

PRODUCT GUIDE

Photosensors



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1 Part Number Index

Part Number	Page	Part Number	Page	Part Number	Page
TLN105B(F)	7	TPS601A(F)	9	TPS852(T)/TPS852(K)	10
TLN108(F)	7	TPS610(F)	9	TPS853(E)	10
TLN110(F)	7	TPS611(F)	9	TPS856(T)/TPS856(K)	10
TLN115A(F)	7	TPS615(F)	9	TPS859(T)/TPS859(K)	10
TLN117(F)	7	TPS616(F)	9	TLP830(F)	11
TLN119(F)	7	TPS622(F)	9	TLP831(F)	11
TLN231(F)	7	TPS703(F)	10	TLP832(F)	11
TLN233(F)	7	TPS704(F)	10	TLP833(F)	11
TLN238(F)	7	TPS820(B, F)	10		
TLN1108	7	TPS851(E)	10		

2 New Product Digest

Small Surface Mount Type High-power Infrared LED

New

TLN1108



The TLN1108 is a small, high-power infrared LED that has been realized by combining a newly developed high-power infrared chip with a highly reliable surface mount package. Available for use with a wide range of products, including consumer equipment and on-vehicle components, this LED can contribute to the production of smaller, thinner applications that consume less power.

► Features

- Small surface mount package
TLN1108: PLCC-4 type, which offers good radiation performance 3.5(L) x 2.9(W) x 1.9(H) mm
- High radiant intensity has been realized owing to the adoption of a newly developed high-power infrared chip
- High heat resistance type with a wide range of operating temperatures
Operating temperature: -40 to 100°C; Storage temperature: -40 to 110°C

► Applications

Free-space optical communications; auxiliary light sources for security and automotive cameras; light sources for optoelectronic switches, etc.

► Absolute maximum rating (Ta = 25°C)

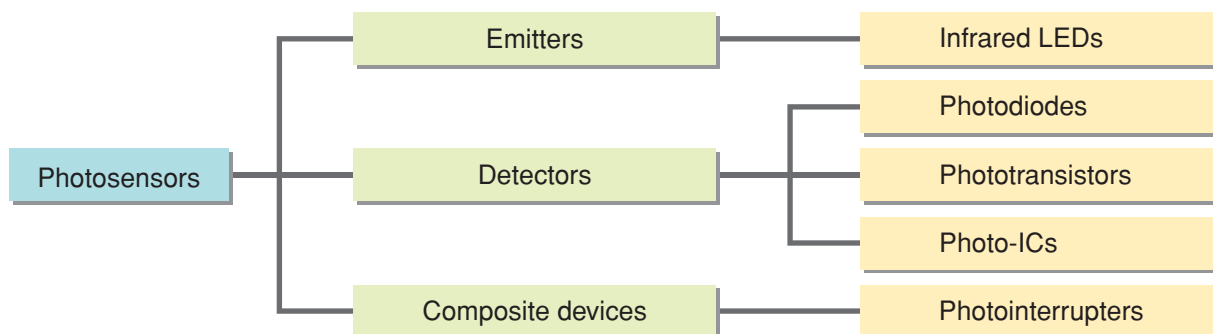
Characteristic	Rating	Unit
Direct forward current	100	mA
Direct reverse current	5	V
Operating temperature	-40 to 100	°C
Storage temperature	-40 to 110	°C

► Electrical and optical characteristics (If = 100 mA, Ta = 25°C) *Standard characteristics

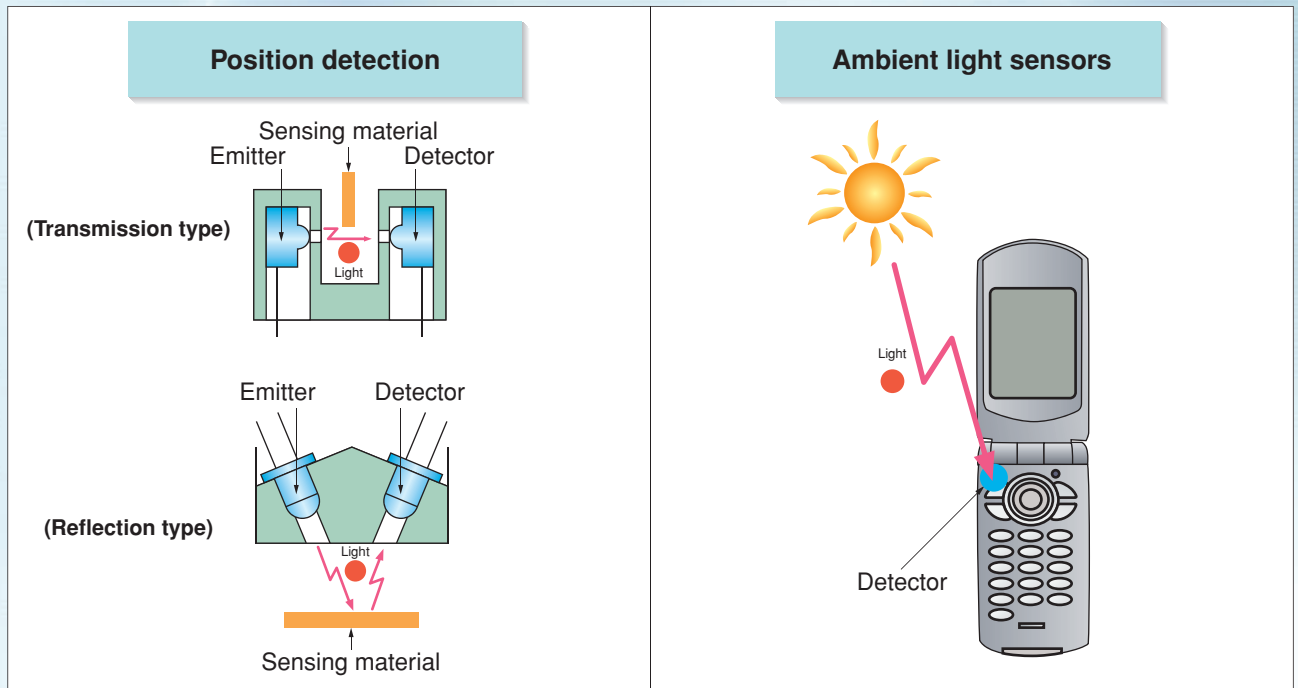
Part number	Radiant intensity (mW/sr)	Forward voltage (V)	Peak emission wavelength (nm)	Angle of beam spread (°)
TLN1108	18	2.5	870	120

3 Classification of Photosensors

Photosensors are classified as follows:



4 Applications of Photosensors



5 Features of Photosensors

Infrared LEDs, and visible LEDs for sensor light sources

- TLN100 Series Infrared LEDs of λ_p (peak-emission wavelength) = 940 nm to 950 nm
The light output is greater than that of visible LEDs and is most suitable for light sources for optoelectronic switches.
- TLN200 Series, TLN1000 Series..... Infrared LEDs of λ_p = 850 nm to 870 nm. The radiant power is greater than that of the TLN100 Series.

