

Product Features

- ▶ Compliant to IEEE 200G FR4 specification
- ▶ 4 CWDM lanes MUX/DEMUX design
- ▶ 4x53.125G PAM4 electrical interface (200GAUI-4, CEI-56G-VSR-PAM4)
- ▶ Non-hermetic package design
- ▶ Maximum power consumption 7.0W
- ▶ LC duplex connector
- ▶ Supports 212.5Gb/s aggregate bit rate
- ▶ Up to 2km transmission on single mode fiber with FEC
- ▶ Operating case temperature: 0 to 70°C
- ▶ Single 3.3V power supply
- ▶ I2C digital management interface
- ▶ RoHS 2.0 compliant
- ▶ Hardware SFF-8679 Rev 1.8 compliant

Applications

- ▶ Data Center Interconnect

1. Descriptions

STC-200G-XXX are QSFP56 transceiver modules designed for 2km optical communication applications with single mode fiber. They are compliant to IEEE 802.3-2018 200GBASE FR4¹, SFF-8679², CEI-56G-VSR-PAM4³ standards. Digital diagnostic management interface (DDMI) is realized by I2C interface in compliance with CMIS⁴. The modules are RoHS 2.0 compliant.

The modules can convert 4-channel 53.125Gb/s electrical data to 4-channel optical signals, and multiplex them into a single channel for 212.5Gb/s optical transmission. Similarly, they optically de-multiplex a 212.5Gb/s input into 4-channel signals, and convert them to 4-channel output electrical data on the receiver side. It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

