TOSHIBA

LED Lamps

PRODUCT GUIDE

■ Toshiba Visible LED Lamp Family Outline

LED Lamp Family 299 products

InGaAℓP

High-blightness lead type: 231 products

- **TL✻H Series**
- **TL✻E Series**
- **TL✻U Series**

● InGaAℓP products are mainly from the World's highest luminosity level "TL✻H Series" to general-purpose "TL✻U Series"

● Stopper lead type and straight lead type available. (for ø5-mm type only)
Suffix "P" indicates straight or stopper type.
(example: TL✻E16TP is straight type.)

Surface-mount devices (SMDs): 68 products

- **TL✻H Series**
- **TL✻E Series**
- **TL✻U Series**
- **S4F42✻ Series**
- **S4F43✻ Series**

● Package size: 1.6 x 0.8 mm
2.0 x 1.25 mm
3.2 x 2.4 mm (ø2 lens-top)
3.2 x 2.8 mm (flat type / ø3 lens-top)

● Four-element (InGaAℓP) chip LEDs enable construction of low power dissipation equipment.

● Wider operating range: Topr = –40°C to 100°C
(TL✻1100 Series, TL✻1102 Series, S4F42✻ Series, S4F43✻ Series)

Related catalog on website

The following related catalog are also published on the website.
"LED Lamps Application Guide"
http://doc.semicon.toshiba.co.jp/noseek/us/buct/bcfm.htm

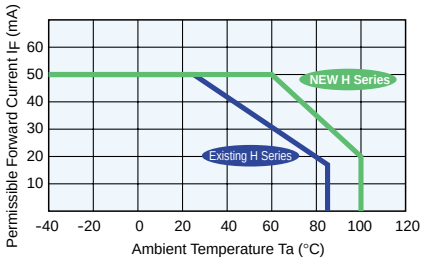
1. New TL✻H Series (Ultra-High-Brightness ø5-mm LED Lamp Series)

Using thin-film crystal growth technology to produce the ultra-bright light-emitting material InGaAℓP, as well as a new process and structure. Toshiba has developed a new line-up of InGaAℓP ultra-bright LED lamps.
These new LED lamps emit ultra-bright light. Higher brightness can be achieved at high temperature owing to an improved derating characteristic. The new series is effective in various applications such as outdoor LED information panels, high-brightness indications and backlighting for displays.

Features

- A brightness approximately 1.3 times that of the existing high-brightness InGaAℓP TL✻H Series of LED lamps can be achieved (comparison conditions: I_F = 20 mA, Ta = 25°C, same radiation pattern)
- Sufficient current can be obtained, even at high temperature, owing to an improved derating characteristic. Thus, at Ta = 50°C, brightness is approximately double that of the existing TL✻H Series.
- High-brightness emission can be achieved even at low-current drive. Lowering the drive current reduces product power dissipation.
- Four types of ø5-mm lens with various radiation patterns are available.

Derating Characteristics



Uses

LED information panels, indicators
The package specification in the product number for new TL✻H Series is now given as two digits instead of three as at present.

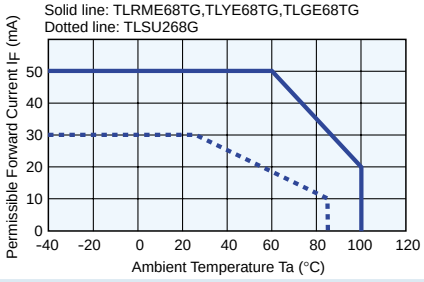
2. TLRME68TG Series (Round ø3-mm InGaAℓP LED Lamps Which Can Be Mounted Flush with PCB Using Surface Mounter)

When products are selected for use in equipment, mountability is a key factor. Most devices are now mounted using a high-speed surface mounter. To comply with this requirement, Toshiba has introduced a series of ø3-mm InGaAℓP LED lamps which can be mounted flush with a PCB using a surface mounter. High-brightness InGaAℓP, suitable for both indoor and outdoor applications, is used as the emitting substance.
These new LED lamps can be used in a wide range of applications, such as LED information panels, low-power-consumption indicators and high-brightness backlighting for displays.

Features

- Can be mounted flush with a PCB using a surface mounter.
  This enables reduction in assembly costs and time, reduction in height of finished product, and reduction of risk of damage due to finished products shifting during transportation.
- High-brightness InGaAℓP LEDs used
- Transparent packages with wide viewing angle
- Emitted colors: red (626 nm and 613 nm), yellow and green
- Superior derating characteristics enable excellent high-brightness emission in high-temperature environments.
- Because high-brightness emission can be low, resulting in low power consumption by the equipment as a whole.

Derating Characteristics



Uses

Display light sources, information display boards, light sources for backlighting

3. TLFGE / TLPYE Series with New Colors

Toshiba has added to its LED product line-up the TLFGE Series (of a color between those of the existing TLPGE and TLGE Series) and the TLPYE Series (of a color between those of the existing TLGE and TLYE Series). High-brightness InGaAℓP, widely used in both indoor and outdoor applications, is used as the light-emitting material.

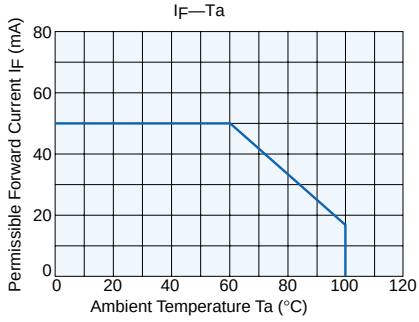
Features

- High-brightness InGaAℓP LED
- Emitted colors: TLFGE Series (fresh green): λd = 565 nm (typ.)
  TLPYE Series (pure yellow): λd = 580 nm (typ.)
- High-brightness even at high temperature owing to improved derating characteristic
- High-brightness emission even at low-current drive. Product power dissipation can be reduced.
- Four types of ø5-mm and ø3-mm lens with various radiation patterns are available. Select a lens according to the intended application.

Uses

Display light sources, information display boards, light sources for backlighting

Derating Characteristics



4. TLGU / TLPGU Series

Toshiba now offers a lead-type green U series. A brightness approximately five to eight times that of the Toshiba general-purpose medium-brightness Series (which uses GaP as the light-emitting material) can be achieved. High-brightness InGaAℓP, widely used in both indoor and outdoor applications, is used as the light-emitting material.

Features

- High-brightness InGaAℓP LED
- Emitted colors: TLGU Series (green): λd = 571 nm
  TLPGU Series (pure green): λd = 558 nm
- High-brightness even at high temperature owing to improved derating characteristic
- 20 types of green and pure-green ø5-mm and ø3-mm oval lens with various radiation patterns are available.
  Select a lens according to the intended application.

Uses

Display light sources, information display boards, panel indicators

2 Overview

1. Features

Toshiba LED lamps feature higher brightness, multiple colors and many types of package.
Select LEDs for your applications as appropriate.

Lead type

- Colors are from red to pure green (total 10 colors).
- Line-up of four-element (InGaAℓP) compound semiconductors allows outdoor use.
- Many types of package enable the user to select LED lamps to suit his or her application.

SMD type

- Miniature surface mount, upper-face emitting type
- A wide product line-up by high luminosity four-element (InGaAℓP) emitted-light devices
- Can be used in automatic mounting.
- Suitable for reflow soldering
- Standard 1.6 x 0.8 mm type and 2 x 1.25 mm type
  The original ø2-mm lens-top type suitable for thin profile applications not possible with conventional lead type LEDs
  Select the best device for your own particular application.
- Line-up of high-heat resistance type
  Suitable for use in automobile backlight sorce

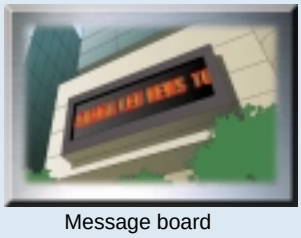
2. Uses

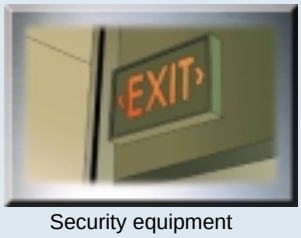
Lead type


CHMSL
(Center High Mounted Stop Lamp)


Light-emitting display


Traffic light


Message board



Security equipment

SMD type

Thin-electronic bulletin board


OA equipment


Handy camera


Accessaries on dashboard


FA equipment
(Programable control, etc.)


Home/cellular telephone

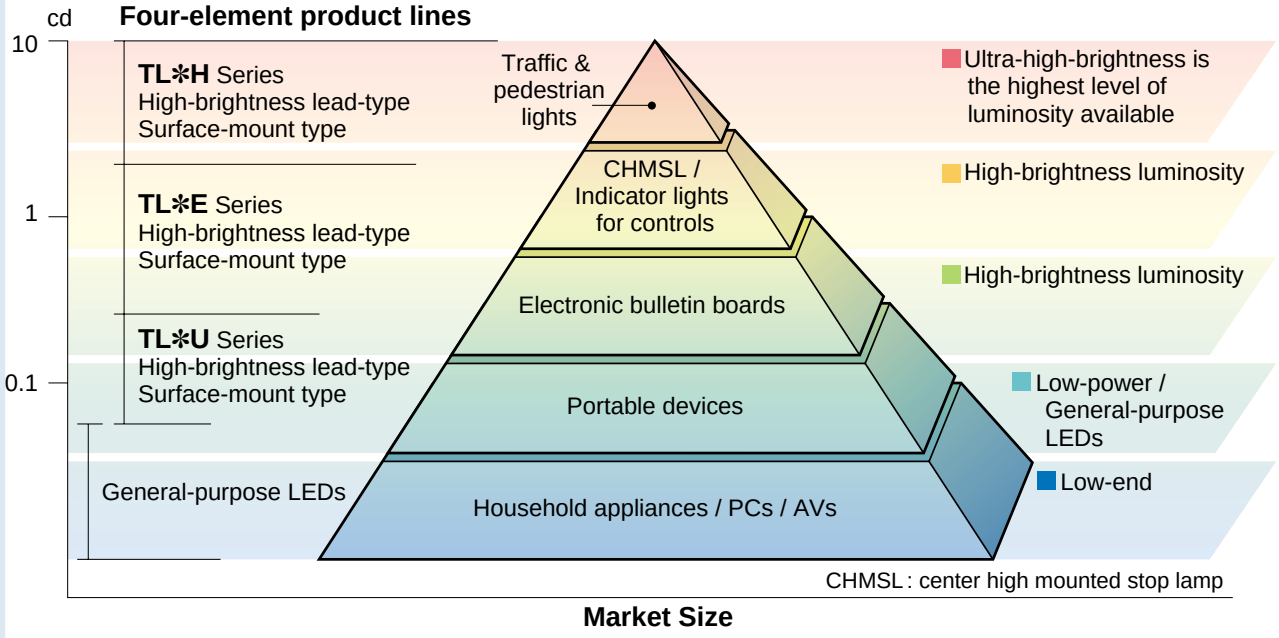

AV equipment
(Karaoke set, etc.)

3. Merits of Four-Element High-Brightness LED Lamps

What are four-element LEDs?

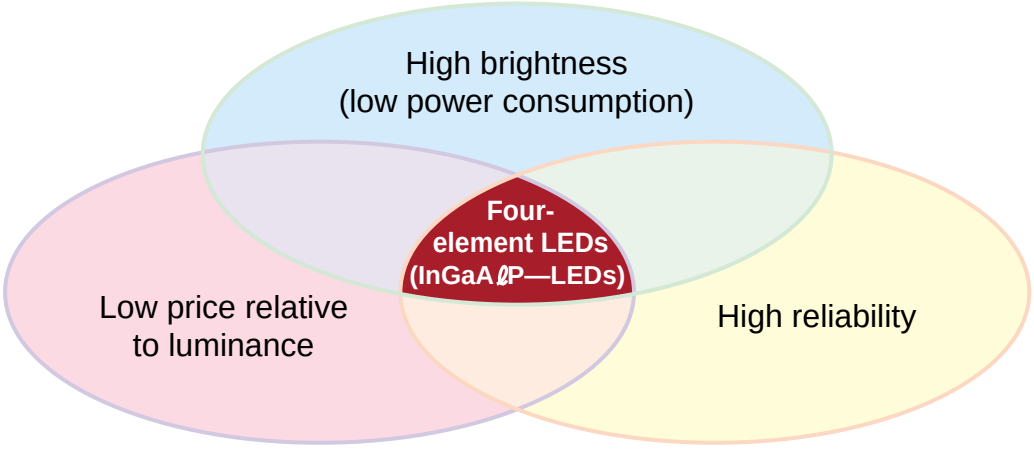
These are composite semiconductor devices made up of four elements (In, Ga, Aℓ and P). High-intensity emissions are possible from pure green to red, using the same materials and the same crystal growth method. Compared to other materials, these materials offer extremely high efficiency light emission in LEDs.

Wide market size for four-element LEDs



Merits of high-brightness LEDs

1. Higher visibility: Visibility is improved in the daytime or in bright environments. Operating status is clear from a distance.
2. Low power dissipation: LED current and circuit power dissipation is reduced compared to these for general-purpose LEDs with the same brightness.
3. Fewer devices required: Number of LEDs needed for backlighting or for multiple LED applications is reduced. Cost of mounting components also reduced.
4. Higher reliability: Product life is prolonged by reduced LED current.



Comparison between four-element high-brightness LED lamps and general-purpose brightness LEDs

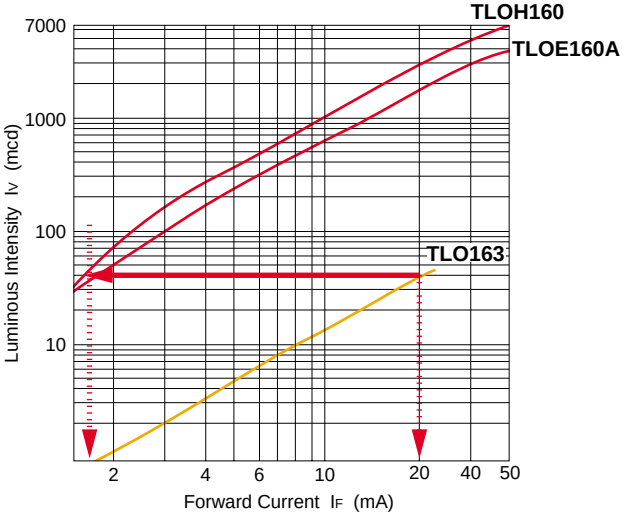
In designing sets that achieve the same luminous intensity through a four-element high-brightness LED lamp as through a general-purpose brightness LED lamp, the use of the four-element high-brightness LED lamp reduces the power dissipation by approximately 90%. (Toshiba internal comparison.)

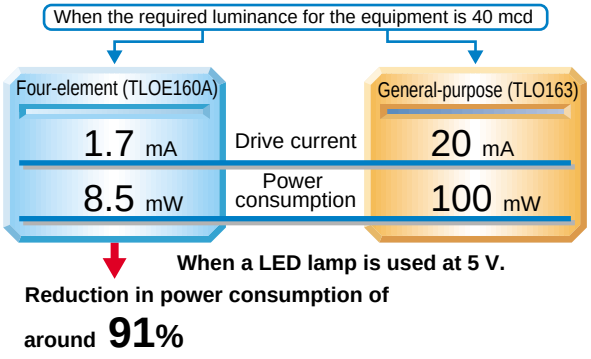
(1) Lead type

Comparison: (general-purpose LED) **TLO163**
10° ← Viewing angle

(high-brightness) **TLOH160, TLOE160A**
10° 10° ← Viewing angle

● **Typical Luminous Intensity Comparison**





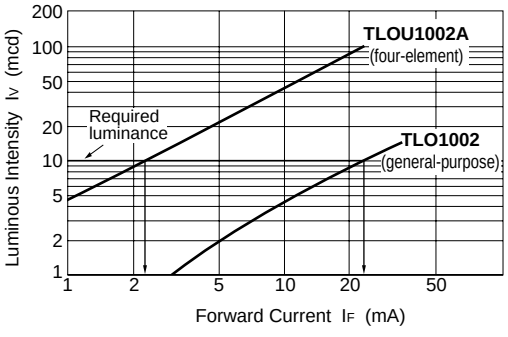
When a LED lamp is used at 5 V.
Reduction in power consumption of around 91%

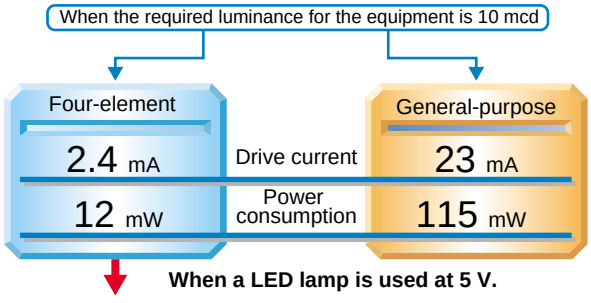
(2) SMD type

● **Four-element LEDs vs. General-purpose LEDs**

Example: TLOU1002A (Four-element) vs. TLO1002 (General-purpose)

● **Typical Luminous Intensity Comparison**

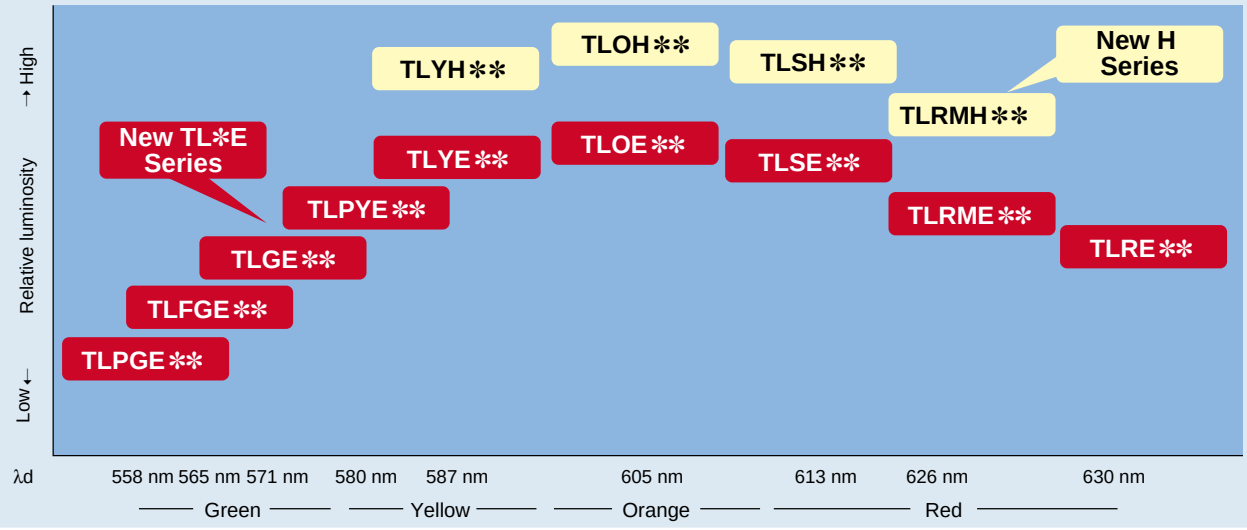




When a LED lamp is used at 5 V.
Reduction in power consumption of around 90%

4. About the Toshiba InGaAℓP LED Lamps

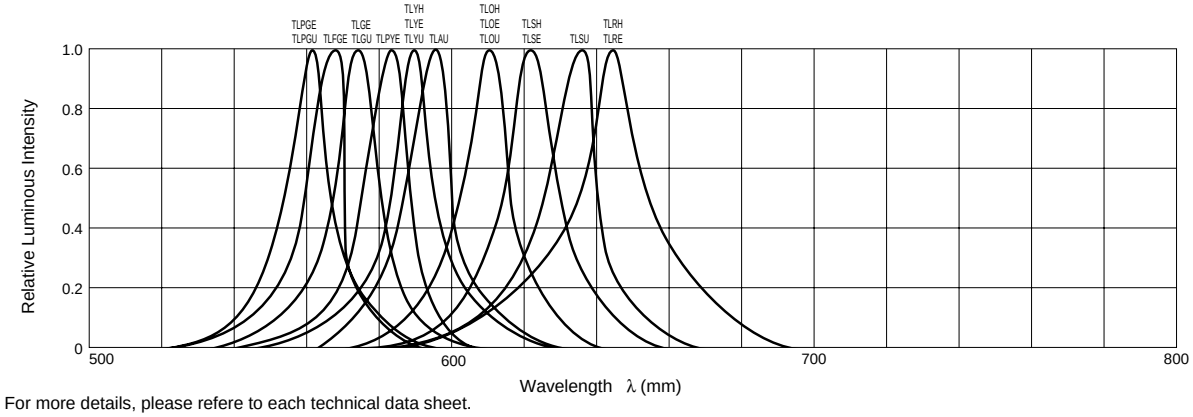
Toshiba are now offering a line-up consisting of several types of unpackaged InGaAℓP LED chip, allowing the most appropriate device to be selected for the job at hand. An overview of the line-up is given below.
Note that the comparisons are made under the following conditions: I_F = 20 mA, Ta = 25°C.



5. Emitted-Light Colors and Materials

Emitted-Light Color	Emitted-Light Material	Peak Emission Wavelength (typ.) λp (nm)	Dominant λd (nm)	Color Symbol (High-brightness series)
Red	InGaAℓP	644	630	RH / RE
	InGaAℓP	636	626	RMH / RME
	InGaAℓP	636	623	SU
	InGaAℓP	623	613	SH / SE
Orange	InGaAℓP	612	605	OH / OE / OU
Amber	InGaAℓP	596	592	AU
Yellow	InGaAℓP	590	587	YH / YE / YU
	InGaAℓP	583	580	PYE
Green	InGaAℓP	574	571	GE
	InGaAℓP	568	565	FGE
	InGaAℓP	562	558	PGE

Main Products Typical Spectrum



For more details, please refere to each technical data sheet.

