

TOSHIBA Photo-interrupter Infrared LED + Phototransistor

TLP1243(C8)

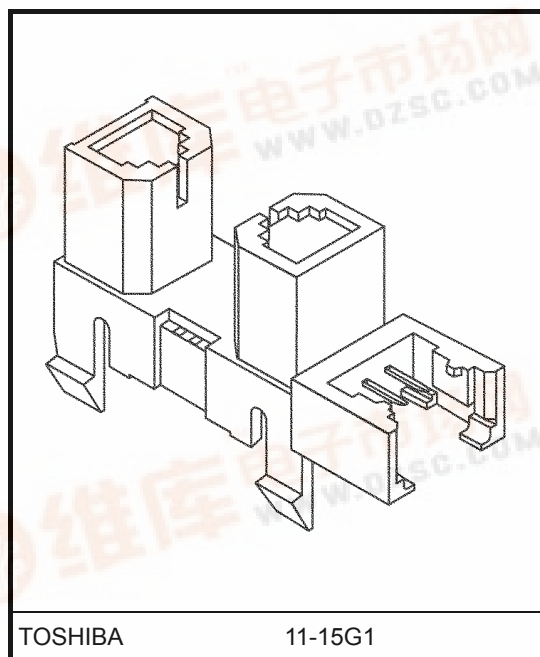
Copiers, Printers and Fax Machines

Air-conditioners

Game Machines

The TLP1243 (C8) is a compact photointerrupter with a built-in connector that uses a GaAs infrared LED and an Si phototransistor.

- Small package
Compared to Toshiba's TLP1241 (C5), the volume and the mounting area of the TLP1243 (C8) are reduced to approximately 70% and 75% respectively.
- Three board thicknesses supported: 1.0 mm, 1.2 mm and 1.6 mm
- Gap: 5 mm
- Resolution: Slit width = 0.7 mm
- High-temperature operation: $T_{opr} = 95^{\circ}\text{C}$ (max)
- Current transfer ratio: $I_C/I_F = 2.5\%$ (min)
- Mini CT connector (1.5-mm pitch, receptacle assembly/housing crimp type) made by Tyco Electronics AMP, Ltd.
- Package and connector material: Polycarbonate (UL94V-2)
- Lead(Pb)-Free

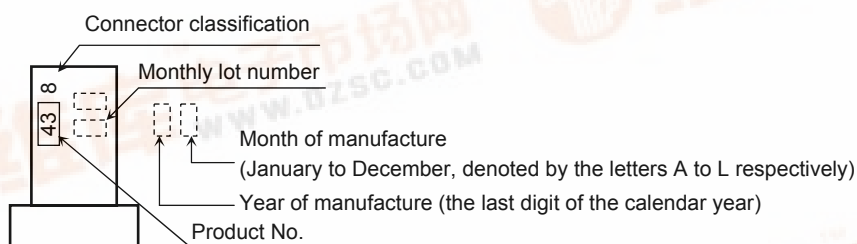


TOSHIBA

11-15G1

Weight: 0.8 g (typ.)

Marking



Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | | Symbol | Rating | Unit |
|-----------------------------|--|-----------------------------|------------|-------|
| LED | Forward current | I_F | 30 | mA |
| | Forward current derating (Ta>25°C) | $\Delta I_F/^\circ\text{C}$ | -0.28 | mA/°C |
| | Reverse voltage | V_R | 5 | V |
| Detector | Collector-emitter voltage | V_{CEO} | 35 | V |
| | Emitter-collector voltage | V_{ECO} | 5 | V |
| | Collector power dissipation | P_C | 75 | mW |
| | Collector power dissipation derating (Ta>25°C) | $\Delta P_C/^\circ\text{C}$ | -1 | mW/°C |
| | Collector current | I_C | 50 | mA |
| Operating temperature range | | T_{opr} | -30 to 95 | °C |
| Storage temperature range | | T_{stg} | -40 to 100 | °C |

Note: 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).

