

Please read this data sheet before purchasing, and keep it on file for future reference. It contains important information on the product specifications.

**Optocom**

**Optoelectronics Group**

**OPT3495-5X**

**CWDM OC-48**

**Optical Transmitter**

**Data Sheet**

**2004/5**



210 Andover Street, Wilmington, MA 01887

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## General

### Description

The OPT3495-5X is a 20-pin DIP fiber optic transmitter module which converts electrical data signals to lightwaves in one of eight CWDM wavelengths (1470 nm, 1490 nm, 1510 nm, 1530 nm, 1550 nm, 1570 nm, 1590 nm, and 1610 nm) at data rates from 1 Mbps to 2.5 Gbps. The transmitter consists of a hermetic, 1.5  $\mu\text{m}$ , InGaAsP/InP MQW DFB laser and a circuitry providing modulation, automatic optical power control and thermal compensation.

### Applications

The device is designed for data communication systems and telecommunication transmission systems over singlemode fiber.

### Standards Met

The specifications met are: the SONET/SDH STS-48/STM-16 interface, the Long Reach OC-48 Optical Parameters (LR-2, LR-3) of Bellcore GR-253-CORE, the Long-haul Recommendation (L-16.2, L-16.3) of ITU-T G.957, and the monitor & alarm requirements of Bellcore GR-253-CORE & ITU-T G.783 and G.958.

## Function

### Operation Features

The OPT3495-5X optical transmitter operates using either a single +5 V or -5 V power supply. The device maintains electrical and optical stability over the specified temperature and voltage ratings. Outputs include the laser bias current monitor (LBM) voltage and the laser backface monitor (BFM).

To minimize input data pattern-dependent jitter, the differential clock signal may be connected to the data input latch, which is selected by an external LATCH (pin 20) control. If LATCH pin is high, the input data is retimed by the rising edge of CLOCK (+). If LATCH pin is low or left unconnected, the input data is directly used to drive the optical output. When this latch function is not used, PIN 11, PIN 13, and PIN 20 can be left open. In this case, the module is pin compatible to its lower data rate (OC-3, OC-12, and OC-24) versions.

### Operation Suggestions

Operator can disable optical output through a user-provided electrical input.

### User Options

For further uses of LBM and BFM, refer to Bellcore GR-253-CORE & ITU-T G.783.

# Ratings

## Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage*	$V_{CC}-V_{EE}$	0	6.0	V
Operating Case Temperature Range	$T_C$	0	70	°C
Operating Relative Humidity (non-condensing)	$H_{OP}$	---	85	%
Lead Soldering Temperature/Time	T/t	---	250/10	°C/s
Minimum Fiber Bend Radius	$R_F$	32/1.25	---	mm/in.
Storage Case Temperature Range	$T_{STG}$	-40	85	°C

\* With  $V_{CC}$  and  $V_{EE}$  connected to (+5 V, 0 V) respectively, or with  $V_{CC}$  and  $V_{EE}$  connected to (0 V, -5.2 V) respectively.

# Operating Characteristics

## Electrical

Parameter	Symbol	Min	Typ	Max	Unit
dc Power Supply Voltage	$V_{CC} - V_{EE}$	4.75	5.0	5.25	V
dc Power Supply Current	$I_{CC}$ OR $I_{EE}$	---	0.19	0.3	A
Input Data, Clock Voltage: <sup>1,2</sup>					
Low	$V_{IL}$	-1.95	-1.8	-1.45	V
High	$V_{IH}$	-1.16	-0.9	-0.7	V
Input Swing <sup>3</sup>	$V_{PP}$	200	---	1600	mV
Common Mode Range	$V_{CM}$	$V_{CC} - 1.49$	---	$V_{CC} - 0.4$	V
Input Setup and Hold Time <sup>4</sup>	$T_{SU}, T_H$	100	---	---	ps
Input Transition Time <sup>5</sup>	$t_i$	---	0.402	---	ns
Transmitter Disable, Latch Voltage <sup>6</sup>	$V_D$	2.0	---	$V_{CC}$	V
Transmitter Enable, Latch Voltage	$V_{EN}$	$V_{EE}$	---	$V_{EE} + 0.8$	V
Laser Bias Voltage <sup>7</sup>	$V_{LB}$	0.01	---	0.70	V
Laser Facet Voltage <sup>8</sup>	$V_{BF}$	0.01	---	0.30	V

<sup>1</sup> It is recommended for optimum performance to use  $\overline{DATA}$  & DATA inputs simultaneously.

<sup>2</sup> Data inputs are 10K, 10KH, 100K, 10E, and 100E ECL compatible. Voltage is in reference to VCC.

<sup>3</sup> The input swing, is measured as the absolute difference between  $\overline{DATA}$  & DATA (or CLOCK & CLOCK) inputs.

<sup>4</sup> See Figure 1.

<sup>5</sup> Between 10% and 90% (50% duty cycle).

