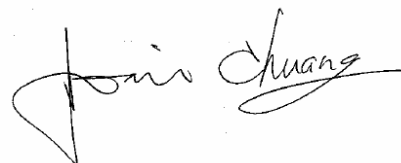


Harvatek Surface Mount CHIP LEDs Approval Sheet
Model No.: HT-F199NB5**Acknowledged by**

Section Manager
Production Engineering Dept.

Manager
Production Engineering Dept.

| | | | |
|---|------------------------|---------------|----------------|
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Introduction

- *The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by HARVATEK for any infringements of intellectual property or other rights of the third parties which may result from it use.*
- *Harvatek is continually effort to improve the quality of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing HARVATEK products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such HARVATEK products cause loss of human life, bodily injury or damage to property.*
- *The HARVATEK products listed in this document are intended for usage in general electronics (computer, personal equipment, office equipment, industrial robotics, domestic, etc...) These products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury.*
- *In developing your designs, please ensure that HARVATEK products are used within specified operating ranges as set forth in the most recent HARVATEK products specifications.*
- *Also, please keep in mind the precautions listed in this document.*

| | | | | |
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Product Specification

| | Specification | Material | Quantity |
|-----------------------|---|-----------------------------------|------------------|
| Iv | 11.2-45mcd @5mA/ Ta= 25° C Tolerance: ± 10% | | |
| lambda(λ_D) | 465-480nm @5mA/ Ta= 25° C | | |
| Vf | 2.55-3.15V @5mA/ Ta= 25° C Tolerance: ± 0.05V | | |
| Ir | < 100 μ A @ $V_R = 5$ V | | |
| Resin | Milky White | Epoxy resin | |
| Carrier tape | According to EIA 481-1A specs | Conductive black tape | 4000pcs per reel |
| Reel | According to EIA 481-1A specs | Conductive black | |
| Label | HT standard | Paper | |
| Packing bag | 220x240mm | Aluminum laminated bag/ no-zipper | One reel one bag |
| Carton | HT standard | Paper | Non-specified |

Others:

Every mid-box will be loaded 5 reels. These 5 reels can be different in lot, Iv, lambda, or Vf. Every reel will have an independent label to identify its specification and the mid-box there will have a corresponding label post on it.

ATTENTION: Electricstatic Discharge (ESD) protection




The symbol shown on the page herein to introduce 'Electro-Optical Characteristics'. ESD protection for GaP and AlGaAs based chips is still necessary even though they are safe in low static-electric discharge. Parts built with AlInGaP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD protection has to considered and taken in the initial design stage.

If manual work/process is needed, please ensure the device is well protected from ESD during all the process.

| | | | |
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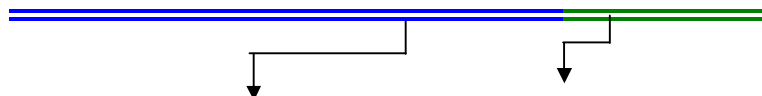
Label Spec.:

| | | | |
|-------------------|------------|---|----------------------|
| HARVATEK | |  | Date: yyyy/mm/dd |
| CUSTOMER P/N: | | | |
| HARVATEK P/N: | | QTY: PCS | |
| LOT NO: | | QC | |
| IV BIN: | COLOR BIN: | VF: | |

■ Customer P/N: To Be Defined

■ Harvatek P/N

H T - F 1 9 9 NB5



| Series Name | Emitting Color |
|--------------------------|-------------------|
| HT-F199: 1.6x0.8x0.25 mm | NB5: Blue @5mA |

■ Lot No.

