

## PLCC Series

# 3528 0.5W Single Color 4P (H) Datasheet - Automotive

Automotive  
LightingSignal  
Lighting

Mood Lighting

Decorative  
Light

Warning Light

### Introduction :

Ultra high luminous efficacy, combined with the flexibility in design due to its slim and miniature size, PLCC LED Series are optimized to be used as lighting for automotive signal lighting designs or signboard.

### Description :

- Best luminous and color uniformity
- Enables halogen and CDM replacement
- The article itself presents the actual color
- Wide Viewing angle 120°
- Automotive lighting interior and exterior
- Signal and Symbol Luminaire

### Feature and Benefits :

- High luminous flux and high efficiency
- Based on Red : AlGaInP technology
- Excellent performance and visibility
- Suitable for all SMT assembly methods
- IR reflow process compatible
- Environmental friendly; RoHS compliance
- Qualification according to AEC-Q101

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## General Information

### Ordering Code Format

2      T      03      X5      xX      X      00      03      xxx  
 X1      X2      X3-X4      X5-X6      X7-X8      X9      X10-X11      X12-X13      X14-X16

X1		X2		X3-X4		X5-X6		X7-X8	
Type		Component		Series		Wattage		Color/CCT	
2	Emitter	T	PLCC	03	3528	X5	0.5W	RX	Red
								YX	Yellow

X9		X10-X11		X12-X13		X14-X16	
BIN		CRI		Voltage		Serial Number	
X	Single Color	00	-	03	3V	-	-

## Absolute Maximum Ratings

Absolute maximum ratings ( $T_J=25^{\circ}\text{C}$ )

Parameter	Symbol	Value	Units
Forward Current	$I_F$	20...200	mA
Pulse Forward Current ( $t_p \leq 100\mu\text{s}$ , Duty cycle=0.25)	$I_{\text{pulse}}$	300	mA
Reverse Current	$I_R$	10	$\mu\text{A}$
Reverse Voltage	$V_R$	-	V
LED Junction Temperature	$T_J$	125	$^{\circ}\text{C}$
Operating Temperature	-	-40 ~ +100	$^{\circ}\text{C}$
Storage Temperature	-	-40 ~ +125	$^{\circ}\text{C}$
ESD Sensitivity	$V_B$	2,000	V
Soldering Temperature	$T_s$	Reflow Soldering : 255~260 $^{\circ}\text{C}$ /10~30sec Manual Soldering : 350 $^{\circ}\text{C}$ /3sec	

Notes:

1. Proper current derating must be observed to maintain junction temperature below the maximum at all time.
2. LEDs are not designed to be driven in reverse bias.
3.  $t_p$ : Pulse width time

## Characteristics

Parameter	Symbol	Value	Units
Viewing Angle (Typ.)	$2\theta_{1/2}$	120	Degree
Thermal resistance	(Rth J-A) (Rth J-S)	90 40	$^{\circ}\text{C}/\text{W}$
Wavelength (Red) (Yellow)	-	615-630 585-595	nm
JEDEC Moisture Sensitivity	-	Level 2a <b>Floor Life</b> Conditions: $\leq 30^{\circ}\text{C}$ / 60% RH <b>Soak Requirements(Standard)</b> Time (hours): 120+1/-0 Conditions: 60 $^{\circ}\text{C}$ / 60% RH	-

Notes:

$2\theta_{1/2}$  is the off-axis angle where the luminous flux is half of the axial luminous flux.

## Luminous Flux Characteristic

Luminous flux Characteristics,  $I_f=150\text{mA}$  and  $T_j=25^\circ\text{C}$

Color	Group	Min Luminous Flux (lm)@150mA	Max Luminous Flux (lm)@150mA	Order Code
Red	20	20	22	2T03X5RXX00030A3
	22	22	24	
	24	24	26	
	26	26	28	
Yellow	20	20	22	2T03X5YXX00030A3
	22	22	24	
	24	24	26	
	26	26	28	

Note:

The luminous flux performance is guaranteed within published operating conditions. Edison maintains a tolerance of  $\pm 10\%$  on flux measurements.

