

**Harvatek Surface Mount LED Data Sheet
HT-191 Series**

| | | | | |
|--|------------------------|---------------|----------------|----------------|
| Official Product | Product: HT-191 Series | | | Data Sheet No. |
| Tentative Product | ***** | | | HT-191 Series |
| Specifications are subject to change without notice. Data and drawings herein are copyrighted. | | Jan. 14, 2009 | Version of 1.4 | Page 1/25 |

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LIFE SUPPORT POLICY

HARVATEK's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President of HARVATEK or HARVATEK INTERNATIONAL. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Product Specifications

| Product | Emission Color | Technology | Test Current I_F (mA) | Luminous Intensity I_V (mcd) | Forward Voltage V_F (V) | Orderable Part Number |
|-----------|---------------------------|------------|----------------------------|-----------------------------------|------------------------------|-----------------------|
| HT-191YG | Yellow Green | GaP | 20 | 20 typ | 2.2 typ | HT-191YG-YYYY |
| HT-191Y | Yellow | GaAsP | 20 | 8 typ | 2.1 typ | HT-191Y-YYYY |
| HT-191D | Orange | GaAsP | 20 | 9 typ | 2.1 typ | HT-191D-YYYY |
| HT-191SD | Red | GaAsP | 20 | 11 typ | 2.1 typ | HT-191SD-YYYY |
| HT-191UR | Bright Red | AlGaAs | 20 | 16 typ | 1.8 typ | HT-191UR-YYYY |
| HT-191URO | Ultra Deep Red | AlInGaP | 20 | 120 typ | 1.9 typ | HT-191URO-YYYY |
| HT-191UYG | Ultra Bright Yellow Green | AlInGaP | 20 | 60 typ | 2.0 typ | HT-191UYG-YYYY |
| HT-191UY | Ultra Bright Yellow | AlInGaP | 20 | 140 typ | 1.9 typ | HT-191UY-YYYY |
| HT-191UD | Ultra Bright Orange | AlInGaP | 20 | 110 typ | 1.9 typ | HT-191UD-YYYY |
| HT-191USD | Ultra Bright Red | AlInGaP | 20 | 120 typ | 1.9 typ | HT-191USD-YYYY |
| HT-191NB | Blue | InGaN | 20 | 40 typ | 3.3 typ | HT-191NB-YYYY |
| HT-191NG | True Green | InGaN | 20 | 140 typ | 3.3 typ | HT-191NG-YYYY |
| HT-191TW | White | InGaN | 20 | 285 typ | 3.3 typ | HT-191TW-YYYY |

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| | Specification | Material | Quantity |
|--------------|----------------------|-----------------------------------|------------------|
| Resin | Clear Diffused | Epoxy resin | |
| Carrier tape | Per EIA 481-1A specs | Conductive black tape | 4000pcs per reel |
| Reel | Per EIA 481-1A specs | Conductive black | |
| Label | HT standard | Paper | |
| Packing bag | 220x240mm | Aluminum laminated bag/ no-zipper | One reel per bag |
| Carton | HT standard | Paper | |

Others:

Each immediate box consists of 5 reels. The 5 reels may not necessarily have the same lot number or the same bin combinations of I_v , λ_D and V_f . Each reel has a label identifying its specification; the immediate box consists of a product label as well.

ATTENTION: Electrostatic Discharge (ESD) protection



The symbol to the left denotes that ESD precaution is needed. ESD protection for GaP and AlGaAs based chips is necessary even though they are relatively safe in the presence of low static-electric discharge. Parts built with AlInGaP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD precaution must be taken during design and assembly.

If manual work or processing is needed, please ensure the device is adequately protected from ESD during the process.

Compliance and Certified


ISO9002, QS9000 and ISO14001 Certified

RoHS Compliant



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Label Specifications

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

■ Harvatek P/N:

H T - 1 9 1 XXX - YYYY

| Series Name | Emitting Color | Customer Code |
|--|--|--|
| HT-191 HT: Harvatek 191: 0603 0.6mm series 1.6 (L) x 0.8 (W) x 0.6 (H) mm Viewing Angle: 130° | XXX YG: Yellow Green Y: Yellow D: Orange SD: Red UR: Bright Red URO: Ultra Deep Red UYG: Ultra Bright Yellow Green UY: Ultra Bright Yellow UD: Ultra Bright Orange USD: Ultra Bright Red NB: Blue NG: True Green TW: White | YYYY Customer Product Code (TBD) |

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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 | Z: 2000 1: 2001 2: 2002 3: 2003 | 1: Jan. 2: Feb. 9: Sep. A: Oct. B: Nov. C: Dec. | 1~31/ (30) | 01~99, A,B,C... | C: Clear D: Diffused | T: Tape & Reel |

■ Luminous Intensity (Iv) Bin:

| Bin | Luminous Intensity Range (mcd) | | Bin | Luminous Intensity Range (mcd) | |
|-----|--------------------------------|---------|-----|--------------------------------|---------|
| | Minimum | Maximum | | Minimum | Maximum |
| H1 | 2.8 | 3.6 | H2 | 3.6 | 4.5 |
| J1 | 4.5 | 5.7 | J2 | 5.7 | 7.2 |
| K1 | 7.2 | 9.0 | K2 | 9.0 | 11.2 |
| L1 | 11.2 | 14.2 | L2 | 14.2 | 18.0 |
| M1 | 18.0 | 22.5 | M2 | 22.5 | 28.5 |
| N1 | 28.5 | 36.0 | N2 | 36.0 | 45.0 |
| P1 | 45.0 | 57.0 | P2 | 57.0 | 71.5 |
| Q1 | 71.5 | 90.0 | Q2 | 90.0 | 112.5 |
| R1 | 112.5 | 142.0 | R2 | 142.0 | 180.0 |
| S1 | 180.0 | 227.0 | S2 | 227.0 | 285.0 |
| T1 | 285.0 | 360.0 | T2 | 360.0 | 450.0 |
| U1 | 450.0 | 570.0 | U2 | 570.0 | 715.0 |