6. Product Number Format

Lead Type I (Three digits type)

Product type is determined by color symbol and package type number.

Product number: TL □ ○○○ □* □**

- Package number (numbers: three digits)
- Color symbol (letter)
- Toshiba LED

* Change code

** Straight lead type without a lead stopper is indicated by the suffix P which is added at the end of the product number (only applicable to products 5 mm or more in diameter).
G: Mount flush with PCB.

Example: TLRE156AP
This indicates that the product belongs to the high-brightness RE Series, has the package number 156A and is of straight lead type.

Example: TLSU113
This indicates that the product belongs to the SU Series, has the package number 113 and has a lead stopper.

Lead Type II (Two digits type)

Product type is determined by color symbol and package type number.

Product number: TL □ ○○ □* □**

- Package number (numbers: two digits)
- Color symbol (letter)
- Toshiba LED

* Resin type T: Transparent, C: Colored and transparent, D: Colored and diffusing, M: Milky-white and diffusing

** Straight lead type without a lead stopper is indicated by the suffix P which is added at the end of the product number (only applicable to products 5 mm or more in diameter).
G: Mount flush with PCB.

Example: TLRME68TG
This indicates that the product belongs to the high-brightness RME Series, has the package number 68 and has a transparent, mount flush with PCB type led lamp.

SMD Type

Product type is determined by color symbol and package type number.

Product number: TL □ ○○○○ □ (T□)

- Tape packing specifications
- Change code (letter)
- Package number (4 digits)
- Color symbol (letter)
- Toshiba LED

Example: TLYU1008A(T04)
This indicates that the product belongs to the high-brightness YU Series, has the package number 1008A and has T04 tape packing specifications.

7. Lead-Type Luminous Intensity Classification Table

Rank	Luminous Intensity (mcd)	Rank	Luminous Intensity (mcd)
A	0.1~0.2	M	56~112
B	0.18~0.36	N	100~200
C	0.32~0.64	P	180~360
D	0.56~1.12	Q	320~640
E	1.0~2.0	R	560~1,120
F	1.8~3.6	S	1,000~2,000
G	3.2~6.4	T	1,800~3,600
H	5.6~11.2	U	3,200~6,400
J	10~20	V	5,600~11,200
K	18~36	W	10,000~20,000
L	32~64	X	18,000~36,000
		Y	32,000~64,000

The table to the left provides of high-brightness LED lamp series as common criterion for luminous intensity classification. Measurement tolerance for each limit is ±15%.

Luminous Intensity Classification Format (Lead type)

Example:

TLYH180P (UV)

Product number — Rank symbol

This example shows that the product is a TLYH180P of ranks U and V.
Rank-classified products include two ranking levels as standard.

8. Lens Color and Appearance

Lens Type	Transparent	Milky white, Diffusing	Colored, Transparent	Colored, Diffusing
Appearance				

The colored lens type is using the luminescence color.

9. Pulse Drive

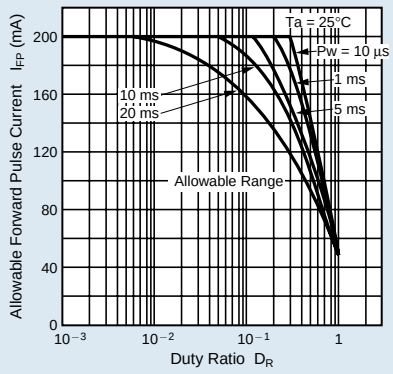
Since the allowable forward pulse current varies with I_F max, please refer to the graphs of allowable forward pulse current ratings. Note also that pulse drive requires derating with respect to the ambient temperature, as does DC drive.

Allowable forward pulse current rating
(T_a = 25°C)

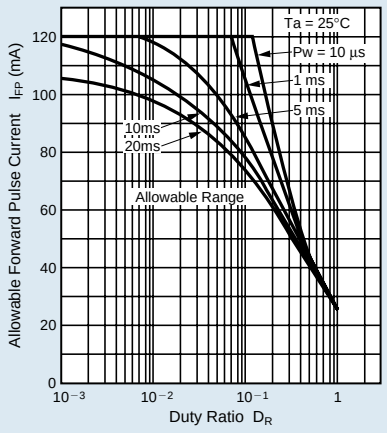
DC Forward I_F max (mA)	Allowable Forward Pulse Current $I_{FPm}ax$ (Note 2) (mA)	Characteristic Curves
50	200	1
25	120	2
30		3

Note 1:
Pulse width Pw = 100 µs,
Duty ratio $D_R = 10^{-1}$

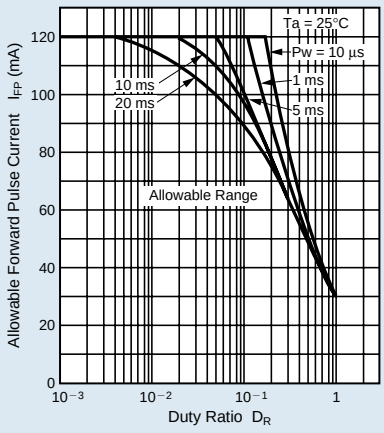
Characteristic curves (1)



Characteristic curves (2)



Characteristic curves (3)



10. General LED Characteristics

Absolute maximum rating

Absolute maximum ratings are the rated specifications which must not be exceeded in any operating environment. Please check the ratings for your intended product before designing a circuit.

Radiation (viewing) angle

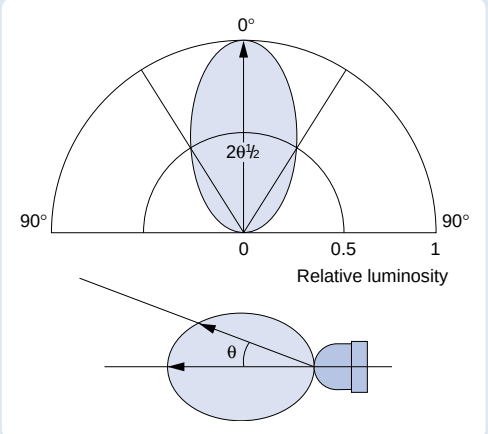
This parameter indicates the ratio of the LED's luminous intensity to its axial luminous intensity (= 100%) as viewed from an angle of θ with respect to the axis of the light source. The angle at which luminous intensity is exactly 50% of the axial luminous intensity is called the half-value angle θ 1/2. The half-value angle on both sides of the axis is expressed as 2 θ 1/2.

Luminous intensity

The light-emitting diode is assumed to be a spot light source and the luminous intensity is defined as the flux of light per unit solid angle for that light source.
The unit of luminous intensity is mcd.
This value is generally higher for the converging type of product which has high directional sensitivity.

Temperature dependency of luminous intensity

Optical output power decreases as the ambient temperature rises at a rate of approximately 1% per °C.



Viewing angle

3 Product List for Lead Type

1. Electrical and Optical Characteristics

Toshiba produces an extensive product line of newly developed ultra-high-brightness red, orange, yellow, green and pure green LEDs using InGaAℓP material and optimum lens design. Toshiba high-brightness LED lamps will help you to choose the most suitable type for your application.

Type I (Three digits type)

Series Name	Absolute Maximum Ratings					Electrical / Optical Characterostics								
	DC forward current I_F (mA)	DC reverse voltage V_R (V)	Power dissipation P_D (mW)	Operating temperature T_{opr} (°C)	Storage temperature T_{stg} (°C)	Forward voltage V_F (V) typ.	Forward voltage V_F (V) max	Forward voltage I_F (mA)	Reverse current I_R (μA) max	Reverse current V_R (V)	Standard emission wavelength characteristics (nm) Peak wavelength λp	Half width Δλ	Dominant wavelength λd	I_F (mA)
TLRH Series	50	4	125	–30~85	–40~120	1.9	2.5	20	50	4	644	18	630	20
TLRMH Series	50	4	125	–40~100	–40~120	2.05	2.5	20	50	4	636	20	626	20
TLRE Series	50	4	125	–30~85	–40~120	1.85	2.4	20	50	4	644	18	630	20
TLSH Series	50	4	125	–30~85	–40~120	2.1	2.5	20	50	4	623	15	613	20
TLSE Series	50	4	125	–30~85	–40~120	1.95	2.4	20	50	4	623	15	613	20
TLSU Series	30	4	72	Note 1	—	2.0	2.4	20	50	4	636	17	623	20
TLOH Series	50	4	125	–30~85	–40~120	2.1	2.5	20	50	4	612	15	605	20
TLOE Series	50	4	125	–30~85	–40~120	1.95	2.4	20	50	4	612	15	605	20
TLOU Series	30	4	72	Note 2	—	2.0	2.4	20	50	4	612	15	605	20
TLYH Series	50	4	125	–30~85	–40~120	2.1	2.5	20	50	4	590	13	587	20
TLYE Series	50	4	125	–30~85	–40~120	2.1	2.5	20	50	4	590	13	587	20
TLYU Series	30	4	75	Note 3	—	2.1	2.5	20	50	4	590	13	587	20
TLGE Series	50	4	140	–30~85	–40~120	2.27	2.8	20	50	4	574	11	571	20
TLPGE Series	50	4	140	–30~85	–40~120	2.27	2.8	20	50	4	562	11	558	20

* Some individual product specifications may differ from the series specifications given above. Please check the characteristics for each device.
Note 1: For operating and storage temperatures, please see page 14, 15.
Note 2: For operating and storage temperatures, please see page 18, 19.
Note 3: For operating and storage temperatures, please see page 20, 21.

Type II (Two digits type)

Series Name	Absolute Maximum Ratings					Electrical / Optical Characterostics								
	DC forward current I_F (mA)	DC reverse voltage V_R (V)	Power dissipation P_D (mW)	Operating temperature T_{opr} (°C)	Storage temperature T_{stg} (°C)	Forward voltage V_F (V) typ.	Forward voltage V_F (V) max	Forward voltage I_F (mA)	Reverse current I_R (μA) max	Reverse current V_R (V)	Standard emission wavelength characteristics (nm) Peak wavelength λp	Half width Δλ	Dominant wavelength λd	I_F (mA)
TLRE Series	50	4	120	–40~100	–40~120	1.9	2.4	20	50	4	644	20	630	20
TLRMH Series	50	4	120	–40~100	–40~120	1.9	2.4	20	50	4	636	13	626	20
TLRME Series	50	4	120	–40~100	–40~120	1.9	2.4	20	50	4	636	23	626	20
TLSH Series	50	4	120	–40~100	–40~120	2.0	2.4	20	50	4	623	13	613	20
TLSE Series	50	4	120	–40~100	–40~120	1.9	2.4	20	50	4	623	20	613	20
TLOH Series	50	4	120	–40~100	–40~120	2.0	2.4	20	50	4	612	13	605	20
TLOE Series	50	4	120	–40~100	–40~120	2.0	2.4	20	50	4	612	20	605	20
TLYH Series	50	4	120	–40~100	–40~120	2.0	2.4	20	50	4	590	13	587	20
TLYE Series	50	4	120	–40~100	–40~120	2.0	2.4	20	50	4	590	17	587	20
TLPYE Series	50	4	120	–40~100	–40~120	2.0	2.4	20	50	4	583	14	580	20
TLGE Series	50	4	120	–40~100	–40~120	2.0	2.4	20	50	4	574	17	571	20
TLGU Series	30	4	72	–40~100	–40~120	2.1	2.4	20	50	4	574	17	571	20
TLFGE Series	50	4	120	–40~100	–40~120	2.0	2.4	20	50	4	568	15	565	20
TLPGE Series	50	4	120	–40~100	–40~120	2.1	2.4	20	50	4	562	14	558	20
TLPGU Series	30	4	72	–40~100	–40~120	2.1	2.4	20	50	4	562	14	558	20

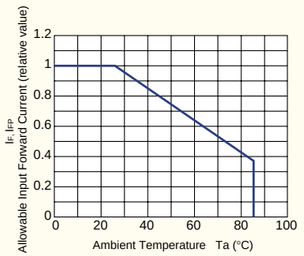
* Some individual product specifications may differ from the series specifications given above. Please check the characteristics for each device.

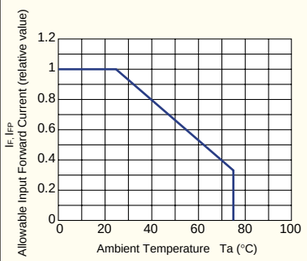
2. High-Brightness Red LED Lamps

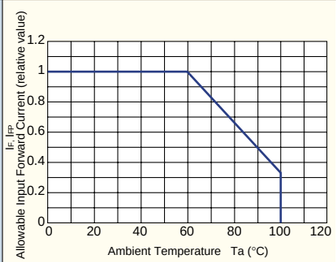
@Ta = 25°C

Series Name	Package Size (mm)	Viewing Angle 2θ1/2	Intensity I_V (mcd) @I_F = 20 mA Min	Intensity I_V (mcd) @I_F = 20 mA Typ.	Product Number: Open rank	Product Number: Rank specified	Typical Emitting Wavelength λd (nm)	Typical Emitting Wavelength λp (nm)	Lens Type	Absolute Maximum Ratings: Guaranteed Temperature	Absolute Maximum Ratings: DC Forward Current I_F (mA)	Absolute Maximum Ratings: Pulse Forward Current I_{FP} (mA)	Package Dimension Number	Typical Applicons
TL✻H Series	ø10	4°	4760	19000	**TLRH190P**	**TLRH190P(WX)**	630	644	Transparent	✻1	50	200	ø10-1	Traffic light
	ø5	7°	4760	11000	NEW **TLSH20TP**	—	613	623	Transparent	✻3	50	200	ø5-1	Pilot lamps (narrow range)
			2720	9000	NEW **TLRMH20TP**	—	626	636	Transparent	✻3	50	200	ø5-1	
		8°	2720	10000	**TLSH180P**	**TLSH180P(VW)**	613	623	Transparent	✻1	50	200	ø5-1	
			1530	5000	**TLRH180P**	**TLRH180P(UV)**	630	644	Transparent	✻1	50	200	ø5-1	
		12°	2720	6500	NEW **TLSH38TP**	—	613	623	Transparent	✻3	50	200	ø5-4	
			1530	4800	NEW **TLRMH38TP**	—	626	636	Transparent	✻3	50	200	ø5-4	
		15°	1530	4200	**TLRMH151P**	—	626	636	Transparent	✻3	50	200	ø5-4	
		20°	1530	4500	NEW **TLSH17TP**	—	613	623	Transparent	✻3	50	200	ø5-2	Message board Backlighting
			850	3200	NEW **TLRMH17TP**	—	626	636	Transparent	✻3	50	200	ø5-2	
		22°	850	2700	**TLSH157P**	**TLSH157P(ST)**	613	623	Transparent	✻1	50	200	ø5-2	
			850	2240	**TLRMH157P**	—	626	636	Transparent	✻3	50	200	ø5-2	
			476	1700	**TLRH157P**	**TLRH157P(ST)**	630	644	Transparent	✻1	50	200	ø5-2	
		25°	850	1900	NEW **TLSH16TP**	—	613	623	Transparent	✻3	50	200	ø5-3	
			476	1500	NEW **TLRMH16TP**	—	626	636	Transparent	✻3	50	200	ø5-3	
			476	900	**TLRMH156P**	—	626	636	Transparent	✻3	50	200	ø5-3	
		30°	476	1400	**TLSH156P**	**TLSH156P(RS)**	613	623	Transparent	✻1	50	200	ø5-3	
			272	800	**TLRH156P**	**TLRH156P(QR)**	630	644	Transparent	✻1	50	200	ø5-3	
		35°	272	650	**TLRMH265P**	—	626	636	Milky-white, diffusing	✻3	50	200	ø5-3	
	ø3	10°	2720	4500	**TLSH160**	—	613	623	Transparent	✻1	50	200	ø3-3	Pilot lamps
			850	1800	**TLRH160**	**TLRH160(ST)**	630	644	Transparent	✻1	50	200	ø3-3	
		40°	272	800	**TLSH125**	—	613	623	Transparent	✻1	50	200	ø3-4	
		80°	85	220	**TLRH262**	**TLRH262(NP)**	630	644	Transparent	✻1	50	200	ø3-2	Message board (wide range)
	Elliptical 5 X 5.8	30°/60°	153	450	**TLRH247**	**TLRH247(PQ)**	630	644	Transparent	✻1	50	200	Elliptical-1	Message board
TL✻U Series	ø5	6°	1530	4500	**TLSU180P**	**TLSU180P(TU)**	623	636	Transparent	✻1	30	120	ø5-1	Pilot lamps (narrow range)
		20°	272	900	**TLSU156P**	**TLSU156P(QR)**	623	636	Transparent	✻1	30	120	ø5-3	Message board Backlighting
		30°	153	550	**TLSU113P**	—	623	636	Red, transparent	✻2	30	120	ø5-5	
		40°	47.6	250	**TLSU114P**	**TLSU114P(NP)**	623	636	Red, diffusing	✻2	30	120	ø5-5	
	ø3	9°	476	4000	**TLSU163**	—	623	636	Pale red, transparent	✻1	30	120	ø3-3	Pilot lamps
			476	1600	**TLSU160**	—	623	636	Transparent	✻1	30	120	ø3-3	
		18°	153	450	**TLSU164**	—	623	636	Pale red, diffusing	✻1	30	120	ø3-3	
		35°	153	300	**TLSU125**	**TLSU125(PQ)**	623	636	Transparent	✻1	30	120	ø3-4	
			85	270	**TLSU123**	**TLSU123(PQ)**	623	636	Red, transparent	✻2	30	120	ø3-4	
		40°	85	180	**TLSU126**	—	623	636	Milky-white, diffusing	✻1	30	120	ø3-4	
			47.6	100	**TLSU124**	**TLSU124(MN)**	623	636	Red, diffusing	✻2	30	120	ø3-4	
		60°	47.6	170	**TLSU262**	**TLSU262(NP)**	623	636	Transparent	✻1	30	120	ø3-2	Backlighting (wide range)
		80°	47.6	130	NEW **TLSU268G◆**	—	623	636	Transparent	✻1	30	120	ø3-5	

◆: Mount flush with PCB

Parameter	✻1
Derating of Absolute Maximum Forward Current	
Operating Temperature	–30°C~85°C
Storage Temperature	–40°C~120°C

Parameter	✻2
Derating of Absolute Maximum Forward Current	
Operating Temperature	–20°C~75°C
Storage Temperature	–30°C~100°C

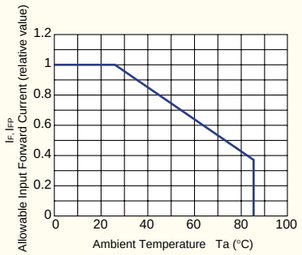
Parameter	✻3
Derating of Absolute Maximum Forward Current	
Operating Temperature	–40°C~100°C
Storage Temperature	–40°C~120°C

