


## TSBP-23192-ER & TSBP-32192-ER Series

Tx: 1270nm/Rx: 1330nm BIDI SFP+ 40km Transceiver for 10GbE

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RoHS 6 Compliant

### Features

- Simplex LC Connector Bi-Directional SFP+ Optical Transceiver
- Compliant with SFF-8431, SFF-8432 and IEE802.3ae
- Up to 40km on 9/125um SMF
- Two types:
  - A:1270nm DFB Laser transmitter,1330nm receiver
  - B:1330nm DFB Laser transmitter,1270nm receiver
- Digital Diagnostic SFF-8472 Compliant
- Operating case temperature 0 ~ 70 °C
- RoHS6 compliant (lead free) 

### Applications

- 10GBASE-ER at 10.3125Gbps
- 10GBASE-EW at 9.953Gbps
- Other Optical Links

### Product description

The TSBP-23192-ER & TSBP-32192-ER series single mode transceiver is small form factor pluggable module for duplex optical data communications such as 10GBASE-LR/LW defined by IEEE 802.3ae. It is with the SFP+ 20-pin connector to allow hot plug capability.

The TSBP-23192-ER module is designed for single mode fiber and operates at a nominal wavelength of 1270nm; TSBP-32192-ER module is designed for single mode fiber and operates at a nominal wavelength of 1330nm. The transmitter section uses a multiple quantum well DFB, which is 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.

### Absolute Maximum Ratings

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

Parameters	Symbol	Min.	Max.	Unit
Supply Voltage	V <sub>CC</sub>	-0.5	+3.6	V
Storage Temperature	T <sub>c</sub>	-40	+85	°C
Operating Case Temperature	T <sub>c</sub>	0	+70	°C
Relative Humidity	RH	0	85	%

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max	Unit
Supply Voltage	V <sub>CC</sub>	3.0	3.3	3.6	V
Supply current	I <sub>CC</sub>		200	300	mA
Operating Case Temperature	T <sub>c</sub>	0	25	70	°C
Module Power Dissipation	P <sub>m</sub>	-	0.7	1.1	W

#### 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	Ref.
Supply Voltage	V <sub>CC</sub>	3.00		3.60	V	1
Supply Voltage	I <sub>CC</sub>	-	200	300	mA	1

#### Transmitter

Input differential impedance	R <sub>in</sub>	-	100		Ω	2
Single ended data input swing	V <sub>in,pp</sub>	150	-	1200	mVpp	-
Transmit Disable Voltage	V <sub>D</sub>	2	-	V <sub>CC</sub>	V	-
Transmit Enable Voltage	V <sub>EN</sub>	V <sub>ee</sub>		V <sub>ee</sub> +0.8	V	3

#### Receiver

Output differential impedance	R <sub>out</sub>	-	100	-	Ω	2
Single ended data output swing	V <sub>out,pp</sub>	300	-	700	mV	4
LOS Fault	V <sub>LOS fault</sub>	2	-	V <sub>CC,HOST</sub>	V	5
LOS Normal	V <sub>LOS norm</sub>	V <sub>ee</sub>	-	V <sub>ee</sub> +0.8	V	5

#### Notes:

1. Module power consumption never exceeds 1W.
2. AC coupled.
3. Or open circuit.
4. Into 100 ohm differential termination.
5. LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

**Optical characteristics (TSBP-23192-ER, 1270 DFB & PIN/TIA)**

Parameter	Symbol	Min.	Typical	Max	Unit	Ref.
<b>Transmitter</b>						
Optical Wavelength	$\lambda_C$	1260	1270	1280	nm	-
Side Mode Suppress Ratio	SMSR	30	-	-	dB	-
Spectral Width(-20dB)	$\Delta\lambda$		-	1	nm	-
Average Output Power	$P_{op}$	+1	-	+5	dBm	1,2
Extinction Ratio	ER	3.5	-	-	dB	-
Eye Mask	-	Compliant with IEEE 802.3				
<b>Receiver</b>						
Average Receiver Power	RSENS	-	-	-14.1	dBm	2,3
Receiver Overload	$P_{MAX}$	-	-	+0.5	dBm	-
Centre Wavelength	$\lambda_C$	1320	-	1340	nm	-
LOS De-Assert	$LOS_D$		-	-15	dBm	-
LOS Assert	$LOS_A$	-30	-	-	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

**Optical characteristics (TSBP-32192-ER, 1330 DFB & PIN/TIA)**

Parameter	Symbol	Min.	Typical	Max	Unit	Ref.
<b>Transmitter</b>						
Optical Wavelength	$\lambda_C$	1320	1330	1340	nm	-
Side Mode Suppress Ratio	SMSR	30	-	-	dB	-
Spectral Width(-20dB)	$\Delta\lambda$	-	-	1	nm	-
Average Output Power	$P_{op}$	+1	-	+5	dBm	1,2
Extinction Ratio	ER	3.5	-	-	dB	--
Eye Mask	-	Compliant with IEEE 802.3				
<b>Receiver</b>						
Average Receiver Power	RSENS	-	-	-14.1	dBm	2,3
Receiver Overload	$P_{MAX}$	-	-	+0.5	dBm	-
Centre Wavelength	$\lambda_C$	1260	-	1270	nm	-
LOS De-Assert	$LOS_D$	-	-	-15	dBm	-
LOS Assert	$LOS_A$	-30	-	-	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

