

# OC-48/STM-16 TRANSMITTER

## STX48 Series

### Product Description

The STX48 modules are laser transmitters designed to meet or exceed the SONET/SDH optical interface requirements at OC-48/STM-16 (2.5 Gb/s) data rate. Many performance versions are available which are fully compliant with Short Reach, Intermediate Reach and Long Reach specifications at 1310 nm or 1550 nm wavelength. The Short Reach version uses uncooled Fabry Perot lasers while the Intermediate Reach version uses uncooled DFB lasers. For the Long Reach version, uncooled DFB lasers with internal optical isolators are used. All modules satisfy Class I Laser Safety requirements in accordance with the US FDA/CDRH and international IEC-825 standards.

The transmitter incorporates an Automatic Power Control (APC) circuit to maintain the optical output power at a constant level against variations in ambient temperature and device aging. It also features a Mode Selector input pin which selects between clocked and non-clocked operation. In the clocked operation mode, the input DATA is resynchronized by the input CLOCK before driving the laser diode in order to reduce output jitter to a minimum. A Transmitter Disable control input is also provided. Both the laser bias current and back-facet light output can be monitored as well.

All STX48 transmitter modules are available in two power supply options: single +5V and single -5 V. The DATA and CLOCK interface can either be direct PECL/ECL or via AC coupling. The operating temperature range is -40°C to +85°C for the Short Reach and Intermediate Reach 1310 nm version and 0°C to +70°C for the Long Reach version. All modules are housed in a 24-pin dual-in-line metal package with a single mode fiber pigtail, which is terminated with ST, FC or SC connector.



### Features

- ☑ Fully compliant with SONET/SDH OC-48/ STM-16 (2.5 Gb/s) specifications
- ☑ Long Reach 1310 nm & 1550 nm as well as Intermediate Reach and Short Reach
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Mode Selector switch between Clocked or Non-clocked operation
- ☑ -40°C to +85°C Operating Temperature (Intermediate Reach and Short Reach)
- ☑ 24-pin DIP metal package
- ☑ FC, ST, SC-connectorized fiber pigtails
- ☑ Differential PECL DATA & CLOCK interface
- ☑ Single +5 V and - 5 V supply option

### Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	$T_{ST}$	- 40	+ 85	°C
Operating Case Temperature <sup>1</sup>	"l" option (SR & IR only)	- 40	+ 85	°C
	"H" option	0	+ 70	
Supply Voltage	$V_{CC} - V_{EE}$	0	+ 6.0	V
Input Voltage	$V_{IN} - V_{EE}$	$V_{EE}$	$V_{CC} - V_{EE}$	V
Lead Soldering Temperature & Time	-	-	260°C, 10 sec	

**Transmitter Performance Characteristics** (Over Operating Case Temperature.)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Data Rate		$B$	0.05	2.5	3.0	Gb/s
Average Optical Output Power (50% duty cycle)		$P_o$	- 10.0	- 7.0	- 3.0	dBm
			- 5.0	- 3.0	0	
			- 2.0	0	3.0	
Extinction Ratio		$P_{hi} / P_{lo}$	8.2	-	-	dB
Center Wavelength	Short Reach (SR)	$\lambda_c$	1266	1310	1360	nm
	Intermediate Reach (IR)		1266	1310	1360	
	Long Reach (LR) 1310 nm		1280	1310	1335	
	Long Reach (LR) 1550 nm		1500	1550	1580	
Spectral Width (RMS)	Short Reach	$\Delta\lambda_{RMS}$	-	-	4.0	nm
Spectral Width (-20 dB)	Intermediate Reach & Long Reach	$\Delta\lambda_{20}$	-	-	1.0	
Side Mode Suppression Ratio	Intermediate Reach & Long Reach	$SMSR$	30	-	-	dB
Transmitter Output Eye		Compliant with Bellcore TR-NWT-000253 and ITU-T Recommendation G.957				