Phototransistors

- TPS600 Series Photodetectors with higher sensitivity than photodiodes. Suitable for optoelectronic switch applications.

Photodiodes

- TPS700 Series High-speed response detectors best suited for optical remote controls and various analog detection

Photo-ICs










- TPS800 series Detectors incorporate a photodiode and various circuits in a single chip.
Linear output type: Suitable for ambient light sensors, optoelectronic switches and analog displacement detection

Photointerrupters

- TLP800 Series..... Phototransistor output

6 Selection Guide by Package

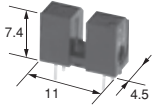
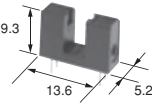
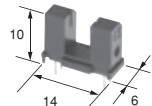
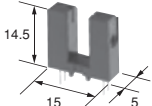
Emitters and Detectors

Package	External Appearance	Emitter		Detector	
		Infrared LED	Phototransistor	Photodiode	Photo-IC
TO-18CAN		TLN108(F)	TPS601A(F)		
φ3		TLN119(F) TLN238(F)	TPS615(F) TPS616(F)		
φ5		TLN105B(F) TLN110(F) TLN115A(F) TLN231(F) TLN233(F)	TPS610(F) TPS611(F)		
Side-View Package		TLN117(F)	TPS622(F)		
					TPS820(B, F)
				TPS703(F) TPS704(F)	
Surface-Mount Package					TPS851(E*) TPS853(E*)
					TPS852(T)/TPS852(K)* TPS856(T)/TPS856(K)* TPS859(T)/TPS859(K)*
		NEW TLN1108			

*: Manufactured by Toshiba Semiconductor (Thailand) Co., Ltd.

6 Selection Guide by Package

Photointerrupters

Package	External Appearance (mm)	Gap (mm)	Slit Width (mm)	Output Type
				Photo transistor
PWB Direct Mounting (General-Purpose)		2	0.15	TLP830(F)
		4.2	0.5*	TLP831(F)
		5	0.5	TLP832(F)
		5	0.5	TLP833(F)

*: Horizontal slit

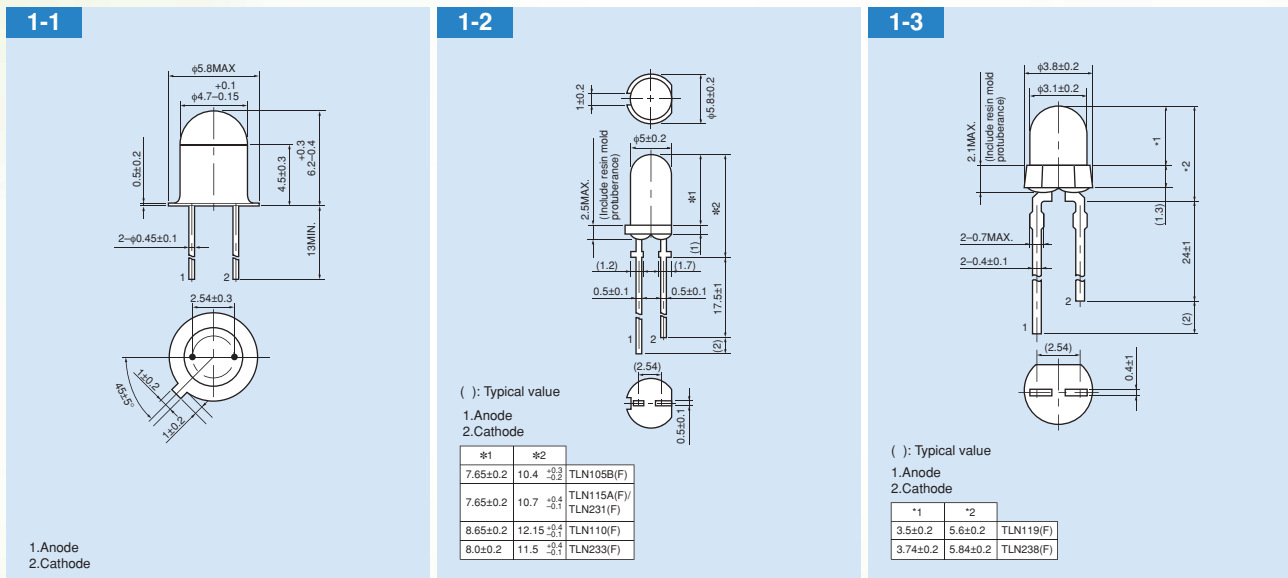
7 Product Lineup

7.1 Infrared LEDs, and Visible LEDs for Sensor Light Sources

Part No.	Package	Electrical and Optical Characteristics (Ta = 25°C)									Package No.	Applications
		Radiant intensity (mW/sr)			Radiant power (mW)			Peak-emission wavelength (nm)	Half-intensity angle (°)			
		Part number with rank	Min	Max	Min	Max	Min			Max		
TLN108(F)	TO-18 CAN	—	10	—	50	—	—	—	940	±8	1-1	Optoelectronic switches
TLN105B(F)	φ5	—	12	—	50	—	—	—	950	±23.5	1-2	Remote controls
TLN110(F)	φ5	—	15	—	50	—	—	—	940	±8		Optoelectronic switches
TLN115A(F)	φ5	—	15	—	50	—	—	—	950	±21		Remote controls
TLN231(F)	φ5	—	35	—	50	—	—	—	870	±16	1-3	Fiberless optical transmissions Optoelectronic switches
TLN233(F)	φ5	—	46	—	50	—	—	—	870	±13		
TLN238(F)	φ3	—	40	—	50	—	—	—	870	±18		
TLN119(F)	φ3	—	2.5	10	20	—	—	—	945	±30	1-3	Optoelectronic switches
		TLN119(B, F)	4.2	10								
TLN117(F)	Small side-view package	—	2	—	20	—	—	—	940	±15	1-4	
		TLN117(C, F)	5	18.7								
NEW TLN1108	PLCC	—	10	35	100	70(Typ.)	100	870	±60	1-5	Infrared lighting Fiberless optical transmissions	