1 2 3 4 5 6 7 8 9 10
P 1 2 2 3 0 A - D T

| Code 1 | Code 2 | Code 3 | Code 4, 5 | Code 6, 7 | Code 9 | Code 10 |
|--------------------------|--|--|------------|--------------------|----------------|---------------|
| | Mfg. Year | Mfg. Month | Mfg. Date | Lots | Resin Color | Packaging |
| Internal Tracing Code | 2: 2002 3: 2003 4: 2004 | 1: Jan. 2: Feb. 9: Sep. A: Oct. B: Nov. C: Dec. | 1~31/ (30) | 01~99, A,B,C... | D: Milky White | T: Taped Reel |

| | | | |
|---|------------------------|---------------|-----------------------------|
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■ Iv Bin:

| Color | Bin Code | Spec. Range |
|-------|----------|-------------|
| Blue | L | 11.2-18mcd |
| | M | 18-28mcd |
| | N | 28-45mcd |

■ Color Bin:

| Color | Bin Code | Spec. Range |
|-------|----------|-------------|
| Blue | B | 465-470nm |
| | C | 470-475nm |
| | D | 475-480nm |

■ Vf Bin:

| Color | Bin Code | Spec. Range |
|-------|----------|-------------|
| Blue | G2T | 2.55-2.65V |
| | G3T | 2.65-2.75V |
| | G4T | 2.75-2.85V |
| | H1T | 2.85-2.95V |
| | H2T | 2.95-3.05V |
| | H3T | 3.05-3.15V |

| | | | |
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Product Feature

Electro-Optical Characteristics

| Code for parts | Lighting Color | Material | $V_F(V)$ | | $\lambda (nm)$ | | | $I_V^*(mcd)$ |
|----------------|----------------|----------|----------|------|----------------|-------------|------------------|--------------|
| | | | typ | max | λ_D | λ_P | $\Delta \lambda$ | Typ |
| HT-F199NB5 | Blue | InGaN | 2.8 | 3.15 | 470 | 468 | 40 | 25 |

($I_F @ 5mA, T_a 25^\circ C$)

Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

Unit: mm Tolerance: +/-0.1

| Outline Dim. | Soldering Pattern |
|--|-------------------|
| | |
| 1. Soldering terminal may shift in x, y direction. | |

Absolute Maximum Ratings

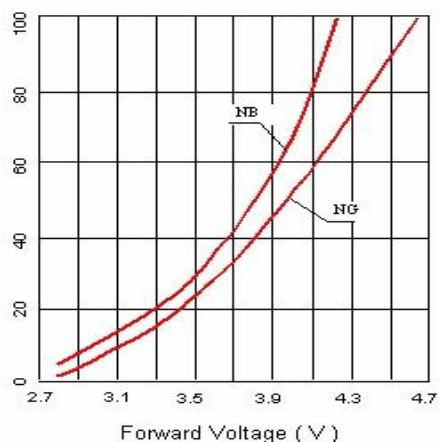
| (T _a 25°C) | | | | | | | |
|-----------------------|---------------------|---------------------|----------------------|--------------------|--------------------------|----------------------|----------------------|
| Series | P _d (mW) | I _F (mA) | I _{FP} (mA) | V _R (V) | I _R (uA) | T _{OP} (°C) | T _{ST} (°C) |
| HT-F199NB | 117 | 30 | 120 | 5 | <100@ V _R = 5 | -40~+80 | -40~+80 |

** Condition for I_{FP} is pulse of 1/10 duty and 0.1msec width

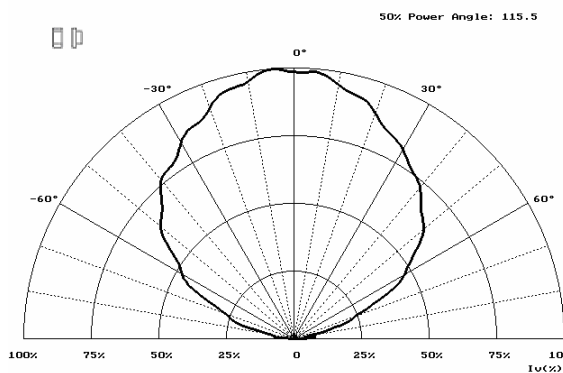
| | | | | |
|---|------------------------|---------------|----------------|----------------|
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Characteristics of HT-F199 Series

