SHARP

SPEC. No. DG-

ISSUE Jan-21-08

ELECTRONIC COMPONENTS GROUP

SHARP CORPORATION

# SPECIFICATION

DEVICE SPECIFICATION FOR

## LIGHT EMITTING DIODE MODULE

MODEL No. GW5□□C15L02

Specified for

□ □ depends on the emission of light color.

| | | |
|---|---|---|
| Normal white | : | GW5BWC15L02 |
| Lamp | : | GW5BDC15L02 |
| Hi color rendering | : | GW5BNC15L02 (5000K) |
| | : | GW5BNC15L12 (6500K) |

Reference

CUSTOMERS' APPROVAL

Date

By

PRESENTED

Date

By

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

※ This specification is reference.

PRODUCT NAME Light Emitting Diode Module

MODEL No. GW5□□C15L02

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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. Manufacturing method or materials of this product which does not influence on its specifications are subject to change without notice.
4. Please contact and consult with a Sharp sales representative for any questions about this product.

※ This specification is reference.

# GW5□□C15L00 specification

1. Application

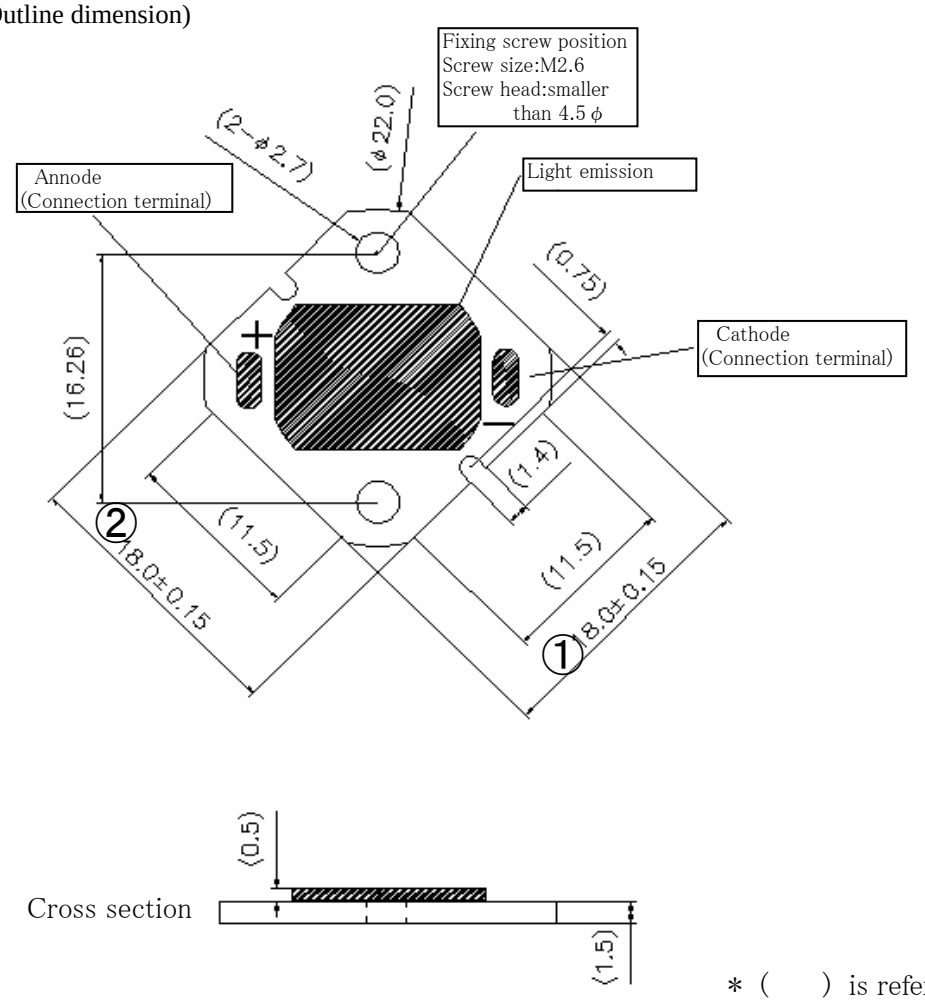
This specification applies to the light emitting diode module Model No. GW5□□C15L00
[White (from InGaN Blue LED chip + Phosphor) LED module]
Main use : Illumination



※ This specification is reference.

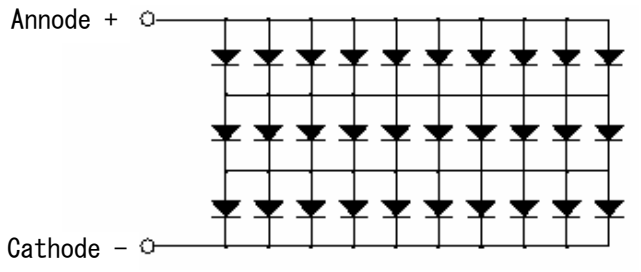
2. Outline dimensions and terminal connections

(Outline dimension)




＊（　　）is reference.

