FIBER OPTIC RECEIVING MODULE

TORX1701A(F)

○ FIBER OPTIC RECEIVING MODULE FOR HIGH SPEED DATA TRANSMISSION

- For JIS F05 type optical connector
- Data rate : 20Mb/s to 125Mb/s
- Tansmission distance : Up to 20m (APF)
  Up to 100m (GI-PCF)
- Optical receiving IC built-in
- Compatible with 3.3 V PECL Level
- Resin molded type

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

Characteristics	Symbol	Rating	Unit
Storage Temperature	T_{stg}	−40 to 85	°C
Operating Temperature	T_{opr}	−10 to 70	°C
Supply Voltage	V_{CC}	-0.5 to 4.5	V
Output Current	Io	50	mA
Soldering Temperature	T_{sol}	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_{CC}	3.0	3.3	3.6	V
Data Rate		20	-	125	Mb/s
Mark Ratio		-	50	-	%
Output Load	R_L	-	50	-	Ω

Start of commercial production
2015-06

3. Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 3.3 V)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Data Rate		NRZ code (Note.2)	20	-	125	Mb/s
Transmission Distance		APF(Note.3), 125 Mb/s Using TOTX1701A(F)	0.1	-	20	m
		GI-PCF(Note.4), 125 Mb/s Using TOTX1701A(F)	0.1	-	100	m
Maximum Receivable Power (Note 5)	P_{MAX}	APF(Note.3), 125 Mb/s Using TOTX1701A(F)	- 8.0	-	-	dBm
		GI-PCF(Note.4), 125 Mb/s Using TOTX1701A(F)	-11.5	-	-	dBm
Minimum Receivable Power (Note 6)	P_{MIN}	APF(Note.3), 125 Mb/s Using TOTX1701A(F)	-	-	-19.0	dBm
		GI-PCF(Note.4), 125 Mb/s Using TOTX1701A(F)	-	-	-23.0	dBm
Current Consumption (Note 7)	I_{CC}		-	45	60	mA
High Level Output Voltage (Note 8)	V_{OH}	R_L=50 Ω	Vcc-1.15	-	Vcc-0.90	V
Low Level Output Voltage (Note 8)	V_{OL}	R_L=50 Ω	Vcc-1.79	-	Vcc-1.49	V
SD Assert Level (Note 9)	SDA	APF (Note.3), 125 Mb/s	-	-	-19.0	dBm
		GI-PCF (Note.4), 125 Mb/s	-	-	-23.0	dBm
SD Deassert Level (Note 10)	SDD	APF (Note.3), 125 Mb/s	-	-	-20.0	dBm
		GI-PCF (Note.4), 125 Mb/s	-	-	-24.0	dBm
High Level SD Output Voltage	V_OSDH		Vcc×0.8	-	-	V
Low Level SD Output Voltage	V_OSDL		-	-	Vcc×0.2	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 μm core / 1000 μm cladding, NA=0.5) .Polished surface.

Note.4: GI-PCF (200 μm core / 230 μm cladding, NA=0.4). polished surface.

Note.5: 2^7-1 pattern. BER≤10^{-9}. Measured by standard optical module. Averaged value.

Note.6: 2^7-1 pattern. BER≤10^{-9}. Measured by eye center. Measured by standard optical module. Averaged value.

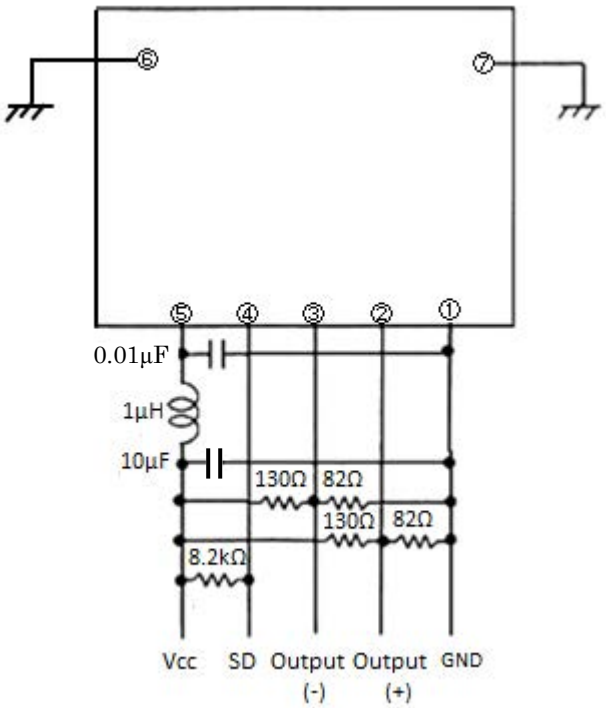
Note.7: Without terminating resistance current.

Note.8: High level output when high level optical flux is received, Low level output when low level optical flux is received.

Note.9: The value when SD output changes from L level to H level.

Note.10: The value when SD output changes from H level to L level.

4. Application Circuit



(Bottom View)

Note.11： Place termination resistors near physical layer device data input pin.
Make differential signal paths short and the same length.
Use ground plane(or multi-layer)printed circuit board for best high frequency performance.
Signal trace should be 50 Ω transmission lines(micro strip or strip line).
Use high-frequency monolithic ceramic bypass capacitors and low DC resistance inductors.
Do not directly connect optical transceiver's ECL outputs to the GND without proper current limiting impedance.

5. Applicable Optical Fiber with Fiber Optic Connectors

All Plastic Fiber (980 μm core / 1000 μm cladding, NA=0.5) with F05 type connector. Polished surface.

GI-PCF (200 μm core / 230 μm cladding, NA=0.4) with F05 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 broken.

