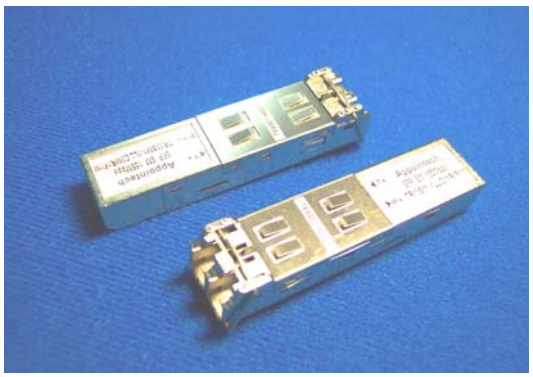
Singlemode 155Mbps Bi-directional Optical Transceiver SFP with MSA

Features



- Compliant SFP MSA
- Compliant with GR-253-CORE SONET OC-3 and ITU-T G.957 SDH STM-1 specifications
- Metal case & LC duplex receptacle with bail de-latch
- Transmitter disable input and receiver loss of signal output
- Single 3.3V power supply
- AC coupled LVPECL compatible data input and output
- 2-wire serial EEPROM protocol

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	-9	-	-3	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 (20-80%)	t_r	-	0.5	0.8	ns
Output Fall Time (20-80%)	t_f	-	0.5	0.8	ns
Data Differential Input Voltage	V_i	500	-	2400	mV_{p-p}
TX Fault Output Voltage	V_{FOL} V_{FOH}	0 2.4	- -	0.4 Vcc	V
TX Disable Input Voltage	V_{DIL} V_{DIH}	0 2	- -	0.8 Vcc	V
Supply Voltage	Vcc	2.97	3.3	3.63	V
Supply Current	Icc	-	-	150	mA

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Parameter	Symbol	Min.	Typ.	Max.	Unit
Receiver					
Data Rate (NRZ)	B	10	155	250	Mb/s
Optical Input Sensitivity (avg.) (1) (2) (3) (4) (7)	P_{IN}				dBm
-1	P_{IN}	-	-30	-28	dBm
-2	P_{IN}	-	-34	-31	dBm
Saturation (avg. power)	P_{SAT}	-3	-	-	dBm
Optical Wavelength	λ	1100	-	1600	nm
Output Rise Time (20-80%)	t_r	-	0.5	0.8	ns
Output Fall Time (20-80%)	t_f	-	0.5	0.8	ns
Data Differential Output Voltage	V_o	370	-	2000	mV_{p-p}
LOS Deasserted Power Level (avg.)	P_A	-	-	-29	dBm
LOS Asserted Power Level (avg.)	P_D	-38	-	-	dBm
LOS Hysteresis	P_{HYS}	0.5	3	-	dB
LOS Output Voltage	V_{LOS-OL} V_{LOS-OH}	0 2.4	- -	0.4 Vcc	V
Supply Voltage	Vcc	2.97	3.3	3.63	V
Supply Current	Icc	-	-	130	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) 2^{23} -1 PRBS, BER= 10^{-10}.
(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		-0.5	4	V

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Timing of Control and Status I/O

Parameter	Symbol	Min.	Max.	Unit	Condition
TX Disable Assert Time	t_off		10	μs	Time from rising edge of TX Disable to when the optical output falls below 10% of nominal.
TX Disable Negate Time	t_on		1	ms	Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal.
Time to initialize, including reset of TX_Fault	t_init		300	ms	From power on or negation of TX Fault using TX Disable.
TX Fault Assert Time	t_fault		100	μs	Time from fault to TX fault on.
TX Disable to reset	t_reset	10		μs	Time TX Disable must be held high to reset TX_fault.
LOS Assert Time	t_loss_on		100	μs	Time from LOS state to RX LOS assert.
LOS Deassert Time	t_loss_off		100	μs	Time from non-LOS state to RX LOS deassert.
Serial ID Clock Rate	f_serial_clock		100	kHz	

