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TOSHIBA Photo-interrupter Infrared LED + Phototransistor

TLP1243(C8)

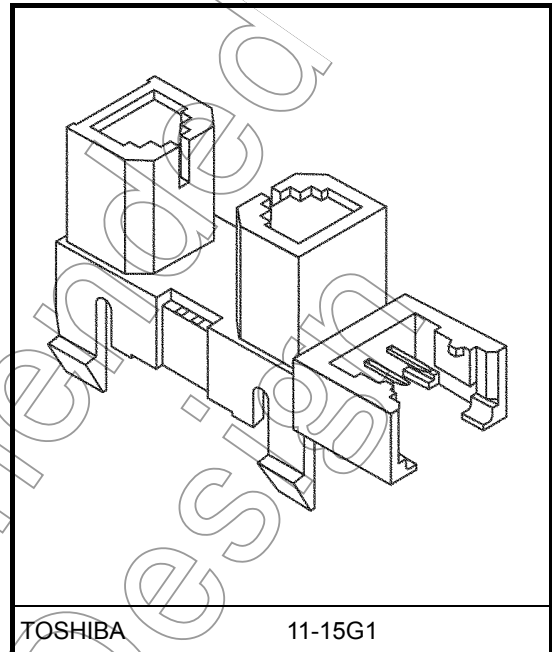
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The TLP1243 (C8) is a compact photointerrupter with a built-in connector that uses a GaAs infrared LED and an Si phototransistor.

- 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)

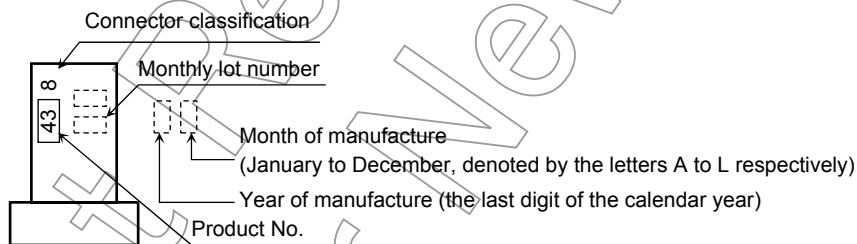


TOSHIBA

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	$V_{CE} \geq 2 \text{ V}, I_F = 10 \text{ mA}$	2.5	—	100	%
	Collector-emitter saturation voltage	$V_{CE}(\text{sat})$	$I_F = 20 \text{ mA}, I_C = 0.25 \text{ mA}$	—	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			

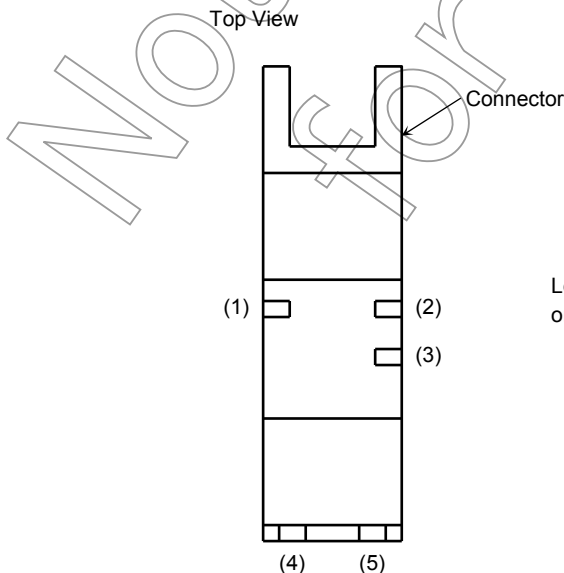
Note: For further details of connector characteristics, please contact the relevant connector manufacturer.