Note: If = forward current

Unit: mm

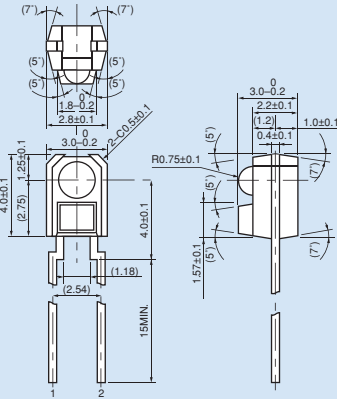


7 Product Lineup

7.1 Infrared LEDs, and Visible LEDs for Sensor Light Sources

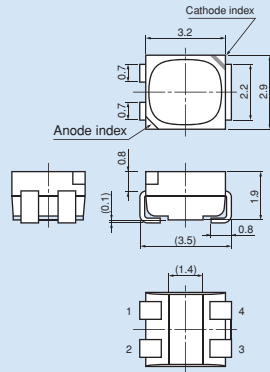
Unit: mm

1-4



(): Typical value
 1.Cathode
 2.Anode

1-5



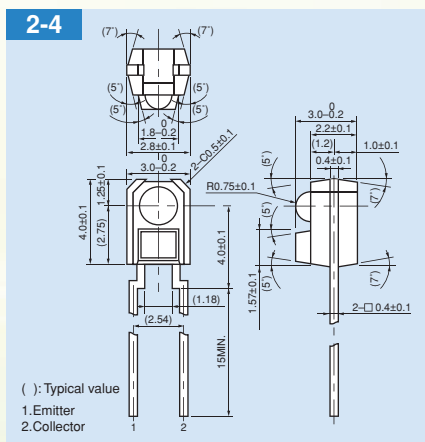
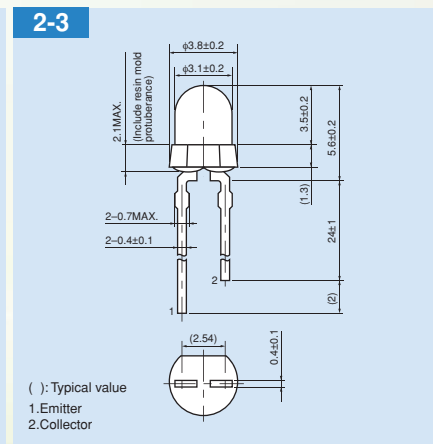
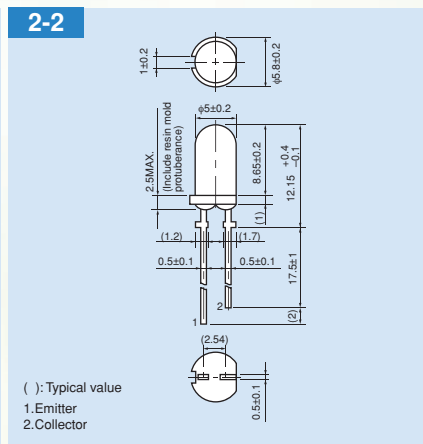
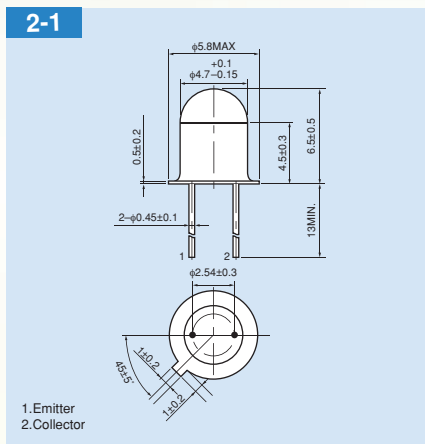
(): Typical value
 Tolerance: ±0.2
 1.Anode
 2.Cathode
 3.Cathode
 4.Cathode

7.2 Phototransistors

Part No.	Package	Electrical and Optical Characteristics (Ta = 25 °C)									Package No.	Applications			
		Light current (μA)			Dark current (μA)		Peak-sensitivity wavelength (nm)	Half-intensity angle (°)	Impermeable to visible light						
		Part number with rank	Min	Max	E(mW/cm ²)	Max				V _{CE} (V)					
TPS601A(F)	TO-18 CAN	—	100	—	0.1	0.2	30	800	±10	—	2-1	Optoelectronic switches			
		TPS601A(A, F)	100	300											
		TPS601A(B, F)	200	600											
		TPS601A(C, F)	400	1200											
TPS610(F)	φ5	—	100	—	0.1	0.1	24	800	±8	—	2-2		Optoelectronic switches		
TPS611(F)	φ5	—	30	—	0.1	0.1	24	900	±8	Y					
TPS615(F)	φ3	—	20	150	0.1	0.1	24	800	±30	—	2-3			Optoelectronic switches	
		TPS615(B, F)	34	85											
		TPS615(C, F)	60	150											
		TPS615(BC, F)	34	150											
TPS616(F)	φ3	—	10	75	0.1	0.1	24	900	±30	Y	2-3				Optoelectronic switches
		TPS616(B, F)	17	42.5											
		TPS616(C, F)	30	75											
		TPS616(BC, F)	17	75											
TPS622(F)	Small side-view	—	27	—	0.1	0.1	24	870	±15	Y	2-4	Optoelectronic switches			
		TPS622(A, F)	27	80											
		TPS622(B, F)	55	165											

Note: E = radiant incident, V_{CE} = collector-emitter voltage

Unit: mm



7 Product Lineup

7.3 Photodiodes

Part No.	Package	Electrical and Optical Characteristics (Ta = 25°C)							Package No.	Applications
		Short-circuit current (μA)		Dark current (nA)		Peak-sensitivity wavelength (nm)	Half-intensity angle (°)	Impermeable to visible light		
		Min	E(mW/cm²)	Max	VR(V)					
TPS703(F)	Side-view	0.9	0.1	30	10	960	±65	Y	3-1	Remote controls
TPS704(F)		0.5	0.1	30	10	1000	±65	Y		

Note: E = radiant incident, VR = reverse voltage

7.4 Photo-ICs

Part No.	Package	Electrical and Optical Characteristics (Ta = 25°C)										Package No.	Applications								
		Part number with rank	Light current (μA)				Dark current (μA)		Peak-sensitivity wavelength (nm)	Half-intensity angle (°)	Impermeable to visible light										
			Min	Max	Ev (lx)	Vcc (V)	Max	Vcc(V)													
TPS820(B, F)	Side-view Package	—	1500	6000	E = 0.1 mW/cm²	5	0.5	5	870	±15	Y	4-1	Optoelectronic switches								
TPS851(E*)	Chip type	—	37	74	E = 0.1 mW/cm²	3	0.17	3.3	600	±55	—	4-2	Ambient light sensors								
TPS852(T)*/TPS852(K)*		TPS851(E, A)	37	62										100	3	0.1	3.3	600	±55	—	4-3
TPS853(E*)		—	27	54										100	3	0.1	3.3	600	±55	—	4-2
TPS856(T)*/TPS856(K)*		TPS852(A,T)/TPS852(A,K)	30	50										100	3	0.1	3	550	±55	—	4-3
TPS859(T)*/TPS859(K)*		—	37	74										100	3	0.1	3.3	600	±55	—	4-2
TPS859(T)*/TPS859(K)*		TPS853(E, A)	39	65										100	3	0.1	3.3	600	±55	—	4-2
TPS856(T)*/TPS856(K)*	—	40	80	100	3	0.1	3	550	±55	—	4-3										
TPS859(T)*/TPS859(K)*	TPS856(A,T)/TPS856(A,K)	44.1	73.7	100	3	0.1	3	550	±55	—	4-3										
TPS859(T)*/TPS859(K)*	—	160	320	100	3	0.2	3	550	±55	—	4-3										
TPS859(T)*/TPS859(K)*	TPS859(A,T)/TPS859(A,K)	180	300	100	3	0.2	3	550	±55	—	4-3										

Note1: Vcc = supply voltage, Ev = illuminance, E = radiant incident

*: The parts with the (E, (T) and (K) suffixes are manufactured by Toshiba Semiconductor (Thailand) Co., Ltd.

