GM5BW94320A

Light Emitting Diode

■ Features

1. High brightness (3600 mcd @ I_F = 25 mA)
2. White Color (achieved via InGaN/SiC Blue LED chips in combination with Yellow Phosphor)

■ Agency Approvals/Compliance

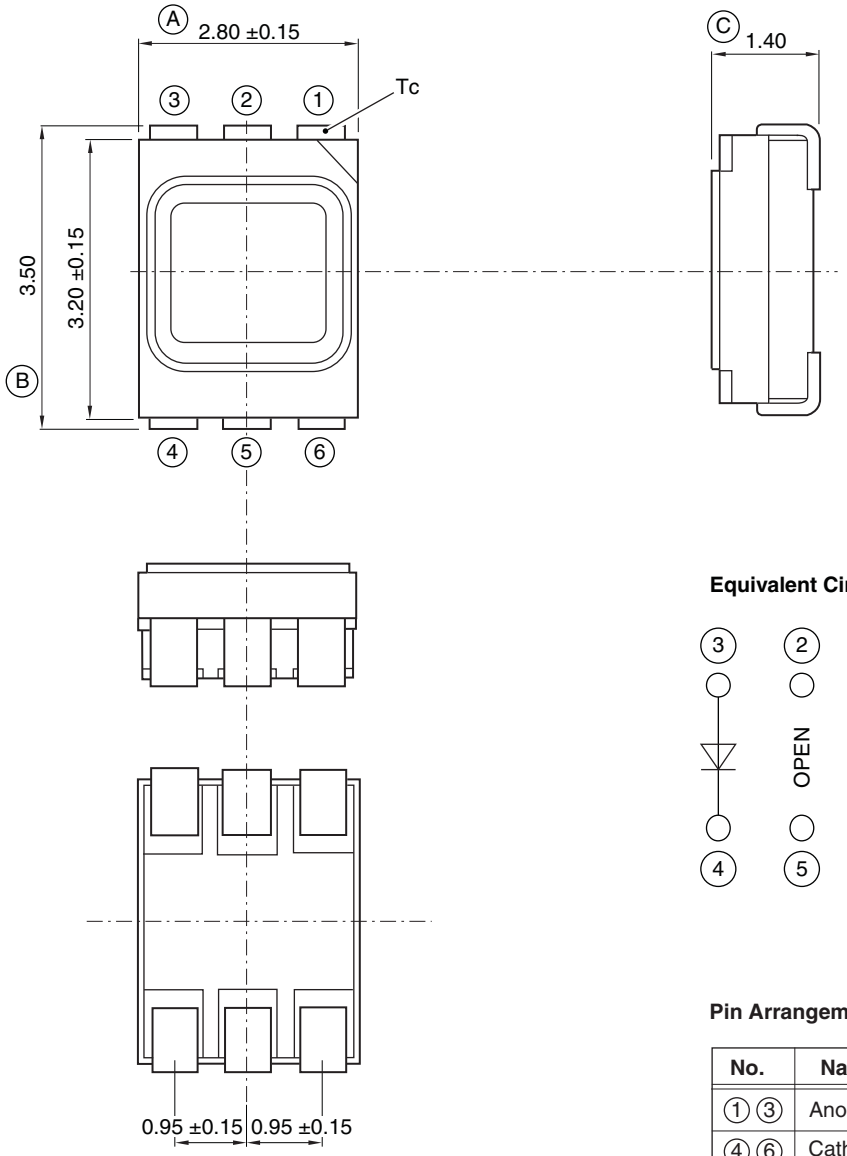
1. RoHS compliant

■ Applications

1. General indication
2. Office Automation equipment
3. Audio/visual equipment
4. Home appliances
5. Telecommunications equipment
6. Measuring equipment
7. Tooling machines
8. Computers