**Receiver Electrical Interface**

Parameter		Symbol	Minimum	Typical	Maximum	Units
Supply Voltage <sup>1</sup>		$V_{CC} - V_{EE}$	4.75	5.0	5.25	V
Supply Current		$I$	-	200	300	mA
Input HIGH Voltage (DATA & CLOCK, PECL)		$V_{IH}$	$V_{CC} - 1.165$	-	$V_{CC} - 0.880$	V
Input LOW Voltage (DATA & CLOCK, PECL)		$V_{IL}$	$V_{CC} - 1.810$	-	$V_{CC} - 1.475$	V
Input Voltage (DATA & CLOCK, PECL)		$V_{IN}$	0.30	0.80	1.00	Vp-p
Input DATA & CLOCK timing		$T_{DC}$	200	-	300	ps
MODE SELECTOR Input Voltage	Clocked	$V_{MSCK}$	$V_{EE}$	-	$V_{EE} + 1.5$	V
	Non-Clocked	$V_{MSNCK}$	$V_{CC} - 1.5$	-	$V_{CC}$	V
Transmitter Disable Voltage		$V_{DIS}$	$V_{CC} - 2.0$	-	$V_{CC}$	V
Transmitter Enable Voltage		$V_{EN}$	$V_{EE}$	-	$V_{EE} + 0.6$	V
LD Bias Alarm Output Voltage	HIGH Voltage	$V_{ALMH}$	$V_{CC}$	-	$V_{EE} V_{CC}$	V
	LOS Voltage	$V_{ALML}$	$V_{EE} - 1.0$	-	$V_{EE} + 0.5$	V
Differential Bias Monitor Voltage	at 25	$V_{BM, DIF}$	-	100	200	mV
	Decreasing Light Input		-	300	500	
Differential Back Facet Monitor Voltage		$V_{FM, DIF}$	10	100	250	mV

<sup>1</sup> For +5V single supply modules, connect VCC to +5V and VEE to 0V or GND (circuit ground). The package housing is internally connected to VEE. For - 5V single supply modules, connect VCC to 0V or GND (circuit ground) and VEE to - 5V. The package housing is internally connected to VCC.

**Related OC-48/STM-16 Transceiver & Receiver Modules**

- SRX-48 : Receiver without Clock Recovery (24-pin DIP)
- SRC-48 : Receiver with Clock Recovery (24-pin DIP)
- DTR-2488-SM : Transceiver without Clock Recovery (industry standard 1x9 package)
- DTR-2488-SM2 : Transceiver without Clock Recovery (industry standard 2x9 package)
- DTC-48 : Transceiver with Clock Recovery (industry standard 2x9 package)

**Application Notes**

When the DATA+ input is at logic HIGH and DATA- input is at logic LOW, 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  $V_{CC} - 2V$ , the laser is disabled (less than -30dBm output power) independent of the input data.

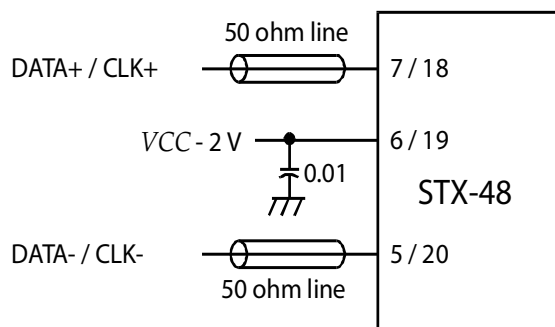
The transmitter incorporates an Average Power Control (APC) loop to stabilize the transmitter average optical output power against temperature variation. The APC loop always acts to keep the transmitter average optical output power at a constant value (when the transmitter is enabled). Therefore, when 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).

When the MODE SELECTOR input is left unconnected or at logic "LOW" ( $V_{EE}$  to  $V_{EE} + 1.5V$ ), the transmitter is in clocked

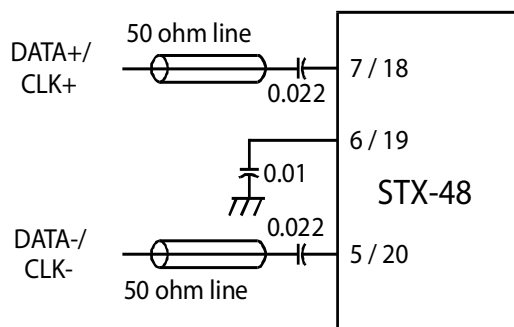
operation mode. In this mode, the input clock resynchronizes the incoming data to reduce timing jitter. The timing between the DATA and CLOCK inputs is as shown below. When the MODE SELECTOR input at logic "HIGH" ( $V_{CC} - 1.5V$  to  $V_{CC}$ ), the transmitter is in non-clocked operation mode. In this mode, the CLOCK inputs are not used and hence need not be provided.

