DTC-03

OC-3/STM-1 Single Mode Transceiver with Clock Recovery

Features

- ☑ *Full Compliance with OC-3/STM-1 SONET/SDH Specifications*
- ☑ *Long Reach 1310 nm & 1550 nm as well as Intermediate Reach*
- ☑ *Eye Safe (Class I Laser Safety)*
- ☑ *Multi-sourced 2x9 package style*
- ☑ *Duplex SC or ST or FC connector*
- ☑ *- 40°C to +85°C Operating Temperature ("A" option)*
- ☑ *Single +5 V supply & PECL interface*
- ☑ *Wave Solder Process Compatible*

Description

The DTC-03 fiber optic transceivers with clock recovery offer a simple, convenient way to interface SONET/SDH OC-3/STM-1 PCBs to single mode fiber optic cables. Both Long Reach (1300 nm or 1550 nm) and Intermediate Reach versions are available. 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 a highly reliable 1300 nm or 1550 nm InGaAsP Laser and a driver circuit which converts PECL data to light. The receiver incorporates efficient 1300 nm InGaAs/InP PIN photodiodes converting the light signal into an electrical current which is amplified and resampled using internal clock recovery (PLL) to generate PECL-compatible data and clock. The transimpedance amplifier IC has an internal AGC for wide dynamic range.

The transceiver operates from a single +5V supply over an operating temperature range of 0°C to +70°C ("B" option) or - 40°C to +85°C ("A" option). The package is made of either *conductive* plastic with blue color (Duplex-SC version) or metal (FC and ST version) for excellent EMI shielding.

Related OC-3 tranceivers

DTR-156-SM: 1x9 Transceiver without Clock Recovery, 5 V supply

DTR-156-SM2: 2x9 Transceiver without Clock Recovery, 5 V supply

DTR-156-3.3-SM: 1x9 Transceiver without Clock Recovery, 3.3 V

DTR-156-3.3-SM2: 2x9 Transceiver without Clock Recovery, 3.3 V

DTC-03-3.3: 2x9 Transceiver with Clock Recovery, 3.3 V

Absolute Maximum Ratings

Parameter		Symbol	Minimum	Maximum	Units
Storage Temperature		T_{st}	- 40	+ 85	°C
Operating Temperature	"A" option	T_{op}	- 40	+ 85	°C
	"B" option		0	+ 70	
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	

Transmitter Performance Characteristics (over Operating Case Temperature Range)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Data Rate		B	155	155.52	156	Mb/s
Average Optical Output Power (coupled into single mode fiber), 50% duty cycle	L0	P_o	- 5.0	- 3.0	0	dBm
	L1		- 8.0	- 5.0	- 2.0	
	L2		- 12.0	- 8.0	- 5.0	
	L3		- 15.0	- 11.0	- 8.0	
Extinction Ratio		P_{hi}/P_{lo}	10	-	-	dB
Center Wavelength	IR (Intermediate Reach)	λ_c	1261	1310	1360	nm
	LR1 (Long Reach 1310 nm)		1280	1310	1335	
	LR2 (Long Reach 1550 nm)		1480	1550	1580	
Spectral Width (RMS)	LR1 (0°C to 70°C) & IR	$\Delta\lambda_{RMS}$	-	-	4	nm
Spectral Width (-20 dB)	LR1 (-40°C to 85°C) & LR2	$\Delta\lambda_{20}$	-	-	1	
Optical Rise and Fall Time (10% to 90%)		t_r, t_f	-	1	2	ns
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	155	155.52	156	Mb/s
Receiver Sensitivity (10^{-10} BER) [1]		P_{min}	- 34.0	- 36.0	-	dBm
Maximum Input Optical Power (10^{-10} BER) [1]		P_{max}	- 7.0	0	-	dBm
Signal Detect Thresholds	Increasing Light Input	P_{sd+}	-	-	- 34.0	dBm
	Decreasing Light Input	P_{sd-}	- 45.0	-	-	dBm
Signal Detect Hysteresis		-	-	0.5	-	dB
Wavelength of Operation		λ	1100	-	1600	nm
Output Clock Jitter		CLK_J	-	-	0.01	Ulrms
Jitter Tolerance & Transfer Function		compliant with ITU Recommendation G.958				

[1] Specified in Average Optical Input Power and measured at 1300 nm wavelength (1550 nm for LR2 option) with 2^{23}-1 PRBS.