2. Block Diagrams

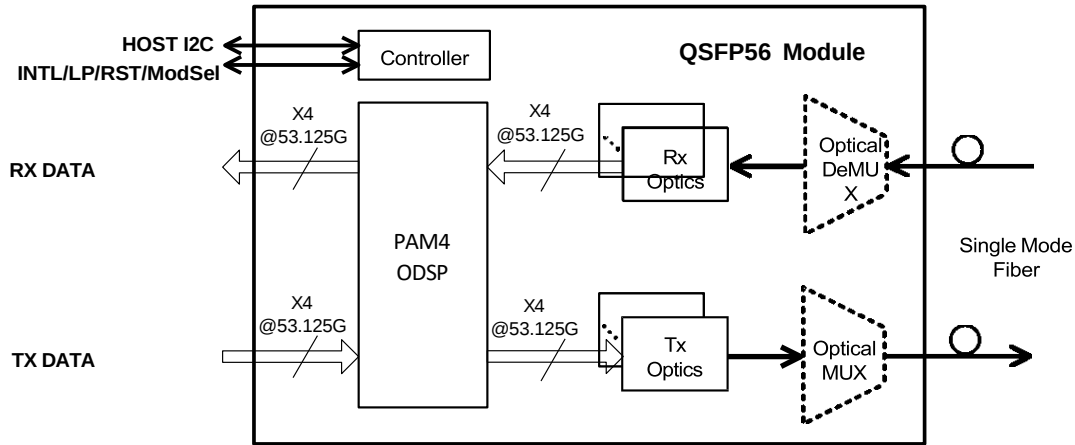


Figure 1. Transceiver Block Diagram

3. Pin Descriptions

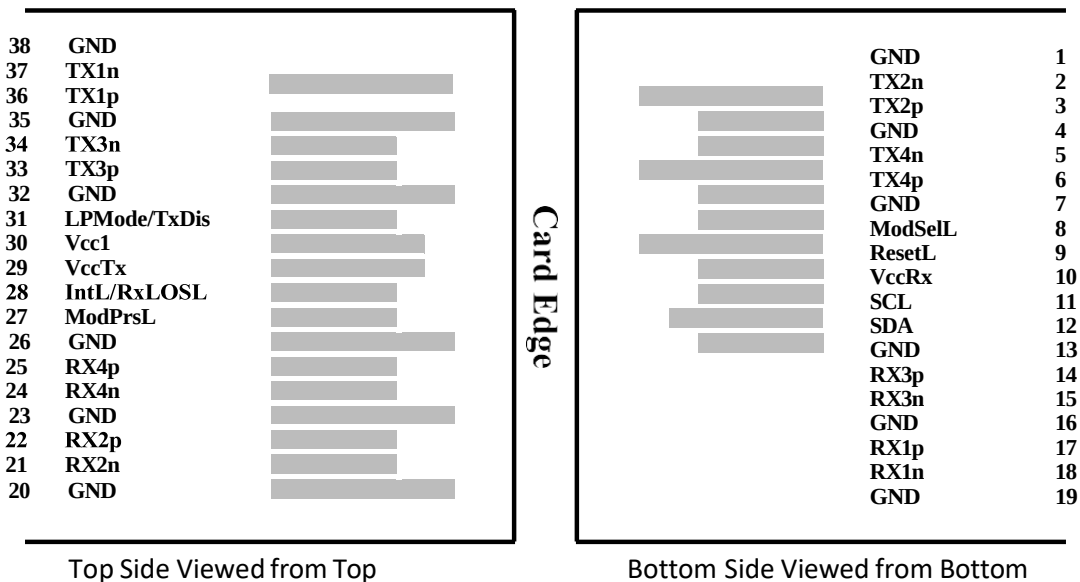


Figure 2. MSA compliant Connector

Pin	Symbol	Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	

Pin	Symbol	Description	Notes
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc Rx	+3.3V Power Supply Receiver	2
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Non-Inverted Data Output	
25	Rx4p	Receiver Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL/RxLOSL	Interrupt . Optionally configurable as RxLOSL via the management interface (SFF-8636).	
29	Vcc Tx	+3.3V Power supply transmitter	2
30	Vcc1	+3.3V Power supply	2
31	LPMODE/TxDis	Low Power Mode. Optionally configurable as TxDis via the management interface (SFF-8636).	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Notes

1. Circuit ground is internally isolated from chassis ground. GND is the symbol for signal and supply (power) common for the module. All are common within the 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. VccRx, Vcc1 and VccTx are applied concurrently and may be internally connected within the module in any combination. Vcc contacts in SFF-8662 and SFF-8672 each have a steady state current Rating of 1A.

