

P20-X-A

High Power LED

Introduction

The P20-X-A LEDs from SemiLEDs utilize innovative MvpLED™ technology which delivers superior levels of optical performance and reliability. Use of state of the art silicone packaging guarantees a long lifetime and high levels of efficacy. P20-X-A LEDs are reflow solderable at 240°C and the light output decay is less than 10% under crucial test conditions (700mA, ambient 85°C and 85%RH).



Because of a special design allowing it to fit secondary optics and a capability to easily get uniform light with small size optics, the P20-X-A LED is suitable for a wide variety of lighting applications.



The special phosphor technology used in warm white P20-X-A LEDs give them very good color stability under high temperature conditions. The typical CCT change is less than 50K when the junction temperature reaches 100°C.

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RoHS Compliant

Features

-  Excellent Operating Life
-  High Efficacy
-  Low Thermal Resistance
-  Superior ESD Protection
-  No UV
-  SMD Device
-  Instant Light
-  Fully Dimmable
-  RoHS Compliant

Characteristics

Absolute Ratings

Parameter	Rating
	White Series / Royal Blue / Blue / Green / Amber / Red
DC Forward Current (mA)	700 mA
LED Junction Temperature	150°C (White / Royal Blue / Blue / Green)
LED Junction Temperature	125°C (Amber / Red)
LED Operating Temperature	-40°C ~ 110°C
Storage Temperature	-40°C ~ 110°C
Soldering Temperature	Max. 260°C / Max. 10sec. (JEDEC 020c)
ESD Sensitivity	2,000 V HBM (JESD-22A-114-B)
Reverse Voltage	Not designed to be driven in reverse bias ($V_R \leq 5V$)
Preconditioning	Acc. to JEDEC Level 2

General Characteristics at 350mA

Part number	Color	Typ. CRI	Dominant Wavelength λ_d Peak Wavelength λ_p * Correlated Color Temperature, CCT		$2\theta_{1/2}$	Temperature Coefficient of Vf (mV/°C)	Thermal Resistance Junction to Lead (°C/W) $R_{\theta_{J-L}}$
			Min	Max			
P20-W-A	Daylight	70	4750K	7000K	145	-3	10
	Neutral White	75	3700K	4750K	132	-3	10
	Warm White	80	2600K	3700K	125	-3	10
P20-R	Red	-	620	635	145	-	10
P20-A	Amber	-	580	600	145	-	10
P20-G-A	Green	-	520	535	150	-3	10
P20-B-A	Blue	-	460	470	140	-3	10
P20-D-A	Royal Blue	-	440*	460*	140	-3	10

Notes:

1. The CCT is measured with an accuracy of $\pm 200K$
2. The peak/dominant wavelength is measured with an accuracy of $\pm 1nm$

Luminous Flux and Forward Voltage

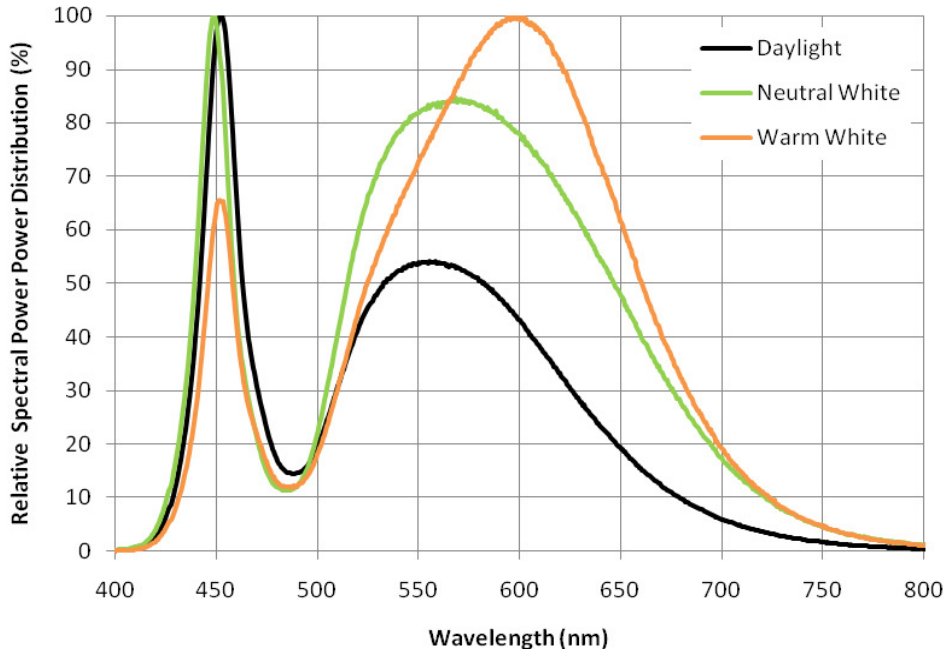
Part number	Color	Performance at Test Current (350mA)				Performance at 700mA Typical Luminous Flux (lm) or Radiometric Power* (mW)
		Group	Minimum Luminous Flux (lm) or Radiometric Power* (mW)	VF		
				Min	Max	
P20-W-A	Daylight	U2	90	2.8	3.8	160
		U3	100	2.8	3.8	170
		VA	110	2.8	3.8	185
		VB	120	2.8	3.8	200
		VC	130	2.8	3.8	220
	Neutral White	UA	80	2.8	3.8	135
		U2	90	2.8	3.8	160
		U3	100	2.8	3.8	170
	Warm White	TA	65	2.8	3.8	115
		UA	80	2.8	3.8	141
U2		90	2.8	3.8	160	
P20-R	Red	Q2	35	2.0	3.4	68
		R1	40	2.0	3.4	77
		R2	45	2.0	3.4	85
P20-A	Amber	Q2	35	2.0	3.4	68
		R1	40	2.0	3.4	77
		R2	45	2.0	3.4	85
P20-G-A	Green	S2	55	2.8	3.8	100
		T1	65	2.8	3.8	115
P20-B-A	Blue	M0	14	2.8	3.8	27
		N0	18	2.8	3.8	33
P20-D-A	Royal Blue	D2	240*	2.8	3.8	435*
		D3	280*	2.8	3.8	500*
		D4	320*	2.8	3.8	570*

