

Product Specification

40GBase-ER4

SINGLEMODE OPTICAL QSFP+ TRANSCEIVER

40Gbps 1270/1290/1310/1330nm 40Km LC



Overview

Atrian optical transceivers are Quad Small Form Factor Pluggable (QSFP) compatible with the QSFP+ (Multi Sourcing Agreement) MSA and IEEE 802.3bm 40GBASE-ER4 requirements specified in ITU-T Recommendation G.695 as adapted to a 40 Km interface. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP+ MSA.

aTrian Quad Small Form Factor Pluggable (QSFP) transceivers provides a reliable and high-performing 40Gigabit Ethernet network connectivity. They can be easily installed without interrupting the host equipment in operation thanks to the hot pluggable feature.

aTrian optical transceivers are designed to be used on aTrian's media converters and switches as well as third party equipments that supports SFP transceivers.

Key Features

- **Fiber Mode:** Single Mode @ 9/125 μ m
- **Speed:** 4 x 10 Gbps CWDM (41.3 Gb/s)
- **Insertion Loss Budget:** 18.5 dB
- **Temperature:** 0~70°C (Commercial)
- **Connector:** Duplex LC/UPC Connector
- **DMI:** Diagnostic Monitoring

Regulatory Compliance

aTrian Communication Technologies transceivers are products with Class 1 Lasers that complies with FDA regulations on eye safety and ETSI EN 60825 and electrical safety measures in accordance with ETSI EN 60950.

Technical Specifications

General Parameters	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T _s	-40		+85	°C
Operating Temperature	T _c	0		+70	°C
Relative Humidity (Non-condensing)	RH	0		85	%
Damage Threshold, per Lane	DT	3.8			dBm
Maximum Supply Voltage	V _{cc1} , V _{ccTx} , V _{ccRx}	-0.5		3.6	V
Power Current	I _{cc}			1.13	A
Maximum Power Consumption	M _{PC}			3.5	W
Maximum Aggregate Data Rate	MDR			41.250	Gbps
Maximum Data Rate per Lane	MDRL			10.3125	Gbps
Module Form Factor			QSFP+		
Protocol Supported			40G Ethernet		
Management Interface			Serial, I2C-based, 400 kHz maximum frequency		

Data Rate Specification	Symbol	Min.	Typical	Max.	Unit
Bit Rate per Lane ¹	BR		10.3125		Gbps
Bit Error Ratio ²	BER			10 ⁻¹²	
Link distance on SMF-28 ³	d	0.002		40	Km

Notes

- ± 100 ppm, compliant with 40GBASE-ER4 and XLPP1 per IEEE 802.3bm.
- Tested with a PRBS 2³¹-1 test pattern.
- Per 40GBASE-ER4, IEEE 802.3bm. Links longer than 30km are considered to be engineered links, with losses less than the worst case specified for the fiber type.

Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
Supply Voltage	V _{cc1} , V _{ccTx} , V _{ccRx}	3.1		3.47	V
Supply Current	I _{cc}			1.13	A

Link turn-on time	Symbol	Min.	Typical	Max.	Unit
Transmit turn-on time ¹				2000	ms

Transmitter (per Lane)	Symbol	Min.	Typical	Max.	Unit
Single ended input voltage tolerance	V _{inT}	-0.3		4.0	V

Differential data input swing ²	V _{in,pp}	120	1200	mV _{pp}
Differential input threshold			50	mV
AC common mode input voltage tolerance (RMS)		15		mV
Differential input return loss ³			Per IEEE P802.3ba, Section 86A.4.1.1	dB
J2 Jitter Tolerance	Jt2	0.17		UI
J9 Jitter Tolerance	Jt9	0.29		UI
Data Dependent Pulse Width Shrinkage	DDPWS	0.07		UI
Eye mask coordinates ⁴	X1, X2 Y1, Y2		0.11, 0.31 95, 350	UI mV

