40 Gb/s 150m QSFP+ SR4 Transceiver with DDM

QSFP+ Series

- **QSFP+ MSA Specification**
- **4x10Gbps 850nm VCSEL-based Transmitter**
- **Maximum Link Length of 150m Via OM3 Multimode Fiber(MMF)**
- **Power consumption < 3.5W**
- **Wide Operating Temperature**

Ascent's QSFP-40-SR4-01 QSFP transceivers are designed for use in 40 Gigabit per second links over multimode fiber. They are compliant with the QSFP+ MSA and IEEE 802.3ba-2010 40GBASE-SR4.

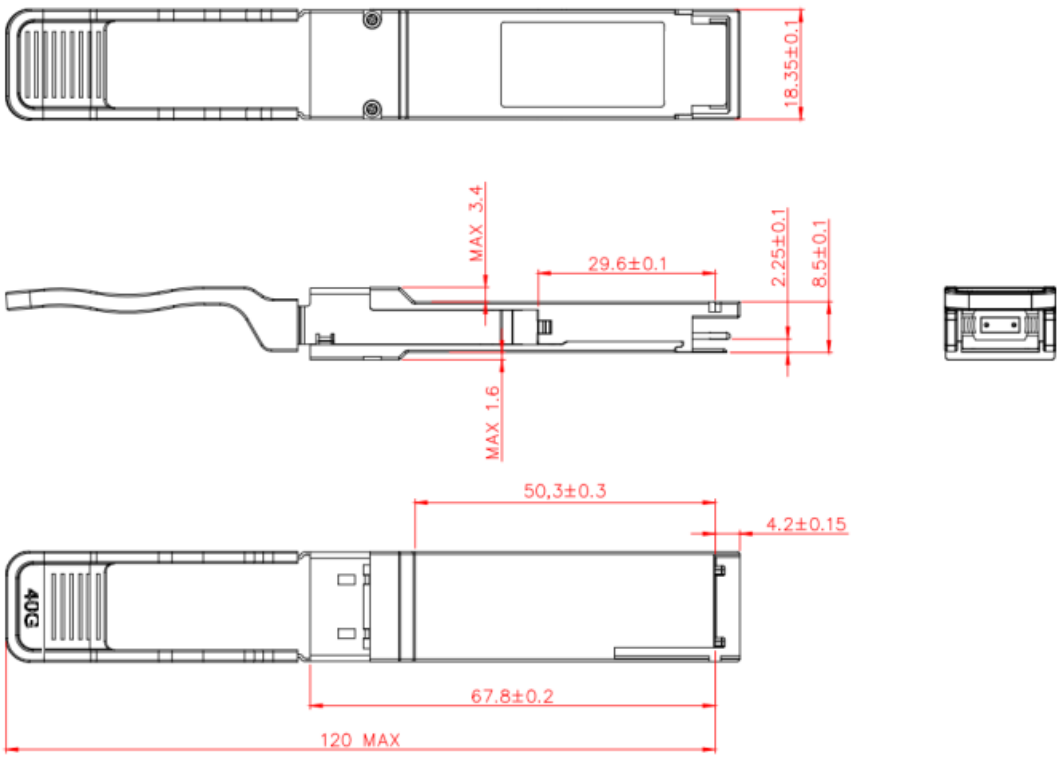
The optical transmitter portion of the transceiver incorporates a 4-channel VCSEL array, a 4-channel input buffer and laser driver, diagnostic monitors, control and bias blocks. For module control, the control interface incorporates a Two Wire Serial interface of clock and data signals. Diagnostic monitors for VCSEL bias, module temperature, transmitted optical power, received optical power and supply voltage are implemented and results are available through the TWS interface. Alarm and warning thresholds are established for the monitored attributes. Fault detection or channel deactivation through the TWS interface will disable the channel. Status, alarm/warning and fault information are available via the TWS interface.

The optical receiver portion of the transceiver incorporates a 4-channel PIN photodiode array, a 4-channel TIA array, a 4-channel output buffer, diagnostic monitors, and control and bias blocks. Diagnostic monitors for optical input power are implemented and results are available through the TWS interface. Alarm and warning thresholds are established for the monitored attributes.

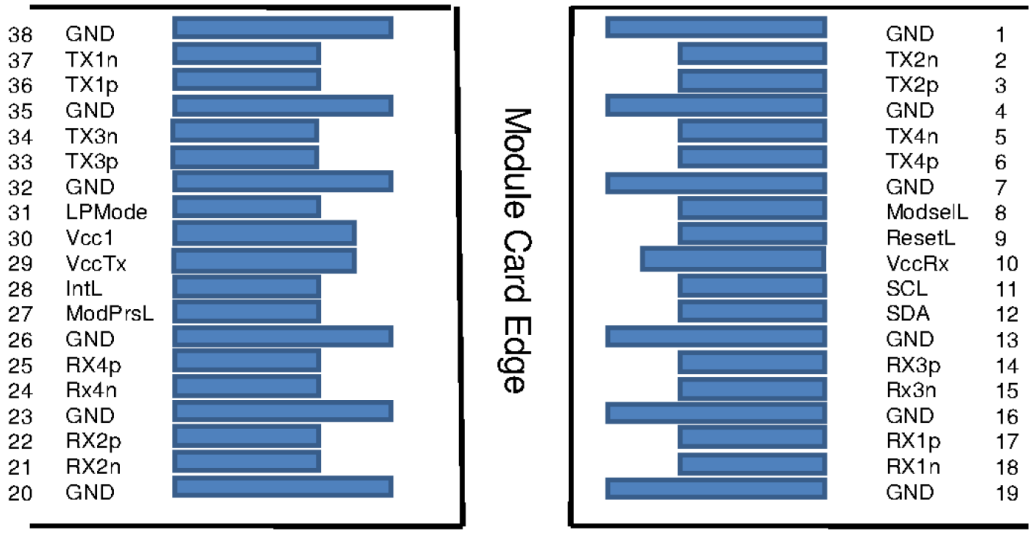
Key Features

- Compliant with QSFP+ MSA Specification
- 4x10Gbps 850nm VCSEL-based Transmitter
- Maximum Link Length of 150m Via OM3 Multimode Fiber(MMF)
- Wide Operating Temperature: 0°C to +70°C
- RoHS and FCC compliant

