16G DWDM SFP+ C20-C61 40km Duplex LC Transceiver

DWDM-SFP16G-40

Applications

- 4.25/8.5/14.025G Fibre Channel
- Other Optical Links

Features

- Supports Up to 14.025Gbps Bit Rates
- Hot-pluggable SFP+ Footprint
- 50GHz ITU, C-Band & H-Band DWDM Cooled EML Laser and PIN Photodiode, Up to 40km for SMF Transmission
- Compliant with SFP+ MSA and SFF-8472 with Duplex LC Receptacle
- Class 1 FDA Laser Safety
- Single +3.3V Power Supply
- Real Time Digital Diagnostic Monitoring
- Operating Case Temperature:
  Standard: 0~+70° C

Description

The SFP+ transceivers are high performance, cost effective modules supporting data rate of 14.025Gbps and 40km transmission distance with SMF. The transceiver consists of three sections: a Cooled EML laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.

Product Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{CC}	-0.5	4.5	V
Storage Temperature	T_S	-40	+85	℃
Operating Humidity		5	85	%

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T_C	0		70	℃
Power Supply Voltage	V_{CC}	3.135	3.30	3.465	V
Power Supply Current	I_{CC}			550	mA
Data Rate		4.25	14.025		Gbps

III. Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Centre Wavelength	λc	As per ITU-T 694.1			nm	
Centre Wavelength (EOL)	λc_EOL	λc ± 100pm			nm	
Spectral Width (-20dB)	Δλ			1	nm	

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Side-Mode Suppression Ratio		SMSR	30			dB	
Average Output Power		P_{out}	-1		+3	dBm	1
Extinction Ratio		ER	6.0			dB	
Data Input Swing Differential		VIN	180		850	mV	2
Input Differential Impedance		ZIN	90	100	110	Ω	
TX Disable	Disable		2.0		V_{CC}	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		V_{CC}	V	
	Normal		0		0.8	V	
Receiver							
Centre Wavelength		λc	1450		1620	nm	
Receiver Sensitivity					-14	dBm	3
Receiver Overload			0.5			dBm	3
LOS De-Assert		LOS_D			-15	dBm	
LOS Assert		LOS_A	-28			dBm	
LOS Hysteresis			0.5			dB	
Data Output Swing Differential		V_{out}	300		900	mV	4
LOS	High		2.0		V_{CC}	V	
	Low				0.8	V	

Notes:
1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 231-1 test pattern @14025Mbps, BER ≤1×10-12.
4. Internally AC-coupled.

IV. Timing and Electrical

Parameter	Symbol	Min.	Typical	Max.	Unit
Tx Disable Negate Time	t_on			2	ms
Tx Disable Assert Time	t_off			100	μs
Time to Initialize, includingReset of Tx Fault	t_init			300	ms
Tx Fault Assert Time	t_fault			100	μs
Tx Disable To Reset	t_reset	10			μs
LOS Assert Time	t_loss_on			100	μs
LOS De-assert Time	t_loss_off			100	μs
Serial ID Clock Rate	f_serial_clock		100	400	KHz
MOD_DEF (0:2)-High	VH	2		V_{CC}	V
MOD_DEF (0:2)-Low	VL			0.8	V

