

# Cree® 5-mm Red and Amber Round LEDs

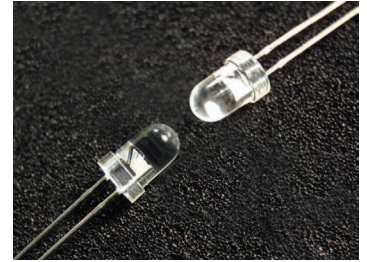
## C503B-RAS/RAN/AAS/AAN (15 degrees)

## C503B-RBS/RBN/ABS/ABN (23 degrees)

## C503B-RCS/RCN/ACS/ACN (30 degrees)

### Data Sheet

These round LED families offer superior light output for excellent readability in outdoor applications. The lamps are made with an advanced optical-grade epoxy that offers superior high-temperature and high-moisture resistance performance in outdoor sign and signal applications. The encapsulation resin contains UV inhibitors to minimize the effects of long-term exposure to direct sunlight, resulting in stable light output over the life of the LED.



#### FEATURES

- Size (mm): 5
- Color and Typical Dominant Wavelength (nm):
  - » Red (624)
  - » Amber (591)
- Luminous Intensity (mcd)
  - » C503B-RAS/RAN (5860 - 23500)
  - » C503B-RBS/RBN (3000 - 12000)
  - » C503B-RCS/RCN (3000 - 12000)
  - » C503B-AAS/AAN (5860 - 23500)
  - » C503B-ACS/ACN (3000 - 8200)
  - » C503B-ABS/ABN (3000 - 12000)
- Viewing angle:
  - » C503B-RAS/RAN/AAS/AAN: 15 degree
  - » C503B-RBS/RBN/ABS/ABN: 23 degree
  - » C503B-RCS/RCN/ACS/ACN: 30 degree
- Lead-Free
- RoHS-Compliant

#### APPLICATIONS

- Electronic Signs & Signals (ESS)
- Motorway Signs
- Variable-Message Sign (VMS)
- Advertising Signs
- Petrol Signs
- Amusement



## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ )

Items	Symbol	Absolute Maximum Rating	Unit
		Red/Amber	
Forward Current	$I_F$	50 <sup>Note1</sup>	mA
Peak Forward Current <sup>Note2</sup>	$I_{FP}$	200	mA
Reverse Voltage	$V_R$	5	V
Power Dissipation	$P_D$	130	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. (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 10 mA and 30 mA are recommended. Please contact a 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/Amber	$V_F$	$I_F = 20$ mA	V		2.1	2.6	
Reverse Current	Red/Amber	$I_R$	$V_R = 5$ V	$\mu\text{A}$			100	
Dominant Wave-length	Red	$\lambda_D$	$I_F = 20$ mA	nm	618	624	630	
	Amber	$\lambda_D$	$I_F = 20$ mA	nm	584	591	596	
Luminous Intensity	Red	C503B-RAS/RAN (15 degree)	$I_V$	$I_F = 20$ mA	mcd	5860	12000	
		C503B-RBS/RBN (23 degree)	$I_V$	$I_F = 20$ mA	mcd	3000	5000	
		C503B-RCS/RCN (30 degree)	$I_V$	$I_F = 20$ mA	mcd	3000	5100	
	Amber	C503B-AAS/AAN (15 degree)	$I_V$	$I_F = 20$ mA	mcd	5860	13000	
		C503B-ABS/ABN (23 degree)	$I_V$	$I_F = 20$ mA	mcd	3000	5000	
		C503B-ACS/ACN (30 degree)	$I_V$	$I_F = 20$ mA	mcd	3000	5000	
50% Power Angle	C503B-RAS/RAN/AAS/AAN		$2\theta_{1/2}$	$I_F = 20$ mA	deg	15		
	C503B-RBS/RBN/ABS/ABN		$2\theta_{1/2}$	$I_F = 20$ mA	deg	23		
	C503B-RCS/RCN/ACS/ACN		$2\theta_{1/2}$	$I_F = 20$ mA	deg	30		