(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) Noise resistance

It is believed that the use of optical transfer devices improve noise resistance. In theory, optical fiber is not affected by noise at all. However, receiving modules which handle signals whose level is extremely small, are susceptible to noise.
TOSLINK improve noise resistance to use a conductive case. However, the current signal output by the optical receiving modules' photodiode is extremely small. Thus, in some environments, shielding the case may not achieve sufficient noise resistance.
First systems which incorporate TOSLINK, Toshiba recommend testing using the actual device to check its noise resistance.
Use a simple noise filter on TOSLINK fiber optic transceiving module's power line. If the ripple in the power supply used is significant, reinforce the filter.
The optical module is to be used in an area which is susceptible to radiated noise, increase the shielding by covering the optical module and the power line filter with a metallic cover.

(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) Shielding and wiring pattern of fiber optic receiving modules

To shield, connect the fixed pins (pins 6 and 7) of fiber optic receiving module TORX1701A(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.

(7) Fixing fiber optic receiving module
Solder the fixed pin (pins 6 and 7) of fiber optic receiving module TORX1701A(F) to the printed circuit board to fix the module to the board.

(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 to the optical connector ports. If solvent is inadvertently poured in to them, clean it off using cotton tips.

(9) Protective cap
When the fiber optic receiving module TORX1701A(F) is not in use, attach the protective cap.

(10) 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.

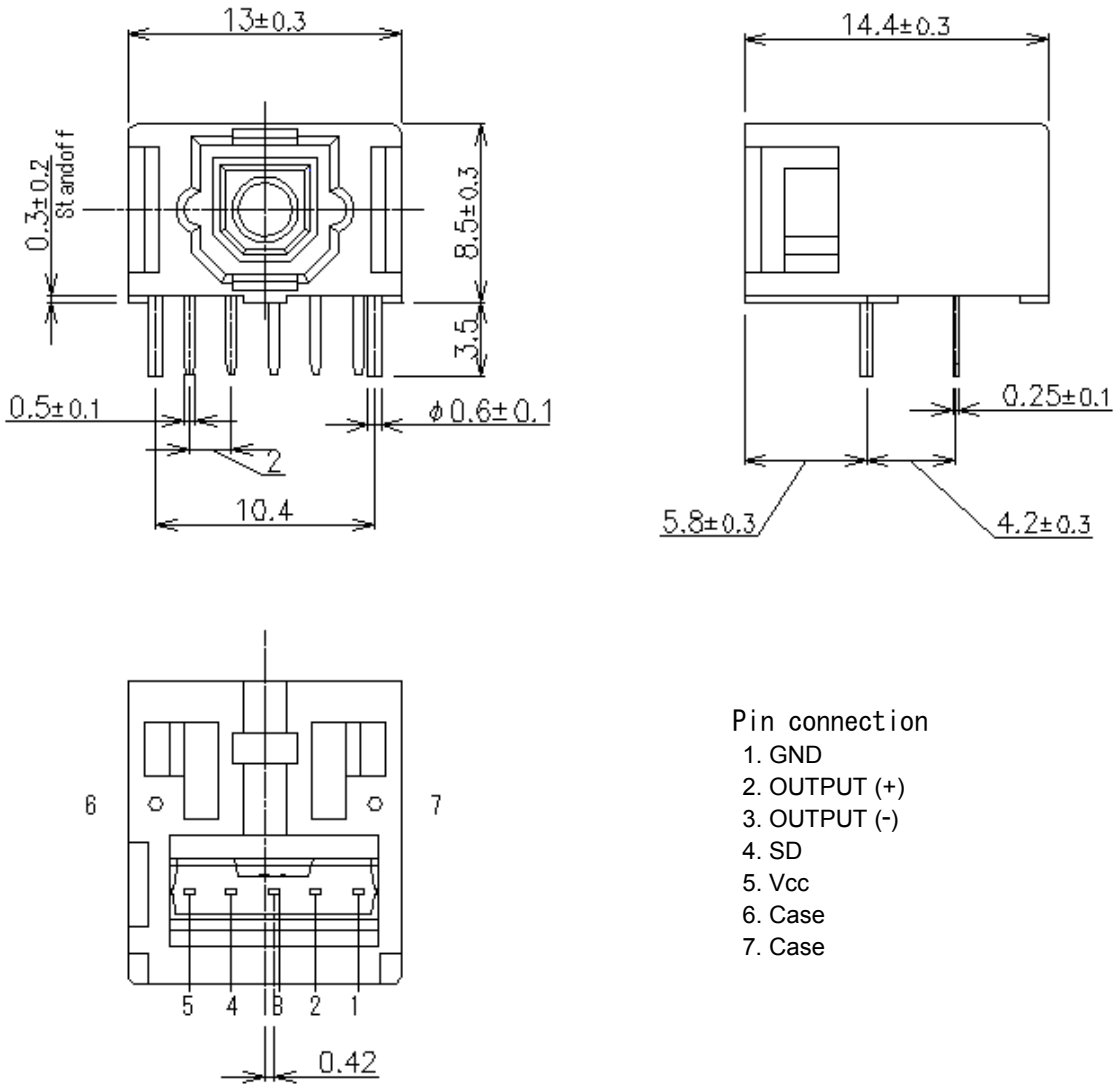
(11) Supply voltage
Use the supply voltage within the operating range (V_{CC} =3.3 ± 0.3 V). Make sure that supply voltage does not exceed the absolute maximum rating value of 4.5 V, even for an instant.

(12) Soldering condition
Solder at 260°C or less for no more than ten seconds.

(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.

7. Package Outline drawing

Unit: mm



Pin connection

1. GND
2. OUTPUT (+)
3. OUTPUT (-)
4. SD
5. Vcc
6. Case
7. Case

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