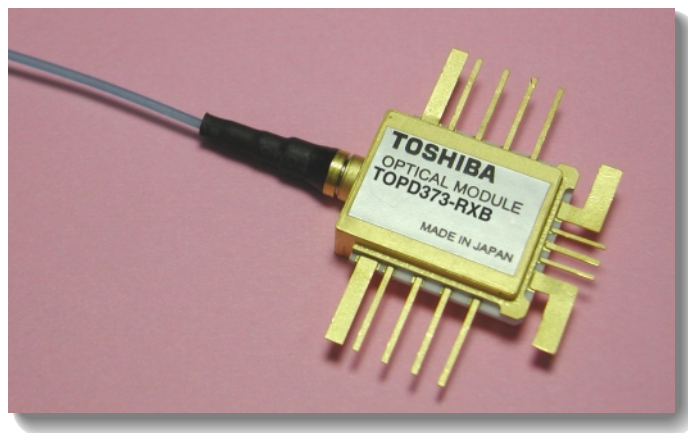


# Optical Communication Devices

## 10 Gb/s Optical Receiver

TOPD373-RXB Series  
(PRELIMINARY)



### APPLICATION

---

- SONET / SDH (OC-192 / STM-64) applications

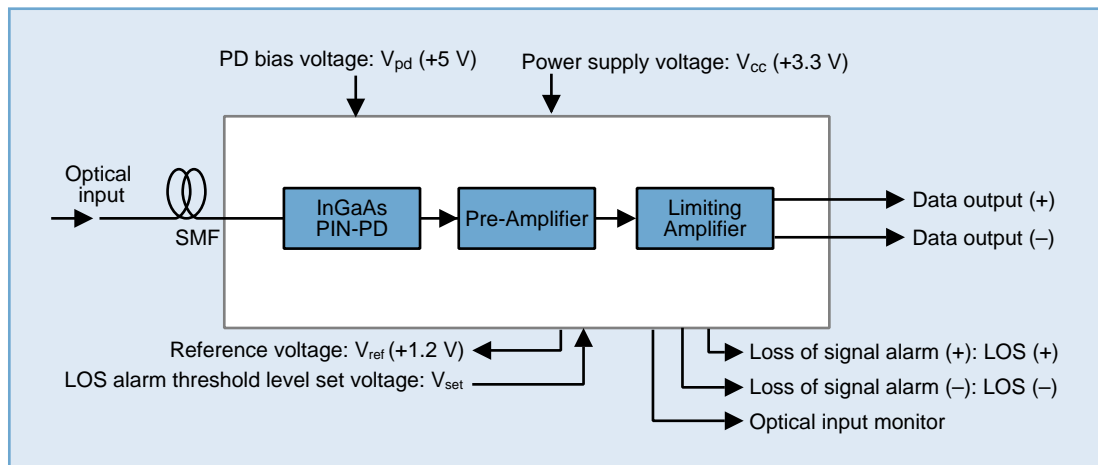
### FEATURES

---

- InGaAs PIN-PD and TIA with Limiting Amplifier
- 2R function included
- Differential output
- Sensitivity:  $-17$  dBm (typ. @ BER =  $1 \times 10^{-11}$ , PRBS  $2^{31}-1$ )
- Overload:  $-3$  dBm (min @ BER =  $1 \times 10^{-11}$ , PRBS  $2^{31}-1$ )
- Data output: 300 mVpp (typ. @ single output)
- Loss of signal (LOS) alarm
- Optical input monitor

# TOPD373-RXB Series

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Ratings	Unit
Storage temperature	Tstg	-40 to +85	°C
Operating case temperature	Tc	0 to +70	°C
PD forward current	If	3	mA
PD reverse current	Ir	2.5	mA
PD reverse voltage	Vpd	0 to 15	V
Source voltage	Vcc	-0.5 to 4	V
Soldering temperature	Tsol	260	°C
Soldering time	tsol	5	s

## ELECTRICAL AND OPTICAL CHARACTERISTICS

( Tc = 0 °C to 70 °C, λ = 1.55 μm, Vcc = +3.3 V, Vpd = +5 V )

Item	Symbol	Condition	Min	Typ.	Max	Unit
Source current	Icc	—	—	60	—	mA
Responsivity	R <sub>1.55</sub>	Pin = -10 dBm	0.68	0.85	—	A/W
Dark current	Id	—	—	—	10	nA
Cutoff frequency	fc	3dB down from 500 MHz	7	8.5	—	GHz
Transimpedance	Zt	—	8	12	16	kΩ
Sensitivity	Ps	Note 1	—	-17	—	dBm
Overload	Po	Note 1	-3	0	—	dBm
Optical return loss	ORL	—	27	—	—	dB
Data output voltage	Vout	single-ended	100	300	400	mVp-p
Data output offset	Vo-off	Differential	—	—	+/-50	mV
Reference voltage	Vref	Note 2	—	1.2	—	V
LOS output high	LOS(H)	Note 3	2.4	—	Vcc	V
LOS output low	LOS(L)	Note 3	—	—	5	V
LOS alarm threshold level set voltage range	Vset	Note 4,5	—	0.8 to 1.1	—	V
Optical input monitor output voltage range	Vmon	Note 6,7	—	1.4 to 1.6	—	V

Note 1: 10.664228 Gb/s, NRZ, PRBS2<sup>31</sup>-1, BER = 10<sup>-11</sup>

Note 2: Vref: Reference voltage for Vset resistive divider (R1 and R2). See recommended application circuit.