(Internal circuit diagram)




"3series × 10parallel=30 pcs of LED"
(3 serially connected LED compose a block.10 blocks are parallelly connected)

※ This specification is reference.

| unit | Material | Finish | Drawing No. |
| --- | --- | --- | --- |
| mm | Substrate: Alumina ceramic | Connection terminal: Au plating | 51908003 |

3. Ratings and characteristics

3-1. Absolute maximum ratings

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Power dissipation *1 | P | 4.4 | W |
| Forward current *1 | $I_F$ | 400 | mA |
| Reverse Voltage | $V_R$ | −5 | V |
| Operating temperature *2 | Topr | −30～+90 *3 | ℃ |
| Storage temperature | Tstg | −40～+100℃ | ℃ |

*1 Power dissipation and forward current are the value when the module temperature is set lower than the rating by using an adequate heat sink.

*2 Operating temperature is fixed to the temperature of module's external part. (Not an ambient temperture)

*3 The derating curve in the next page is applied to the operating current.

3-2. Electro-optical characteristics

(Tc＝25 ℃)

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Forward voltage | | $V_F$ | IF=360mA | 8.5 | (10.2) | 11.5 | V |
| Luminous Flux *4 | BW:Nomal White | $\phi$ | IF=360mA | 220 | (280) | − | lm |
| | BD:Lamp | $\phi$ | IF=360mA | 150 | (200) | − | lm |
| | BN:Hi color rendering | $\phi$ | IF=360mA | 135 | (190) | − | lm |
| Chromaticity *5 | BW:Nomal White | x | IF=360mA | − | 0.35 | − | |
| | | y | | − | 0.36 | − | |
| | | Tc | | (4700) | 5000 | (5300) | K |
| | BD:Lamp | x | IF=360mA | − | 0.45 | − | |
| | | y | | − | 0.41 | − | |
| | | Tc | | (2550) | 2800 | (3050) | K |
| | BN: Hi color rendering (5000K) | x | IF=360mA | − | 0.35 | − | |
| | | y | | − | 0.35 | − | |
| | | Tc | | (4700) | 5000 | (5300) | K |
| | BN: Hi color rendering (6500K) | x | IF=360mA | − | 0.31 | − | |
| | | y | | − | 0.32 | − | |
| | | Tc | | (6000) | 6500 | (7000) | K |

＊ (　　) is reference.

*4 Measured by Sharp`s Integrating sphere. (After 20ms drive. Measurement accuracy：±20%)

*5 Measured by Ohtsuka electronics MCPD-LE3400 (Measurement accuracy： x、y ±0.02)

※ This specification is reference.

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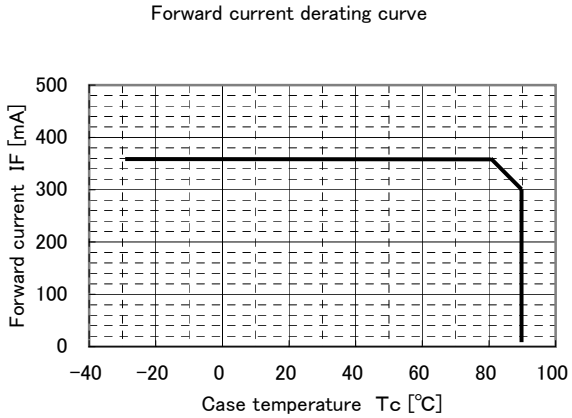
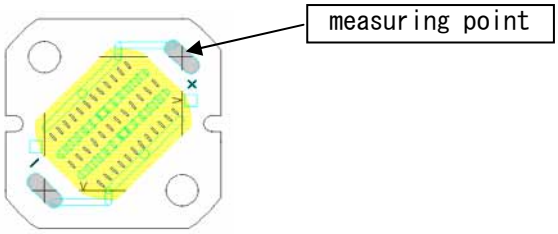
3-3. Derating Curve

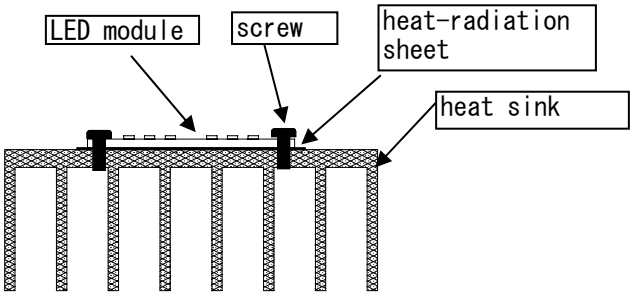



*To keep the case temperature lower than the rating, enough heat-radiation performance needs to be secured by using an adequate heat sink.
To secure long-term life,use it by the current equal to or less than 360mA .