@20mA / Ta=25° C, Tolerance: ± 10%

| | | |
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■ Wavelength (λ_D) Bin:

| Bin | Wavelength Range (nm) | | | | | | | | | | | |
|-----|-----------------------|-------|----------|-------|------------|-------|------------|-------|-------------------|-------|-----------|-------|
| | Bright Red (UR) | | Red (SD) | | Orange (D) | | Yellow (Y) | | Yellow Green (YG) | | Red (USD) | |
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| - | 620.0 | 650.0 | 615.0 | 635.0 | | | | | | | 615.0 | 630.0 |
| A | | | | | 597.0 | 600.0 | 582.0 | 584.5 | 561.5 | 564.5 | | |
| B | | | | | 600.0 | 603.0 | 584.6 | 587.0 | 564.5 | 567.5 | | |
| C | | | | | 603.0 | 606.0 | 587.0 | 589.5 | 567.5 | 570.5 | | |
| D | | | | | 606.0 | 609.0 | 589.5 | 592.0 | 570.5 | 573.5 | | |
| E | | | | | 609.0 | 612.0 | 592.0 | 594.5 | 573.5 | 576.5 | | |
| F | | | | | 612.0 | 615.0 | 594.5 | 597.0 | | | | |
| H | | | | | | | | | | | | |
| J | | | | | | | | | | | | |

@20mA / Ta=25° C, Tolerance: \pm 0.5nm

| Bin | Wavelength Range (nm) | | | | | | | | | | | |
|-----|-----------------------|-------|-------------|-------|-------------|-------|--------------------|-------|-----------------|-------|-----------|-------|
| | Deep Red (URO) | | Orange (UD) | | Yellow (UY) | | Yellow Green (UYG) | | True Green (NG) | | Blue (NB) | |
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| - | 630.0 | 650.0 | | | | | | | | | | |
| A | | | 597.0 | 600.0 | 582.0 | 584.5 | 561.5 | 564.5 | 515.0 | 520.0 | 460.0 | 464.0 |
| B | | | 600.0 | 603.0 | 584.6 | 587.0 | 564.5 | 567.5 | 520.0 | 525.0 | 464.0 | 468.0 |
| C | | | 603.0 | 606.0 | 587.0 | 589.5 | 567.5 | 570.5 | 525.0 | 530.0 | 468.0 | 472.0 |
| D | | | 606.0 | 609.0 | 589.5 | 592.0 | 570.5 | 573.5 | 530.0 | 535.0 | 472.0 | 476.0 |
| E | | | 609.0 | 612.0 | 592.0 | 594.5 | 573.5 | 576.5 | 535.0 | 540.0 | 476.0 | 480.0 |
| F | | | 612.0 | 615.0 | 594.5 | 597.0 | | | | | 480.0 | 485.0 |
| H | | | | | | | | | | | | |
| J | | | | | | | | | | | | |

@20mA / Ta=25° C, Tolerance: \pm 0.5nm

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■ Forward Voltage (V_F) Bin:

| Color | Bin Code | Spec. Range |
|---|----------|-------------|
| Ultra Bright (UYG, UY, UD, USD, URO) | - | 2.4 V max |
| Standard Bright (YG, Y, D, SD) | - | 2.6 V max |
| Bright Red (UR) | - | 2.2 V max |
| Blue (NB) Green (NG) White (TW) | - | 3.9V max |

@20mA / Ta=25°C, Tolerance: ± 0.05 V

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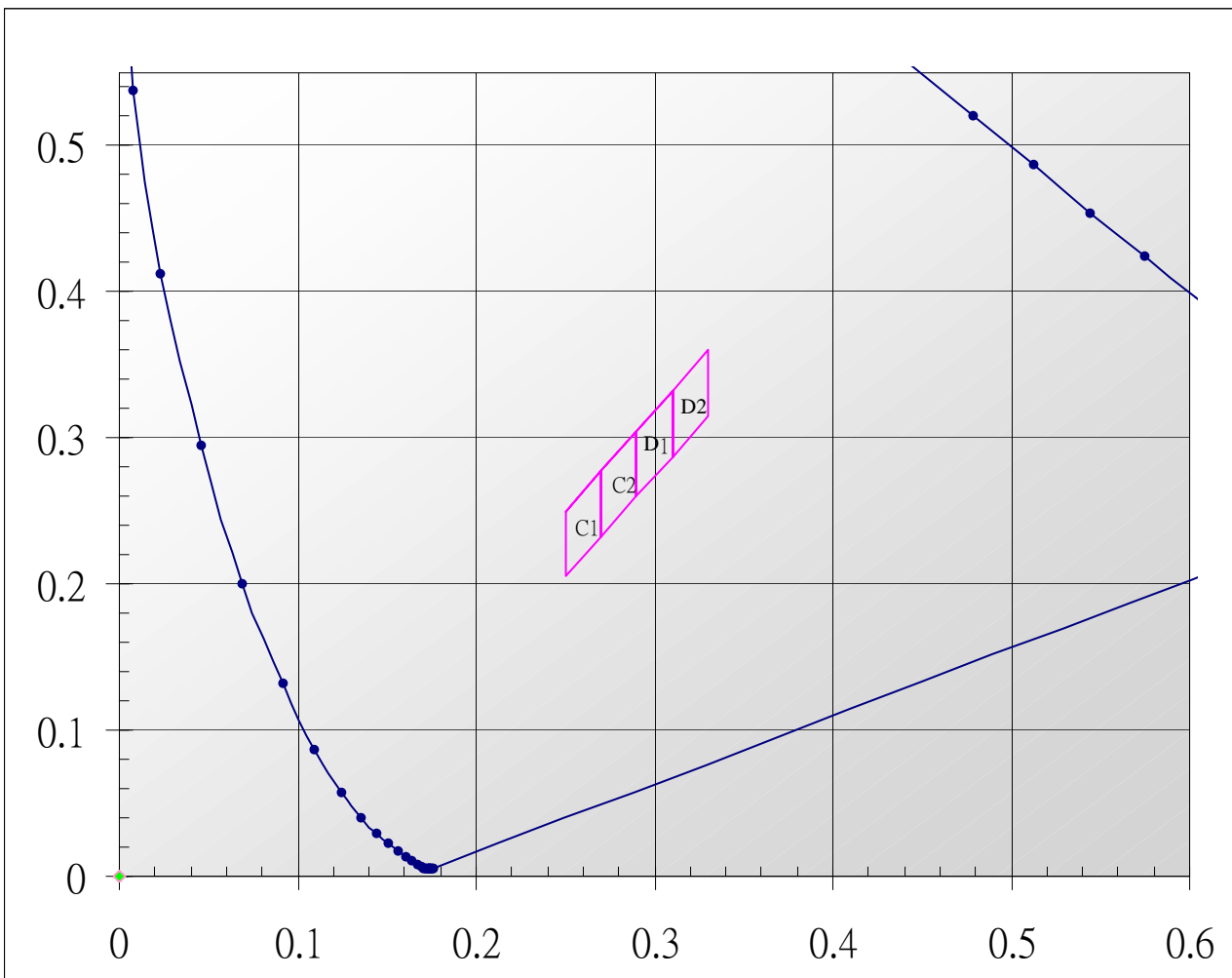
■ Chromaticity Bin (for TW only):

