

1.0625~1.25Gbps GBIC Transceiver

TSGB313-FSS10

(Up to 10km transmission, RoHS compliant)

Description

1.0625~1.25Gbps GBIC transceivers are high performance, cost effective modules. They are designed for Gigabit Ethernet and 1x Fibre Channel applications from 2km to 10km.

The transceiver consists of two sections: The transmitter section incorporates a highly reliable FP laser. And the receiver section consists of a PIN photodiode mounted together with a trans-impedance preamplifier (TIA). All modules satisfy Class I Laser Safety requirements.

The standard serial ID information compatible with GBIC MSA describes the transceiver's capabilities, standard interfaces, manufacturer and other information. The host equipment can access this information via the 2-wire serial CMOS EEPROM protocol. For further information, please refer to SFF-8053.

TSGB313-FSS10 transceiver series are compliant with RoHS



Features

- 1.0625~1.25Gbps multi-rate
- 1310nm FP laser transmitter.
- 2m~10km with 9/125μm SMF
- 550m with 50/125 μm MMF
- 550m with 62.5/125 μm MMF
- Class I laser product
- Low EMI and excellent ESD protection
- Duplex SC optical interface
- Extended power supply +3.3/5.0V compatibility
- Standard serial ID information compatible with SFF-8053
- Operating case temperature: 0 to +70°C

Applications

- Switch to Switch interface
- Switched backplane applications
- Router/Server interface
- Other optical transmission systems

Standard

- Compatible with GBIC specification (SFF-8053), Rev 5.5
- Compatible with ANSI specification for Fibre Channel
- Compatible with IEEE 802.3z
- Compatible with IEEE 802.3ah
- Compatible with FCC 47 CFR Part 15, Class B
- Compatible with FDA 21 CFR 1040.10 and 1040.11, Class I
- Compatible with Telcordia GR-468-CORE
- RoHS compliance and lead free assembly process compatibility

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Absolute Maximum Ratings

Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Temperature	TS	-40	+85	°C	
Supply Voltage	VCC	-0.5	6.0	V	
Operating Relative Humidity	-	5	95	%	

Note:

Stress in excess of the maximum absolute ratings can cause permanent damage to the module.

Operating Conditions

Table 2 - Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	TC	0		70	°C	
Power Supply Voltage	VCC	3.1		5.5	V	
Power Supply Current	ICC			300	mA	
Data Rate	Gigabit Ethernet		1.25		Gbps	
	Fibre Channel		1.0625			

Electrical Input/Output Characteristics

Table 3- Transmitter electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Data Input Swing Differential	Vin	200		1660	mV	1
Input Differential Impedance	Zin	140	150	160	Ω	
TX Disable	Disable	2.0		Vcc+0.3	V	
	Enable	0		0.8	V	
TX Fault	Fault	Vcc-0.5		Vcc+0.3	V	2
	Normal	0		0.5	V	

Table 4- Receiver electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Data Output Swing Differential	VOUT	370		2000	mV	3
LOS	High	Vcc-0.5		Vcc+0.3	V	2
	Low	0		0.5	V	

Notes:

1. TD+/- are internally AC coupled with 100Ω differential termination inside the module.
2. Tx Fault and Rx LOS are open collector outputs, which should be pulled up with 4.7k to 10kΩ resistors on the host board. Pull up voltage between 2.0V and Vcc+0.3V.
3. RD+/- outputs are internally AC coupled, and should be terminated with 100Ω (differential) at the user SERDES.

