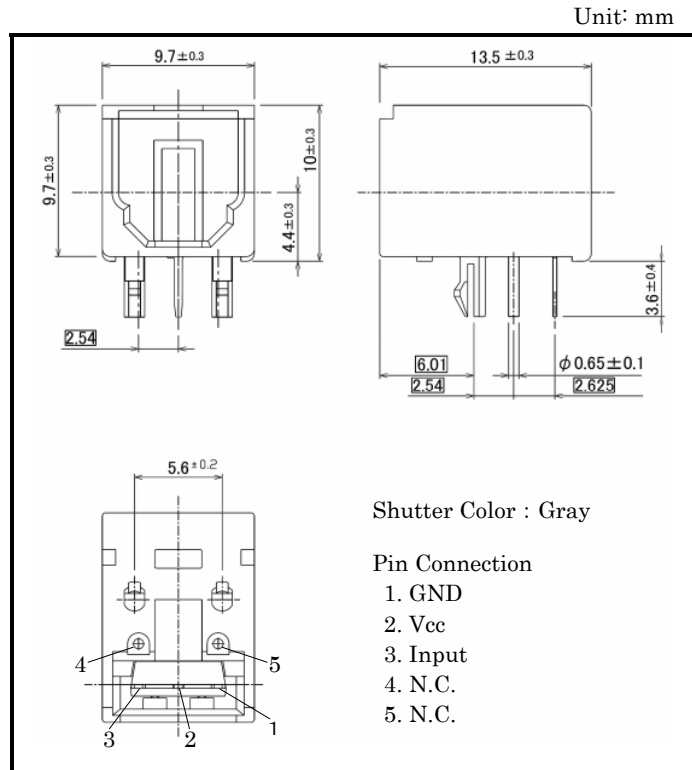


FIBER OPTIC TRANSMITTING MODULE

TOTX147PL(F,T)

FIBER OPTIC TRANSMITTING MODULE FOR DIGITAL AUDIO INTERFACE

- For JEITA Standard CP-1212 (Digital Audio Optical Interface for Consumer Equipment).
- LED is driven by differential circuit.
- Mini-package with Shutter System



1. Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Storage Temperature	T _{stg}	-40 to 70	°C
Operating Temperature	T _{opr}	-20 to 70	°C
Supply Voltage	V _{CC}	-0.5 to 4.5	V
Input Voltage	V _{IN}	-0.5 to V _{CC} + 0.5	V
Soldering Temperature	T _{sol}	260 (Note 1)	°C

Note 1: Soldering time ≤ 10 seconds (At a distance of 1 mm from the package).

2. Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply Voltage	V _{CC}	2.7	3.0	3.6	V
High-Level Input Voltage	V _{IH}	2.1	---	V _{CC}	V
Low-Level Input Voltage	V _{IL}	0	---	0.9	V

Handling 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.

3. Electrical and Optical Characteristics (Ta = 25°C, VCC = 3 V)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Data Rate		NRZ Code (Note 2)	DC	---	15	Mb / s
Transmission Distance		Using APF (Note 3) and TORX147PL(F,T)	0.2	---	5	m
Pulse Width Distortion (Note 4)	Δt_w	Pulse Width = 67 ns Pulse Cycle = 134 ns Using TORX147PL(F,T) $C_L = 10 \mu\text{F}$	-15	---	15	ns
Fiber Output Power (Note 5)	P_f		-21	---	-15	dBm
Peak Emission Wavelength	λ_c		---	650	---	nm
Current Consumption	I_{CC}		---	8	15	mA
High Level Input Voltage	V_{IH}		2.1	---	---	V
Low Level Input Voltage	V_{IL}		---	---	0.9	V

Note 2: LED is on when input signal is high, and off when it is low.
7.5Mb/s (max.) Biphase Signal.

Note 3: All Plastic Fiber (980 / 1000 μm).

Note 4: Between input of TOTX147PL(F,T) and output of TORX147PL(F,T).

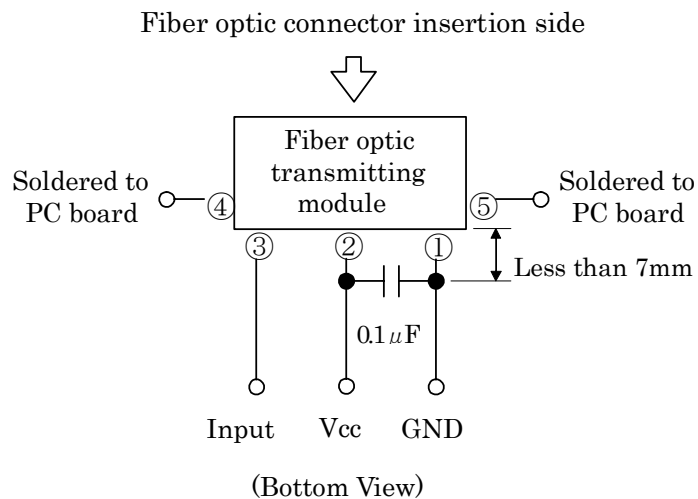
Note 5: Measure with a standard optical fiber, peak value.