Note 3: Recommended pullup resistor value is 4.7 kΩ to 10 kΩ to Vcc.

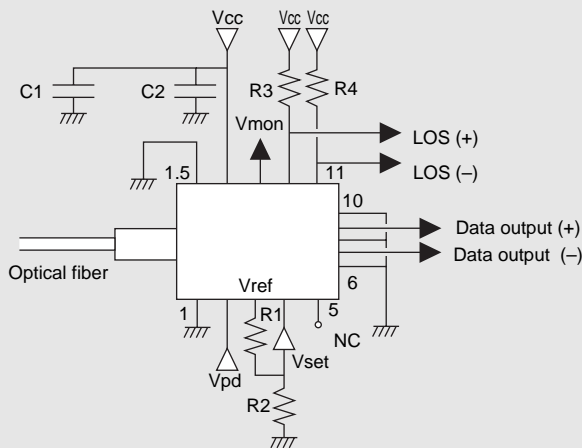
Note 4: Vset: LOS alarm threshold level is given by the voltage (Vset)  
(See recommended Circuit)

Note 5: Photocurrent level is 15 μA to 100 μA

Note 6: Vmon: Voltage output corresponding to the peak to peak input photocurrent.

Note 7: Photocurrent level is 15 μA to 100 μA

## RECOMMENDED APPLICATION CIRCUIT



### Pin Assignment

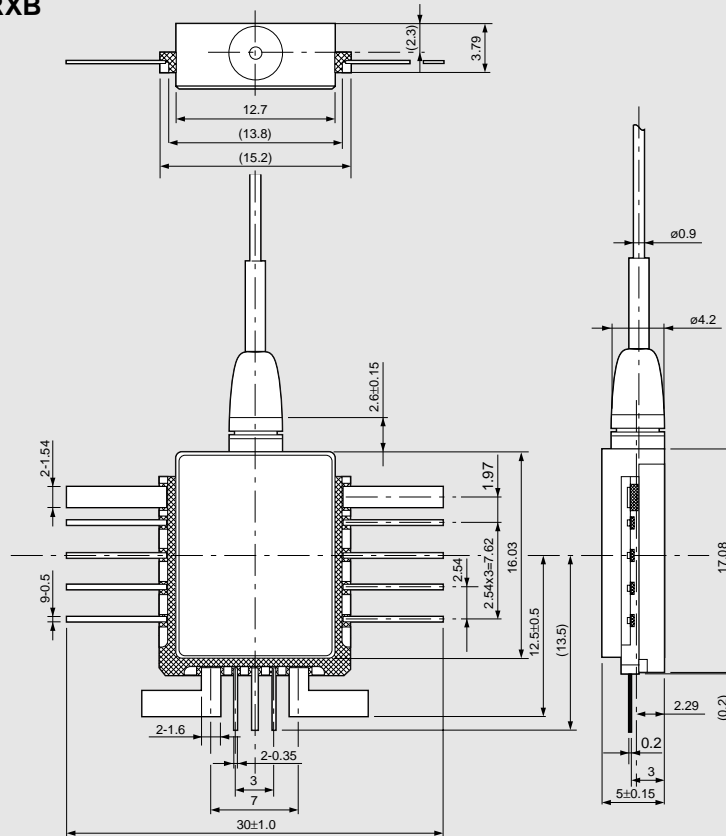
Designator	Description
C1	4.7 $\mu$ F, 6 V ceramic
C2	1 $\mu$ F, 6 V ceramic
R1	$R_1 = 50 \text{ k}\Omega - R_2$
R2	$R_2 = 50 \text{ k}\Omega \times (V_{set} / V_{ref})$
R3,R4	$4.7 \text{ k}\Omega \leq R_3, R_4 \leq 10 \text{ k}\Omega$

Note: LOS alarm threshold level can be determined by the voltage ( $V_{set}$ ).  $V_{set}$  is flexibly set by the R1 and R2 which are inserted between  $V_{ref}$  and Ground.

## DIMENSIONAL OUTLINES AND PIN CONFIGURATION

### TOPD373-RXB

(Unit: mm)



### Pin Assignment

Pin	Function
1	GND
2	Vpd (+5 V)
3	Vref
4	Vset
5	NC
6	GND
7	Data output (-)
8	GND
9	Data output (+)
10	GND
11	LOS (-)
12	LOS (+)
13	Vmon
14	Vcc (+3.3 V)
15	GND

## PRECAUTIONS

- Power supply: Transient electric spike may cause a damage to the photodiode or IC chips. A surge-free power supply and a slow starter circuit should be used. To avoid causing an electrical surge, pins should not be connected or disconnected on the test fixture before turning power off.
- The product should be grounded for obtaining the performance.

