

DTR-2488-SM-LC & DTR-2488-SM-LS

3.3 volt 2x5 LC connector OC-48 Single Mode Transceiver



Features

- ☑ Full Compliance with OC-48/STM-16 SONET/SDH Specifications
- ☑ Long Reach, Intermediate Reach & Short Reach
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Multi-sourced 2x5 package style
- ☑ Duplex LC optical connector interface
- ☑ Metal package for excellent EMI shielding
- ☑ Compatible with LV-PECL DATA interface (AC coupling option also available)
- ☑ LV-TTL SIGNAL DETECT output
- ☑ - 40°C to +85°C Operating Temperature ("A" Option)
- ☑ Single +3.3 V supply

Description

The DTR-2488-SM-LC fiber optic transceivers offer a simple, convenient way to interface ATM/SONET/SDH OC-48/STM-16 PCBs to single mode fiber optic cables for both Short and Intermediate Reach applications. They are fully compliant to all applicable SONET/SDH specifications. Many versions are available with 1300 nm Fabry Perot laser for SR, 1310 nm DFB for IR1 and LR1, 1550 nm DFB lasers for IR2 and LR2 applications. All modules satisfy Class I Laser Safety requirements in accordance with the US FDA/CDRH and international IEC-825 standards.

The transmit and receive functions are contained in two-row, 10-pin (2x5) package with Duplex LC connector interface. The receptacle fits into an RJ-45 form factor outline. The 10-pin configuration is in conformance to a Small Form Factor (SFF) multisource transceiver agreement.

The transmitter incorporates all the necessary control and driver circuitry for converting differential data to light. The receiver uses an InGaAs/InP PIN photodiode for Short Reach (SR) and Intermediate Reach (IR), and Avalanche Photodiode Detector (APD) for Long Reach (LR) to convert the light signal into an electrical current which is amplified and regenerated into differential data outputs. The transmitter and receiver DATA interfaces are compatible with LV-PECL signal levels. An alternate version with AC coupling interface is also available. A LV-TTL Signal Detect function which indicates loss of optical input is also provided.

The transceiver operates from a single +3.3V power supply over an operating temperature range of 0°C to +70°C or -40°C to +85°C ("A" Option). The package is made of metal for excellent EMI shielding.

Absolute Maximum Ratings

Parameter		Symbol	Minimum	Maximum	Units
Storage Temperature		T_{st}	- 40	+ 85	°C
Operating Temperature	"A" Option	T_{op}	- 40	+ 85	°C
	"Blank" Option		0	+ 70	
Supply Voltage		V_{CC}	0	+ 5.0	V
Input Voltage		V_{in}	0	V_{CC}	V
Output Current		I_O	-	50	mA
Lead Soldering Temperature & Time		-	-	260°C, 10 sec	

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DTR-2488-SM-LC & DTR-2488-SM-LS**Transmitter Performance Characteristics (over Operating Case Temperature Range)**

Parameter		Symbol	Minimum	Typical	Maximum	Units
Serial Optical Output Data Rate		B_O	0.155	2.488	3.000	Gb/s
Average Optical Output Power (50% duty cycle)	L1	P_o	- 10.0	- 7.0	- 3.0	dBm
	L0		- 5.0	- 3.0	0	
	HP		- 2.0	0	3.0	
Extinction Ratio		P_{hi}/P_{lo}	8.2	-	-	dB
Center Wavelength	SR (Short Reach)	λ_c	1266	1310	1360	nm
	IR1 (Intermediate Reach 1310 nm)		1266	1310	1360	
	IR2 (Intermediate Reach 1550 nm)		1430	1550	1580	
	LR1 (Long Reach 1310 nm)		1280	1310	1335	
	LR2 (Long Reach 1550 nm)		1500	1550	1580	
Spectral Width (RMS)		$\Delta\lambda_{RMS}$	-	-	4.0	nm
Spectral Width (-20 dB)		$\Delta\lambda_{20}$	-	-	1.0	
Side Mode Suppression Ratio	IR1, IR2, LR1 & LR2	$SMSR$	30	-	-	dB
Optical Output Eye		compliant with Bellcore TR-NWT-000253 and ITU-T Recommendation G.957				