Optical and Electrical Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test conditions | Min | Typ. | Max | Unit |
|-----------------|--------------------------------------|-----------------|---|------|-------|------|------|
| LED | Forward voltage | V_F | $I_F = 10 \text{ mA}$ | 1.00 | 1.18 | 1.40 | V |
| | Reverse current | I_R | $V_R = 5 \text{ V}$ | — | — | 10 | μA |
| | Peak emission wavelength | λ_P | $I_F = 10 \text{ mA}$ | — | 940 | — | nm |
| Detector | Dark current | $I_D (I_{CEO})$ | $V_{CE} = 24 \text{ V}, I_F = 0$ | — | 0.001 | 0.1 | μA |
| | Peak sensitivity wavelength | λ_P | — | — | 870 | — | nm |
| Coupled | Current transfer ratio | I_C/I_F | $V_{CE} = 2 \text{ V}, I_F = 10 \text{ mA}$ | 2.5 | — | 100 | % |
| | Collector-emitter saturation voltage | $V_{CE (sat)}$ | $I_F = 20 \text{ mA}, I_C = 0.25 \text{ mA}$ | — | 0.1 | 0.35 | V |
| | Rise time | t_r | $V_{CE} = 5 \text{ V}, I_C = 1 \text{ mA}, R_L = 1 \text{ k}\Omega$ | — | 15 | 50 | μs |
| | Fall time | t_f | | — | 15 | 50 | |

Recommended Connector

Mini CT connector (1.5-mm pitch, receptacle assembly/housing crimp type) made by Tyco Electronics AMP, Ltd.

| Housing-Terminal En Block Type | Type | Model Number | Terminal Material | AWG Size | External Diameter of Insulation Coating |
|-----------------------------------|------------------------|--------------|-------------------|-------------|--|
| | Receptacle assembly | 353293-3 | Phosphor bronze | AWG26 to 28 | 0.85 mm to 0.95 mm |
| | Housing crimp type | 353908-3 | | | |

Note: For further details of connector characteristics, please contact the relevant connector manufacturer.

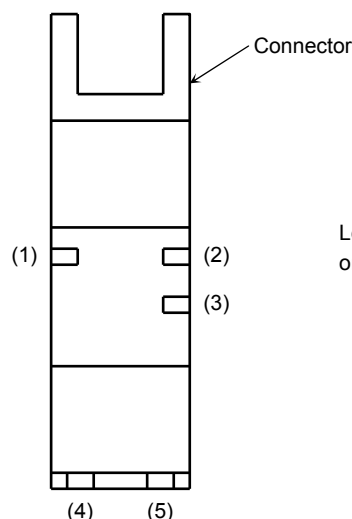
Precautions

- Protect the device from ambient light interference. The integrated phototransistor is insensitive to light below 700 nm (e.g., fluorescent light), but is sensitive to light above 700 nm (e.g., incandescent light). If it detects ambient light, it may cause malfunction. Be sure to make a thorough evaluation of the equipment in which the device is to be used.
- Care must be taken regarding the environment in which the device is to be installed. Oil or chemicals may cause the package to melt or crack.
- When attaching the device to the metal board, always hold the body of the device. Do not hold the device by the connector. Ensure that the board is flat, and not warped or twisted. Attach the device to the metal board at room temperature.
- Toshiba recommends attaching the device to the smoother side of the board.
- Toshiba recommends testing the attachment strength beforehand by actually attaching a device to the board.
- Do not apply solder to the pins of the device's connector. Make sure that the connector is plugged into the Mini CT connector or equivalent connector.
- When inserting or removing the Mini CT connector or equivalent connector, always grasp it and its cable firmly and either plug it straight into or pull it straight out of the device's connector. If the Mini CT connector or equivalent connector is inserted or removed at an angle, both the device's connector and the Mini CT connector or equivalent connector may get damaged, resulting in an unreliable connection.
- Conversion efficiency decreases over time due to current flow in the infrared LED. When designing a circuit, take into account this change in conversion efficiency over time. The ratio of fluctuation in conversion efficiency to fluctuation in infrared LED optical output is 1:1.

$$\frac{I_C/I_F(t)}{I_C/I_F(0)} = \frac{P_o(t)}{P_o(0)} \quad .$$

- The leadframe of the package is exposed as shown below. Ensure that no conductive material or object (such as a metal pin) comes into contact with the leads of the leadframe and shorts them together. Care must be taken when designing a chassis.