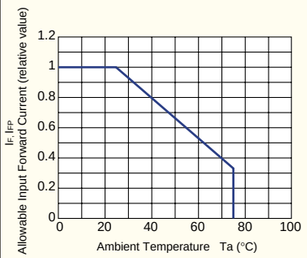
2. High-Brightness Red LED Lamps

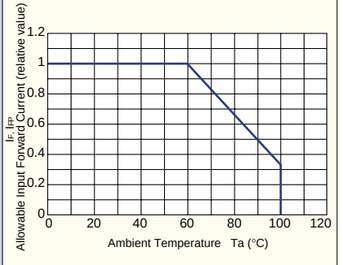
@Ta = 25°C

Series Name	Package Size (mm)	Viewing Angle 2θ1/2	Intensity I_V (mcd) @I_F = 20 mA Min	Intensity I_V (mcd) @I_F = 20 mA Typ.	Product Number: Open rank	Product Number: Rank specified	Typical Emitting Wavelength λd (nm)	Typical Emitting Wavelength λp (nm)	Lens Type	Absolute Maximum Ratings: Guaranteed Temperature	Absolute Maximum Ratings: DC Forward Current I_F (mA)	Absolute Maximum Ratings: Pulse Forward Current I_{FP} (mA)	Package Dimension Number	Typical Applicons
TL✻E Series	ø5	7°	2720	9000	**TLSE20TP**	—	613	623	Transparent	✻3	50	200	ø5-1	Pilot lamps (narrow range)
			2720	8000	**TLRME20TP**	—	626	636	Transparent	✻3	50	200	ø5-1	
			2720	7000	**TLRE20TP**	—	630	644	Transparent	✻3	50	200	ø5-1	
		8°	1530	8000	**TLSE180P**	—	613	623	Transparent	✻1	50	200	ø5-1	
			850	3000	**TLRE180AP**	**TLRE180AP(TU)**	630	644	Transparent	✻1	50	200	ø5-1	
		20°	850	3000	**TLSE17TP**	—	613	623	Transparent	✻3	50	200	ø5-2	Message board Backlighting
			850	2400	**TLRME17TP**	—	626	636	Transparent	✻3	50	200	ø5-2	
			476	1500	**TLRE17TP**	—	630	644	Transparent	✻3	50	200	ø5-2	
			85	270	**TLRE138P**	—	630	644	Red, diffusing	✻1	50	200	ø5-2	
		22°	476	1900	**TLSE157P**	**TLSE157P(ST)**	613	623	Transparent	✻1	50	200	ø5-2	
			272	1000	**TLRE157AP**	**TLRE157AP(RS)**	630	644	Transparent	✻1	50	200	ø5-2	
		25°	476	1500	**TLSE16TP**	—	613	623	Transparent	✻3	50	200	ø5-3	
			476	1000	**TLSE16CP**	—	613	623	Red, transparent	✻3	50	200	ø5-3	
			272	1200	**TLRME16TP**	—	626	636	Transparent	✻3	50	200	ø5-3	
			272	800	**TLRE16TP**	—	630	644	Transparent	✻3	50	200	ø5-3	
			153	600	**TLRE16CP**	—	630	644	Red, transparent	✻3	50	200	ø5-3	
			153	500	**TLRME17DP**	—	626	636	Red, diffusing	✻3	50	200	ø5-2	
		30°	272	900	**TLSE156P**	**TLSE156P(RS)**	613	623	Transparent	✻1	50	200	ø5-3	
			153	450	**TLRE156AP**	**TLRE156AP(PQ)**	630	644	Transparent	✻1	50	200	ø5-3	
		75°	47.6	150	**TLRE25TP**	—	613	644	Transparent	✻3	50	200	ø5-6	Backlighting (wide range)
		90°	27.2	80	**TLRE263AP**	**TLRE263AP(MN)**	630	644	Transparent	✻1	50	200	ø5-6	
		130°	8.5	20	**TLRE11TP**	—	613	644	Transparent	✻3	50	200	ø5-7	
		150°	8.5	15	**TLRE261AP**	—	630	644	Transparent	✻1	50	200	ø5-7	
	ø3	10°	476	1200	**TLRE160A**	**TLRE160A(RS)**	630	644	Transparent	✻1	50	200	ø3-3	Pilot lamps
		16°	1530	3500	**TLSE50T**	—	613	623	Transparent	✻3	50	200	ø3-3	
			850	2200	**TLRME50T**	—	626	636	Transparent	✻3	50	200	ø3-3	
			850	1800	**TLRE50T**	—	630	644	Transparent	✻3	50	200	ø3-3	
		45°	272	800	**TLSE53T**	—	613	623	Transparent	✻3	50	200	ø3-4	
			272	600	**TLRME53T**	—	626	636	Transparent	✻3	50	200	ø3-4	
			153	400	**TLRE53T**	—	630	644	Transparent	✻3	50	200	ø3-4	
		80°	85	330	NEW **TLRME68TG◆**	—	626	636	Transparent	✻3	50	200	ø3-5	Backlighting (wide range)
			85	200	**TLSE62T**	—	613	623	Transparent	✻3	50	200	ø3-2	
			47.6	180	**TLRME62T**	—	626	636	Transparent	✻3	50	200	ø3-2	
			47.6	150	**TLRE262A**	**TLRE262A(MN)**	630	644	Transparent	✻1	50	200	ø3-2	
			47.6	120	**TLRE62T**	—	630	644	Transparent	✻3	50	200	ø3-2	
		120°	15.3	45	**TLRE60T**	—	630	644	Transparent	✻3	50	200	ø3-1	
		140°	8.5	25	**TLRE260A**	—	630	644	Transparent	✻1	50	200	ø3-1	
	Elliptical 5 X 5.8	30°/50°	272	750	**TLSE27C**	—	613	623	Red, transparent	✻3	50	200	Elliptical-1	Message board
			153	400	**TLRME27C**	—	626	636	Red, transparent	✻3	50	200	Elliptical-1	
			85	300	**TLRE27C**	—	630	644	Red, transparent	✻3	50	200	Elliptical-1	
		30°/60°	85	350	**TLRE248**	—	630	644	Red, transparent	✻1	50	200	Elliptical-1	

◆: Mount flush with PCB

Parameter	✻1
Derating of Absolute Maximum Forward Current	
Operating Temperature	–30°C~85°C
Storage Temperature	–40°C~120°C

Parameter	✻2
Derating of Absolute Maximum Forward Current	
Operating Temperature	–20°C~75°C
Storage Temperature	–30°C~100°C

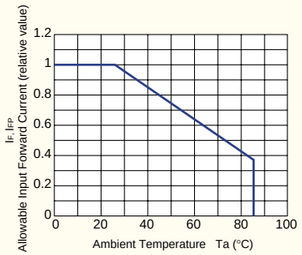
Parameter	✻3
Derating of Absolute Maximum Forward Current	
Operating Temperature	–40°C~100°C
Storage Temperature	–40°C~120°C

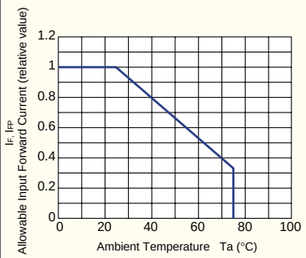
3. High-Brightness Orange LED Lamps

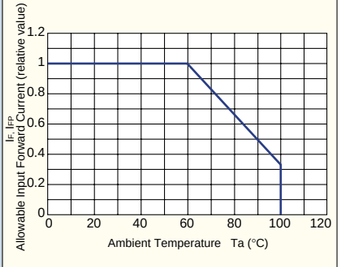
@Ta = 25°C

Series Name	Package Size (mm)	Viewing Angle 2θ1/2	Intensity I_V (mcd) @I_F = 20 mA Min	Intensity I_V (mcd) @I_F = 20 mA Typ.	Product Number: Open rank	Product Number: Rank specified	Typical Emitting Wavelength λd (nm)	Typical Emitting Wavelength λp (nm)	Lens Type	Absolute Maximum Ratings: Guaranteed Temperature	Absolute Maximum Ratings: DC Forward Current I_F (mA)	Absolute Maximum Ratings: Pulse Forward Current I_{FP} (mA)	Package Dimension Number	Typical Applicons
TL✻H Series	ø10	4°	8500	33000	TLOH190P	TLOH190P(XY)	605	612	Transparent	✻1	50	200	ø10-1	Traffic light
	ø5	7°	4760	15000	NEW TLOH20TP	—	605	612	Transparent	✻3	50	200	ø5-1	Pilot lamps (narrow range)
		8°	2720	10000	TLOH180P	TLOH180P(VW)	605	612	Transparent	✻1	50	200	ø5-1	
		12°	2720	7500	NEW TLOH38TP	—	605	612	Transparent	✻3	50	200	ø5-4	
		20°	1530	5000	NEW TLOH17TP	—	605	612	Transparent	✻3	50	200	ø5-2	
		22°	850	2800	TLOH157P	TLOH157P(TU)	605	612	Transparent	✻1	50	200	ø5-2	Message board Backlighting
		25°	850	2300	NEW TLOH16TP	—	605	612	Transparent	✻3	50	200	ø5-3	
		30°	476	1500	TLOH156P	TLOH156P(ST)	605	612	Transparent	✻1	50	200	ø5-3	
	ø3	10°	850	2300	TLOH160	TLOH160(TU)	605	612	Transparent	✻1	50	200	ø3-3	Pilot lamps
		80°	153	450	TLOH262	TLOH262(PQ)	605	612	Transparent	✻1	50	200	ø3-2	Backlighting (wide range)
TL✻E Series	ø5	7°	4760	10000	TLOE20TP	—	605	612	Transparent	✻3	50	200	ø5-1	Pilot lamps (narrow range)
		8°	1530	7000	TLOE180AP	TLOE180AP(UV)	605	612	Transparent	✻1	50	200	ø5-1	
		20°	1530	4500	TLOE17TP	—	605	612	Transparent	✻3	50	200	ø5-2	
		22°	476	2800	TLOE157AP	TLOE157AP(ST)	605	612	Transparent	✻1	50	200	ø5-2	Message board Backlighting
		25°	850	2000	TLOE16TP	—	605	612	Transparent	✻3	50	200	ø5-3	
			476	1600	TLOE16CP	—	605	612	Orange, transparent	✻3	50	200	ø5-3	
		30°	272	1000	TLOE156AP	TLOE156AP(RS)	605	612	Transparent	✻1	50	200	ø5-3	
			272	900	TLOE266	TLOE266(RS)	605	612	Orange, transparent	✻1	50	200	ø5-8	
		75°	153	350	TLOE25TP	—	605	612	Transparent	✻3	50	200	ø5-6	Backlighting (wide range)
		90°	47.6	260	TLOE263AP	TLOE263AP(PQ)	605	612	Transparent	✻1	50	200	ø5-6	
		130°	27.2	65	TLOE11TP	—	605	612	Transparent	✻3	50	200	ø5-7	
		150°	15.3	50	TLOE261AP	TLOE261AP(LM)	605	612	Transparent	✻1	50	200	ø5-7	
	ø3	10°	476	1500	TLOE160A	TLOE160A(ST)	605	612	Transparent	✻1	50	200	ø3-3	Pilot lamps
		16°	1530	4500	TLOE50T	—	605	612	Transparent	✻3	50	200	ø3-3	
		45°	272	1000	TLOE53T	—	605	612	Transparent	✻3	50	200	ø3-4	Backlighting (wide range)
		80°	153	350	TLOE62T	—	605	612	Transparent	✻3	50	200	ø3-2	
		80°	85	300	TLOE262A	TLOE262A(PQ)	605	612	Transparent	✻1	50	200	ø3-2	
		120°	27.2	100	TLOE60T	—	605	612	Transparent	✻3	50	200	ø3-1	
		140°	15.3	70	TLOE260A	TLOE260A(LM)	605	612	Transparent	✻1	50	200	ø3-1	
	Elliptical 5 X 5.8	30°/50°	272	800	TLOE27C	—	605	612	Orange, transparent	✻3	50	200	Elliptical-1	Message board
		30°/60°	153	370	TLOE248	—	605	612	Orange, transparent	✻1	50	200	Elliptical-1	
TL✻U Series	ø5	6°	2720	7000	TLOU180P	TLOU180P(UV)	605	612	Transparent	✻1	30	120	ø5-1	Pilot lamps (narrow range)
		20°	476	900	TLOU156P	TLOU156P(RS)	605	612	Transparent	✻1	30	120	ø5-3	
			476	800	TLOU172P	—	605	612	Orange, transparent	✻1	30	120	ø5-3	
		30°	272	900	TLOU113P	TLOU113P(RS)	605	612	Orange, transparent	✻2	30	120	ø5-5	Message board Backlighting
		40°	47.6	250	TLOU114P	TLOU114P(NP)	605	612	Orange, diffusing	✻2	30	120	ø5-5	
	ø3	9°	476	2500	TLOU160	—	605	612	Transparent	✻1	30	120	ø3-3	Pilot lamps
		35°	85	400	TLOU123	—	605	612	Orange, transparent	✻2	30	120	ø3-4	
		40°	47.6	180	TLOU124	—	605	612	Orange, diffusing	✻2	30	120	ø3-4	
		60°	47.6	300	TLOU262	TLOU262(PQ)	605	612	Transparent	✻1	30	120	ø3-2	Backlighting (wide range)
			47.6	200	TLOU267	—	605	612	Orange, transparent	✻1	30	120	ø3-2	
	Elliptical 5 X 5.8	30°/45°	85	450	TLOU248	—	605	612	Orange, transparent	✻1	30	120	Elliptical-1	Message board

◆: Mount flush with PCB

Parameter	✻1
Derating of Absolute Maximum Forward Current	
Operating Temperature	–30°C~85°C
Storage Temperature	–40°C~120°C

Parameter	✻2
Derating of Absolute Maximum Forward Current	
Operating Temperature	–20°C~75°C
Storage Temperature	–30°C~100°C

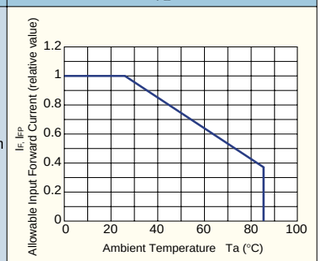
Parameter	✻3
Derating of Absolute Maximum Forward Current	
Operating Temperature	–40°C~100°C
Storage Temperature	–40°C~120°C

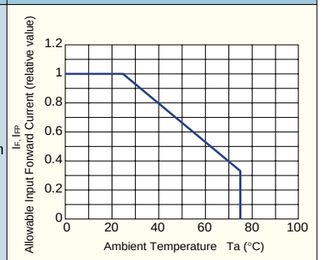
4. High-Brightness Yellow LED Lamps

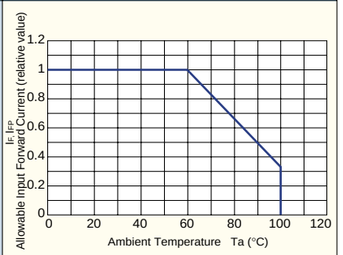
@Ta = 25°C

Series Name	Package Size (mm)	Viewing Angle 2θ1/2	Intensity I_V (mcd) @I_F = 20 mA Min	Intensity I_V (mcd) @I_F = 20 mA Typ.	Product Number: Open rank	Product Number: Rank specified	Typical Emitting Wavelength λd (nm)	Typical Emitting Wavelength λp (nm)	Lens Type	Absolute Maximum Ratings: Guaranteed Temperature	Absolute Maximum Ratings: DC Forward Current IF (mA)	Absolute Maximum Ratings: Pulse Forward Current I_{FP} (mA)	Package Dimension Number	Typical Applicons
TL✻H Series	ø10	4°	8500	30000	TLYH190P	TLYH190P(XY)	587	590	Transparent	✻1	50	200	ø10-1	Traffic light
	ø5	7°	4760	13000	NEW TLYH20TP	—	587	590	Transparent	✻3	50	200	ø5-1	Pilot lamps (narrow range)
		8°	2720	8000	TLYH180P	TLYH180P(VW)	587	590	Transparent	✻1	50	200	ø5-1	
		12°	2720	7000	NEW TLYH38TP	—	587	590	Transparent	✻3	50	200	ø5-4	
		15°	2200	4500	TLYH151P	—	587	590	Transparent	✻1	50	200	ø5-4	
		20°	1530	4800	NEW TLYH17TP	—	587	590	Transparent	✻3	50	200	ø5-2	
		22°	850	2500	TLYH157P	TLYH157P(TU)	587	590	Transparent	✻1	50	200	ø5-2	Message board Backlighting
		25°	850	2200	NEW TLYH16TP	—	587	590	Transparent	✻3	50	200	ø5-3	
		30°	476	1400	TLYH156P	TLYH156P(RS)	587	590	Transparent	✻1	50	200	ø5-3	
	ø3	10°	850	4300	TLYH160	TLYH160(TU)	587	590	Transparent	✻1	50	200	ø3-3	Pilot lamps
		80°	85	280	TLYH262	TLYH262(PQ)	587	590	Transparent	✻1	50	200	ø3-2	Backlighting (wide range)
	Elliptical 5 X 5.8	60°/30°	153	700	TLYH247	TLYH247(QR)	587	590	Transparent	✻1	50	200	Elliptical-1	Message board
TL✻E Series	ø5	5°	2720	8000	NEW TLPYE23TP	—	580	583	Transparent	✻3	50	200	ø5-9	Pilot lamps (narrow range)
		7°	2720	9500	TLYE20TP	—	587	590	Transparent	✻3	50	200	ø5-1	
		8°	1530	4700	TLYE180AP	TLYE180AP(UV)	587	590	Transparent	✻1	50	200	ø5-1	
		18°	476	2000	NEW TLPYE19TP	—	580	583	Transparent	✻3	50	200	ø5-10	
		20°	850	3000	TLYE17TP	—	587	590	Transparent	✻3	50	200	ø5-2	
		22°	476	2200	TLYE157AP	TLYE157AP(ST)	587	590	Transparent	✻1	50	200	ø5-2	Message board Backlighting
		25°	476	1500	TLYE16TP	—	587	590	Transparent	✻3	50	200	ø5-3	
			476	1200	TLYE16CP	—	587	590	Yellow, transparent	✻3	50	200	ø5-3	
		30°	272	750	NEW TLPYE18TP	—	580	583	Transparent	✻3	50	200	ø5-12	
			272	700	TLYE156AP	TLYE156AP(QR)	587	590	Transparent	✻1	50	200	ø5-3	
		75°	85	300	TLYE25TP	—	587	590	Transparent	✻3	50	200	ø5-6	Backlighting (wide range)
		90°	47.6	170	TLYE263AP	TLYE263AP(NP)	587	590	Transparent	✻1	50	200	ø5-6	
		130°	15.3	45	TLYE11TP	—	587	590	Transparent	✻3	50	200	ø5-7	
		150°	8.5	27	TLYE261AP	TLYE261AP(JK)	587	590	Transparent	✻1	50	200	ø5-7	
	ø3	10°	476	2300	TLYE160A	TLYE160A(ST)	587	590	Transparent	✻1	50	200	ø3-3	Pilot lamps
		16°	1530	3500	TLYE50T	—	587	590	Transparent	✻3	50	200	ø3-3	
			850	2500	NEW TLPYE50T	—	580	583	Transparent	✻3	50	200	ø3-3	
		45°	272	800	TLYE53T	—	587	590	Transparent	✻3	50	200	ø3-4	
			153	450	NEW TLPYE53T	—	580	583	Transparent	✻3	50	200	ø3-4	
		80°	85	340	NEW TLYE68TG◆	—	587	590	Transparent	✻3	50	200	ø3-5	Backlighting (wide range)
			85	250	TLYE62T	—	587	590	Transparent	✻3	50	200	ø3-2	
			85	240	TLYE262A	TLYE262A(NP)	587	590	Transparent	✻1	50	200	ø3-2	
			47.6	150	NEW TLPYE62T	—	580	583	Transparent	✻3	50	200	ø3-2	
		120°	27.2	85	TLYE60T	—	587	590	Transparent	✻3	50	200	ø3-1	
		140°	15.3	40	TLYE260A	TLYE260A(KL)	587	590	Transparent	✻1	50	200	ø3-1	
	Elliptical 5 X 5.8	30°/50°	272	650	TLYE27C	—	587	590	Yellow, transparent	✻3	50	200	Elliptical-1	Message board
TL✻U Series	ø5	6°	850	4300	TLYU180P	TLYU180P(TU)	587	590	Transparent	✻1	30	120	ø5-1	Pilot lamps (narrow range)
		20°	153	500	TLYU156P	TLYU156P(QR)	587	590	Transparent	✻1	30	120	ø5-3	
			153	400	TLYU172P	—	587	590	Yellow, transparent	✻1	30	120	ø5-3	
		30°	153	500	TLYU113P	—	587	590	Yellow, transparent	✻2	30	120	ø5-5	Message board Backlighting
		40°	47.6	130	TLYU114P	TLYU114P(MN)	587	590	Yellow, diffusing	✻2	30	120	ø5-5	
	ø3	35°	85	220	TLYU123	TLYU123(NP)	587	590	Yellow, transparent	✻2	30	120	ø3-4	Pilot lamps
		40°	47.6	110	TLYU124	TLYU124(MN)	587	590	Yellow, diffusing	✻2	30	120	ø3-4	
		60°	47.6	150	TLYU262	TLYU262(MN)	587	590	Transparent	✻1	30	120	ø3-2	Backlighting (wide range)
			47.6	90	TLYU267	—	587	590	Yellow, transparent	✻1	30	120	ø3-2	
		90°	476	1500	TLYU160	TLYU160(ST)	587	590	Transparent	✻1	30	120	ø3-3	

◆: Mount flush with PCB

Parameter	✻1
Derating of Absolute Maximum Forward Current	
Operating Temperature	–30°C~85°C
Storage Temperature	–40°C~120°C

Parameter	✻2
Derating of Absolute Maximum Forward Current	
Operating Temperature	–20°C~75°C
Storage Temperature	–30°C~100°C

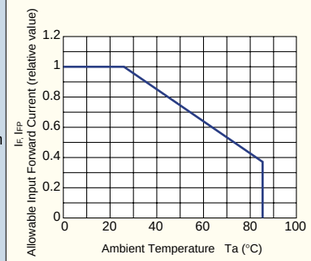
Parameter	✻3
Derating of Absolute Maximum Forward Current	
Operating Temperature	–40°C~100°C
Storage Temperature	–40°C~120°C