Receiver Performance Characteristics (over Operating Case Temperature Range)

Parameter			Symbol	Minimum	Typical	Maximum	Units
Serial Optical Input Data Rate			B_O	0.155	2.48832	3.00	Gb/s
Receiver Sensitivity (10^{-10} BER) ¹	SR & IR (Short & Intermediate Reach)		P_{min}	- 18.0	- 20.0	-	dBm
	LR (Long Reach)			- 28.0	- 31.0	-	
Maximum Input Optical Power (10^{-10} BER) ¹	SR (Short Reach)		P_{max}	-	-	- 3.0	dBm
	IR (Intermediate Reach)			-	-	0	
	LR (Long Reach)			-	-	- 8.0	
Signal Detect Thresholds	SR & IR	Increasing Light Input	P_{sd+}	-	-	- 18.0	dBm
		Decreasing Light Input	P_{sd-}	- 35.0	-	-	
	LR	Increasing Light Input	P_{sd+}	-	-	- 28.0	dBm
		Decreasing Light Input	P_{sd-}	- 42.0	-	-	
Signal Detect Timing			-	3	-	100	μ s
Signal Detect Hysteresis			-	0.5	1.0	-	dB
Wavelength of Operation			λ	1100	-	1600	nm
Optical Path Penalty ²			-	-	-	1	dB
Jitter Tolerance & Transfer Function			compliant with ITU Recommendation G.958				

¹ Specified in Average Optical Input Power and measured at 2.48832 Gb/s and 1300 nm or 1550 nm wavelength with 2²³-1 PRBS.
² Optical Path Penalty for distance up to 40Km. Penalty for 80km is 2dB.

Transmitter Electrical Interface (over Operating Case Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input Voltage Swing between DATA+ & DATA-	V_{INDIF}	0.30	0.80	1.60	V_{P-P}
Input Impedance	Z_{IL}	-	50	-	ohm
Transmitter Disable Voltage	V_{DIS}	$V_{CC} - 1.3$	-	V_{CC}	V
Transmitter Enable Voltage	V_{EN}	0	-	0.8	V

Receiver Electrical Interface (over Operating Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output HIGH Voltage (LV-PECL) ^{1,2}	V_{OH}	$V_{CC} - 1.10$	-	$V_{CC} - 0.90$	V
Output LOW Voltage (LV-PECL) ^{1,2}	V_{OL}	$V_{CC} - 1.84$	-	$V_{CC} - 1.60$	V
Output Current	I_O	-	-	25	mA
Output HIGH Voltage (LV-TTL)	V_{OH}	2.4	-	V_{CC}	
Output LOW Voltage (LV-TTL)	V_{OL}	0	-	0.4	

¹ With 50 ohm terminated to $V_{CC} - 2$ volt (for DC-coupled modules).

² For AC-coupled modules, the output voltage swing into 50-ohm load is 0.3 V minimum and 0.8 V maximum single-ended.

Electrical Power Supply Characteristics (over Operating Case Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	V_{CC}	3.13	3.3	3.47	V
Supply Current ¹	DC-coupled module SR/IR	-	180	230	mA
	AC-coupled module SR/IR	-	200	250	mA
	DC-coupled module LR	-	270	370	mA
	AC-coupled module LR	-	290	390	mA

¹ Supply current does not include termination resistor current.

