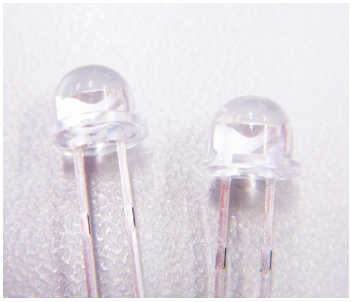
C535A-WJS/WJN: 5-mm Round White LEDs



PRODUCT DESCRIPTION

Round LEDs offer superior light output for excellent readability in sunlight and dependable performance. They provide extremely stable light output over long periods of time.

These lamps are made with an advanced optical grade epoxy offering superior high temperature and high moisture resistance performance in lighting and illumination applications.

FEATURES

- Size (mm): 5
- Color Temperatures:
  Cool White :
  Min . (4600K) / Typical (9000K)
- Luminous Intensity (mcd)
  C535A-WJS/WJN:(1100-4180)
- Viewing angles:
  110°: C535A-WJS/WJN
- Lead - Free
- RoHS Compliant

APPLICATIONS

- Garden Light
- Channel Letter
- Retail Display Lighting

Cree LED / 4400 Silicon Drive / Durham, NC 27703 USA / +1.919.313.5330 / www.cree-led.com

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Items	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	25	mA
Peak Forward Current Note 1	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Power Dissipation	P_D	100	mW
Operation Temperature	T_{opr}	-40 ~ +95	°C
Storage Temperature	T_{stg}	-40 ~ +100	°C
Lead Soldering Temperature	T_{sol}	Max. 260°C for 3 sec. max. (3 mm from the base of the epoxy bulb)	

Note:

1. Pulse width ≤0.1 msec, duty ≤1/10.

TYPICAL ELECTRICAL & OPTICAL CHARACTERISTICS (T_A = 25°C)

Characteristics	Color	Symbol	Condition	Unit	Minimum	Typical	Maximum
Forward Voltage	WJS/WJN	V_F	I_F = 20 mA	V		3.2	4.0
Reverse Current	WJS/WJN	I_R	V_R = 5 V	µA			100
Luminous Intensity	WJS/WJN	I_V	I_F = 20 mA	mcd	1100	2750	
Chromaticity Coordinates	WJS/WJN	x	I_F = 20 mA			0.2895	
		y	I_F = 20 mA			0.2905	
50% Power Angle	WJS/WJN	2θ½	I_F = 20 mA	deg		110	

* Continuous reverse voltage can cause LED damage.

INTENSITY BIN LIMIT

Cool White (20 mA) - C535A-WJS/WJN		
Bin Code	**Min.(mcd)**	**Max.(mcd)**
T0	1100	1520
U0	1520	2130
V0	2130	3000
W0	3000	4180

* Tolerance of measurement of luminous intensity is ±15%

VOLTAGE BIN LIMIT

Cool White (20 mA) - C535A-WJS/WJN		
Bin Code	**Min. (V)**	**Max. (V)**
27	2.8	3.0
28	3.0	3.2
29	3.2	3.4
2a	3.4	3.6
2b	3.6	3.8
2c	3.8	4.0

* Tolerance of measurement of voltage is ±0.05V

COLOR BIN LIMIT

Cool White (20 mA) - C535A-WJS/WJN

Bin Code	Sub-bin	x	y
W1	Wa1	0.2449	0.2288
		0.2497	0.2384
		0.2543	0.2356
		0.2497	0.2267
	Wa2	0.2497	0.2267
		0.2543	0.2356
		0.2589	0.2328
		0.2545	0.2245
	Wa3	0.2497	0.2384
		0.2545	0.2480
		0.2589	0.2445
		0.2543	0.2356
	Wa4	0.2543	0.2356
		0.2589	0.2445
		0.2633	0.2410
		0.2589	0.2328
	Wb1	0.2545	0.2245
		0.2589	0.2328
		0.2635	0.2299
		0.2593	0.2223
	Wb2	0.2593	0.2223
		0.2635	0.2299
		0.2680	0.2270
		0.2640	0.2200
	Wb3	0.2589	0.2328
		0.2633	0.2410
		0.2677	0.2375
		0.2635	0.2299
	Wb4	0.2635	0.2299
		0.2677	0.2375
		0.2720	0.2340
		0.2680	0.2270