| | | Rank C1 | | | |
|---|--|---------|--------|--------|--------|
| x | | 0.2500 | 0.2700 | 0.2700 | 0.2500 |
| y | | 0.2500 | 0.2775 | 0.2325 | 0.2050 |

| | | Rank C2 | | | |
|---|--|---------|--------|--------|--------|
| x | | 0.2700 | 0.2900 | 0.2900 | 0.2700 |
| y | | 0.2775 | 0.3050 | 0.2600 | 0.2325 |

| | | Rank D1 | | | |
|---|--|---------|--------|--------|--------|
| x | | 0.2900 | 0.3100 | 0.3100 | 0.2900 |
| y | | 0.3050 | 0.3325 | 0.2875 | 0.2600 |

| | | Rank D2 | | | |
|---|--|---------|--------|--------|--------|
| x | | 0.3100 | 0.3300 | 0.3300 | 0.3100 |
| y | | 0.3325 | 0.3600 | 0.3150 | 0.2875 |



@20mA / Ta=25°C, Tolerance: ± 0.01

| | | | |
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Product Characteristics

Absolute Maximum Ratings

| Product | Emission Color | P _d (mW) | I _F (mA) | I _{FP} * (mA) | V _R (V) | T _{OP} (°C) | T _{ST} (°C) |
|-----------|---------------------------|---------------------|---------------------|------------------------|--------------------|----------------------|----------------------|
| HT-191YG | Yellow Green | 65 | 25 | 100 | 5 | -30°C~+85°C | -40°C~+90°C |
| HT-191Y | Yellow | | | | | | |
| HT-191D | Orange | | | | | | |
| HT-191SD | Red | | | | | | |
| HT-191UR | Bright Red | 66 | 30 | 100 | | | |
| HT-191URO | Ultra Deep Red | 72 | 30 | 100 | | | |
| HT-191UYG | Ultra Bright Yellow Green | | | | | | |
| HT-191UY | Ultra Bright Yellow | | | | | | |
| HT-191UD | Ultra Bright Orange | | | | | | |
| HT-191USD | Ultra Bright Red | | | | | | |
| HT-191NB | Blue | 78 | 20 | 80 | 5 | -30°C~+85°C | -40°C~+90°C |
| HT-191NG | True Green | | | | | | |
| HT-191TW | White | | | | | | |

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

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Electro-Optical Characteristics

(T_a 25 °C)

| Product | Emission Color | I _F (mA) | V _F (V) | | λ(nm) | | | I _V (mcd) | |
|-----------|---------------------------|---------------------|--------------------|-----|------------------|----------------|----|----------------------|-----|
| | | | typ | max | λ _D | λ _P | Δλ | min | typ |
| HT-191YG | Yellow Green | 20 | 2.2 | 2.6 | 573 | 568 | 30 | 9 | 20 |
| HT-191Y | Yellow | 20 | 2.1 | 2.6 | 590 | 589 | 35 | 3.6 | 8 |
| HT-191D | Orange | 20 | 2.1 | 2.6 | 608 | 610 | 35 | 3.6 | 9 |
| HT-191SD | Red | 20 | 2.1 | 2.6 | 629 | 642 | 35 | 5.6 | 11 |
| HT-191UR | Bright Red | 20 | 1.8 | 2.2 | 643 | 660 | 20 | 9 | 16 |
| HT-191URO | Ultra Deep Red | 20 | 1.9 | 2.4 | 632 | 645 | 22 | 56 | 120 |
| HT-191UYG | Ultra Bright Yellow Green | 20 | 2.0 | 2.4 | 573 | 574 | 20 | 35 | 60 |
| HT-191UY | Ultra Bright Yellow | 20 | 1.9 | 2.4 | 591 | 593 | 15 | 35 | 140 |
| HT-191UD | Ultra Bright Orange | 20 | 1.9 | 2.4 | 605 | 609 | 17 | 25 | 110 |
| HT-191USD | Ultra Bright Red | 20 | 1.9 | 2.4 | 622 | 636 | 17 | 56 | 120 |
| HT-191NB | Blue | 20 | 3.3 | 3.9 | 470 | 468 | 40 | 25 | 40 |
| HT-191NG | True Green | 20 | 3.3 | 3.9 | 527 | 520 | 40 | 60 | 140 |
| HT-191TW | White | 20 | 3.3 | 3.9 | X=0.29 Y=0.31 | - | - | 140 | 285 |

