TOSHIBA Photo−Interrupter Infrared LED + Phototransistor

TLP1242(C6,F)

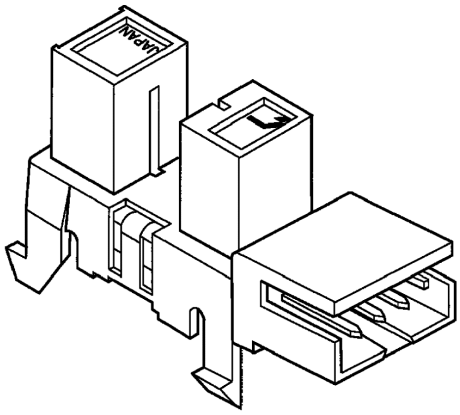
Lead-Free Product

Copiers, Printers, Fax Machines

Air−Conditioners

Game Machines

The TLP1242(C6,F) is a compact photo−interrupter with a built−in connector that uses a high radiant intensity GaAs infrared LED and a Si phototransistor. The device is housed in a highly reliable package which eliminates the need for a printed circuit board or for soldering. It is ideal for use as a paper carrier location sensor for copiers and printers. As the device can operate at temperatures of up to 95°C,it can be used in high−temperature applications such as paper−out sensors. Open−collector output can be enabled using the phototransistor.

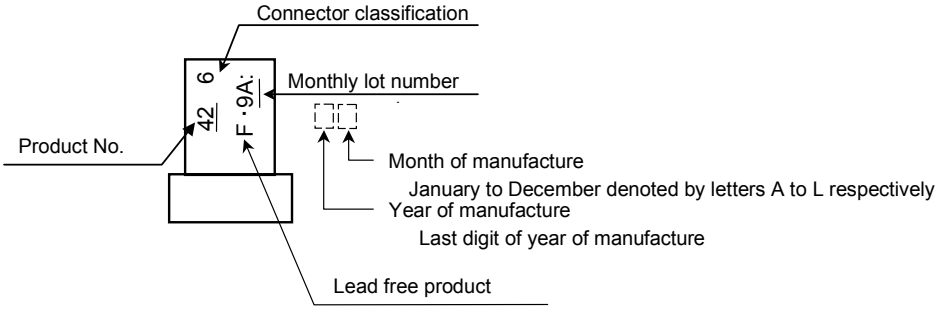


TOSHIBA	11−15E2

Weight: 1.3 g (typ.)

- Highly reliable package; the device need not be attached to a PCB
- Small package
- Snap−in installation
- Three board thicknesses supported: 1.0mm, 1.2mm and 1.6mm
- Gap: 5mm
- Resolution: Slit width = 0.5mm
- High−temperature operation: T_{opr} = 95°C (max)
- High current transfer ratio: I_C / I_F = 5% (min)
- CT connector (2−mm pitch, MT receptacle type, MT crimp receptacle type II) made by Tyco Electronics AMP, Ltd.
- Package material: Polycarbonate (UL94V−2, black)
- Connector material: 66 nylon (UL94V−0, white)

Marking



Maximum Ratings (Ta = 25°C)

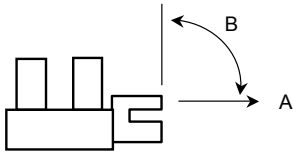
Characteristic		Symbol	Rating	Unit
Forward current		I_F	50	mA
Forward current derating	(Ta > 25°C)	ΔI_F / °C	−0.33	mA / °C
	(Ta > 85°C)		−2	
Reverse voltage		V_R	6	V
Collector−emitter voltage		V_{CEO}	35	V
Emitter−collector voltage		V_{ECO}	5	V
Collector power dissipation		P_C	75	mW
Collector power dissipation derating (Ta > 25°C)		ΔP_O / °C	−1	mW / °C
Collector current		I_C	50	mA
Operating temperature range		T_{opr}	−30~95	°C
Storage temperature range		T_{stg}	−40~100	°C

Optical and Electrical Characteristics (Ta = 25°C)

	Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	I_F = 10mA	1.00	1.15	1.30	V
	Reverse current	I_R	V_R = 5V	—	—	10	μA
	Peak emission wavelength	λ_P	I_F = 10mA	—	940	—	nm
Detector	Dark current	$I_D(I_{CEO})$	V_{CE} = 24V, 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} = 2V, I_F = 10mA	5	—	100	%
	Collector−emitter saturation voltage	$V_{CE(sat)}$	I_F = 20mA, I_C = 0.5mA	—	0.1	0.35	V
	Rise time	t_r	V_{CC} = 5V, I_C = 1mA	—	15	50	μs
	Fall time	t_f	R_L = 1kΩ	—	15	50	

