

### Specification

#### Small Form Factor

Duplex LC Receptacle – SFF

#### Optical Transceivers

1000BASE-LX

1250Mbit/s



### Ordering Information

**TSP - F<sub>x</sub>CA1 - G21**



Voltage / Temperature

1 : 3.3V / +0 ~ +70°C

2 : 3.3V / -40 ~ +85°C

Model Name	Voltage	Category	Device type	Interface	SD/LOS	Temperature	Distance
TSP-F1CA1-G21	3.3V	W/O DDMI	FP / PIN	DC / DC Coupling	LVPECL	+0 ~+70°C	20Km
TSP-F2CA1-G21						-40 ~+85°C	

## Features

- **ROHS Compliant**
- **Standard Small Form Factor Package – SFF MSA Compliant**
- **Gigabit Ethernet Standard ( IEEE802.3Z 1000BASE-LX ) Compliant**
- **Fibre Channel Standard ( 100-SM-LC-L ) Compliant**
- **Laser Class 1 Product – IEC/EN 60825-1 Compliant**
- **Standard Duplex LC Receptacle Optical Interface**
- **Single + 3.3 V Power Supply**
- **Differential LVPECL Data Input and Output**
- **LVPECL Signal Detect**
- **Low Power Consumption**

## Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit
Storage temperature	T <sub>s</sub>	-40		85	°C
Supply voltage	VCC	0		4	V
Operating Relative Humidity	RH	5		95	%
Input voltage	V <sub>IN</sub>	0		VCC	V

**Operating Conditions**

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VCC	3.1	3.3	3.5	V
Operating Case temperature ( TSP-F1CA1-G21 )	Top	0		70	°C
Operating Case temperature ( TSP-F2CA1-G21 )		-40		85	
Current	Icc	-	-	250	mA
Soldering Temperature (sec)	Tsold	-		260	°C

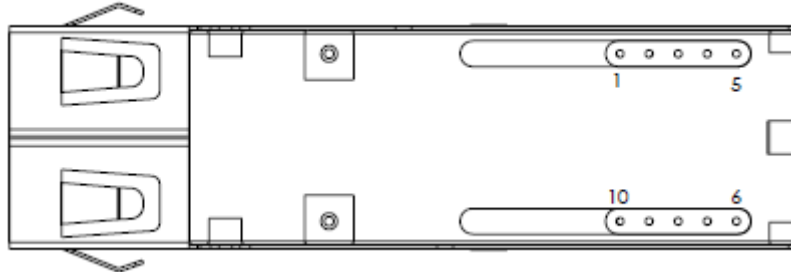
**Transmitter Specifications ( Vcc =3.1 ~ 3.5V ; Top = 0 ~ 70°C / Top = -40 ~ 85°C)**

Parameter	Symbol	Min	Typ	Max	Unit
<b>Optical Characteristics</b>					
Output Optical Power	P <sub>O</sub>	-5	--	0	dBm
Extinction Ratio	ER	9	--	--	dB
Center Wavelength	λ	1260	1310	1360	nm
Spectral Width (RMS)	σλ	--	--	4	nm
Rise/Fall time (20-80%)	T <sub>r</sub> / T <sub>f</sub>	--	--	260	ps
Relative Intensity Noise	RIN	--	--	-120	dB/Hz
Output Eye	Compliant with IEEE 802.3z				
Max. P <sub>out</sub> TX-DISABLE Asserted	POFF	--	--	-45	dBm
<b>Electrical Characteristics</b>					
Transmitter Data Input Voltage - High	V <sub>IH</sub> -Vcc	-1.1	--	-0.74	V
Transmitter Data Input Voltage - Low	V <sub>IL</sub> -Vcc	-2.0		-1.58	V
Tx_Disable_Input_High	VDISH	2.0	--	Vcc+0.3	V
Tx_Disable_Input_Low	VDISL	0	--	0.8	V

**Receiver Specifications** (  $V_{CC} = 3.1 \sim 3.5V$  ;  $T_{OP} = 0 \sim 70^{\circ}C / T_{OP} = -40 \sim 85^{\circ}C$  )

Parameter	Symbol	Min	Typ	Max	Unit
<b>Optical Characteristics</b>					
Optical Input Power-maximum	$P_{max}$	-3	--	--	dBm
Receiver Sensitivity ( PRBS=2 <sup>7</sup> -1 ; BER ≤ 10 <sup>-12</sup> )	Sens	--	--	-23	dBm
Operating Center Wavelength	$\lambda$	1260	--	1610	nm
Signal Detect – Asserted	$P_{SA}$	--	--	-23	dBm
Signal Detect – De-asserted	$P_{SD}$	-45	--	--	dBm
Signal Detect – Hysteresis	$P_{SH}$	0.5		6	dB
<b>Electrical Characteristics</b>					
Differential Output Voltage	$V_{DIFF}$	0.4	--	2.0	V
Signal Detect Output Voltage - High	$V_{OH} - V_{CC}$	-1.1	--	-0.74	V
Signal Detect Output Voltage - Low	$V_{OL} - V_{CC}$	-2.0		-1.58	V

