SO-SFP-16GFC-ER-Dxxxx
SFP+, 16/8/4G FC, DWDM 100GHz grid, 40km, 14dB, LC, D9200-D9600

OVERVIEW

The SO-SFP-16GFC-ER-Dxxxx is a versatile DWDM transceiver in SFP+ form-factor supporting a wide range of Fiber Channel (FC) services (4G to 16G).

For diagnostic purposes, the transceiver supports optical (OWRAP) and electrical (EWRAP) loop-back functionality, with or without forwarding. The transceiver is provided in 41 channel versions at the 100GHz DWDM grid as specified in the ITU-T 694.1 standard. The transceiver can also be used in 1550/1530nm CWDM applications by selecting wavelength versions that match these.

The optical performance provides a bridgeable distance of up to 40km (without dispersion compensation) for 16G FC.
This transceiver provides digital diagnostic functions via a 2-wire serial interface as defined by the SFF-8472 specification.

The transceiver module is compliant to RoHS-6/6.

TECHNICAL DATA

Parameter	Value
Technology	DWDM SFP+
Transmission media	SM (2x LC)
Typical reach	40km
Nominal wavelengths	192.00 – 196.00 THz (41ch)
Bit rate support	4.25 – 14.025Gbps
Protocol support	4G FC, 8G FC, 16G FC
Power budget	6 – 13dB [1]
	6 – 14dB [2]
Dispersion tolerance	800ps/nm
Dispersion penalty	Max 2dB
Power consumption	< 2.1W
Operating temperature	0°C to +70°C
Storage temperature	-40°C to +85°C

Parameter	Value
Transmitter data:	
Output power	Min: 0dBm [3]
	Max: +4.0dBm [3]
Transmit wavelengths	192.00 – 196.00 THz (40ch)
	100GHz grid (G.694.1)
Receiver data:	
Minimum input power	-13dBm [1] [3] [4]
	-14dBm [2] [3] [4]
Overload (max power)	-2 dBm [3]
LOS Asserted	Min -24dBm
LOS De-asserted	Max -14dBm
Wavelength range	1480 – 1580nm
DDM	Yes
MSA compliance	SFP+ MSA, SFF-8472

[1] 16G FC

[2] 8G FC & 4G FC

[3] Average power

[4] @ BER < 1E-12 using PRBS 2^{31}-1

Safety/regulatory compliance:

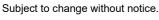TUV/UL/FDA (contact Smartoptics for latest certification information)

RoHS compliance

For a 1550nm CWDM channel the DWDM channels D250 – D410 can be used.
For a 1530nm CWDM channel the DWDM channels D500 – D600 can be used.
(The ITU G.694.2 channel grid states 1551/1531nm ± 7nm)

For 1550nm single-channel applications, the ITU-T G.959 states 1500nm – 1565nm, which means any channel between D200 – D600.

ORDERING INFORMATION

Ordering number	Frequency THz	Wavelength nm	Ordering number	Frequency THz	Wavelength nm
SO-SFP-16GFC-ER-D9200	192.00	1561.42	SO-SFP-16GFC-ER-D9410	194.10	1544.53
SO-SFP-16GFC-ER-D9210	192.10	1560.61	SO-SFP-16GFC-ER-D9420	194.20	1543.73
SO-SFP-16GFC-ER-D9220	192.20	1559.79	SO-SFP-16GFC-ER-D9430	194.30	1542.94
SO-SFP-16GFC-ER-D9230	192.30	1558.98	SO-SFP-16GFC-ER-D9440	194.40	1542.14
SO-SFP-16GFC-ER-D9240	192.40	1558.17	SO-SFP-16GFC-ER-D9450	194.50	1541.35
SO-SFP-16GFC-ER-D9250	192.50	1557.36	SO-SFP-16GFC-ER-D9460	194.60	1540.56
SO-SFP-16GFC-ER-D9260	192.60	1556.55	SO-SFP-16GFC-ER-D9470	194.70	1539.77
SO-SFP-16GFC-ER-D9270	192.70	1555.75	SO-SFP-16GFC-ER-D9480	194.80	1538.98
SO-SFP-16GFC-ER-D9280	192.80	1554.94	SO-SFP-16GFC-ER-D9490	194.90	1538.19
SO-SFP-16GFC-ER-D9290	192.90	1554.13	SO-SFP-16GFC-ER-D9500	195.00	1537.40
SO-SFP-16GFC-ER-D9300	193.00	1553.33	SO-SFP-16GFC-ER-D9510	195.10	1536.61
SO-SFP-16GFC-ER-D9310	193.10	1552.52	SO-SFP-16GFC-ER-D9520	195.20	1535.82
SO-SFP-16GFC-ER-D9320	193.20	1551.72	SO-SFP-16GFC-ER-D9530	195.30	1535.04
SO-SFP-16GFC-ER-D9330	193.30	1550.92	SO-SFP-16GFC-ER-D9540	195.40	1534.25
SO-SFP-16GFC-ER-D9340	193.40	1550.12	SO-SFP-16GFC-ER-D9550	195.50	1533.47
SO-SFP-16GFC-ER-D9350	193.50	1549.32	SO-SFP-16GFC-ER-D9560	195.60	1532.68
SO-SFP-16GFC-ER-D9360	193.60	1548.51	SO-SFP-16GFC-ER-D9570	195.70	1531.90
SO-SFP-16GFC-ER-D9370	193.70	1547.72	SO-SFP-16GFC-ER-D9580	195.80	1531.12
SO-SFP-16GFC-ER-D9380	193.80	1546.92	SO-SFP-16GFC-ER-D9590	195.90	1530.33
SO-SFP-16GFC-ER-D9390	193.90	1546.12	SO-SFP-16GFC-ER-D9600	196.00	1529.55
SO-SFP-16GFC-ER-D9400	194.00	1545.32			

