



Features

- ☑ Compliant with SONET/SDH OC-48/STM-16 Specifications
- ☑ Short, Intermediate and Long Reaches
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Multi-sourced 2x5 Package Style
- ☑ Duplex LC Optical Interface
- ☑ AC Coupling or DC Coupling Option to LV-PECL DATA Compatible Interface
- ☑ LV-TTL SIGNAL DETECT Output
- ☑ Metal Package for Excellent EMI Shielding
- ☑ Single +3.3V Power Supply

Description

The DTR-2488-SM-LC/LS-W-G SFF series of fiber optic transceivers provide a quick and reliable interface for SONET/SDH OC-48/STM-16 short reach, intermediate reach and long reach applications. The short reach (SR-1) version uses a 1310nm Fabry Perot laser while the intermediate reach (IR-1) and long reach (LR-1) versions use a 1310nm DFB laser to achieve reaches of 2km, 15km and 40km, respectively. For intermediate reach (IR-2) and long reach (LR-2) versions, a 1550nm DFB laser is used to obtain the reaches of 15km and 80km, respectively. All modules are compliant with all applicable SONET/SDH OC-48/STM-16 standards and satisfy Class I Laser Safety requirements per U.S. FDA/CDRH and international IEC-60825 standards.

The transmit and receive functions are contained in a narrow width two-row, 10-pin (2x5) package with a duplex LC optical interface. The receptacle fits into an RJ-45 form

factor outline. The 10-pin configuration is in conformance to the SFF MSA.

The transmitter design 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 and intermediate reach applications and an APD photodiode for long reach applications to convert the light signal into an electrical current which is amplified and regenerated into differential data outputs. AC-coupled transmit and receive DATA interface is recommended for compatibility with LV-PECL signal levels. An option for DC-coupled interface is also available. LV-TTL SIGNAL DETECT function is provided to indicate optical input loss.

The transceivers operate from a single +3.3V power supply over an operating case temperature range of -5° to +70°C or -40° to +85°C ("A" option). The housing is made of metal to enhance EMI immunity.

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_{st}	- 40	+ 85	°C
Operating Case Temperature	"Blank" option	- 5	+ 70	°C
	"A" option	- 40	+ 85	
Maximum Input Optical Power (for LR-1, LR-2 only)	$P_{in, max}$	-	- 5.0	dBm
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 seconds	

DTR-2488-SM-LC/LS-W-G

Transmitter Performance Characteristics (over Operating Case Temperature Range, $V_{CC} = 3.13$ to $3.47V$)

All parameters guaranteed only at typical data rate

Parameter		Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate ¹		B	-	2.488	-	Gb/s
Average Optical Output Power (coupled into single mode fiber) 50% duty cycle	L1	P_o	- 10.0	- 7.0	- 3.0	dBm
	L0		- 5.0	- 2.0	0	
	HP		- 2.0	0	+ 3.0	
Extinction Ratio		P_{hi}/P_{lo}	8.2	-	-	dB
Center Wavelength	SR-1	λ_c	1266	1310	1360	nm
	IR-1		1266	1310	1360	
	IR-2		1430	1550	1580	
	LR-1		1280	1310	1335	
	LR-2		1500	1550	1580	
Spectral Width (RMS)		$\Delta\lambda_{RMS}$	-	-	4.0	nm
Spectral Width (-20dB)		$\Delta\lambda_{20}$	-	-	1.0	nm
Side Mode Suppression Ratio		$SMSR$	30	-	-	dB
Dispersion Penalty	SR-1, IR-1, IR-2, LR-1	-	-	-	1.0	dB
	LR-2 ²	-	-	-	2.0	
Optical Output Eye		Compliant with Telcordia GR-253-CORE and ITU-T Recommendation G.957				
¹ Data rate ranges from 155Mb/s to 2.7Gb/s. However, some degradation may be incurred in overall performance. ² Specified at 1600ps/nm dispersion, which corresponds to the approximate worst-case dispersion for 80km G.652/G.654 fiber over the wavelength range of 1500nm - 1580nm.						