Bin Code	Sub-bin	x	y
W1	Wc1	0.2545	0.2480
		0.2593	0.2575
		0.2635	0.2534
		0.2589	0.2445
	Wc2	0.2589	0.2445
		0.2635	0.2534
		0.2677	0.2493
		0.2633	0.2410
	Wc3	0.2593	0.2575
		0.2640	0.2670
		0.2680	0.2623
		0.2635	0.2534
	Wc4	0.2635	0.2534
		0.2680	0.2623
		0.2720	0.2575
		0.2677	0.2493
	Wd1	0.2633	0.2410
		0.2677	0.2493
		0.2718	0.2451
		0.2677	0.2375
	Wd2	0.2677	0.2375
		0.2718	0.2451
		0.2760	0.2410
		0.2720	0.2340
	Wd3	0.2677	0.2493
		0.2720	0.2575
		0.2760	0.2528
		0.2718	0.2451
	Wd4	0.2718	0.2451
		0.2760	0.2528
		0.2800	0.2480
		0.2760	0.2410

Bin Code	Sub-bin	x	y
W2	We1	0.2640	0.2670
		0.2688	0.2765
		0.2726	0.2711
		0.2680	0.2623
	We2	0.2680	0.2623
		0.2726	0.2711
		0.2764	0.2658
		0.2720	0.2575
	We3	0.2688	0.2765
		0.2735	0.2860
		0.2772	0.2800
		0.2726	0.2711
	We4	0.2726	0.2711
		0.2772	0.2800
		0.2808	0.2740
		0.2764	0.2658
	Wf1	0.2720	0.2575
		0.2764	0.2658
		0.2802	0.2604
		0.2760	0.2528
	Wf2	0.2760	0.2528
		0.2802	0.2604
		0.2840	0.2550
		0.2800	0.2480
	Wf3	0.2764	0.2658
		0.2808	0.2740
		0.2844	0.2680
		0.2802	0.2604
	Wf4	0.2802	0.2604
		0.2844	0.2680
		0.2880	0.2620
		0.2840	0.2550

* Tolerance of measurement of the color coordinates is ±0.01

COLOR BIN LIMIT

Cool White (20 mA) - C535A-WJS/WJN

Bin Code	Sub-bin	x	y
W2	Wg1	0.2735	0.2860
		0.2783	0.2955
		0.2817	0.2889
		0.2772	0.2800
	Wg2	0.2772	0.2800
		0.2817	0.2889
		0.2852	0.2823
		0.2808	0.2740
	Wg3	0.2783	0.2955
		0.2830	0.3050
		0.2863	0.2978
		0.2817	0.2889
	Wg4	0.2817	0.2889
		0.2863	0.2978
		0.2895	0.2905
		0.2852	0.2823
	Wh1	0.2808	0.2740
		0.2852	0.2823
		0.2886	0.2756
		0.2844	0.2680
	Wh2	0.2844	0.2680
		0.2886	0.2756
		0.2920	0.2690
		0.2880	0.2620
	Wh3	0.2852	0.2823
		0.2895	0.2905
		0.2928	0.2833
		0.2886	0.2756
	Wh4	0.2886	0.2756
		0.2928	0.2833
		0.2960	0.2760
		0.2920	0.2690

Bin Code	Sub-bin	x	y
W3	Wj1	0.2830	0.3050
		0.2890	0.3130
		0.2918	0.3048
		0.2863	0.2978
	Wj2	0.2863	0.2978
		0.2918	0.3048
		0.2947	0.2967
		0.2895	0.2905
	Wj3	0.2890	0.3130
		0.2950	0.3210
		0.2974	0.3119
		0.2918	0.3048
	Wj4	0.2918	0.3048
		0.2974	0.3119
		0.2998	0.3028
		0.2947	0.2967
	Wk1	0.2895	0.2905
		0.2947	0.2967
		0.2975	0.2890
		0.2928	0.2833
	Wk2	0.2928	0.2833
		0.2975	0.2890
		0.3003	0.2813
		0.2960	0.2760
	Wk3	0.2947	0.2967
		0.2998	0.3028
		0.3022	0.2946
		0.2975	0.2890
	Wk4	0.2975	0.2890
		0.3022	0.2946
		0.3045	0.2865
		0.3003	0.2813

