



RoHS compliant
Small Form Pluggable (SFP+)
SFP+ DWDM 40KM Optical Transceivers

Product Features



- Duplex LC Connector
- Support hot-pluggable
- Metal with lower EMI
- Excellent ESD protection
- RoHS Compliant and Lead-Free
- Compliant with IEEE 802.3ae
- ITU-T G.959,G.691 and G.692 compliant
- Temperature-stabilized DWDM-rated EML transmitter and PIN ROSA
- Up to 40KM for single mode fiber
- 100GHz ITU Grid, C Band
- GR-253-CORE compliant
- Compliant with SFP+ MSA: SFF-8431 Rev4.1
- Digital diagnostic compatible with SFF-8472 Rev11.0
- Single 3.3V power supply and Low power dissipation <2.5W

Applications

- 10GBASE-ER/EW 10G Ethernet
- 10G Fibre Channel
- SONET OC-192 /SDH STM-64
- DWDM Networks

Ordering Information

PART NUMBER	TX/RX	INPUT/OUTPUT	SIGNAL DETECT	TEMPERATURE	PACKAGE	Distance
CL-SFP+_D40-XX		AC/AC	TTL	-5°C to 70 °C	LC SFP +	40km



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Product Selection — CL-SFP+_D40-XX xx: DWDM ITU Channel

Product Code	ITU channel	Frequency (THz)	Center Wavelength (nm)
CL-SFP+_D40-61	61	196.1	1528.77
CL-SFP+_D40-60	60	196.0	1529.55
CL-SFP+_D40-59	59	195.9	1530.33
CL-SFP+_D40-58	58	195.8	1531.12
CL-SFP+_D40-57	57	195.7	1531.90
CL-SFP+_D40-56	56	195.6	1532.68
CL-SFP+_D40-55	55	195.5	1533.47
CL-SFP+_D40-54	54	195.4	1534.25
CL-SFP+_D40-53	53	195.3	1535.04
CL-SFP+_D40-52	52	195.2	1535.82
CL-SFP+_D40-51	51	195.1	1536.61
CL-SFP+_D40-50	50	195.0	1537.40
CL-SFP+_D40-49	49	194.9	1538.19
CL-SFP+_D40-48	48	194.8	1538.98
CL-SFP+_D40-47	47	194.7	1539.77
CL-SFP+_D40-46	46	194.6	1540.56
CL-SFP+_D40-45	45	194.5	1541.35
CL-SFP+_D40-44	44	194.4	1542.14
CL-SFP+_D40-43	43	194.3	1542.94
CL-SFP+_D40-42	42	194.2	1543.73
CL-SFP+_D40-41	41	194.1	1544.53



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CL-SFP+_D40-40	40	194.0	1545.32
CL-SFP+_D40-39	39	193.9	1546.12
CL-SFP+_D40-38	38	193.8	1546.92
CL-SFP+_D40-37	37	193.7	1547.72
CL-SFP+_D40-36	36	193.6	1548.51
CL-SFP+_D40-35	35	193.5	1549.32
CL-SFP+_D40-34	34	193.4	1550.12
CL-SFP+_D40-33	33	193.3	1550.92
CL-SFP+_D40-32	32	193.2	1551.72
CL-SFP+_D40-31	31	193.1	1552.52
CL-SFP+_D40-30	30	193.0	1553.33
CL-SFP+_D40-29	29	192.9	1554.13
CL-SFP+_D40-28	28	192.8	1554.94
CL-SFP+_D40-27	27	192.7	1555.75
CL-SFP+_D40-26	26	192.6	1556.55
CL-SFP+_D40-25	25	192.5	1557.36
CL-SFP+_D40-24	24	192.4	1558.17
CL-SFP+_D40-23	23	192.3	1558.98
CL-SFP+_D40-22	22	192.2	1559.79
CL-SFP+_D40-21	21	192.1	1560.61
CL-SFP+_D40-20	20	192.0	1561.42
CL-SFP+_D40-19	19	191.9	1562.23
CL-SFP+_D40-18	18	191.8	1563.05



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CL-SFP+_D40-17	17	191.7	1563.86
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Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-2
- EMI/EMC compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS Directive 2011/65/EU

