UNDER DEVELOPMENT

OPTICAL FIBER LESS MODULE

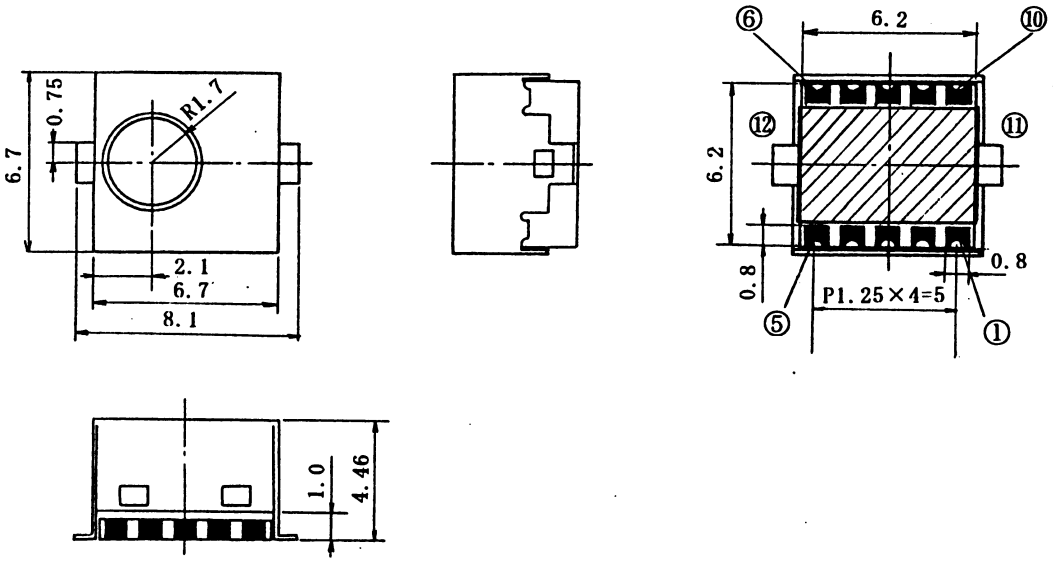
TOTX1500/TORX1500

○ Optical fiber-less modules for short distance high speed data transmission.

- Data Rate : 20 to 125 Mb/s.
- Transmission Distance : Up to 3 cm
- 3.3V PECL Interface

Handing precaution
The LED's used in this product contain GaAs (Gallium Arsenide).
Care must be taken to protect the safety of people and the environment when scrapping or terminal processing.

Unit : mm



Pin No.	TOTX1500 (Transmitter)	TORX1500 (Receiver)
①	GND	GND
②	GND	GND
③	NC	Vcc1
④	Enable	Vcc2
⑤	INPUT (+)	SD
⑥	INPUT (-)	GND
⑦	GND	OUTPUT (-)
⑧	GND	OUTPUT (+)
⑨	Vcc	GND
⑩	GND	GND
⑪	Case	Case
⑫	Case	Case

1. Maximum Ratings (Ta=25℃)

ITEM	SYMBOL	RATING	UNIT
Storage Temperature	Tstg	−20 ～ 85	℃
Operating Temperature	Topr	0 ～ 60	℃
Supply Voltage	Vcc	−0.5 ～ 4.5	V
Output Current	Io	50	mA
Soldering Temperature	Tsol	260 (1)	℃

Note (1) Soldering time ≦ 3 seconds. (More than 1 mm apart from package)

2. Recommended Operating Conditions

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	Vcc	3.0	3.3	3.6	V
Data Rate		20	—	125	Mb/s
Mark Ratio		—	50	—	%
Output Load	RL	—	50	—	Ω

