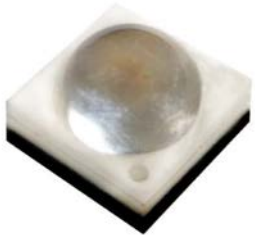
台宙晶體科技股份有限公司

Top Crystal Technology Inc.,

**Power Light Source**

Introduction：

THCA-D6U-viewing angle 60° Quartz Package, is one of the smallest high power LED, has offered extended solid-state lighting design possibilities. Due to the special design of chip and package. THCA-D6U -viewing angle 60°is designed with using copper leadframe, the best thermal material of the world.



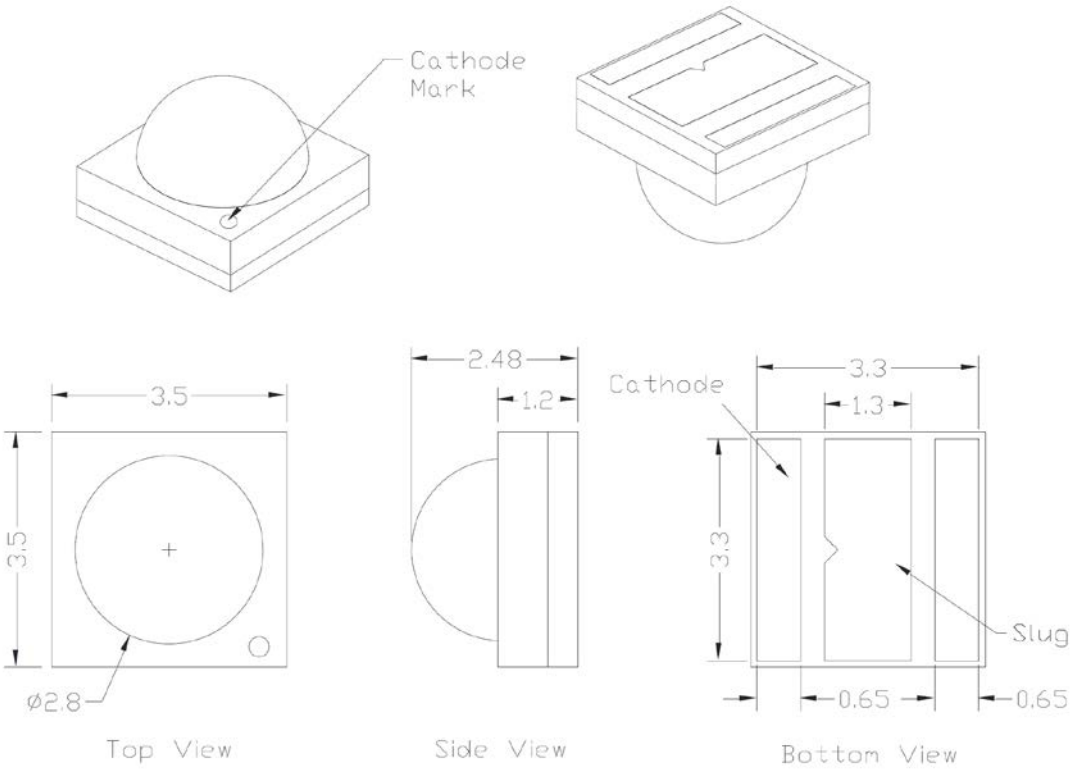
Feature：

- Long operating life
- Energy efficiency
- Compact design
- View angle 60°
- ROHS compatibility
- Quartz Glass Lens

Typical Applications:

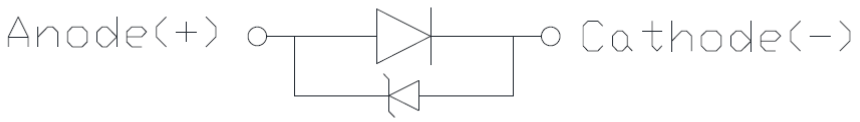
- Currency inspection
- UV drying of printing inks and lacquers
- UV gluing, UV curing, UV marking
- Detects fluorescing minerals and gemsIntroduction

Package Dimensions:




