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Customer: Seoul Semiconductor Co. Ltd.

Part Name: G1212-GA

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| Seoul VIOSYS Co., Ltd. | | |
|------------------------|------------|-------------|
| Drawn by | Checked by | Approved by |
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| 02/02/17 | 02/02/17 | 02/02/17 |

| Checked by | | Approved by |
|------------|--|-------------|
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1. Features and Application

High luminous intensity with long life.

All Chips are 100% tested and sorted.

Small & Medium LCD Backlighting and Lighting applications

2. Part Name

G1212-GA

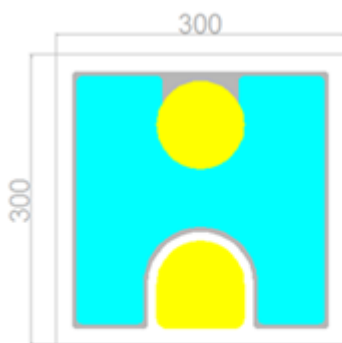
3. Main Material

InGaN/GaN on Sapphire

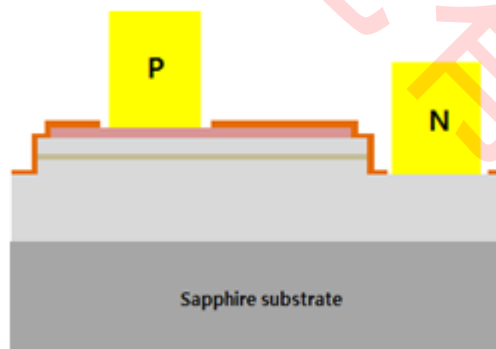
4. Electrodes

Anode - Au ; Cathode - Au ;

5. Chip Diagram



[Top View]



[Cross View]

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6. Maximum Ratings [추후 업데이트 예정]

| item | symbol | value | unit |
|------------------------------|----------|-------------|------|
| DC forward Current | I_f | 35 | mA |
| Junction Temperature | T_j | 100 | °C |
| Operating Temperature | T_{op} | -30 ~ +85 | °C |
| Assembly Process Temperature | T_p | 250(<10sec) | °C |

Note. "Maximum Ratings" mean when it exceeds the chip has the possibility of breaking down when these conditions are exceeded momentarily. "Maximum ratings", the chip is not guaranteed to endure such conditions. "Maximum Ratings" concerning your LED device after the chip is built into your package shall be established by yourself since these greatly depend on the design of the device, the conditions of assembly, the environment used, and so forth.

7. Typical Electro-Optical Characteristics at Ta=25°C

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------------------|-------------|--------------|------|------|------|---------|
| Reverse Current | I_R | $V_R=5V$ | 0 | - | 1.0 | μA |
| Turn-on Voltage | V_{F1} | $I_f=1\mu A$ | 1.8 | - | 2.7 | V |
| Forward Voltage ^a | V_{F2} | $I_f=10mA$ | 2.7 | - | 3.3 | V |
| Dominant Wavelength ^b | λ_D | $I_f=20mA$ | 515 | - | 535 | nm |
| Radiant Power ^c | P_o | $I_f=20mA$ | 11 | - | | mW |

Note.

- All the data were measured by Seoul Viosys Co., Ltd. testing equipment.
- Reverse voltage is applied for the electrical characteristic measurement **only**. Applying the continuous reverse voltage to the chip is not recommended, it may cause metal migration.

I_f : Forward Current

^a Tolerance of measured Forward Voltage: $\pm 1\%$

^b Tolerance of measured Dominant Wavelength: $\pm 1nm$

^c Tolerance of measured Radiant Power: $\pm 10\%$

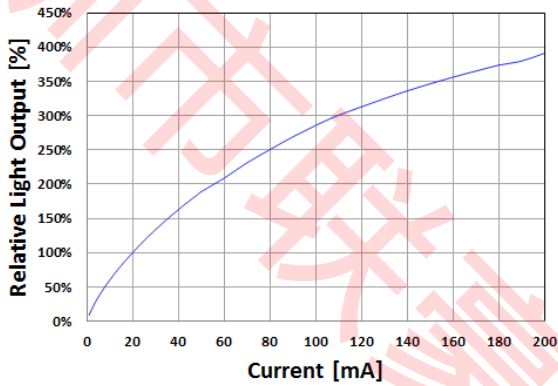
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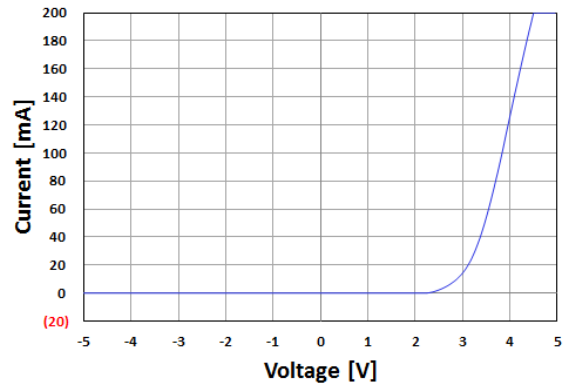
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These following graphs represent typical performance of the **G1212-GA** chip. Actual performance will vary slightly for different power and dominant wavelength bins.