Bin Code	Sub-bin	x	y
W3	Wm1	0.2950	0.3210
		0.3010	0.3290
		0.3030	0.3190
		0.2974	0.3119
	Wm2	0.2974	0.3119
		0.3030	0.3119
		0.3050	0.3090
		0.2998	0.3028
	Wm3	0.3010	0.3290
		0.3070	0.3370
		0.3085	0.3260
		0.3030	0.3190
	Wm4	0.3030	0.3190
		0.3085	0.3260
		0.3100	0.3150
		0.3050	0.3090
	Wn1	0.2998	0.3028
		0.3050	0.3090
		0.3070	0.3005
		0.3022	0.2946
	Wn2	0.3022	0.2946
		0.3070	0.3005
		0.3090	0.2920
		0.3045	0.2865
	Wn3	0.3050	0.3090
		0.3100	0.3150
		0.3115	0.3060
		0.3070	0.3005
	Wn4	0.3070	0.3005
		0.3115	0.3060
		0.3130	0.2970
		0.3090	0.2920

* Tolerance of measurement of the color coordinates is ±0.01

COLOR BIN LIMIT

Cool White (20 mA) - C535A-WJS/WJN

Bin Code	Sub-bin	x	y
W4	Wp1	0.3070	0.3370
		0.3130	0.3430
		0.3140	0.3320
		0.3085	0.3260
	Wp2	0.3085	0.3260
		0.3140	0.3320
		0.3150	0.3210
		0.3100	0.3150
	Wp3	0.3130	0.3430
		0.3190	0.3490
		0.3195	0.3380
		0.3140	0.3320
	Wp4	0.3140	0.3320
		0.3195	0.3380
		0.3200	0.3270
		0.3150	0.3210
	Wq1	0.3100	0.3150
		0.3150	0.3210
		0.3163	0.3118
		0.3115	0.3060
	Wq2	0.3115	0.3060
		0.3163	0.3118
		0.3175	0.3025
		0.3130	0.2970
	Wq3	0.3150	0.3210
		0.3200	0.3270
		0.3208	0.3173
		0.3163	0.3118
	Wq4	0.3163	0.3118
		0.3208	0.3173
		0.3215	0.3075
		0.3175	0.3025

Bin Code	Sub-bin	x	y
W4	Wr1	0.3190	0.3490
		0.3245	0.3545
		0.3248	0.3438
		0.3195	0.3380
	Wr2	0.3195	0.3380
		0.3248	0.3438
		0.3250	0.3330
		0.3200	0.3270
	Wr3	0.3245	0.3545
		0.3300	0.3600
		0.3300	0.3495
		0.3248	0.3438
	Wr4	0.3248	0.3438
		0.3300	0.3495
		0.3300	0.3390
		0.3250	0.3330
	Ws1	0.3200	0.3270
		0.3250	0.3330
		0.3255	0.3230
		0.3208	0.3173
	Ws2	0.3208	0.3173
		0.3255	0.3230
		0.3260	0.3130
		0.3215	0.3075
	Ws3	0.3250	0.3330
		0.3300	0.3390
		0.3300	0.3285
		0.3255	0.3230
	Ws4	0.3255	0.3230
		0.3300	0.3285
		0.3300	0.3180
		0.3260	0.3130

Bin Code	Sub-bin	x	y
W5	Wt1	0.3300	0.3600
		0.3378	0.3663
		0.3375	0.3563
		0.3300	0.3495
	Wt2	0.3300	0.3495
		0.3375	0.3563
		0.3372	0.3463
		0.3300	0.3390
	Wt3	0.3378	0.3663
		0.3455	0.3725
		0.3449	0.3630
		0.3375	0.3563
	Wt4	0.3375	0.3563
		0.3449	0.3630
		0.3443	0.3535
		0.3372	0.3463
	Wu1	0.3300	0.3390
		0.3372	0.3463
		0.3368	0.3363
		0.3300	0.3285
	Wu2	0.3300	0.3285
		0.3368	0.3363
		0.3365	0.3263
		0.3300	0.3180
	Wu3	0.3372	0.3463
		0.3443	0.3535
		0.3437	0.3440
		0.3368	0.3363
	Wu4	0.3368	0.3363
		0.3437	0.3440
		0.3430	0.3345
		0.3365	0.3263