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Optical Characteristics

Table 5- Transmitter Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Average Output Power	P0ut	-9		-3	dBm	1
Centre Wavelength	λ_C	1260	1310	1360	nm	
P0ut@TX Disable Asserted	P0ut			-45	dBm	1
Extinction Ratio	EX	9			dB	
Deterministic Jitter	1.25G	DJ		0.2	UI	3
	1.0625			0.21		
Total Jitter	1.25G	TJ		0.431	UI	3
	1.0625			0.43		
Spectral Width (RMS)	σ			4	nm	
Rise/Fall Time (20%~80%)	tr/ta			0.26	ns	2
Output Optical Eye	IEEE 802.3z and ANSI Fibre Channel Compatible					4

Table 6- Receiver Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Centre Wavelength	λ_C	1200	1310	1650	nm	
Receiver Sensitivity				-23	dBm	5
Receiver Overload		-3			dBm	5
Return Loss		12			dB	
LOS De-Assert	LOSD			-24	dBm	
LOS Assert	LOSA	-35			dBm	
LOS Hysteresis		1		4	dB	
Total Jitter	1.25G	TJ		0.749	UI	3
	1.0625			0.61		
Deterministic Jitter	1.25G	DJ		0.462	UI	3
	1.0625			0.36		

Notes:

1. The optical power is launched into SMF.
2. Unfiltered, measured with a PRBS 2⁷-1 test pattern @1.25Gbps
3. Meet the specified maximum output jitter requirements if the specified maximum input jitter is present.
4. Measured with a PRBS 2⁷-1 test pattern @1.25Gbps/1.0625Gbps.
5. Measured with a PRBS 27-1 test pattern @1.25Gbps, worst-case extinction ratio, BER $\leq 1 \times 10^{-12}$.
Receiver Sensitivity is -18 dBm with following link lengths:

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Pin Definitions

Figure 1 below shows the pin numbering of GBIC electrical interface. The pin functions are described in Table 7.

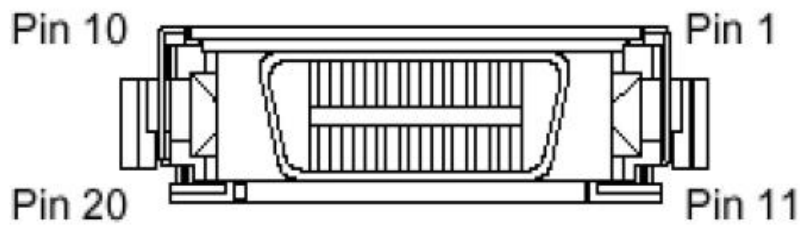


Figure 1 Pin Out Diagram

Table 7-Pin Function Definitions

Pin Name	Pin #	Name/Function	Signal Specification
RECEIVER SIGNALS			
RGND	2, 3, 11, 14	Receiver Ground (may be connected with TGND in GBIC)	Ground, to GBIC
V _{DD} R	15	Receiver +3.3/5 volt (may be connected with V _{DD} T in GBIC)	Power, to GBIC
-RX_DAT	12	Receive Data, Differential PECL	High speed serial, from GBIC
+RX_DAT	13	Receive Data, Differential PECL	High speed serial, from GBIC
RX_LOS	1	Receiver Loss of Signal, logic high, open collector compatible, 4.7k to 10k Ω pull up to V _{DD} T on host	Low speed, from GBIC
TRANSMITTER SIGNALS			
TGND	8, 9, 17, 20	Transmitter Ground (may be connected with RGND internally)	Ground, to GBIC
V _{DD} T	16	Transmitter +3.3/5 volt (may be connected with V _{DD} R in GBIC)	Power, to GBIC
+TX_DAT	18	Transmit Data, Differential PECL	High speed serial, to GBIC
-TX_DAT	19	Transmit Data, Differential PECL	High speed serial, to GBIC

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TX_DISABLE	7	Transmitter Disable, logic high, open collector compatible, 4.7k to 10k Ω pull up to V _{DDT} on GBIC	Low speed, to GBIC
TX_FAULT	10	Transmitter Fault, logic high, open collector compatible, 4.7k to 10k Ω pull up to V _{DDT} on host	Low speed, from GBIC
CONTROL SIGNALS			
MOD_DEF(0)	4	TTL low, output	Please reference GBIC standard, Annex D: Module definition "4"
MOD_DEF(1)	5	SCL serial clock signal, input	
MOD_DEF(2)	6	SDA serial data signal, input/output	

Recommended Interface Circuit

Figure 2 shows the recommended interface circuit.

