

# SO-QSFP28-Dxx-A

## QSFP28 100G Ethernet DWDM PAM4 100GHz D9210-D9600

### OVERVIEW

The SO-QSFP28-Dxx-A is a QSFP28 form-factor DWDM transceiver for 100Gbps Ethernet applications. It is intended for use in interconnect applications between data centers between switches, routers, storage equipment etc.

The transceiver is provided in 40 channel versions at the 100GHz DWDM grid as specified in the ITU-T 694.1 standard. The line signal is PAM4-modulated which means that the transmission links will need optical amplifiers and dispersion compensation. The receiver optical specification is consequently only specifying optimum input receiver power range and damage threshold.

The module includes FEC coding Forward Error Correction (KP4 FEC) to ensure reliable system operation. The host system shall thus not have FEC activated. The optical parameters will provide a bit error ratio (BER) of  $2.4 \times 10^{-4}$ . FEC will render in the required BER of better than  $1 \times 10^{-12}$ .

Digital diagnostics functions are available via the I<sup>2</sup>C interface as specified by the QSFP MSA specification SFF 8636. The electrical signals are transmitted and received from the host via a standard 38 pin connector described in the QSFP28 MSA (SFF-8679). The electrical interface is compliant to CAUI-4 (IEEE P802.3bm Annex 83E), splitting the 100Gbps signal in to four parallel 25 Gbps NRZ streams.

### TECHNICAL DATA

Parameter	Value
Technology	DWDM QSFP28
Transmission media	SM (2x LC)
Typical reach	80km with EDFA and DCM
Nominal wavelengths	192.10 – 196.00 THz (40ch)
Interface standards	100GBASE
Bit rate support	53.125Gbaud (PAM4) / 103.12Gbps
Protocol support	100GbE
Dispersion tolerance	+/-40ps/nm
Power consumption	< 5.5W
Operating temperature	0°C to +70°C
Storage temperature	-40°C to +85°C

<sup>1)</sup> Average power

<sup>2)</sup> pre FEC BER <  $2.4 \times 10^{-4}$

Parameter	Value
<b>Transmitter data:</b>	
Output power	Min: -7.0dBm <sup>1)</sup> Max: +4.0dBm <sup>1)</sup>
Transmit wavelengths	192.10 – 196.00 THz (40ch) 100GHz grid (G.694.1)
<b>Receiver data:</b>	
Damage threshold (max power)	+5.5dBm <sup>1) 2)</sup>
Input power @ OSNR 33.5dB	-3.0 to +4.5dBm <sup>1) 2)</sup>
LOS Asserted	Min -15dBm
LOS De-asserted	Max -12dBm
LOS hysteresis	Min 0.5dB
Wavelength range	1528 – 1566nm
DDM	Yes
MSA compliance	QSFP28 MSA SFF-8636

#### Safety/regulatory compliance:

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

RoHS compliance

## ORDERING INFORMATION

Part number	Freq. THz	$\lambda$ nm
SO-QSFP28-D21-A	192.10	1560.61
SO-QSFP28-D22-A	192.20	1559.79
SO-QSFP28-D23-A	192.30	1558.98
SO-QSFP28-D24-A	192.40	1558.17
SO-QSFP28-D25-A	192.50	1557.36
SO-QSFP28-D26-A	192.60	1556.55
SO-QSFP28-D27-A	192.70	1555.75
SO-QSFP28-D28-A	192.80	1554.94
SO-QSFP28-D29-A	192.90	1554.13
SO-QSFP28-D30-A	193.00	1553.33
SO-QSFP28-D31-A	193.10	1552.52
SO-QSFP28-D32-A	193.20	1551.72
SO-QSFP28-D33-A	193.30	1550.92
SO-QSFP28-D34-A	193.40	1550.12
SO-QSFP28-D35-A	193.50	1549.32
SO-QSFP28-D36-A	193.60	1548.51
SO-QSFP28-D37-A	193.70	1547.72
SO-QSFP28-D38-A	193.80	1546.92
SO-QSFP28-D39-A	193.90	1546.12
SO-QSFP28-D40-A	194.00	1545.32

Part number	Freq. THz	$\lambda$ nm
SO-QSFP28-D41-A	194.10	1544.53
SO-QSFP28-D42-A	194.20	1543.73
SO-QSFP28-D43-A	194.30	1542.94
SO-QSFP28-D44-A	194.40	1542.14
SO-QSFP28-D45-A	194.50	1541.35
SO-QSFP28-D46-A	194.60	1540.56
SO-QSFP28-D47-A	194.70	1539.77
SO-QSFP28-D48-A	194.80	1538.98
SO-QSFP28-D49-A	194.90	1538.19
SO-QSFP28-D50-A	195.00	1537.40
SO-QSFP28-D51-A	195.10	1536.61
SO-QSFP28-D52-A	195.20	1535.82
SO-QSFP28-D53-A	195.30	1535.04
SO-QSFP28-D54-A	195.40	1534.25
SO-QSFP28-D55-A	195.50	1533.47
SO-QSFP28-D56-A	195.60	1532.68
SO-QSFP28-D57-A	195.70	1531.90
SO-QSFP28-D58-A	195.80	1531.12
SO-QSFP28-D59-A	195.90	1530.33
SO-QSFP28-D60-A	196.00	1529.55

## 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 100G4WDM-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): typically 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.

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