

40Gb/s QSFP+ SRBD 850nm 300m MMF Optical Transceiver

Features

- Compliant to the 40GbE XLPPI electrical specification per IEEE 802.3ba-2010
- Compliant to QSFP+ SFF-8436 Specification
- Aggregate bandwidth of >40Gbps
- Operates at 10.3125Gbps per electrical channel with 64b/66b encoded data
- QSFP MSA compliant
- Capable of over 100m transmission on OM3 Multi-mode Fiber (MMF) and 150m on OM4 MMF
- Single +3.3V power supply operating
- Built-in 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

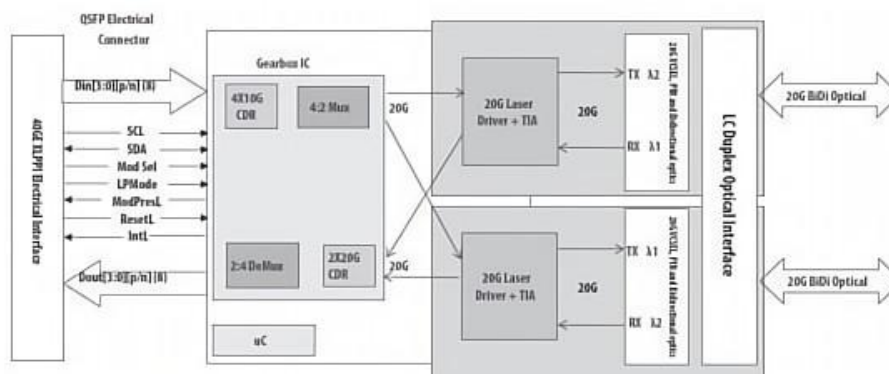
Applications

- 40 Gigabit Ethernet interconnects
- Datacom/Telecom switch & router connections
- Data aggregation and backplane applications
- Proprietary protocol and density applications

Description

It is a Four-Channel, Pluggable, LC Duplex, Fiber-Optic QSFP+ Transceiver for 40 Gigabit Ethernet Applications. This transceiver is a high performance module for short-range duplex data communication and interconnect applications. It integrates four electrical data lanes in each direction into transmission over a single LC duplex fiber optic cable. Each electrical lane operates at 10.3125Gbps and conforms to the 40GE XLPI interface.

The transceiver internally multiplexes an XLPI 4x10G interface into two 20Gb/s electrical channels, transmitting and receiving each optically over one simplex LC fiber using bi-directional optics. This results in an aggregate bandwidth of 40Gbps into a duplex LC cable. This allows reuse of the installed LC duplex cabling infrastructure for 40GbE application. Link distances up to 100 m using OM3 and 150m using OM4 optical fiber are supported. These modules are designed to operate over multi-mode fiber systems using a nominal wavelength of 850nm on one end and 900nm on the other end. The electrical interface uses a 38 contact QSFP+ type edge connector. The optical interface uses a conventional LC duplex connector.



Absolute Maximum Ratings

Table1-Absolute Maximum Ratings

Parameter	Symbols	Min.	Typical	Max.	Unit	Notes
Storage Temperature	TS	-40		+85	°C	
Supply Voltage	VCCT, R	-0.5		4	V	
Relative Humidity	RH	0		85	%	

Recommended Operating Conditions

Table2-Recommended Operating Conditions

Parameter	Symbols	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	Tc	0		+70	°C	
Supply Voltage	VCCT, R	+3.13	3.3	+3.47	V	
Supply Current	ICC			1000	mA	
Power Dissipation	PD			3.5	W	

Electrical (TOP= 0 to 70°C, VCC = 3.15 to 3.45 Volts)

