

SDH/SONET 2.5Gpbs CWDM Transceiver TSG#3xx(STM-16/OC-48)



- 1470 ~ 1610nm CWDM Transceiver with 20nm spacing
 - SDH STM-16, SONET OC-48

Data Rate of 2.488Gbps

- Single +3.3V Power Supply
- 2X5 or 2X10 Duplex LC Connector

Family Model

TSGA340	TSGB340	TSGC340	TSGD340
TSGE340	TSGF340	TSGG340	TSGH340

Features

- Compliant with SONET OC-48 and ITU-T SDH STM-16 specifications
- Industry standard 2X5 or 2X10 package with duplex LC connector
- 1.47μm ~ 1.61μm uncooled InGaAsP SMQW distributed feed-back(DFB) LD with 20nm spacing
- High sensitive InGaAs PIN photodiode used at wavelengths from 1.1μm to 1.6μm
- Single +3.3V power supply and LVPECL differential data inputs/outputs
- Operating temperature ; 0 to $+70^{\circ}$ C/-40 to $+85^{\circ}$ C
- Tested by Teradian's Reliability and Qualification Program
- Wavelength options(8 channels with 20nm spacing) 1470nm/1490nm/1510nm/1530nm/1550nm/1570nm/1590nm/1610nm
- Distance options 40km with 9/125µm SMF

Description

The TSGX3XX series transceivers are designed to meet the specifications of SONET OC-48 and ITU-T SDH rates of STM-16(2.5Gbps). The transceivers are manufactured in 2x5 pin or 2X10 pin package with duplex LC connector interface and made of metallized housing to obtain excellent EMI shielding.

The transmitter consists of a long wavelength(1.3μm or 1.55μm) InGaAsP SMQW laser diode (FP- LD or DFB-LD) in an optical subassembly(OSA).

The OSA is driven by a custom IC which converts differential LVPECL logic signals into a laser diode drive current. The receiver includes a planar InGaAs PIN photodiode mounted with a transimpedance preamplifier IC in an OSA. The OSA is mated to a custom limiting-amplifier

which provides post-amplification and signal detect function(active high).

The transceivers are designed to used in a single power supply(+3.3V) and an operating temperature range of 0% to +70% or -40% to +85%.

Applications

Used in telecommunication and data communication systems, from medium to high speed for intra-office, short-haul inter-office and long-haul inter-office applications.

- CWDM applications
- Intra-office and Inter-office SONET/ITU-T SDH
- High-speed data links
- Metropolitan Area Network

Absolute Maximum Ratings

Parameters	Symbol	Unit	Min.	Max.	Remarks
Ambient Operating Temperature	т	°C	0	70	Indoor use
Ambient Operating Temperature	T _{op}	O	-40	85	Outdoor use
Storage Temperature	T_{stg}	$^{\circ}$	-40	85	
Supply Voltage	V _{CC} -V _{EE}	V	-0.5	6.0	
Lead Soldering Temperature/Time		℃/sec		260/10	
Relative Humidity	RH	%	-	95	

Electrical Characteristics

Parameters	Symbol	Unit	Min.	Тур.	Max.	Remarks	
DC Power Supply Volta	V _{cc} -V _{EE}	V	3.1	3.3	3.5		
DC Power Supply Curre	$I_{CC,TX}$	mA	50		170		
	$I_{CC,RX}$	mA	60		90		
Input Data Voltage Sw	V _{IH} - V _{IL}	mV	150		930		
(Single-ended)		VIH- VIL	IIIV	130		930	
Output Data Voltage S	V _{OH} - V _{OL}	mV	590		900		
(Single-ended)		VOH- VOL	IIIV	390		900	
Transmit Disable	Low	V	V			0.8	CMOS/TTL
Input Voltage	High	V_{TDIS}	\	2.0			CMO3/TTL
Signal Detect Output Lo		V_{SD}	V	-		0.4	ΠL
Voltage	High	∨ SD	V	2.4		-	116

Eye Diagram

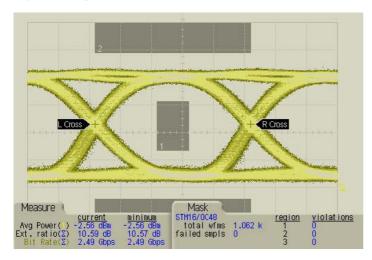


Fig. 1 Back-to-back (measured with 2.5Gbps filter)

