

## FIBER OPTIC RECEIVING MODULE

**TORX1950(F)**

## GENERAL PURPOSE OPTICAL RECEIVING MODULE

- Data rate: DC to 10 Mb / s (NRZ code)
- For JIS F05 Optical Connector
- TTL Interface
- ATC (Automatic Threshold Control) circuit is used for stabilized output at a wide range of optical power level.

**1. Absolute Maximum Ratings (Ta = 25°C)**

Characteristics	Symbol	Rating	Unit
Storage Temperature	T <sub>stg</sub>	-40 to 85	°C
Operating Temperature	T <sub>opr</sub>	-40 to 85	°C
Supply Voltage	V <sub>CC</sub>	-0.5 to 6	V
Low Level Output Current	I <sub>OL</sub>	20	mA
High Level Output Current	I <sub>OH</sub>	-1	mA
Soldering Temperature	T <sub>sol</sub>	260 (Note 1)	°C

Note 1: Soldering time ≤ 10 s (More than 1 mm apart from the package).

Using continuously heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

**2. Operating Ranges**

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply Voltage	V <sub>CC</sub>	4.75	5.0	5.25	V
High Level Output Current	I <sub>OH</sub>	-	-	-150	μA
Low Level Output Current	I <sub>OL</sub>	-	-	2.0	mA

**3. Electrical and Optical Characteristics (Ta = 25°C, Vcc=5V)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Data Rate		NRZ Code(Note 2)	DC	-	10	Mb / s	
Transmission Distance		APF (Note3)	DC to 10 Mb/s	0.2	-	50	m
		H-PCF (Note4)	DC to 10 Mb/s	0.2	-	1000	m
		H-PCF (Note5)		0.2	-	700	m
		H-PCF (Note4)	DC to 6 Mb/s	0.2	-	1000	m
		H-PCF (Note5)		0.2	-	800	m
Pulse Width Distortion (Note 6)	$\Delta tw$	Using APF or H-PCF and TOTX1950(F),TOTX1960(F) Pulse width 100 ns Pulse cycle 200 ns, CL = 10 pF	-30	-	30	ns	
		Using APF or H-PCF and TOTX1950(F),TOTX1960(F) Pulse width 165 ns Pulse cycle 330 ns, CL = 10 pF	-55	-	55	ns	
Maximum Receivable Power (Note 7)	$P_{MAX}$	DC to 10 Mb / s, Using APF	- 9	-	-	dBm	
		DC to 10 Mb / s, Using H-PCF	-14	-	-	dBm	
Minimum Receivable Power (Note 7)	$P_{MIN}$	DC to 10 Mb / s, Using APF	-	-	-27	dBm	
		DC to 6 Mb / s, Using APF	-	-	-28	dBm	
		DC to 10 Mb / s, Using H-PCF	-	-	-29	dBm	
		DC to 6 Mb / s, Using H-PCF	-	-	-30	dBm	
Current Consumption	$I_{CC}$		-	9	20	mA	
High Level Output Voltage	$V_{OH}$	Vcc=4.75V	3.5	4.0	-	V	
Low Level Output Voltage	$V_{OL}$	Vcc=5.25V	-	0.1	0.4	V	

Note 2: High level output when optical flux is received. Low level output when it is not received.  
The duty factor must be kept 25 to 75%.

Note 3: All Plastic fiber (980 / 1000  $\mu$ m) with polished surface.

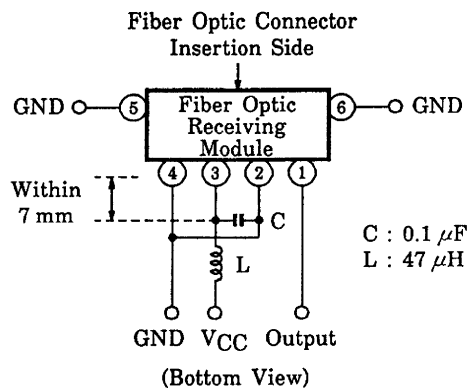
Note 4: H-PCF (200 / 230  $\mu$ m). F05 type optical connector with polished surface.