## Voltage Bin Structure

Group	Min Voltage (V)	Max Voltage (V)
UA4	1.9	2.0
UB4	2.0	2.1
UC4	2.1	2.2
UA5	2.2	2.3
UB5	2.3	2.4
UC5	2.4	2.5
VA0	2.5	2.6

Note:

Forward voltage measurement allowance is  $\pm 0.06\text{V}$ .

## Wavelength Bin Structure

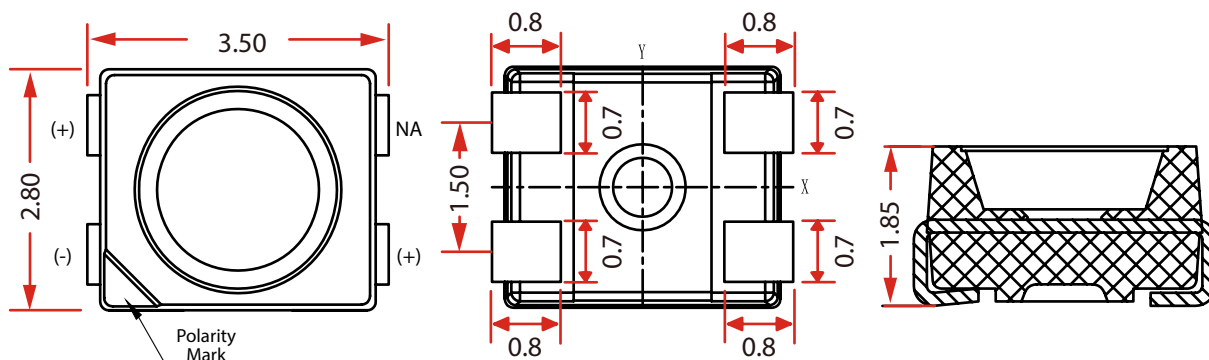
Color	Group	Min Wd (nm)	Max Wd (nm)
Red	OX2	615	620
	RX0	620	630
Yellow	YW0	585	588
	YX0	588	591
	YY0	591	595

Note:

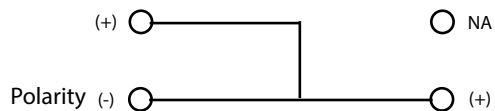
Dominant wavelength Measurement Allowance is  $\pm 1\text{nm}$

