DATASHEET 5.3

SO-QSFP-DD-4C-LR4 / -LR4-4

QSFP-DD 400G Ethernet-LR4, 4x100G PAM4,1271nm/1291nm/1311nm/1331nm, 10km, 6.3dB, LC

OVERVIEW

The SO-QSFP-DD-4C-LR4 is a QSFP-DD form-factor transceiver for 400Gbps Ethernet applications. It is intended for use in data center interconnect between switches, routers, storage equipment etc. for optical distances up to 10km over a SingleMode (SM) fiber cable.

The electrical interface consists of eight 53.125G signals (400GAUI-8) that are converted to eight PAM4-modulated channels/lanes to transport the Ethernet signal. The transceiver can also be set in 4x100GAUI-2 mode (application code 2) to enable 400G to 4x 100G break-out configurations. Digital diagnostics functions are available via an I²C interface, as specified by the QSFP-DD MSA.

Forward Error Correction (FEC) is required to be implemented by the host to ensure reliable system operation. The FEC type shall be as defined in IEEE802.3bj, i.e. Reed Solomon RS(528,514). The optical parameters will provide a bit error ratio (BER) of 2.4×10^{-4}.

The optical interface to the transceiver is 2x LC connectors. The transceiver is provided in two versions, compliant with Common Management Interface Specification CMIS3.0 and CMIS4.0.

Subject to change without notice. For more information visit **smartoptics.com**

SO-QSFP-DD-4C-LR4 / -LR4-4

TECHNICAL DATA

Parameter	Value
Technology	Grey QSFP-DD
Transmission media	SM (2x LC)
Typical reach	10km
Nominal wavelengths	1271nm
	1291nm
	1311nm
	1331nm
Interface standards	400GBASE-LR4
Electrical interfaces	400GAUI-8 or 4x100GAUI-2
Bit rate support	425Gbps [1]
	53.125Gbd [2]
Protocol support	400GbE
Power budget	0 – 6.3dB
Power consumption	< 10W
Operating temperature	0°C to +70°C
Storage temperature	-40°C to +85°C

1). Aggregated line rate 400GbE

2). Line baud rate per lane

3). Average power, per lane

4). Specified at BER 2.4x10^{-4}

Parameter	Value
Transmitter data:	
Output power, per lane	Min: -2.8dBm [3]
	Max: +4.0dBm [3]
Transmit wavelenghts	1264.5 - 1277.5nm
	1284.5 - 1297.5nm
	1304.5 - 1317.5nm
	1324.5 - 1337.5nm
Receiver data:	
Minimum input power, per lane	-9.1dBm [3] [4]
Overload (max power), per lane	+4.0dBm [3] [4]
	1264.5 - 1277.5nm
	1284.5 - 1297.5nm
	1304.5 - 1317.5nm
	1324.5 - 1337.5nm
LOS Assert	Min -15dBm
LOS De-assert	Max -10dBm
LOS Hysteresis	Min 1dB
DDM	Yes
MSA compliance	QSFP-DD MSA / CMIS3.0 /4.0

Safety/regulatory compliance:
TUV/UL/FDA (contact Smartoptics for latest certification information)
RoHS compliance

PAM4 ASIC
8x 25Gbd ⟷ 4x 50Gbd
4x CWDM EML
4x PIN ARRAY

ORDERING INFORMATION

Ordering number	Description
SO-QSFP-DD-4C-LR4	QSFP-DD 400G-LR4 Ethernet, 4×100G-LR, PAM4 CMIS3.0, 1271nm/1291nm/1311nm/1331nm 10km 6.3dB LC
SO-QSFP-DD-4C-LR4-4	QSFP-DD 400G-LR4 Ethernet, 4×100G-LR, PAM4 CMIS4.0, 1271nm/1291nm/1311nm/1331nm 10km 6.3dB LC

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.

Subject to change without notice. For more information visit **smartoptics.com**

SO-QSFP-DD-4C-LR4 / -LR4-4

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.