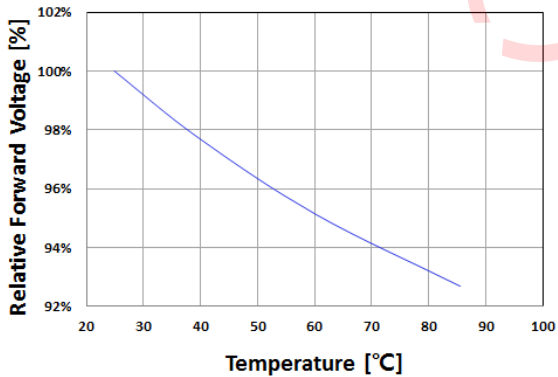
Relative Light Output vs. Current



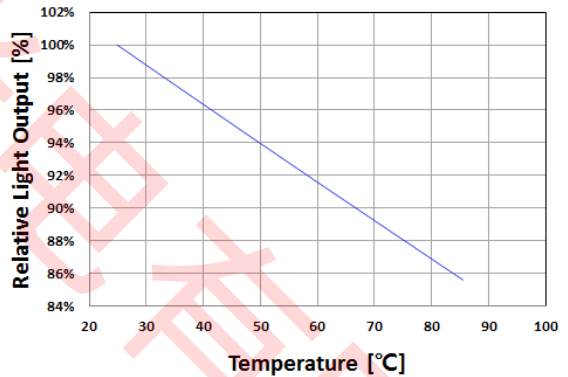
Current vs. Voltage



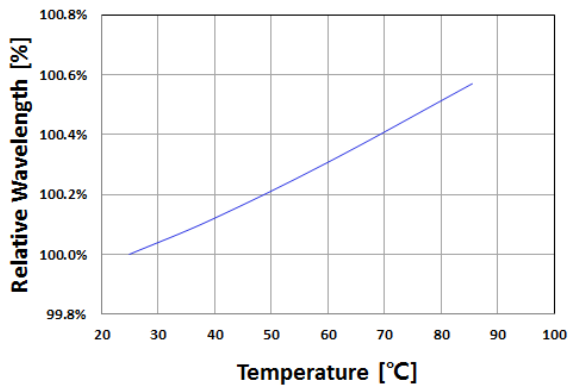
Relative Forward Voltage vs. Temp



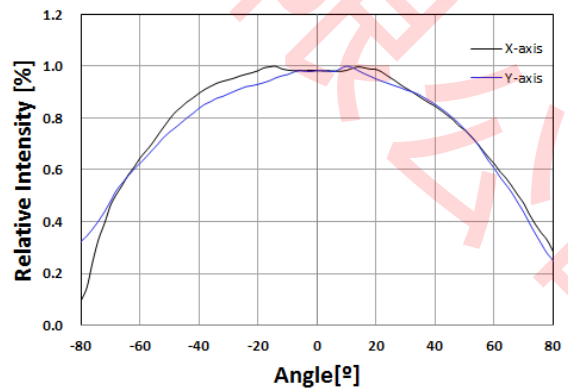
Relative Light Output vs. Temp



Relative Wavelength vs. Temp



Radiation Pattern in Cartesian Coordinate



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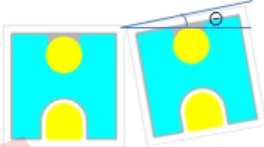

8. Mechanical Specifications

| Description | Dimension (um) | Tolerance |
|----------------|----------------|-----------|
| Chip size | 300x300 | ±40um |
| Chip thickness | 100 | ±10um |
| p-pad diameter | 90 | ±5um |
| n-pad diameter | 90 | ±5um |

9. Visual inspection

| Item | NG criteria | NG Example |
|---------------------------|--|---|
| Pinhole | larger than 5% of surface emitting area |  |
| Surface contamination | Surface & Pad contamination larger than 10% of surface emitting area |  |
| Surface scratches | larger than 10% of surface emitting area |  |
| TCL film peeling | larger than 10% of surface emitting area |  |
| Partially missing P/N Pad | larger than 10% of bond pad area larger than 2/3 of finger pad area |  |

