

Single-mode 155Mbps 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
Transmitter						
Data Rate (NRZ)		B	10	155	250	Mb/s
Optical Output Power (avg.) ^{(1) (5)}						
-1		P _o	-12	-	-6	dBm
-2		P _o	-5	-	0	dBm
-3		P _o	-3	-	+2	dBm
Extinction Ratio ^{(2) (3) (4)}		ER	10	-	-	dB
Optical Wavelength						
1310nm FP LD ^{(2) (3)}		λ_c	1270	1310	1360	nm
1550nm DFB LD ⁽⁴⁾		λ_c	1530	1550	1570	nm
Spectral Width						
1310nm FP LD (RMS) ^{(2) (3)}		$\Delta\lambda$	-	-	2.5	nm
1550nm DFB LD (-20dB) ⁽⁴⁾		$\Delta\lambda$	-	-	1	nm
Side Mode Suppression Ratio						
1550nm DFB LD ⁽⁴⁾		SMSR	30	-	-	dB
Output Rise Time (10-90%)		t _r	-	0.4	1	ns
Output Fall Time (10-90%)		t _f	-	1.0	1.5	ns
Data Input ⁽⁹⁾	DC Coupled	V _{IL} V _{IH}	V _{CC} -1.810 V _{CC} -1.165	- -	V _{CC} -1.475 V _{CC} -0.880	V V
	AC Coupled (Differential)	V _I	0.25	-	1.6	V
Tx Disable Input		V _{DIL} V _{DIH}	0 2	- -	0.8 V _{CC}	V V
Supply Voltage		V _{CC}	3.10 4.75	3.3 5.0	3.50 5.25	V V
Supply Current		I _{CC}	-	-	110	mA

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Parameter		Symbol	Min.	Typ.	Max.	Unit
Receiver						
Data Rate (NRZ)		B	10	155	200	Mb/s
Optical Input Sensitivity (avg.) ^{(1) (2) (3) (4) (7)}		P _{IN}	-	-38	-34	dBm
Saturation		P _{SAT}	-3	-	-	dBm
Optical Wavelength		λ	1100	-	1600	nm
Output Rise Time (10-90%)		t _r	-	1.5	2.5	ns
Output Fall Time (10-90%)		t _f	-	1.5	2.5	ns
Data Output ⁽⁹⁾	DC Coupled	V _{OL} V _{OH}	V _{CC} -1.840 V _{CC} -1.045	- -	V _{CC} -1.62 V _{CC} -0.88	V V
	AC Coupled (Differential)	V _I	0.6	-	1.8	V
Signal Detect Asserted (avg.)		P _A	-	-	-34	dBm
Signal Detect Deasserted (avg.)		P _D	-48	-	-	dBm
Signal Detect Hysteresis		P _{HYS}	-	2	-	dB
Supply Voltage		V _{CC}	3.10	3.3	3.50	V
			4.75	5.0	5.25	V
Supply Current		I _{CC}	-	-	100	mA

Notes :

- (1) With 0.275 NA, 9/125μm fiber.
- (2) Compliant to GR-253-CORE SONET OC-3 IR-1 and ITU-T G.957 STM-1 S-1.1.
- (3) Compliant to GR-253-CORE SONET OC-3 LR-1 and ITU-T G.957 STM-1 L-1.1.
- (4) Compliant to GR-253-CORE SONET OC-3 LR-2 and ITU-T G.957 STM-1 L-1.2.
- (5) Class 1 eye safe per FDA and IEC.
- (6) Transmitter eye mask diagram is compliant to ITU-T G.957 Eye Diagram.
- (7) 2²³ -1 PRBS, BER= 10⁻¹⁰.
- (8) The transmitter output should not be viewed directly.
- (9) 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 □ □ SM1 - □ □ LC □ AR1 □ □

Operating Temperature Range :