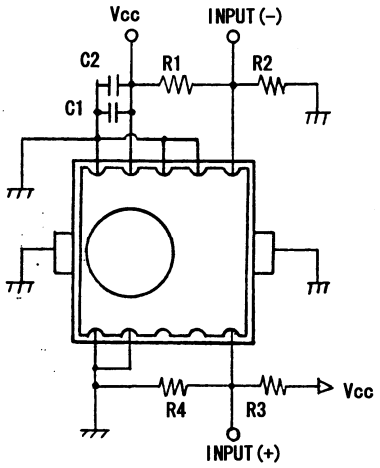
3. Electrical and Optical Characteristics (Ta=25℃, Vcc=3.3V)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Date Rate		NRZ code	20	—	125	Mb/s
Transmission Distance			0.1	—	3	cm
Center Wavelength	λc		—	870	—	nm
Current Consumption(T)	Icc (T)	Icc for Transmitter	—	40	60	mA
Current Consumption(R)(2)	Icc (R)	Icc for Receiver	—	27	35	mA
High Level Input Voltage	VIH		Vcc-1.165	—	Vcc-0.88	V
Low Level Input Voltage	VIL		Vcc-1.81	—	Vcc-1.475	V
High Level Output Voltage	VOH		Vcc-1.045	—	Vcc-0.88	V
Low Level Output Voltage	VOL		Vcc-1.84	—	Vcc-1.62	V
Input Voltage (enable on) (3)			Vcc×0.8	—	—	V
Input Voltage (enable off) (4)			—	—	Vcc×0.2	V
Output Voltage (SD On)			Vcc×0.8	—	—	V
Output Voltage (SD Off)			—	—	Vcc×0.2	V

Note (2) Without output current.
(3) Transmitter function is on when enable is H level or open.
(4) Transmitter function is off when enable is L level.

5. Application Circuit

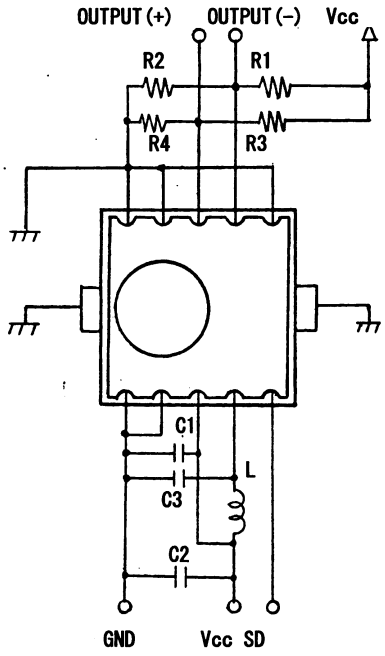
(1) TOTX1500 (Transmitter)



(TOP VIEW)

R1=R3	130 Ω
R2=R4	82 Ω
C1	0.01 μF
C2	10 μF

(2) TORX1500 (Receiver)



(TOP VIEW)

R1=R3	130 Ω
R2=R4	82 Ω
C1=C3	0.01 μF
C2	10 μF
L	1 μH

Notes

1. Place termination resistors near receiving input data point.
2. Make differential signal paths short and of the same length with equal termination to Vcc−2V.
3. Signal trace should be 50 ohm transmission lines (microstrip or strip line). Use ground plane (or multi-layer) printed circuit board for best high frequency performance.
4. Use high-frequency monolithic ceramic bypass capacitors and low DC resistance inductors. Locate power supply filter components close to a optical transceiver.
5. Do not directly connect optical transciver's ECL outputs to the GND without proper current limiting impedance.

7. Precaution on Use

(1) Maximum Rating

The maximum ratings are the limit values which must not be exceeded when using the device. Any one of the ratings must not be exceeded. If the maximum rating is exceeded, the characteristics may not be recovered. In some extreme cases, the device may be permanently damage.

(2) Life of light emitters

When the optical module is used for over a long period, degeneration of characteristics is mostly due to lowering of the fiber output power (Pf). This is caused by the degradation of the optical output of the LED's used as the light source. The cause of degradation of the optical output of the LED's may be defects in wafer crystallization or mold resin stress. The detailed causes are, however, not clear.

The life of light emitters is greatly influenced by operating conditions and usage environment as well as the life characteristics unique to the device. Thus,when selecting a light emitter and setting the operating conditions, Toshiba recommends that you check the life characteristics. Depending on the environment conditions, Toshiba recommends maintenance such as regular checks on the amount of optical output.

