

# TO293BN-RXYZ

1310 nm TO-Can Package for 10 Gb/s Applications



## Data Sheet



### Description

The TO293BN-RXYZ is a hermetically-sealed device with a photo diode for optical output monitoring. It incorporates 1310 nm single mode edge-emitting laser diode chips for use in uncooled applications up to 10.7 Gb/s. The laser is mounted into a Transistor Outline (TO) header and is hermetically sealed with a lens cap specific to it. The laser design is buried hetero structure with multi-quantum well (MQW) active layers and distributed-feedback (DFB) grating layer. All laser chips come from wafers that have been certified using a representative lot of devices that must achieve an acceptable yield for burn-in and other multi-temperature, CW and dynamic tests.

### Features

- Low threshold current
- High bandwidth
- Qualified as per intent of Telcordia GR-468
- Operating temperature -40 °C to 85 °C

### Applications

- Supports performance up to 10.7 Gb/s bit rate
- LR1 SONET/SDH OC192/STM-64
- 10 Gb/s Gigabit Ethernet
- 10 Gb/s Fiber Channel

## Electro-Optical Characteristics for T0293BN-RXYZ 1310 nm DFB TO-Can

Parameters tested at 25 °C, data for extended temperature range is based on product characterization results for reference only.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Threshold Current	$I_{th}$	CW, T = 25 °C		8	12	mA
		T = 85 °C		25	30	
Slope Efficiency	$\eta$	CW, T = 25 °C	0.2	0.25		W/A
		T = 85 °C	0.12	0.18		
Optical Output Power	$P_f$	$I_f = 30$ mA	3.2	5.0		mW
Forward Voltage	$V_f$	$I_f = 30$ mA		1.3	1.6	V
		$I_f = 30$ mA with Matching R		1.9	3	
Series Resistance	R	Without Matching R		5		$\Omega$
		With Matching R	12		30	
Kink Current	$I_{knk}$	$I_{th}$ to 100 mA	70			mA
Wavelength	$\lambda$	CW, $I_f = 30$ mA	1290	1310	1330	nm
Side Mode Suppression Ratio	SMSR	CW, $I_f = 30$ mA	30	40		dB
Monitor Output Current	$I_m$	$I_f = 30$ mA	100		1000	$\mu$ A
Monitor Dark Current	$I_d$	$V_{rp} = 5$ V, not in black box			100	nA

## Product Characteristics of Chip-on-Carrier or Package at 25 °C

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Wavelength/Temperature Coefficient	$D\lambda/dT$	T = -5 °C to 85 °C		0.09		nm/°C
Relative Intensity Noise	RIN	$I_f = 30$ mA, 50 MHz – 12 GHz		-140		dB/Hz
Bandwidth	BW	$I_{th} + 36$ mA	9			GHz
Rise Time	$\tau_r$	Unfiltered 20 – 80%; ER = 5 dB		35		Ps
Fall Time	$\tau_f$	Unfiltered; 80 – 20%; ER = 5 dB		45		Ps
Monitor Capacitance	C	$V_{rp} = 5$ V, f = 1 MHz		5	7	pF

Notes:

$P_f$  = Light from the TO

$I_f$  = Forward current

$V_f$  = Forward voltage

$V_{rp}$  = Reversed bias for photo diode

## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Unit	Min.	Max.
Forward Current	mA		150
Front Power	mW		20
Reverse Voltage (Laser Diode)	V		2
Reverse Voltage (Photo Diode)	V		20
Forward Current (Photo Diode)	mA		10
Operating Temperature	°C	-40	85
Storage Temperature	°C	-40	100
Storage Relative Humidity	%		85

## **Handling Precautions**

- Radiation from the laser can be dangerous; avoid direct eye contact with the laser. Use an infrared camera or IR viewer to observe the laser light.
- Semiconductor lasers are sensitive to electrostatic damage. Pack the module with ESD-proof material for carry and shipment. Carefully ground the working environment, such as working bench, soldering iron, and the workers.

## **Electrical and Optical Overstress (ESD/EOS) Information**

Results of ESD testing indicate that this is a Class I laser with an ESD withstand voltage of 500 V.

Switching transients can cause electrical overstress (EOS) damage in a chip.