Receiver Performance Characteristics (over Operating Case Temperature Range, $V_{CC} = 3.13$ to $3.47V$)

All parameters guaranteed only at typical data rate

Parameter		Symbol	Minimum	Typical	Maximum	Units	
Operating Data Rate ¹		B	-	2.488	-	Gb/s	
Receiver Sensitivity (10^{-10} BER) ²	SR-1, IR-1, IR-2	P_{min}	- 18.0	- 20.0	-	dBm	
	LR-1, LR-2		- 28.0	- 31.0	-		
Maximum Input Optical Power (10^{-10} BER) ²	SR-1	P_{max}	- 3.0	-	-	dBm	
	IR-1, IR-2		0	-	-		
	LR-1, LR-2		- 8.0	-	-		
SIGNAL DETECT Thresholds	SR-1, IR-1, IR-2	Increasing Light Input	P_{sd+}	-	-	dBm	
		Decreasing Light Input	P_{sd-}	- 35.0	-		
	LR-1, LR-2	Increasing Light Input	P_{sd+}	-	-		- 27.0
		Decreasing Light Input	P_{sd-}	- 42.0	-		-
SIGNAL DETECT Timing		-	3	-	100	μs	
SIGNAL DETECT Hysteresis		-	0.5	1.0	-	dB	
Wavelength of Operation		λ	1100	-	1600	nm	
Jitter Tolerance & Transfer Function		Compliant with ITU Recommendation G.958					
¹ Data rate ranges from 155Mb/s to 2.7Gb/s. However, some degradation may be incurred in overall performance. ² Specified in average input optical power and measured at 2.488Gb/s and 1310nm or 1550nm wavelength with $2^{23}-1$ PRBS.							

Laser Safety: All transmitters are Class I Laser products per FDA/CDRH and IEC-60825 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-2488-SM-LC/LS-W-G

Transmitter Electrical Interface (over Operating Case Temperature Range, $V_{CC} = 3.13$ to $3.47V$)

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	-	Ω
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 Case Temperature Range, $V_{CC} = 3.13$ to $3.47V$)

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}	2.0	-	V_{CC}	V
Output LOW Voltage (LV-TTL)	V_{OL}	0	-	0.4	V
Receiver Power Monitor Current	SR, IR (P_{in} from -20dBm to 0dBm)	-	0.80	-	$\mu A/\mu W$
	LR (P_{in} from -28dBm to -17dBm)	-	0.85	-	

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

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

Electrical Power Supply Characteristics (over Operating Case Temperature Range, $V_{CC} = 3.13$ to $3.47V$)

