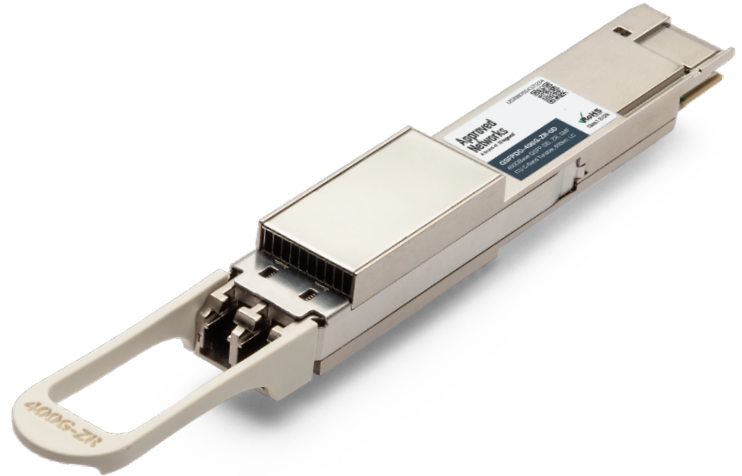


## Features:

- Digital Coherent Optics module, QSFP-DD form factor, Type 2A
- IEEE 400GE or 4x100GE Ethernet compliant host interface
- Coherent 400G optical interface based on OIF 400ZR implementation agreement
- High Tx output power (0dBm) enabling:
  - Unamplified DWDM links up to 40km
  - Unamplified single wavelength links up to 80km
- Dispersion limited transmission reach up to 120km amplified
- Full C-band tunable, 75GHz or 100GHz grid
- Transmitter type EML



- Case temperature range 0°C to 70°C
- Power dissipation < 18.5W

## Applications:

- Metro / regional ROADM networks
- Data center interconnect

## 1. Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
DC supply voltage		VCC	-0.3		3.6	V
Low speed I/O voltages			-0.3		3.6	V
Storage temperature		TS	-40		85	°C
Case operating temperature		TOP	-5		75	°C
Relative humidity	Non-condensing	RH	5		95	%
Rx input power		PRx,in			18	dBm
ESD damage threshold	Human body model (HBM)	DC pins		2000		V
		RF pins		1000		

\* Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

## 2. Environmental Specifications

Parameter	Conditions	Symbol	Min	Max	Unit
Storage temperature		TS	-40	85	°C
Case operating temperature		TOP	0	70	°C
Relative humidity	Non-condensing	RH	5	85	%

## 3. Host and Line Interface Modes

Host Interface Modes					
Host Interface ID	Host Interface Description	Modulation	Forward Error Correction Code	Nominal Symbol Rate (GBd)	Supported Line Interface IDs
17	400GAUI-8	PAM4	RS(544,514)	26.5625	62, 63
13	4 × 100GAUI-2	PAM4	RS(544,514)	26.5625	62, 63
Line Interface Modes					
Line Interface ID	Line Interface Description	Modulation	Forward Error Correction Code	Nominal Symbol Rate (GBd)	Spectral Shaping
62	400ZR, DWDM, Amplified	16QAM	C-FEC	59.8438	None
63	400ZR, Single Wavelength, Unamplified	16QAM	C-FEC	59.8438	None

## 4. Electrical Characteristics

Power & Low Speed I/O						
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Power supply - General						
Power supply voltages	Including ripple, droop and noise below 100kHz		3.135	3.300	3.465	V
Host RMS noise output	40Hz - 10MHz				25	mV
Module RMS noise output	10Hz - 10MHz				30	mV
Module supply noise tolerance	10Hz - 10MHz, peak-to-peak	PSNRmod			66	mV

