Single-mode 1.25Gbps 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	-	1250	-	Mb/s
Optical Output Power (avg.) (1) (2) (3)						
-1		P_o	-11	-	-6	dBm
-2		P_o	-5	-	0	dBm
-3		P_o	-3	-	+2	dBm
Extinction Ratio (2)		ER	9	-	-	dB
Optical Wavelength						
1310nm FP LD (2)		λ_C	1270	1310	1355	nm
1550nm DFB LD		λ_C	1530	1550	1570	nm
Spectral Width						
1310nm FP LD (RMS) (2)		$\Delta\lambda$	-	-	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%) (2)		t_r	-	-	0.26	ns
Output Fall Time (20-80%) (2)		t_f	-	-	0.26	ns
Data Input (7)	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
Laser Bias Monitor (BM) (8)		BM	-	0.1	-	mA/mV
Laser Power Monitor (TPM) (8)		TPM	-	5	-	μA/mV
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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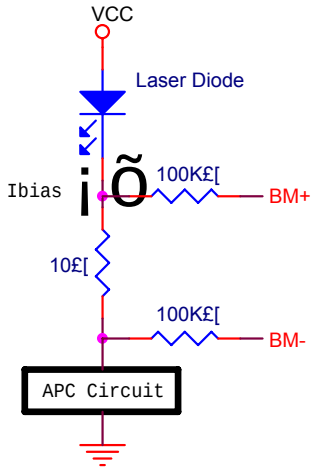
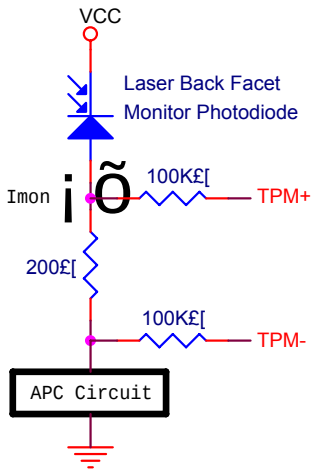
Parameter		Symbol	Min.	Typ.	Max.	Unit
Receiver						
Data Rate (NRZ)		B	-	1250	-	Mb/s
Optical Input Sensitivity (avg.) (1) (2) (5)						
-1		P_{IN}	-	-	-20	dBm
-2		P_{IN}	-	-	-23	dBm
Saturation		P_{SAT}	-3	0	-	dBm
Optical Wavelength		λ	1100	-	1600	nm
Output Rise Time (20-80%)		t_r	-	-	0.4	ns
Output Fall Time (20-80%)		t_f	-	-	0.4	ns
Data Output (7)	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	-	-	-20	dBm
Signal Detect Deasserted (avg.)		P_D	-35	-	-	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 V
Supply Current		I_{CC}	-	-	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) 2^7 -1 PRBS, BER= 10^{-12}.
(6) The transmitter output should not be viewed directly.
(7) Compatible with PECL and LVPECL logic levels.
(8) The figure below shows the laser bias monitor and power monitor equivalent circuit.



Laser Bias Monitor Circuit



Laser Power Monitor 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

Ordering Information

T R □ □ S M 3 - □ □ 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 (FP LD)

15 : 1550nm (FP LD)

31 : 1310nm (DFB LD)

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Part Number	Laser Type	Power Budget (1)	Recommended Maximum Reach (2)	Compliant to Gigabit Ethernet (4)
TR13SM3-1LLC□ KR1□ □	1310nm, FP	9dB	17Km	1000BASE-LX
TR13SM3-2LLC□ KR2□ □	1310nm, FP	18dB	42Km	-
TR15SM3-3FLC□ KR2□ □	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.
(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.

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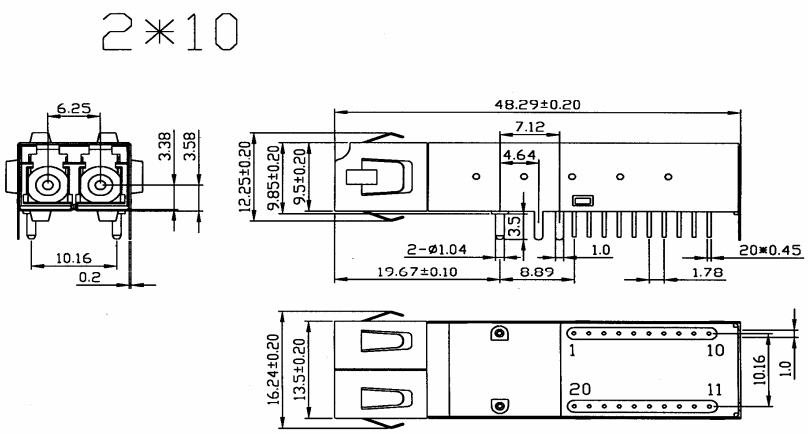
Outline Drawing