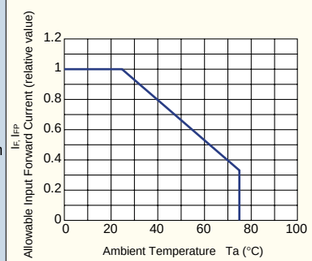
5. High-Brightness Green LED Lamps

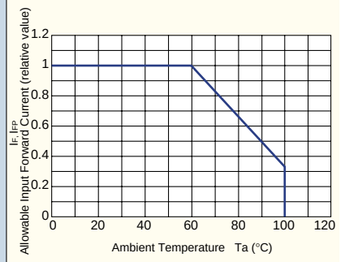
@Ta = 25°C

Series Name	Package Size (mm)	Viewing Angle 2θ1/2	Intensity I_V (mcd) @I_F = 20 mA Min	Intensity I_V (mcd) @I_F = 20 mA Typ.	Product Number: Open rank	Product Number: Rank specified	Typical Emitting Wavelength λd (nm)	Typical Emitting Wavelength λp (nm)	Lens Type	Absolute Maximum Ratings: Guaranteed Temperature	Absolute Maximum Ratings: DC Forward Current I_F (mA)	Absolute Maximum Ratings: Pulse Forward Current I_{FP} (mA)	Package Dimension Number	Typical Applicons
TL✻E Series	ø5	5°	2720	7000	TLGE23TP	—	571	574	Transparent	✻3	50	200	ø5-9	Pilot lamps (narrow range)
			850	3000	TLPGE23TP	—	558	562	Transparent	✻3	50	200	ø5-9	
			1530	5000	NEW TLFGE23TP	—	565	568	Transparent	✻3	50	200	ø5-9	
		7°	1530	5000	TLGE183P	—	571	574	Transparent	✻1	50	200	ø5-9	
			476	2000	TLPGE183P	TLPGE183P(ST)	558	562	Transparent	✻1	50	200	ø5-9	
		18°	476	1300	TLGE19TP	—	571	574	Transparent	✻3	50	200	ø5-10	
			272	800	NEW TLFGE19TP	—	565	568	Transparent	✻3	50	200	ø5-10	
			153	500	TLPGE19TP	—	558	562	Transparent	✻3	50	200	ø5-10	
		20°	476	1700	TLGE159P	TLGE159P(ST)	571	574	Transparent	✻1	50	200	ø5-10	
			476	1400	TLGE174P	—	571	574	Green, transparent	✻1	50	200	ø5-11	
			153	430	TLPGE159P	—	558	562	Transparent	✻1	50	200	ø5-10	
		28°	272	800	TLGE158P	TLGE158P(QR)	571	574	Transparent	✻1	50	200	ø5-12	Message board Backlighting
			85	150	TLPGE158P	—	558	562	Transparent	✻1	50	200	ø5-12	
		30°	85	300	NEW TLFGE18TP	—	565	568	Transparent	✻3	50	200	ø5-12	
			272	700	TLGE18TP	—	571	574	Transparent	✻3	50	200	ø5-12	
			153	500	TLGE18CP	—	571	574	Green, transparent	✻3	50	200	ø5-12	
			85	200	TLPGE18TP	—	558	562	Transparent	✻3	50	200	ø5-12	
		75°	27.2	90	TLGE25TP	—	571	574	Transparent	✻3	50	200	ø5-6	
		130°	8.5	20	TLGE11TP	—	571	574	Transparent	✻3	50	200	ø5-7	
			2.72	8	TLPGE11TP	—	558	562	Transparent	✻3	50	200	ø5-7	
	ø3	9°	850	2400	TLGE160	TLGE160(TU)	571	574	Transparent	✻1	50	200	ø3-3	Pilot lamps
			272	450	TLPGE160	—	558	562	Transparent	✻1	50	200	ø3-3	
		16°	476	1500	TLGE50T	—	571	574	Transparent	✻3	50	200	ø3-3	
			272	1000	NEW TLFGE50T	—	565	568	Transparent	✻3	50	200	ø3-3	
			153	600	TLPGE50T	—	558	562	Transparent	✻3	50	200	ø3-3	
		35°	153	500	TLGE125	TLGE125(QR)	571	574	Transparent	✻1	50	200	ø3-4	
			153	450	TLGE123	TLGE123(PQ)	571	574	Green, transparent	✻1	50	200	ø3-4	
			47.6	150	TLPGE125	—	558	562	Transparent	✻1	50	200	ø3-4	
		45°	153	400	TLGE53T	—	571	574	Transparent	✻3	50	200	ø3-4	
			85	200	NEW TLFGE53T	—	565	568	Transparent	✻3	50	200	ø3-4	
			47.6	130	TLPGE53T	—	558	562	Transparent	✻3	50	200	ø3-4	
		65°	47.6	220	TLGE262	TLGE262(NP)	571	574	Transparent	✻1	50	200	ø3-2	Backlighting (wide range)
			15.3	45	TLPGE262	—	558	562	Transparent	✻1	50	200	ø3-2	
		80°	47.6	155	NEW TLGE68TG◆	—	571	574	Transparent	✻3	50	200	ø3-5	
			47.6	110	TLGE62T	—	571	574	Transparent	✻3	50	200	ø3-2	
			27.2	70	NEW TLFGE62T	—	565	568	Transparent	✻3	50	200	ø3-2	
			15.3	45	TLPGE62T	—	558	562	Transparent	✻3	50	200	ø3-2	
		120°	15.3	50	TLGE60T	—	571	574	Transparent	✻3	50	200	ø3-1	
			8.5	45	TLGE260	TLGE260(KL)	571	574	Transparent	✻1	50	200	ø3-1	
	Elliptical 5 X 5.8	30°/50°	85	250	TLGE27C	—	571	574	Green, transparent	✻3	50	200	Elliptical-1	Message board
		60°/30°	153	400	TLGE247	TLGE247(PQ)	571	574	Transparent	✻1	50	200	Elliptical-1	
			153	360	TLGE248	—	571	574	Green, transparent	✻1	50	200	Elliptical-1	
			27.2	90	TLPGE247	TLPGE247(LM)	558	562	Transparent	✻1	50	200	Elliptical-1	

◆: Mount flush with PCB

Parameter	✻1
Derating of Absolute Maximum Forward Current	
Operating Temperature	–30°C~85°C
Storage Temperature	–40°C~120°C

Parameter	✻2
Derating of Absolute Maximum Forward Current	
Operating Temperature	–20°C~75°C
Storage Temperature	–30°C~100°C

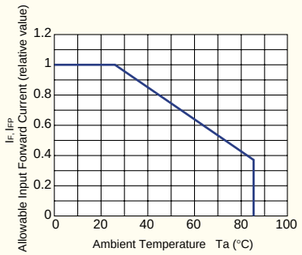
Parameter	✻3
Derating of Absolute Maximum Forward Current	
Operating Temperature	–40°C~100°C
Storage Temperature	–40°C~120°C

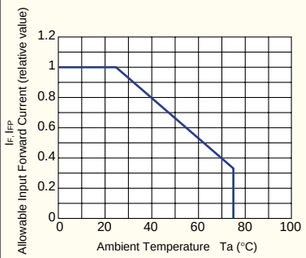
5. High-Brightness Green LED Lamps

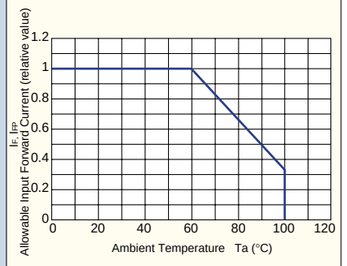
@Ta = 25°C

Series Name	Package Size (mm)	Viewing Angle 2θ1/2	Intensity I_V (mcd) @I_F = 20 mA Min	Intensity I_V (mcd) @I_F = 20 mA Typ.	Product Number Open rank	Product Number Rank specified	Typical Emitting Wavelength λd (nm)	Typical Emitting Wavelength λp (nm)	Lens Type	Absolute Maximum Ratings Guaranteed Temperature	Absolute Maximum Ratings DC Forward Current I_F (mA)	Absolute Maximum Ratings Pulse Forward Current I_{FP} (mA)	Package Dimension Number	Typical Applicons
TL∗U Series	ø5	5°	(1530)	4000	NEW TLGU23TP	—	571	574	Transparent	∗3	30	120	ø5-9	Pilot lamps (narrow range)
			(476)	1600	NEW TLPGU23TP	—	558	562	Transparent	∗3	30	120	ø5-9	
		30°	(85.0)	200	NEW TLGU18TP	—	571	574	Transparent	∗3	30	120	ø5-12	Message board Backlighting
			(27.2)	90	NEW TLPGU18TP	—	558	562	Transparent	∗3	30	120	ø5-12	
			(47.6)	180	NEW TLGU18CP	—	571	574	Green, transparent	∗3	30	120	ø5-12	
		45°	(47.6)	120	NEW TLGU13CP	—	571	574	Green, transparent	∗3	30	120	ø5-5	
			(27.2)	80	NEW TLPGU13CP	—	558	562	Green, transparent	∗3	30	120	ø5-5	
		55°	(27.2)	70	NEW TLGU13DP	—	571	574	Green, diffusing	∗3	30	120	ø5-5	
			(15.3)	35	NEW TLPGU13DP	—	558	562	Green, diffusing	∗3	30	120	ø5-5	
	ø3	10°	(476)	1200	NEW TLGU50T	—	571	574	Transparent	∗3	30	120	ø3-3	Pilot lamps
			(153)	450	NEW TLPGU50T	—	558	562	Transparent	∗3	30	120	ø3-3	
		40°	(47.6)	170	NEW TLGU53T	—	571	574	Transparent	∗3	30	120	ø3-4	
			(27.2)	80	NEW TLPGU53T	—	558	562	Transparent	∗3	30	120	ø3-4	
			(47.6)	150	NEW TLGU53C	—	571	574	Green, transparent	∗3	30	120	ø3-4	
			(27.2)	70	NEW TLPGU53C	—	558	562	Green, transparent	∗3	30	120	ø3-4	
		50°	(27.2)	80	NEW TLGU53D	—	571	574	Green, diffusing	∗3	30	120	ø3-4	Pilot lamps (narrow range)
			(15.3)	40	NEW TLPGU53D	—	558	562	Green, diffusing	∗3	30	120	ø3-4	
		80°	(27.2)	70	NEW TLGU62T	—	571	574	Transparent	∗3	30	120	ø3-2	
			(8.5)	25	NEW TLPGU62T	—	558	562	Transparent	∗3	30	120	ø3-2	
	Elliptical 5 X 5.8	30°/50°	(47.6)	180	NEW TLGU27C	—	571	574	Green, transparent	∗3	30	120	Elliptical-1	Message board

◆: Mount flush with PCB

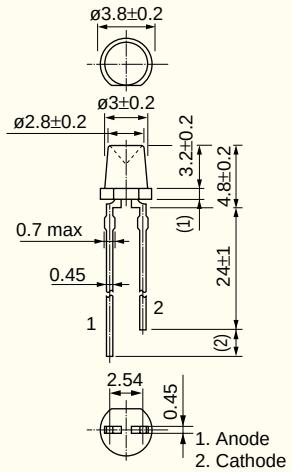
Parameter	∗1
Derating of Absolute Maximum Forward Current	
Operating Temperature	–30°C~85°C
Storage Temperature	–40°C~120°C

Parameter	∗2
Derating of Absolute Maximum Forward Current	
Operating Temperature	–20°C~75°C
Storage Temperature	–30°C~100°C

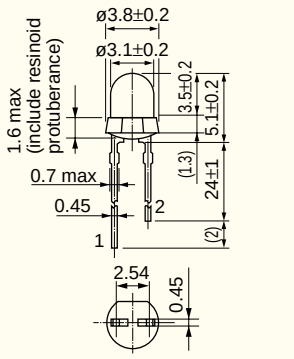
Parameter	∗3
Derating of Absolute Maximum Forward Current	
Operating Temperature	–40°C~100°C
Storage Temperature	–40°C~120°C

6. Package Dimensions

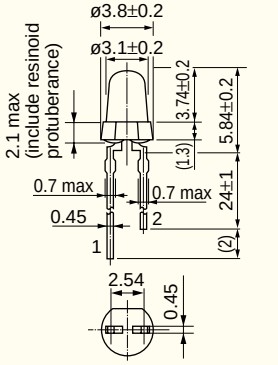
ø3-1



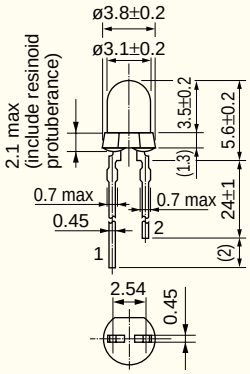
ø3-2



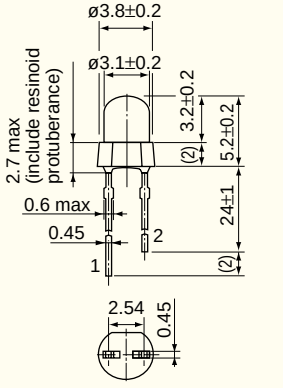
ø3-3



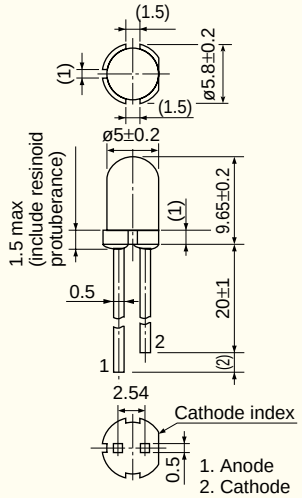
ø3-4



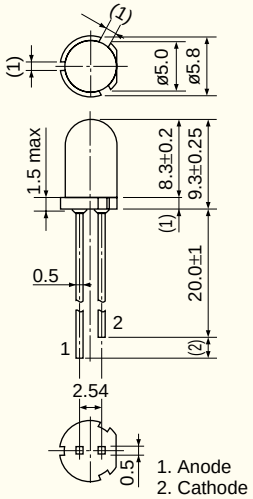
ø3-5



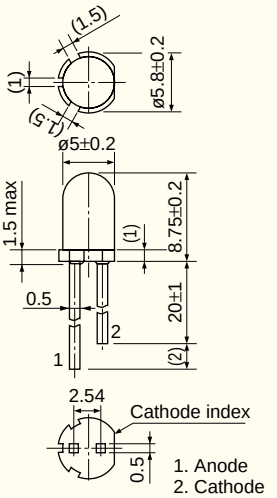
ø5-1



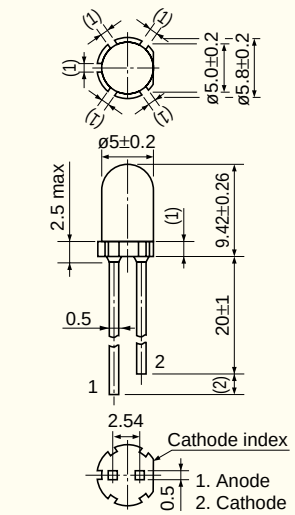
ø5-2



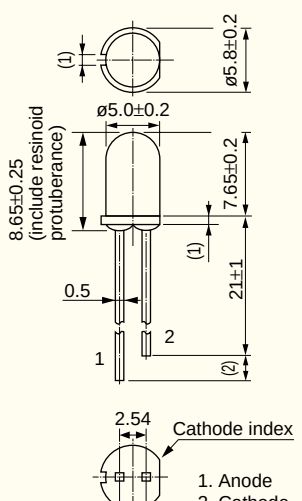
ø5-3



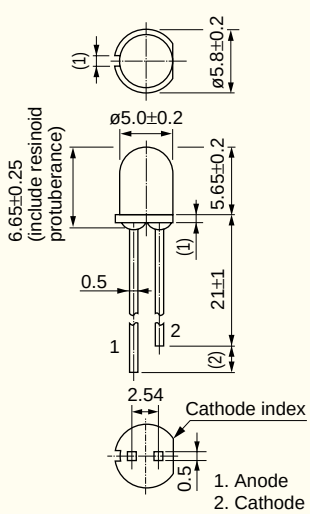
ø5-4



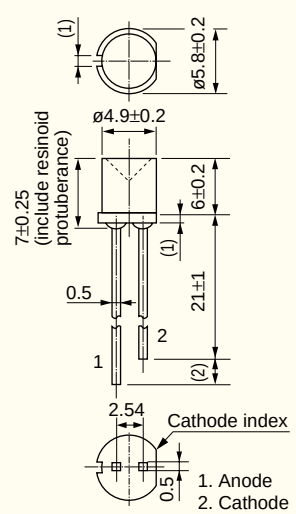
ø5-5



ø5-6

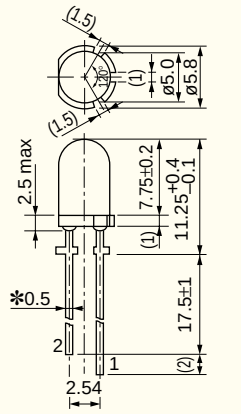


ø5-7

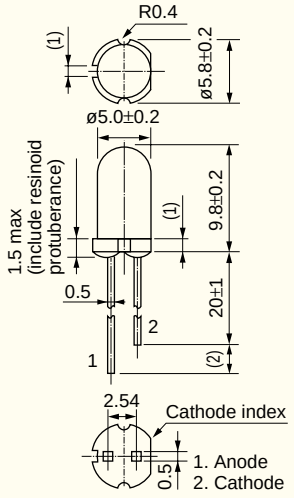


(Unit:mm)

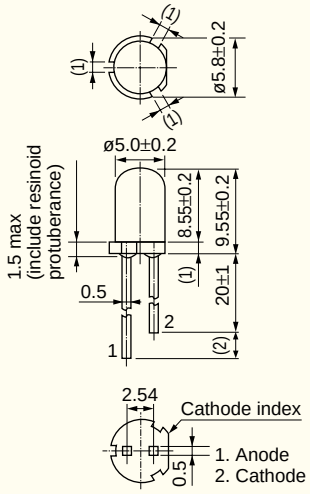
ø5-8



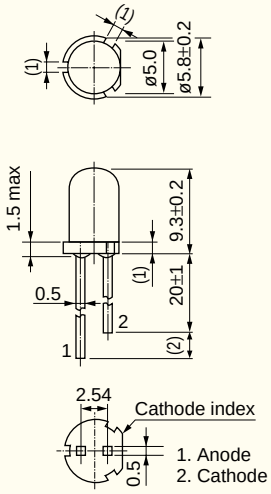
ø5-9



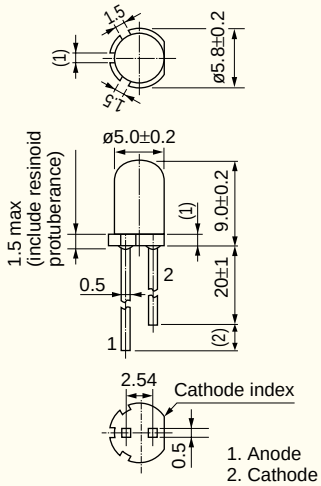
ø5-10



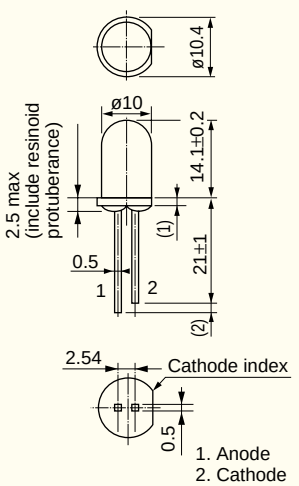
ø5-11



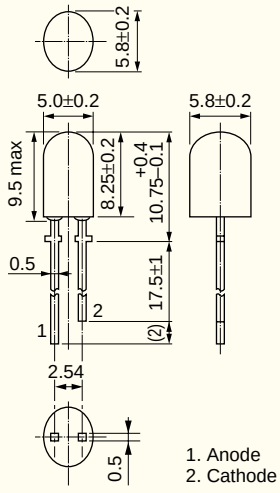
ø5-12



ø10-1



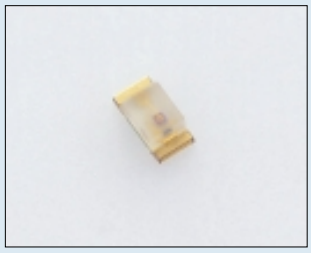
Elliptical-1



4 Product List for SMD Type

1. TL∗1008A (T04), TL∗1008A (T5)

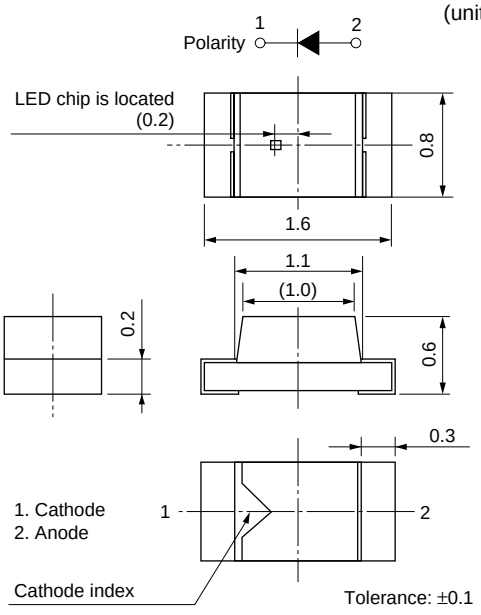
Features



- Package dimensions: 1.6 (L) x 0.8 (W) x 0.6 (H) mm
- Four-element (InGaAℓP)
- High-brightness and low power consumption can be accomplished by a switch-over from general-purpose lamps.
- Taping with 4 mm (T04 specification) and 2 mm (T05 specification) pitch is standard. Achieves mounting efficiency.
- Product height of 0.6 mm is suitable for use as backlighting for thin equipment.

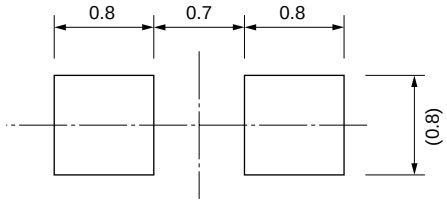
Package Dimensions

(unit: mm)



Recommended Soldering Pad Dimensions

(unit: mm)



Maximum Rating

(Ta = 25°C)

Characteristics	Symbol	Rating	Unit
DC Forward Current	I_F	25	mA
DC Reverse Voltage	V_R	4	V
Power Dissipation	P_D	60~62.5 (Note 1)	mW
Operating Temperature	Topr	–40~85	°C
Storage Temperature	Tstg	–40~100	°C

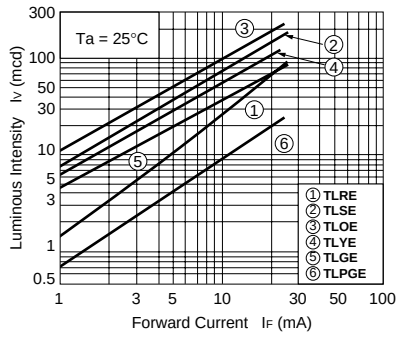
Note 1: please refer to each technical datasheet.

