

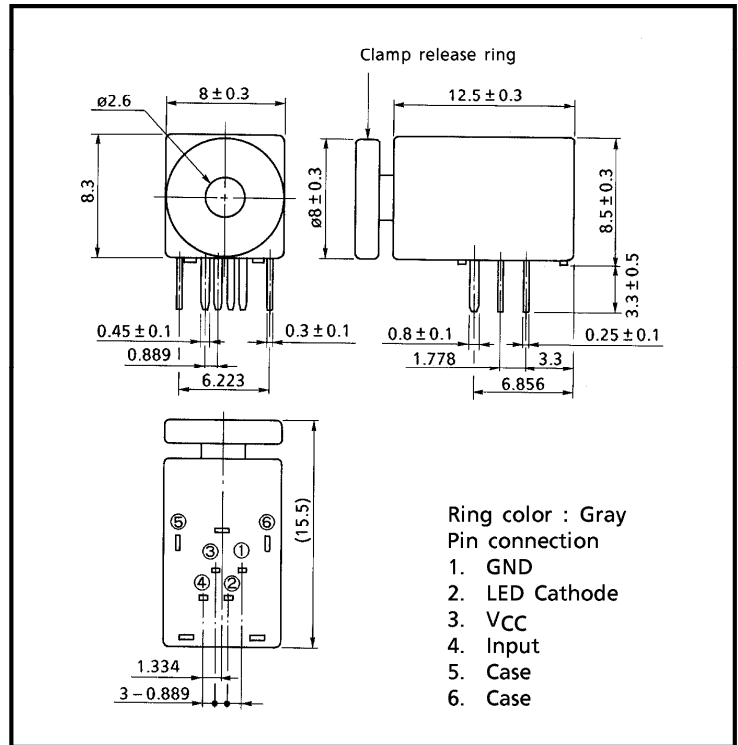
FIBER OPTIC TRANSMITTING MODULE

TOTX111

FIBER OPTIC TRANSMITTING MODULE FOR APF

Unit : mm

- Non-connector (connector less) type
- Data rate : DC to 6 Mb/s (NRZ code)
- Transmission distance :  
Up to 10 m (With TORX111)
- TTL interface



1. Maximum Ratings (Ta = 25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Storage Temperature	T <sub>stg</sub>	-40 to 85	°C
Operating Temperature	T <sub>opr</sub>	-20 to 70	°C
Supply Voltage	V <sub>CC</sub>	-0.5 to 7	V
Input Voltage	V <sub>IN</sub>	-0.5 to V <sub>CC</sub> + 0.5	V
Clamped Fiber Bearable Force	F <sub>CB</sub>	19.6 <sup>(1)</sup>	N
Soldering Temperature	T <sub>sol</sub>	260 <sup>(2)</sup>	°C

- Note <sup>(1)</sup> Pulling in the axial direction. Momentary value.  
<sup>(2)</sup> Soldering time ≤ 3 s (More than 1 mm apart from the package).

Handling precaution : The LEDs 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.

961001EAC1

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and 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 a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

## 2. Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT
Supply Voltage	V <sub>CC</sub>	4.75	5.0	5.25	V
High Level Input Voltage	V <sub>IH</sub>	2.0	—	V <sub>CC</sub>	V
Low Level Input Voltage	V <sub>IL</sub>	0	—	0.8	V

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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP.	MAX	UNIT
Data Rate		NRZ code <sup>(3)</sup>	DC	—	6	Mb/s
Transmission Distance		APF <sup>(4)</sup> with TORX111	0.2	—	10	m
Pulse Width Distortion <sup>(5)</sup>	$\Delta tw$	Pulse width 165 ns Pulse cycle 330 ns C <sub>L</sub> = 10 pF	-55	—	55	ns
Fiber Output Power	P <sub>f</sub>	APF <sup>(6)</sup> 1 m	-12	—	-5	dBm
Peak Emission Wavelength	$\lambda_p$		—	670	—	nm
Current Consumption	I <sub>CC</sub>		—	40	50	mA
High Level Input Voltage	V <sub>IH</sub>		2.0	—	—	V
Low Level Input Voltage	V <sub>IL</sub>		—	—	0.8	V

<sup>(3)</sup> When High level input, optical output is on. Low level input, optical output is off.