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| | | |
|--------------------------|---|---|
| Pad metal Residue | larger than 10% of chip surface area |  |
| Pad scratch | larger than 50% of pad area (including probing mark) |  |
| Chipping | touching TCL |  |
| Bad cut | extrusion √ Out of chip size tolerance √ Including the pad metal of other chips |  |
| θ shift | $\theta > \pm 5^\circ$ (10°) |  |
| Passivation Film Peeling | Passivation Film peeling larger than 10% Of surface emitting Area |  |

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10. Sorting Bins and Product Name (Rev.1)

(1) Sorting Bins

| IR (μA) | VF1 (V) | VF2 (V) | λD (nm) | Po (mW) |
|---------|---------|---------|---------|---------|
| 0~1 | 1.8~2.7 | 2.7~3.3 | 515~520 | 11~12 |
| | | | 520~525 | 12~13 |
| | | | 525~530 | 13~14 |
| | | | 530~535 | 14~15 |
| | | | | 15~16 |
| | | | | 16~17 |
| | | | | 17~18 |
| | | | | 18~19 |
| | | | | 19~20 |
| | | | | 20~30 |

(2) Product Name: G1212-GA-*₁*₂*₃

| *1*2*3 | 515~520 | 520~525 | 525~530 | 530~535 |
|---------|---------|---------|---------|---------|
| 11~12mW | A11 | B11 | C11 | D11 |
| 12~13mW | A12 | B11 | C11 | D11 |
| 13~14mW | A13 | B11 | C11 | D11 |
| 14~15mW | A14 | B11 | C11 | D11 |
| 15~16mW | A15 | B11 | C11 | D11 |
| 16~17mW | A16 | B11 | C11 | D11 |
| 17~18mW | A17 | B11 | C11 | D11 |
| 18~19mW | A18 | B11 | C11 | D11 |
| 19~20mW | A19 | B11 | C11 | D11 |
| 20~30mW | A20 | B11 | C11 | D11 |

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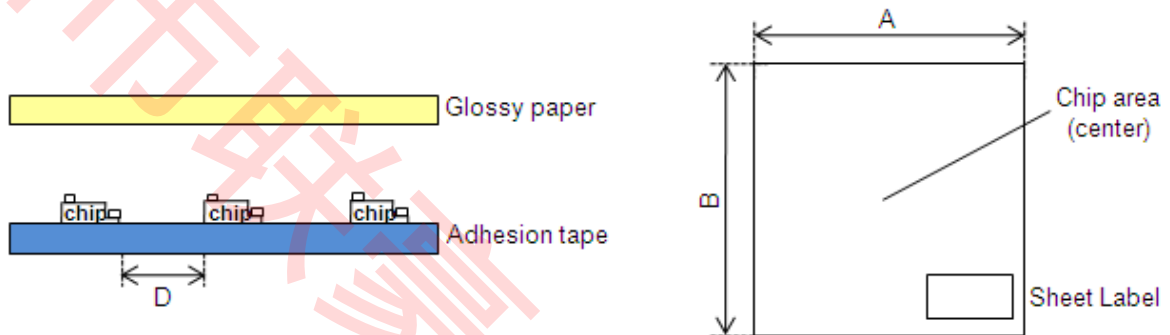
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11. Packing

(1) Chips on tape

- (a) A sheet label which contains electrical and optical measurement data is attached on the backside of yellow glossy paper. The area of chip array which is placed in the center of adhesive tape, and sorted up-right; the emission area is facing the glossy paper.



- (b) The sheet label includes Product name, Lot No., quantity, and electrical/optical characteristics. It is labeled on the right-bottom of the glossy paper.

| Item | Instruction |
|-----------------------|------------------------|
| Adhesion tape | Semi- transparent blue |
| Glossy paper (A×B) | 195mm × 208mm |
| Chip Qty tape | Max. 22,500 ea |
| Chip separation (X,Y) | X : 0.20mm, Y : 0.20mm |