## Mechanical Dimensions

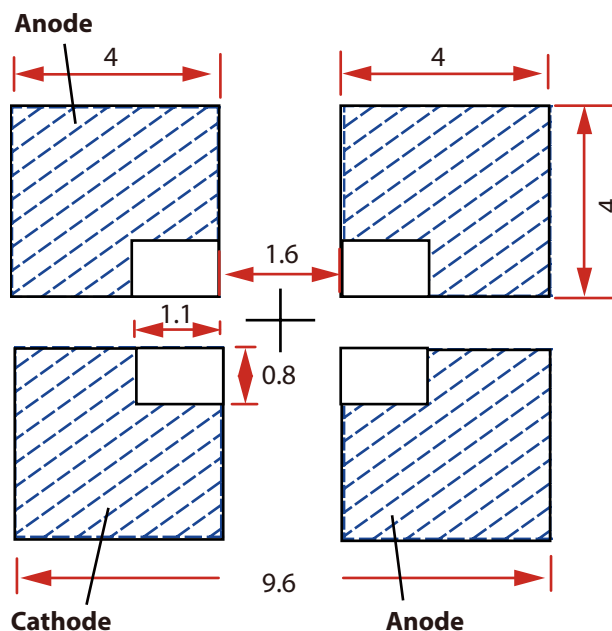
### Emitter Type Dimension



### Circuit



### Solder Pad



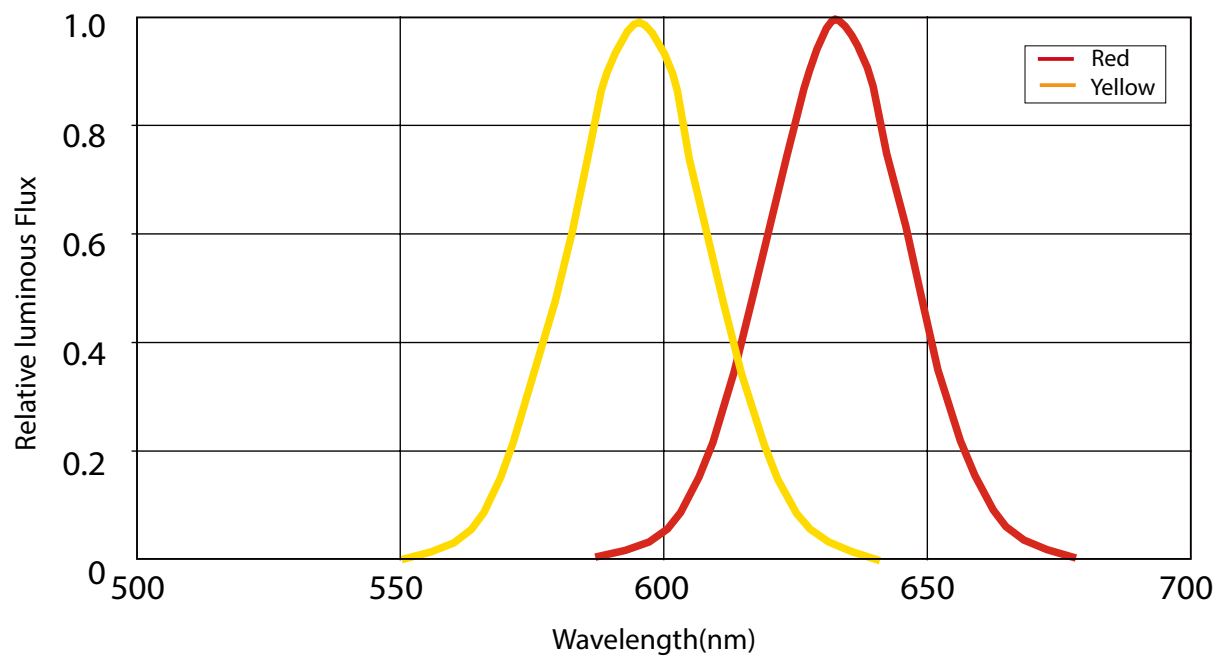
 Solder Resist

#### Notes:

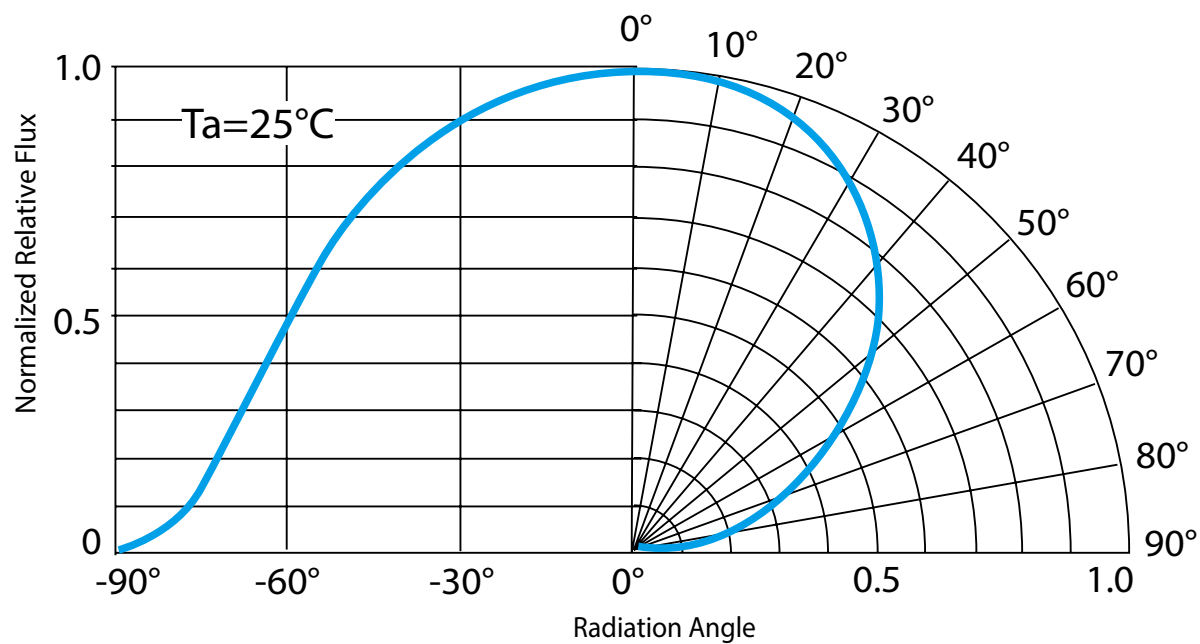
1. All dimensions are measured in mm.
2. Tolerance :  $\pm 0.2$  mm

