

# SHARP

SPEC. No. DG-076015

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REFERENCE

ELECTRONIC COMPONENTS GROUP

SHARP CORPORATION

## SPECIFICATION

DEVICE SPECIFICATION FOR  
LIGHT EMITTING DIODE

MODEL No.

### GM4BW64330A

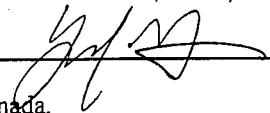
CUSTOMERS' APPROVAL

Date \_\_\_\_\_

By \_\_\_\_\_

PRESENTED

Date June 26, 2007

By 

Y. Inada,  
Department General Manager  
A1249 Project Team  
Electronic Components Group  
SHARP CORPORATION

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PRODUCT NAME Light Emitting Diode  
MODEL No. GM4BW64330A

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2. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets, as well as the precautions mentioned below. Sharp assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets, and the precautions mentioned below.

(Precautions)

- (1) This products is designed for use in the following application areas;
  - \* OA equipment \* Audio visual equipment \* Home appliance
  - \* Telecommunication equipment (Terminal) \* Measuring equipment
  - \* Tooling machines \* Computers

If the use of the product in the above application areas is for equipment listed in paragraphs (2) or (3), please be sure to observe the precautions given in those respective paragraphs.

- (2) Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when this product is used for equipment which demands high reliability and safety in function and precision, such as ;

- \* Transportation control and safety equipment (aircraft, train, automobile etc.)
- \* Traffic signals \* Gas leakage sensor breakers \* Rescue and security equipment
- \* Other safety equipment

- (3) Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;

- \* Space equipment \* Telecommunication equipment (for trunk lines)
- \* Nuclear power control equipment \* Medical equipment

- (4) Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above three paragraphs.

3. Please contact and consult with a Sharp sales representative for any questions about this product.

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### GM4BW64330A specification

#### 1. Application

This specification applies to the light emitting diode device Model No. GM4BW64330A  
[White (from InGaN Blue LED chip + Yellow Phosphor) LED device]

2. External dimensions and equivalent circuit ----- Refer to the attached sheet Page 3.

3. Ratings and characteristics ----- Refer to the attached sheet Page 4. ~ 6.

- 3-1. Absolute maximum ratings
- 3-2. Electro-optical characteristics
- 3-3. Derating Curve
- 3-4. Characteristics Diagram

4. Reliability ----- Refer to the attached sheet Page 7.

- 4-1. Test items and test conditions
- 4-2. Failure criteria

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- 5-1. Applied standard : ISO 2859-1
- 5-2. Sampling inspection
- 5-3. Inspection items and defect criteria

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- 6-1. Taping
- 6-2. Packing specification
- 6-3. Label
- 6-4. Luminous intensity rank table
- 6-5. Chromaticity rank table
- 6-6. Information on environmental impact substances

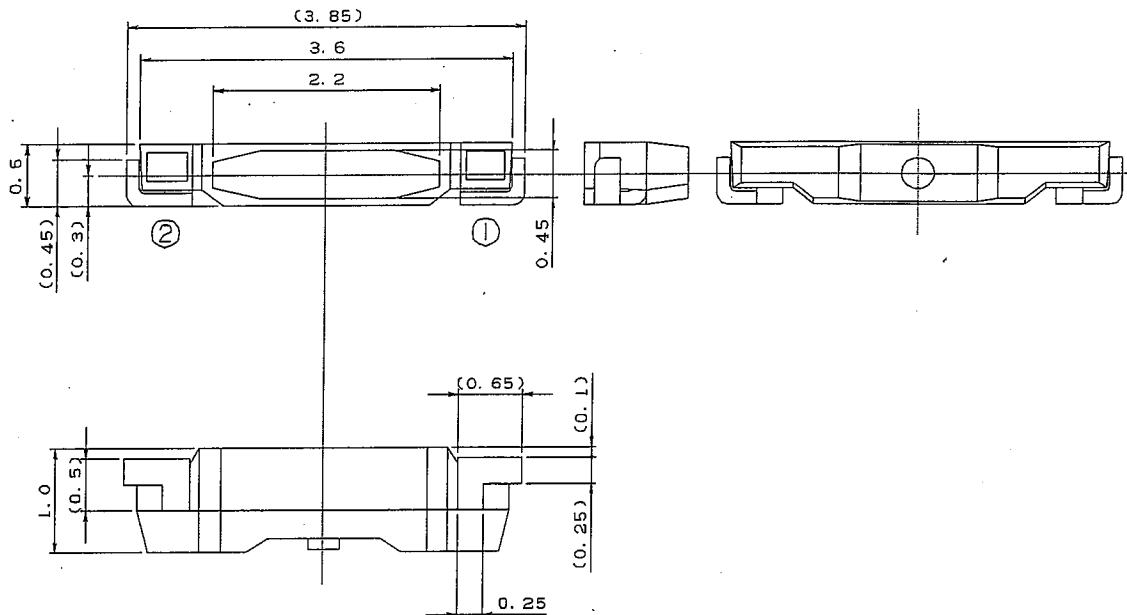
7. Precautions ----- Refer to the attached sheet Page 13. ~ 14.

