

# Single-mode 2.5Gbps 2x5 SFF Optical Transceiver

## Features

- LC duplex receptacle
- Standard 2 x 5 footprint
- 1310nm or 1550nm laser transmitter with automatic power control
- AC coupled LVPECL compatible data input and output
- Transmitter disable input
- PECL or TTL signal detect output
- Single 3.3V power supply



## Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit
<b>Transmitter</b>					
Data Rate (NRZ)	B	-	2.4883	-	Gb/s
Optical Output Power (avg.) <sup>(1) (5) (6)</sup>					
-1 <sup>(2)</sup>	P <sub>o</sub>	-10	-	-6	dBm
-2 <sup>(3) (4)</sup>	P <sub>o</sub>	-5	-	0	dBm
-3	P <sub>o</sub>	-3	-	+2	dBm
Extinction Ratio	ER	9	-	-	dB
<b>Optical Wavelength</b>					
1310nm FP LD <sup>(2)</sup>	$\lambda_c$	1270	1310	1360	nm
1310nm DFB LD <sup>(3)</sup>	$\lambda_c$	1260	1310	1360	nm
1550nm DFB LD <sup>(4)</sup>	$\lambda_c$	1520	1550	1580	nm
<b>Spectral Width</b>					
1310nm FP LD (RMS) <sup>(2)</sup>	$\Delta\lambda$	-	-	2.5	nm
1310nm DFB LD (-20dB) <sup>(3)</sup>	$\Delta\lambda$	-	-	1	nm
1550nm DFB LD (-20dB) <sup>(4)</sup>	$\Delta\lambda$	-	-	1	nm
<b>Side Mode Suppression Ratio</b>					
1310nm DFB LD <sup>(3)</sup>	SMSR	30	-	-	dB
1550nm DFB LD <sup>(4)</sup>	SMSR	30	-	-	dB
Output Rise Time (20-80%)	t <sub>r</sub>	-	-	180	ps
Output Fall Time (20-80%)	t <sub>f</sub>	-	-	180	ps
Data Differential Input Voltage	V <sub>i</sub>	500	-	2400	mV <sub>p-p</sub>
Tx Disable Input	V <sub>DIL</sub> V <sub>DIH</sub>	0 2	- -	0.8 V <sub>CC</sub>	V
Supply Voltage	V <sub>CC</sub>	2.97	3.3	3.63	V
Supply Current	I <sub>CC</sub>	-	-	110	mA

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Parameter	Symbol	Min.	Typ.	Max.	Unit
<b>Receiver</b>					
Data Rate (NRZ)	B	-	2.4883	-	Gb/s
Optical Input Sensitivity (avg.) <sup>(1) (7)</sup>	P <sub>IN</sub>	-	-	-18	dBm
Saturation	P <sub>SAT</sub>	0	-	-	dBm
Optical Wavelength	λ	1100	-	1600	nm
Output Rise Time (20-80%)	t <sub>r</sub>	-	-	175	ps
Output Fall Time (20-80%)	t <sub>f</sub>	-	-	175	ps
Data Differential Output Voltage	V <sub>o</sub>	600	-	1200	mV <sub>p-p</sub>
Signal Detect Asserted (avg.)	P <sub>A</sub>	-	-	-18	dBm
Signal Detect Deasserted (avg.)	P <sub>D</sub>	-28	-	-	dBm
Signal Detect Hysteresis	P <sub>HYS</sub>	0.5	2	-	dB
Supply Voltage	V <sub>CC</sub>	2.97	3.3	3.63	V
Supply Current	I <sub>CC</sub>	-	-	100	mA

Notes :

- (1) With 0.275 NA, 9/125μm fiber.
- (2) Compliant to GR-253-CORE SONET OC-48 SR-1 and ITU-T G.957 STM-16 I-16.
- (3) Compliant to GR-253-CORE SONET OC-48 IR-1 and ITU-T G.957 STM-16 S-16.1.
- (4) Compliant to GR-253-CORE SONET OC-48 IR-2 and ITU-T G.957 STM-16 S-16.1.
- (5) Class 1 eye safe per FDA and IEC.
- (6) Transmitter eye mask diagram is compliant to ITU-T G.957 Eye Diagram.
- (7) 2<sup>7</sup> -1 PRBS, BER= 10<sup>-12</sup>.
- (8) The transmitter output should not be viewed directly.

### Absolute Maximum Ratings

Parameter		Min.	Max.	Unit
Operating Temperature	-1	0	70	°C
	-2	-40	85	°C
Storage Temperature		-40	100	°C
Lead Soldering Limits		-	240/10	°C /sec
Supply Voltage		-0.2	4	V

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## Ordering Information

TR □ □ SM4 - □ □ LC3AR1 □ □

**Operating Temperature Range :**

1 : 0°C ~ 70°C

2 : -40°C ~ 85°C

**Data Coupling & SD Output Level :**

Symbol	Tx Coupling	Rx Coupling	SD
E	AC	AC	PECL
F	AC	AC	TTL

**Laser Type :**

L : FP LD

F : DFB LD

**Tx Output Power Grade :** (refer to Specifications)

1 : -1

2 : -2

3 : -3

**Wavelength :**

13 : 1310nm

15 : 1550nm

Part Number	Laser Type	Power Budget <sup>(1)</sup>	Recommended Maximum Reach <sup>(2)</sup>	Compliant to SONET OC-48 / SDH STM-16 <sup>(4)</sup>
TR13SM4-1LLC3AR1 □ □	1310nm, FP	8dB	14Km	SR-1 / I-16
TR13SM4-2FLC3AR1 □ □	1310nm, DFB	13dB	28Km	IR-1 / S-16.1
TR15SM4-2FLC3AR1 □ □	1550nm, DFB	13dB	40Km	IR-2 / S-16.2