4. Mechanical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Insertion Force (Note 6)		Initial value	---	---	39.2	N
Withdrawal Force (Note 6)		Initial value	5.9	---	39.2	N

Note 6: Square type connector : EIAJ RC-5720B

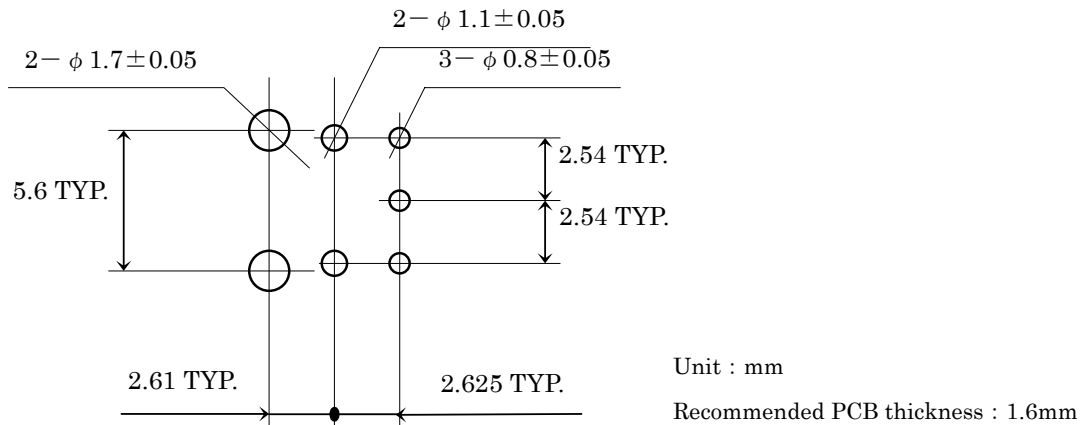
5. Application Circuit



6. Required Optical Fiber with Fiber Optic Connectors

All Plastic Fiber with Square Type Connector (EIAJ RC-5720B)

7. Board layout hole pattern (Recommendation)



8. Precautions during use

- (1) Maximum rating

The 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 maximum rating value is exceeded, the characteristics of devices may never be restored properly. In extreme cases, the device may be permanently damages.
- (2) 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.
- (3) 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 shutter system. The shutter system 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.
- (4) 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 sometimes 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.
- (5) Support pins

The optical transmission module TOTX147PL(F,T) has support pins in order to fix itself to the PCB temporary. Please make the hole for these pins in the PCB under the condition described in board layout hole pattern.

- (6) Attaching the fiber optic receiving module
Solder the fixed pins (pins 4 and 5) of the fiber optic receiving module TOTX147PL(F,T) to the printed circuit board in order to fix it 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) Supply voltage
Use the supply voltage within the recommended operating condition ($V_{CC} = 2.7$ to 3.6 V). Make sure that supply voltage does not exceed the maximum rating value of 4.5 V, even for an instant.
- (9) Input voltage
If a voltage exceeding the maximum rating value ($V_{CC} + 0.5$ V) is applied to the transmitters' input, the internal IC may suffer damage. If there is a possibility that excessive voltage due to surges may be added to the input terminal, insert a protective circuit.
- (10) Soldering condition
Solder at 260°C or less for no more than ten seconds.
- (11) Case(receptacle) material
The case is made of polycarbonate. Polycarbonate is usually stable with acid, alcohol, and aliphatic hydrocarbons however, with petrochemicals (such as benzene, toluene, and acetone), alkali, aromatic hydrocarbons, or chloric hydrocarbons, polycarbonate becomes cracked, swollen, or melted. Please take care when choosing a packaging material by referencing the table below.

〈Chemicals to avoid with polycarbonate〉

	PHENOMENON	CHEMICALS
A	Little deterioration But staining	• nitric acid(low concentration) , hydrogen peroxide, chlorine
B	Cracked crazed, or Swollen	• acetic acid(70% or more) • gasoline • methyl isobutyl ketone, ethyl acetate, butyl acetate • methyl methacrylate, ethyl ether, MEK • acetone, m-amino alcohol, carbon tetrachloride • carbon disulfide, trichloroethylene, cresol • thinners, oil of turpentine • triethanolamine
C	Melted { } : used as solvent	• concentrated sulfuric acid • benzene • styrene, acrylonitrile, vinyl acetate • ethylenediamine, diethylenediamine • {chloroform, methyl chloride, tetrachloromethane, dioxane} {1,2-dichloroethane}
D	Decomposed	• ammonia water • other alkali

- (12) 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.
Compound semiconductors such, as GaAs are used as LED materials in this module. When devices are disposed of, worker safety and protection of the environment must be taken into account.
- (13) Precautions during use
Toshiba is continually working to improve the quality and reliability of their products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and their 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 the malfunction or failure of a Toshiba product could cause loss of human life, bodily injury or damage to property.
When developing equipment, please ensure that Toshiba products are used within the specified operating ranges 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.

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