- 7-1. Precautions matters for designing circuit
- 7-2. Soldering
- 7-3. Cleaning method

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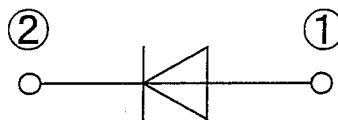
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2. External dimensions and equivalent circuit



1. Pin Connection

①	Anode
②	Cathode



2. Tolerance : ±0.1mm

\* ( ) is reference.

unit	Material	Finish	Drawing No.
mm	Frame: Copper alloy Package: Nylon + Silicone resin	Ag plate	51906015

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## 3. Ratings and characteristics

## 3-1. Absolute maximum ratings

(Ta=25°C) (\*3)

Parameter	Symbol	Rating	Unit
Power dissipation	P	123	mW
Forward current	I <sub>F</sub>	35	mA
Peak pulsed forward current(*1)	I <sub>FM</sub>	80	mA
Forward current derating factor	DC	-0.58	mA/°C
	Pulse	-1.07	mA/°C
Reverse voltage	V <sub>R</sub>	5	V
Operating temperature(*3)	T <sub>opr</sub>	-30 to +85	°C
Storage temperature	T <sub>stg</sub>	-40 to +100	°C
Soldering temperature (*2)	T <sub>sol</sub>	260	°C

(\*1) Duty ratio = 1/10, Pulse width = 0.1msec

(\*2) For reflow soldering (Max.10s)

Refer to "7-2.Soldering" for the condition in the hand solder.

(\*3) Ta and Topr mean atmospheric temperature near surface of the device when the device does not operate.

## 3-2. Electro-optical characteristics

(Ta=25°C)

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Forward Voltage	V <sub>F</sub>		-	3.2	3.5	V
Luminous intensity(*4)	I <sub>V</sub>	I <sub>F</sub> =20 mA	1600	(2000)	2200	mcd
Chromaticity coordinates(*5)	x		-	(0.30)	-	-
	y		-	(0.29)	-	-
Reverse Current	I <sub>R</sub>	V <sub>R</sub> =4V	-	-	50	μA

(\*4) Measured by EG&amp;G MODEL550(Radiometer/Photometersystem)

(Measurement accuracy : ±10%)

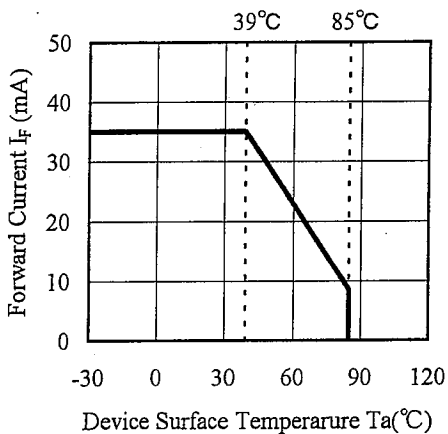
(\*5) Measured by Ohtsuka electronics MODEL MCPD-2000

(Measurement accuracy : x,y:±0.01)

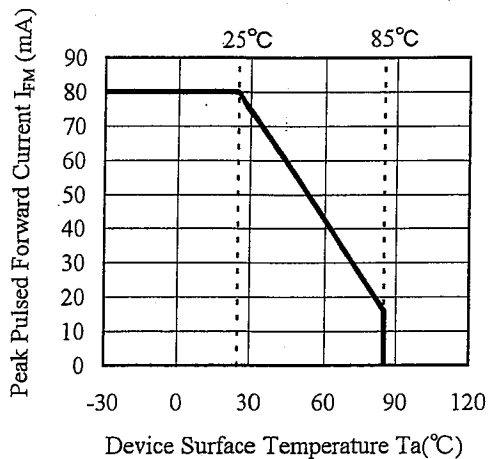
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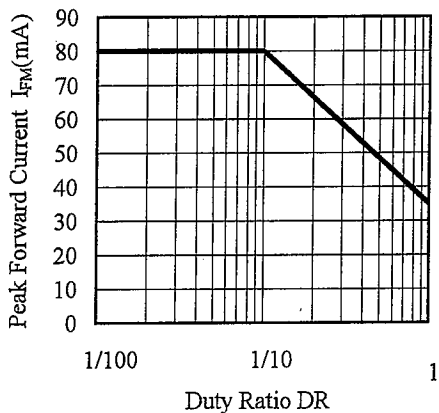
3-3. Derating Curve