## Characteristic curve

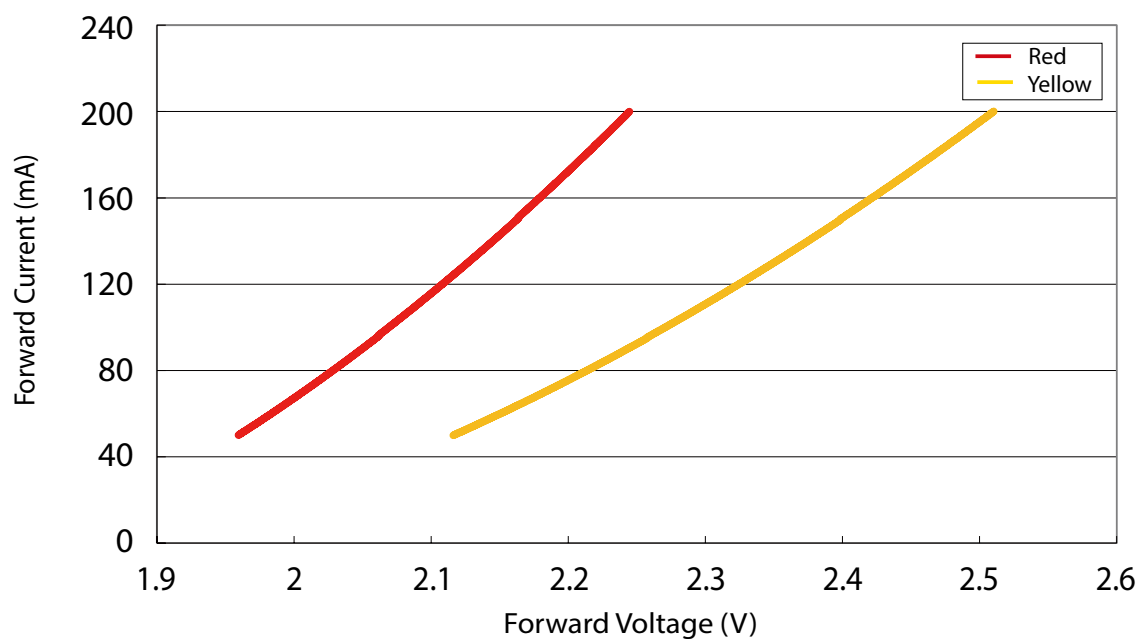
### Color Spectrum



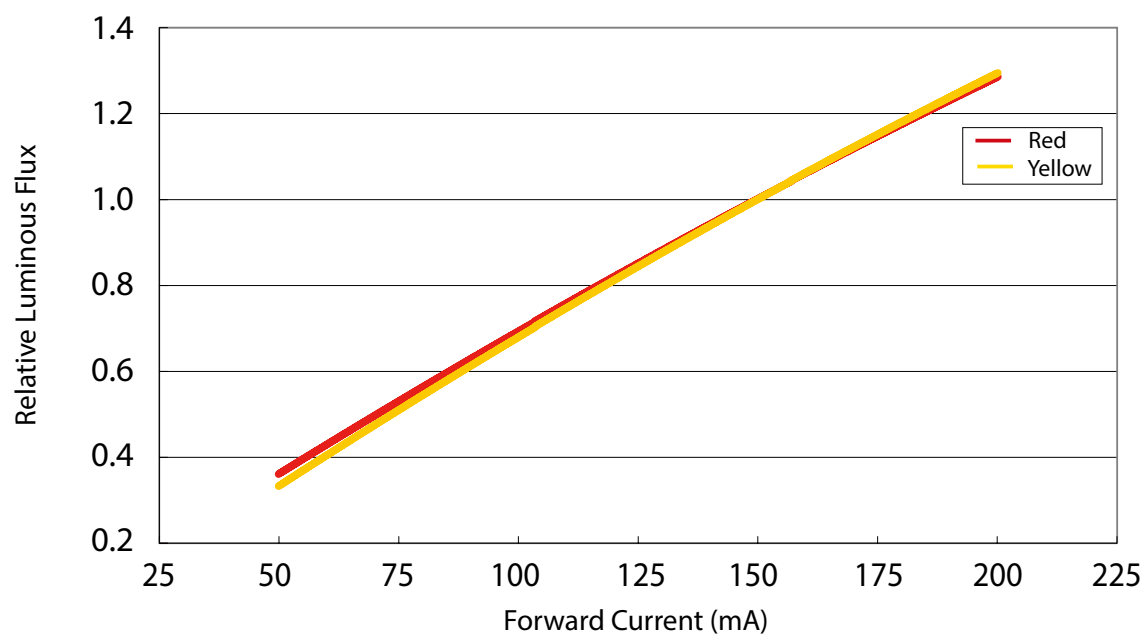