Notes :
1. 1. All dimensions are in millimeters
2. 2. Tolerance is ±0.25mm

## Circuit Diagram



## Absolute Maximum Ratings

| Parameter | Rating |
|---|---|
| DC Forward Current (mA) | 1000 |
| Peak Pulsed Forward Current (mA)<br>1100 (less than 1/10 duty cycle@1KHz) | 1100 |
| ESD Sensitivity<br>(HBM per MIL-STD-883E Method 3015.7) | ±4000V |
| LED Junction Temperature (℃) | 120 |
| Operating Temperature (℃) | -40~85 |
| Storage Temperature (℃) | -40~100 |
| Soldering Temperature | JEDEC 020c 260°C |
| Allowable Reflow Cycles | 3 |
| Reverse Voltage ($V_R$) | Not designed to be driven in reverse bias |

## Optical Characteristics@700mA (Tj=25℃)

| Color | Peak Wavelength λp | | | Viewing Angle Degree |
|---|---|---|---|---|
| | Min. | Typical | Max. | $2\theta_{1/2}$ |
| UV | 365nm | 367.5nm | 370nm | 60 |
| | 380nm | 385nm | 390nm | 60 |
| | 390nm | 395nm | 400nm | 60 |
| | 400nm | 405nm | 410nm | 60 |

Notes :

1. Peak wavelength is measured with an accuracy of ±0.5nm..

## Flux Characteristics (Tj=25℃)

| Peak Wavelength | Radiometric Power (mW) | | |
|---|---|---|---|
| | @700mA | | Refer@500mA |
| | Min. | Typ. | Typ. |
| 365-370nm | 1000mW | 1080mW | 770mW |
| 380-390nm | 1210mW | 1250mW | 880mW |
| 390-400nm | 1100mW | 1180mW | 845mW |
| 400-410nm | 1210mW | 1250mW | 880mW |

- TCI maintains a tolerance of ±7% on flux and power measurements.
- Please do not drive at rated current more than 1 second without proper heat sink.

## Electrical Characteristics (Tj=25℃)

| Peak Wavelength | Forward Voltage VF (V) | | | | Thermal Resistance Junction to lead (℃/W) |
|---|---|---|---|---|---|
| | @700mA | | | Refer @500mA | |
| | Min. | Typical | Max. | Typical | |
| 365-370nm | 3.4 | 3.7 | 4.0 | 3.6 | 8 |
| 380-390nm | 3.2 | 3.5 | 3.8 | 3.4 | 8 |
| 390-400nm | 3.2 | 3.5 | 3.8 | 3.4 | 8 |
| 400-410nm | 3.2 | 3.5 | 3.8 | 3.4 | 8 |

Notes:

1. $V_F$ ±0.1V tester tolerance.

## RELIABILITY ITEMS and SPECTIONS

| Stress Test | Stress Conditions | Stress Duration | Failure Criteria |
|---|---|---|---|
| Room Temperature Operating Life (RTOL) | 25°C, $I_F$ = max DC (Note 1) | 1000 hours | Note 2 |
| Wet High Temperature Operating Life (WHTOL) | 85°C/60%RH, $I_F$ = max DC (Note 1) | 1000 hours | Note 2 |
| Wet High Temperature Storage Life (WHTSL) | 85°C/85%RH, non-operating | 1000 hours | Note 2 |
| High Temperature Storage Life (HTSL) | 110°C, non-operating | 1000 hours | Note 2 |
| Low Temperature Storage Life (LTSL) | -40°C, non-operating | 1000 hours | Note 2 |
| Non-operating Temperature Cycle (TMCL) | -40°C to 120°C, 30 min. dwell, <5 min. transfer | 200 cycles | Note 2 |
| Mechanical Shock | 1500 G, 0.5 msec. pulse, 5 shocks each 6 axis | | Note 3 |
| Natural Drop | On concrete from 1.2 m, 3X | | Note 3 |
| Variable Vibration Frequency | 10-2000-10 Hz, log or linear sweep rate, 20 G about 1 min., 1.5 mm, 3X/axis | | Note 3 |
| Solder Heat Resistance (SHR) | 260°C ± 5°C, 10 sec. | | Note 3 |
| Solderability | Steam age for 16 hrs., then solder dip at 260°C for 5 sec. | | Solder coverage on lead |

