

SO-SFP-16GFC-ER-Dxxxx

SFP+, 16/8/4 Gbps FC/FICON, DWDM, SM, DDM, 13dB, 40km

OVERVIEW

The SO-SFP-16GFC-ER-Dxxxx fiber optical SFP+ (small form pluggable) transceivers include a PIN diode and temperature stabilized DFB-EML transmitter. The modules operate at data-rates up to 14.025 Gbps. The DWDM modules operate at nominal Dense Wavelength Division Multiplexing (DWDM) wavelengths on the 50GHz/100GHz grid as defined in the ITU-T 694.1 standard. The module has a duplex LC optical interface and all mechanical characteristics are compliant with the current SFP+ specification (SFF-8431 and SFF-8432). All SFP modules fulfill the content of the serial EEPROM described in the SFP MSA, Appendix B4, table 3.1, at base data fields (defined as addresses 0 to 63) and extended data fields (defined as addresses 64 to 95). The nominal transmitter output wavelength is stated at the reserved addresses 60-61 according to SFF document SFF-8472 rev 10.5, "Digital Diagnostics Monitoring Interface". Wavelengths stated in the specification are measured in vacuum. All requirements in this specification are valid throughout the specified lifetime and operational environmental temperature range unless otherwise stated. The transceiver modules are compliant to RoHS-6/6

PRODUCT FEATURES

- Up to 14.025 Gbps data-rates
- Up to 40km on 9/125um SMF (G.652)
- Rate selection clock data recovery (CDR) IC
- Duplex LC connector
- Compliant with SFP+ MSA
- Hot-pluggable SFP footprint
- Built-in digital diagnostic functions
- Single power supply 3.3V
- RoHS6 compliant
- Class 1 laser product complies with EN 60825-1
- Operating temperature range: 0°C to 70°C.
- Power consumption <1.8W

APPLICATIONS

- 16G/8G/4G Fibre Channel

ORDERING INFORMATION

Part Number	Description
SO-SFP-16GFC-ER-Dxxxx*	SFP+, 16/8/4 Gbps FC/FICON, DWDM, SM, DDM, 13dB, 40km

*xxxx = Refers to notation for frequency data. Please see extended order information on last page for additional information.

GENERAL SPECIFICATIONS

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Data Rate	<i>DR</i>	4.25		14.025+100ppm	Gbps	
Bit Error Rate	<i>BER</i>			10 ⁻¹²		
Operating Temperature	<i>TOP</i>	0		70	°C	Case temperature
Storage Temperature	<i>TSTO</i>	-40		85	°C	Ambient temperature
Supply Current	<i>IS</i>		350	550	mA	For electrical power interface
Input Voltage	<i>VCC</i>	3.13	3.3	3.45	V	
Maximum Voltage	<i>VMAX</i>	-0.5		3.6	V	For electrical power interface
Total Power Dissipation			1.2	1.7	W/1	

OPTICAL CHARACTERISTICS – TRANSMITTER

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Output Optical Power	<i>PTX</i>	-1		+4	dBm	Average, coupled into 9/125um SMF
Extinction ratio	<i>Er</i>	8.2			dB	
Optical Center Wavelength	λ_c	According to ITU-T 694.1			nm	±100pm, EOL value
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	<i>SMSR</i>	30			dB	
Transmitter and Dispersion Penalty				2	dB	800ps/nm, 14.025Gb/s
Relative Intensity noise	<i>RIN</i>			-130	dB/Hz	Peak-to-Peak
Launch Power OFF	<i>Poff</i>			-30	dBm	Average

OPTICAL CHARACTERISTICS – RECEIVER

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Optical Receiver Power	<i>PRX</i>			+1	dBm	Average
Optical Center Wavelength	λ_c	1480		1580	nm	
Receiver Sensitivity @ 14.25GBps	<i>RX_SENS1</i>			-14	dBm	BER<10 ⁻¹² , PRBS 2 ³¹ -1
Receiver Sensitivity @ 8.5GBps	<i>RX_SENS2</i>			-14	dBm	BER<10 ⁻¹² , PRBS 2 ⁷ -1
Receiver Sensitivity @ 4.25GBps	<i>RX_SENS3</i>			-14	dBm	BER<10 ⁻¹² , PRBS 2 ⁷ -1
Loss of Signal-Asserted	<i>PLOS_A</i>			-24	dBm	
Loss of Signal-Deasserted	<i>PLOS_D</i>	-14			dBm	
Loss of Signal-Hysteresis	<i>PLOS_H</i>	1		4	dB	