Table3-Electrical Characteristic

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Data Rate per Channel			10.3125	11.2	Gbps	
Power Consumption			2.5	3.5	W	
Supply Current			0.75	1.0	A	
Control I/O Voltage-High	Icc			Vcc	V	
Control I/O Voltage-Low	VIH	2.0		0.7	V	
Inter-Channel Skew	VIL	0		150	Ps	
RESETL Duration	TSK		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				35	ps
Total Jitter	TJ				0.7	UI
Deterministic Jitter	DJ				0.42	UI

Note:

1. 20-80%

Optical Characteristic (TOP= 0 to 70°C, VCC = 3.15 to 3.47 Volts)

Table4- Optical Characteristic						
Parameter	Symbols	Min.	Typical	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 channel	P _{avg}	-4	-2.5	+5.0	dBm	
Laser Off Power Per Channel	P _{off}			-30	dBm	
Optical Wavelength CH1	ER	3.5			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		-6		dBm	
Maximum Input Power	P _{MAX}	+0.5			dBm	
Receiver Reflectance	R _{rx}	30		- 12	dB	
LOS De-Assert	LOSD			- 14	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis	LOSH	0.5			dB	

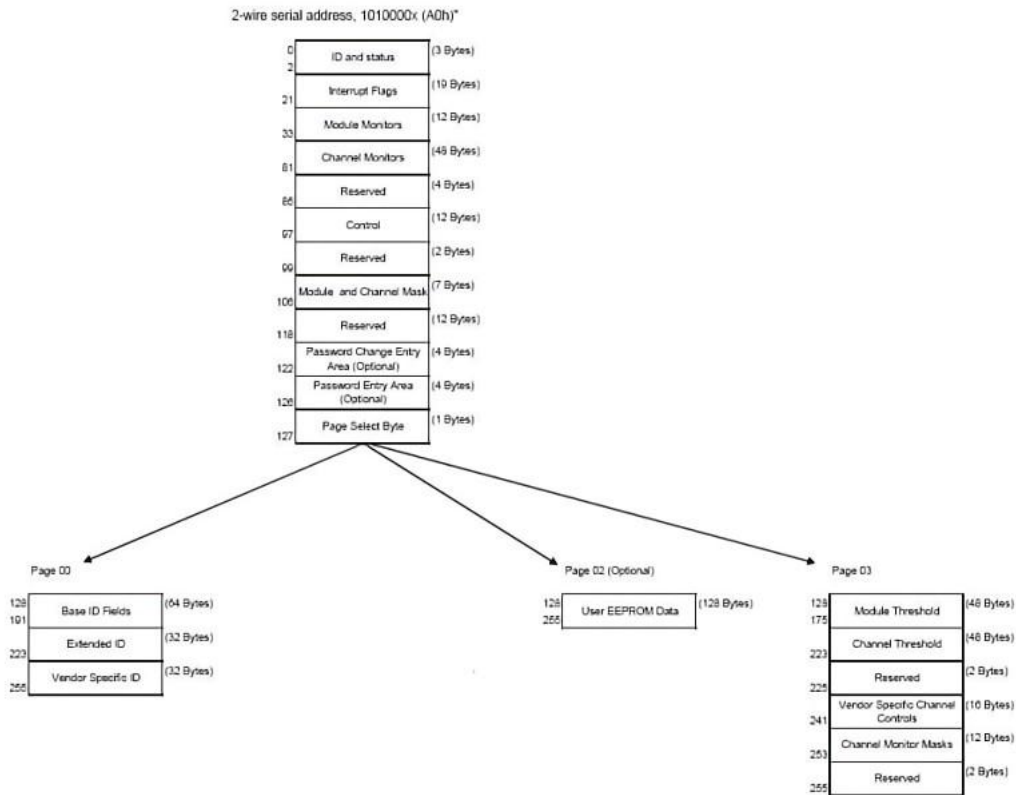
Note:

1. 12dB Reflection

Diagnostic Monitoring Interface

Digital diagnostics monitoring function is available on all QSFP+ SRBD. A2-wire serial interface provides user to contact with module. The structure of the memory is shown in flowing. 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, such as Interrupt Flags and Monitors. Less time critical time entries, such as serial ID information and threshold settings, are available with the Page Select function. 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 affected channel and type of flag.