Pin Strength (Ta = 25°C)

Characteristic	Test Condition		Limit
Pulling	Direction	A	No defect in electrical characteristics
	Weight	19.6N	
	Time	5s / once	
Bending	Direction	B	
	Weight	9.8N	
	Time	5s / three times	



CT Connector

CT connector manufactured by Tyco Electronics AMP (2mm pitch MT receptacle type)

Housing–Terminal En Block Type	Model Number	Terminal Material	AWG Size	External Diameter of Insulation Coating
	173977–3	Phosphor bronze	AWG26~28	0.85~1.05mm

CT connector manufactured by Tyco Electronics AMP (2mm pitch MT receptacle type II)

Housing	179228–3				
Model number of terminal	Model Number	Product Type	Material	AWG Size	External Diameter Of Insulation Coating
	179518–1	Detached	Phosphor bronze	AWG22~26	0.93~1.5mm
	179227–1	Coupled			

For more details of connector characteristics, please contact the relevant connector manufacturer.

Precautions

1. Protect the device from ambient light interference. The integrated photo-IC 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.
2. Care must be taken in relation to the environment in which the device is to be installed. Oil or chemicals may cause the package to melt or crack.
3. When attaching the device to the metal board, always hold the body of the device. Do not hold it by the connector. Ensure that the board is flat, and not warped or twisted. Attach the device to the metal board at room temperature.
4. Toshiba recommends attaching the device to the smoother side of the board.
5. Toshiba recommends testing the attachment strength beforehand by actually attaching a device to the board.
6. Do not apply solder to the pins of the device's connector. Make sure that the connector is plugged into the CT connector.
7. When inserting or removing the CT 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 CT connector is inserted or removed at an angle, both the device's connector and the CT connector may get damaged, resulting in an unreliable connection.
8. Conversion efficiency falls over time due to the current which flows 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.