V. Diagnostics

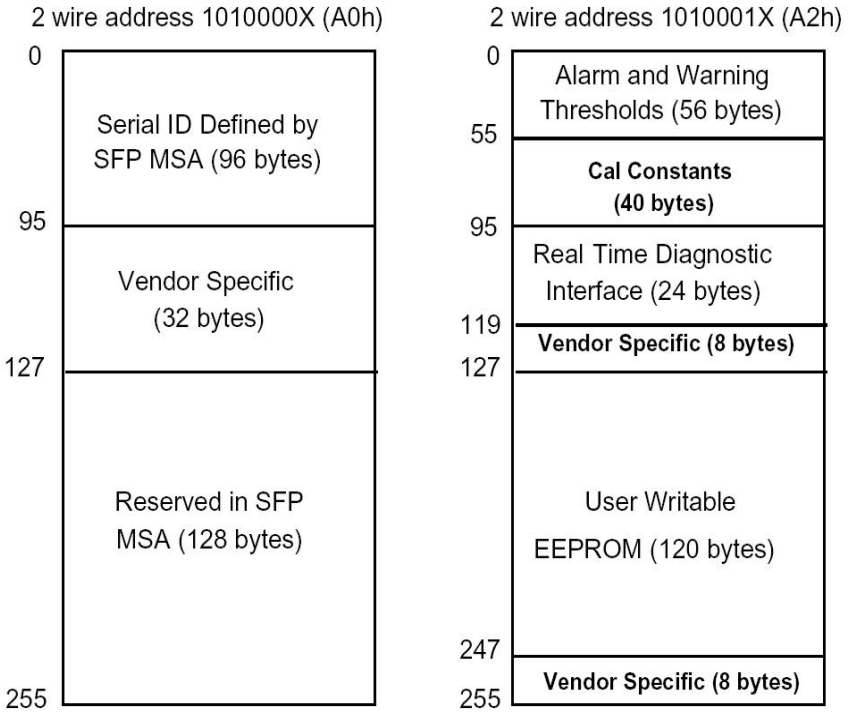
Parameter	Range	Unit	Accuracy	Calibration
Tx Disable Negate Time	0 ~ +70	℃	±3° C	Internal
Tx Disable Assert Time	3.0 ~3.6	V	±3%	Internal
Time to Initialize, Including Reset of Tx Fault	0 ~ 100	mA	±10%	Internal
Tx Fault Assert Time	-1~+3	dBm	±3dB	Internal
Tx Disable To Reset	-16~ -1	dBm	±3dB	Internal

VI. Digital Diagnostic Memory Map

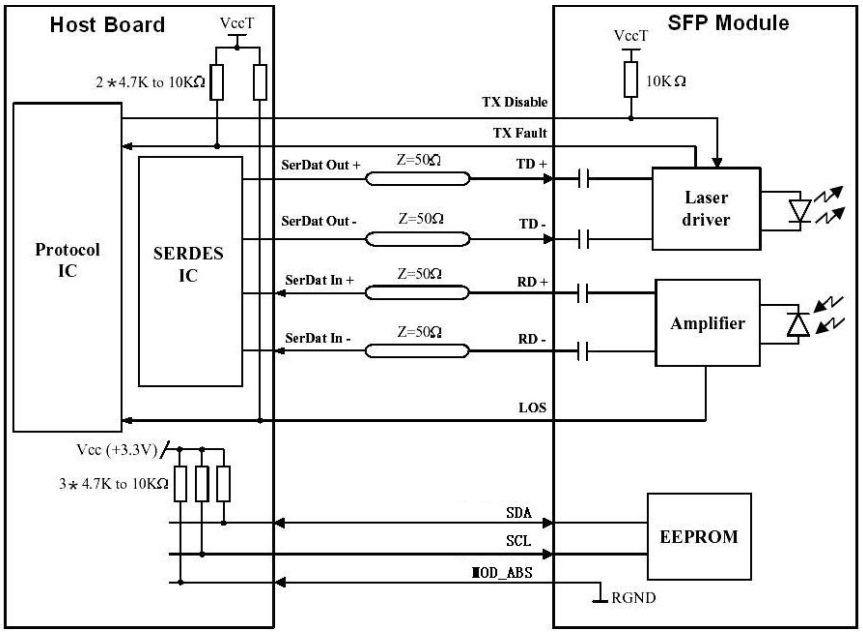
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



VII. Recommended Interface Circuit



VIII. Pin Description

Pin	Signal Name	Description	Plug Seq.	Notes
1	$V_{EE}T$	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note1
3	TX DISABLE	Transmitter Disable	3	Note2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded Within the Module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	Note3
9	RS1	Not Connected	3	
10	$V_{EE}R$	Receiver Ground	1	
11	$V_{EE}R$	Receiver Ground	1	
12	RD-	Inv. Received Data Out	3	Note4
13	RD+	Received Data Out	3	Note4
14	$V_{EE}R$	Receiver Ground	1	
15	$V_{CC}R$	Receiver Power Supply	2	
16	$V_{CC}T$	Transmitter Power Supply	2	
17	$V_{EE}T$	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note5

