Professional high-speed optical transceiver

OPN-S6F131-LC2 / OPN-S6F131E-LC2 / OPN-S6F131T-LC2 / OPN-S6F131ET-LC2

3.3V / CWDM / 622 Mbps RoHS Compliant 2X10 SFF LC 2X10 SINGLE-MODE TRANSCEIVER

PRODUCT FEATURES

- Duplex LC Single Mode Transceiver
- SONET OC-12 LR / SDH STM-1 Compliant
- Small Form Factor, RJ-45 size, 2X10 pin Package
- 18-Wavelength CWDM DFB LD Transmitter from1270 nm to 1610 nm with step 20 nm
- 29 dB Link Power Budget at Least
- Analog Monitor Function

-- Transmitter Laser Bias Current
-- Transmitter Laser Optical Power Monitor
-- Receiver Photo Detector Current

- LVPECL Signal Input / Output
- LVTTL Transmitter Disable Input
- LVPECL Signal Detection Output: OPN-S6F131-LC2
- LVTTL Signal Detection Output: OPN-S6F131T-LC2
- Single +3.3 V Power Supply
- 0 to 70ºC Operation
- Wave Solderable and Aqueous Washable
- Class 1 Laser International Safety Standard IEC-60825Compliant

APPLICATIONS

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

PRODUCT DESCRIPTION

The OPN-S6F131T-LC2 series single mode transceivers are low power, high performance CWDM modules for bi-directional serial optical data communications such as long-reach SONET OC-12 LR / SDH STM-4 and Fast Ethernet. There are eighteen center wavelengths available from 1270 nm to 1610 nm, each step 20 nm. A guaranteed minimum optical link budget of 29 dB is offered The transmitter section uses a multiple quantum well CWDM DFB 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	Power Budget (dB)	Wavelength (nm)	Package	Temp. (ºC)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
OPN-S6F131T-LC2	622	LR	> 29	CWDM*	2X10 LC	0 to 70	5 to 0	-29	Yes

CWDM Wavelength (0 to 70ºC)

Central Wavelength	Min. (nm)	Typ. (nm)	Max. (nm)	Central Wavelength	Min. (nm)	Typ. (nm)	Max. (nm)
127	1264.5	1270	1277.5	145	1444.5	1450	1457.5
129	1284.5	1290	1297.5	147	1464.5	1470	1477.5
131	1304.5	1310	1317.5	149	1484.5	1490	1497.5
133	1324.5	1330	1337.5	151	1504.5	1510	1517.5
135	1344.5	1350	1357.5	153	1524.5	1530	1537.5
137	1364.5	1370	1377.5	155	1544.5	1550	1557.5
139	1384.5	1390	1397.5	157	1564.5	1570	1577.5
141	1404.5	1410	1417.5	159	1584.5	1590	1597.5
143	1424.5	1430	1437.5	161	1604.5	1610	1617.5

CWDM*: 18 Wavelengths from 1270 nm to 1610 nm, each step 20 nm.

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Absolute Maximum Ratings					
Parameter	**Symbol**	**Min**	**Max**	**Units**	**Notes**
Storage Temperature	Tstg	-50	85	°C	
Operating Temperature	Topr	0	70	°C	With air flow 1m/sec
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	

Recommended Operating Conditions					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units / Notes**
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Operating Temperature	Topr	0		70	°C /air flow 1m/sec
Data Rate		50	622		Mb/s
Power Supply Current	Icc		200	300	mA

Transmitter Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Optical						
Optical Transmit Power	Po	0	---	5	dBm	1
Output Center Wavelength	λ	λ-5.5	λ	λ+7.5	nm	2
Output Spectrum Width	Δλ	---	---	1	nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	E_R	10	---	---	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 Jiter	TJ			0.55	ns	3
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	4
Data Input Voltage -- High	V_{IH} - V_{CC}	-1.1		-0.74	V	4
Disable Input Voltage -- Low	$V_{TDIS,L}$	0		0.5	V	TX Output Enabled
Disable Input Voltage -- High	$V_{TDIS,H}$	Vcc – 1.3		Vcc	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. ITU-T G.694.2 CWDM wavelength from 1270 nm to 1610 nm, each step 20 nm.
3. Measured with 2^{23}-1 PRBS with 72 ones and 72 zeros
4. These inputs are compatible with 10K, 10KH and 100K ECL and PECL inputs.

