



Features

- Up to 14.025Gb/s bi-directional data links
- Electrical interface specifications per SFF-8431
- Management interface specifications per SFF-8432 and SFF-8472
- Build-in Dual CDR at 14.025Gb/s and bypass at 4.25Gb/s and 8.5Gb/s
- SFP+ MSA package with duplex LC connector
- Uncooled 1310nm DFB Laser
- Up to 10 km on 9/125um SMF
- Single +3.3V power supply
- Class 1 laser safety certified

- 1.8W maximum power consumption with established link
- RoHS Compliant
- Commercial operating temperature: 0°C to +70°C

Applications

- Tri-Rate 4.25/8.5/14.025 Gb/s Fibre Channel Rate

1. Absolute Maximum Ratings

Operation in excess of any absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Typ	Max	Units
Maximum Supply Voltage	Vcc	-0.5		4.2	V
Storage Temperature	TS	-40		85	°C
Case Operating Temperature	TOP	0		70	°C
Relative Humidity	RH	0		85	%

2. Electrical Characteristics

(TOP = -5 to 85 °C, VCC = 3.00 to 3.60 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.15		3.45	V	2
Supply Current	Icc		200	300	mA	2

Transmitter						
Input differential impedance	Rin		100		Ω	3
Single ended data input swing	Vin,pp	90		350	mV	
Transmit Disable Voltage	VD	2		VccT+0.3	V	
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	4
Receiver						
Single ended data output swing	Vout,pp	185		425	mV	5
Data output rise/fall time, 4.25 Gb/s	tr, tf			120	ps	6
LOS Fault	VLOS fault	2		VccHOST	V	7
LOS Normal	VLOS norm	Vee-0.3		Vee+0.4	V	7
Power Supply Rejection	PSR	66			mVpp	8

Notes:

1. Non-condensing.
2. Module power consumption never exceeds 1W with established link.
3. AC coupled.
4. Or open circuit.
5. Into 100 ohm differential termination.
6. 20 – 80 %.
7. LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
8. All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver MultiSource Agreement (MSA)6, September 14, 2000. The Power Supply Rejection applies for a supply voltage range of 3.1 to 3.6 V.
9. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and Δ DJ.
10. For 14.025 and 8.5 Gb/s operation, Deterministic Jitter and Total Jitter are not specified per FC-PI-5 Rev 6.10. Jitter values for gamma T and gamma R are controlled by TDP and stressed receiver sensitivity.

3. Optical Characteristics

(TOP = 0 to 70 °C, VCC = 3.15 to 3.45 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Power, 14.025 Gb/s	PO,RH	-5.0		+2.0	dBm	1,2
Output Opt. Power, 4.25, 8.5 Gb/s	PO,RL	-5.0		-1.0	dBm	3
Optical Wavelength	σ	1295		1325	nm	4
Spectral Width	λ			1	nm	4,5
Optical Modulation Amplitude, 14.025 Gb/s	OMA	631			mW	6
Optical Modulation Amplitude, 4.25, 8.5 Gb/s	OMA	290			mW	4,6
Transmitter and Dispersion Penalty, 14.025 Gb/s	TDP			4.4	dB	7
Transmitter and Dispersion Penalty, 8.5 Gb/s	TDP			3.2	dB	7
Optical Rise/Fall Time, 4.25 Gb/s	tr/ tf			90	ps	8
RIN				-130	dB/Hz	
Receiver						
Unstressed Receiver OMA Sensitivity, 14.025 Gb/s	RSENSr			0.063	mW	
Unstressed Receiver OMA Sensitivity, 8.5 Gb/s	RSENSr			0.042	mW	9
Unstressed Receiver OMA Sensitivity, 4.25 Gb/s	RSENS4			0.029	mW	9
Average Received Power	RxMAX			+2.0	dBm	
Optical Center Wavelength	$^{\circ}\text{C}$	1260		1370	nm	
Return Loss		12			dB	
LOS De-Assert	LOSD			-19	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis		0.5			dB	

Notes:

1. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
2. High Bandwidth Mode. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
3. Low Bandwidth Mode. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
4. Also specified to meet curves in FC-PI-5 Rev 6.101 Figures 23, 24, and 25, which allow trade-off between wavelength, spectral width and OMA for 4.25 and 8.5 Gb/s operation.