$$\frac{I_C/I_F(t)}{I_C/I_F(0)} = \frac{P_O(t)}{P_O(0)}$$

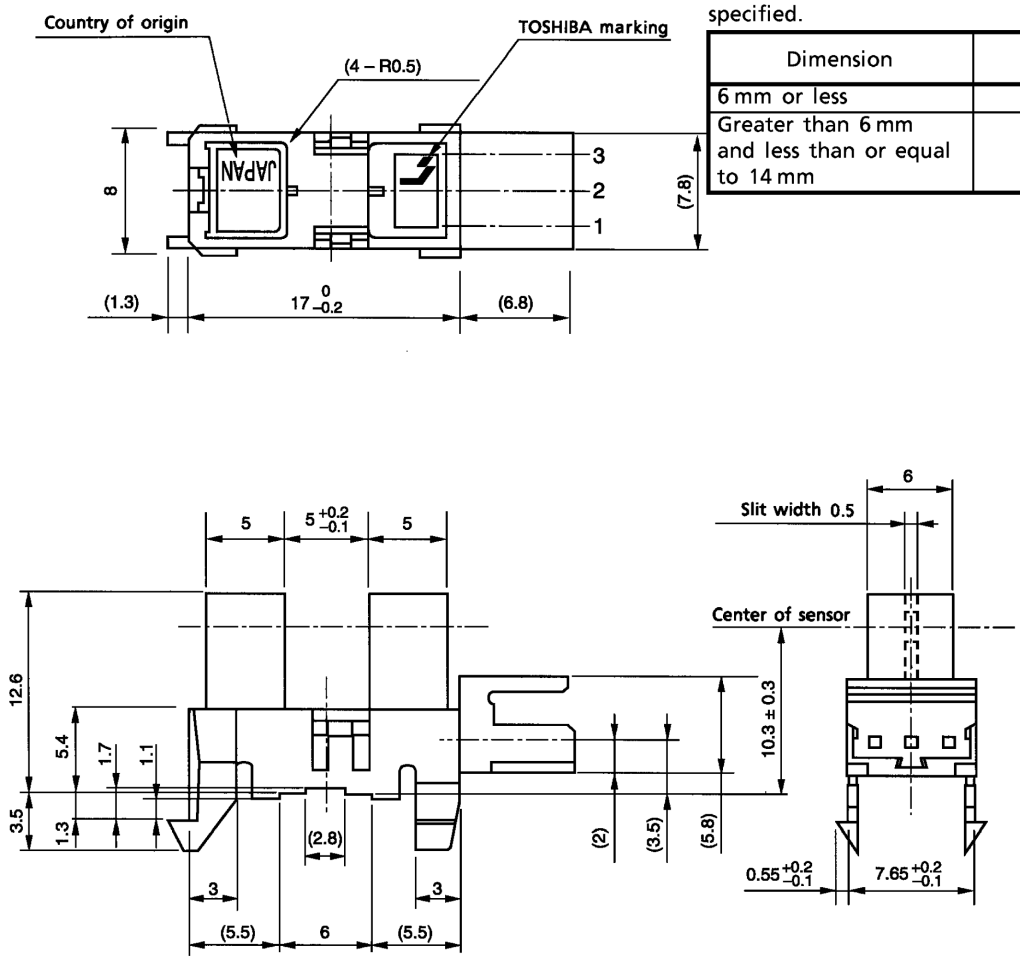
Package Dimensions: TOSHIBA 11–15E2

Unit in mm

( ) : Reference value

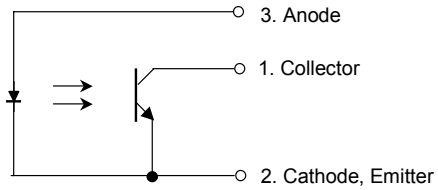
Tolerance are listed below unless otherwise specified.

Dimension	Tolerance
6 mm or less	± 0.1
Greater than 6 mm and less than or equal to 14 mm	± 0.2

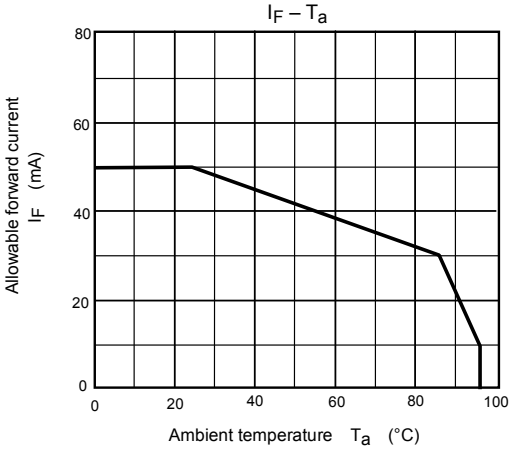


Weight : 1.3 g (typ.)