The transmitter has internal 50 ohm termination to  $V_{TD}$  (pin 6) for DATA inputs &  $V_{TC}$  (pin 19) for CLOCK inputs. The DATA & CLOCK interface can be either direct PECL/ECL coupling or via AC coupling as shown below. The use of differential signals is strongly recommended. In cases where only single-ended signal is available, the unused DATA input pin should be biased to  $V_{CC} - 1.29V$  for direct PECL/ ECL coupling or bypassed to AC Ground for AC coupling. Similarly, the unused CLOCK input pin should be bypassed with a 0.01  $\mu F$  capacitor to  $V_{EE}$ .

**Interface Circuit**

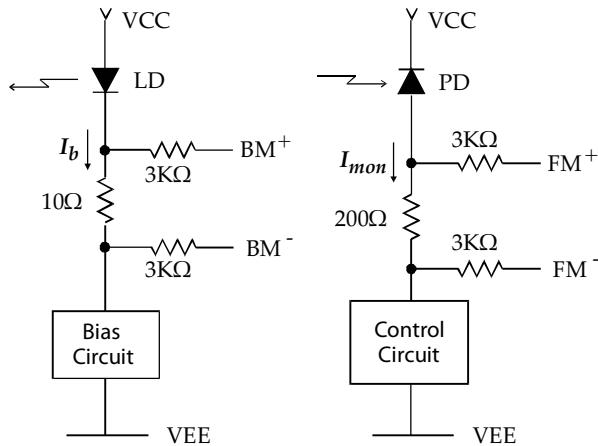


DIFFERENTIAL DIRECT-COUPLED PECL

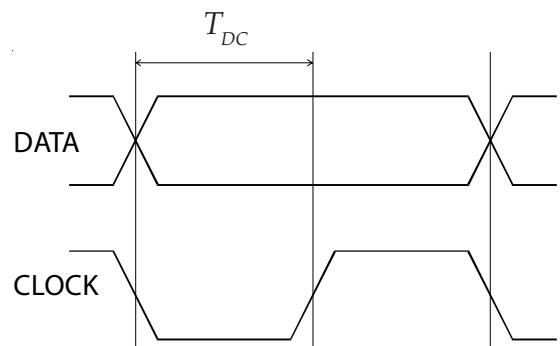


DIFFERENTIAL AC-COUPLED

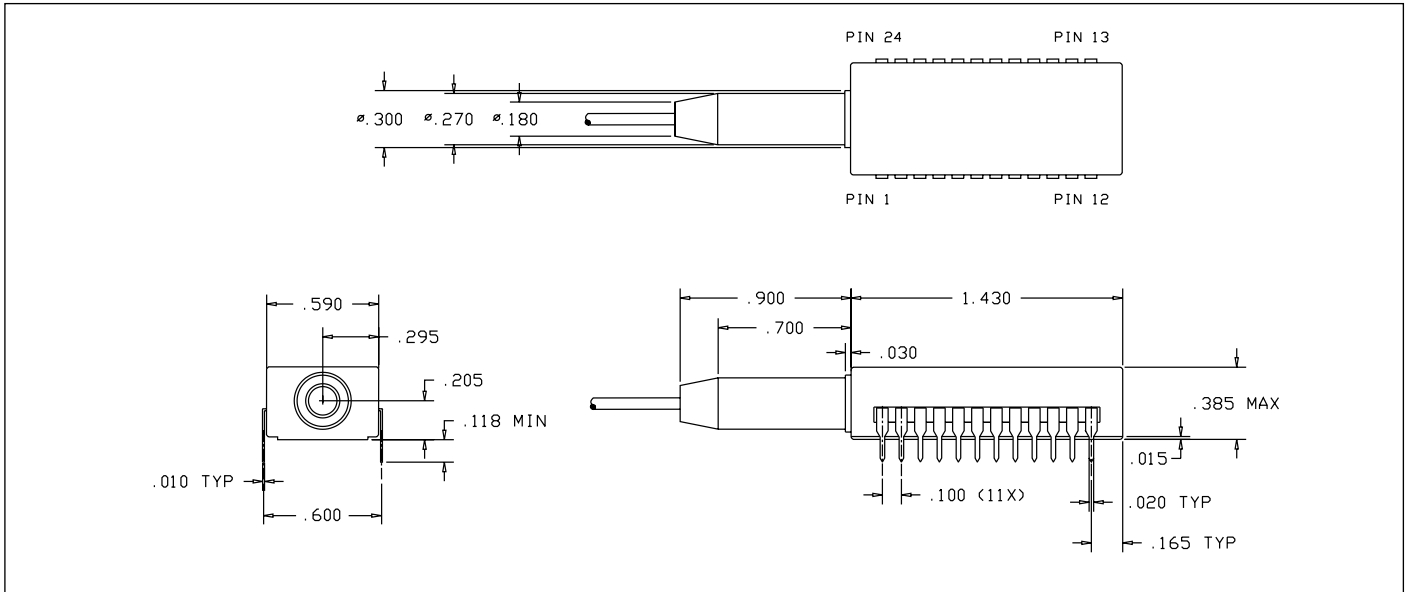
**Monitor Circuit**



**Timing Diagram (Clocked Operation)**



**Package Outline (Dimension in inches)**



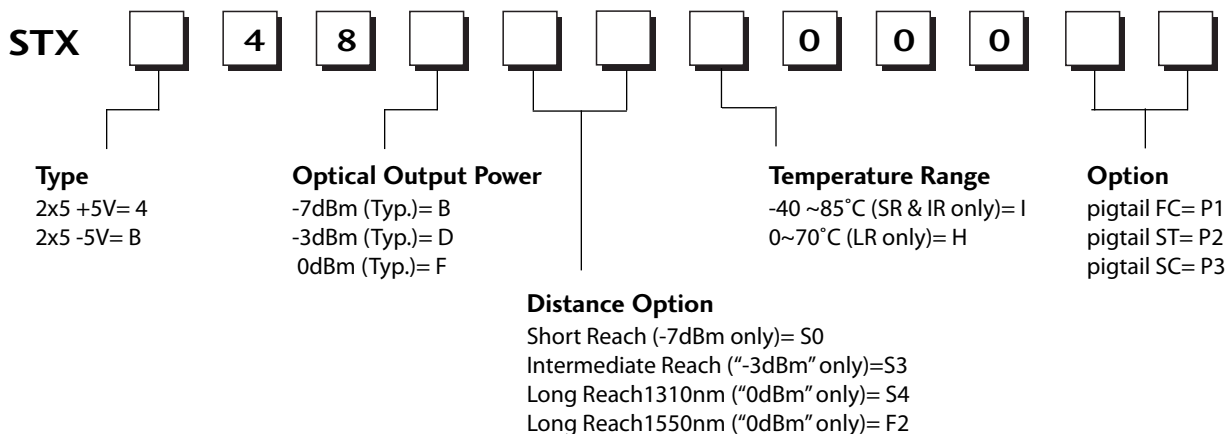
**Pinout Assignments**

PIN	FUNCTION	PIN	FUNCTION
1	VCC	24	VCC
2	VCC	23	VCC
3	FM + (LD FACET MONITOR +)	22	BM+ (LD BIAS MONITOR +)
4	FM - (LD FACET MONITOR -)	21	BM- (LD BIAS MONITOR -)
5	DATA INPUT -	20	CLK - (INPUT CLOCK -)
6	VTD (TERMINATION FOR DATA)	19	VTC (TERMINATION FOR CLK)
7	DATA INPUT +	18	CLK+ (INPUT CLOCK +)
8	DO NOT CONNECT (FOR INTERNAL USE ONLY)	17	MODE SELECTOR (CLOCKED or NON-CLOCKED)
9	VCC	16	TX DISABLE INPUT
10	VCC	15	ALM (LD BIAS ALARM)
11	VEE	14	VEE
12	VEE	13	VEE

**Laser Safety:** All transceivers are Class I Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions.

**Oplink Communications, Inc.**  
 DATE OF MANUFACTURE:  
  
 This product complies with  
 21 CFR 1040.10 and 1040.11  
**Meets Class I Laser Safety Requirements**

**Ordering Information**



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