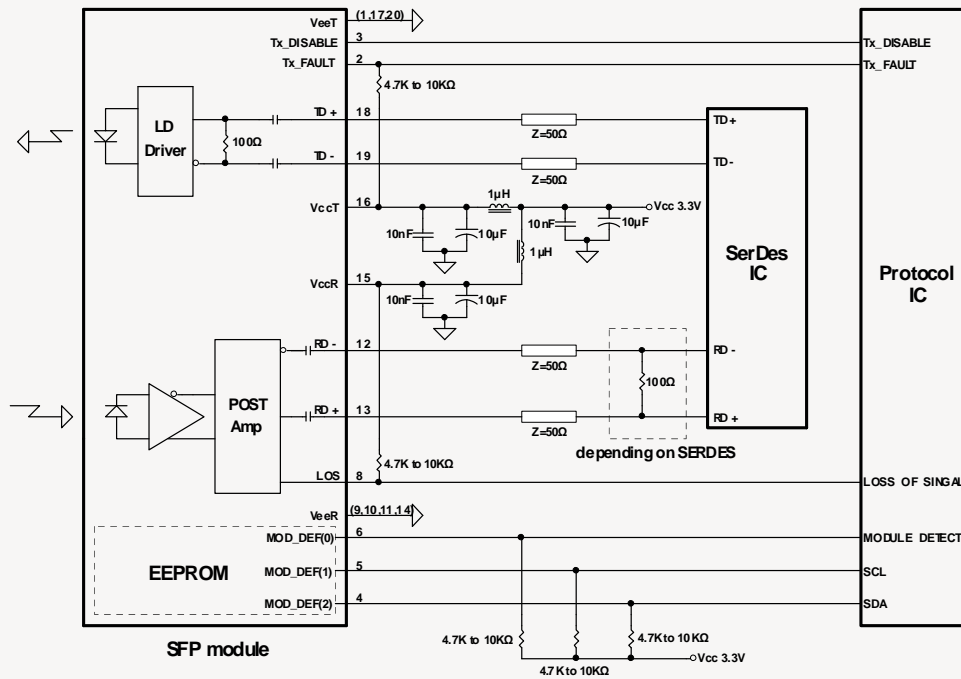
ELECTRICAL CHARACTERISTICS – HIGH-SPEED SIGNAL INTERFACE (CML)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Input Data Rate		4.25	14.025		Gb/s	
TX Clock Tolerance				±100	ppm	
Differential Input Impedance	<i>R_{IN}</i>		100		Ω	
Differential data input amplitude		150		1200	mVpp	Internally AC coupled
Output Data Rate		4.25	14.025		Gb/s	
RX Clock Tolerance				±100	ppm	
Differential Output Impedance	<i>R_{OUT}</i>		100		Ω	
Differential data output amplitude		350	600	700	mVpp	Internally AC coupled

ELECTRICAL CHARACTERISTICS – LOW-SPEED SIGNAL INTERFACE (LVTTTL)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Input High Voltage		2.0		VCC+0.3	V	TX-DIS, TX-FAULT
Input Low Voltage		GND		0.8	V	
Output High Voltage		2.4		V _{cc}	V	RX-LOS
Output Low Voltage		GND		0.5	V	