(3) Soldering

Optical modules use semiconductor devices internally. However, in principle,optical modules are optical components. At soldering, take care that flux dose not contact the emitting surface or detecting surface. Also take care at flux removal after soldering.

Some optical modules come with protective cap. The protective cap is used to avoid malfunction when the optical module is not in use. Not that it is not dust or waterproof.

As mentioned before, optical modules are optical component. Thus, in principle,soldering where there may be flux residue or flux removal after soldering is not recommended.

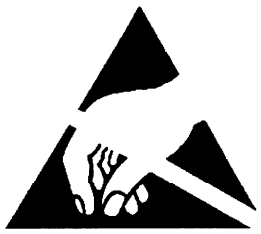
Toshiba recommends that soldering be performed without the optical module mounted on the board. Then, after the board is cleaned, solder the optical module manually. Do not perform any further cleaning.If the optical module cannot be soldered manually, use non-halogen (chlorine-free) flux and make sure, without cleaning, there is no residue such as chlorine.

This is one of the ways to eliminate the effects of flux. In such a case, check the reliability.

(4) Electrostatic Discharge (ESD)

When handling individual devices (Which are not yet mounted on a printed circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects which come into direct contact with deices should be made of anti-static materials and should be grounded to earth via an 0.5 to 1.0 MΩ protective resistor.

Please follow the precautions described below, I this is particularly important for devices which are marked "Be careful of static.".



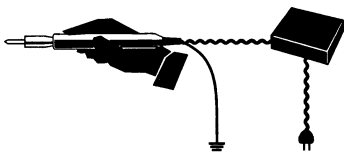
(A) Work environment

- when humidity in the working environment decreases, the human body and other insulators can easily become charged with static electricity due to friction.
  Maintain the recommended humidity of 40% to 60% in the work environment, while also taking into account the fact that moisture-proof-packed products nay absorb moisture after unpacking.
- Be sure that all equipment, jigs and tools in the working area are grounded to earth.
- Place a conductive mat over the door of the work area, or take other appropriate measures, so that the floor surface is protected against static electricity and is grounded to earth. The surface resistivity should be 10^4 to 10^8 Ω/sq and the resistance between surface and ground, 7.5×10^5 to 10^8 Ω.

- Cover the workbench surface also with a conductive mat (with a surface resistivity of 10^4 to 10^8 Ω/sq, for a resistance between surface and ground of 7.5 x 10^5 to 10^8 Ω).The purpose of this is to disperse static electricity on the surface (through resistive components) and ground it to earth. Workbench surfaces must not be constructed of low-resistance metallic materials that allow rapid static discharge when a charged device touches them directly.
- Pay attention to the following points when using automatic equipment in your workplace:
  (a) When picking up ICs with a vacuum unit, use a conductive rubber fitting on the end of the pick-up wand to protect against electrostatic charge.
  (b) Minimize friction on IC package surfaces. If some rubbing is unavoidable due to the device's mechanical structure, minimize the friction plane or use material with a small friction coefficient and low electrical resistance. Also, consider the use of an ionizer.
  (c) In sections, which come into contact with device, lead terminals, use a material, which dissipates static electricity.
  (d) Ensure that no statically charged bodies (such as work clothes or the human body) touch the devices.
  (e) Make sure that sections of the tape carrier which come into contact with installation devices or other electrical machinery are made of a low-resistance material.
  (f) Make sure that jigs and tools used in the assembly process do not touch devices.
  (g)In processes in which packages may retain an electrostatic charge, use an ionizer to neutralize the ions.
- Make sure that CRT displays in the working area are protected against static charge, for example by a VDT filter. As much as possible, avoid turning displays on and off. Doing so can cause electrostatic induction in devices.
- Keep track of charged potential in the working area by taking periodic measurements.
- Ensure that work chairs are Protected by an anti-static textile cover and are grounded to the floor surface by a grounding chain. (suggested resistance between the seat surface and grounding chain is 7.5xlO^5 to 10^{12} Ω.)
- Install anti-static mats on storage shelf surfaces. (Suggested surface resistivity is 10^4 to 10^8 Ω/sq; suggested resistance between surface and ground is 7.5x10^5 to 10^8 Ω.)
- For transport and temporary storage of devices, use containers (boxes, jigs or bags) that are made of anti-static materials or materials which dissipate electrostatic charge.
- Make sure that cart surfaces which come into contact with device packaging are made of materials which will conduct static electricity,and verify that they are grounded to the floor surface via a grounding chain.
- In any location where the level of static electricity is to be closely controlled, the ground resistance level should be Class 3 or above. Use different ground wires for all items of equipment, which may come into physical contact with devices.