Sheet No.: DG-067010A
Date August, 2008

■ External Dimensions



Equivalent Circuit

Pin Arrangement

No.	Name
① ③	Anode
④ ⑥	Cathode

NOTES:
1. Units: mm
2. Unspecified tolerance: ±0.2 mm
3. 6 terminal pins, flatness within 0.1 mm
4. Pins 2 and 5 are not connected
5. Case temperature (Tc) measurement point

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■ Absolute Maximum Ratings

(Tc = 25°C)

Parameter	Symbol	Rating	Unit
Power dissipation (Package total)	P	264	mW
Forward current *1	I_F	30	mA
Peak pulsed forward current *1, *2	I_{FM}	50	mA
Forward current derating factor *1, 2	DC	0.5	mA/°C
	Pulse	0.83	mA/°C
Reverse voltage *1	V_R	5	V
Operating temperature *3	Tc	-30 to +100	°C
Storage temperature *4	Tstg	-40 to +100	°C
Soldering temperature *5	Tsol	350	°C

*1 Rating for single chip (die) operation.
*2 Duty ratio = 1/10, Pulse width = 0.1 ms
*3 Case temperature (See External Dimensions on page 2)
*4 Do not exceed these temperatures under any condition while in packing. Refer to *Storage and Handling*.
*5 Each terminal must be soldered with a 30 W soldering iron within 3 seconds under 350°C.
For Reflow Soldering information, see Fig. 17.
*6 Operating current values here follow the derating curves shown in Fig. 1 through Fig. 3.
*7 This device uses the leads for heat sinking, therefore the operating temperature range is prescribed by Tc.

■ Electro-optical Characteristics

(Tc = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Forward voltage *1	V_F	I_F = 25 mA	–	3.4	4.4	V
Luminous intensity *1, *2	I_V		*3	3600	*3	mcd
Chromaticity coordinates *1, *3	x, y		*4	0.31, 0.31	*4	
Reverse current *1	I_R	V_R = 4 V	—	—	100	μA

*1 Rating for single chip (die) operation.
*2 Measured by EG&G Model 550 (Radiometer/Photometer) after 20 ms drive (Tolerance: ±15%)
*3 Measured by Otsuka Electronics Model MCPD-2000 after 20 ms drive (Tolerance: x, y: ±0.02). All chips (die) operating.
*4 See Luminosity Rank table on page 6.
*5 See Chromaticity Rank table on page 6.

■ Derating Curves

Fig. 1 Forward Current vs. Case Temperature

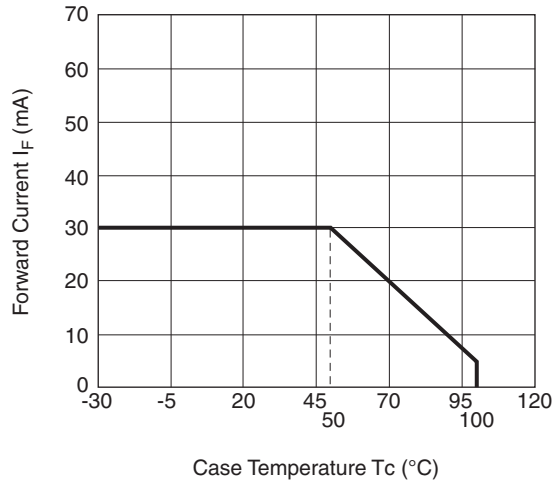

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Fig. 2 Peak Pulsed Forward Current vs. Duty Ratio

