

Single-mode 622Mbps 2X10 SFF Transceiver

Features

- LC duplex receptacle
- Standard 2 x 10 footprint
- 1310nm or 1550nm laser transmitter with automatic power control
- Laser bias and power monitor
- 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

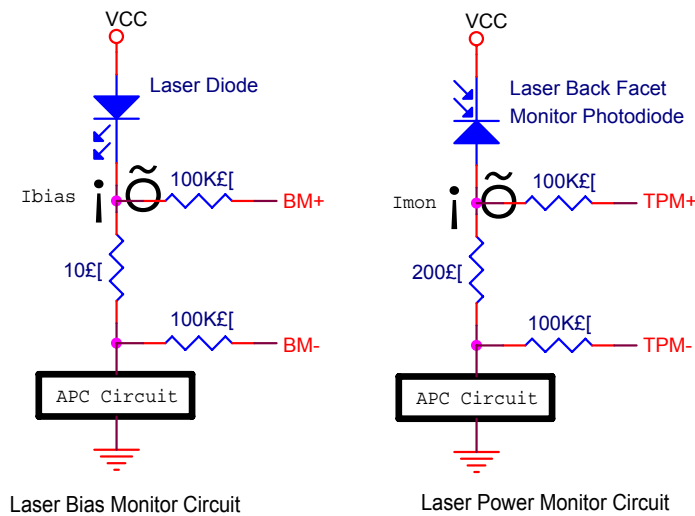
Parameter	Symbol	Min.	Typ.	Max.	Unit	
Transmitter						
Data Rate (NRZ)	B	-	622	-	Mb/s	
Optical Output Power (avg.) ⁽¹⁾⁽⁶⁾						
-1	P _o	-12	-	-6	dBm	
-2	P _o	-5	-	0	dBm	
-3	P _o	-3	-	+2	dBm	
Extinction Ratio ⁽²⁾⁽³⁾⁽⁴⁾⁽⁵⁾	ER	10	-	-	dB	
Optical Wavelength						
1310nm FP LD ⁽²⁾⁽³⁾	λ_c	1274	1310	1356	nm	
1310nm DFB LD ⁽⁴⁾	λ_c	1290	1310	1330	nm	
1550nm DFB LD ⁽⁵⁾	λ_c	1530	1550	1570	nm	
Spectral Width						
1310nm FP LD (RMS) ⁽²⁾⁽³⁾	$\Delta\lambda$	-	-	2.5	nm	
1310nm DFB LD (-20dB) ⁽⁴⁾	$\Delta\lambda$	-	-	1	nm	
1550nm DFB LD (-20dB) ⁽⁵⁾	$\Delta\lambda$	-	-	1	nm	
Side Mode Suppression Ratio						
1310nm DFB LD ⁽⁴⁾	SMSR	30	-	-	dB	
1550nm DFB LD ⁽⁵⁾	SMSR	30	-	-	dB	
Output Rise Time (10-90%)	t _r	-	0.5	0.8	ns	
Output Fall Time (10-90%)	t _f	-	0.5	0.8	ns	
Data Input ⁽¹⁰⁾	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}	0	-	0.8	V	
	V _{DIH}	2	-	V _{CC}	V	
Laser Bias Monitor (BM) ⁽¹¹⁾	BM	-	0.1	-	mA/mV	
Laser Power Monitor (TPM) ⁽¹¹⁾	TPM	-	5	-	μA/mV	
Supply Voltage	V _{CC}	3.10	3.3	3.50	V	
		4.75	5.0	5.25	V	
Supply Current	I _{CC}	-	-	110	mA	

