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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: [info@chipsmall.com](mailto:info@chipsmall.com) Web: [www.chipsmall.com](http://www.chipsmall.com)

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## FIBER OPTIC TRANSCEIVING MODULE

**TODX2353(F)**

## GENERAL PURPOSE OPTICAL TRANSCEIVING MODULE

- Based on JIS F07(PN) type fiber optic connector
- 650nm LED
- Low current LED drive
- ATC (Automatic Threshold Control) circuit built-in.

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

Characteristics	Symbol	Rating	Unit
Storage Temperature	T <sub>stg</sub>	-40 to 95	°C
Operating Temperature	T <sub>opr</sub>	-40 to 85	°C
Forward Current (DC)	I <sub>FDC</sub>	30	mA
Reverse Voltage	V <sub>R</sub>	MAX 5	V
Supply Voltage	V <sub>CC</sub>	-0.5 to 6	V
High Level Output Current	I <sub>OH</sub>	-1	mA
Low Level Output Current	I <sub>OL</sub>	20	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 under 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
Forward Current (DC)	I <sub>F</sub>	-	1.5	10	mA
Supply Voltage	V <sub>CC</sub>	4.75	5.0	5.25	V
Data Rate		DC	-	500	kb/s
High Level Output Current	I <sub>OH</sub>	-	-	-0.8	mA
Low Level Output Current	I <sub>OL</sub>	-	-	0.8	mA

Start of commercial production  
2015-02

### 3. Electrical and Optical Characteristics (Ta = 25°C, V<sub>CC</sub> = 5 V)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Data Rate			NRZ Code(Note 2)	DC	-	500	kb / s
Transmission Distance (Note 2)			APF(Note 3), Using TODX2353(F)	0.2	-	10	m
Pulse Width Distortion (Note 4)		$\Delta tw$		-30	-	30	%
Fiber Output Power (Note 5)		$P_f$	$I_F=1.5mA$ , Using APF (Note3),	-17	-	-12	dBm
Center Emission Wavelength		$\lambda_c$		-	650	-	nm
Forward Voltage		$V_F$	$I_F=1.5mA$	-	1.75	2.2	V
Reverse Current		$I_R$	$V_R=5V$	-	-	10	$\mu A$
Maximum Receivable Power (Note 6)		$P_{MAX}$	APF(Note 3), DC to 500kb/s	-11	-	-	dBm
Minimum Receivable Power (Note 6)		$P_{MIN}$	APF(Note 3), DC to 500kb/s	-	-	-23.5	dBm
Current Consumption	Active (Optical flux on)	$I_{CC(1)}$		-	0.3	1.5	mA
	Standby (No optical flux on)	$I_{CC(2)}$		-	20	30	$\mu A$
High Level Output Voltage		$V_{OH}$		4.2	4.8	-	V
Low Level Output Voltage		$V_{OL}$		-	0.2	0.4	V

Note 2: Data rate and transmission distance differ from driver circuit.

High level output when optical flux is received. Low level output when it is not received.

Note 3: All Plastic Fiber (980 $\mu m$  core / 1000 $\mu m$  cladding, NA=0.5). Polished surface.

