

# Single-mode 1.25Gbps 2X5 SFF Transceiver

## Features

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



## Specifications

Parameter		Symbol	Min.	Typ.	Max.	Unit
<b>Transmitter</b>						
Data Rate (NRZ)		B	-	1250	-	Mb/s
Optical Output Power (avg.) <sup>(1) (2) (3)</sup>						
-1		P <sub>o</sub>	-11	-	-6	dBm
-2		P <sub>o</sub>	-5	-	0	dBm
-3		P <sub>o</sub>	-3	-	+2	dBm
Extinction Ratio <sup>(2)</sup>		ER	9	-	-	dB
Optical Wavelength						
1310nm FP LD <sup>(2)</sup>		$\lambda_c$	1270	1310	1355	nm
1550nm DFB LD		$\lambda_c$	1530	1550	1570	nm
Spectral Width						
1310nm FP LD (RMS) <sup>(2)</sup>		$\Delta\lambda$	-	-	2.5	nm
1550nm DFB LD (-20dB)		$\Delta\lambda$	-	-	1	nm
Side Mode Suppression Ratio						
1550nm DFB LD		SMSR	30	-	-	dB
Output Rise Time (20-80%) <sup>(2)</sup>		t <sub>r</sub>	-	-	0.26	ns
Output Fall Time (20-80%) <sup>(2)</sup>		t <sub>f</sub>	-	-	0.26	ns
Data Input <sup>(7)</sup>	DC Coupled	V <sub>IL</sub> V <sub>IH</sub>	V <sub>CC</sub> -1.810 V <sub>CC</sub> -1.165	- -	V <sub>CC</sub> -1.475 V <sub>CC</sub> -0.880	V V
	AC Coupled (Differential)	V <sub>I</sub>	0.25	-	1.6	V
Tx Disable Input		V <sub>DIL</sub> V <sub>DIH</sub>	0 2	- -	0.8 V <sub>CC</sub>	V V
Supply Voltage		V <sub>CC</sub>	3.10 4.75	3.3 5.0	3.50 5.25	V 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	-	1250	-	Mb/s
Optical Input Sensitivity (avg.) <sup>(1) (2) (5)</sup>						
-1		P <sub>IN</sub>	-	-	-20	dBm
-2		P <sub>IN</sub>	-	-	-23	dBm
Saturation		P <sub>SAT</sub>	-3	-	-	dBm
Optical Wavelength		λ	1100	-	1600	nm
Output Rise Time (20-80%)		t <sub>r</sub>	-	-	0.4	ns
Output Fall Time (20-80%)		t <sub>f</sub>	-	-	0.4	ns
Data Output <sup>(7)</sup>	DC Coupled	V <sub>OL</sub> V <sub>OH</sub>	V <sub>CC</sub> -1.840 V <sub>CC</sub> -1.045	- -	V <sub>CC</sub> -1.62 V <sub>CC</sub> -0.88	V V
	AC Coupled (Differential)	V <sub>I</sub>	0.6	-	1.8	V
Signal Detect Asserted (avg.)		P <sub>A</sub>	-	-	-20	dBm
Signal Detect Deasserted (avg.)		P <sub>D</sub>	-35	-	-	dBm
Signal Detect Hysteresis		P <sub>HYS</sub>	-	2	-	dB
Supply Voltage		V <sub>CC</sub>	3.10 4.75	3.3 5.0	3.50 5.25	V V
Supply Current		I <sub>CC</sub>	-	-	100	mA

Notes :

- (1) With 0.275 NA, 9/125μm fiber.
- (2) Compliant to IEEE802.3z Gigabit Ethernet 1000BASE-LX.
- (3) Class 1 eye safe per FDA and IEC.
- (4) Transmitter eye mask diagram is compliant to IEEE802.3z Eye Diagram.
- (5) 2<sup>7</sup> -1 PRBS, BER= 10<sup>-12</sup>.
- (6) The transmitter output should not be viewed directly.
- (7) Compatible with PECL and LVPECL logic levels.

