

HCC P5F

PRODUCT DATASHEET



The P5F is a new generation high power LED for solid state lighting. The packages is designed with an ultra low profile which enables wider design possibilities for LED applications and luminaires.

The P5F is a 0.5W LED which has been designed to maximize thermal and optical performance. The P5F is reflow solderable under standard SMT process.



Feature :

- Excellent Operating Life
- High Efficacy
- Low Thermal Resistance
- Instant Light
- Fully Dimmable
- Superior ESD Protection
- RoHS Compatibility

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Characteristics

Absolute Ratings

Parameter	Rating
	White Series
DC Forward Current (mA)	150 mA
LED Junction Temperature	125°C
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 design to be driven in reverse bias ($V_R \leq 5V$)
Preconditioning	Acc. to JEDEC Level 2

General Characteristics at 150mA

Part number	Color	Typ. CRI	Dominant Wavelength λ_d Peak Wavelength λ_p * Correlated Color Temperature, CCT		$2\theta_{1/2}$	Temperature Coefficient of V_f (mV/°C)
			Min	Max		
P5F-W	Daylight	70	4750 K	7000 K	Lambertian	-3
P5F-W	Warm White	80	2600 K	3700K	Lambertian	-3

Notes :

1. The CCT is measured with an accuracy of $\pm 200K$



Luminous Flux and Forward Voltage at 150mA

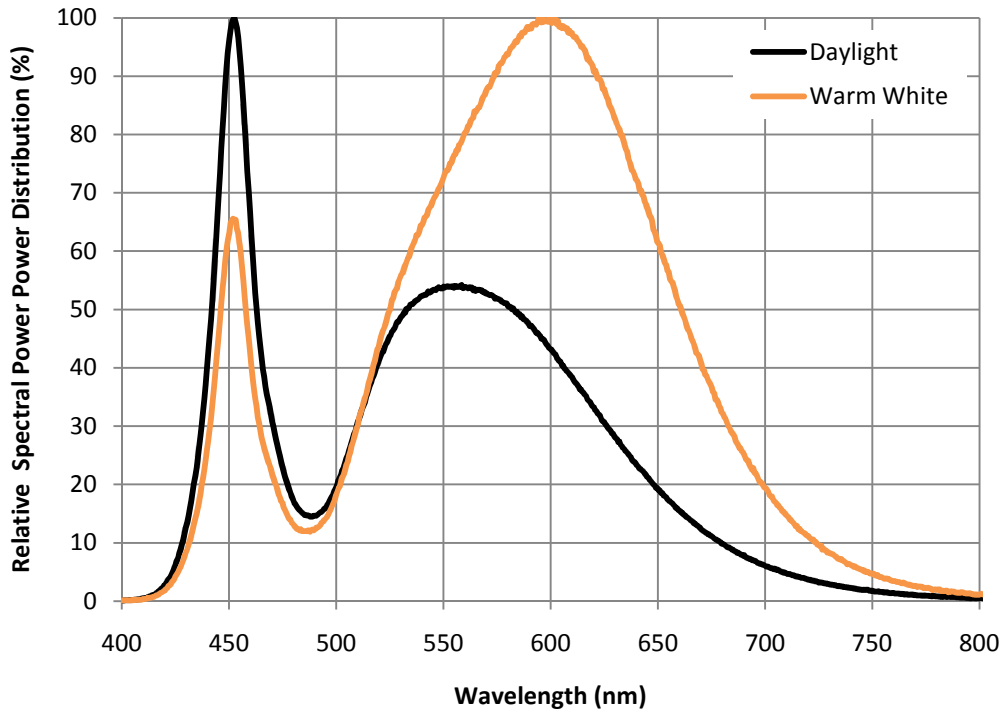
Part number	Color	Performance at Test Current (150mA)			
		Group	Minimum Luminous Flux (lm) or Radiometric Power* (mW)	VF	
				Min	Max
P5F-W	Daylight	Q1	30	2.8	3.8
		Q2	35	2.8	3.8
		R1	40	2.8	3.8
		R2	45	2.8	3.8
	Warm White	P2	26	2.8	3.8
		Q1	30	2.8	3.8
		Q2	35	2.8	3.8

Note:

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

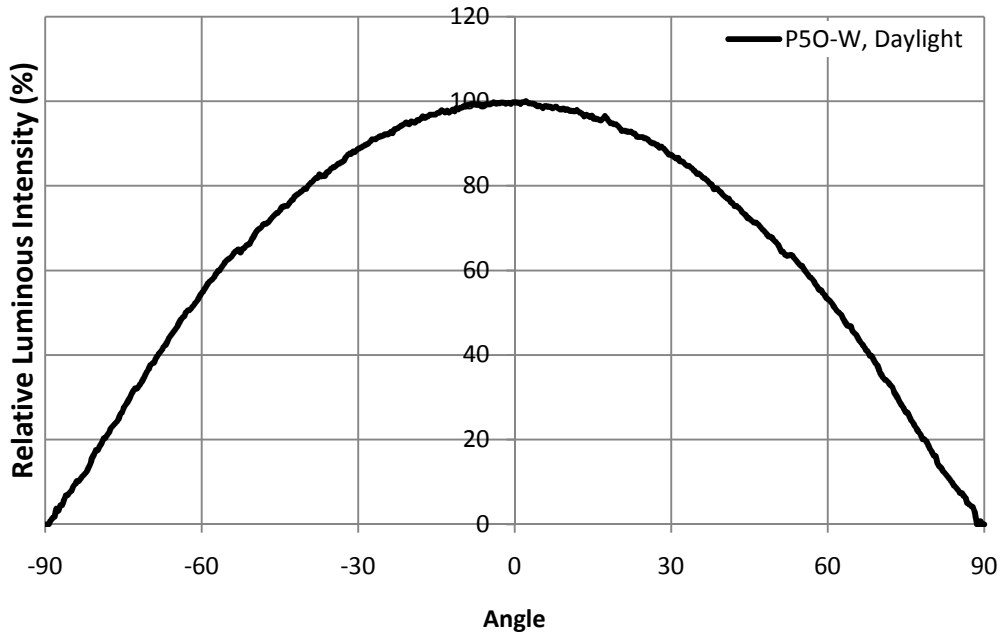
Relative Spectral Power Distribution, $T_a=25^\circ\text{C}$

