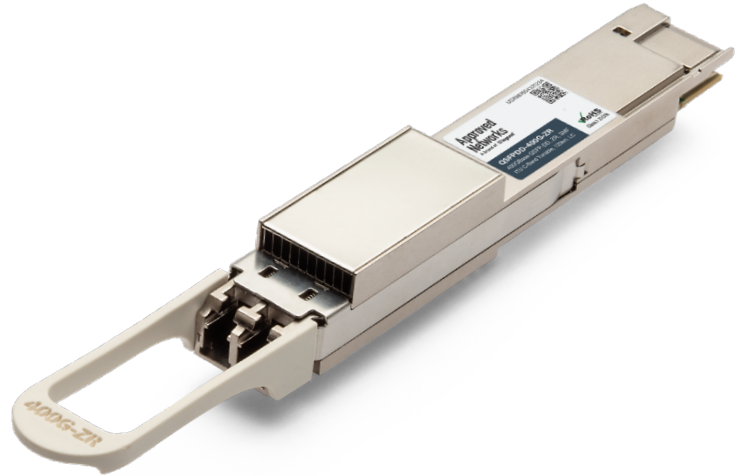


Features:

- Supports 425Gbps
- Single 3.3V Power Supply
- Power dissipation < 19W
- Transmitter type SiPh
- Up to 40km unamplified or up to 120km over SMF with EDFA
- RoHS compliant
- QSFP-DD MSA Compliant
- 8x53.125Gbps (PAM4) electrical interface
- Default full C-band 100GHz Grid with 75GHz Grid is optional
- Duplex LC connector
- Commercial case temperature range of 0°C to 70°C



- I²C interface with integrated Digital Diagnostic Monitoring
- Safety Certification: TUV/UL/FDA*1
- RoHS compliant

Applications:

- 400G-ZR applications
- Data center interconnection
- DWDM networks

1. Absolute Maximum Ratings

Exceeding the absolute maximum ratings table may cause permanent damage to the device. This is just an emphasized rating, and does not involve the functional operation of the device that exceeds the specifications of this technical specification under these or other conditions. Long-term operation under absolute maximum ratings will affect the reliability of the device.

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T _s	-40		85	°C
Relative Humidity	RH	5		85	%
Power Supply Voltage	V _{cc}	-0.5	3.3	3.6	V
Data Input Voltage	Single Ended	-0.5		V _{cc} +0.5	V
	Differential*			0.8	V

* This is the maximum voltage that can be applied across the differential inputs without damaging the input circuitry. The damage threshold of the module input shall be at least 1600 mV peak to peak differential.

2. Operating Conditions*1

For operations beyond the recommended operating conditions, optical and electrical characteristics are not defined, reliability is not implied, and such operations for a long time may damage the module.

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature*2	Tc	0		70	°C
Power Supply Voltage	Vcc	3.135	3.3	3.465	V
Power Supply Noise*3				66	mVpp
Power Dissipation	PD			19	W
Electrical Signal Rate Per Channel*4			26.5625		GBd
Optical Signal Rate Per Channel*5			59.84375		GBd
Receiver Differential Data Output Load		100			Ohm
Fiber Length*6				120	km

Notes:

1. Power Supply specifications, Instantaneous, sustained and steady state current compliant with QSFP-DD MSA Power Classification.
2. The position of case temperature measurement is shown in Figure 9. Continuous operation at the maximum Recommended Operating Case Temperature should be avoided in order not to degrade reliability.
3. Power Supply Noise is defined as the peak-to-peak noise amplitude over the frequency range at the host supply side of the recommended power supply filter with the module and recommended filter in place. Voltage levels including peak-to-peak noise are limited to the recommended operating range of the associated power supply.
4. 400GAUI-8 operation with Host generated FEC. The transmitter must receive pre-coded FEC signals from the host ASIC.
5. 400G ZR operation with Line generated CFEC.
6. *11: 9µm SMF with EDFA.

3. General Electrical Characteristics

Unless otherwise stated, the following characteristics are defined under recommended operating conditions.

Parameter	Typical	Max.	Unit
Transceiver Power Consumption	18	19	W
Transceiver Power Supply Total Current	5450	6060	mA
AC Coupling Internal Capacitor	0.1		µF

4. High Speed Electrical Specifications

Unless otherwise stated, the following characteristics are defined under recommended operating conditions.