Note 5: H-PCF (200 / 230  $\mu$ m). F05 type optical connector with non-polished surface (cut by fiber cutter).

Note 6: Between input of TOTX1950(F),TOTX1960(F) and output of TORX1950(F).

Note 7: BER  $\leq 10^{-9}$ , Valued by peak.

**4. Application Circuit**



## 5. Applicable Optical Fiber with Fiber Optic Connectors

All Plastic Fiber (980  $\mu$  m core / 1000  $\mu$  m cladding), NA=0.5  
F05 type optical connector with Polished Surface.

Plastic Cladding Silica Fiber (200  $\mu$  m / 230  $\mu$  m cladding),  
F05 type optical connector with Polished Surface.

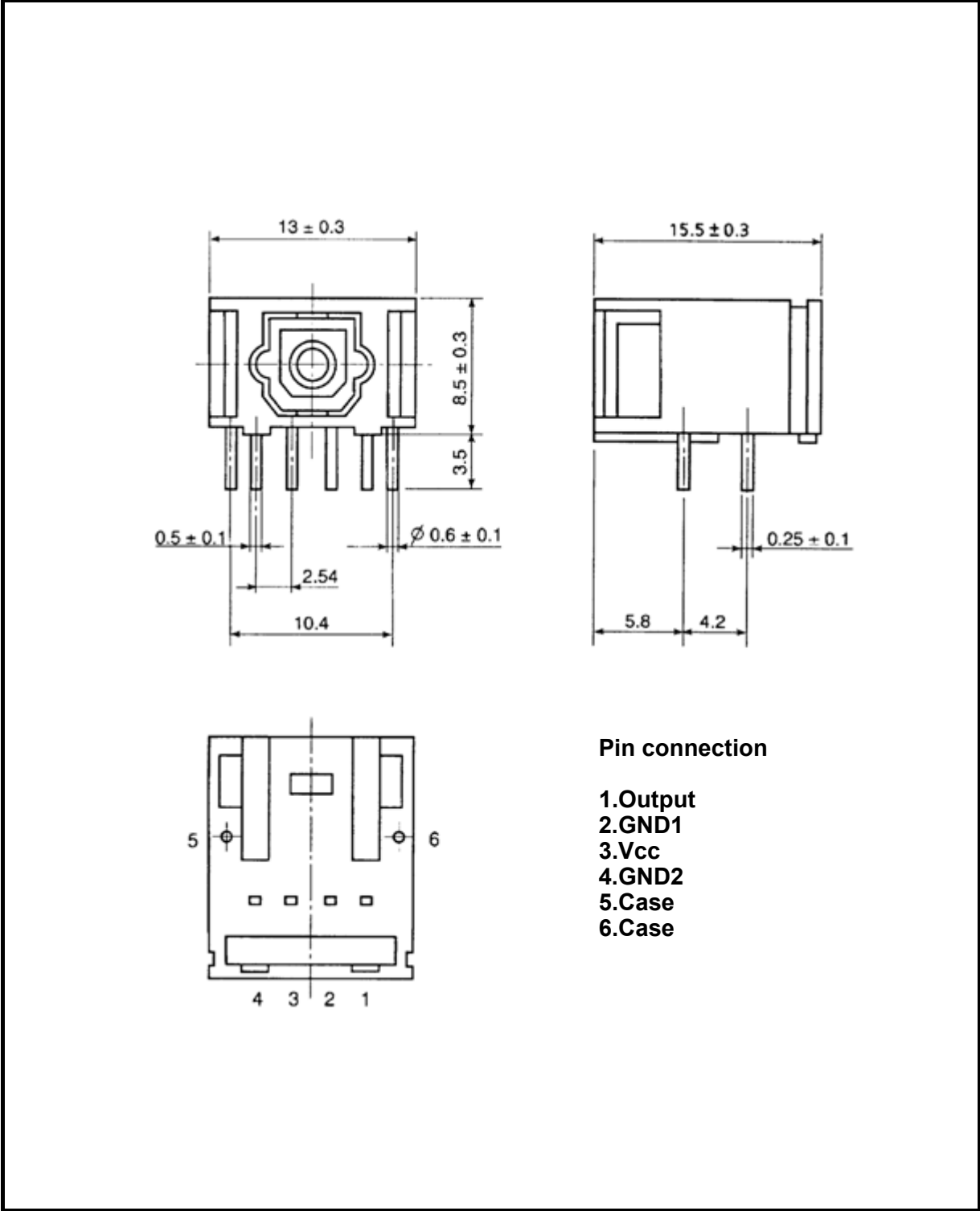
## 6. Precautions during use

- (1) Absolute maximum rating  
The absolute maximum ratings are the limit values which must not be exceeded during operation of device. None of these rating value must not be exceeded. If The absolute maximum rating value is exceeded, the characteristics of devices may never be recovered properly. In extreme cases, the device may be permanently damages.
- (2) Operating Range  
The operating range is the range of conditions necessary for the device to operate as specified in individual technical datasheets and databooks. Care must be exercised in the design of the equipment. If a device is used under conditions that do not exceed absolute maximum ratings but exceed the operating range, the specifications related to device operation and electrical characteristics may not be met, resulting in a decrease in reliability.  
If greater reliability is required, derate the device's operating ranges for voltage, current, power and temperature before use.
- (3) Soldering  
Optical modules are comprised of internal semiconductor devices. However, in principle, optical modules are optical components. During soldering, ensure that flux dose not contact with the emitting surface or detecting surface. Also ensure that proper flux removal is conducted 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) Noise resistance  
Where the fiber optic receiving module case uses conductive resin, shield by connecting the reinforcing pin at a front end of the module to GND. When using this optical module, connect the pin to SIGNAL-GND.  
Where the fiber optic receiving module case has a resistance of several tens of ohms, take care that the case does not contact power line of other circuits.  
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.  