White light

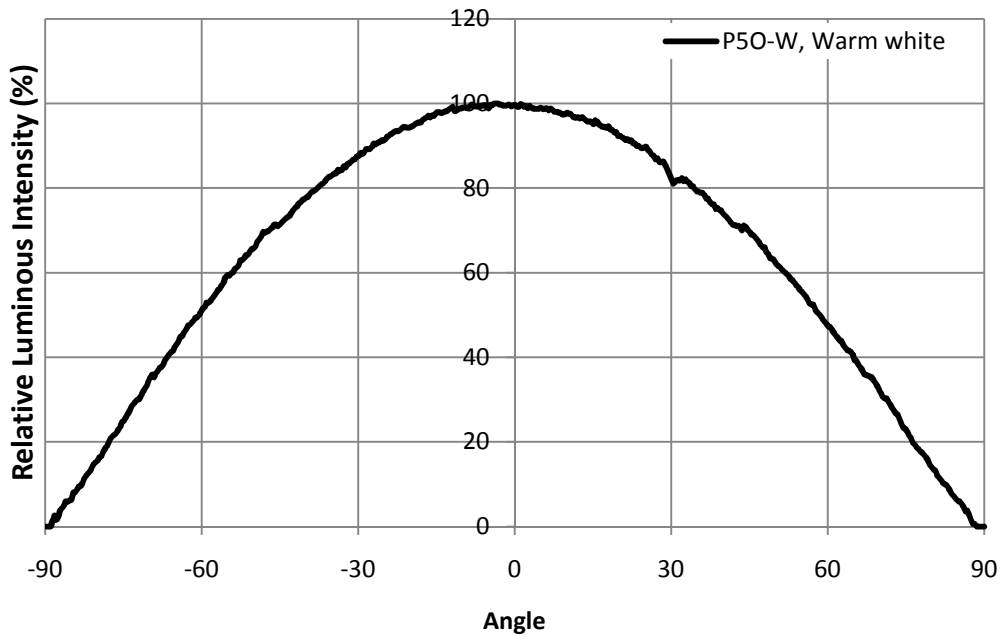


Typical Spatial Radiation Pattern

P5F-W, Daylight

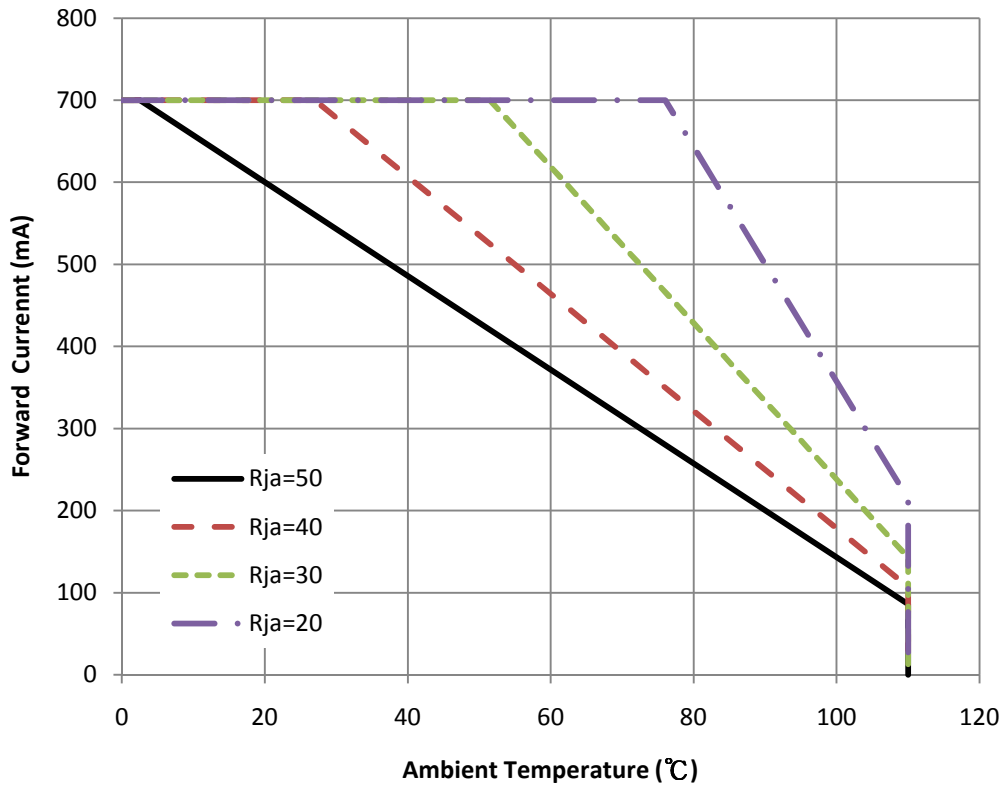


P5F-W, Warm White



Thermal Design

Thermal design of the end product is important. Considering the thermal resistance between the junction and the solder point ($R_{\theta_{J-L}}$) is $10^{\circ}\text{C}/\text{W}$, the end product should be 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 Ambient Temperature vs. Allowable Forward Current.