* Per NIST standards

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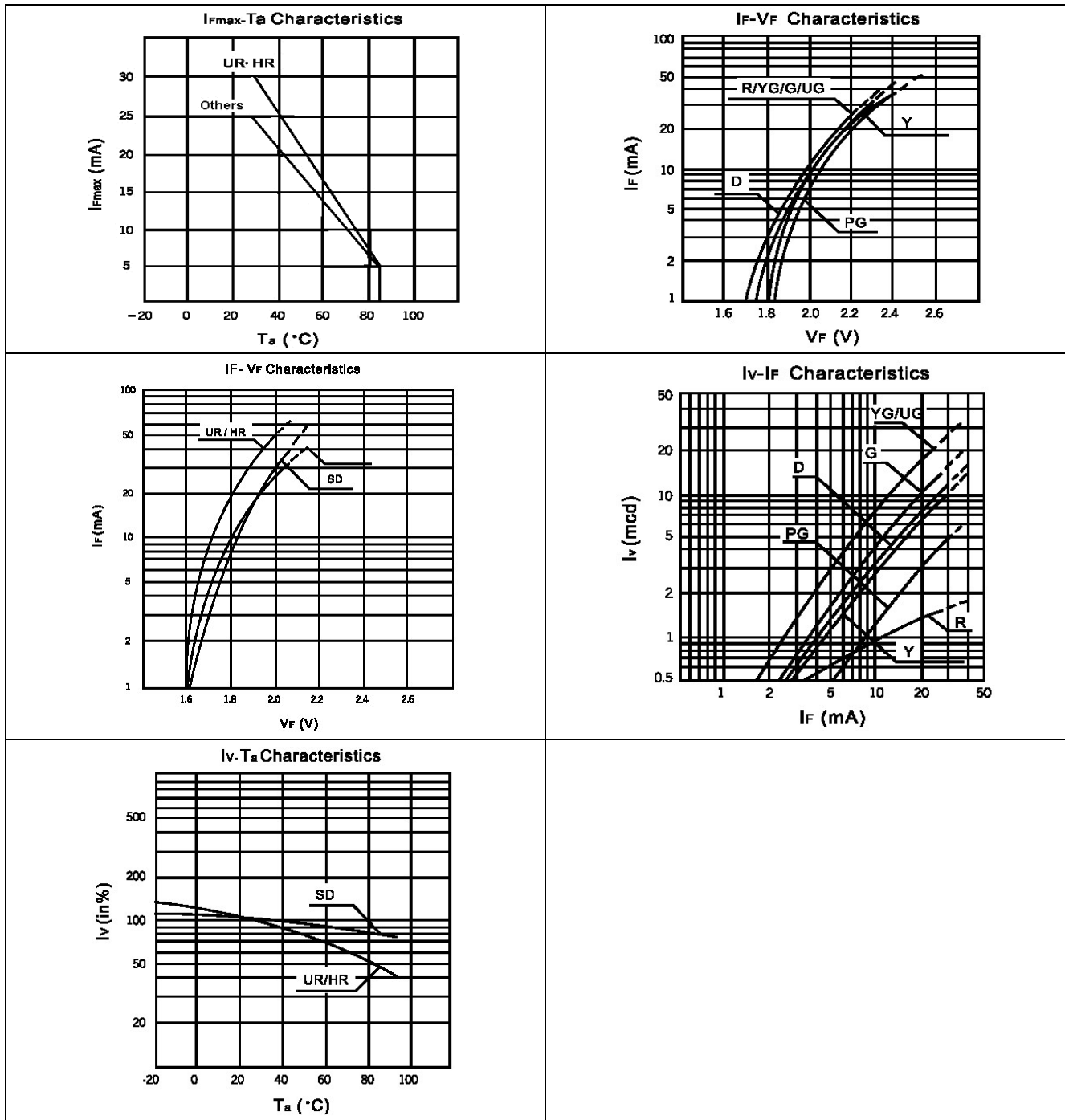
Package Outline Dimension
Recommended Soldering Pattern for Reflow Soldering

Unit: mm Tolerance: +/-0.1

| Outline Dimension | Solder Pattern |
|---|-----------------|
| | |
| <p>Soldering terminals may shift in the x, y direction.</p> | <p>Unit: mm</p> |

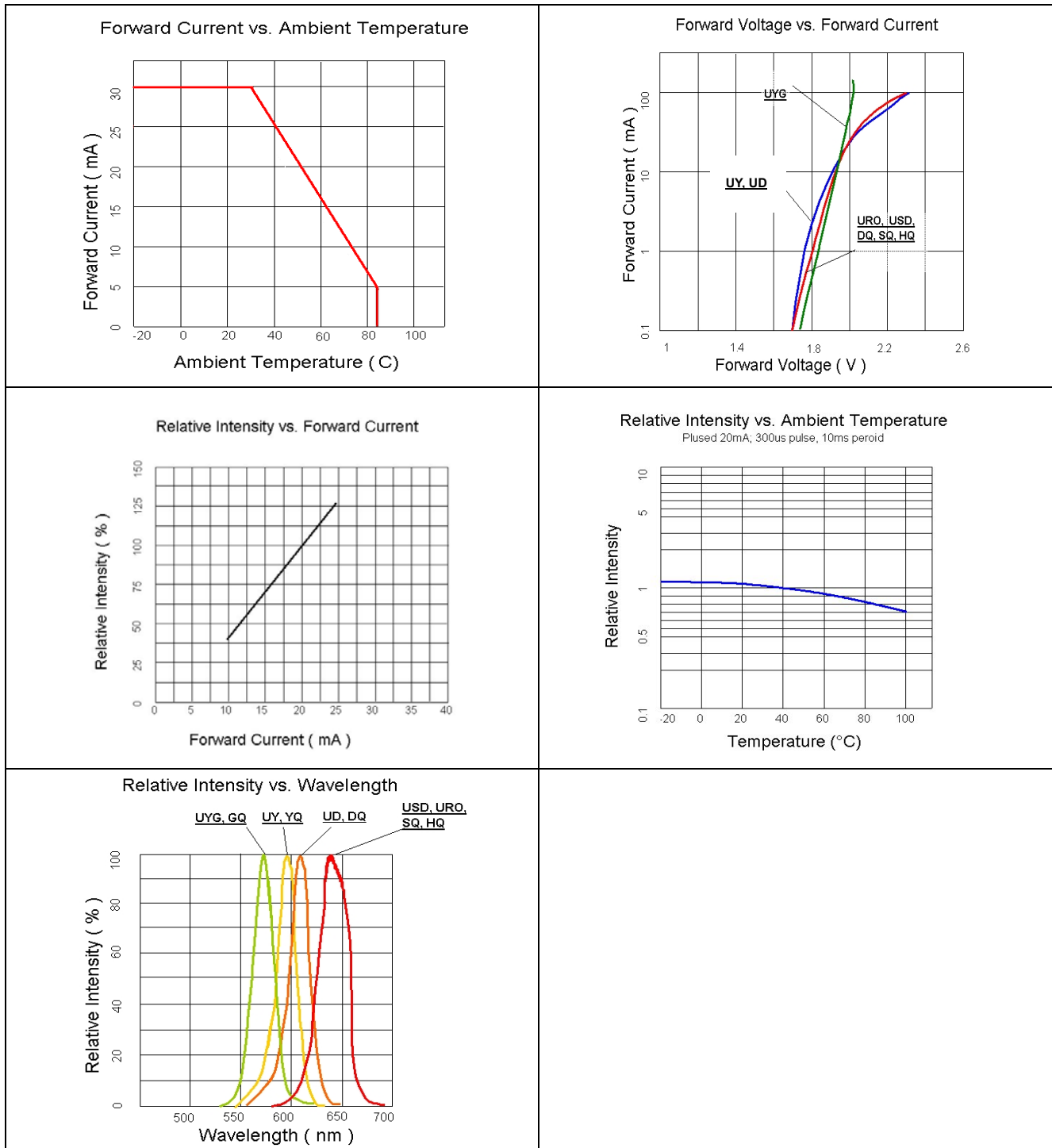
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Characteristic Curves for YG, Y, D, SD and UR