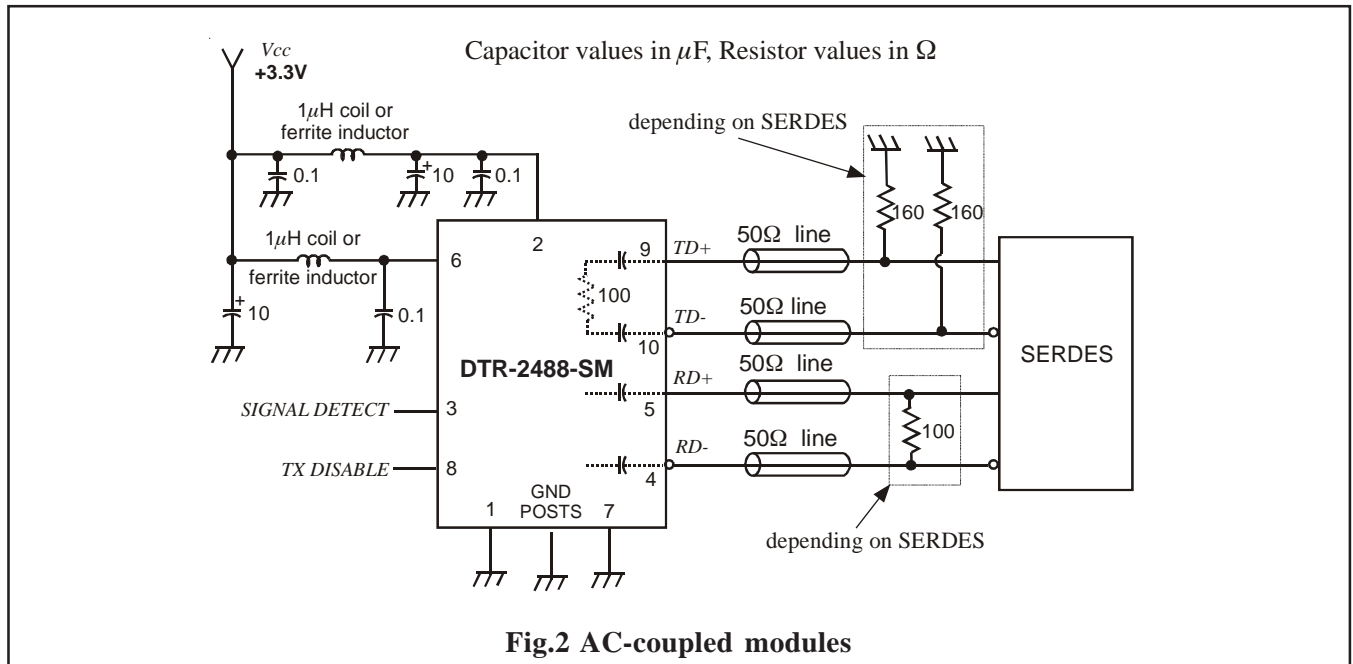
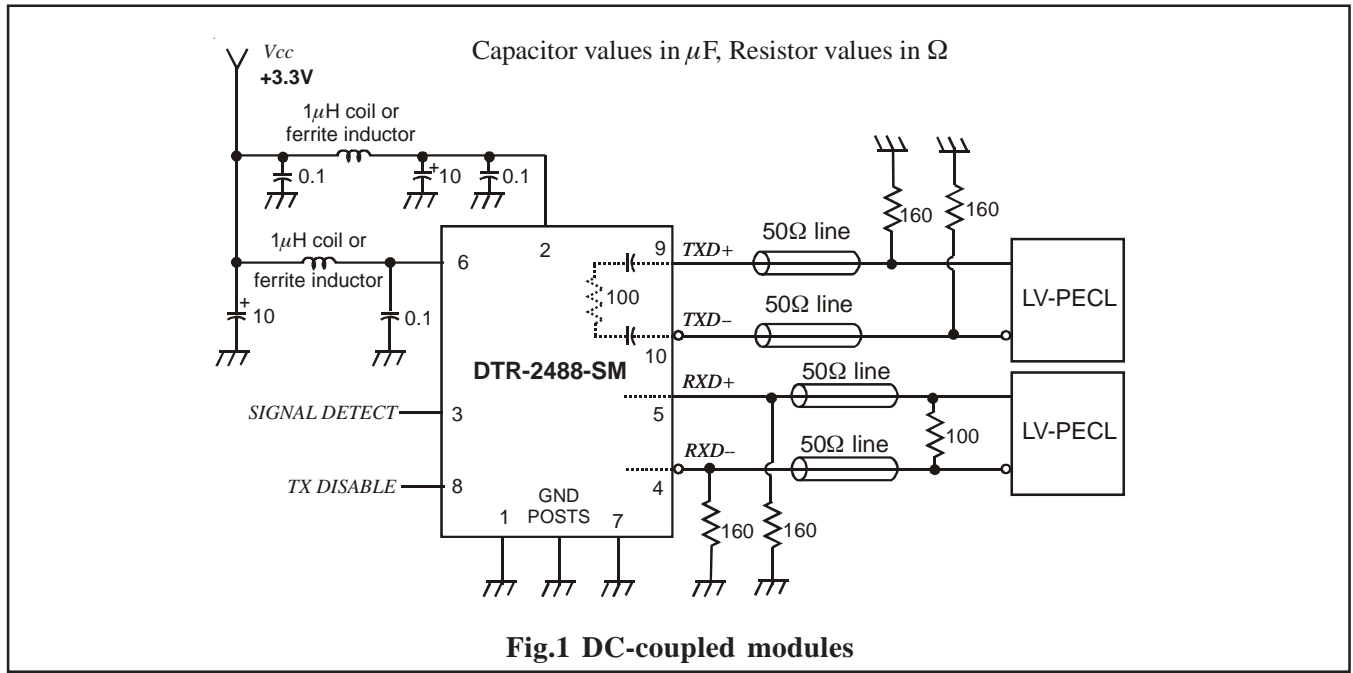
Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	V_{CC}	3.13	3.3	3.47	V
Supply Current ¹	DC-coupled modules	-	180	230	mA
	AC-coupled modules	-	200	250	