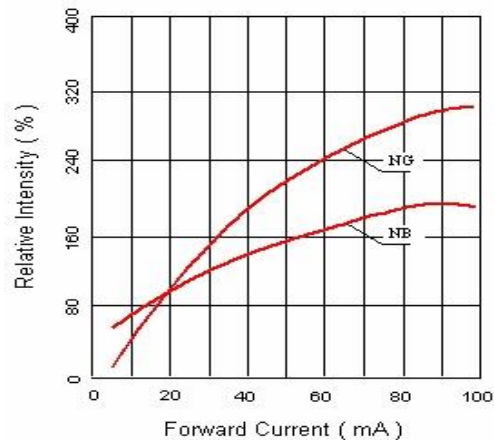
Forward Voltage vs. Forward Current



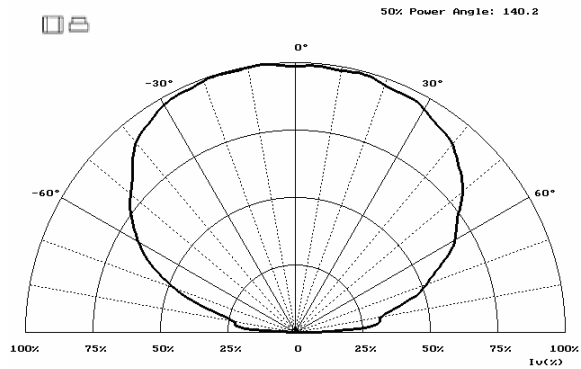
Directive Characteristics



Relative Intensity vs. Forward Current

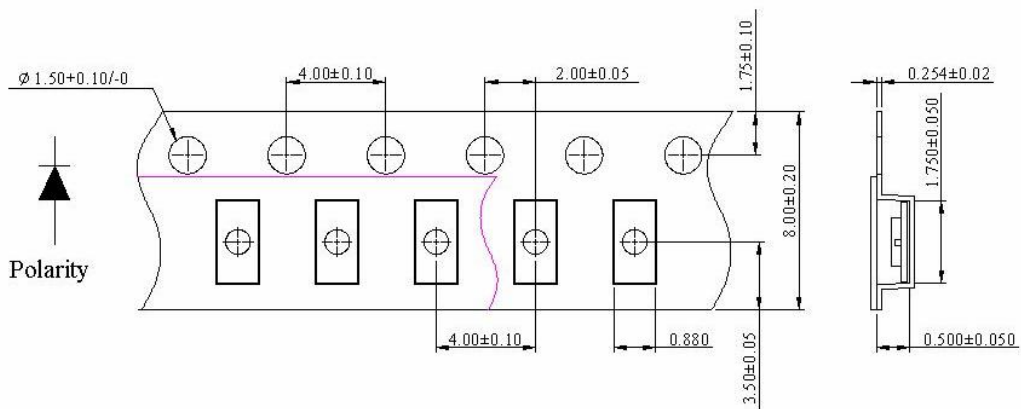


Directive Characteristics



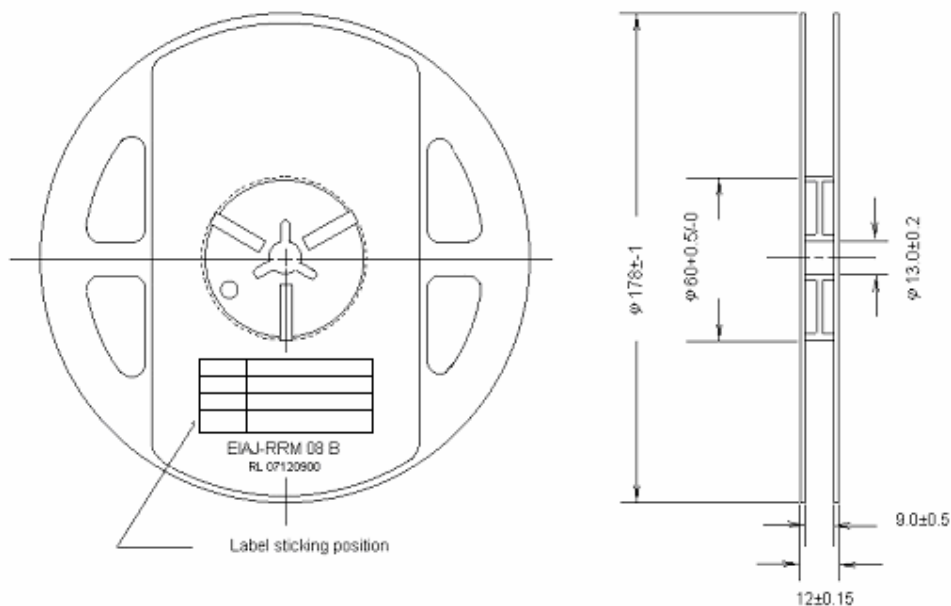
| | | | |
|---|------------------------|---------------|----------------|
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Packaging Tape, Reel, and Packing Model Tape Dimension