Electrical and Optical Characteristics

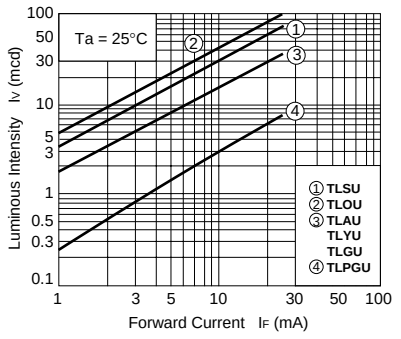
Series Name	Emitted-Light Color	Product Number	Typical Luminous Intensity I_V (mcd) @I_F = 20 mA		Forward Voltage V_F (V) @I_F = 20 mA		Reverse Current I_R (μA) @V_R = 4 V	Typical Emission Wavelength (nm) @I_F = 20 mA		
			Min	Typ.	Typ.	Max	Max	λp	△λ	λd
TL∗E Series	Red	**TLRE1008A(T04)/(T05)**	27.2	70	1.9	2.4	50	644	18	630
	Red	**TLSE1008A(T04)/(T05)**	47.6	140	1.9	2.4	50	623	17	613
	Orange	**TLOE1008A(T04)/(T05)**	47.6	180	2.0	2.4	50	612	15	605
	Yellow	**TLYE1008A(T04)/(T05)**	27.2	105	2.0	2.4	50	590	13	587
	Green	**TLGE1008A(T04)/(T05)**	27.2	70	2.0	2.4	50	574	11	571
	Pure green	**TLPGE1008A(T04)/(T05)**	4.76	18	2.1	2.4	50	562	11	558
TL∗U Series	Red	**TLSU1008A(T04)/(T05)**	27.2	60	2.0	2.4	50	636	17	623
	Orange	**TLOU1008A(T04)/(T05)**	27.2	78	2.1	2.5	50	612	15	605
	Amber	**TLAU1008A(T04)/(T05)**	8.5	30	2.1	2.5	50	596	13	592
	Yellow	**TLYU1008A(T04)/(T05)**	8.5	30	2.1	2.5	50	590	13	587
	Green	**TLGU1008A(T04)/(T05)**	8.5	30	2.1	2.5	50	574	11	571
	Pure green	**TLPGU1008A(T04)/(T05)**	1.53	6	2.1	2.5	50	562	11	558

Characteristics Diagram

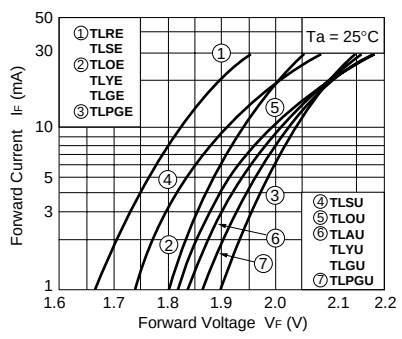
IV — IF



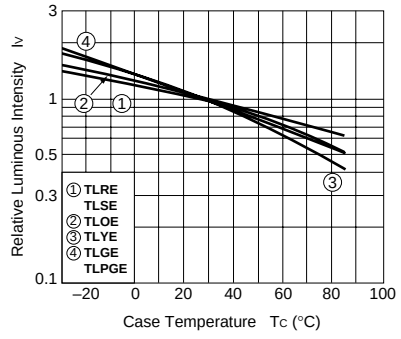
IV — IF



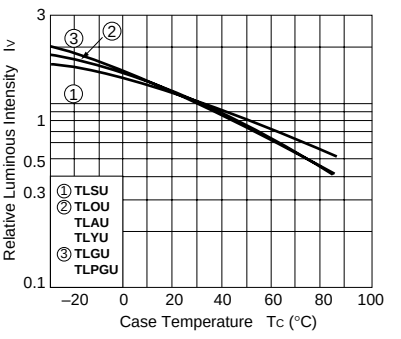
IF — VF



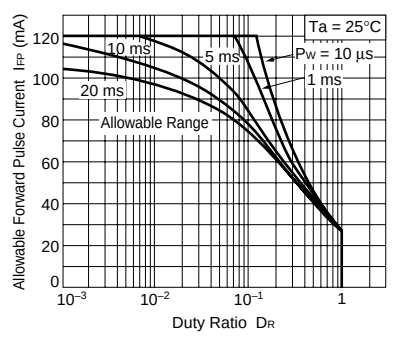
IV — TC



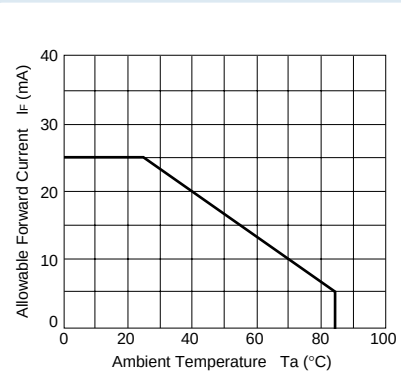
IV — TC



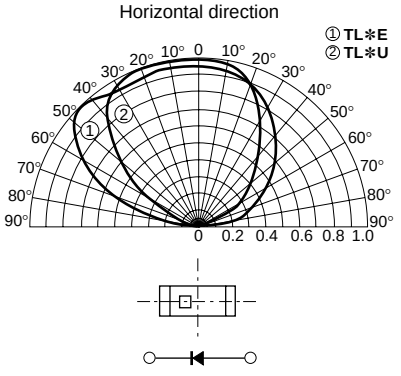
Allowable forward pulse current characteristics

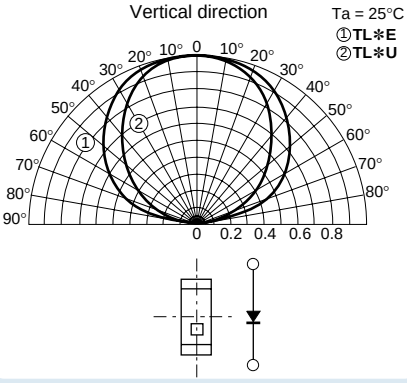


IF — Ta

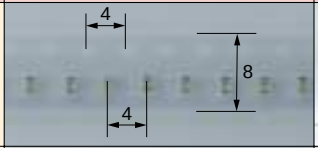
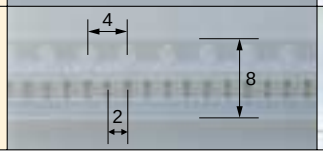


Radiation pattern



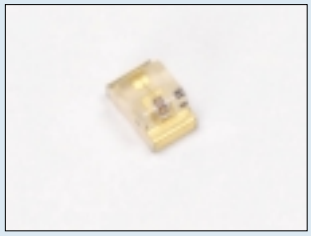


Tape Specifications

Tape Packing Type	Tape Type Suffix	Pitches	Packing		Quantity/Reel
			Package dimensions (mm)	Appearance	
Embossed Tape Packing	T04	4 mm			4000/reel
Embossed Tape Packing	T05	2 mm			8000/reel

2. TL∗1002A (T02)

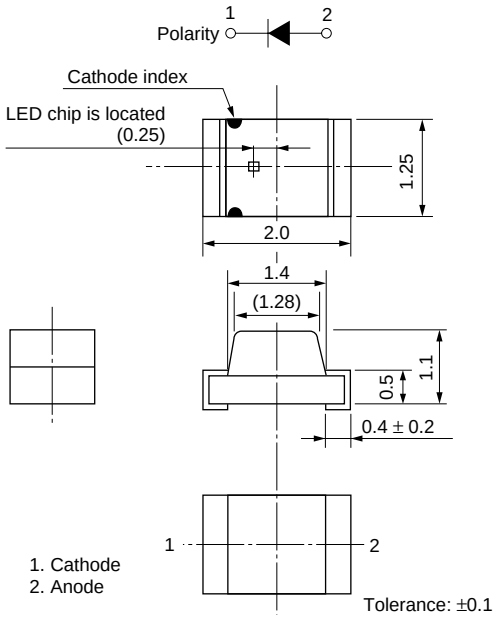
Features



- Package dimensions: 2.0 (L) x 1.25 (W) x 1.1 (H) mm
- Four-element (InGaAℓP)
- High-brightness and low power consumption can be accomplished by a switchover from general-purpose lamps.
- Product height of 1.1 mm is suitable for use as backlighting for thin equipment.

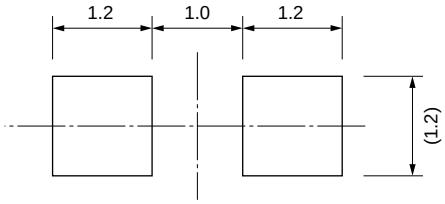
Package Dimensions

(unit: mm)



Recommended Soldering Pad Dimensions

(unit: mm)



Maximum Rating

(Ta = 25°C)

Characteristics	Symbol	Rating	Unit
DC Forward Current	I_F	25	mA
DC Reverse Voltage	V_R	4	V
Power Dissipation	P_D	60~62.5 (Note 1)	mW
Operating Temperature	Topr	–40~85	°C
Storage Temperature	Tstg	–40~100	°C

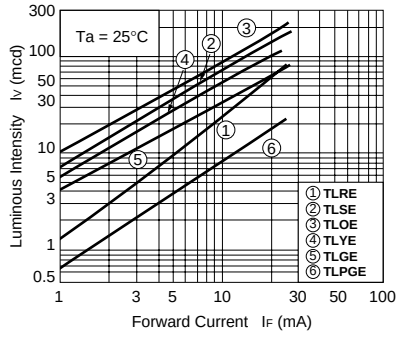
Note 1: please refer to each technical datasheet.

Electrical and Optical Characteristics

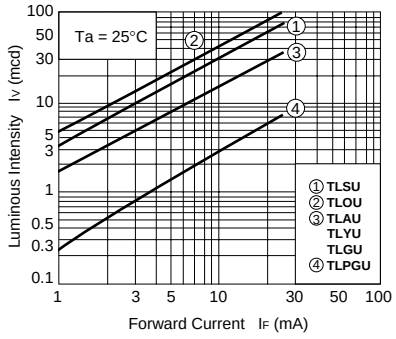
Series Name	Emitted-Light Color	Product Number	Typical Luminous Intensity Iv (mcd) @IF = 20 mA		Forward Voltage VF (V) @IF = 20 mA		Reverse Current IR (μA) @VR = 4 V	Typical Emission Wavelength (nm) @IF = 20 mA		
			Min	Typ.	Typ.	Max	Max	λp	△λ	λd
TL∗E Series	Red	**TLRE1002A(T02)**	27.2	70	1.9	2.4	50	644	18	630
	Red	**TLSE1002A(T02)**	47.6	140	1.9	2.4	50	623	17	613
	Orange	**TLOE1002A(T02)**	47.6	180	2.0	2.4	50	612	15	605
	Yellow	**TLYE1002A(T02)**	27.2	105	2.0	2.4	50	590	13	587
	Green	**TLGE1002A(T02)**	27.2	70	2.0	2.4	50	574	11	571
	Pure green	**TLPGE1002A(T02)**	4.76	18	2.1	2.4	50	562	11	558
TL∗U Series	Red	**TLRU1002A(T02)**	15.3	45	2.0	2.4	50	644	18	630
	Red	**TLSU1002A(T02)**	27.2	60	2.0	2.4	50	636	17	623
	Orange	**TLOU1002A(T02)**	27.2	78	2.1	2.5	50	612	15	605
	Amber	**TLAU1002A(T02)**	8.5	30	2.1	2.5	50	596	13	592
	Yellow	**TLYU1002A(T02)**	8.5	30	2.1	2.5	50	590	13	587
	Green	**TLGU1002A(T02)**	8.5	30	2.1	2.5	50	574	11	571
	Pure green	**TLPGU1002A(T02)**	1.53	6	2.1	2.5	50	562	11	558

Characteristics Diagram

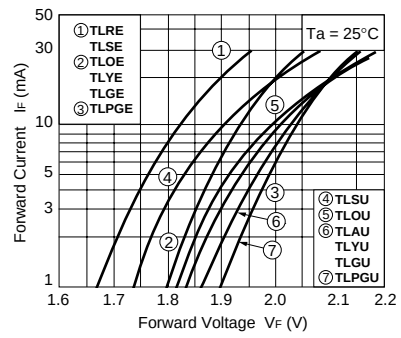
$I_V - I_F$



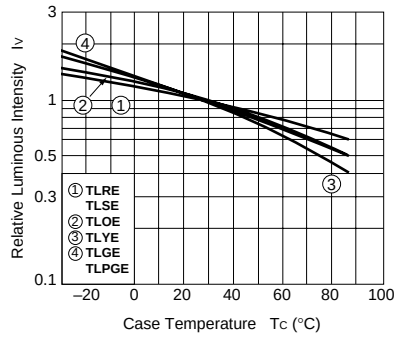
$I_V - I_F$



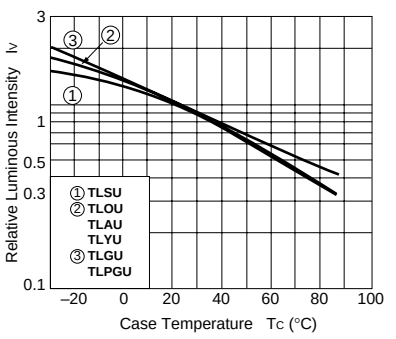
$I_F - V_F$



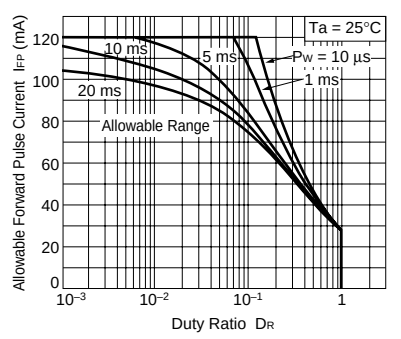
$I_V - T_C$



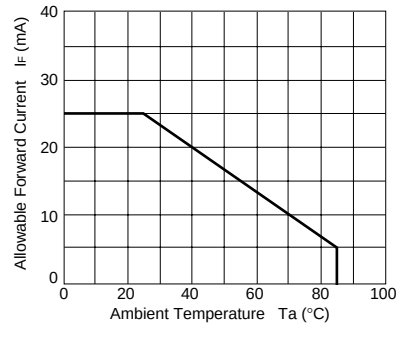
$I_V - T_C$



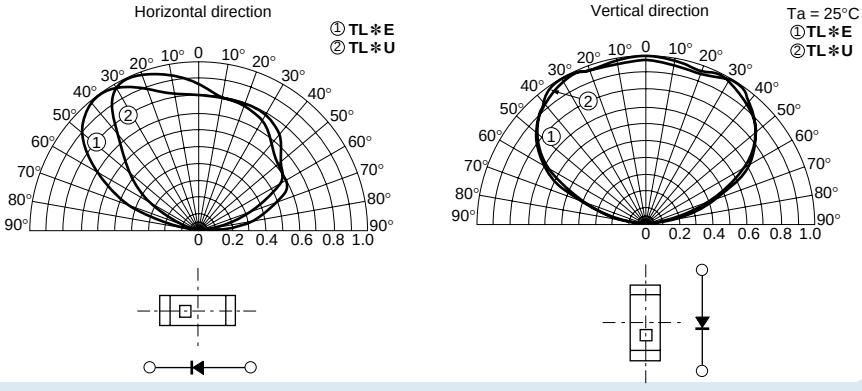
Allowable forward pulse current characteristics



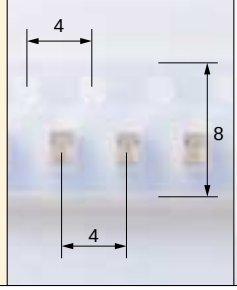
$I_F - T_a$



Radiation pattern



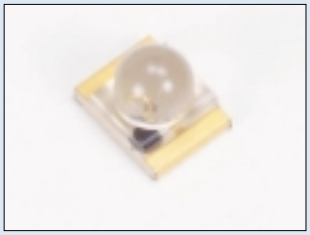
Tape Specifications

Tape Packing Type	Tape Type Suffix	Pitches	Packing		Quantity/Reel
			Package dimensions (mm)	Appearance	
Embossed Tape Packing	T02	4 mm			3000/reel

3. TL∗E1005B (T03), TL∗U1005A (T03)

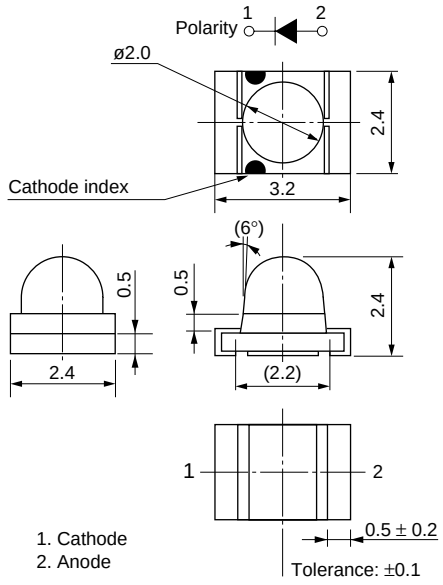
Features

- Package dimensions: 3.2 (L) x 2.4 (W) x 2.4 (H) mm
- Unique ø2 mm lens top structure substantially improves light extraction.
- Designed for miniaturization and slimming while maintaining high luminance
- Optical axis precision is substantially improved over lead-frame structure LEDs. Designed to reduce nonuniformity in the display



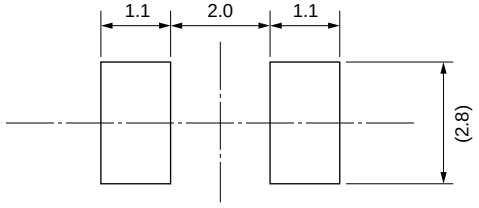
Package Dimensions

(unit: mm)



Recommended Soldering Pad Dimensions

(unit: mm)



Maximum Rating

(Ta = 25°C)

Characteristics	Symbol	Rating		Unit
DC Forward Current	I_F	25		mA
DC Reverse Voltage	V_R	4		V
Power Dissipation	P_D	60~62.5 (Note 1)		mW
Operating Temperature	Topr	TL∗U	–25~80	°C
		TL∗E	–40~85	
Storage Temperature	Tstg	TL∗U	–30~85	°C
		TL∗E	–40~100	

Note 1: please refer to each technical datasheet.

Electrical and Optical Characteristics

Series Name	Emitted-Light Color	Product Number	Typical Luminous Intensity Iv (mcd) @IF = 20 mA		Forward Voltage VF (V) @IF = 20 mA		Reverse Current IR (μA) @VR = 4 V	Typical Emission Wavelength (nm) @IF = 20 mA		
			Min	Typ.	Typ.	Max	Max	λp	△λ	λd
TL∗E Series	Red	**TLRE1005B(T03)**	153	450	1.9	2.4	50	644	18	630
	Red	**TLSE1005B(T03)**	272	1000	1.9	2.4	50	623	17	613
	Orange	**TLOE1005B(T03)**	476	1500	2.0	2.4	50	612	15	605
	Yellow	**TLYE1005B(T03)**	272	850	2.0	2.4	50	590	13	587
	Green	**TLGE1005B(T03)**	153	350	2.0	2.4	50	574	11	571
	Pure green	**TLPGE1005B(T03)**	47.6	130	2.1	2.4	50	562	11	558
TL∗U Series	Red	**TLSU1005A(T03)**	153	450	2.0	2.4	50	636	17	623
	Orange	**TLOU1005A(T03)**	153	450	2.0	2.4	50	612	15	605
	Yellow	**TLYU1005A(T03)**	47.6	140	2.1	2.5	50	590	13	587

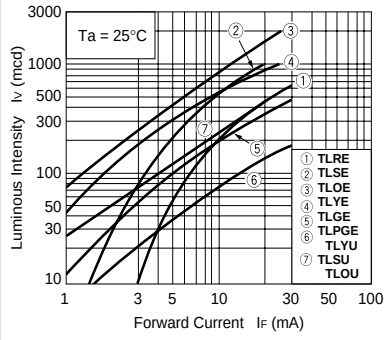
Automatic Mounting: Recommended Conditions

Absorption Head Diameter	ø1.2 mm

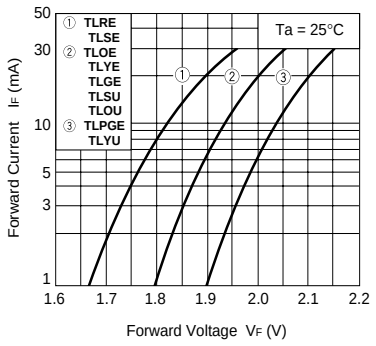
Please ask the mounting equipment maker for the ideal automatic mounting conditions.