Top View



Leads (1) to (5) of the leadframe shown on the left must not be shorted together.

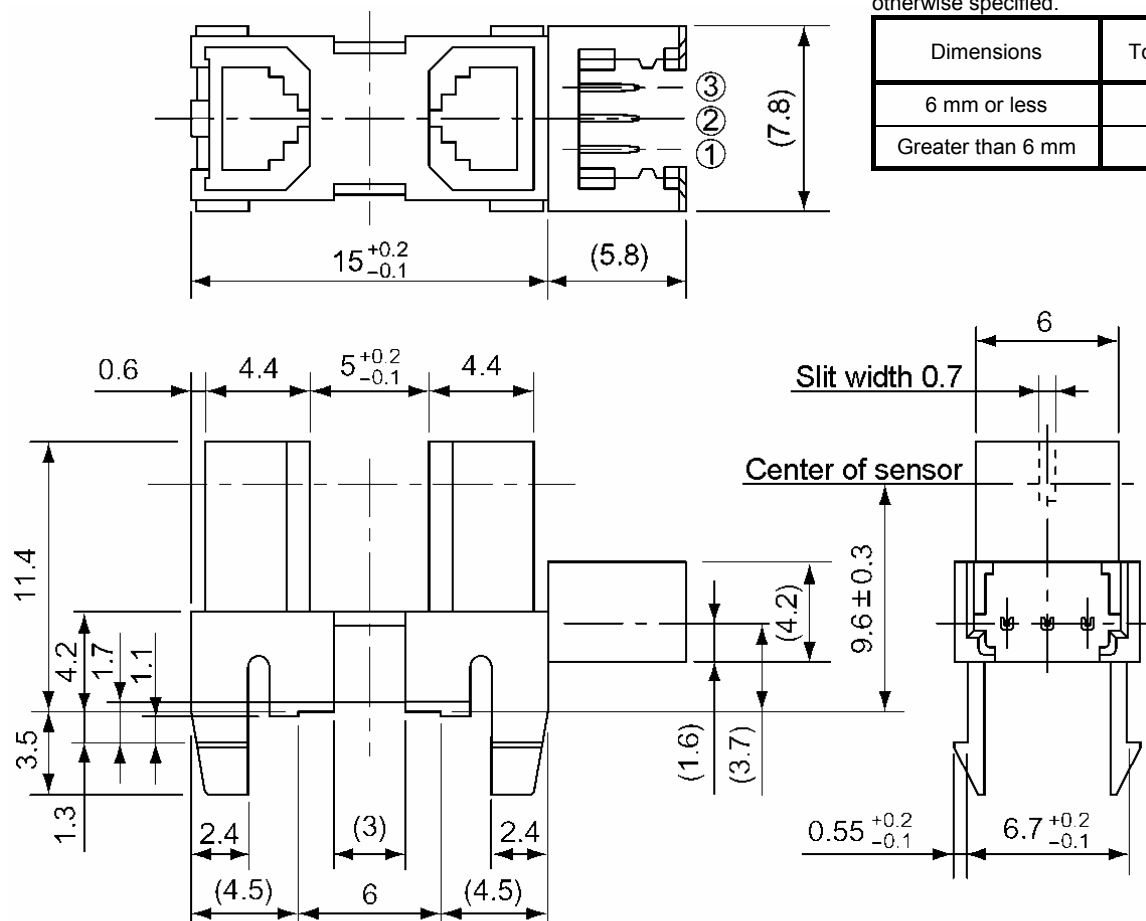
Package Dimensions:

Unit: mm

TOSHIBA 11-15G1

Tolerances are listed below unless otherwise specified.

