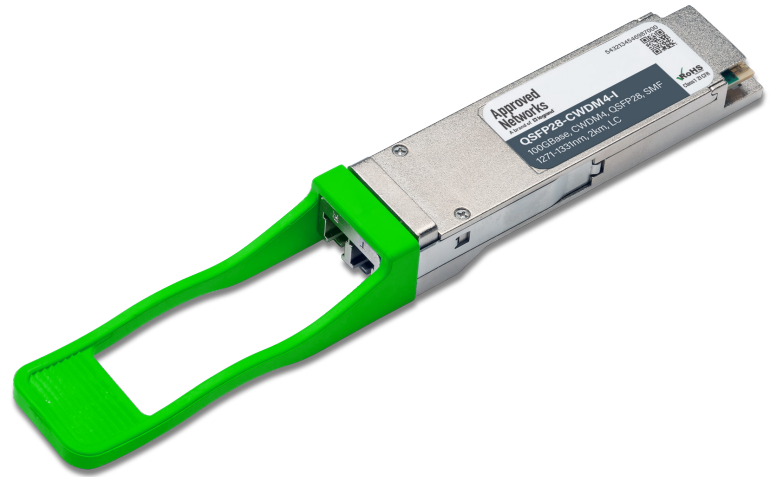


Features

- Hot-pluggable QSFP28 form factor
- Supports 103.1Gb/s aggregate bit rate
- Power dissipation < 4.5W
- RoHS-6 compliant
- Industrial case temperature range of -40°C to +85°C
- Adaptive CTLE
- Single 3.3V power supply
- Loss budget of 5 dB on up to 2 km of Single Mode Fiber (SMF) [with KR4 FEC]
- 4x25Gb/s CWDM transmitter
- 4x25G retimed electrical interface



- Duplex LC receptacles
- I2C management interface

Applications

- 100G CWDM applications with FEC
- Outside plant
- Reduced air flow central office

1. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate (all wavelengths combined)	BR			103.1	Gb/s	
Bit Error Ratio @25.78Gb/s	BER			5x10 ⁻⁵		1
Maximum Supported Reach						
Fiber Type						
SMF per G.652	LossBdgt			5	dB	2

1. Tested with a 2³¹ - 1 PRBS.
2. This 5 dB loss budget includes 2.5dB optical coding gain from FEC on the host [RS-FEC (528,514) per Clause 91]. The maximum informative link length is 2km. The option to bypass RS-FEC is not supported. Loss budget may include up to 1dB MPI loss penalty with worse case Transmitter and worst case connector MPI.

2. Environmental Specifications

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

3. Absolute Maximum Ratings

Module performance is not guaranteed beyond the operating range.
Exceeding the limits below may damage the transceiver module permanently.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		3.6	V	
Storage Temperature	TS	-40		85	°C	
Case Operating Temperature	TOP	-40		85	°C	
Relative Humidity	RH	15		85	%	1
Receiver Damage Threshold, per Lane	PRdmg	3.5			dBm	

1. Non-condensing.

4. Optical Characteristics

(EOL, TOP = -40 to +85 °C, VCC = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Signaling Speed per Lane		25.78125, 24.33024, 10.3125			GBd	1
Lane center wavelengths (range)		1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5			nm	
Transmit OMA per Lane	TxOMA1	-4		2.5	dBm	
Transmit OMA per Lane @TDP max	TxOMA2	-2			dBm	2
Transmit Average Power per Lane				2.5	dBm	8
Optical Extinction Ratio	ER	3.5			dB	
Transmitter and Dispersion Penalty per Lane	TDP			3	dB	3
Launch Power (OMA-TDP)	OMA-TDP	-5			dBm	
Sidemode Suppression ratio	SSRmin	30			dB	
Average launch power of OFF transmitter, per lane				-30	dBm	

Transmitter Reflectance				-12	dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		Follow CWDM4 MSA				4
Receiver						
Signaling Speed per Lane		25.78125, 24.33024, 10.3125			GBd	5
Lane center wavelengths (range)		1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5			nm	
Receive Saturation (OMA) per Lane	Rmax	2.5			dBm	
Damage threshold per Lane		3.5			dBm	
Unstressed Receiver Sensitivity (OMA) per Lane	Rxsens			-11.3	dBm	6
Stressed Receiver Sensitivity (OMA) per Lane	SRS			-8.9	dBm	7
Conditions of stressed receiver sensitivity test:						
Vertical Eye Closure Penalty	VECP	Follow CWDM4 MSA			dB	
Stressed J2 Jitter	J2		UI			
Stressed J4 Jitter	J4		UI			
SRS eye mask definition {X1, X2, X3, Y1, Y2, Y3}		Follow CWDM4 MSA				
LOS De-Assert	LOSD			-13.5	dBm	
LOS Assert	LOSA	-24		-15	dBm	
LOS Hysteresis			1.5		dB	

1. Transmitter consists of 4 lasers operating at 25.78Gb/s each.
2. At maximum TDP.
3. TDP value does not include MPI penalty.
4. Hit ratio of 5×10^{-5} , per IEEE.
5. Receiver consists of 4 photodetectors operating at 25.78Gb/s each.
6. Sensitivity is specified at 5×10^{-5} BER.
7. Measured with 4WDM MSA⁷ conformance test signal at TP3 for 5×10^{-5} BER.
8. Power value and power accuracy are with all channels on.