Parameter	Test Point	Min.	Typical	Max.	Unit	Conditions
Signaling Rate, Per Lane (PAM4 Encoded)	TP1		26.5625		GBd	+/- 100 ppm
Differential Peak-Peak Input Voltage Tolerance	TP1a	900			mV	
Differential Input Return Loss	P1		Equation (83E-5)		dB	802.3bs
Differential To Common Mode Input Return Loss (Min)	TP1		Equation (83E-6)		dB	802.3bs
Differential Termination Mismatch				10	%	
Single-Ended Voltage Tolerance Range	TP1a	-0.4		3.3	V	
DC Common-Mode Output Voltage*1	TP1	-350		2850	mV	
Module Stressed Input Test *2						
Eye Width			0.22		UI	
Applied Peak-Peak Sinusoidal Jitter			120E-6			802.3bs
Eye Height			32		mV	

Notes:

1. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.
2. Module stressed input tolerance is measured using the procedure defined in 120E.1.1.

5. High Speed Electrical Output Characteristics

Unless otherwise stated, the following characteristics are defined under recommended operating conditions.

Parameter	Test Point	Min.	Typical	Max.	Unit
Signaling Rate Per Lane(Range)	TP4a		26.5625 ± 100 ppm		GBd
Differential Peak-To-Peak Input Voltage Tolerance	TP4		900	mV	dB

Differential Input Return Loss (Min)	TP4a	Equation (83E-5)			dB
Differential To Common Mode Input Return Loss (Min)	TP4a	Equation (83E-6)			dB
Differential Termination Mismatch	TP4a			10	%
Common Mode Voltage	TP4a	-0.35		2.85	V
Transition time (20% to 80%)	TP4	9.5			ps

6. High Speed Optical Transmitter Characteristics

Unless otherwise stated, the following characteristics are defined under recommended operating conditions.

Optical Characteristics @TP2 Test Point					
Parameter	Symbol	Min.	Typical	Max.	Unit
Signaling Speed		59.84375±20ppm			GBd
Modulation format		DP-16QAM			
Channel frequency	λ	191.3		196.1	THz
Channel Spacing*15			100(75)		GHz
Wavelength Accuracy		-1.8		1.8	GHz
Tx Spectral Excursion				32	GHz
Average launch power*1		-10		-6	dBm
Average launch power*2		-9		0	dBm
Output power with Tx disabled				-20	dBm
Output power during wavelength switching				-20	dBm
In band OSNR		34			dB/0.1nm
Out of band OSNR*1		23			dB/0.1nm
Transmitter Reflectance				-20	dB
Transmitter back reflectance tolerance				-24	dB
Transmitter polarization dependent power power				1.5	dBm
X-Y Skew				5	ps
DC I-Q offset (mean per polarization)				-26	dB
I-Q instantaneous offset				-20	dB
Mean I-Q amplitude imbalance				1	dB
I-Q phase imbalance		-5		5	degrees

I-Q Skew (per polarization)				0.75	ps
Laser RIN (0.2GHz≤f≤10GHz Avg)				-145	dB/Hz
Laser RIN (0.2GHz≤f≤10GHz Peak)				-140	dB/Hz
Transmitter laser disable time				100	ms
Transmitter turn-up time from warm start				180	s
Transmitter turn-up time from cold start				200	s
Transmitter wavelength switching time				180	s
Output power monitor Accuracy	-2			2	dB

Note:

1. This parameter is only for 400G ZR DWDM amplified application.
2. This parameter is only for 400G ZR single wavelength unamplified application.

