

**Features**



- SFP Multi-Source Agreement compliant
- Compliant with SFF8472 diagnostic monitoring interface
- Industry standard small form pluggable (SFP) package
- Multi-rate
- Duplex LC connector
- Differential LVPECL inputs and outputs
- Single power supply 3.3V
- TTL signal detect indicator
- Hot Pluggable
- Class 1 laser product complies with EN 60825-1
- RoHS Compliant

**Absolute Maximum Ratings**

Parameter	Symbol	Min.	Max.	Units	Note
Storage Temperature	$T_S$	-40	85	°C	
Supply Voltage	$V_{CC}$	-0.5	4.0	V	
Input Voltage	$V_{IN}$	-0.5	$V_{CC}$	V	
Output Current	$I_o$	---	50	mA	
Operating Current	$I_{OP}$	---	400	mA	

**Recommended Operating Conditions**

Parameter	Symbol	Min.	Max.	Units	Note
Case Operating Temperature	$T_c$	0 -40	70 85	°C	
Supply Voltage	$V_{CC}$	3.1	3.5	V	
Supply Current	$I_{TX} + I_{RX}$	---	300	mA	

**Diagnostics Monitoring**

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-20 to 95	± 3	°C	
Voltage	0 to VCC	± 0.1	V	
Bias Current	0 to 120	± 5	mA	External
TX Power	-2 to +7	± 3 dB	dBm	
RX Power	-20 to -3	± 3 dB	dBm	

**Transmitter Electro-optical Characteristics**

**$V_{CC} = 3.1\text{ V to }3.5\text{ V}$ ,  $T_C = 0\text{ }^\circ\text{C to }70\text{ }^\circ\text{C}$  (  $-40\text{ }^\circ\text{C to }85\text{ }^\circ\text{C}$  )**

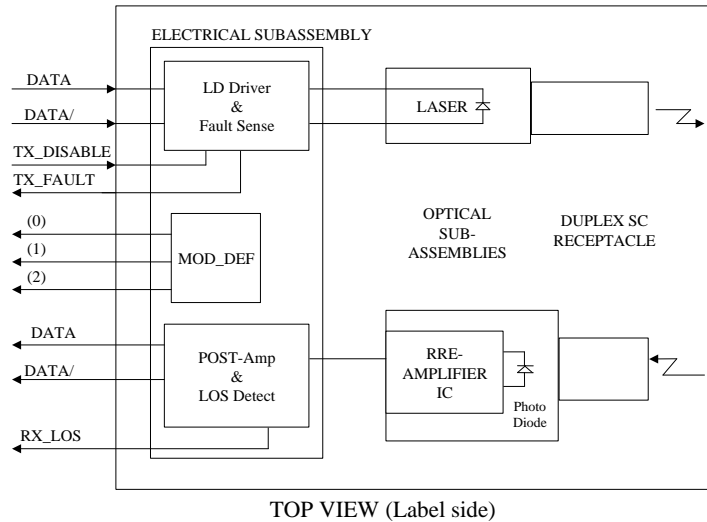
<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Output Optical Power 9/125 $\mu\text{m}$ fiber	$P_{out}$	0	---	+5	dBm	Average
Extinction Ratio	$ER$	8.2	---	---	dB	
Center Wavelength	$\lambda_C$	1280	1310	1340	nm	
Spectral Width (-20dB)	$\Delta\lambda$	---	---	1	nm	
Side Mode Suppression Ratio	$SMSR$	30	---	---	dB	
Output Eye	Compliant with Telcordia GR-253-CORE Issue 3 and ITU-T recommendation G-957					
Max. $P_{out}$ TX-DISABLE Asserted	$P_{OFF}$	---	---	-45	dBm	
Differential Input Voltage	$V_{DIFF}$	0.4	---	2.0	V	

### Receiver Electro-optical Characteristics

$V_{CC} = 3.1\text{ V to }3.5\text{ V}$ ,  $T_C = 0\text{ }^{\circ}\text{C to }70\text{ }^{\circ}\text{C}$  (  $-40\text{ }^{\circ}\text{C to }85\text{ }^{\circ}\text{C}$  )

