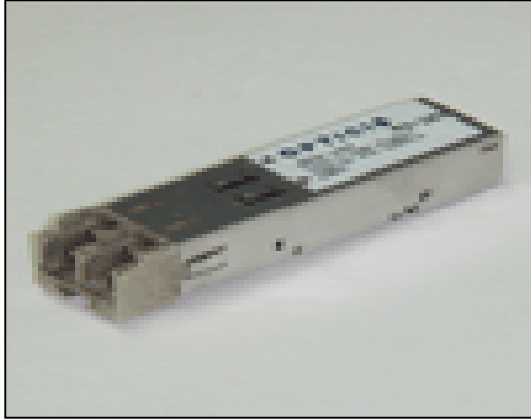




## 850nm VCSEL SFP Transceiver TFx83SX(1.25-1.0625Gbps/2.5-2.125Gbps)



- 850nm MMF SFP Transceiver
- Up to 2.5Gbps(2.125G) Tx/RX  
(bi-directional) data links
- Single +3.3V Power Supply
- Duplex LC Connector

### Family Model

TF883SX(1.25G)    TFF83SX(1.0625G)    TFG83SX(2.5G)    TFS83SX(2.125G)

### Features

- Compliant with IEEE 802.3z Gigabit Ethernet (1000Base-SX) at 1.25Gbp
- Compliant with InfiniBand™ Architecture (IBA) IB-1X-SX at 2.5Gbps
- Compliant with Small Form Factor Pluggable (SFP) MultiSource Agreement
- 850nm Vertical Cavity Surface Emitting Laser (VCSEL) Source
- Single 3.3volt Power Supply
- AC coupled LVPECL differential inputs and outputs
- Supports Serial ID
- None DDM(Digital Diagnostic Monitoring) Function
- Operates with 50µm and 62.5µm multimode optical fibers
- Metallized Case for the good EMI performance
- Compliant with Class I FDA/CDRH and IEC60825 Laser Safety
- Operating Temperature : 0 to 70 degree

### Description

TFx83SX is a fiber optic transceiver, which meets the specifications defined in Gbit Ethernet as well as Fibre Channel. The transceiver offers a simple and convenient way to interface for Ethernet switch system running up to 1.25Gbps and Fibre Channel system running up to 2.5Gbps with multimode fiber optic cables. All modules satisfy Class I Laser Eye Safety requirements in accordance SEL) with awith the CDRH supervised by FDA in the US and international IEC-825 standards. This transceiver is compliant with the Small Form Factor Pluggable (SFP) specification . The transmitter employs a high performance 850 nm Vertical Cavity Surface Emitting Laser (VC driver circuit, which converts Positive Emitter Coupled Logic (PECL) data to light. The receiver incorporates a GaAs PIN photodiode converting the light signal into an electrical current, which is amplified and regenerated into PECL-compatible data. A Loss of Signal status

output is also provided in the receiver. The transceiver is operated by +3.3V power supply over 0°C to +70°C. The transceiver package is made of metal case for good EMI shielding.

## Applications

- Data Communication Networks
- Network Interface Cards
- High Performance Desktops
- Storage Area Network (SAN)

## Absolute Maximum Ratings

These are absolute maximum ratings only. Higher stress than these ratings may adversely affect device reliability or cause permanent damage to the device.

Parameters	Symbol	Unit	Min.	Max.	Remarks
Ambient Operating Temperature	$T_{op}$	°C	0	70	Indoor use
Storage Temperature	$T_{stg}$	°C	-40	85	
Supply Voltage	$V_{CC}$	V		3.8	
Lead Soldering Temperature/Time		°C/sec		260/6	
Relative Humidity	RH	%	-	95	

## Electrical Characteristics

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remarks
DC Power Supply Voltage	$V_{CC}-V_{EE}$	V	3.1	3.3	3.6	
Transmitter Differential Input voltage	VD	V	0.4		1.6	
Supply Current						
TX	$I_C$	mA			100	
RX					200	

