



DTR-2488-SM

5 volt OC-48/STM-16 1x9 Single Mode Transceiver



Features

- ☑ Full Compliance with OC-48/STM-16 SONET/SDH Specifications
- ☑ Intermediate Reach & Short Reach
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Multi-sourced 1x9 package style
- ☑ Duplex SC or ST or FC connector
- ☑ Conductive plastic, Metalized plastic or Metal package
- ☑ Optional EMI shields included
- ☑ Compatible with PECL DATA interface (AC coupling option also available)
- ☑ TTL SIGNAL DETECT output
- ☑ 0°C to +70°C Operating Temperature
- ☑ Single +5 V supply
- ☑ Wave Solder Process Compatible

Description

The DTR-2488-SM 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. The Short Reach version uses a 1300 nm Fabry Perot Laser while the Intermediate Reach version uses a 1300 nm DFB Laser. 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 a one-row, 9-pin (1x9) package with a Duplex SC or ST or FC connector interface. The transmitter incorporates all the necessary control and driver circuit for converting differential data to light. The receiver uses an InGaAs/InP PIN photodiode 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 PECL signal levels. An alternate version with AC coupling interface is also available. A TTL Signal Detect function which indicates loss of optical input is also provided.

The transceiver operates from a single +5V power supply over an operating temperature range of 0°C to +70°C. The transceivers with duplex-SC interface are offered in two different packages: blue *conductive* plastic or metalized plastic. Options for septum (notch) design as well as three types of EMI shields for extra EMI protection are also available. The transceivers are also offered with FC and ST connector interface in a metal package.

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_{st}	- 40	+ 85	°C
Operating Temperature	T_{op}	0	+ 70	°C
Supply Voltage	V_{CC}	0	+ 6.0	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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Transmitter Electrical Interface (over Operating Case Temperature Range)

Input Voltage (between DATA+ & DATA -)	V_{IN}	0.30	0.80	1.60	Vp-p
Input impedance	Z_{IN}	-	50	-	ohm

Receiver Electrical Interface (over Operating Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output HIGH Voltage (PECL) ^{1,2}	V_{OH}	$V_{CC} - 1.10$	-	$V_{CC} - 0.90$	V
Output LOW Voltage (PECL) ^{1,2}	V_{OL}	$V_{CC} - 1.84$	-	$V_{CC} - 1.60$	V
Output HIGH Voltage (TTL)	V_{OH}	2.7	-	V_{CC}	
Output LOW Voltage (TTL)	V_{OL}	0	-	0.8	
Output Current	I_o	-	-	25	mA

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 1 V maximum single-ended.

Electrical Power Supply Characteristics (over Operating Case Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	V_{CC}	4.75	5.0	5.25	V
Supply Current ¹	DC-coupled module	I_{CC}	-	195	mA
	AC-coupled module	I_{CC}	-	220	mA

¹ Supply current does not include termination resistor current.