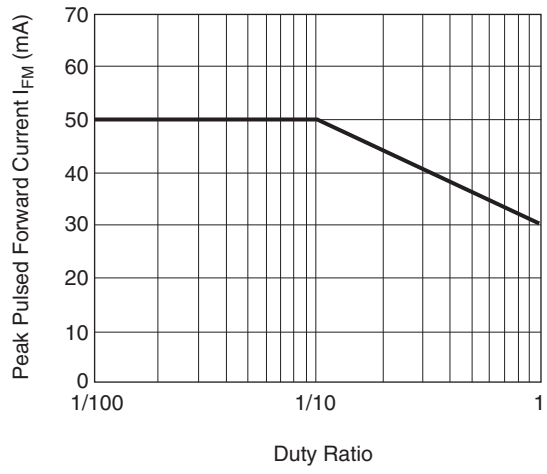

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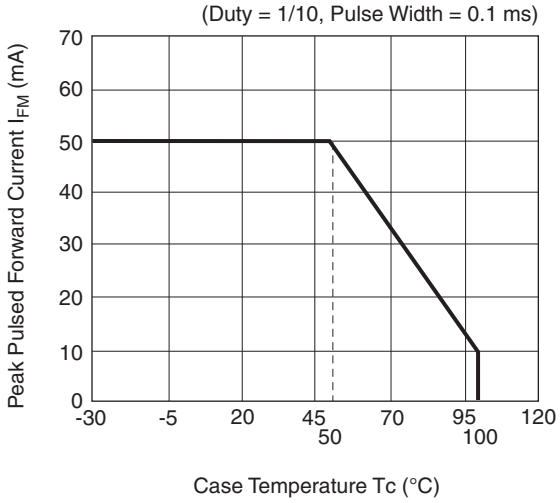
Fig. 3 Peak Pulsed Forward Current vs. Case Temperature



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■ Characteristic Diagrams (TYP.)

NOTE: Characteristics data are typical data and so are not guaranteed data.

Fig. 4 Relative Luminous Intensity vs. Forward Current

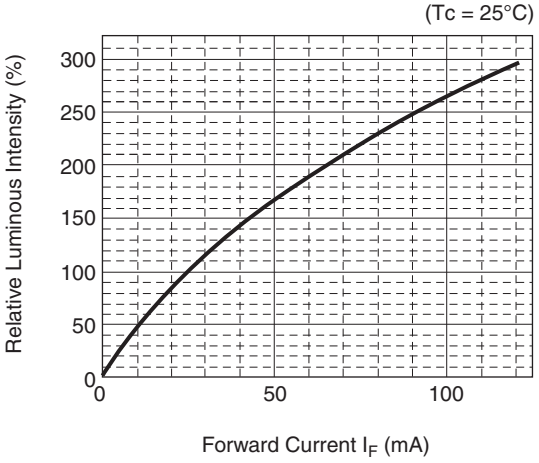

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Fig. 5 Forward Current vs. Forward Voltage

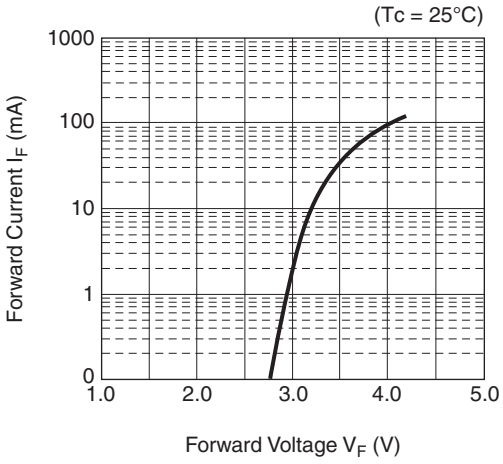

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Fig. 6 Relative Luminous Intensity vs. Case Temperature

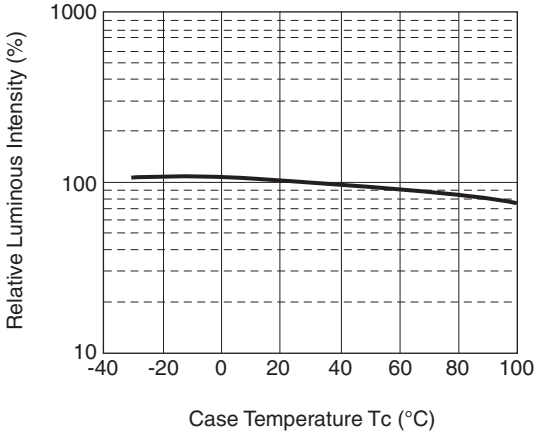

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Fig. 7 Forward Voltage vs. Case Temperature