Those with the (K) suffix are the part numbers used for ordering in Japan. Those with the (E) suffix are also available in Japan.

For details, ask your local Toshiba sales representative.

Unit: mm

3-1

(): Typical value
1. Anode
2. Cathode

4-1

(): Typical value
1. GND
2. OUT
3. Vcc

4-2

(): Typical value
Tolerance: ±0.1

	TPS851(E)	TPS853(E)
1	Vcc	Vcc
2	GND	GND
3	NC	NC
4	NC	Vstb
5	OUT	OUT

4-3

(): Typical value
Tolerance: ±0.1

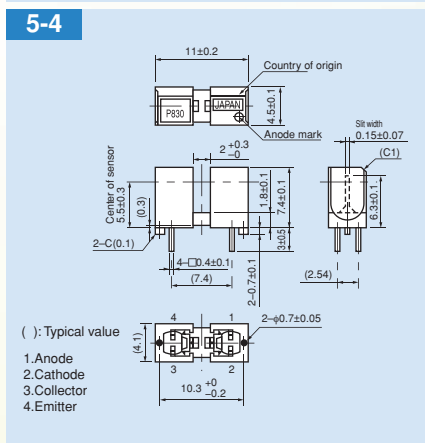
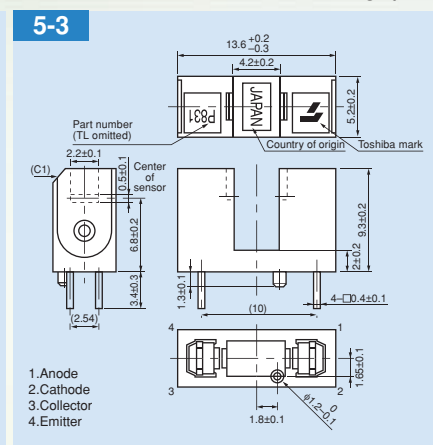
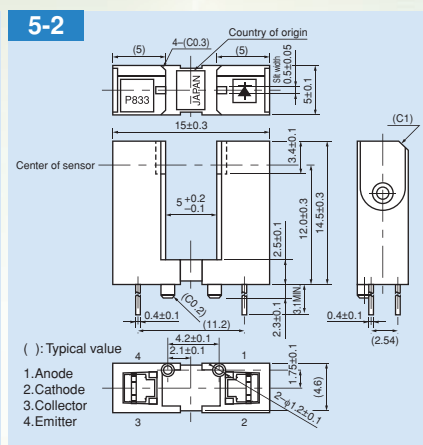
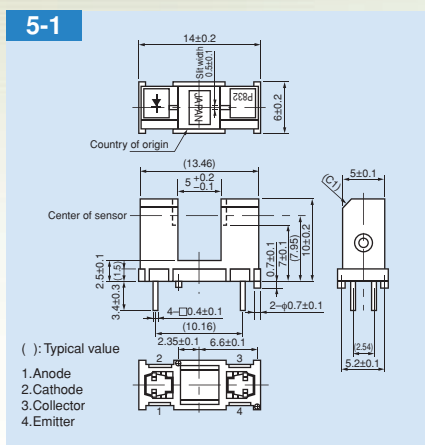
	TPS852(T)/852(K) TPS859(T)/859(K)	TPS856(T) TPS856(K)
1	Vcc	Vcc
2	GND	GND
3	GND	GND
4	GND	GND
5	GND	GND
6	OUT	OUT(Vstb)

7.5 Photointerrupters

Part No.	Package	Gap (mm)	Slit Width (mm)	Electrical Characteristics (Ta = 25°C)				Absolute Maximum Rating★	Package No.	Applications
				Current transfer ratio (%)		If (mA)	VCE (V)			
				Min	Max				Collector-emitter voltage (V)	
TLP832(F)	PWB direct mounting	5	0.5	5	100	10	2	35	5-1	Printers, Fax machines Copiers, Image scanners Vending machines Tape readers, Cameras
TLP833(F)		5	0.5	5	100	10	2	35	5-2	
TLP831(F)		4.2	0.5*	5	100	10	2	35	5-3	
TLP830(F)		2	0.15	3	20	10	2	35	5-4	

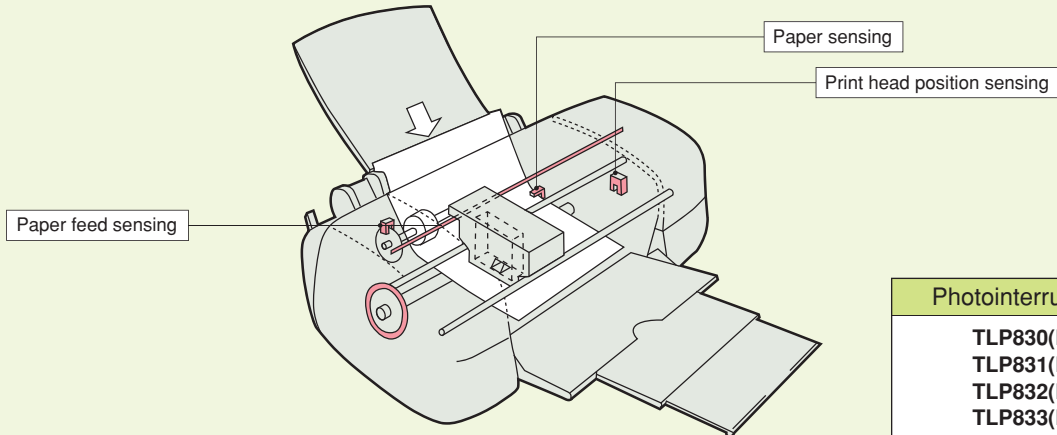
★: Ta = 25°C *: Horizontal slit Note: If: forward current, VCE: collector-emitter voltage, PWB: Printed wired board

Unit: mm



8 Application Examples

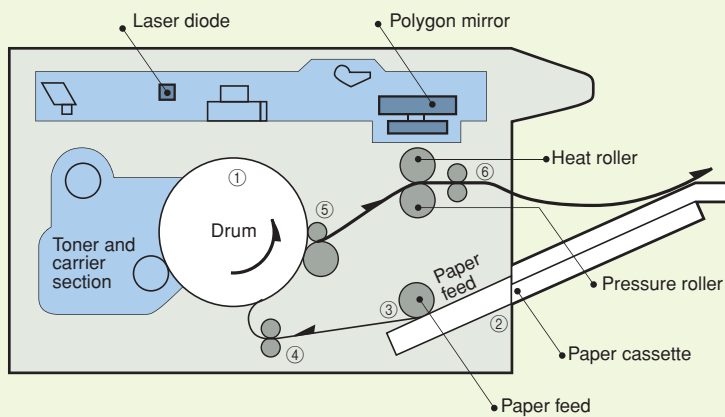
8.1 Inkjet Printers



Photointerrupters

TLP830(F)
TLP831(F)
TLP832(F)
TLP833(F)