Characteristics Diagram

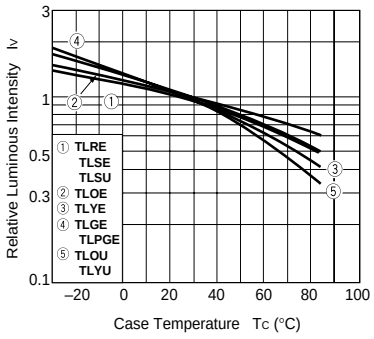
$I_V - I_F$



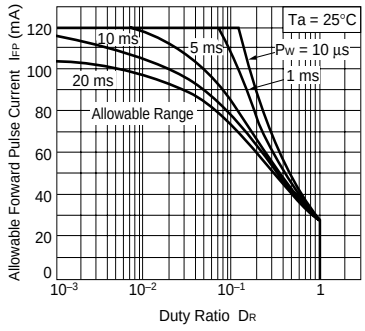
$I_F - V_F$



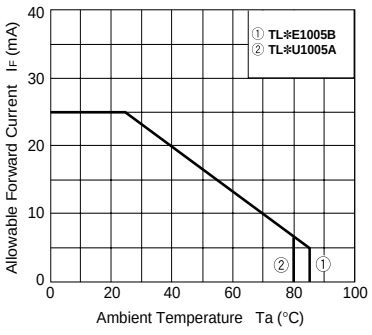
$I_V - T_C$



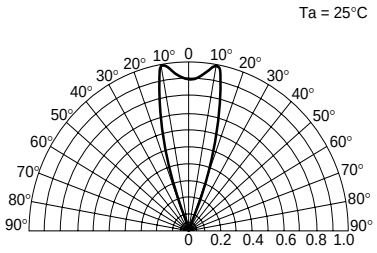
Allowable forward pulse current characteristics



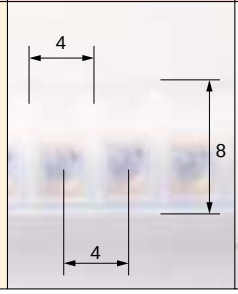
$I_F - Ta$



Radiation pattern



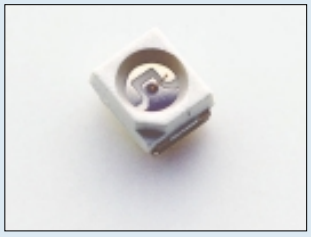
Tape Specifications

Tape Packing Type	Tape Type Suffix	Pitches	Packing		Quantity/Reel
			Package dimensions (mm)	Appearance	
Embossed Tape Packing	T03	4 mm			1000/reel

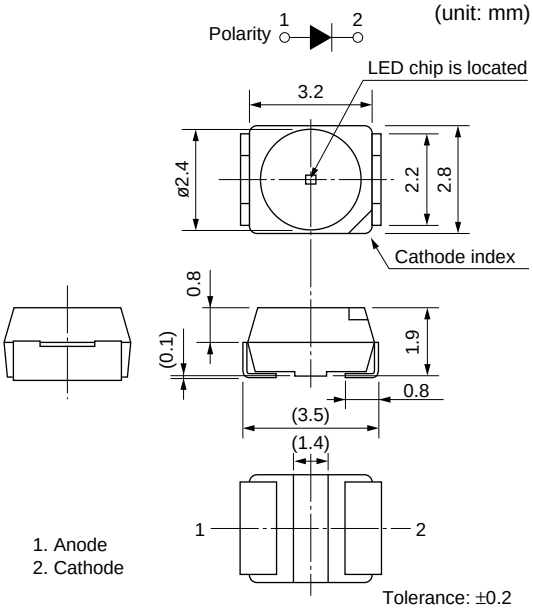
4. TL∗1100 (T09), TL∗E1100 (T11), S4F42∗ (T09)

Features

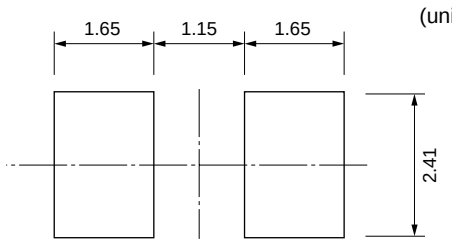
- Package dimensions: 3.2 (L) x 2.8 (W) x 1.9 (H) mm
- Four-element (InGaAℓP)
- High-heat resistance extends the operating temperature range.
  Topr = –40~100°C



Package Dimensions



Recommended Soldering Pad Dimensions



Maximum Rating

(Ta = 25°C)

Characteristics	Symbol	Rating	Unit
DC Forward Current	I_F	30 / 50 (Note 1)	mA
DC Reverse Voltage	V_R	4	V
Power Dissipation	P_D	72~140 (Note 1)	mW
Operating Temperature	Topr	–40~100	°C
Storage Temperature	Tstg	–40~100	°C

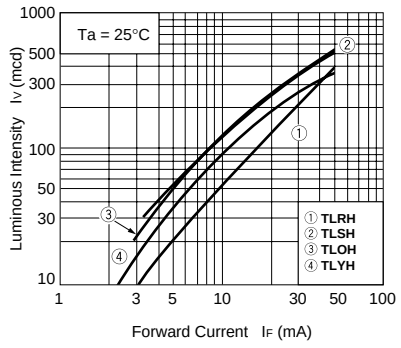
Note 1: please refer to each technical datasheet.

Electrical and Optical Characteristics

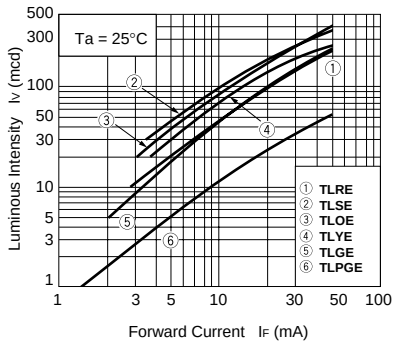
Series Name	Emitted-Light Color	Product Number	Typical Luminous Intensity I_V (mcd) @I_F = 20 mA		Forward Voltage V_F (V) @I_F = 20 mA		Reverse Current I_R (μA) @V_R = 4 V	Typical Emission Wavelength (nm) @I_F = 20 mA		
			Min	Typ.	Typ.	Max	Max	λp	△λ	λd
TL∗H Series	Red	**TLRH1100(T09)**	47.6	130	1.9	2.5	50	644	18	630
	Red	**TLSH1100(T09)**	85	240	2.1	2.5	50	623	15	613
	Orange	**TLOH1100(T09)**	85	260	2.1	2.5	50	612	15	605
	Yellow	**TLYH1100(T09)**	85	190	2.1	2.5	50	590	13	587
TL∗E Series	Red	**TLRE1100(T11)**	47.6	100	1.9	2.4	50	644	18	630
	Red	**TLSE1100(T11)**	47.6	180	1.9	2.4	50	623	15	613
	Orange	**TLOE1100(T11)**	47.6	180	2.0	2.4	50	612	15	605
	Yellow	**TLYE1100(T11)**	47.6	150	2.0	2.4	50	590	13	587
	Green	**TLGE1100(T11)**	47.6	100	2.0	2.4	50	574	11	571
	Pure green	**TLPGE1100(T11)**	8.5	25	2.1	2.4	50	562	11	558
TL∗U Series	Red	**TLSU1100(T09)**	27.2	80	2.0	2.4	50	636	17	623
	Orange	**TLOU1100(T09)**	47.6	100	2.0	2.4	50	612	15	605
	Yellow	**TLYU1100(T09)**	15.3	50	2.1	2.5	50	590	13	587
	Green	**TLGU1100(T09)**	15.3	45	2.3	2.8	50	574	11	571
	Pure green	**TLPGU1100(T09)**	4.76	12	2.3	2.8	50	562	11	558
Others	Green	**S4F42Q1(T09)**	47.6	110	2.27	2.8	50	574	11	571
	Pure green	**S4F42Z1(T09)**	8.5	25	2.27	2.8	50	562	11	558

Characteristics Diagram

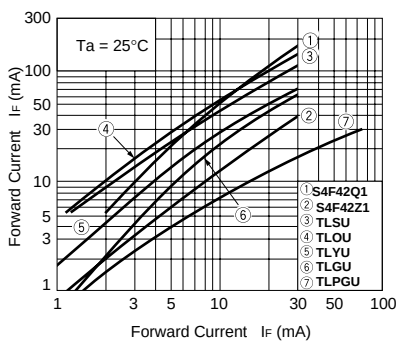
IV — IF



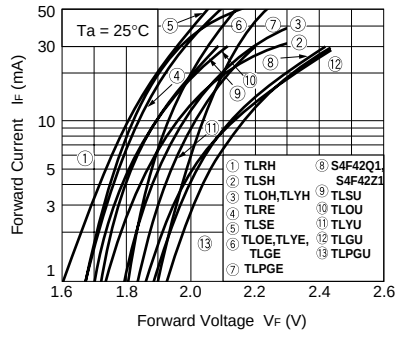
IV — IF



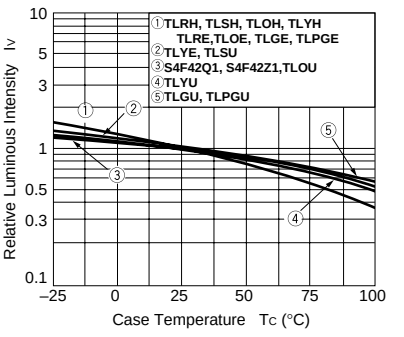
IV — IF



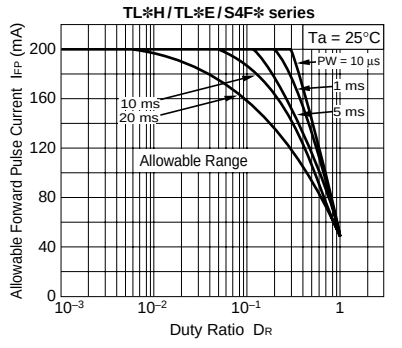
IF — VF



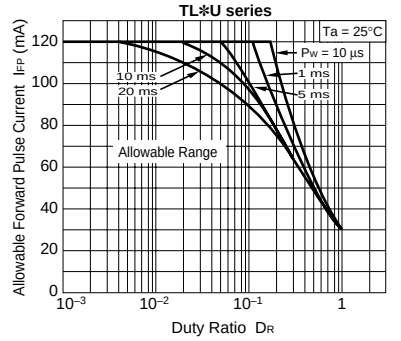
IV — TC



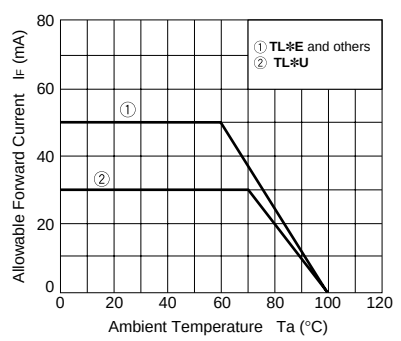
Allowable forward pulse current characteristics



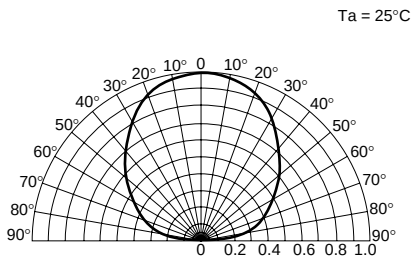
Allowable forward pulse current characteristics



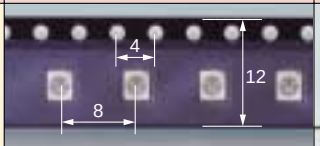
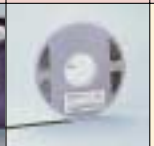
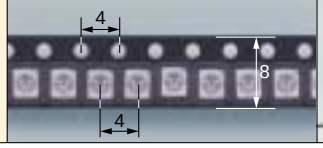
IF — Ta



Radiation pattern



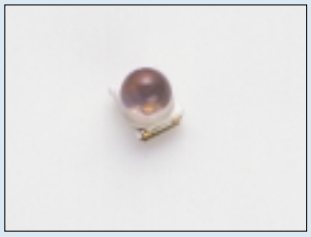
Tape Specifications

Tape Packing Type	Tape Type Suffix	Pitches	Packing		Quantity/Reel
			Package dimensions (mm)	Appearance	
Embossed Tape Packing	T09	8 mm			1000/reel
Embossed Tape Packing	T11	4 mm			2000/reel

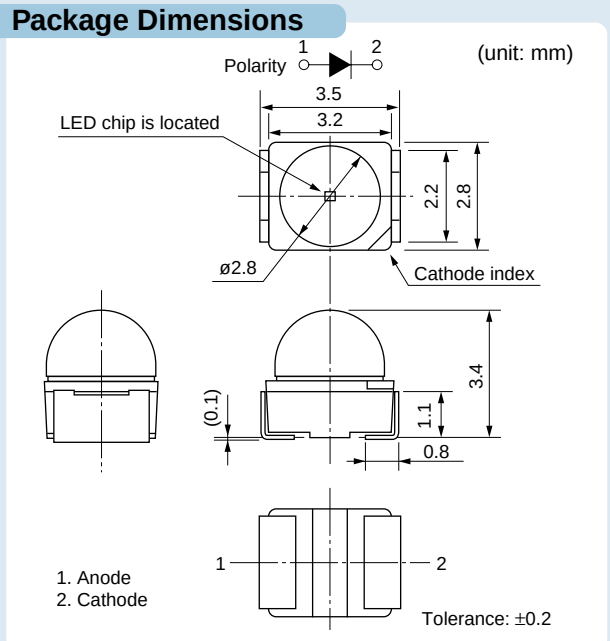
5. TL∗1102 (T10), S4F43∗ (T10)

Features

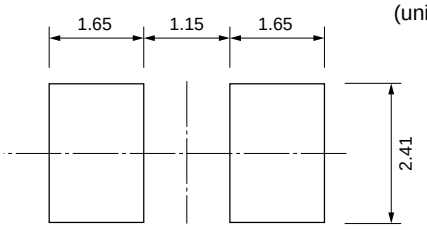
- Package dimensions: 3.2 (L) x 2.8 (W) x 3.4 (H) mm
- 4-element (InGaAℓP), H Series / U Series
- High-heat resistance extends the operating temperature range.
  Topr = –40~100°C



Package Dimensions



Recommended Soldering Pad Dimensions



Maximum Rating

(Ta = 25°C)

Characteristics	Symbol	Rating	Unit
DC Forward Current	I_F	30/50 (Note 1)	mA
DC Reverse Voltage	V_R	4	V
Power Dissipation	P_D	72~140 (Note 1)	mW
Operating Temperature	Topr	–40~100	°C
Storage Temperature	Tstg	–40~100	°C

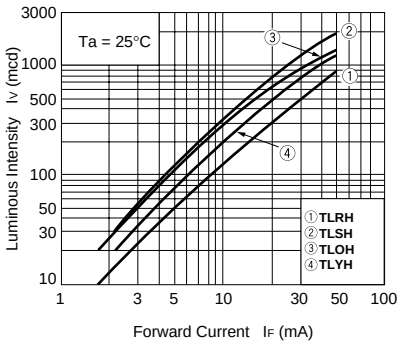
Note1: please refer to each technical datasheet.

Electrical and Optical Characteristics

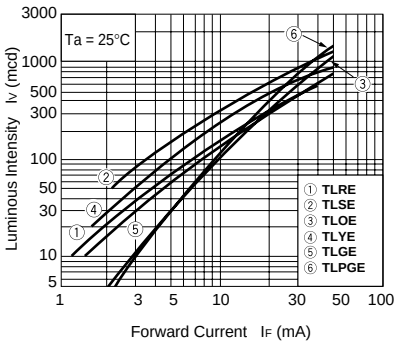
Series Name	Emitted-Light Color	Product Number	Typical Luminous Intensity I_V (mcd) @I_F = 20 mA		Forward Voltage V_F (V) @I_F = 20 mA		Reverse Current I_R (μA) @V_R = 4 V	Typical Emission Wavelength (nm) @I_F = 20 mA		
			Min	Typ.	Typ.	Max	Max	λp	△λ	λd
TL∗H Series	Red	**TLRH1102(T10)**	85	320	1.9	2.5	50	644	18	630
	Red	**TLSH1102(T10)**	153	600	2.1	2.5	50	623	15	613
	Orange	**TLOH1102(T10)**	272	650	2.1	2.5	50	612	15	605
	Yellow	**TLYH1102(T10)**	153	480	2.1	2.5	50	590	13	587
TL∗E Series	Red	**TLRE1102(T10)**	85	320	1.9	2.4	50	644	18	630
	Red	**TLSE1102(T10)**	272	600	1.9	2.4	50	623	17	613
	Orange	**TLOE1102(T10)**	272	650	2.0	2.4	50	612	15	605
	Yellow	**TLYE1102(T10)**	153	480	2.0	2.4	50	590	13	587
	Green	**TLGE1102(T10)**	85	300	2.0	2.4	50	574	11	571
	Pure green	**TLPGE1102(T10)**	27.2	75	2.1	2.4	50	562	11	558
TL∗U Series	Red	**TLSU1102(T10)**	85	200	2.0	2.4	50	636	17	623
	Orange	**TLOU1102(T10)**	85	250	2.0	2.4	50	612	15	605
	Yellow	**TLYU1102(T10)**	47.6	130	2.1	2.5	50	590	13	587
	Green	**TLGU1102(T10)**	47.6	120	2.3	2.8	50	574	11	571
	Pure green	**TLPGU1102(T10)**	8.5	30	2.3	2.8	50	562	11	558
Others	Green	**S4F43Q1(T10)**	85	250	2.27	2.8	50	574	11	571
	Pure green	**S4F43Z1(T10)**	27.2	60	2.27	2.8	50	562	11	558

Characteristics Diagram

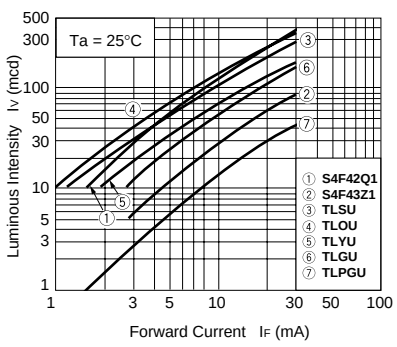
IV — IF



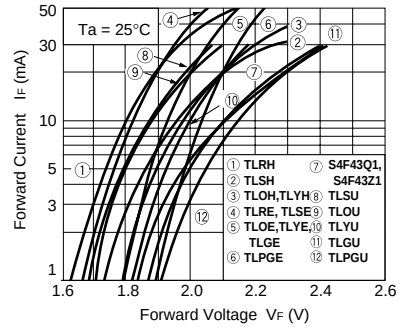
IV — IF



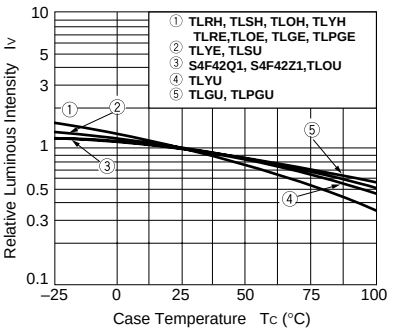
IV — IF



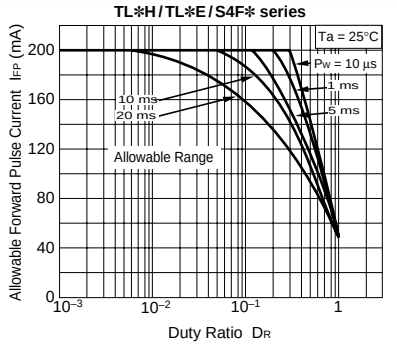
IF — VF



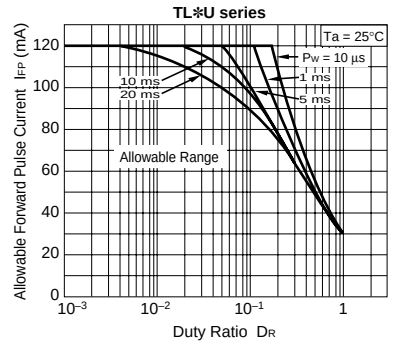
IV —TC



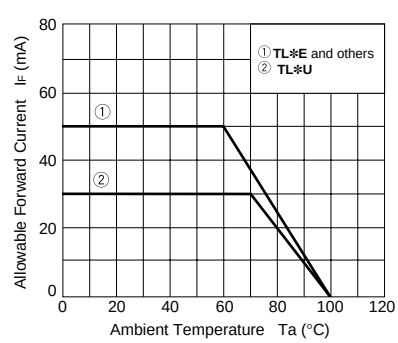
Allowable forward pulse current characteristics



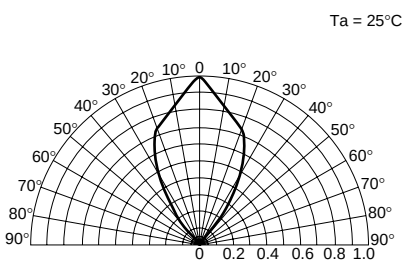
Allowable forward pulse current characteristics



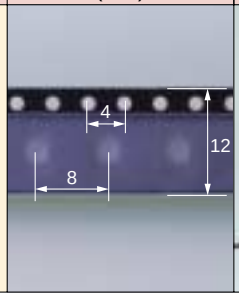
IF — Ta



Radiation pattern



Tape Specifications

Tape Packing Type	Tape Type Suffix	Pitches	Packing		Quantity/Reel
			Package dimensions (mm)	Appearance	
Embossed Tape Packing	T10	8 mm			500/reel

5 Packing Specifications

1. Lead Type

1-1 Tape packing

These tape specifications apply to 2-lead LED lamps with diameters of 3.1 mm and 5 mm.
These LED lamps have 2.54 mm and 5 mm lead pitches respectively, and can be mounted on a circuit board using an auto-insertion machine. Packing can either be in an ammo pack or a reel pack as desired.

Product number format

Example: **TLRE180AP** **(TPK51)**

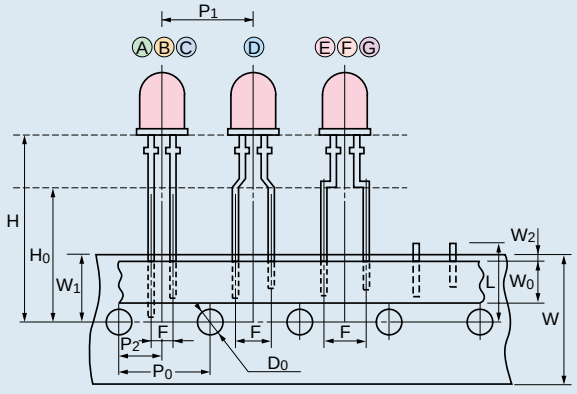
Product number — Tape specification

Tape specifications

Tapes are classified by lead polarity, packing style and distance from the device base to the tape feedhole centerline, as shown below.

