DTC-48

OC-48/STM-16 Single Mode Transceiver with Clock Recovery

Features

- ☑ *Full Compliance with OC-48/STM-16 SONET/SDH Specifications, including Jitter Tolerance & Transfer Function*
- ☑ *Intermediate Reach & Short Reach*
- ☑ *Eye Safe (Class I Laser Safety)*
- ☑ *No external Clock required*
- ☑ *Multi-sourced 2x9 package style*
- ☑ *Duplex SC or ST or FC connector*
- ☑ *0°C to +70°C Operating Temperature*
- ☑ *Single +5 V supply*
- ☑ *Wave Solder Process Compatible*

Description

The DTC-48 fiber optic transceivers with clock recovery 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 including Clock Jitter Tolerance and Transfer Function. 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 two-row, 18-pin (2x9) 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 signals to light. A Transmitter Disable input and differential Laser Facet and Bias Monitor outputs are provided. The receiver uses an InGaAs/InP PIN photodiode to convert the light signal into an electrical current which is amplified and resampled using internal clock recovery (PLL) to generate output data and clock. A Signal Detect function which indicates loss of optical input is also provided.

The DTC-48 transceiver operates from a single +5V power supply over an operating temperature range of 0°C to +70°C. The transceiver package is made of either *conductive* plastic (Duplex-SC version) or metal (FC and ST version) for good EMI shielding.

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
Lead Soldering Temperature & Time	-	-	260°C, 10 sec	

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Transmitter Performance Characteristics (over Operating Case Temperature Range)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Data Rate		B	0.1	2.488	3.0	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	
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	
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	2.48832 - 500 ppm	2.48832	2.48832 + 500 ppm	Gb/s
Receiver Sensitivity (10^{-10} BER) [1]		P_{min}	- 19.0	- 22.0	-	dBm
Maximum Input Optical Power (10^{-10} BER) [1]	SR (Short Reach)	P_{max}	- 3.0	- 1.0	-	dBm
	IR (Intermediate Reach)		0	2.0	-	
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
Clock Sampling Point		T_{CSP}	110	200	290	ps
Output Clock Jitter		CLK_J	-	-	0.01	UIrms
Jitter Tolerance & Transfer Function		compliant with ITU Recommendation G.958				

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

Transmitter Electrical Interface

Parameter		Symbol	Minimum	Typical	Maximum	Units
Supply Voltage		V_{CC}	4.75	5.0	5.25	V
Supply Current		I	-	150	200	mA
Input Voltage (between DATA+ & DATA -)		V_{IN}	0.25	0.80	1.00	Vp-p
Transmitter Disable Voltage		V_{DIS}	V_{CC} - 2.0	-	V_{CC}	V
Transmitter Enable Voltage		V_{EN}	0	-	0.6	V
Differential Bias Monitor Voltage	at 25°C	$V_{BM,DIF}$	-	100	200	mV
	at 70°C		-	300	500	
Differential Back Facet Monitor Voltage		$V_{FM,DIF}$	15	150	325	mV

Receiver Electrical Interface

Parameter		Symbol	Minimum	Typical	Maximum	Units
Supply Voltage		V_{CC}	4.75	5.0	5.25	V
Supply Current		I	-	300	350	mA
Output Voltage Swing	DATA	V_{PP}	0.4	0.5	0.8	V
	CLOCK		0.35	0.45	0.8	
Output HIGH Voltage (SIGNAL DETECT)		V_{OH}	2.7	-	V_{CC}	V
Output LOW Voltage (SIGNAL DETECT)		V_{OL}	0	-	0.7	V

Application Notes

Transmitter: When the DATA+ input is at logic HIGH and DATA- input is at logic LOW (DATA+ voltage is higher than DATA- voltage by 0.25 V), the LD is ON; and vice versa. The transmitter is normally enabled (i.e. when the TX DISABLE control input is not connected). When the TX DISABLE input voltage is higher than V_{CC} - 2 V, the laser is disabled (less than -30dBm output power) independent of the input data.

The transmitter incorporates an Average Power Control (APC) loop to stabilize the transmitter average optical output power against temperature variation. The APC loop always acts to keep the transmitter average optical output power at a constant value (when the transmitter is enabled). Therefore, when the input data is all continuous "zeroes" or all continuous "ones", the transmitter optical output power is a constant level equal to the nominal average optical output power (not at the "OFF" level or at the "ON" level).

Receiver: The Signal Detect circuit monitors the level of the incoming optical signal and generates a TTL logic LOW signal at the SIGNAL DETECT output when insufficient photocurrent is produced.