Notes:

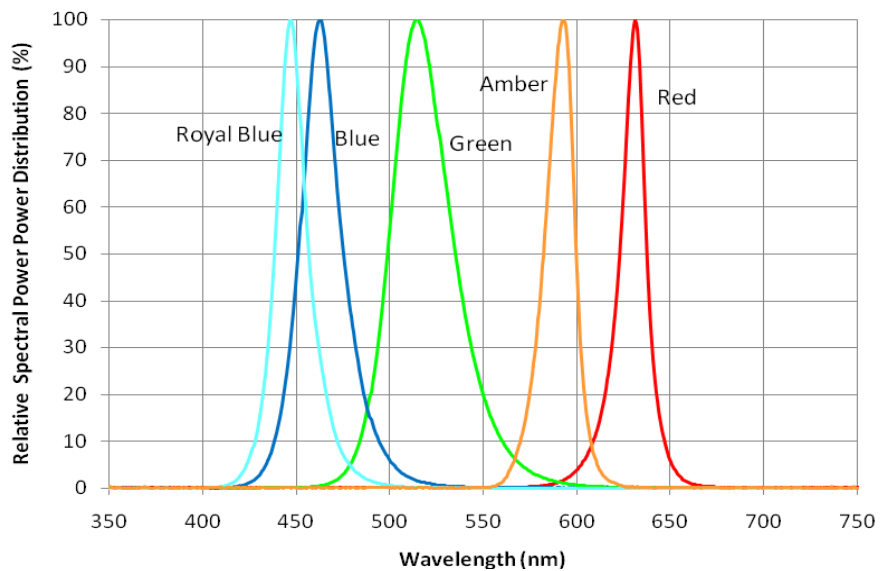
1. Luminous flux is measured with an accuracy of $\pm 10\%$
2. The forward voltage is measured with an accuracy of $\pm 0.1V$

Relative Spectral Power Distribution, Ta=25 °C

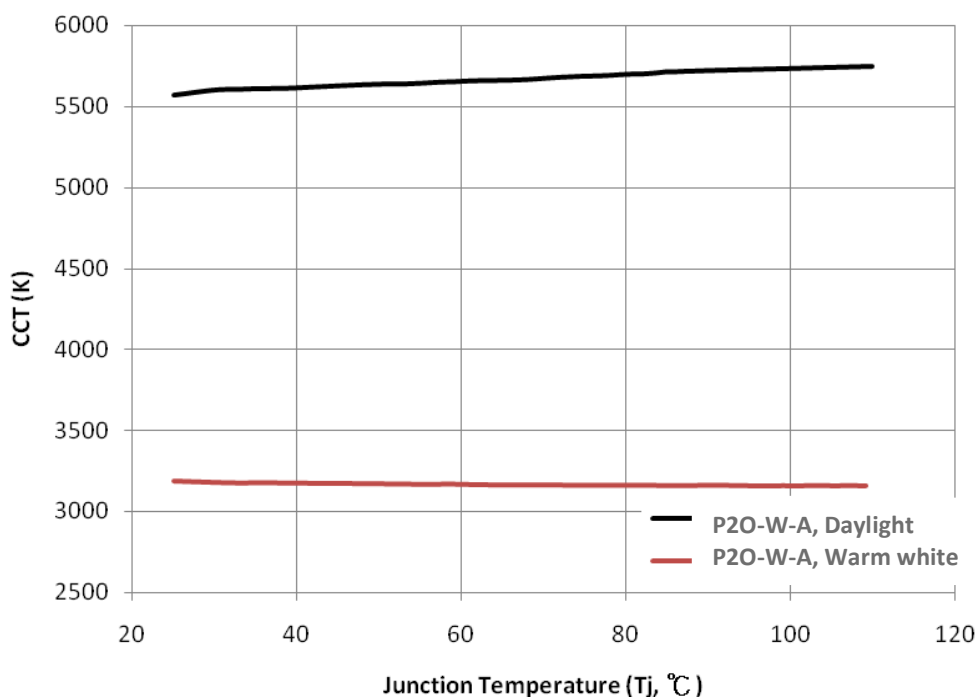
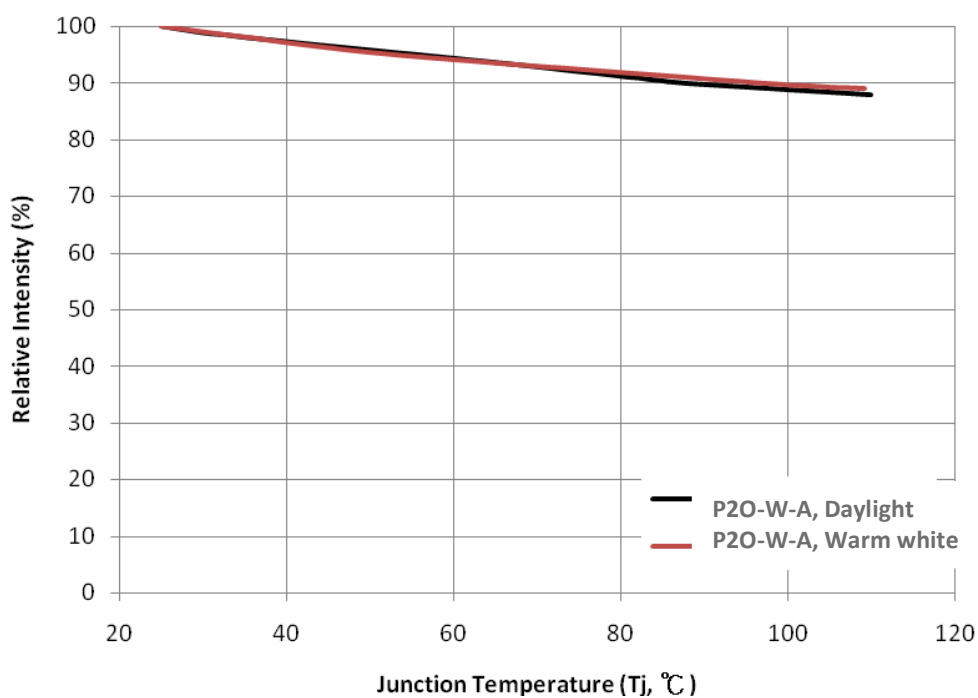
White light