Tape Specifications			Tape Forms
Reel pack		Ammo pack	
Anode lead-out	Cathode lead-out		
TPK1	TPKR1	TPK51	Ⓐ
TPK3	TPKR3	TPK53	Ⓑ
TPK5	TPKR5	TPK55	Ⓒ
TPJ1	TPJR1	TPJ51	Ⓓ
TPJ2	TPJR2	TPJ52	Ⓔ
TPJ3	TPJR3	TPJ53	Ⓕ
TPJ6	TPJR6	TPJ56	Ⓖ

Tape dimensions

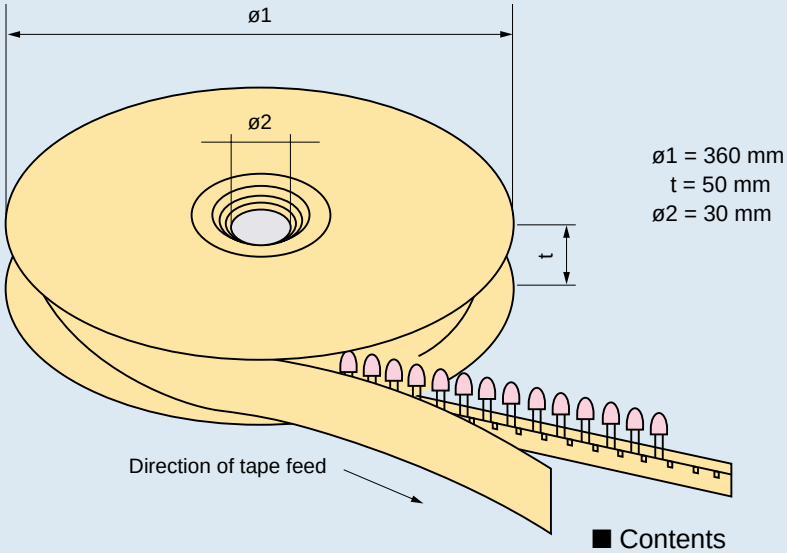


Unit: mm

	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ
H	23.35 ±1.0	18.55 ±1.0	17.0 ±1.0	23.35 ±1.0	20.5 ±1.0	22.5 ±1.0	23.35 ±1.0
H_0	—			16.0 ± 0.5			
W	$18.0^{+1}_{-0.5}$						
W_0	6.0 ± 0.3 or 13.0 ± 0.3						
W_1	$9.0^{+0.75}_{-0.5}$						
W_2	≦ 0.5						
P_0	12.7						
P_1	12.7 ± 1 (product pitch)						
P_2	6.35 ± 1.3						
F	$2.54^{+0.8}_{-0.2}$			$5.00^{+0.8}_{-0.2}$			
L	11.0 max						
D_0	ø4.0 ± 0.2						

Reel pack

■ Reel dimensions and winding



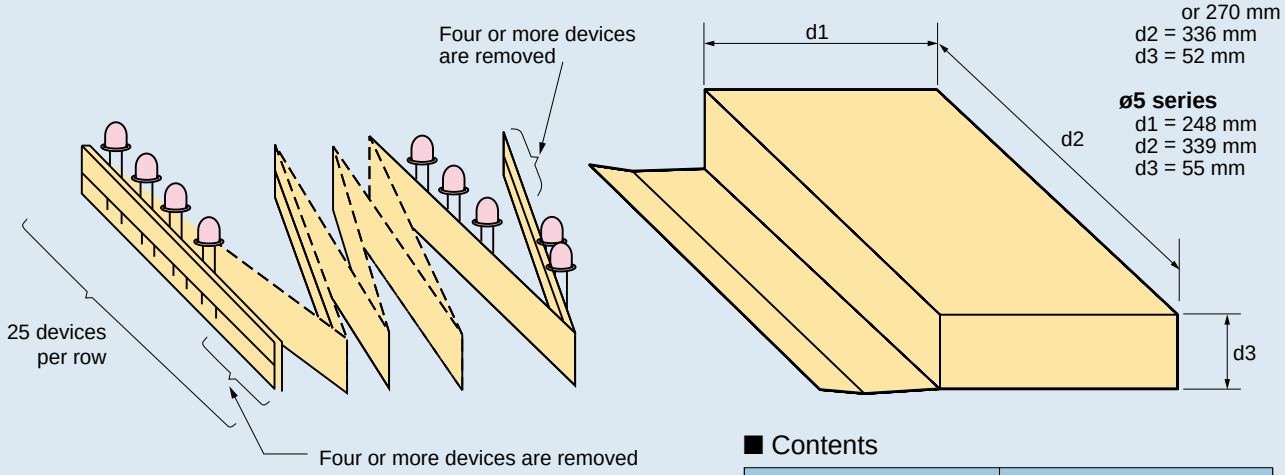
ø1 = 360 mm
t = 50 mm
ø2 = 30 mm

■ Contents

LED type	Quantity per Reel
ø3 Series	2,000
ø5 Series	1,000

Ammo pack

(1) Taped devices are packed by alternately folding the tape every 25 devices.
(2) Four or more devices are removed from the beginning and end of the tape.



ø3.1 series
d1 = 140
or 270 mm
d2 = 336 mm
d3 = 52 mm

ø5 series
d1 = 248 mm
d2 = 339 mm
d3 = 55 mm

■ Contents

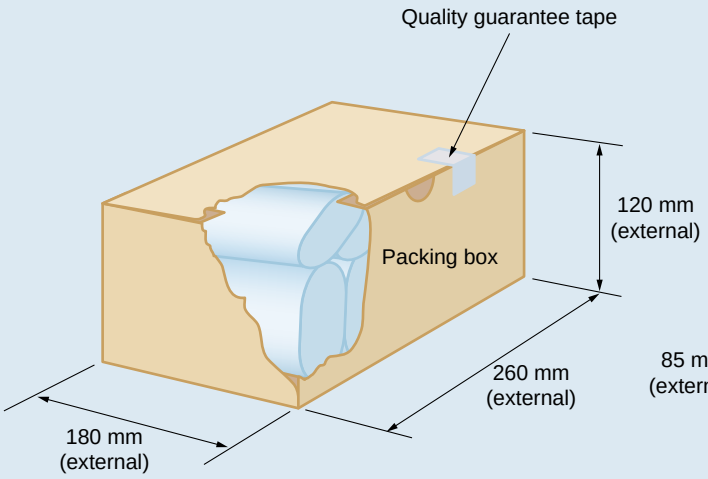
LED type	Quantity per Reel
ø3 Series	2,000 or 4,000
ø5 Series	1,000 or 2,000

1-2 Packing (Devices are loose in bags.)

Packing for ø5-mm type

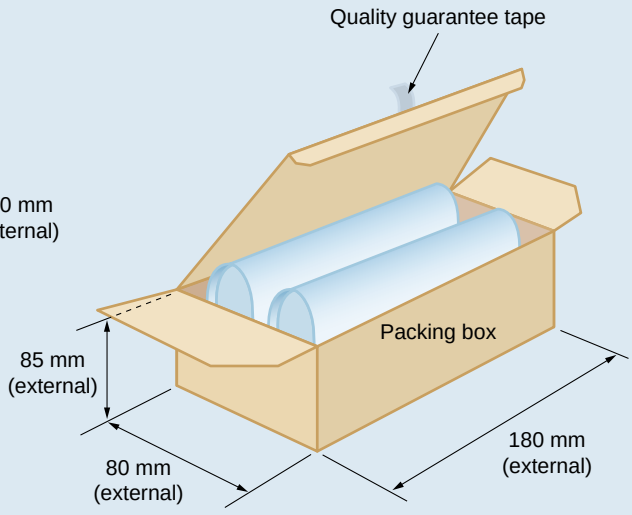
Minimum number of LED lamps: 500 per plastic bag

● Large box (standard)



10 bags with 5,000 LED lamps

● Small box

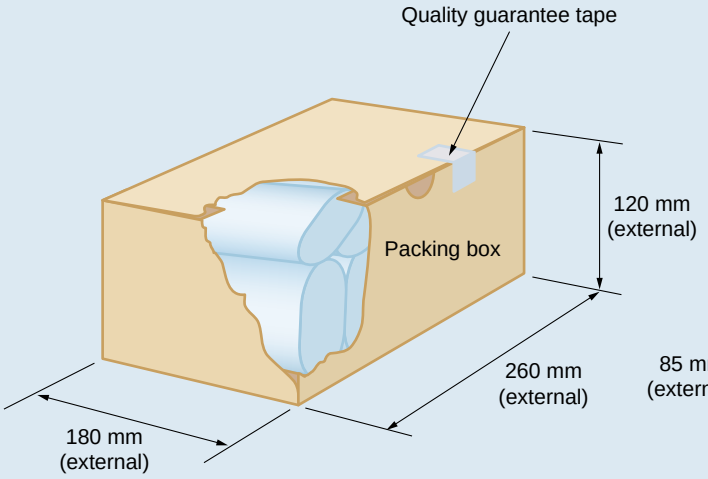


2 bags with 1,000 LED lamps

Packing for ø3-mm type

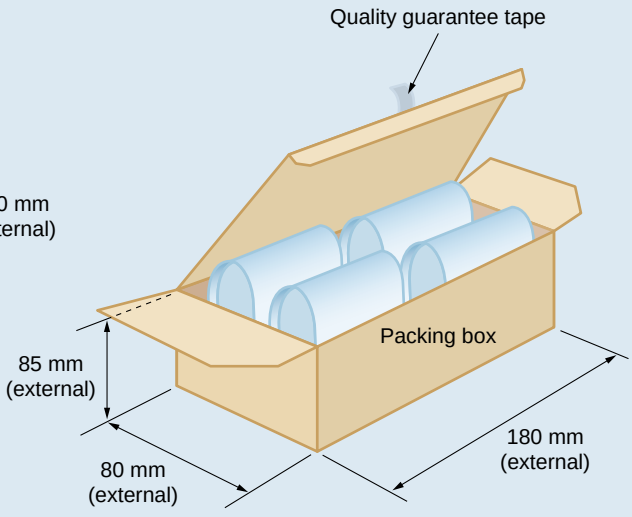
Minimum number of LED lamps: 500 per plastic bag

● Large box (standard)



20 bags with 10,000 LED lamps

● Small box



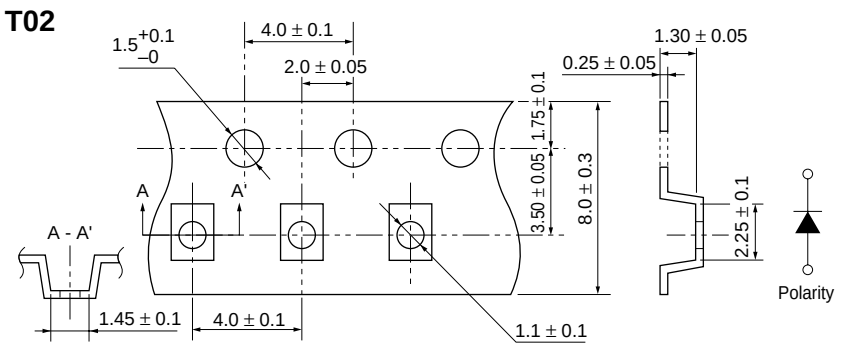
4 bags with 2,000 LED lamps

2. SMD Type

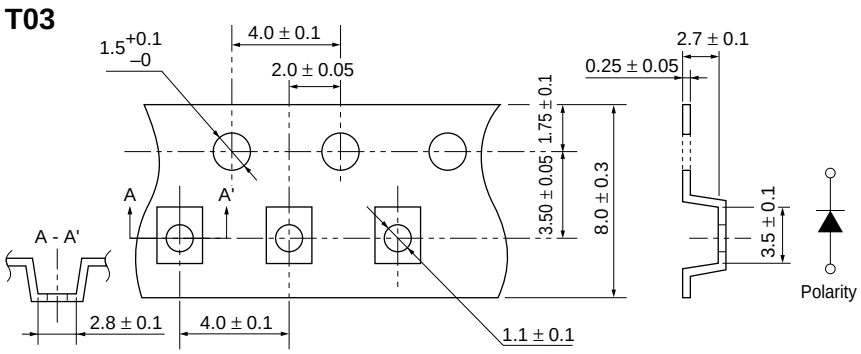
Tape dimensions

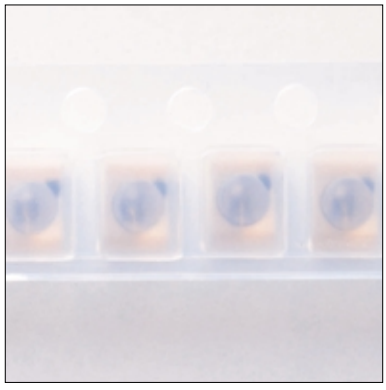
(Unit: mm)

T02



T03





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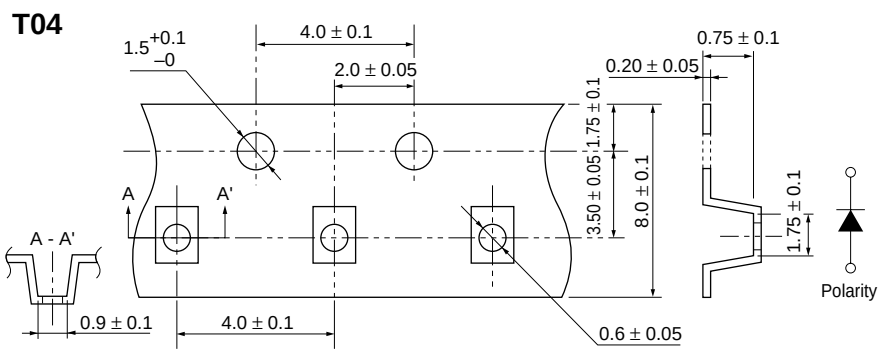

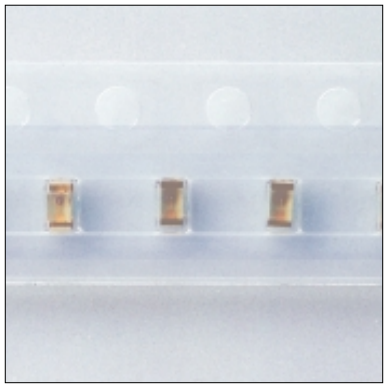

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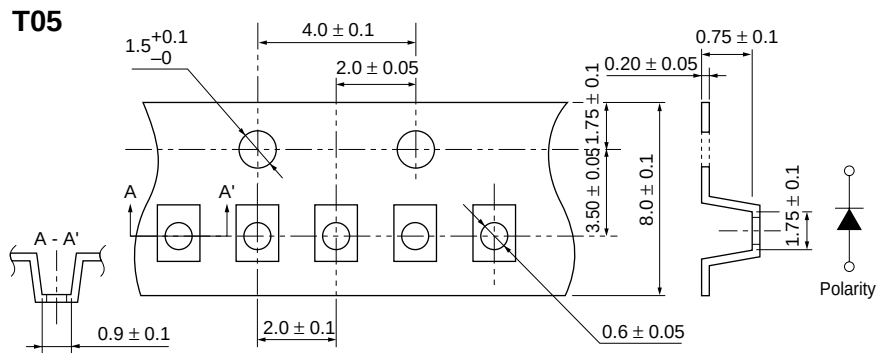
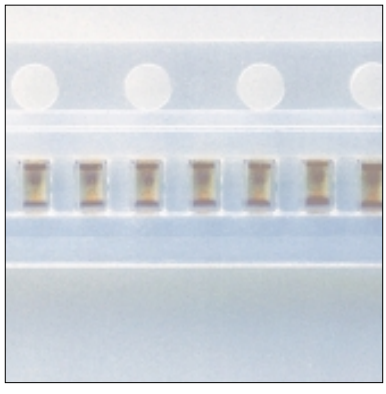
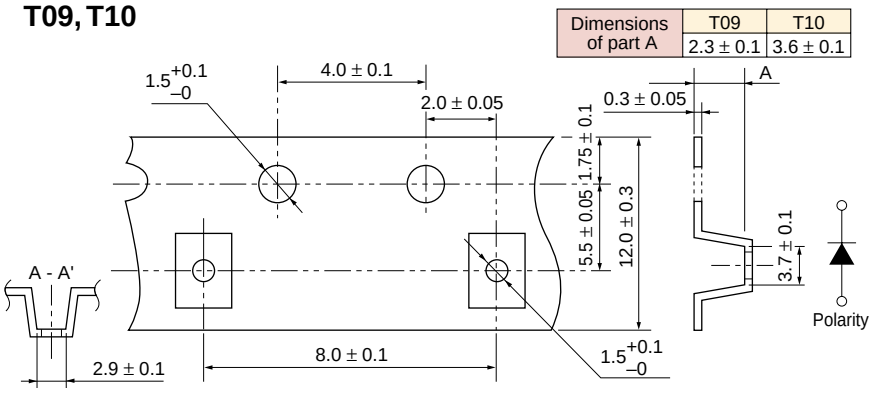
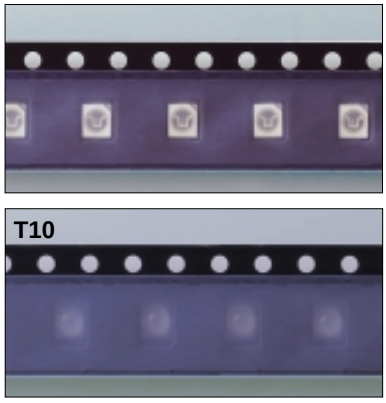




T09, T10





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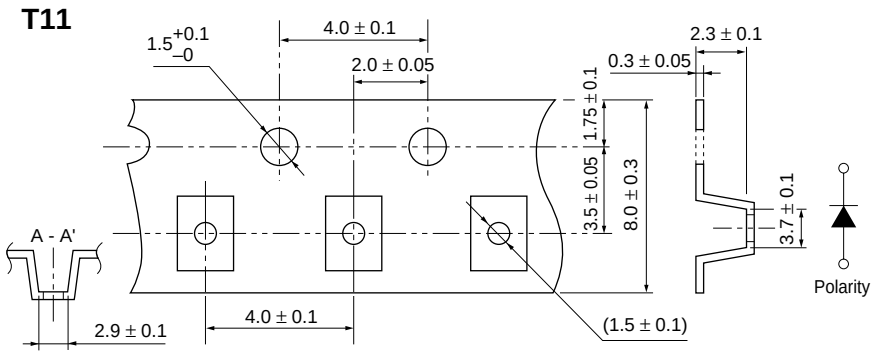
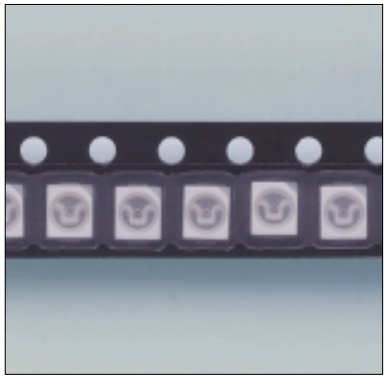
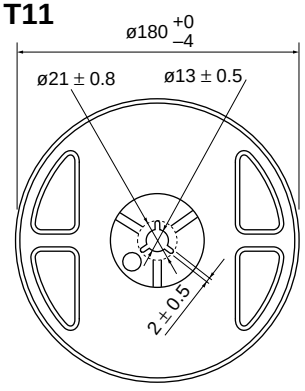


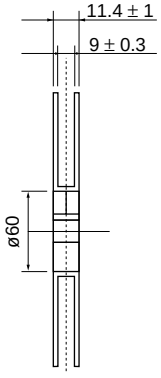


(Unit: mm)

Reel dimensions

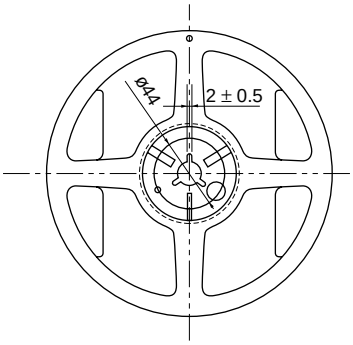
T02, T03, T04, T05, T11

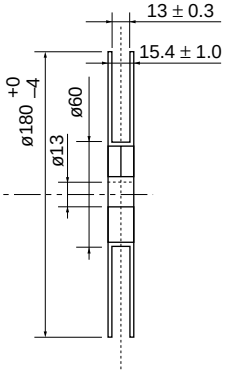


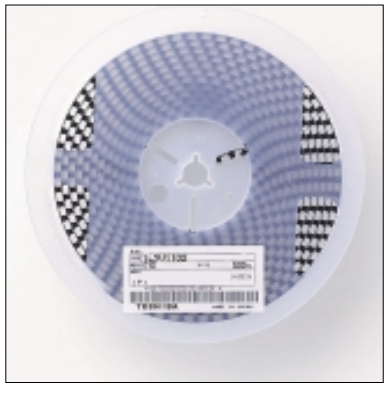


Corresponds to EIAJ RRM08B

T09, T10







Corresponds to EIAJ RRM12B

6 Handling Precautions

1. Lead Type

1-1 Mounting on a Printed Circuit Board (PCB)

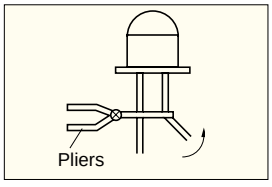
Soldering coditions

Type of soldering	Conditions	Precautions
Solder dip	Solder temperature: 260°C max Dipping time: 3 seconds max Soldering portion of lead: at least 2 mm away from the body of the device	● When the temperature of the device itself is rising, please be careful not to apply mechanical stress to it. ● During solder dip, do not apply mechanical stress between leads of a device; measures should taken especially in order to prevent temperature rise in a device. ● It is recommended to radiate heat by gripping leads with pliers or a tweezer when the working condition permits doing so.
Manual soldering (using soldering iron)	Iron tip temperature: 300°C max Soldering iron capacity: 30 W max Soldering time: 3 seconds max Soldering portion of lead: at least 2 mm away from the body of the device	

●Soldering precaution for TLRME68TG Series

These newly designed LED lamps are less prone to the effects of stress during automatic mounting than conventional LED lamps. Hence, this type of LED lamp can be mounted close to a through-hole on the PCB. However, if one of these lamps is subjected to excessive stress, the resin part may break or the lamp may be damaged in such a way that it will not emit light. Before using this type of LED lamp, please carefully read the technical datasheets for the product in question.

