

Professional high-speed optical transceiver

**OPN-S3F13-20LC2 / OPN-S3F13-20LC2I / OPN-S3F13T-20LC2 /
OPN-S3F13T-20LC2I / OPN-S3F13E-20LC2 / OPN-S3F13E-20LC2I /
OPN-S3F13ET-20LC2 / OPN-S3F13ET-20LC2I
3.3V / 1310 nm / 622 Mbps RoHS Compliant SFF LC SINGLE-MODE TRANSCEIVER**

PRODUCT FEATURES

- Duplex LC Single Mode Transceiver
- SONET OC-12 IR-1 / SDH STM-4 (S-4.1) Compliant
 - Small Form Factor, RJ-45 size, 2X5 pin Package
 - 1310 nm LD Transmitter
 - LVPECL Signal Input / Output
 - LVTTTL Transmitter Disable Input
- LVPECL Signal Detection Output: OPN-S3F13E-20LC2
- LVTTTL Signal Detection Output: OPN-S3F13ET-20LC2
 - Single +3.3 V Power Supply
 - RoHS Compliant
- 0 to 70°C Operation: OPN-S3F13E-20LC2
- -50 to 85°C Operation: OPN-S3F13E-20LC2I
- Wave Solderable and Aqueous Washable
- Class 1 Laser International Safety Standard IEC-60825 Compliant

APPLICATIONS

- ATM 622 Mbps Links
- SONET / SDH Equipment Interconnect
 - Fiber Channel 533 Mb/s Links

PRODUCT DESCRIPTION

The OPN-S3F13E-20LC2 series single mode transceivers are small form factor, low power, high performance module for bi-directional serial optical data communications such as SONET OC-12 IR-1 / SDH STM-4 (S-4.1) and Fiber Channel. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a multiple quantum well laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A PECL logic interface simplifies interface to external circuitry.

ORDER INFORMATION

P/No.	Bit Rate (Mb/s)	SONET /SDH	Distance (km)	Wavelength (nm)	Package	Temp. (°C)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
OPN-S3F13E-20LC2	622	IR-1/S-4.1	20	1310	2X5 LC	0 to 70	-8 to -14	-28	Yes
OPN-S3F13E-20LC2I	622	IR-1/S-4.1	20	1310	2X5 LC	-50 to 85	-8 to -14	-28	Yes

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-50	85	°C	
Operating Temperature	Topr	0 -50	70 85	°C	OPN-S3F13E-20LC2 OPN-S3F13E-20LC2I
Soldering Temperature	---		260	°C	10 seconds on leads only
Power Supply Voltage	Vcc	0	3.6	V	
Input Voltage	---	GND	Vcc	V	
Output Current	Iout	0	30	mA	

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Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units / Notes
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V
Operating Temperature	T _{opr}	0 -50		70 85	°C / OPN-S3F13E-20LC2 °C / OPN-S3F13E-20LC2I
Data Rate		50	622		Mb/s
Power Supply Current	I _{CC}		180	240	mA

Transmitter Specifications (0°C < T _{opr} < 70°C, 3.13V < V _{CC} < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Optical Transmit Power	P _o	-14	---	-8	dBm	1
Output Center Wavelength	λ	1274	1310	1356	nm	
Output Spectrum Width	Δλ	---	---	2.5	nm	RMS(σ)
Extinction Ratio	E _R	8.2	---	---	dB	
Output Eye	Compliant with Bellcore GR-253-CORE and ITU recommendation G.957					
Optical Rise Time	t _r			1.2	ns	10% to 90% Values
Optical Fall Time	t _f			1.2	ns	10% to 90% Values
Relative Intensity Noise	RIN			-120	dB/Hz	
Total Jitter	TJ			0.55	ns	2
Electrical						
Data Input Current – Low	I _{IL}	-350			μA	
Data Input Current – High	I _{IH}			350	μA	
Differential Input Voltage	V _{IH} - V _{IL}	300			mV	
Data Input Voltage – Low	V _{IL} - V _{CC}	-2.0		-1.58	V	3
Data Input Voltage -- High	V _{IH} - V _{CC}	-1.1		-0.74	V	3
Disable Input Voltage -- Low	V _{TDIS,L}	0		0.5	V	TX Output Enabled
Disable Input Voltage -- High	V _{TDIS,H}	V _{CC} - 1.3		V _{CC}	V	TX Output Disabled
Shut Off Time for TxDis	t _{DIS}			1	ms	

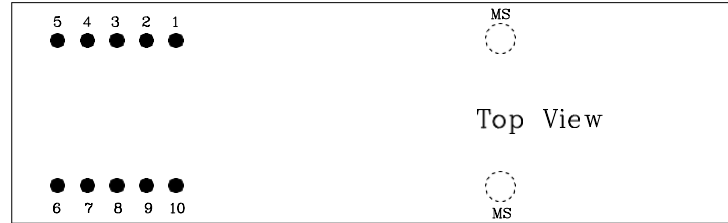
- Notes: 1. Output power is power coupled into a 9/125 μm single mode fiber.
 2. Measured with 2²³-1 PRBS with 72 ones and 72 zeros
 3. These inputs are compatible with 10K, 10KH and 100K ECL and PECL inputs.

