


TSQS-852HG01-MC Optical Transceiver

Multi-mode 200GBASE-SR4 QSFP56 Transceiver, With Diagnostic Monitoring
4 channels full-duplex 100m Transceiver

Features

- Supports 212.5Gb/s aggregate bit rate
- Maximum link length of 100m on OM4 Multimode Fiber
- 4x50Gb/s PAM4 VCSEL transmitter
- Hot-pluggable QSFP56 form factor
- 200GAUI-4 C2M electrical interface (4x50Gb/s PAM4 retimed)
- Low power dissipation < 5.5W
- I2C management interface
- Single 1X12 MPO connector
- Operating case temperature: 0°C~+70°C
- RoHS6 compliant (lead free) 



Applications

- 200G 100m on OM4 with FEC

Description

The TSQS-852HG01-MC 200G QSFP56 SR4 transceiver modules are designed for use in 200 Gigabit Ethernet interfaces over multi-mode fiber. They are compliant with the QSFP MSA and portions of IEEE 802.3-2018 and 802.3cd. Digital diagnostics functions are available via the I2C interface, as specified by the CMIS 4.0. The transceiver is RoHS compliant per Directive 2011/65/EU.

Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	VCC	-0.5	+3.6	V
Storage Temperature	Tc	-40	+85	°C
Relative Humidity ¹	RH	15	85	%

Notes:

[1] Non-condensing.

Recommended Operating Environment

Parameter	Symbol	Min	Typical	Max	Unit
Power Supply Voltage	VCC	3.15	3.30	3.45	V
Supply current	Icc	-	-	1594	mA
Operating Case Temperature ¹	Tca	0	-	70	°C

Notes:

[1] 48-hour excursions, maximum

Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit
Transmitter					
Signaling rate per lane	-	26.5625 ± 100 ppm.			GBd
Differential peak-peak input voltage tolerance ¹	Vin	900	-	-	mV
Differential input return loss	-	Per equation (83E-5) IEEE802.3-2018			-
Differential to common mode input return loss	-	Per equation (83E-6) IEEE802.3-2018			-
Differential termination mismatch	-	-	-	10	%
Module stress input test ²	-	Per 120E.3.4.1 IEEE802.3-2018			-
Single-ended voltage tolerance range	-	-0.4	-	3.3	V
DC common mode voltage ³	-	-350	-	2850	mV
Receiver					
Signaling rate per lane	-	26.5625 ± 100 ppm.			GBd
AC common-mode output voltage (RMS)	-	-	-	17.5	mV
Differential peak-to-peak output voltage	-	-	-	900	mV
Near-end ESMW (Eye symmetry mask width)	-	0.265			UI
Near-end Eye height, differential (min)	-	70	-	-	mV
Far-end ESMW (Eye symmetry mask width)	-	0.2			UI
Far-end Eye height, differential (min)	-	30	-	-	mV
Differential output return loss	-	Per equation 83E-2 IEEE802.3-2018			-
Common to differential mode conversion return loss	-	Per equation 83E-3 IEEE802.3-2018			-
Differential termination mismatch	-	-	-	10	%
Transition time (min, 20% to 80%)	-	9.5	-	-	ps
DC common mode voltage ³	-	-350	-	2850	mV

Notes:

[1] With the exception to 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.

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[2] Meets specified BER

[3] DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

Transmitter Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Signaling Speed per Lane ¹	-	26.5625 ± 100ppm			GBd
Modulation format	-	PAM4			-
Center Wavelength	λ	840	850	860	nm
RMS spectral width ¹	$\Delta\lambda$	-	-	0.6	nm
Average Launch Power per Lane	Po	-6.5	-	4	dBm
Outer Optical Modulation Amplitude (OMA outer), each lane ²	OMA	-4.5	-	3	dBm
Launch power in OMA outer minus TDECQ, each lane	-	-5.9	-	-	dBm
Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane	-	-	-	4.5	dB
TDECQ – 10log ₁₀ (C _{eq}), each lane ³	-	-	-	4.5	dB
Extinction Ratio	ER	3	-	-	dB
Optical Return Loss Tolerance	ORL	-	-	12	dB
Encircled Flux ⁴	FLX	> 86% at 19 μ m < 30% at 4.5 μ m			-
Average launch power of OFF transmitter, each lane	-	-	-	-30	dBm

Notes:

[1] RMS spectral width is the standard deviation of the spectrum.