**Notes:**

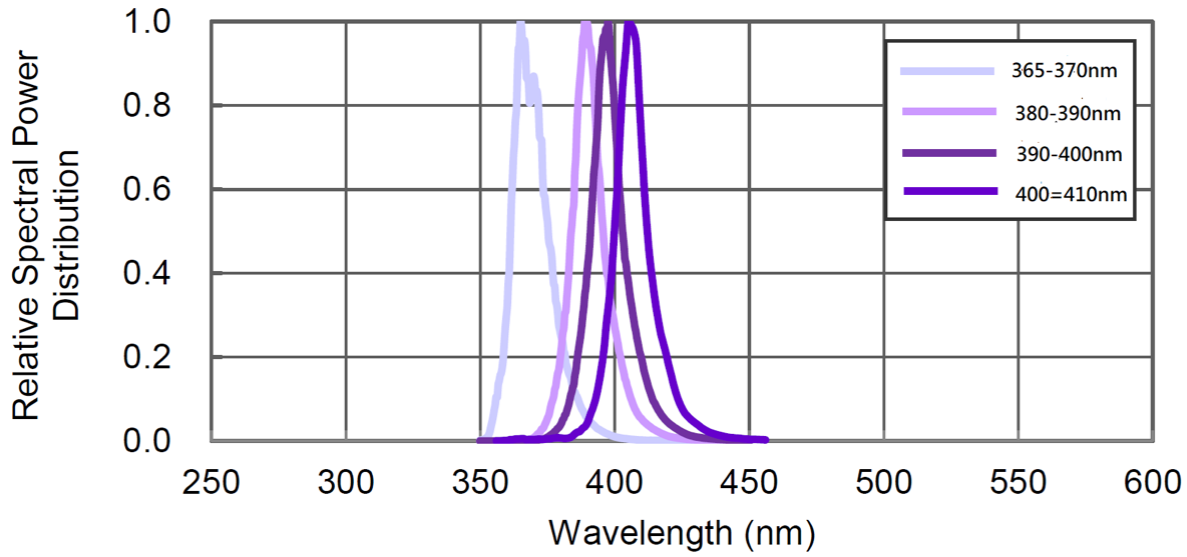
1. Depending on the maximum derating curve.
2. Criteria for judging failure

| Item | Test Condition | Criteria for Judgement | |
|---|---|---|---|
| | | Min. | Max. |
| Forward Voltage ($V_F$) | $I_F$ = max DC | -- | Initial Level x 1.1 |
| Luminous Flux or | $I_F$ = max DC | Initial Level x 0.7 | -- |
| Reverse Current ($I_R$) | $V_R$ = 5V | -- | 50 μA |

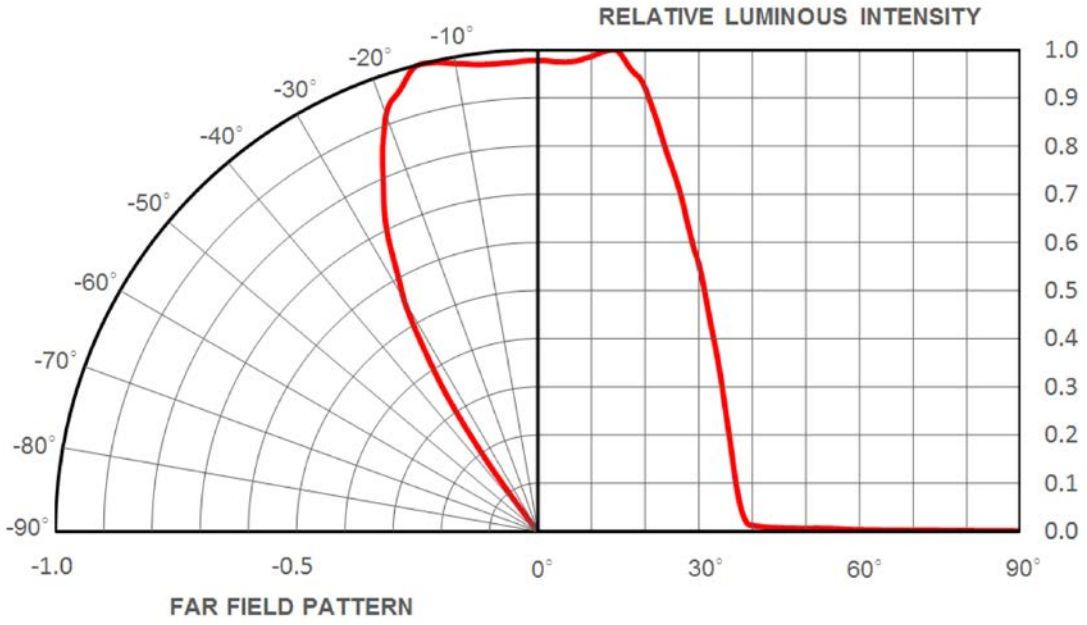
* The test is performed after the LED is cooled down to the room temperature.