Royal Blue / Blue / Green / Amber / Red

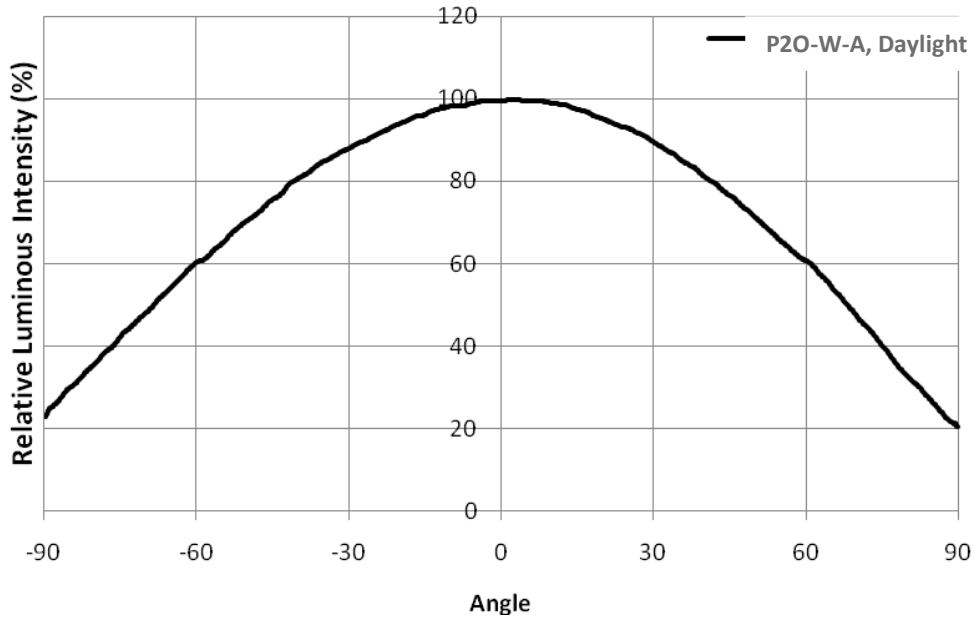


Typical Light Output Characteristics Vs. Temperature

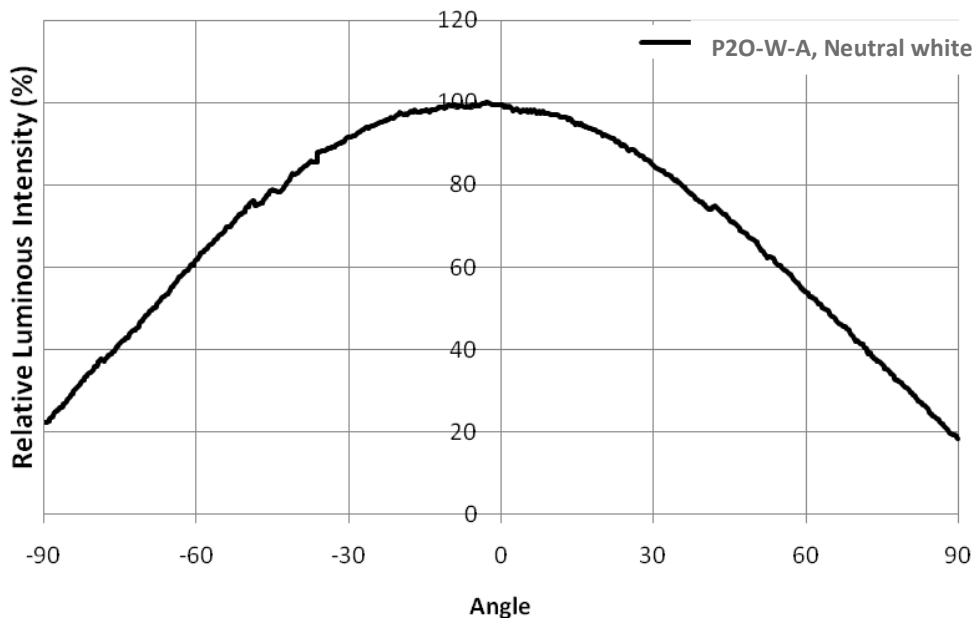


Typical Spatial Radiation Pattern

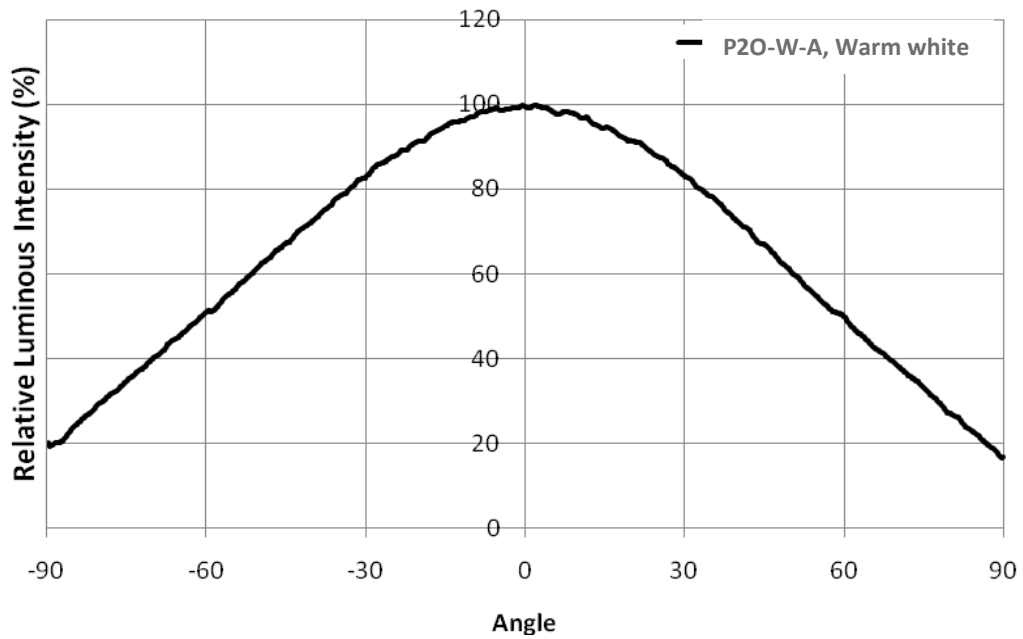
P20-W-A, Daylight



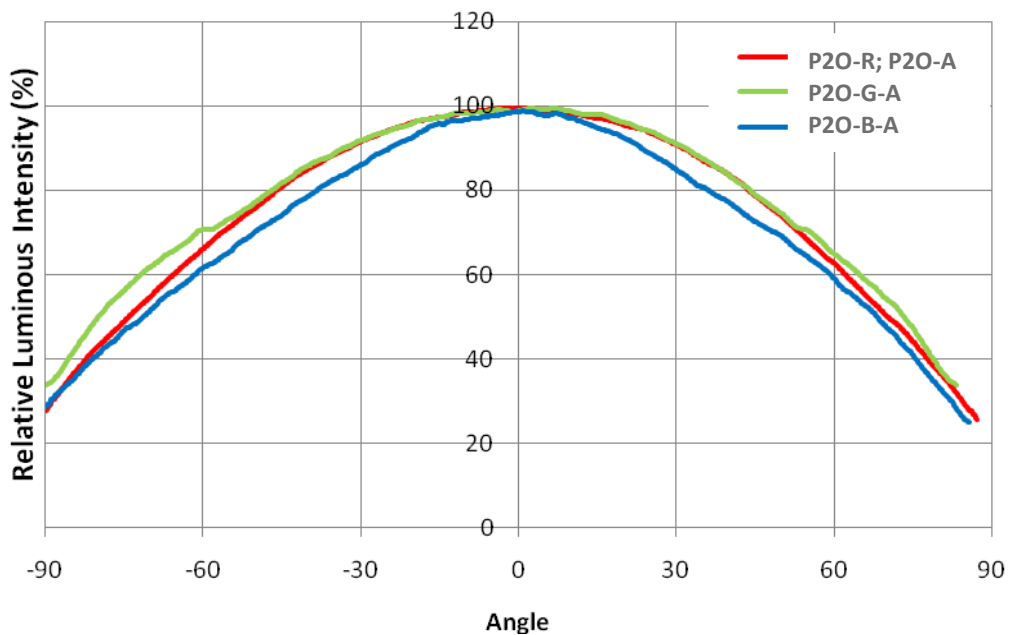
P20-W-A, Neutral White



P20-W-A, Warm White

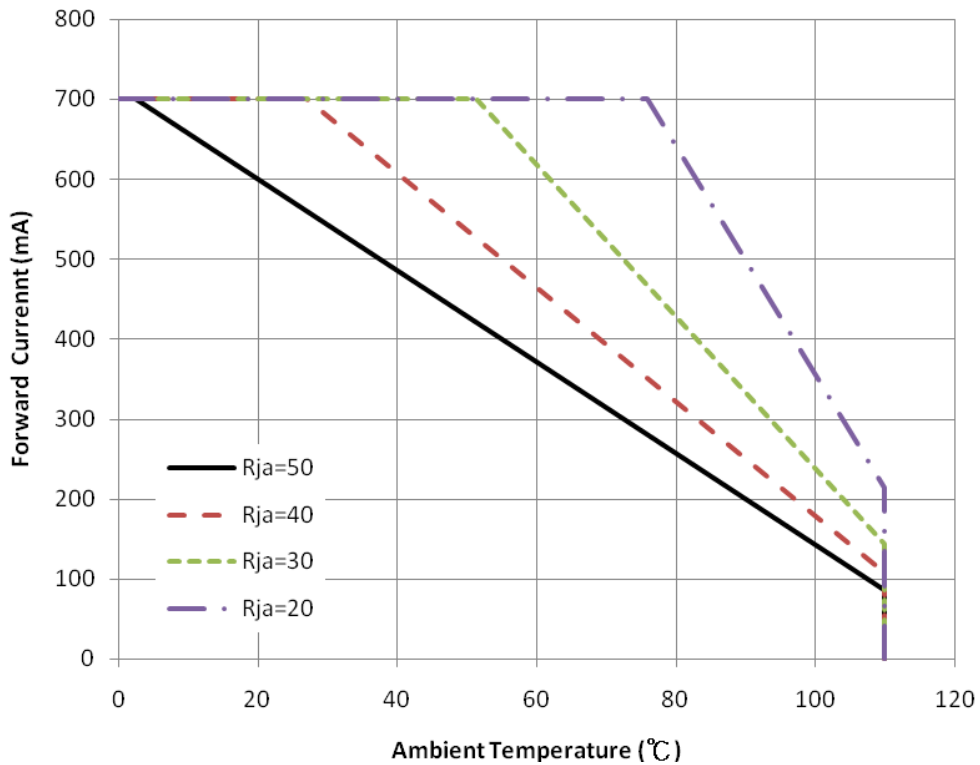


P20-R, P20-A, P20-G-A, P20-B-A



Thermal Design

Thermal design of the end product is important. The thermal resistance between the junction and the solder point ($R_{\theta_{J-L}}$) is $10^{\circ}\text{C}/\text{W}$, and the end product is designed to minimize the thermal resistance from the solder point to ambient in order to optimize the emitter life and optical characteristics. The maximum operation current is determined by the plot of Allowable Forward Current vs. Ambient Temperature .