[2] Even if the TDECQ < 1.4 dB, the OMAouter (min) must exceed this value.

[3] C_{eq} is a coefficient defined in 121.8.5.3, which accounts for the reference equalizer noise enhancement.

[4] If measured into type A1a.2 or type A1a.3, or A1a.4, 50 μ m fiber, in accordance with IEC 61280-1-4

Receiver Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Signaling Rate per Channel	DR	26.5625 ± 100ppm			GBd
Modulation format	-	PAM4			-
Center Wavelength	λ	840	850	860	nm
Damage Threshold ¹	DT	5			dBm
Average receive power, each lane ²	RXPOW	-8.4	-	4	dbm
Receive power (OMAouter), each lane	RxOMA	-	-	3	dBm
Stressed Receiver Sensitivity (OMA) per Lane ³	SRS	-	-	-3.4	dBm
Stressed eye closure for PAM4 (SECQ), lane under test ⁴	-	4.5			dB
SECQ – 10log ₁₀ (C _{eq})f, each lane (max) ⁴	-	4.5			dB

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OMAouter of each aggressor lane	-	3			dBm
LOS De-Assert	Lda	-	-	-9	dBm
LOS Assert	Lsa	-30	-	-	dBm
LOS Hysteresis	Lh	0.5	-	-	dB

Notes:

[1] The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level on one lane. The receiver does not have to operate correctly at this input power.

[2] Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.

[3] Measured with conformance test signal at TP3 (see IEEE 802.3cd 138.8.10) for the BER of 2.4E-4.

[4] C_{eq} is a coefficient defined in 121.8.5.3, which accounts for the reference equalizer noise enhancement.

General Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Bit Rate (all wavelengths combined) ¹	BR	-	-	212.5	Gb/s
Bit Error Ratio (pre-FEC) ²	BER	-	-	2.4E-4	-