Pin Descriptions

Pin	Symbol	Name/Description	Ref.
1	VeeT	Transmitter Ground (Common with Receiver Ground)	1
2	TX Fault	Transmitter Fault. LVTTTL-O	2
3	TX Disable	Transmitter Disable. Laser output disabled on high or open. LVTTTL-I	3
4	SDA	2-Wire Serial Interface Data Line(Same as MOD-DEF2 in INF-8074i). LVTTTL-I/O	
5	SCL	2-Wire Serial Interface Data Line(Same as MOD-DEF2 in INF-8074i). LVTTTL-I	
6	Mod_ABS	Module Absent, Connect to VeeT or VeeR in Module.	4
7	RS0	Rate Select 0, optionally controls SFP+ module receiver LVTTTL-I	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation. LVTTTL-O	2
9	RS1	Rate Select 1, optionally controls SFP+ module transmitter. LVTTTL-I	5
10	VeeR	Receiver Ground (Common with Transmitter Ground)	1
11	VeeR	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled. CML-O	
13	RD+	Receiver Non-inverted DATA out. AC Coupled. CML-O	
14	VeeR	Receiver Ground (Common with Transmitter Ground)	1
15	VccR	Receiver Power Supply	
16	VccT	Transmitter Power Supply	
17	VeeT	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled. CML- I	
19	TD-	Transmitter Inverted DATA in. AC Coupled. CML- I	
20	VeeT	Transmitter Ground (Common with Receiver Ground)	1

Notes:



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1. The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
2. This contact is an open collector/drain output and should be pulled up to the Vcc_Host with resistor in the range 4.7KΩ to 10KΩ. Pull ups can be connected to one or several power supplies, however the host board design shall ensure that no module contact has voltage exceeding module VccT/R +0.5V.
3. Tx_Disable is an input contact with a 4.7KΩ to 10KΩ pull-up resistor to VccT inside module.
4. Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull the contact up to Vcc_Host with a resistor in the range from 4.7KΩ to 10KΩ. Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.
5. RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module. RS0 optionally selects the optical receive signaling rate coverage. RS1 optionally selects the optical transmit signaling rate coverage.

These contacts can also be used for RS0 and RS1 if implementing SFF8079. See SFF8079 for details. RS1 is commonly connected to VeeT or VeeR in the classic SFP modules. The host needs to ensure that it will not be damaged if this contact is connected to VeeT or VeeR in the module.

The SFP+ module provides two inputs RS0 and RS1 that can optionally be used for rate selection. RS0 controls the receive path signalling rate capability, and RS1 controls the transmit path signaling rate capability. The host and module may choose to use either, both, or none of these functions. Because contact 9 in the classic SFP INF-8074i is connected to VeeR, an SFP+ host utilizing RS1 must provide short circuit protection.