Application Notes

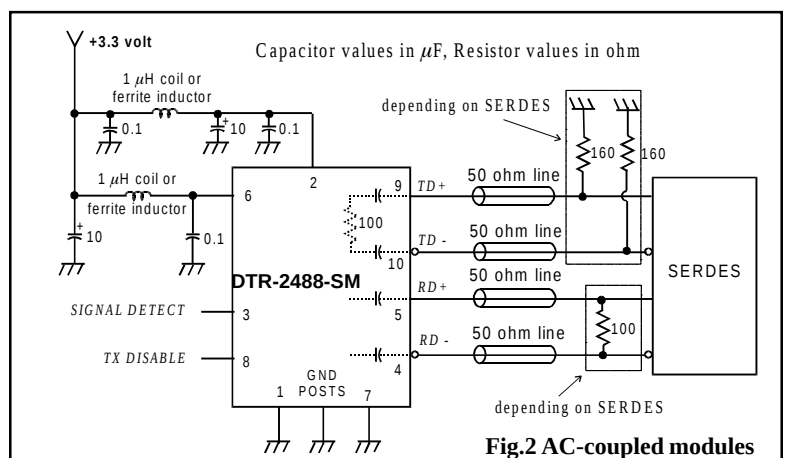
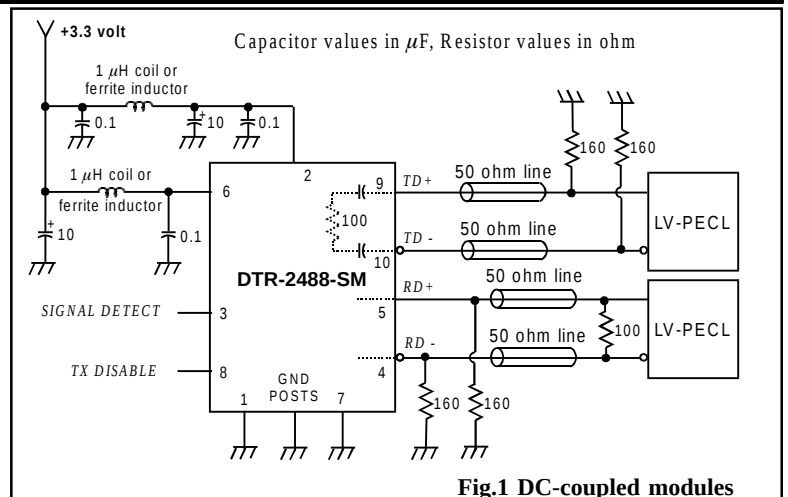
DATA interface (DC-coupled modules): The interface circuit for standard DC-coupled modules with direct-coupled LV-PECL interface is shown in Fig. 1. The transmitter input has internal 50 ohm termination.

DATA interface (AC-coupled modules): For modules with AC coupling option, both transmitter and receiver interface has internal bias, 50 ohm termination and AC coupling capacitor. The transmitter can be connected directly to the driving SERDES as shown in Fig. 2. The receiver can be connected directly to the external 50 ohm loads (termination resistor of the SERDES). For best performance, both DATA+ & DATA- should be used.

SIGNAL DETECT: The Signal Detect circuit monitors the incoming optical signal level and generates a logic LOW signal when insufficient photocurrent is produced. The output is LV-TTL with no termination required.

TX DISABLE: The transmitter is normally enabled (i.e. when the TX Enable control input is not connected). When the TX Enable control input voltage is higher than $V_{CC} - 1.3V$, the laser is turned off independent of the input data.

Power supply and grounding: The power supply line should be well-filtered. All 0.1 μF power supply bypass capacitors should be as close to the DTR transceiver module as possible.



DTR-2488-SM-LC & DTR-2488-SM-LS

Pin Assignment

PIN	FUNCTION	PIN	FUNCTION
1	RX GND	6	V _{CC} TX
2	V _{CC} RX	7	TX GND
3	SD (RX SIGNAL DETECT)	8	TX DISABLE
4	RD+ (RX DATA OUT +)	9	TD- (TX DATA IN -)
5	RD- (RX DATA OUT -)	10	TD+ (TX DATA IN +)

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

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DATE OF MANUFACTURE:

MANUFACTURED IN THE USA

This product complies with
21 CFR 1040.10 and 1040.11

Meets Class I Laser Safety Requirements

Ordering Information

Ordering Information for “LC” modules (without EMI shield)

MODULE NAME		SONET / SDH Standard	Distance ¹
0°C to 70°C Operating	-40°C to 85°C Operating		
DTR-2488-SM-LC-L1-SR-M	DTR-2488-SM-LC-A-L1-SR-M	SR 1310 nm / I-16.1	2 km
DTR-2488-SM-LC-L0-IR1-M	DTR-2488-SM-LC-A-L0-IR1-M	IR 1310 nm / S-16.1	15 km
DTR-2488-SM-LC-L0-IR2-M	² DTR-2488-SM-LC-A-L0-IR2-M	IR2 1550 nm / S-16.2	15 km
DTR-2488-SM-LC-HP-LR1-M	DTR-2488-SM-LC-A-HP-LR1-M	LR1 1310 nm / L-16.1	40 km
DTR-2488-SM-LC-HP-LR2-M	² DTR-2488-SM-LC-A-HP-LR2-M	LR2 1310 nm / L-16.2	80 km