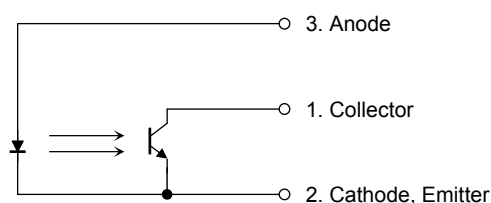
| Dimensions | Tolerance |
|-------------------|-----------|
| 6 mm or less | ±0.1 |
| Greater than 6 mm | ±0.2 |

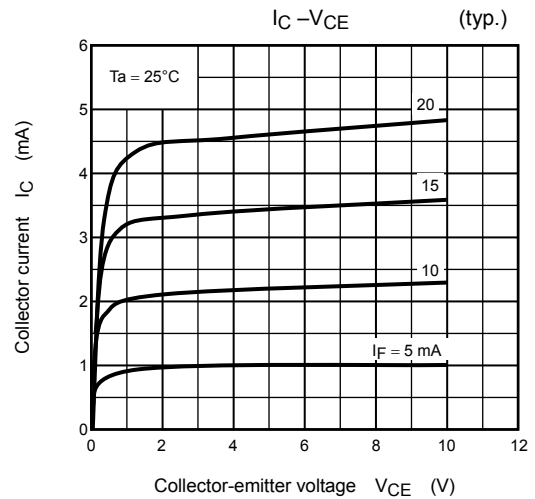
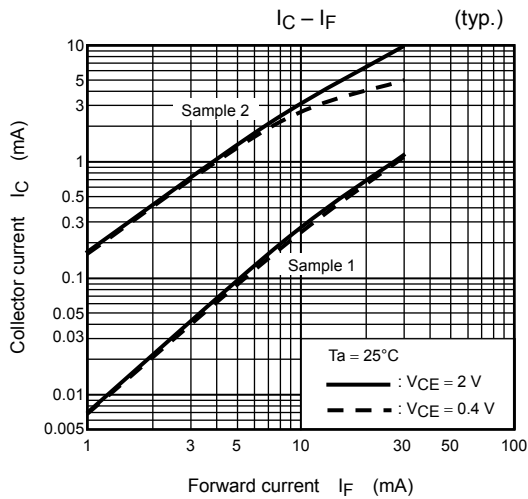
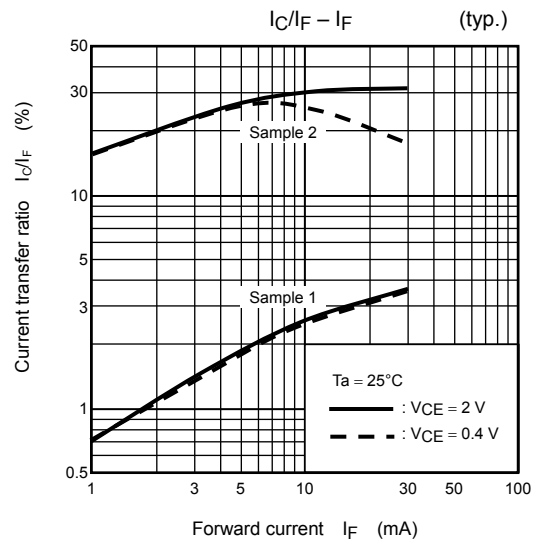
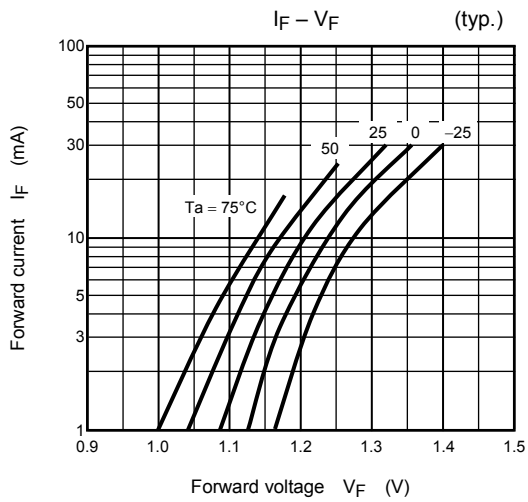
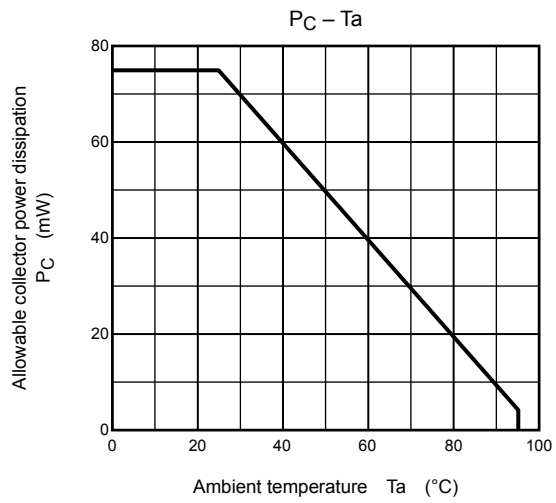
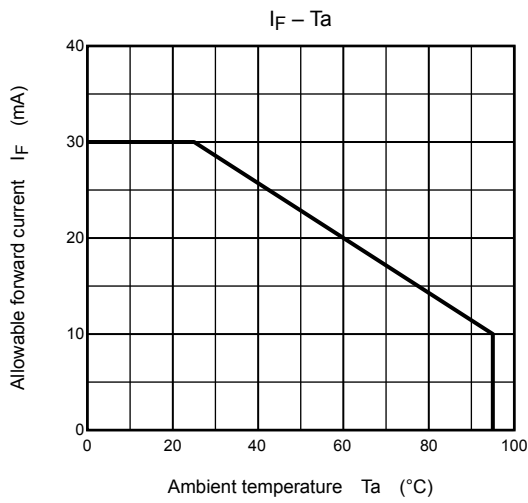