## Intensity Bin Limit ( $I_f = 20 \text{ mA}$ )

Red

C503B-RAS/RAN (15 degree)

Bin Code	Min. (mcd)	Max. (mcd)
Y0	5860	8200
Z0	8200	12000
A0	12000	16800
B0	16800	23500

C503B-RBS/RBN (23 degree)

Bin Code	Min. (mcd)	Max. (mcd)
W0	3000	4180
X0	4180	5860
Y0	5860	8200
Z0	8200	12000

C503B-RCS/RCN (30 degree)

Bin Code	Min. (mcd)	Max. (mcd)
W0	3000	4180
X0	4180	5860
Y0	5860	8200
Z0	8200	12000

Amber

C503B-AAS/AAN (15 degree)

Bin Code	Min. (mcd)	Max. (mcd)
Y0	5860	8200
Z0	8200	12000
A0	12000	16800
B0	16800	23500

C503B-ABS/ABN (23 degree)

Bin Code	Min. (mcd)	Max. (mcd)
W0	3000	4180
X0	4180	5860
Y0	5860	8200
Z0	8200	12000

C503B-ACS/ACN (30 degree)

Bin Code	Min. (mcd)	Max. (mcd)
W0	3000	4180
X0	4180	5860
Y0	5860	8200

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

## Color Bin Limit ( $I_f = 20 \text{ mA}$ )

Red

Bin Code	Min. (nm)	Max. (nm)
RA	618	630

Amber

Bin Code	Min. (nm)	Max. (nm)
A2	584	587
A3	587	590
A4	590	593
A5	593	596

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



## Order Code Table\*

### Red (15 degree)

Color	Kit Number	Viewing Angle	Luminous Intensity (mcd)		Dominant Wavelength				Package	Standoff
			Min.	Max.	Color Bin	Min. (nm)	Color Bin	Max. (nm)		
Red	C503B-RAS-CY0B0AA1	15	5860	23500	RA	618	RA	630	Bulk	Yes
Red	C503B-RAS-CY0Z0AA1	15	5860	12000	RA	618	RA	630	Bulk	Yes
Red	C503B-RAS-CZ0A0AA1	15	8200	16800	RA	618	RA	630	Bulk	Yes
Red	C503B-RAN-CY0B0AA1	15	5860	23500	RA	618	RA	630	Bulk	No
Red	C503B-RAN-CY0Z0AA1	15	5860	12000	RA	618	RA	630	Bulk	No
Red	C503B-RAN-CZ0A0AA1	15	8200	16800	RA	618	RA	630	Bulk	No
Red	C503B-RAS-CY0B0AA2	15	5860	23500	RA	618	RA	630	Ammo	Yes
Red	C503B-RAS-CY0Z0AA2	15	5860	12000	RA	618	RA	630	Ammo	Yes
Red	C503B-RAS-CZ0A0AA2	15	8200	16800	RA	618	RA	630	Ammo	Yes
Red	C503B-RAN-CY0B0AA2	15	5860	23500	RA	618	RA	630	Ammo	No
Red	C503B-RAN-CY0Z0AA2	15	5860	12000	RA	618	RA	630	Ammo	No
Red	C503B-RAN-CZ0A0AA2	15	8200	16800	RA	618	RA	630	Ammo	No