¹ These are target distances to be used for classification and not for specification, per ITU-T Recommendation G.957.
For AC-coupled modules, please add suffix "AC" to the above Model Names ("AC" goes before "M" for Metal Housing)
For example, the AC-coupled version of DTR-SM-LC-L1-SR-M is DTR-2488-SM-LC-L1-SR-AC-M
² DTR-2488-SM-LC-A-L0-IR2-M & DTR-2488-SM-LC-A-HP-LR2-M are specified over -25 °C to +70 °C

Ordering Information for “LS” modules (with EMI shield)

MODULE NAME		SONET / SDH Standard	Distance ¹
0°C to 70°C Operating	-40°C to 85°C Operating		
DTR-2488-SM-LS-L1-SR-M	DTR-2488-SM-LS-A-L1-SR-M	SR 1310 nm / I-16.1	2 km
DTR-2488-SM-LS-L0-IR1-M	DTR-2488-SM-LS-A-L0-IR1-M	IR 1310 nm / S-16.1	15 km
DTR-2488-SM-LS-L1-IR2-M	² DTR-2488-SM-LS-A-L1-IR2-M	IR2 1550 nm / S-16.2	15 km
DTR-2488-SM-LS-HP-LR1-M	DTR-2488-SM-LS-A-HP-LR1-M	LR1 1310 nm / L-16.1	40 km
DTR-2488-SM-LS-HP-LR2-M	² DTR-2488-SM-LS-A-HP-LR2-M	LR2 1550 nm / L-16.2	80 km

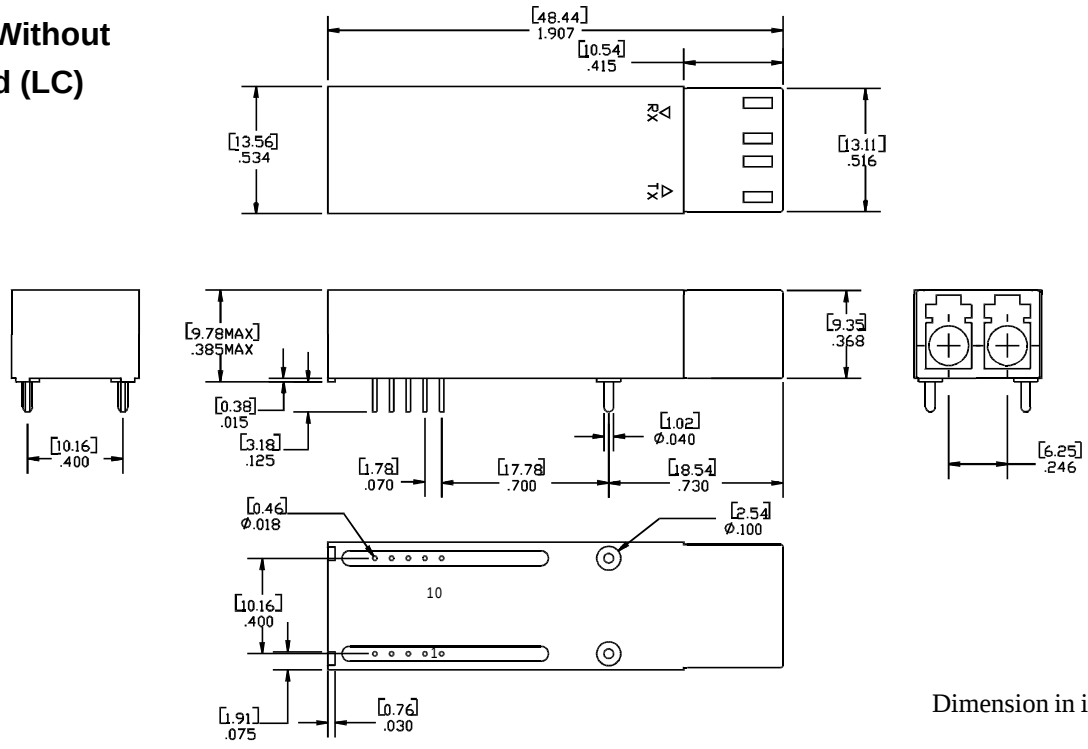
¹ These are target distances to be used for classification and not for specification, per ITU-T Recommendation G.957.
For AC-coupled modules, please add suffix "AC" to the above Model Names ("AC" goes before "M" for Metal Housing).
For example, the AC-coupled version of DTR-2488-SM-LS-L1-SR-M is DTR-2488-SM-LS-L1-SR-AC-M
² DTR-2488-SM-LC-A-L0-IR2-M & DTR-2488-SM-LC-A-HP-LR2-M are specified over -25 °C to 70 °C