Ordering Information

TR□□R□□-1□□RLC3MF□M

Operating Temperature Range：
1：0°C ~ 70°C
2：-40°C ~ 85°C

Sensitivity Grade：
1：-1
2：-2

Tx Output Power Grade：
1：-1
2：-2
3：-3

Wavelength：
13：1310nm FP LD
31：1310nm DFB LD
15：1550nm FP LD
55：1550nm DFB LD

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Part Number	Laser Type	Power Budget (1)	Recommended Maximum Reach (2)	Compliant to SONET OC-3 / SDH STM-1 (4)
TR13R15-111RLC3MF□M	1310nm, FP	19dB	60Km	IR-1 / S-1.1
TR13R15-122RLC3MF□M	1310nm, FP	26dB	80Km	LR-1 / L-1.1
TR55R13-132RLC3MF□M	1550nm, DFB	28dB	90Km	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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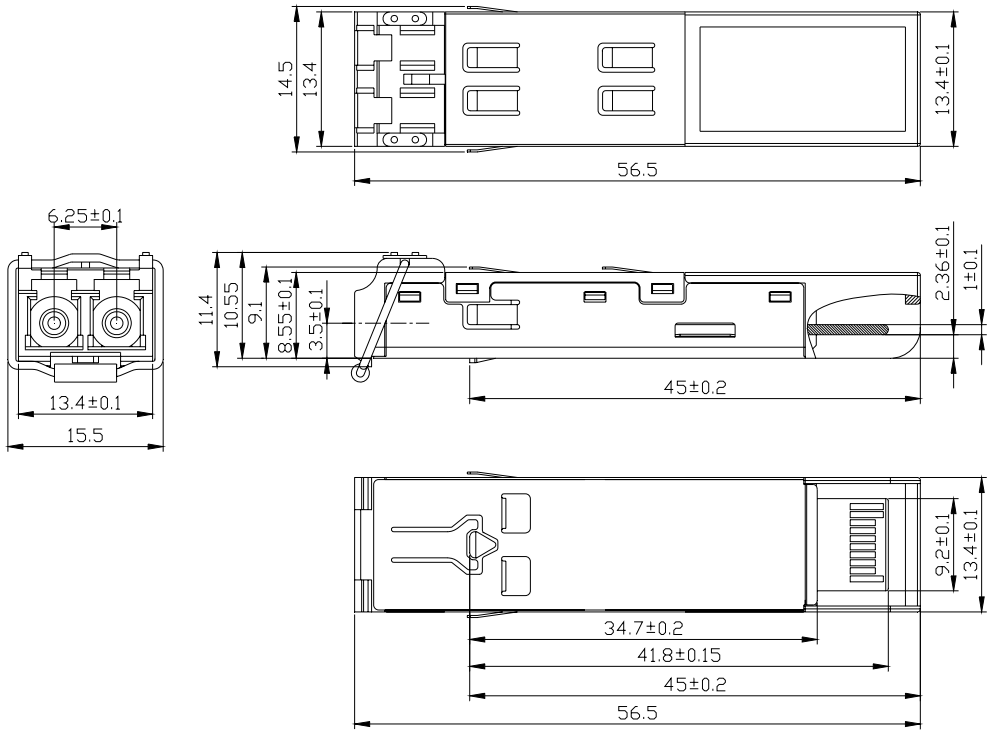
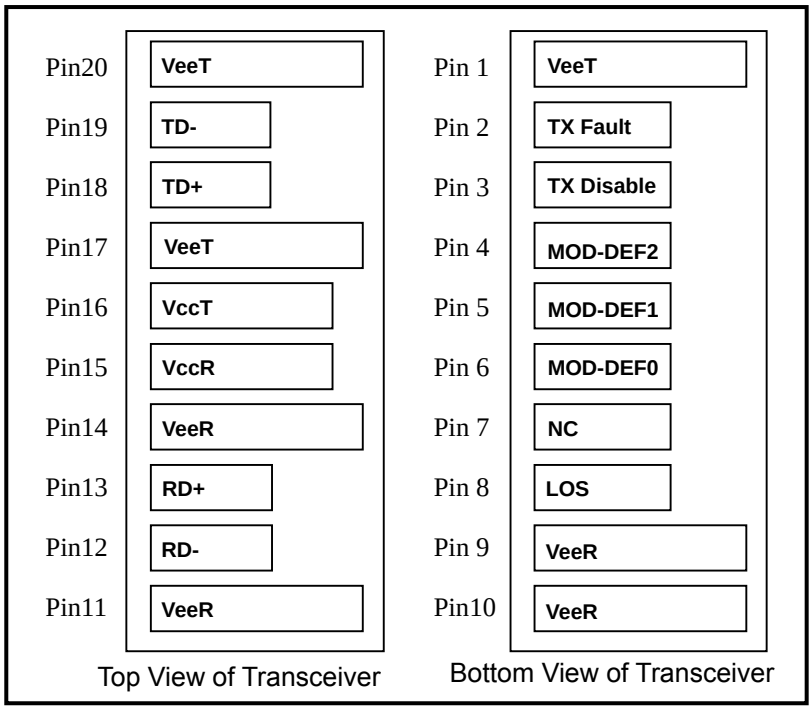
Outline Drawing