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Parameter	Symbol	Min.	Typ.	Max.	Unit	
Receiver						
Data Rate (NRZ)	B	-	622	-	Mb/s	
Optical Input Sensitivity (avg.) ⁽¹⁾⁽⁸⁾						
-1 ⁽²⁾	P_{IN}	-	-25	-23	dBm	
-2 ⁽³⁾⁽⁴⁾⁽⁵⁾	P_{IN}	-	-29	-28	dBm	
Saturation	P_{SAT}	-3	-	-	dBm	
Optical Wavelength	λ	1100	-	1600	nm	
Output Rise Time (10-90%)	t_r	-	0.5	0.8	ns	
Output Fall Time (10-90%)	t_f	-	0.5	0.8	ns	
Data Output ⁽¹⁰⁾	DC Coupled	V_{OL}	$V_{CC} - 1.840$	-	$V_{CC} - 1.62$	V
		V_{OH}	$V_{CC} - 1.045$	-	$V_{CC} - 0.88$	V
	AC Coupled (Differential)	V_I	0.6	-	1.8	V
Signal Detect Asserted (avg.)	P_A	-	-	-23	dBm	
Signal Detect Deasserted (avg.)	P_D	-38	-	-	dBm	
Signal Detect Hysteresis	P_{HYS}	-	2	-	dB	
Supply Voltage	V_{CC}	3.10 4.75	3.3 5.0	3.50 5.25	V	
Supply Current	I_{CC}	-	-	100	mA	

Notes :

- (1) With 0.275 NA, 9/125 μ m fiber.
- (2) Compliant to GR-253-CORE SONET OC-12 SR-1 and ITU-T G.957 STM-4 I-4.
- (3) Compliant to GR-253-CORE SONET OC-12 IR-1 and ITU-T G.957 STM-4 S-4.1.
- (4) Compliant to GR-253-CORE SONET OC-12 LR-1 and ITU-T G.957 STM-4 L-4.1.
- (5) Compliant to GR-253-CORE SONET OC-12 LR-2 and ITU-T G.957 STM-4 L-4.2.
- (6) Class 1 eye safe per FDA and IEC.
- (7) Transmitter eye mask diagram is compliant to ITU-T G.957 Eye Diagram.
- (8) $2^{23} - 1$ PRBS, BER = 10^{-10} .
- (9) The transmitter output should not be viewed directly.
- (10) Compatible with PECL and LVPECL logic levels.
- (11) The figure below shows the laser bias monitor and power monitor equivalent circuit.



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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

T R □ □ S M 2 - □ □ L C □ K R □ □ □

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

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

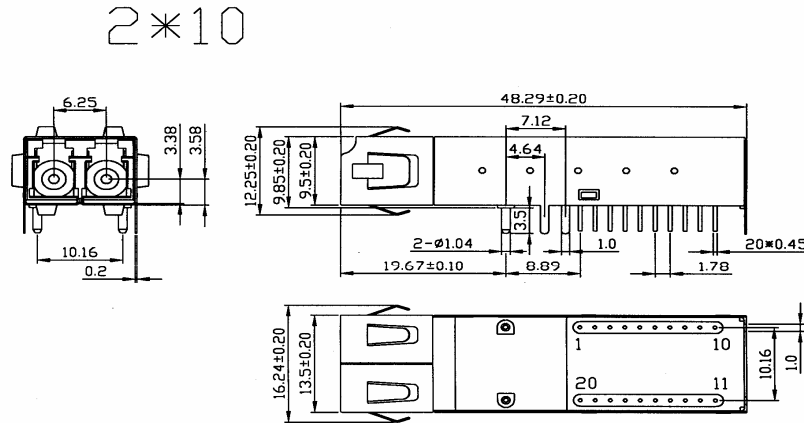
Part Number	Laser Type	Power Budget ⁽¹⁾	Recommended Maximum Reach ⁽²⁾	Compliant to SONET OC-12 / SDH STM-4 ⁽⁴⁾
TR13SM2-1LLC□ KR1□ □	1310nm, FP	11dB	22Km	SR-1 / I-4
TR13SM2-1LLC□ KR2□ □	1310nm, FP	16dB	37Km	IR-1 / S-4.1
TR13SM2-3FLC□ KR2□ □	1310nm, DFB	25dB	62Km	LR-1 / L-4.1
TR15SM2-3FLC□ KR2□ □	1550nm, DFB	25dB	88Km	LR-2 / L-4.2