¹Supply current does not include termination resistor current.

Pin Assignments

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-)

DTR-2488-SM-LC/LS-W-G



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 50Ω termination.

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

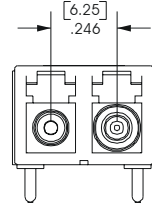
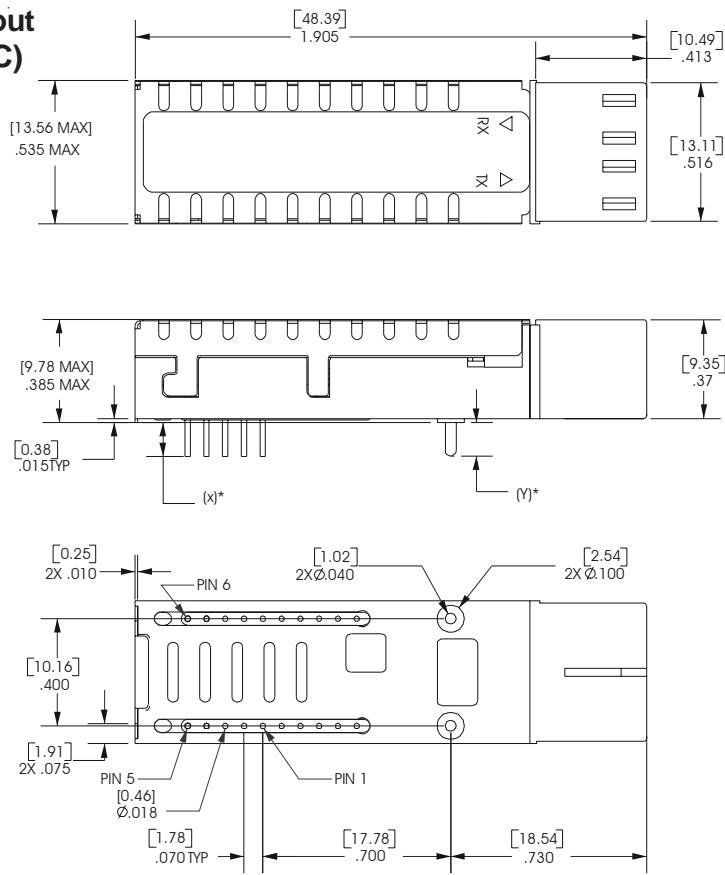
SIGNAL DETECT: The SIGNAL DETECT circuit monitors the incoming optical signal level and generates a logic LOW signal when an insufficient photocurrent is produced. The output is LV-TTL with no termination required.

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

Power supply and grounding: The power supply line should be well-filtered. All $0.1\mu\text{F}$ power supply bypass capacitors should be as close to the DTR transceiver module as possible. The module case ground is internally AC-coupled to the circuit ground.