Transmitter Electrical Interface (over Operating Case Temperature Range)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Input HIGH Voltage		V_{IH}	V_{CC} - 1.165	-	V_{CC} - 0.700	V
Input LOW Voltage		V_{IL}	V_{CC} - 1.890	-	V_{CC} - 1.475	V
Data Input Current - HIGH		I_H	-	-	350	μA
Data Input Current - LOW		I_L	-	-	250	μA
Transmitter Disable Voltage		V_{DIS}	V_{CC} - 2.0	-	V_{CC}	V
Transmitter Enable Voltage		V_{EN}	0	-	0.8	V
Transmitter End-of-Life Alarm	Normal Operation	V_{NO}	0	-	0.8	V
	End-of-Life	V_{EOL}	V_{CC} - 0.5	-	V_{CC}	V
Differential Bias Monitor Voltage (T_a = 25°C)		V_{BM+} - V_{BM-}	0.02	-	0.12	V
Back Facet Monitor Voltage (T_a = 25°C) [1]		V_{FM}	0.4	-	2.8	V

[1] For manufacturing purposes.

Receiver Electrical Interface (over Operating Case Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output HIGH Voltage (DATA & CLOCK)	V_{OH}	V_{CC} - 1.200	-	V_{CC} - 0.700	V
Output LOW Voltage (DATA & CLOCK)	V_{OL}	V_{CC} - 2.000	-	V_{CC} - 1.620	V
Output Current	I_O	-	-	25	mA
SIGNAL DETECT Ouput HIGH Voltage	V_{OH}	2.7	-	V_{CC}	V
SIGNAL DETECT Ouput LOW Voltage	V_{OL}	0	-	0.50	V

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	TX	Fabry Perot lasers	I_{CC}	-	100	130	mA
		DFB lasers		-	120	150	
	RX		I_{CC}	-	80	100	mA

Application Notes

Transmitter: When the DATA+ input is at logic HIGH and DATA- input is at logic LOW, the LD is ON; and vice versa. In single-ended applications, the unused input pin should be biased to V_{CC} - 1.29 V. The transmitter is normally enabled (i.e. when the TX DISABLE input is not connected). When the TX DISABLE input voltage is higher than V_{CC} - 2 V, the laser is turned off independent of the input data. A Transmitter End-of-Life Alarm (T_{ALM}) is also provided, which will switch to TTL level HIGH when the laser is reaching its End-of-Life.

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 (assuming that 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).

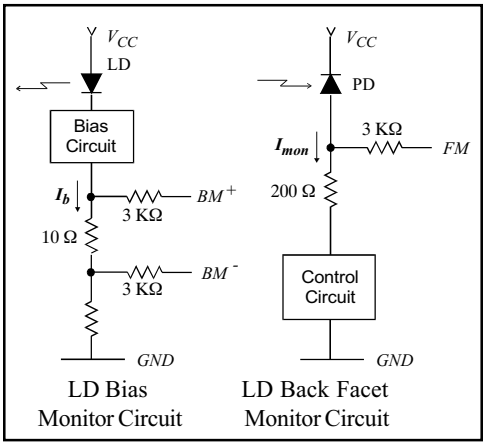
Receiver: Both differential outputs (DATA+ and DATA-, CLOCK+ and CLOCK-) are PECL levels requiring termination (50 ohms to V_{CC} - 2 volts or 510 ohms to *GND* is recommended). For optimum performance, both outputs should be terminated in the same manner, even if only one is used. The Signal Detect circuit monitors the level of the incoming optical signal and generates a TTL logic LOW signal when insufficient photocurrent is produced.

