

## Cree® Screen Master® 4-mm Oval LED C4SMG-RJS/GJS/BJS C4SMH-RJS



### PRODUCT DESCRIPTION

The oval LED is specifically designed for variable-message signs and passenger-information signs. The oval-shaped radiation pattern and high luminous intensity ensure that these devices are excellent for wide-field-of-view outdoor applications where a wide viewing angle and readability in sunlight are essential.

These lamps are made with an advanced optical-grade epoxy that offers superior high-temperature and high-moisture-resistance performance in outdoor signal and sign applications. The encapsulation resin contains anti-UV material in order to reduce the effects of long-term exposure to direct sunlight.

### FEATURES

- Size (mm): 4
- Color and Typical Dominant Wavelength:  
Red (621nm)  
Green(527nm)  
Blue(470nm)
- Luminous Intensity (mcd)  
C4SMG-RJS:(770-2130)  
C4SMG-GJS:(1520-4180)  
C4SMG-BJS:(390-1520)  
C4SMH-RJS:(550-1520)
- Lead - Free
- RoHS Compliant

### APPLICATIONS

- Electronic Signs & Signals (ESS)
- Full Color video screen
- Motorway Signs
- Variable Message Sign (VMS)
- Advertising signs
- Petrol Signs

## ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

| Items                                                 | Symbol    | Absolute Maximum Rating                                                             |                | Unit             |
|-------------------------------------------------------|-----------|-------------------------------------------------------------------------------------|----------------|------------------|
|                                                       |           | Red                                                                                 | Blue and Green |                  |
| Forward Current                                       | $I_F$     | 50 <sup>Note1</sup>                                                                 | 35             | mA               |
| Peak Forward Current <sup>Note2</sup>                 | $I_{FP}$  | 200                                                                                 | 100            | mA               |
| Reverse Voltage                                       | $V_R$     | 5                                                                                   | 5              | V                |
| Power Dissipation                                     | $P_D$     | 130                                                                                 | 140            | mW               |
| Operation Temperature                                 | $T_{opr}$ | -40 ~ +95                                                                           |                | $^\circ\text{C}$ |
| Storage Temperature                                   | $T_{stg}$ | -40 ~ +100                                                                          |                | $^\circ\text{C}$ |
| Lead Soldering Temperature                            | $T_{sol}$ | Max. 260 $^\circ\text{C}$ for 3 sec. max.<br>(3 mm from the base of the epoxy bulb) |                |                  |
| Electrostatic Discharge Classification (MIL-STD-883E) | ESD       | Class 2                                                                             |                |                  |

### Note:

1. For long term performance the drive currents between 10mA and 30mA are recommended. Please contact CREE sales representative for more information on recommended drive conditions.
2. Pulse width  $\leq 0.1$  msec, duty  $\leq 1/10$ .

## TYPICAL ELECTRICAL & OPTICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

| Characteristics     | Color       | Symbol      | Condition     | Unit          | Minimum | Typical | Maximum |
|---------------------|-------------|-------------|---------------|---------------|---------|---------|---------|
| Forward Voltage     | Red         | $V_F$       | $I_F = 20$ mA | V             |         | 2.1     | 2.6     |
|                     | Blue/Green  | $V_F$       | $I_F = 20$ mA | V             |         | 3.4     | 4.0     |
| Reverse Current     | Red         | $I_R$       | $V_R = 5$ V   | $\mu\text{A}$ |         |         | 100     |
|                     | Blue/Green  | $I_R$       | $V_R = 5$ V   | $\mu\text{A}$ |         |         | 100     |
| Dominant Wavelength | Red         | $\lambda_D$ | $I_F = 20$ mA | nm            | 619     | 621     | 624     |
|                     | Green       | $\lambda_D$ | $I_F = 20$ mA | nm            | 520     | 527     | 535     |
|                     | Blue        | $\lambda_D$ | $I_F = 20$ mA | nm            | 460     | 470     | 475     |
| Luminous Intensity  | C4SMG - Red | $I_V$       | $I_F = 20$ mA | mcd           | 770     | 1400    |         |
|                     | C4SMH - Red | $I_V$       | $I_F = 20$ mA | mcd           | 550     | 800     |         |
|                     | Green       | $I_V$       | $I_F = 20$ mA | mcd           | 1520    | 2800    |         |
|                     | Blue        | $I_V$       | $I_F = 20$ mA | mcd           | 390     | 900     |         |

