

### Top view LEDs 45-21UMC/XXXXXXXX/TR8



#### Features

- Top View White LEDs
- Lead frame package with individual 2 pins
- Wide viewing angle
- Soldering methods: IR reflow soldering Pb-free
- The product itself will remain within RoHS compliant version.

#### Applications

- LCD back light
- Mobile phones
- Indicators.
- Illuminations.
- Switch lights.

## Device Selection Guide

| Chip<br>Materials | Emitted Color | Resin Color |
|-------------------|---------------|-------------|
| InGaN             | White         | Yellowish   |

### 45-21UMC/XXXXXXXX/TR8

| 45-21 | - | UM | C | - | XX | XX | XX | X | - | T | R | 8 |
|-------|---|----|---|---|----|----|----|---|---|---|---|---|
| 1     |   |    |   |   | 2  | 3  | 4  | 5 |   | 6 | 7 | 8 |

The product name is designated as below:

|    |                             |
|----|-----------------------------|
| 1. | Product type                |
| 2. | C.I.E Range Code Of Group   |
| 3. | Iv Range Code Of Group      |
| 4. | Forward Voltage Spec. Setup |
| 5. | Test Of Electric Current    |
| 6. | Package Quantity            |
| 7. | Packing method              |
| 8. | Forming types               |

### Absolute Maximum Ratings (Ta=25℃)

| Parameter             | Symbol    | Rating                                                                    | Unit |
|-----------------------|-----------|---------------------------------------------------------------------------|------|
| Reverse Voltage       | $V_R$     | 5                                                                         | V    |
| Forward Current       | $I_F$     | 30                                                                        | mA   |
| Power Dissipation     | $P_d$     | 110                                                                       | mW   |
| Operating Temperature | $T_{opr}$ | -40 ~ +85                                                                 | ℃    |
| Storage Temperature   | $T_{stg}$ | -40 ~ +90                                                                 | ℃    |
| Soldering Temperature | $T_{sol}$ | Reflow Soldering : 260 ℃ for 10 sec.<br>Hand Soldering : 350 ℃ for 3 sec. |      |

### Electro-Optical Characteristics (Ta=25℃)

| Parameter          | Symbol          | Min.  | Typ.  | Max.  | Unit | Condition  |
|--------------------|-----------------|-------|-------|-------|------|------------|
| Luminous Intensity | $I_v$           | 1200  | ----- | 2200  | mcd  | $I_F=20mA$ |
| Viewing Angle      | $2\theta_{1/2}$ | ----- | 120   | ----- | deg  | $I_F=20mA$ |
| Forward Voltage    | $V_F$           | 2.8   | ----- | 3.55  | V    | $I_F=20mA$ |
| Reverse Current    | $I_R$           | ----- | ----- | 50    | μA   | $V_R=5V$   |

Note:

1. Tolerance of Luminous Intensity: ±11%
2. Tolerance of Dominant Wavelength: ±1nm
3. Tolerance of Forward Voltage: ±0.1V

## Bin Range of Luminous Intensity

| Bin Code | Min. | Max. | Unit | Condition           |
|----------|------|------|------|---------------------|
| 22       | 1200 | 1250 | mcd  | $I_F = 20\text{mA}$ |
| 23       | 1250 | 1300 |      |                     |
| 24       | 1300 | 1350 |      |                     |
| 25       | 1350 | 1400 |      |                     |
| 26       | 1400 | 1450 |      |                     |
| 27       | 1450 | 1500 |      |                     |
| 28       | 1500 | 1550 |      |                     |
| 29       | 1550 | 1600 |      |                     |
| 30       | 1600 | 1650 |      |                     |
| 31       | 1650 | 1700 |      |                     |
| 32       | 1700 | 1750 |      |                     |
| 33       | 1750 | 1800 |      |                     |
| 34       | 1800 | 1850 |      |                     |
| 35       | 1850 | 1900 |      |                     |
| 36       | 1900 | 1950 |      |                     |
| 37       | 1950 | 2000 |      |                     |
| 38       | 2000 | 2050 |      |                     |
| 39       | 2050 | 2100 |      |                     |
| 40       | 2100 | 2150 |      |                     |
| 41       | 2150 | 2200 |      |                     |