Forward Current Derating Curve



Peak Pulsed Forward Current Derating Curve



Peak Pulsed Forward Current vs Duty Ratio ( $T_a=25^\circ\text{C}$ )

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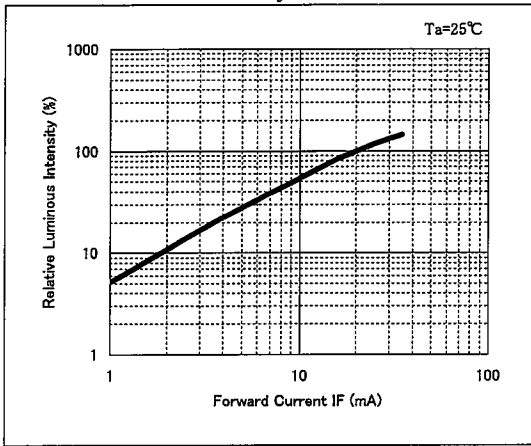
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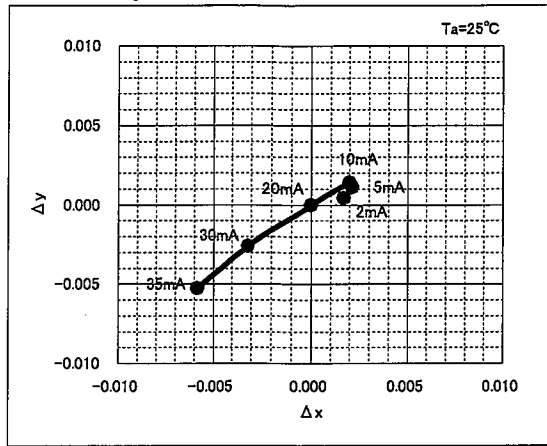


3-4. Characteristics Diagram (\*1)

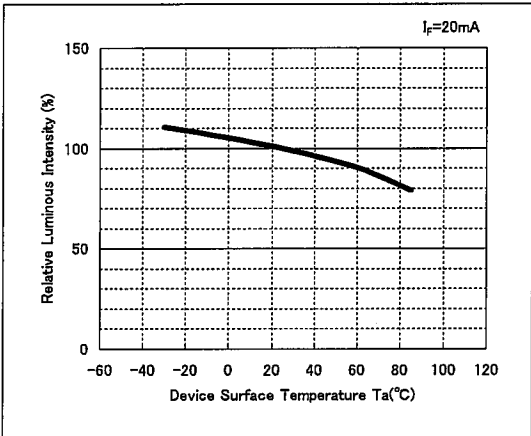
Relative Luminous Intensity vs. Forward Current



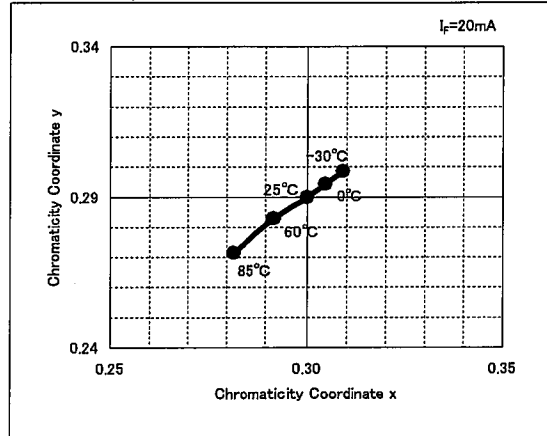
Chromaticity Coordinate vs. Forward Current



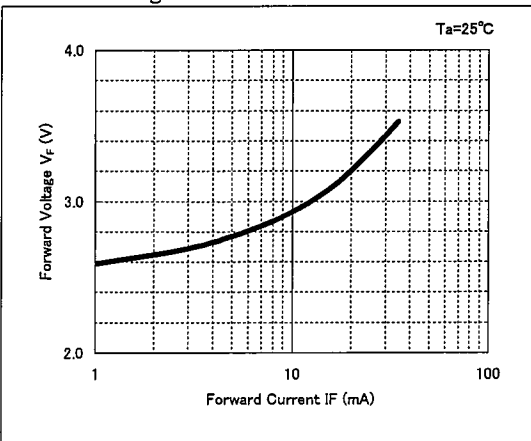
Relative Luminous Intensity vs. Device Surface Temperature



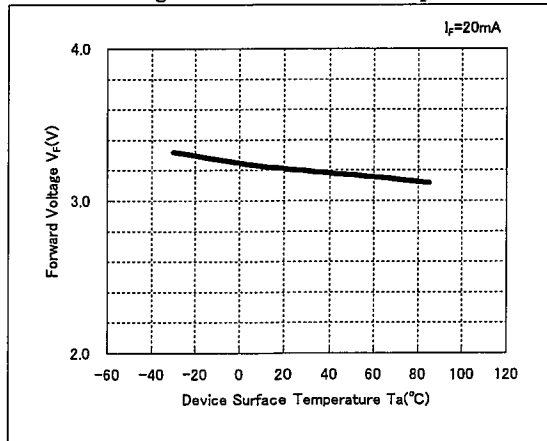
Chromaticity Coordinate vs. Device Surface Temperature



Forward Voltage vs. Forward Current



Forward Voltage vs. Device Surface Temperature



(\*1) Above characteristics data are typical data and not a guaranteed data

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4. Reliability

The reliability of products shall satisfied with items listed below.