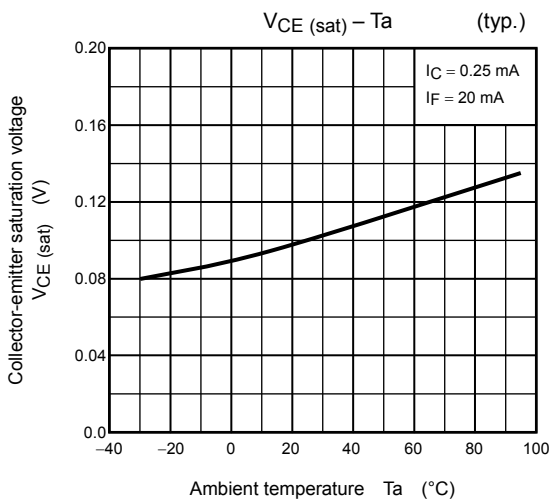
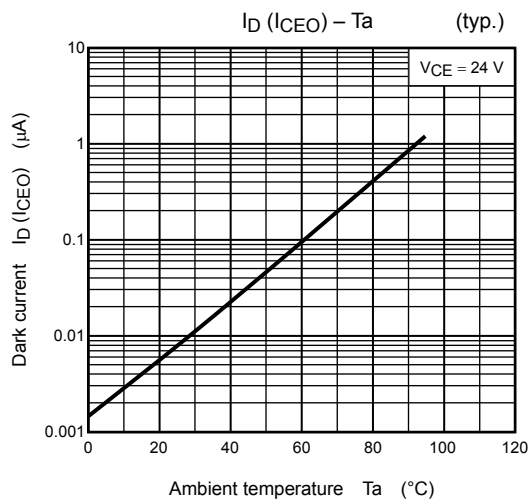
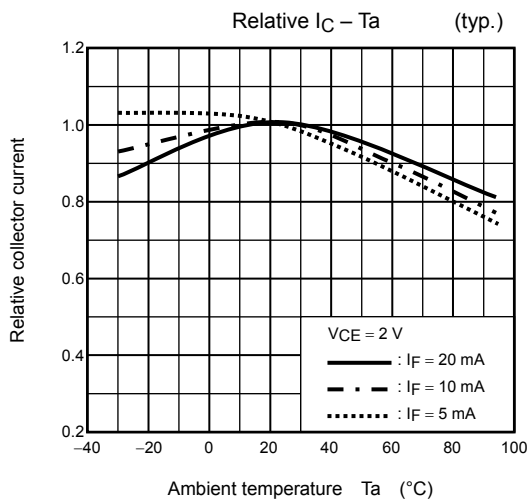
(): Reference value

Weight: 0.8 g (typ.)