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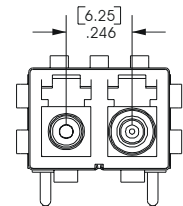
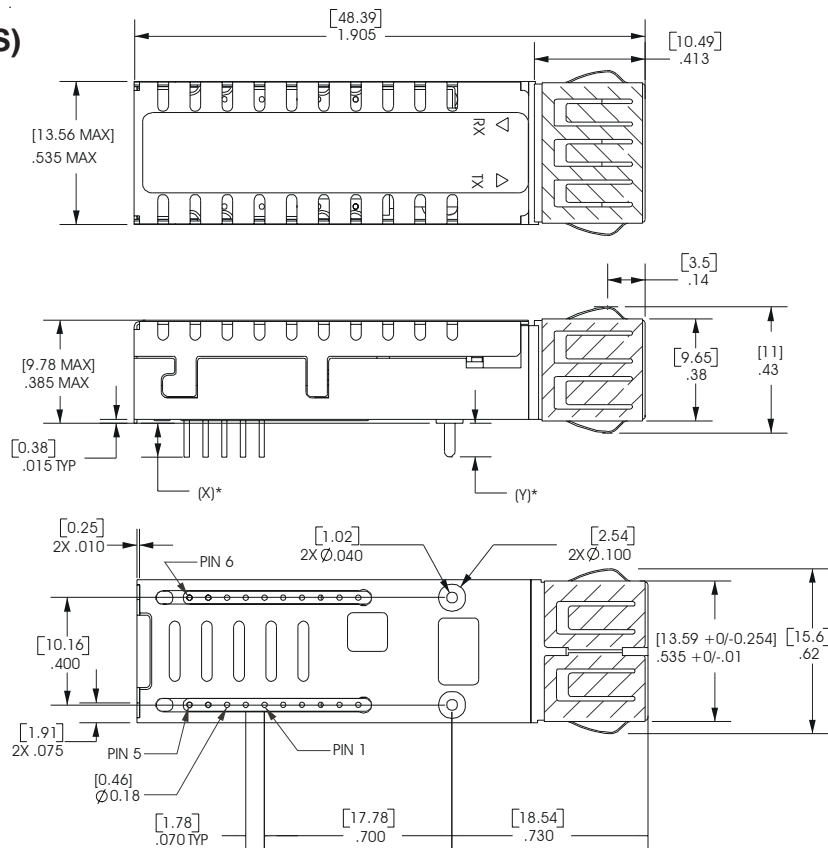
Package without EMI Shield (LC)