### Red (23 degree)

Color	Kit Number	Viewing Angle	Luminous Intensity (mcd)		Dominant Wavelength				Package	Standoff
			Min.	Max.	Color Bin	Min. (nm)	Color Bin	Max. (nm)		
Red	C503B-RBS-CW0Z0AA1	23	3000	12000	RA	618	RA	630	Bulk	Yes
Red	C503B-RBS-CW0X0AA1	23	3000	5860	RA	618	RA	630	Bulk	Yes
Red	C503B-RBS-CX0Y0AA1	23	4180	8200	RA	618	RA	630	Bulk	Yes
Red	C503B-RBN-CW0Z0AA1	23	3000	12000	RA	618	RA	630	Bulk	No
Red	C503B-RBN-CW0X0AA1	23	3000	5860	RA	618	RA	630	Bulk	No
Red	C503B-RBN-CX0Y0AA1	23	4180	8200	RA	618	RA	630	Bulk	No
Red	C503B-RBS-CW0Z0AA2	23	3000	12000	RA	618	RA	630	Ammo	Yes
Red	C503B-RBS-CW0X0AA2	23	3000	5860	RA	618	RA	630	Ammo	Yes
Red	C503B-RBS-CX0Y0AA2	23	4180	8200	RA	618	RA	630	Ammo	Yes
Red	C503B-RBN-CW0Z0AA2	23	3000	12000	RA	618	RA	630	Ammo	No
Red	C503B-RBN-CW0X0AA2	23	3000	5860	RA	618	RA	630	Ammo	No
Red	C503B-RBN-CX0Y0AA2	23	4180	8200	RA	618	RA	630	Ammo	No



Red (30 degree)

Color	Kit Number	Viewing Angle	Luminous Intensity (mcd)		Dominant Wavelength				Package	Standoff
			Min.	Max.	Color Bin	Min. (nm)	Color Bin	Max. (nm)		
Red	C503B-RCS-CW0Z0AA1	30	3000	12000	RA	618	RA	630	Bulk	Yes
Red	C503B-RCS-CW0X0AA1	30	3000	5860	RA	618	RA	630	Bulk	Yes
Red	C503B-RCS-CX0Y0AA1	30	4180	8200	RA	618	RA	630	Bulk	Yes
Red	C503B-RCN-CW0Z0AA1	30	3000	12000	RA	618	RA	630	Bulk	No
Red	C503B-RCN-CW0X0AA1	30	3000	5860	RA	618	RA	630	Bulk	No
Red	C503B-RCN-CX0Y0AA1	30	4180	8200	RA	618	RA	630	Bulk	No
Red	C503B-RCS-CW0Z0AA2	30	3000	12000	RA	618	RA	630	Ammo	Yes
Red	C503B-RCS-CW0X0AA2	30	3000	5860	RA	618	RA	630	Ammo	Yes
Red	C503B-RCS-CX0Y0AA2	30	4180	8200	RA	618	RA	630	Ammo	Yes
Red	C503B-RCN-CW0Z0AA2	30	3000	12000	RA	618	RA	630	Ammo	No
Red	C503B-RCN-CW0X0AA2	30	3000	5860	RA	618	RA	630	Ammo	No
Red	C503B-RCN-CX0Y0AA2	30	4180	8200	RA	618	RA	630	Ammo	No



## Order Code Table\*

### Amber (15 degree)

Color	Kit Number	Viewing Angle	Luminous Intensity (mcd)		Dominant Wavelength				Package	Standoff
			Min.	Max.	Color Bin	Min. (nm)	Color Bin	Max. (nm)		
Amber	C503B-AAS-CY0B0251	15	5860	23500	A2	584	A5	596	Bulk	Yes
Amber	C503B-AAS-CY0Z0341	15	5860	12000	A3	587	A4	593	Bulk	Yes
Amber	C503B-AAS-CZ0A0341	15	8200	16800	A3	587	A4	593	Bulk	Yes
Amber	C503B-AAN-CY0B0251	15	5860	23500	A2	584	A5	596	Bulk	No
Amber	C503B-AAN-CY0Z0341	15	5860	12000	A3	587	A4	593	Bulk	No
Amber	C503B-AAN-CZ0A0341	15	8200	16800	A3	587	A4	593	Bulk	No
Amber	C503B-AAS-CY0B0252	15	5860	23500	A2	584	A5	596	Ammo	Yes
Amber	C503B-AAS-CY0Z0342	15	5860	12000	A2	587	A4	593	Ammo	Yes
Amber	C503B-AAS-CZ0A0342	15	8200	16800	A3	587	A4	593	Ammo	Yes
Amber	C503B-AAN-CY0B0252	15	5860	23500	A2	584	A5	596	Ammo	No
Amber	C503B-AAN-CY0Z0342	15	5860	12000	A2	587	A4	593	Ammo	No
Amber	C503B-AAN-CZ0A0342	15	8200	16800	A3	587	A4	593	Ammo	No