1 : 0 ~ 70°C

2 : -40 ~ 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

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 ⁽¹⁾	Recommended Maximum Reach ⁽²⁾	Compliant to SONET OC-3 / SDH STM-1 ⁽⁴⁾
TR13SM1-1LLC □ AR1 □ □	1310nm, FP	22dB	54Km	IR-1 / S-1.1
TR13SM1-2LLC □ AR1 □ □	1310nm, FP	29dB	74Km	LR-1 / L-1.1
TR15SM1-2FLC □ AR1 □ □	1550nm, DFB	29dB	104Km	LR-2 / L-1.2

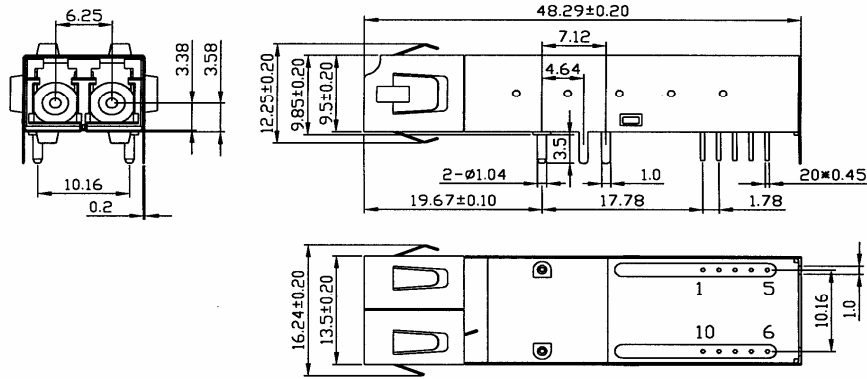
Notes :