Module inrush	Instantaneous peak duration	Tip			50	μs
	Initialization time	Tinit			500	ms
<b>Power supply - Low power mode</b>						
Power dissipation		Plp			1.5	W
Power supply current	Instantaneous peak current	ICC,ip,lp			600	mA
	Sustained peak current	ICC,sp,lp			495	
	Steady state current	ICC,lp			475	
<b>Power supply - High power mode - 400GE client</b>						
Power dissipation		Php			18.5	W
Power supply current	Instantaneous peak current	ICC,ip,hp			7.4	A
	Sustained peak current	ICC,sp,hp			6.2	
	Steady state current	ICC,hp			6.0	
<b>Power supply - High power mode - 4x100GE clients</b>						
Power dissipation		Php			19.5	W
Power supply current	Instantaneous peak current	ICC,ip,hp			7.8	A
	Sustained peak current	ICC,sp,hp			605	
	Steady state current	ICC,hp			6.3	
<b>Low speed I/O</b>						
Output voltage, SCL and SDA	Output low	VOL	0.0		0.4	V
	Output high	VOH	VCC-0.5		VCC+0.3	
Input voltage, SCL and SDA	Input low	VIL	-0.3		0.3×VCC	V
	Input high	VIH	0.7×VCC		VCC+0.5	
Capacitance for SCL and SDA I/O signal		Ci			14	pF
Total bus capacitive load for SCL and SDA <sup>1</sup>	400kHz clock rate, 3.0kΩ pull-up, max.	Cb			100	pF
	400kHz clock rate, 1.6kΩ pull-up, max.				200	
Input voltage / current, InitMode, ResetL and ModSelL	Input voltage, low	VIL	-0.3		0.8	V
	Input voltage, high	VIH	2.0		VCC+0.3	
	Input current, 0V < Vin < VCC	lin			360	μA
Output voltage, IntL	Output low, IOL = 2mA	VOL			0.4	V
	Output high, 10kΩ pull-up resistor to host VCC	VOH	VCC-0.5		VCC+0.3	

Output voltage, ModPrsL <sup>2</sup>	Output low, IOL = 2mA	VOL	0.0		0.4	V
	Output high	VOH				
<b>High Speed Data I/O</b>						
<b>Transmitter (module input) - 400GAUI-8, 100GAUI-2</b>						
Signaling rate per lane						GBd
Differential pk-pk input voltage tolerance						mV
Differential input return loss						dB
Differential to common mode input return loss	Per IEEE Std 802.3 [2], Annex 120E, Table 120E-7					dB
Differential termination mismatch						%
Module stressed input test						
Single-ended voltage tolerance range						V
DC common mode voltage						mV
<b>Receiver (module output) - 400GAUI-8, 100GAUI-2</b>						
Signaling rate per lane						GBd
AC common-mode output voltage						mV
Differential peak-to-peak output voltage						mV
Near-end ESMW						UI
Near-end eye height, differential						mV
Far-end ESMW						UI
Far-end eye height, differential	Per IEEE Std 802.3 [2], Annex 120E, Table 120E-3					mV
Far-end pre-cursor ISI ratio						%
Differential output return loss						dB
Common to differential mode conversion return loss						dB
Differential termination mismatch						%
Transition time						ps
DC common mode voltage						mV

**Notes:**

1. For 1000kHz clock rate refer to Figure 6 in [4].
2. ModPrsL can be implemented as a short-circuit to GND on the module.

## 5. Optical Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Symbol rate		Rbaud		59.84		GBd
Modulation format			16QAM			