### Beam Pattern



### Forward Current vs. Forward Voltage

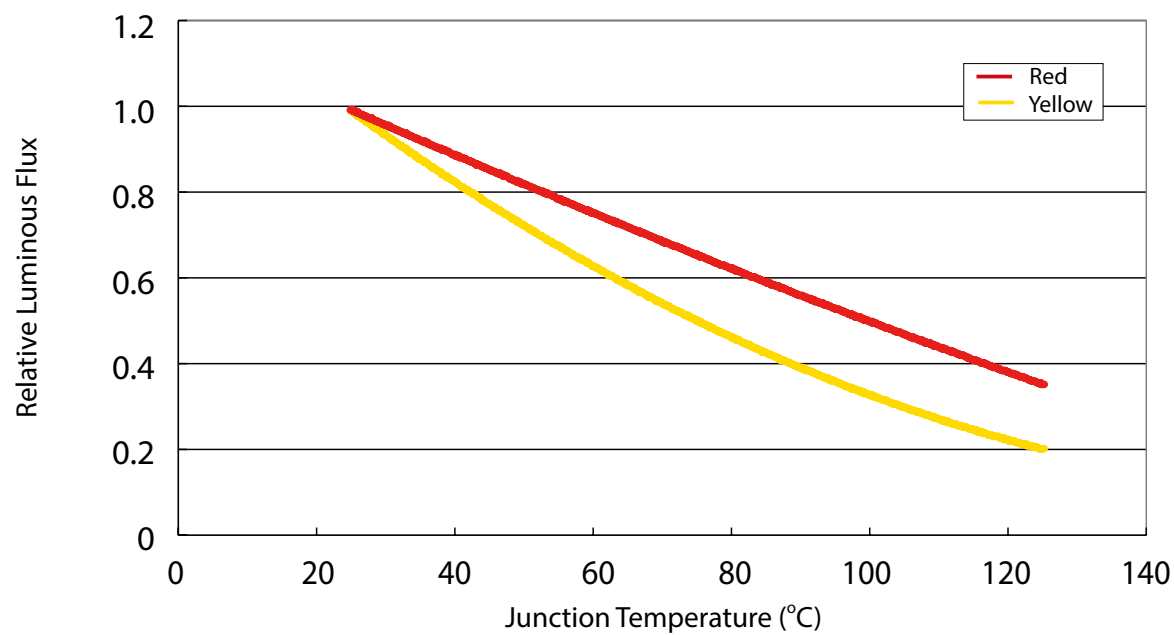


### Relative Luminous Flux vs. Forward Current