## INTENSITY BIN LIMIT ( $I_F = 20 \text{ mA}$ )

Red: C4SMG-RJS

| Bin Code | Sub-bin | Min. (mcd) | Max. (mcd) |
|----------|---------|------------|------------|
| S0       | S1      | 770        | 852        |
|          | S2      | 852        | 934        |
|          | S3      | 934        | 1017       |
|          | S4      | 1017       | 1100       |
| T0       | T1      | 1100       | 1205       |
|          | T2      | 1205       | 1310       |
|          | T3      | 1310       | 1415       |
|          | T4      | 1415       | 1520       |
| U0       | U1      | 1520       | 1672       |
|          | U2      | 1672       | 1824       |
|          | U3      | 1824       | 1976       |
|          | U4      | 1976       | 2130       |

Green: C4SMG-GJS

| Bin Code | Sub-bin | Min. (mcd) | Max. (mcd) |
|----------|---------|------------|------------|
| U0       | U1      | 1520       | 1672       |
|          | U2      | 1672       | 1824       |
|          | U3      | 1824       | 1976       |
|          | U4      | 1976       | 2130       |
| V0       | V1      | 2130       | 2347       |
|          | V2      | 2347       | 2564       |
|          | V3      | 2564       | 2781       |
|          | V4      | 2781       | 3000       |
| W0       | W1      | 3000       | 3295       |
|          | W2      | 3295       | 3590       |
|          | W3      | 3590       | 3885       |
|          | W4      | 3885       | 4180       |

Blue: C4SMG-BJS

| Bin Code | Sub-bin | Min. (mcd) | Max. (mcd) |
|----------|---------|------------|------------|
| Q0       | Q1      | 390        | 430        |
|          | Q2      | 430        | 470        |
|          | Q3      | 470        | 510        |
|          | Q4      | 510        | 550        |
| R0       | R1      | 550        | 605        |
|          | R2      | 605        | 660        |
|          | R3      | 660        | 715        |
|          | R4      | 715        | 770        |
| S0       | S1      | 770        | 852        |
|          | S2      | 852        | 934        |
|          | S3      | 934        | 1017       |
|          | S4      | 1017       | 1100       |
| T0       | T1      | 1100       | 1205       |
|          | T2      | 1205       | 1310       |
|          | T3      | 1310       | 1415       |
|          | T4      | 1415       | 1520       |

Red: C4SMH-RJS

| Bin Code | Sub-bin | Min. (mcd) | Max. (mcd) |
|----------|---------|------------|------------|
| R0       | R1      | 550        | 605        |
|          | R2      | 605        | 660        |
|          | R3      | 660        | 715        |
|          | R4      | 715        | 770        |
| S0       | S1      | 770        | 852        |
|          | S2      | 852        | 934        |
|          | S3      | 934        | 1017       |
|          | S4      | 1017       | 1100       |
| T0       | T1      | 1100       | 1205       |
|          | T2      | 1205       | 1310       |
|          | T3      | 1310       | 1415       |
|          | T4      | 1415       | 1520       |

- Tolerance of measurement of luminous intensity is  $\pm 15\%$

## COLOR BIN LIMIT ( $I_F = 20 \text{ mA}$ )

Red

| Bin Code | Min.(nm) | Max.(nm) |
|----------|----------|----------|
| RB       | 619      | 624      |

Green

| Bin Code | Min.(nm) | Max.(nm) |
|----------|----------|----------|
| G7       | 520      | 525      |
| G23      | 522.5    | 527.5    |
| G8       | 525      | 530      |
| G45      | 527.5    | 532.5    |
| G9       | 530      | 535      |

Blue

| Bin Code | Min.(nm) | Max.(nm) |
|----------|----------|----------|
| B3       | 460      | 465      |
| B23      | 462.5    | 467.5    |
| B4       | 465      | 470      |
| B45      | 467.5    | 472.5    |
| B5       | 470      | 475      |