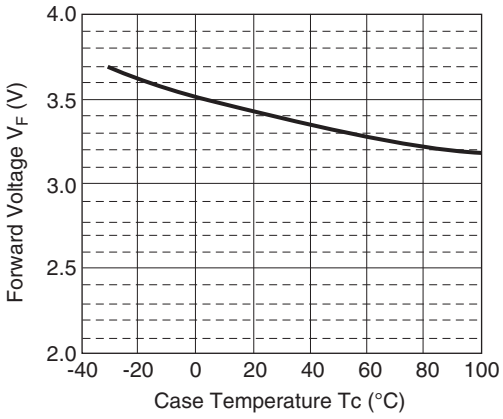

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Fig. 8 Relative Chromaticity vs. Forward Current

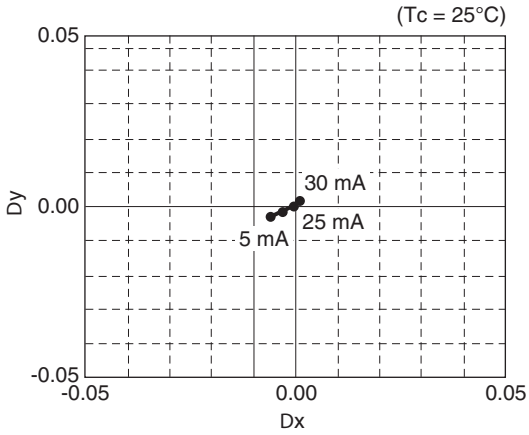

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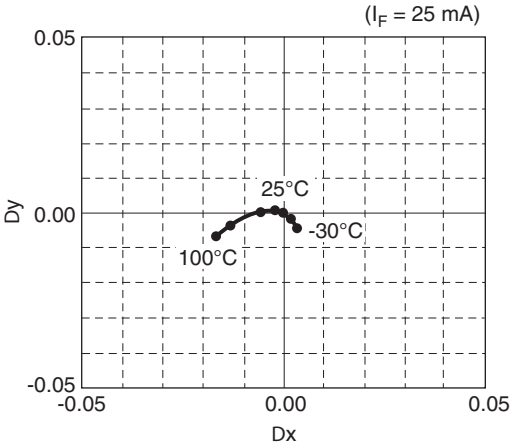
Fig. 9 Relative Chromaticity vs. Case Temperature



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■ Luminous Intensity Rank Table

(Tc = 25°C)

Rank	Range	Unit	Conditions
A	1500 to 3428	mcd	I_F = 25 mA (per chip)
B	2535 to 5795		
C	4284 to 7200		

*1 Quantity of each rank is decided by Sharp.

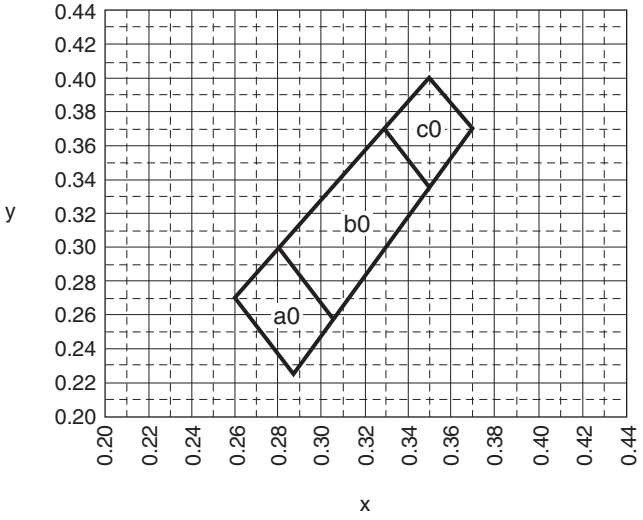
■ Chromaticity Rank Table

(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	0.260	0.270	0.280	0.300	0.305	0.257	0.287	0.225	I_F = 25 mA (per chip)
b0	0.280	0.300	0.329	0.370	0.350	0.335	0.305	0.257	
c0	0.329	0.370	0.350	0.400	0.370	0.370	0.350	0.335	