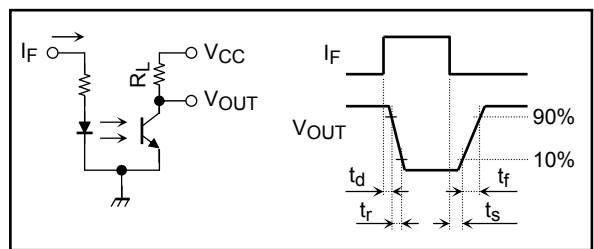
Pin Connection

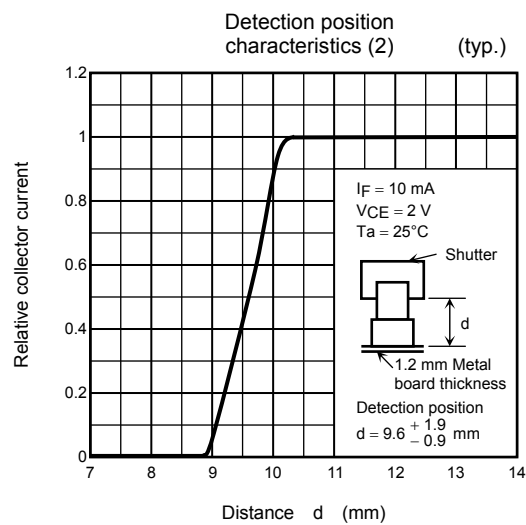
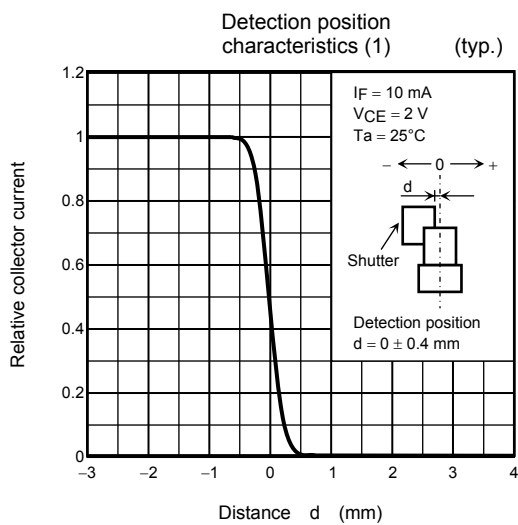
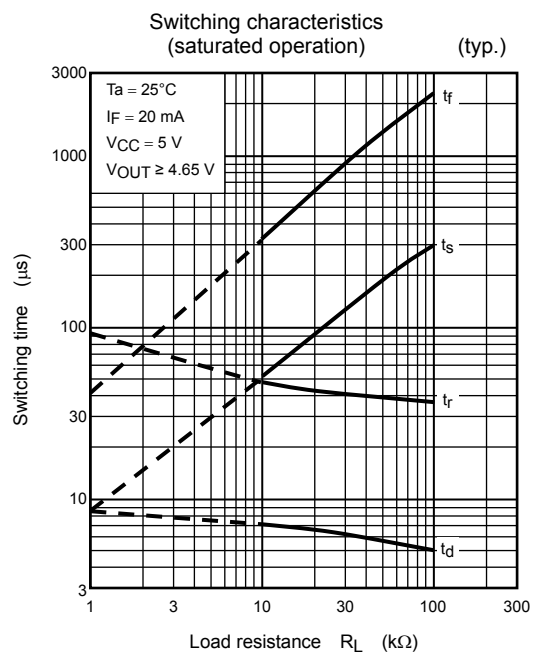
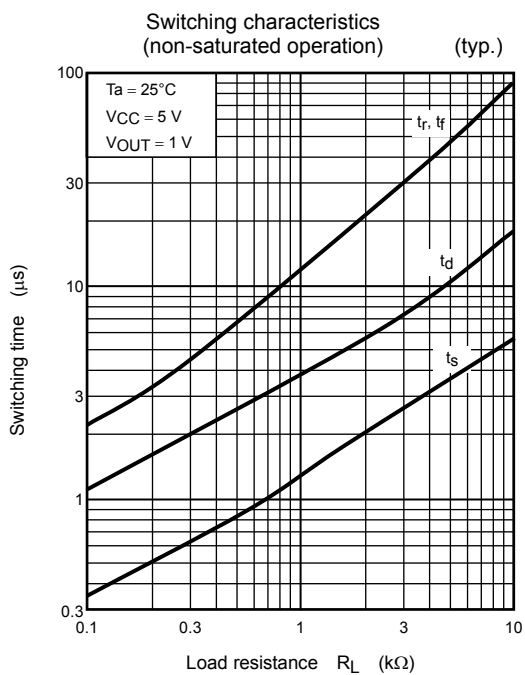






