\_Ready bit negated in the memory map. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset. Low Power Mode (LPMode) pin is used to set the maximum power consumption for the product in order to protect hosts that are not capable of cooling higher power modules, should such modules be accidentally inserted.

Module Present (ModPrsL) is a signal local to the host board which, in the absence of a product, is normally pulled up to the host Vcc. When the product is inserted into the connector, it completes the path to ground through a resistor on the host board and asserts the signal. ModPrsL then indicates its present by setting ModPrsL to a “Low” state.

Interrupt (IntL) is an output pin. When “Low”, it indicates a possible operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled to the Host Vcc voltage on the Host board.

### Pin Assignment

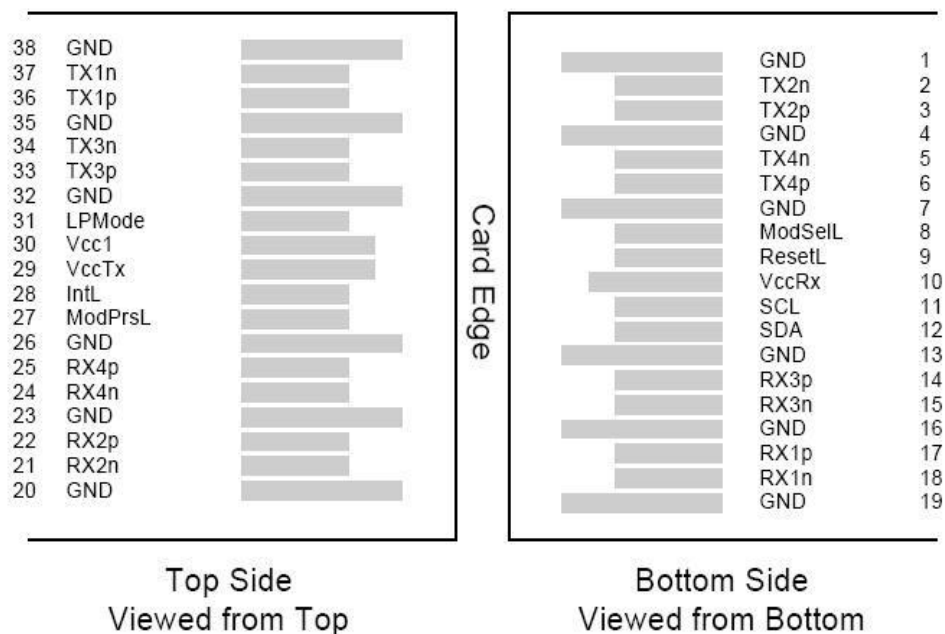


Figure: QSFP Transceiver Electrical Pad Layout

### Pin Description

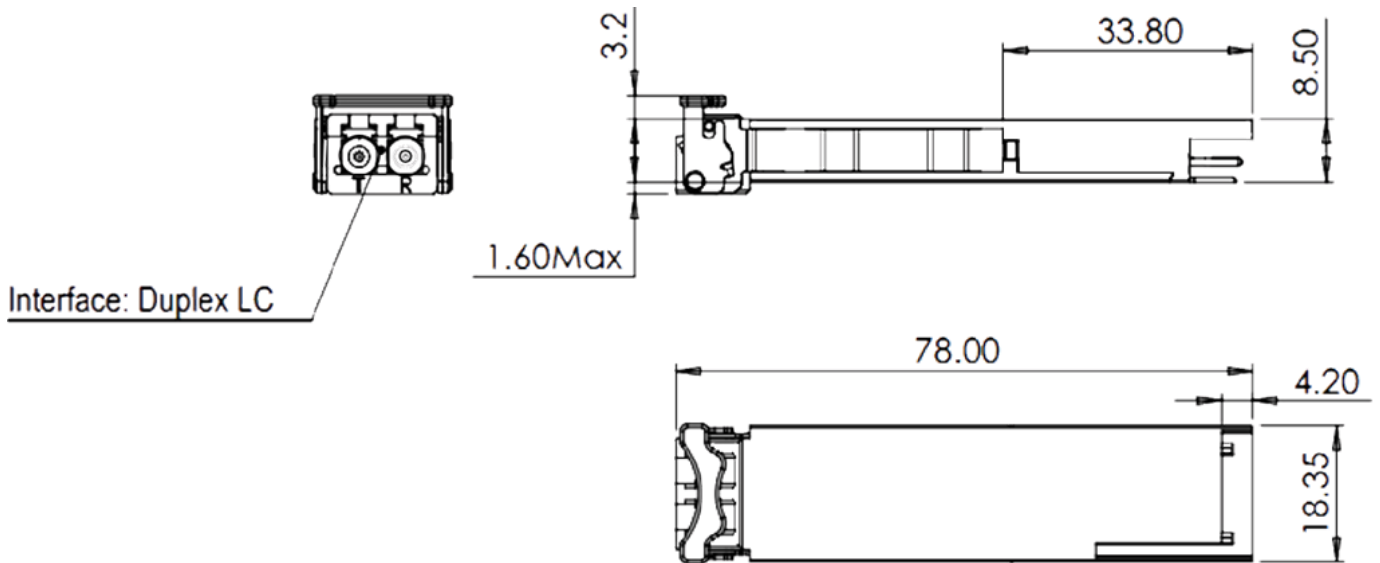
PIN	Logic	Symbol	Name/Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data output	
15	CML-O	Rx3n	Receiver Inverted Data output	
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	