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

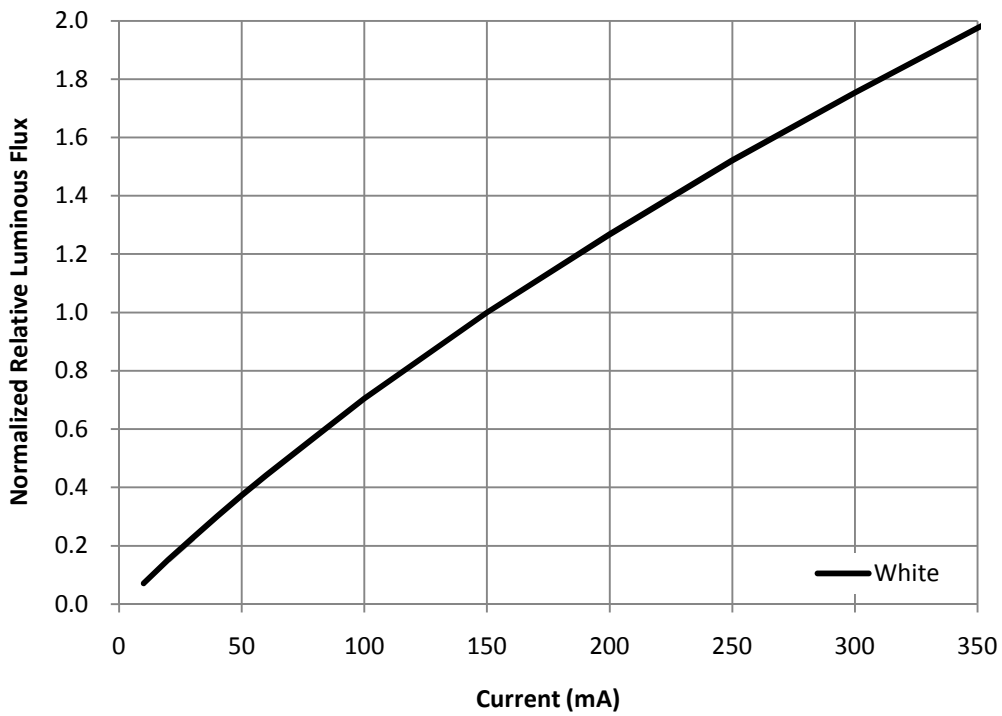
T_a : Ambient temperature

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

W : Inputting power ($I_F * V_F$)