### Amber (23 degree)

Color	Kit Number	Viewing Angle	Luminous Intensity (mcd)		Dominant Wavelength				Package	Standoff
			Min.	Max.	Color Bin	Min. (nm)	Color Bin	Max. (nm)		
Amber	C503B-ABS-CW0Z0251	23	3000	12000	A2	584	A5	596	Bulk	Yes
Amber	C503B-ABS-CW0X0341	23	3000	5860	A3	587	A4	593	Bulk	Yes
Amber	C503B-ABS-CX0Y0341	23	4180	8200	A3	587	A4	593	Bulk	Yes
Amber	C503B-ABN-CW0Z0251	23	3000	12000	A2	584	A5	596	Bulk	No
Amber	C503B-ABN-CW0X0341	23	3000	5860	A3	587	A4	593	Bulk	No
Amber	C503B-ABN-CX0Y0341	23	4180	8200	A3	587	A4	593	Bulk	No
Amber	C503B-ABS-CW0Z0252	23	3000	12000	A2	584	A5	596	Ammo	Yes
Amber	C503B-ABS-CW0X0342	23	3000	5860	A3	587	A4	593	Ammo	Yes
Amber	C503B-ABS-CX0Y0342	23	4180	8200	A3	587	A4	593	Ammo	Yes
Amber	C503B-ABN-CW0Z0252	23	3000	12000	A2	584	A5	596	Ammo	No
Amber	C503B-ABN-CW0X0342	23	3000	5860	A3	587	A4	593	Ammo	No
Amber	C503B-ABN-CX0Y0342	23	4180	8200	A3	587	A4	593	Ammo	No



Amber (30 degree)

Color	Kit Number	Viewing Angle	Luminous Intensity (mcd)		Dominant Wavelength				Package	Standoff
			Min.	Max.	Color Bin	Min. (nm)	Color Bin	Max. (nm)		
Amber	C503B-ACS-CW0Y0251	30	3000	8200	A2	584	A5	596	Bulk	Yes
Amber	C503B-ACS-CW0X0341	30	3000	5860	A3	587	A4	593	Bulk	Yes
Amber	C503B-ACS-CX0Y0341	30	4180	8200	A3	587	A4	593	Bulk	Yes
Amber	C503B-ACN-CW0Y0251	30	3000	8200	A2	584	A5	596	Bulk	No
Amber	C503B-ACN-CW0X0341	30	3000	5860	A3	587	A4	593	Bulk	No
Amber	C503B-ACN-CX0Y0341	30	4180	8200	A3	587	A4	593	Bulk	No
Amber	C503B-ACS-CW0Y0252	30	3000	8200	A2	584	A5	596	Ammo	Yes
Amber	C503B-ACS-CW0X0342	30	3000	5860	A3	587	A4	593	Ammo	Yes
Amber	C503B-ACS-CX0Y0342	30	4180	8200	A3	587	A4	593	Ammo	Yes
Amber	C503B-ACN-CW0Y0252	30	3000	8200	A2	584	A5	596	Ammo	No
Amber	C503B-ACN-CW0X0342	30	3000	5860	A3	587	A4	593	Ammo	No
Amber	C503B-ACN-CX0Y0342	30	4180	8200	A3	587	A4	593	Ammo	No

Notes:

1. The above kit numbers represent order codes that include multiple intensity-bin and color-bin codes. Only one intensity-bin code and one color-bin code will be shipped on each reel. Single intensity-bin codes and single color-bin codes will not be orderable.
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

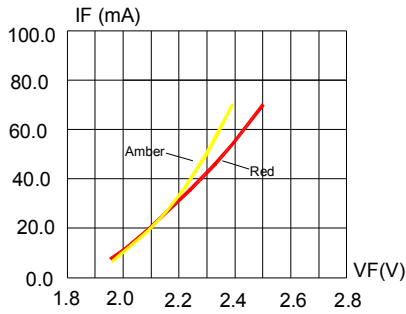


FIG. 1 FORWARD CURRENT VS. FORWARD VOLTAGE.