Interface circuit: The power supply line should be well-filtered. All 0.1 μF power supply bypass capacitors should be as close to the DTC transceiver module as possible. The two front GND posts should be grounded to Circuit Ground or Chassis Ground.

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

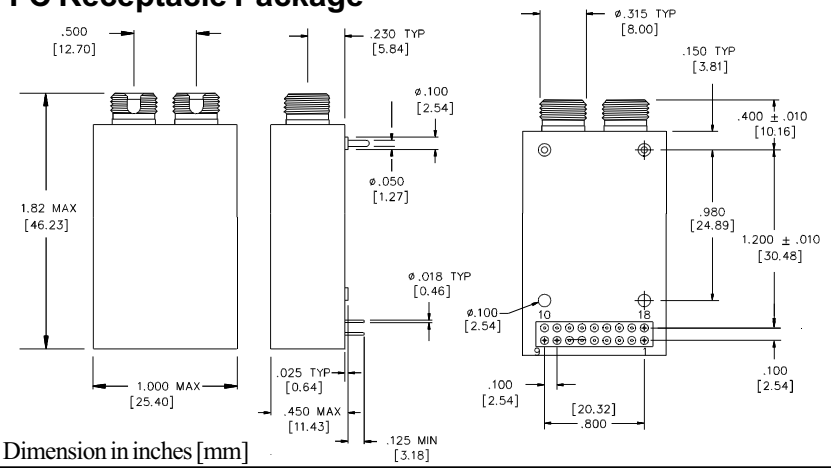
Optical Communication Products, Inc.
DATE OF MANUFACTURE:

MANUFACTURED IN THE USA
This product complies with
21 CFR 1040.10 and 1040.11
Meets Class I Laser Safety Requirements



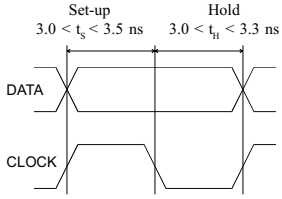
LD Bias Monitor Circuit | LD Back Facet Monitor Circuit

FC Receptacle Package



Dimension in inches [mm]

DATA & CLOCK Timing



Note: If the opposite timing (rising edge of CLOCK) is required, please use the DTC-03-H transceivers.