4-1. Test items and test conditions

Confidence level: 90%

No.	Test items	Test conditions	Samples n	Defective C	LTPD (%)
1	Temperature cycle	-40 °C(30 min)~+100 °C(30 min), 100 times	22	0	10
2	Temperature humidity storage	Ta=+60°C, RH=90%, t=1000h	22	0	10
3	High temperature storage	Ta= +100°C, t=1000h	22	0	10
4	Low temperature storage	Ta= -40 °C, t=1000h	22	0	10
5	Steady state operating life Condition 1	Ta=+25 °C, I <sub>F</sub> =20 mA, t=1000h	22	0	10
6	Steady state operating life Condition 2	Ta=+25 °C, I <sub>F</sub> =35 mA, t=500h	22	0	10
7	Steady state operating life of high temperature	Ta= +85°C, I <sub>F</sub> =8.5 mA, t=1000h	22	0	10
8	Steady state operating life of high humidity temperature	Ta=+60°C, RH=90%, I <sub>F</sub> =23 mA, t=500h	22	0	10
9	Steady state operating life of low temperature	Ta=-30°C, I <sub>F</sub> =20 mA, t=1000h	22	0	10
10	Shock	15000 m/s <sup>2</sup> , 0.5 ms ±X·±Y·±Z direction, 3 times	11	0	20
11	Vibration	200 m/s <sup>2</sup> , 100~2 000~100 Hz / sweep for 4 min. X·Y·Z direction, 4 times	11	0	20
12	Resistance to soldering heat	Refer to the attached sheet, Page 13. , 2 times	11	0	20
13	Solderability (Dip Method)	240±5°C, 5±1s (Solder/Flux : M705/ESR250 (SENJU METAL INDUSTRY))	11	0	20

4-2. Failure criteria (\*1 , 4 - 1. No.1~9)

(Ta=25°C)

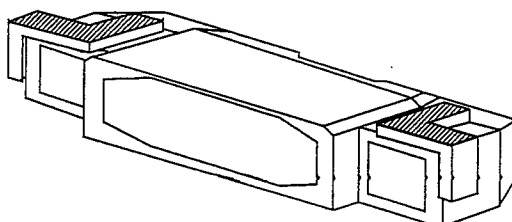
No.	Parameter	Symbol	Condition	Failure criteria (*2)
1	Forward voltage	V <sub>F</sub>	I <sub>F</sub> =20 mA	V <sub>F</sub> > U.S.L × 1.2
2	Reverse current	I <sub>R</sub>	V <sub>R</sub> =4 V	I <sub>R</sub> > U.S.L × 2.0
3	Luminous intensity	I <sub>V</sub>	I <sub>F</sub> =20 mA	I <sub>v</sub> < Initial value × 0.5, I <sub>v</sub> > Initial value × 2.0

\*1 : Measuring condition accord with the specification.

\*2 : U.S.L. stands Upper Specification Limit.

• Solderability (4 - 1.No.13)

Solder shall be adhere at the electrode area of 90% or more after dipping.



( It is the same as the anode and the cathode. )



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## 5. Quality level

5-1. Applied standard : ISO 2859-1

## 5-2. Sampling inspection

A single normal sampling inspection, level S-4.

## 5-3. Inspection items and defect criteria

No.	Inspection items	Defect criteria	Classification	AQL
1	No radiation	No light emission	Major defect	0.1%
2	Taping	Not conforming to the inserted direction shown in the specifications		
3	Electro-optical characteristics	Not conforming to the specification (Forward voltage, Reverse current, Luminous intensity)	Minor defect	0.4%
4	External dimensions	Not conforming to the specification (vertical size, horizontal size and thickness)		
5	Appearance	<ul style="list-style-type: none"> <li>•Dust and scratch on emission area (obstacle to emission)</li> <li>•Resin burr over the tolerance of out line dimensions</li> <li>•Chipping of resin and electrode : 0.3mm or more</li> </ul>		