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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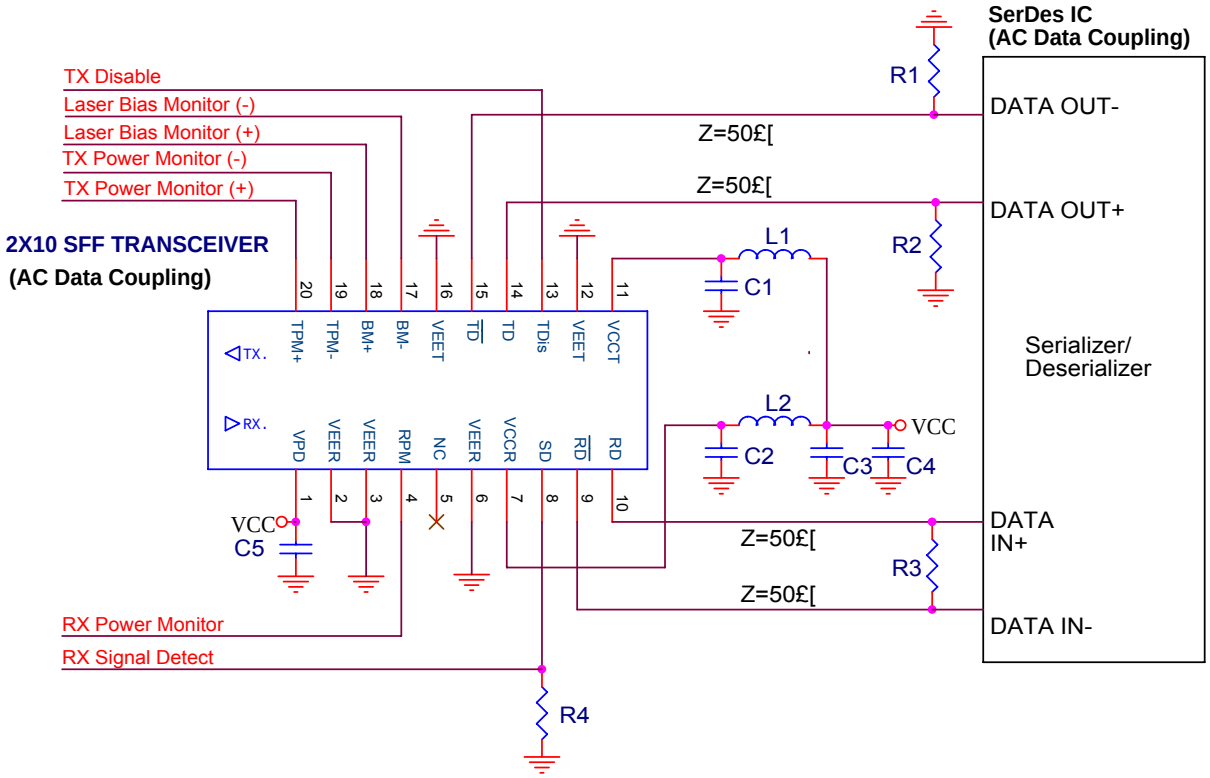
Application Notes

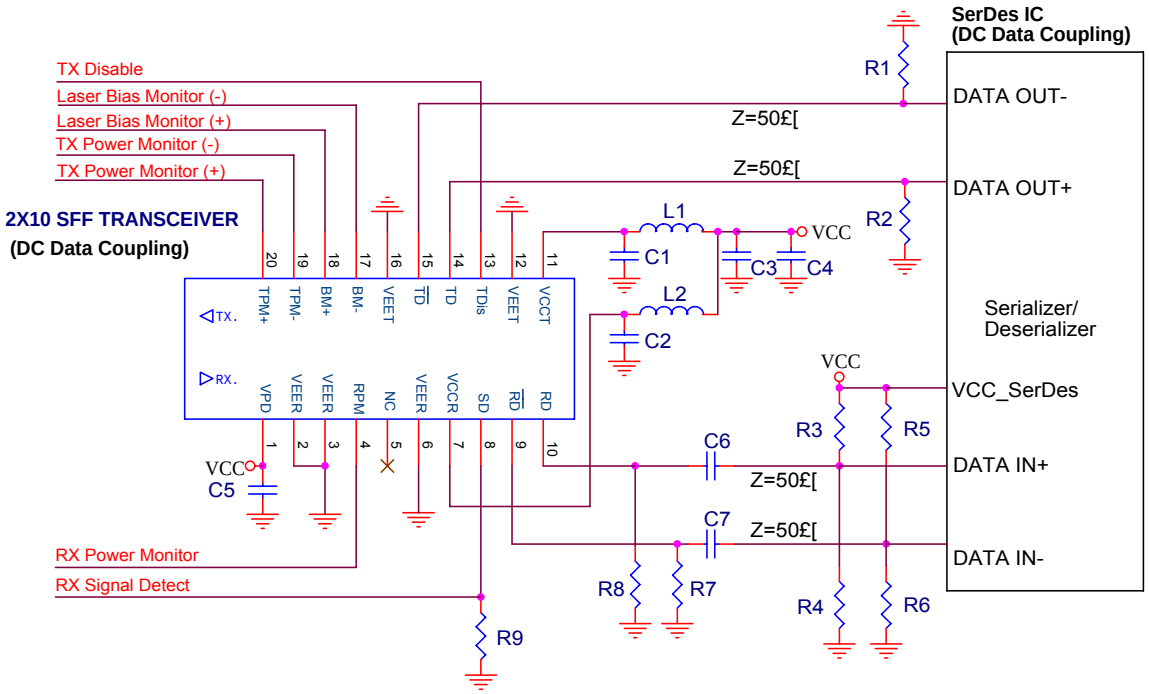
Recommended AC Coupling Interface Circuit :



L1=L2=1£gH or ferrite bead
C1=C2=C3=0.1£gF
C4=10£gF
C5=1£gF
R1, R2, R3 depends on SerDes IC specification.
(Consult the SerDes IC application information)
R4=510£[

NOTE¡G
1. Transmission line characteristic impedance Z=50£
2. R1, R2, R3 as close to SerDes IC as possible.

Recommended DC Coupling Interface Circuit :



L1=L2=1£gH or ferrite bead
C1=C2=C3=C6=C7=0.1£gF
C4=10£gF
C5=1£gF
R1, R2, R3, R4, R5, R6 depends on SerDes IC specification.
(Consult the SerDes IC application information)
R7=R8=270£[(VCC=3.3V)
=510£[(VCC=5V)
R9=510£[

NOTE¡G
1. Transmission line characteristic impedance Z=50£
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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