Application Notes

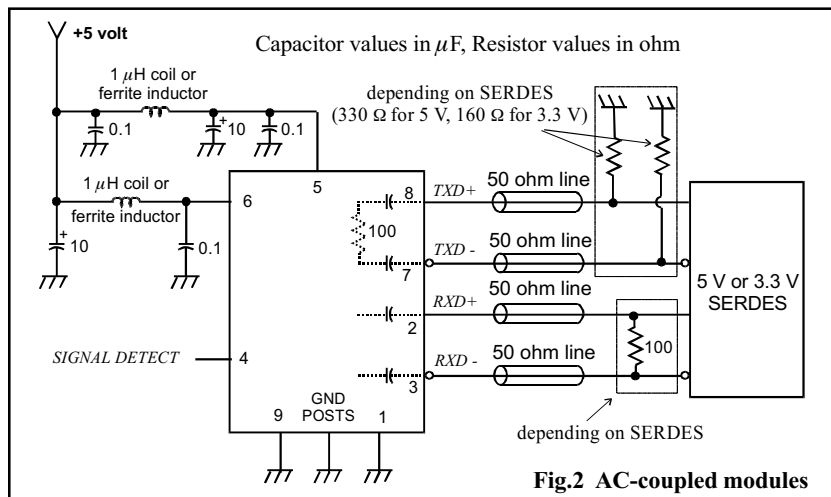
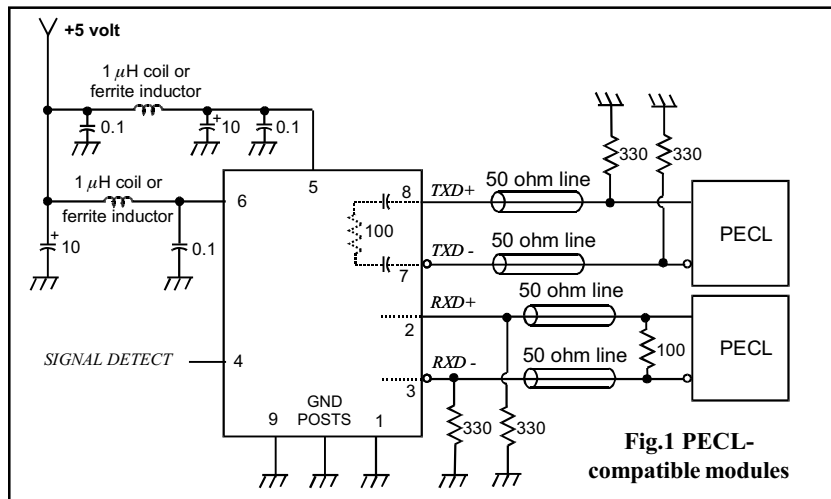
DATA interface (PECL-compatible modules): The Transmitter input has internal bias, 50 ohm termination and AC coupling capacitor. It can be driven from PECL signals as shown in Fig. 1. The Receiver output is direct-coupled PECL and needs to be terminated accordingly.

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). The SERDES can be 5 V or 3.3 V supply. For best performance, both DATA+ & DATA- should be used.

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

Power supply and grounding: The power supply line should be well-filtered. All 0.1 μ F power supply bypass capacitors should be as close to the DTR transceiver module as possible. For the conductive plastic modules, the two front GND posts (mounting studs) should be grounded to Chassis Ground for best EMI and ESD protection. If Chassis Ground is not available, they should be tied to Circuit Ground. In the case of the metalized plastic

modules, the two front GND posts should be used only as mechanical mounting posts. They may be connected to Chassis Ground or Circuit Ground.



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Transmitter Performance Characteristics (over Operating Case Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Data Rate	B	0.15	2.488	3.0	Gb/s
Average Optical Output Power (50% duty cycle)	L1	- 10.0	- 7.0	- 3.0	dBm
	L0	- 5.0	- 3.0	0	
Extinction Ratio	P_{hi}/P_{lo}	8.2	-	-	dB
Center Wavelength	SR (Short Reach)	1266	1310	1360	nm
	IR1 (Intermediate Reach 1310 nm)	1266	1310	1360	
Spectral Width (RMS)	SR (Short Reach)	$\Delta\lambda_{RMS}$	-	4.0	nm
Spectral Width (-20 dB)	IR1 (Intermediate Reach 1310 nm)	$\Delta\lambda_{20}$	-	1.0	
Side Mode Suppression Ratio	IR1 (Intermed Rch 1310 nm)	$SMSR$	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
Data Rate	B	0.15	2.488	3.0	Gb/s
Receiver Sensitivity (10^{-10} BER) ¹	P_{min}	- 18.0	- 21.0	-	dBm
Maximum Input Optical Power (10^{-10} BER) ¹	SR (Short Reach)	- 3.0	- 1.0	-	dBm
	IR (Intermediate Reach)	0	1.0	-	
Signal Detect Thresholds	Increasing Light Input	P_{sd+}	-	- 19.0	dBm
	Decreasing Light Input	P_{sd-}	- 35.0	-	
Signal Detect Hysteresis	-	-	0.5	-	dB
Wavelength of Operation	λ	1100	-	1600	nm

¹ Specified in Average Optical Input Power and measured at 2.488 Gb/s and 1300 nm wavelength with $2^{23}-1$ PRBS.