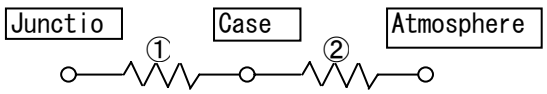
（Measureing point for case temperature）




(Example of heat sink attatchment)




(Thermal resistance)



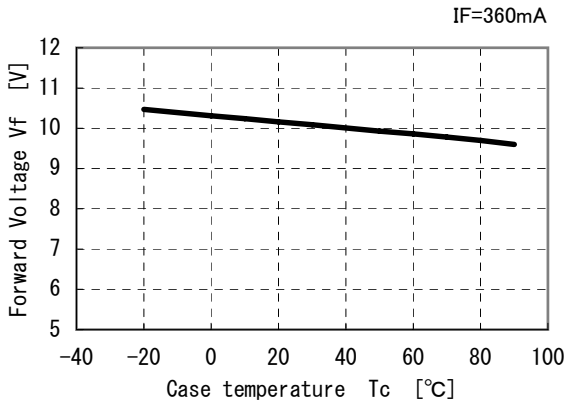

①Thermal resisitance: 6.5℃/W ＜Refference value＞
(Junction-Case)
②Thermal resisitance :Depends on a performance of attached heat sink.
(Case-Atmosphere)

※ This specification is reference.

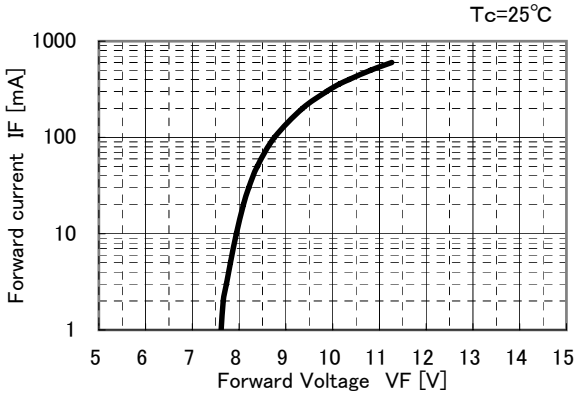
3-4. Characteristics Diagram

3-4-① Normal white "BW"type. (*1)