3. A failure is an LED that is open or shorted.

## Color Spectrum, TJ = 25°C

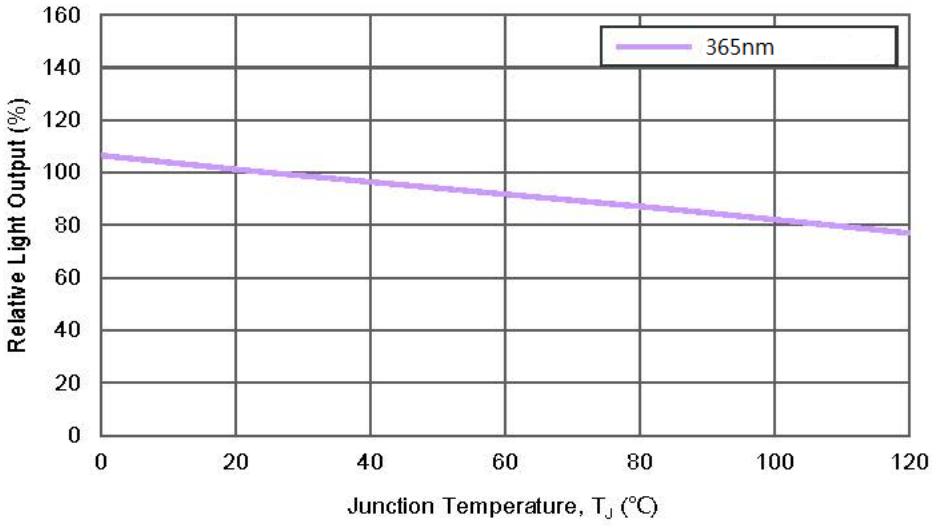



## Typical Spatial Radiation Pattern



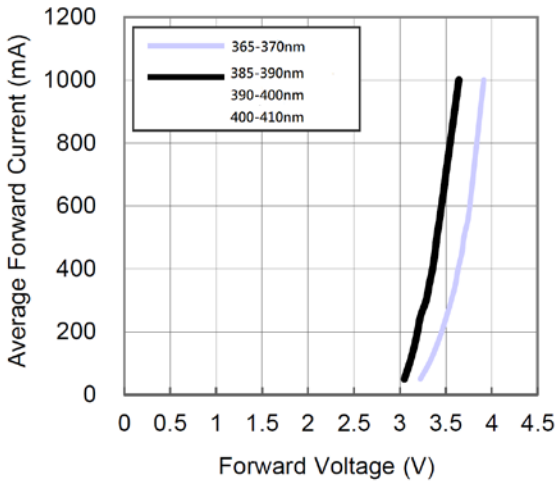
## Light Output Characteristics

Relative Light Output vs. Junction Temperature at 350mA

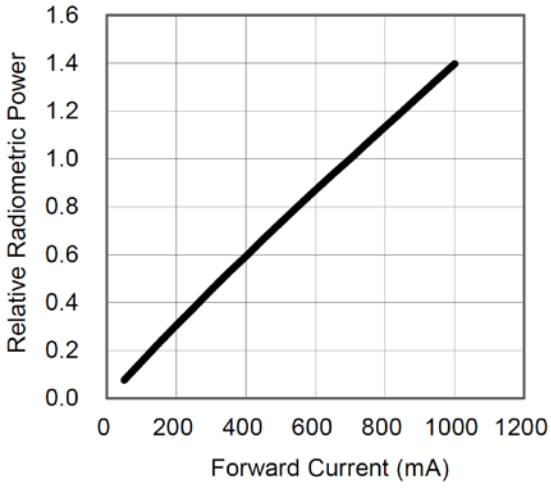



## Forward Current Characteristics, TJ = 25°C

Forward Voltage vs. Forward Current




Forward Current vs. Luminous Flux



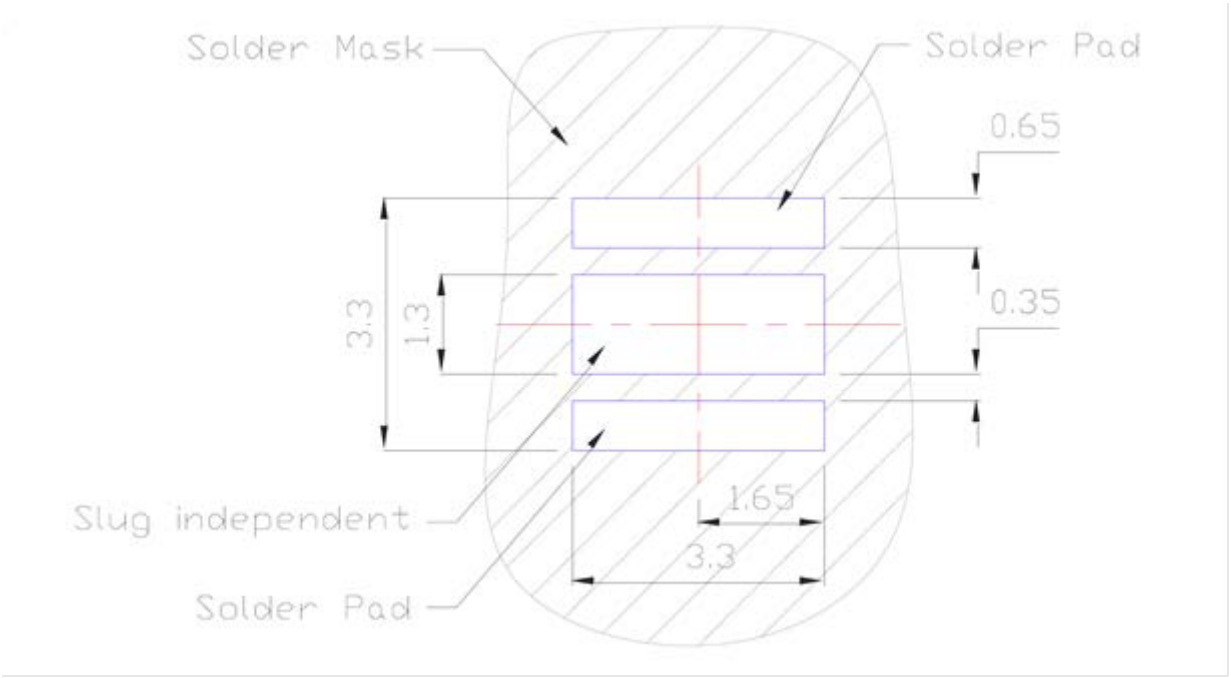
## Moisture Sensitivity Level - JEDEC Level 1

| Level | Floor Life | | Soak Requirements | | | |
|---|---|---|---|---|---|---|
| | | | Standard | | Accelerated Environment | |
| | Time | Conditions | Time (hours) | Conditions | Time (hours) | Conditions |
| 1 | Unlimited | ≤30˚C / 85% RH | 168 +5/-0 | 85˚C / 85% RH | NA | NA |

- **The standard soak time includes a default value of 24 hours for semiconductor manufature's exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor's facility.**
- **Table below presents the moisture sensitivity level definitions per IPC/JEDEC's J-STD-020C.**