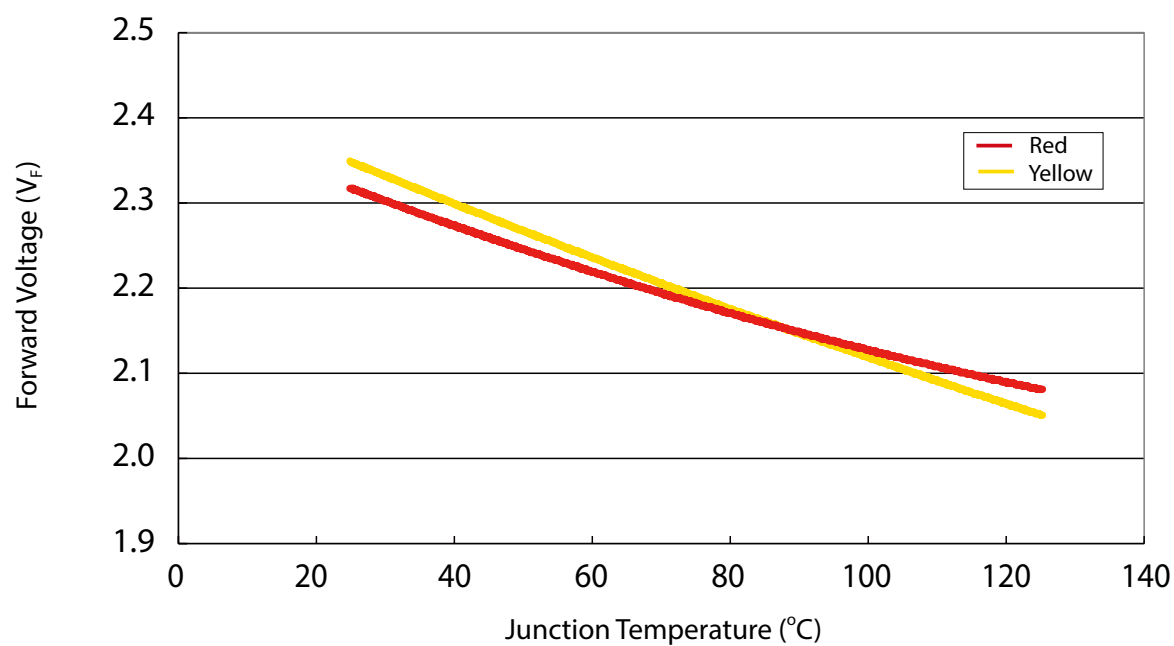




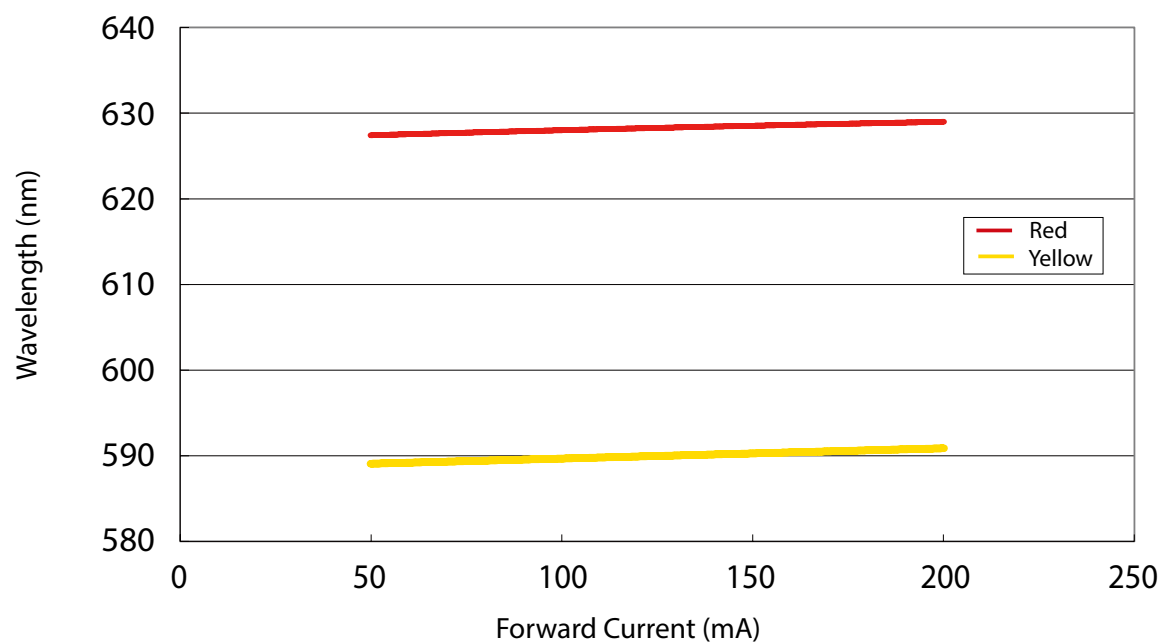
### Relative Luminous Flux vs. Junction Temperature