Note:  
Tolerance of Luminous Intensity:  $\pm 11\%$

## Bin Range of Forward Voltage

| Group |   |   |  |   |   |   |   | Bin Code | Min. | Max. | Unit | Condition            |
|-------|---|---|--|---|---|---|---|----------|------|------|------|----------------------|
| 0     | 1 |   |  | 4 | 5 | 6 | 7 | 6-1      | 2.95 | 3.05 | V    | I <sub>F</sub> =20mA |
|       |   |   |  |   |   |   |   | 6-2      | 3.05 | 3.15 |      |                      |
|       | 2 | 3 |  |   |   |   | 8 | 7-1      | 3.15 | 3.25 |      |                      |
|       |   |   |  |   |   |   |   | 7-2      | 3.25 | 3.35 |      |                      |
|       |   |   |  |   |   |   |   | 8-1      | 3.35 | 3.45 |      |                      |
|       |   |   |  |   |   |   |   | 8-2      | 3.45 | 3.55 |      |                      |

| Group | Bin Code | Min. | Max. | Unit | Condition            |
|-------|----------|------|------|------|----------------------|
| 9     | 6-11     | 3.00 | 3.05 | V    | I <sub>F</sub> =20mA |
|       | 6-2      | 3.05 | 3.15 |      |                      |
|       | 7-1      | 3.15 | 3.25 |      |                      |
|       | 7-2      | 3.25 | 3.35 |      |                      |
|       | 8-1      | 3.35 | 3.45 |      |                      |
|       | 8-11     | 3.45 | 3.50 |      |                      |

| Group |   |   |   |   |   |   |   | Bin Code | Min  | Max  | Unit | Condition            |
|-------|---|---|---|---|---|---|---|----------|------|------|------|----------------------|
| C     | R | L | N | B | K | H | E | 5-1-3    | 2.80 | 2.90 | V    | I <sub>F</sub> =20mA |
|       |   |   |   |   |   |   |   | 5-2-3    | 2.90 | 3.00 |      |                      |
|       |   |   |   |   |   |   |   | 6-1-3    | 3.00 | 3.10 |      |                      |
|       |   |   |   |   |   |   |   | 6-2-3    | 3.10 | 3.20 |      |                      |
|       |   |   |   |   |   |   |   | 7-1-3    | 3.20 | 3.30 |      |                      |
|       |   |   |   |   |   |   |   | 7-2-3    | 3.30 | 3.40 |      |                      |
|       |   |   |   |   |   |   |   | 8-1-3    | 3.40 | 3.50 |      |                      |
|       |   |   |   |   |   |   |   |          |      |      |      |                      |

Note:  
Tolerance of Forward Voltage: ± 0.05V

# Bin Range of Chromaticity Coordinates Block (If=20mA)

| Group | Range               | I <sub>v</sub> Rank* | Group | Range                  | I <sub>v</sub> Rank* |
|-------|---------------------|----------------------|-------|------------------------|----------------------|
| 01    | B5-1,B5-2,B5-3,B5-4 | 38                   | 26    | A0-1, A0-3, A0-4       | 36                   |
| 02    | B5-1~B5-4,A0-2,A0-4 | 38                   | 27    | A0-1, A0-2, A0-3       | 36                   |
| 07    | B5-1,B5-3,A0-4      | 37                   | 28    | A0-2, A0-3, A0-4       | 36                   |
| 08    | A0-2,A0-3,A0-4      | 36                   | 29    | A0-2, B5-1, B5-3       | 37                   |
| 09    | A0-1,A0-3,A0+4      | 35                   | 30    | A0-2, A0-4, B5-3       | 37                   |
| 10    | A0+1, A0+2, A0-1    | 35                   | 31    | B5-1, A0-2, A0-4       | 37                   |
| 11    | A0+2, A0-1, A0-2    | 36                   | 32    | B5-1, B5-3, A0-4       | 37                   |
| 12    | A0-1, A0-2, B5-1    | 37                   | 33    | B5-1, B5-2, B5-4       | 38                   |
| 13    | A0-2, B5-1, B5-2    | 38                   | 34    | B5-1, B5-3, B5-4       | 38                   |
| 14    | A0+3, A0+4, A0-3    | 35                   | 35    | B5-1, B5-2, B5-3       | 38                   |
| 15    | A0+4, A0-3, A0-4    | 36                   | 36    | B5-2, B5-3, B5-4       | 38                   |
| 16    | A0-3, A0-4, B5-3    | 37                   | 37    | B5-1, B5-2             | 38                   |
| 17    | A0-4, B5-3, B5-4    | 38                   | 38    | A0-1, A0-3             | 35                   |
| 18    | A0+1, A0+2, A0+4    | 34                   | 39    | A0-2, A0-4, B5-1, B5-3 | 37                   |
| 19    | A0+1, A0+3, A0+4    | 34                   | 40    | A0-3,A0-4              | 36                   |
| 20    | A0+1, A0+2, A0+3    | 34                   | 41    | A0-4, B5-1, B5-3, B5-4 | 38                   |
| 21    | A0+2, A0-1, A0-3    | 35                   | 42    | A0-4, B5-3             | 37                   |
| 22    | A0+2, A0+4, A0-3    | 35                   | 43    | B5-2,B5-4              | 38                   |
| 23    | A0-1, A0+2, A0+4    | 35                   | 44    | A0-1, A0-2, A-4, B5-3  | 37                   |
| 24    | A0-1, A0-3, A0+4    | 35                   | 45    | B5-1, B5-3             | 37                   |
| 25    | A0-1, A0-2, A0-4    | 36                   | 46    | A0+1, A0+2             | 34                   |