The junction temperature can be correlated to the thermal resistance between the junction and ambient (R_{ja}) by the following equation.

$$T_j = T_a + R_{ja} * W$$

T_j : LED junction temperature

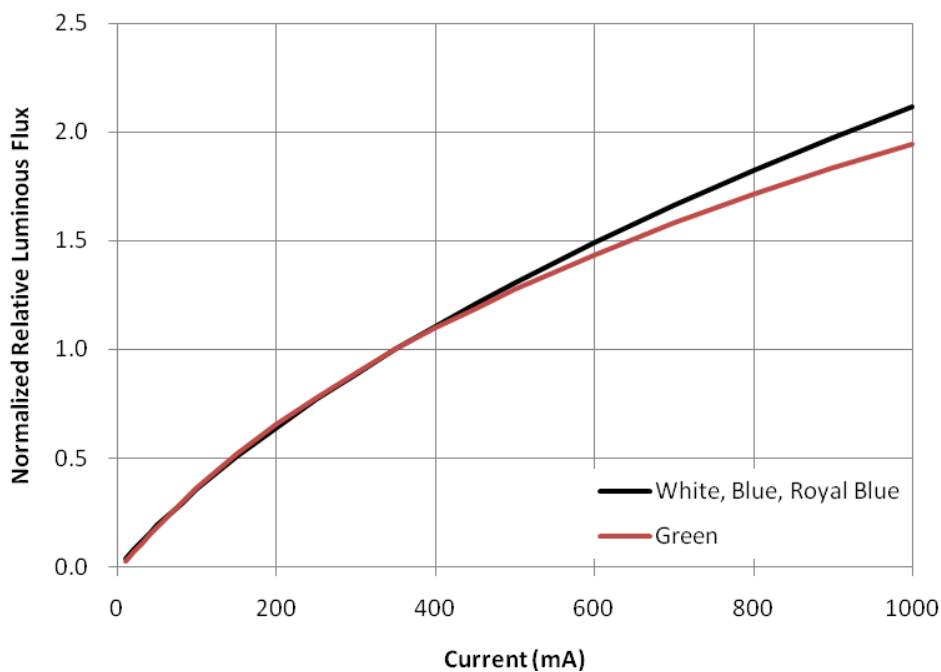
T_a : Ambient temperature

R_{ja} : Thermal resistance between the junction and ambient

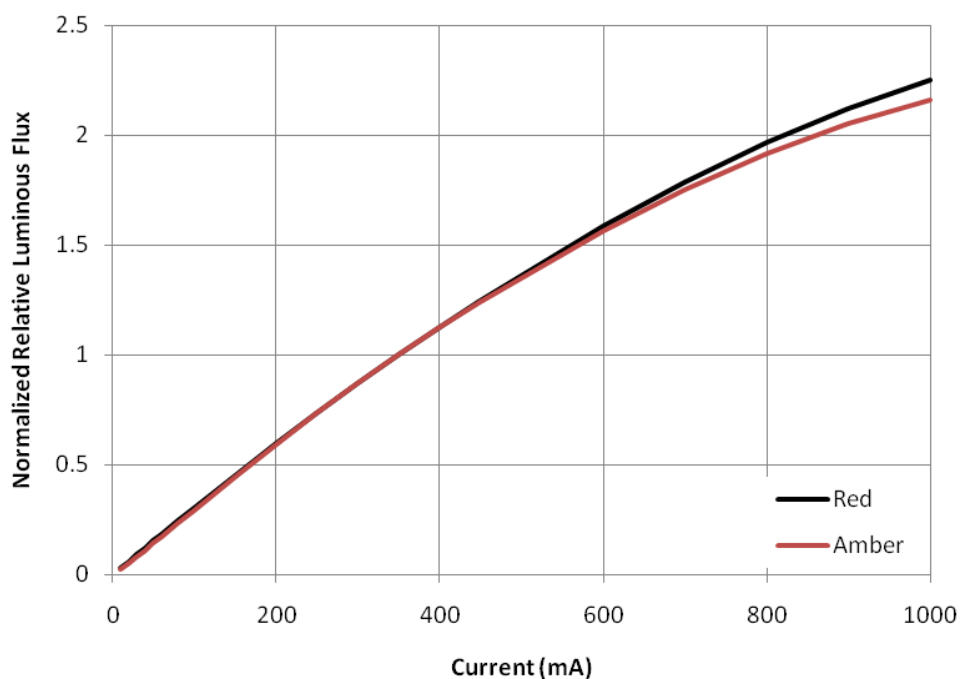
W : Input power ($I_F * V_F$)