Pin	Signal Name	Description	Plug Seq.	Notes
19	TD-	Inv. Transmit Data In	3	Note5
20	$V_{EE}T$	Transmitter Ground	1	

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

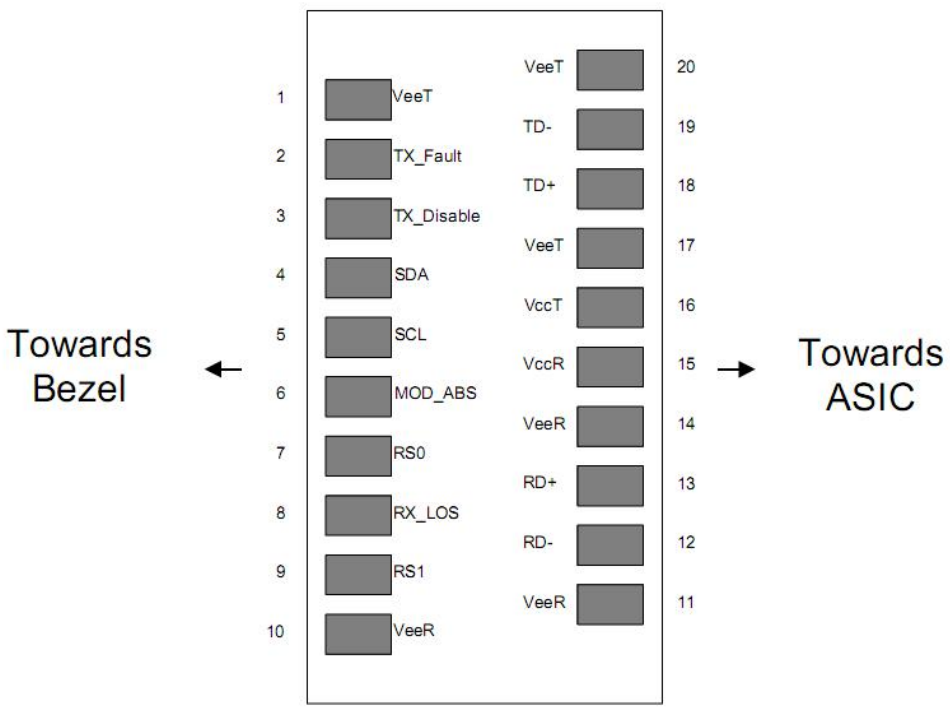
1. TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{CC}+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.

2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.

3. LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

4. RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

5. TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.



IX. λC Wavelength Guide

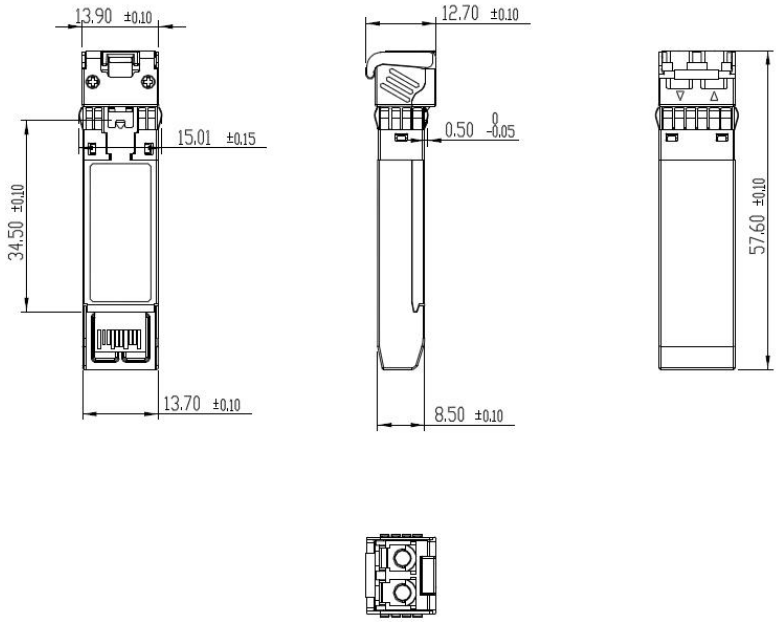
ITU Channel Product Code	Frequency(THz)	Wavelength	ITU Channel Product Code	Frequency (THz)	Wavelength
		C-Band			
-	-	-	40	194.00	1545.32
-	-	-	41	194.10	1544.53
-	-	-	42	194.20	1543.73
20	192.00	1561.42	43	194.30	1542.94
21	192.10	1560.61	44	194.40	1542.14
22	192.20	1559.79	45	194.50	1541.35
23	192.30	1558.98	46	194.60	1540.56
24	192.40	1558.17	47	194.70	1539.77
25	192.50	1557.36	48	194.80	1538.98
26	192.60	1556.55	49	194.90	1538.19
27	192.70	1555.75	50	195.00	1537.40
28	192.80	1554.94	51	195.10	1536.61
29	192.90	1554.13	52	195.20	1535.82
30	193.00	1553.33	53	195.30	1535.04
31	193.10	1552.52	54	195.40	1534.25
32	193.20	1551.72	55	195.50	1533.47
33	193.30	1550.92	56	195.60	1532.68

ITU Channel Product Code	Frequency(THz)	Wavelength	ITU Channel Product Code	Frequency (THz)	Wavelength
34	193.40	1550.12	57	195.70	1531.90
35	193.50	1549.32	58	195.80	1531.12
36	193.60	1548.51	59	195.90	1530.33
37	193.70	1547.72	60	196.00	1529.55
38	193.80	1546.92	61	196.10	1528.77
39	193.90	1546.12	-	-	-
			H-Band		
-	-	-	40	194.05	1544.92
-	-	-	41	194.15	1544.13
-	-	-	42	194.25	1543.33
20	192.05	1561.03	43	194.35	1542.54
21	192.15	1560.20	44	194.45	1541.75
22	192.25	1559.39	45	194.55	1540.95
23	192.35	1558.58	46	194.65	1540.16
24	192.45	1557.77	47	194.75	1539.37
25	192.55	1556.96	48	194.85	1538.58
26	192.65	1556.15	49	194.95	1537.79
27	192.75	1555.34	50	195.05	1537.00
28	192.85	1554.54	51	195.15	1536.22

ITU Channel Product Code	Frequency(THz)	Wavelength	ITU Channel Product Code	Frequency (THz)	Wavelength
29	192.95	1553.73	52	195.25	1535.43
30	193.05	1552.93	53	195.35	1534.64
31	193.15	1552.12	54	195.45	1533.86
32	193.25	1551.32	55	195.55	1533.07
33	193.35	1550.52	56	195.65	1532.29
34	193.45	1549.72	57	195.75	1531.51
35	193.55	1548.91	58	195.85	1530.72
36	193.65	1548.11	59	195.95	1529.94
37	193.75	1547.32	60	196.05	1529.16
38	193.85	1546.52	61	196.15	1528.38
39	193.95	1545.72	-	-	-

X. Mechanical Specifications

the mechanical dimensions of the module. Max. dimensions (L × W × H): 57.6 mm × 13.9 mm × 12.7 mm

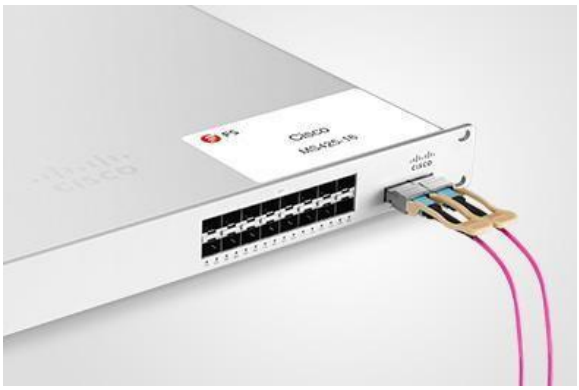


Test Center

I. Compatibility Testing

Each fiber optical transceiver has been tested in host device on site in FS Assured Program to ensure full compatibility with over 200 vendors.

