TSSP-13192L-LR Optical Transceiver

1310nm SFP+ Single-mode Transceiver, With Diagnostic Monitoring

Duplex SFP+ 10km Transceiver

Features

- Optical interface compliant to IEEE 802.3ae 10GBASE-LR
- Electrical interface compliant to SFF-8431
- Hot Pluggable
- Data rate up to 11.3Gbps
- 1310nm DFB transmitter, PIN photo-detector
- Low power consumption < 1.0W
- Distance up to 10km
- Specifications compliant with SFF 8472
- 2-wire interface with integrated Digital Diagnostic monitoring
- Operating case temperature: Standard: 0°C ~+70°C

  Industrial: -40°C ~+85°C
- RoHS6 compliant (lead free)

Applications

- 10GBASE-LR at 10.3125Gbps
- 10GBASE-LW at 9.95Gbps

Description

The TSSP-13192L-LR single mode transceiver is small form factor pluggable module for serial optical data communications such as IEEE 802.3ae 10GBASE-LR/LW. It is with the SFP+ 20-pin connector to allow hot plug capability. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a 1310nm multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

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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	RH	0	85	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Power Supply Voltage	VCC	3.15	3.30	3.45	V
Supply current	Icc	-	-	1014	mA
Operating Case Temperature (Standard)	TCa	0	-	70	°C
Operating Case Temperature (Industrial)	TCa	-40	-	85	°C

Notes:

1. Supply current is shared between VCCTX and VCCRX.

2. In-rush is defined as current level above steady state current requirements.

Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit
Transmitter					
Data Rate	Mra	1.0	10.3	11.3	Gbps
Input differential impedance1	Rin	-	100	-	Ω
Differential Input Voltage swing	Vin	150	-	1200	mV
Transmit Disable Voltage	VD	2.0	-	VCC+0.3	V
Transmit Enable Voltage2	Ven	Vee	-	Vee+0.8	V
Transmit Disable Assert Time	Vn	-	-	100	us
Receiver					
Data Rate	Mra	-	10.3	11.3	Gbps
Output differential impedance1	Rout		100	-	Ω
Differential Output Swing3	Vout	300	-	700	mV
Loss of Signal –Asserted4	-	2.0	-	VCC+0.3	V
Loss of Signal –Negated4	-	Vee	-	Vee+0.8	V

Notes:

1.AC coupled.

2.Or open circuit.

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3.Into 100 ohm differential termination.

4.LOS is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Transmitter Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Center Wavelength	λ	1260	1310	1355	nm
Average Optical Power1	Po	-8.2	-	+0.5	dBm
Optical Modulation Amplitude	OMA	-5.2		-	dBm
Transmitter and dispersion penalty	TDP	-	-	3.2	dB
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Average Launch Power of OFF	Poff	-	-	-30	dBm
Extinction Ratio	ER	3.5	-	-	dB
Optical Return Loss Tolerance	ORL	-	-	12	dB
Eye Mask	-	Compliant with IEEE 802.3			

Receiver Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Center Wavelength	λ	1260	-	1355	nm
Receiver sensitivity in OMA2	Rsen1	-	-	-14.4	dBm
Receiver Overload	Pmax	0.5		-	dBm
Stressed receiver sensitivity in OMA3	Rsen2	-	-	-10.3	dBm
Receiver Reflectance	Rrx	-	-	-12	dB
Receive electrical 3 dB upper cutoff	-	-	-	12.3	GHz
LOS Asserted	Lsa	-28	-	-	dBm
LOS De-Asserted	Lda	-	-	-16	dBm
LOS Hysteresis	Lh	0.5	-	-	dB

Notes:

1. Output power is coupled into a 9/125μm SMF.

2. Average received power; BER less than 1E-12 and PRBS 2^{31-1} test pattern.

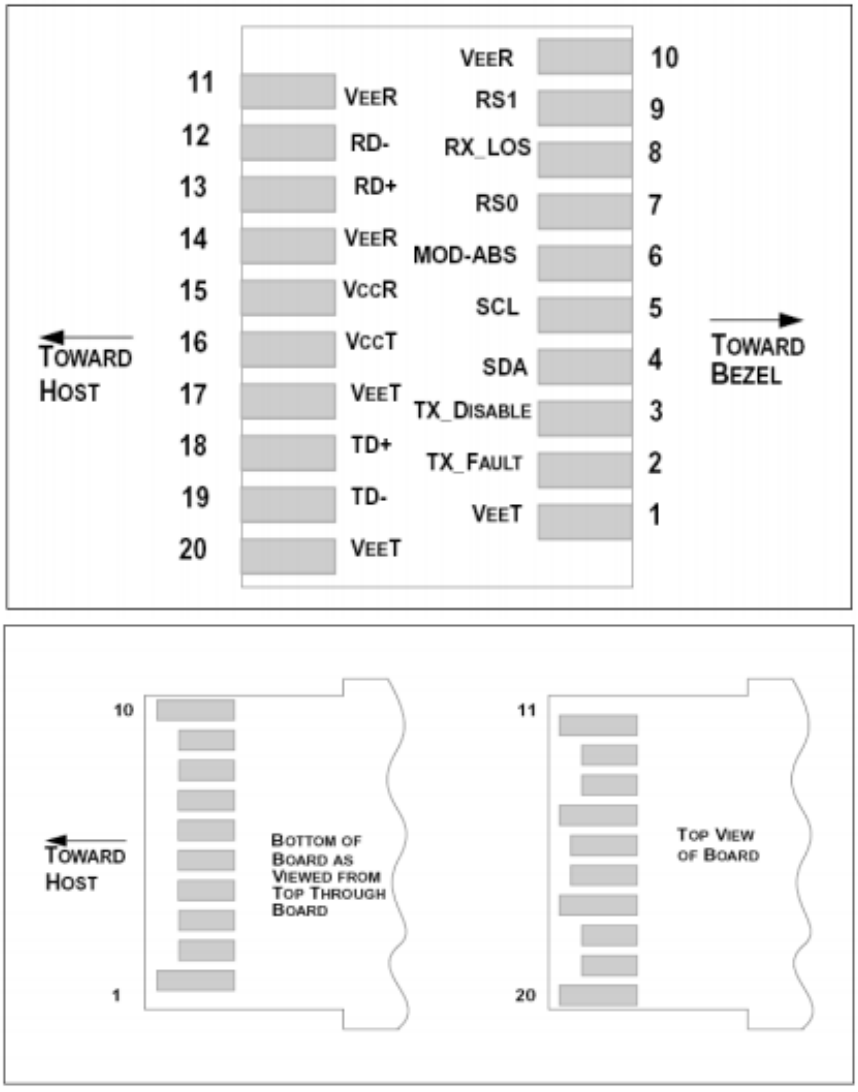
3.The stressed sensitivity values in the table are for system level BER measurements which include the effects of CDR circuits. It is recommended that at least 0.4 dB additional margin be allocated if component level measurements are made without the effects of CDR circuits.

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Electrical Pad Layout

Parameter	Symbol	Min	Typical	Max	Unit
TX_Fault,RX_LOS	VOL	0	-	0.4	V
	VOH	Host_VCC-0.5	-	Host_VCC+0.3	V
TX_DIS	VIL	-0.3	-	0.8	V
	VIH	2.0	-	VCCT+0.3	V
RS0,RS1	VIL	-0.3	-	0.8	V
	VIH	2.0	-	VCCT+0.3	V

Electrical Pad Layout



Pin definition

Pin	Symbol	Name/Description
1	VEET1	Transmitter Ground
2	Tx_FAULT2	Transmitter Fault
3	Tx_DIS3	Transmitter Disable. Laser output disabled on high or open
4	SDA2	2-wire Serial Interface Data Line
5	SCL2	2-wire Serial Interface Clock Line
6	MOD_ABS4	Module Absent. Grounded within the module
7	RS05	Rate Select 0
8	RX_LOS2	Loss of Signal indication. Logic 0 indicates normal operation
9	RS15	Rate Select 1
10	VEER1	Receiver Ground
11	VEER1	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver DATA out. AC Coupled
14	VEER1	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET1	Transmitter Ground
18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET1	Transmitter Ground

Notes:

1.Module circuit ground is isolated from module chassis ground within the module.

2.Should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15Vand 3.6V.

3.Tx_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VCCT inside the module.

4.Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to VCC_Host with a resistor in the range 4.7 kΩ to10 kΩ.Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.

5.RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module.

Ordering information

Part Number	Product Description
TSSP-13192L-LRC	10Gbps SFP+ 1310nm 10km 0°C ~ +70°C
TSSP-13192L-LRT	10Gbps SFP+ 1310nm 10km -40°C ~ +85°C

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References

1. SFP28 MSA
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.

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