## Optical Characteristics

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

Parameters	Symbol	Condition	Unit	Min.	Typ.	Max.	Remark
Data Bit Rate		NRZ	Gbps		1.25/2.5		
<b>TRANSMITTER</b>							
Average Power Output	$P_{OUT}$	$I_f = I_{BIAS} + I_{mod}/2$	dBm	-9.5		-4	
Extinction Ratio	ER		dB	9			
Center Wavelength	$\lambda_C$	CW, @ $P_{OUT}$	nm	830	850	860	VCSEL
Spectral Width	$\sigma$	RMS Width Max. -20dB WD	nm			0.85	
Optical Rise/Fall Time	$t_r/t_f$	20 ~ 90%	nsec			0.26	1.25Gbps

		20 ~ 80%				0.15	2.5Gbps
Relative intensity noise	RIN		dB/Hz			-117	
Optical modulation amplitude	OMA		$\mu$ W	200			
Optical contributed jitter(total)	TJ		ps			150	
<b>RECEIVER</b>							
Sensitivity (Average Input Power)	$P_{IN,MIN}$	PRBS $2^7-1$ , $10^{-12}$ BER	dBm			-17	
Receiver Overload	$P_{IN,MAX}$		dBm			-1.5	
Return loss of receiver			dB	12			
Loss of Signal-asserted	PA		dBm		-22	-18	
Loss of Signal-deasserted	PD		dBm	-26	-24		
Loss of Signal-hysteresis	PA-PD		dB		2	3	

## Pin Descriptions

Pin	Symbol	Sequence	Type	Function	Logic Family
1	VeeT	1	Ground	Transmitter signal ground	
2	TX Fault	3	Signal Out	Transmitter fault indication	
3	TX Disable	3	Signal In	Transmitter disable	
4	MOD_DEF2	3	Input/Output	Module definition 2	
5	MOD_DEF1	3	Input/Output	Module definition1	
6	MOD_DEF0	3	Input/Output	Module definition 0	
7	Rate Select	3	Not Connected	Select between full or reduced receiver bandwidth	
8	LOS	3	Signal Out	Loss of signal	
9	VeeR	1	Ground	Receiver ground	
10	VeeR	1	Ground	Receiver ground	
11	VeeR	1	Ground	Receiver ground	
12	RD-	3	Data Out	Received data inverted output	
13	RD+	3	Data Out	Received data non-inverted output	
14	VeeR	1	Ground	Receiver ground	
15	VccR	2	Power	+3.3V Receiver power supply	
16	VccT	2	Power	+3.3V Transmitter power supply	
17	VeeT	1	Ground	Transmitter ground	
18	TD+	3	Data In	Transmitter data non-inverted output	
19	TD-	3	Data In	Transmitter data inverted output	
20	VeeT	1	Ground	Transmitter ground	

### Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K ~ 10K $\Omega$  resistor on the

host board. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to  $< 0.8V$ .

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a  $4.7K \sim 10K\Omega$  resistor. Its states are:

Low ( $0 \sim 0.8V$ ) : Transmitter on  
 ( $>0.8, < 2.0V$ ) : Undefined  
 High ( $2.0 \sim 3.465V$ ) : Transmitter Disabled  
 Open : Transmitter Disabled

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a  $4.7K \sim 10K\Omega$  resistor on the host board. The pull-up voltage shall be  $V_{ccT}$  or  $V_{ccR}$ . Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID Mod-Def 2 is the data line of two wire serial interface for serial ID.

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a  $4.7K \sim 10K\Omega$  resistor. When high, this output indicates the received optical power is below the worst-case receiver sensitivity. Low indicates normal operation. In the low state, the output will be pulled to  $< 0.8V$ .

5) VeeR and VeeT may be internally connected within the SFP module.

6) Rx\_Data-/+ : These are the differential receiver outputs. They are AC coupled  $100\Omega$  differential lines which should be terminated with  $100\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 600 and 800 mV differential when properly terminated.