Byte Address	Description	Type
0	Identifier(1 Byte)	Read Only
1-2	Status (2 Bytes)	Read Only
3-21	Interrupt Flags (31 Bytes)	Read Only
22-33	Module Monitors (12 Bytes)	Read Only
34-81	Channel Monitors (48 Bytes)	Read Only
82-85	Reserved (4 Bytes)	Read /Write
86-97	Control (12 Bytes)	Read /Write
98-99	Reserved (2 Bytes)	Read /Write
100- 106	Module and Channel Masks (7 Bytes)	Read /Write
107- 118	Reserved (12 Bytes)	Read /Write
119- 122	Reserved (4 Bytes)	Read /Write
123- 126	Reserved (4 Bytes)	Read /Write
127	Page Select Byte	Read /Write
128- 175	Module Thresholds (48 Bytes)	Read Only
176-223	Reserved (48 Bytes)	Read Only
224-225	Reserved (2 Bytes)	Read /Write
226-239	Reserved (14 Bytes)	Read /Write
240-241	Channel Controls (2 Bytes)	Read /Write
242-253	Reserved (12 Bytes)	Read /Write
254-255	Reserved (2 Bytes)	Read /Write



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 100Mbps/s
141	Extended Rate Select Compliance (1 Byte)	Tags for Extended Rate Select compliance
142	Length SMF (1 Byte)	Link length supported for SM fiber in km
143	Length E-50 μ m (1 Byte)	Link length supported for EBW 50/125 μ m fiber, units of 2m
144	Length 50 μ m (1 Byte)	Link length supported for 50/125 μ m fiber, units of 1m
145	Length 62.5 μ m (1 Byte)	Link length supported for 62.5/125 μ m fiber, units of 1m
146	Length copper (1 Byte)	Link length supported for copper, units of 1m
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 (ASCII)
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 Degree 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 (1Byte)	Indicates which type of diagnostic monitoring is implemented
221	Enhanced Options (1Byte)	Indicates which optional enhanced features are implemented
222	Reserved (1Byte)	Reserved
223	CC-EXT	Check code for the Extended ID Fields (addresses 192-222)
224-255	Vendor Specific (32 Bytes)	Vendor Specific EEPROM

Page02 is User EEPROM and its format decided by user.

The detail description of low memory and page00.page03 upper memory please see SFF-8436 document.

Timing for Soft Control and Status Functions

Parameter	Symbols	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	μ s	A Reset is generated by a low level longer than 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, de-asserted and IntL asserted
Reset Assert Time	t_reset	2000	ms	Time from rising edge on the ResetL pin until the module is fully functional2
LPMMode Assert Time	ton_LPMMode	100	μ s	Time from assertion of LPMMode (Vin:LPMMode =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	μ s	toff_IntL 500 μ s 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 set ⁴ until associated IntL assertion is inhibited
Mask De-assert Time	toff_mask	100	ms	Time from mask bit cleared ⁴ until associated IntL operation resumes

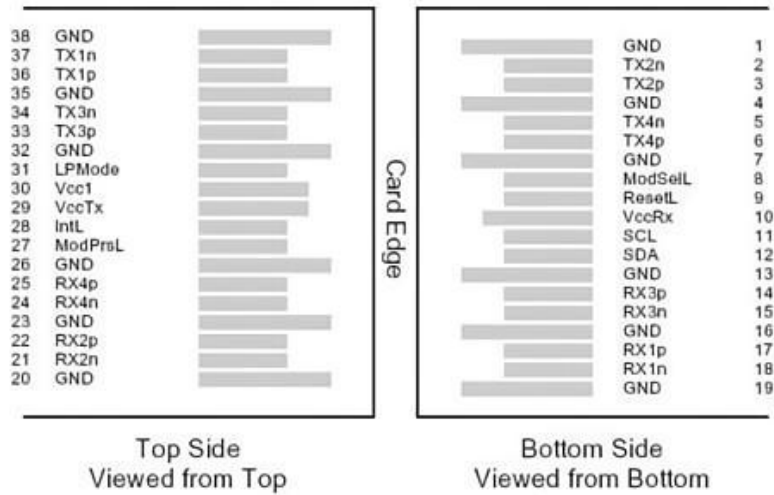
Timing for Soft Control and Status Functions