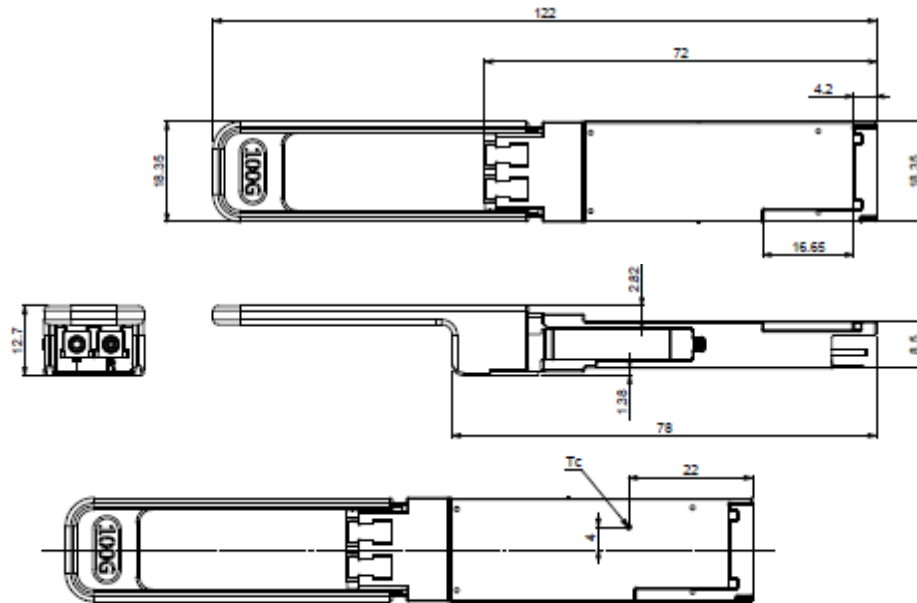
5. Electrical Characteristics

(EOL, TOP = -40 to +85 °C, VCC = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.135		3.465	V	
Supply Current	Icc			1.6	A	
Module total power	P			4.5	W	1
Transmitter						
Signaling rate per lane		25.78125, 24.33024, 10.3125			GBd	
Differential data input swing per lane	V _{in,pp}			900	mV	
Differential input return loss (min)	RL _d (f)	9.5 - 0.37f, 0.01 ≤ f < 8 4.75 - 7.4log ₁₀ (f/14), 8 ≤ f < 19				
Differential to common mode input return loss (min)	RL _{dc} (f)	22-20(f/25.78), 0.01 ≤ f < 12.89 15-6(f/25.78), 12.89 ≤ f < 19			dB	
Differential termination mismatch				10	%	
Stressed input parameters						
Eye width			0.46		UI	
Applied pk-pk sinusoidal jitter		Per IEEE 802.3bm Table 88-13				
Eye height			95		mV	
DC common mode voltage		-350		2850	mV	
Receiver						
Signaling rate per lane		25.78125, 24.33024, 10.3125			GBd	
Differential data output swing	V _{out,pp}	100		400	mVpp	2
		300		600		
		400		800		
		600		1200		
Eye width		0.57			UI	
Vertical eye closure				5.5	dB	
Differential output return loss (min)	RL _d (f)	9.5 - 0.37f, 0.01 ≤ f < 8 4.75 - 7.4log ₁₀ (f/14), 8 ≤ f < 19			dB	
Common to differential mode conversion return loss (min)	RL _{dc} (f)	22-20(f/25.78), 0.01 ≤ f < 12.89 15-6(f/25.78), 12.89 ≤ f < 19			dB	
Differential termination mismatch				10	%	
Transition time, 20% to 80%	tr _{tf}	12			ps	

- Maximum total power value is specified across the full temperature and voltage range. Power consumption ≤ 4.5W when stabilized (both Tx and Rx CDR locked), but may be ≤ 5W during locking acquisition.
- Output voltage is settable in 4 discrete ranges via I2C. Default range is Range 2 (400 – 800 mV).

6. Mechanical Diagram



Case Temperature measurement point

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 Generic	QSFP28-CWDM4-I		

8. Contact Information

Tel: 800.590.9535

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