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

ST & FC Receptacle Package

(see separate data sheet for 1x9 metal package outline)

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DATE OF MANUFACTURE:

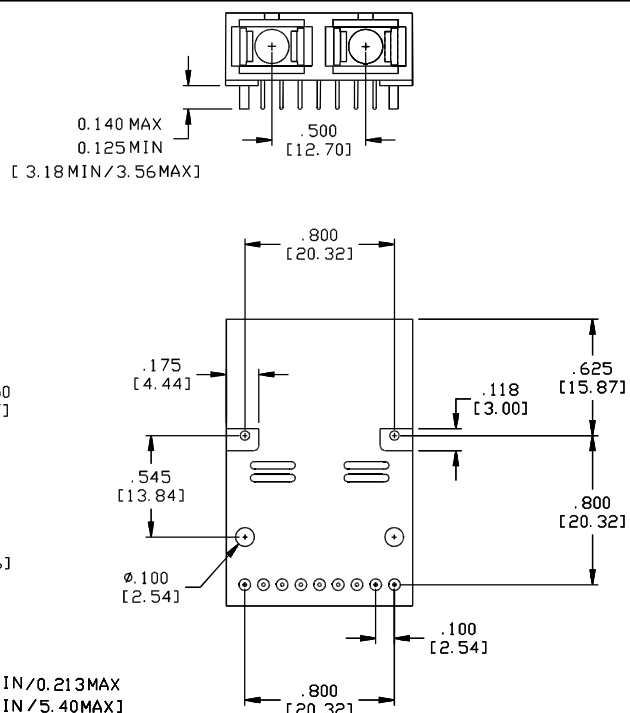
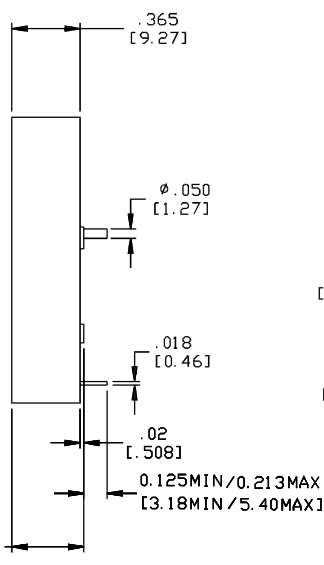
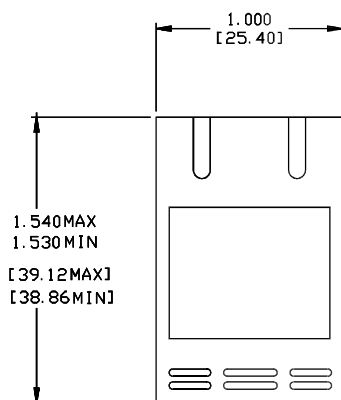
MANUFACTURED IN THE USA

This product complies with
21 CFR 1040.10 and 1040.11

Meets Class I Laser Safety Requirements

Duplex SC Receptacle Package

(see separate 1x9 SC Shield data sheet for package outline with EMI shields)

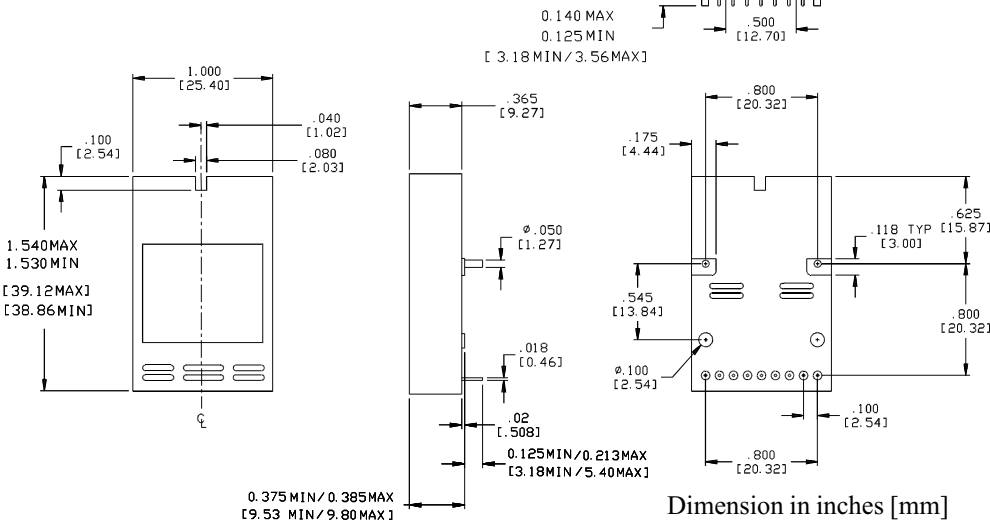


Dimension in inches [mm]