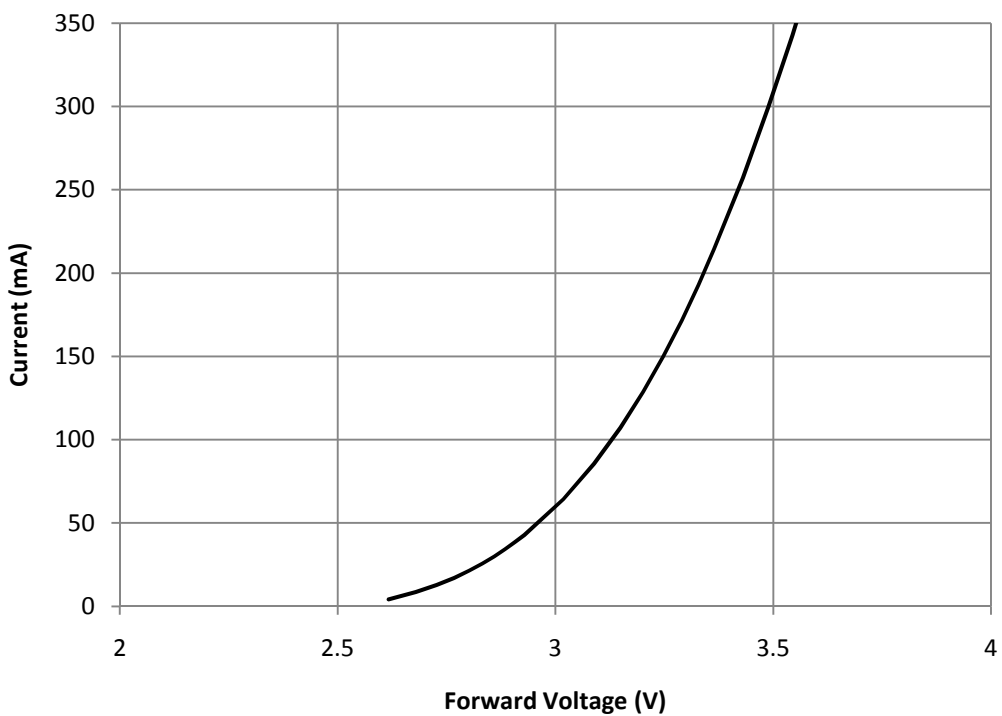
Typical Forward L-I Characteristics

White series

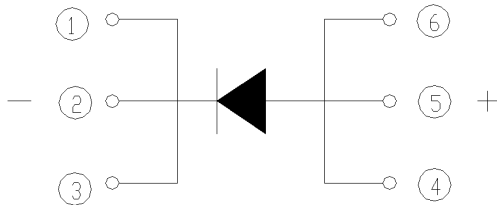
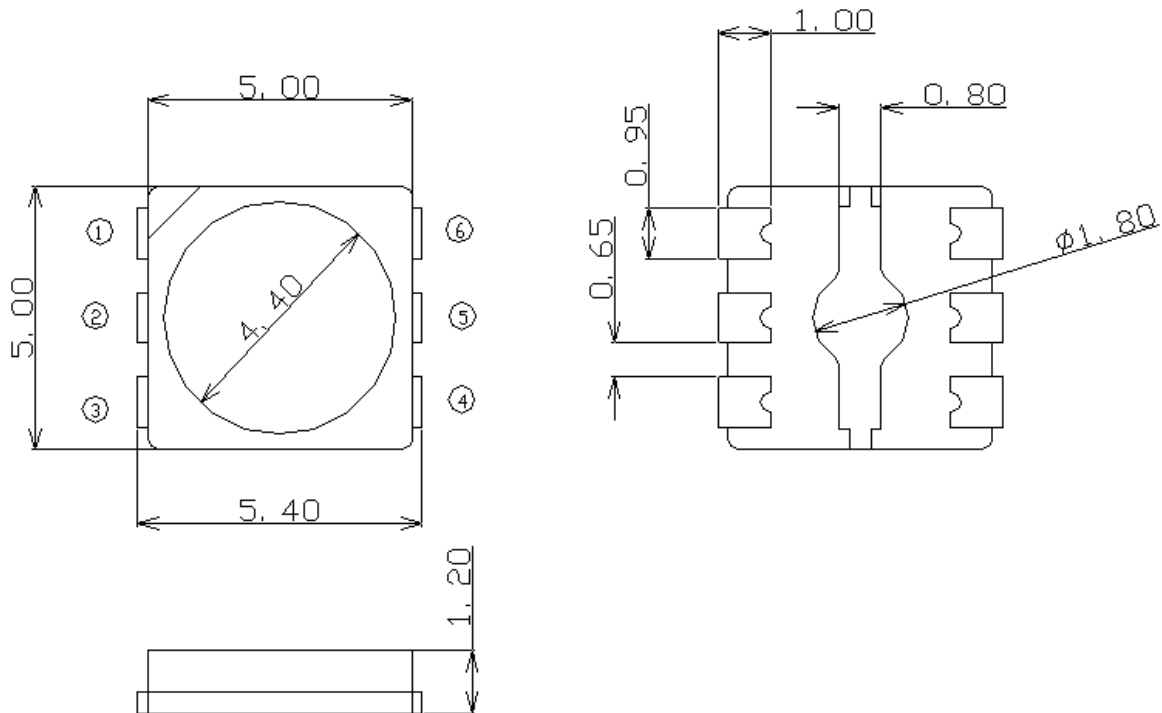