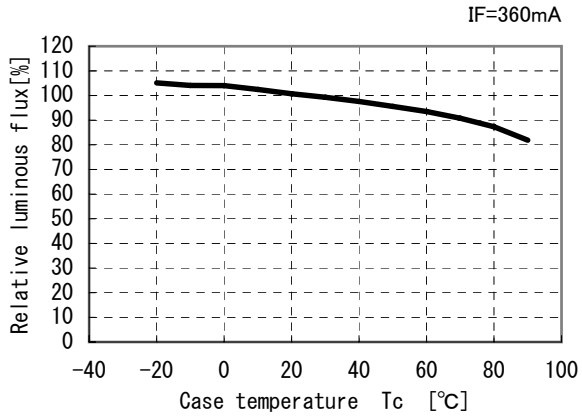
Forward Voltage vs Case temperature



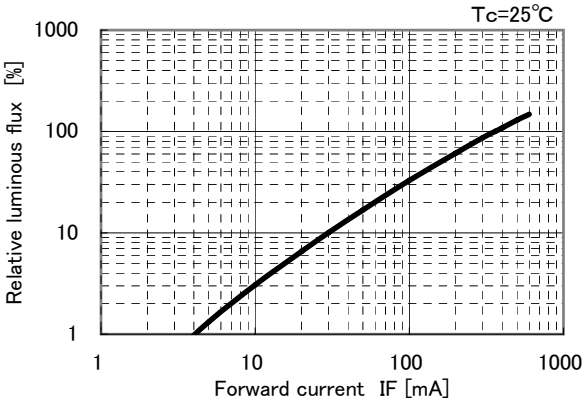

Forward Current VS ForwardVoltage



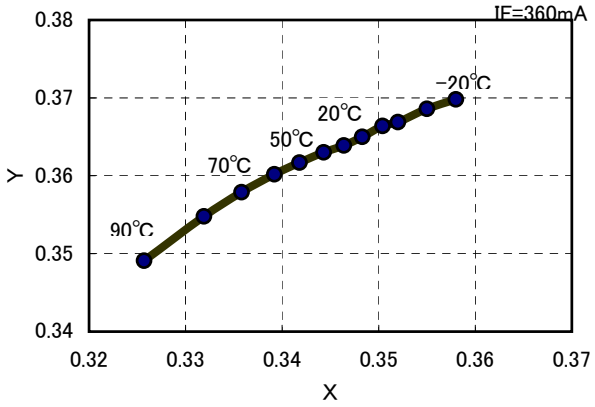

Relative luminous flux Vs Case temperature



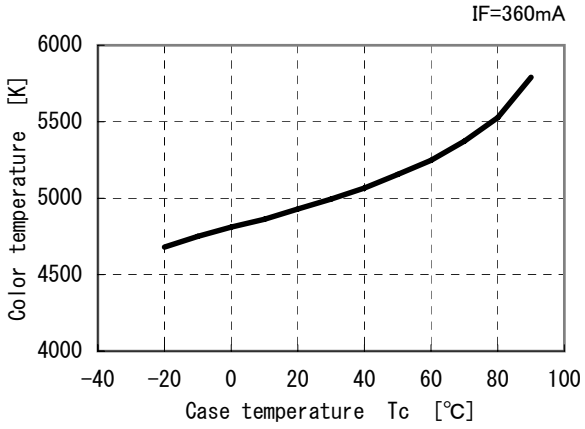

Relative luminous flux VS Forward current




Chromaticity coordinate VS Case tenperature




Color temperature VS Case temperature

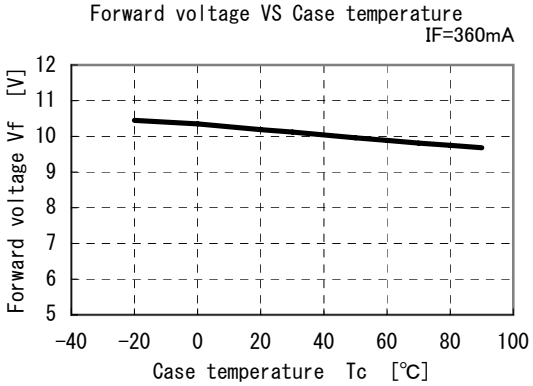



(*1)Above characteristics data are typical data and not a guaranteed data.

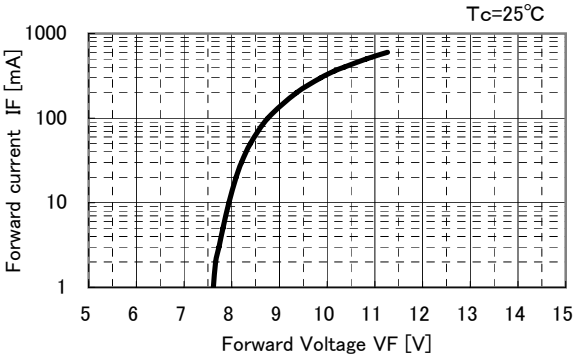
※ This specification is reference.

3-4-② Lamp "BD"type. (*1)

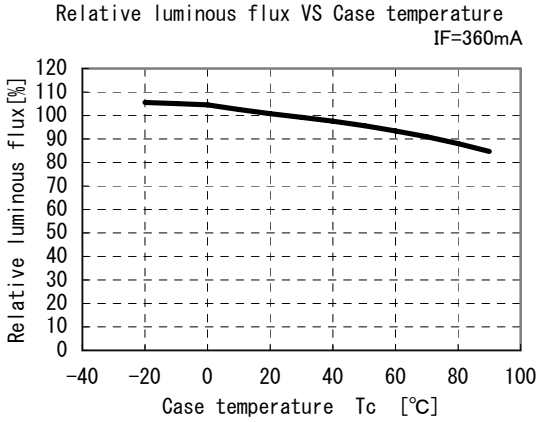
Forward voltage VS Case temperature



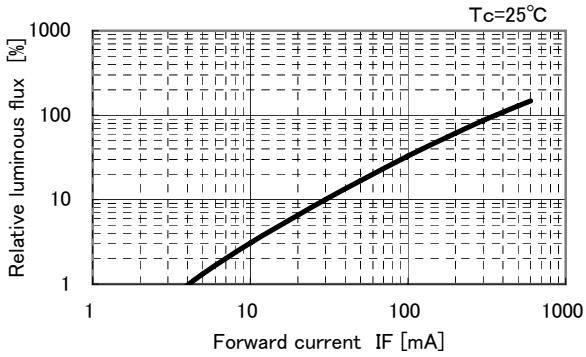

"Forward current VS Forward Voltage"



