

## AT A GLANCE

E.C.I. NETWORKS's QSFP-DD or QSFP56-DD transceiver module is designed for use in 200/400 Gigabit Ethernet links up 10km single mode fiber. QSFP-DD ports is mechanically and electrically compatible with QSFP28 and QSFP+. The module is hot pluggable when mated to a compliant 76-pin connector that delivers a supply voltage of 3.3 V.

EN-QDD-LR4 is a 400G Quad Small Form Factor Pluggable-double density (QSFP-DD) optical module designed for 2 and 10km km optical communication applications. The module converts 8 channels of 50Gb/s (PAM4) electrical input data to 4 channels of CWDM optical signals and multiplexes them into a single channel for 400Gb/s optical transmission. Reversely, on the receiver side, the module optically demultiplexes a 400Gb/s optical input into 4 channels of CWDM optical signals and converts them to 8 channels of 50Gb/s (PAM4) electrical output data.

The central wavelengths of the 4 CWDM channels are 1271, 1291, 1311 and 1331 nm as members of the CWDM wavelength grid defined in ITU-T G.694.2. It contains a duplex LC connector for the optical interface and a 76-pin connector for the electrical interface.

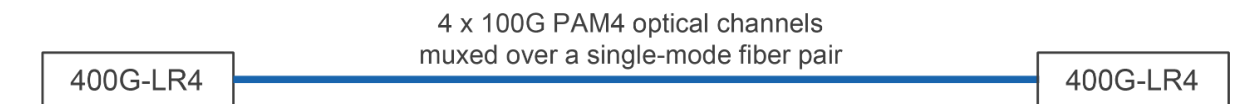
## PRODUCT FEATURES

- ◆ QSFP-DD MSA compliant
- ◆ 4 CWDM lanes MUX/DEMUX design
- ◆ Duplex LC connector
- ◆ EN-QDD-LR4 Up to 10km transmission on single mode fiber (SMF) with FEC
- ◆ 8x53.125Gb/s electrical interface (400GAUI-8)
- ◆ Data Rate 106.25Gbps (PAM4) per channel.
- ◆ Maximum power consumption 12W
- ◆ Duplex LC connector
- ◆ RoHS compliant
- ◆ I2C interface with integrated DDM
- ◆ EN-QDD-LR4 100G Lambda MSA 100G-LR specification compliant
- ◆ Commercial operating temperature: 0 to +70 °C



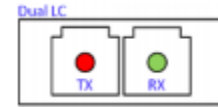
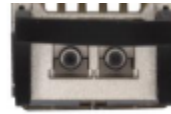
## APPLICATIONS EXAMPLES

Usually used DCI within data centers, or across data centers for up to 10km use.



**EN-QDD-LR4 Direct Connectivity**

The 400G-FR4/LR4 modules use duplex LC fiber connectors – the same connectors that are used on existing 100G and 40G QSFPs that use duplex SMF (e.g. 100G-CWDM4, 40G-LR4 etc).



**Ordering Information**

Part Number	Description	Data Rate	Wavelength	Distance
EN-QDD-LR4-xx	400GBASE-FR4 transceiver, up to 10km over duplex SMF, LC Connector, EML CWDM4	400G	EML CWDM4 1271nm/1291nm/1311nm/1331nm	10 KM

**Product Selection**

xx: Refers to vendor compatibility

I: I refers to Industrial Temperature where applicable

Per example:

EN-SFP10G-LR-EZ refers to Commercial Temperature, and compatible with Evertz, EN-SFP10GIDL-JREX refers to Industrial Temperature, and compatible with Juniper EX Series

\*\* Please note pricing is same for most of the NEMs including Cisco, Juniper, F5, Fortinet, except HP, Evertz. There is an additional charge

**Compatibility; Tested and Proven**

- ◆ Proven Compatibility and Interoperability with; TBD

**Compliance**

All our products come with Built-in digital diagnostic functions DDM Compliant with SFF-8472 Rev12 and Compliant with the MSA SFF SPECIFICATIONS.

**ABSOLUTE MAXIMUM RATING**

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	T <sub>s</sub>	-40	85	°C
Relative Humidity	RH	0	85	%
Supply Voltage	V <sub>cc</sub>	-0.5	3.6	V

**Recommended Operating Conditions**

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T <sub>c</sub>	0	25	70	°C
Supply Voltage	V <sub>cc</sub>	3.135	3.3	3.465	V
Power Dissipation	P <sub>d</sub>	-		12	W
Data Rate, each Lane			26.5625		GBd
Data Rate Accuracy		-100		100	ppm
Pre-FEC Bit Error Ratio				2.4x10 <sup>-4</sup>	
Post-FEC Bit Error Ratio				1x10 <sup>-12</sup>	
Link Distance	D	0.5		2000 (FR4) or 10000 (LR4)	m

