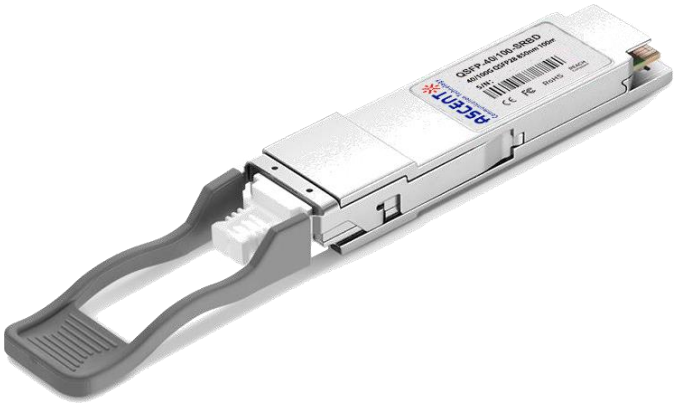
QSFP28 40/100G SWDM4 Dual Rate 100 m DOM Transceiver

QSFP28 Series



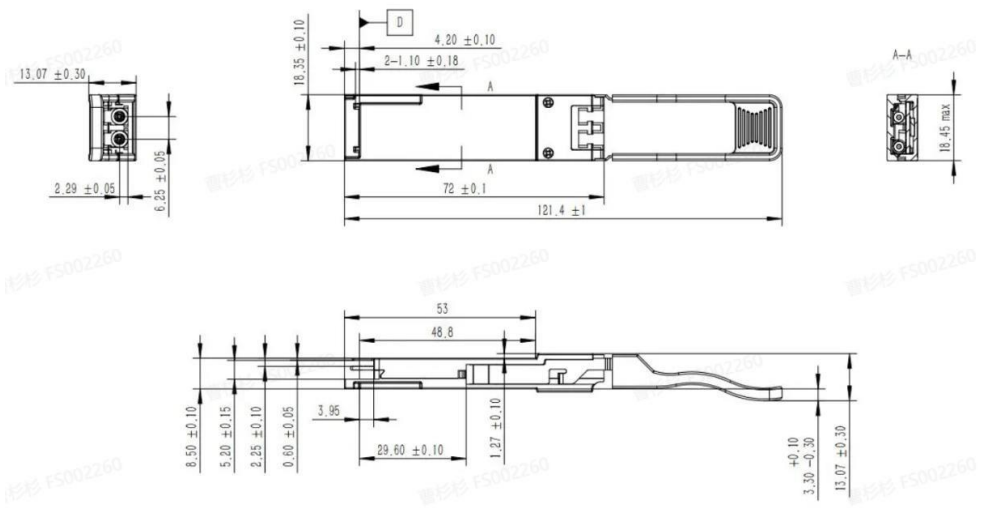
- 4x25 Gb/s 850nm VCSEL-based Transmitter
- Maximum link length of 150 m
- Hot-pluggable QSFP28 Form Factor
- Supports 40G/100G dual-rate operation
- Power Consumption < 3.5 W
- Duplex LC connector
- Compliant with QSFP28 MSA, SWDM MSA and IEEE802.3bm CAUI-4
- RoHS Compliant

Ascent's 40G/100G QSFP28 SWDM4 transceiver modules are designed for use in 40G/100GEthernet links over duplex multi-mode fiber. Four channels/lanes in the 850 nm to 940 nm region @ 10.3125 Gb/s / @25.78 Gbps to transport the Ethernet signal. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP28 MSA.

Key Features

- 4x25 Gb/s 850nm VCSEL-based Transmitter
- Hot-pluggable QSFP28 Form Factor
- Supports 40G/100G dual-rate operation
- Power Consumption < 3.5 W
- Duplex LC connector
- Compliant with QSFP28 MSA, SWDM MSA and IEEE802.3bm CAUI-4
- Maximum link length of 150 m on OM5 multi-mode Fiber
- Operating Temperature Range: 0 °C to 70 °C
- RoHS Compliant

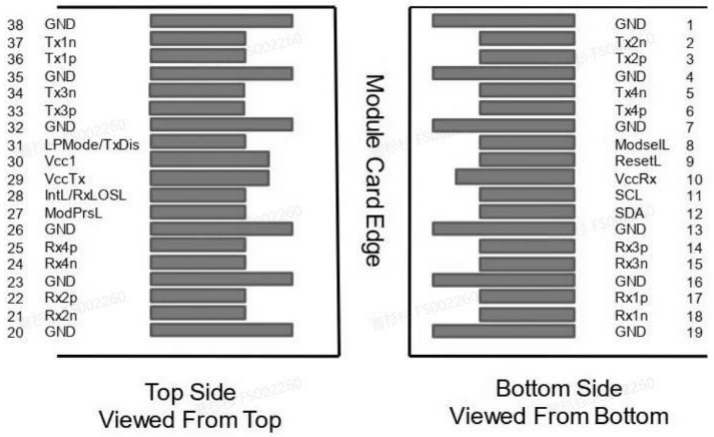
Mechanical Dimensions



Digital Diagnostic Monitor Functions

Parameter	Unit	Value
Temperature Monitor	°C	±3
Voltage Monitor	V	±5 %
I_bias Monitor	mA	±10 %
Received Power (Rx) Monitor	dB	±3.0
Transmit Power (Tx) Monitor	dB	±3.0