8.2 Page Printers



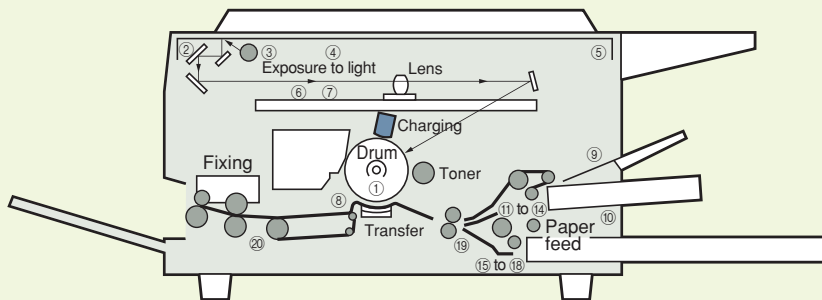
[Application examples]

- ① Drum revolution sensing
- ② Paper presence sensing
- ③, ④ Paper transport sensing
- ⑤ Paper separation sensing
- ⑥ Paper ejection sensing

Photointerrupters

TLP832(F)
TLP833(F)

8.3 Copiers



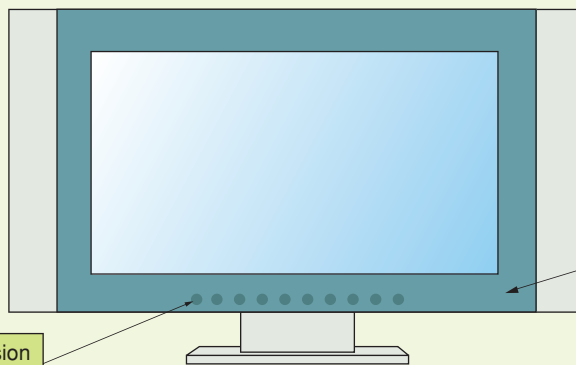
[Application examples]

- ① Drum position sensing
- ② to ⑤ Optics block position sensing
- ⑥, ⑦ Lens position sensing
- ⑧ Paper separation sensing
- ⑨, ⑩ Paper presence sensing
- ⑪ to ⑭ Upper cassette paper transport sensing
- ⑮ to ⑰ Lower cassette paper transport sensing
- ⑱, ⑲ Paper ejection and transport sensing

Photointerrupters

TLP832(F)
TLP833(F)

8.4 TV Monitors



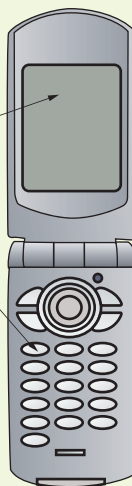
3D timing signal transmission

TLN1108

Luminous adjustment
for screens

**TPS851(E, TPS853(E
TPS859(T)/TPS859(K)**

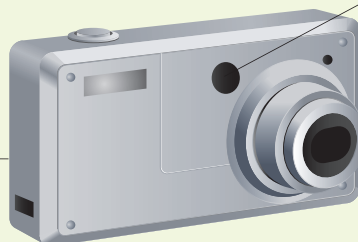
8.5 Cell Phones



Ambient light sensors for LCDs
Brightness control for key backlighting

**TPS851(E, TPS852(T)/TPS852(K)
TPS853(E, TPS856(T)/TPS856(K)**

8.6 Digital Still Cameras



Ambient light sensors
for LCDs

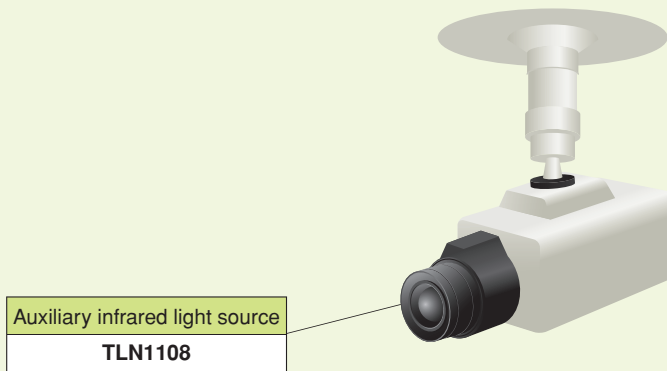
**TPS851(E, TPS852(T)/TPS852(K)
TPS853(E, TPS856(T)/TPS856(K)**

Phototransistor for
strobe light sensors

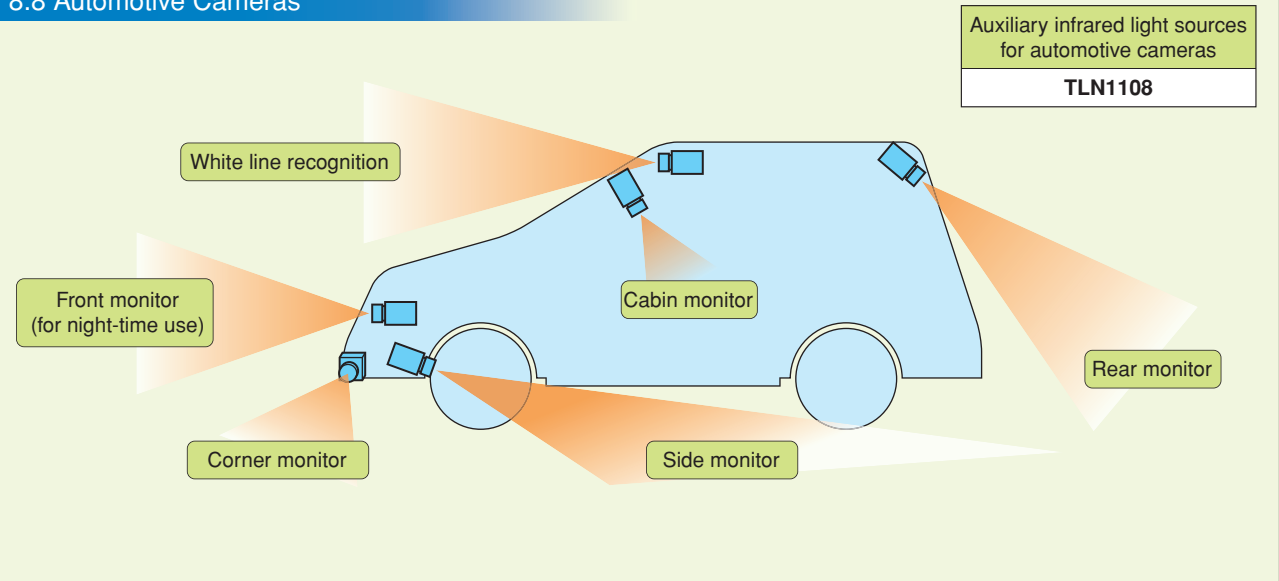
TPS615(F)