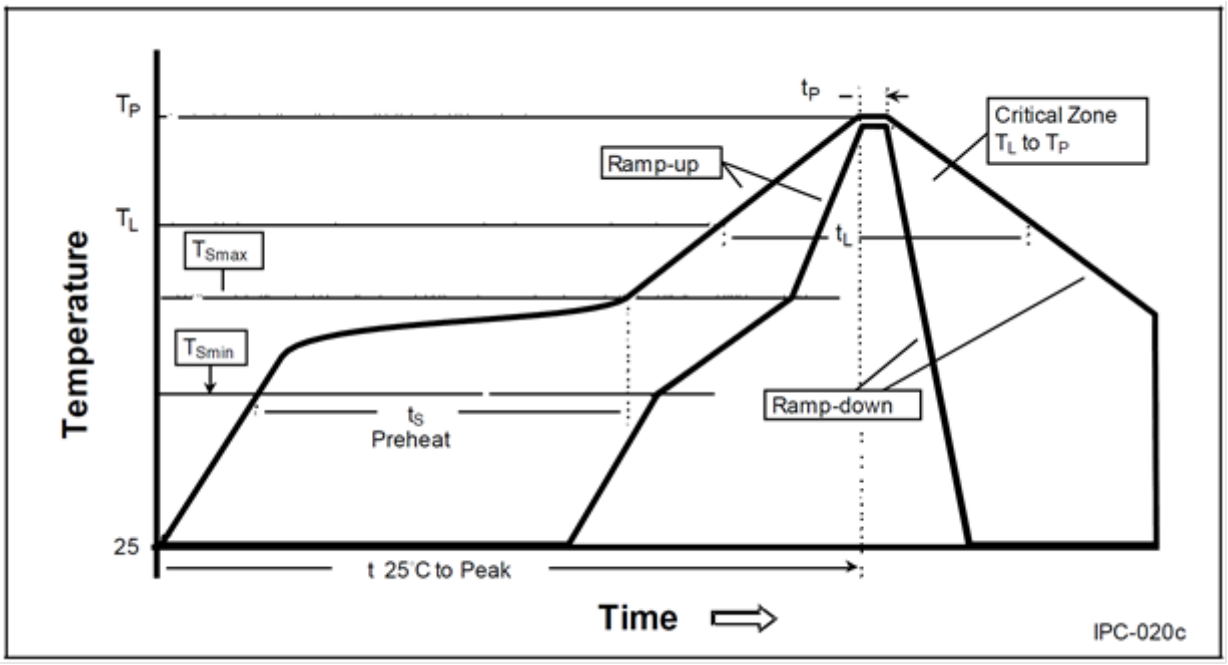
| Level | Floor Life | | Soak Requirements | | | |
|---|---|---|---|---|---|---|
| | | | Standard | | Accelerated Environment | |
| | Time | Conditions | Time (hours) | Conditions | Time (hours) | Conditions |
| 1 | Unlimited | ≤30˚C / 85% RH | 168 +5/-0 | 85˚C / 85% RH | NA | NA |
| 2 | 1 year | ≤30˚C / 60% RH | 168 +5/-0 | 85˚C / 60% RH | NA | NA |
| 2a | 4 weeks | ≤30˚C / 60% RH | 696 +5/-0 | 30˚C / 60% RH | 120 +1/-0 | 60˚C / 60% RH |
| 3 | 168 hours | ≤30˚C / 60% RH | 192 +5/-0 | 30˚C / 60% RH | 40 +1/-0 | 60˚C / 60% RH |
| 4 | 72 hours | ≤30˚C / 60% RH | 96 +2/-0 | 30˚C / 60% RH | 20 +0.5/-0 | 60˚C / 60% RH |
| 5 | 48 hours | ≤30˚C / 60% RH | 72 +2/-0 | 30˚C / 60% RH | 15 +0.5/-0 | 60˚C / 60% RH |
| 5a | 24 hours | ≤30˚C / 60% RH | 48 +2/-0 | 30˚C / 60% RH | 10 +0.5/-0 | 60˚C / 60% RH |
| 6 | Time on Label (TOL) | ≤30˚C / 60% RH | Time on Label (TOL) | 30˚C / 60% RH | NA | NA |

## Recommended Solder Pad Design




- All dimensions are in millimeters.
- Electrical isolation is required between Slug and Solder Pad