## Bin Range of Chromaticity Coordinates Block (If=20mA)

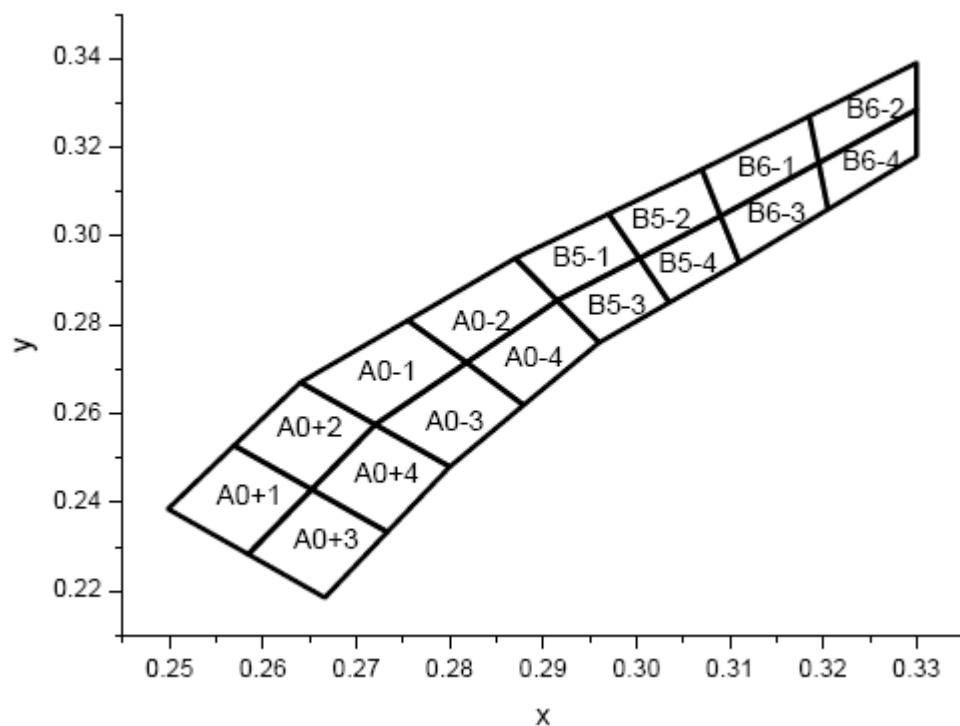
| Group | Range                           | I <sub>v</sub> Rank* | Group | Range                                               | I <sub>v</sub> Rank* |
|-------|---------------------------------|----------------------|-------|-----------------------------------------------------|----------------------|
| 47    | B6-1, B6-2, B6-3, B6-4          | 40                   | 67    | A0+2, A0-1, A0-3, A0-4                              | 36                   |
| 48    | B6-2, B6-4                      | 40                   | 68    | A0+4-R, A0-3, A0-4-L                                | 35                   |
| 49    | A0-2, B5-1, B5-3, B5-4          | 38                   | 69    | B5-1, 2, 3, 4 subdivision                           | 38                   |
| 50    | A0-1~A0-4, B5-1~B5-4            | 38                   | 70    | A0+4-2, A0+4-4, A0-3<br>subdivision, A0-4-1, A0-4-3 | 35                   |
| 51    | A0-1, A0-3, A0-4-1, A0-4-3      | 36                   | 71    | A0-3 non-division, A0-4<br>subdivision              | 36                   |
| 52    | A0+3, A0+4                      | 34                   | 72    | A0+1~+4, A0-1~+4, B5-1~+4,<br>B6-1~+4               | 40                   |
| 53    | B6-1, B6-2, B6-3                | 40                   | 73    | A0-4, B5-1, B5-3 subdivision                        | 37                   |
| 54    | B6-1, B6-3                      | 40                   | 74    | A0-4                                                | 36                   |
| 55    | B5-2, B5-4, B6-1, B6-3          | 39                   | 75    | B5-2                                                | 38                   |
| 56    | B5-2, B6-1                      | 39                   | 76    | A0-1~A0-4; B5-1~B5-4                                | 38                   |
| 57    | A0-2, B5-1                      | 37                   | 77    | B5-3, B5-4 subdivision                              | 38                   |
| 58    | A0-1, A0-2                      | 36                   | 78    | A0-3, A0+4                                          | 35                   |
| 59    | A0-1, A0-2, A0-3, A0-4,<br>B5-1 | 37                   | 79    | B5-1, B5-2, B5-3, B5-4, B6-3<br>subdivision         | 40                   |
| 60    | A0+2, A0+4, A0-1, A0-3          | 35                   | 80    | A0-3, A0-4, B5-3 subdivision                        | 38                   |
| 61    | B5-2-1~B5-2-4,<br>6-1-1~B6-1-4  | 39                   | 81    | A0-3, A0-4, B5-3 divide into<br>8 parts (each)      | 38                   |
| 62    | B5-3, B5-4                      | 39                   | 82    | A0-1~A0-4, A0+2, A0+4                               | 35                   |
| 63    | A0-1~A0-4, B5-1, B5-3           | 38                   | 83    | B5-4, B6-3                                          | 40                   |
| 64    | A0-2, A0-4                      | 37                   | 84    | B6-1, B6-2                                          | 40                   |
| 65    | A0-2, A0-3, A0-4, B5-3          | 36                   | 85    | A0-4, B5-2, B5-3, B5-4                              | 38                   |
| 66    | A0-3-1~A0-3-4,<br>A0-4-1~A0-4-4 | 36                   | 86    | B5 & B6 subdivision                                 | 40                   |

