

QSFP28 BIDI 100 Gb/s SR Transceiver

E - E

QSFP Series

- Compliant to 100GbE IEEE 802.3bm
- QSFP28 SFF-8636
- Support 40GE/100GE aggregate bit rates
- 100m on OM4 MMF
- Single +3.3 V Power Supply
- < 3.5 W Power Dissipation</p>
- Temperature range 0°C to 70°C
- RoHS Compliant Part

Ascent 's QSFP28 100G SR BIDI is a parallel Quad Small Form-factor Pluggable (QSFP28) Bi-Direction optical module which can support dual rate 40Gb/s and 100Gb/s bit rates in an optical communication application compliant to SFF-8636 standards.

The module integrates four host electrical data into two optical lanes (by Dual Wavelength VCSEL Bi-Directional Optical Interface, 850nm and 900nm) to allow optical communication over a 2-fiber duplex LC optical multi-mode fiber. Reversely, on the receiver side, the module demultiplexes 2 sets of optical input signal and converts them to 4 channels of electrical data.

An optical fiber ribbon cable with an LC connector can be plugged into the QSFP28 module receptacle. Proper alignment is ensured by the guide pins inside the receptacle. The cable usually cannot be twisted for proper channel to channel alignment. Electrical connection is achieved through an MSA-compliant 38-pin edge type connector.

The product is designed with form factor, optical/electrical connection, and digital diagnostic interface according to the QSFP+ Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity, and EMI interference.



Key Features -

- Compliant to the 100GbE XLPPI electrical specification per IEEE 802.3bm
- Compliant to QSFP28 SFF-8636 Specification
- Support 40GE/100GE aggregate bit rates
- Aggregate bandwidth of > 100Gbps
- Dual wavelength VCSEL bi-directional optical interface, PAM4 2 × 50-Gb/s 850nm/900 nm
- QSFP28 MSA compliant
- Capable of over 70m transmission on OM3 Multimode Fiber (MMF)and 100m on OM4 MMF
- Single +3.3V power supply operating
- With digital diagnostic functions
- Temperature range 0°C to 70°C
- RoHS Compliant Part
- Utilizes a standard LC duplex fiber cable allowing reuse of existing cable infrastructure

Outline Dimension





Functional Diagram



Recommended Power Supply Filter





EEPROM Definitions -

Address	Name	Description
128	Identifier (1 Byte)	Identifier Type of serial transceiver
129	Ext. Identifier (1 Byte)	Extended identifier of serial transceiver
130	Connector (1 Byte)	Code for connector type
131-138	Transceiver (8 Bytes)	Code for electronic compatibility or optical compatibility
139	Encoding (1 Byte)	Code for serial encoding algorithm
140	BR, nominal (1 Byte)	Nominal bit rate, units of 100 Mbits/s
141	Extended RateSelect Compliance (1 Byte)	Tags for Extended RateSelect compliance
142	Length SMF (1 Byte)	Link length supported for SM fiber in km
143	Length E-50 µm (1 Byte)	Link length supported for EBW 50/125 μm fiber, units of 2 m
144	Length 50 µm (1 Byte)	Link length supported for 50/125 μm fiber, units of 1 m
145	Length 62.5 µm (1 Byte)	Link length supported for 62.5/125 μm fiber, units of 1 m
146	Length copper (1 Byte)	Link length supported for copper, units of 1 m
147	Device Tech (1 Byte)	Device technology
148-163	Vendor name (16 Bytes)	QSFP vendor name (ASCII)
164	Extended Transceiver (1 Byte)	Extended Transceiver Codes for InfiniBand [†]
165-167	Vendor OUI (3 Bytes)	QSFP vendor IEEE vendor company ID
168-183	Vendor PN (16 Bytes)	Part number provided by QSFP vendor (ASCII)
184-185	Vendor rev (2 Bytes)	Revision level for part number provided by vendor (ASCII)
186-187	Wavelength (2 Bytes)	Nominal laser wavelength (Wavelength = value / 20 in nm)
188-189	Wavelength Tolerance (2 Bytes)	Guaranteed range of laser wavelength (+/- value) from Nominal wavelength (Wavelength Tol. = value / 200 in nm)
190	Max Case Temp (1 Byte)	Maximum Case Temperature in Degrees C
191	CC_BASE (1 Byte)	Check code for Base ID fields (addresses 128-190)
192-195	Options (4 Bytes)	Rate Select, TX Disable, TX Fault, LOS
196-211	Vendor SN (16 Bytes)	Serial number provided by vendor (ASCII)
212-219	Date code (8 Bytes)	Vendor's manufacturing date code
220	Diagnostic Monitoring Type (1 Byte)	Indicates which type of diagnostic monitoring is implemented
221	Enhanced Options (1 Byte)	Indicates which optional enhanced features are implemented
222	Reserved (1 Byte)	Reserved
223	CC_EXT	Check code for the Extended ID Fields (addresses 192-222)
224-255	Vendor Specific (32 Bytes)	Vendor Specific EEPROM