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

Fig. 10 Chromaticity Diagram



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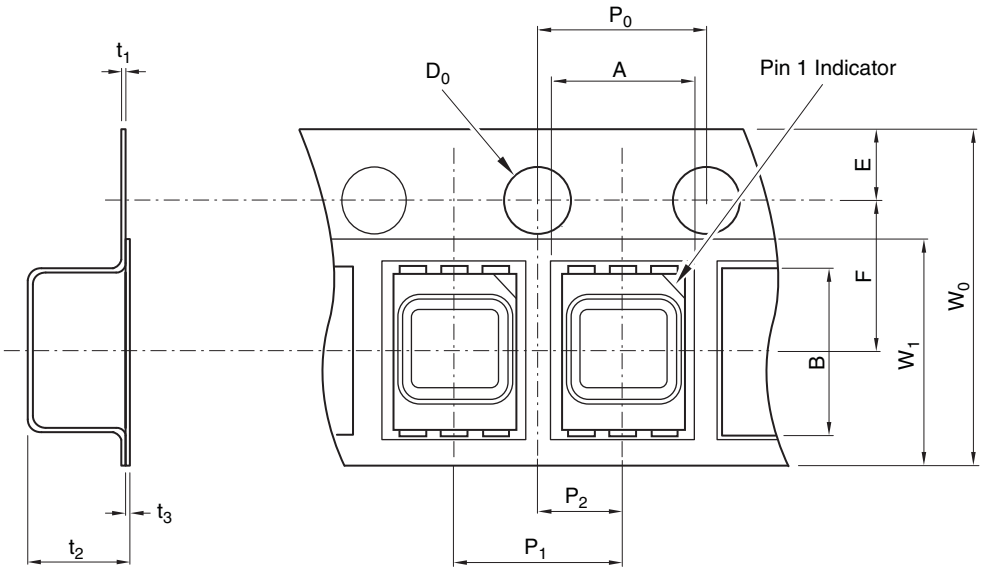
■ Tape Specifications