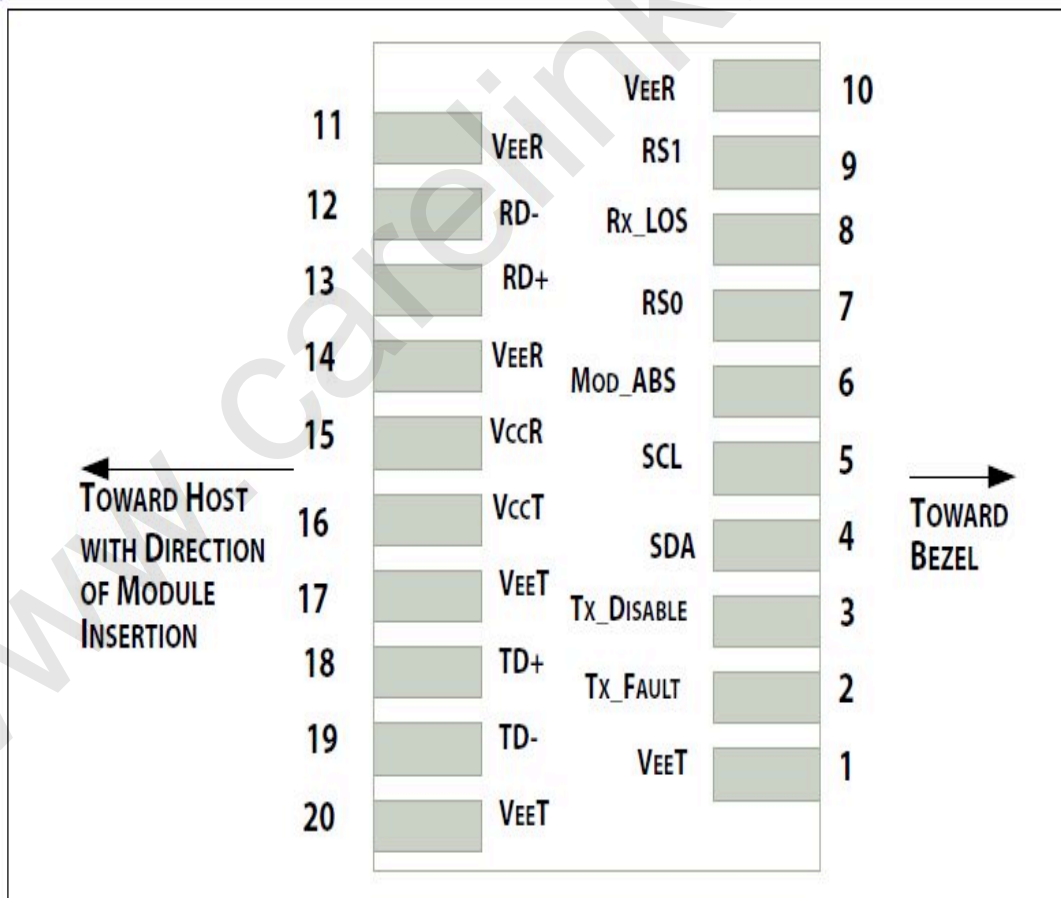
This rate select functionality can also be controlled by software as defined by SFF-8472. Optionally the rate select methods of Part 2 of SFF-8079 may be used instead of the method described here by setting the management declaration bit (A0h byte 93 bit 2) to 1, see SFF-8472.



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Parameter	State	Conditions
RS0	Low	Rx signally rate less than or equal to 4.25GBd.
	High	Rx signally rate great than 4.25GBd.
RS1	Low	Tx signally rate less than or equal to 4.25GBd.
	High	Tx signally rate great than 4.25GBd.