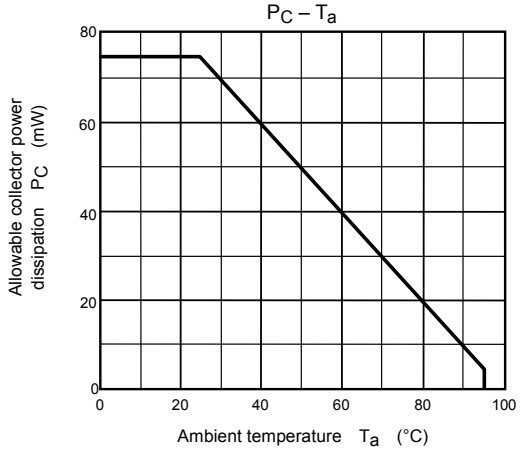
Pin Connection



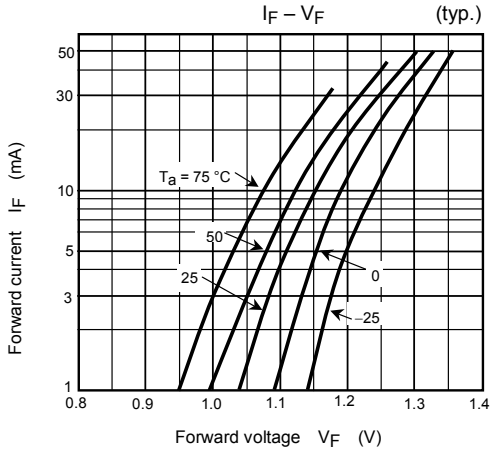
$I_F - T_a$



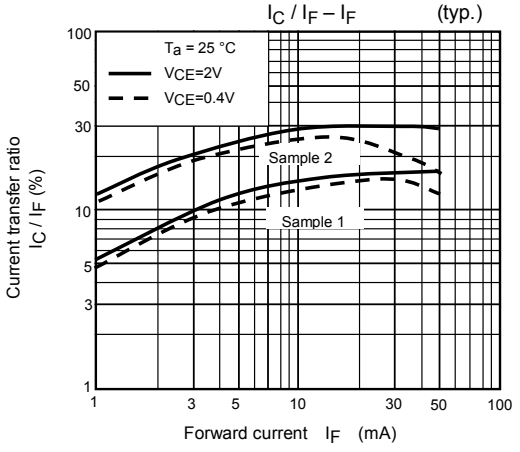
$P_C - T_a$



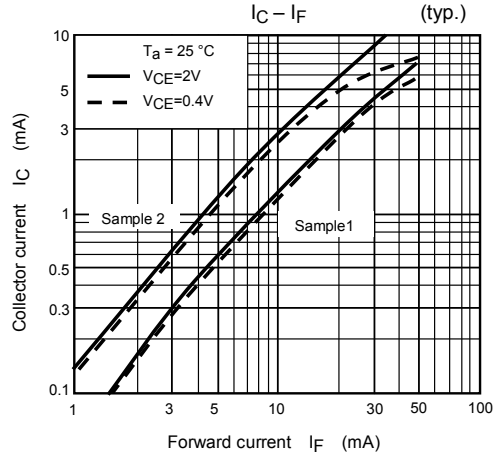
$I_F - V_F$ (typ.)



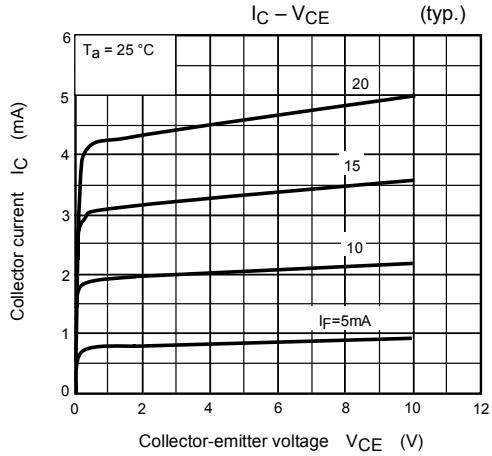
$I_C / I_F - I_F$ (typ.)



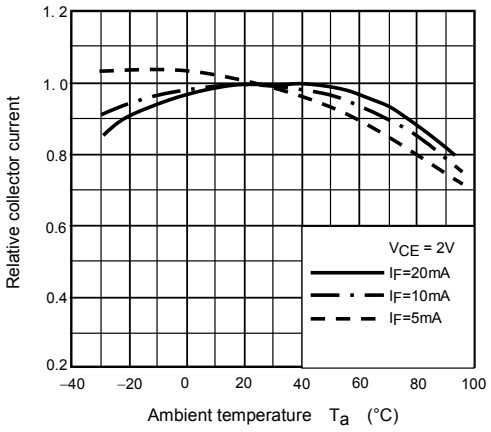
$I_C - I_F$ (typ.)



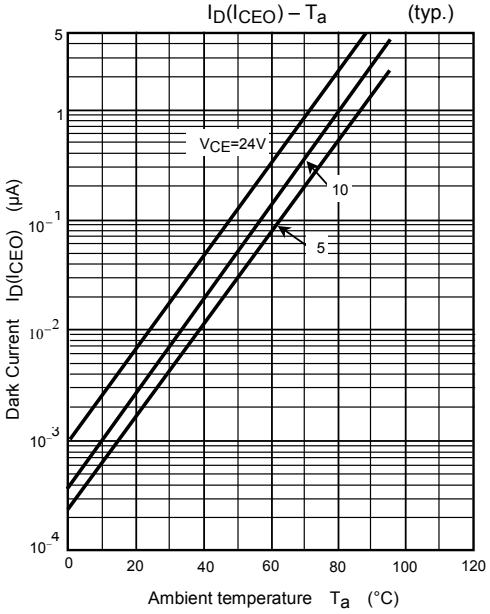
$I_C - V_{CE}$ (typ.)