### 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	5V	-0.2	7	V
	3.3V	-0.2	4	V

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## Ordering Information

TR □ □ SM3 - □ □ LC □ AR □ □ □

**Operating Temperature Range :**

1 : 0°C ~ 70°C

2 : -40°C ~ 85°C

**Data Coupling & SD Output Level :**

Symbol	Tx Coupling	Rx Coupling	SD
C	AC	DC	PECL
D	AC	DC	TTL
E	AC	AC	PECL
F	AC	AC	TTL
G	DC	DC	PECL
H	DC	DC	TTL
I	DC	AC	PECL
J	DC	AC	TTL

**Sensitivity Grade :** (refer to Specifications)

1 : -1

2 : -2

**Supply Voltage :**

5 : 5V

3 : 3.3V

**Laser Type :**

L : FP LD

F : DFB LD

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

1 : -1

2 : -2

**Wavelength :**

13 : 1310nm

15 : 1550nm

Part Number	Laser Type	Power Budget <sup>(1)</sup>	Recommended Maximum Reach <sup>(2)</sup>	Compliant to Gigabit Ethernet <sup>(4)</sup>
TR13SM3-1LLC □ AR1 □ □	1310nm, FP	9dB	17Km	1000BASE-LX
TR13SM3-2LLC □ AR2 □ □	1310nm, FP	18dB	42Km	-
TR15SM3-3FLC □ AR2 □ □	1550nm, DFB	20dB	68Km	-

**Notes :**

(1) Power Budget (min.) = TX Output Power (min.) - RX Sensitivity (min.)

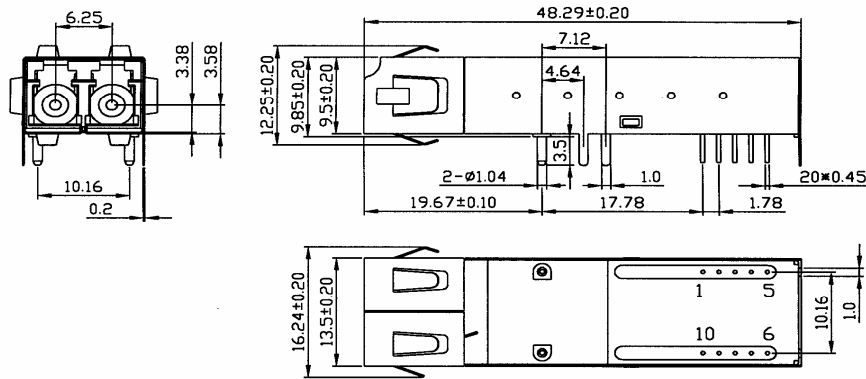
(2) Assuming connector loss 3dB; 1310nm fiber attenuation coefficient 0.35dB/Km; 1550nm fiber attenuation coefficient 0.25dB/Km.

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- (3) The maximum reach value is recommended, not guaranteed. The exact transmission distance depends on fiber loss, connector loss and system penalty.
- (4) Gigabit Ethernet standard specification is defined in IEEE802.3z.