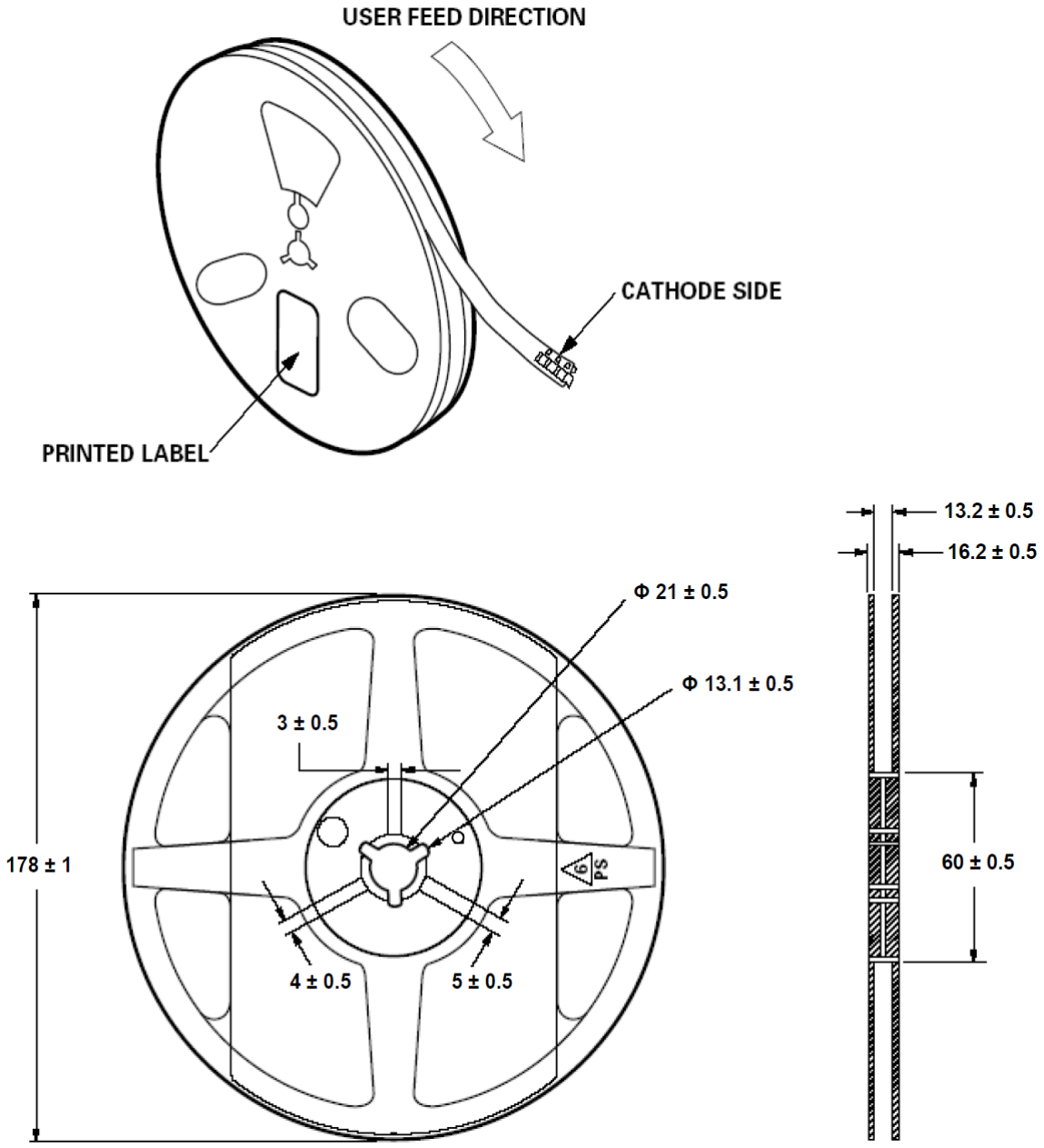
## Reflow Soldering Temperature Profile



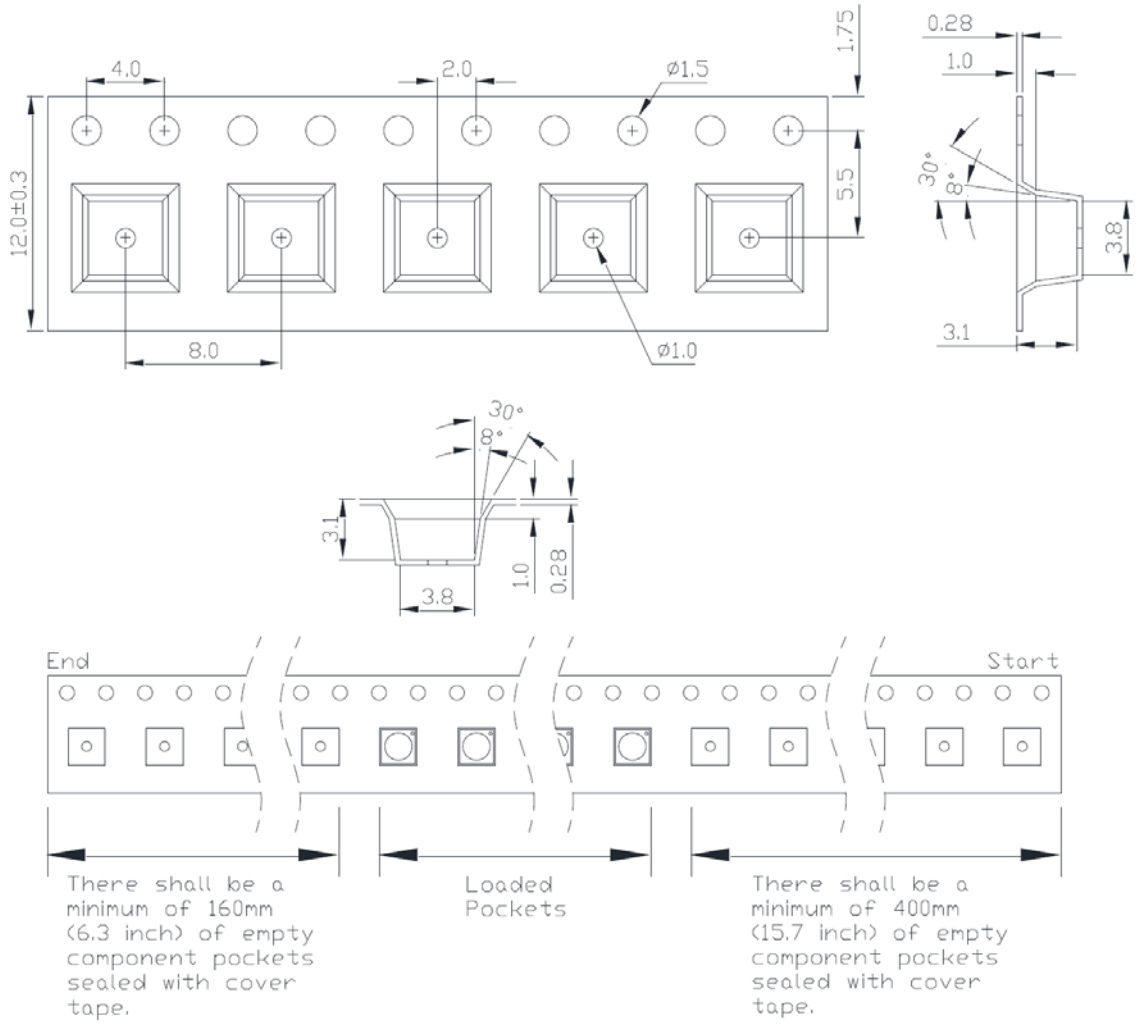

| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|---|---|---|
| Average Ramp-Up Rate ($T_{Smax}$ to $T_P$) | 3°C / second max. | 3°C / second max. |
| Preheat<br>– Temperature Min ($T_{Smin}$)<br>– Temperature Max ($T_{Smax}$)<br>– Time ($t_{Smin}$ to $t_{Smax}$) | <br>100°C<br>150°C<br>60-120 seconds | <br>150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>– Temperature ($T_L$)<br>– Time ($t_L$) | <br>183°C<br>60-150 seconds | <br>217°C<br>60-150 seconds |
| Peak/Classification Temperature ($T_p$) | 240°C | 260°C |
| Time Within 5°C of Actual Peak Temperature ($t_p$) | 10-30 seconds | 20-40 seconds |
| Ramp-Down Rate | 6°C/second max. | 6°C/second max. |
| Time 25°C to Peak Temperature | 6 minutes max. | 8 minutes max. |

- All temperatures refer to topside of the package, measured on the package body surface.
- Repairing should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used. It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.
- Reflow soldering should not be done more than three times.
- When soldering, do not put stress on the LEDs during heating.
- After soldering, do not warp the circuit board.

**Tape and Reel Packaging Specifications**



**Carrier tape dimensions**




**Note**

All dimensions are in millimeters

## Notice

1. In order to avoid absorption of moisture, it is recommended that the products are stored in the dry box (or desiccators ) with a desiccants. Alternatively the following environment is recommended: Storage temperature : 5°C~30°C Humidity:60% HR max.
