

# 1.25Gb 20klm SM 80klm LC (Cisco Coded) L1-OP3480D-C



## PRODUCT DESCRIPTION:

Layer 1 Transceiver is a high performance, cost effective module which have a Duplex LC optics interface. Standard AC coupled CML for high speed signal and LVTTTL control and monitor signals.

The receiver section uses a PIN receiver and the transmitter uses 1550 nm DFB laser, up to 22dB link budge ensure this module 1000Base Ethernet 80Km application.



## KEY FEATURES

- ◆ Up to 1.25Gb/s Data Links
- ◆ Hot-Pluggable
- ◆ 1550nm DFB laser transmitter
- ◆ Duplex LC connector
- ◆ RoHS compliant and Lead Free
- ◆ Up to 80 km on 9/125µm SMF
- ◆ Single +3.3V Power Supply
- ◆ Monitoring Interface Compliant with SFF-8472
- ◆ Low power dissipation <1W typically
- ◆ Commercial operating temperature range: 0°C to 70°C

## APPLICATIONS

- ◆ Metro/Access Networks
- ◆ 1.25 Gb/s 1000Base-ZX Ethernet
- ◆ 1xFibre Channel
- ◆ Other Optical Link

## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T <sub>S</sub>	-40		+85	°C
Supply Voltage	V <sub>CC</sub>	-0.5		4	V
Relative Humidity	RH	0		85	%

## RECOMMENDED OPERATING ENVIRONMENT

Parameter	Symbol	Min.	Typical	Max.	Unit
Case operating Temperature	T <sub>C</sub>				°C
		Commercial	0	70	
Supply Voltage	V <sub>CC</sub>	3.0	3.30	3.60	V
Supply Current	I <sub>CC</sub>		160	280	mA

Inrush Current	$I_{\text{surge}}$			Icc+30	mA
Maximum Power	$P_{\text{max}}$			1.0	W

### ELECTRICAL CHARACTERISTICS ( $T_{\text{OP}} = T_{\text{C}}$ , VCC = 3.0 TO 3.60 VOLTS)

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
<b>Transmitter Section:</b>						
Input differential impedance	$R_{\text{in}}$	90	100	110	$\Omega$	$\Omega$
Single ended data input swing	$V_{\text{in PP}}$	200		1200	mVp-p	
Transmit Disable Voltage	$V_{\text{D}}$	$V_{\text{CC}} - 1.3$		$V_{\text{CC}}$	V	2
Transmit Enable Voltage	$V_{\text{EN}}$	$V_{\text{EE}}$		$V_{\text{EE}} + 0.8$	V	
Transmit Disable Assert Time	$T_{\text{dessert}}$			10	us	
<b>Receiver Section:</b>						
Single ended data output swing	$V_{\text{out,pp}}$	300		1000	mv	3
Data output rise time	$t_{\text{r}}$			260	ps	4
Data output fall time	$t_{\text{f}}$			260	ps	4
LOS Fault	$V_{\text{losfault}}$	$V_{\text{CC}} - 0.5$		$V_{\text{CC\_host}}$	V	5
LOS Normal	$V_{\text{los norm}}$	$V_{\text{EE}}$		$V_{\text{EE}} + 0.5$	V	5
Power Supply Rejection	PSR	100			mVpp	6
Deterministic Jitter Contribution	RX $\Delta$ DJ			51.7	ps	7
Total Jitter Contribution	RX $\Delta$ TJ			122.4	ps	

**Note:**

1. AC coupled.
2. Or open circuit.
3. Into 100 kohm differential termination.
4. 20 – 80 %
5. LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 14, 2000.
7. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and DJ.