- Tolerance of measurement of dominant wavelength is  $\pm 1 \text{ nm}$

## ORDER CODE TABLE\*

### C4SMG

| Color | Kit Number         | Luminous Intensity (mcd)                          |      | Dominant Wavelength |              |           |              | Pack-<br>age |
|-------|--------------------|---------------------------------------------------|------|---------------------|--------------|-----------|--------------|--------------|
|       |                    | Min.                                              | Max. | Color Bin           | Min.<br>(nm) | Color Bin | Max.<br>(nm) |              |
| Red   | C4SMG-RJS-CR0U0BB1 | 550                                               | 2130 | RB                  | 619          | RB        | 624          | Bulk         |
| Red   | C4SMG-RJS-CR14QBB1 | Any 4 consecutive sub-bins: R1 (550) - S2 (934)   |      | RB                  | 619          | RB        | 624          | Bulk         |
| Red   | C4SMG-RJS-CR34QBB1 | Any 4 consecutive sub-bins: R3 (660) - S4 (1100)  |      | RB                  | 619          | RB        | 624          | Bulk         |
| Red   | C4SMG-RJS-CS14QBB1 | Any 4 consecutive sub-bins: S1 (770) - T2 (1310)  |      | RB                  | 619          | RB        | 624          | Bulk         |
| Red   | C4SMG-RJS-CS34QBB1 | Any 4 consecutive sub-bins: S3 (934) - T4 (1520)  |      | RB                  | 619          | RB        | 624          | Bulk         |
| Red   | C4SMG-RJS-CT14QBB1 | Any 4 consecutive sub-bins: T1 (1100) - U2 (1824) |      | RB                  | 619          | RB        | 624          | Bulk         |
| Red   | C4SMG-RJS-CR0U0BB2 | 550                                               | 2130 | RB                  | 619          | RB        | 624          | Ammo         |
| Red   | C4SMG-RJS-CR14QBB2 | Any 4 consecutive sub-bins: R1 (550) - S2 (934)   |      | RB                  | 619          | RB        | 624          | Ammo         |
| Red   | C4SMG-RJS-CR34QBB2 | Any 4 consecutive sub-bins: R3 (660) - S4 (1100)  |      | RB                  | 619          | RB        | 624          | Ammo         |
| Red   | C4SMG-RJS-CS14QBB2 | Any 4 consecutive sub-bins: S1 (770) - T2 (1310)  |      | RB                  | 619          | RB        | 624          | Ammo         |
| Red   | C4SMG-RJS-CS34QBB2 | Any 4 consecutive sub-bins: S3 (934) - T4 (1520)  |      | RB                  | 619          | RB        | 624          | Ammo         |
| Red   | C4SMG-RJS-CT14QBB2 | Any 4 consecutive sub-bins: T1 (1100) - U2 (1824) |      | RB                  | 619          | RB        | 624          | Ammo         |

| Color | Kit Number         | Luminous Intensity (mcd)                          |      | Dominant Wavelength                       |              |           |              | Pack-<br>age |
|-------|--------------------|---------------------------------------------------|------|-------------------------------------------|--------------|-----------|--------------|--------------|
|       |                    | Min.                                              | Max. | Color Bin                                 | Min.<br>(nm) | Color Bin | Max.<br>(nm) |              |
| Green | C4SMG-GJS-CT0W0791 | 1100                                              | 4180 | G7                                        | 520          | G9        | 535          | Bulk         |
| Green | C4SMG-GJS-CU14Q7T1 | Any 4 consecutive sub-bins: U1 (1520) - V2 (2564) |      | Any 1 color bin from G7 (520) to G8 (530) |              |           |              | Bulk         |
| Green | C4SMG-GJS-CU34Q7T1 | Any 4 consecutive sub-bins: U3 (1824) - V4 (3000) |      | Any 1 color bin from G7 (520) to G8 (530) |              |           |              | Bulk         |
| Green | C4SMG-GJS-CV14Q7T1 | Any 4 consecutive sub-bins: V1 (2130) - W2 (3590) |      | Any 1 color bin from G7 (520) to G8 (530) |              |           |              | Bulk         |
| Green | C4SMG-GJS-CT0W0792 | 1100                                              | 4180 | G7                                        | 520          | G9        | 535          | Ammo         |
| Green | C4SMG-GJS-CU14Q7T2 | Any 4 consecutive sub-bins: U1 (1520) - V2 (2564) |      | Any 1 color bin from G7 (520) to G8 (530) |              |           |              | Ammo         |
| Green | C4SMG-GJS-CU34Q7T2 | Any 4 consecutive sub-bins: U3 (1824) - V4 (3000) |      | Any 1 color bin from G7 (520) to G8 (530) |              |           |              | Ammo         |
| Green | C4SMG-GJS-CV14Q7T2 | Any 4 consecutive sub-bins: V1 (2130) - W2 (3590) |      | Any 1 color bin from G7 (520) to G8 (530) |              |           |              | Ammo         |
| Green | C4SMG-GJS-CV24Q8T2 | Any 4 consecutive sub-bins: V2 (2347) - W3 (3885) |      | Any 1 color bin from G8 (530) to G9 (535) |              |           |              | Ammo         |