## Bin Range of Chromaticity Coordinates Block (If=20mA)

| Group | Range                                                                                       | I <sub>v</sub> Rank <sup>±</sup> | Group | Range                               | I <sub>v</sub> Rank <sup>±</sup> |
|-------|---------------------------------------------------------------------------------------------|----------------------------------|-------|-------------------------------------|----------------------------------|
| 87    | B5-3                                                                                        | 38                               | 99    | B5-2,B5-4,B6-1,B6-3<br>Sub-division | 40                               |
| 88    | B5-2-3/ B5-2-4/ B5-4<br>subdivision/ B6-1-2/ B6-1-3/<br>B6-1-4/ B6-3 subdivision/<br>B6-4-1 | 40                               | A     | A0+1, A0+2, A0+3, A0+4              | 35                               |
| 89    | A0-4, B5-3 subdivision                                                                      | 38                               | B     | A0+4, A0-3, A0-4                    | 35                               |
| 90    | A0-4-R, B5-3 subdivision                                                                    | 38                               | C     | A0-1,A0-2,A0-3,A0-4                 | 36                               |
| 91    | A0-3-2, A0-3-4, A0-4<br>subdivision, B5-3-1,B5-3-3                                          | 38                               | C0    | C0-1,C0-2,C0-3,C0-4                 | 41                               |
| 92    | B5-2, B6-1-1, B6-4-1,<br>B5-3-2, B6-1-3, B6-4-3,<br>B6-1-4, B6-4-4, B5-4, B6-3              | 40                               | A1    | A0+1,A0+2sub-division               | 34                               |
| 93    | A0+4, A0-3 subdivision                                                                      | 35                               | A2    | B6-2,B6-3,B6-4                      | 40                               |
| 94    | A0-4-R, B5-3, B5-4<br>subdivision                                                           | 38                               | A3    | B5-2,B5-4,B6-3                      | 40                               |
| 95    | B5-4, B6-3 subdivision                                                                      | 40                               | A4    | A0-1,A0-2,A0-4<br>Sub-division      | 36                               |
| 96    | A0-4, B5-3, B5-4 subdivision                                                                | 38                               | A5    | A0-2,A0-4,B5-3<br>Sub-division      | 38                               |
| 97    | B6-1,B6-3,B6-4                                                                              | 40                               | A6    | A0-4-R,B5-3,B5-4-L                  | 38                               |
| 98    | A0+1~A0+4; A0-1~A0-4;<br>B5-1~B5-4;B6-2~B6-4;<br>NA0-3~NB6-3                                | 40                               | A7    | B6-2,B6-4,C0-1,C0-3                 | 41                               |