UNIT：mm

SFP Transceiver Electrical Pad Layout



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Pin Description

Pin No.	Symbol	Description
1	VeeT	Transmitter Ground
2	TX Fault	Transmitter Fault Indication Logic Low indicates normal operation. Logic High Indicates a laser fault of some kind. TX Fault is an open drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board.
3	TX Disable	Transmitter Disable Its states are： Low (0 – 0.8V) ：Transmitter on (>0.8, < 2.0V) ：Undefined High (2.0 – 3.465V) ：Transmitter Disabled Open ：Transmitter Disabled It is pulled up within the module with a 4.7K – 10 K.Ω resistor.
4	MOD-DEF2	Module Definition 2 (SDA) The data line of two wire serial interface for serial ID. MOD-DEF2 should be pulled up with a 4.7K – 10KΩresistor on the host board. The pull-up voltage shall be VccT or VccR.
5	MOD-DEF1	Module Definition 1 (SCL) The clock line of two wire serial interface for serial ID. MOD-DEF1 should be pulled up with a 4.7K – 10KΩresistor on the host board. The pull-up voltage shall be VccT or VccR.
6	MOD-DEF0	Module Definition 0 (WP) MOD-DEF0 is grounded by the module to indicate that the module is present.
7	NC	Not connected
8	LOS	Loss of Signal Logic High indicates the received optical power is below the worst-case receiver sensitivity. Logic Low indicates normal operation. LOS is an open drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board.
9	VeeR	Receiver Ground
10	VeeR	Receiver Ground
11	VeeR	Receiver Ground
12	RD-	Inv. Received Data Out (Note 1)
13	RD+	Received Data Out (Note 1)
14	VeeR	Receiver Ground
15	VccR	Receiver Power Supply
16	VccT	Transmitter Power Supply
17	VeeT	Transmitter Ground
18	TD+	Transmitter Data In (Note 2)
19	TD-	Inv. Transmit Data In (Note 2)
20	VeeT	Transmitter Ground

Notes：

1. RD+ and RD- are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 – 1000 mV single ended) when properly terminated.
2. TD+ and TD- are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 500 – 2400 mV (250 – 1200 mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600 mV single-ended) be used for best EMI performance.