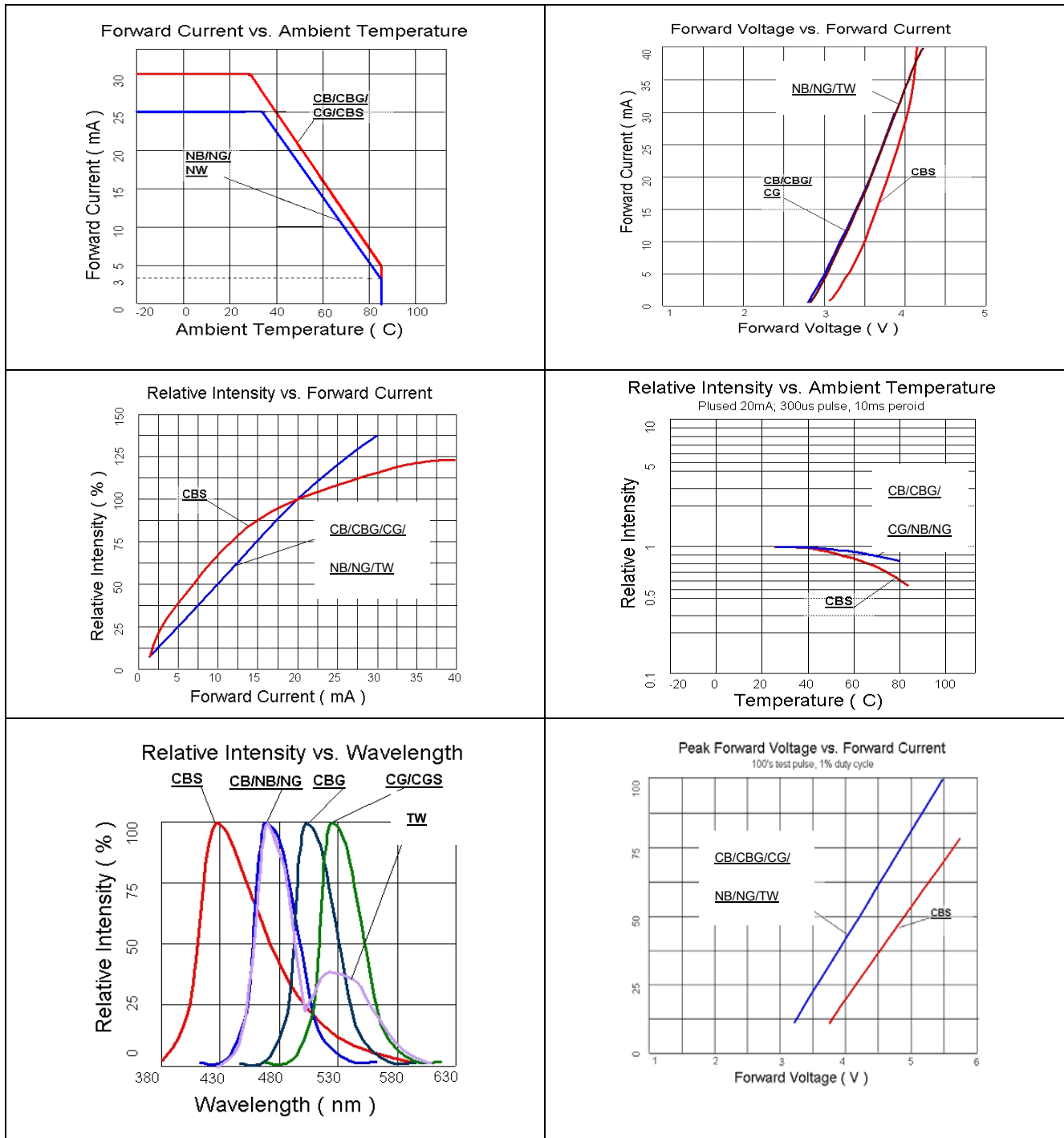
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Characteristic Curves for UYG, UY, UD, USD, and URO



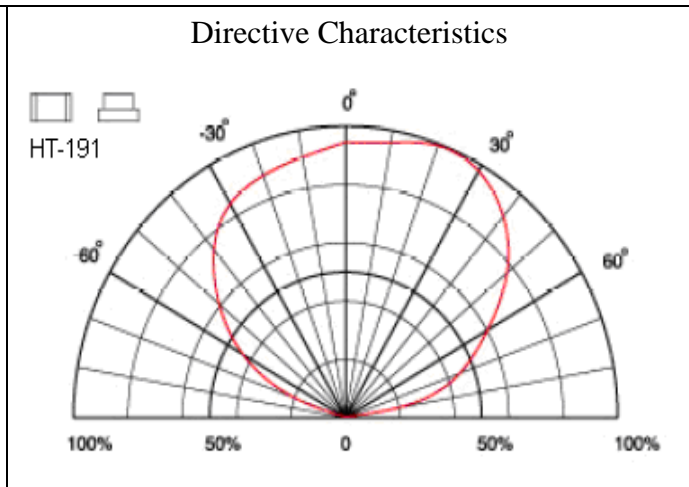
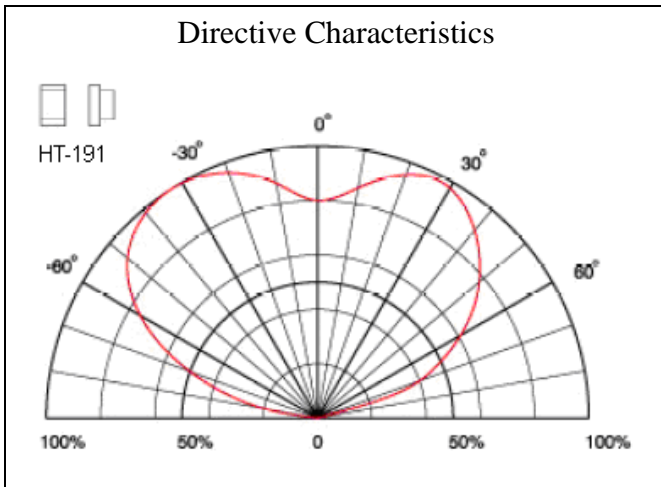
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Characteristic Curves for NB, NG and TW