Fig. 11 Tape Shape and Dimensions



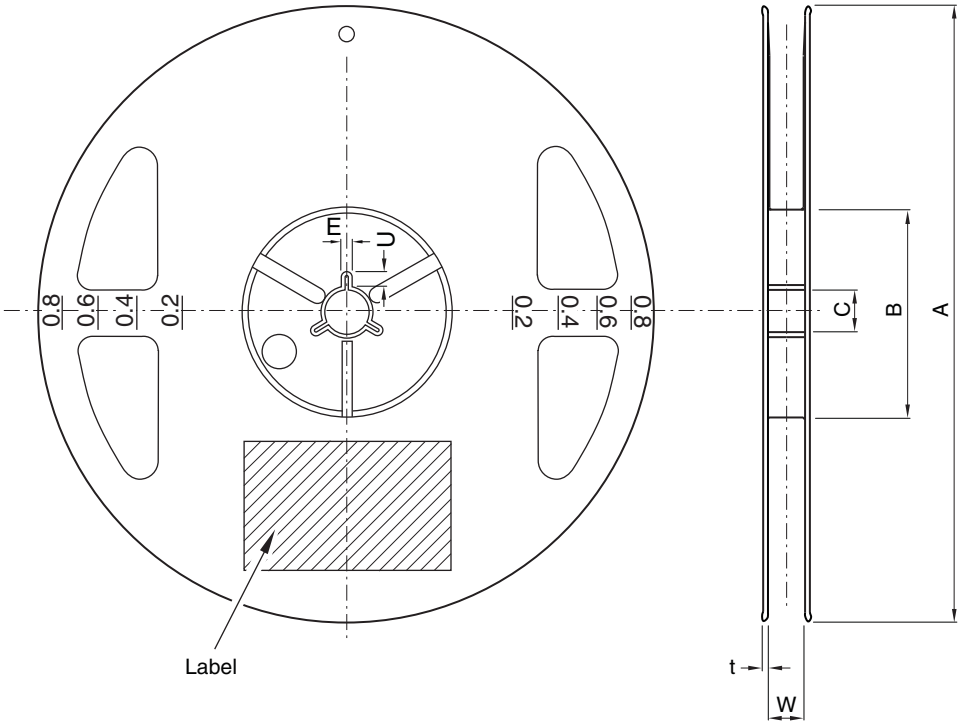
GM5BW94320A-12

■ Tape Dimension Specifications

Parameter		Symbol	Dimension (mm)	Remarks
Embossed pocket	Vertical	A	3.3	Measured at inside bottom square corner
	Horizontal	B	3.85	
	Pitch	P_1	4.0	
Sprocket hole	Diameter	D_0	1.5	
	Pitch	P_0	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
Pocket Position	Vertical	P_2	2.0	Distance between center lines of the concave square hole and round sprocket hole
	Horizontal	F	3.5	
Cover tape	Width	W_1	5.5	
	Thickness	t_3	0.1	
Carrier tape	Width	W_0	8.0	
	Thickness	t_1	0.2	
Overall thickness		t_2	2.05	Includes thickness of cover tape and carrier tape

■ Reel Specifications

Fig. 12 Reel Shape and Dimensions



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■ Reel Dimension Specifications

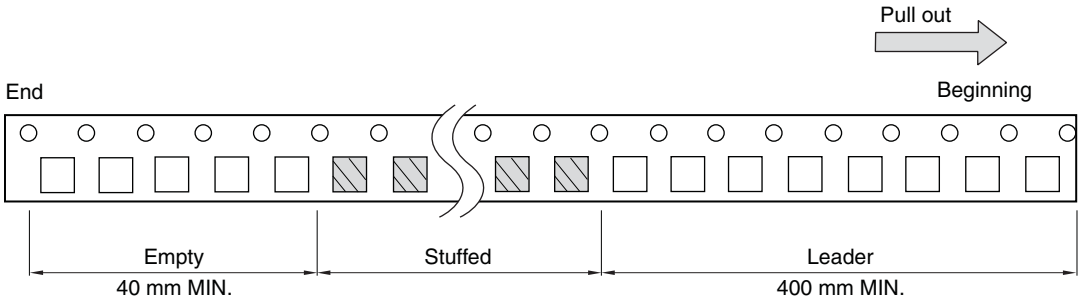
Parameter		Symbol	Dimension (mm)	Remarks
Flange	Diameter	A	180	
	Thickness	t	1.5	
	Flange spacing	W	10	Shaft core dimension
Hub	External diameter	B	60	
	Spindle hole diameter	C	13	
	Key slit width	E	2.0	
	Key slit depth	U	4.5	

*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. 13 Leader Tape



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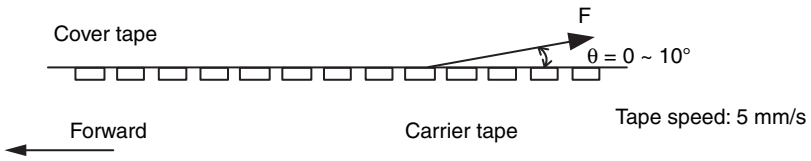
2. Cover tape peel resistance: F = 0.1 to 1.0 N (θ = 10° or less). See Fig. 10.