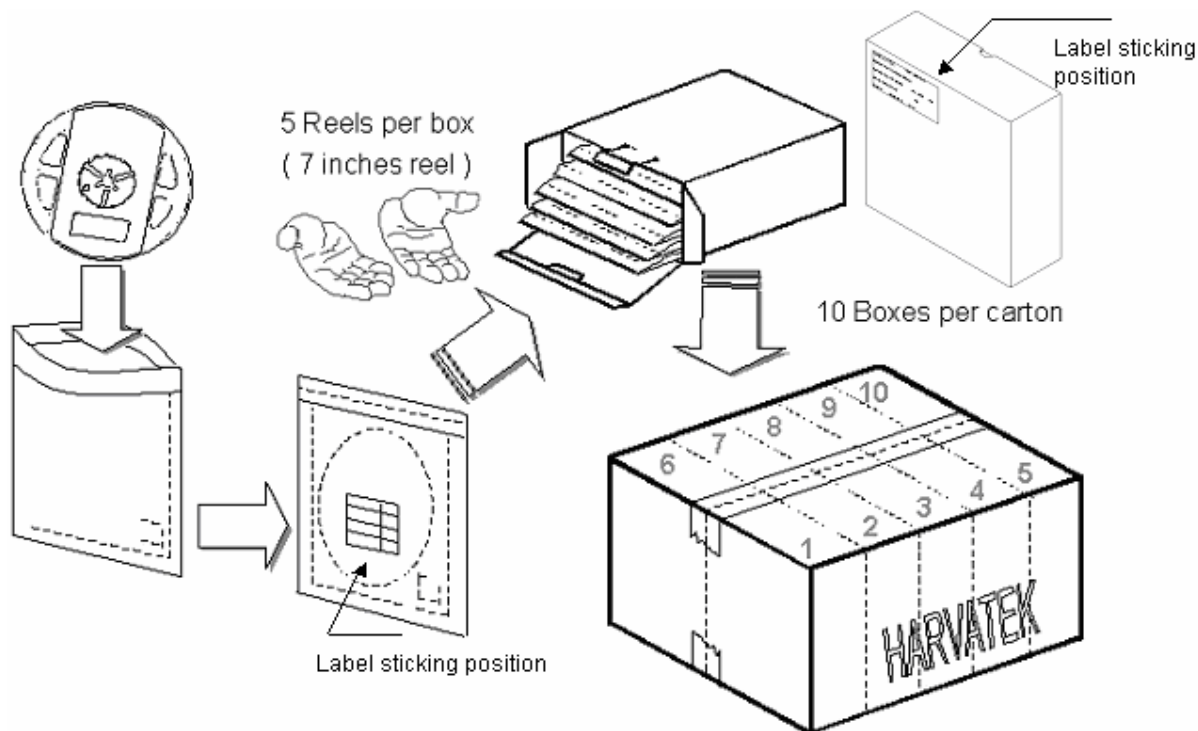
| Part No. | Dim. A | Dim. B | Dim. C | Q'ty/Reel |
|----------|----------|----------|--------|-----------|
| HT-F199 | 1.75±0.1 | 0.90±0.1 | TBD | 4K |

Reel Dimension



| | | | |
|---|------------------------|---------------|----------------|
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Packing Model



5 boxes per carton is available according to shipping quantity.