7) VccR and VccT are the receiver and transmitter power supplies. They are defined as  $3.3V \pm 5\%$  at the SFP connector pin. Maximum supply current is 300 mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than  $1\Omega$  should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

8) Tx\_Data-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with  $100\Omega$  differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of  $200 \sim 1660$  mV, though it is recommended that values between 500 and 1200 mV differential be used for best EMI performance

## Recommended Interface Circuit

In order to prevent unwanted reflections between system and transceiver, it is necessary to have both a  $50\Omega$  impedance matched transmission line as well as a  $50\Omega$  termination load. The system board differential pair transmission lines must be designed with the same length. The transmitter internally includes a  $100\Omega$  differential termination for the two differential input lines (TD+, TD-). Therefore, additional  $50\Omega$

terminations should not be externally connected to the transmitter-input lines. The transmitter is disabled when the TX disable is TTL high and enabled when TTL low. If this feature is not needed, it should be connected to system ground.

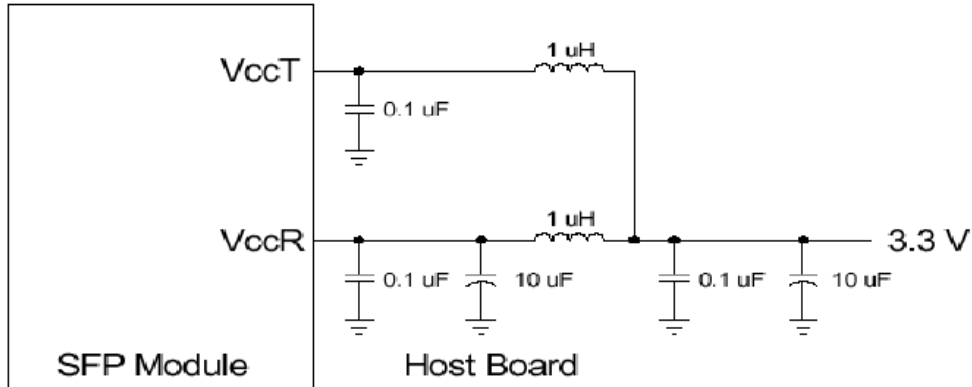


Figure 1. Recommended Host Board Supply Filtering Network

Application Circuit

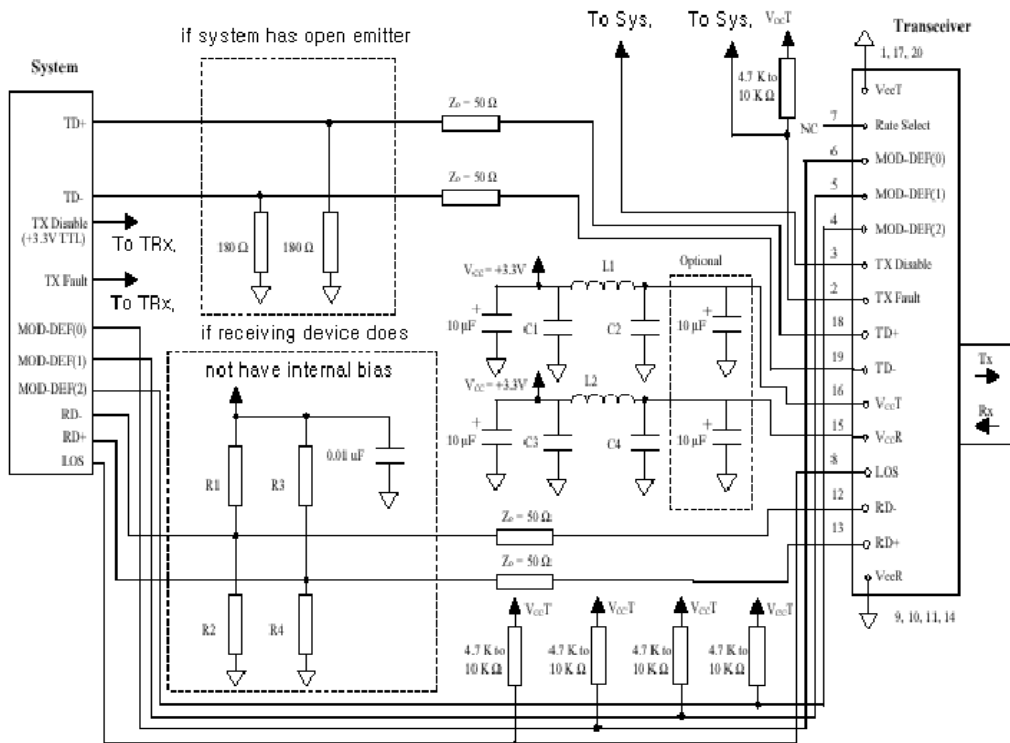


Figure 2. Example SFP Host Board Schematics

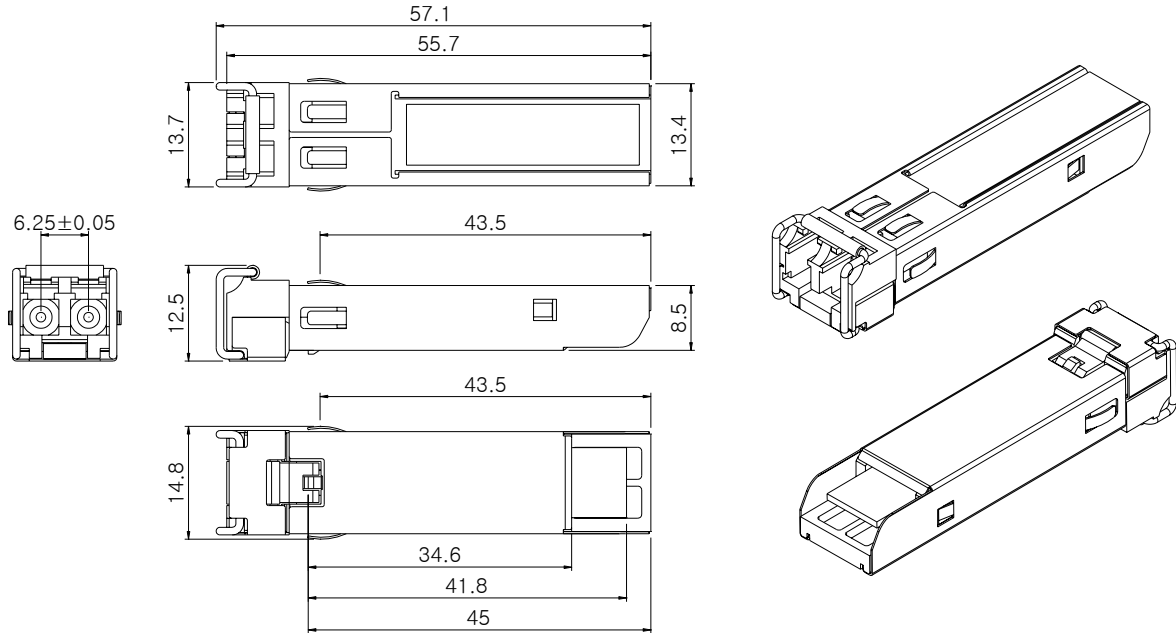
## Serial ID

Data Address	Length	Name of Field	Description
<b>BASE ID FIELDS</b>			
0	1	Identifier	03h=SFP
1	1	Ext. Identifier	04h=All SFP modules indicating serial ID module definition
2	1	Connector	07h=LC
3-10	8	Transceiver	SONET code - Reserved Gigabit Ethernet code – 1000BASE_SX FC(Fibre Channel) link length – Intermediated distance FC transmitter technology – Shortwave laser w/o OFC FC transmission media – Multi-mode 50/62.5 um FC speed – 100 Mbytes/Sec