Typical Forward L-I Characteristics

White Series / Green / Blue / Royal Blue

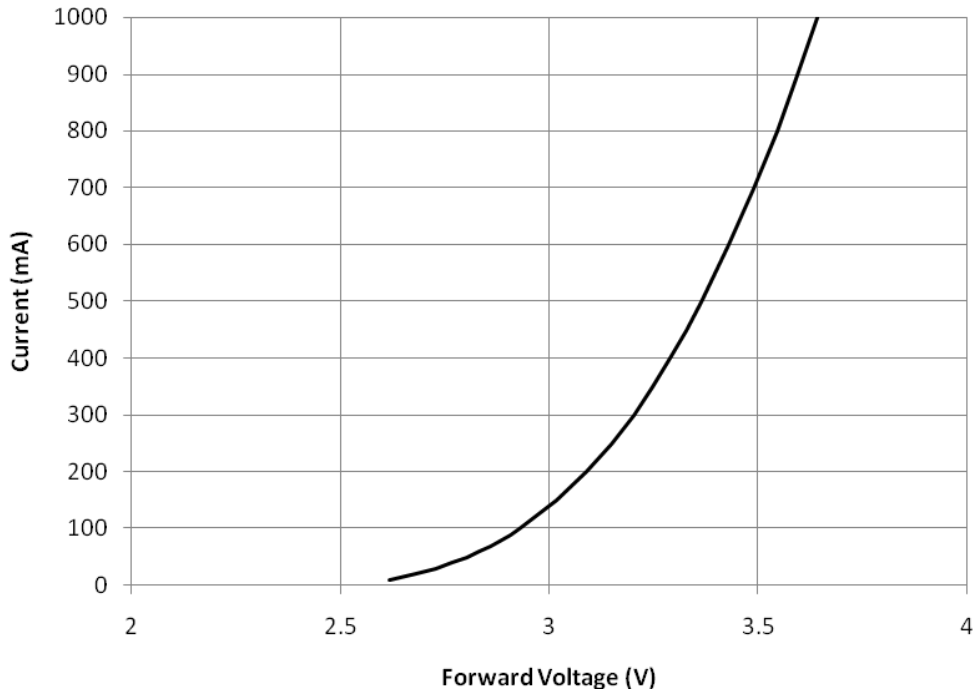


Amber / Red

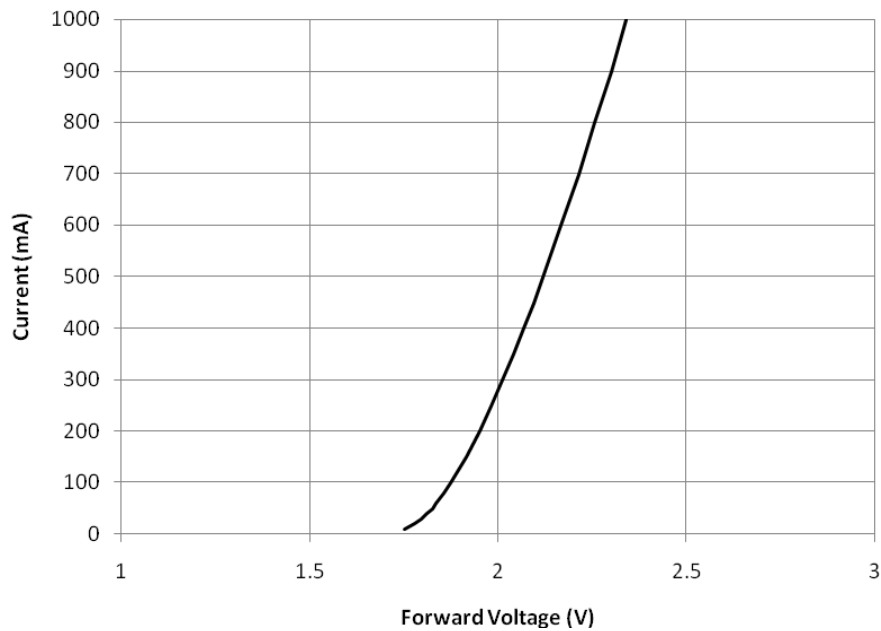


Typical Forward I-V Characteristics

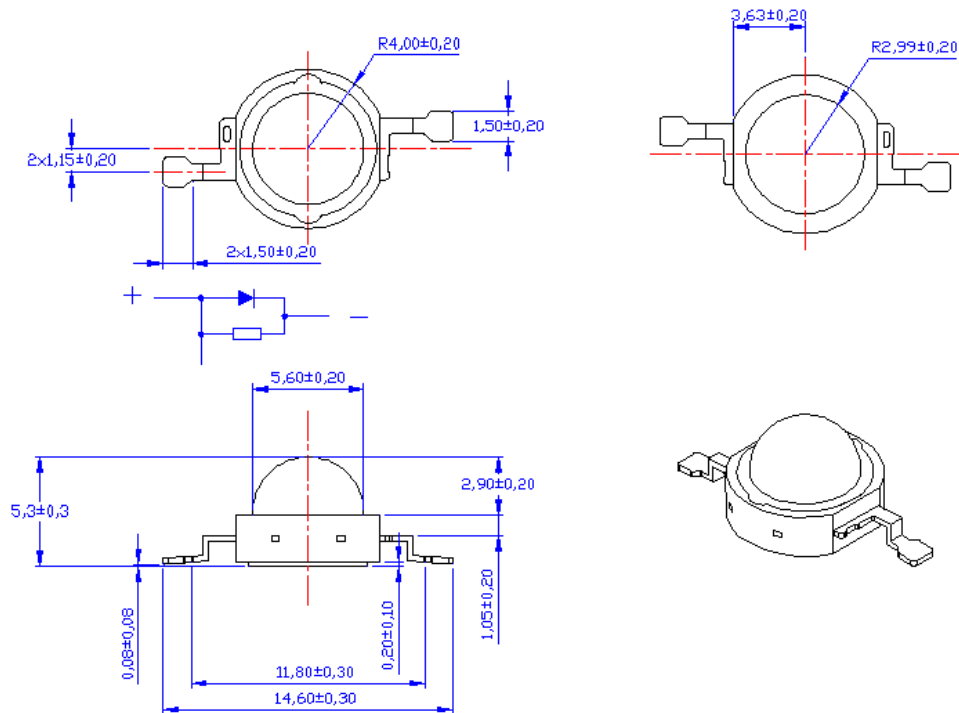
White Series / Green / Blue / Royal Blue