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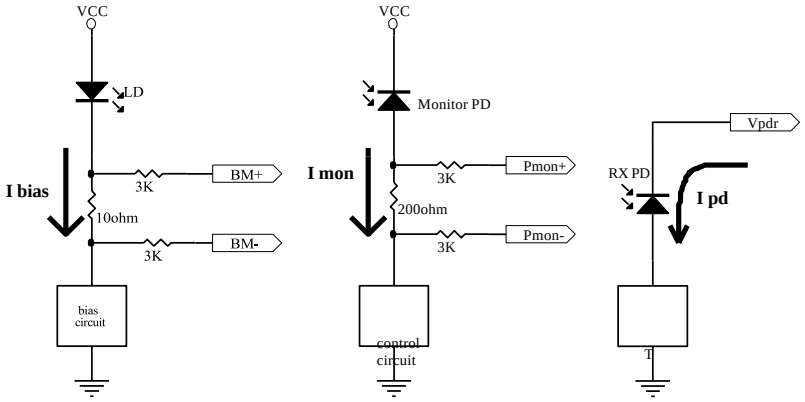
Receiver Specifications (0ºC < Topr < 70ºC, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Optical						
Sensitivity	---	---	---	-29	dBm	1
Maximum Input Power	Pin	-5		---	dBm	
Signal Detect -- Asserted	Pa	---	---	-29	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-43	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1100	---	1620	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-S6F131-LC2
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-S6F131T-LC2
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 2^{23}-1 PRBS with 72 ones and 72 zeros.
2. These outputs are compatible with 10K, 10KH and 100K ECL and PECL outputs.

ANALOG DIAGNOSTICS FUNCTIONS

Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Transmitter						
Laser Bias Current Monitor	Bmon+, Bmon-	0		Vcc	V	1
Monitor Photodiode Current Monitor	Pmon+,Pmon-	0		Vcc	V	2
Receiver						
Received Photocurrent	Rpd	0		1	mA	3
Photodiode Responsivity	R	0.5	0.9	1.0	A/W	
Applied Voltage at VpdR pin	Vpd	2.4		Vcc	V	3

Notes: 1. PIN 17 and 18 provide an analog voltage output proportional to the laser bias current, based on the following formula: Ibias = V (Bmon+ - Bmon-) / 10 Ω. See below the equivalent circuit.
2. PIN 19 and 20 provide an analog voltage output proportional to the monitor photodiode current, based on the following formula: Imon = V (Pmon+ - Pmon-) / 200Ω. See below the equivalent circuit.
3. PIN 1 is used to monitor the received photocurrent. It must be connected to a positive voltage within the specified above. The received power is given by the photocurrent multiplied by the photodiode responsivity.



Analog Monitoring Function Connections

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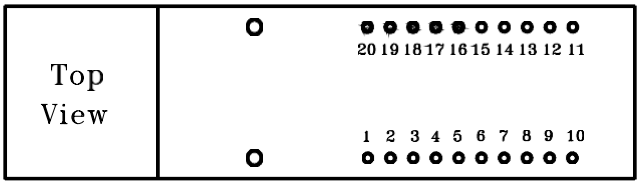
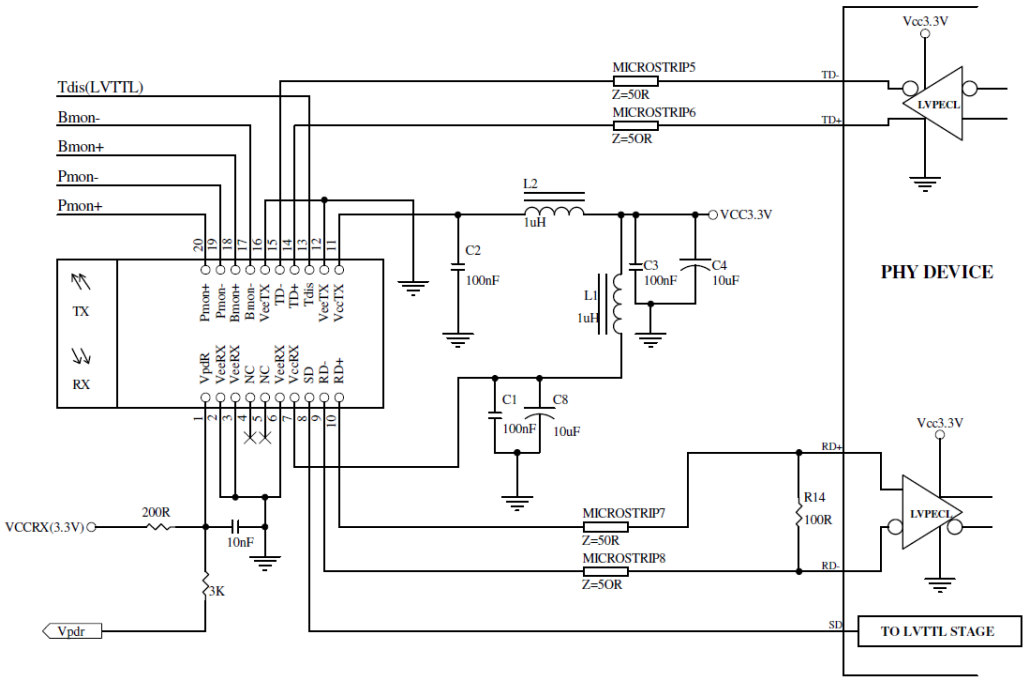
CONNECTION DIAGRAM