8 Application Examples

8.7 Security Cameras



8.8 Automotive Cameras



8.7 Others

Category	Appliances	Applications	Recommended Devices
AV equipment	Camcorders	Ambient light sensors for monitor screens	TPS85x Series
	Digital still cameras		
Household appliances	Refrigerators	Icemaker internal position sensing	TLP800 Series
		Ambient light sensors	TPS85x Series
	Microwave ovens	Sensing of height and number of cooked objects	TLN108(F) → TPS601A(F)
	Electric pots	Ambient light sensors	TPS85x Series
	Air conditioners	Remote controls	TLN105B(F) TLN115A(F) } → TPS703(F)
		Ambient light sensors	TPS85x Series
		Louver direction sensing	TLP800 Series
	Automatic blinkers	Ambient light sensors	TPS85x Series
	Washing machines	Sensing of degree of rinsing	TLN115A(F) → TPS611(F)
	Health equipment	Internal mechanism position sensing	Any photointerrupters
Sewing machines	Needle up/down and cloth-feed sensing	Any photointerrupters	
Control and Measurement	Optoelectronic switches	Emitters and detectors	TLN108(F) → TPS601A(F) TLN117(F) → TPS622(F)
			Automatic production machines
	Industrial robots	Object sensing	TLN108(F) → TPS601A(F)
Information devices, Automatic vending machines and Office equipment	Copiers	Paper size sensing, toner quantity sensing and toner density sensing	TLN117(F) → TPS820(B,F)
	Printers	Paper size sensing, toner quantity sensing and toner density sensing	TLN117(F) → TPS820(B,F)
	Automatic vending machines	Coin sensing and product feed sensing	TLN108(F) → TPS601A(F)
		Ambient light sensors	TPS85x Series
	PDA's	Ambient light sensors for monitor screens	
	Notebook PCs	Ambient light sensors for screens	
PC monitors	Ambient light sensors for screens		
Communications Devices	Telephones	Hook sensors	TLP831(F)
	Optical telephones	Information transmission	TLN115A(F) → TPS704(F)
	Optical communications	Space transmission	TLN231(F) TLN233(F) TLN238(F) TLN1108
Others	Gaming equipment (pachinko, computer games, etc.)	Coin sensing and internal mechanism position sensing	TLN108(F) → TPS601A(F)
	Toys (rifle games, remote controls, robots and game controls)	Remote controls	TLN115A(F) TLN231(F) TLN233(F) → TPS704(F)

9 Usage Considerations

LEDs for Optical Sensor Applications

Toshiba photosensors are available with two types of LEDs, and a projection of the operating life has been made for each LED. The table below shows the types of LED used in photosensors and the figures on pages 17 and 18 show projections of long-term light output performance and operating life. Note that these operating life data are estimates extrapolated from long-term light output degradation over a single wafer lot and are shown as reference only.

	Projected Operating Life ($T_a = 40^\circ\text{C}$, $I_F = 20\text{ mA}$, failure criteria: degradation rate $\Delta P_o < -50\%$)		Photosensors
	F50% operating life	F0.1% operating life	
① GaAs LED	1,300,000 h	260,000 h	Photointerrupters, Infrared LEDs
② GaAlAs LED	1,000,000 h	200,000 h	Infrared LEDs

F50% (cumulative failure rate 50%) operating life: Time period until the projected long-term light output degradation curve of the average light output change (\bar{X}) shown on pages 17 to 18 reaches the failure criteria.

F0.1% (cumulative failure rate 0.1%) operating life: Time period until the projected long-term light output degradation curve of $\bar{X} - 3\sigma$ shown on pages 17 to 18 reaches the failure criteria.

The relationship between LED light output degradation and optical coupling characteristics is shown below.

The relationship between the current transfer ratio (I_c/I_F) or LED radiant intensity (I_E) degradation and the LED light output degradation is 1:1.

$$\frac{I_c/I_F(t)}{I_c/I_F(o)} = \frac{P_o(t)}{P_o(o)} \quad \text{or} \quad \frac{I_E(t)}{I_E(o)} = \frac{P_o(t)}{P_o(o)}$$

■ Reading a projected operating life from a graph

As an example, let's read the operating life of an LED from the *GaAs LED Projected Operating Life Data* (Failure criteria: light output degradation $\Delta P_o < -50\%$).

Assume that the ambient temperature is 25°C .

1. Convert the ambient temperature into Kelvin. $25^\circ\text{C} + 273 = 298\text{ (K)}$
2. Calculate the reciprocal of the Kelvin temperature. $1/298 = 3.36 \times 10^{-3}$
3. Read the projected operating life from the graph.

$T_a = 25^\circ\text{C}$, $I_F = 50\text{ mA}$ (Failure criteria: light output degradation $\Delta P_o < -50\%$)

F50% (cumulative failure rate: 50%) operating life: Approx. 200,000 hours (for reference only)

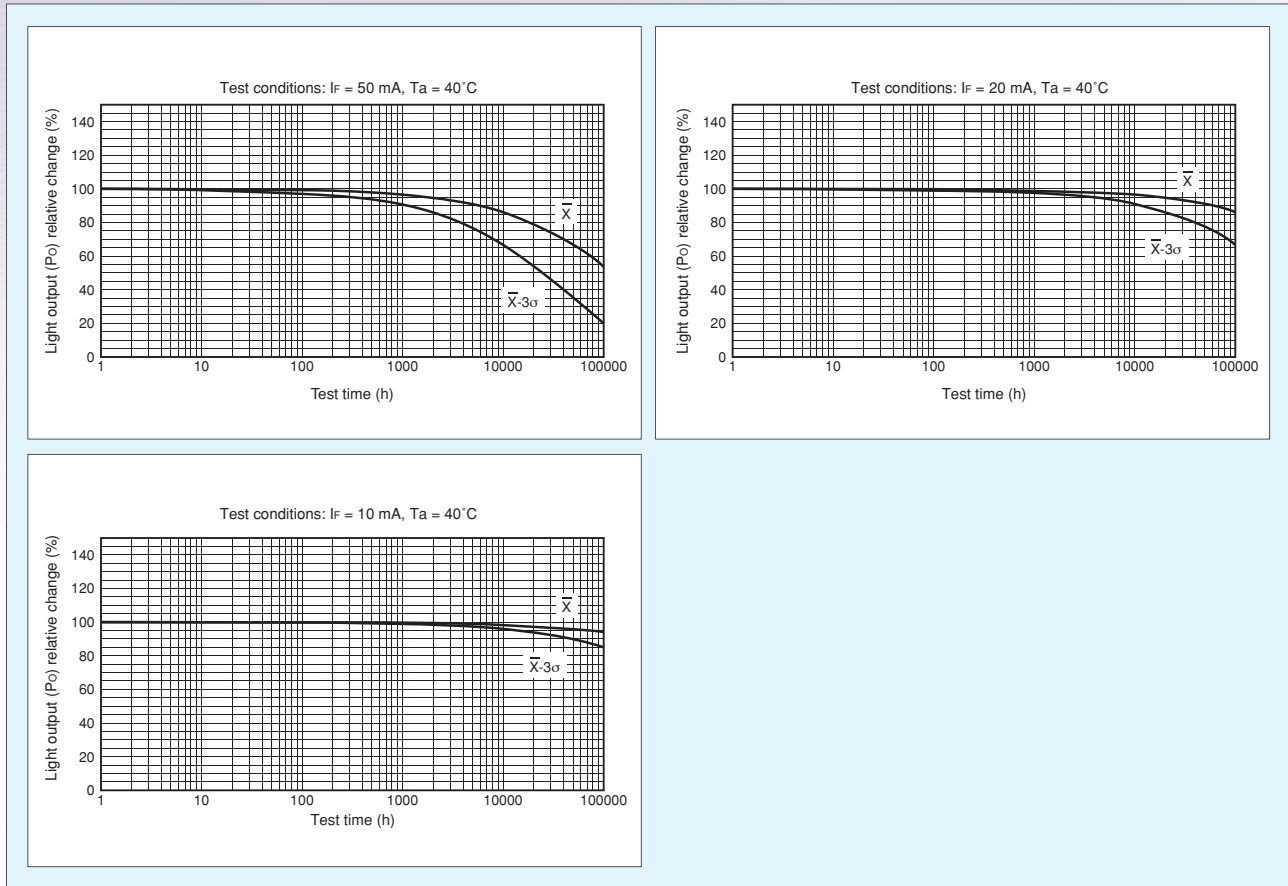
F0.1% (cumulative failure rate: 0.1%) operating life: Approx. 40,000 hours (for reference only)