Parameter	Symbols	Max.	Unit	Conditions
ModSelL Assert Time	ton_ModSelL	100	μs	Time from assertion of ModSelL until module responds to data transmission over the 2-wire serial bus
ModSelL Deassert Time	toff_ModSelL	100	μs	Time from de-assertion 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 cleared ⁴ until the module is fully functional ³

Notes:

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 Description



Pin	Symbols	Logic	Description	Notes
1	GND		Ground	1
2	Tx2n	CML-I	Transmitter Inverted Data Input	
3	Tx2p	CML-I	Transmitter Non-Inverted Data Input	
4	GND		Ground	1
5	Tx4n	CML-I	Transmitter Inverted Data Input	
6	Tx4p	CML-I	Transmitter Non-Inverted Data Input	
7	GND		Ground	
8	ModSelL	LVTTL-I	Module Select	
9	ResetL	LVTTL-I	Module Reset	
10	Vcc Rx		+3.3V Power Supply Receiver	2
11	SCL	LVCOMS-I/O	2-wire serial interface clock	
12	SDA	LVCOMS-I/O	2-wire serial interface data	
13	GND		Ground	
14	Rx3p	CML-0	Receiver Non-Inverted Data Output	
15	Rx3n	CML-0	Receiver Inverted Data Output	
16	GND		Ground	1
17	Rx1p	CML-0	Receiver Non-Inverted Data Output	
18	Rx1n	CML-0	Receiver Inverted Data Output	1
19	GND		Ground	1
20	GND		Ground	
21	Rx2n	CML-0	Receiver Inverted Data Output	
22	Rx2p	CML-0	Receiver Non-Inverted Data Output	
23	GND		Ground	
24	Rx4n	CML-0	Receiver Inverted Data Output	
25	Rx4p	CML-0	Receiver Non-Inverted Data Output	

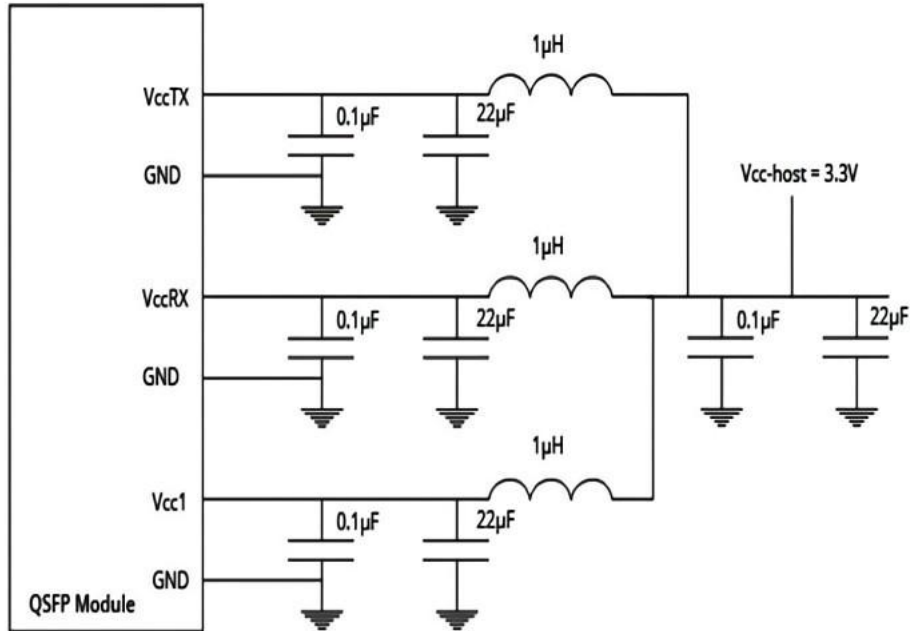
26	GND		Ground	1
27	ModPrsL	LVTTTL-0	Module Present	
28	IntL	LVTTTL-0	Interrupt	
29	VccTx		+3.3V Power supply transmitter	2
30	Vcc1		+3.3V Power supply	2
31	LPMMode	LVTTTL-I	Low Power Mode	
32	GND		Ground	1
33	Tx3p	CML-I	Transmitter Non-Inverted Data Input	
34	Tx3n	CML-I	Transmitter Inverted Data Input	
35	GND		Ground	1
36	Tx1p	CML-I	Transmitter Non-Inverted Data Input	
37	Tx1n	CML-I	Transmitter Inverted Data Input	
38	GND		Ground	1