Optical Characteristics

 $(T_{op} = 25^{\circ}C)$

Parameters	Symbol	Condition	Unit	Min.	Тур.	Max.	Remark
Data Bit Rate		PRBS 2 ²³ -1,NRZ	Gbps		2.488		
Fiber Length 9µm core SMF		10 ⁻¹⁰ BER, 2.488Gbps	km	40			
TRANSMITTER						'	
Average Power Output	P _{OUT}	$I_f = I_{BIAS} + I_{mod}/2$	dBm	-5.0	-3.0	0	
Extinction Ratio	ER		dB	8.2			
Center Wavelength	λ_{C}	CW, @ P _{OUT}	nm	1468 1488 1508 1528 1548 1568 1588 1608	1470 1490 1510 1530 1550 1570 1590 1610	1472 1492 1512 1532 1552 1572 1592 1612	TSGA3XX TSGB3XX TSGC3XX TSGD3XX TSGE3XX TSGF3XX TSGG3XX TSGG3XX TSGH3XX
Side Mode Suppression Ratio	SMSR		dB	30			
Optical Rise/Fall Time	t _r /t _f	20 - 80%	nsec			0.17	
RECEIVER							
Sensitivity (Average Input Power)	P _{IN,MIN}	PRBS 2 ²³ -1, 10 ⁻¹⁰ BER	dBm		-21.0	-18.0	
Receiver Overload	$P_{IN,MAX}$		dBm	0			
Signal Detect Threshold Decreasing light input Increasing light input Signal Detect Hysteresis	P _D P _A P _A - P _D		dBm dBm dB	-30 0.5		-20	
Receiver Reflectance	R R		dВ	0.5		-27	

Pin Descriptions

Fill Descriptions							
Pin (2×10)	Pin (2×5)	Symbol	Function	Logic Family			
1		V_{PD}	Photodetector(PD) Bias; optional feature If not use the input power monitoring function, connect this pin to power supply.				
2		$V_{EE,RX}$	Receiver(RX) Signal Ground				
3		$V_{\text{EE,RX}}$	Receiver Signal Ground				
4		N/C					
5		N/C					
6	1	$V_{\text{EE,RX}}$	Receiver Signal Ground				
7	2	$V_{CC,RX}$	Receiver Power Supply				
8	3	SD	Signal Detect. (Logic HIGH for normal operation)	TTL			
9	4	RD-	Received Data Out Bar	LVPECL			
10	5	RD+	Received Data Out	LVPECL			
11	6	$V_{CC,TX}$	Transmitter(TX) Power Supply				
12	7	$V_{\text{EE,TX}}$	Transmitter Signal Ground				
13	8	TDis	Transmitter Disable (Logic LOW for normal operation)	ΠL			
14	9	TD+	Transmitter Data In	LVPECL			
15	10	TD-	Transmitter Data In Bar	LVPECL			
16		$V_{\text{EE,TX}}$	Transmitter Signal Ground				
17		Bmon(-)	Laser Diode Bias Current Monitor - Negative End	Analog			
18		Bmon(+)	Laser Diode Bias Current Monitor - Positive End	Analog			
19		Pmon(-)	Laser Diode Optical Power Monitor – Negative End	Analog			
20		Pmon(+)	Laser Diode Optical Power Monitor – Positive End	Analog			

Recommended Interface Circuit

The transceiver can operate with LVPECL logic level. The interface circuit with DC-coupled PECL interface is recommended as shown in Figure. The power supply filters are required for good EMI performance and should be as close to the transceiver as possible.

The Signal Detect circuit monitors the incoming optical signal and generates a logic LOW signal when the optical signal is lower than a predefined level. The transmitter is normally enabled except when the TX DISABLE control input is level HIGH. The transmitter offers the functions of monitoring the laser diode bias current and the laser diode optical power. The voltage measured between pins 17 and 18 is proportional to the bias current through an internal 10Ω resistor. Similarly voltage between pins 19 and 20 is measured across an internal 200Ω resistor, which is proportional to the laser diode optical power.

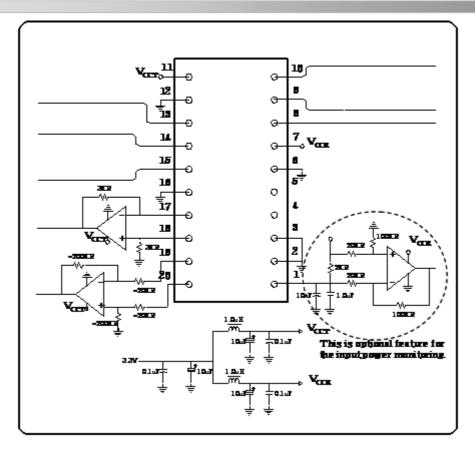


Fig. 2 DC-Coupled PECL Interface

Outline Diagram(2X5 or 2X10pin)

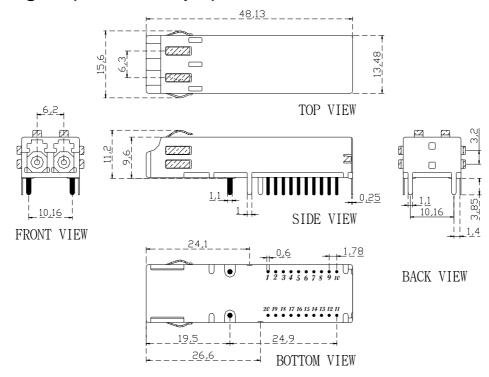


Fig.3 SFF Transceiver Package Dimensions [unit: mm]

