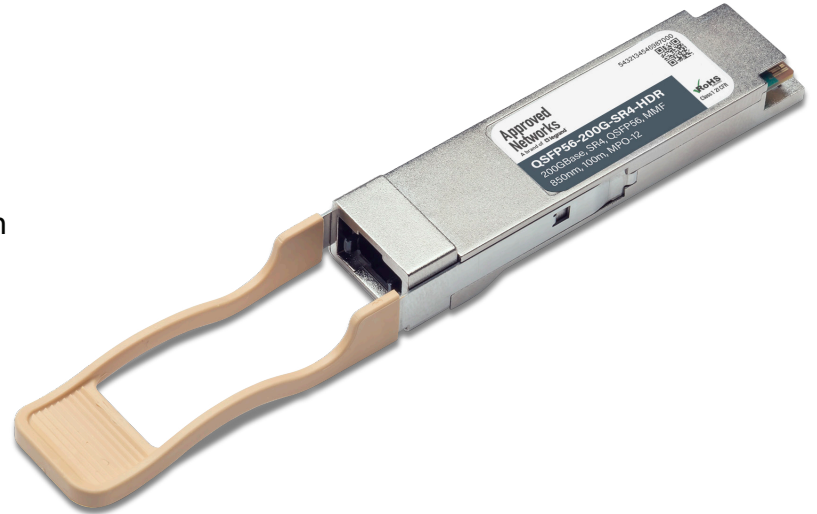


## Features:

- QSFP56 MSA compliant
- 4 parallel lanes on 850nm center wavelength
- Compliant to IEEE 802.3bs Specification
- Up to 70m transmission on OM3, 100m on OM3 with FEC or 100m on OM4
- Operating case temperature: 0 to 70°C
- 4x53.125Gb/s electrical interface (200GAUI-4)
- Data Rate 53.125Gbps (PAM4) per channel.
- Maximum power consumption 5W
- MPO-12 APC connector
- RoHS compliant



## Applications:

- Data Center Interconnect
- 200G Ethernet
- Infiniband interconnects
- Enterprise networking

## 1. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Storage Temperature	TS	-40	85	degC
Operating Case Temperature	TOP	0	70	degC
Power Supply Voltage	VCC	-0.5	3.6	V
Relative Humidity (non-condensation)	RH	0	85	%

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

## 2. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Operating Case Temperature	TOP	0		70	degC	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate, each Lane			26.5625		GBd	PAM4
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>		1
Link Distance with OM3	D	0.5		100	m	2

**Notes:**

1. FEC provided by host system.
2. FEC required on host system to support maximum distance.

**3. Electrical Characteristics**

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Test Point	Min	Typical	Max	Unit	Notes
Power Consumption				5	W	
Supply Current	I <sub>cc</sub>			1.52	A	
<b>Transmitter (each Lane)</b>						
Signaling Rate, each Lane	TP1	26.5625 ± 100 ppm			GBd	
Differential pk-pk Input Voltage Tolerance	TP1a	900			mV <sub>pp</sub>	1
Differential Termination Mismatch	TP1			10	%	
Differential Input Return Loss	TP1	IEEE 802.3-2015 Equation (83E-5)			dB	
Differential to Common Mode Input Return Loss	TP1	IEEE 802.3-2015 Equation (83E-6)			dB	
Module Stressed Input Test	TP1a	See IEEE 802.3bs 120E.3.4.1				2
Single-ended Voltage Tolerance Range (Min)	TP1a	-0.4 to 3.3			V	
DC Common Mode Input Voltage	TP1	-350		2850	mV	3
<b>Receiver (each Lane)</b>						
Signaling Rate, each lane	TP4	26.5625 ± 100 ppm			GBd	
Differential Peak-to-Peak Output Voltage	TP4			900	mV <sub>pp</sub>	
Common Mode Voltage		-350		2850	mV	
AC Common Mode Output Voltage, RMS	TP4			17.5	mV	

Differential Termination Mismatch	TP4			10	%	
Differential Output Return Loss	TP4	IEEE 802.3-2015 Equation (83E-2)				
Common to Differential Mode Conversion Return Loss	TP4	IEEE 802.3-2015 Equation (83E-3)				
Transition Time, 20% to 80%	TP4	9.5			ps	
Near-end Eye Symmetry Mask Width (ESMW)	TP4		0.265		UI	
Near-end Eye Height, Differential	TP4	70			mV	
Far-end Eye Symmetry Mask Width (ESMW)	TP4		0.2		UI	
Far-end Eye Height, Differential	TP4	30			mV	
Far-end Pre-cursor ISI Ratio	TP4	-4.5		2.5	%	
Common Mode Output Voltage (Vcm)	TP4	-350		2850	mV	3

**Notes:**

1. With the exception to IEEE 802.3bs 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
2. Meets BER specified in IEEE 802.3bs 120E.1.1.
3. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