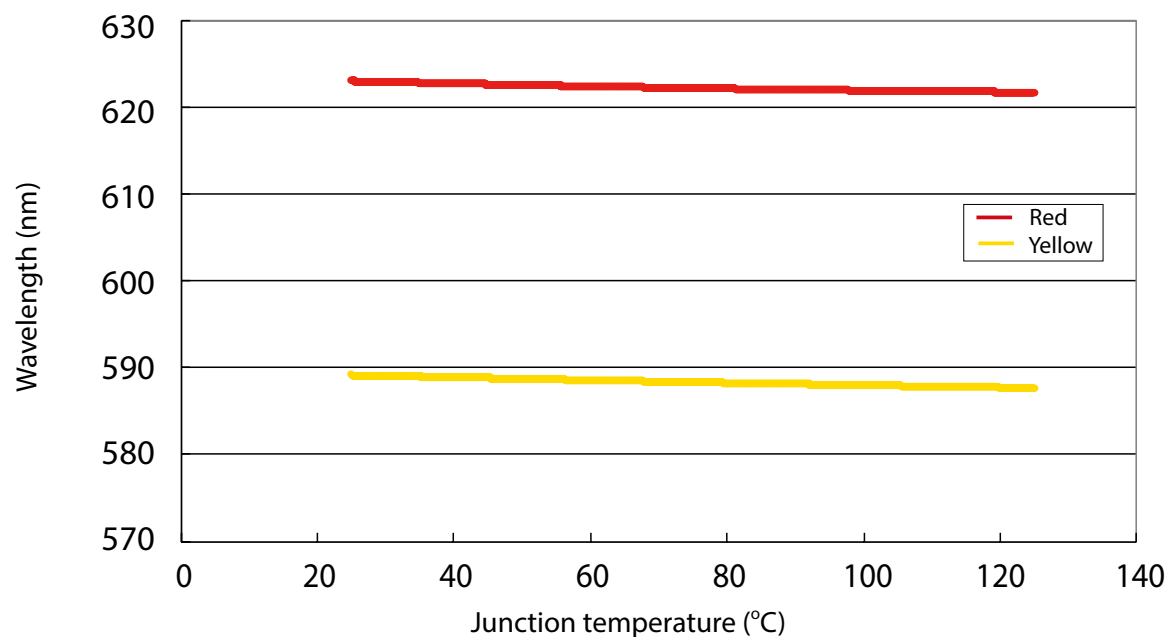
### Forward Voltage vs. Junction Temperature