PIN	Symbol	Notes	PIN	Symbol	Notes
1	VpdR	Receiver power monitor. This pin must be connected to a positive power supply (Vcc), preferably via a small resistor. Supplier photocurrent and maybe used to monitor receiver power.	11	VccT	+3.3V dc transmitter power supply
2	VeeR	Receiver ground.	12	VeeT	Transmitter ground.
3	VeeR	Receiver ground.	13	T Dis	Transmitter Disable. Connect this pin to logic “1” to disable module. To enable module connect to logic low “0”
4	NC	No connected	14	TD +	Transmitter Data In
5	NC	No connected	15	TD –	Transmitter Data In Bar
6	VeeR	Receiver ground.	16	VeeT	Transmitter ground.
7	VccR	+3.3V dc receiver power supply	17	Bmon–	Laser Bias Monitoring – Negative End
8	SD	Signal detect. Logic 1 indicate a normal operation.	18	Bmon+	Laser Bias Monitoring – Positive End (Bmon+ - Bmon-) = 10 Ω X laser bias current
9	RD–	Receiver Dataout Bar	19	Pmon-	Laser Power Monitoring -- Negative end
10	RD+	Receiver Dataout	20	Pmon+	Laser Power Monitoring -- Positive end (Pmon+ - Pmon-) = 200 Ω X monitor photodiode current
MS	MS	Mounting Studs. Connect to Chassis Ground			

RECOMMENDED CIRCUIT SCHEMATIC



Note: 1. TX input is terminated inside the module.
2. Veer and Veet are not internally connected to each other.
3. 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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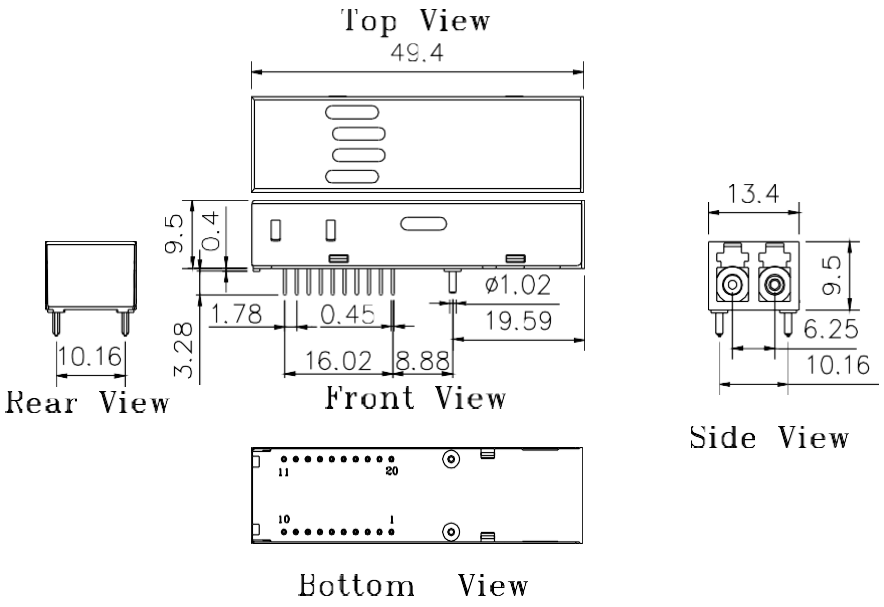
PACKAGE DIAGRAM

Units in mm

1) Standard Case



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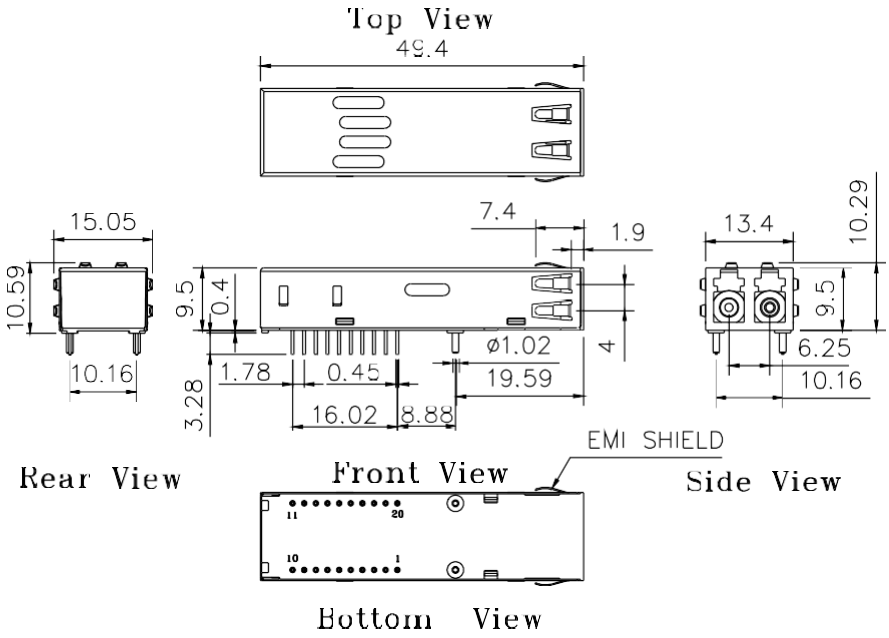
2) Extended Case



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Note: Specifications subject to change without notice.