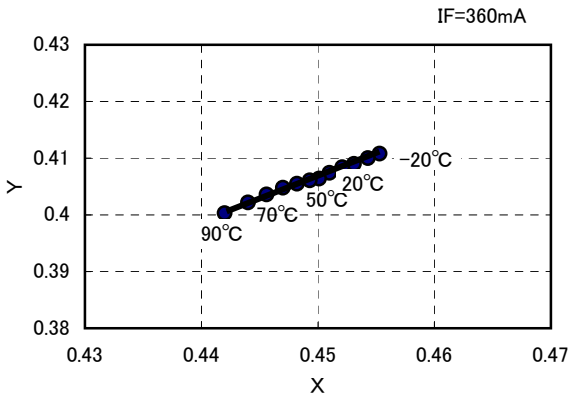

Relative luminous flux VS Case temperature



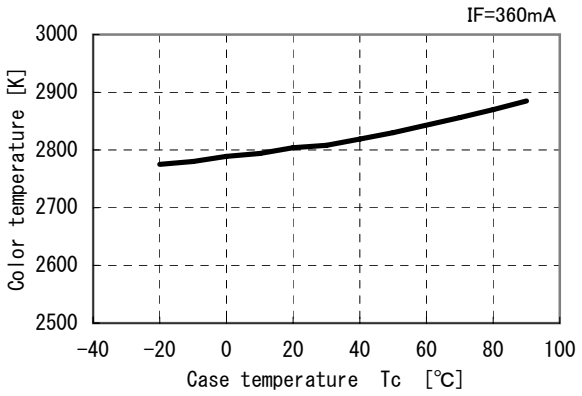

"Relative luminous flux VS Forward current"




Chromaticity Coordinate VS Case temperature




Color temperature VS Case temperature

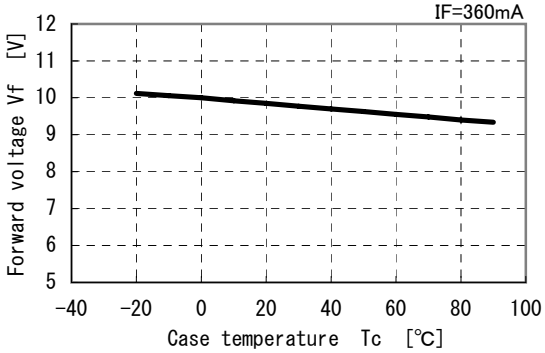



(*1)Above characteristics data are typical data and not a guaranteed data,

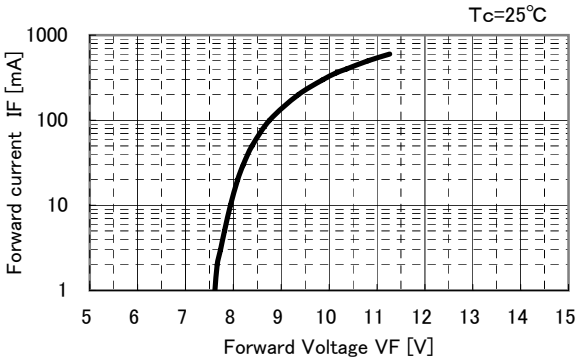
※ This specification is reference.

3-4-③ Hi color rendering "BN"type. (*1)

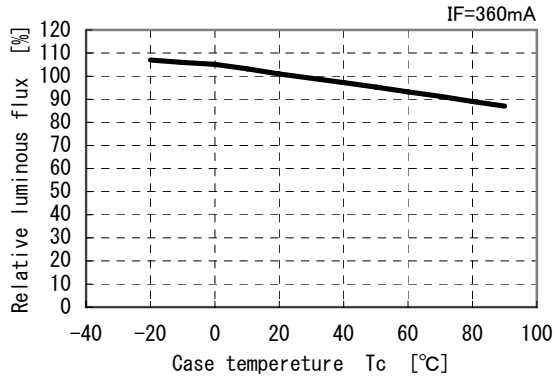
Forward voltage VS Case temperature



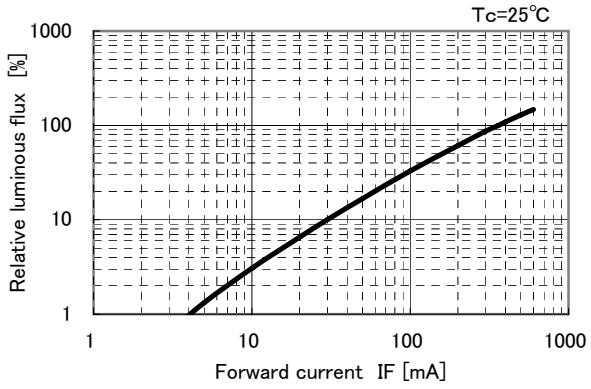

"Forward current VS Forward Voltage"