<sup>(4)</sup> All Plastic Fiber (980  $\mu$ m core, 1000  $\mu$ m cladding).

<sup>(5)</sup> Between input of TOTX111 and digital output of TORX111.

<sup>(6)</sup> Measured by APF with polished surface. Peak value.

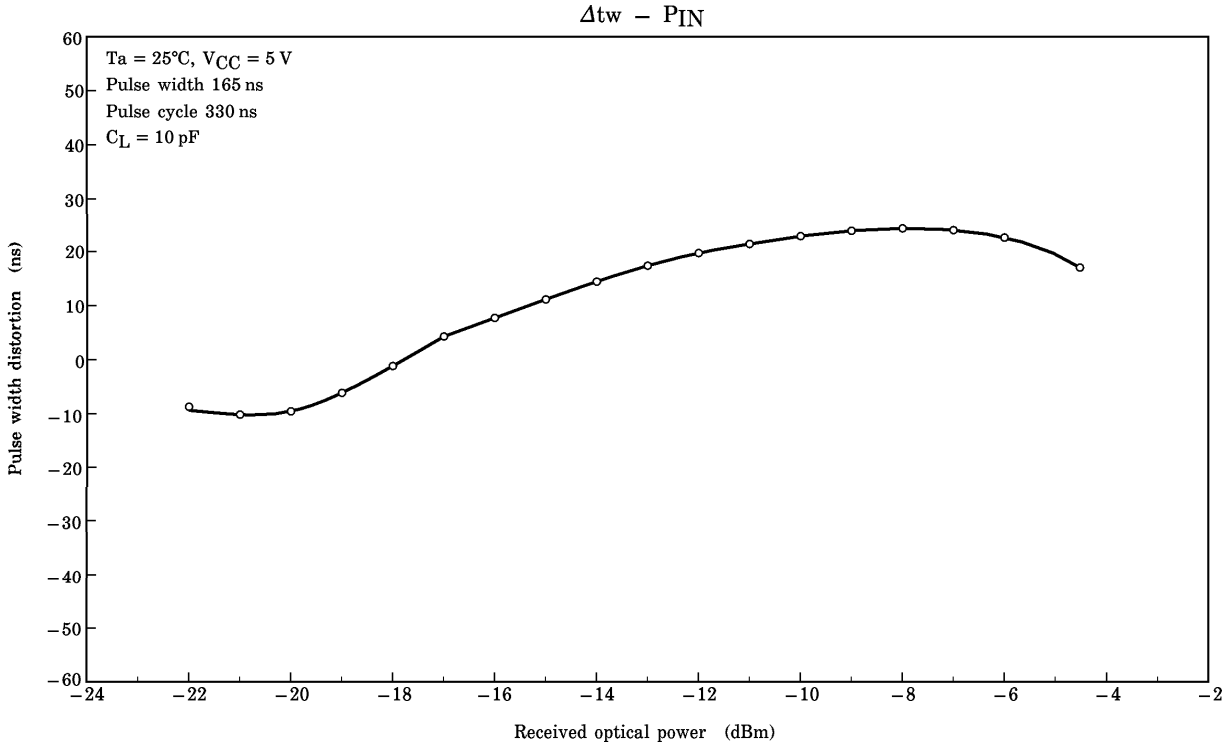
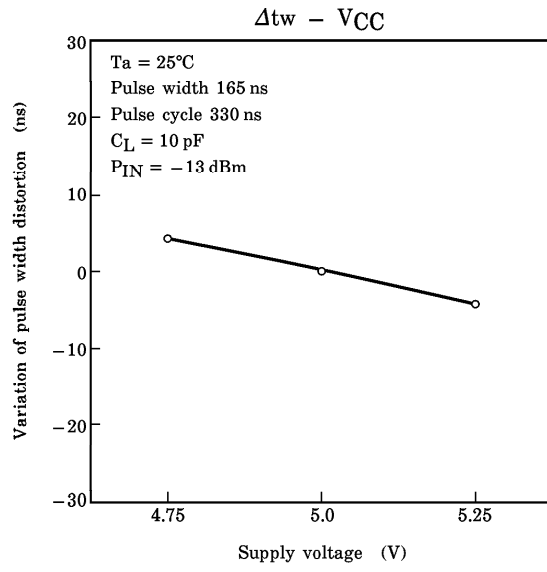
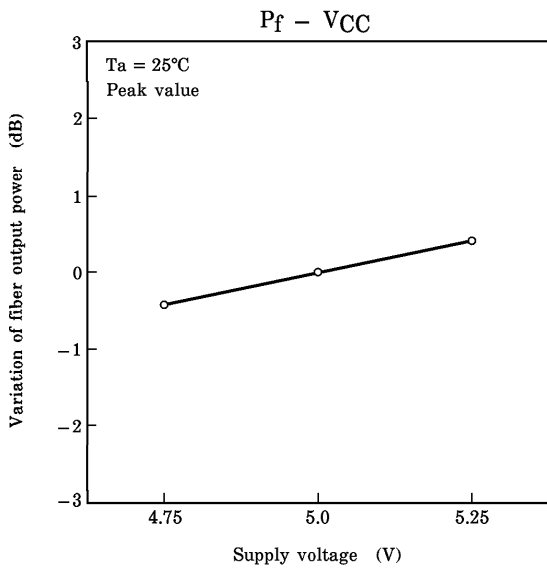
## 4. Mechanical Characteristics (Ta = 25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP.	MAX	UNIT
Fiber Insert Force	F <sub>FI</sub>	Using TOFC100, First value	—	6	19.6	N
Fiber Clamping Force <sup>(7)</sup>	F <sub>FC</sub>	Using TOFC100, First value	19.6	35	—	N
Ring Unclamping Force <sup>(8)</sup>	F <sub>RC</sub>	Using TOFC100, First value	—	10	19.6	N