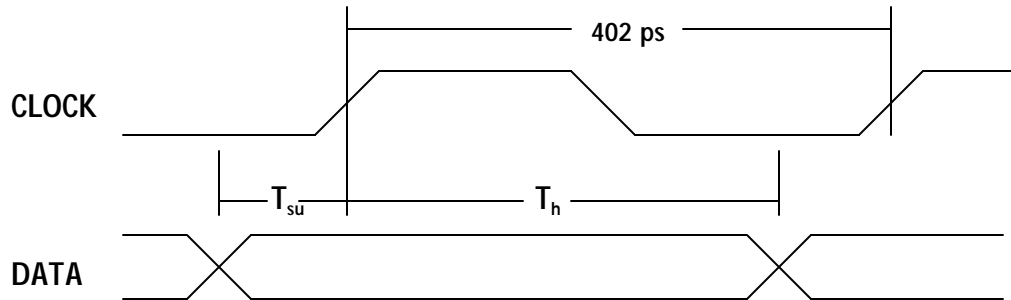
<sup>6</sup> The transmitter remains enabled and requires the user to provide an external voltage to disable.

<sup>7</sup> The laser bias current is determined to be the ratio of the voltage to an internal 10 $\Omega$  current-sensing resistor.

<sup>8</sup> Laser facet current is determined to be the ratio of the voltage to an internal 200 $\Omega$  current-sensing resistor.

## Operating Characteristics – continued

Figure 1. Set/Hold Time Diagram



## Optical

Parameter	Symbol	Min	Typ	Max	Unit
Average Power Output <sup>1</sup>	$P_0$	0	+1	+2	dBm
Operating Wavelength Range	$\lambda$	$\lambda_c - 5.5$	$\lambda_c$	$\lambda_c + 7.5$	nm
20 dB Spectral Width (SLM Laser)	$\Delta\lambda_{20}$	---	---	1	nm
Side-mode Suppression Ratio (SLM Laser)	$SSR_{min}$	30	---	---	dB
Extinction Ratio <sup>2</sup>	$E_r$	8.2	---	---	dB
Optical Rise & Fall Times <sup>3</sup>	$t_r, t_f$	---	---	0.15	ns
Jitter Generation, rms <sup>4</sup>	GJ	---	---	0.005	UI
Output Waveform <sup>5</sup>	SONET SDH Compliant				

<sup>1</sup> Measured using an electrical input with a  $2^{23} - 1$  pseudorandom word having a 50% duty factor. It is also suitable to use additional measurement parameters and techniques specified in ITU-T Rec. G.957 and Bellcore GR-253-CORE. Optical loss of pigtail termination connector and measurement uncertainty is included in the numbers specified.

<sup>2</sup> The ratio of logic "1" to logic "0" average power levels calculated as  $10\log_{10}(P_1/P_0)$  in dB.

<sup>3</sup> Measured with a 50% duty factor from the 10% to 90% points.

<sup>4</sup> ITU-T Rec. G.958 and Bellcore GR-253 CORE (for Category II interfaces) list a fraction of the maximum amount of allowable generated jitter to allow for additional sources of jitter within the system. These ITU-T and Bellcore documents include information for measurement bandwidth specifications and techniques.

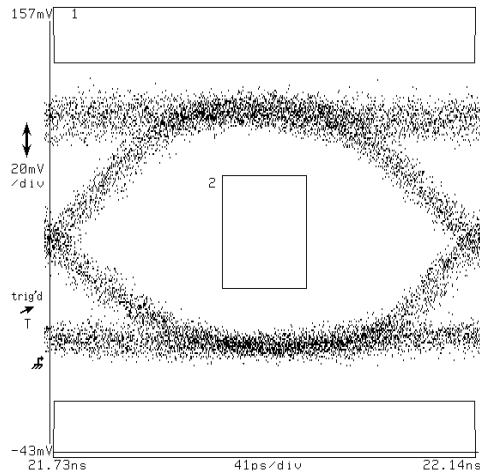
<sup>5</sup> The optical output (see Figure 2) meets the eye diagram mask determined by GR-253-CORE (Fig. 4.3 of GR-253-CORE).

## Transmitting Wavelengths

Product Code	Wavelength, $\lambda_c$	Product Code	Wavelength, $\lambda_c$
OPT3495-5A	1470	OPT3495-5E	1550
OPT3495-5B	1490	OPT3495-5F	1570
OPT3495-5C	1510	OPT3495-5G	1590
OPT3495-5D	1530	OPT3495-5H	1610

