

# SO-SFP-10GE-ER-Dxxxx

SFP+, 10GBase-ER, DWDM 100GHz, SM, DDM, 14dB, 40km

## OVERVIEW

The SO-SFP-10GE-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 from 0.6 Gbps up to 11.1 Gbps. The DWDM modules operate at nominal Dense Wavelength Division Multiplexing (DWDM) wavelengths on the 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). 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

- Duplex LC connector
- Compliant with SFP+ MSA
- Hot-pluggable SFP footprint
- Built-in digital diagnostic functions
- Up to 40km on 9/125um SMF (G.652)
- Dispersion tolerance from -300 ps/nm to 800 ps/nm
- Single power supply 3.3V
- RoHS6/6 Compliant
- Class 1 laser product complies with EN 60825-1
- Operating temperature range:
  - Normal: 0°C to 70°C.
  - Industrial: -40°C to 85°C.
- Power consumption <1.5W

## APPLICATIONS

- 10GBASE-ER/EW
- 10G FC
- OBSAI rates 6.144 Gbps, 3.072 Gbps, 1.536 Gbps, 0.768 Gbps
- CPRI rates 9.830 Gbps, 7.373 Gbps, 6.144 Gbps, 4.915 Gbps, 2.458 Gbps, 1.229 Gbps, 0.614 Gbps

## ORDERING INFORMATION

Part Number	Description
SO-SFP-10GE-ER-Dxxxx	SFP+, 10GBase-ER, DWDM 100GHz, SM, DDM, 14dB, 40km
SO-SFP-10GE-ER-Dxxxx-I	SFP+, 10GBase-ER, DWDM 100GHz, SM, DDM, 14dB, 40km, ind. temp.

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## GENERAL SPECIFICATIONS

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	DR	0.6		11.1	Gbps	
Bit Error Rate	BER			$10^{-12}$		
Operating Temperature	$T_{OP}$	0		70	°C	Standard temperature - case
		-40		85	°C	Industrial temperature - case
Operating Relative Humidity				95	%	
Storage Temperature	$T_{STO}$	-40		85	°C	Ambient temperature
Supply Current	$I_S$		350	455	mA	For electrical power interface
Input Voltage	$V_{CC}$	3.15	3.3	3.45	V	
Maximum Voltage	$V_{MAX}$	-0.5		3.6	V	For electrical power interface

## ELECTRICAL CHARACTERISTICS – HIGH-SPEED SIGNAL INTERFACE (CML)

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Differential Input Impedance	$R_{IN}$	85	100	115	$\Omega$	
Differential data input swing	$V_{IN\_PP}$	250		1000	mVpp	Internally AC coupled
Differential Output Impedance	$R_{OUT}$	85	100	115	$\Omega$	
Differential data output swing	$V_{OUT\_PP}$	350		700	mVpp	Internally AC coupled

## ELECTRICAL CHARACTERISTICS – LOW-SPEED SIGNAL INTERFACE (LVTTTL)

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input High Voltage		2.0		$V_{CC}+0.3$	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	

## OPTICAL CHARACTERISTICS – TRANSMITTER

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Output Optical Power	$P_{TX}$	-1		+4	dBm	Average, coupled into 9/125um SMF
Extinction ratio	$E_r$	8.2			dB	
Optical Center Wavelength	$\lambda_c$	According to ITU-T 694.1			nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter and Dispersion Penalty				2	dB	-300 to 800ps/nm@ 10.3Gb/s
TX Jitter	TXj	Per 802.3 ae requirements				
Relative Intensity noise	RIN			-128	dB/Hz	Peak-to-Peak
Launch Power OFF	Poff			-30	dBm	Average