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Optical Input Power-maximum	$P_{IN}$	0	---	---	dBm	BER < $10^{-10}$
RX Sensitivity @2.67 Gb/s	$P_{IN}$	---	---	-21	dBm	PRBS23, BER < $10^{-10}$
RX Sensitivity @OC-48	$P_{IN}$	---	---	-21	dBm	PRBS23, BER < $10^{-10}$
RX Sensitivity @2xFC	$P_{IN}$	---	---	-21	dBm	PRBS7, BER < $10^{-12}$
RX Sensitivity @GbE	$P_{IN}$	---	---	-21	dBm	PRBS7, BER < $10^{-12}$
RX Sensitivity @OC-12	$P_{IN}$	---	---	-21	dBm	PRBS23, BER < $10^{-10}$
RX Sensitivity @OC-3	$P_{IN}$	---	---	-21	dBm	PRBS23, BER < $10^{-10}$
RX Sensitivity @Fast ethernet	$P_{IN}$	---	---	-21	dBm	PRBS7, BER < $10^{-10}$
Operating Center Wavelength	$\lambda_C$	1260	---	1610	nm	
Signal Detect-Asserted	$P_A$	---	---	-21	dBm	
Signal Detect-Deasserted	$P_D$	-30	---	--	dBm	
Differential Output Voltage	$V_{DIFF}$	0.5	---	1.2	V	
Receiver Loss of Signal Output Voltage-Low	$RX\_LOS_L$	0	---	0.5	V	
Receiver Loss of Signal Output Voltage-High	$RX\_LOS_H$	2.4	---	$V_{CC}$	V	

**Block Diagram of Transceiver**



**Transmitter Section**

The transmitter section consists of a 1310 nm InGaAsP laser in an eye safe Optical Sub-Assembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current.

**TX\_DISABLE**

The TX\_DISABLE signal is high (TTL logic "1") to turn off the laser output. The laser will turn on when TX\_DISABLE is low (TTL logic "0").

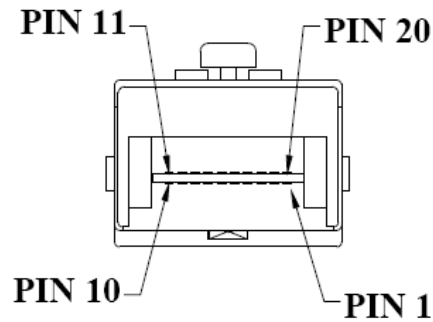
**Receiver Section**

The receiver utilizes InGaAs PIN photodiode mounted together with a trans-impedance preamplifier in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

**Receive Loss (RX\_LOS)**

The RX\_LOS is high (logic "1") when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