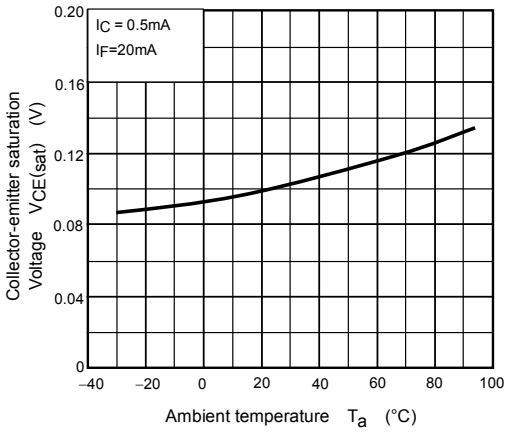
Relative $I_C - T_a$ (typ.)



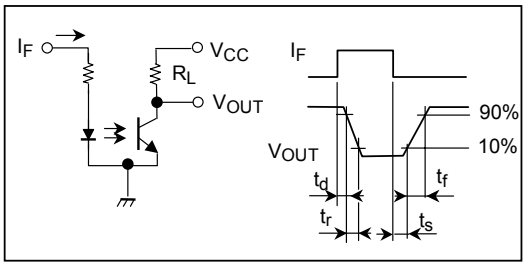
$I_D(I_{CEO}) - T_a$ (typ.)



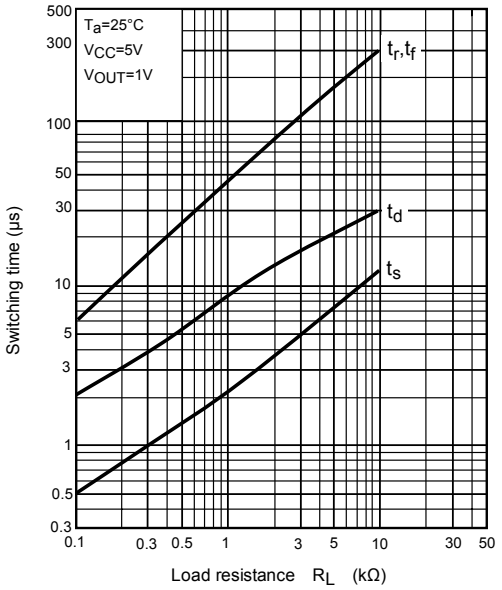
$V_{CE(sat)} - T_a$ (typ.)



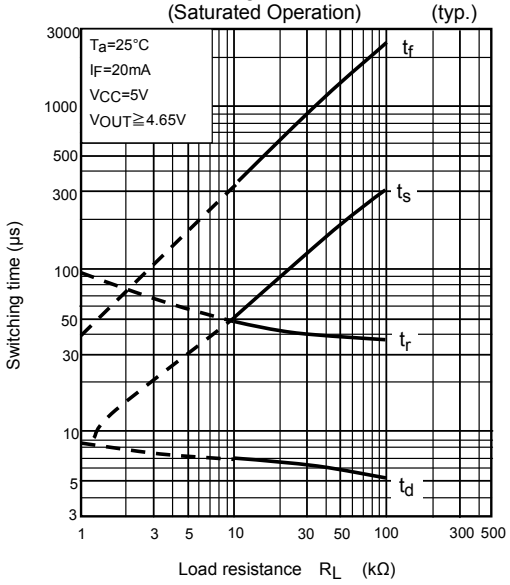
Switching Time Test Circuit



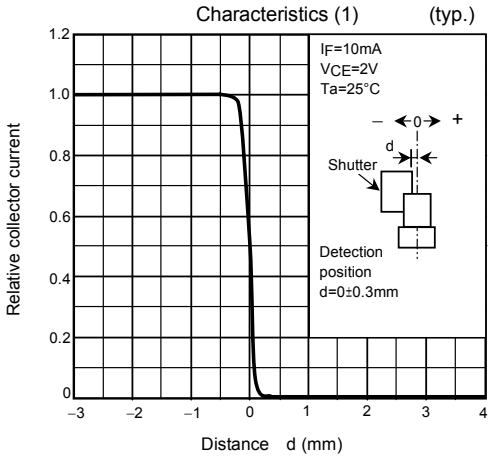
Switching Characteristics
(Non-Saturated Operation) (typ.)