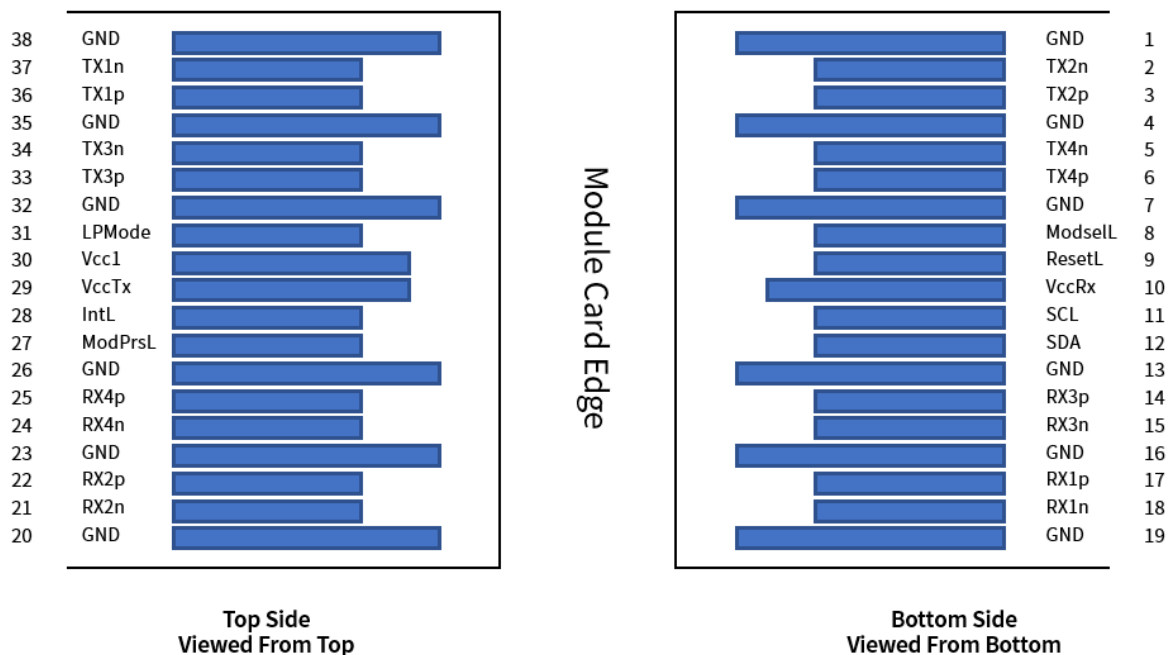
Maximum Supported Distances

Fiber Type	--	-	-	--	-
OM3 MMF	LMAX1	-	-	70	m
OM4 MMF	LMAX2	-	-	100	m

Notes:

[1] Supports 200GBASE-SR4 per IEEE P802.3cd.

[2] The typical BER is better than 1E-6 when Measured with a transmitter to produce SECQ up to 3dB.

Qsfp Transceiver Electrical Pad Layout

Pin Definition

Pin	Symbol	Name/Description
1	GND	Ground
2	Tx2n	Transmitter Inverted Data Input
3	Tx2p	Transmitter Non-Inverted Data Input
4	GND	Ground
5	Tx4n	Transmitter Inverted Data Input
6	Tx4p	Transmitter Non-Inverted Data Input
7	GND	Ground
8	ModSelL	Module Select
9	ResetL	Module Reset
10	VCC Rx	+3.3 V Power supply receiver
11	SCL	2-wire serial interface clock
12	SDA	2-wire serial interface data
13	GND	Ground
14	Rx3p	Receiver Non-Inverted Data Output
15	Rx3n	Receiver Inverted Data Output
16	GND	Ground
17	Rx1p	Receiver Non-Inverted Data Output
18	Rx1n	Receiver Inverted Data Output
19	GND	Ground
20	GND	Ground
21	Rx2n	Receiver Inverted Data Output
22	Rx2p	Receiver Non-Inverted Data Output
23	GND	Ground
24	Rx4n	Receiver Inverted Data Output
25	Rx4p	Receiver Non-Inverted Data Output
26	GND	Ground
27	ModPrsL	Module Present
28	IntL	Interrupt
29	VCC Tx	+3.3 V Power supply transmitter
30	VCC 1	+3.3 V Power Supply
31	LPMoDe	Low Power Mode
32	GND	Ground

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33	Tx3p	Transmitter Non-Inverted Data Input
34	Tx3n	Transmitter Inverted Data Input
35	GND	Ground
36	Tx1p	Transmitter Non-Inverted Data Input
37	Tx1n	Transmitter Inverted Data Input
38	GND	Ground

Ordering Information

Part Number	Product Description
TSQS-852HG01-MC	QSFP56 200G SR4 100m@OM4 0°C ~ +70°C

References

1. SFF-8665: “QSFP+ 28Gb/s 4X Pluggable Transceiver Solution (QSFP28)” , Rev 1.9, June 29, 2015 and associated SFF documents referenced therein:
 - i. SFF-8661
 - ii. SFF-8679
 - iii. SFF-8662
 - iv. SFF-8663
 - v. SFF-8672
 - vi. SFF-8472
2. Directive 2011/65/EU of the European Parliament and of the Council, “on the restriction of the use of certain hazardous substances in electrical and electronic equipment,” July 1, 2011.
3. Common Management Interface Specification (CMIS) Rev 4.0.
4. IEEE P802.3-2018, 200GAUI-4 Interface.
5. IEEE P802.3cd

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