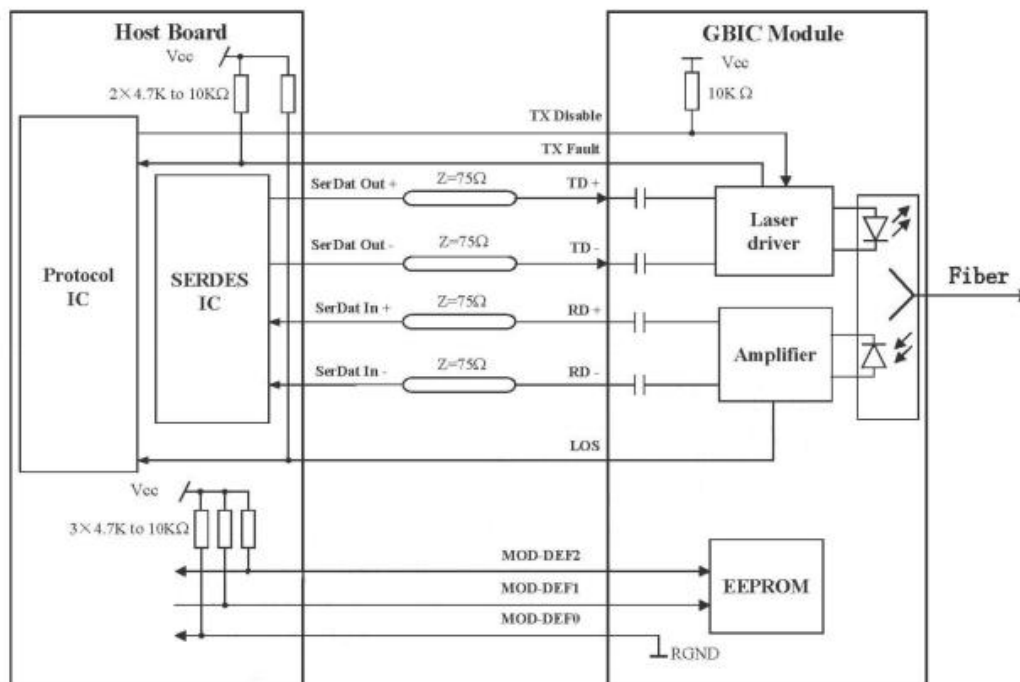
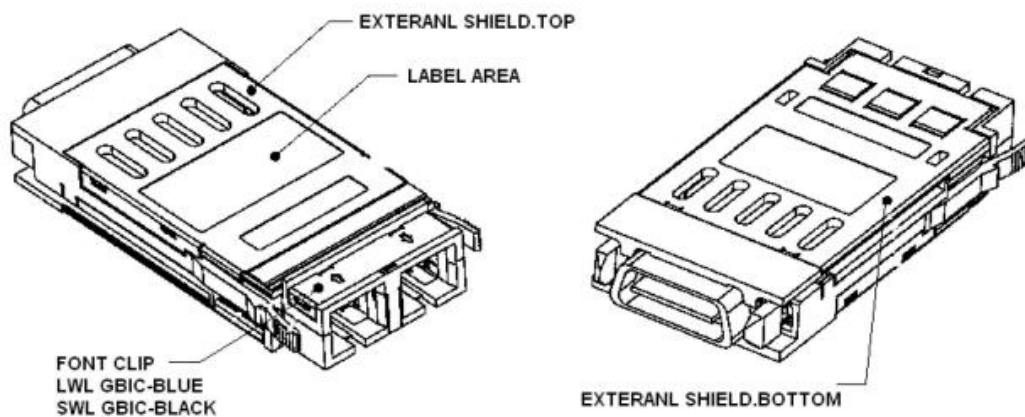
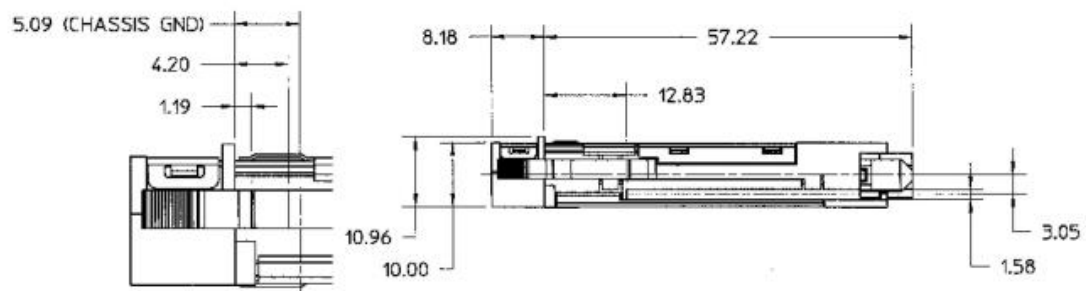
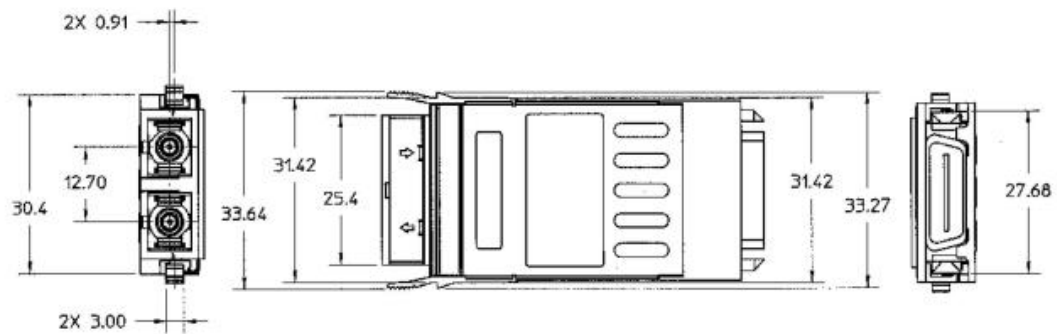