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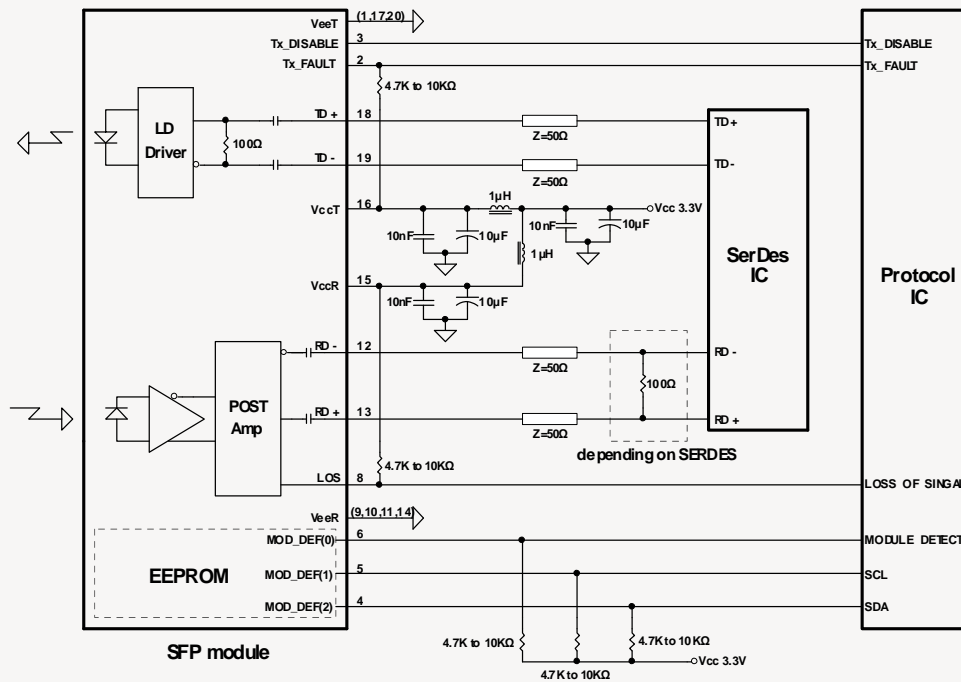
## OPTICAL CHARACTERISTICS – RECEIVER

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Receiver Power	$P_{RX}$			-1	dBm	Average
Optical Center Wavelength	$\lambda_c$	1480		1580	nm	
Receiver Sensitivity @ 10.3GBps	$R_{X\_SENS}$			-15	dBm	BER<10 <sup>-12</sup> , PRBS 2 <sup>31</sup> -1
Loss of Signal-Asserted	$P_{LOS\_A}$	-29			dBm	
Loss of Signal-Deasserted	$P_{LOS\_D}$			-17	dBm	
Optical Return Loss	ORL			-27	dB	

## OSNR– RECEIVER

SFP+	BER	RX Input Power (dBm)	Min OSNR back-to-back (dB)	Min OSNR w/ dispersion -300 to +800 ps/nm (dB)
10G ER	1E-12	-2 to -12	24	26
10G ER	1E-3	-2 to -12	15	17