## ORDER CODE TABLE\*

| Color | Kit Number         | Luminous Intensity (mcd)                         |      | Dominant Wavelength                       |              |           |           | Pack-<br>age |
|-------|--------------------|--------------------------------------------------|------|-------------------------------------------|--------------|-----------|-----------|--------------|
|       |                    | Min.                                             | Max. | Color Bin                                 | Min.<br>(nm) | Color Bin | Max. (nm) |              |
| Blue  | C4SMG-BJS-CQ0T0351 | 390                                              | 1520 | B3                                        | 460          | B5        | 475       | Bulk         |
| Blue  | C4SMG-BJS-CQ0T0451 | 390                                              | 1520 | B4                                        | 465          | B5        | 475       | Bulk         |
| Blue  | C4SMG-BJS-CQ14Q3T1 | Any 4 consecutive sub-bins: Q1 (390) - R2 (660)  |      | Any 1 color bin from B3 (460) to B4 (470) |              |           |           | Bulk         |
| Blue  | C4SMG-BJS-CQ14Q4T1 | Any 4 consecutive sub-bins: Q1 (390) - R2 (660)  |      | Any 1 color bin from B4 (465) to B5 (475) |              |           |           | Bulk         |
| Blue  | C4SMG-BJS-CR14Q3T1 | Any 4 consecutive sub-bins: R1 (550) - S2 (934)  |      | Any 1 color bin from B3 (460) to B4 (470) |              |           |           | Bulk         |
| Blue  | C4SMG-BJS-CR14Q4T1 | Any 4 consecutive sub-bins: R1 (550) - S2 (934)  |      | Any 1 color bin from B4 (465) to B5 (475) |              |           |           | Bulk         |
| Blue  | C4SMG-BJS-CR24Q4T1 | Any 4 consecutive sub-bins: R2 (605) - S3 (1017) |      | Any 1 color bin from B4 (465) to B5 (475) |              |           |           | Bulk         |
| Blue  | C4SMG-BJS-CS24Q3T1 | Any 4 consecutive sub-bins: S2 (852) - T3 (1415) |      | Any 1 color bin from B3 (460) to B4 (470) |              |           |           | Bulk         |
| Blue  | C4SMG-BJS-CS24Q4T1 | Any 4 consecutive sub-bins: S2 (852) - T3 (1415) |      | Any 1 color bin from B4 (465) to B5 (475) |              |           |           | Bulk         |
| Blue  | C4SMG-BJS-CQ0T0352 | 390                                              | 1520 | B3                                        | 460          | B5        | 475       | Ammo         |
| Blue  | C4SMG-BJS-CQ0T0452 | 390                                              | 1520 | B4                                        | 465          | B5        | 475       | Ammo         |
| Blue  | C4SMG-BJS-CQ14Q3T2 | Any 4 consecutive sub-bins: Q1 (390) - R2 (660)  |      | Any 1 color bin from B3 (460) to B4 (470) |              |           |           | Ammo         |
| Blue  | C4SMG-BJS-CQ14Q4T2 | Any 4 consecutive sub-bins: Q1 (390) - R2 (660)  |      | Any 1 color bin from B4 (465) to B5 (475) |              |           |           | Ammo         |
| Blue  | C4SMG-BJS-CR14Q3T2 | Any 4 consecutive sub-bins: R1 (550) - S2 (934)  |      | Any 1 color bin from B3 (460) to B4 (470) |              |           |           | Ammo         |
| Blue  | C4SMG-BJS-CR14Q4T2 | Any 4 consecutive sub-bins: R1 (550) - S2 (934)  |      | Any 1 color bin from B4 (465) to B5 (475) |              |           |           | Ammo         |
| Blue  | C4SMG-BJS-CR24Q4T2 | Any 4 consecutive sub-bins: R2 (605) - S3 (1017) |      | Any 1 color bin from B4 (465) to B5 (475) |              |           |           | Ammo         |
| Blue  | C4SMG-BJS-CS24Q3T2 | Any 4 consecutive sub-bins: S2 (852) - T3 (1415) |      | Any 1 color bin from B3 (460) to B4 (470) |              |           |           | Ammo         |
| Blue  | C4SMG-BJS-CS24Q4T2 | Any 4 consecutive sub-bins: S2 (852) - T3 (1415) |      | Any 1 color bin from B4 (465) to B5 (475) |              |           |           | Ammo         |