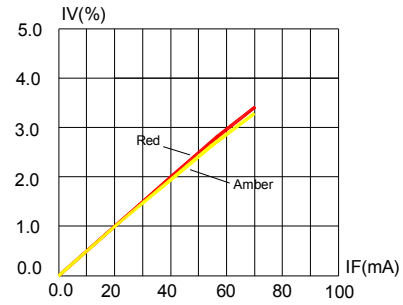


FIG. 2 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

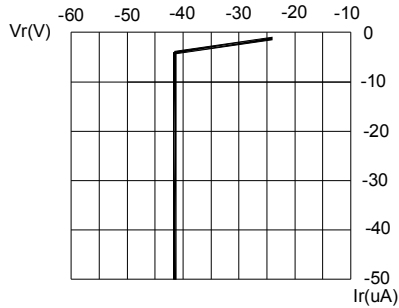


FIG. 3 RED & AMBER REVERSE CURRENT VS. REVERSE VOLTAGE.

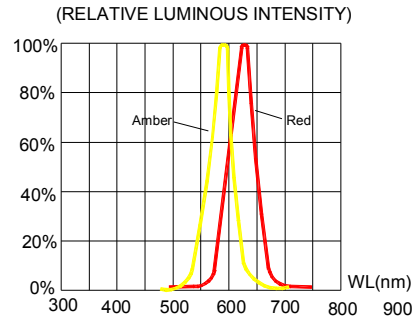


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. WAVELENGTH.

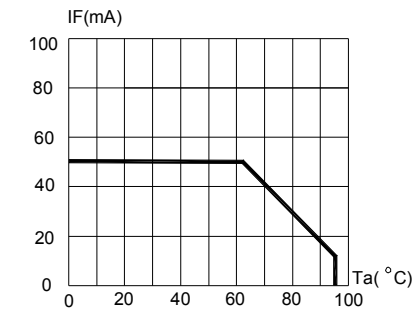


FIG. 5 RED & AMBER MAXIMUM FORWARD DC CURRENT VS AMBIENT TEMPERATURE ( $T_{jmax}=105^{\circ}C$ )