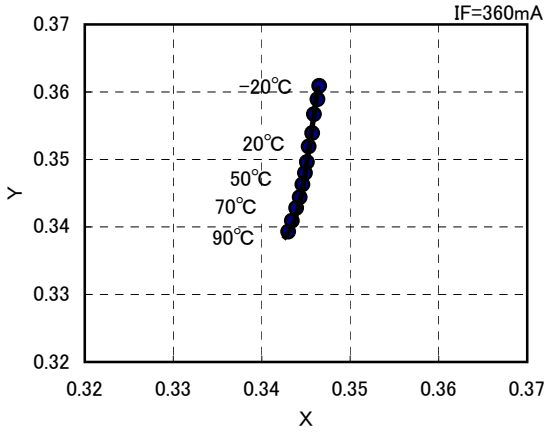

Relative luminous flux Vs Case temperature



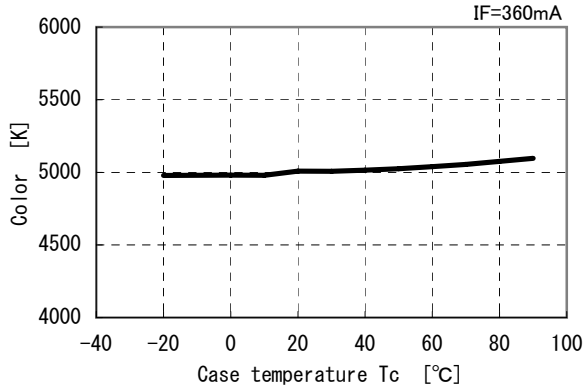

"Relative luminous flux VS Forward current"




Chromaticity cordinate VS Case temperature




Color temperature VS Case temperature




(*1)Above characteristics data are typical data and not a guaranteed data,
and these data about Color temperature 5000K type.

※ This specification is reference.

4. Reliability

The reliability of products shall be 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 ℃(30 min)～+100 ℃(30 min), 30 times | 11 | 0 | 20 |
| 2 | High temp and high humidity storage | Ta*=+60℃, RH=90%, t=1000h | 11 | 0 | 20 |
| 3 | High temperature storage | Ta*= +100℃, t=1000h | 11 | 0 | 20 |
| 4 | Low temperature storage | Ta*= -40 ℃, t=1000h | 11 | 0 | 20 |
| 5 | Operating test | Tc=60 ℃, IF=400mA, t=1000h | 11 | 0 | 20 |
| 6 | Mechanical shock test | 15000 $m/s^2$, 0.5 ms ±X･±Y･±Z direction, 3 times | 5 | 0 | 50 |
| 7 | Variable frequency vibration | 200 $m/s^2$, 100～2 000～100 Hz / sweep for 4 min. X･Y･Z direction, 4 times | 5 | 0 | 50 |

4-2. Failure judgment criteria (*1 , 4 - 1. No.1～7) (Ta*＝25℃)

| No. | Parameter | Symbol | Condition | Failure judgment criteria (*2) |
|---|---|---|---|---|
| 1 | Forward voltage | $V_F$ | IF=360mA | $V_F$ ＞ U.S.L × 1.1 |
| 2 | Luminous flux | Φ | IF=360mA | Φ＜Initial value × 0.5, Φ＞Initial value × 2.0 |

*1 : Measuring condition is accordance with this specification.

*2 : U.S.L. is shown by Upper Specification Limit.

※ This specification is reference.

5. Incoming inspection

5-1. Inspection method

A single sampling plan, normal inspection S-4 based on ISO 2859-1 shall be adopted.

5-2. Description of inspection and criteria

| No. | Inspection items | Criteria | Defect | AQL |
|---|---|---|---|---|
| 1 | Emission | No emission | Major defect | 0.1% |
| 2 | Electro-optical characteristics | Not conforming to the specification (Forward voltage, Luminous flux and Chromaticity) | Minor defect | 0.4% |
| 3 | Outline dimensions | Not conforming to the specification （Outline dimensions of ①、② in page3） | | |
| 4 | Appearance | Nonconformity observed in product appearance is determined as good product except that electro-optical characteristics is affected by. | | |

*Products with removable foreign material attached on is not determined to be defective.