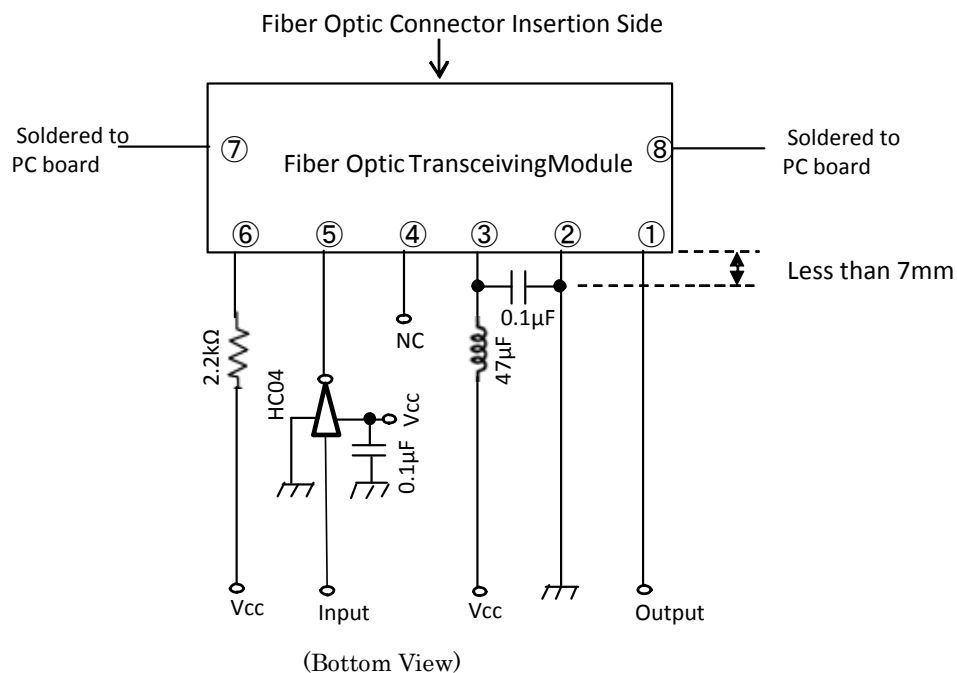
Note 4: Between input of driver circuit of TODX2353(F) and output of TODX2353(F).

A value changes with LED drive circuits.

Note 5: Measure with a standard optical fiber with fiber optic connectors. Valued by peak.

Note.6:  $BER \leq 10^{-9}$ , 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) with PN type optical connector. 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 restored 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) Lifetime of light emitters

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

The lifetime of light emitters is greatly influenced by the operating conditions and the environment in which it is used as well as by the lifetime characteristics unique to the device type. Thus, when a light emitting device and its operating conditions determined, Toshiba recommend that lifetime characteristics be checked.

Depending on the environment conditions, Toshiba recommend that maintenance such as regular checks of the amount of optical output in accordance with the condition of operating environment.

(4) Soldering

Optical modules are comprised of internal semiconductor devices. However, in principle, optical modules are optical components. During soldering, ensure that flux does not contact with the emitting surface or the detecting surface. Also ensure that proper flux removal is conducted after soldering.

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

As mentioned before, optical modules are optical components. Thus, in principle, soldering where there may be flux residue and flux removal after soldering is not recommended. Toshiba recommend that soldering be performed without the optical module mounted on the board. Then, after the board has been cleaned, the optical module should be soldered on to the board manually.

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 cases, be sure to check the devices' reliability.