# Graphs

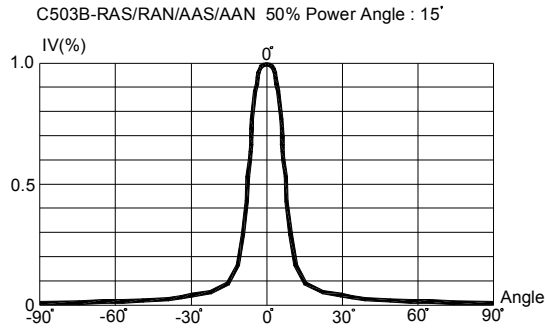


FIG.6 RED & AMBER FAR FIELD PATTERN

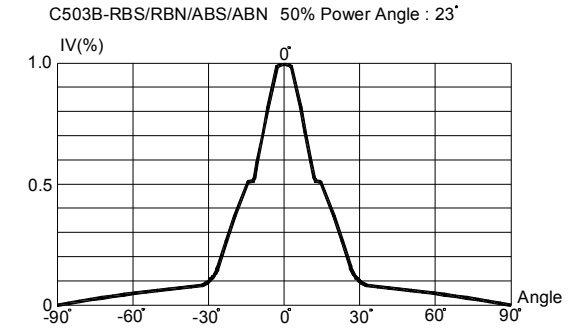


FIG.7 RED & AMBER FAR FIELD PATTERN

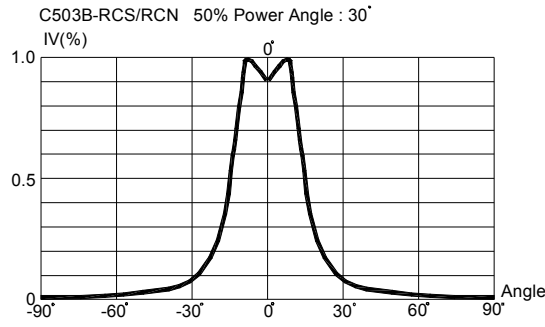


FIG.8 RED FAR FIELD PATTERN

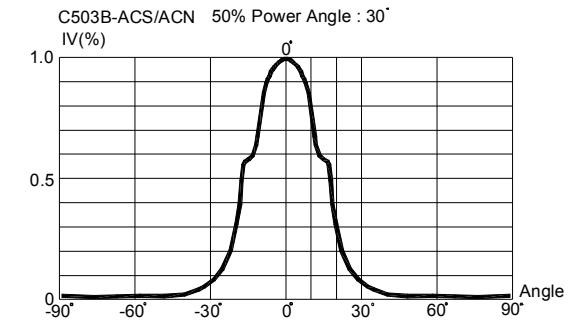


FIG.9 AMBER FAR FIELD PATTERN

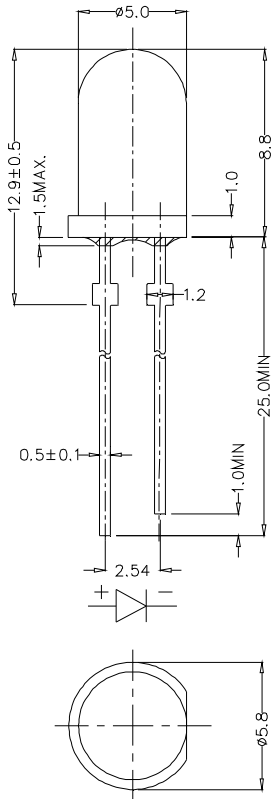
## Mechanical Dimensions

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

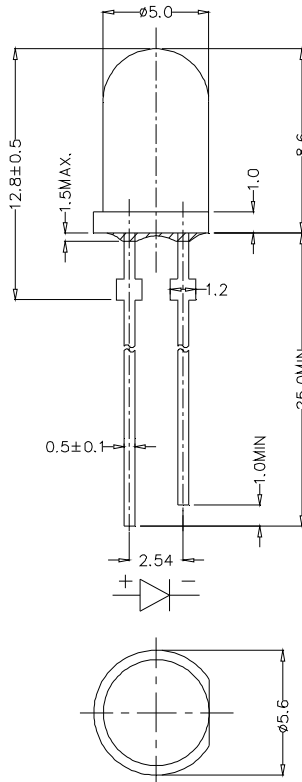
An epoxy meniscus may extend about 1.5 mm down the leads.

Burr around bottom of epoxy may be 0.5 mm max.

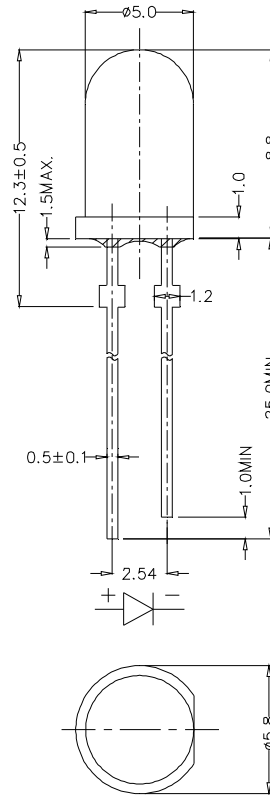
C503B-RAS/AAS:



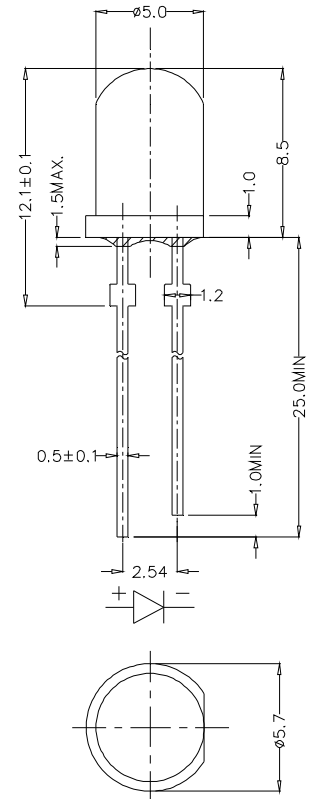
C503B-RBS/ABS:



C503B-RCS:



C503B-ACS:



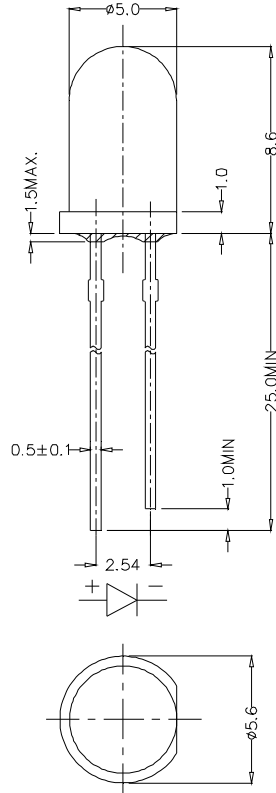
## Mechanical Dimensions

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

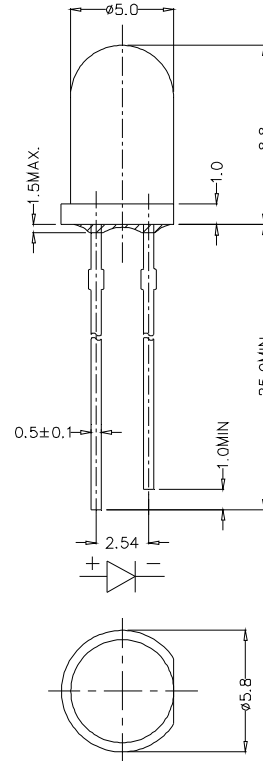
An epoxy meniscus may extend about 1.5 mm down the leads.

Burr around bottom of epoxy may be 0.5 mm max.

C503B-RBN/ABN:



C503B-RAN/RCN/AAN/ACN:



## Notes

### 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

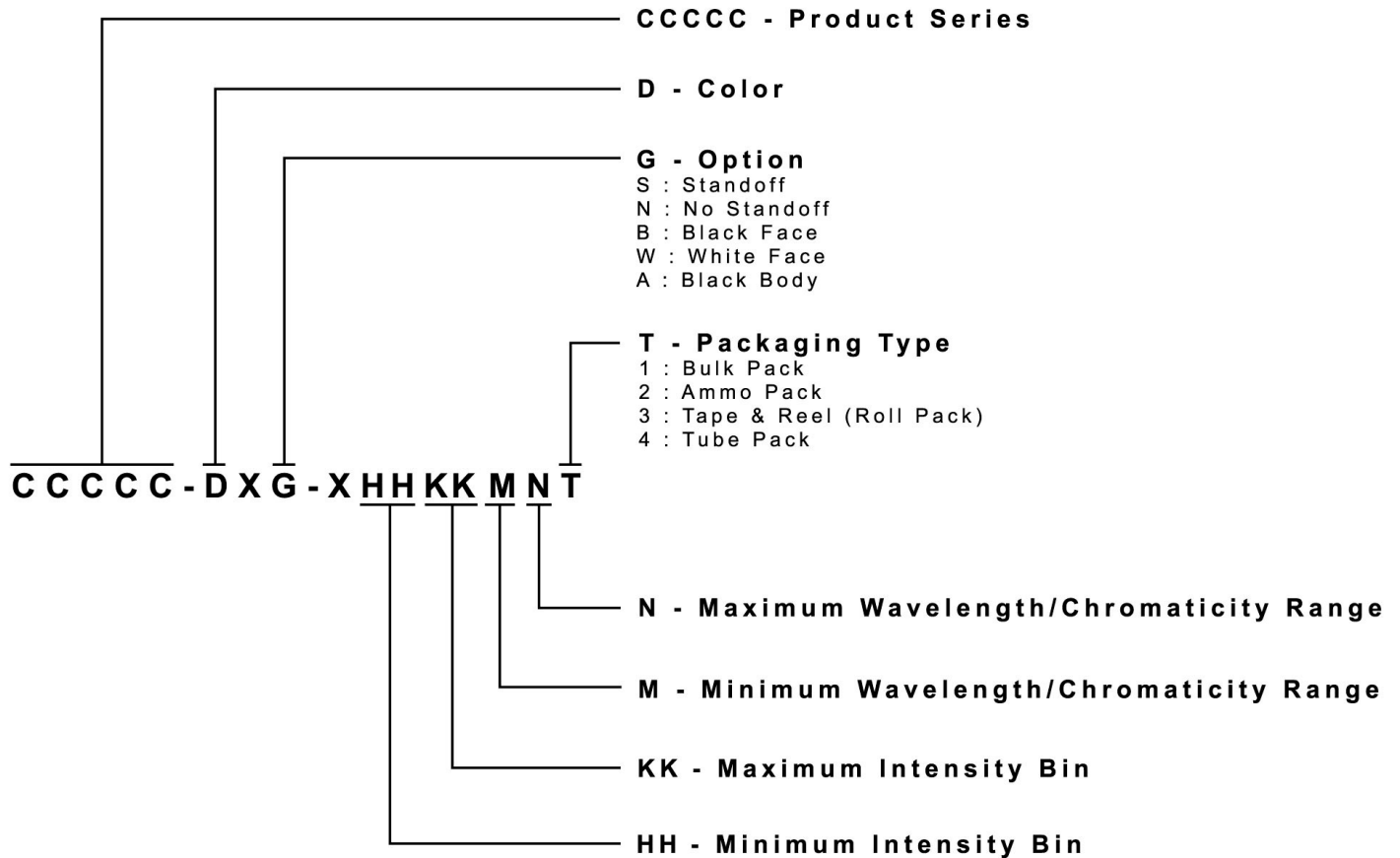
Users should be cautioned not to stare at the light of this LED product. The bright light can damage the eye.



## Kit Number System

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:

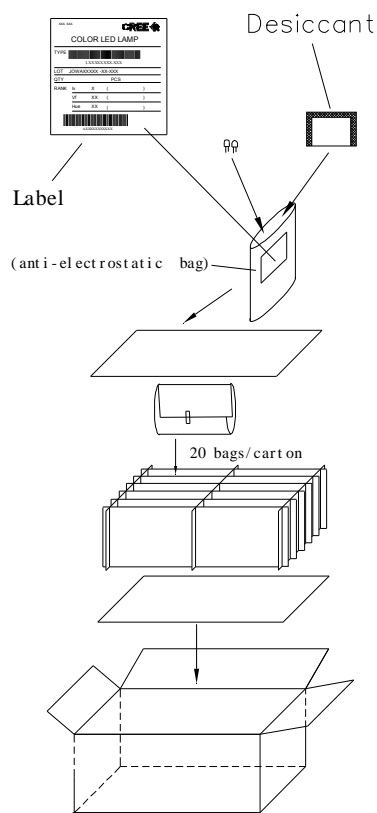


## Package

### Features:

- 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 500 pcs per bulk and Max 2500 pcs per ammo.

### Bulk Pack Packaging Type:



### Ammo Pack Packaging Type:

