FIBER OPTIC RECEIVING MODULE

TORX1950A(F)

GENERAL PURPOSE OPTICAL RECEIVING MODULE

- For JIS F05 type optical connector
- CMOS level interface
- +5 V single power supply
- ATC (Automatic Threshold Control) circuit built-in

1. Absolute Maximum Ratings (Note) (Unless otherwise specified, Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Storage Temperature	T_{stg}	−40 to 95	°C
Operating Temperature	T_{opr}	−40 to 85	°C
Supply Voltage	V_{CC}	−0.5 to 6	V
High Level Output Current	I_{OH}	−20	mA
Low Level Output Current	I_{OL}	20	mA
Soldering Temperature	T_{sol}	260 (Note 1)	°C

Note: 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.).

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

2. Operating Ranges

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply Voltage	V_{CC}	4.75	5.0	5.25	V
High Level Output Current	I_{OH}	-	-	−2.0	mA
Low Level Input Voltage	I_{OL}	-	-	2.0	mA

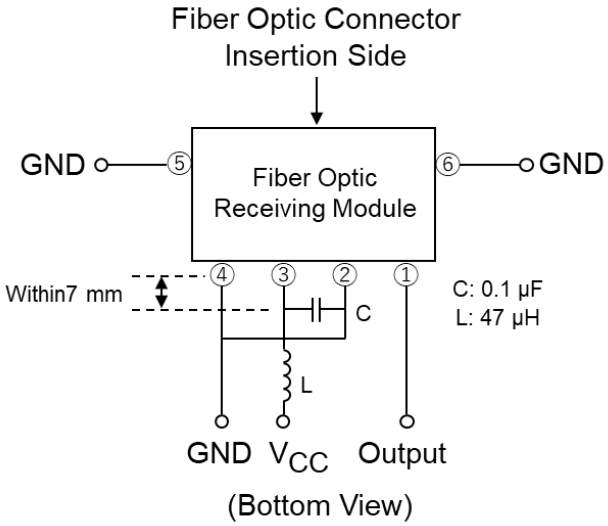
Start of commercial production
2016-01

3. Electrical and Optical Characteristics (Unless otherwise specified, Ta = 25°C, V_{CC} = 5 V)

Characteristics	Symbol	Test Condition		Min	Typ.	Max	Unit
Data Rate	−	NRZ Code (Note 1)		DC	−	10	Mb/s
Transmission Distance	−	DC to 10 Mb/s	APF (Note 2)(Note 4)	0.2	−	50	m
		DC to 10 Mb/s	H-PCF (Note 3)(Note 5)	0.2	−	1000	
			H-PCF (Note 3)(Note 6)	0.2	−	700	
			H-PCF (Note 2)(Note 6)	0.2	−	300	
		DC to 6 Mb/s	H-PCF (Note 3)(Note 5)	0.2	−	1000	
			H-PCF (Note 3)(Note 6)	0.2	−	800	
Pulse Width Distortion (Note 7)	Δtw	Pulse width 100 ns Pulse cycle 200 ns C_L = 10 pF		−30	−	30	ns
		Pulse width 165 ns Pulse cycle 330 ns C_L = 10 pF		−55	−	55	
Maximum Receivable Power (Note 8)	P_{MAX}	DC to 10 Mb/s, Using APF (Note 2)(Note 4)		−9	−	−	dBm
		DC to 10 Mb/s, Using H-PCF (Note 3)(Note 5)		−14	−	−	
		DC to 10 Mb/s, Using H-PCF (Note 2)(Note 6)		−18	−	−	
Minimum Receivable Power (Note 8)	P_{MIN}	DC to 10 Mb/s, Using APF (Note 2)(Note 4)		−	−	−27	dBm
		DC to 6 Mb/s, Using APF (Note 2)(Note 4)		−	−	−28	
		DC to 10 Mb/s, Using H-PCF (Note 3)(Note 5)(Note 6)		−	−	−29	
		DC to 6 Mb/s, Using H-PCF (Note 3)(Note 5)		−	−	−30	
Current Consumption	I_{CC}	−		−	9	20	mA
High Level Output Voltage	V_{OH}	V_{CC} = 4.75 V		4.1	4.5	-	V
Low Level Output Voltage	V_{OL}	V_{CC} = 4.75 V		−	0.1	0.4	V

Note 1: 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 2: Optical Transmitting Module TOTX1950A(F)Usage.
Note 3: Optical Transmitting Module TOTX1960A(F)Usage.
Note 4: All Plastic Fiber(980 / 1000 μm, cladding)with F05 type optical connector. Polished surface.
Note 5: Plastic Cladding Silica Fiber(200μm core / 230μm cladding)with F05 type optical connector with polished surface.
Note 6: Plastic Cladding Silica Fiber(200μm core / 230μm cladding)with F05 type optical connector. Non-polished surface (cut by fiber cutter).
Note 7: Between input of TOTX1950A(F),TOTX1960A(F) and output of TORX1950A(F).
Note 8: BER ≤ 10^{-9}, Valued by peak.