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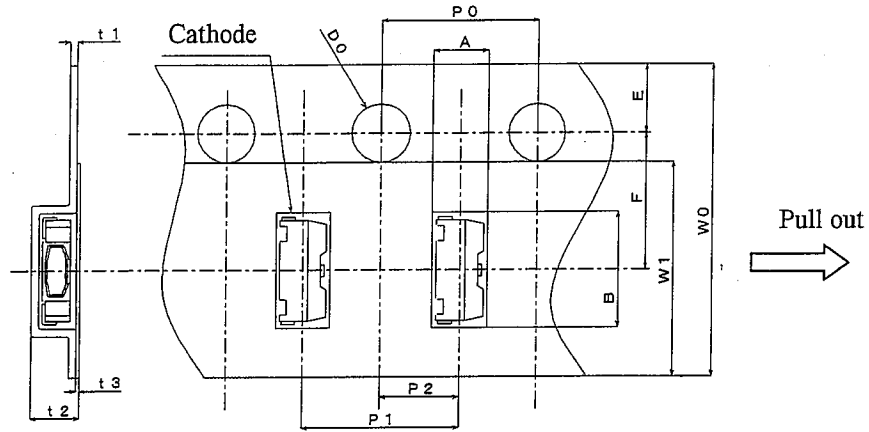
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6. Supplements

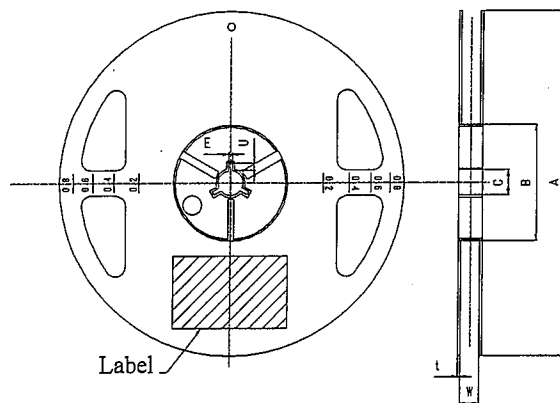
6-1. Taping

6-1-1. Shape and dimension of tape (Ref.)



Parameters	Symbols	Dimensions [mm](Typ.)	Remarks
Concave square hole for part insertion	Vertical	A	1.2
	Horizontal	B	4.0
	pitch	P <sub>1</sub>	4.0
Round sprocket hole	Diameter	D <sub>0</sub>	1.5
	Pitch	P <sub>0</sub>	4.0
	Position	E	1.75
Center to center dimension	Vert.dir.	P <sub>2</sub>	2.0
	Hori.dir.	F	5.5
Cover tape	Width	W <sub>1</sub>	9.5
	Thickness	t <sub>3</sub>	0.1
Carrier tape	Width	W <sub>0</sub>	12.0
	Thickness	t <sub>1</sub>	0.3
Thickness of the entire unit	t <sub>2</sub>	1.10	With cover tape and carrier tape combined

6-1-2. Shape and dimension of reel (Ref.)



Parameters	Symbols	Dimensions [mm](Typ.)	Remarks	
Flange	Diameter	A	φ180	
	Thickness	t	1.1	
	Inner space direction	W	13	
Hub	External diameter	B	φ60	
	Spindle hole diameter	C	φ13	
	Key slit	Width	E	2.0
		Depth	U	4.5

Notation for part name etc. Labelling on one side of flange. (part name, quantity, lot No.)

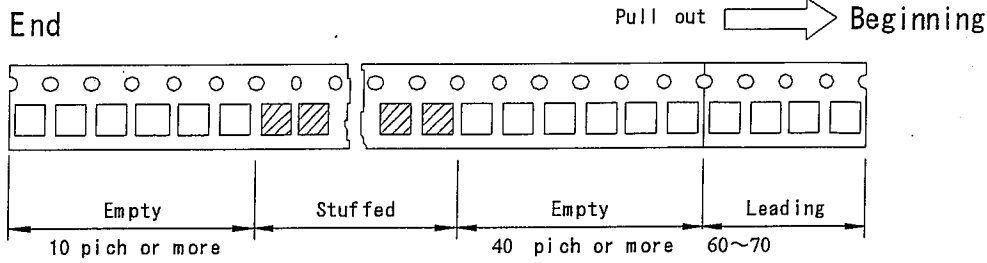
※Material : Reel...Polystyrene

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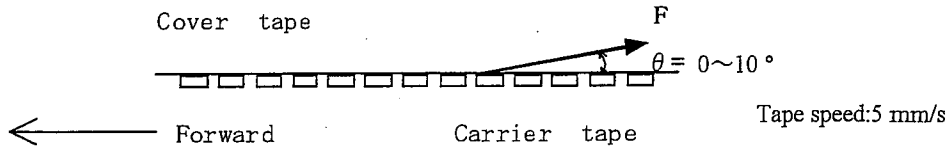
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6-1-3. Taping specification

(1) Lead tape : Conformity standard JIS C0806



(2) Cover tape strength against peeling:  $F=0.1\sim0.8$  N ( $\theta=10^\circ$  or less)



(3) Tape strength against bending:

The radius of bending circle should be 30 mm or more.  
If it is less than 30 mm, the cover may peel.