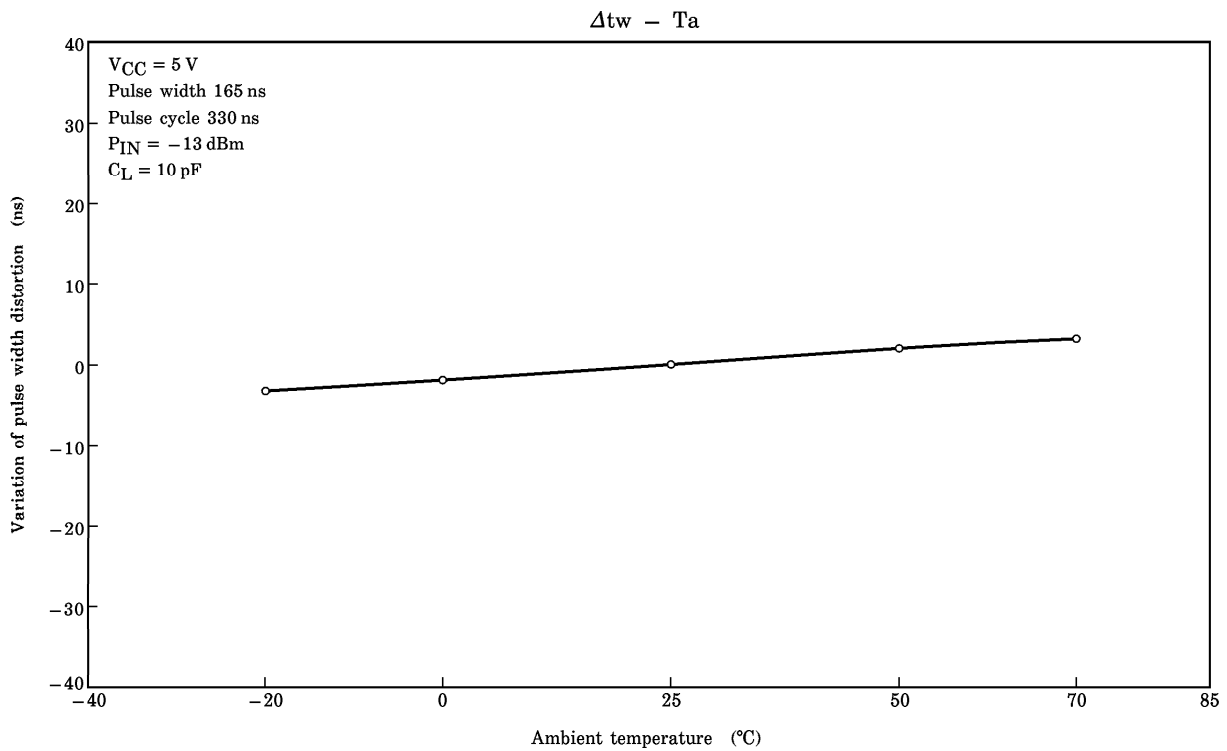
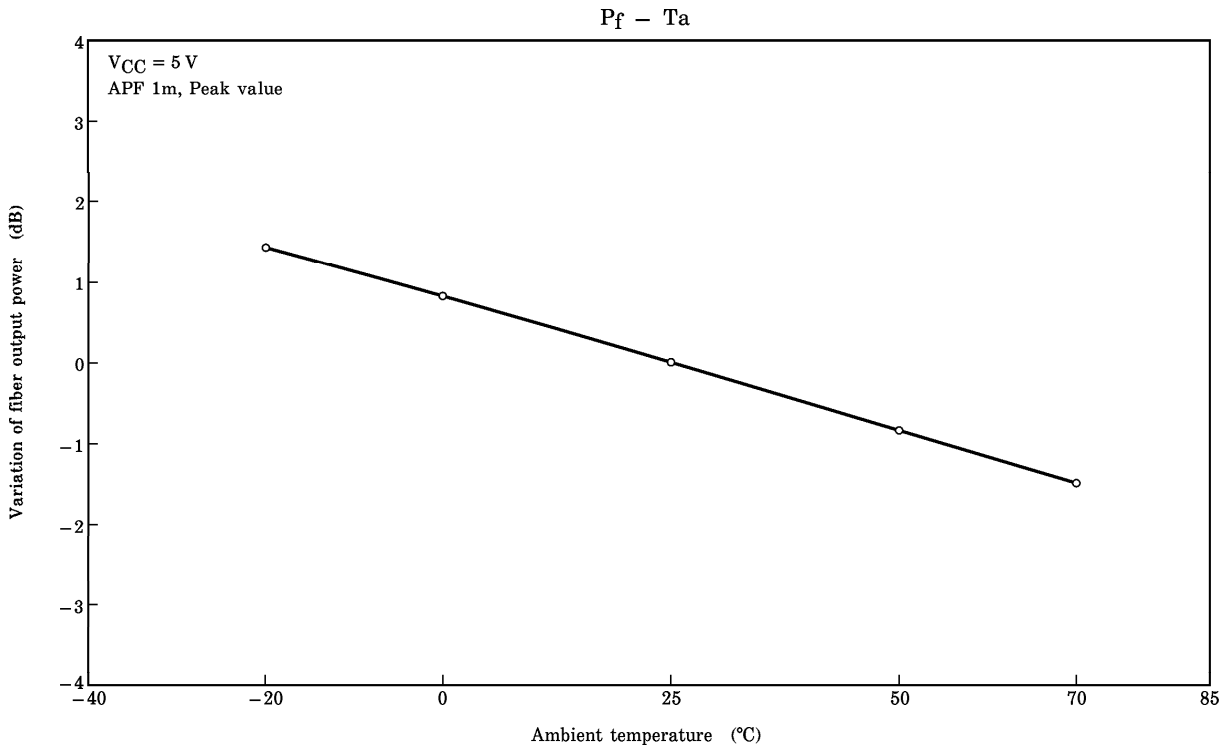
<sup>(7)</sup> The optical fiber is disconnected when it is pulled with this load in the axial direction.