Channel frequency range	100GHz grid	vC	191.400		196.100	THz
	75GHz grid		191.375		196.100	
Channel spacing	100GHz grid	$\Delta vC$		100		GHz
	75GHz grid			75		
Frequency accuracy		$\delta vC$	-1.5		1.5	GHz
Frequency fine tune range	Fine tuning with Tx output enabled (bright tuning)	vadj	-6.25		6.25	GHz
Laser intrinsic linewidth	Calculated based on FM noise power spectral density (PSD) measurement	LW			300	kHz
Side-mode suppression ratio	No modulation	SMSR	40			dB
Relative intensity noise	Peak over 0.2GHz < f < 10GHz	RIN			-140	dB/Hz
	Average over 0.2GHz < f < 10GHz				-145	
<b>Transmitter</b>						
Tx output power configurable range <sup>1</sup>		PTx,out	-6	0	1	dBm
Tx output power adjustment resolution					0.1	dB
Tx output power tolerance <sup>2</sup>		$\delta PTx,out$	-1.0		1.0	dB
Tx output power monitor range		PTx,m	-8		2	dBm
Tx output power monitor accuracy <sup>3</sup>		$\delta PTx,m$	-1.0		1.0	dB
Tx output power during tuning or when Tx disabled		PTx,dark			-35	dBm
Tx output power imbalance between X- and Y-polarizations		$\Delta PX/Y$			1.5	dB
Tx XY skew					5.0	ps
Tx IQ offset					-26	dB

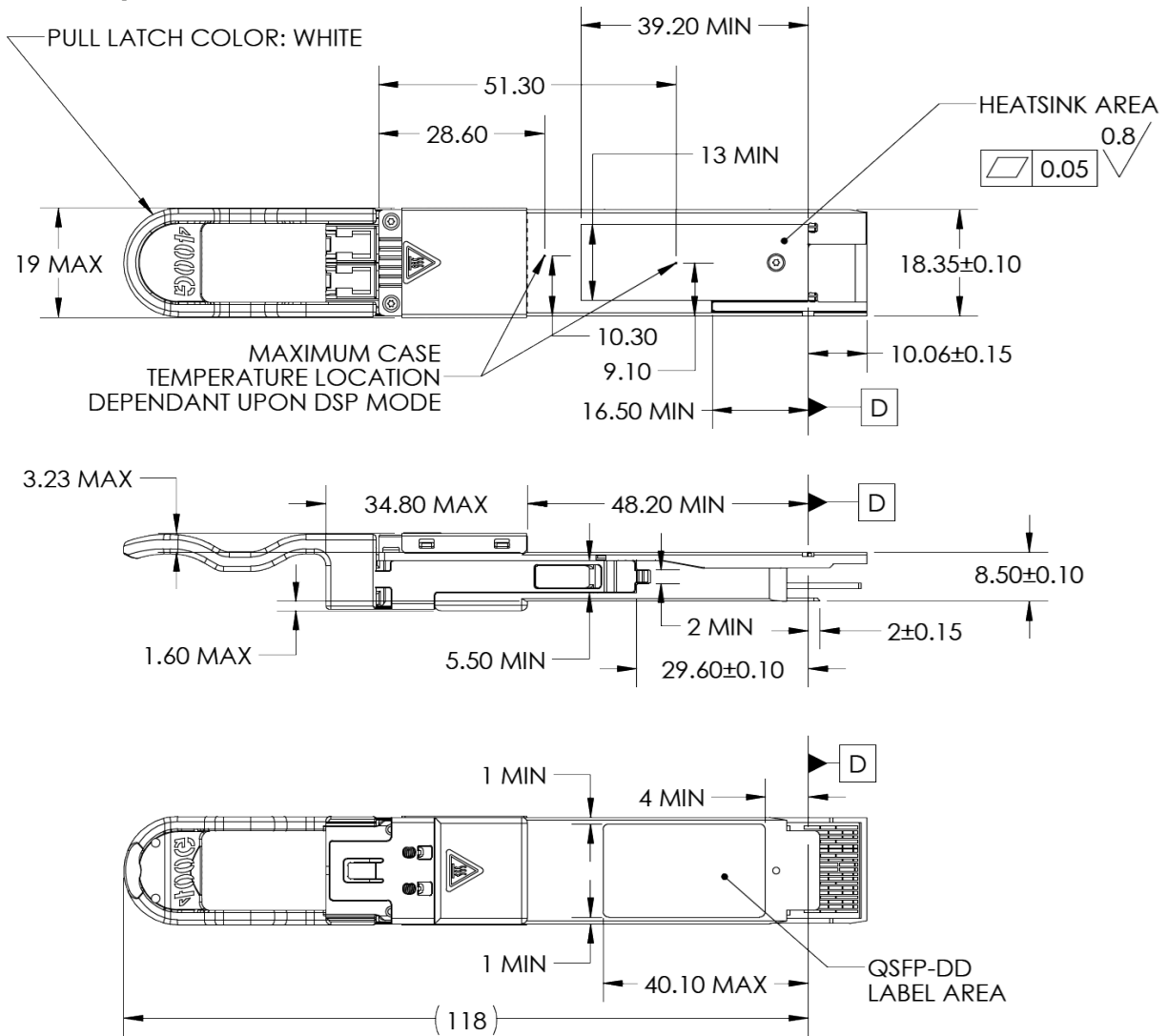
Tx IQ imbalance					1.0	dB
Tx quadrature error			-5.0		5.0	°
Tx IQ skew					0.75	ps
Tx in-band optical signal to noise ratio	Under modulation, $ \Delta f  < 150$ GHz		OSNR <sub>Rin</sub>	40		dB/0.1nm
Tx out-of-band optical signal to noise ratio	Under modulation, $ \Delta f  > 150$ GHz, excluding side mode peaks	Max P <sub>Tx,out</sub>	OSNR <sub>Rout</sub>	40		dB/0.1nm
		Min P <sub>Tx,out</sub>		35		
Tx reflectance					-27	dB
<b>Receiver</b>						
Rx signal input power (amplified) <sup>4</sup>	Full Rx OSNR tolerance		PR <sub>x,sig</sub>	-12		0
	Extended range			-15		3