## Operating Characteristics – continued

Figure 2. Eye Mask & Typical Output Waveform

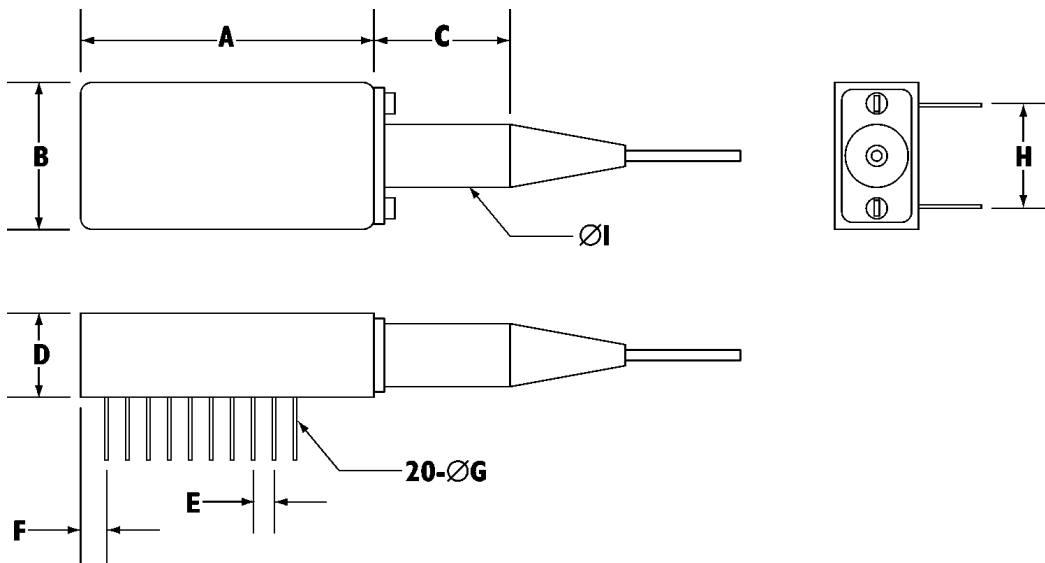


Typical output waveform, with retiming, no optical filter.

## Physical Characteristics

The device package conforms to the 20-pin DIP outline shown in Figure 1. Dimensions for the package are also given in its corresponding Dimensions table.

### Outline Diagram



## Physical Characteristics – continued

### Dimensions

Dimension	Typ	
	Inches	Metric (mm)
A	1.300	33.0
B	0.635	16.13
C	1.000	25.40
D	0.365	9.27
E	0.100	2.54
F	0.110	2.79
ØG	0.018	0.46
H	0.400	10.16
ØI	0.236	6.00

An assigned serial number in both barcode and human readable formats appear on this device. All markings and labels are permanent and meet the requirements of MIL-STD-883C-2015.7.

### Mounting and Connections

The pigtail has a single-mode (SM) fiber with an 8 μm core. The outer jacket has a nominal 900 μm diameter and is terminated with an ST<sup>®</sup>\*, FC, or SC Connector. Other connector

types may be available upon request. The minimal pigtail length is 1 meter (39.4 inches) long.

\* ST<sup>®</sup> is a registered trademark of AT&T

### Pin Designations

<b>Pin</b>	1	2	3	4	5	6	7	8	9	10
	NC	LBM(+)	NC	LBM(-)	V <sub>EE</sub>	V <sub>CC</sub>	DISABLE	V <sub>CC</sub>	V <sub>CC</sub>	NC
<b>Pin</b>	20	19	18	17	16	15	14	13	12	11
	LATCH†	BFM(+)	V <sub>CC</sub>	BFM(-)	DATA(+)	DATA(-)	V <sub>EE</sub>	CLOCK (+)†	V <sub>CC</sub>	CLOCK (-)†

† Optional: if CLOCK (+) and CLOCK (-) inputs are not used, PIN 11, PIN 13, and PIN 20 can be left open. In this case, the module is pin compatible to its lower data rate (OC-3, OC-12, and OC-24) versions.

# Safety

## Laser Compliance Statement

The OPT3495-5X is classified as a:

- Class 1 Laser Product
- Laser Klasse 1
- Luokan 1 Laser laite
- Appareil A Laser De Classe 1
- Klass 1 Laser Apparat.

The OPT3495-5X is certified in the U.S. to conform to the requirements of the Department of Health & Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J of the FDA for Class 1 Laser Products.

 Caution - use of device other than those specified herein may result in hazardous laser radiation exposure. Please embrace all customary precautions & discretion while handling this device.

<b>Optical</b>	<ul style="list-style-type: none"><li>• Avoid direct eye exposure to laser beam projection area or a broken fiber under operation.</li></ul>
<b>Electrical</b>	<ul style="list-style-type: none"><li>• Warning against overvoltages or current surges as these may cause failure, electrical shock or fire.</li><li>• Solder leads to electronics entirely so as to eschew short circuits.</li><li>• Solder or plug in device while power is turned off.</li></ul>
<b>Other</b>	<ul style="list-style-type: none"><li>• Avoid storage above maximum temperature rating &amp; other extreme conditions.</li><li>• Avoid device disassembly as damages may be incurred.</li><li>• Avoid excessive force to fiber pigtail and bending beyond a 20 mm radius.</li><li>• Take normal handling precautions as for all electrostatic sensitive devices.</li></ul>

## Appendix

### Terms

BFM: indicates the laser output power

LBM: indicates the total amount of dc current supplied to the laser

NC: not connected



# Additional Information

## Contact

For additional information, product specifications, or information about Optocom:

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