* Tolerance of measurement of the color coordinates is ±0.01

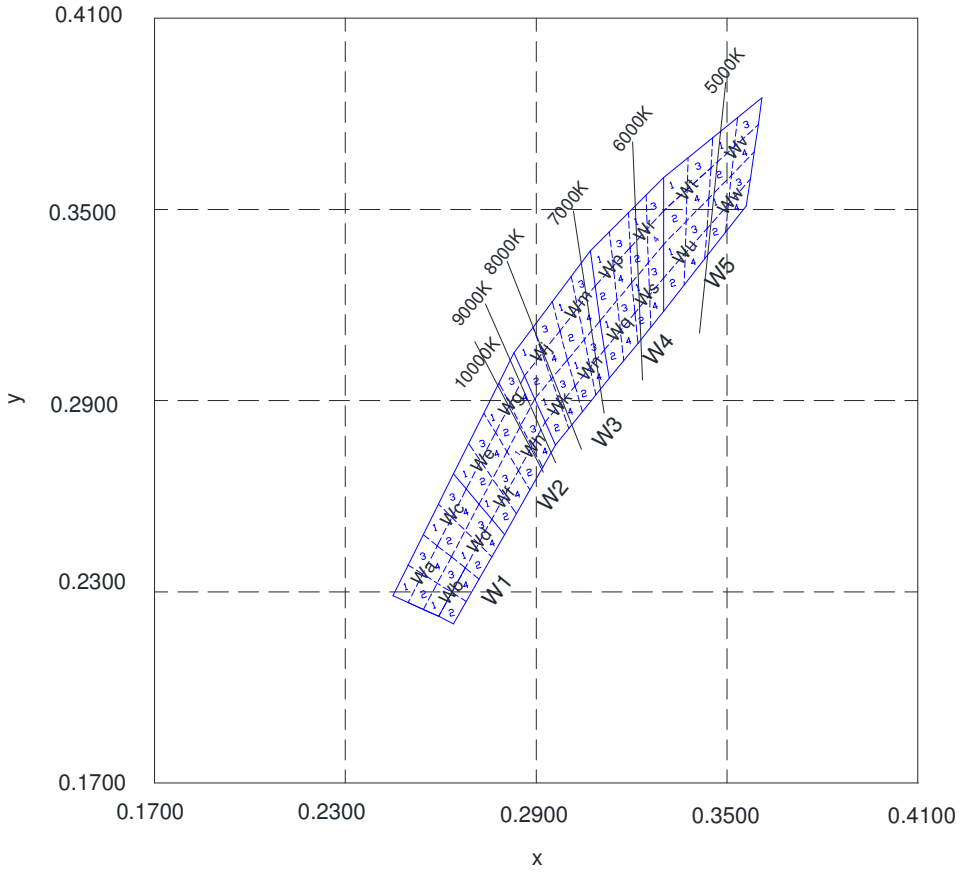
COLOR BIN LIMIT

Cool White (20 mA) - C535A-WJS/WJN

Bin Code	Sub-bin	x	y
W5	Wv1	0.3455	0.3725
		0.3533	0.3788
		0.3523	0.3698
		0.3449	0.3630
	Wv2	0..3449	0.3630
		0.3523	0.3698
		0.3514	0.3608
		0.3443	0.3535
	Wv3	0.3533	0.3788
		0.3610	0.3850
		0.3598	0.3765
		0.3523	0.3698
	Wv4	0.3523	0.3698
		0.3598	0.3765
		0.3585	0.3680
		0.3514	0.3608
	Ww1	0.3443	0.3535
		0.3514	0.3608
		0.3505	0.3518
		0.3437	0.3440
	Ww2	0.3437	0.3440
		0.3505	0.3518
		0.3495	0.3428
		0.3430	0.3345
	Ww3	0.3514	0.3608
		0.3585	0.3680
		0.3573	0.3595
		0.3505	0.3518
	Ww4	0.3505	0.3518
		0.3573	0.3595
		0.3560	0.3510
		0.3495	0.3428