4. Proposed Application Schematics

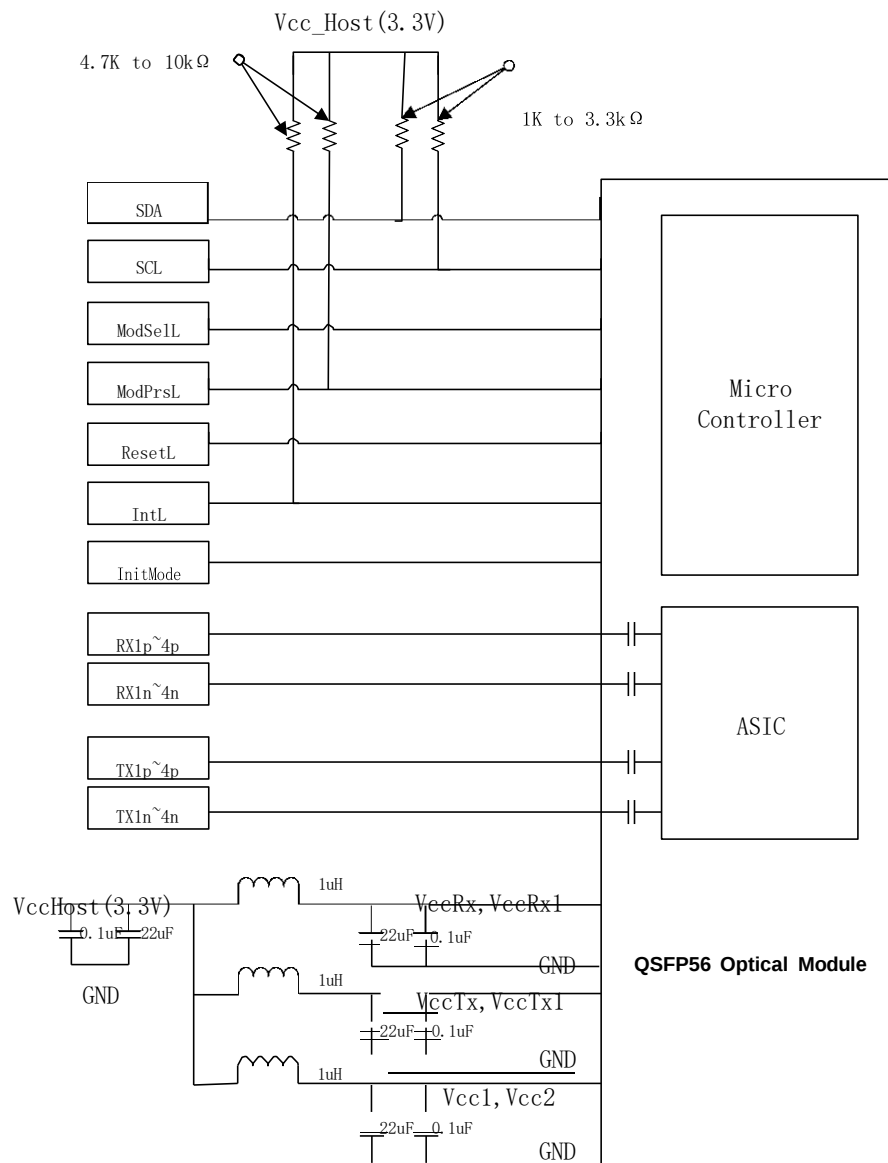


Figure 3. Proposed Application Schematics

5. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Maximum Supply Voltage	Vcc	-0.5	3.3	3.6	V	
Storage Temperature	Ts	-40		85	°C	
Relative Humidity	RH	0		85	%	1

Notes:

1. Non-condensing

6. Operating Environments

Electrical and optical characteristics below are defined under this operating environment, unless otherwise specified.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	Vcc	3.135	3.3	3.465	V
Case Temperature	Top	0		70	°C
Signaling rate, each lane			26.5625		GBd
Data Rate Accuracy		-100		100	ppm
Link Distance with G.652		0.002		2	km

7. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Power dissipation				7.0	W	
Supply Current	Icc			2.12	A	
Transmitter						
Signaling rate per lane (range)		26.5625 ±100 ppm			GBd	
Differential Voltage pk-pk	Vpp			900	mV	At 1 MHz
Common Mode Voltage	Vcm	-350		2850	mV	
Common Mode Noise, RMS				17.5	mV	
Differential Termination Resistance Mismatch				10	%	
Differential Return Loss	SDD22	Complaint to CEI-56G-VSR-PAM4				
Common Mode to Differ- ential Mode Conversion	SDC22	Complaint to CEI-56G-VSR-PAM4				

Common Mode ReturnLoss	SCC22			-2	dB	From 250MHz to fb GHz
Transition time	Trise/Tfall	9.5			ps	20%~80%
Near-end Eye Width at 10 ⁻⁶ probability	EW6	0.265			UI	
Near-end Eye Height at 10 ⁻⁶ probability	EH6	70			mV	
Far-end Eye Width at 10 ⁻⁶ probability	EW6	0.2			UI	
Far-end Eye Height at 10 ⁻⁶ probability	EH6	30			mV	
Near-end Eye Linearity		0.85				
Receiver						
Signaling rate per lane (range)		26.5625 ±100 ppm			GBd	
Overload Differential Voltage pk-pk	Vpp	900			mV	
Common Mode Voltage	Vcm	-350		2850	mV	
Differential Termination Resistance Mismatch				10	%	At 1 MHz
Differential Return Loss	SDD11	Complaint to CEI-56G-VSR-PAM4				
Differential Mode to Common Mode Conversion	SCD11	Complaint to CEI-56G-VSR-PAM4				
Stressed Input Test		Complaint to CEI-56G-VSR-PAM4				

8. Optical Characteristics

Parameters	Unit	min	type	max
Transmitter				
Signaling rate, each lane	GBd		26.5625	
Total average launch power	dBm			10.7
Average launch power, each lane	dBm	-4.2		4.7
Line wavelengths	nm	1264.5		1277.5
		1284.5		1297.5
		1304.5		1317.5
		1324.5		1337.5
Optical Modulation Amplitude (OMA _{outer}), each lane	dBm	-1.2		4.5

Common Mode ReturnLoss	SCC22			-2	dB	From 250MHz to fb GHz
Transition time	Trise/Tfall	9.5			ps	20%~80%
Near-end Eye Width at 10 ⁻⁶ probability	EW6	0.265			UI	
Near-end Eye Height at 10 ⁻⁶ probability	EH6	70			mV	
Far-end Eye Width at 10 ⁻⁶ probability	EW6	0.2			UI	
Far-end Eye Height at 10 ⁻⁶ probability	EH6	30			mV	
Near-end Eye Linearity		0.85				
Receiver						
Signaling rate per lane (range)		26.5625 ±100 ppm			GBd	
Overload Differential Voltage pk-pk	Vpp	900			mV	
Common Mode Voltage	Vcm	-350		2850	mV	
Differential Termination Resistance Mismatch				10	%	At 1 MHz
Differential Return Loss	SDD11	Complaint to CEI-56G-VSR-PAM4				
Differential Mode to Common Mode Conversion	SCD11	Complaint to CEI-56G-VSR-PAM4				
Stressed Input Test		Complaint to CEI-56G-VSR-PAM4				

