

# GM5BW96370A

## Light Emitting Diode



### ■ Features

1. High brightness (2,000 mcd @  $I_F = 20$  mA)
2. White Color (achieved via InGaN Blue LED chip in combination with Yellow Phosphor)
3. Internal ESD protection

### ■ Agency Approvals/Compliance

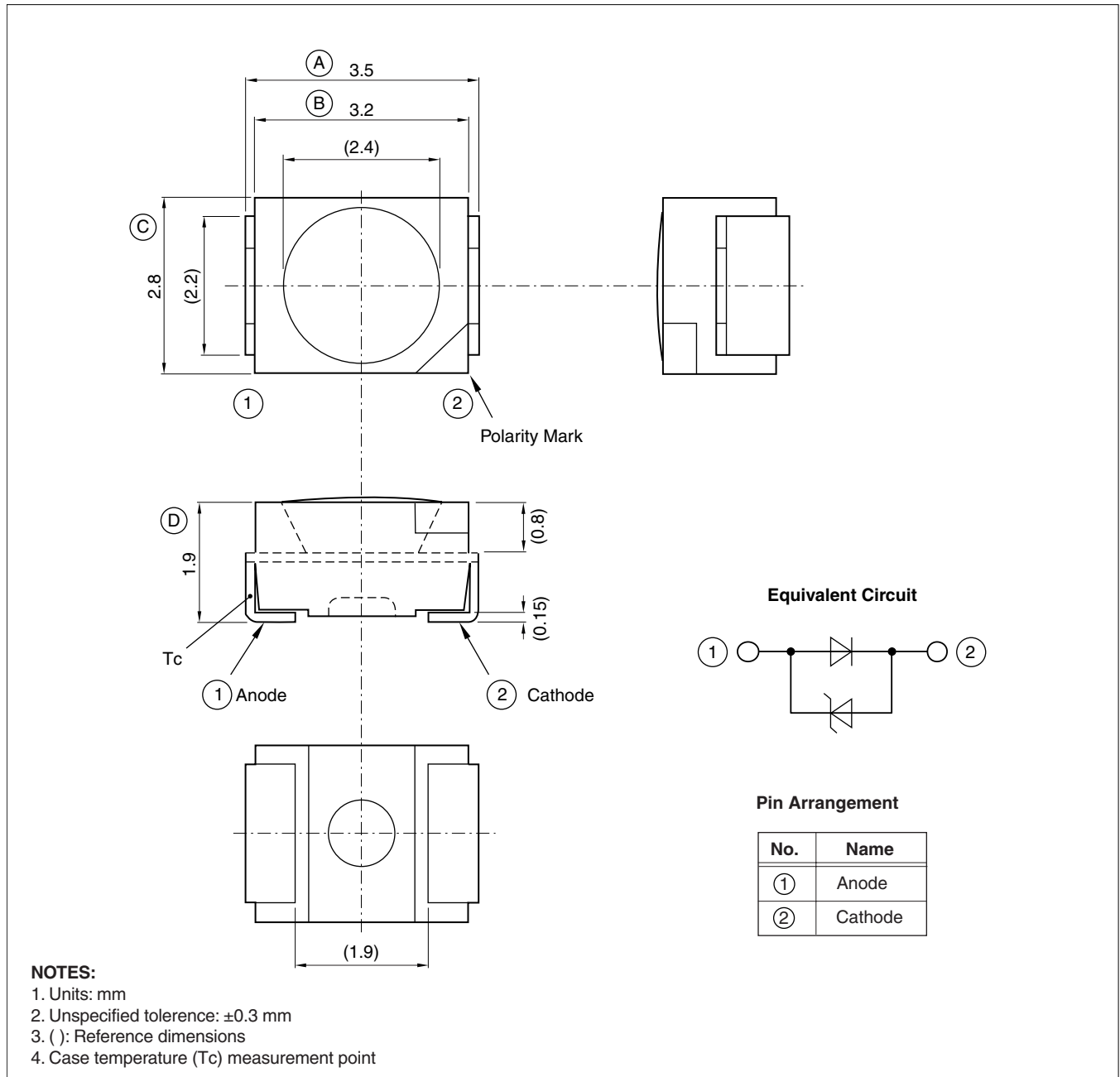
1. RoHS compliant

### ■ Applications

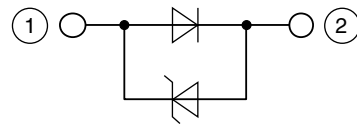
1. General Indication

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**External Dimensions**



**Equivalent Circuit**



**Pin Arrangement**

No.	Name
①	Anode
②	Cathode

**NOTES:**

1. Units: mm
2. Unspecified tolerance:  $\pm 0.3$  mm
3. ( ): Reference dimensions
4. Case temperature (Tc) measurement point

**■ Absolute Maximum Ratings**

(Ta = 25°C)

Parameter	Symbol	Rating	Unit
Power dissipation	P	117	mW
Forward current	I <sub>F</sub>	30	mA
Peak pulsed forward current *1	I <sub>FM</sub>	100	mA
Forward current derating factor	DC	0.6	mA/°C
	Pulse	2.0	mA/°C
Reverse current	I <sub>R</sub>	70	mA
Operating temperature *2	T <sub>c</sub>	-30 to +100	°C
Storage temperature	T <sub>stg</sub>	-40 to +100	°C