Pin Description



Pin No.	Symbol	Description	Note
1	GND	Transmitter ground (common with receiver ground)	1
2	Tx2n	Transmitter inverted data input	
3	Tx2p	Transmitter non-inverted data output	
4	GND	Transmitter ground (common with receiver ground)	
5	Tx4n	Transmitter inverted data input	
6	Tx4p	Transmitter non-inverted data output	
7	GND	Transmitter ground (common with receiver ground)	1
8	ModSelL	Module select	
9	ResetL	Module reset	
10	VccRx	3.3V power supply receiver	2
11	SC L	2-wire serial Interface Clock	
12	SDA	2-wire serial Interface Data	
13	GND	Transmitter ground (common with receiver ground)	
14	Rx3p	Receiver non-inverted data output	
15	Rx3n	Receiver inverted data output	
16	GND	Transmitter ground (common with receiver ground)	
17	Rxlp	Receiver non-inverted data output	
18	RxIn	Receiver inverted data output	
19	GND	Transmitter ground (common with receiver ground)	
20	GND	Transmitter ground (common with receiver ground)	1
21	Rx2n	Receiver inverted data output	
22	Rx2p	Receiver non-inverted data output	
23	GND	Transmitter ground (common with receiver ground)	
24	Rx4n	Receiver inverted data output	
25	Rx4p	Receiver non-inverted data output	
26	GND	Transmitter ground (common with receiver ground)	
27	ModPrsl	Module present	
28	IntL	Interrupt	

Pin No.	Symbol	Description	Note
29	VccTx	3.3V power supply transmitter	2
30	Vccl	3.3V power supply	2
31	LPMode	Low power mode, not connected	
32	GND	Transmitter ground (common with receiver ground)	
33	Tx3p	Transmitter non-inverted data input	
34	Tx3n	Transmitter inverted data output	
35	GND	Transmitter ground (common with receiver ground)	
36	Tx1p	Transmitter non-inverted data input	
37	Tx1n	Transmitter inverted data output	
38	GND	Transmitter ground (common with receiver ground)	

Notes:

1. GND is the symbol for signal and supply (power) common for QSFP28 modules. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the hostboard signal common ground plane.

2. VccRx, Vcc1, and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. VccRx, Vcc1 and VccTx may be internally connected within the QSFP28transceiver module in any combination. The connector pins are each rated for a maximum current of 1000 mA.

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature Range	T_S	-40	85	°C
Supply Voltage	V_{CC}	-0.5	3.6	V
Relative Humidity	RH	15%	85%	

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Operating Case Temperature	Tcase	0	70	°C
Supply Voltage	V_{CC}	3.14	3.46	V
Power Consumption	P		3.5	W
Link Distance on OM3 Fiber (100G)			75	M
Link Distance on OM4 Fiber (100G)			100	M
Link Distance on OM5 Fiber (100G)			150	M
Link Distance on OM3 Fiber (40G)			240	M
Link Distance on OM4 Fiber (40G)			350	M
Link Distance on OM5 Fiber (40G)			440	M

Optical Characteristics @10.3125 Gb/s

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Signaling Rate, Each Lane		10.3125, 9.953 ± 100 ppm			Gb/s	
Lane Wavelength Range	Lane0	844		858	nm	
	Lane1	874		888		
	Lane2	904		918		
	Lane3	934		948		
Difference in Launch Power Between Any Two Lanes				4.5	dBm	
RMS Spectral Width @850nm, @880nm, @910nm, @940nm	Lane0			0.53	nm	
	Lane1			0.59		
	Lane2			0.59		
	Lane3			0.59		
Optical Modulation Amplitude (OMA), Each Lane		-5.5		3	dBm	
Average Launch Power Per Lane		-7.5		3	dBm	
Launch Power Tx OMA-TDP	Lane0	-6.4			dBm	
	Lane1	-6.0				
	Lane2	-6.5				
	Lane3	-7.0				
Transmitter and Dispersion Eye Closure	Lane0			3.7	dB	
	Lane1			4.0		
	Lane2			4.5		
	Lane3			5.0		
Extinction Ratio		2			dB	
Optical Return Loss Tolerance		12			dB	
Average Launch Power Per Lane @ TX Off State				-30	dBm	
Encircled Flux		>=86% at 19um<=30% at 4.5um				
Transmitter Eye Mask Definition {X1, x2, X3, Y1, Y2. Y3} Hit Ratio 5x10-5 Hits Per Sample		{0.23, 0.34, 0.43, 0.27, 0.35, 0.4}				
Receiver						
Signaling Rate, Each Lane		10.3125, 9.953 ± 100 ppm			Gb/s	
Lane Wavelength Range	Lane0	844		858	nm	
	Lane1	874		888		
	Lane2	904		918		
	Lane3	934		948		
Damage Threshold, Each Lane		3.8			dBm	
Average Receive Power, Each Lane		-12.9		2.4	dBm	
		-12.5				
		-12.2				
		-11.9				
Receiver Power, each lane (OMA)				3	dBm	
Receiver sensitivity OMA, per lane				-9.1	dB	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Difference in Receive Power Between Any Two Lanes (OMA)				5	dB	
RX_Los_Assert		-30			dBm	
RX_Los_De-ASSERT				-13	dBm	
RX_Los_Hysteresis		0.5			dBm	
Return Reflectance				-12	dB	