(B) Operating environment

- Operators must wear anti-static clothing and conductive shoes (Or a leg or heel strap).
- Operators must wear a wrist strap grounded to earth via a resistor of about 1 MΩ.



- Soldering irons must be grounded from iron tip to earth, and must be used only at low voltages (6 V to 24 V).
- If the tweezers you use are likely to touch the device terminals, use anti-static tweezers and in particular avoid metallic tweezers. If a charged device touches a low-resistance tool, rapid discharge can occur. When using vacuum tweezers, attach a conductive chucking pat to the tip, and connect it to a dedicated ground used especially for anti-static purposes (suggested resistance value: 10^4 to 10^8 Ω)
- Do not place devices or their containers near sources of strong electrical fields (such as above a CRT).
- When storing printed circuit boards which have devices mounted on them, use a board container or bag that is protected against static charge. To avoid the occurrence of static charge or discharge due to friction, keep the boards separate from one other and do not stack them directly on top of one another.
- Ensure, if possible, that any articles (such as clipboards) which are brought to any location where the level of static electricity must be closely controlled are constructed of anti-static materials.

(5) Noise resistance

It is believed that the use of optical transfer devices improve the noise resistance. In principle, optical fiber is not affected by noise. However, especially receiving module which handle signals whose level is extremely small, are comparatively more susceptible to noise.

This device improves noise resistance using a conductive case. However, the current of the signal output from the photodiode of the optic receiving module is extremely small. Thus, depending on the usage environment, shielding the case is not sufficient for noise resistance.

When using this one, we recommends that you test using the actual device and check the noise resistance.

Use a simple noise filter on this device's power line. If the ripple in power supply used is high, further reinforce the filter.

When locating the optical module in an area susceptible to radiated noise,increase shielding by covering the optical module and the power line filter using a metallic cover .

(6) Vibration and Shock

This module is plastic sealed with wire fixed by resin. The structure is relatively sound against vibration or shock. In actual equipment, there are some cases where vibration, shock, or stress is applied to soldered parts or connected parts, resultingin line cut. Attention must be paid to the design of the mechanism for applications which are subject to large amounts of vibration.

(7) Solvent

When using solvent for flux removal, do not use a high acid or high alkali solvent. Be careful not to pour solvent in the optical connector ports. If solvent is inadvertently poured there, clean with cotton tips.

(8) Protective cap

When this optical transceiver is not in use, use the protective cap.

(9) Supply voltage

Use the supply voltage within the typical operating condition (Vcc=3±0.3V).
Make sure that supply voltage does not exceed the maximum rating value of 4.5V, even instantaneously.

(10) Input voltage

If a voltage exceeding the maximum rating value (Vcc+0.5V) is applied to the transmitter input, the internal IC may degrade causing some damage. If excessive voltage due to surges may be added to the input, insert a protective circuit.

(11) Soldering condition

Solder at 260℃ or less within ten seconds.

(12) Precaution on waste

When discarding devices and packing materials, follow procedures stipulated by local regulations in order to protect the environment against contamination.
Compound semiconductors such as GaAs are used as LED materials for this module.
When discarding waste or at final processing, attention must be paid to workers and the environment.

(13) Precaution on use

The Toshiba products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, domestic appliances, etc).

These Toshiba products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or 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, industrial instruments, all types of safety devices, etc. Unintended Usage of Toshiba products listed in this document shall be made at the customers' own risk.

Toshiba is continually working to improve the quality and the 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 observe standards of safety, and to avoid situations in which a malfunction or failure of a Toshiba product 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 product specifications.

Also, please keep in mind the precautions and conditions set forth in the Toshiba Semiconductor Reliability Handbook.