LEDs Used in Photosensors

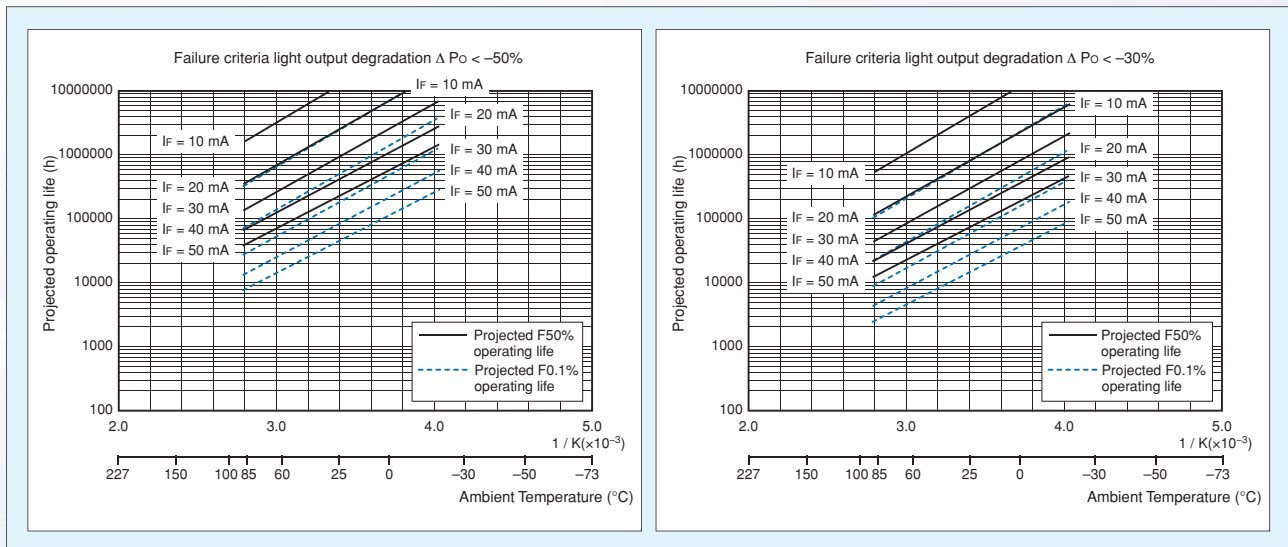
Photosensors	LED	Photosensors	LED
TLN105B(F)	①	TLN233(F)	②
TLN108(F)	①	TLN238(F)	②
TLN110(F)	①	TLP830(F)	①
TLN115A(F)	①	TLP831(F)	①
TLN117(F)	①	TLP832(F)	①
TLN119(F)	①	TLP833(F)	①
TLN231(F)	②		

①: GaAs Infrared LEDs ②: GaAlAs Infrared LEDs

① GaAs LED Projected Light Output Degradation Data



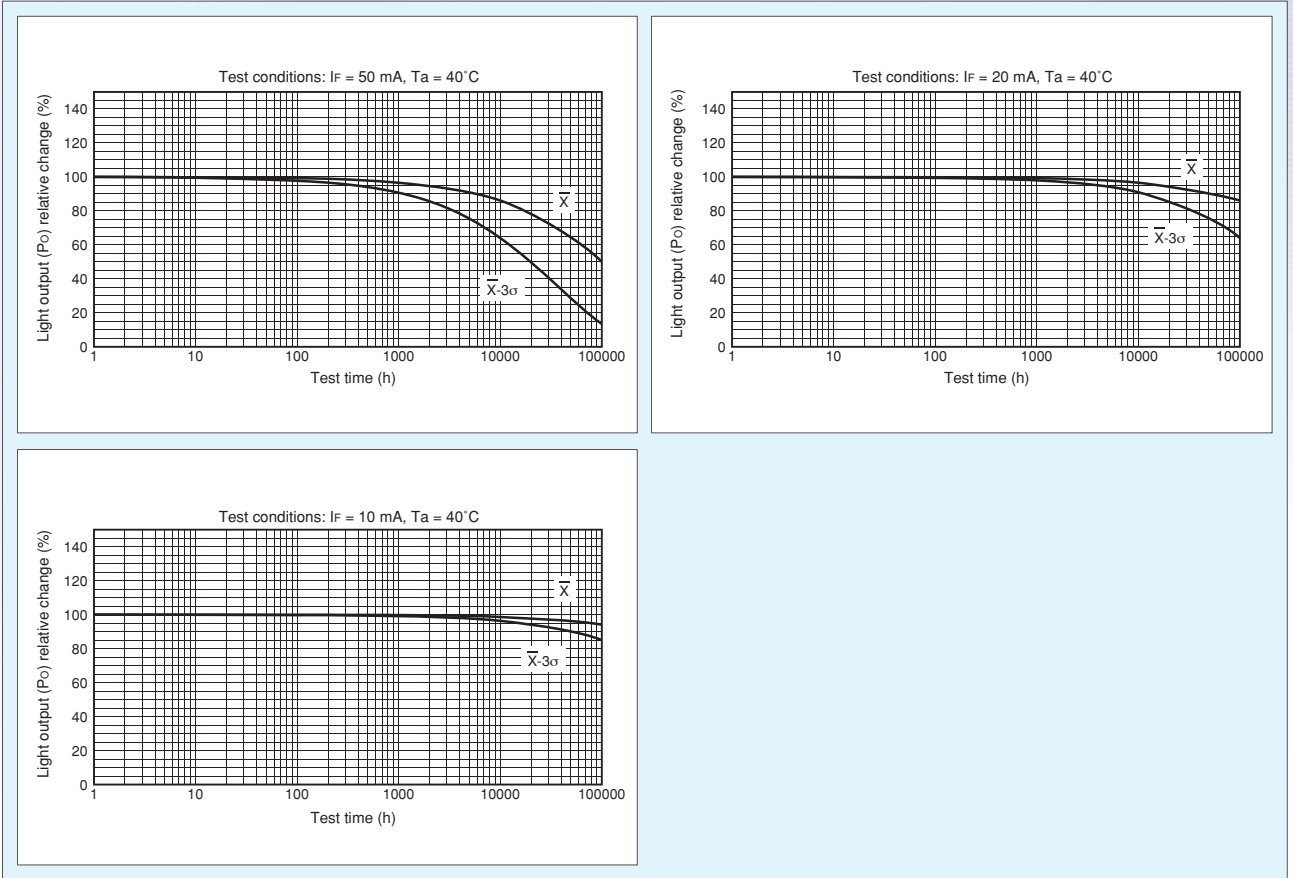
① GaAs LED Projected Operating Life Data