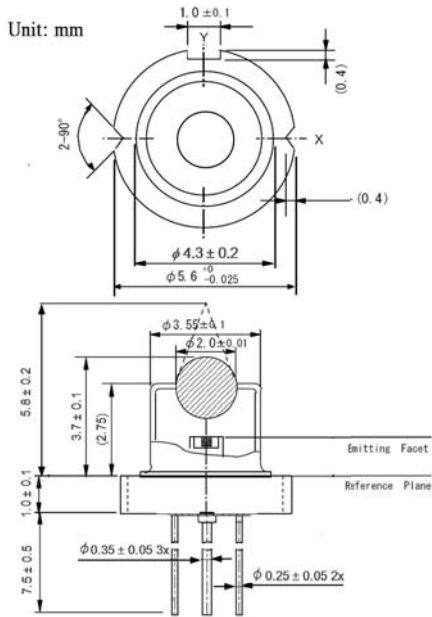
EOS may result from improper ESD handling, improper power sequencing, a faulty power supply or an intermittent connection.

Proper turn-on sequence:

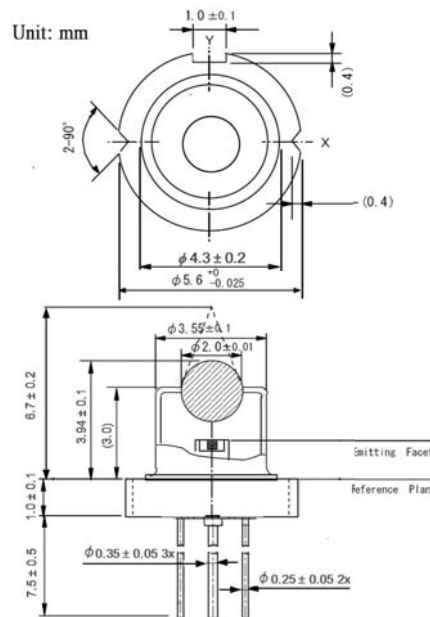
1. All ground connections
2. Most negative supply
3. Most positive supply
4. All remaining connections

Reverse the order to turn off.

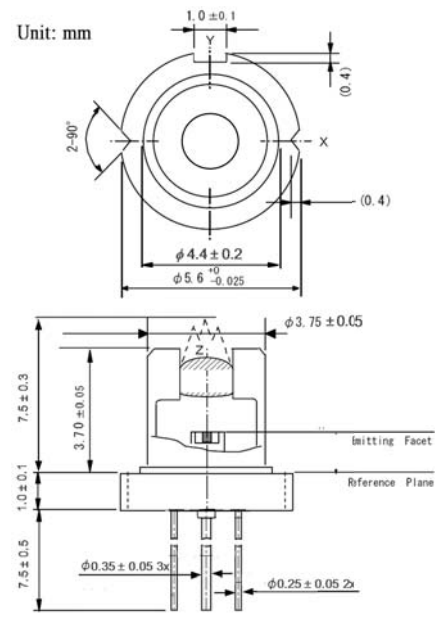
## Dimensions (Unit: mm)



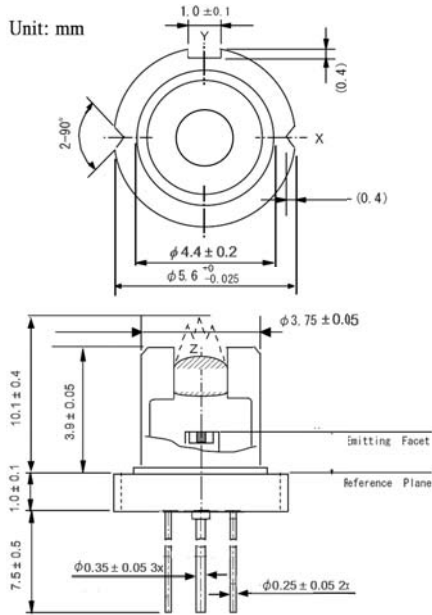
T0293BN-EFAZ



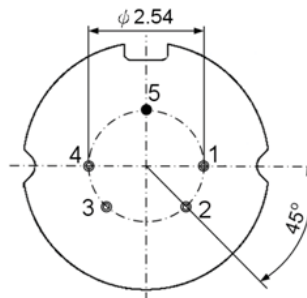
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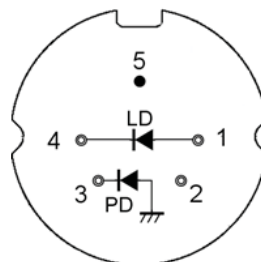
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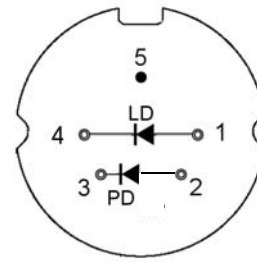
T0293BN-EHAZ