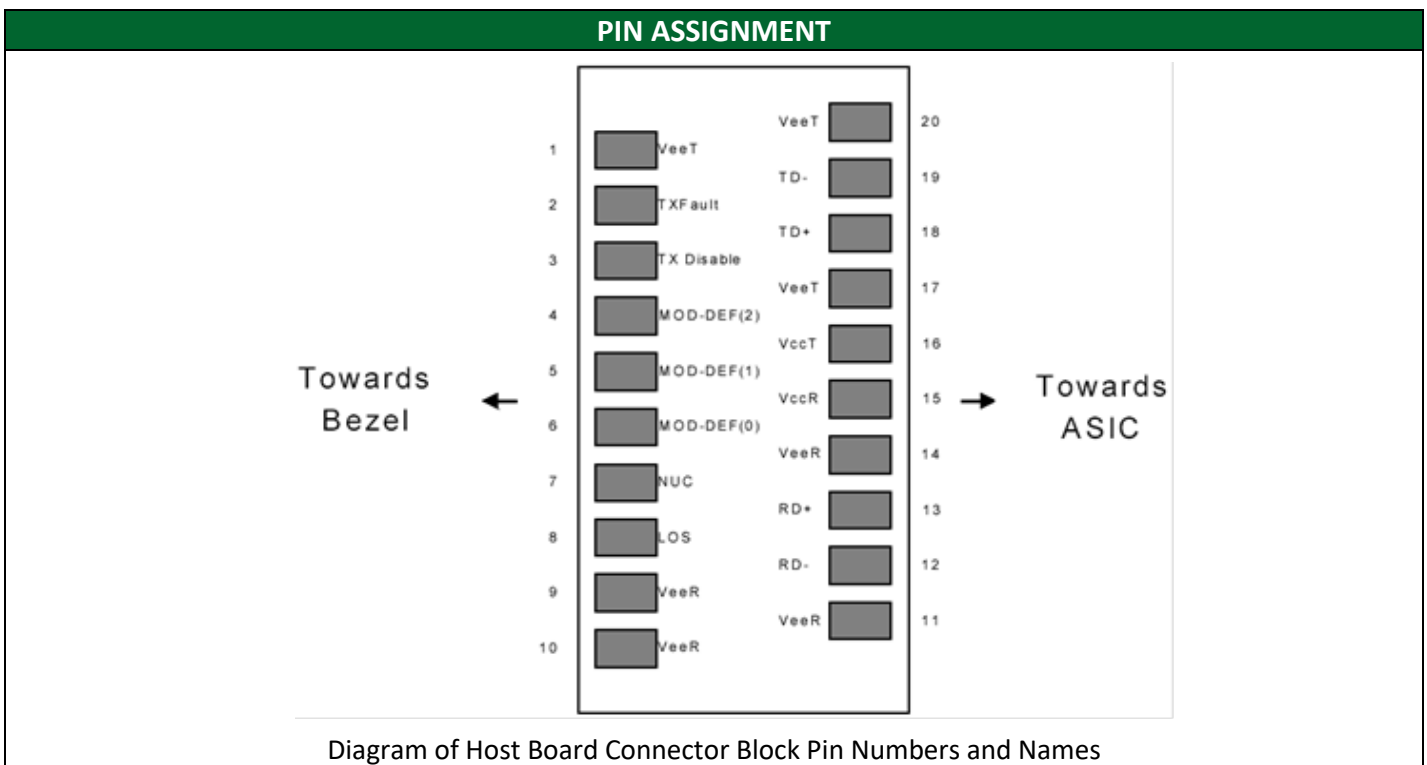
### OPTICAL PARAMETERS ( $T_{\text{OP}} = T_{\text{C}}$ , VCC = 3.00 to 3.60 Volts)

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
<b>Transmitter Section:</b>						
Center Wavelength	$\lambda_{\text{c}}$	1500	1550	1580	nm	1
Spectral Width(-20dB)	$\sigma$			1	nm	
Optical Output Power	$P_{\text{out}}$	-2		+3	dBm	2
Optical Rise/Fall Time	$t_{\text{r}} / t_{\text{f}}$			260	ps	3
Extinction Ratio	ER	9			dB	
Deterministic Jitter Contribution	TX $\Delta$ DJ			56.5	ps	4
Total Jitter Contribution	TX $\Delta$ TJ			119	ps	
Eye Mask for Optical Output	Compliant with Eye Mask Defined in IEEE 802.3 standard					
<b>Receiver Section:</b>						
Optical Input Wavelength	$\lambda_{\text{in}}$	1270		1610	nm	
Optical Input Power	$P_{\text{in}}$	-24		-3	dBm	5.6
Receiver Overload	$P_{\text{ol}}$	-3			dBm	5.6