Receiver Specifications (0°C < T _{opr} < 70°C, 3.13V < V _{CC} < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Sensitivity	---	---	---	-28	dBm	1
Maximum Input Power	P _{in}	-5		---	dBm	
Signal Detect -- Asserted	P _a	---	---	-28	dBm	Transition: low to high
Signal Detect -- Deasserted	P _d	-40	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1100	---	1600	nm	
Electrical						
Data Output Voltage – Low	V _{OL} - V _{CC}	-2.0		-1.58	V	2
Data Output Voltage – High	V _{OH} - V _{CC}	-1.1		-0.74	V	2
Signal Detect Output Voltage -- Low	V _{OL}	-2.0		-1.58	V	OPN-S3F13E-20LC2
Signal Detect Output Voltage -- High	V _{OH}	-1.1		-0.74	V	
Signal Detect Output Voltage -- Low	V _{OL} - V _{CC}			0.5	V	OPN-S3F13ET-20LC2
Signal Detect Output Voltage -- High	V _{OH} - V _{CC}	2.0			V	

- Notes: 1. Minimum sensitivity and saturation levels at BER=1E-10 for a 2²³-1 PRBS with 72 ones and 72 zeros.
 2. These outputs are compatible with 10K, 10KH and 100K ECL and PECL outputs.

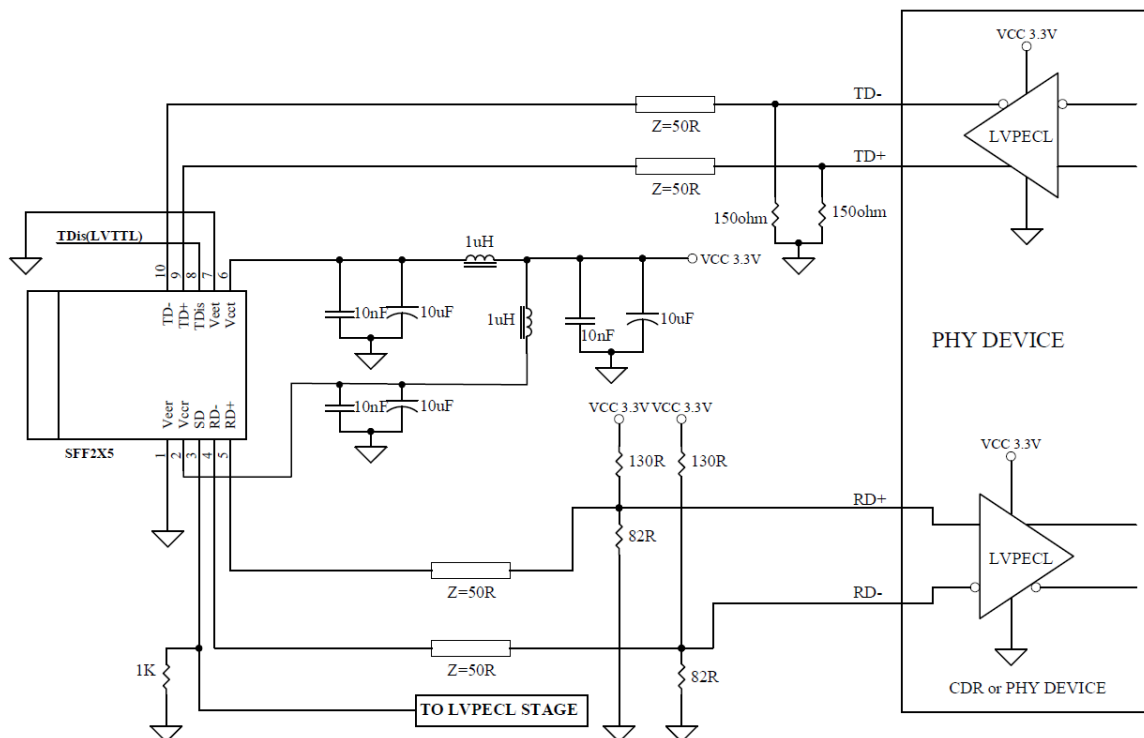
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CONNECTION DIAGRAM



PIN	Symbol	Notes
1	V_{EEr}	Directly connect this pin to the receiver ground plane
2	V_{CCr}	+3.3V dc power for the receiver section
3	SD	Active high on this indicates a received optical signal.
4	RD-	Receiver Data out Bar. See recommended circuit schematic
5	RD+	Receiver Data out. See recommended circuit schematic
6	V_{CCt}	+3.3V dc power for the transmitter section
7	V_{EEt}	Directly connect this pin to the transmitter ground plane
8	TDIs	Transmitter Disable. Connect this pin to +3.3V TTL logic "1" to disable module To enable module connect to TTL logic low "0"
9	TD+	Transmitter Data In. See recommended circuit schematic
10	TD-	Transmitter Data In Bar. See recommended circuit schematic
MS	MS	Mounting Studs. Connect to Chassis Ground