21737-0350, Rev. G
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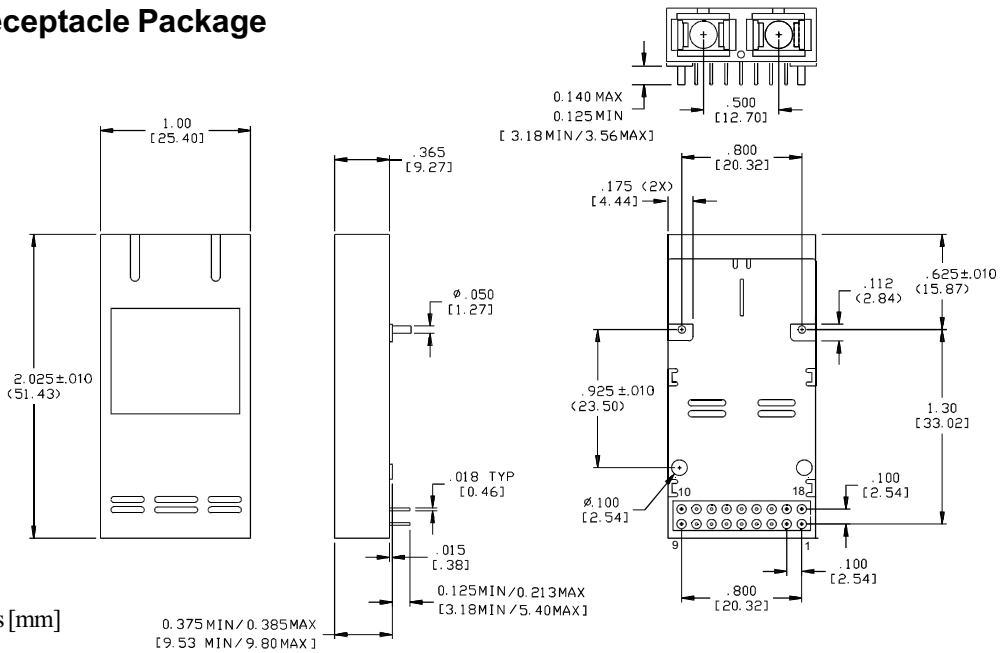
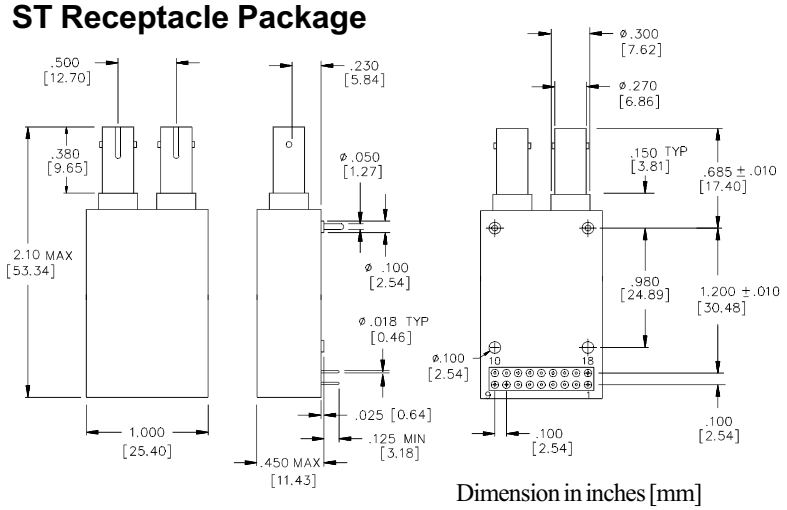
DTC-03

Duplex SC Receptacle Package



Dimension in inches [mm]

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	T_{ALM} (TX ALARM)	17	RD+ (RX DATA OUT +)
9	FACET MONITOR	18	RX GND

Ordering Information

DTC - 03 - *XX -T- Ln - DR*

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

Temperature Range
A: - 40°C to +85°C
B: 0°C to +70°C

Light Output Option
L0: - 3 dBm (typ.)
L1: - 5 dBm (typ.)
L2: - 8 dBm (typ.)
L3: - 11 dBm (typ.)

Distance Option
specifies the range for Center Wavelength & Spectral Width to be compliant with SONET/SDH standard
Blank: Intermediate Reach / S-1.1
LR1 : Long Reach 1310 nm / L-1.1
LR2 : Long Reach 1550 nm / L-1.2

NOTES

1. The DTC-03-*xx*-A-L3 & DTC-03-*xx*-B-L3 modules are fully compliant with OC-3/STM-1 Intermediate Reach / S-1.1 standard.
2. The DTC-03-*xx*-A-L0-LR1 & DTC-03-*xx*-B-L0-LR1 modules are fully compliant with OC-3/STM-1 Long Reach 1310 nm / L-1.1 standard. The DTC-03-*xx*-A-L0-LR1 uses a DFB laser to satisfy the - 40°C to +85°C requirement for Center Wavelength.
3. The DTC-03-*xx*-A-L0-LR2 & DTC-03-*xx*-B-L0-LR2 are fully compliant with OC-3/STM-1 Long Reach 1550 nm / L-1.2 standard. Both modules use DFB lasers. However, the DTC-03-*xx*-A-L0-LR2 is specified only over - 25°C to +70°C.
4. The LR1 (- 40°C to +85°C) & LR2 options are available only with DFB lasers and L0 optical output power level.

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