(5) Vibration and shock

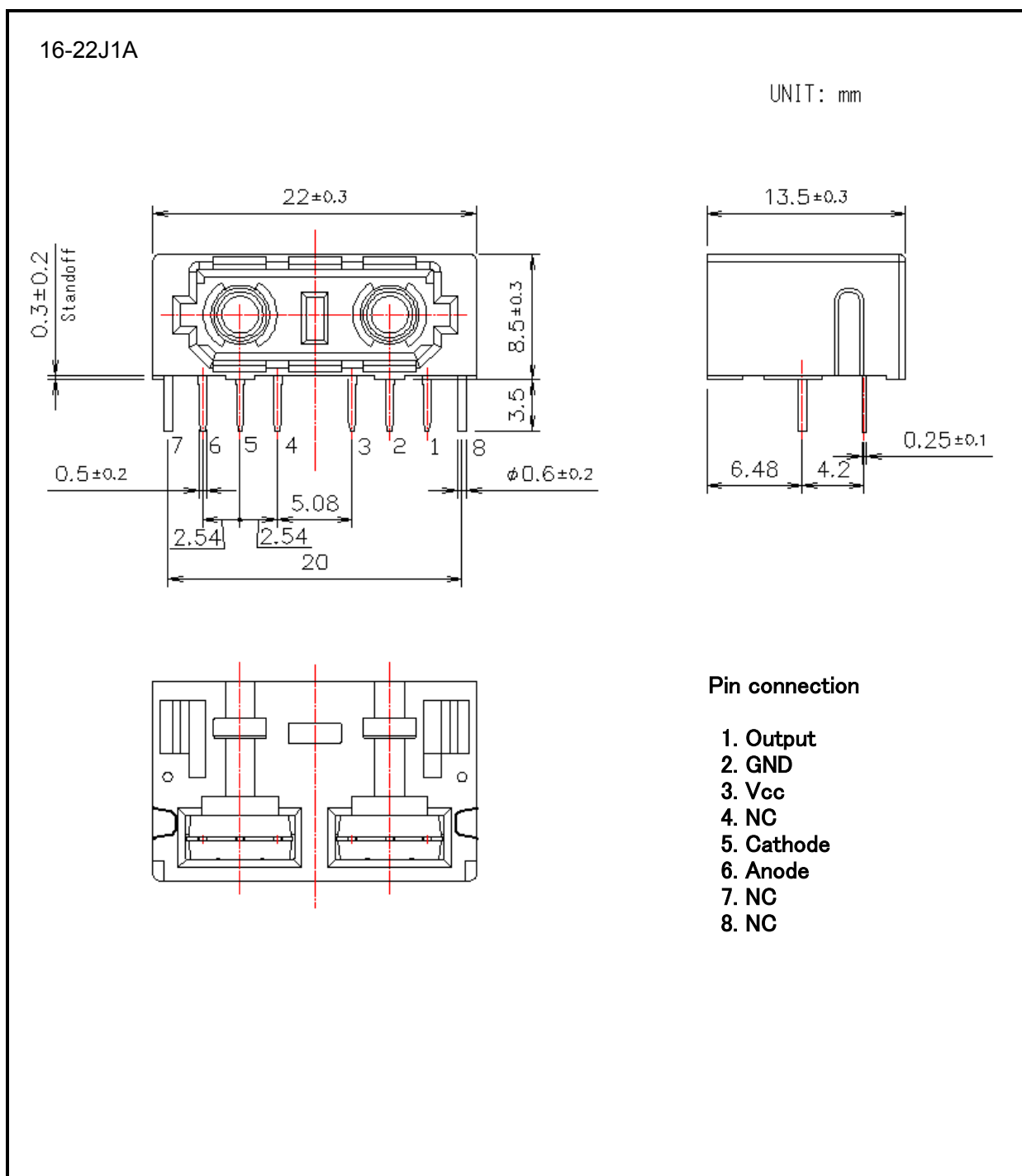
This module is plastic sealed and has its wire fixed by resin. This structure is relatively resistant to vibration and shock. In actual equipment, there are sometime cases in which vibration, shock, or stress is applied to soldered parts or connected parts, resulting in lines cut. A care must be taken in the design of equipment which will be subject to high levels of vibration.

(6) Fixing fiber optical transceiving module

Solder the fixed pin (pins 7 and 8) of fiber optic transceiving module TODX2353 (F) to the printed circuit board to fix the module to the board.

- (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 to the optical connector ports. If solvent is inadvertently poured in to them, clean it off using cotton tips.
- (8) Protective cap  
When the TODX2353(F) is not in use, attach the protective cap..
- (9) An influence of flash or strong light  
Do not emit a flash or a strong light to the optical module directly they may cause an error in data transmission.
- (10) Soldering condition  
Solder at 260°C or less for no more than ten seconds.
- (11) Supply Voltage  
Use the supply voltage within the recommended operating condition ( $V_{cc}=5\pm0.25V$ ). Make sure that Supply voltage does not exceed the maximum rating value of 6V, even for an instant.
- (12) Output  
If the receiver output is at low and is connected to the power supply, or if the output is high and is connected to GND, the internal IC may be destroyed.
- (13) Precautions when disposing of devices and packing materials.  
When disposing devices and packing materials, follow the procedures stipulated by local regulations in order to protect the environment against contamination.
- (14) Others  
This product is an optical transceiving module for plastic optical fiber.  
Use only for an optical transceiving module purpose.

## 7. Package Outline drawing





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