RX Sensitivity	Sen			-24	dBm	5.6
RX_LOS Assert	LOS <sub>A</sub>	-40			dBm	
RX_LOS Deassert	LOS <sub>D</sub>			-25	dBm	
RX_LOS Hysteresis	LOS <sub>H</sub>	0.5			dB	
<b>General Specifications</b>						
Data Rate	BR		1250		Mb/s	
Bit Error Rate	BER			10 <sup>-12</sup>		
Max. Supported Link Length on 9/125µm SMF@1.25G	LMAX			80	km	7
Total System Budget	LB	22			dB	

**Note:**

- Also specified to meet curves in FC-PI 13.0 Figures 18 and 19, which allow trade-off between wavelength spectral width.
- Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
- Unfiltered, 20-80%. Complies with IEEE 802.3 (Gig. E), FC 1x and 2x eye masks when filtered.
- Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and DJ.
- Measured with conformance signals defined in FC-PI 13.0 specifications.
- Measured with PRBS 27 -1at 10-12 BER
- Dispersion limited per FC-PI Rev. 13



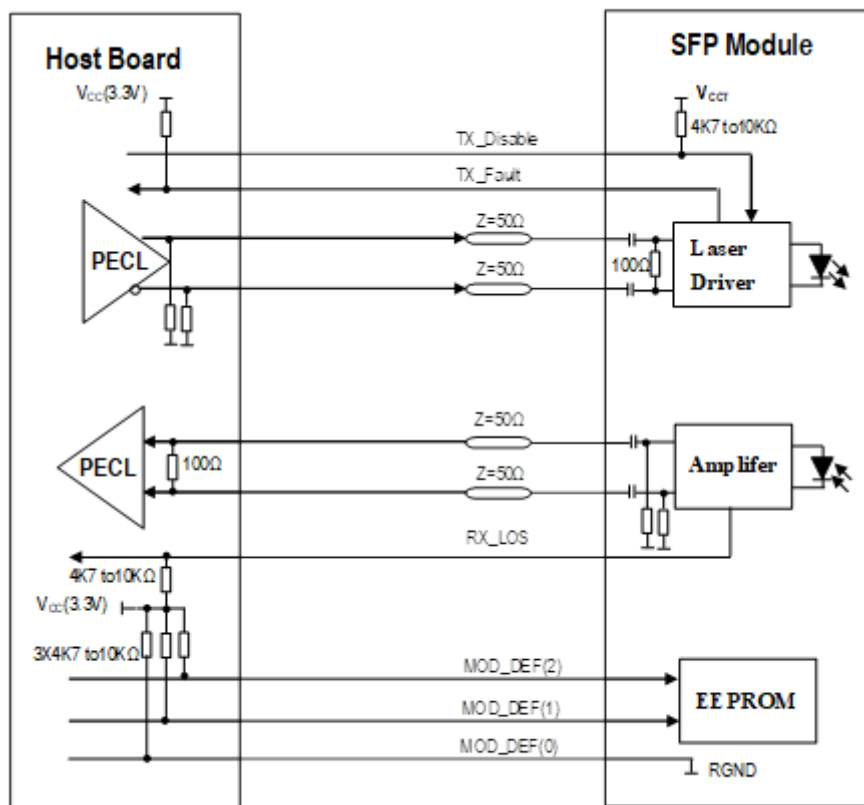
<b>PIN DESCRIPTION</b>				
Pin No	Name	Function	Plug Seq	Notes
1	VeeT	Transmitter Ground	1	1
2	TX Fault	Transmitter Fault Indication	3	
3	TX Disable	Transmitter Disable	3	2
4	MOD-DEF2	Module Definition	2	3
5	MOD-DEF1	Module Definition 1	3	3
6	MOD-DEF0	Module Definition 0	3	3
7	Rate Select	Not Connected	3	4

8	LOS	Loss of Signal	3	5
9	VeeR	Receiver Ground	1	1
10	VeeR	Receiver Ground	1	1
11	VeeR	Receiver Ground		1
12	RD-	Inv. Received Data Out	3	6
13	RD+	Received Data Out	3	6
14	VeeR	Receiver Ground	3	1
15	VccR	Receiver Power	2	1
16	VccT	Transmitter Power	2	
17	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	6
19	TD-	Inv. Transmit In	3	6
20	VeeT	Transmitter Ground	1	

**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. MOD\_DEF(0) pulls line low to indicate module is plugged in.
4. Rate select is not used
5. LOS is open collector output. Should be pulled up with 4.7k – 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
6. AC Coupled