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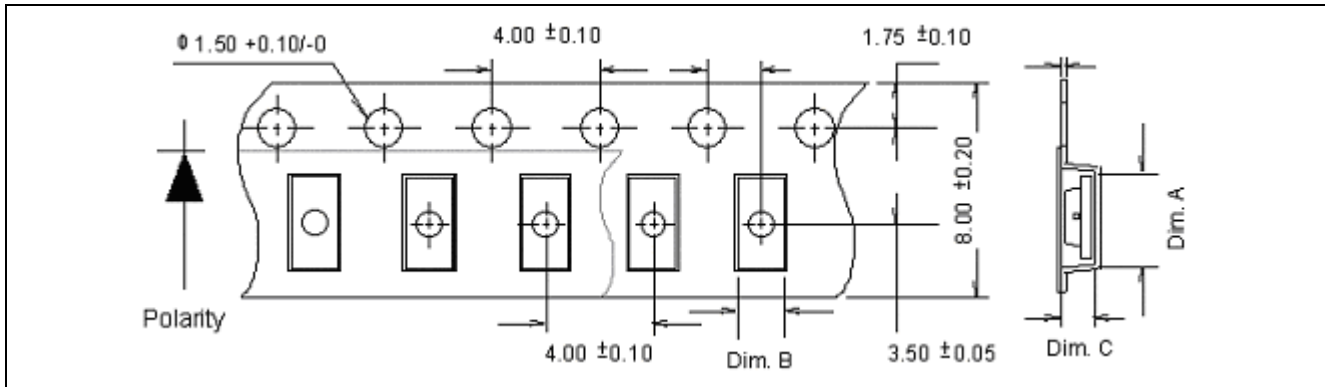
Characteristic Curves for All Colors (Radiation Pattern)



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Packaging

Tape Dimension

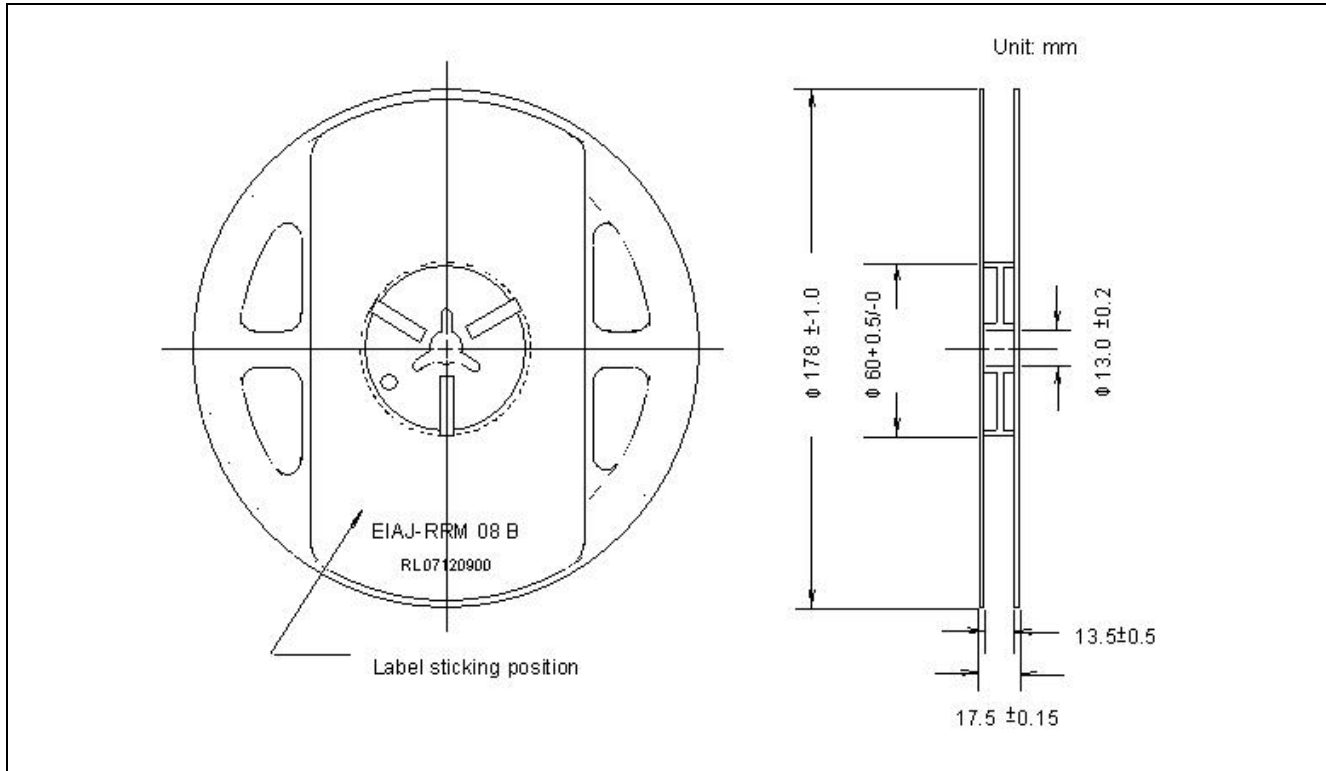


| Part No. | Dim. A | Dim. B | Dim. C | Q'ty/Reel |
|----------|-----------|-----------|-----------|-----------|
| HT-191 | 1.80±0.10 | 0.95±0.10 | 0.75±0.10 | 4K |