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



UNIT : mm

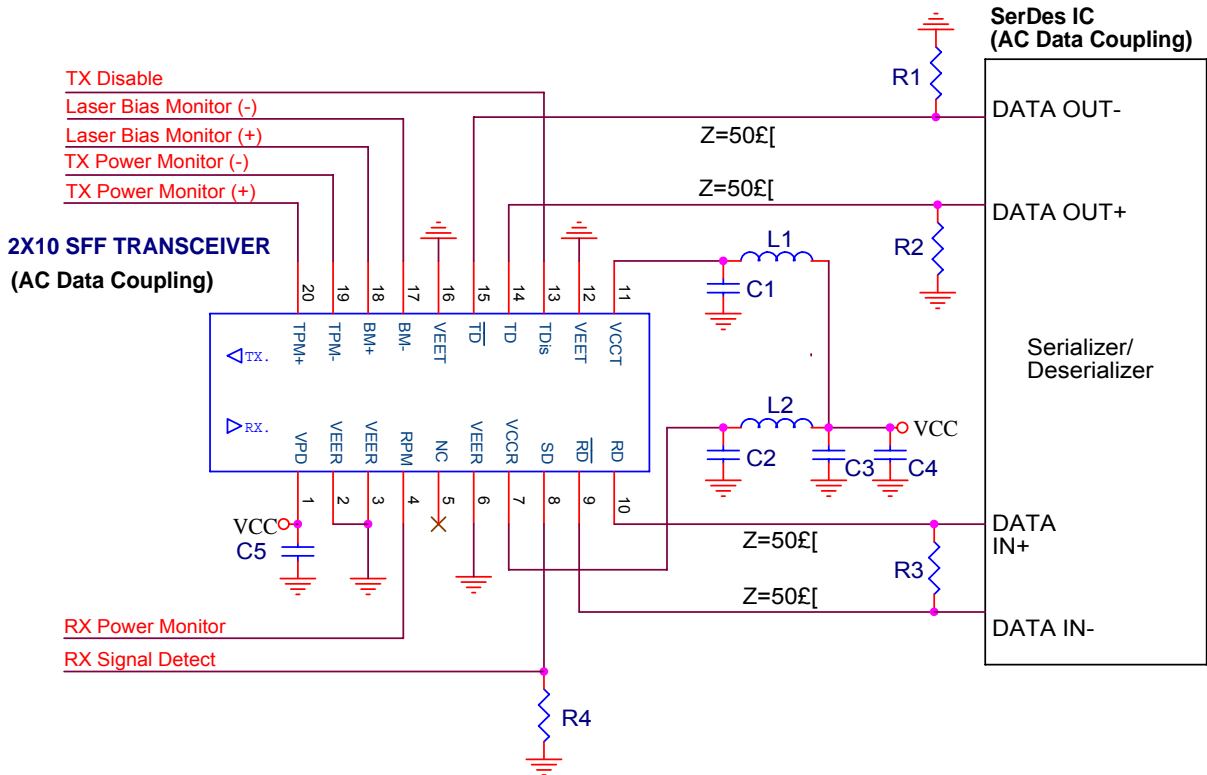
Pinout Description

Pin No.	Symbol	Description
1	V _{PD}	Receiver PD Bias Supply
2	V _{EER}	Receiver Ground
3	V _{EER}	Receiver Ground
4	NC	No Connection
5	NC	No Connection
6	V _{EER}	Receiver Ground
7	V _{CCR}	Receiver Power Supply
8	SD	Receiver Signal Detect
9	RD-	Receiver Data Out (Inverted)
10	RD+	Receiver Data Out
11	V _{CCT}	Transmitter Power Supply
12	V _{EET}	Transmitter Ground
13	TDis	Input Logic Low Level to Switch Laser "ON" Input Logic High Level to Switch Laser "OFF"
14	TD+	Transmitter Data in
15	TD-	Transmitter Data In (Inverted)
16	V _{EET}	Transmitter Ground
17	BM-	Laser Diode Bias Current Monitor-Negative End
18	BM+	Laser Diode Bias Current Monitor-Positive End
