

## Features:

- Supports 206Gbps
- Single 3.3V Power Supply
- Compliant with QSFP-DD CMIS Rev 4.0
- Power dissipation < 8.0W
- Up to 10km over SMF
- QSFP DD MSA Compliant
- 8x25G electrical interface
- Dual CS connector
- Commercial case temperature range of 0°C to 70°C
- 8\*25Gbps DFB based CWDM transmitter
- PIN and TIA array on the receiver side



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

## Applications:

- QSFP DD 2\*100G Ethernet
- Data Centers

## 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	Ts	-40		+85	°C
3.3 V Power Supply Voltage	Vcc	-0.5	3.3	3.6	V
Data Input Voltage – Single Ended		-0.5		Vcc+0.5	V
Data Input Voltage – Differential*5				0.8	V
Operating Relative Humidity	RH	5		85	%
Receiver Damage Threshold, per Lane	Rxdmg	5.5			dBm

\*4: Exceeding any one of these values may damage the device permanently.

\*5: 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. Recommended Operating Conditions

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*7	Tc	0	25	70	°C
Power supply voltage	Vcc	3.135	3.3	3.465	V
Power dissipation	PD			8	W
Electrical Signal Rate per Channel*8				25.78125	GBd
Optical Signal Rate per Channel*9				25.78125	GBd
Power Supply Noise*10				66	mVpp
Receiver Differential Data Output Load		100			Ohm

\*6: Power Supply specifications, Instantaneous, sustained and steady state current compliant with QSFP DD MSA Power Classification.

\*7: 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.

\*8: CAUI 4 operation with Host generated FEC. The transmitter must receive pre coded FEC signals from the host ASIC.

\*9: 2x100G LR4 operation with Host generated FEC. The transmitter must receive pre coded FEC signals from the host ASIC.

\*10: 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. See Figure 7 for recommended power supply filter.

## 3. General Electrical Characteristics\*11

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

Parameter	Symbol	Min.	Typical	Max.	Unit
Transceiver Power Consumption				8	W
Transceiver Power Supply Current, Total				2560	mA

\*11: For control signal timing including ModSelL, ResetL, LPMODE/TxDisable, ModePrsL, IntL/RxLOSL, SCL and SDA see Control Interface Section.

## 4. High Speed Electrical Input Characteristics

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

Parameter	Test Point	Min.	Typical	Max.	Unit	Conditions
Signaling Rate, Per Lane	TP1		25.78125		GBd	+/- 100 ppm
Differential pk-pk Input Voltage Tolerance	TP1a	900			mV	
Differential Return Loss (min)	TP1		Equation(83E-5)		dB	802.3bm

Differential to common mode input return loss (min)	TP1		Equation(83E-6)		dB	802.3bm
Differential termination mismatch	TP1			10	%	
Module stressed input test	TP1a					
Single-ended voltage tolerance range	TP1a	-0.4		3.3	V	
DC common-mode output voltage*12	TP1	-350		2850	mV	
<b>Module stressed input test *13</b>						
Eye width		0.46			UI	
Applied pk-pk sinusoidal jitter	Table 88-13					802.3bm
Eye height		95			mV	

\*12: DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

\*13: Module stressed input tolerance is measured using the procedure defined in 83E.3.4.1.1.

## 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)	TP4		25.78125 ± 100 ppm		GBd
Differential output voltage	TP4			900	mV
Differential output return loss (Min)	TP4	Equation (83E-2)			dB
Differential to common mode conversion return loss (min)	TP4	Equation (83E-3)			dB
Differential termination mismatch	TP4			10	%
Common mode voltage	TP4	-0.35		2.85	V
Transition Time (20% to 80%)	TP4	12			ps
Eye width	TP4	0.57			UI
Eye height differential	TP4	228			mV
Vertical eye closure	TP4			5.5	dB

## 6. Transmitter Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
Signaling speed per lane	BRAVE		25.78125		Gbps
Data Rate Variation		-100		+100	ppm
Modulation format	NRZ				
Lane_0/4 Center Wavelength	$\lambda C0$	1294.53	1295.56	1296.59	nm
Lane_1/5 Center Wavelength	$\lambda C1$	1299.02	1300.05	1301.09	nm
Lane_2/6 Center Wavelength	$\lambda C2$	1303.54	1304.58	1305.63	nm
Lane_3/7 Center Wavelength	$\lambda C3$	1308.09	1309.14	1310.19	nm
Total Average Output Power	Po			10.5	dBm
Side Mode Suppression Ratio	SMSR	30			dB
Extinction Ratio	ER	4			dB
Average Launch Power each Lane*14	Peach	-4.3		4.5	dBm
Transmit OMA each Lane*15	TxOMA	-1.3		4.5	dBm
Launch power in OMA minus TDP, each lane	OMA-TDP	-2.3			dBm
Transmitter and Dispersion Penalty per Lane *16	TDP			2.2	dB
Average launch power of OFF transmitter				-30	dBm
Optical Return Loss Tolerance				20	dB
Transmitter Reflectance*17				-12	dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}*18	{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				

\*14: Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter

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with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.

\*15: Even if the TDP < 1.0dB, the OMA (min) must exceed this value.

\*16: TDP does not include a penalty for multi-path interference (MPI).

\*17: Transmitter reflectance is defined looking into the transmitter.