## The C.I.E. 1931 Chromaticity Diagram



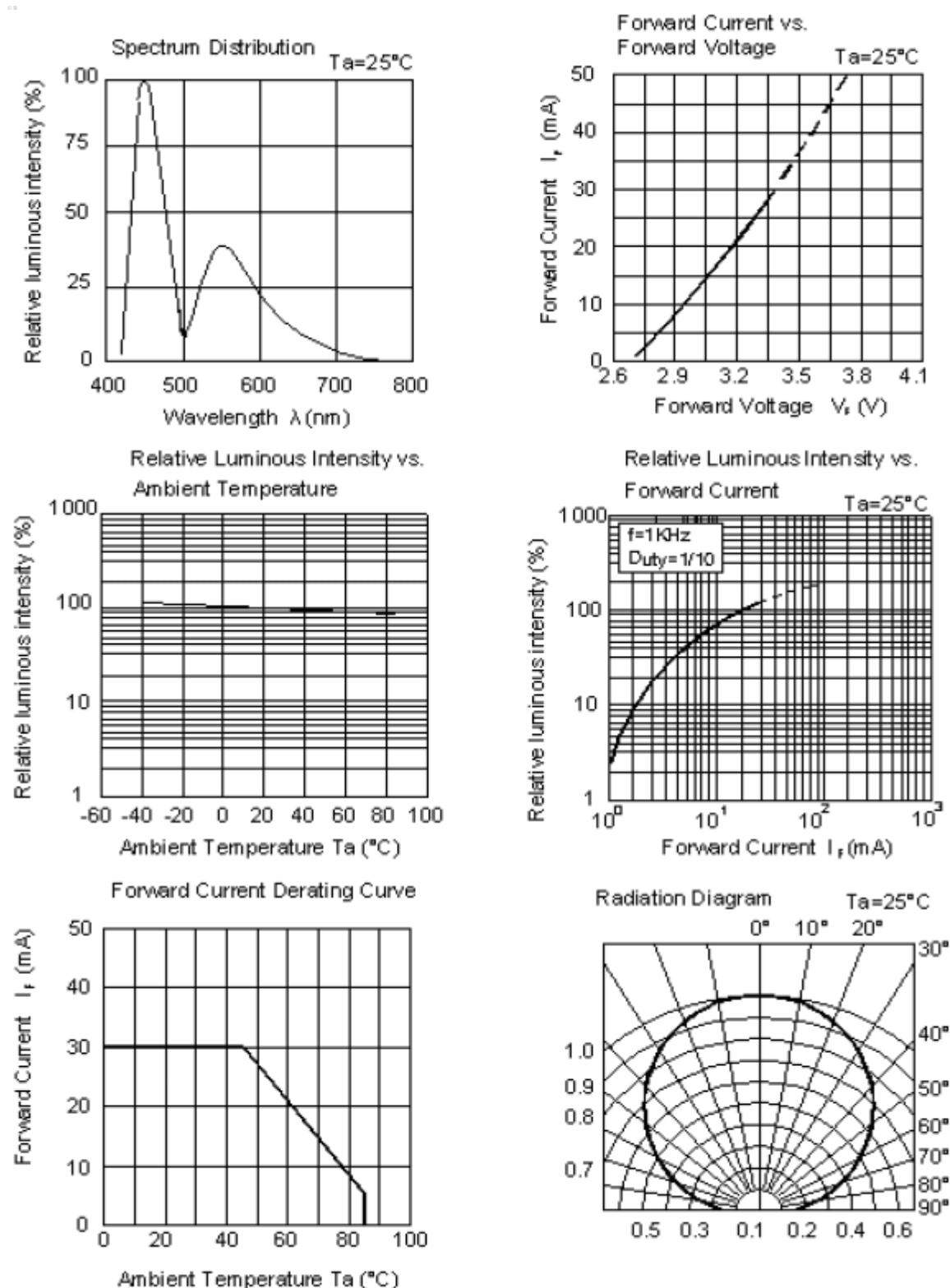
## Chromaticity Coordinates of Bin Code

| Bin Code | CIE_x  | CIE_y  | Bin Code | CIE_x  | CIE_y  |
|----------|--------|--------|----------|--------|--------|
| A0+1     | 0.2569 | 0.2528 | A0+3     | 0.2652 | 0.2429 |
|          | 0.2498 | 0.2385 |          | 0.2584 | 0.2283 |
|          | 0.2584 | 0.2283 |          | 0.2666 | 0.2185 |
|          | 0.2652 | 0.2429 |          | 0.2733 | 0.2333 |
| A0+2     | 0.2640 | 0.2670 | A0+4     | 0.2720 | 0.2575 |
|          | 0.2569 | 0.2528 |          | 0.2652 | 0.2429 |
|          | 0.2652 | 0.2429 |          | 0.2733 | 0.2333 |
|          | 0.2720 | 0.2575 |          | 0.2800 | 0.2480 |