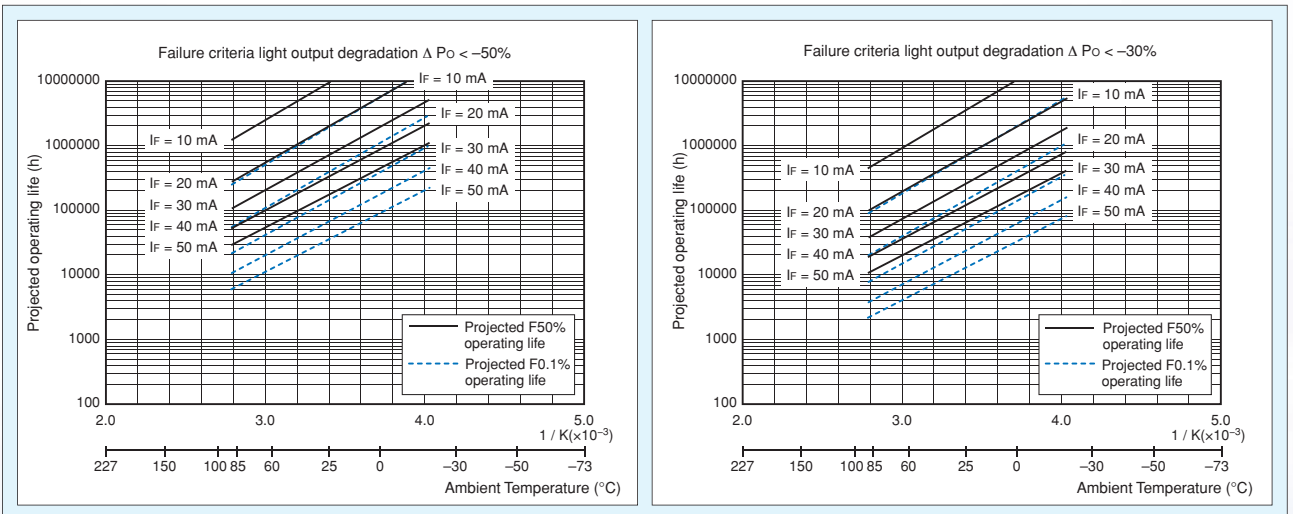
The above operating life data are estimates extrapolated from long-term light output degradation over a single wafer lot and are shown as reference only. Operating conditions exceeding the maximum ratings are not guaranteed.

9 Usage Considerations

② GaAs LEDs Projected Light Output Degradation Data



② GaAs LEDs Projected Operating Life Data



The above operating life data are estimates extrapolated from long-term light output degradation over a single wafer lot and are shown as reference only. Operating conditions exceeding the maximum ratings are not guaranteed.

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► Web pages by product type



Easy to Understand

You can search for parts, based on product types, specs, packages and so on.

Easy to Search

You can find Toshiba's parts functionally equivalent to our competitors' by entering their part number.

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You can narrow your search, based on functions, characteristics and so on.

Visible LEDs: High-Brightness LED Lamps (option package) by package

- Clicking on a part number jumps to the Product Detail page.
- You can also see a list of products by series number.
- You can also see a list of products by standard LED types.

Series Color	Half value Angle (°)	Part Number	Series Color	Life Color	Diameter (mm)	Mounting Height (mm)	Viewing Angle
Blue	45°	5951	Blue	Blue	5.0	4.0	Half value Angle T
Blue	45°	5952	Green	Blue	5.0	4.0	
Blue	45°	5953	Green	Blue	5.0	4.0	
Blue	45°	5954	Green	Blue	5.0	4.0	
Blue	45°	5955	Green	Blue	5.0	4.0	
Blue	45°	5956	Green	Blue	5.0	4.0	

Product List

Cross Reference Search: Transistors

By entering a competitor's device part number, you can find an equivalent part from Toshiba.

► Products: M3T025, Bipolar Transistors, Non Recovery Soft-Switch Transistors (SRFT)

Cross Reference Search:

Manufacturer: All Manufacturers
Part Number:

7 products 2 characteristics or more
* Cross Reference Search is possible only in a part of the manufacturer part number.

Manufacturer	Manufacturer Part Number	Toshiba Part Number	Category	Package (Symbol)	Package
ON Semiconductor	2N3055	2N3055	Small signal NPN PNP	VS84	TO18-3
ON Semiconductor	2N3055	2N3055	Small signal NPN PNP	VS84	TO18-3
ON Semiconductor	2N3055	2N3055	Small signal NPN PNP	VS84	TO18-3
ON Semiconductor	2N3055	2N3055	Small signal NPN PNP	VS84	TO18-3
ON Semiconductor	2N3055	2N3055	Small signal NPN PNP	VS84	TO18-3
ON Semiconductor	2N3055	2N3055	Small signal NPN PNP	VS84	TO18-3

Cross-Reference Search

Parametric Search

Search for products by various parameters.

Part Number	Manufacturer	Category	Package	Mounting	Operating Voltage	Operating Current	Operating Power	Operating Temperature	Storage Temperature	Lead Free
2N3055	ON Semiconductor	Small signal NPN PNP	VS84	TO18-3	5V	100mA	1W	-55 to 150°C	-55 to 150°C	Yes
2N3055	ON Semiconductor	Small signal NPN PNP	VS84	TO18-3	5V	100mA	1W	-55 to 150°C	-55 to 150°C	Yes
2N3055	ON Semiconductor	Small signal NPN PNP	VS84	TO18-3	5V	100mA	1W	-55 to 150°C	-55 to 150°C	Yes
2N3055	ON Semiconductor	Small signal NPN PNP	VS84	TO18-3	5V	100mA	1W	-55 to 150°C	-55 to 150°C	Yes
2N3055	ON Semiconductor	Small signal NPN PNP	VS84	TO18-3	5V	100mA	1W	-55 to 150°C	-55 to 150°C	Yes
2N3055	ON Semiconductor	Small signal NPN PNP	VS84	TO18-3	5V	100mA	1W	-55 to 150°C	-55 to 150°C	Yes

Parametric Search

► New and hot products

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Topics on new products



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