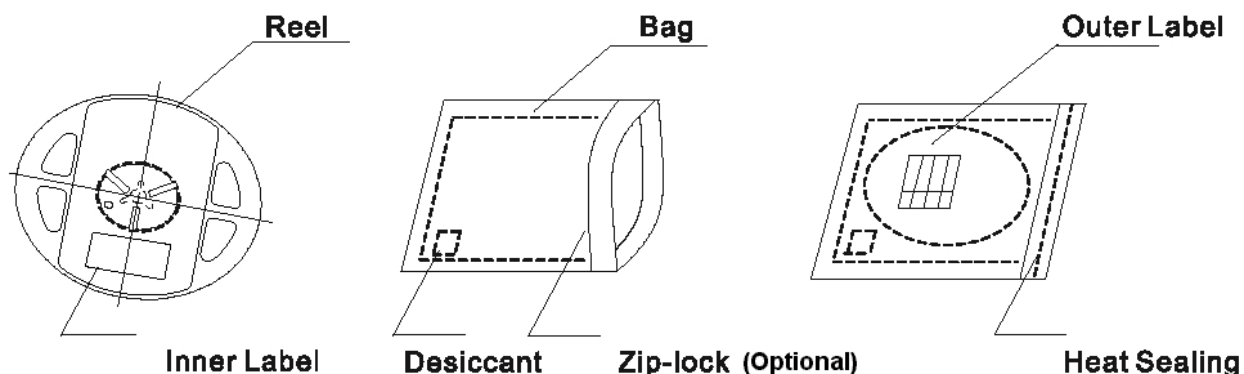
Dry Pack

Any SMD optical device, like this chip LED, is **MOISTURE SENSITIVE device**. Avoid absorbing moisture at any time during transportation or storage. Every reel will be packaged in the moisture barrier anti-static bag (Specific bag material will depend upon customers' requirement or option). And the bag is well sealed before shipment.

By customer's requirement, we will put a humidity indicator in each moisture barrier anti-static bag before shipment.

The package is the following:

| | | | |
|---|------------------------|---------------|----------------|
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Cautions of Pick and Place

It should be avoided to load stress on the resin during high temperature.

Avoid rubbing or scraping the resin by any object.

Electric-static may cause damage to the component. Please confirm that the equipment grounding well. Using an ionizer fan is recommended.

PRECAUTIONS

1. Avoid absorbing moisture at any time during transportation or storage.
2. Anti-Static process is needed especially when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a proper series current limit resistor. Avoid driving reverse voltage over the specification of LEDs when turning the unit ON/OFF.
4. Any application should refer to the specifications of absolute maximum ratings.
5. Avoid any direct contact with the viewing area.
6. If possible, assemble the unit in a clean room or dust-free environment.

Reflow Soldering

Recommend soldering paste specifications:

Melting temperature: 178~192 °C

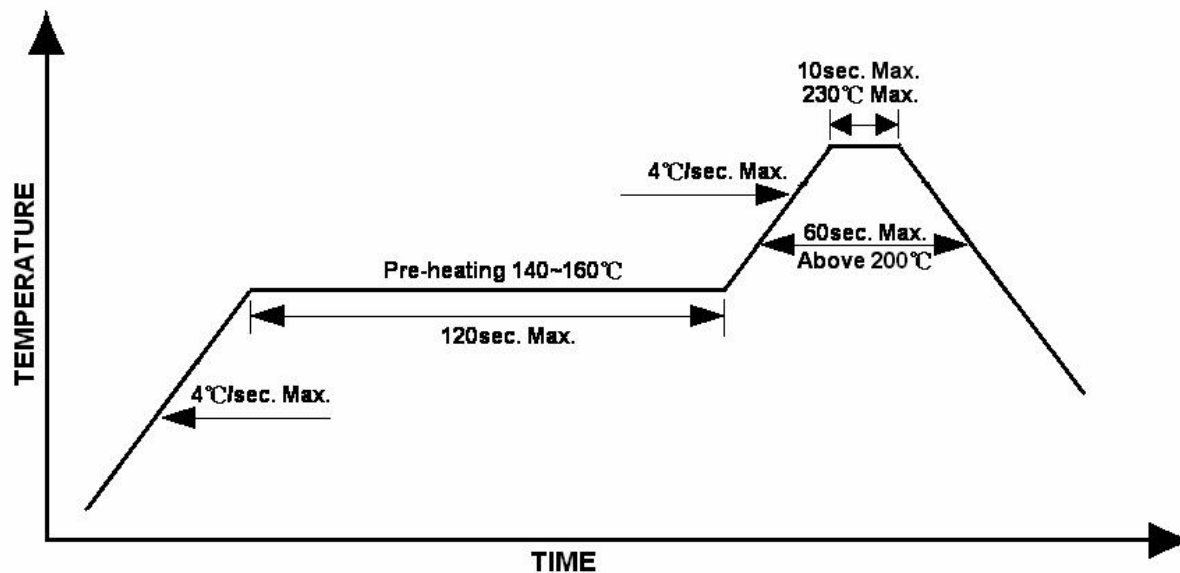
Never take next process until the component is cooled down to room temperature after reflow.

The recommended reflow soldering profile (measuring on the surface of the LED terminal) is following:

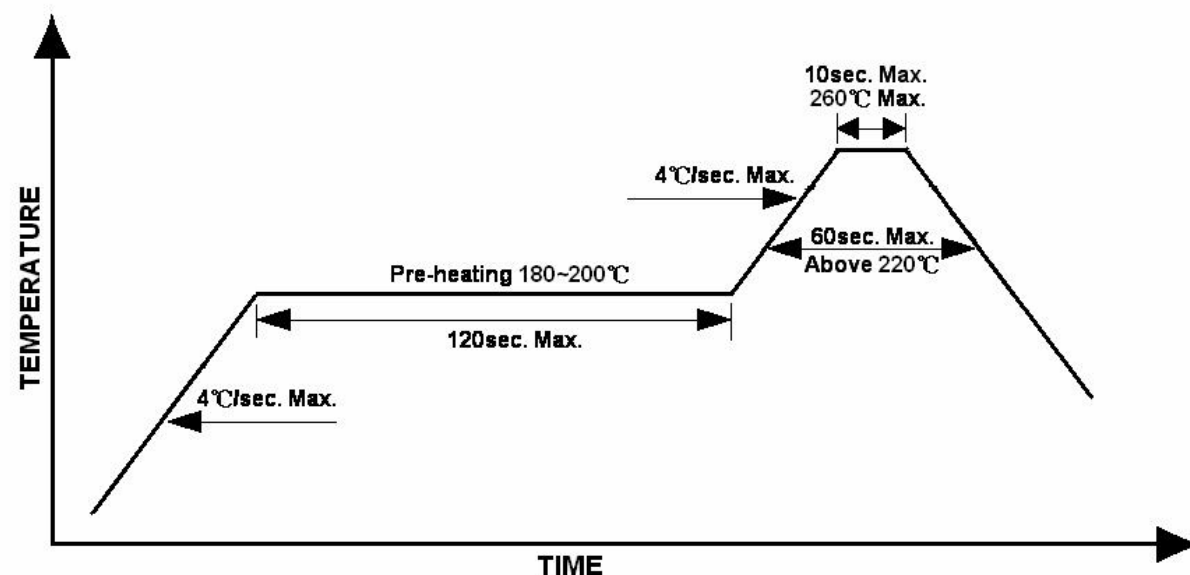
| | | | |
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Soldering conditions

Lead Solder



Lead-free Solder



| | | | | |
|---|------------------------|---------------|----------------|----------------|
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Cleaning

The conditions of cleaning after soldering:

An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended.

Temperature×Time: <50 °C×30sec, or <30 °C×3min

Ultra sonic cleaning: < 15W/ bath; Bath volume: 1liter max.