Receiver (per Lane)	Symbol	Min.	Typical	Max.	Unit
Single-ended output voltage		-0.3		4.0	V
Differential data output swing ⁴	V _{out,pp}	0		800	mV _{pp}
AC common mode output voltage (RMS)				7.5	mV
Termination mismatch at 1 MHz				5	%
Differential output return loss ³			Per IEEE P802.3ba, Section 86A.4.2.1		dB
Common mode output return loss ³			Per IEEE P802.3ba, Section 86A.4.2.2		dB
Output transition time, 20% to 80%		28			ps
J2 Jitter output	Jo2			0.42	UI
J9 Jitter output	Jo9			0.65	UI
Eye mask coordinates #1 ⁴	X1, X2 Y1, Y2		0.29, 0.5 150, 425		UI mV
Power Supply Ripple Tolerance	PSR	50			mV _{pp}

Notes

1. Maximum total power value is specified across the full temperature and voltage range.
2. From power-on and end of any fault conditions.
3. After internal AC coupling. Self-biasing 100Ω differential input.
4. 10 MHz to 11.1 GHz range.
5. Hit ratio = 5 x 10E-5.
6. AC coupled with 100Ω differential output impedance.

Optical Characteristics

Transmitter	Symbol	Min.	Typical	Max.	Unit
Signaling Speed per Lane ¹			10.3125		GBd
Lane center wavelengths (range)	λ _c		1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5		nm

Total Average Launch Power	P_{OUT}		10.5	dBm
Transmit OMA per Lane	TxOMA	0.3	5.0	dBm
Average Launch Power per Lane ²	TXPx	-2.7	4.5	dBm
Difference in launch power between any two lanes (OMA)			4.7	dB
Transmitter Dispersion Penalty	TDP		2.6	dB
Launch power (OMA) minus TDP per lane		-0.5		dBm
Optical Extinction Ratio	ER	5.5		dB
Sidemode Suppression ratio	SSRmin	30		dB
Average launch power of OFF transmitter, per lane			-30	dBm
Relative Intensity Noise ³	RIN		-128	dB/Hz
Optical Return Loss Tolerance			20	dB
Transmitter Reflectance			-12	dB
Transmitter eye mask definition	X1, X2, X3, Y1, Y2, Y3		0.25, 0.4, 0.45 0.25, 0.28, 0.4	

Receiver	Symbol	Min.	Typical	Max.	Unit
Signaling Speed per Lane ⁴			10.3125		GBd
Lane center wavelengths (range)	λ_c		1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5		nm
Receive Power (OMA) per Lane	RxOMA			-4.0	dBm
Average Receive Power per Lane ^{5,6}	RXPx	-21.2		-4.5	dBm
Receiver Sensitivity (OMA) per Lane	Rxsens			-19	dBm
Signaling Speed per Lane			10.3125		GBd
Damage Threshold per Lane	PMAX			3.8	dBm
Return Loss	RL			-26	dB
Vertical eye closure penalty, per lane				2.2	dB
Receive electrical 3 dB upper cutoff frequency, per lane				12.3	GHz
LOS De-Assert	LOSD			-19	dBm
LOS Assert	LOSA	-35			dBm
LOS Hysteresis			1		dB
Damage Threshold per Lane	PMAX			3.8	dBm

Notes:

1. Transmitter consists of 4 lasers operating at up to 10.3 Gb/s each, ± 100 ppm
2. Minimum value is informative.
3. RIN is scaled by $10 \cdot \log(10/4)$ to maintain SNR outside of transmitter.

- 4. Receiver consists of 4 photodetectors operating at up to 10.3125 Gb/s each, ± 100 ppm
- 5. Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.
- 6. Maximum value is based on a min. of 9dB loss. Additional attenuation may be required when connected in loopback or short fiber link.

Ordering Information

Part Number	Wavelength	Distance 9/125 μ m SMF	Temperature
AQSFP40GER4-40	1270/1290/1310/1330nm	40 Km	0~70°C Commercial

Warranty

FIVE years of limited warranty for products sold directly by aTrian Technologies, unless special agreements have been set. Warranty period start from the ship date and will be only valid for the original customer who bought the product. If you have purchased the product from a reseller you must contact him directly. RMA Form and full warranty details are available on our website.