## C4SMH

| Color | Kit Number         | Luminous Intensity (mcd)                         |      | Dominant Wavelength |              |           |           | Pack-<br>age |
|-------|--------------------|--------------------------------------------------|------|---------------------|--------------|-----------|-----------|--------------|
|       |                    | Min.                                             | Max. | Color Bin           | Min.<br>(nm) | Color Bin | Max. (nm) |              |
| Red   | C4SMH-RJS-CR0T0BB1 | 550                                              | 1520 | RB                  | 619          | RB        | 624       | Bulk         |
| Red   | C4SMH-RJS-CS14QBB1 | Any 4 consecutive sub-bins: S1 (770) - T2 (1310) |      | RB                  | 619          | RB        | 624       | Bulk         |
| Red   | C4SMH-RJS-CS34QBB1 | Any 4 consecutive sub-bins: S3 (934) - T4 (1520) |      | RB                  | 619          | RB        | 624       | Bulk         |
| Red   | C4SMH-RJS-CR0T0BB2 | 550                                              | 1520 | RB                  | 619          | RB        | 624       | Ammo         |
| Red   | C4SMH-RJS-CS14QBB2 | Any 4 consecutive sub-bins: S1 (770) - T2 (1310) |      | RB                  | 619          | RB        | 624       | Ammo         |
| Red   | C4SMH-RJS-CS34QBB2 | Any 4 consecutive sub-bins: S3 (934) - T4 (1520) |      | RB                  | 619          | RB        | 624       | Ammo         |

### Notes:

1. The above kit numbers represent order codes that include multiple intensity-bin and color-bin codes. Only one intensity-sub-bin code and one color-bin code will be shipped on each reel. Selected single intensity-bin, single color-bin codes will be orderable in certain quantities. For example, any four consecutive sub-bins from V1 to W2 mean only one intensity bin with four sub-bins of the following brightness ranges (V1-V4, V2-W1, V3-W2) will be shipped by Cree. For example, any one-color bin from G7 to G9 means only one color bin (G7 or G23 or G8 or G45 or G9) will be shipped by Cree.
2. Please refer to the "Cree LED Lamp Reliability Test Standards" document for reliability test conditions.
3. Please refer to the "Cree LED Lamp Soldering & Handling" document for information about how to use this LED product safely.

## GRAPHS

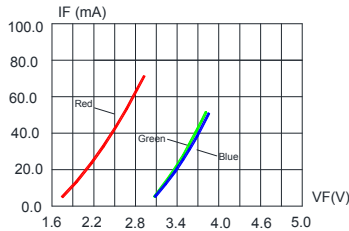


FIG.1 FORWARD CURRENT VS. FORWARD VOLTAGE.

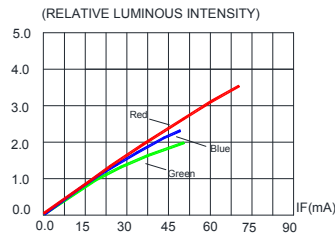


FIG.2 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

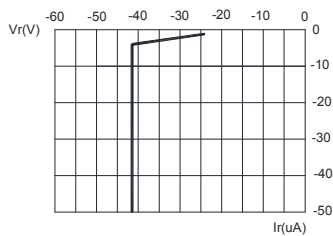


FIG.3a RED REVERSE CURRENT VS. REVERSE VOLTAGE.

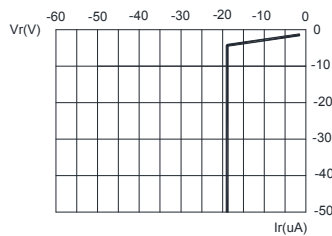


FIG.3b BLUE & GREEN REVERSE CURRENT VS. REVERSE VOLTAGE.