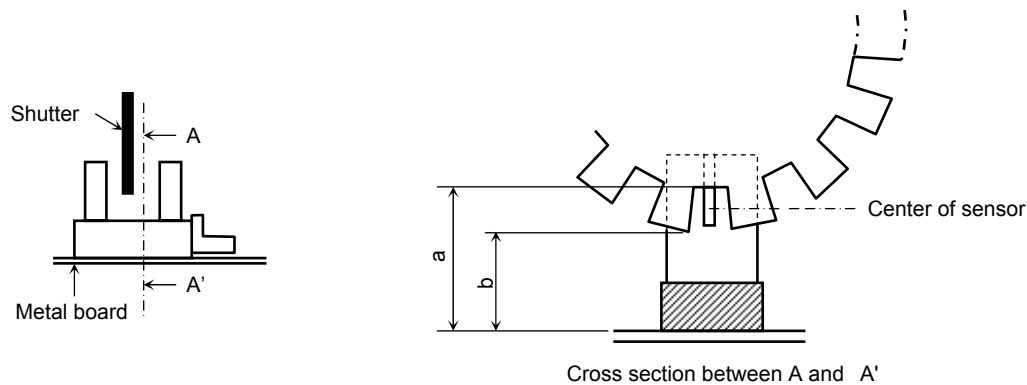
Switching Time Test Circuit





Relative Positioning of Shutter and Device

For normal operation, position the shutter and the device as shown in the figure below. By considering the device's detection direction characteristic and switching time, determine the shutter slit width and pitch.

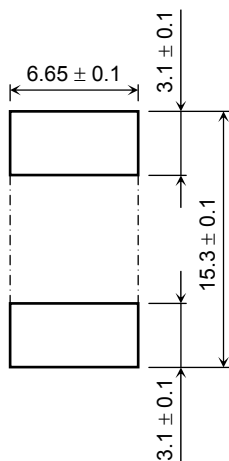


Unit: mm

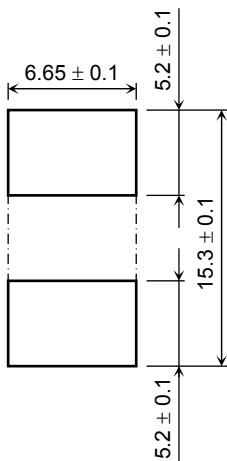
| Thickness of Metal Board | a Dimension | b Dimension |
|--------------------------|-------------|-------------|
| 1.0 | 11.7 min | 8.9 max |
| 1.2 | 11.5 min | 8.7 max |
| 1.6 | 11.1 min | 8.3 max |

Recommended Size of Connection Holes (Unit: mm)

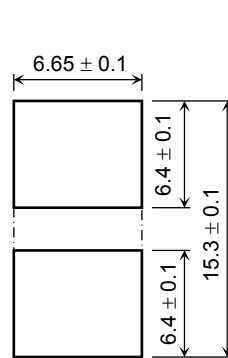
1.0-mm thick metal board



1.2-mm thick metal board



1.6-mm thick metal board



RESTRICTIONS ON PRODUCT USE

20070701-EN

- The information contained herein is subject to change without notice.
- TOSHIBA is continually working to improve the quality and 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 comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products 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 TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc.
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document shall not be used or embedded to any downstream products of which manufacture, use and/or sale are prohibited under any applicable laws and regulations.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patents or other rights of TOSHIBA or the third parties.
- GaAs(Gallium Arsenide) is used in this product. The dust or vapor is harmful to the human body. Do not break, cut, crush or dissolve chemically.
- Please contact your sales representative for product-by-product details in this document regarding RoHS compatibility. Please use these products in this document in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances. Toshiba assumes no liability for damage or losses occurring as a result of noncompliance with applicable laws and regulations.