6. Supplement

6-1 Chromaticity coordinates

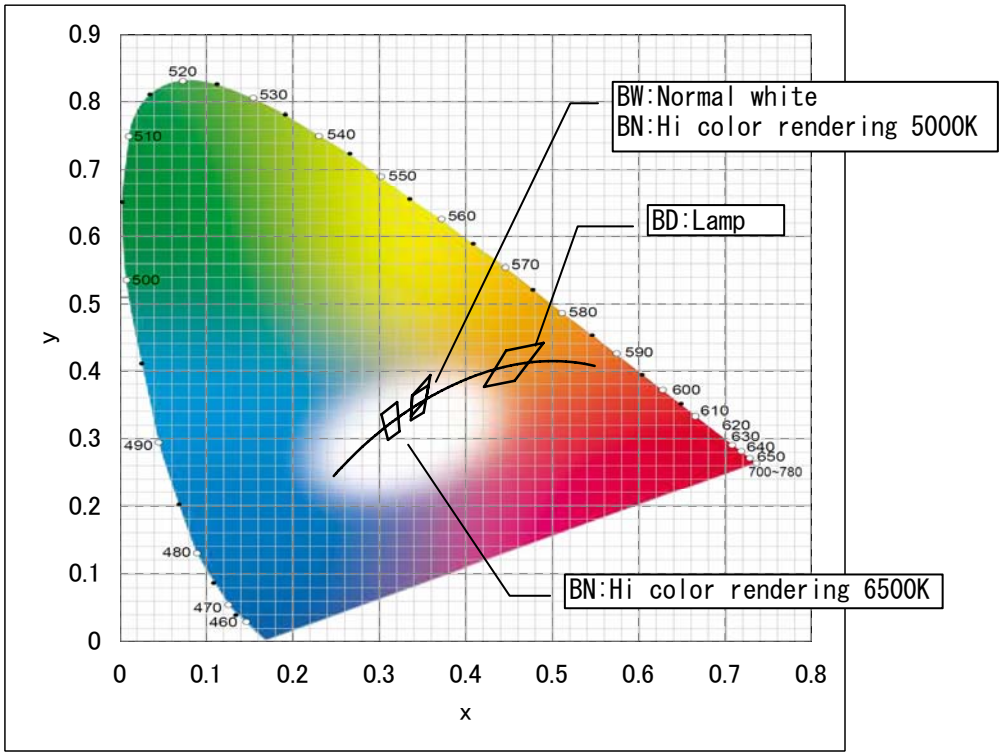
(Chromaticity table)

($I_F$=360mA, Ta=25℃)

| | | | | | |
|---|---|---|---|---|---|
| BW: Normal white | x | 0.3380 | 0.3367 | 0.3541 | 0.3592 |
| | y | 0.3640 | 0.3332 | 0.3586 | 0.3946 |
| BD : Lamp | x | 0.4467 | 0.4212 | 0.4565 | 0.4901 |
| | y | 0.4310 | 0.3770 | 0.3861 | 0.4424 |
| BN : Hi color rendering (5000K) | x | 0.3380 | 0.3365 | 0.3513 | 0.3571 |
| | y | 0.3640 | 0.3275 | 0.3390 | 0.3797 |
| BN : Hi color rendering (6500K) | x | 0.3024 | 0.3101 | 0.3235 | 0.3206 |
| | y | 0.3361 | 0.2984 | 0.3110 | 0.3544 |

(Measurement accuracy : ±0.02)

(Chromaticity coordinates)




※ This specification is reference.

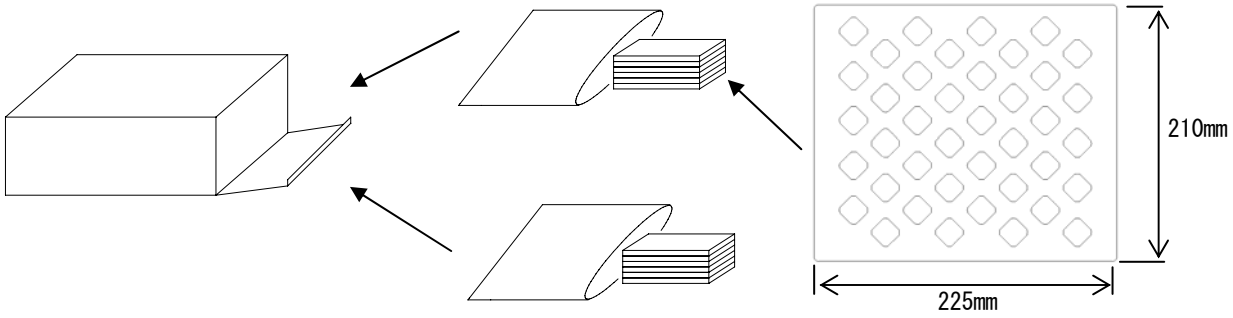
6-2 Packing

- Amount in one box : 400 (2 bags)
- Amount in one bag : 200 (5 trays)
- Amount in one tray : 40
- Putting 5 pieces of tray in a dampproofing packing bag and 2 bags in a box.
- Dimensions of the box: 235×220×90mm

(Packing form: Box)
200×2bags= 400

(Packing form: bag)
40×5trays= 200

(Packing form: Tray)
5×8= 40




*The packing dimensions are reference.
There is a case to become another packing specifications.

