



#### **Features**

- ☑ Compliant with GBIC Specification, Rev. 5.5
- ☑ Compliant with IEEE 802.3z 1000BASE-LX Specifications for Gigabit Ethernet
- ☑ Compliant with Optical Interface Requirements in Annex F of GBIC Specification, Rev. 5.5
- ☑ Compliant with GBIC Serial Module Definition Protocol (Module Definition 4 in Annex D)
- ☑ 10km with Single Mode Fiber
- ☑ Hot-pluggable
- ☑ Excellent EMI & ESD Protection
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Duplex SC Optical Interface
- ☑ Single +5V Power Supply

#### **Description**

The DTR-1250-SM-GB-L1 GBIC transceiver provides a long haul, single mode solution for 1000BASE-LX Gigabit Ethernet ports in a networking switch. The transceiver uses a 1310nm Fabry Perot laser and a high sensitivity receiver to provide a minimum optical link power budget of 11dB, corresponding to a minimum distance of 10km, assuming fiber loss of 0.45dB/km. It satisfies Class I Laser Safety requirements in accordance with the US FDA/CDRH and international IEC-825 standards.

The DTR-1250-SM-GB-L1 transceiver is fully compliant with Annex F of GBIC specification, Rev. 5.5.

The transceiver connects to a standard 20-pad GBIC connector for hot plug capability. This allows the system designer to make configuration changes or maintenance by simply plugging in different types of converters without removing the power supply from the host system.

The transceiver operates from a single +5V power supply over an operating case temperature range of -5°C to +70°C.

#### **Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	$T_{st}$	- 40	+ 85	°C
Operating Case Temperature	$T_{op}$	- 5	+ 70	°C
Supply Voltage	$V_{DD}$	0	+ 6.0	V
Input Voltage	$V_{in}$	0	+ 6.0	V

# DTR-1250-SM-GB-L1

## Transmitter Performance Characteristics (over Operating Case Temperature, $V_{CC} = 4.75$ to $5.25V$ ) All parameters guaranteed only at typical data rate

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate <sup>1</sup>	$B$	-	1250	-	Mb/s
Optical Output Power <sup>2</sup>	$P_o$	- 9.0	-	- 3.0	dBm
Center Wavelength	$\lambda_c$	1290	1310	1340	nm
Spectral Width (RMS) <sup>2</sup>	$\Delta\lambda_{RMS}$	-	-	2.5	nm
Extinction Ratio	$P_{hi}/P_{lo}$	9	-	-	dB
Transmitter Disabled Optical Output Power <sup>2</sup>	$P_{dis}$	-	-	- 35.0	dBm
Deterministic Jitter	$DJ$	-	-	80	ps
Total Jitter	$TJ$	-	-	227	ps
Relative Intensity Noise	$RIN$	-	-	- 120	dB/Hz
Transmitter Output Eye	Compliant with Eye Mask Defined in IEEE 802.3z standard				

<sup>1</sup>Data rate ranges from 125Mb/s to 1300Mb/s. However, some degradation may be incurred in overall performance.  
<sup>2</sup>Measured average power coupled into single mode fiber (SMF).

## Receiver Performance Characteristics (over Operating Case Temperature, $V_{CC} = 4.75$ to $5.25V$ ) All parameters guaranteed only at typical data rate

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate <sup>1</sup>	$B$	-	1250	-	Mb/s
Minimum Input Optical Power ( $10^{-12}$ BER) <sup>2</sup>	$P_{min}$	- 20.0	-	-	dBm
Maximum Input Optical Power ( $10^{-12}$ BER) <sup>2</sup>	$P_{max}$	- 3.0	-	-	dBm
LOS Thresholds	Increasing Light Input	$P_{los+}$	-	- 20.0	dBm
	Decreasing Light Input	$P_{los-}$	- 30.0	-	dBm
LOS Hysteresis	-	0.5	-	-	dB
Deterministic Jitter	$DJ$	-	-	170	ps
Total Jitter	$TJ$	-	-	266	ps
Wavelength of Operation	$\lambda$	1100	-	1600	nm
Optical Return Loss	-	12	-	-	dB
Stressed Receiver Sensitivity	Compliant with IEEE 802.3z standard				

<sup>1</sup>Data rate ranges from 125Mb/s to 1300Mb/s. However, some degradation may be incurred in overall performance.  
<sup>2</sup>Measured with  $2^7-1$  PRBS at 1250Mb/s at 1310nm wavelength.

**Laser Safety:** All transceivers are Class I Laser products per FDA/CDRH and IEC-825 standards. They must be operated under specified operating conditions.