(4) Jointing of tape: There should not be joint of cover tape or carrier tape.

(5) Quantity per reel: Average 5,000 pcs. per reel

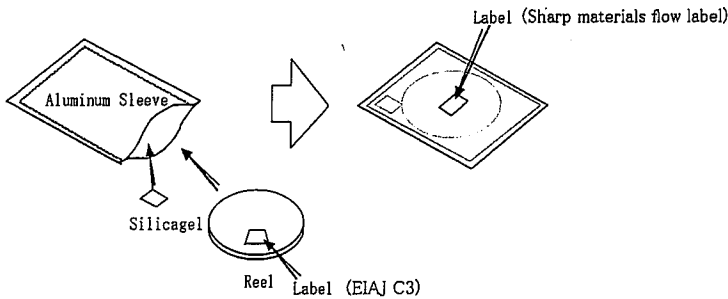
(6) Product weight: Approx. 4.0 mg

- (7) Others:
- ① There should not be missing above continuous two products.
  - ② The laking quantity of the products should be less than 0.1% of total product quantity.
  - ③ Products should be easily taken out.

6-2. Packing specification

< Moisture proof package >

In order to avoid the absorption of humidity in transport and storage, the devices are packed in aluminum moisture proof package.



6-2-1. Strage conditions

Temperature : 5 to 30°C Humidity : less than 60%RH (Please use within 1-year.)  
Storage with a closed top container with the desiccant is recommended.

6-2-2. Treatment after opening

(1) The LEDs should be kept at 30°C or less and 60%RH or less. The LEDs should be soldered within 72 hours (3days) after opening package.

\*Make contact separately when it wants to make a change in a character by reflow soldering small very much.

(2) In case the devices are not used for a long time after opening ,the storage in dry box is recommendable. Or it is better to repack the devices with a desiccative by the sealer and put them in the some storage conditions as 6-2-1.

(3) If unused term is exceeded the storage time, baking treatment should be performed.

\*Baking treatment :

① In taping : 60°C to 65°C, 36 to 48 hours

② In loose end : Temperature:100°C to 120°C ,Time:2 to 3 hours (on PWB or metallic tray)

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6-3. Label

<b>SHARP CORPORATION</b>	
PART No. GM4BW64330A	← Model number
QUANTITY 5000	← Quantity of products
<div style="border: 1px dashed black; width: 100px; height: 20px;"></div>	← EIAJ C-3 Bar code
<div style="border: 1px dashed black; width: 100px; height: 20px;"></div>	← EIAJ C-3 Bar code
LOT No. MI01A01 RANK 20e1	← Lot number / Rank
(EIAJ C-3) MADE IN PHILIPPINES	← Production country

- Lot Number
- |  |   |
|--|---|
| <u>M</u> <u>I</u> <u>0</u> <u>1</u> <u>A</u> <u>0</u> <u>1</u> | ① Production plant code (to be indicated alphabetically)    |
| ① ② ③ ④ ⑤  | ② Production lot (single or double figures)                 |
|  | ③ Year of production (the last two figures of the year)     |
|  | ④ Month of production                                       |
|  | (to be indicated alphabetically with January corresponding) |
|  | ⑤ Date of production (01~31)                                |

- Rank
- |                     |                           |
|---------------------|---------------------------|
| <u>20</u> <u>e1</u> | ① Luminous intensity rank |
| ① ②                 | ② Chromaticity rank       |

6-4. Luminous intensity rank table (\*1)

Rank	Luminous Intensity			Unit
16	1600	~	1700	mcd
17	1700	~	1800	
18	1800	~	1900	
19	1900	~	2000	
20	2000	~	2100	
21	2100	~	2200	

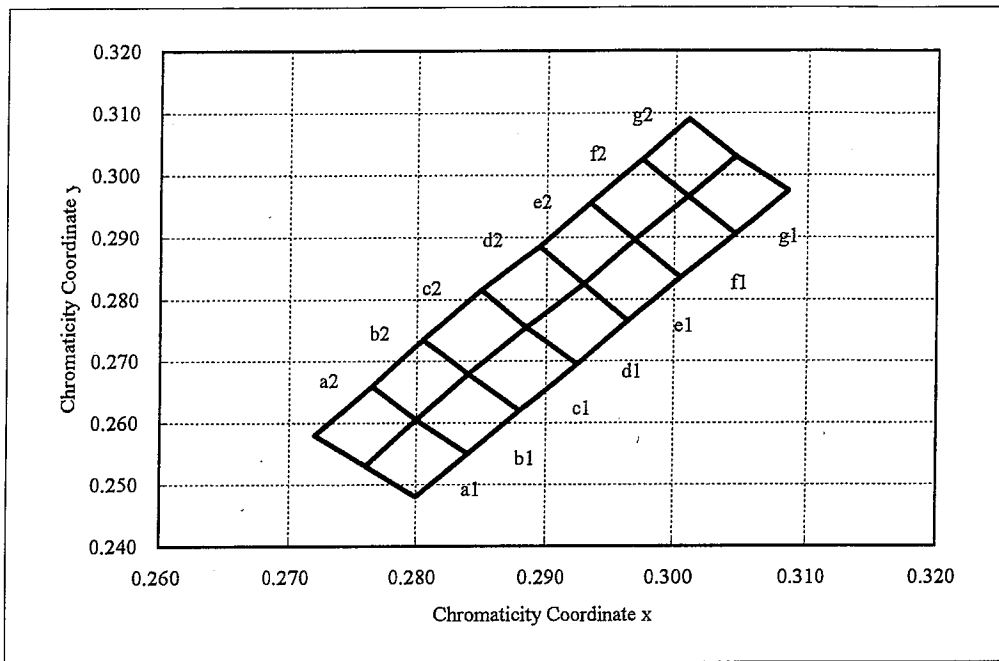
( $I_F=20mA$ ,  $T_a=25^\circ C$ )