Unit: mm

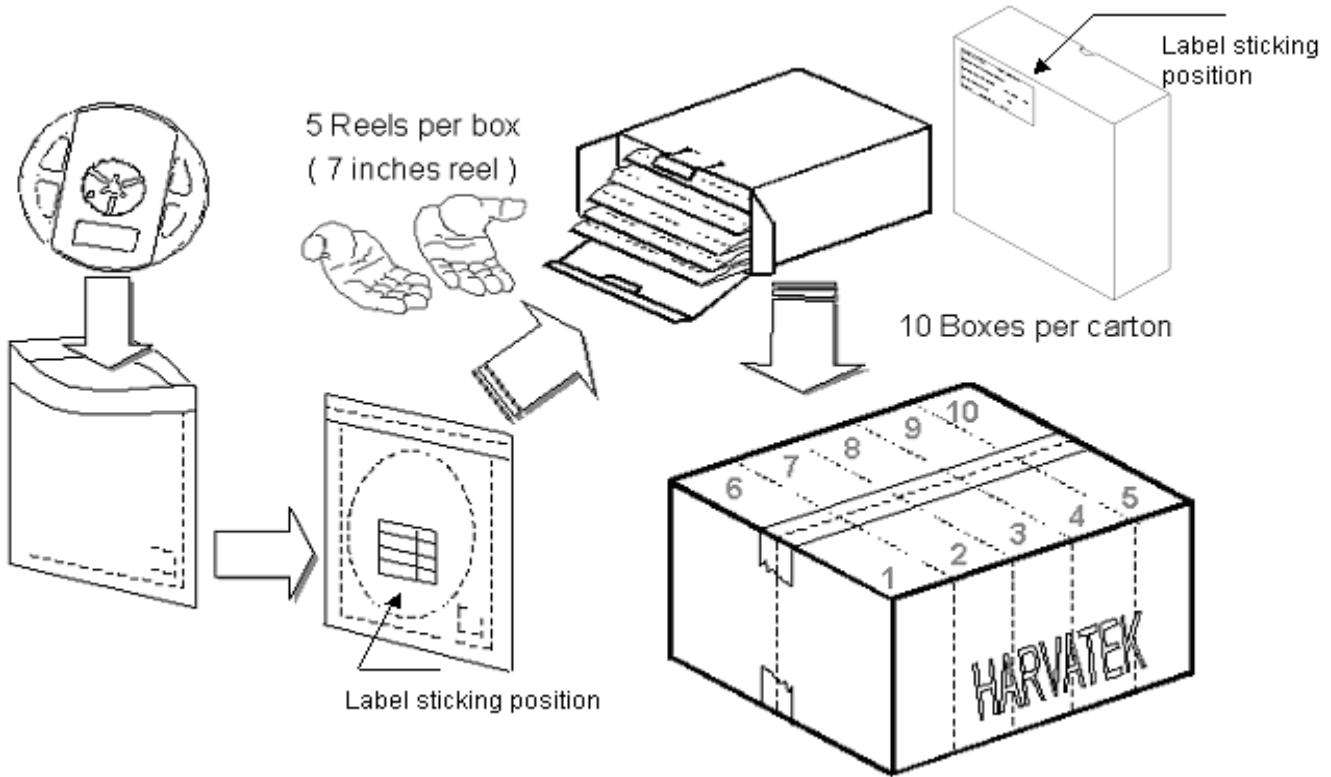
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Reel Dimension



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Packing



5 boxes per carton is available depending on shipment quantity.

| | Specification | Material | Quantity |
|--------------|----------------------|-----------------------------------|------------------|
| Carrier tape | Per EIA 481-1A specs | Conductive black tape | 4000pcs per reel |
| Reel | Per EIA 481-1A specs | Conductive black | |
| Label | HT standard | Paper | |
| Packing bag | 220x240mm | Aluminum laminated bag/ no-zipper | One reel per bag |
| Carton | HT standard | Paper | Non-specified |

Others:

Each immediate box consists of 5 reels. The 5 reels may not necessarily have the same lot number or the same bin combinations of Iv, λ_D and Vf. Each reel has a label identifying its specification; the immediate box consists of a product label as well.

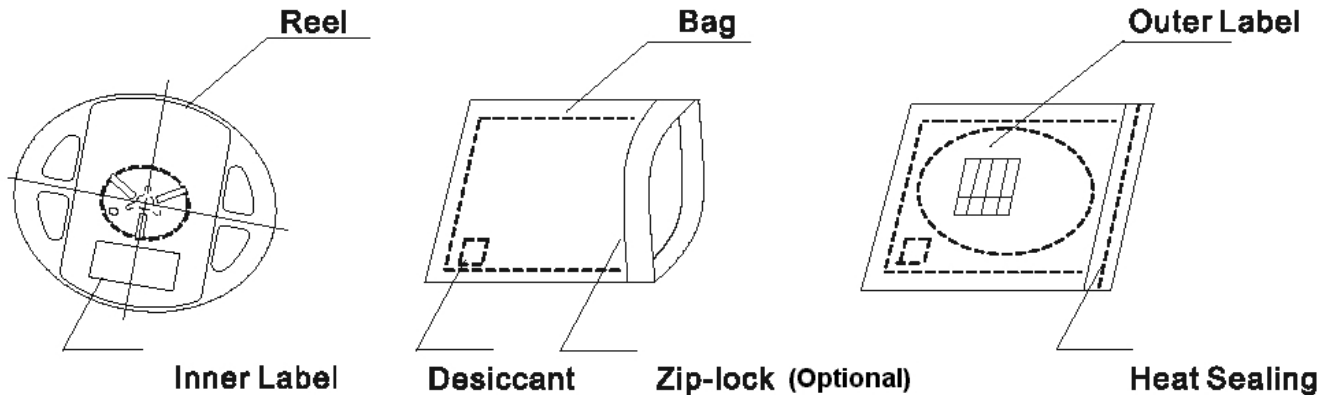
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Dry Pack

All SMD optical devices are **MOISTURE SENSITIVE**. Avoid exposure to moisture at all times during transportation or storage. Every reel is packaged in a moisture protected anti-static bag. Each bag is properly sealed prior to shipment.

Upon request, a humidity indicator will be included in the moisture protected anti-static bag prior to shipment.