DTR-2488-SM-LC & DTR-2488-SM-LS

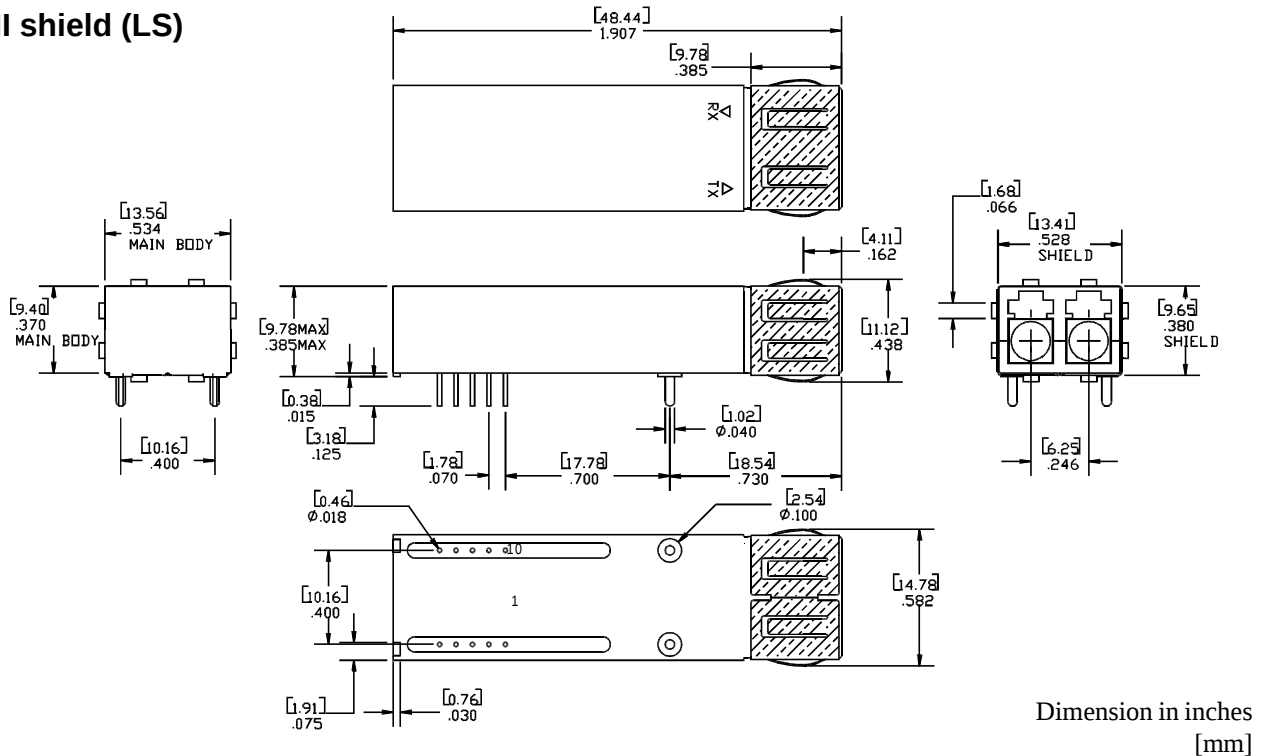
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Mechanical Drawing

Package Without EMI shield (LC)



Package with EMI shield (LS)



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