EEPROM Definitions



Timing for Soft Control and Status Functions

Parameter	Symbol	Max	Unit	Conditions
Initialization Time	t_init	2000	ms	Time from power on1, hot plug or rising edge of Reset until the module is fully functional2
Reset Init Assert Time	t_reset_init	2	μs	the minimum reset pulse time present on the ResetL pin.
Serial Bus Hardware Ready Time	t_serial	2000	ms	Time from power on1 until module responds to data transmission over the 2-wire serial bus
Monitor Data Ready Time	t_data	2000	ms	Time from power on1 to data not ready, bit 0 of Byte 2, deasserted and IntL asserted
Reset Assert Time	t_reset	2000	ms	Time from rising edge on the ResetL pin until the module is fully functional2
LPMode Assert Time	ton_LPMode	100	μs	=Vih) until module power consumption enters lower Power Level
IntL Assert Time	ton_IntL	200	ms	Time from occurrence of condition triggering IntL until Vout:IntL = Vol
IntL Deassert Time	toff_IntL	500	μs	toff_IntL 500 μs Time from clear on read3 operation of associated flag until Vout:IntL = Voh. This includes deassert times for Rx LOS, Tx Fault and other flag bits.
Rx LOS Assert Time	ton_los	100	ms	Time from Rx LOS state to Rx LOS bit set and IntL asserted
Flag Assert Time	ton_flag	200	ms	Time from occurrence of condition triggering flag to associated flag bit set and IntL asserted
Mask Assert Time	ton_mask	100	ms	Time from mask bit set4 until associated IntL assertion is inhibited
Mask De-assert Time	toff_mask	100	ms	Time from mask bit cleared4 until associated IntlL operation resumes
ModSelL Assert Time	ton_ModSel L	100	μs	Time from assertion of ModSelL until module responds to data transmission over the 2-wire serial bus
ModSelL Deassert Time	toff_ModSel L	100	μs	Time from deassertion of ModSelL until the module does not respond to data transmission over the 2-wire serial bus
Power_over-ride or Power-set Assert Time	ton_Pdown	100	ms	Time from P_Down bit set 4 until module power consumption enters lower Power Level
Power_over-ride or Power-set De-assert Time	toff_Pdown	300	ms	Time from P_Down bit cleared4 until the module is fully functional3

Note:

1. Power on is defined as the instant when supply voltages reach and remain at or above the minimum specified value.

- 2. Fully functional is defined as IntL asserted due to data not ready bit, bit 0 byte 2 de-asserted.
- 3. Measured from falling clock edge after stop bit of read transaction.
- 4. Measured from falling clock edge after stop bit of write transaction.



Pin Assignment



Viewed from Top

Viewed from Bottom

Diagram of Host Board Connector Block Pin Numbers and Name

Pin	Logic	Symbol	Name/Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Output	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Output	
7		GND	Ground	1
8	LVTTL-I	ModSelL	Module Select	
9	LVTTL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	1
14	CML-O	Rx3p	Receiver Inverted Data Output	
15	CML-O	Rx3n	Receiver Non-Inverted Data Output	
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Inverted Data Output	
18	CML-O	Rx1n	Receiver Non-Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	



29		VccTx	+3.3V Power Supply Transmitter	2
30		Vcc1	+3.3V Power Supply	2
31	LVTTL-I	LPMode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Тх3р	Transmitter Inverted Data Output	
34	CML-I	Tx3n	Transmitter Non-Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Inverted Data Output	
37	CML-I	Tx1n	Transmitter Non-Inverted Data Output	
38		GND	Ground	1

Notes:

- GND is the symbol for single and supply (power) common for QSFP modules, All are common within the QSFP module and all module voltages are referenced to this potential otherwise noted. Connect these directly to the host board signal common ground plane. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 2. VccRx, Vcc1 and VccTx are the receiver and transmitter 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 QSFP transceiver module in any combination. The connector pins are each rated for maximum current of 500mA.