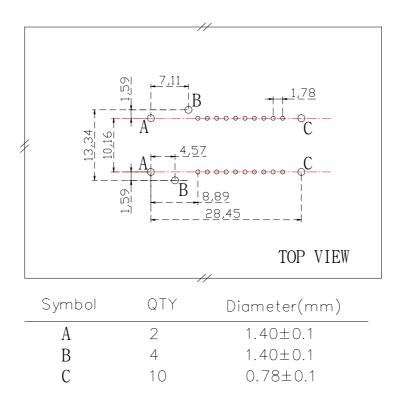


Fig.4 Recommended PCB Layout & Hole size [unit : mm]

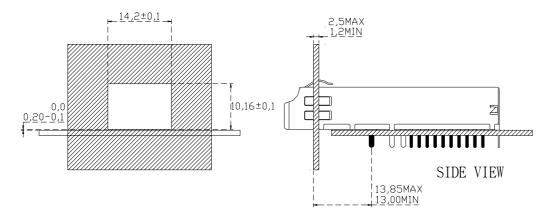


Fig.5 Bezel Opening Dimensions [unit: mm]

! Handling Caution

The transceiver can be damaged by overvoltage and current surges. Precautions should be taken for transient power supply.

This device is susceptible to damage as a result of electrostatic discharge(ESD). Take proper precautions during both handling and testing

Laser Eye Safety

These transceivers have laser semiconductor product and are classified as AEL Class I per U.S. FDA/CDRH 21CFR 1040 and class 1 per EN60825-1. These products comply with 21CFR, Chapter 1, Subchapter J(21CFR 1040.10 and 1040.11 laser safety requirements).

Laser Data

Wavelength: nm (model)

Modulation Frequency: 2.5Gbps (duty cycle: 50 percent) Measured output power(Aperture Size 7mm): mW

Limit power: mW

! Caution

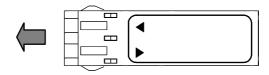
- All adjustments are made at the factory before shipment to our customers. No maintenance and alteration to device is required.
- Tampering with or modifying the performance of the modules will result in voided product warranty. It may also result in improper operation of the circuitry, and possible overstress of the semiconductor components. Device degradation or product failure may result.
- Use of controls or adjustments or procedures other than those specified herein (ex: Connection of the modules to a non-approved optical source, operating above the recommended absolute maximum conditions, operating in a manner inconsistent with unit design and function) may result in hazardous radiation exposure and may be considered an act of modifying or manufacturing a laser product. The person(s) performing such an act is required by law to recertify the laser product under the provisions of US 21CFR (Subchapter J).
- The use of optical instruments with this product will increase eye hazard.

Notice

On operation, If optical connectors are unterminated, modules can emit invisible laser radiation. Avoided eye exposure to direct or indirect radiation

Laser Emission

Indication of laser aperture and beam



Ordering Information

Com pany	Func- tion	Data Rate	Wavelength	Supply Voltage	Distance		Pin	Temp. Range	Shielding
Т	S	G	С	3	40	-	1	I	N
Tera dian	V;TRV S;SFF F;SFP B;Bi-Di TRV. (Receptacle) D;Bi-Di TRV. (Pig-tailed)		3;1.3µm 5;1.55µm 6;Bi-Di T1.3/R1.5 7;Bi-Di T1.5/R1.3 8;850nm A;1470nm B;1490nm C;1510nm D;1530nm E;1550nm F;1570nm G;1590nm H;1610nm M;1270nm N;1290nm O;1310nm P;1330nm Q;1350nm R;1370nm S;1390nm T;1410nm U;1430nm W;1450nm	3 ;3.3V	SX ;Note1 02 ;2km LX ;5km 10 ;10km 15 ;15km 20 ;20km 30 ;30km 40 ;40km 60 ;60km 80 ;80km A0 ;100km C0 ;120km		1;2X5 (10 pin) 2;2X10 (20 pin) 9;1X9 (9 pin)	I;Indoor Use (0~70℃) O;Outdoor Use (-40~85℃)	N;No Shield

^{*}Note 1;

- 220m with $62.5/125\mu m$ MMF @1.25Gbps
- 500m with 50/125μm MMF @1.25Gbps
- 200m with 62.5/125μm MMF @2.125Gbps

- Connector type default is SC/PC and the default length of fiber is 1m
- In case of ordering pigtailed Bi-Di Transceiver, please specify specs. clearly if not default.

More Information

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^{*}Note 2; additional order information