### Outline Drawing

2\*5



UNIT : mm

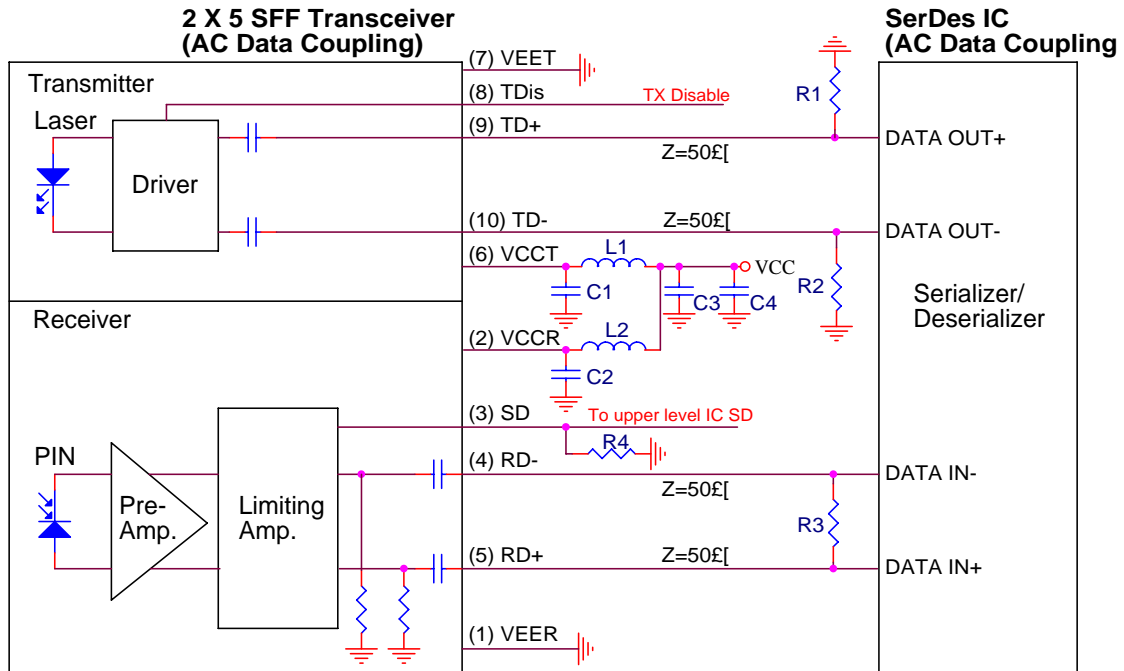
### Pinout Description

Pin No.	Symbol	Description
1	V <sub>EER</sub>	Receiver Ground
2	V <sub>CCR</sub>	Receiver Power Supply (5V/3.3V)
3	SD	Receiver Signal Detect
4	RD-	Receiver Data Out (Inverted)
5	RD+	Receiver Data Out
6	V <sub>CCT</sub>	Transmitter Power Supply (5V/3.3V)
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 AC Coupling Interface Circuit :

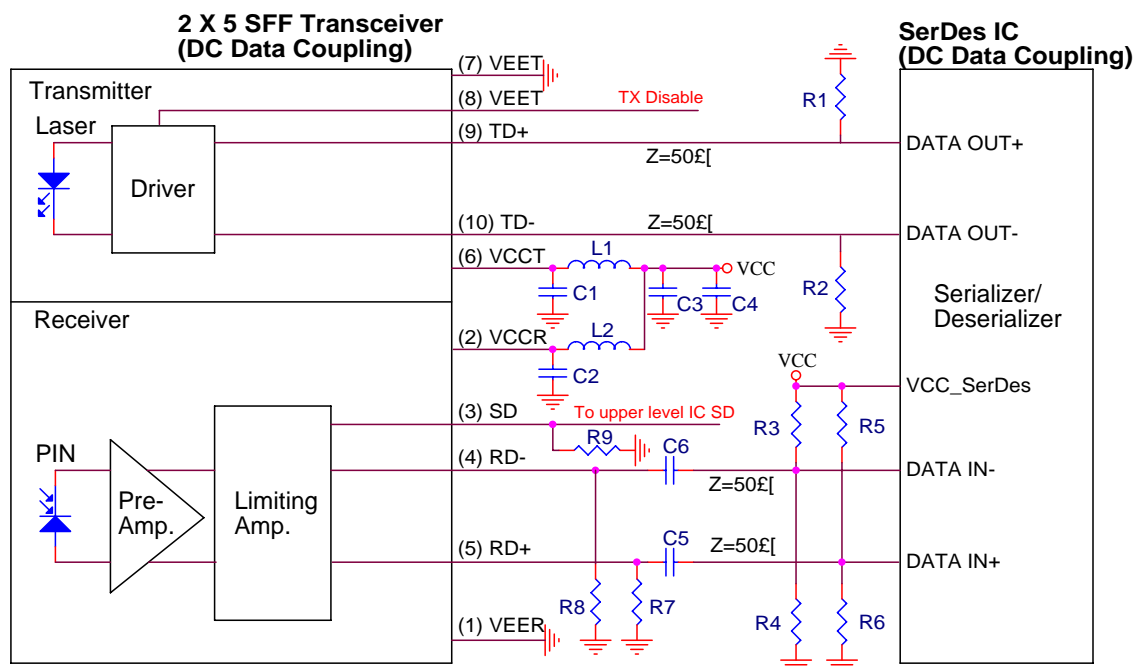


L1=L2=1 $\mu$ H or ferrite bead  
 C1=C2=C3=0.1 $\mu$ F  
 C4=10 $\mu$ F  
 R1, R2, R3 depends on SerDes IC specification.  
 (Consult the SerDes IC application information)  
 R4=510 $\Omega$

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

# Single-mode 1.25Gbps 2X5 SFF Transceiver

Recommended DC Coupling Interface Circuit :



$L1=L2=1\text{f}gH$  or ferrite bead  
 $C1=C2=C3=C5=C6=0.1\text{f}gF$   
 $C4=10\text{f}gF$   
 $R1, R2, R3, R4, R5, R6$  depends on SerDes IC specification.  
 (Consult the SerDes IC application information)  
 $R7=R8=270\text{f}g\Omega$  ( $VCC=3.3V$ )  
 $=510\text{f}g\Omega$  ( $VCC=5V$ )  
 $R9=510\text{f}g\Omega$

**NOTE;G**

1. Transmission line characteristic impedance  $Z=50\text{f}g\Omega$ .
2.  $R1, R2, R3, R4, R5, R6$  as close to SerDes IC as possible
3.  $R7, R8$  as close to 1X9 Transceiver as possible.

**Appointech, Inc.**

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