Curing: 100 °C max, <3min

Do not contact with component on the assembly board.

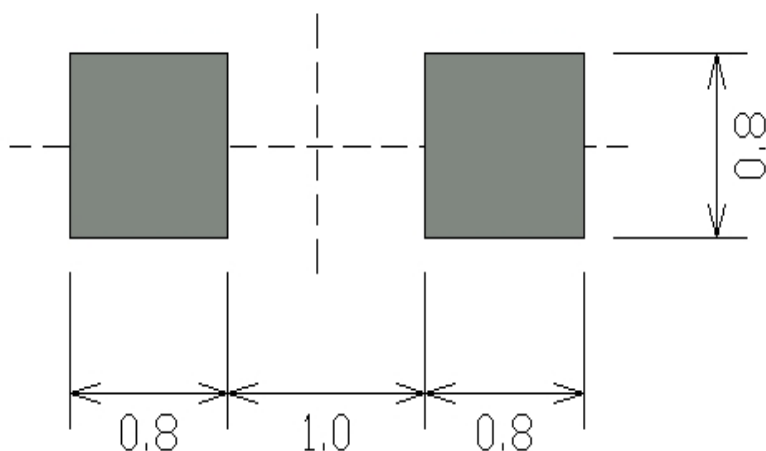
Cautions of Pick and Place

It should be avoided to load stress on the resin during high temperature.

Avoid rubbing or scraping the resin by any object.

Electric-static may cause damage to the component. Please confirm that the equipment grounding well. Using an ionizer fan is recommended.

Soldering Pattern



| | | | |
|---|------------------------|---------------|----------------|
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Reliability Test

| Item | Frequency/ lots/ samples/ failures | Standards Reference | Conditions |
|--------------------------------------|---|--------------------------------|--|
| Precondition | For all reliability monitoring tests according to JEDEC Level 2 | J-STD-020 | 1.) Baking at 85°C for 24hrs 2.) Moisture storage at 85°C/ 60% R.H. for 168hrs |
| Solderability | 1Q/ 1/ 22/ 0 | JESD22-B102-B And CNS-5068 | Accelerated aging 155°C/ 24hrs Tinning speed: 2.5±0.5cm/s Tinning: A: 215°C/ 3±1s or B: 260°C/ 10±1s |
| Resistance to soldering heat | | CNS-5067 | Dipping soldering terminal only Soldering bath temperature A: 260+/-5°C; 10+/-1s B: 350+/-10°C; 3+/-0.5s |
| Operating life test | 1Q/ 1/ 40/ 0 | CNS-11829 | 1.) Precondition: 85°C baking for 24hrs 85°C/ 60%R.H. for 168hrs 2.) T _{amb} 25°C; I _F =20mA; duration 1000hrs |
| High humidity, high temperature bias | 1Q/ 1/ 45/ 0 | JESD-A101-B | T _{amb} : 85°C Humidity: 85% R.H., I _F =5mA Duration: 1000hrs |
| High temperature bias | 1Q/ 1/ 20 | HT specs. | T _{amb} : 55°C I _F =20mA Duration: 1000hrs |
| Pulse life test | 1Q/ 1/ 40/ 0 | | T _{amb} 25°C, I _F =20mA, I _p =100mA, Duty cycle=0.125 (tp=125 μs, T=1sec) Duration 500hrs) |
| Temperature cycle | 1Q/ 1/ 76/ 0 | JESD-A104-A IEC 68-2-14, Nb | A cycle: -40 degree C 15min; +85 degree C 15min Thermal steady within 5 min.. 300 cycles 2 chamber/ Air-to-air type |
| High humidity storage test | 1Q/ 1/ 40/ 0 | CNS-6117 | 60±3°C 90+5/-10% R.H. for 500hrs |
| High temperature storage test | 1Q/ 1/ 40/ 0 | CNS-554 | 100±10°C for 500hrs |
| Low temperature storage test | 1Q/ 1/ 40/ 0 | CNS-6118 | -40±5°C for 500hrs |

| | | | |
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