PIN	Logic	Symbol	Name/Description	Note
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data output	
22	CML-O	Rx2p	Receiver Non-Inverted Data output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data output	1
25	CML-O	Rx4p	Receiver Non-Inverted Data output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3V Power Supply transmitter	2
30		Vcc1	+3.3V Power Supply	2
31	LVTTL-I	LPMODE	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

Note:


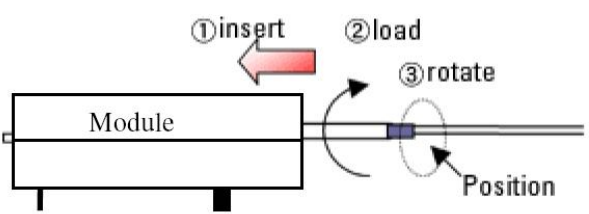
1. GND is the symbol for signal and supply (power) common for QSFP modules. All are common within the QSFP module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiver and transmitter power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

**Dimensions**



**Optical Receptacle Cleaning Recommendations :**

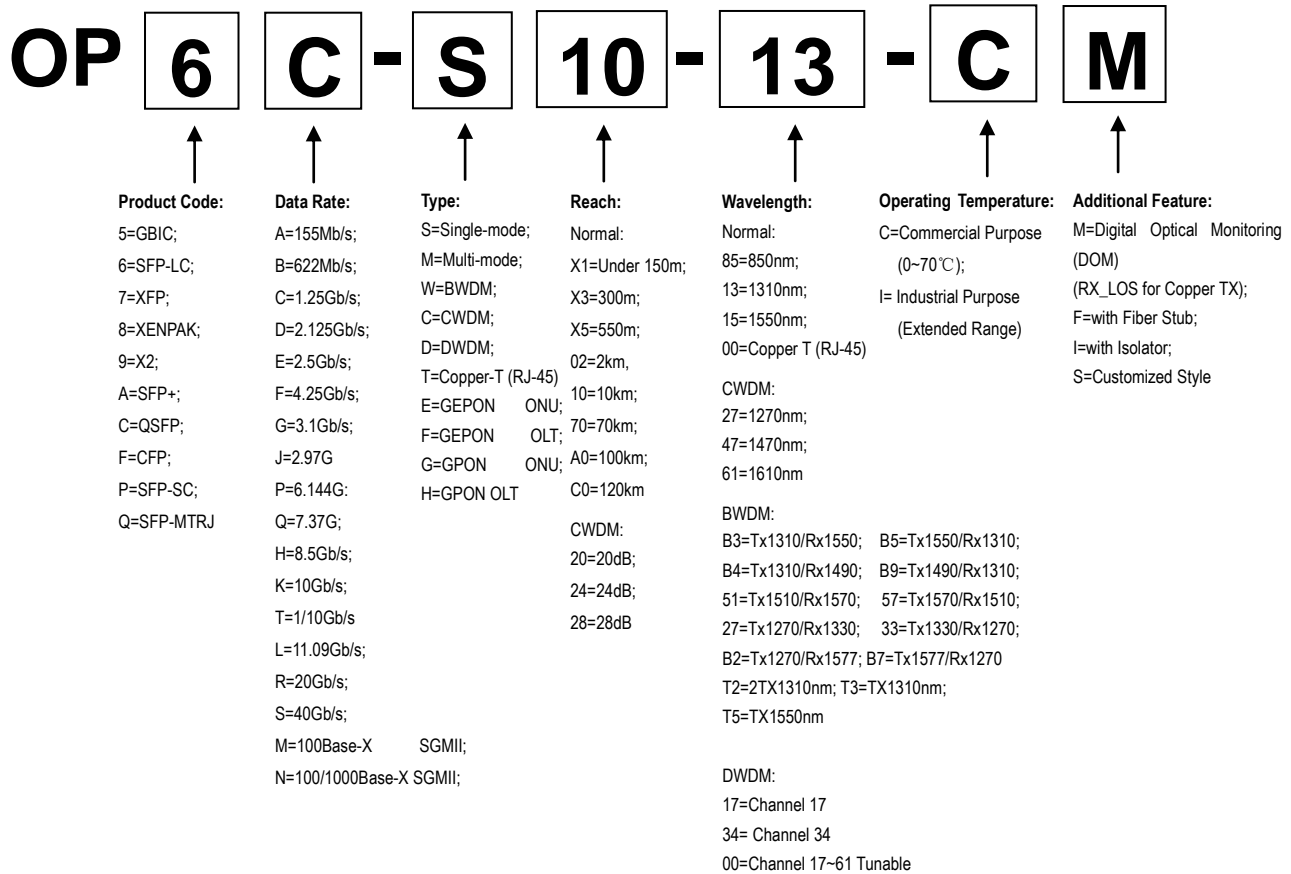
All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop® stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop® cleaning cassette.

<p><b>Cleaning of patch-cord</b></p> 	<p><b>Cleaning of fiber stub</b></p>  <ol style="list-style-type: none"> <li>1. Insert Ensure that stick is held straight when inserting into sleeve.</li> <li>2. Load Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve.</li> <li>3. Rotate Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained.</li> </ol> <p><i>Notice: Number of possible wipes: Maintenance (repair) ~1 use / piece Equipment construction: 4 uses / piece (max.)</i></p>
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Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME



**Ordering Information**



Model Number	Part Number	Voltage	Temperature
QSFP-40G-IR4	OPCS-S02-13-CB	3.3V	0°C to 70 °C

**Note: All information contained in this document is subject to change without notice.**