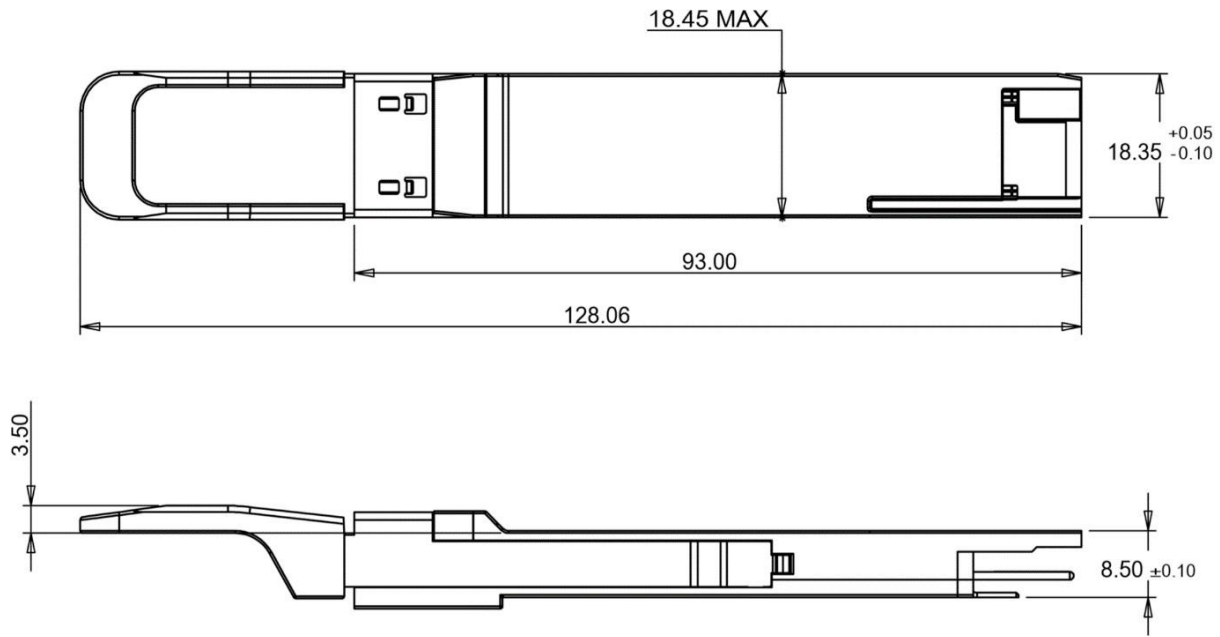
**Optical Characteristics**

**EN-QDD-LR4**

Parameter	Symbol	Min	Typical	Max	Units	Notes
Wavelength Assignment	L0	1264.5	1271	1277.5	nm	
	L1	1284.5	1291	1297.5	nm	
	L2	1304.5	1311	1317.5	nm	
	L3	1324.5	1331	1337.5	nm	
<b>Transmitter</b>						
Data Rate, each Lane		53.125 ± 100 ppm			GBd	
Modulation Format		PAM4				
Side-mode Suppression Ratio	SMSR	30			dB	Modulated
Total Average Launch Power	PT			10	dBm	
Average Launch Power, each Lane	PAVG	-1.4		4.5	dBm	1
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each Lane	POMA	0.7		4.7	dBm	2
Launch Power in OMA <sub>outer</sub> minus TDECQ, each Lane		-0.7			dB	For ER ≥4.5dB
Launch Power in OMA <sub>outer</sub> minus TDECQ, each Lane		-0.6			dB	For ER <4.5dB
Transmitter and Dispersion Eye Clouser for PAM4, each Lane	TDECQ			3.4	dB	
Extinction Ratio	ER	3.5			dB	
Difference in Launch Power between any Two Lanes (OMA <sub>outer</sub> )				4	dB	
RIN <sub>17.1OMA</sub>	RIN			-136	dB/Hz	
Optical Return Loss Tolerance	TOL			15.6	dB	
Transmitter Reflectance	TR			-26	dB	

Average Launch Power of OFF Transmitter, each Lane	Poff			-20	dBm	
Receiver						
Data Rate, each Lane		53.125 ± 100 ppm			GBd	
Modulation Format		PAM4				
Damage Threshold, each Lane	TH <sub>d</sub>	5.5			dBm	
Average Receive Power, each Lane		-7.7		4.5	dBm	
Receive Power (OMAouter), each Lane				4.7	dBm	
Difference in Receiver Power between any Two Lanes (OMAouter)				4.1	dB	
Receiver Sensitivity (OMAouter), each Lane	SEN			-6.6	dBm	
Receiver Reflectance	R			-26	dB	
LOS Assert	LOSA	-30			dBm	
LOS De-assert	LOSD			-12	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Stressed Eye Closure for PAM4 (SECQ), Lane under Test		0.9		3.4	dB	
OMAouter of each Aggressor Lane			1.5		dBm	

Mechanical specifications



Regulatory Compliance

Feature	Reference	Performance
Electrostatic discharge (ESD)	IEC/EN 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2	Class 1 laser product
Component Recognition	IEC/EN 60950, UL	Compatible with standards
ROHS	2002/95/EC	Compatible with standards
EMC	EN61000-3	Compatible with standards

**Notice:**

ECI Networks reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only.

For further information



E.C.I.NETWORKS

Office: 1-800-967-1672

Fax : 1-855-201-7283

<mailto:sales@ecin.ca>