Soldering temperature *3	T <sub>sol</sub>	295	°C

\*1 Duty ratio = 1/10, Pulse width = 0.1 ms

\*2 Case temperature (See Outline Dimension on page 2)

\*3 Each terminal must be soldered with a 30 W soldering iron within 3 seconds under 295°C. For Reflow Soldering information, see Fig. 14.

\*4 Operating current values here follow the derating curves shown in Fig. 1 through Fig. 3.

\*5 This device uses the leads for heat sinking, therefore the Operating Temperature range is prescribed by T<sub>c</sub>.

**■ Electro-optical Characteristics**

(Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 20 mA	—	3.2	3.9	V
Luminous intensity *1	I <sub>v</sub>		*3	2,000	*3	mcd
Chromaticity coordinates *2	x, y		*4	0.31	*4	—

\*1 Measured by EG&G Model 550 (Radiometer/Photometer) after 20 ms drive (Tolerance: ±15%)

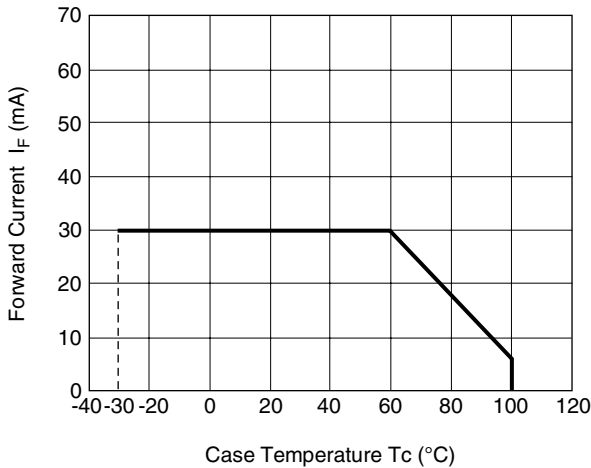
\*2 Measured by Ohtsuka Electronics Model MCPD-2000 after 20 ms drive (Tolerance: x,y: ±0.02)

\*3 See Luminous Intensity Rank table on page 8.

\*4 See Chromaticity Rank table on page 8.