*(x) & (y): See Pin Length Option Table in Ordering Information

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

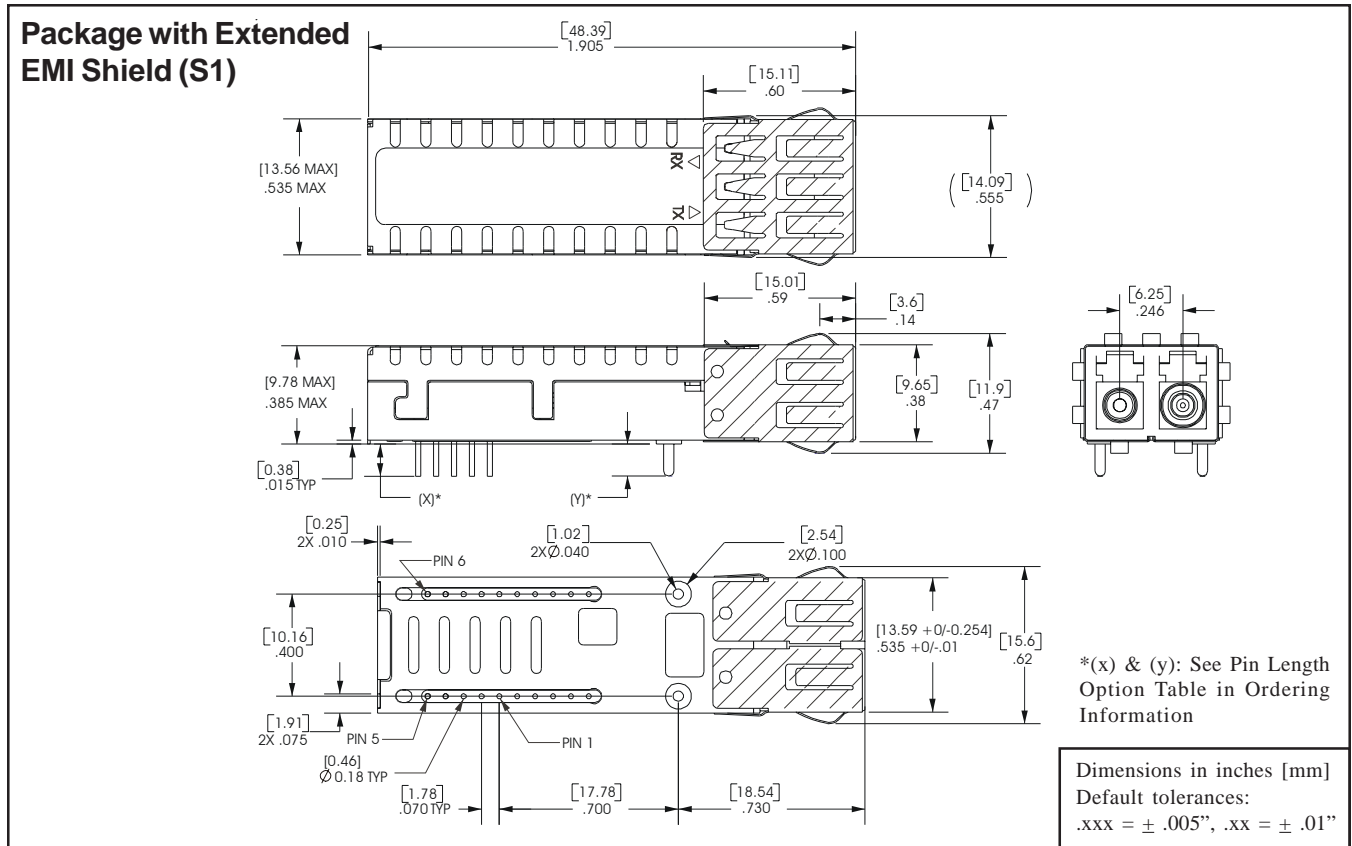
Package with EMI Shield (LS)



*(x) & (y): See Pin Length Option Table in Ordering Information

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

DTR-2488-SM-LC/LS-W-G



Ordering Information

DTR - 2488 - SM - Lx - T - Ln - DR - XX - Wp - G - S1

Connector
 LC : w/o EMI Shield
 LS : w/ EMI Shield
 or w/ Extended S1 Shield

Temperature Range
 "Blank" : -5°C to +70°C
 "A" : -40°C to +85°C (see Note 1)

Light Output Option
 L1 : -10 to -3dBm (SR-1)
 L0 : -5 to 0dBm (IR-1 & IR-2)
 HP : -2 to +3dBm (LR-1 & LR-2)

Receiver Coupling Option
 "Blank" : DC Coupling
 "AC" : AC Coupling

Distance Option (see Note 2)
 SR : SR-1/I-16 (12/2km)
 IR1 : IR-1/S-16.1 (21/15km)
 IR2 : IR-2/S-16.2 (42/15km)
 LR1 : LR-1/L-16.1 (40km)
 LR2 : LR-2/L-16.2 (80km)

Extended Shield
 "Blank" : None
 "S1" : Extended EMI Shield

see Pin Length Option Table

Pin Length Option Table

Options (p)	Pin Length (x)		Post Length (y)	
	Inches	Millimeters	Inches	Millimeters
"blank"	0.140 ± 0.010	3.56 ± 0.250	0.125 + 0.010 - 0.005	3.17 + 0.250 - 0.125
5	0.155 ± 0.010	3.94 ± 0.250	0.155 + 0.010 - 0.005	3.94 + 0.250 - 0.125
8	0.180 ± 0.010	4.57 ± 0.250	0.180 + 0.010 - 0.005	4.57 + 0.250 - 0.125

Note:
 1. Industrial temperature range, -40°C to +85°C, is only available for SR and IR modules.
 2. These are target distances to be used for classification and not for specification, per Telcordia GR-253-CORE/ITU-T Recommendation G.957.

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