Figure 2 Recommended Interface Circuit

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Package Dimension



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EEPROM Information

The SFF-8053 defines a 256-byte memory map in EEPROM describing the transceiver's capabilities, standard interfaces, manufacturer, and other information, which is accessible over a 2 wire serial interface at the 8-bit address 1010000X (A0h). The memory contents refer to Table 8

Table 8-EEPROM Serial ID Memory Contents

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifier	01	GBIC
1	1	Ext. Identifier	04	MOD4
2	1	Connector	01	SC
3—10	8	Transceiver	00 00 00 02 12 00 0D 01	Transmitter Code
11	1	Encoding	01	8B10B
12	1	BR, nominal	0D	1.25Gbps
13	1	Reserved	00	
14	1	Length (9um)-km	0A	10KM
15	1	Length (9um)	64	
16	1	Length (50um)	37	550m
17	1	Length (62.5um)	37	550m
18	1	Length (copper)	00	
19	1	Reserved	00	
20—35	16	Vendor name	54 45 4D 4E 4F 54 4E 20 20 20 20 20 20 20 20 20	"TENOPTO." (ASC II)
36	1	Reserved	00	
37—39	3	Vendor OUI	00 00 00	
40—55	16	Vendor PN	54 53 47 30 42 33 38 2D 46 53 53 31 30 20 20 20	"TSGB313-FSS10 " (ASC II)
56—59	4	Vendor rev	xx xx xx xx	ASC II ("31 30 20 20" means 1.0 revision)
60-61	2	Wavelength	05 1E	1310nm
62	1	Reserved	00	
63	1	CC BASE	xx	Check sum of bytes 0 - 62
64—65	2	Options	00 1A	LOS, TX_FAULT and TX_DISABLE
66	1	BR, max	00	
67	1	BR, min	00	
68—83	16	Vendor SN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	ASC II
84—91	8	Vendor date code	xx xx xx xx xx xx 20 20	Year(2 bytes), Month(2 bytes), Day (2 bytes)
92—94	1	Reserved	00 00 00	

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95	1	CC_EXT	xx	Check sum of bytes 64 - 94
96—255	160	Vendor specific		

Note:

The "xx" byte should be filled in according to practical case. For more information, please refer to the related document of SFF-8053 Rev 5.5.