| A0-1     | 0.2720 | 0.2575 | A0-3     | 0.2800 | 0.2480 |
|          | 0.2640 | 0.2670 |          | 0.2720 | 0.2575 |
|          | 0.2755 | 0.2810 |          | 0.2818 | 0.2715 |
|          | 0.2818 | 0.2715 |          | 0.2879 | 0.2619 |
| A0-2     | 0.2818 | 0.2715 | A0-4     | 0.2879 | 0.2619 |
|          | 0.2755 | 0.2810 |          | 0.2818 | 0.2715 |
|          | 0.2870 | 0.2950 |          | 0.2915 | 0.2855 |
|          | 0.2915 | 0.2855 |          | 0.2960 | 0.2760 |

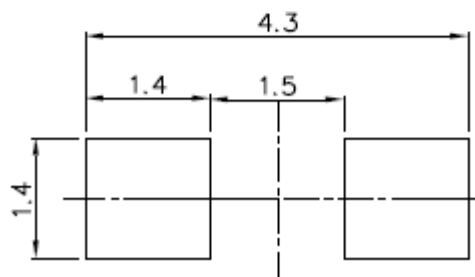
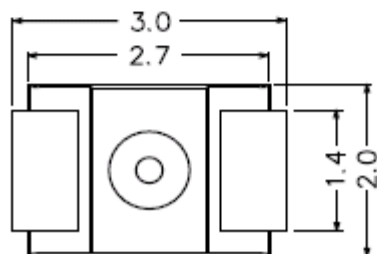
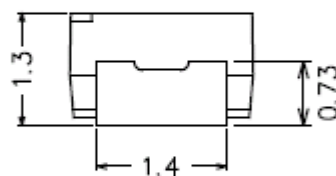
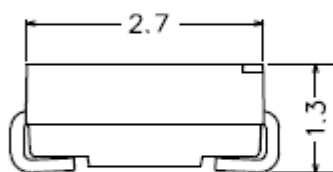
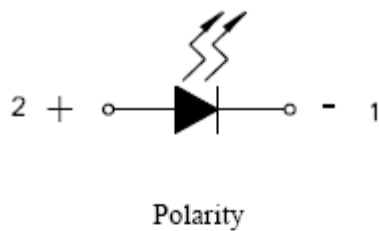
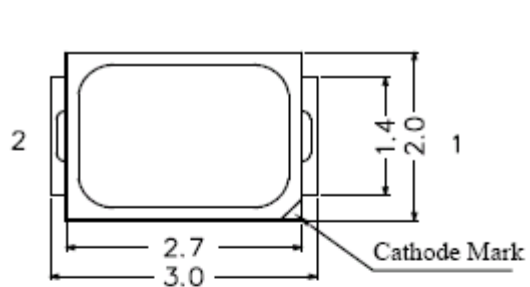
## Chromaticity Coordinates of Bin Code