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Duplex SC Receptacle Package with septum (notch)

(see separate 1x9 SC Shield data sheet for package outline with EMI shields)



Pin Assignments

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

Ordering Information

SR 1310 nm / I-16.1 standard (2 km *)

IR 1310 nm / S-16.1 standard (15 km *)

MODEL NAME	Septum	EMI Shield	Package
DTR-2488-SM-L1-SR	NO	NO	Conductive Plastic Package with Duplex SC connector
DTR-2488-SM-ES-L1-SR	NO	YES (ES)	
DTR-2488-SM-EI-L1-SR	NO	YES (EI)	
DTR-2488-SM-EN-L1-SR	NO	YES (EN)	
DTR-2488-SM-S0-L1-SR	YES	NO	
DTR-2488-SM-SS-L1-SR	YES	YES (SS)	
DTR-2488-SM-SN-L1-SR	YES	YES (SN)	
DTR-2488-SM-L1-SR-M	NO	NO	Metalized Plastic Package with Duplex SC connector
DTR-2488-SM-ES-L1-SR-M	NO	YES (ES)	
DTR-2488-SM-EI-L1-SR-M	NO	YES (EI)	
DTR-2488-SM-EN-L1-SR-M	NO	YES (EN)	
DTR-2488-SM-S0-L1-SR-M	YES	NO	
DTR-2488-SM-SS-L1-SR-M	YES	YES (SS)	
DTR-2488-SM-SN-L1-SR-M	YES	YES (SN)	

MODEL NAME	Septum	EMI Shield	Package
DTR-2488-SM-L0-IR1	NO	NO	Conductive Plastic Package with Duplex SC connector
DTR-2488-SM-ES-L0-IR1	NO	YES (ES)	
DTR-2488-SM-EI-L0-IR1	NO	YES (EI)	
DTR-2488-SM-EN-L0-IR1	NO	YES (EN)	
DTR-2488-SM-S0-L0-IR1	YES	NO	
DTR-2488-SM-SS-L0-IR1	YES	YES (SS)	
DTR-2488-SM-SN-L0-IR1	YES	YES (SN)	
DTR-2488-SM-L0-IR1-M	NO	NO	Metalized Plastic Package with Duplex SC connector
DTR-2488-SM-ES-L0-IR1-M	NO	YES (ES)	
DTR-2488-SM-EI-L0-IR1-M	NO	YES (EI)	
DTR-2488-SM-EN-L0-IR1-M	NO	YES (EN)	
DTR-2488-SM-S0-L0-IR1-M	YES	NO	
DTR-2488-SM-SS-L0-IR1-M	YES	YES (SS)	
DTR-2488-SM-SN-L0-IR1-M	YES	YES (SN)	

MODEL NAME	Package
DTR-2488-SM-ST-L1-SR	Metal package with ST connector
DTR-2488-SM-FC-L1-SR	Metal package with FC connector

MODEL NAME	Package
DTR-2488-SM-ST-L0-IR1	Metal package with ST connector
DTR-2488-SM-FC-L0-IR1	Metal package with FC connector

The above Model Names are for PECL-compatible modules.

For AC-coupled modules, please add suffix "AC" to the above Model Names ("AC" goes before "M" for Metalized Plastic).

For example, the AC-coupled version of DTR-2488-SM-L1-SR is DTR-2488-SM-L1-SR-AC

the AC-coupled version of DTR-2488-SM-L1-SR-M is DTR-2488-SM-L1-SR-AC-M

* These are target distances to be used for classification and not for specification, per ITU-T Recommendation G.957

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