<sup>(8)</sup> This is the load required for the clamp release ring to release the optical fiber clamp.  
When disconnecting the optical fiber, hold in the clamp release ring.

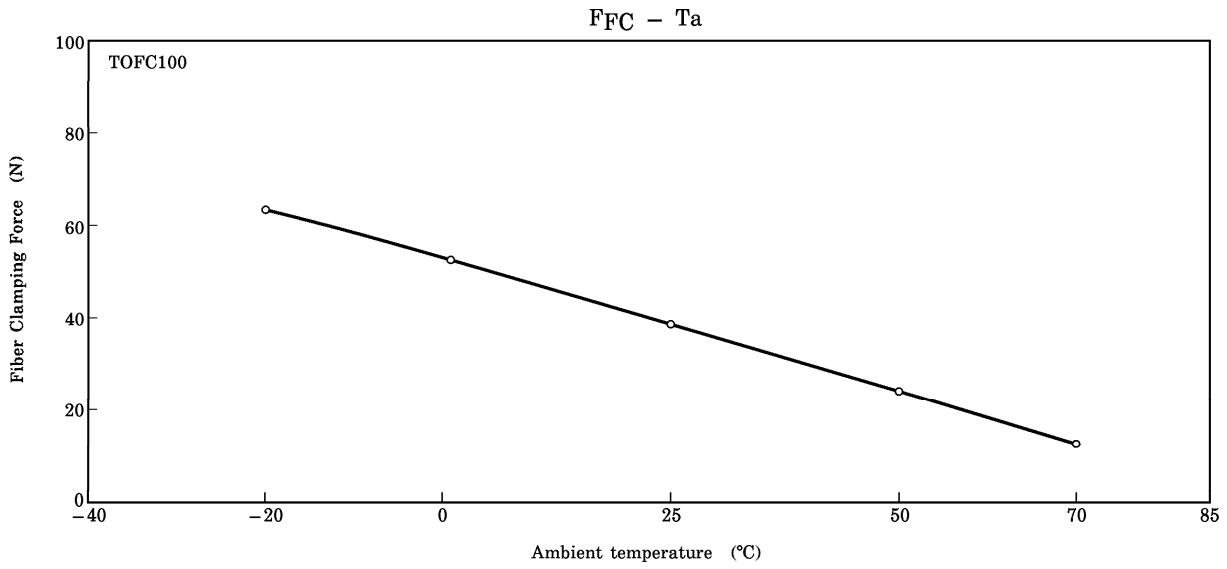
5. Example of Typical Characteristics <sup>(9)</sup>



<sup>(9)</sup> There give characteristic examples, and its values are not guaranteed.

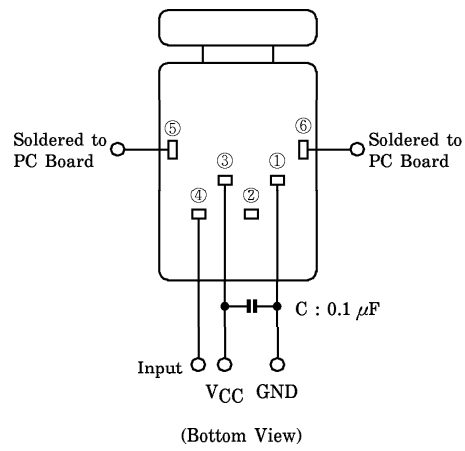


(9) There give characteristic examples, and its values are not guaranteed.



(9) There give characteristic examples, and its values are not guaranteed.

6. Application Circuit



## 7. 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 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.

### (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 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.

(5) Fixing fiber optical transceiving module

Solder the fixed pin (pins 5 and 6) of fiber optic transmitting module TOTX111 to the printed circuit board to fix the module to the board.

(6) 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.

(7) Dirt

Note that dirt should not be in to a module.

(8) Optical fiber

Use TOFC100 or similar product for optical fiber. When cutting optical fiber, use an edged tool such as a cutter knife.

(9) Removing the optical fiber from the module

When removing the optical fiber from the module, push the ring. Note that not to pull the optical fiber out from the module without pushing the ring. The tip of the optical fiber may be cut off and remain in module.

(10) Pin No.2

Do not connect any circuit to LED cathode terminal (pin No.2).

(11) Supply voltage

Use the supply voltage within the recommended operating condition ( $V_{CC} = 5 \pm 0.25$  V). Make sure that supply voltage does not exceed the maximum rating value of 7 V, even for an instant.

(12) Input voltage

If a voltage exceeding the maximum rating value ( $V_{CC} + 0.5$  V) is applied to the transmitter 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.

(13) Soldering condition

Solder at 260°C or less for no more than three seconds.

(14) 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.

(15) Precautions during use

Toshiba is continually working to improve the quality and the 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.