Optical Transmitter Eye Diagrams

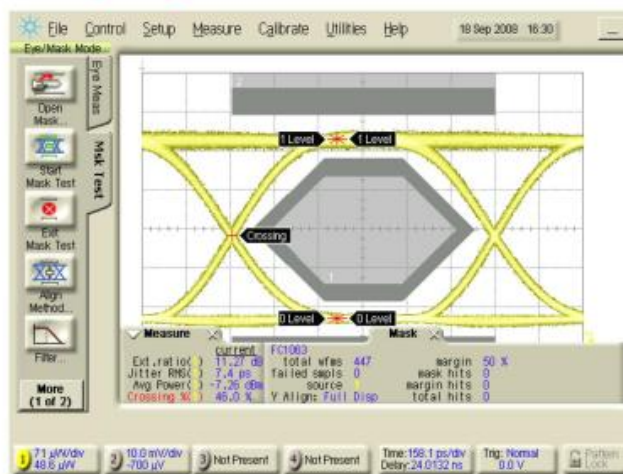


Figure 3 Transmitter Eye Mask FOR FC1063 at 1G FC

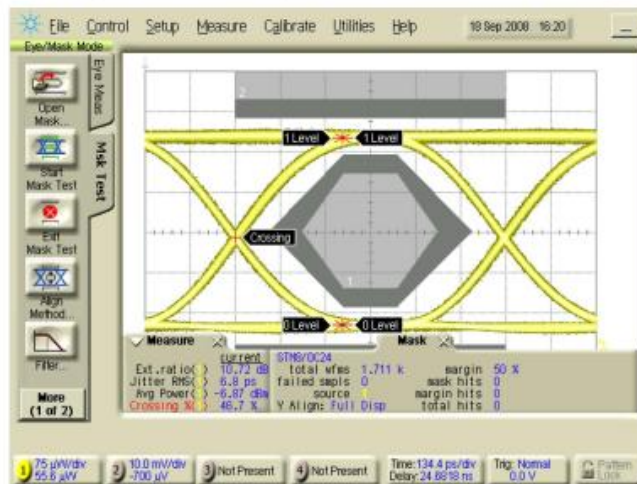


Figure 4 Transmitter Eye Mask For OC-24 at Gigabit Ethernet

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Reliability Test Program

Scope and Conditions

The GBIC series Single-mode transceivers have been fully qualified in accordance with the requirement of Telcordia Document GR-468-CORE. In this report, we briefly describe the qualification test performed on the transceivers under conditions defined in GR-468-CORE standards.

Table 9- Scope and Conditions

HEADING	TEST	CONDITIONS	SAMPLING		
			LTPD	SS	C
Mechanical Integrity	Mechanical Shock	5 times/axis 1,500G, 0.5ms	20	11	0
	Vibration	Cond. A 20G, 20-2,000 Hz, 4min/cy, 4cy/axis	20	11	0
Endurance	Accel. Aging (High Temp.)	85°C; rated power 1,000 hrs. for pass/fail 2,000, 5,000 hrs. for info.	-	25 10	-
	Low Temp. Storage	min. storage T 1,000 hrs. for pass/fail 2,000 hrs. for info.	20	11	0
	Temperature Cycling	-40°C to +85°C 500 for pass/fail 1,000 for info.	20 -	11 11	0 -
	Damp Heat	85°C/85%RH 1,000hrs.	20	11	0
	Cyc. Moist. Res.	-	20	11	0
	Special Tests				
	Internal Moisture	Max. 5,000ppm water vapour	20	11	0
	ESD Threshold		-	6	-

Notes:

SS : Sample Size

C : Maximum number of failure allowed to pass the test

Sampling methods

Acceptance sampling of reliability test have been qualified in accordance with the requirements of Telcordia document GR-468-CORE and CNS14179.LTPD-20%,confidence-90%,SS/C-11/0,except accelerated aging (Biased), ESD threshold and flammability.