Outline Diagram



Pin Assignment



Pin	Logic	Symbol	Name/Description	Note
1		GND	Transmitter Ground (Common with Receiver Ground)	
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Transmitter Ground (Common with Receiver Ground)	
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Transmitter Ground (Common with Receiver Ground)	
8	LVTTL-I	ModSelL	Module Select	
9	LVTTL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	
11	LVCMOS-I/O	SCL	2-Wire serial Interface Clock	
12	LVCMOS-I/O	SDA	2-Wire serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	
20		GND	Ground	
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	
24	CML-O	Rx4n	Receiver Inverted Data Output	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	
27	LVTTL-O	ModPrsL	Module Present	

Pin	Logic	Symbol	Name/Description	Note
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3V Power Supply Transmitter	
30		Vcc1	+3.3V Power Supply	
31	LVTTL-I	LPMode	Low Power Mode	
32		GND	Ground	
33	CML-I	Tx3n	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3p	Transmitter Inverted Data Output	
35		GND	Ground	
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Temperature	$T_{storage}$	-40	+85	℃	
Relative Humidity	RH	0	+85	%	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	T_C	0		70	℃	
Power Supply Voltage	Vcc	3.135	3.3	3.465	V	
Signaling Rate each Channel			10.3125		Gbps	
Supply Noise Rejection		---	---	100	mV	
Receiver Differential Data Output		---	100		Ohm	
Operating Distance	D			150	m	@ OM3 MMF

Optical Characteristics(T=25°C, unless noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Signaling Rate, each Lane (Range)	GBb		10.3125		GBb	
Center Wavelength	λ	840	850	860	nm	
RMS Spectral Width	SW			0.6	nm	
Average Launch Power, each Lane	Pf	-8.4		2.4	dBm	
Optical Modulation Amplitude (OMA), each Lane	TxOMA	-6.4		3	dBm	
Average Launch Power of OFF Transmitter, each Lane				-30	dBm	
Extinction Ratio	ER	3			dB	
Optical Return Loss Tolerance				12	dB	
Reciever						
Signaling Rate, each Lane (Range)	GBb		10.3125		GBb	
Center Wavelength	λ	840		860	nm	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Damage Threshold		3.4			dBm	
Average Power at Receiver Input, each Lane		-10.3		2.4	dBm	
Receiver Power Overload				2.4	dBm	
Receive Power, each Lane (OMA)				3	dBm	
Receiver Sensitivity (OMA)	SOMA			-11.1	dBm	BER@1e-12
Receiver Reflectance				-12	dB	
LOS Assert	LOSA	-30			dBm	
LOS De-Assert	LOSD			-11	dBm	
LOS Hysteresis		0.5			dB	

Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Power Consumption	P			3.5	W	
Supply Current	Icc			1050	mA	

Digital Diagnostic Function

ASCENT's QSFP-40-SR4-01 supports the 2-wire serial communication protocol as defined in the QSFP+ MSA, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

It also access and monitor module information (ex: Media type, Vendor name, Part Number, Serial Number, Wavelength, Voltage, temperature, etc), provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the QSFP+ transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the QSFP+ transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 00h to the maximum address of the memory.

This clause defines the Memory Map for QSFP+ transceiver used for serial ID, digital monitoring and certain control functions. The interface is mandatory for all QSFP+ devices. The memory map has been changed in order to accommodate 4 optical channels and limit the required memory space. The structure of the memory is shown in below figure-QSFP+ Memory Map. The memory space is arranged into a lower, single page, address space of 128 bytes and multiple upper address space pages. This structure permits timely access to addresses in the lower page, e.g. Interrupt Flags and Monitors. Less time critical entries, e.g. serial ID. information and threshold settings, are available with the Page Select function. The structure also provides address expansion by adding additional upper pages as needed. For example, in below figure upper pages 01 and 02 are optional. Upper page 01 allows implementation of Application Select Table, and upper page 02 provides user read/write space. The lower page and upper pages 00 and 03 are always implemented. The interface address used is A0xh and is mainly used for time critical data like interrupt handling in order to enable a “one-time-read” for all data related to an interrupt situation. After an Interrupt, IntL, has been asserted, the host can read out the flag field to determine the effected channel and type of flag.

For more detailed information including memory map definitions, please see the QSFP+ MSA Specification.

Parameter	Accuracy	Unit
Internally Measured Transceiver Temperature	+/-3	°C
Internally Measured Transceiver Supply Voltage	+/-3	%
Measured Tx Bias Current	+/-10	%
Measured Tx Output Power	+/-3	dB
Measured Rx Received Average Optical Power	+/-3	dB

Ordering Information

Product Name	Product Description
QSFP-40-SR4-01	QSFP+ Plug-in, 40Gbps SR4, 150m on OM3, MPO, TX/RX 850nm, with DOM
JQ-40-SR4-01	QSFP+ Plug-in, 40Gbps SR4, 150m on OM3, MPO, TX/RX 850nm, with DOM, Compatible with Juniper

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Specifications and product availability are subject to change without notice.

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