RECOMMENDED CIRCUIT SCHEMATIC



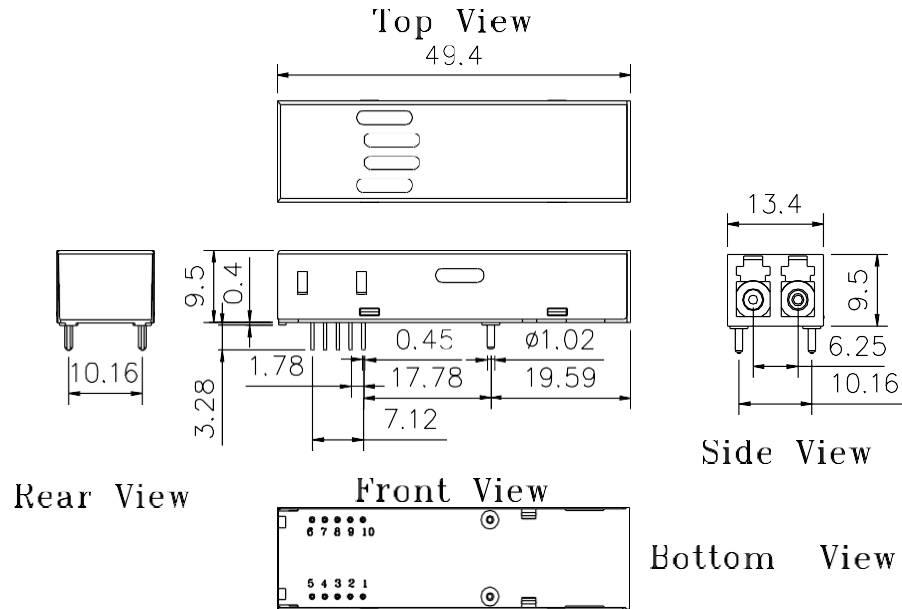
- Note: 1. 1000Ω SD Output pull-down resistor required for OPN-S3F13-20LC2 / OPN-S3F13-20LC2I (LVPECL SD Output).
2. No pull-down resistor required for OPN-S3F13T-20LC2 / OPN-S3F13T-20LC2I (LVCMOS SD Output)
3. V_{EEr} and V_{EEt} are not internally connected to each other.
4. 50 Ω line pattern and component placements on TD+/TD- and RD+/RD- lines shall be symmetrical for better impedance matching.

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PACKAGE DIAGRAM

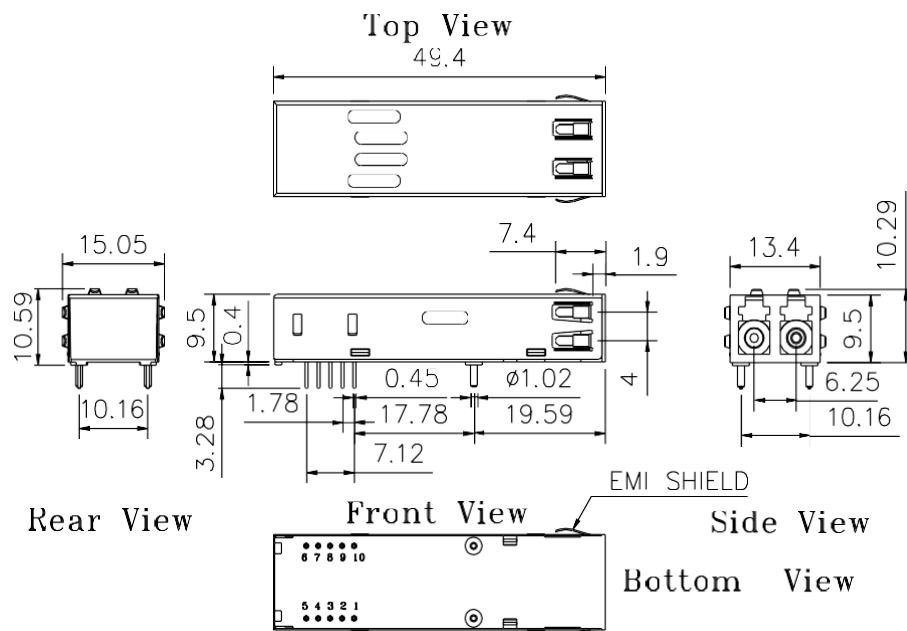
Units in mm

1) Standard Case



OPN-S3F13-20LC2 / OPN-S3F13-20LC2I / OPN-S3F13T-20LC2 / OPN-S3F13T-20LC2I

2) Extended Case



OPN-S3F13E-20LC2 / OPN-S3F13E-20LC2I / OPN-S3F13ET-20LC2 / OPN-S3F13ET-20LC2I

Note: Specifications subject to change without notice.