6-3. Label

The following label is put on the packing box.

| | |
|---|---|
| SHARP CORPORATION | |
| PART No. GW5BWC15L00 | ← Model number |
| QUANTITY 500 | ← Quantity of products |
| | ← EIAJ C-3 Bar code |
| | ← EIAJ C-3 Bar code |
| LOT No.KA01A01 | ← Lot number |
| <EIAJ C-3>MADE IN JAPAN | ← Production contry |

1) About Lot number

K A 0 1 A 0 1
① ② ③ ④

① Production plant code (to be indicated alphabetically)
② Year of production (the last two figures of the year)
③ Month of production
(to be indicated alphabetically with January corresponding to A)
④ Date of production (01～31)

6-4. Indication to the product

Model No. and Lot NO. are indicated on the substrate surface.
Indication contents are to be announced.

※ This specification is reference.

7. Precautions

① Storage conditions

Please follow the conditions below.

・Before opened: Temperature 5～30℃, humidity less than 60%RH

・After opened: Temperature 5～30℃, humidity less than 60%RH (Please apply soldering within 1 week.)

・Avoid exposing to air with corrosive gas.

If exposed, electrode surface would be damaged, which may affect soldering.

② Usage conditions

The products are not designed for the use under any of the following conditions.

Please confirm their performance and reliability well enough if you use under any of the following conditions;

・ In a place with a lot of moisture, dew condensation, briny air, and corrosive gas (Cl, $H_2S$, $NH_3$, $SO_2$, $NO_X$, etc.).

・Under the direct sunlight, outdoor exposure, and in a dusty place.

・In water, oil, medical fluid, and organic solvent.

③ Heat radiation

If the forward current(IF) is applied to single-state module at 360mA, there is a risk of damaging module or emitting smoke.

Equip with specified heat radiator, and avoid heat stuffed inside the module.

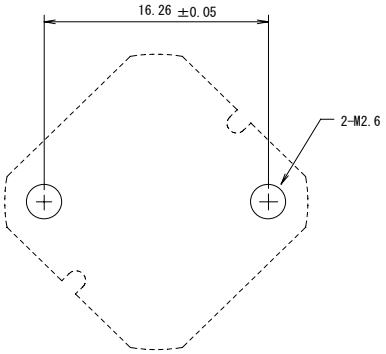
Applying thermal conductive sheet or grease between module and heat radiator enables heat to radiate effectively.

④ Installation

Material of board is alumina ceramic. If installed inappropriately, trouble of no radiation may occur due to board crack. Please take particular notice of install method.

Further information on installation, refer to the following cautions.

- Apply ether screws or adhesives, or both of them when installed to heat radiator.
  In case of applying adhesive only, check the effectiveness before fixing.
  In case of screw, apply thread locker in order to prevent loosening.
  If LED comes off from the heat radiator, unusual temperature rise entails hazardous phenomena including device deterioration, coming off of solder at leads, and emitting smoke.
- Refer to recommended dimensions when installing with screws.




- Screw torque: Within 0.2Nm
  If it is inefficient to tighten screws, apply locker to prevent loosening.
- It is recommended to apply screws which use low corrosive materials such as Stainless steel.
  Avoid applying flat-head screws, which cause board crack due to applying stress to screw holes.
- Avoid convexly uneven boards.
  Those convex boards are subject to crack when tightening screws.
- It is recommended to apply thermal conductive sheet or grease with adhesiveness and heat radiating-adhesives, because of thermal and mechanical combination between module and heat radiator.
  However, depending on their thickness, board crack may be entailed by warped board, which is caused when tightening screws. So please check your actual conditions carefully as for the screw torque.

※ This specification is reference.

⑤ Module surface strength

Module surface is subject to mechanical stress. Applying stress to surface of modules results in damage on resin, and inside-failure.

⑥ Connecting method

In case of solder connecting method, apply solder to the leads
by soldering iron with thermo controller (tip temperature 380℃), within 10seconds per one place.
Put the board on materials whose conductivity is poor enough not to radiate heat of soldering.
Avoid touching yellow phosphor with soldering iron.
This product is not designed for reflow and flow soldering.

⑦ Static electricity

This product is subject to static electricity, so take measures to cope with it.
Install circuit protection device to drive circuit, if necessary.

⑧ Drive methods

Module is composed of LEDs connected in both series and parallel. Constant voltage power supply runs off more than specified current amount due to lowered VF caused by temperature rise.
Constant current power supply is recommended to drive.
In designing a circuit, please make sure not to give reverse voltage to the LEDs at any time.

⑨ Cleaning

Avoid cleaning, since silicone resin is eroded by it.

⑩ Safety

Looking directly at LEDs for a long time may result in hurt your eyes.
In case that excess current(over ratings) are supplied to the device, hazardous phenomena including abnormal heat generation, emitting smoke, or catching fire can be caused.
Take appropriate measures to excess current and voltage.
In case of solder connecting method, there is a possibility of fatigue failure by heat.
Please fix the leads in such case to protect from short circuit or leakage of electricity caused by contact.
Please confirm the safety standards or regulations of application devices.

※ This specification is reference.