Specifications -

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes			
Storage Temperature	Ts	-40	85	°C				
Supply Voltage	V _{CCT} , R	-0.5	4	V				
Relative Humidity	RH	0	85	%				
Recommended Operating Co	nditions							
Parameter	Symbol	Min.	Тур.	Max.	Unit	Notes		
Operating Case Temperature	Tc	0	-	70	°C			
Supply Voltage	V _{CCT} , R	3.13	3.3	3.47	V			
Supply Current	lcc			1000	mA			
Power Dissipation	PD			3.5	W			
Optical Characteristics (TOP =	= 0 to 70 °C, VCC = 3	3.0 to 3.6 Vo	olts)					
Parameter	Symbol	Min.	Тур.	Max.	Unit	Notes		
Transmitter								
Optical Wavelength CH1	λ	832	850	868	nm			
Optical Wavelength CH2	λ	882	900	918	nm			
RMS Spectral Width	Pm		0.5	0.65	nm			
Average Optical Power per Chan	nel							
Laser Off Power Per Channel	Poff			-30	dBm			
Optical Extinction Ratio	ER	3.0			dB			
Relative Intensity Noise	Rin			-128	dB/HZ	1		
Optical Return Loss Tolerance				12	dB			
Receiver								
Optical Center Wavelength CH1	λ	882	900	918	nm			
Optical Center Wavelength CH2	λ	832	850	868	nm			
Receiver Sensitivity per Channel	R			-8	dBm			
Maximum Input Power	PMAX	+0.5			dBm			
Receiver Reflectance	Rrx			-15	dB			
LOS De-Assert	LOSD			-10	dBm			
LOS Assert	LOSA	-30			dBm			
LOS Hysteresis	LOSH	0.5			dB			

Notes:

1. 12dB Reflection



Electrical Characteristics (TOP = 0 to 70 °C, V_{cc} = 3.13 to 3.47 Volts)

Parameter	Symbol	Min.	Тур.	Max.	Unit	Notes
Data Rate per Channel			25.78125		Gbps	
Power Consumption		-	2.5	3.5	W	
Supply Current	I _{cc}		0.75	1.0	А	
Control I/O Voltage-High	VIH	2.0		Vcc	V	
Control I/O Voltage-Low	VIL	0		0.7	V	
Inter-Channel Skew	TSK			150	Ps	
RESETL Duration			10		Us	
RESETL De-assert time				100	ms	
Power On Time				100	ms	
Transmitter						
Single Ended Output Voltage Tolerance		0.3		4	V	1
Common mode Voltage Tolerance		15			mV	
Transmit Input Diff Voltage	VI	120		1200	mV	
Transmit Input Diff Impedance	ZIN	80	100	120		
Data Dependent Input Jitter	DDJ			0.1	UI	
Data Input Total Jitter	TJ			0.28	UI	
Receiver						
Single Ended Output Voltage Tolerance		0.3		4	V	
Rx Output Diff Voltage	Vo		600	800	mV	
Rx Output Rise and Fall Voltage	Tr/Tf	12			ps	1
Total Jitter	TJ			0.7	UI	
Deterministic Jitter	DJ			0.42	UI	

Notes:

1. 20 to 80%

Ordering Information

Product NameProduct DescriptionQ28-100G-BD-SR01QSFP28 Plug-in, 100GBASE-SR BiDi MMF 850nm 100m OM4 DOM Duplex LC



Contact Information

ASCENT Communication Technology



Ascent Communication Technology Ltd

AUSTRALIA

140 William Street, Melbourne Victoria 3000, AUSTRALIA Phone: +61-3-8691 2902

CHINA

Unit 1933, 600 Luban Road 200023, Shanghai, CHINA Phone: +86-21-60232616

EUROPE

Pfarrer-Bensheimer-Strasse 7a 55129 Mainz, GERMANY Phone: +49 (0) 6136 926 3246

Hong Kong SAR

Unit 9, 12th Floor, Wing Tuck Commercial Centre 177 Wing Lok Street, Sheung Wan, Hong Kong SAR Phone: +852-2851 4722

USA

2710 Thomes Ave Cheyenne, WY 82001, USA Phone: +1-203 816 5188

VIETNAM

11th Floor, Hoa Binh Office Tower 106 Hoang Quoc Viet Street, Nghia Do Ward Cau Giay District, Hanoi 10649, VIETNAM Phone: +84-24-37955917

WEB: www.ascentcomtec.com

EMAIL: sales@ascentcomtec.com

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