**■ Derating Curves**

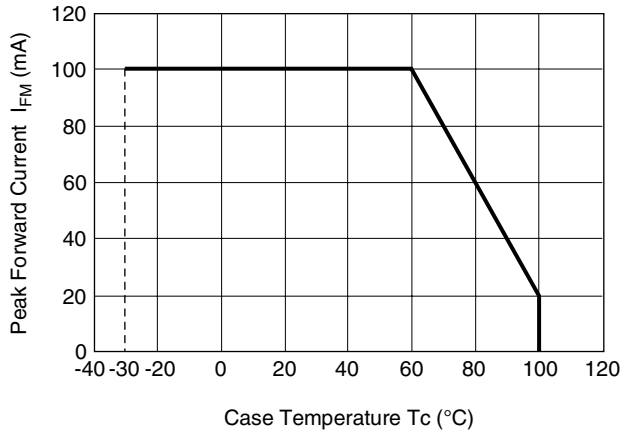
**Fig. 1 Forward Current vs. Case Temperature**



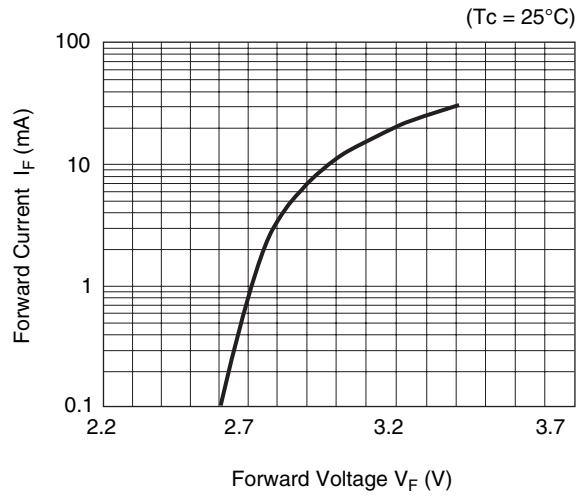
**Fig. 2 Peak Pulsed Forward Current I<sub>FM</sub> vs. Duty Ratio**



**Fig. 3 Peak Forward Current  $I_{FM}$  vs. Case Temperature**

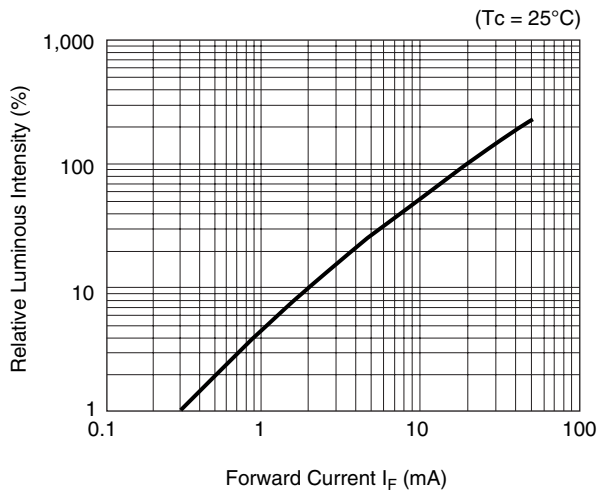


**Fig. 5 Forward Current vs. Forward Voltage**

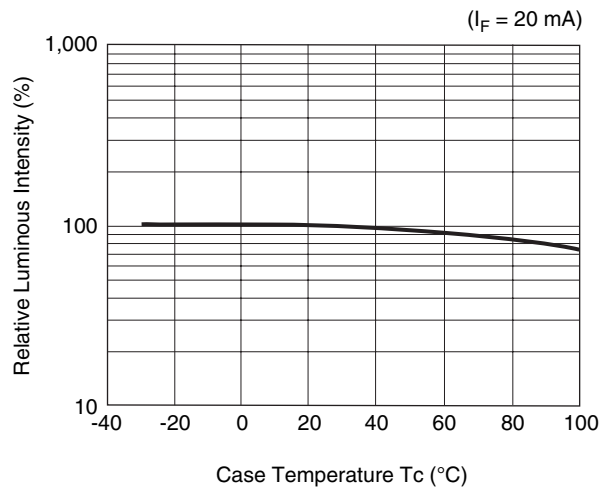


**■ Characteristic Diagrams (TYP.)**

**Fig. 4 Relative Luminous Intensity vs. Forward Current**

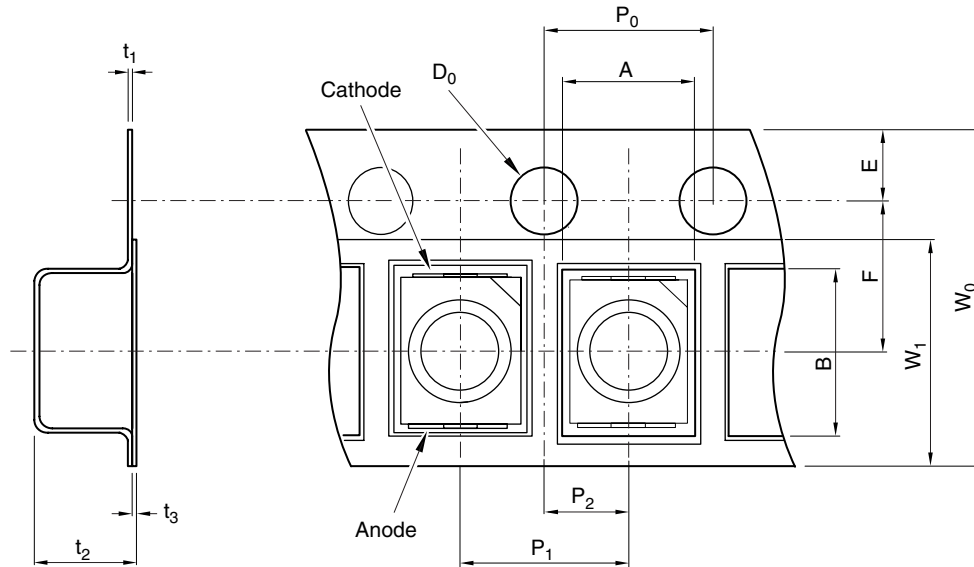


**Fig. 6 Relative Luminous Intensity vs. Case Temperature**



■ **Tape Specifications**

**Fig. 7 Tape Shape and Dimensions**

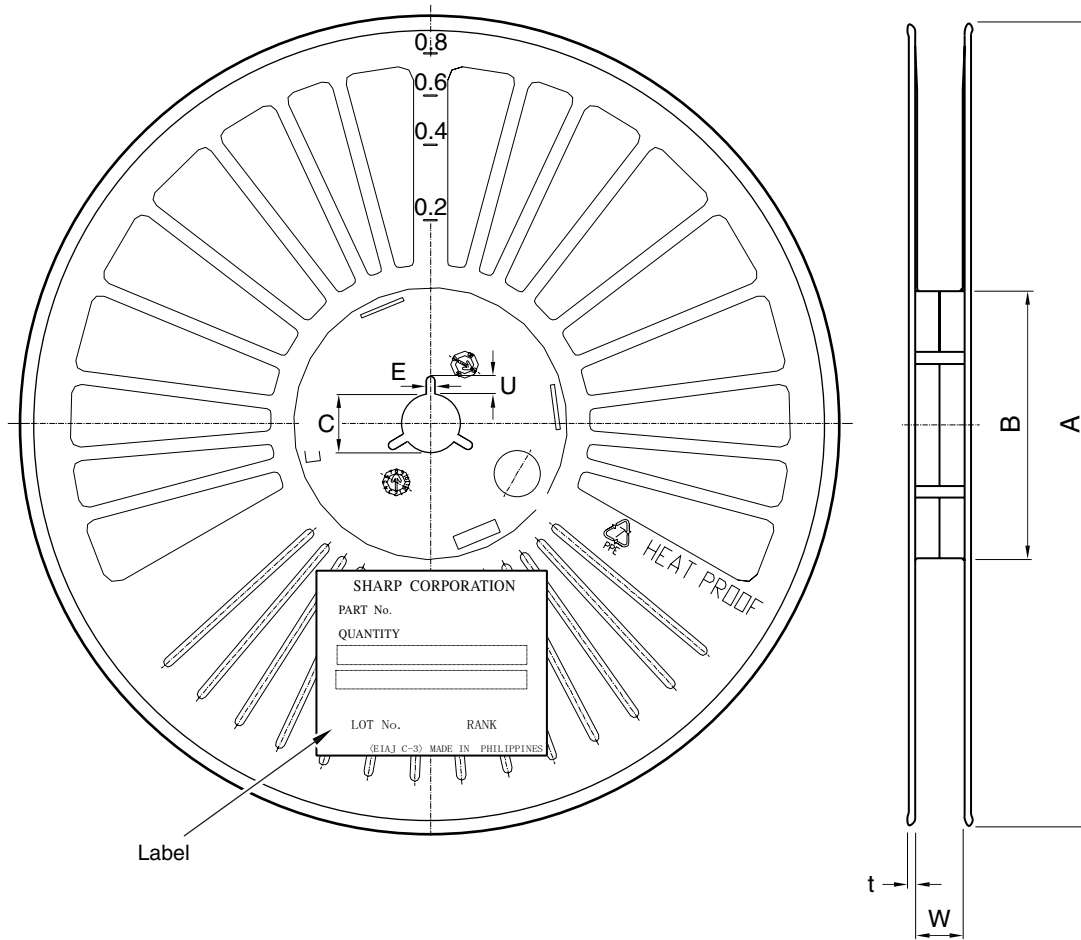


■ **Tape Dimension Specifications**

Parameter	Symbol	Dimension (mm)	Remarks	
Concave square hole for parts insertion	Vertical	A	3.0	Dimension excludes corner R at the bottom inside
	Horizontal	B	3.7	
	Pitch	P <sub>1</sub>	4.0	
Round sprocket hole	Diameter	D <sub>0</sub>	1.5	
	Pitch	P <sub>0</sub>	4.0	Accumulated error ±0.5 mm/10 pitch
	Position	E	1.75	Distance between the edge of the tape and center of the hole
Center to center distance	Vertical	P <sub>2</sub>	2.0	Distance between center line of the concave square hole and round sprocket hole
	Horizontal	F	3.5	
Cover tape	Width	W <sub>1</sub>	5.4	
	Thickness	t <sub>3</sub>	0.1	
Carrier tape	Width	W <sub>0</sub>	8.0	
	Thickness	t <sub>1</sub>	0.3	
Thickness of entire unit	t <sub>2</sub>	2.6	With cover tape and carrier tape combined	

■ Reel Specifications

Fig. 8 Reel Shape and Dimensions



■ Reel Dimension Specifications

	Parameter	Symbol	Dimension (mm)	Remarks
Flange	Diameter	A	$\phi 180$	
	Thickness	t	1.3	
	Inner space direction	W	9.5	Shaft core dimension
Hub	External diameter	B	$\phi 60$	
	Spindle hole diameter	C	$\phi 13$	
	Key slit width	E	2.0	
	Key slit depth	U	4	

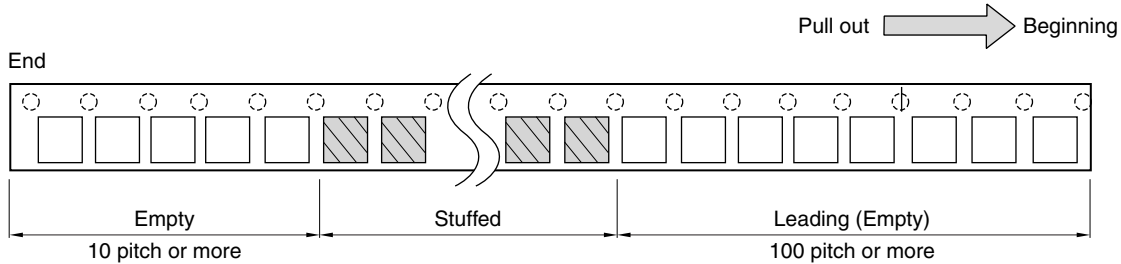
\*1 Label on side of flange: part number, quantity, lot number, and rank.

\*2 Material: described on flange.

## ■ Taping Specifications

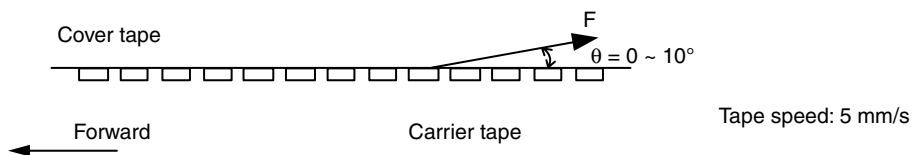
1. Leader tape standard: JIS C0806

**Fig. 9 Leader Tape**



2. Cover tape peel resistance:  $F = 0.1$  to  $1.0$  N ( $\theta = 10^\circ$  or less). See Fig. 10.

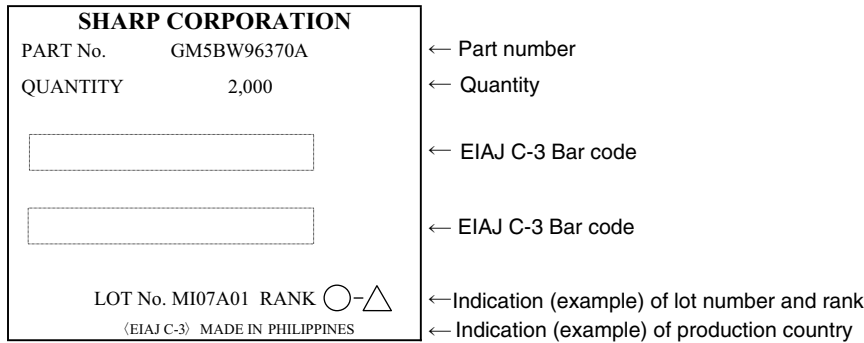
**Fig. 10 Tape Separation**



3. Tape bending resistance: Cover tape will remain in place on radii of 30 mm or more. Under 30 mm radii, the cover may separate.
4. Joints are not allowed in the cover tape.
5. Parts are packed with an average quantity of 2,000 pieces per reel.
6. Product mass: 30 mg (approximately)
7. Sharp guarantees the following:
  - a. No contiguous empty spaces in the tape
  - b. Missing parts will not make up more than 0.1% of the total quantity.
  - c. Parts will be easily removed from the tape.
8. Parts will not stick to the cover tape as it is peeled.

**Label and Marking Information**

**Fig. 11 Label Contents**



LOT Number

M I 07 A 01

① ② ③ ④ ⑤

- ① Production plant code (alphabetically)
- ② Production lot (single or double digits)
- ③ Production year (the last two digits of the year)
- ④ Production month  
(to be indicated alphabetically with January corresponding to A)
- ⑤ Production date (01 ~ 31)

Rank ○ △ : ○ : Luminous intensity rank

△ : Chromaticity coordinates rank

**Luminous Intensity Rank Table (Tc = 25°C)**

Rank	Luminous Intensity	Unit	Condition
N	1,144 ~ 2,229	mcd	I <sub>F</sub> = 20 mA
O	1,648 ~ 3,210		
P	2,373 ~ 4,623		

\*1 Parts are marked to the highest rank of their tested luminosity level.  
\*2 Quantity of each rank is decided by Sharp.

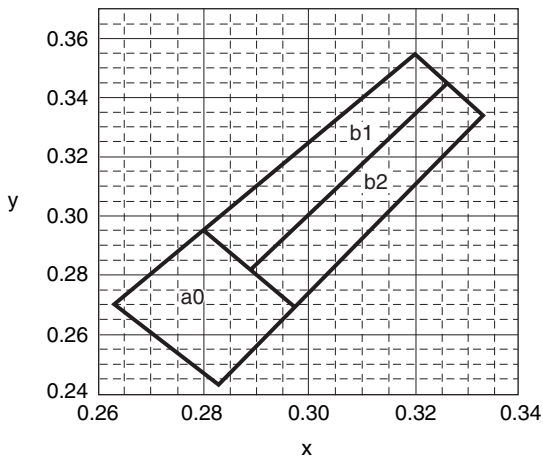
**Chromaticity Rank Table (Tc = 25°C)**

Rank	Chromaticity Coordinates (x,y)								Condition
	Point 1		Point 2		Point 3		Point 4		
	x	y	x	y	x	y	x	y	
a0	0.263	0.270	0.283	0.243	0.297	0.270	0.280	0.295	I <sub>F</sub> = 20 mA
b1	0.280	0.295	0.289	0.282	0.326	0.345	0.320	0.355	
b2	0.289	0.282	0.297	0.270	0.333	0.334	0.326	0.345	

\*1 Tolerance: ±0.02.  
\*2 Quantity of each rank is decided by Sharp.



Fig. 12 Chromaticity Diagram



### ■ Design Notes

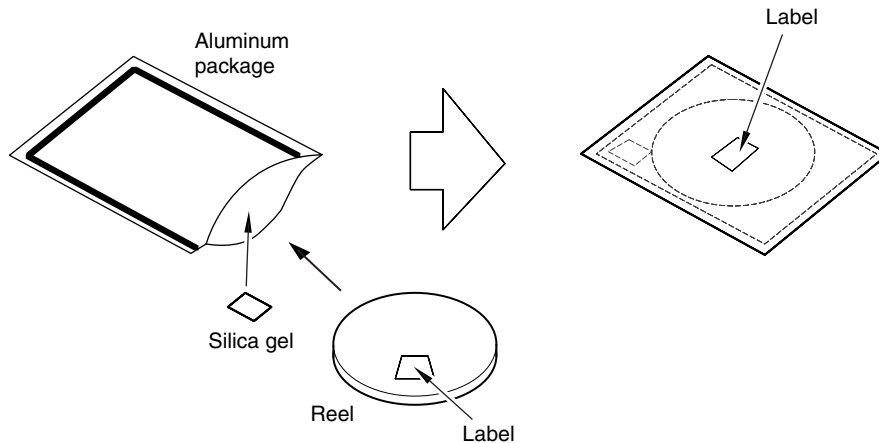
1. This product is not designed to resist electromagnetic and ionized-particle radiation. Moreover, it is not designed to directly resist excessive moisture, such as dew or condensation; or corrosive (salt) air or corrosive gases, such as Cl, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>x</sub>.
2. Do not allow the circuit design to apply any reverse voltage to this device.
3. This part can be easily damaged by external stress. Make sure they are not mechanically stressed during or after assembly.
4. This product uses a blue LED chip in combination with fluorescent materials to achieve its color. There may be some afterglow of the phosphor when driving this part with pulsed power.
5. This part has a high light output. Looking directly at it during full power output may cause injury.
6. Sharp recommends taking proper personal and environmental static control precautions when handling this part.
7. Materials of high thermal conductivity are incorporated in this device to allow generated heat to be effectively transferred from it to the circuit board. For best reliability, Sharp recommends against locating other sources of heat near the LED, and to design the circuit board in such a way that heat can easily escape from the circuit board. Sharp also recommends designing the circuit board so that the part's case temperature is always kept under 100° (when the LED is turned on) including self-heating.
8. Sharp recommends handling these parts in a clean, non-dusty environment since surface dust may be difficult to remove and can affect the optical performance of the part.
9. Sharp recommends confirming the part's performance, reliability, and resistance to any of these conditions, if it is to be used in any of these environments:
  - Direct sunlight, outdoor exposure, dusty conditions
  - In water, oil, medical fluids, and organic solvents
  - Excessive moisture, such as dew or condensation
  - Corrosive (salt) air or corrosive gases, such as Cl, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>x</sub>

## ■ Manufacturing Guidelines

### ● Storage and Handling

1. Moisture-proofing: These parts are shipped in vacuum-sealed packaging to keep them dry and ready for use. See Fig. 13.

**Fig. 13 Factory Moisture-proof Packaging**



2. Store these parts between 5°C and 30°C, at a relative humidity of less than 60%.
3. After breaking the package seal, maintain the environment within 5°C to 30°C, at a relative humidity of less than 60%. Solder the parts within 3 days.
4. If the parts will not be used immediately, repack them in a dry box, or re-vacuum-seal them with a desiccant.
5. If the parts are exposed to air for more than 3 days, or if the silica gel telltale indicates moisture contamination, bake the parts:
  - When in the tape carrier, bake them at a temperature of 95°C to 100°C, for 16 to 24 hours.
  - When loose or on a PCB, bake them at a temperature of 110°C to 120°C, for 8 to 12 hours.
  - Note that the reels may become distorted if they are in a stack when baking. Confirm that the parts have cooled to room temperature after baking.