### Optical Communication Products, Inc.

DATE OF MANUFACTURE:

MANUFACTURED IN THE USA

This product complies with  
21 CFR 1040.10 and 1040.11

**Meets Class I Laser Safety Requirements**

# DTR-1250-SM-GB-L1

## Transmitter Electrical Interface (over Operating Case Temperature, $V_{CC} = 4.75$ to $5.25V$ )

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input Voltage Swing (+TX_DAT & -TX_DAT) <sup>1</sup>	$V_{PP-DIF}$	0.65	-	2.0	V
Input HIGH Voltage (TX_DISABLE) <sup>2</sup>	$V_{IH}$	2.0	-	$V_{DD} + 0.3$	V
Input LOW Voltage (TX_DISABLE) <sup>2</sup>	$V_{IL}$	0	-	0.8	V
Output HIGH Voltage (TX_FAULT) <sup>3</sup>	$V_{OH}$	$V_{CC} - 0.5$	-	$V_{CC} + 0.3$	V
Output LOW Voltage (TX_FAULT) <sup>3</sup>	$V_{OL}$	0	-	0.5	V

<sup>1</sup>Differential peak-to-peak voltage.  
<sup>2</sup>There is an internal 5.1k $\Omega$  pullup resistor to  $V_{DDT}$ .  
<sup>3</sup>Open collector compatible, 4.7 to 10k $\Omega$  pullup resistor to  $V_{CC}$  (Host Supply Voltage).

## Receiver Electrical Interface (over Operating Case Temperature, $V_{CC} = 4.75$ to $5.25V$ )

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output Voltage Swing (+RX_DAT & -RX_DAT) <sup>1</sup>	$V_{PP-DIF}$	0.60	-	2.0	Vp-p
Output HIGH Voltage (RX_LOS) <sup>2</sup>	$V_{OH}$	$V_{CC} - 0.5$	-	$V_{CC} + 0.3$	V
Output LOW Voltage (RX_LOS) <sup>2</sup>	$V_{OL}$	0	-	0.5	V

<sup>1</sup>Differential peak-to-peak voltage across external 150 $\Omega$  load.  
<sup>2</sup>Open collector compatible, 4.7 to 10k $\Omega$  pullup resistor to  $V_{CC}$  (Host Supply Voltage).

## Electrical Power Supply Characteristics (over Operating Case Temperature, $V_{CC} = 4.75$ to $5.25V$ )

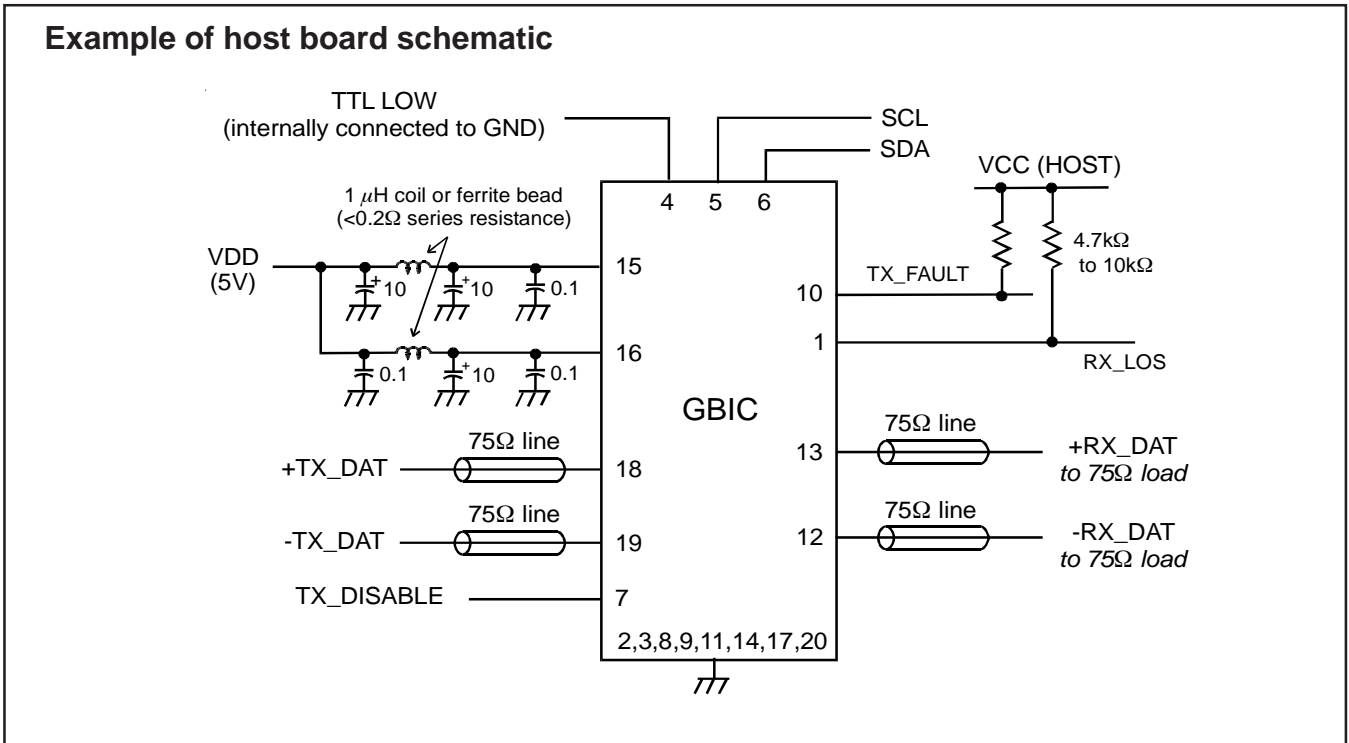
Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	$V_{DD}$	4.75	5.0	5.25	V
Supply Current	$I_{DD}$	-	160	220	mA