19	TPM-	Transmitter Power Monitor-Negative End
20	TPM+	Transmitter Power Monitor-Positive End

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Application Notes

Recommended AC Coupling Interface Circuit :



L1=L2=1 μ H or ferrite bead

C1=C2=C3=0.1 μ F

C4=10 μ F

C5=1 μ F

R1, R2, R3 depends on SerDes IC specification.

(Consult the SerDes IC application information)

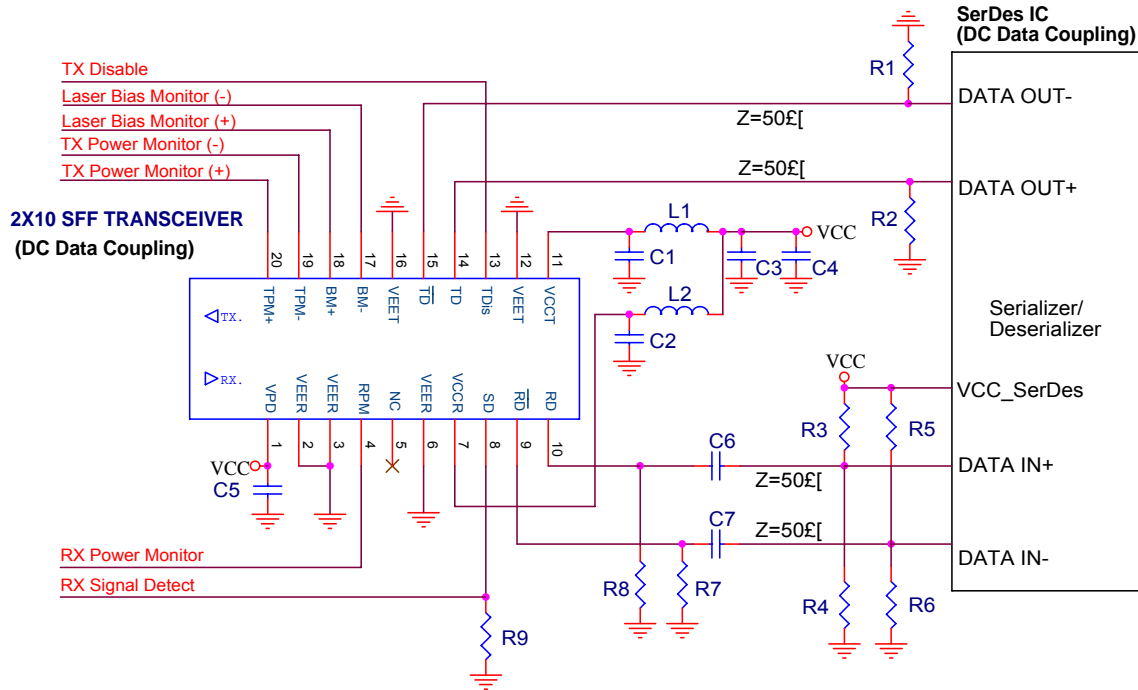
R4=510 Ω

NOTE_iG

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

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Recommended DC Coupling Interface Circuit :



$L1=L2=1\mu\text{gH}$ or ferrite bead
 $C1=C2=C3=C6=C7=0.1\mu\text{gF}$
 $C4=10\mu\text{gF}$
 $C5=1\mu\text{gF}$
 $R1, R2, R3, R4, R5, R6$ 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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