LOOPBACK CONFIGURATION

Loopback can be configured on optical side (OWRAP) and electrical side (EWRAP), with and without forwarding. See definition in figure.

Loopback is set in A2H, BYTE 111.

Byte	Bit	Name	Description
111	4-7	Reserved	Reserved
	3	QWRAP Forward	When set in combination with OWRAP Enable, OWRAP Forward routes incoming SFP+ Rx optical data to both the Tx optical output and the Rx electrical output. Enabling sets bit 2 and clears all other bits in byte 111.
	2	QWRAP	When set, OWRAP routes incoming SFP+ Rx optical data to the Tx optical output. Enabling clears all other bits in byte 111.
	1	EWRAP Forward	When set in combination with EWRAP Enable, EWRAP Forward routes incoming SFP+ Tx electrical data to both Rx electrical output and Tx optical output. Enabling sets bit 0 and clears all other bits in byte 111
	0	EWRAP	When set, EWRAP Enable routes incoming SFP+ Tx electrical data to the Rx electrical output. Enabling clears all other bits in byte 111.

GENERAL DEFINITIONS

Parameter	Description
Technology	Grey; Transceiver type for non-WDM applications. Electrical or optical. CWDM; Transceiver type for CWDM applications using G.694.2 channel grid. DWDM; Transceiver type for DWDM applications using G.694.1 channel grid. BiDi; Transceiver pair using two different wavelength channels operating on a single-fiber. DAC: Direct Attach Cable. Electrical cable with attached connectors. AOC: Active Optical Cable. Optical cable with attached connectors.
Transmission Media	Type of fiber, e.g. Multimode (MM) or Singlemode (SM). Number of and connector type within brackets (e.g. 2x LC, 1x MPO).
Typical reach	Nominal distance performance based on typical fiber dispersion, fiber loss and power budget properties, i.e. w/o dispersion compensation and optical amplification. Actual distance is dependent on actual optical path loss and dispersion properties.
Bit rate range	Supported bit rate range in Gigabit or Megabit per second (Gbps or Mbps).
Protocols	Protocols within supported bit rate range.
Nominal wavelength	Typical wavelength(s) from transmitter.
Interface standards	Referenced interface standards or MSA's, e.g. IEEE 802.3 standard for 10GbE services or 100G 4WDM-10 etc.
Power budget	Min and max power budget between Transmitter and Receiver w/o optical path penalties.
Dispersion tolerance/penalty	Maximum amount of tolerated dispersion and required reduction of power budget to maintain stipulated Bit Error Rate (BER) and at a given bit rate.
Temperature range	Max operating case temperature range. Standard temperature range (C-temp): 0°C to +70°C (32°F to +158°F) Extended temperature range (E-temp): typically -20°C to +75°C (-4°F to +167°F) Industrial temperature range (I-temp): -40°C to +85°C (-40°F to +185°F)
Power consumption	Worst case power consumption. Will vary over temperature.
Transmitter Output power	Average output power. Provided in min and max values.
Receiver minimum input power	Minimum average input power at specified BER, normally $1E^{-12}$. Note that some protocols require FEC to achieve sufficient BER.
Receiver max input power	Maximum average input power giving a BER, normally $1E^{-12}$.
DDM	Digital Diagnostic Monitoring functionality as defined in e.g. SFF-8472 MSA.