**Notes:**

1. Output is coupled into a 9/125um SMF.
2. Average Receiver Power (Min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant.
3. Measured with a PRBS231-1 test pattern @10.3125Gbps, BER $\leq$ 10<sup>-12</sup>

**Pin definition**

Pin	Symbol	Name/Description
1	VEET [1]	Transmitter Ground
2	Tx_FAULT [2]	Transmitter Fault
3	Tx_DIS [3]	Transmitter Disable. Laser output disabled on high or open
4	SDA [2]	2-wire Serial Interface Data Line
5	SCL [2]	2-wire Serial Interface Clock Line
6	MOD_ABS [4]	Module Absent. Grounded within the module
7	RS0 [5]	RS0 for Rate Select: Open or Low = Module supports $\leq 4.25$ Gbps High = Module supports 9.95 Gb/s to 10.3125 Gb/s
8	RX_LOS [2]	Loss of Signal indication. Logic 0 indicates normal operation
9	RS1 [5]	No connection required
10	VEER [1]	Receiver Ground
11	VEER [1]	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver DATA out. AC Coupled
14	VEER [1]	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET [1]	Transmitter Ground
18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET [1]	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 3.15V and 3.6V.

[3]Tx\_Disable is an input contact with a 4.7 k $\Omega$  to 10 k $\Omega$  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 k $\Omega$  to 10 k $\Omega$ . 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 k $\Omega$  resistors in the module.

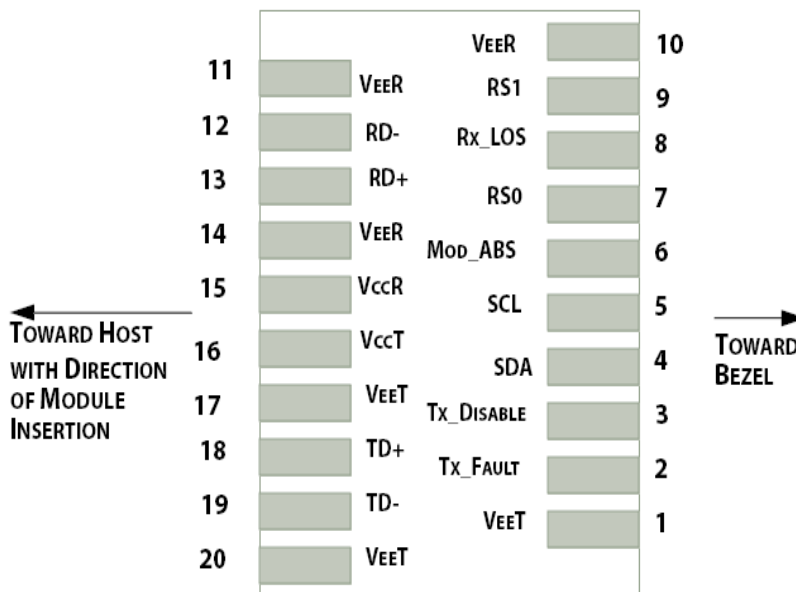


Figure1.Electrical Pin-out Details

**Regulatory Compliance**

T&S SFP+ transceiver is designed to be Class I Laser safety compliant and is certified per the following standards:

Feature	Agency	Standard	Certificate / Comments
Laser Safety	FDA	CDRH 21 CFR 1040 annd Laser Notice No. 50	1120292-000
Product Safety	UL	UL and CUL EN60950-2:2007	E347511
Environmental protection	SGS	RoHS Directive 2002/95/EC	GZ1001008918/CHEM
EMC	WALTEK	EN 55022:2006+A1:2007 EN 55024:1998+A1+A2:2003	WT10093759-D-E-E

**Ordering information**

Part Number	Product Description
TSBP-23192-ER	10Gbps, SFP+ BIDI TX1270nm/RX1330nm, 40km, 0°C ~ +70°C
TSBP-32192-ER	10Gbps, SFP+ BIDI TX1330nm/RX1270nm, 40km, 0°C ~ +70°C

**References**

1. "Specifications for Enhanced Small Form Factor Pluggable Module SFP+", SFF-8431, Rev 4.1, July 6, 2009.
2. "Improved Pluggable Formfactor", SFF-8432, Rev 4.2, Apr 18,2007
3. IEEE802.3ae – 2002
4. "Diagnostic Monitoring Interface for Optical Transceivers" SFF-8472, Rev 10.3, Dec 1,2007

**Important Notice**

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