Fig. 14 Tape Separation



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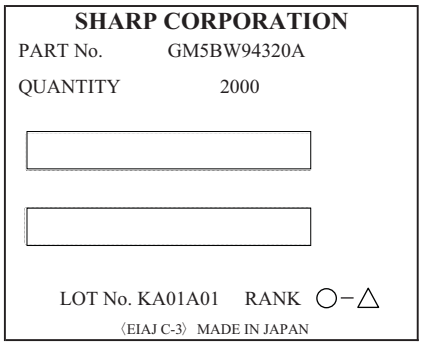
3. Tape bending resistance: Cover tape will remain in place on radii of 30 mm or more. Under 30 mm radii, the cover may separate.
4. Joints are not allowed in the cover tape.
5. Parts are packed with an average quantity of 2000 pieces per reel.
6. Product mass: 30 mg (approximately)
7. Sharp guarantees 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. 15 Label Contents



← Part number
← Quantity
← EIAJ C-3 Bar code
← EIAJ C-3 Bar code
←Indication (example) of lot number and rank
← Indication (example) of production country

LOT Number

KA 01 A 01

① ② ③ ④

RANK ○−△ (Luminosity - Chromaticity)

○: Luminous intensity

△: Chromaticity

① Production plant code (alphabetically)

② Production year (the last two digits of the year)

③ Production month
(indicated alphabetically with January corresponding to A)

④ Production date (01 ~ 31)

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■ Design Notes

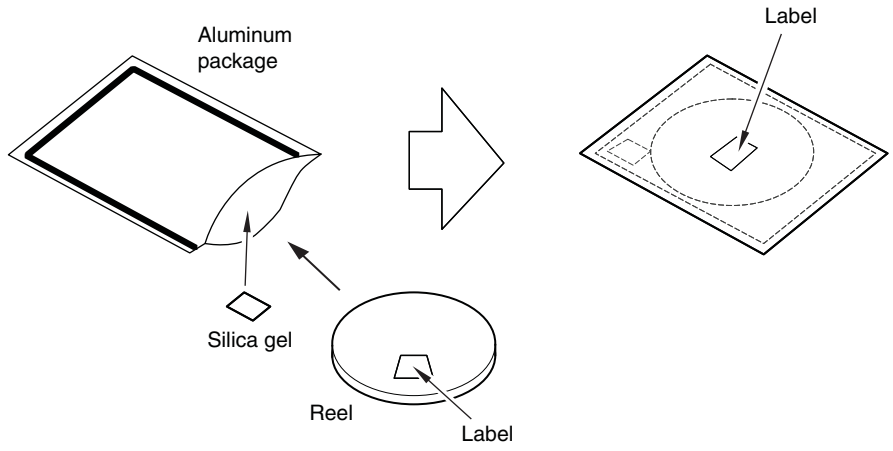
1. Do not allow the circuit design to apply any reverse voltage to the LEDs at any time, operating or not. Do not bias this part in any manner when it is not operating.
2. This part can be easily damaged by external stress. Make sure they are not mechanically stressed during or after assembly.
3. This product uses blue LED chips in combination with yellow phosphor to achieve its color. There may be some slight color change due to afterglow of the phosphor when driving this part with pulsed power.
4. This part has a high light output. Looking directly at it during full power output may cause injury.
5. Sharp recommends taking proper personal and environmental static control precautions when handling this part.
6. 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°C (when the LED is turned on) including self-heating.
7. 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.
8. 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_2S, NH_3, SO_2, NO_X

■ Manufacturing Guidelines

● Storage and Handling

1. Moisture-proofing: These parts are shipped in vacuum-sealed bags to keep them dry and ready for use. See Fig. 16.

Fig. 16 Factory Moisture-proof Packing



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2. Store these parts between 5°C and 30°C, at a relative humidity of less than 70%; for no more than one year from the production date.
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 60°C to 65°C, for 36 to 48 hours.
   - When loose or on a PCB, bake them at a temperature of 100°C to 120°C, for at least 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.