Precautions

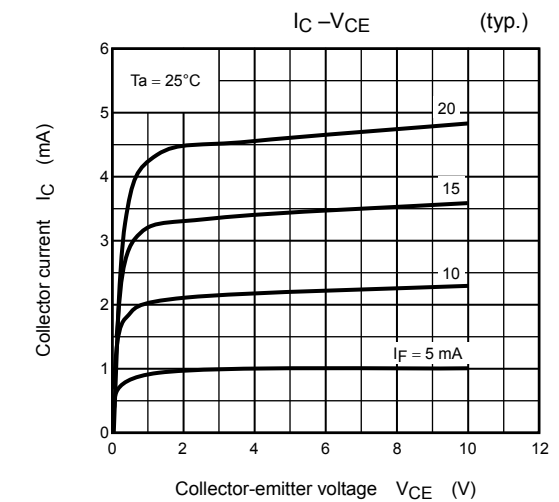
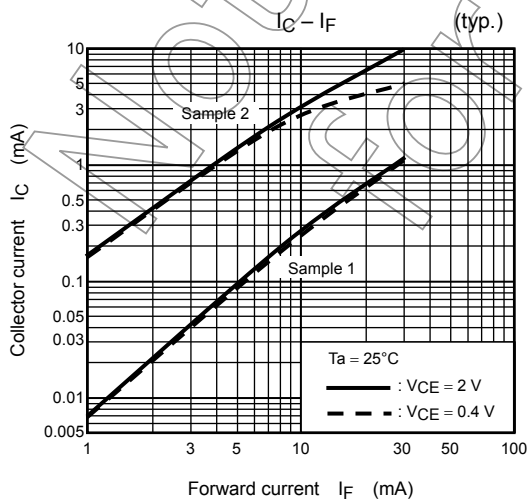
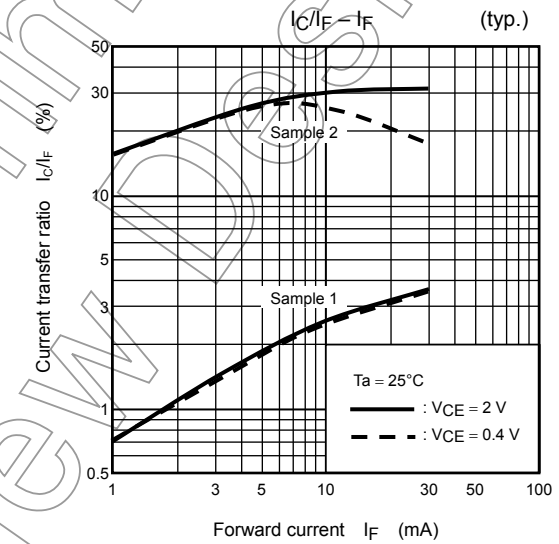
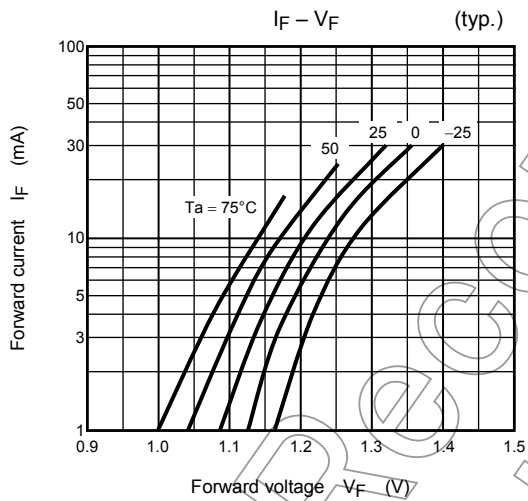
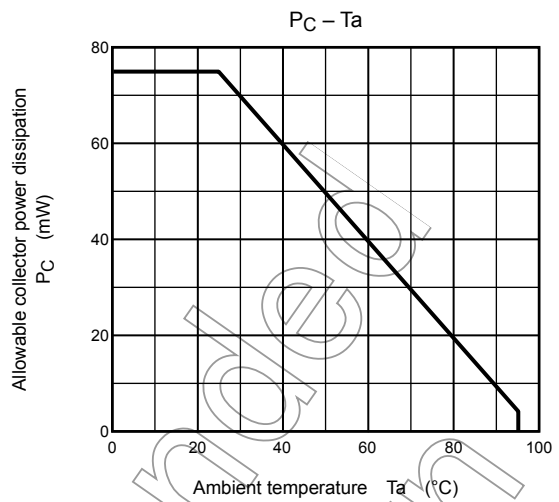
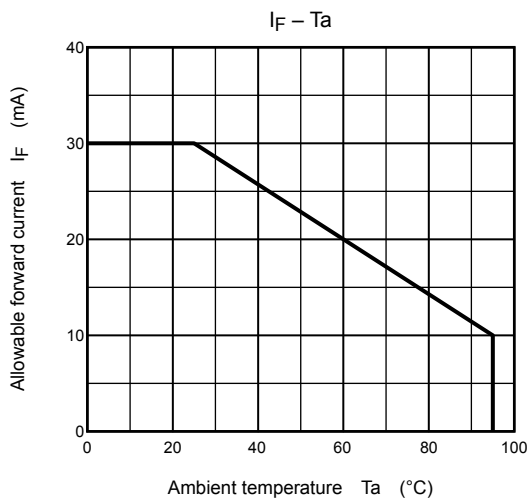
- Protect the device from ambient light interference. The integrated phototransistor is insensitive to light below 700 nm (e.g., fluorescent light), but is sensitive to light above 700 nm (e.g., incandescent light). If it detects ambient light, it may cause malfunction. Be sure to make a thorough evaluation 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:

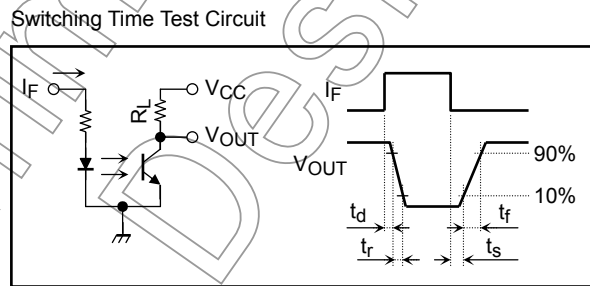
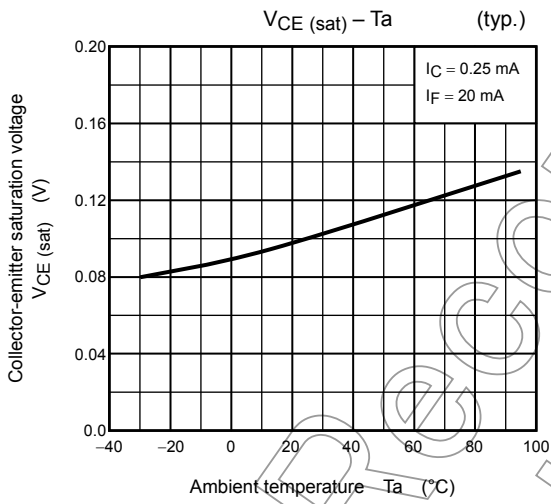
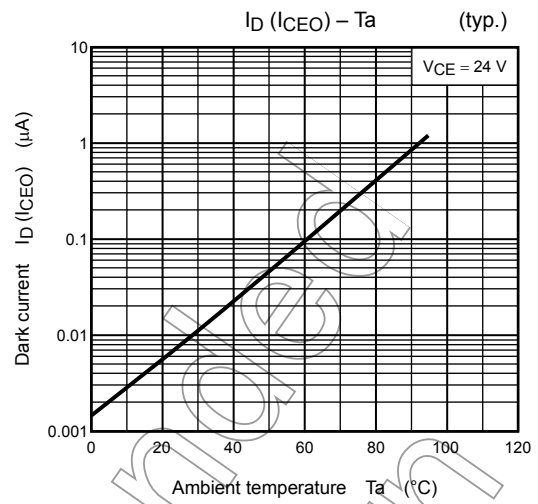
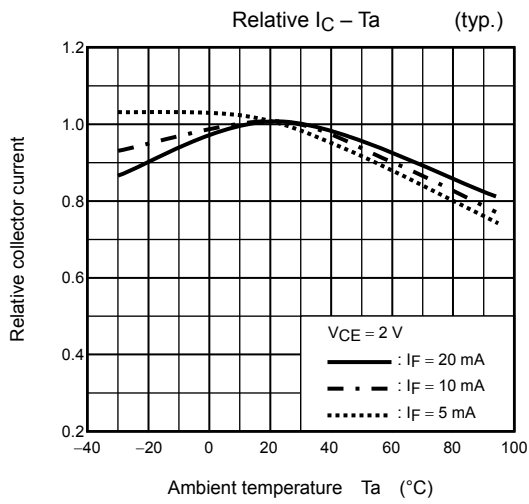
$$\frac{IC/IF(t)}{IC/IF(0)} = \frac{P_o(t)}{P_o(0)}$$