* Tolerance of measurement of the color coordinates is ±0.01

CIE CHROMATICITY DIAGRAM



ORDER CODE TABLE

Color	Viewing Angle	Kit Number	Luminous Intensity (mcd)		Color Bin Code	Package	Standoff
			Min.	Max.			
Cool White	110°	C535A-WJS-CT0W0151	1100	4180	W1,W2,W3,W4,W5	Bulk	Yes
		C535A-WJS-CT0W0231	1100	4180	W2,W3	Bulk	Yes
		C535A-WJS-CU0W0231	1520	4180	W2,W3	Bulk	Yes
		C535A-WJS-CV0W0231	2130	4180	W2,W3	Bulk	Yes
		C535A-WJN-CT0W0151	1100	4180	W1,W2,W3,W4,W5	Bulk	No
		C535A-WJN-CT0W0231	1100	4180	W2,W3	Bulk	No
		C535A-WJN-CU0W0231	1520	4180	W2,W3	Bulk	No
		C535A-WJN-CV0W0231	2130	4180	W2,W3	Bulk	No

Notes:

- 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 bulk. Single intensity-bin code and single color-bin codes will not be orderable.
- Please refer to the HB LED Lamp Reliability Test Standards document for reliability test conditions.
- Please refer to the HB LED Lamp Soldering & Handling document for information about how to use this LED product safely.

GRAPHS

The data below 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.

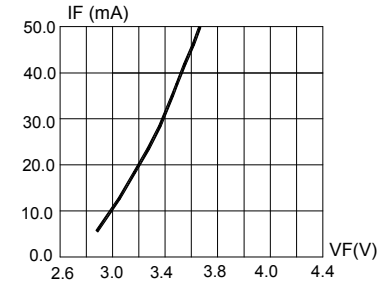


FIG.1 FORWARD CURRENT VS. FORWARD VOLTAGE.

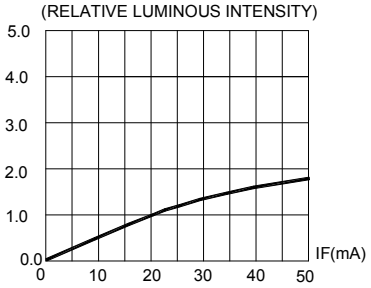


FIG.2 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

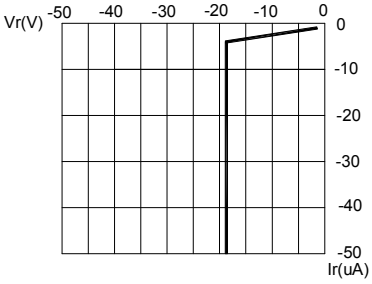


FIG.3 REVERSE CURRENT VS. REVERSE VOLTAGE.

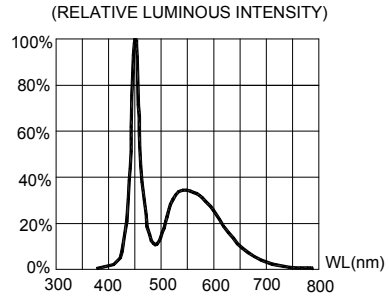


FIG.4 RELATIVE LUMINOUS INTENSITY VS. WAVELENGTH.

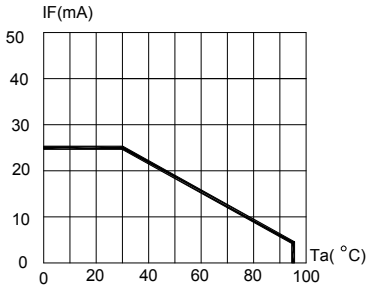


FIG.5 MAXIMUM FORWARD DC CURRENT VS AMBIENT TEMPERATURE (Tjmax=105°C)

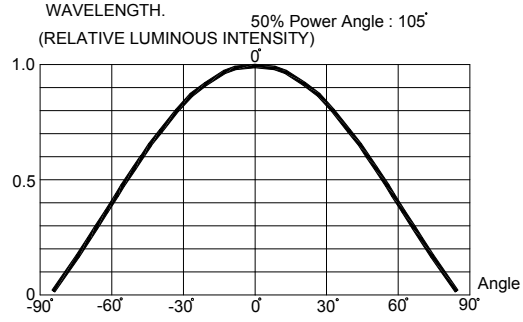
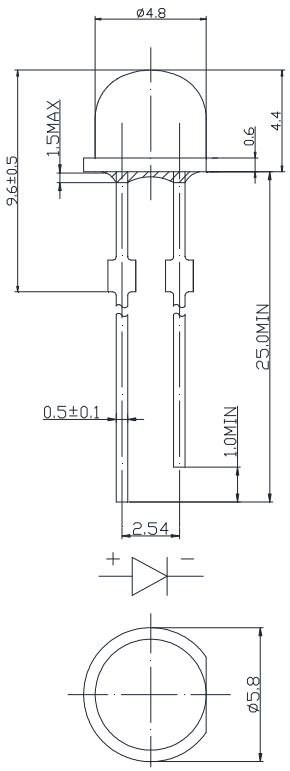