4. Application Circuit



5. Applicable Optical Fiber with Fiber Optic Connectors

All Plastic Fiber(980 / 1000 μm, cladding, NA=0.5) with F05 type optical connector. Polished surface.
Plastic Cladding Silica Fiber(200 / 230 μm, cladding) with F05 type optical connector with polished surface or non-polished surface(cut by fiber cutter).

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 optic receiving module TORX1950A(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 TORX1950A(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 TORX1950A(F) is not in use, use the protective cap.

(10) Supply voltage
Use the supply voltage within the operating ranges (V_{CC} = 5 ± 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.

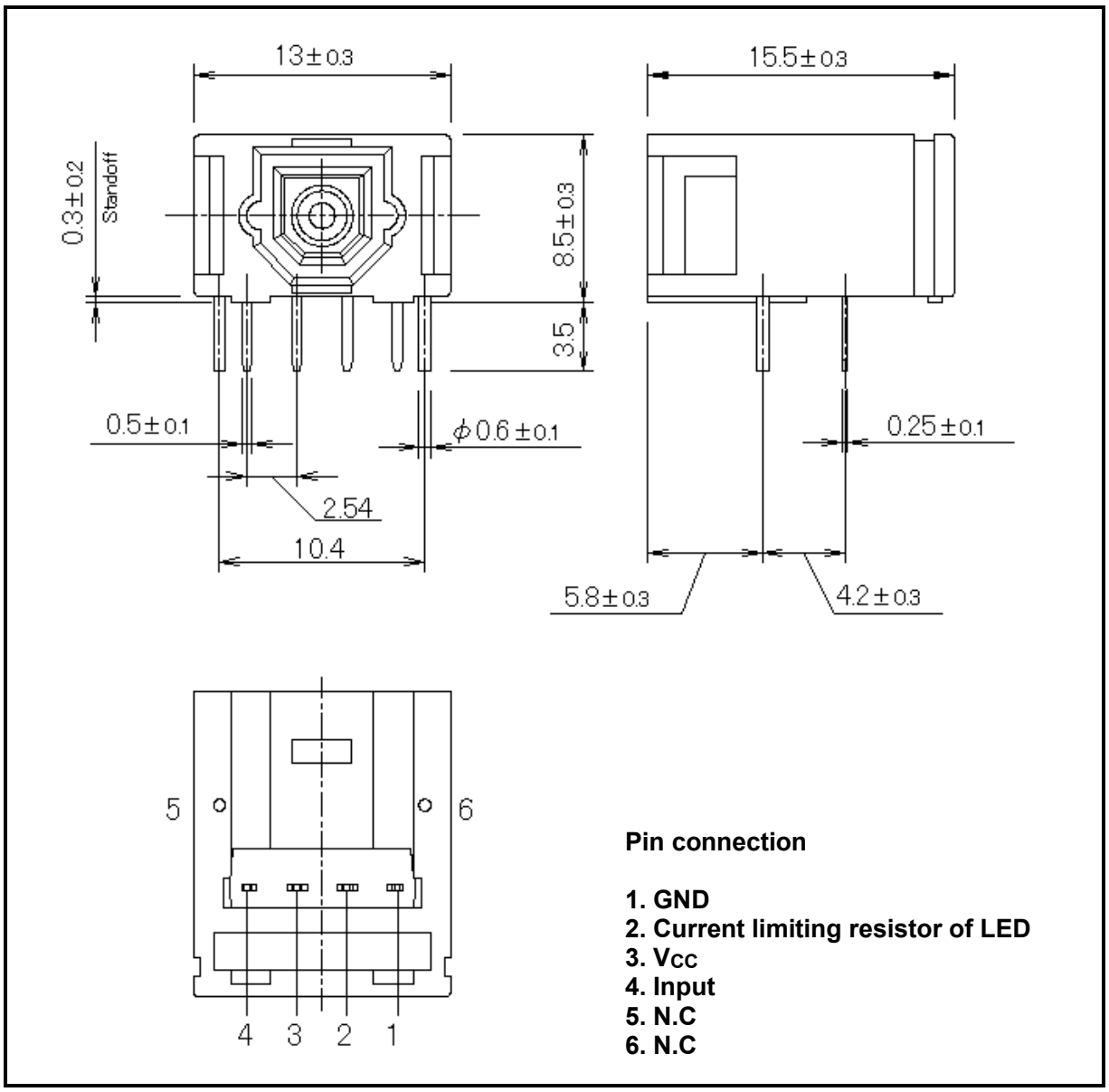
(12) Soldering condition
Solder at 260°C or less within ten seconds.

(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



Pin connection

1. GND
2. Current limiting resistor of LED
3. Vcc
4. Input
5. N.C
6. N.C

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