Bottom View



Standard Type



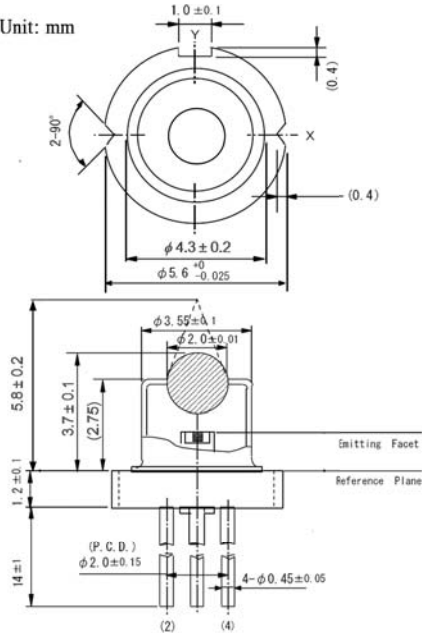
Isolated MPD Type

## Pin Assignment

Pin No.	Standard Type	Isolated MPD Type
1	LD Anode	LD Anode
2	No Connection	PD Anode
3	PD Cathode	PD Cathode
4	LD Cathode	LD Cathode
5	Case (GND)	Case (GND)

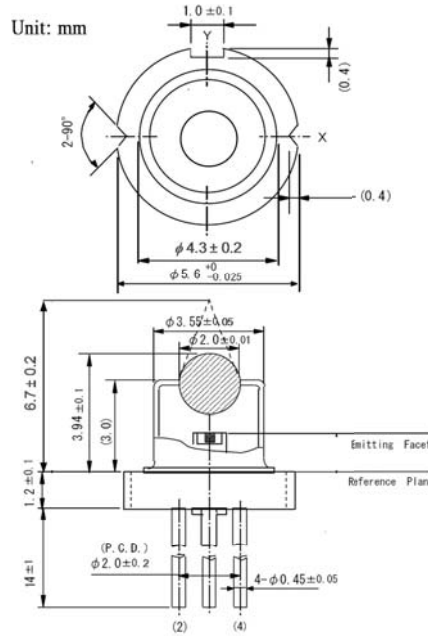
## Dimensions (Unit: mm)