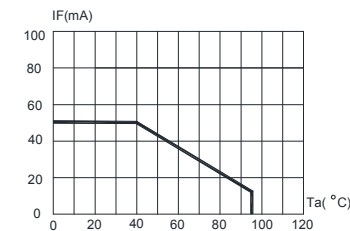


FIG.4a RED MAXIMUM FORWARD DC CURRENT VS AMBIENT TEMPERATURE ( $T_{jmax}=105^{\circ}\text{C}$ )

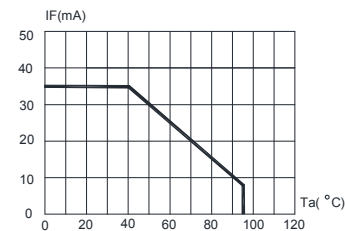


FIG.4b BLUE & GREEN MAXIMUM FORWARD DC CURRENT VS AMBIENT TEMPERATURE ( $T_{jmax}=105^{\circ}\text{C}$ )

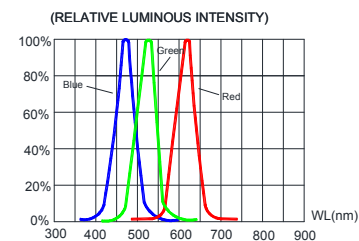


FIG.5 RELATIVE LUMINOUS INTENSITY VS. WAVELENGTH.

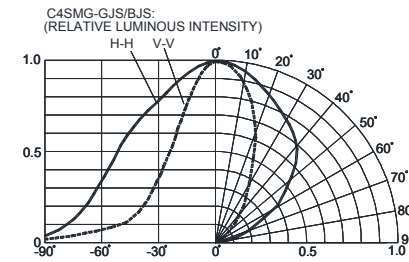


FIG.6 BLUE&GREEN FAR FIELD PATTERN

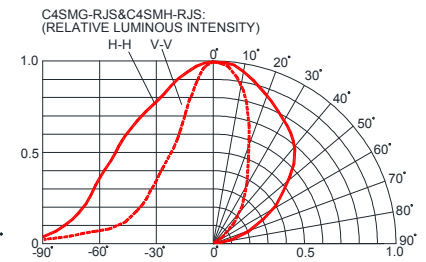


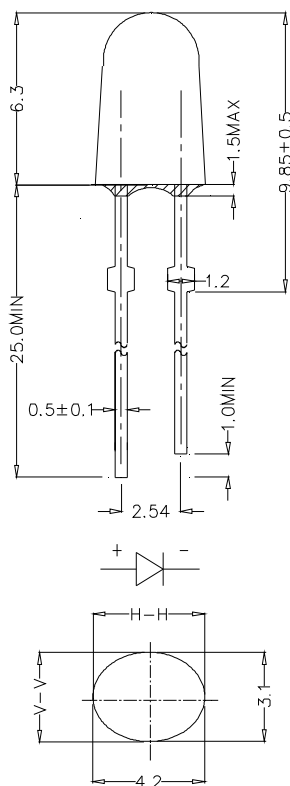
FIG.6 RED FAR FIELD PATTERN

The above data are collected from statistical figures that do not necessarily correspond to the actual parameters of each single LED. Hence, these data will be changed without further notice.

All dimensions are in mm. Tolerance is  $\pm 0.25$  mm unless otherwise noted.

An epoxy meniscus may extend about 1.5 mm down the leads.

Burr around bottom of epoxy may be 0.5 mm max.



## RoHS Compliance

The levels of environmentally sensitive, persistent biologically toxic (PBT), persistent organic pollutants (POP), or otherwise restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended through April 21, 2006.

### Vision Advisory Claim

Users should be cautioned not to stare at the light of this LED product. The bright light can damage the eye.

## KIT NUMBER SYSTEM

All dimensions in mm. Cree LED lamps are tested and sorted into performance bins. A bin is specified by ranges of color, forward voltage, and brightness. Sorted LEDs are packaged for shipping in various convenient options. Please refer to the "Cree LED Lamp Packaging Standard" document for more information about shipping and packaging options.

Cree LEDs are sold by order codes in combinations of bins called kits. Order codes are configured in the following manner:



- The LEDs are packed in cardboard boxes after packaging in normal or anti-electrostatic bags.
- Cardboard boxes will be used to protect the LEDs from mechanical shock during transportation.
- The boxes are not water resistant, and they must be kept away from water and moisture.
- The Bulk Pack types of packaging.
- Max 1000 pcs per bulk and Max 3000 pcs per ammo.