(\*1) The quantity-ratio of the ranks are decided by Sharp. (measurement accuracy :  $\pm 10\%$ )  
 The delivery ratio of each rank isn't decided to be asked to it.

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6-5. Chromaticity rank table (\*2)



( $I_F=20mA, T_a=25^{\circ}C$ )

Rank	Point 1		Point 2		Point 3		Point 4	
	x	y	x	y	x	y	x	y
a1	0.2800	0.2480	0.2760	0.2530	0.2800	0.2605	0.2840	0.2550
a2	0.2760	0.2530	0.2720	0.2580	0.2765	0.2660	0.2800	0.2605
b1	0.2840	0.2550	0.2800	0.2605	0.2840	0.2680	0.2880	0.2620
b2	0.2800	0.2605	0.2765	0.2660	0.2805	0.2735	0.2840	0.2680
c1	0.2880	0.2620	0.2840	0.2680	0.2885	0.2755	0.2925	0.2695
c2	0.2840	0.2680	0.2805	0.2735	0.2850	0.2815	0.2885	0.2755
d1	0.2925	0.2695	0.2885	0.2755	0.2930	0.2825	0.2965	0.2765
d2	0.2885	0.2755	0.2850	0.2815	0.2895	0.2885	0.2930	0.2825
e1	0.2965	0.2765	0.2930	0.2825	0.2970	0.2895	0.3005	0.2835
e2	0.2930	0.2825	0.2895	0.2885	0.2935	0.2955	0.2970	0.2895
f1	0.3005	0.2835	0.2970	0.2895	0.3010	0.2965	0.3045	0.2905
f2	0.2970	0.2895	0.2935	0.2955	0.2975	0.3025	0.3010	0.2965
g1	0.3045	0.2905	0.3010	0.2965	0.3045	0.3030	0.3085	0.2975
g2	0.3010	0.2965	0.2975	0.3025	0.3010	0.3090	0.3045	0.3030

(\*2) The quantity-ratio of the ranks are decided by Sharp.(measurement accuracy :  $\pm 0.01$ )

6-6. Information on environmental impact substances

6-6-1. Ozone Depleting Substances

- (1) This product doesn't contain the following Ozone Depleting Substances.
- (2) This product doesn't have a production line whose process requires the following Ozone Depleting Substances.

Restricted substances : CFCs,halones,  $CCl_4$ , 1-1-1 Trichloroethane(Methylchloroform)

6-6-2. Brominated Flame Retardants

This product doesn't contain Brominated Flame Retardants(PBBOs,PBBs).

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## 7. Precautions

## 7-1. Precautions matters for designing circuit

- When designing a circuit, please make sure that not to give a reverse voltage to the LED.
- There is a case that LED to be damaged with external stresses since the devices very small. Please make sure that not to give any hard shock to the LED.
- Blue chip LED and fluorescent materials are used as luminescent materials. Please note there is possibility to have color change in some degree depended on applied current.
- Please note there is possibility to damage your eyes when person look LED in face for long time.
- During processing, mechanical stress on the surface should be minimized as much as possible. Sharp objects of all types should not be used to pierce the sealing compound.
- When populating boards in SMT production, there are basically no restrictions regarding the form of the pick and place nozzle, except that mechanical pressure on the surface of the resin must be prevented.
- Static electricity or surge voltage damages the LEDs. It is recommended that a wrist band or anti-electrostatic glove be used when handling the LEDs. All devices, equipment and machinery must be grounded.
- The LED doesn't be considered using in the following special environment. Please use the LED after confirming the performance and reliability, before using in the following special environment.
  - (1) Using in place where a lot of moisture, dew, sea breezes, and causticity gases (Cl, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>x</sub>, etc.) exist.
  - (2) Using in direct sunshine, out-of-door exposure, and dust.
  - (3) Using in atmosphere such as water, oil, chemical solutions, and organic solvents.
  - (4) Using in environment with strong static electricity and electromagnetic radiation.
  - (5) Using the LED near the heat parts or arranging the combustibles near the LED.