Unit: mm



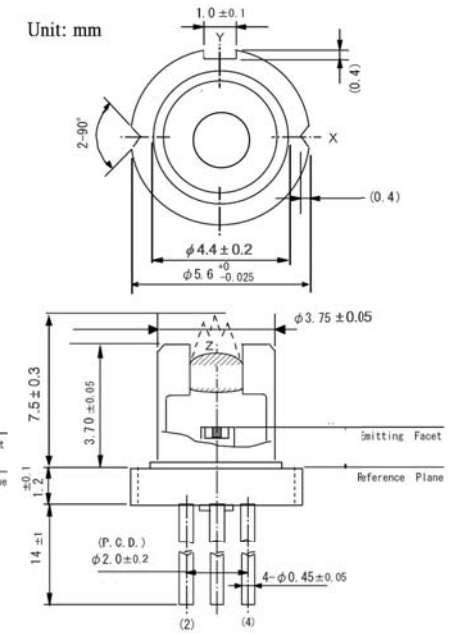
TO293BN-EFAX

Unit: mm



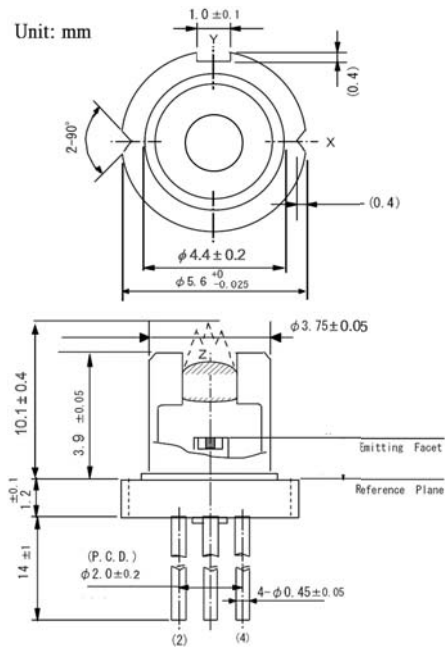
TO293BN-EBAX

Unit: mm

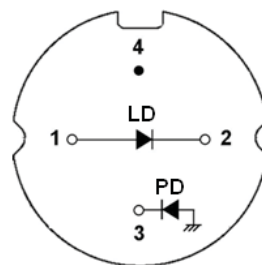


TO293BN-ECAX

Unit: mm



TO293BN-EHAX



Bottom View

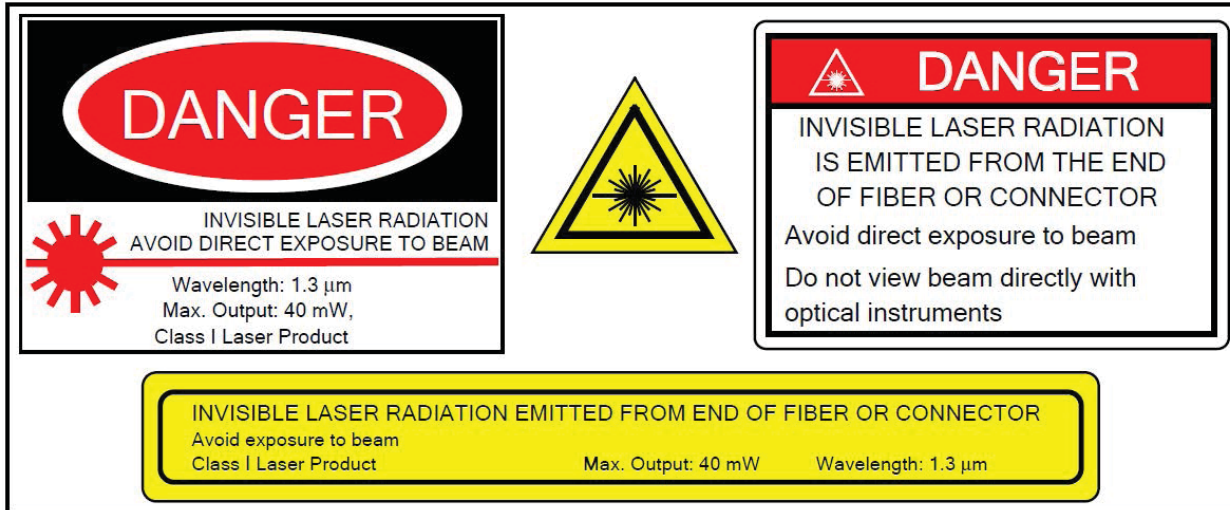
## Pin Assignment

Pin No.	Standard	Note
1	LD Anode	
2	LD Cathode	
3	PD Cathode	PD Anode connects to the case (GND)
4	Case (GND)	

## Laser Safety

All versions of these laser chips are classified as Class III per CDRH, 21 CFR 1040 Laser Safety requirements. All versions are classified as Class 1M laser chips consistent with IEC® 60825-2: 2001.

This product complies with 21 CFR 1040.10 and 1040.11.



## Qualification Information

Laser diodes have passed all qualification requirements as specified by Telcordia GR-468.

## Ordering Information T0293BN-RXYZ

### R: Temperature Range

E: -5 °C to 75 °C

N: -5 °C to 85 °C

I: -40 °C to 85 °C

### X: Type of Cap Lens

B: 2-mm ball lens cap with 6.7-mm focal point

C: Aspherical lens cap with 7.5-mm focal point

F: 2-mm high index ball lens cap with 5.8-mm focal point

H: Aspherical lens cap with 10.1-mm focal point

### Y: Type of Lead

A: Cathode MPD (Anode GND)

C: Anode MPD (Cathode GND)

E: Isolated MPD

### Z: Type of Header and Matching Resistor

1: 5-pin header, with matching resistor

2: 4-pin header, with 18-ohm matching resistor

3: 4-pin header, with 9-ohm matching resistor

X: 4-pin header, without matching resistor

Z: 5-pin header, without matching resistor

Performance of the laser will depend on a number of factors, including the customers' RF and thermal design, fiber length, bit rate, and temperature range. For particular applications, contact Avago.

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