**Recommended Circuit**



**SFP Host Recommended Circuit**

SERIAL ID MEMORY CONTENTS			
Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP)

1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	
11	1	Encoding	NRZ (03h)
12	1	BR, Nominal	Nominal baud rate, unit of 100Mbps
13	1	Reserved	(0000h)
14	1	Length (9um, km)	Link length supported for 9/125um fibre, units of km
15	1	Length(9um)	Link length supported for 9/125um fibre, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fibre, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fibre, units of 10m
18	1	Length (Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name: Layer 1
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "L1-OP3480D-C" (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-61	2	Wavelength	Laser wavelength
62	1	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
Extended ID Fields			
64-65	2	Option	Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	Manufacturing date code
92	1	Diagnostic Type	Diagnostics
93	1	Enhanced Options	Diagnostics
94	1	SFF-8472	Diagnostics
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	Vendor specific data, read only
128-255	128	Reserved	Reserved for SFF-8079

#### References

1. IEEE Std 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-ZX. IEEE Standards Department, 2002.
2. "Fibre Channel Physical and Signalling Interface (FC-PH, FC-PH2, FC-PH3)" American National Standard for Information Systems.
3. "Fibre Channel Draft Physical Interface Specification (FC-PI 13.0)". American National Standard for Information Systems.
4. Small Form-factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA) September 14, 2000.

### DIGITAL DIAGNOSTIC MONITOR CHARACTERISTICS

Data Address	Parameter	Accuracy	Unit
96-97	Transceiver Internal Temperature	±3.0	°C
98-99	VCC3 Internal Supply Voltage	±5.0	%
100-101	Laser Bias Current	±10	%
102-103	Tx Output Power	±3.0	dBm

104-105	Rx Input Power	±3.0	dBm
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**REGULATORY COMPLIANCE**

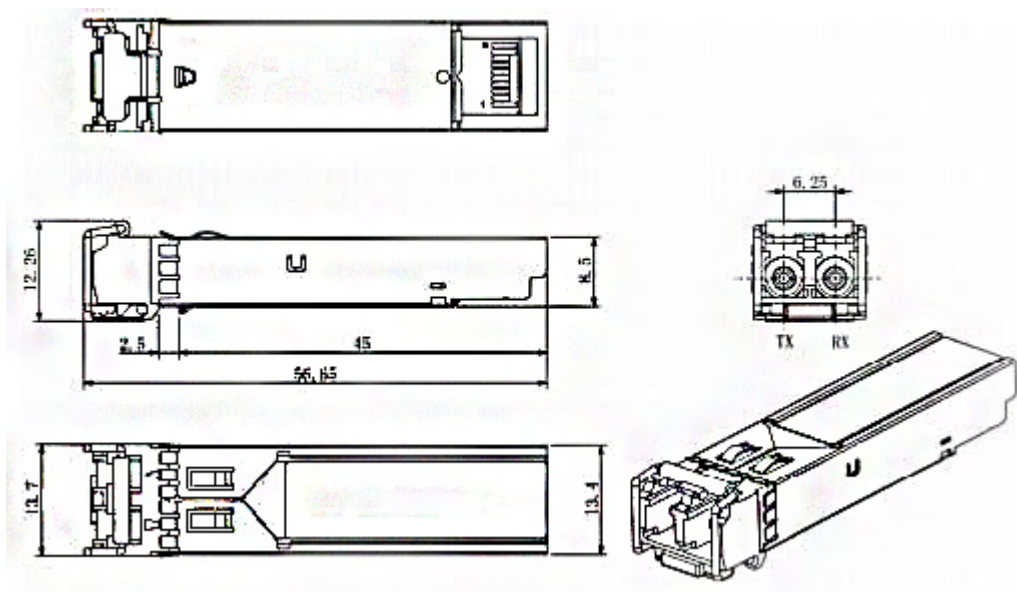
The L1- complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product.

**References**

1. IEEE Std 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-LX.IEEE Standards Department, 2002.
2. "Fibre Channel Physical and Signalling Interface (FC-PH, FC-PH2, FC-PH3)"American National Standard for Information Systems.
3. "Fibre Channel Draft Physical Interface Specification (FC-PI 13.0)". American National Standard for Information Systems.
4. Small Form-factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA) September 14, 2000.

**Mechanical Dimensions**



**Mechanical Drawing**