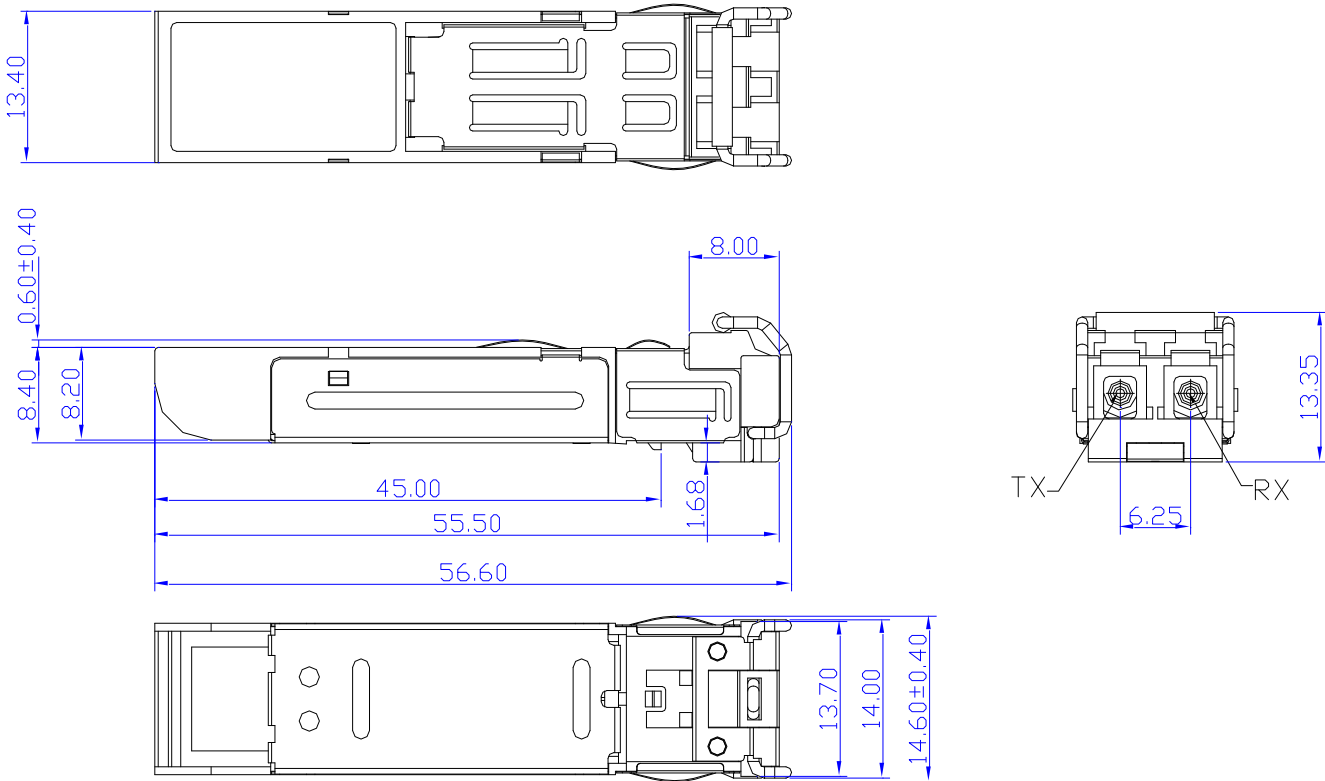
## Pin Assignment



## Pin Descriptions

Pin	Signal Name	Description
1	T <sub>GND</sub>	Transmitter Ground
2	TX_FAULT	Transmit Fault
3	TX_DISABLE	Transmit Disable
4	MOD_DEF(2)	SDA Serial Data Signal
5	MOD_DEF(1)	SCL Serial Clock Signal
6	MOD_DEF(0)	TTL Low
7	RATE SELECT	Open Circuit
8	RX_LOS	Receiver Loss of Signal, TTL High, Open collector
9	R <sub>GND</sub>	Receiver Ground
10	R <sub>GND</sub>	Receiver Ground
11	R <sub>GND</sub>	Receiver Ground
12	RX-	Receive Data Bar, Differential PECL, ac coupled
13	RX+	Receive Data, Differential PECL, ac coupled
14	R <sub>GND</sub>	Receiver Ground
15	V <sub>CCR</sub>	Receiver Power Supply
16	V <sub>CCT</sub>	Transmitter Power Supply
17	T <sub>GND</sub>	Transmitter Ground
18	TX+	Transmit Data, Differential PCEL, ac coupled
19	TX-	Transmit Data Bar, Differential PCEL, ac coupled
20	T <sub>GND</sub>	Transmitter Ground

**Dimensions**



**DIMENSIONS ARE IN MILLIMETERS**

**ALL DIMENSIONS ARE ± 0.2mm UNLESS OTHERWISE SPECIFIED**

Ordering Information

<b>OP</b>	<b>6</b>	<b>C</b>	-	<b>S</b>	<b>10</b>	-	<b>13</b>	-	<b>C</b>	<b>M</b>
	↑	↑		↑	↑		↑		↑	↑
<b>Product Code:</b>	<b>Data Rate:</b>	<b>Type:</b>		<b>Reach:</b>	<b>Wavelength:</b>		<b>Operating Temperature:</b>		<b>Additional Feature:</b>	
5=GBIC; 6=SFP-LC; 7=XFP; 8=XENPAK; 9=X2; A=SFP+; C=QSFP; F=CFP; P=SFP-SC; Q=SFP-MTRJ	A=155Mb/s; B=622Mb/s; C=1.25Gb/s; D=2.125Gb/s; E=2.5Gb/s; F=4.25Gb/s; G=3.1Gb/s; J=2.97G; P=6.144G; Q=7.37G; H=8.5Gb/s; K=10Gb/s; T=1/10Gb/s; L=11.09Gb/s; R=20Gb/s; S=40Gb/s; M=100Base-X SGMII; N=100/1000Base-X SGMII;	S=Single-mode; M=Multi-mode; W=BWDM; C=CWDM; D=DWDM; T=Copper-T (RJ-45) E=GEPON ONU; F=GEPON OLT; G=GPON ONU; H=GPON OLT		Normal: X1=Under 150m; X3=300m; X5=550m; O2=2km, 10=10km; 70=70km; A0=100km; C0=120km  CWDM: 20=20dB; 24=24dB; 28=28dB	Normal: 85=850nm; 13=1310nm; 15=1550nm; 00=Copper T (RJ-45)  CWDM: 27=1270nm; 47=1470nm; 61=1610nm  BWDM: B3=Tx1310/Rx1550; B5=Tx1550/Rx1310; B4=Tx1310/Rx1490; B9=Tx1490/Rx1310; 51=Tx1510/Rx1570; 57=Tx1570/Rx1510; 27=Tx1270/Rx1330; 33=Tx1330/Rx1270; B2=Tx1270/Rx1577; B7=Tx1577/Rx1270 T2=2TX1310nm; T3=TX1310nm; T5=TX1550nm  DWDM: 17=Channel 17 34= Channel 34 00=Channel 17~61 Tunable		C=Commercial Purpose (0~70°C); I= Industrial Purpose (Extended Range)	M=Digital Optical Monitoring (DOM) (RX_LOS for Copper TX); F=with Fiber Stub; I=with Isolator; S=Customized Style		

Model Number	Part Number	Reach	Input/Output	Signal Detect	Voltage	Temperature
SFP-2.5G-40-31-DM	OP6E-S40-13-CM	40km	AC/AC	TTL	3.3V	0°C to 70 °C
SFP-2.5G-40-31-IM	OP6E-S40-13-IM	40km	AC/AC	TTL	3.3V	-40°C to 85 °C

Note: All information contained in this document is subject to change without notice.