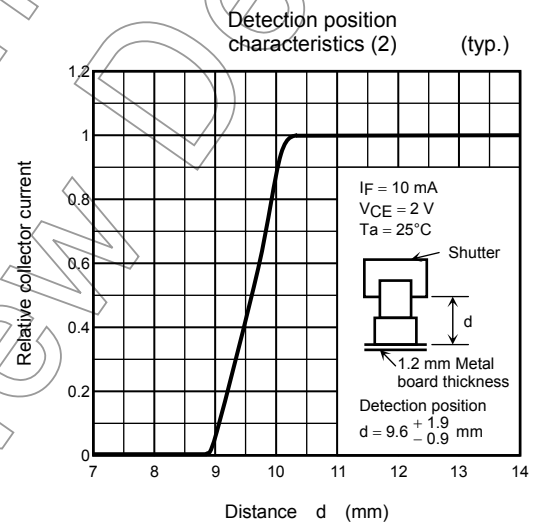
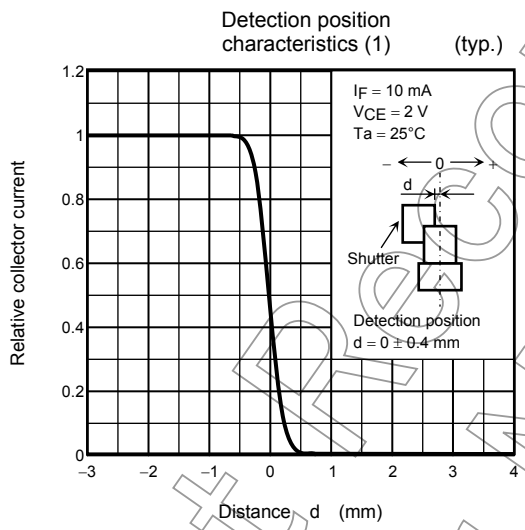
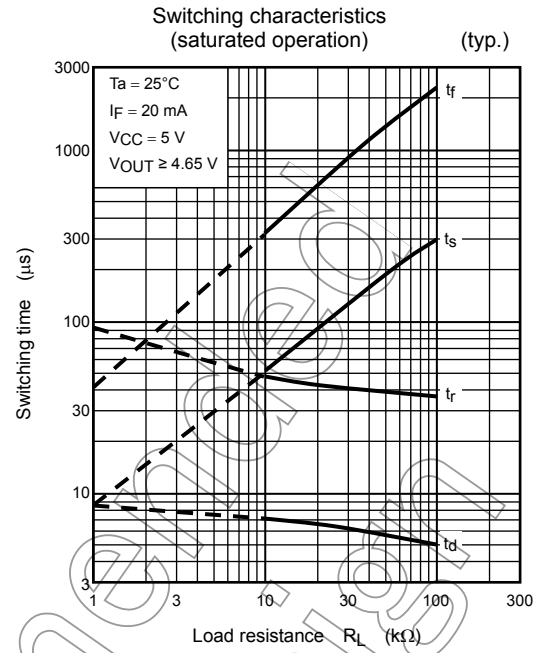
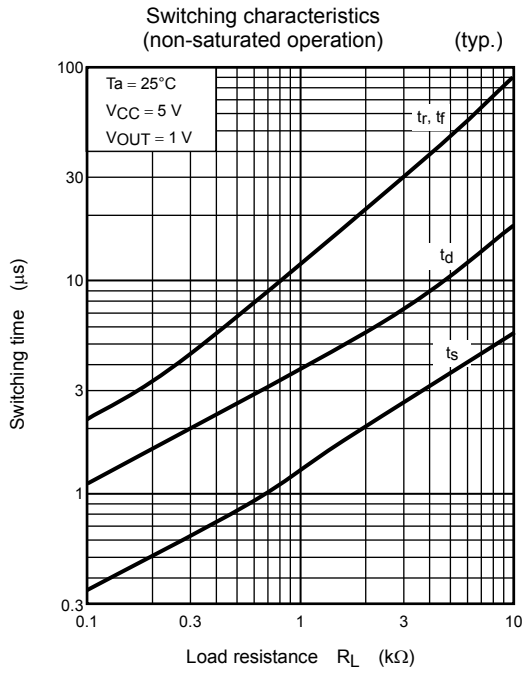
- The leadframe of the package is exposed as shown below. Ensure that no conductive material or object (such as a metal pin) comes into contact with the leads of the leadframe and shorts them together. Care must be taken when designing a chassis.