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Regulatory Compliance

TSGB313-FSS10 GBIC transceiver is designed to be class Laser safety compliant and is certified per the following standards:

Table 10- Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>500V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product.
Component Recognition	UL and CSA	Compatible with standards
RoHS	2002/95/EC 4.1&4.2 2005/747/EC	Compliant with standards <small>note</small>

Package and handling instructions

Process Plug

It is important to note that single mode optics ,as with all optical devices are susceptible to contamination from air borne particles, human body oils, and mating connector particles. Care should be taken to protect all exposed optical interfaces with process plugs and dust covers. All Tenopto TSGB313-FSS10 GBIC products are supplied with a process plug. This plug protects the transceiver's optics during standard handling and manufacturing processes. It is recommended that the process plug remain in the transceiver whenever an optical fibre connector is not inserted.

ESD Discharge(ESD)

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging and it should not be removed from its packaging or otherwise handled unless in an ESD protected environment utilizing standard grounded benches, floor mats, and wrist straps.

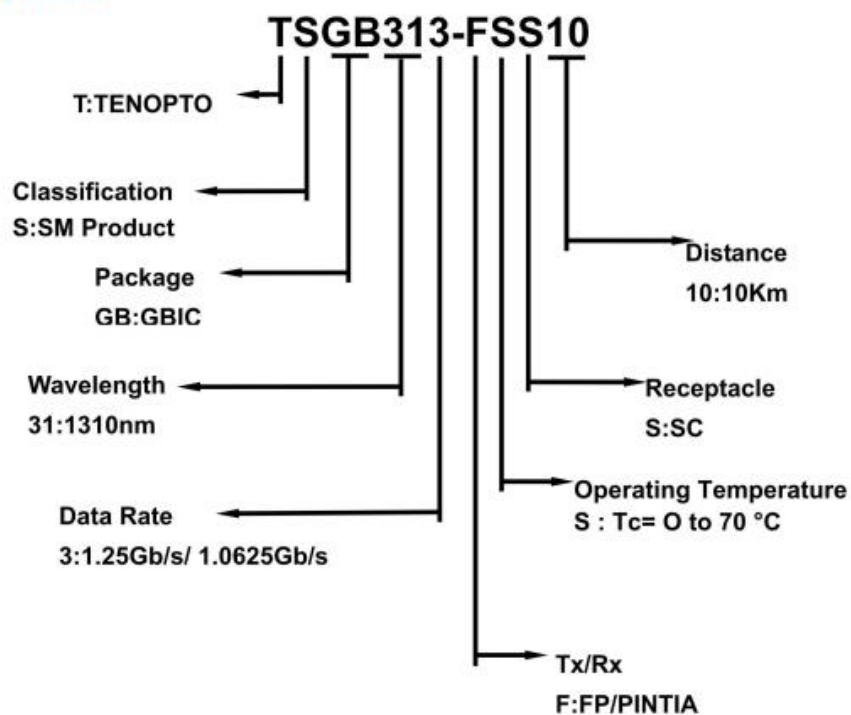
Eye Safety

The Tenopto TSGB313-FSS10 GBIC products are Class laser products per IEC/EN60950-1:2001 and 60825-1:2001, and are certified per CDRH,21 CFR1040, Laser Safety Requirements. It is an eye safe device when operated within the limits of this specification. Operating this product in a manner inconsistent with intended usage and specification of the modified product as required by the U.S. Food and Drug Administration (21 CFR 1040).

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Ordering information

Ordering Number



Label Part Number

Part NO	Product Description
TSGB313-FSS10	1310nm, 1.0625~1.25Gbps, 10km, GBIC, RoHS compliant, 0°C~+70°C

Note:

Some option codes may not be applicable to all the product models, please contact our sales representatives for further information.