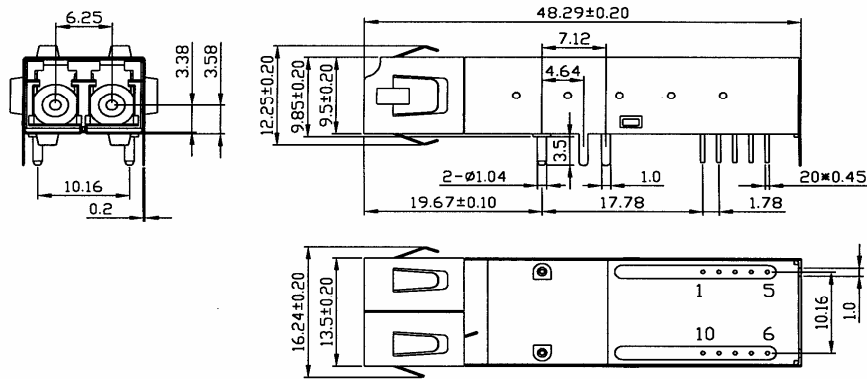
**Notes :**

- (1) Power Budget (min.) = TX Output Power (min.) - RX Sensitivity (min.)
- (2) Assuming connector loss 3dB; 1310nm fiber attenuation coefficient 0.35dB/Km; 1550nm fiber attenuation coefficient 0.25dB/Km.
- (3) The maximum reach value is recommended, not guaranteed. The exact transmission distance depends on fiber loss, connector loss and system penalty.
- (4) SONET/SDH standard specification is defined in GR-253-CORE/ITU-T G.957.

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## Outline Drawing

2\*5



UNIT : mm

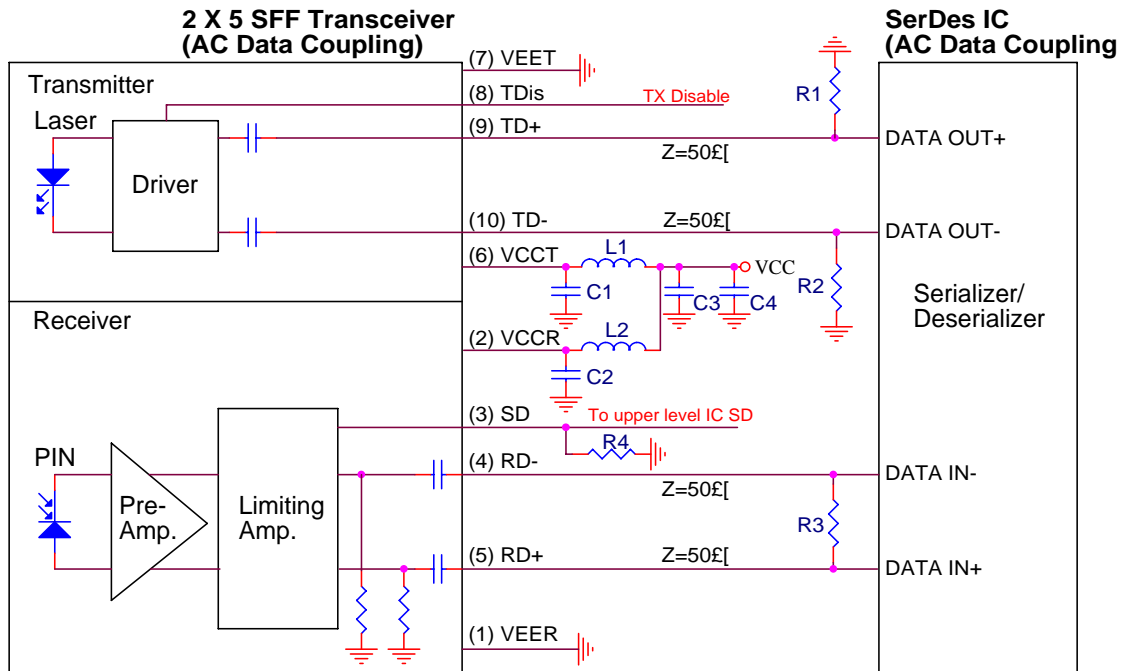
## Pinout Description

Pin No.	Symbol	Description
1	V <sub>EER</sub>	Receiver Ground
2	V <sub>CCR</sub>	Receiver Power Supply
3	SD	Receiver Signal Detect
4	RD-	Receiver Data Out (Inverted)
5	RD+	Receiver Data Out
6	V <sub>CCT</sub>	Transmitter Power Supply
7	V <sub>EET</sub>	Transmitter Ground
8	TDis	Input Logic Low Level to Switch Laser "ON" Input Logic High Level to Switch Laser "OFF"
9	TD+	Transmitter Data in
10	TD-	Transmitter Data In (Inverted)

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## Application Notes

Recommended Interface Circuit :



$L1=L2=1\text{gH}$  or ferrite bead  
 $C1=C2=C3=0.1\text{gF}$   
 $C4=10\text{gF}$   
 $R1, R2, R3$  depends on SerDes IC specification.  
 (Consult the SerDes IC application information)  
 $R4=510\text{g}$

NOTE<sub>i</sub>G  
 1. Transmission line characteristic impedance  $Z=50\text{g}$ .  
 2.  $R1, R2, R3$  as close to SerDes IC as possible.

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