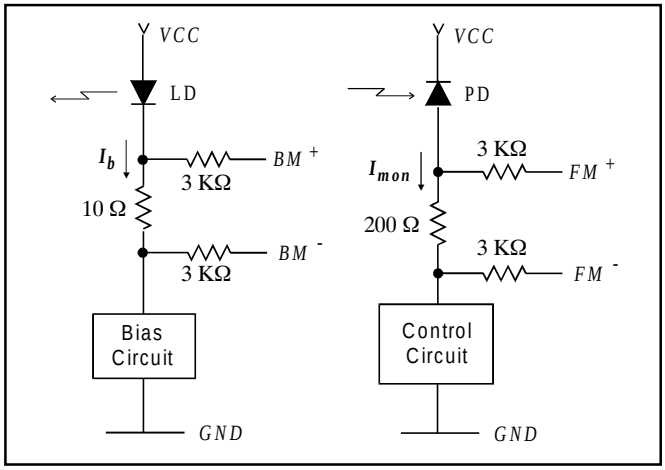
Interface circuit: The power supply line should be well-filtered. All 0.01 μF power supply bypass capacitors should be as close to the DTC-48 transceiver module as possible. The two front GND posts should be grounded to Circuit Ground or Chassis Ground.

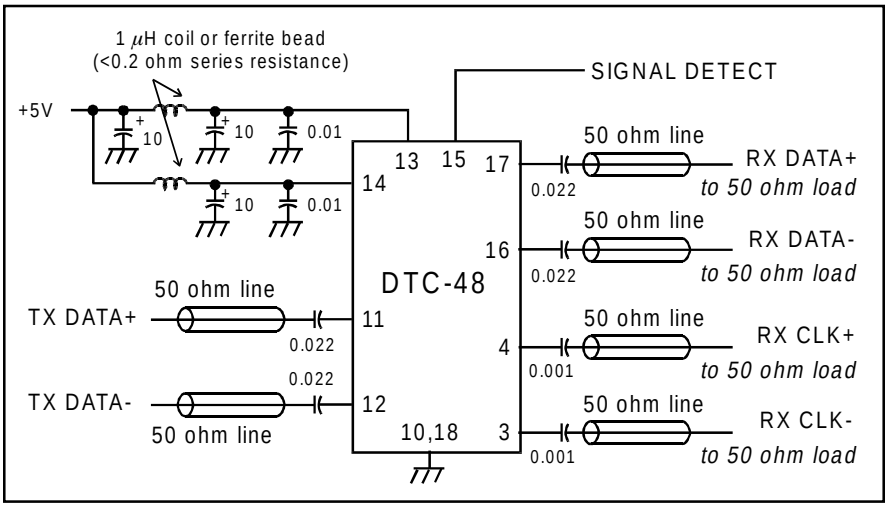
The transmitter input stage has internal 50 ohm termination. The DATA input interface is via AC coupling as shown. In single-ended applications, the unused DATA input pin should be bypassed to AC Ground.

Both DATA and CLOCK outputs are differential signals designed to be AC-coupled into 50 ohm load. No termination resistor is required for the SIGNAL DETECT output. The load impedance of the SIGNAL DETECT output should be 10 Kohm or more.

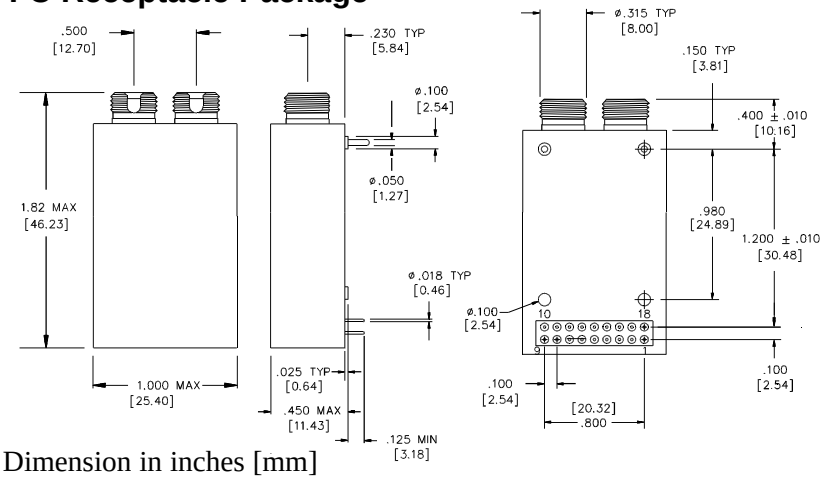
Transmission lines with 50 ohm characteristic impedance are recommended for all DATA and CLOCK interface lines to obtain best performance. The use of both differential inputs and outputs are strongly recommended. If single-ended output is used, the other unused output should be properly terminated into 50 ohm load.

Laser Bias & Facet Monitor Circuits



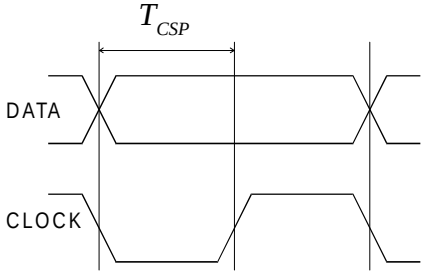


FC Receptacle Package



Dimension in inches [mm]