2. If the storage conditions are of high humidity the product should be dried before use. Recommended drying conditions: 12 hours at 60°C±5°C.
3. Any mechanical force or any excess vibration should be avoid during the cooling process after soldering.
4. Reflow rapidly cooling should be avoided.
5. Components should not be mounted on distorted Printed Circuit Boards.
6. Devices should not contact with any types of fluid, such as water , oil , organic solvents…. etc.
7. The maximum ambient temperature should be taken into consideration when determining the operating current.
8. Devices should be soldered within 7 days after opening the moisture-proof packing.
9. Repack unused product in anti-moisture packing, fold to close any opening and store in a dry place.
10. The appearance and specifications of devices may be modified for improvement without notice.
11. ESD Precautions Static Electricity and surge damages LEDs. It is recommended that wrist bands or anti-electrostatic gloves be used when handing the LEDs . All devices, equipment and machinery should be properly grounded.
12. This product must be driven by constant power supplier.

# Eye Safety Guidelines

- During operation, the LED emits high intensity ultraviolet (UV) light, which is harmful to skin and eyes. UV light is hazardous to skin and may cause cancer. Avoid exposure to UV light when LED is operational.

  Precautions must be taken to avoid looking directly at the UV light without the use of UV light protective

  glasses. Do not look directly at the front of the LED or at the LED's lens when LED is operational.
- Attach warning labels on products/systems that use UV LEDs