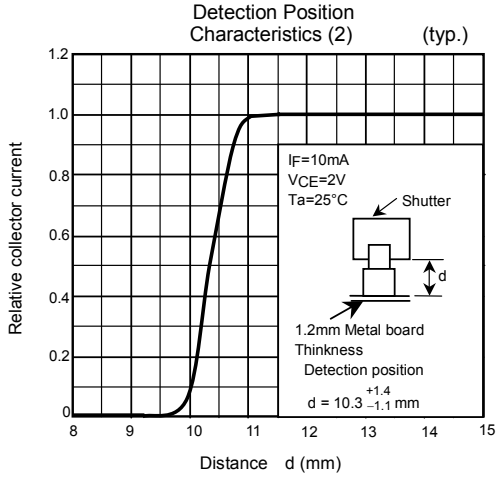
Switching Characteristics
(Saturated Operation) (typ.)



Detection Position
Characteristics (1) (typ.)

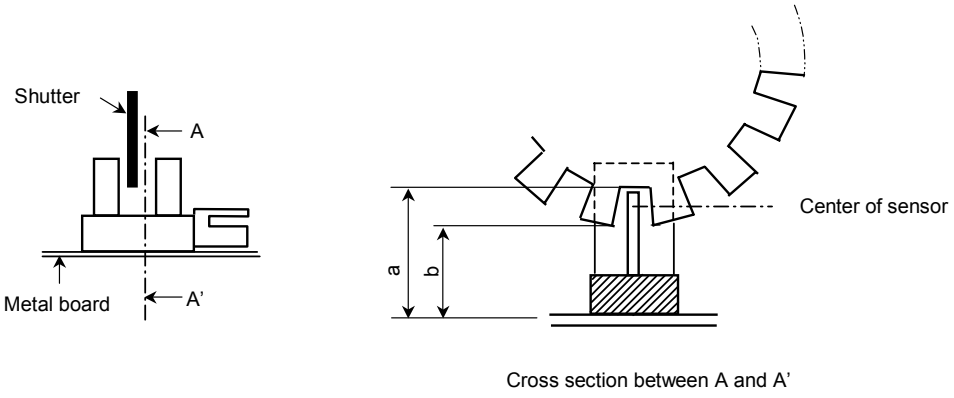


Detection Position
Characteristics (2) (typ.)



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.



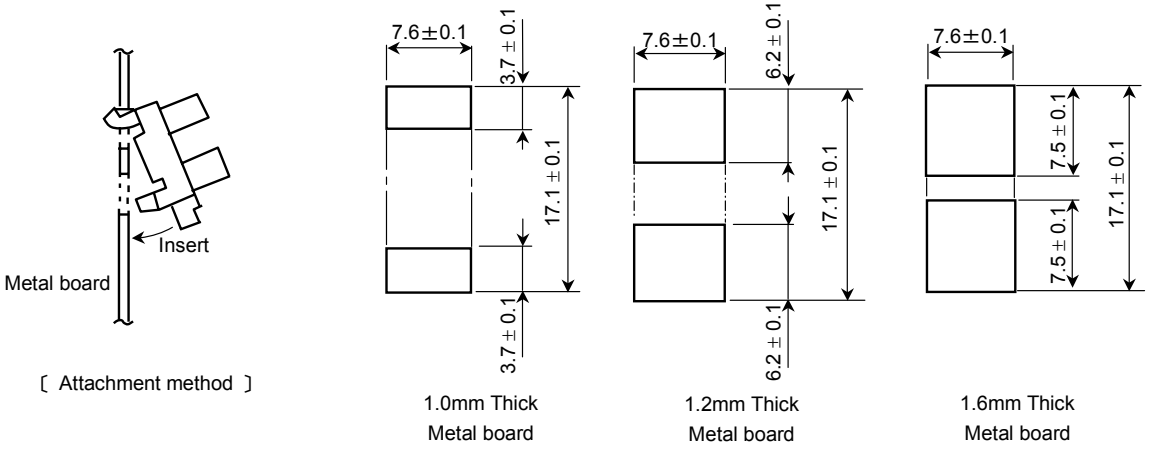
Cross section between A and A'

Unit: mm

Thickness of Metal Board	a Dimension	b Dimension
1.0	11.9min	9.4max
1.2	11.7min	9.2max
1.6	11.3min	8.8max

Recommended Size of Connection Holes

(Unit: mm)



For instructions on how to attach the device to a metal board of a type other than the ones shown above, please contact your local Toshiba sales office.

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