1-2 Mounting Precautions



Lead forming

The lead should be formed at least 5 mm away from the body of the device.
Care must be taken to ensure that no stress is applied to the resin.

Mechanical stress on leads

If stress is applied to leads during soldering, or if excessive stress such as tension, twisting or compression is applied between leads while the temperature is still high immediately after soldering the device may be open circuited and will afterwards be unable to perform according to its specifications. Instead, positions and directions of leads must be corrected after cooling.

Cleaning

1) Ultrasonic cleaning

The resin material of the device package may be harmed if ultrasonic cleaning is conducted after soldering and a solvent is used remove flux, or if non-recommended chemicals are used for brusing.

Note: The amount of stress applied to a device during ultrasonic cleaning will vary according to the size of the cleaning tank, the output power of the oscillator, the size of the PCB, and the mounting method. Please confirm test results under actual conditions before starting cleanig in production line.
Ultrasonic cleaning should normally be conducted with an ultrasonic output of 300 W or lower and should be completed within 30 seconds. These requirements may vary according to the size of the cleaning tank and the PCB.

2) Solvent

Depending on the solvent used, the sealed resin of a device package may be harmed. It is therefore necessary to confirm in advance that the solvent used for cleaning will not harm the resin. (Also, the use of solvents containing freon is restricted so as to prevent destruction of the ozone layer.) Before using any chemical, check whether the solvent will harm the device package resin.

1-3 Reliability

InGaAℓP series LEDs are known for their high reliability compared to other LED devices and exhibit excellent characteristics particularly in high-temperature, high-humidity environments. However, before using these devices in equipment, be sure to perform adequate testing; in addition, include safety margins in design specifications.

1-4 U-Series Lead Sheathing

The new InGaAℓP-type U-Series uses tin (Sn) plating instead of solder dip as the sheathing for leads.
Lead-free (Pb-free) sheathing helps to preserve the environment. When using this series, please note the following:
1) The solderability of tin plate is equivalent to that of solder dip. However, avoid storing U-Series devices for long periods and try to use them as soon as possible.
2) Since there is exposed iron (Fe) on the cut section of the lead tie-bar, leads may get rusty. Treat (protect) the surface of leads where necessary, particularly when devices are to be used in salty environments.
For detailed recommended storage conditions, see the usage cautions in the databook.
Toshiba plan to introduce lead-free (Pb-free) sheathing of leads gradually for conventional LEDs as well.

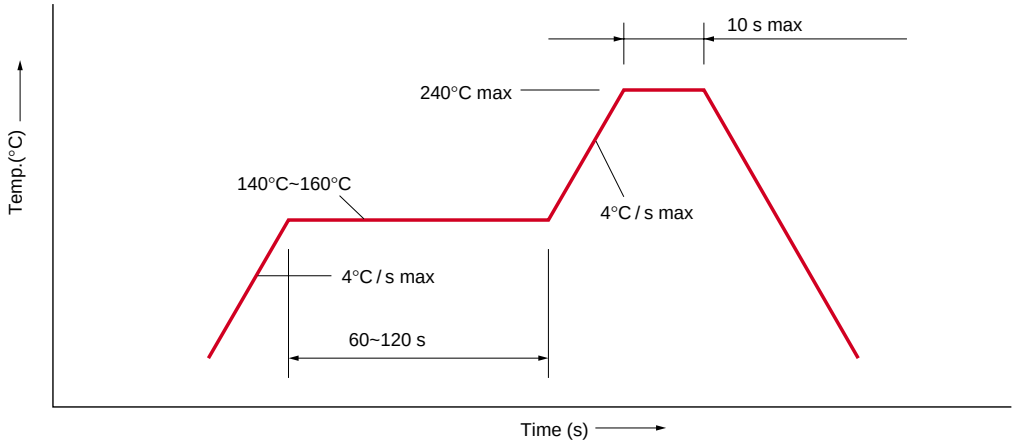
1-5 Four-element LEDs

This type of visible LED lamp also emits some IR light. If a photodetector is located near the LED lamp, please ensure that it will not be affected by this IR light.

2. SMD Type

2-1 Recommended Soldering Conditions

Temperature profile (reflow)



Soldering pad dimensions

Based on the specifications of the individual product.
Please refer to each datasheets. (Page 28, 30, 32, 34 and 36)

■ TL*1002A Series, TL*1005B Series, TL*1008A Series

- Please perform the first reflow soldering with reference to the above temperature profile within 168 h after package is opened.
- If a second reflow soldering, it should be performed within 168 h of the first reflow under the above temperature profile conditions.
- Storage conditions before second reflow soldering: 30°C, 60% RH or lower
- Do not perform flow soldering.

■ TL*1100 Series

- Please perform the first reflow soldering with reference to the above temperature profile within 168 h after package is opened.
- If a second reflow soldering, it should be performed within 168 h of the first reflow under the above temperature profile conditions.
- Storage conditions before second reflow soldering: 30°C, 60% RH or lower
- Please ask your nearest Toshiba distributor for more details before performing flow soldering.

■ TL*1102 Series

- Please perform the first reflow soldering with reference to the above temperature profile within 168 h after package is opened.
- Please ask your nearest Toshiba distributor for more details before performing repeat reflow soldering.
- Do not perform flow soldering.

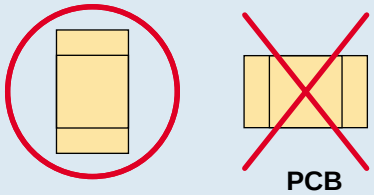
Manual soldering

Manual soldering should be performed within 3 s at a maximum temperature of 300°C using a 25 W soldering iron.
Manual soldering should be performed only once at each soldering spot.

2-2 Mounting Precautions

- Do not apply stress to the resin part at high temperature.
- The resin can easily be scratched. Avoid friction between the resin and any hard materials.
- When installing the PCB in a product, ensure that the device does not come into contact with other components.
- The product should be mounted widthwise on the PCB is across the width of the board.
- Design the PCB layout so as to minimize force which will be exerted on the device if the PCB warps.
- When the device is mounted on a flexible PCB, before using the product, ensure that there is no problem with LED reliability.

Mounting example



When cleaning is required after soldering

Chemical	AK225, alcohol
Temperature and time	50°C x 30 s and 30°C x 30 mins
Ultrasonic cleaning	300 W or less

2-3 Moisture-Proof Packaging

To avoid moisture absorption by the resin, the devices are packed in an aluminum envelope with silica gel.

Because the optical characteristics of the device can be affected during soldering due to gas expansion resulting from previous moisture absorption, store under the following conditions after opening.

Caution:

1. The moisture proof bag may be stored unopened within 6 months at the following conditions.
   Temperature: 5°C~30°C
   Humidity: 90% (max)
2. After opening the moisture proof bag, the devices should be assembled within 168 hours in an environment of 5°C to 30°C / 60% RH or below.
3. If upon opening, the moisture indicator card shows humidity 30% or above (Color of indication changes to pink) or the expiration date has passed, the devices should be baked in taping with reel.
   After baking, use the baked devices within 72 hours, but perform baking only once.
   Baking conditions: 60°C ± 5°C, for 12 to 24 hours.
   Expiration date: 6 months from sealing date, which is imprinted on the same side as this label affixed.
4. Repeated baking can cause the peeling strength of the taping to change, than leads to trouble in mounting. Furthermore, prevent the devices from being destructed against static electricity for baking of it.
5. If the packing material of laminate would be broken, the hermeticity would deteriorate. Therefore, do not throw or drop the packed devices.

2-4 Design Precautions (for the LEDs general characteristics)

Adhere strictly to maximum ratings

The maximum ratings are a set of specified values which must not be exceeded, even for an instant.
For the ratings of a specific device, please refer to the individual specifications for the device in question.

Adhere strictly to the temperature range in which operations are guaranteed.

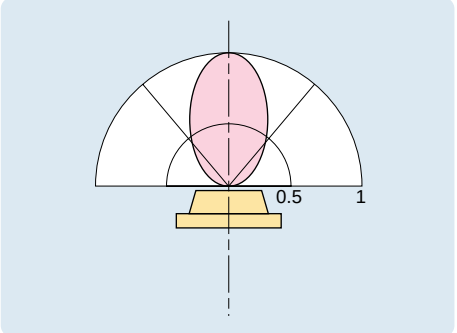
The recommended operating conditions for each device are those necessary to guarantee that the device will operate as specified in the datasheets. To ensure high reliability when using the device, derate the maximum ratings for current, power and temperature as recommended in the individual specifications for the device in question.

Temperature and humidity environment

Compared to mechanical components, semiconductor devices are generally highly sensitive to temperature. Since a the device's electrical characteristics are subject to the usage temperature, first investigate the product's temperature characteristics, and, if necessary, incorporate derating into the design.
If the device is used outside the guaranteed operating temperature range, its electrical characteristics cannot be guaranteed and performance deterioration may result.

Viewing angle characteristic

Each product has its own distinct viewing angle characteristic.
Select the product whose viewing angle characteristic best meets the requirements for the device in which it will be used.
The viewing angle is based on the angle q between the axis on which the luminous intensity of light from the optical source is 100% and any axis on which the luminous intensity is 50%.
The angle between these two axes is referred to as the LED's half-angle value.
For the viewing angle characteristic of a particular product, please refer to the datasheets for the product in question.

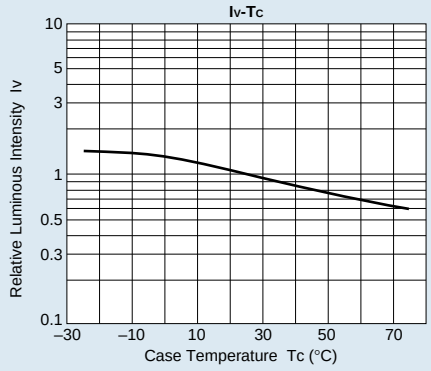


Thermal design precautions

The failure rate of semiconductor devices is greatly accelerated by high operating temperatures.

- Ensure that the ambient temperature (Ta) of the device is not affected by exothermic heat in the device's vicinity, and that the ambient temperature is kept as low as possible.
- If the device's operating power dissipation is comparatively large, consider forced-air cooling, the selection of different PCB materials, or the use of heat-dispersion sink, for example. These measures can lower the thermal resistance of the package.

Example: Temperature dependence of optical output



Temperature dependence

- Luminance
  Because the light recoupling rate of the LED is temperature dependent, as the temperature rises, the intensity of the light emission falls. To avoid a temperature rise in the connection resulting from power dissipation, Toshiba recommends a pulse driving design and a case with good heat dispersion characteristics. Before using the device, check that there are no problems with set use.
- Color tone (Light emission wavelength)
  In LEDs, a temperature rise in the junction resulting from power dissipation causes the light emission wavelength to shift to the longer side. Toshiba therefore recommends a thermal design that avoids temperature rise in the junction due to power dissipation.

  Reference value:
  $\Delta\lambda = 0.2\ \text{nm} \times \Delta Tj$ ΔTj: Emitted-light device junction temperature

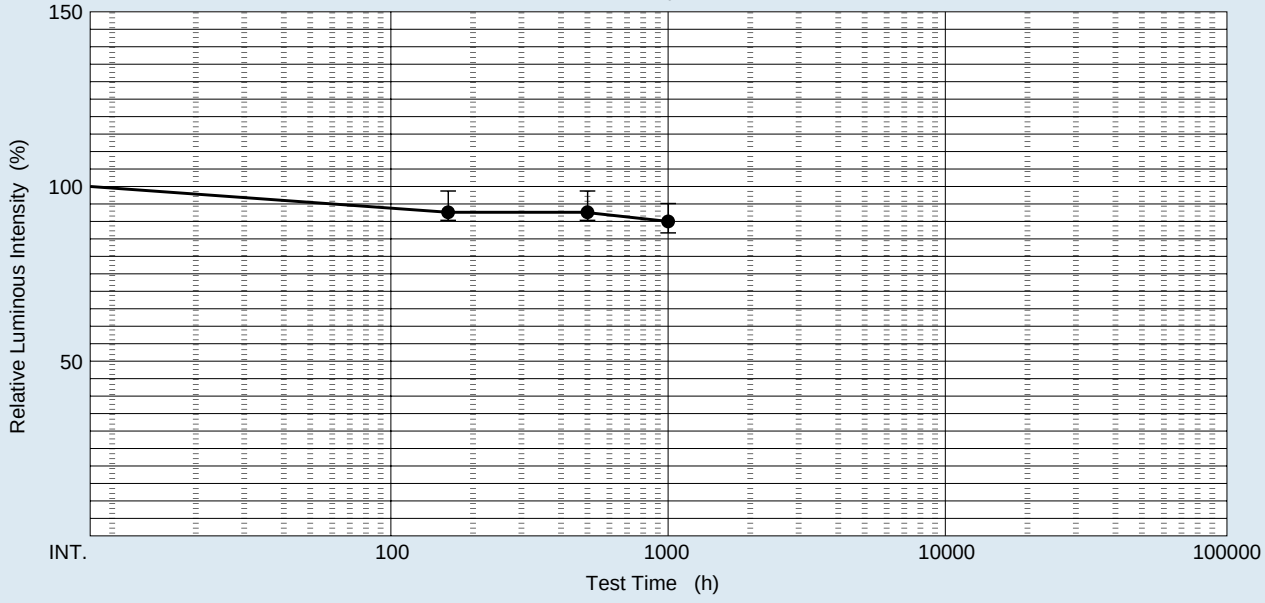
Light output deterioration

The lifespan of the emitted-light device is greatly affected not only by the device's own particular lifespan characteristics, but by the operating conditions and the operating environment as well. Accordingly, when selecting the emitted-light device and setting the operating conditions, we recommend checking first the several characteristics affecting lifespan.

For reliability data on individual products, including lifespan data, inquire at a Toshiba sales office or agency.

TLOE1002 Operation life test

Test Condition: I_F = 25 mA, Duty = 100%, Ta = 25°C, N = 30



● Visible LED lamps made of InGaAℓP will also emit some IR light. If a photodetector is located near an LED lamp, please ensure that it will not be affected by this IR light.

7 Product Manufactured Overseas

Place of Manufacture: Toshiba Semiconductor Thailand Co., Ltd. ⟶ Abbreviation: TST
Manufactured products: High-brightness lead-type LED lamps

The suffix 'T' in brackets at the end of a product number indicates that the product was manufactured by Toshiba Semiconductor Thailand Co., Ltd. The luminosity rank for the product, if there is one, is also specified within the brackets, before the suffix 'T'.

• Example: TLRH157P (TU, T)
The product number above indicates that the product was manufactured in Thailand and that it is available with luminosity ranks of T and U.
If your products are assembled outside Japan, high-brightness lead-type LED lamps can be supplied by Toshiba Semiconductor Thailand Co., Ltd. upon request.

For information about Thai-manufactured products, please contact your nearest Toshiba distributor.

With Lead Stopper Type	Straight Type	With Lead Stopper Type	Straight Type	With Lead Stopper Type	Straight Type
S4E38XX(T)		TLPGE11T(T)	TLPGE11TP(T)	TLRMH151(T)	TLRMH151P(T)
TLGE11T(T)	TLGE11TP(T)	TLPGE158(T)	TLPGE158P(T)	TLRMH156(T)	TLRMH156P(T)
TLGE158(T)	TLGE158P(T)	TLPGE159(T)	TLPGE159P(T)	TLRMH157(T)	TLRMH157P(T)
TLGE159(T)	TLGE159P(T)	TLPGE183(T)	TLPGE183P(T)	TLSE156(T)	TLSE156P(T)
TLGE174(T)	TLGE174P(T)	TLPGE18T(T)	TLPGE18TP(T)	TLSE157(T)	TLSE157P(T)
TLGE183(T)	TLGE183P(T)	TLPGE19T(T)	TLPGE19TP(T)	TLSE16C(T)	TLSE16CP(T)
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TLGE19T(T)	TLGE19TP(T)	TLPGE53T(T)		TLSE180(T)	TLSE180P(T)
TLGE23T(T)	TLGE23TP(T)	TLPGE62T(T)		TLSE20T(T)	TLSE20TP(T)
TLGE25T(T)..	TLGE25TP(T)	TLRE11T(T)	TLRE11TP(T)	TLSE27C(T)	
TLGE260(T)		TLRE156A(T)	TLRE156AP(T)	TLSE50T(T)	
TLGE262(T)		TLRE157A(T)	TLRE157AP(T)	TLSE53T(T)	
TLGE27C(T)		TLRE16C(T)	TLRE16CP(T)	TLSE62T(T)	
TLGE50T(T)		TLRE16T(T)	TLRE16TP(T)	TLSH156(T)	TLSH156P(T)
TLGE53C(T)		TLRE17T(T)	TLRE17TP(T)	TLSH157(T)	TLSH157P(T)
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TLOE16C(T)	TLOE16CP(T)	TLRE60T(T)		TLYE17T(T)	TLYE17TP(T)
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TLOE20T(T)	TLOE20TP(T)	TLRH180(T)	TLRH180P(T)	TLYE260A(T)	
TLOE25T(T)	TLOE25TP(T)	TLRH262(T)		TLYE262A(T)	
TLOE266(T)	TLOE266P(T)	TLRME16C(T)	TLRME16CP(T)	TLYE27C(T)	
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TLOE50T(T)		TLRME17D(T)	TLRME17DP(T)	TLYE53T(T)	
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TLOE60T(T)		TLRME20T(T)	TLRME20TP(T)	TLYE62T(T)	
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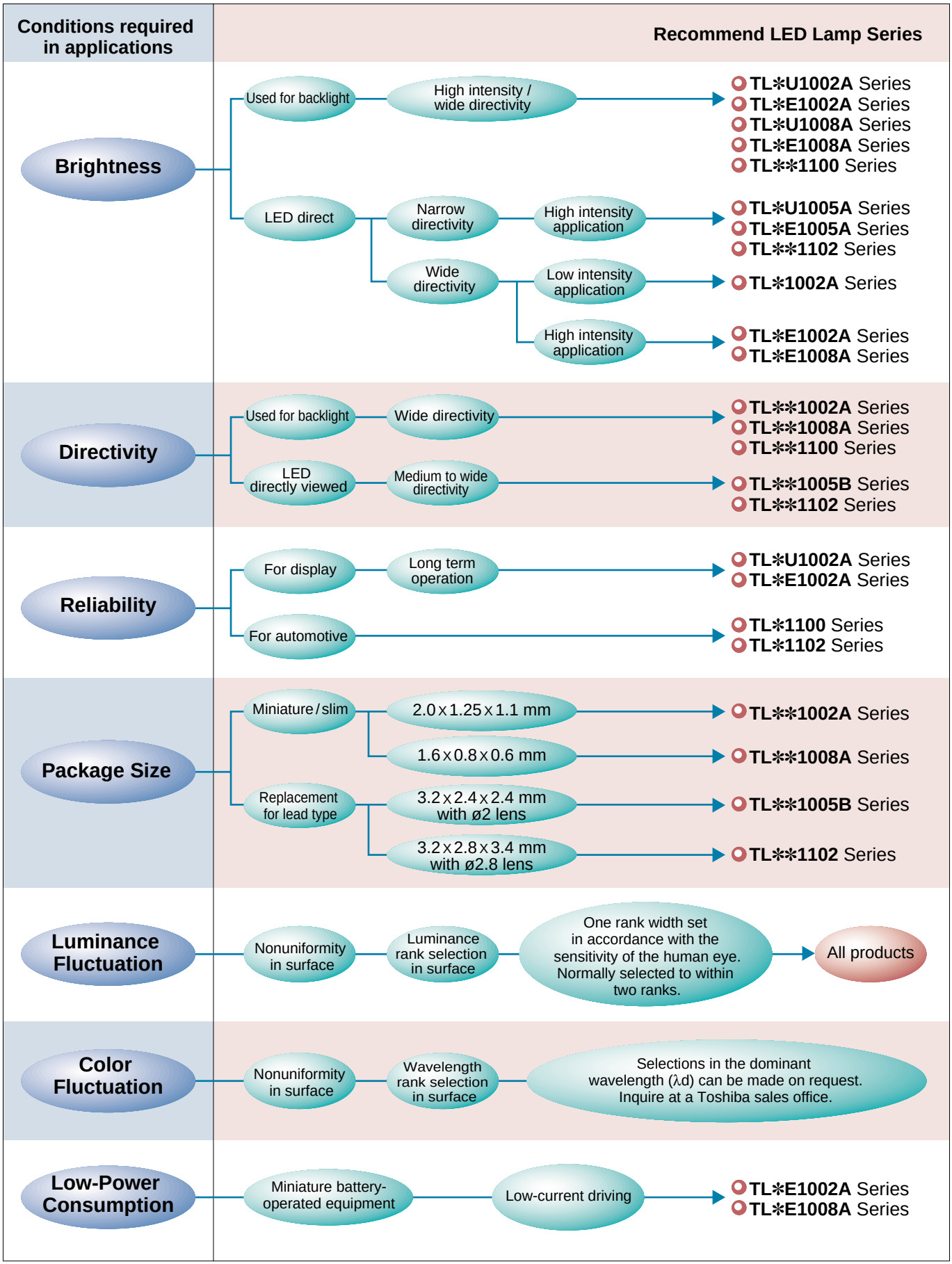
TLOH157(T)	TLOH157P(T)	TLRME53T(T)		TLYH157(T)	TLYH157P(T)
TLOH180(T)	TLOH180P(T)	TLRME62T(T)		TLYH180(T)	TLYH180P(T)

● Considerations for Selecting of SMD Lamps



9 Product Number Index

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