The packaging sequence is as follows:

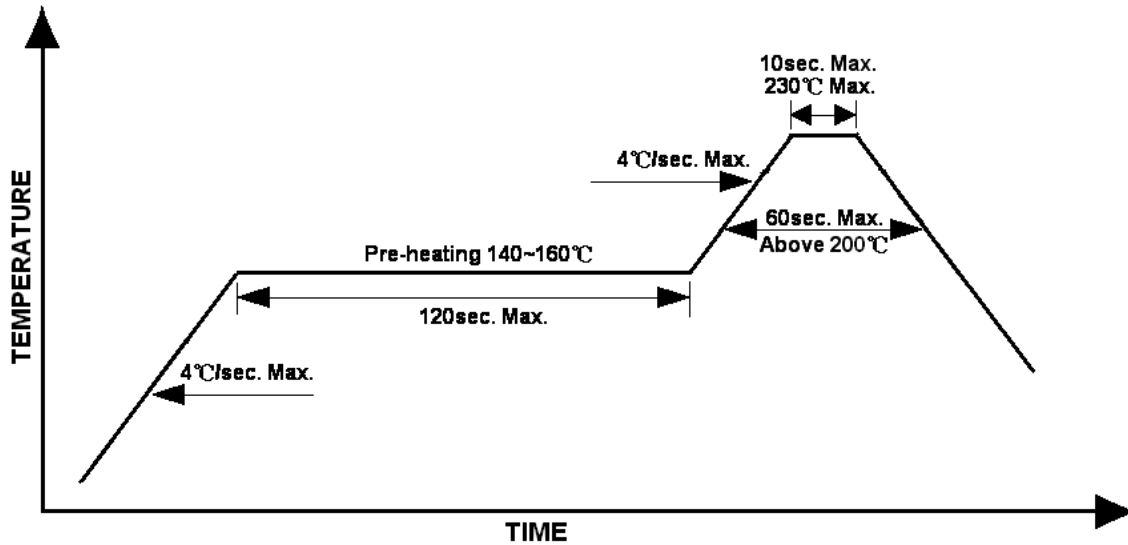


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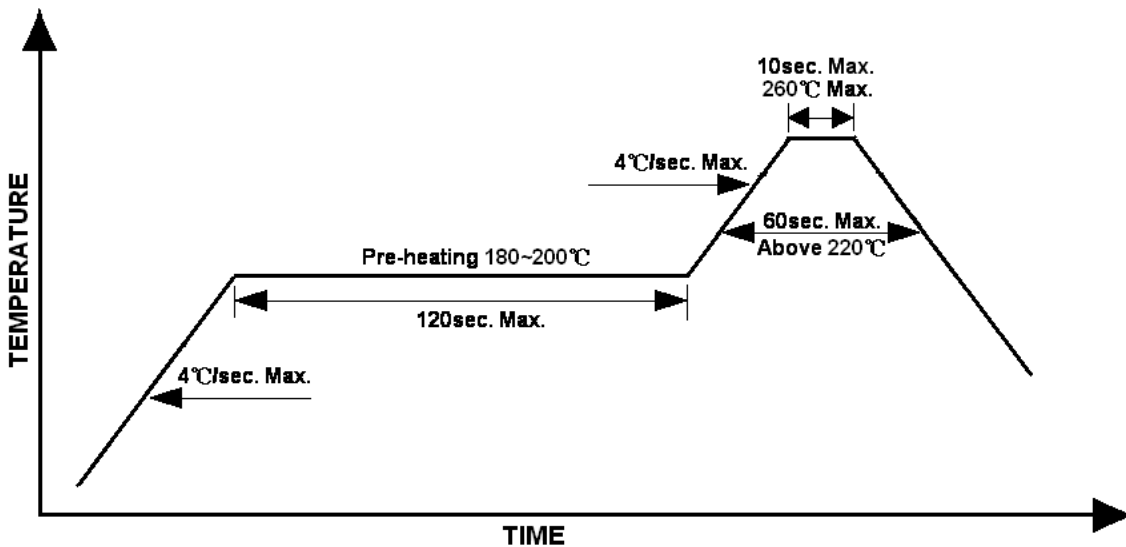
Reflow Soldering

- Recommended tin glue specifications: melting temperature in the range of 178~192 °C
- The recommended reflow soldering profile is as follows (temperatures indicated are as measured on the surface of the LED resin):

Lead Solder Profile



Lead-free Solder Profile



| | | | |
|--|------------------------|----------------|------------|
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Precautions

1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a current limiting resistor of the proper size. Avoid applying a reverse voltage beyond the specified limit.
4. Avoid operation beyond the limits as specified by the absolute maximum ratings.
5. Avoid direct contact with the surface through which the LED emits light.
6. If possible, assemble the unit in a clean room or dust-free environment.

Reworking

- Rework should be completed within 5 seconds under 260 °C.
- The iron tip must not come in contact with the copper foil.
- Twin-head type is preferred.

Cleaning

Following are cleaning procedures after soldering:

- An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended.
- Temperature x Time should be 50°C x 30sec. or <30°C x 3min
- Ultra sonic cleaning: < 15W/ bath; bath volume ≤ 1liter
- Curing: 100 °C max, <3min

Cautions of Pick and Place

- Avoid stress on the resin at elevated temperature.
- Avoid rubbing or scraping the resin by any object.
- Electro-static may cause damage to the component. Please ensure that the equipment is properly grounded. Use of an ionizer fan is recommended.

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Reliability

| 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.) Tamb25°C; IF=20mA; duration 1000hrs |
| High humidity, high temperature bias | 1Q/ 1/ 45/ 0 | JESD-A101-B | Tamb: 85°C Humidity: 85% R.H., IF=5mA Duration: 1000hrs |
| High temperature bias | 1Q/ 1/ 20 | HT specs. | Tamb: 55°C IF=20mA Duration: 1000hrs |
| Pulse life test | 1Q/ 1/ 40/ 0 | | Tamb25°C, If=20mA,, Ip=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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Revision History

| Changes since last revision | Page | Version No. | Revision Date |
|------------------------------------|-------------|--------------------|----------------------|
| New format | | 1.0 | 10-17-2006 |
| Added URO | | 1.1 | 01-29-2007 |
| Added viewing angle | 6 | 1.2 | 03-15-2007 |
| Update to Clear Diffused Lens | 5 | 1.3 | 09-08-2008 |
| Add InGaN parts | | 1.4 | 01-14-2009 |
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