TOSLINK 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 TOSLINK, Toshiba recommends that you test using the actual device and check the noise resistance.  
Use a simple noise filter on the TOSLINK fiber optic receiving module 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.

- (5) **Vibration and shock**  
This module is resin-molded construction with wire fixed by resin. This structure is relatively sound against vibration or shock, In actual equipment, there are some cases where vibration, shock, and stress is applied to soldered parts or connected parts, resulting in line cut. Attention must be paid to the design of the mechanism for applications which are subject to large amounts of vibration.
- (6) **Fixing fiber optical receiving module**  
Solder the fixed pin (pins 5 and 6) of fiber optical receiving module TORX1950(F) to the printed circuit board to fix the module to the board.
- (7) **Shielding and wiring pattern of fiber optic receiving modules**  
To shield, connect the fixed pins (pins 5 and 6) of fiber optic transceiving module TORX1950(F) to the GND. Where the fiber optic receiving module uses conductive resin, be careful that the case does not touch wiring (including land).  
To improve noise resistance, shield the optical module and the power line filter using a metallic cover.
- (8) **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.
- (9) **Protective cap**  
When the fiber optic receiving module TORX1950(F) is not in use, use the protective cap.
- (10) **Supply voltage**  
Use the supply voltage within the operating ranges ( $V_{CC} = 5 \pm 0.25$  V). Make sure that supply voltage does not exceed the absolute maximum rating value of 6 V, even instantaneously.
- (11) **Output**  
When the receiver output is at low level and connected to the power supply, or when the output is at high level and connected to GND, the internal IC may be destroyed.
- (12) **Soldering condition**  
Solder at 260°C or less within ten seconds.
- (13) **Incidence of a photo Flash**  
If strong light such as a photo flash is incident on an optical module, a transmission error may occur. Be careful to avoid such situations.
- (14) **Precaution on waste**  
When discarding devices and packing materials, follow procedures stipulated by local regulations in order to protect the environment against contamination.

7 Package Outline drawing

Unit: mm



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