Notes:

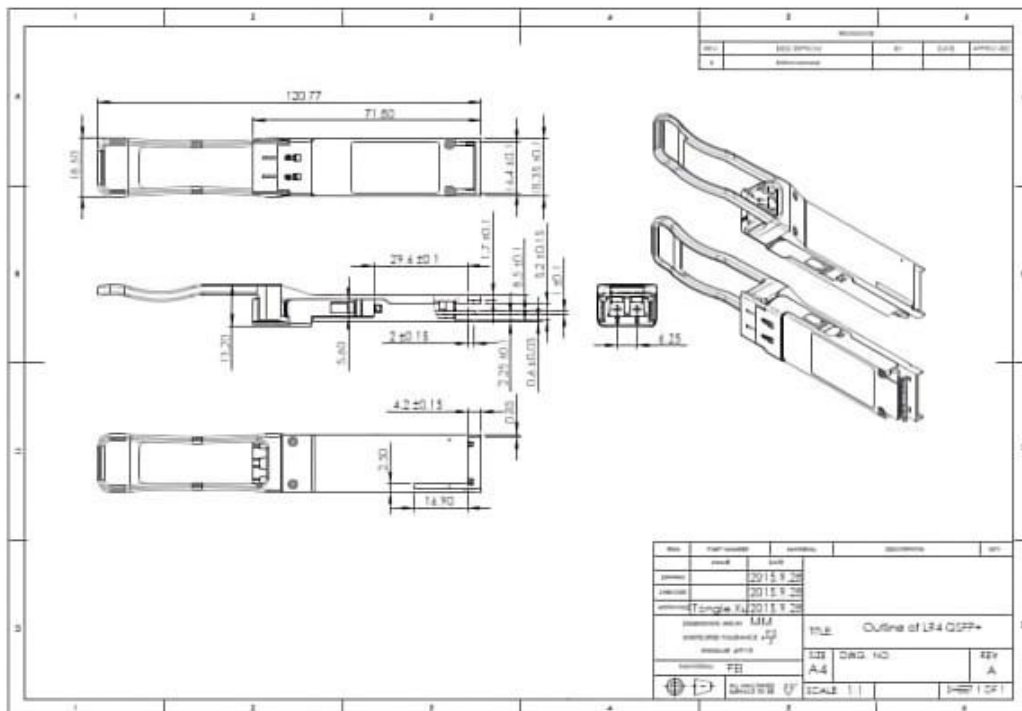
[1] GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

[2] Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 7. Vcc Rx Vcc1 and VccTx may be internally connected within the QSFP+ Module in any combination. The connector pins are each rated for a maximum current of 500mA.

Recommended Circuit



Mechanical Dimensions



Further Information:

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For customer service: support@naddod.com

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