Amber / Red



Mechanical Dimensions

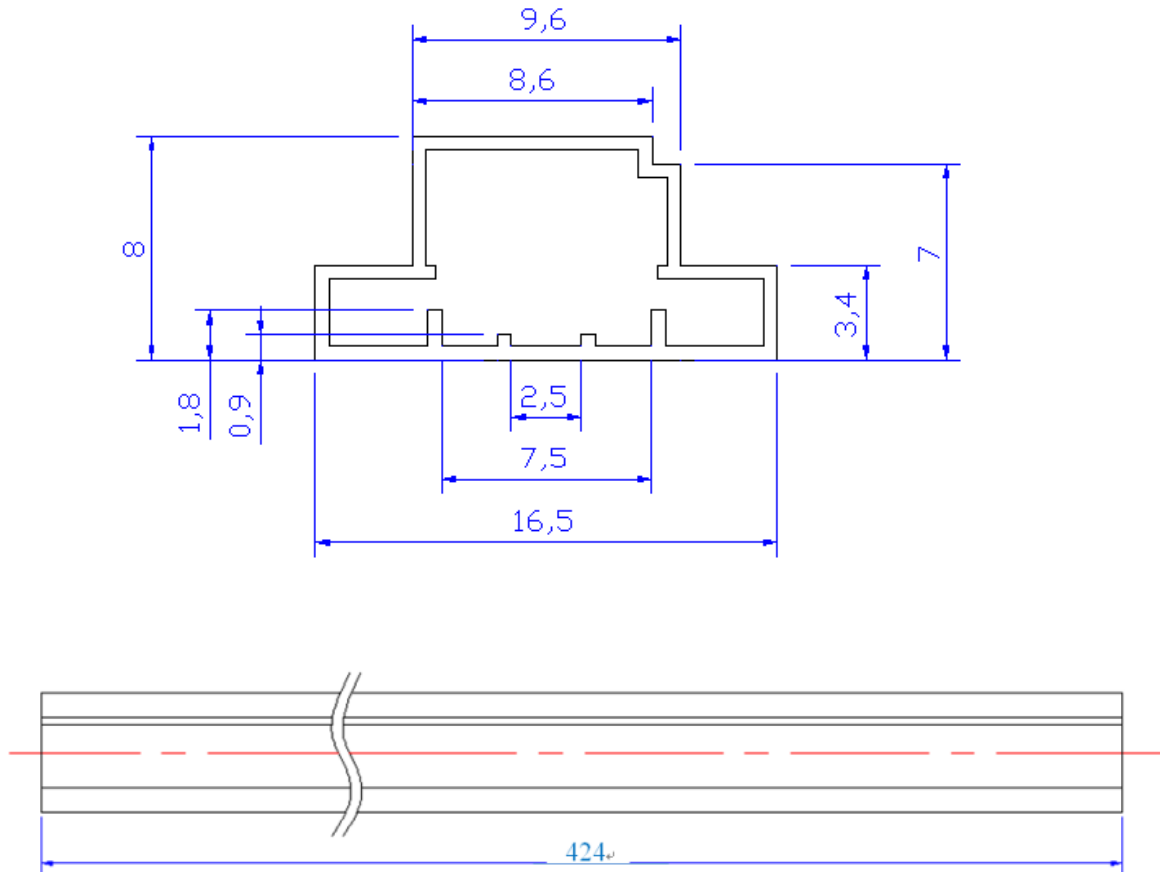


Notes:

1. Drawing is not to scale
2. All dimensions are in millimeter

Shipping Package Information

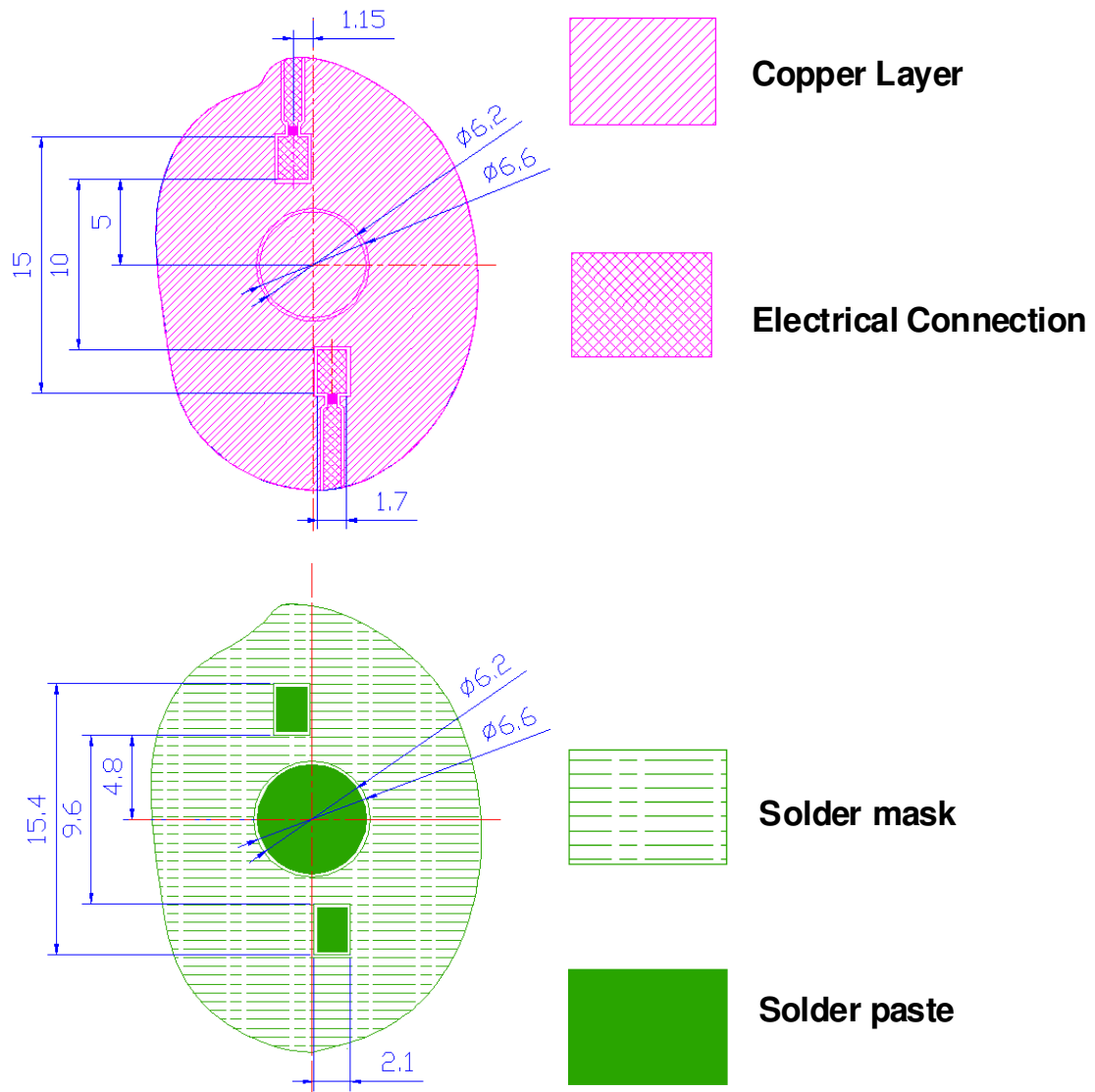
Tube



All dimensions are in millimeter

	Dimensions (L*W*H)	Emitter Quantity
Tube	424*16.7*10.0 mm	50 EA

Recommended Solder Pad Design

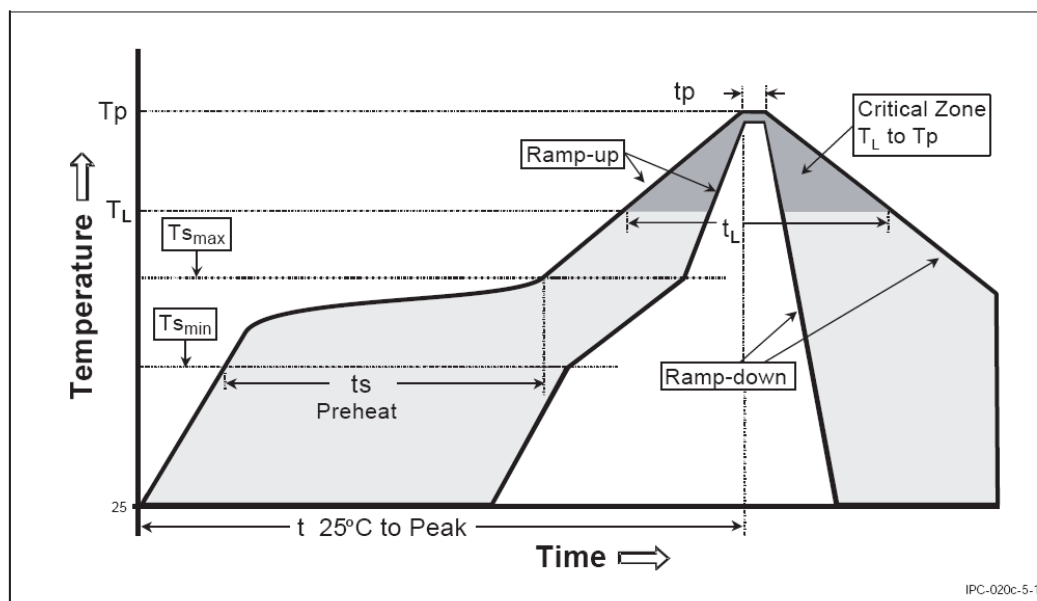


Notes:

1. Drawing is not to scale
2. All dimensions are in millimeter

Recommended Soldering Profile

LEDs should be soldered using the parameter listed below. As a general guideline, users are suggested to follow the recommended soldering profile provided by the manufacturer of the solder paste. Although the recommended soldering conditions are specified in the list, reflow soldering at the lowest possible temperature is advised for the LEDs.



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-up Rate ($T_{s_{max}}$ to T_p)	3°C/second max.	3°C/second max.
Preheat		
- Temperature Min($T_{s_{min}}$)	100°C	150°C
- Temperature Max($T_{s_{max}}$)	150°C	200°C
- Time($t_{s_{min}}$ to $t_{s_{max}}$)	60-120 seconds	60-180 seconds
Time maintained above:		
- Temperature(T_L)	183°C	217°C
- Time(t_L)	60-150 seconds	60-150 seconds
Peak/classification Temperature(T_p)	215°C	240°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.

Reliability Information

Stress Test	Stress Condition	Stress Duration
Room Temperature Operating Life (RTOL)	T _b =25°C, I _f =700mA	1000 hours
High Temperature Operating Life (HTOL)	T _b =85°C, I _f =700mA	1000 hours
Wet High Temperature Operating Life (WHTOL)	T _a =85°C, RH=85%, I _f =700mA	1000 hours
Temperature Cycles (TMCL)	-40°C/125°C, 15min dwell, 5min transfer	200 cycles
High Temperature Storage Life (HTSL)	T _a =110°C, non-operating	1000 hours
Low Temperature Storage Life (LTOL)	T _a =-40°C non-operating	1000 hours
Solder Heat Resistance (SHR)	240°C, 10 sec	

Failure Criteria:

1. Brightness attenuate difference <10%
2. Forward voltage difference: ±20%

Notes:

1. T_b: board temperature
2. T_a: ambient temperature

About Us

SemiLEDs Corporation is a US based manufacturer of ultra-high brightness LED chips with state of the art fabrication facilities in Hsinchu Science Park, Taiwan. SemiLEDs specializes in the development and manufacturing of vertical LED chips in blue (white), green, and UV using a patented copper alloy base. This unique design allows for higher performance and longer lumen maintenance. In December 2008, The World Economic Forum recognized SemiLEDs innovations with the 2009 Technology Pioneer Award. SemiLEDs is fully ISO 9001:2008 Certified

SemiLEDs is a publicly traded company on NASDAQ Global Select Market (stock symbol "LEDS"). For investor information, please contact us at investors@semileds.com.

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