| Bin Code | CIE_x  | CIE_y  | Bin Code | CIE_x  | CIE_y  |
|----------|--------|--------|----------|--------|--------|
| B5-1     | 0.2915 | 0.2855 | B5-3     | 0.2960 | 0.2760 |
|          | 0.2870 | 0.2950 |          | 0.2915 | 0.2855 |
|          | 0.2970 | 0.3050 |          | 0.3003 | 0.2950 |
|          | 0.3003 | 0.2950 |          | 0.3035 | 0.2850 |
| B5-2     | 0.3003 | 0.2950 | B5-4     | 0.3035 | 0.2850 |
|          | 0.2970 | 0.3050 |          | 0.3003 | 0.2950 |
|          | 0.3070 | 0.3150 |          | 0.3090 | 0.3045 |
|          | 0.3090 | 0.3045 |          | 0.3110 | 0.2940 |
| B6-1     | 0.3090 | 0.3045 | B6-3     | 0.3110 | 0.2940 |
|          | 0.3070 | 0.3150 |          | 0.3090 | 0.3045 |
|          | 0.3185 | 0.3270 |          | 0.3195 | 0.3165 |
|          | 0.3195 | 0.3165 |          | 0.3205 | 0.3060 |
| B6-2     | 0.3195 | 0.3165 | B6-4     | 0.3205 | 0.3060 |
|          | 0.3185 | 0.3270 |          | 0.3195 | 0.3165 |
|          | 0.3300 | 0.3390 |          | 0.3300 | 0.3285 |
|          | 0.3300 | 0.3285 |          | 0.3300 | 0.3180 |

## Typical Electro-Optical Characteristics Curves



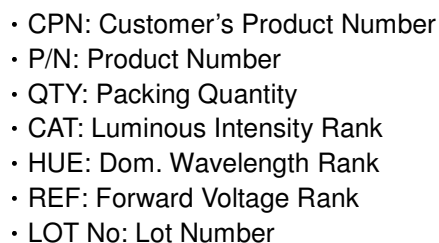
## Package Dimension



Recommended soldering pad design

Note: Tolerances unless mentioned  $\pm 0.1\text{mm}$ . Unit = mm

### Label Explanation



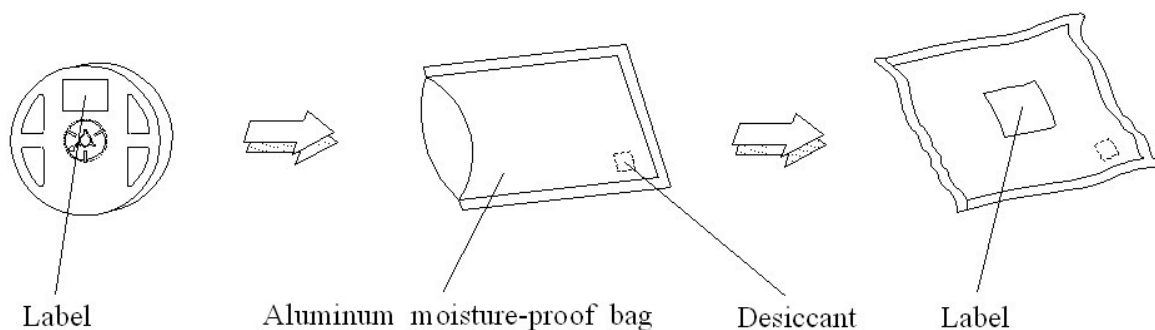
Technical drawing of a circular mechanical part. The drawing includes the following dimensions:

- Top horizontal dimension:  $2.2 \pm 0.5$
- Bottom horizontal dimension:  $13.0 \pm 0.5$
- Right vertical dimension (total):  $\varnothing 178.0 \pm 1.0$
- Right vertical dimension (lower section):  $9.0 \pm 1.0$
- Right vertical dimension (bottom section):  $12.0 \pm 1.0$
- Inner circular feature dimension:  $\varnothing 60.0 \pm 1.0$

Technical drawing of a progressive die. The main view shows a rectangular block with five circular punch holes. Dimensions are given in millimeters. The top edge has a width of  $4.0 \pm 0.1$  and  $2.0 \pm 0.1$ . The bottom edge has a width of  $4.0 \pm 0.1$  and  $2.23 \pm 0.1$ . The left side has a height of  $1.75 \pm 0.1$ . The right side has a height of  $3.50 \pm 0.05$  and  $8.0^{+0.3}_{-0.0}$ . A cross-section on the right shows a depth of  $3.23 \pm 0.1$  and a width of  $1.53 \pm 0.10$ . A dimension of  $\phi 1.5 \pm 1.0$  is indicated for the punch holes. A 'Progressive direction' arrow points to the right. A polarity symbol is shown on the left.