Pin-out of Connector Block on Host Board

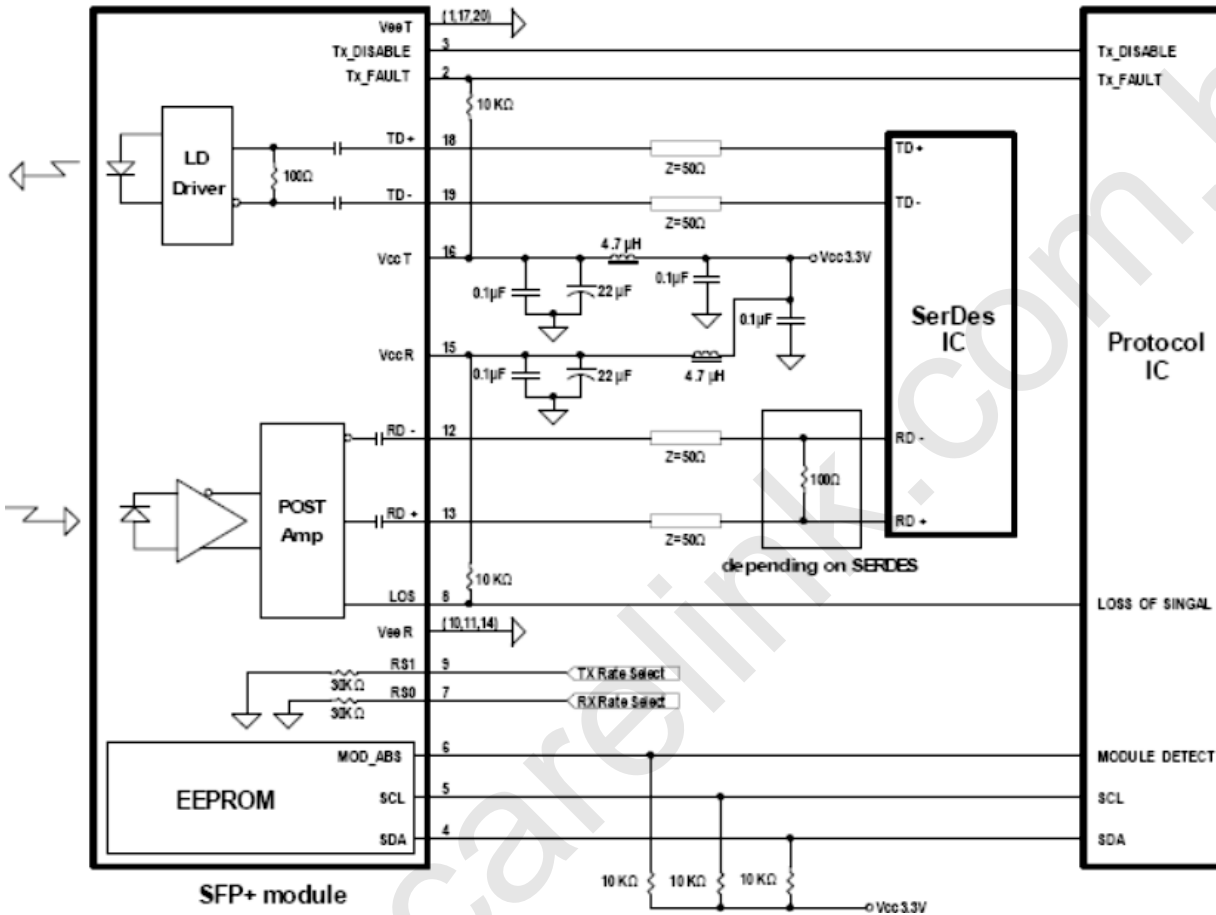


Pin-out of Connector Block on Host Board



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Recommend Circuit Schematic



Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		+4.0	V	
Storage Temperature	TS	-40		+85	°C	
Operating Humidity	RH	5		95	%	



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Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Power Supply Voltage	V _{cc}	3.13	3.30	3.47	V	
Power Supply Current	I _{cc}	-	-	750	mA	
Case Operating Temperature	T _c	-5	-	+70	°C	
9/125um G.652 SMF	L _{max}	-	-	40	km	
Operating Data Rate		9.95		11.3	Gbps	

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Input differential impedance	R _{in}	85	100	115	Ω	1
Differential data input swing	V _{in,pp}	120	600	850	mV	
TX Disable-High	-	2	-	V _{cc} +0.3	V	
TX Disable-Low	-	V _{ee}	-	V _{ee} + 0.8	V	
TX Fault-High	-	2	-	V _{cc} +0.3	V	
TX Fault-Low	-	V _{ee}	-	V _{ee} +0.8	V	
Receiver						
Single ended data output swing	V _{out, pp}	350	400	700	mV	
LOS-High	-	2		V _{cc} +0.3	V	
LOS-Low	-	V _{ee}		V _{ee} +0.8	V	

Notes:

1. AC coupled

Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Power	PO	-1	-	2	dBm	
Center Wavelength Spacing			100		GHZ	
Center Wavelength (BOL)	λ	X-0.025	X	X+0.025	nm	3
Center Wavelength (EOL)	λ	X-0.1	X	X+0.1	nm	3
Spectral Width(-20dB)	Δλ	-	-	1	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Optical Extinction Ratio	ER	8.2	-	-	dB	
Dispersion penalty(@800ps/nm,				2	dB	4



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Generation Jitter 1(20KHZ-80MHZ)				0.3	Ulp-p	1
Generation Jitter 2(4MHZ-80MHZ)				0.1	Ulp-p	1
Optical Eye Mask 1		ITU-T G.691				1
Optical Eye Mask 2		IEEE802.3ae				2
Receiver						
Overload	Po	-1	-	-	dBm	
Optical Center Wavelength	λ_C	1270	-	1600	nm	
LOS De-Assert	LOSD	-	-	-20	dBm	
LOS Assert	LOSA	-30	-	-	dBm	
LOS Hysteresis	-	0.5	-	4	dB	
Receiver Sensitivity @non-FEC rate	Pmin1			-15.8	dBm	4
Receiver Sensitivity @ FEC rate	Pmin2			-19	dBm	4