\*18: Hit ratio of 5x10<sup>-5</sup>

## 7. Receiver Optical Characteristics

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

Parameter	Symbol	Min.	Typical	Max.	Unit
Signaling Speed per Lane	BRAVE		25.78125		Gbps
Data Rate Variation	-100			+100	ppm
Lane_0/4 Center Wavelength	$\lambda C0$	1294.53	1295.56	1296.59	nm
Lane_1/5 Center Wavelength	$\lambda C1$	1299.02	1300.05	1301.09	nm
Lane_2/6 Center Wavelength	$\lambda C2$	1303.54	1304.58	1305.63	nm
Lane_3/7 Center Wavelength	$\lambda C3$	1308.09	1309.14	1310.19	nm
Damage threshold	Rxdmg	5.5			dBm
Average receive power each lane*19	Rxpow	-10.6		4.5	dBm
Receive Power (OMA) per Lane	RxOMA			4.5	dBm
Unstressed Receiver Sensitivity (OMA) per Lane *20	Rxsens			-8.6	dBm
Stressed Receiver Sensitivity (OMA) per Lane*21	RXSRS			-6.8	dBm
Vertical Eye Closure Penalty*22	VECP	1.8			dB
Stressed J2 Jitter*22	J2	0.3			UI
Stressed J4 Jitter*22	J4	0.47			UI
LOS Assert	LOSA	-25			dBm
LOS De-Assert	LOSD			-15	dBm
LOS Hysteresis		0.5			dB
RSSI accuracy		-3		3	dB
Receiver reflectance				-26	dB

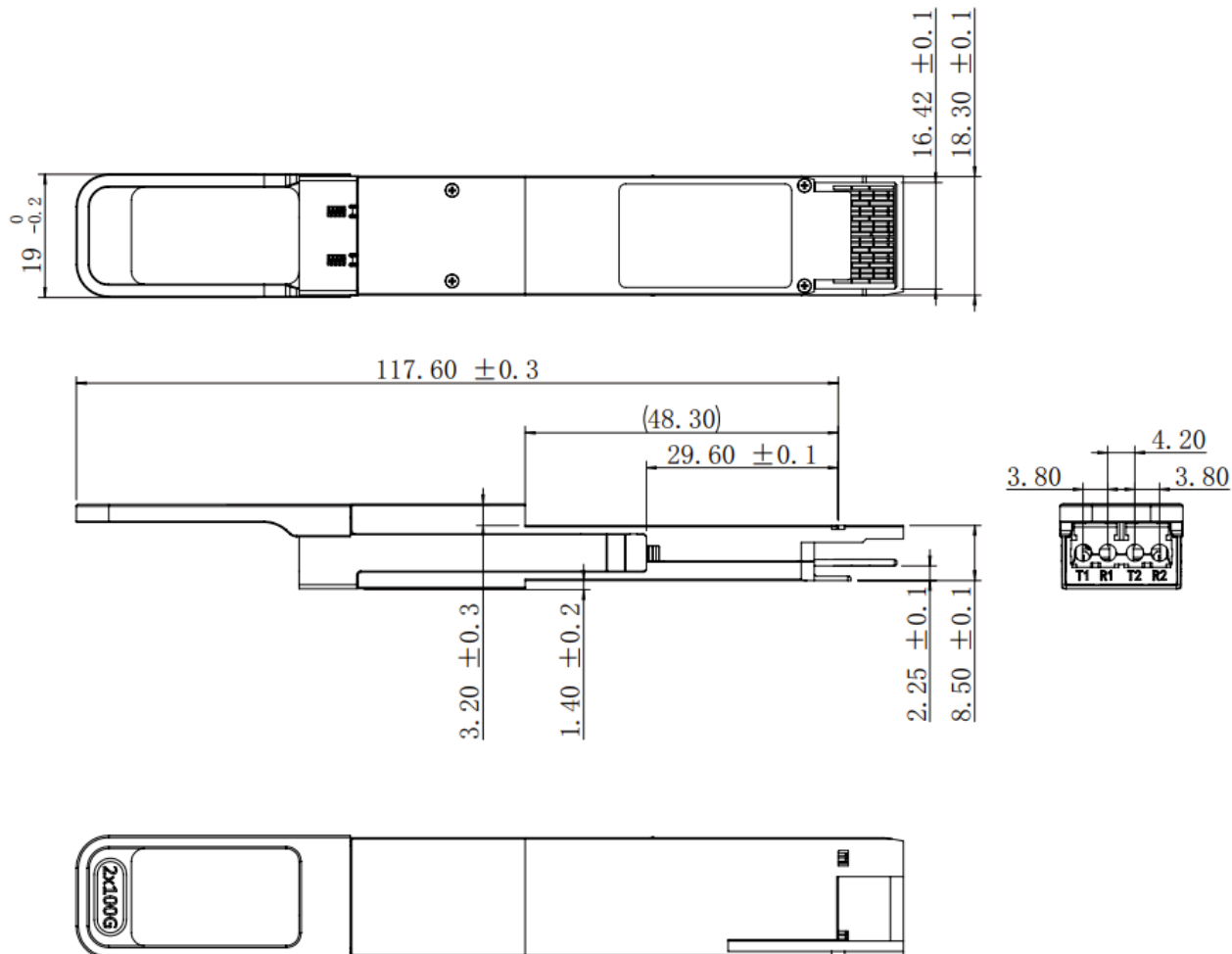
\*19: Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.

\*20: Receiver sensitivity (OMA), each lane (max) is informative.

\*21: Measured with conformance test signal at TP3 for BER = 10<sup>-12</sup>.

\*22: Vertical eye closure penalty, stressed eye J2 Jitter, stressed eye J4 Jitter, and SRS eye mask definition are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

### 8. 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.

### 9. Ordering Information

OEM	Part Number	OEM	Part Number
MSA	AN-QDD2x100G-LR4	Alcatel-Lucent Nokia	3HE14002AA-A

### 10. Contact Information

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