Rx OSNR tolerance			26			dB/0.1nm
CD tolerance <sup>5</sup>	OSNR penalty < 0.5dB			-2.4		2.4 ns/nm
PMD tolerance <sup>5</sup>	OSNR penalty < 0.5dB					10 ps
Tolerance to change in SOP <sup>5</sup>	OSNR penalty < 0.5dB					60 krad/s
Polarization dependent loss OSNR penalty <sup>5</sup>		1dB PDL				0.5
		2dB PDL				1.0
		4dB PDL				2.0
Rx signal input power transient amplitude	Peak excursion from steady state (within Rx signal input power range)			-3		3 dB
Rx signal input power transient rise/fall time				0.1		ms
Rx signal input power (unamplified)	OSNR > 35dB/0.1nm			-22		0 dBm
Rx signal input power monitor range			PR <sub>x,m(s)</sub>	-22		1 dBm

Rx signal input power monitor accuracy		$\delta PR_{x,m}(s)$	-2.0		2.0	dB
Rx total input power monitor range		$PR_{x,m}(t)$	-22		3	dBm
Rx total input power monitor accuracy	-22dBm to -18dBm	$\delta PR_{x,m}(t)$	-2.0		2.0	dB
	-18dBm to +3dBm		-1.5		1.5	
Rx reflectance					-27	dB

**Notes:**

1. Range of target Tx output power values for which other Tx specifications can be maintained.
2. Deviation from target value under closed loop control, over all operating conditions and life.
3. Tx optical output power monitor reading relative to actual Tx output power.
4. Rx signal input power range over which performance can be guaranteed with <1dB OSNR penalty relative to Rx OSNR tolerance limit.
5. Rx OSNR penalty is specified for Rx signal input powers < 0dBm.

## 6. 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.

## 7. Ordering Information

OEM	Part Number	OEM	Part Number
MSA	AN-QSFPDD-400G-ZR-0D	Arista	QDD-400G-ZR-0D-A
Cisco	QDD-400G-ZR-0D-S-A	Juniper	JNP-QDD-400G-ZR-0D-A

## 8. Contact Information

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