Typical Forward I-V Characteristics

White Series



Mechanical Dimensions



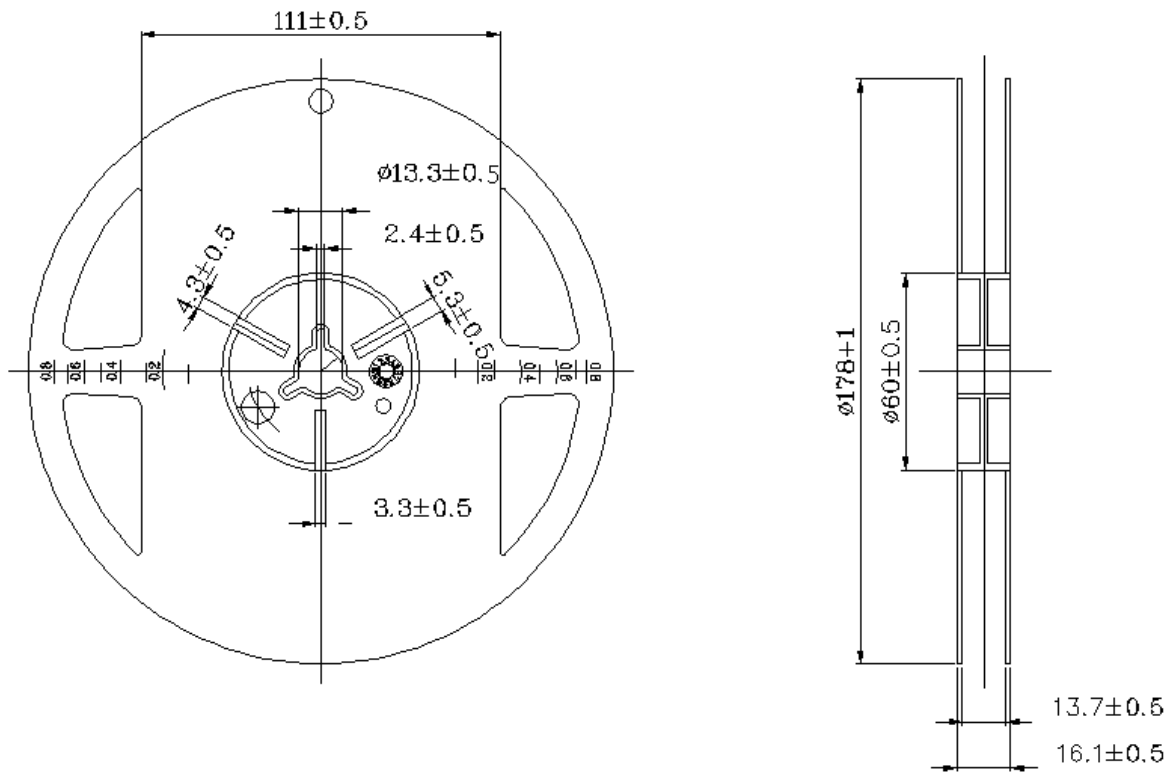
Polarity

Notes :

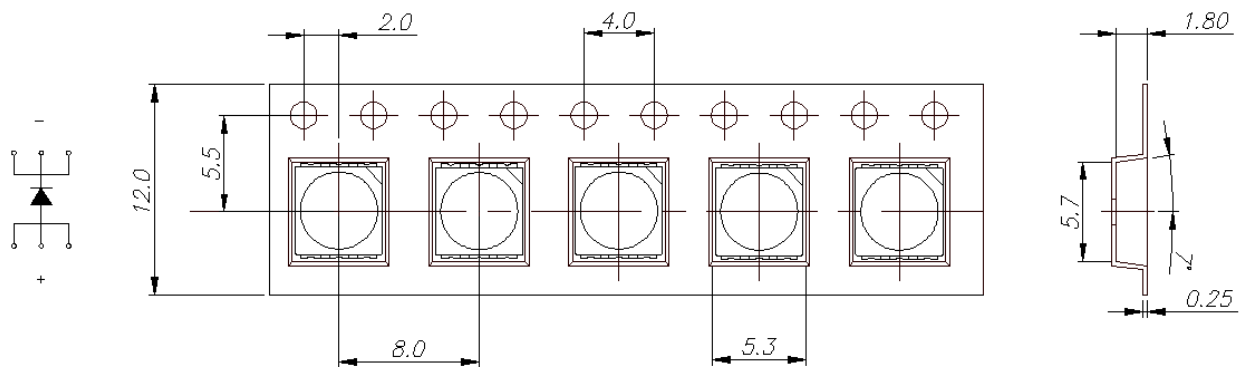
1. Drawings are not to scale.
2. All dimensions are in millimeter.
3. General tolerance is $\pm 0.2\text{mm}$.
4. **The polarity of die heat sink at bottom is Anode; please make sure polarity isolation on MCPCB is done correctly.**
5. The Cathode is denoted by the bar (minus sign) on plastic body.