Cisco Catalyst C9500-24Y4C



Cisco MS425-16

Brocade VDX 6940-144S

Dell EMC Networking Z9100-ON

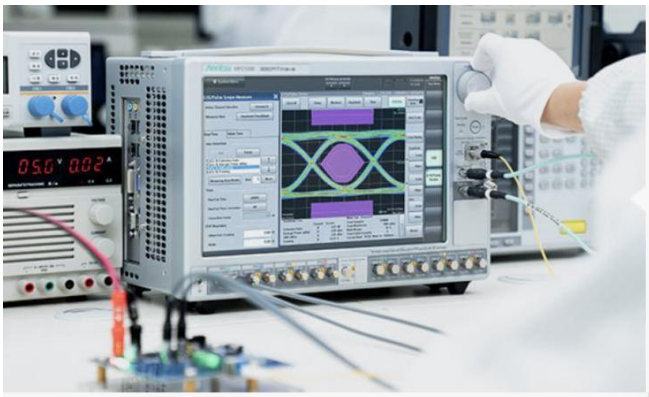
Force⑩tm S60-44T

HUAWEI S6720-30L-HI-24S

Above is part of our test bed network equipment. For more information, please click the Test Bed PDF. It will be updated in real time as we expand our portfolio.

II. Performance Testing

Each fiber optical transceiver has been fully tested in FS Assured Program equipped with world's most advanced analytical equipment to ensure that our transceivers work perfectly on your device.



1. TX/RX Signal Quality Testing

Equipped with the all-in-one tester integrated 4ch BERT & sampling oscilloscope, and variable optical attenuator to ensure the input and output signal quality.

- Eye Pattern Measurements: Jitter, Mask Margin, etc
- Average Output Power
- OMA
- Extinction Ratio
- Receiver Sensitivity
- BER Curve

2. Reliability and Stability Testing

Subject the transceivers to dramatic changes in temperature on the thermal shock chamber to ensure reliability and stability of the transceivers.

- Commercial: 0 °C to 70 °C
- Extended: -5 °C to 85 °C
- Industrial: -40 °C to 85 °C

3. Transfer Rate and Protocol Testing

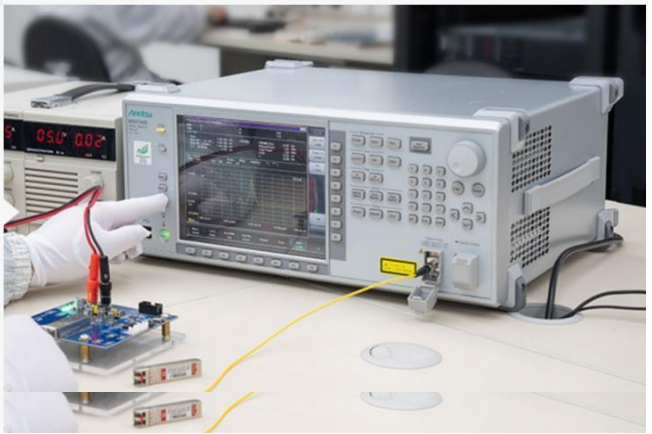
Test the actual transfer data rate and the transmission ability under different protocols with Network Master Pro.

- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI

4. Optical Spectrum Evaluation

Evaluate various important parameters with the Optical Spectrum Analyzer to meet the industry standards.

- Center Wavelength, Level
- OSNR
- SMSR
- Spectrum Width



Ordering Information

Part Number	Description
SFP-16GSR-85	16G Fiber Channel SFP+ 850nm 100m DOM LC Transceiver for MMF
SFP-16GLR-31	16G Fiber Channel SFP+ 1310nm 10km DOM LC Transceiver for SMF
SFP-16GER-55	16G Fiber Channel SFP+ 1550nm 40km DOM LC Transceiver for SMF

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