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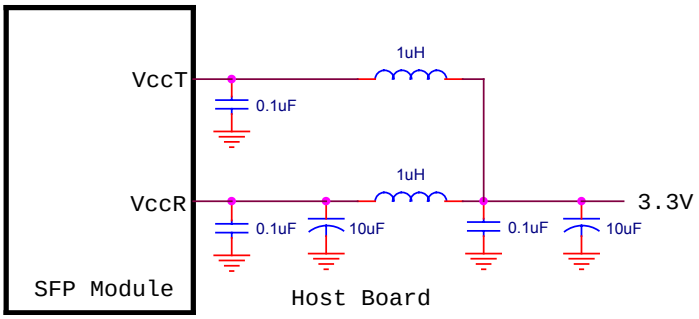
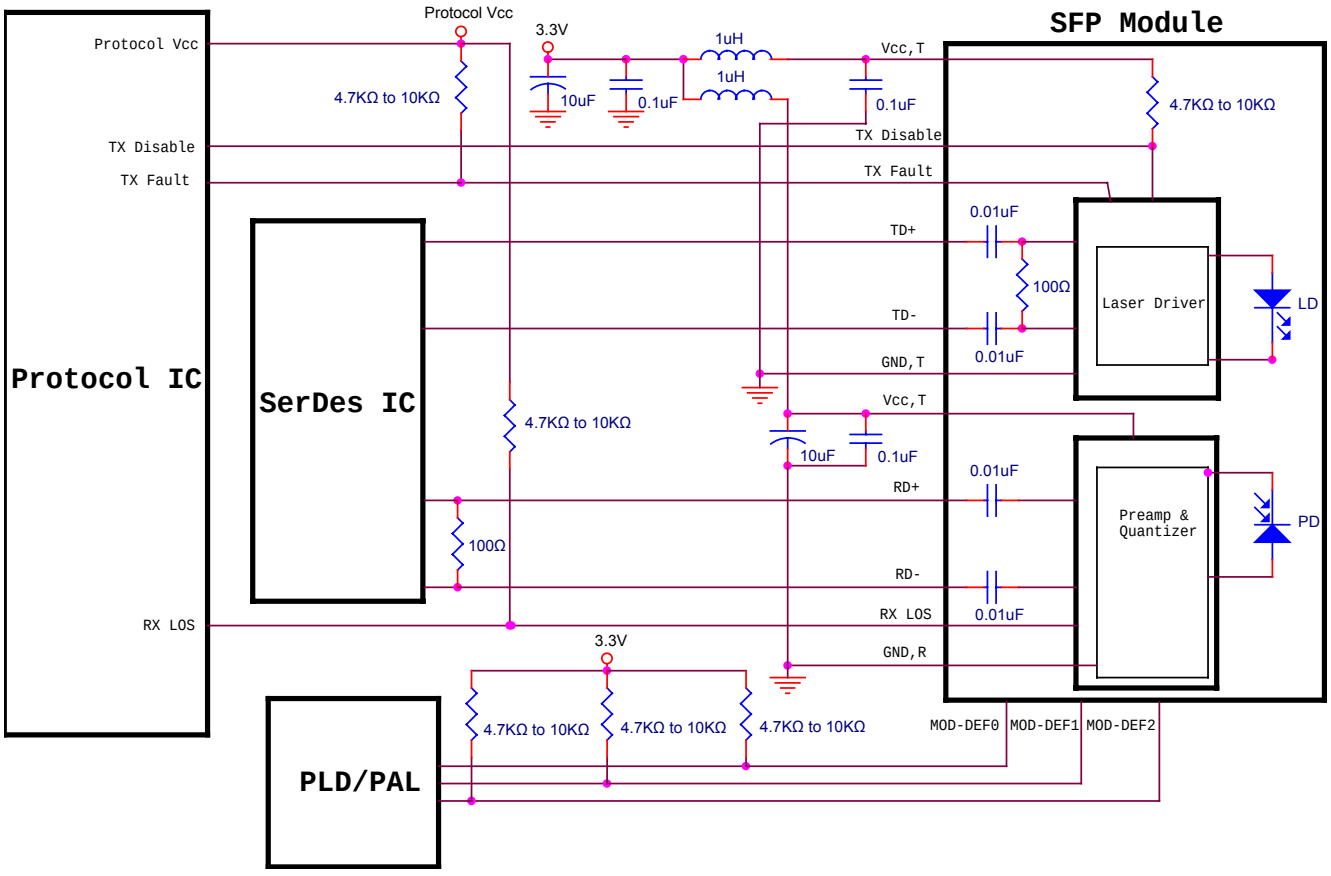
Recommended Host Board Supply Filtering Network



Example SFP Host Board Schematic



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EEPROM Serial ID Memory Contents

Address	Hex	ASCII	Address	Hex	ASCII	Address	Hex	ASCII	Address	Hex	ASCII
0	03		32	20		64	00		96	20	
1	04		33	20		65	1A		97	20	
2	07		34	20		66	00		98	20	
3	00		35	20		67	00		99	20	
4	Note1		36	00		68	Note3		100	20	
5	Note1		37	20		69			101	20	
6	00		38	20		70			102	20	
7	00		39	20		71			103	20	
8	00		40	54	T	72			104	20	
9	00		41	52	R	73			105	20	
10	00		42	Note1	*	74			106	20	
11	05		43	Note1	*	75			107	20	
12	02		44	53	S	76			108	20	
13	00		45	4D	M	77			109	20	
14	Note1		46	31	1	78			110	20	
15	Note1		47	2D	-	79			111	20	
16	Note1		48	Note1	*	80			112	20	
17	Note1		49	Note1	*	81			113	20	
18	00		50	4C	L	82			114	20	
19	00		51	43	C	83			115	20	
20	41	A	52	33	3	84	Note4		116	20	
21	50	P	53	4D	M	85			117	20	
22	50	P	54	52	R	86			118	20	
23	4F	O	55	Note1	*	87			119	20	
24	49	I	56	46	F	88			120	20	
25	4E	N	57	20		89			121	20	
26	54	T	58	20		90			122	20	
27	45	E	59	20		91			123	20	
28	43	C	60	Note1		92	00		124	20	
29	48	H	61	Note1		93	00		125	20	
30	20		62	00		94	00		126	20	
31	20		63	Note2		95	Note2		127	20	

Notes：

1. Data will vary depends on product.
2. Addresses 63 is check sum of bytes 0 – 62.
   Addresses 95 is check sum of bytes 64 – 94.
3. These addresses are reserved for serial number information.
4. These addresses are reserved for date code information.
5. The data transfer protocol and complete description of A0h memory contents are defined in SFP MSA.

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