## Module Definition

Module Definition	MOD_DEF(0) pin 4	MOD_DEF(1) pin 5	MOD_DEF(2) pin 6	Interpretation by Host
4	TTL LOW	SCL	SDA	Serial module definition protocol

## Pin Assignments

PIN	FUNCTION	PIN	FUNCTION
1	RX_LOS (RX LOSS OF SIGNAL)	11	RGND (RX GROUND)
2	RGND (RX GROUND)	12	-RX_DAT (RX DATA OUT -)
3	RGND (RX GROUND)	13	+RX_DAT (RX DATA OUT +)
4	MOD_DEF(0)	14	RGND (RX GROUND)
5	MOD_DEF(1)	15	VDDR (RX SUPPLY VOLTAGE)
6	MOD_DEF(2)	16	VDDT (TX SUPPLY VOLTAGE)
7	TX_DISABLE	17	TGND (TX GROUND)
8	TGND (TX GROUND)	18	+TX_DAT (TX DATA IN +)
9	TGND (TX GROUND)	19	-TX_DAT (TX DATA IN -)
10	TX_FAULT	20	TGND (TX GROUND)



## Application Notes

**Connection of the GBIC transceiver to the host system:** The GBIC's 20-pad connector and two guide tabs connected to the transceiver's circuit ground connect the GBIC to the host system. The two ground tabs make contact to the host circuit ground before the connector pad and discharge any possible component-damaging static electricity. Additionally, surge currents are eliminated by using a special slow start circuit and two-stage contact sequence where operational signals and grounds make contact prior to the power supply (as specified in the GBIC specification, Rev. 5.5).

**Electrical interface:** All signal interfaces are compliant with the GBIC specification, Rev. 5.5. The high speed DATA interface is differential AC-coupled and can be directly connected to either a 5V or 3.3V SERDES IC. All low speed control and sense input/output signals are open collector TTL compatible and should be pulled up with a 4.7 - 10kΩ resistor on the host board.

**Loss of Signal (LOS):** The Loss of Signal circuit monitors the level of the incoming optical signal and generates a logic HIGH when an insufficient photocurrent is produced.

**TX FAULT:** The output indicates LOW when the transmitter is operating normally, and HIGH when the transmitter or laser current is excessive. TX\_FAULT is an open collector/drain output and should be pulled up with a 4.7 - 10kΩ resistor on the host board.

**TX DISABLE:** When the TX\_DISABLE pin is at logic HIGH, the transmitter optical output is disabled (less than -35dBm).

**Serial Identification:** The DTR-1250-SM-GB-L1 transceivers are compliant with Annex D (Module Definition 4) of the GBIC specification, Rev. 5.5, which defines the Serial Identification Protocol.

The module definition of GBIC is indicated by the three module definition pins, MOD\_DEF(0), MOD\_DEF(1) and MOD\_DEF(2). Module Definition 4 specifies a serial definition protocol with a two-wire I<sup>2</sup>C serial interface; upon power up, MOD\_DEF(1:2) appear as NC (no connection), and MOD\_DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol and generates the serial clock signal (SCL). The negative edge clocks data from the GBIC EEPROM.