11	1	Encoding	01h=8B10B
12	1	BR, Nominal	0Ch=100Mbps*12=1.25Gbps / 19h=100Mbps*25=2.5Gbps
13	1	Reserved	
14	1	9μ, distance	
15	1	9μ, distance	
16	1	50μ, distance	37h=55*10m=550m(1.25G) / 19h=25*10m=250m
17	1	62.5μ, distance	1Bh=27*10m=270m(1.25G) / 0Ch=12*10m=120m
18	1	CU, distance	
19	1	Reserved	
20-35	16	Vendor name	Teradian
36	1	Reserved	
37-39	3	Vendor OUI	
40-55	16	Vendor PN	TF883SX (1.25Gbps ) / TFG83SX(2.5Gbps; S:2.12G)
56-59	4	Vendor rev	
60-62	3	Reserved	
63	1	Check sum	Least significant byte of sum of data in addresses 0-62
<b>EXTENDED ID FIELDS</b>			
64-65	2	Options	00h & 1Ah = LOS, Tx_Fault, Tx_Disable all supported
66	1	BR, max	Unspecified
67	1	BR, min	Unspecified
68-83	16	Vendor SN	Unspecified
84-91	8	Date code	Date and lot number
92-94	3	Reserved	
95	1	Check sum	Least significant byte of sum of data in addresses 64-94
<b>VENDOR SPECIFIC ID FIELDS</b>			
96-127	32	Readable	

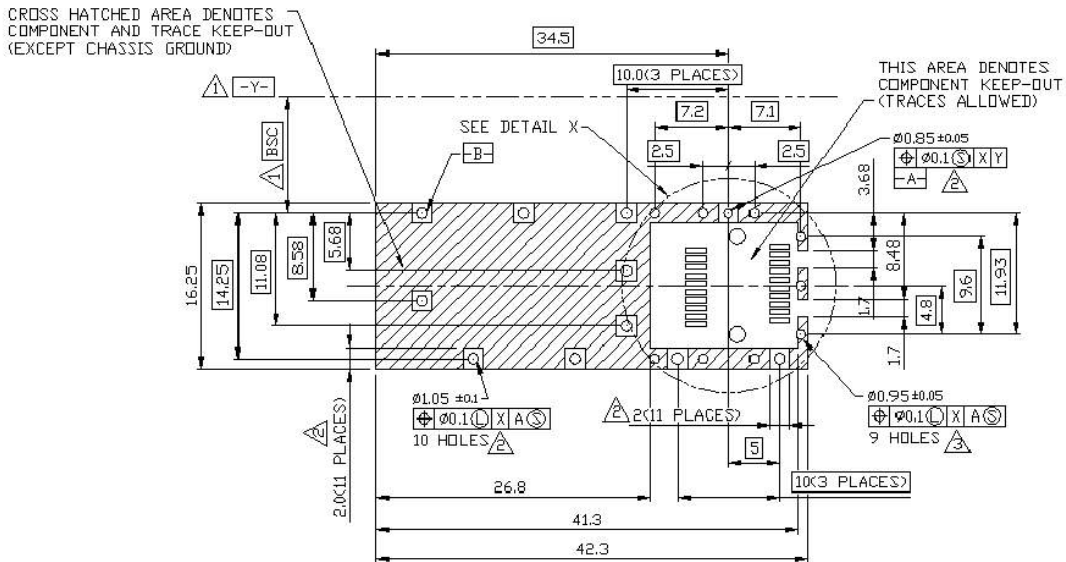
**Mechanical Dimensions**

unit : mm(inches)

Tolerances : x.xx ± 0.025mm, x.x ± 0.05mm, unless otherwise specified



**Figure. 3 Drawing of VCSEL SFP Transceivers**



**Detail X**

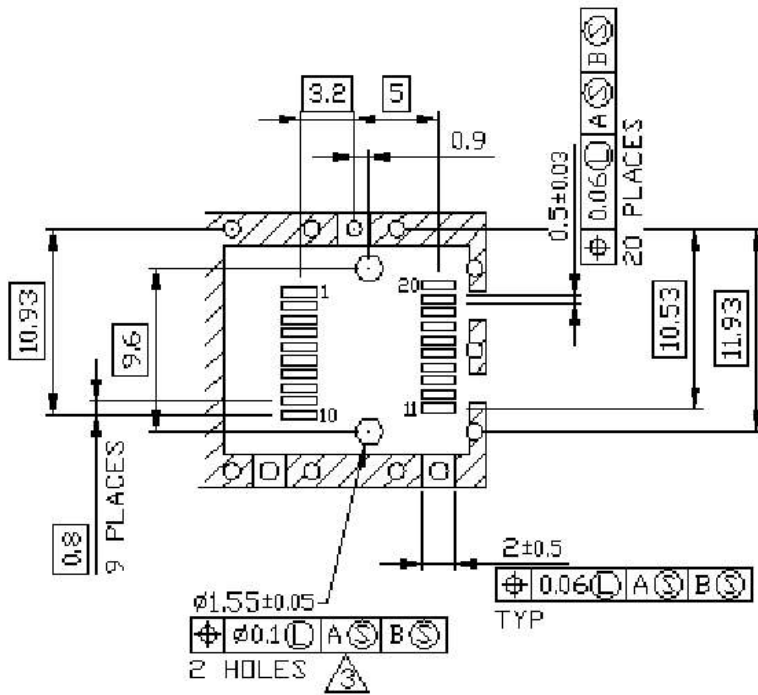


Figure. 4 Mechanical Layout of SFP Host Board for interfacing.