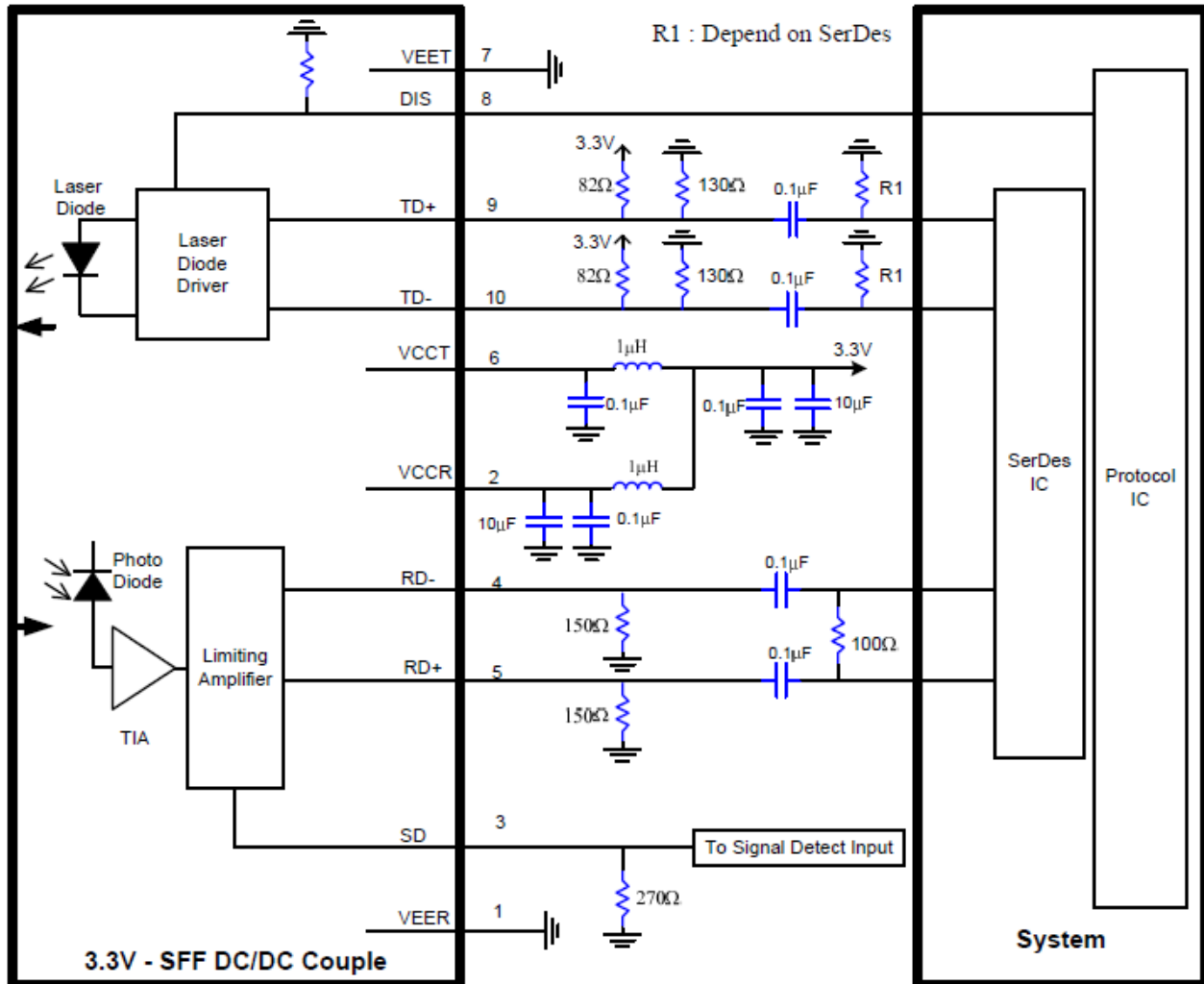
### Pin Definition and Descriptions



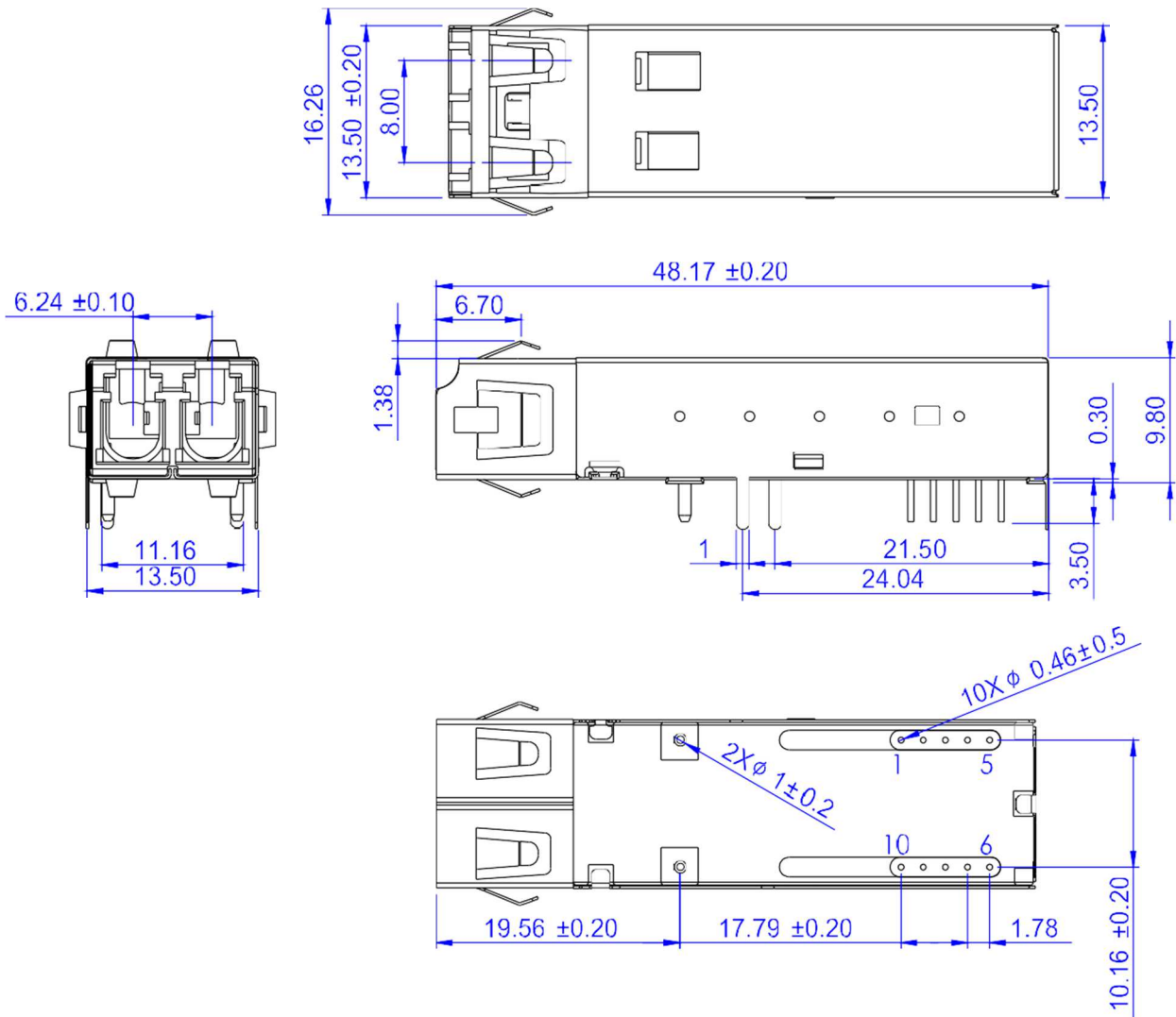
**Bottom View**

Pin	Name	Input-Output /Level	Description	Ref.
1	VEER	Input	Receiver ground	
2	VCCR	Input	Receiver power supply	
3	SD	Output/LVPECL	Receiver signal detect. High signal indicates optical signal is present at receiver input.	
4	RD-	Output/LVPECL	Inverted receiver data output	
5	RD+	Output/LVPECL	Non-inverted receiver data output	
6	VCCT	Input	Transmitter power supply	
7	VEET	Input	Transmitter ground	
8	DIS	Input/LVTTL	Transmitter Disable Control	
9	TD+	Input/LVPECL	Transmitter non-inverted data input	
10	TD-	Input/LVPECL	Transmitter inverted data input	

Recommended Circuit Diagram



Mechanical Outlines ( Unit : mm)





## **ESD**

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

### **Contact Information**

**Formerica OptoElectronics Inc.**

5F-11, No.38, Taiyuan St., Zhubei City,

Hsinchu County 30265, Taiwan

Tel: +886-3-5600286

Fax: +886-3-5600239

**San Diego, CA**

Tel: 1-949-466-8069

[inquiry@formericaoe.com](mailto:inquiry@formericaoe.com)

[www.formericaoe.com](http://www.formericaoe.com)