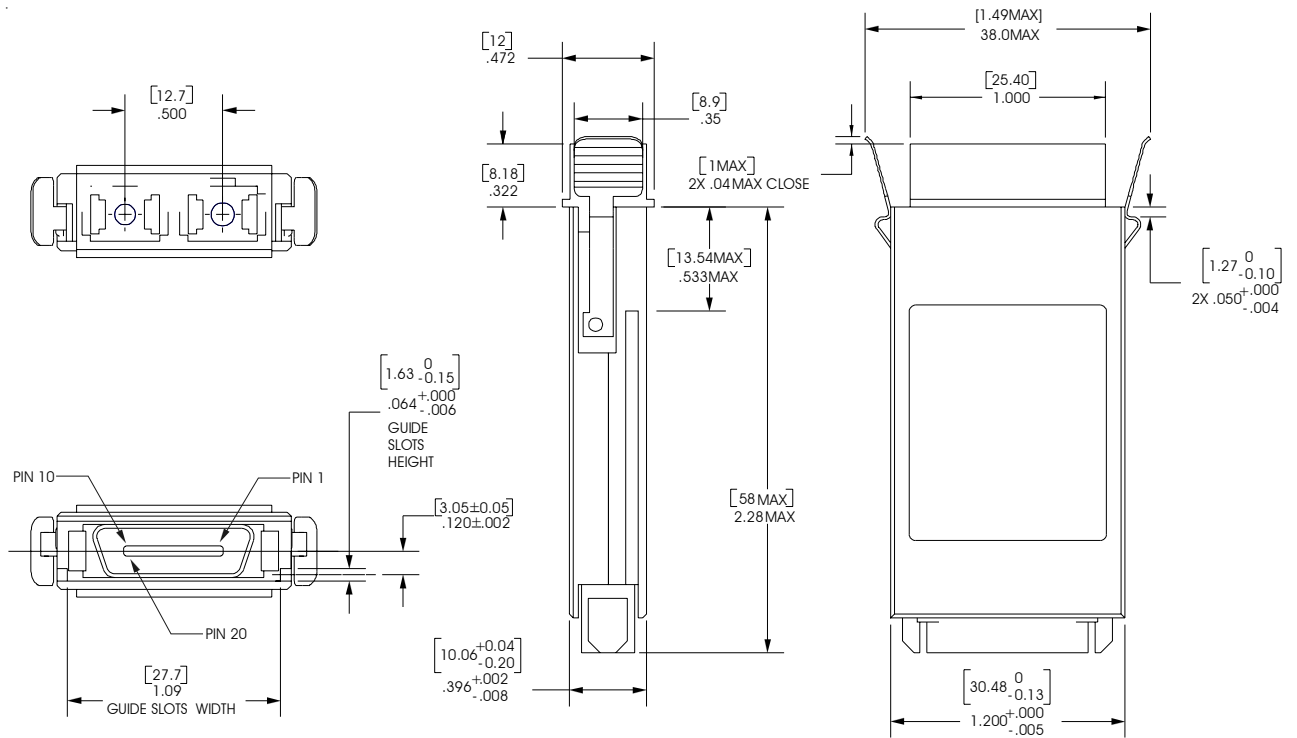
The serial data signal (SDA) is for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation.

The data transfer protocol and the details of the mandatory and vendor specific data structures are defined in Annex D of the GBIC specification, Rev. 5.5.

**Power supply and grounding:** The power supply line should be well-filtered. All 0.1μF power supply bypass capacitors should be as close to the GBIC transceiver module as possible. The module case is AC-grounded internally to circuit ground.

# DTR-1250-SM-GB-L1

## Package Outline



Dimensions in inches [mm]  
 Default tolerances:  
 .xxx =  $\pm .005$ ", .xx =  $\pm .01$ "

## Ordering Informaton

Model Name	Nominal Wavelength	Optical Link Power Budget	Distance <sup>1</sup>
DTR-1250-SM-GB-L1	1310nm	11dB min.	10km

<sup>1</sup>The indicated transmission distance is for guidelines only, not guaranteed. The exact distance is dependent on the fiber loss, connector and splice loss, and allocated system penalty. Longer distances can be supported if the optical link power budget is satisfied.

## Optical Communication Products, Inc.

6101 Variel Avenue, Woodland Hills, CA 91367, Tel.: 818-251-7100, FAX: 818-251-7111, www.ocp-inc.com

Optical Communication Products, Inc. reserves the right to make changes in equipment design or specifications without notice. Information supplied by Optical Communication Products, Inc. is believed to be accurate and reliable. However, no responsibility is assumed by Optical Communication Products, Inc. for its use nor for any infringements of third parties, which may result from its use. No license is granted by implication or otherwise under any patent right of Optical Communication Products, Inc.  
 © 2003, Optical Communication Products, Inc.