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## Moisture Resistant Packing Process

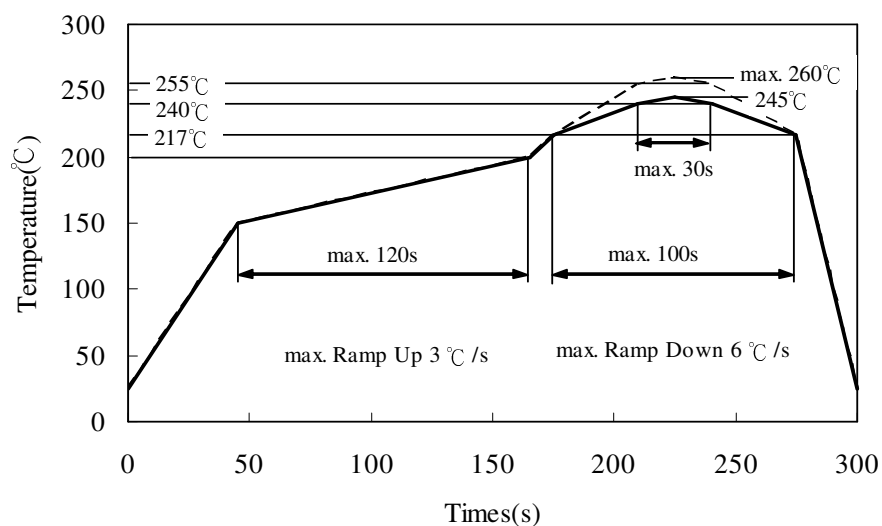


Note: Tolerances unless mentioned  $\pm 0.1\text{mm}$ . Unit = mm

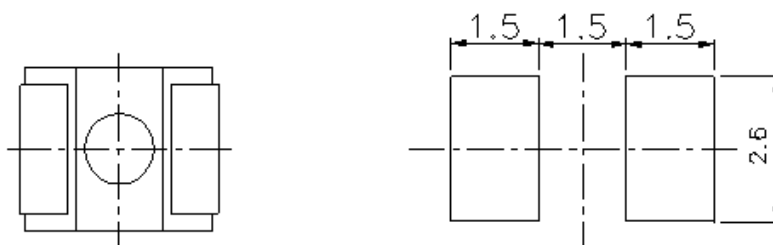
## Precautions for Use

### 1. Soldering Condition

#### 1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile



#### (B) recommend soldering pad



Note: Tolerances unless mentioned  $\pm 0.1\text{mm}$ . Unit = mm

## **2. Current limiting**

A resistor should be used to limit current spikes that can be caused by voltage fluctuations. Otherwise damage could occur.

## **3. Storage**

3.1 Moisture proof bag should only be opened immediately prior to usage.

3.2 Environment should be less than 30°C and 60% RH when moisture proof bag is opened.

3.3 After opening the package MSL Conditions stated on page 1 of this spec should not be exceeded.

3.4 If the moisture sensitivity card indicates higher than acceptable moisture, the component should be baked at min. 60deg +/-5deg for 24 hours.

## **4. Iron Soldering**

Hand soldering is not recommended for regular production. These guidelines are for rework only. Soldering iron tip should contact each terminal no more than 3 sec at 350°C, using soldering iron with nominal power less than 25W. Allow min. 2 sec. between soldering intervals.

## **5. Usage**

Do not exceed the values given in this specification.

## **Application Restrictions**

High reliability applications such as military/aerospace, automotive safety/security systems, and medical equipment may require different product. If you have any concerns, please contact Everlight before using this product in your application. This specification guarantees the quality and performance of the product as an individual component. Do not use this product beyond the specification described in this document.