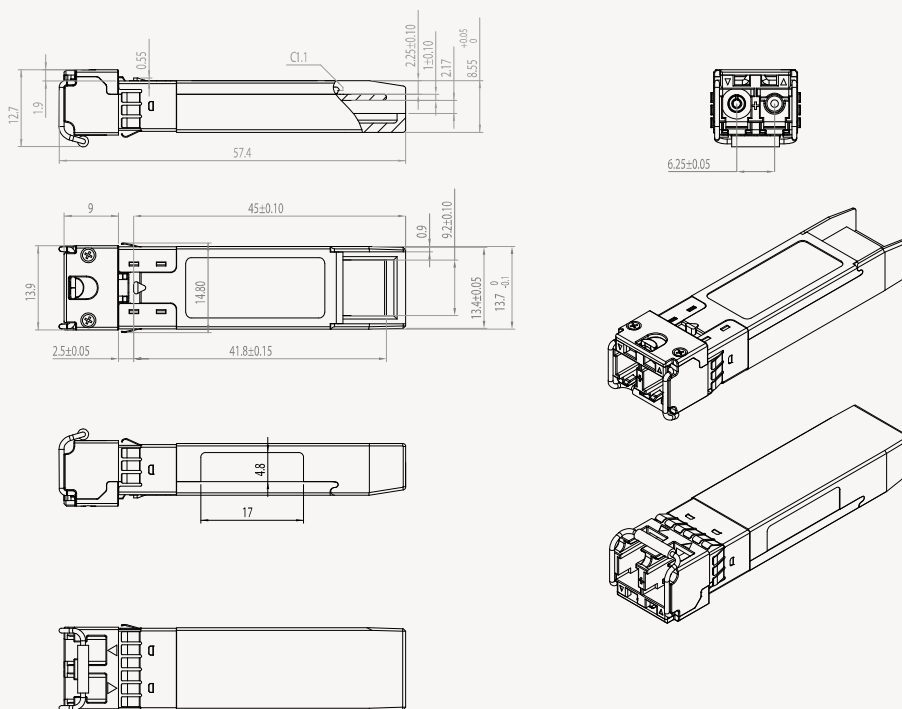
## FUNCTIONAL DIAGRAM OF TRANSCEIVER



### PIN ASSIGNMENT ACCORDING TO MSA

PIN	Signal Name	Description	PIN	Signal Name	Description
1	V <sub>EE</sub> T	Transmitter Signal Ground	11	V <sub>EE</sub> 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 <sub>EE</sub> R	Receiver Signal Ground
5	SDL	Modulation Definition 1 – Two wires serial ID Interface	15	V <sub>CC</sub> R	Receiver Power – 3.3V±5%
6	MOD-ABS	Modulation Definition 0 – Ground in Module	16	V <sub>CC</sub> 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 <sub>EE</sub> 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 <sub>EE</sub> R	Receiver Signal Ground	20	V <sub>EE</sub> T	Transmitter Signal Ground

### MECHANICAL DIMENSIONS



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## EXTENDED ORDERING INFORMATION

Part Number	Frequency (THz)	Center Wavelength (nm)
SO-SFP-10GE-ER-D9210	192.1	1560.61
SO-SFP-10GE-ER-D9220	192.2	1559.79
SO-SFP-10GE-ER-D9230	192.3	1558.98
SO-SFP-10GE-ER-D9240	192.4	1558.17
SO-SFP-10GE-ER-D9250	192.5	1557.36
SO-SFP-10GE-ER-D9260	192.6	1556.55
SO-SFP-10GE-ER-D9270	192.7	1555.75
SO-SFP-10GE-ER-D9280	192.8	1554.94
SO-SFP-10GE-ER-D9290	192.9	1554.13
SO-SFP-10GE-ER-D9300	193.0	1553.33
SO-SFP-10GE-ER-D9310	193.1	1552.52
SO-SFP-10GE-ER-D9320	193.2	1551.72
SO-SFP-10GE-ER-D9330	193.3	1550.92
SO-SFP-10GE-ER-D9340	193.4	1550.12
SO-SFP-10GE-ER-D9350	193.5	1549.32
SO-SFP-10GE-ER-D9360	193.6	1548.51
SO-SFP-10GE-ER-D9370	193.7	1547.72
SO-SFP-10GE-ER-D9380	193.8	1546.92
SO-SFP-10GE-ER-D9390	193.9	1546.12
SO-SFP-10GE-ER-D9400	194.0	1545.32
SO-SFP-10GE-ER-D9410	194.1	1544.53
SO-SFP-10GE-ER-D9420	194.2	1543.73
SO-SFP-10GE-ER-D9430	194.3	1542.94
SO-SFP-10GE-ER-D9440	194.4	1542.14
SO-SFP-10GE-ER-D9450	194.5	1541.35
SO-SFP-10GE-ER-D9460	194.6	1540.56
SO-SFP-10GE-ER-D9470	194.7	1539.77
SO-SFP-10GE-ER-D9480	194.8	1538.98
SO-SFP-10GE-ER-D9490	194.9	1538.19
SO-SFP-10GE-ER-D9500	195.0	1537.40
SO-SFP-10GE-ER-D9510	195.1	1536.61
SO-SFP-10GE-ER-D9520	195.2	1535.82
SO-SFP-10GE-ER-D9530	195.3	1535.04
SO-SFP-10GE-ER-D9540	195.4	1534.25
SO-SFP-10GE-ER-D9550	195.5	1533.47
SO-SFP-10GE-ER-D9560	195.6	1532.68
SO-SFP-10GE-ER-D9570	195.7	1531.90
SO-SFP-10GE-ER-D9580	195.8	1531.12
SO-SFP-10GE-ER-D9590	195.9	1530.33
SO-SFP-10GE-ER-D9600	196.0	1529.55

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