Shipping Package Information

Reel Dimension



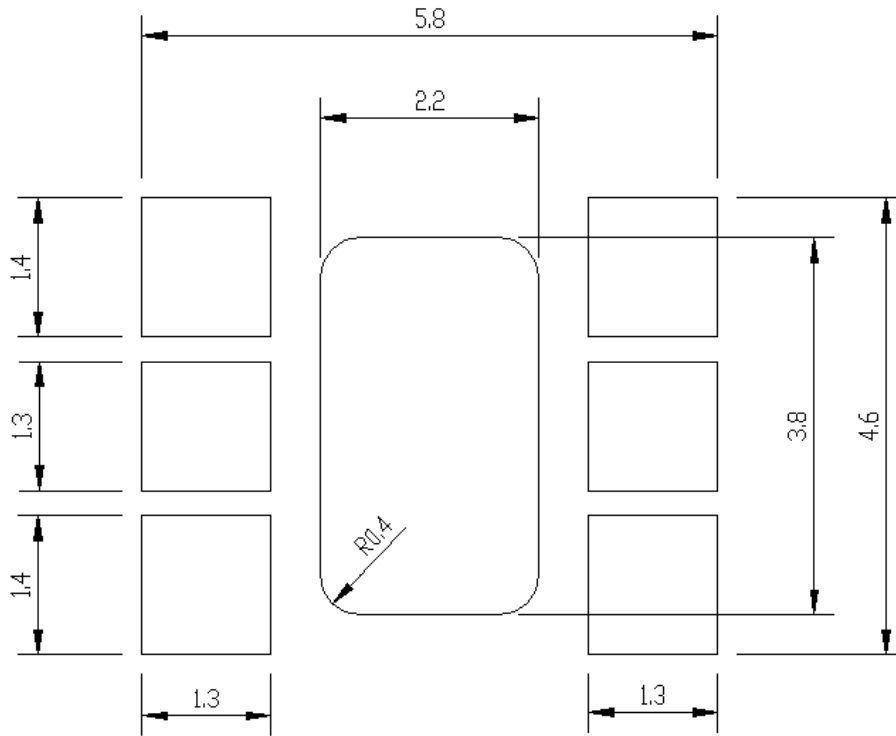
Carrier Tape



Notes :

1. All dimensions are in millimeter
2. Tolerance for fixed dimensions are 0.1mm
3. Packing unit: 1,000pcs/ reel (ϕ 178mm)

Recommended Solder Pad Design

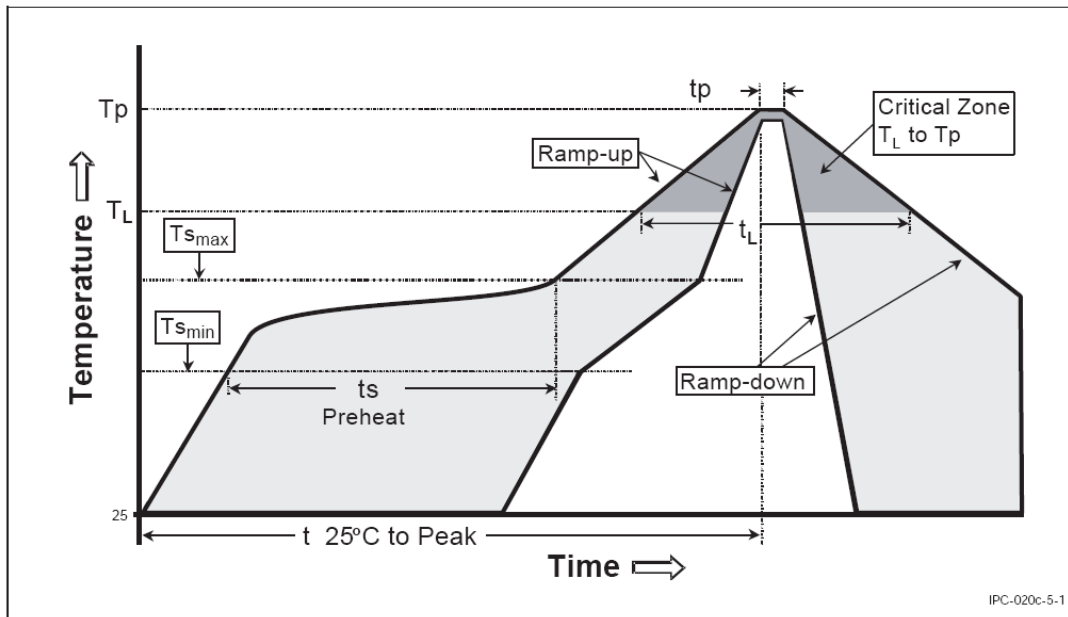


Notes :

- 4. Drawing is not to scale
- 5. All dimensions are in millimeter

Recommended Soldering Profile

The LEDs can be soldered using the parameter listed below. As a general guideline, the 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 preferred for the LEDs.



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-up Rate (T_{smax} to T_p)	3°C/second max.	3°C/second max.
Preheat		
- Temperature Min(T_{smin})	100°C	150°C
- Temperature Max(T_{smax})	150°C	200°C
- Time(t_{smin} to t_{smax})	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	260°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
Wet High Temperature Operating Life (WHTOL)	Ta=85°C, RH=85%, If=150mA	1000 hours
Temperature Cycles (TMCL)	-40°C/125, 15min dwell, 5min transfer	200 cycles
High Temperature Storage Life (HTSL)	Ta=110°C, non-operating	1000 hours
Low Temperature Storage Life (LTOL)	Ta=-40°C non-operating	1000 hours
Solder Heat Resistance (SHR)	260°C, 10 sec	

Failure Criteria:

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

Note:

1. Tb: board temperature
2. Ta: ambient temperature