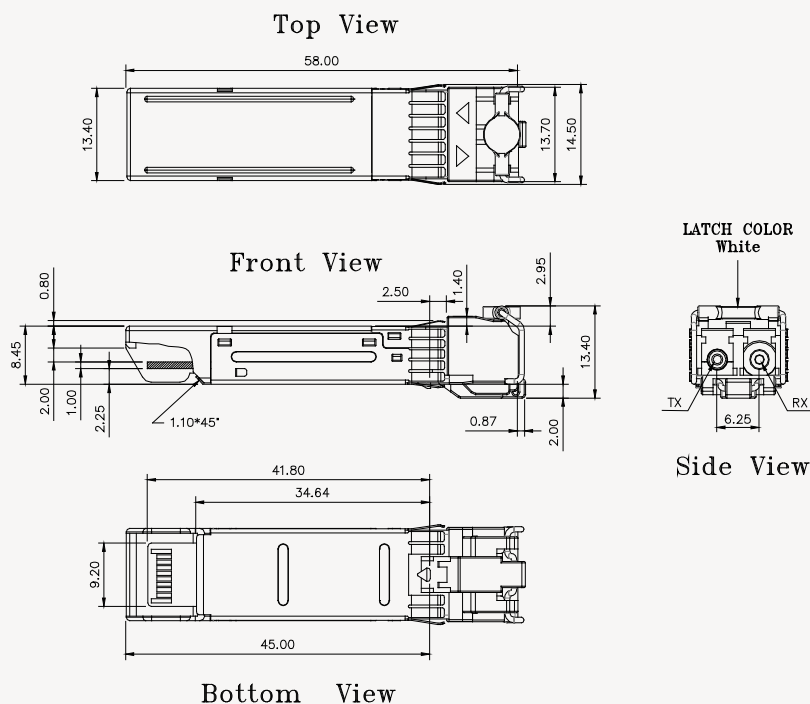
RECOMMENDED CIRCUIT SCHEMATIC



PIN FUNCTION DEFINITIONS

PIN	Signal Name	Description	PIN	Signal Name	Description
1	V _{EE} T	Transmitter Signal Ground	11	V _{EE} R	Receiver Signal Ground
2	TX_Fault	Transmitter Fault Indication. Logic "1" Output = Laser Fault. Logic "0" Output = Normal Operation	12	RD-	Inverse Receiver Data Out
3	TX_Disable	Logic "1" Input (or no connection) = Laser off, Logic "0" = Laser on.	13	RD+	Receiver Data Out
4	SDA	Modulation Definition 2 – Two wires serial ID Interface	14	V _{EE} R	Receiver Signal Ground
5	SDL	Modulation Definition 1 – Two wires serial ID Interface	15	V _{CC} R	Receiver Power – 3.3V±5%
6	MOD-ABS	Modulation Definition 0 – Ground in Module	16	V _{CC} T	Transmitter Power – 3.3V±5%
7	RS0	RX Rate Select (LVTTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance.	17	V _{EE} T	Transmitter Signal Ground
8	RX_LOS	Loss of Signal Out (OC).	18	TD+	Transmitter Data In
9	RS1	TX Rate Select (LVTTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance.	19	TD-	Inverse Transmitter Data In
10	V _{EE} R	Receiver Signal Ground	20	V _{EE} T	Transmitter Signal Ground

MECHANICAL DRAWING



Subject to change without notice.

For more information, visit smartoptics.com.

EXTENDED ORDERING INFORMATION

Part Number	ITU channel no.	Frequency (THz)	Center Wavelength (nm)
SO-SFP-16GFC-ER-D9180	18.0	191.80	1563.05
SO-SFP-16GFC-ER-D9190	19.0	192.90	1562.23
SO-SFP-16GFC-ER-D9200	20.0	192.00	1561.42
SO-SFP-16GFC-ER-D9210	21.0	192.10	1560.61
SO-SFP-16GFC-ER-D9220	22.0	192.20	1559.79
SO-SFP-16GFC-ER-D9230	23.0	192.30	1558.98
SO-SFP-16GFC-ER-D9240	24.0	192.40	1558.17
SO-SFP-16GFC-ER-D9250	25.0	192.50	1557.36
SO-SFP-16GFC-ER-D9260	26.0	192.60	1556.55
SO-SFP-16GFC-ER-D9270	27.0	192.70	1555.75
SO-SFP-16GFC-ER-D9280	28.0	192.80	1554.94
SO-SFP-16GFC-ER-D9290	29.0	192.90	1554.13
SO-SFP-16GFC-ER-D9300	30.0	193.00	1553.33
SO-SFP-16GFC-ER-D9310	31.0	193.10	1552.52
SO-SFP-16GFC-ER-D9320	32.0	193.20	1551.72
SO-SFP-16GFC-ER-D9330	33.0	193.30	1550.92
SO-SFP-16GFC-ER-D9340	34.0	193.40	1550.12
SO-SFP-16GFC-ER-D9350	35.0	193.50	1549.32
SO-SFP-16GFC-ER-D9360	36.0	193.60	1548.51
SO-SFP-16GFC-ER-D9370	37.0	193.70	1547.72
SO-SFP-16GFC-ER-D9380	38.0	193.80	1546.92
SO-SFP-16GFC-ER-D9390	39.0	193.90	1546.12
SO-SFP-16GFC-ER-D9400	40.0	194.00	1545.32
SO-SFP-16GFC-ER-D9410	41.0	194.10	1544.53
SO-SFP-16GFC-ER-D9420	42.0	194.20	1543.73
SO-SFP-16GFC-ER-D9430	43.0	194.30	1542.94
SO-SFP-16GFC-ER-D9440	44.0	194.40	1542.14
SO-SFP-16GFC-ER-D9450	45.0	194.50	1541.35
SO-SFP-16GFC-ER-D9460	46.0	194.60	1540.56
SO-SFP-16GFC-ER-D9470	47.0	194.70	1539.77
SO-SFP-16GFC-ER-D9480	48.0	194.80	1538.98
SO-SFP-16GFC-ER-D9490	49.0	194.90	1538.18
SO-SFP-16GFC-ER-D9500	50.0	195.00	1537.40
SO-SFP-16GFC-ER-D9510	51.0	195.10	1536.61
SO-SFP-16GFC-ER-D9520	52.0	195.20	1535.82
SO-SFP-16GFC-ER-D9530	53.0	195.30	1535.04
SO-SFP-16GFC-ER-D9540	54.0	195.40	1534.25
SO-SFP-16GFC-ER-D9550	55.0	195.50	1533.47
SO-SFP-16GFC-ER-D9560	56.0	195.60	1532.68
SO-SFP-16GFC-ER-D9570	57.0	195.70	1531.90
SO-SFP-16GFC-ER-D9580	58.0	195.80	1531.12
SO-SFP-16GFC-ER-D9590	59.0	195.90	1530.33
SO-SFP-16GFC-ER-D9600	60.0	196.00	1529.55
SO-SFP-16GFC-ER-D9610	61.0	196.10	1528.77

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