## 7-2. Soldering

- The LEDs can be soldered in place using the reflow soldering method once and twice. Please avoid assemble using the dip soldering method. Occasionally there is a brightness decrease caused by the influence of heat or ambient atmosphere during air reflow. It is recommended that the User use the nitorogen reflow method.

## 7-2-1. Reflow soldering

- (1) It is not recommended to exceed the soldering temperature and time shown below. Caused by substrate bend or the other mechanical stress during reflow soldering may happen gold wire disconnection etc. Therefore please check and study your solder reflow machine's best condition.
- (2) In case of 2 times reflow process, 2nd reflow process should be done within 3 days after opening package. (Strage condition ; at 30°C, RH less than 60%RH) (Dry box storage is recommended in the space to reflow soldering.)
- (3) LED electrode and leadframe are comprised of a silver plated copper alloy. The silver surface may be attacked by environments which contain corrosive gases and so on. Please avoid conditions which may cause the LED to corrode, tarnish or discolor. This corrosion or discoloration might lower solderability or might affect on optical characteristics.
- (4) Reflow soldering temperature profile
  - Use the conditions shown to the under figure.
  - ※After reflow soldering, rapid cooling should be avoided.

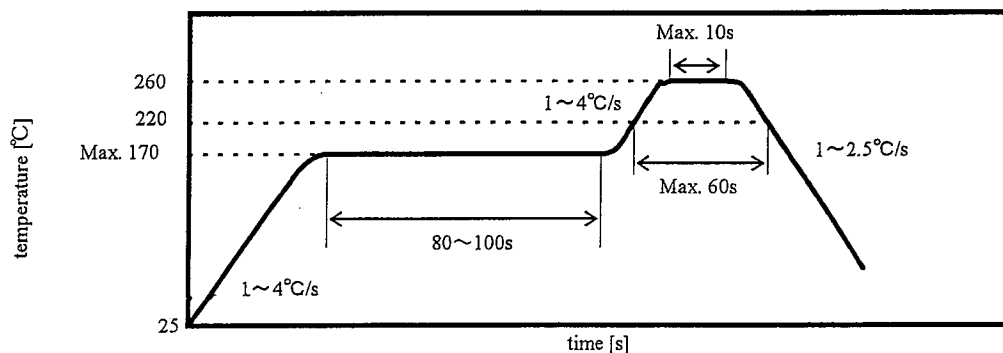


Fig. Reflow soldering temperature profile

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## (5) The cautions at the time of re-reflow process

Please setup reflow process fundamentally to complete at once.

When you perform the second round reflow soldering reluctantly, please carry out promptly after completing the 1st time.

## (6) The reverse side dip soldering process of the substrate after reflow soldering

In case of dip soldering process of reverse side to reflow soldering side for designing, the reverse side dipping first, and reflow soldering after, to reduce mechanical stress caused by dip soldering heat or substrate bend.

## 7-2-2. Hand soldering (with soldering iron)

Please proceed to use soldering iron within 290°C max / 3sec.

In case if you proceed within 1 hour taking out from Aluminum Package, and not touching to the terminals of the Device(Operation at ; under 30degree/60%RH or less) , it is usable under 350°C max. / 3sec. as the option.

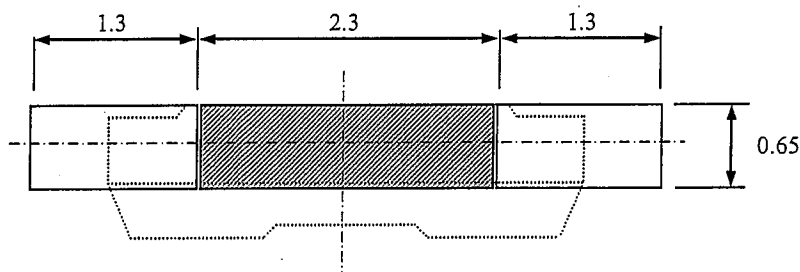
※ In case over 1hour after opening the Aluminum package, we recommend to proceed baking treatment before the use.

## 7-2-3. Recommended solder pattern


Recommend 0.1 mm to 0.2 mm thickness metal mask for screen print.

Caused by solder reflow condition, solder paste, substrate and the other material etc., may change solderbility.

Please check and study actual solderbility before usage.



Unit : mm

 Please do not establish salients such as a pattern, silk printing in the product resin lower part. A soldering-related fall may occurs.

## 7-3. Cleaning method

Use no-clean solder and do not clean because solvent may dissolve the package and the resin.

And do not clean the LED's by the ultrasonic.