FIG.6 FAR FIELD PATTERN

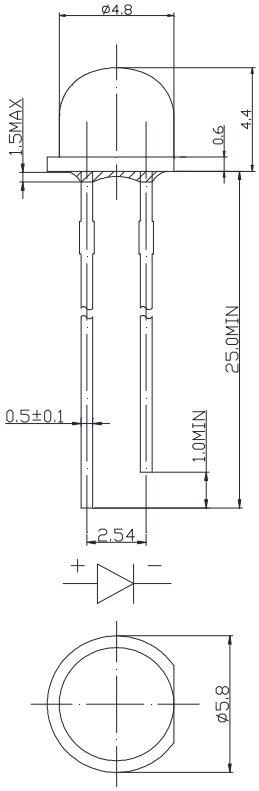
MECHANICAL DIMENSIONS

All dimensions are in mm. Tolerance is ±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.

C535A-WJS:



C535A-WJN:



NOTES

RoHS Compliance

The levels of RoHS 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 2011/65/EC (RoHS2), as implemented January 2, 2013. RoHS Declarations for this product can be obtained from your Cree LED representative or from the Product Ecology section of the Cree LED website.

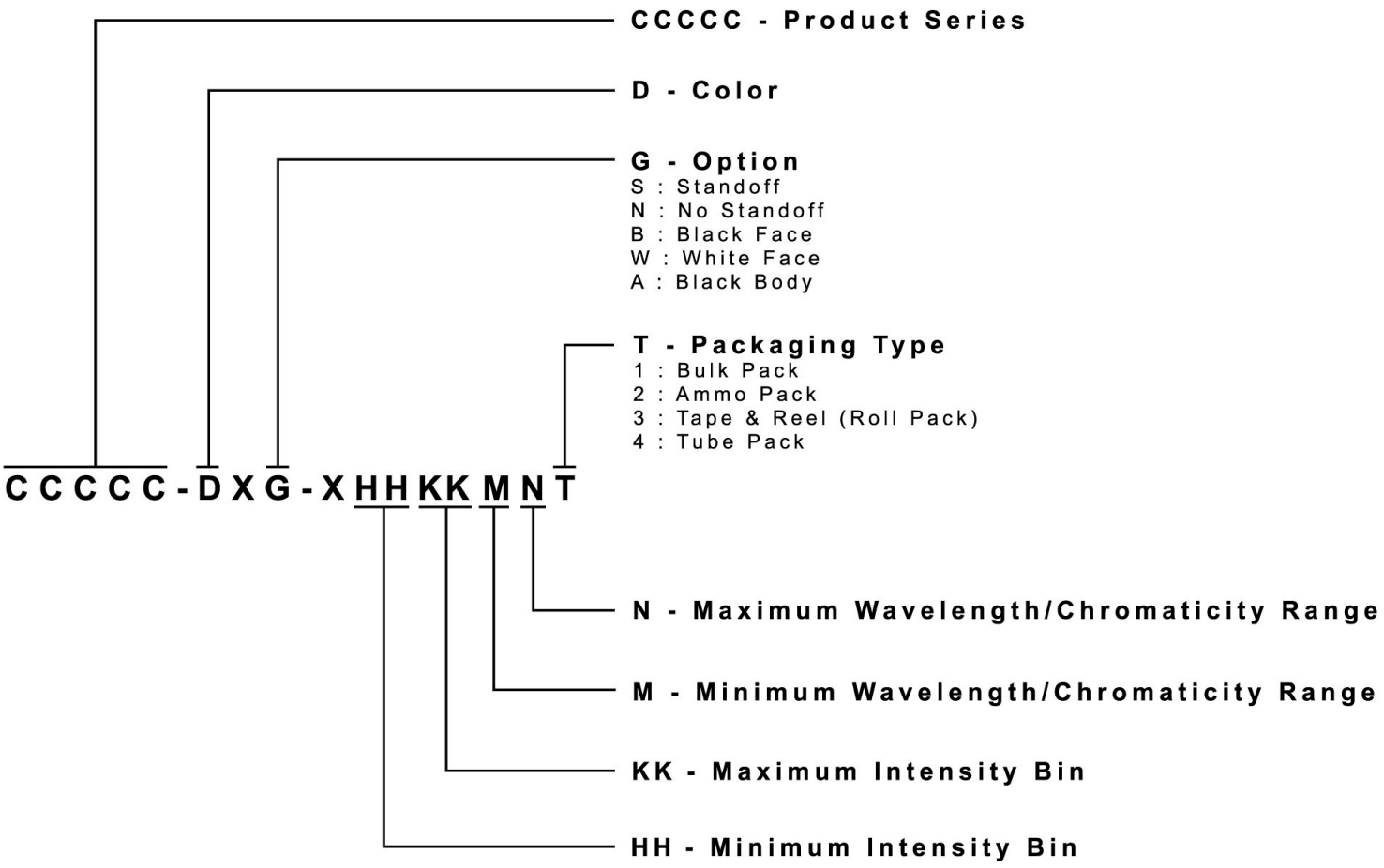
Vision Advisory

WARNING: Do not look at an exposed lamp in operation. Eye injury can result.

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.

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

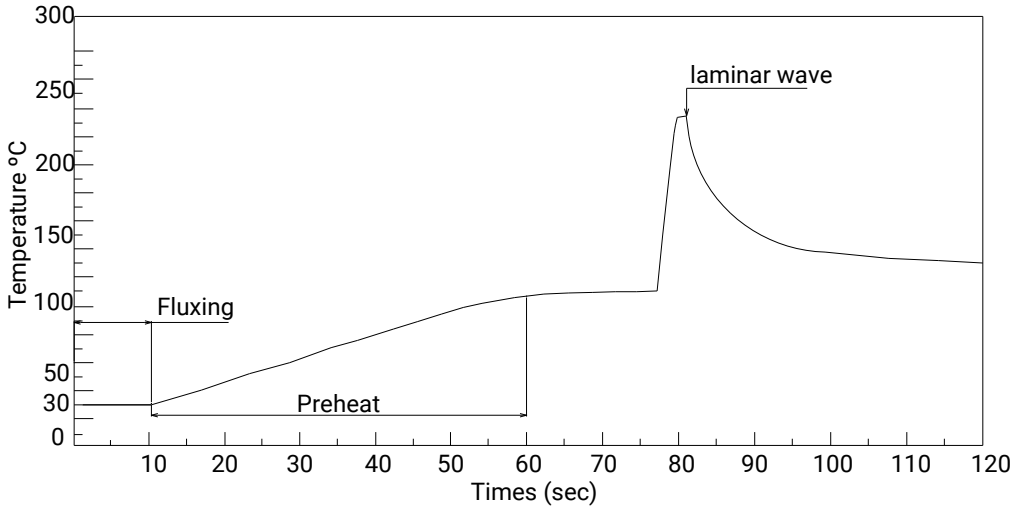


SOLDERING GUIDELINES

The LED soldering specification is shown below(suitable for both leaded solder & lead-free solder):

Manual Soldering		Solder Dipping	
Soldering iron	35 W max	Preheat	110 °C max
Temperature	300 °C max	Preheat time	60 seconds max
		Solder-bath temperature	260 °C Max
Soldering time	3 seconds max	Dipping time	5 seconds max
Position	Not less than 3 mm from the base of the package.	Position	Not less than 3 mm from the base of the package.

- Manual soldering onto the PCB is not recommended because soldering time is uncontrollable.
- The recommended wave soldering is as below:



- Do not apply any stress to the LED package, particularly when heated.
- Only bottom preheat is suggested & should not preheat on top in order to reduce thermal stress experienced by the LEDs.
- The LEDs must not be re used once they have been extracted from PCB.
- After soldering the LEDs, the package should be protected from mechanical shock or vibration until the LEDs have reached 40 °C or below.
- Precautions must be taken as mechanical stress on the LEDs may be caused by PCB warpage or from the clinching and cutting of the LED leads.
- When it is necessary to clam the LEDs during soldering, it is important to ensure no mechanical stress is exerted on the LEDs.
- Cut the LED lead at normal room temperature. Lead cutting at high temperature may cause failure of the LEDs.
- Please refer to the HB LED Lamp Soldering & Handling document for information about how to use this LED product safely.

PACKAGING

- 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 bag.