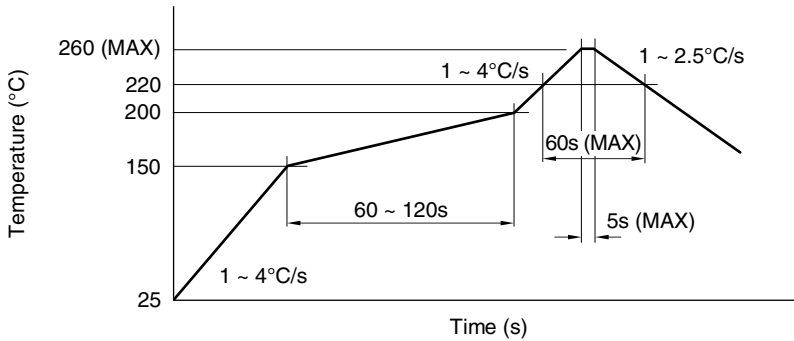
### ● Cleaning Instructions

1. Sharp does not recommend cleaning printed circuit boards containing this device, or cleaning this device with ultrasonic methods. Process chemicals will affect the structural and optical characteristics of this device.
2. Sharp recommends the use of a solder paste that does not require cleaning.

**● Soldering Instructions**

1. When soldering with reflow methods, Sharp recommends following the soldering profile in Fig. 14.
2. Do not subject the package to excessive mechanical force during soldering as it may cause deformation or defects in plated connections. Internal connections may be severed due to mechanical force placed on the package due to the PCB flexing during the soldering process.
3. When using a second reflow, the second process should be carried out as soon as possible after the first.
4. Electrodes on this part are silver-plated. If the part is exposed to a corrosive environment, the plating may be damaged, thereby affecting solderability.
5. The Reflow Profile shown in Fig. 14 should be considered as a set of maximum parameters. Since this part uses the leads for heatsinking, the peak temperature should be kept as cool as possible and the cooldown period lengthened as much as possible. Thermal conduction into the LED will be affected by the performance of the reflow process, so verification of the reflow process is recommended. These parts may be used in a nitrogen reflow process.

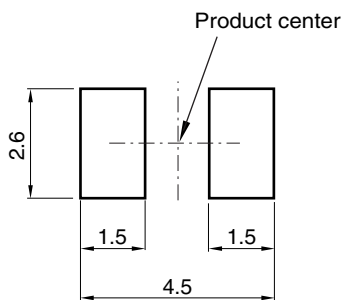
**Fig. 14 Temperature Profile**



**● Recommended Solder Pad Design**

1. Solderability depends on reflow conditions, solder paste, and circuit board materials. Check the entire process before production commences.
2. Fig. 15 shows the recommended solder pattern for this part.
3. When using backside dip methods, Sharp recommends checking the process carefully: board warping from heat can cause mechanical failure in these parts, in addition to the high heat conducted into the part through the leads. Performing reflow after dip is recommended, with the interval between the two as short as possible.

**Fig. 15 Recommended Solder Pad Design**



**NOTE:** Unit: mm

**● Presence of ODCs**

This product shall not contain the following materials, and they are not used in the production process for this product:

- Regulated substances: CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform). Specific brominated flame retardants such as the PBBOs and PBBs are not used in this product at all.

This product shall not contain the following materials banned in the RoHS Directive (2002/95/EC).

- Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE).

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- Office automation equipment
- Telecommunication equipment (terminal)
- Test and measurement equipment
- Industrial control
- Audio visual equipment
- Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:

- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
- Traffic signals
- Gas leakage sensor breakers
- Alarm equipment
- Various safety devices, etc.

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- Space applications
- Telecommunication equipment (trunk lines)
- Nuclear power control equipment
- Medical and other life support equipment (e.g. scuba)

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