Optical Characteristics @25.78125Gb/s

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Signaling Rate, Each Lane		25.78125 ± 100 ppm			Gb/s	
Lane Wavelength Range	Lane0	844		858	nm	
	Lane1	874		888		
	Lane2	904		918		
	Lane3	934		948		
Modulation Format			NRZ			
Difference in Launch Power Between Any Two Lanes				4.5	dBm	
RMS Spectral Width				0.59	nm	1
Optical Modulation Amplitude (OMA), Each Lane		-5.5		3	dBm	2
Average Launch Power Per Lane @ TX Off State				-30	dBm	
Launch Power in OMA Minus TDEC	Lane0	-7			dBm	
	Lane1	-7				
	Lane2	-7.4				
	Lane3	-7.7				
Transmitter and Dispersion Eye Closure	Lane0			4	dB	3
	Lane1			4		
	Lane2			4.4		
	Lane3			4.8		
Extinction Ratio		2			dB	4
Optical Return Lass Tolerance				12	dB	
Encircled Flux		>86% at 19 µm s30% at 4.5 µm				
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2. Y3} Hit Ratio 1.5x10-3 Hits Per Sample		{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}				
Receiver						
Signaling Rate, Each Lane		25.78125 ± 100 ppm			Gb/s	
Lane Wavelength Range	Lane0	844		858	nm	
	Lane1	874		888		
	Lane2	904		918		
	Lane3	934		948		
Modulation Format			NRZ			

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Damage Threshold		4.4			dBm	
Average Receive Power, Each Lane	Lane0	-9.5		3.4	dBm	
	Lane1	-9.4				
	Lane2	-9.4				
	Lane3	-9.4				
Receiver Power, Each Lane (OMA)				3	dBm	
Receiver Reflectance				-12	dB	
Unstressed Receiver Sensitivity (OMA)	Lane0			-8.2	dBm	5
	Lane1			-8.4		
	Lane2			-8.6		
	Lane3			-8.8		
RX_Los_Assert		-30			dBm	
RX_Los_De-Assert				-12	dBm	
RX_Los_Hysteresis		0.5			dBm	

Notes:

1. RMS spectral width is the standard deviation of the spectrum.
2. The normative lowest value of OMA for a compliant transmitter is 'Launch power in OMA minus TDEC, each lane (min)' plus the actual value of 'TDEC', but with a value of at least 'OMA, each lane miny.
3. TDEC is calculated from the measured TDECm using the methods in 3.6. TDECm is measured following the method in IEE 802.3 clause95.8.5 μsing a 12.6 GHz bandwidth reference receiver for all lanes.
4. If measured into type A1a.2 or type A1a.3 50 μm fiber in accordance with IEC 61280-1-4.
5. Unstressed sensitivity at BER of 5E-5(pre FEC)

Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit
Transmitter				
Signaling Rate Per Lane (Range)	25.78125 ± 100 ppm			GBd
Differential Input Return Loss	Equation (83E-5)			dB
Differential to Common Mode Input Return Loss	Equation (83E-6)			dB
Differential Termination Mismatch			10	%
Module Stressed Input Test	See 83E3.4.1			
Differential Pk-pk Input Voltage Tolerance	900			mV
DC Common Mode Voltage	-350		2850	mV
Single Ended Voltage Tolerance Range	-0.4		3.3	V
Receiver				
Signaling Rate Per Lane (Range)	25.78125 ± 100 ppm			GBd
AC Common-mode Output Voltage (RMS)			17.5	mV
Differential Output Voltage			900	mV
Eye Width	0.57			UI
Eye Height, Differential	228			mV
Vertical Eye Closure			5.5	dB

Parameter	Min.	Typ.	Max.	Unit
Differential Output Return Loss	Equation (83E-2)			dB
Common to Differential Mode Conversion Return Loss	Equation (83E-3)			dB
Differential Termination Mismatch			10	%
Transition Time (20% to 80%)	12			ps
DC Common Mode Voltage	-350		2850	mV

Ordering Information

Product Name	Product Description
QSFP-40/100-SRBD	QSFP28 SWDM4 SR BD 40/100GBASE-SM4 Dual Rate 850nm 100m DOM Duplex LC MMF

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