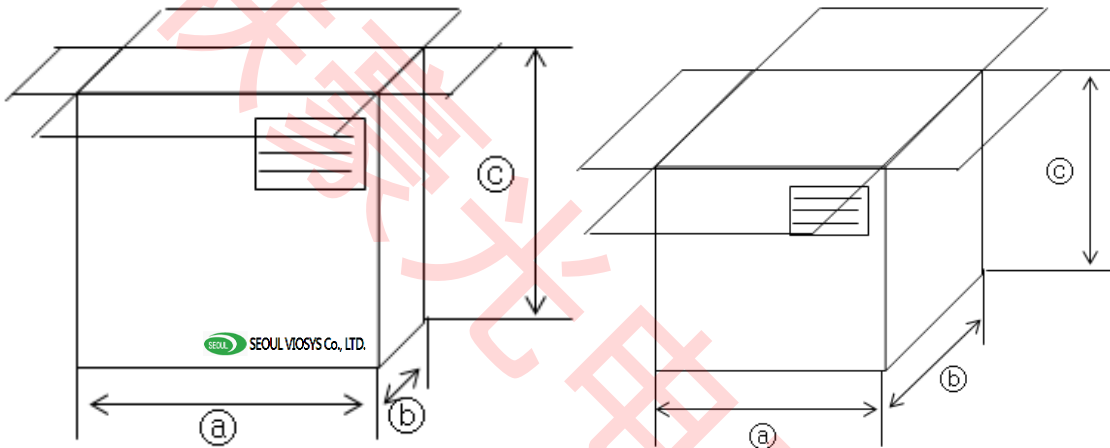
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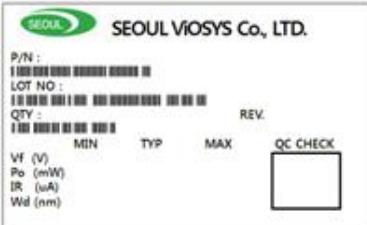
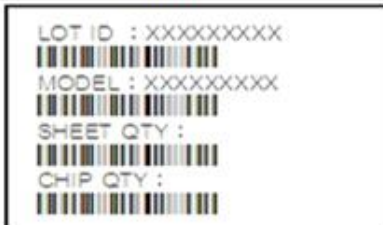

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(2) Packing for shipment

- (a) The sheets (adhesion tape + glossy paper) are packed in an anti-static bag. Each bag contains up to 20 sheets.
- (b) The anti-static bags are packed in a box that has dimension of 250mm×65mm×275mm (a × b × c). Each box contains up to 5 anti-static bags.
- (c) The boxes which contain anti-static bags are packed in an outer box that has size of 260mm×340mm×290mm (a × b × c). Each outer box contains up to 6 inner boxes.
- (d) Each sheet/box is labeled with information describing its content. (Details please refer to section 12)



12. Labeling

| Sheet | Inner Box | Outer Box |
|---|---|---|
|  <p> SEOUL VIOSYS Co., LTD. P/N : LOT NO : QTY : REV. MIN TYP MAX QC CHECK Vf (V) Po (mW) IR (uA) Wd (nm) </p> |  <p> LOT ID : XXXXXXXXX MODEL : XXXXXXXXX SHEET QTY : CHIP QTY : </p> |  <p> LOT ID : XXXXXXXXX MODEL : XXXXXXXXX SHEET QTY : CHIP QTY : </p> |

- (1) Sheet: The measurement data for each bag are shown on the backside of the sheet.
- (2) Inner Box: The information about the products is shown on the inner box.
- (3) Outer Box: The information about the products is shown on the outer box.

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13. Precaution

(1) Quality Guarantee

The chip guarantee period is three months after the delivery under the following preservation conditions. If any defective is found, the customer shall immediately inform of that to Seoul VIOSYS Co., Ltd. Preservation conditions (when the shipping package is unopened.)

- Temperature: 0 ~ 60 °C
- Atmosphere: Keep the chips in a desiccators with silica gel or with nitrogen substitution.

(2) General precaution for use

· Chips should be stored in a clean environment. If the Chips are to be stored for 3 months or more after being shipped from Seoul VIOSYS, they should be packed by a sealed container with nitrogen gas injected.

(Shelf life of sealed bags: 1year, 0~40°C of temperature, 20~70% of RH)

· This chip should not be used directly in any type of fluid such as water, oil, organic solvent, etc. When washing is required, IPA is recommended to use.

· After storage bag is open, device subjected to soldering, solder flow, or other high temperature processes must be:

Mounted within 168 hours (7days) at an assembly line with a condition of no more than 30°C and 60% RH

· Chips require baking before mounting, if humidity card reading is >60% at, 23±5°C. Chips must be baked for 24Hrs. at 65±5°C, if baking required.

· When the chips are illuminating, the maximum ambient temperature should be first considered before operation. If voltage exceeding the absolute maximum rating is applied to chips, it may cause damage or even destruction to chips. Damaged LEDs will show some abnormal characteristics such as remarkable increase of leak current, lower turn-on voltage and getting unlit at low current.

· The appearance and specifications of the products may be modified for improvement without further notice.

· The chips are sensitive to the static electricity and surge. It is strongly recommended to use a grounded wrist band and anti-electrostatic glove when handling the LEDs.

The above specifications are subject to change without prior notice.

Seoul Viosys Co., Ltd.

February, 2nd, 2017