## OVERSEAS SUBSIDIARIES AND AFFILIATES

011025 (X)

### **Toshiba America Electronic Components, Inc.**

**Headquarters-Irvine, CA**  
9775 Toledo Way, Irvine, CA 92618, U.S.A.  
Tel: (949)455-2000 Fax: (949)859-3963

**Deerfield, IL(Chicago)**  
One Pkwy., North, Suite 500, Deerfield,  
IL 60015, U.S.A.  
Tel: (847)945-1500 Fax: (847)945-1044

**Edison, NJ**  
2035 Lincoln Hwy. #3000, Edison.  
NJ 08817, U.S.A.  
Tel: (732)248-8070 Fax: (732)248-8030

**Raleigh, NC**  
5511 Capitol Center Dr., #114,  
Raleigh, NC 27606, U.S.A.  
Tel: (919)859-2800 Fax: (919)859-2898

**Richardson, TX(Dallas)**  
777 East Campbell Rd., #650, Richardson,  
TX 75081, U.S.A.  
Tel: (972)480-0470 Fax: (972)235-4114

**Wakefield, MA(Boston)**  
401 Edgewater Place, #360, Wakefield,  
MA 01880, U.S.A.  
Tel: (781)224-0074 Fax: (781)224-1095

### **Toshiba Electronics Europe GmbH**

**Düsseldorf Head Office**  
Hansaallee 181, D-40549 Düsseldorf,  
Germany  
Tel: (0211)5296-0 Fax: (0211)5296-400

**Toshiba Electronics Italiana S.R.L.**  
Centro Direzionale Colleoni,  
Palazzo Perseo 3,  
1-20041 Agrate Brianza, (Milan), Italy  
Tel: (039)68701 Fax:(039)6870205

**Toshiba Electronics(UK) Ltd.**  
Riverside Way, Camberley Surrey,  
GU15 3YA, U.K.  
Tel: (01276)69-4600 Fax: (01276)69-4800

**Toshiba Electronics Scandinavia A.B.**  
Gustavslundsvägen 12, 2nd Floor,  
S-161 15 Bromma, Sweden  
Tel: (08)704-0900 Fax: (08)80-8459

**Toshiba Electronics Asia  
(Singapore) Pte. Ltd.**

**Singapore Head Office**  
438B Alexandra Road, #06-08/12 Alexandra  
Technopark, Singapore 119968  
Tel: (278)5252 Fax: (271)5155

### **Toshiba Electronics Asia, Ltd.**

**Hong Kong Head Office**  
Level 11, Tower 2, Grand Century  
Place, No.193, Prince Edward Road West,  
Mong Kok, Kowloon, Hong Kong  
Tel: 2375-6111 Fax: 2375-0969

**Beijing Office**  
Rm 714, Beijing Fortune Building,  
No.5 Dong San Huan Bei-Lu, Chao Yang District,  
Beijing, 100004, China  
Tel: (010)6590-8796 Fax: (010)6590-8791

**Toshiba Electronics Korea  
Corporation**

**Seoul Head Office**  
14/F, KEC B/D, 275-7 Yangjae-dong,  
Seocho-ku, Seoul, Korea  
Tel: (02)589-4300 Fax: (02)589-4302

**Toshiba Technology Development  
(Shanghai) Co., Ltd.**  
23F, HSBC Tower, 101  
Yin Cheng East Road, Pudong New Area, Shanghai,  
200120, China  
Tel: (021)6841-0666 Fax: (021)6841-5002

**Toshiba Electronics Taiwan  
Corporation**

**Taipei Head Office**  
17F, Union Enterprise Plaza Bldg. 109  
Min Sheng East Rd., Section 3, 10446 Taipei,Taiwan  
Tel: (02)2514-9988 Fax: (02)2514-7892

(As of August, 2001)

The information contained herein is subject to change without notice.

The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.

TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..

The Toshiba products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These Toshiba products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of Toshiba products listed in this document shall be made at the customer's own risk.

The products described in this document are subject to the foreign exchange and foreign trade laws. Gallium arsenide (GaAs) is a substance used in some of the products described in this documents. GaAs dust and fumes are toxic. Do not break, cut or pulverize the products, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.

**Website:** <http://www.semicon.toshiba.co.jp/eng/index.html>

In Touch with Tomorrow  
**TOSHIBA**

**TOSHIBA CORPORATION**

**Electronic Devices Sales & Marketing Division**  
1-1, Shibaura 1-chome, Minato-ku, Tokyo, 105-8001, Japan  
Tel: +81-3-3457-3405 Fax: +81-3-5444-9431

©2002 TOSHIBA CORPORATION  
Printed in Japan