- (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

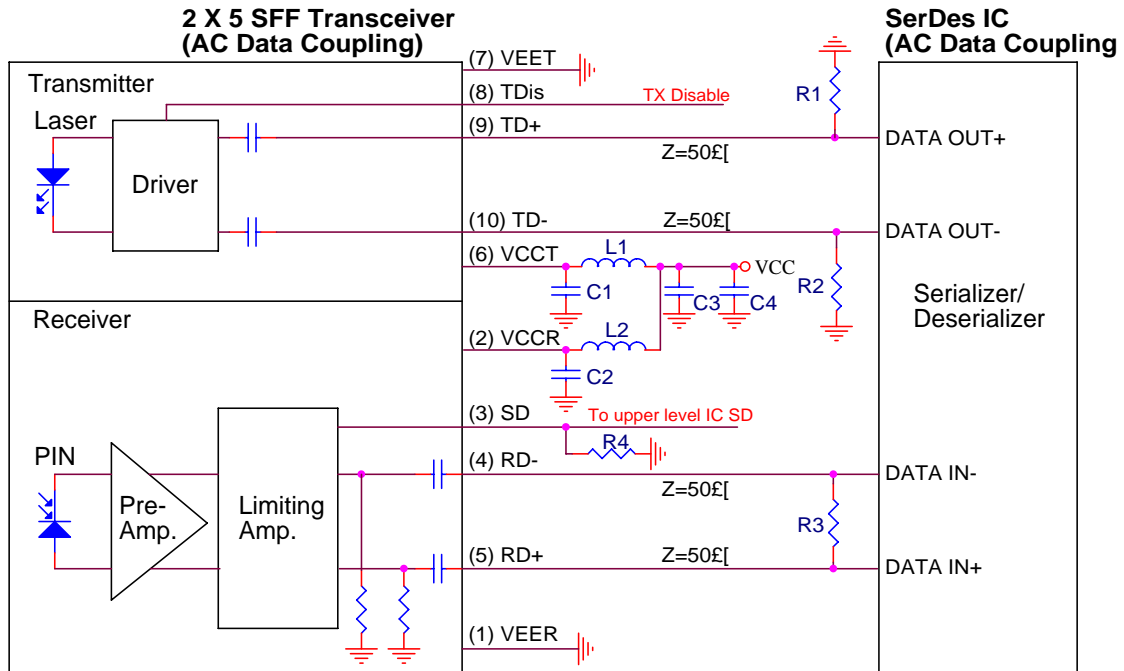
Pinout Description

Pin No.	Symbol	Description
1	V _{EER}	Receiver Ground
2	V _{CCR}	Receiver Power Supply (5V/3.3V)
3	SD	Receiver Signal Detect
4	RD-	Receiver Data Out (Inverted)
5	RD+	Receiver Data Out
6	V _{CCT}	Transmitter Power Supply (5V/3.3V)
7	V _{EET}	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 :

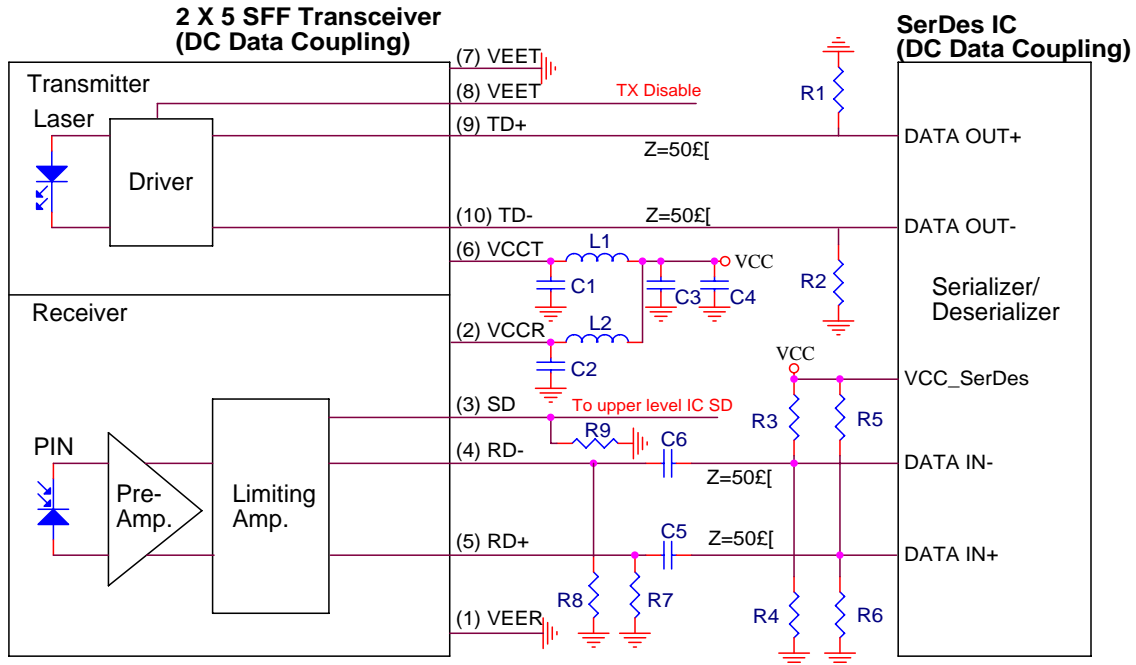


$L1=L2=1\text{ }\mu\text{gH}$ or ferrite bead
 $C1=C2=C3=0.1\text{ }\mu\text{gF}$
 $C4=10\text{ }\mu\text{gF}$
 $R1, R2, R3$ depends on SerDes IC specification.
 (Consult the SerDes IC application information)
 $R4=510\text{ }\Omega$

NOTE_iG
 1. Transmission line characteristic impedance $Z=50\text{ }\Omega$.
 2. $R1, R2, R3$ as close to SerDes IC as possible.

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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)
 $R7=R8=270\Omega$ ($VCC=3.3V$)
 $=510\Omega$ ($VCC=5V$)
 $R9=510\Omega$

NOTE;G

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

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