5. 20dB spectral width.
6. Equivalent extinction ratio specification for Fibre Channel. Allows smaller ER at higher average power.
7. For 14.025 and 8.5 Gb/s operation, Jitter values for gamma T and gamma R are controlled by TDP.
8. Unfiltered, 20-80%. Complies with IEEE 802.3 (Gig. E), FC 4x eye masks when filtered.
9. Measured with PRBS 27-1 at 10-12 BER.

4. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Data Rate	BR	4.25		14.025	Gb/sec	1
Bit Error Rate	BER			10-12		2
Supported Link Length on 9/125 µm SMF, 4.25, 8.5, 14.025 Gb/s	LMAX1		10		km	3

Notes:

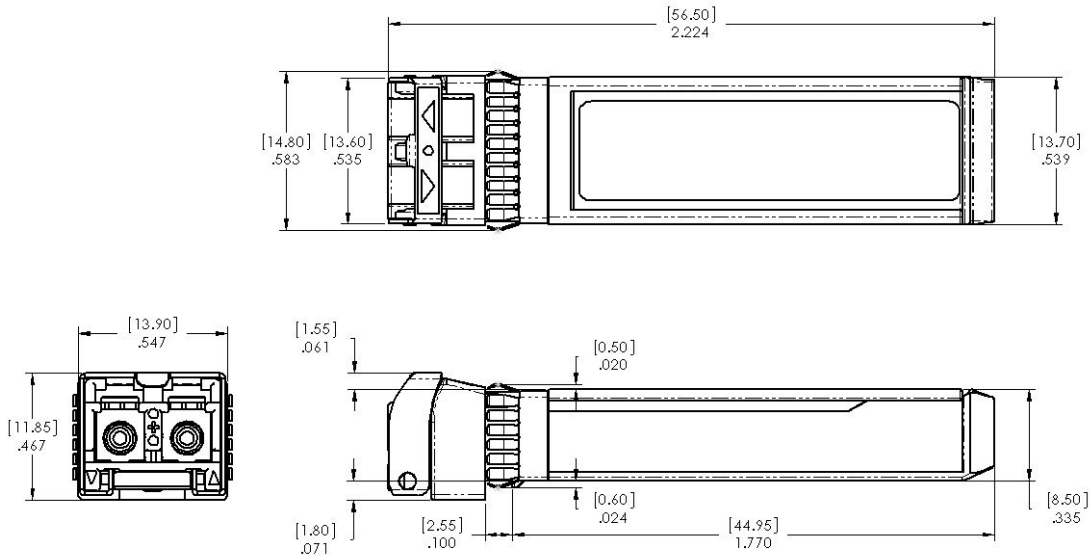
1. 4x/8x/16x Fibre Channel compliant.
2. Tested with a PRBS 27-1 test pattern for 4.25 and 8.5Gb/s operation. Tested with a PRBS 2³¹-1 test pattern for 14.025Gb/s operation.
3. Distances are based on FC-PI-5 Rev. 6.10¹ and IEEE 802.3 standards.

5. Environmental Specifications

These 1310nm Extended Temperature SFP+ transceivers have an operating temperature range from -5°C to +85°C case temperature.

Parameter	Symbol	Min	Typ	Max	Units
Case Operating Temperature	Top	0		70	°C
Storage Temperature	Tsto	-40		85	°C

6. Mechanical Diagram



Note: External physical characteristics are subject to variation. This may include, but is not limited to, external case designs, pull tab colors and/or shapes, removal latch styles or colors, and label sizes and placement. These variations do not affect the function or characteristics of the transceivers.

7. Ordering Information

OEM	Part Number	OEM	Part Number
MSA Champion ONE	16GSFP+F-LR	MSA Champion ONE	XBR-000198-C1

8. Contact Information

Tel: 800.590.9535

Web: <http://www.approvednetworks.com>