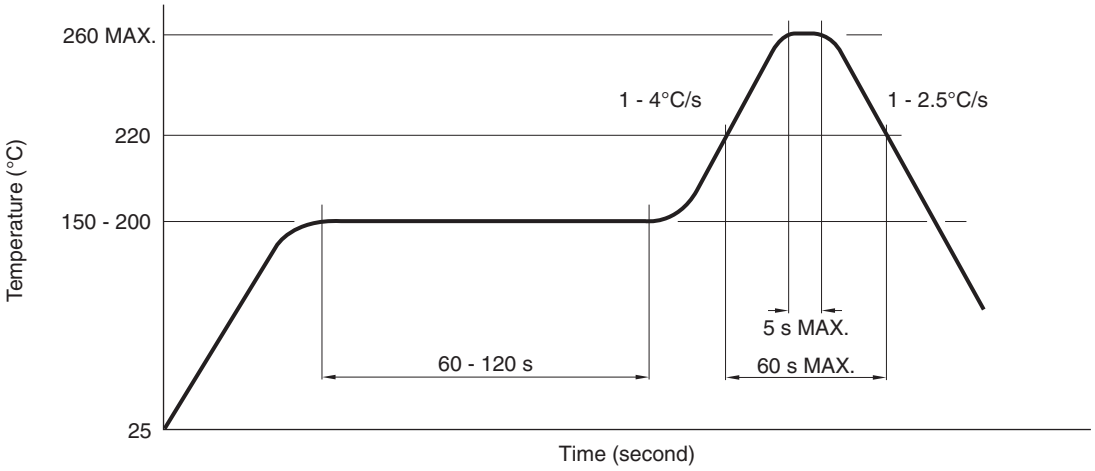
● Cleaning Instructions

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. 17.
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. 17 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. 17 Temperature Profile



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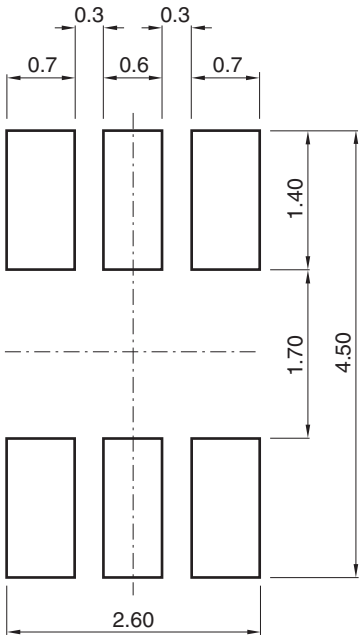
● Recommended Solder Pad Design

1. Solderability depends on reflow conditions, solder paste, and circuit board materials. Check the entire process before production commences.
2. Fig. 18 shows the recommended solder pad design 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. 18 Recommended Solder Pad Design



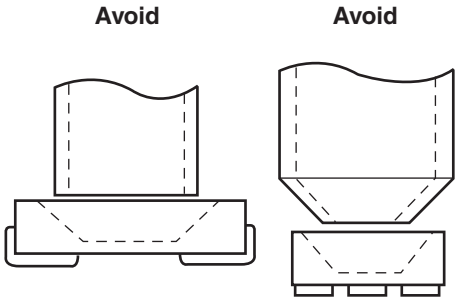
NOTE: Units: mm

GM5BW94320A-20

● Pick and Place Recommendations

1. Please see Fig. 19 for general pick and place nozzle recomendations for installing this part.

Fig. 19 Recommended Nozzle



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2. Picking errors can occur based on the machine's setup, so Sharp recommends verification with the machine in actual use.
3. Do not allow the pick and place machine to contact the sealing resin in this part. If mechanical stress is placed on the sealing resin, such forces can cause the resin to fail, or cause bonding wires within the part to break.

■ 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, and 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 reliabilty such as:
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--- Traffic signals
--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

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