Difference in launch power between any two lanes (OMA _{outer})	dB			4
Extinction Ratio (ER)	dB	3.5		
Side-Mode Suppression Ratio (SMSR)	dB	30		
Launch power in OMA _{outer} minus TDECQ, each lane for extinction ratio >= 4.5 dB for extinction ratio < 4.5 dB	dBm	-2.6 -2.5		
Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane	dB			3.3
Average launch power of OFF transmitter, each lane	dBm			-30
RIN _{16.5OMA}	dB/Hz			-132
Optical return loss tolerance	dB			16.5
Transmitter reflectance	dB			-26
Receiver				
Signaling rate, each lane	GBd		26.5625	
Line wavelengths	nm	1264.5		1277.5
		1284.5		1297.5
		1304.5		1317.5
		1324.5		1337.5
Average receiver power, each lane	dBm	-8.2		4.7
Receiver power, each lane (OMA)	dBm			4.5
Damage threshold, each lane	dBm	5.7		
Difference in receive power between any two lanes (OMA _{outer})	dB			4.1
Receiver sensitivity (OMA), each lane	dBm			max(-5.5, SECQ-6.9)
Receiver reflectance	dB			-26
Stressed receiver Sensitivity (OMA), each lane	dBm			-3.6
Conditions of stressed receiver sensitivity test:				
Stressed eye closure for PAM4 (SECQ), lane under test	dB		3.3	
OMA _{outer} of each aggressor lane	dBm		0.5	

9. EEPROM Definitions

Refer to CMIS Rev4.0 used for QSFP56.

10. Digital Diagnostics Functions

Digital diagnostic management interface (DDMI) is realized by I2C interface in compliance with CMIS 4.0. Diagnostic management functions are realized, and the data addresses are listed in the form below.

Performance Item	Data Address	
	Alarm & Warning	Monitor
Module temperature	Page00h (9)	Page00 (14-15)
Module voltage	Page00h (9)	Page00 (16-17)
Bias current	Page 11h (143-146)	Page 11h (170-177)
Transmitter optical power	Page 11h (139-142)	Page 11h (154-161)
Receiver optical power	Page 11h (149-152)	Page 11h (186-193)

11. Mechanical Specifications

Mechanical specification comply with SFF-8636 Rev 2.10a

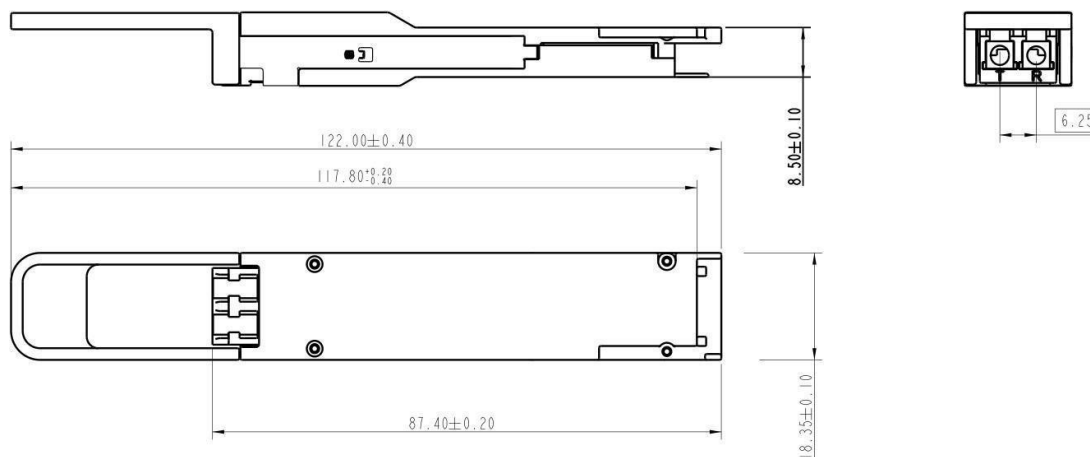


Figure 4. STC-200G-XXX Mechanical Dimensions

12. Ordering Information

Part Number	Description
STC-200G-XXX	200GBASE-FR4 QSFP-56, 2Km