**4. Optical Characteristics**

Parameter	Symbol	Min	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Center Wavelength	$\lambda_C$	840	850	860	nm	
Data Rate, each Lane		26.5625 $\pm$ 100 ppm			GBd	
Modulation Format		PAM4				
RMS Spectral Width	$\Delta\lambda_{rms}$			0.6	nm	Modulated
Average Launch Power, each Lane	PAVG	-6.5		4	dBm	1
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each Lane	POMA	-4.5		3	dBm	2

Launch Power in OMAouter minus TDECQ, each Lane		-5.9				dB	
Transmitter and Dispersion							
Eye Closure for PAM4, each Lane	TDECQ			4.5		dB	
Extinction Ratio	ER	3				dB	
Optical Return Loss Tolerance	TOL			12		dB	
Average Launch Power of OFF Transmitter, each Lane	Poff			-30		dBm	
Encircled Flux		≥ 86% at 19 μm ≤ 30% at 4.5 μm					
<b>Receiver</b>							
Center Wavelength	λC	840	850	860		nm	
Data Rate, each Lane		26.5625 ± 100 ppm				GBd	
Modulation Format		PAM4					
Damage Threshold, each Lane	THd	5				dBm	3
Average Receive Power, each Lane		-8.4		4		dBm	4
Receive Power (OMAouter), each Lane				3		dBm	
Receiver Sensitivity (OMAouter), each Lane	SEN			Equation1		dBm	7
Stressed Receiver Sensitivity (OMAouter), each Lane	SRS			-3.4		dBm	5
Receiver Reflectance	RR			-12		dB	
LOS Assert	LOSA	-30				dBm	
LOS De-assert	LOSD			-12		dBm	
LOS Hysteresis	LOSH	0.5				dB	
<b>Stressed Conditions for Stress Receiver Sensitivity (Note 7)</b>							
Stressed Eye Closure for PAM4 (SECQ), Lane under Test			4.5			dB	
SECQ - 10log10(Ceq)f (max), lane under test			4.5			dB	
OMAouter of each Aggressor Lane			3			dBm	

**Notes:**

1. Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Even if the TDECQ < 1 dB, the OMAouter (min) must exceed the minimum value specified here.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.

4. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
5. Measured with conformance test signal at receiver input for the BER of  $2.4 \times 10^{-4}$ .
6. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.
7. Receiver sensitivity Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 4.5 dB. Receiver sensitivity should meet Equation (1), which is illustrated in Figure 1.

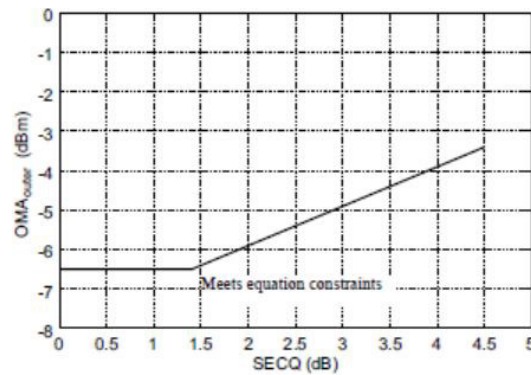
$$RS = \max(-6.5, SECQ - 7.9) \text{ (dBm)} \text{ (Equation 1)}$$

where

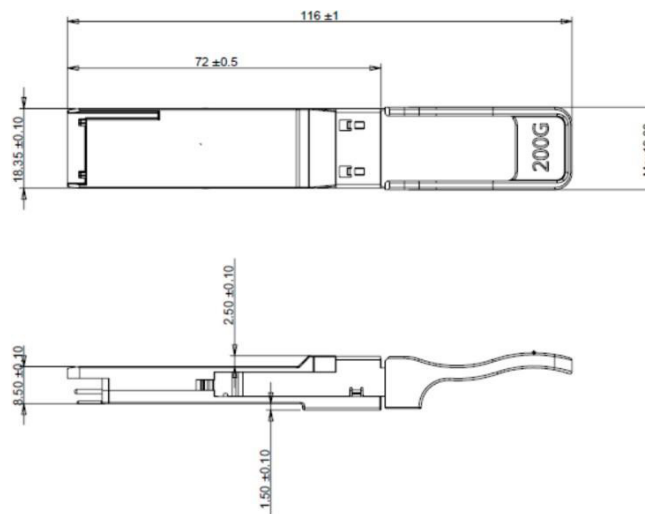
RS is the receiver sensitivity

SECQ is the SECQ of the transmitter used to measure the receiver sensitivity

The normative requirement for receivers is stressed receiver sensitivity.



## 5. 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.

## 6. Ordering Information

OEM	Part Number	OEM	Part Number
MSA Generic	AN-QSFP56-200G-SR4-HDR	NVIDIA/Mellanox	MMA1T00-HS-A

## 7. Contact Information

Tel: 800.590.9535

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