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

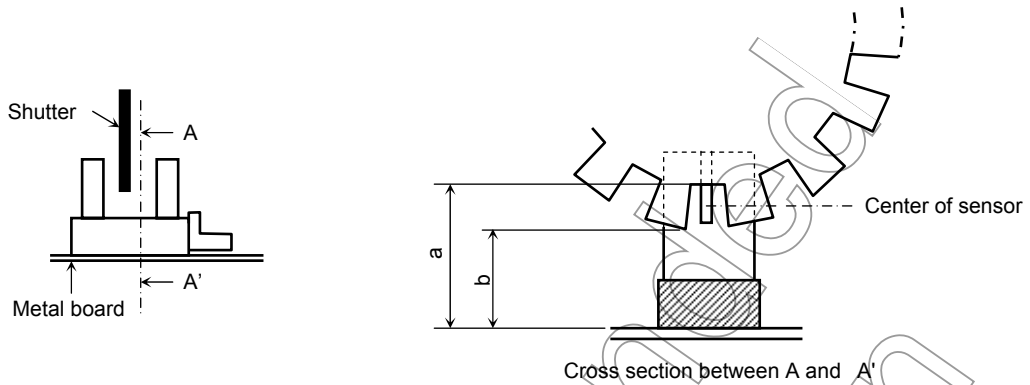






Relative Positioning of Shutter and Device

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.

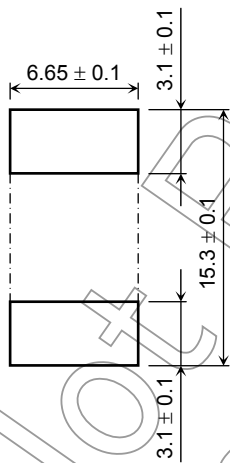


Unit: mm

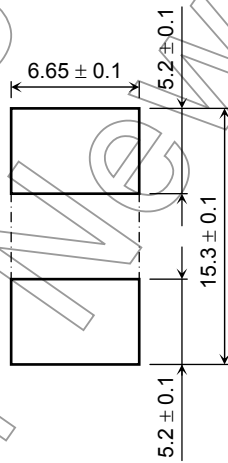
Thickness of Metal Board	a Dimension	b Dimension
1.0	11.7 min	8.9 max
1.2	11.5 min	8.7 max
1.6	11.1 min	8.3 max

Recommended Size of Connection Holes (Unit: mm)

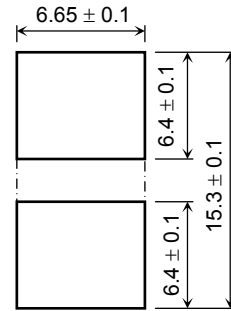
1.0-mm thick metal board



1.2-mm thick metal board



1.6-mm thick metal board



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