Notes:

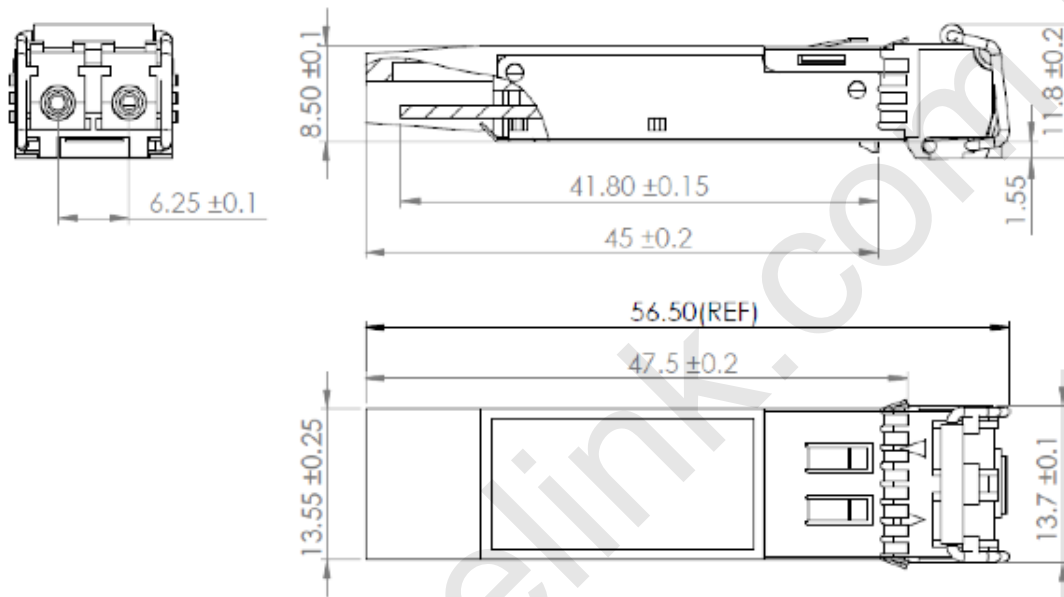
1. Measured at 9.95328Gb/s , PRBS2³¹-1,NRZ,
2. Measured at 10.3125Gb/s,Non-framed PRBS2³¹-1,NRZ
3. X=Specified ITU Grid Wavelength
4. non-FEC rate refers 9.9/10.3/10.5Gbps, and FEC rate refers 10.7/11.1/11.3Gbps, BER of 1E-12 for non-FEC rate, and 1E-4 for FEC rate



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Mechanical Specifications

Carelink's Small Form Factor Pluggable (SFP+) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



EEPROM Information

EEPROM memory map specific data field description is as below:

2 wire address 1010000X (A0h)		2 wire address 1010001X (A2h)	
0	Serial ID Defined by SFP MSA (96 bytes)	0	Alarm and Warning Thresholds (56 bytes)
95		55	Cal Constants (40 bytes)
	Vendor Specific (32 bytes)	95	Real Time Diagnostic Interface (24 bytes)
127		119	Vendor Specific (8 bytes)
	Reserved, SFF8079 (128 bytes)	127	User Writable EEPROM (120 bytes)
		247	
255		255	Vendor Specific (8 bytes)



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Digital Diagnostic Monitoring Interface

Five transceiver parameter values are monitored. The following table defines the monitored parameter's accuracy.

Parameter	Range	Accuracy	Calibration
Temperature	-5 to +70°C (C)	±3°C	Internal
Voltage	2.97 to 3.63V	±3%	Internal
Bias Current	0 to 100mA	±10%	Internal
TX Power	-1 to +2dBm	±2dB	Internal
RX Power	-15.8 to -1dBm	±3dB	Internal