RECEIVER
DATA & CLOCK Timing



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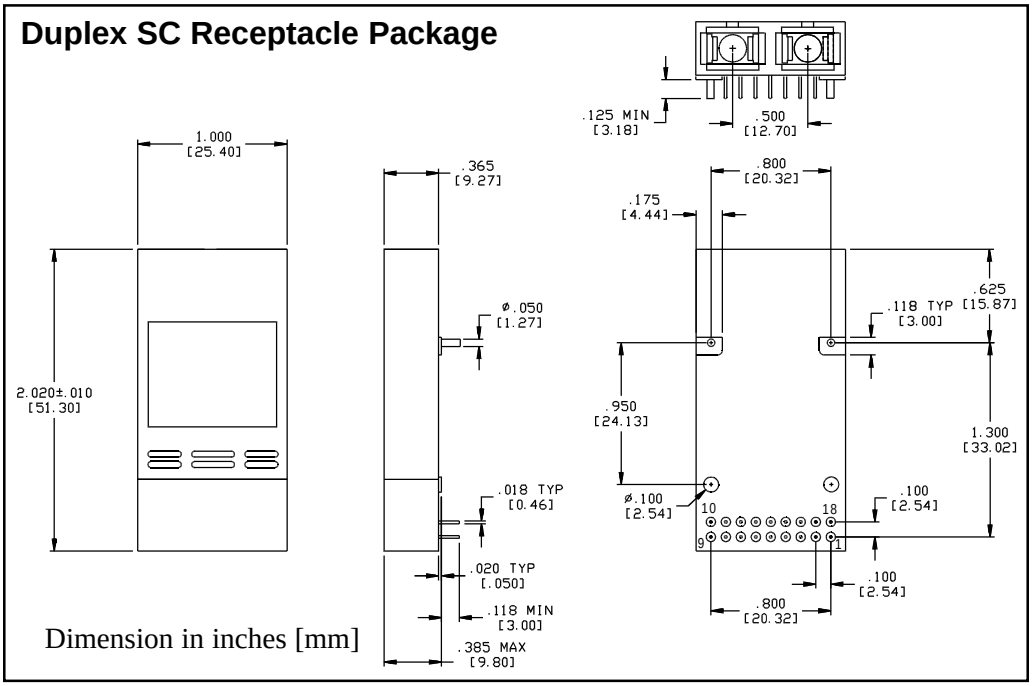
Duplex SC Receptacle Package

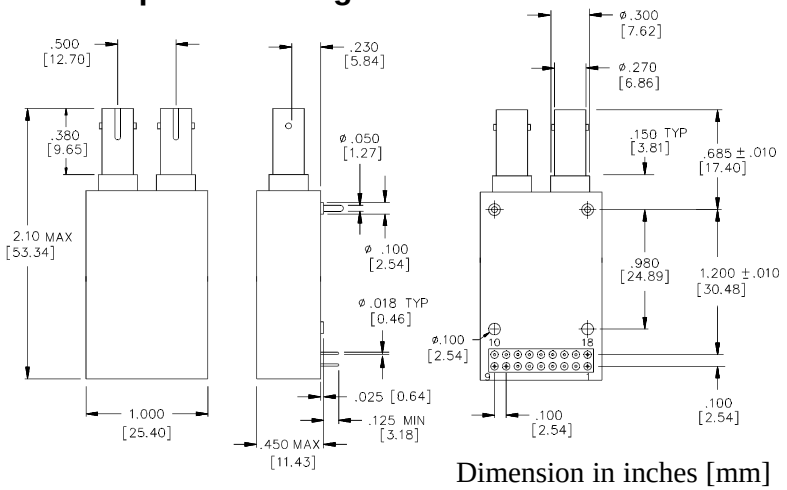


Dimension in inches [mm]

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

ST Receptacle Package



Dimension in inches [mm]

PIN	FUNCTION	PIN	FUNCTION
1	N/C	10	TX GND
2	N/C	11	TD+ (TX DATA IN +)
3	CLOCK -	12	TD- (TX DATA IN -)
4	CLOCK +	13	V_{CC}TX
5	BM- (BIAS MONITOR -)	14	V_{CC}RX
6	BM+ (BIAS MONITOR +)	15	SD (RX SIGNAL DETECT)
7	TX DISABLE	16	RD- (RX DATA OUT -)
8	FM+ (FACET MONITOR +)	17	RD+ (RX DATA OUT +)
9	FM- (FACET MONITOR -)	18	RX GND

Related OC-48/STM-16 Transceiver, Transmitter & Receiver Modules

DTR-2488-SM & DTR-2488-SM2 : Transceiver without Clock Recovery (industry standard 1x9 & 2x9 package)

STX/SRX/SRC-48: Transmitter, Receiver without Clock Recovery & Receiver with Clock Recovery (24-pin DIP package)

Ordering Information

DTC - 48 - *YY* - *Ln* - *DRn*

Receptacle
- Blank : SC Receptacle
- ST : ST Receptacle
- FC : FC Receptacle

Light Output Power
- L1: - 7 dBm (typ.)
- L0: - 3 dBm (typ.)

Distance Option
- SR : Short Reach (“L1” only)
- IR1 : Intermediate Reach (“L0” only)

NOTES

1. For full compliance with OC-48/STM-16 Short Reach, the DTC-48-*YY*-L1-SR module are recommended.
2. For full compliance with OC-48/STM-16 Intermediate Reach/S-16.1 standard, the DTC-48-*YY*-L0-IR1 modules are recommended.

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4-30-99

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