7. High Speed Optical Receiver Characteristics

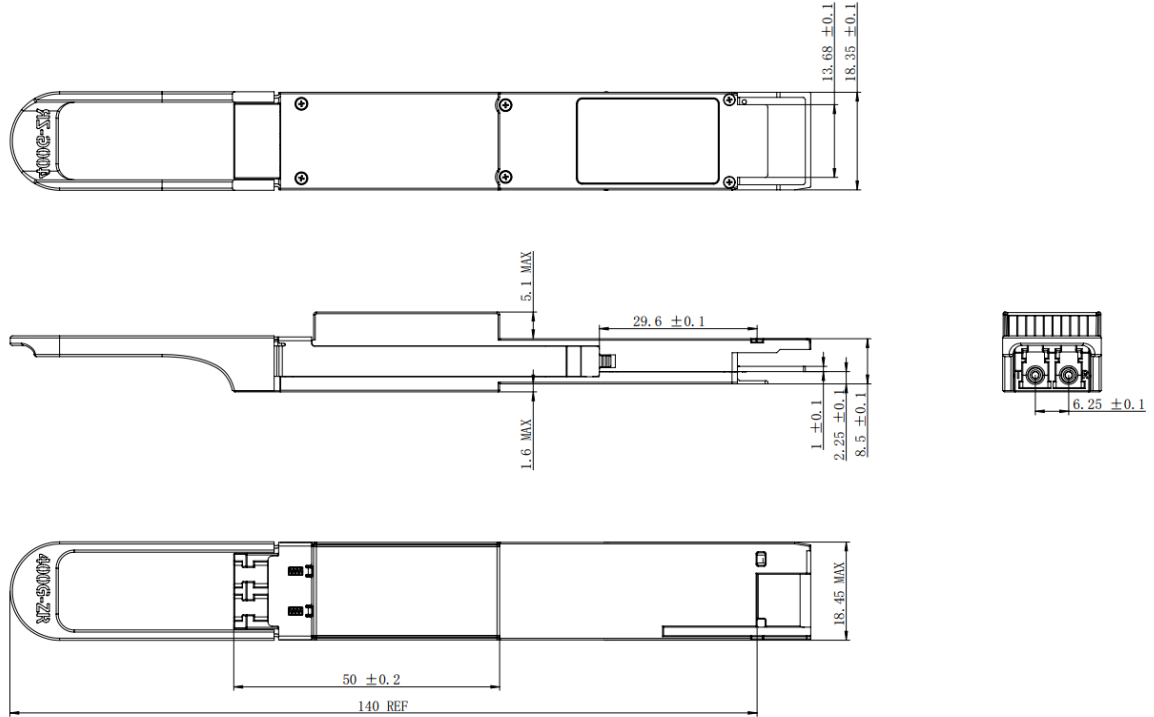
Unless otherwise stated, the following characteristics are defined under recommended operating conditions.

Optical Characteristics @TP3 Test Point (DWDM amplified)					
Parameter	Symbol	Min.	Typical	Max.	Unit
Signaling Speed		59.84375±20ppm			GBd
Channel frequency	λ	191.3		196.1	THz
Frequency offset between received carrier and LO		-3.6		3.6	GHz
Input power range		-12		13	dBm
Input sensitivity*	Sen	-12			dBm
OSNR Tolerance				26	dB/0.1nm
Optical return loss		20			dB
CD Tolerance		2400			ps/nm
Optical path OSNR penalty tolerance				0.5	dB
PMD tolerance		10			ps
Peak PDL tolerance		3.5			dB
Tolerance to change in SOP		50			Krad/s
Optical input power transient tolerance		-2		2	dB
Receiver turn-up time from warm start				10	s

Receiver turn-up time from cold start				200	s
Input power monitor Accuracy		-4		4	dB
Optical Rx_LOS Assert Threshold	LOSA	-20			dBm
Optical Rx_LOS Deassert Threshold	LOSD			-15	dBm
Optical Rx_LOS Hysteresis		1		2.5	dBm
Optical Characteristics @TP3 Test Point (single wavelength unamplified)					
Signaling Speed		59.84375±20ppm			GBd
Channel frequency	λ	191.3		196.1	THz
Frequency offset between received carrier and LO		-3.6		3.6	GHz
Input power range		-20		13	dBm
Input sensitivity*	Sen	-20			dBm
OSNR Tolerance				26	dB/0.1nm
Optical return loss		20			dB
CD Tolerance		1200			ps/nm
Optical path power penalty				0.5	dB
PMD tolerance		7			ps
Peak PDL tolerance		1.5			dB
Tolerance to change in SOP		50			Krad/s
Optical input power transient tolerance		-2		2	dB
Receiver turn-up time from warm start				10	s
Receiver turn-up time from cold start				200	s
Input power monitor Accuracy		-4		4	dB
Optical Rx_LOS Assert Threshold	LOSA	-28			dBm
Optical Rx_LOS Deassert Threshold	LOSD			-23	dBm
Optical Rx_LOS Hysteresis		1		2.5	dBm

* Measured with conformance test signal at TP3 for the BER specified in OIF-400ZR clause.

8. Mechanical Specifications



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.

9. Ordering Information

OEM	Part Number	OEM	Part Number
MSA	AN-QSFPDD-400G-ZR	Arista	QDD-400G-ZR-A
Cisco	QDD-400G-ZR-S-A	Juniper	JNP-QDD-400G-ZR-A

10. Contact Information

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