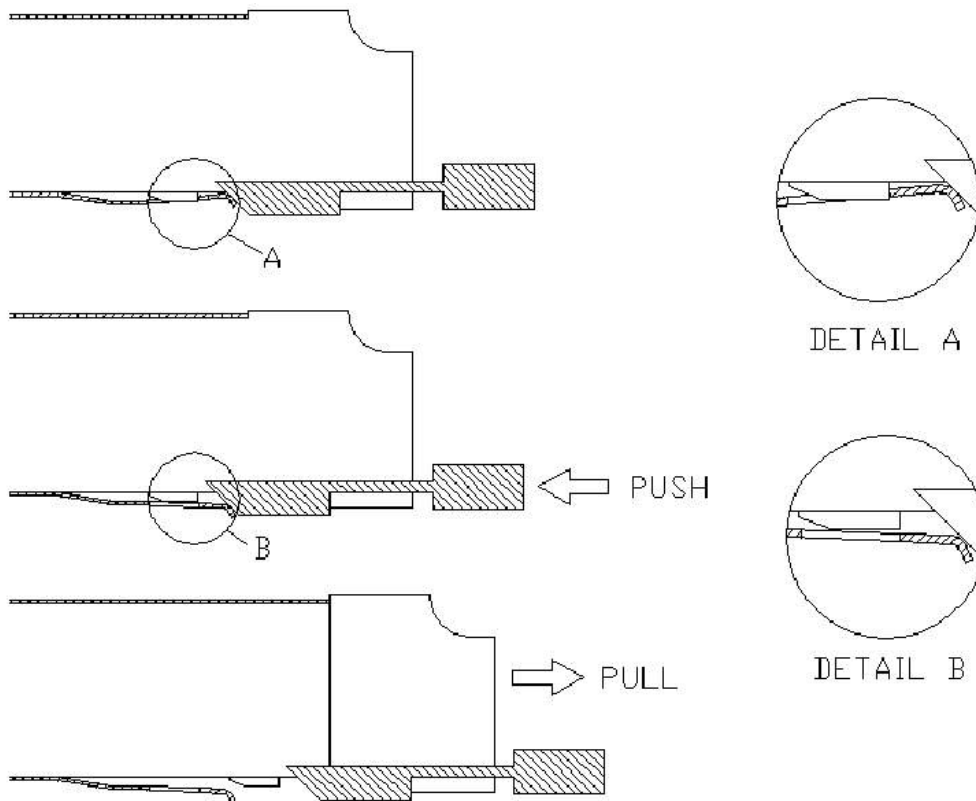


Figure. 5 Ejection Mechanism



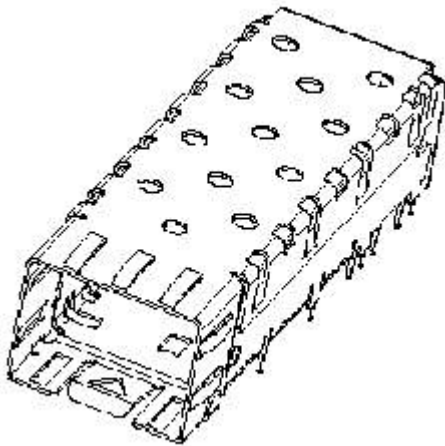


Figure. 6 Drawing of Cage for SFP Transceivers

### Recommendation of Cages and Sockets for Mechanical Interface

Maker	Cage (Lower)	Cage (Upper)	Socket
Fujikura, DDK	SPT-R020-CL	SPT-R020-CT	SPT-RS020B-12

For more detail information on sales, please visit [www.ddkconnectors.com](http://www.ddkconnectors.com).

### ! 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).

### ! 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**

**Ordering Information**

Com pany	Func- tion	Data Rate	Wavelength	Supply Voltage	Distance	Pin	Temp. Range	Shielding	
<b>T</b>	<b>F</b>	<b>8</b>	<b>3</b>	<b>3</b>	<b>SX</b>	<b>-</b>	<b>2</b>	<b>I</b>	<b>M</b>
Terad ian	<b>V</b> ;TRV <b>S</b> ;SFF <b>F</b> ;SFP  <b>B</b> ;Bi-Di TRV. (Recep- tacle)  <b>D</b> ;Bi-Di TRV. (Pig- tailed)	<b>1</b> ;155Mbps <b>4</b> ;622Mbps <b>F</b> ;1.06Gbps <b>8</b> ;1.25Gbps <b>S</b> ;2.12Gbps <b>G</b> ;2.5Gbps <b>T</b> ;10Gbps  <b>A</b> ;Asy. Bi-Di 622M/155M  <b>E</b> ;Asy. Bi-Di 1.25G/155M  <b>O</b> ;Order- made	<b>3</b> ;1.3μm <b>5</b> ;1.55μm <b>6</b> ;Bi-Di T1.3/R1.5 <b>7</b> ;Bi-Di T1.5/R1.3 <b>8</b> ;850nm <b>A</b> ;1470nm <b>B</b> ;1490nm <b>C</b> ;1510nm <b>D</b> ;1530nm <b>E</b> ;1550nm <b>F</b> ;1570nm <b>G</b> ;1590nm <b>H</b> ;1610nm  <b>M</b> ;1270nm <b>N</b> ;1290nm <b>O</b> ;1310nm <b>P</b> ;1330nm <b>Q</b> ;1350nm <b>R</b> ;1370nm <b>S</b> ;1390nm <b>T</b> ;1410nm <b>U</b> ;1430nm <b>W</b> ;1450nm	<b>3</b> ;3.3V	<b>SX</b> ;Note1 <b>02</b> ;2km <b>LX</b> ;5km <b>10</b> ;10km <b>15</b> ;15km <b>20</b> ;20km <b>30</b> ;30km <b>40</b> ;40km <b>60</b> ;60km <b>80</b> ;80km <b>A0</b> ;100km <b>C0</b> ;120km	<b>1</b> ;2X5 (10 pin) <b>2</b> ;2X10 (20 pin) <b>9</b> ;1X9 (9 pin)	<b>I</b> ;Indoor Use (0~70℃) <b>O</b> ;Outdoor Use (-40~85℃)	<b>N</b> ;No Shield <b>M</b> ;Metal coating	

- \*Note 1 ;  
 - 220m with 62.5/125μm MMF @1.25Gbps  
 - 500m with 50/125μm MMF @1.25Gbps  
 - 200m with 62.5/125μm MMF @2.125Gbps (120m;62.5u@2.5G)  
 \*Note 2 ; additional order information  
 - Connector type default is SC/PC and the default length of fiber is 1m

**More Information**

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