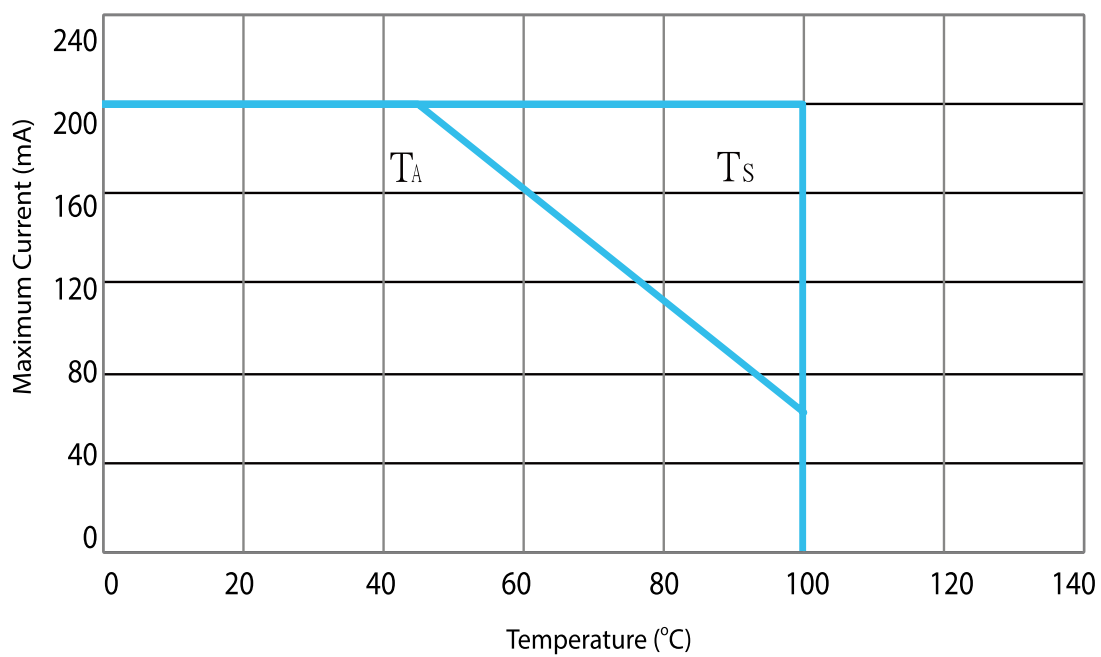
### Wavelength vs. Forward Current



### Wavelength vs. Junction temperature

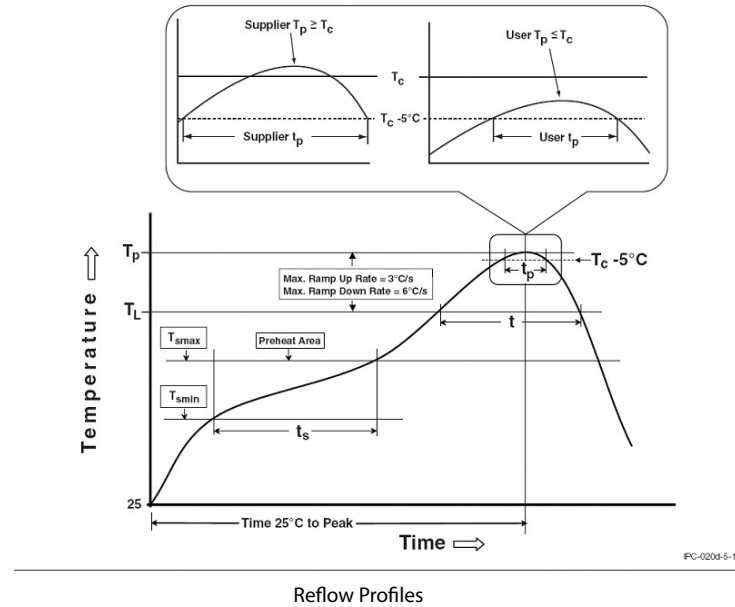


## Maximum Current vs. Temperature



## Reflow Profile

The following reflow profile is from IPC/JEDEC J-STD-020D which provided here for reference.



## Classification Reflow Profiles

Profile Feature	Pb-Free Assembly
Preheat & Soak	
Temperature min ( $T_{smin}$ )	150 °C
Temperature max ( $T_{smax}$ )	200 °C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max.
Liquidous temperature ( $T_l$ )	217 °C
Time at liquidous ( $t_l$ )	60-150 seconds
Peak package body temperature ( $T_p$ )*	255 °C ~260 °C *
Classification temperature ( $T_c$ )	260 °C
Time ( $t_p$ )** within 5 °C of the specified classification temperature ( $T_c$ )	30** seconds
Average ramp-down rate ( $T_p$ to $T_{smax}$ )	6°C/second max.
Time 25°C to peak temperature	8 minutes max.

### Notes:

- \* Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.
- \*\* Tolerance for time at peak profile temperature ( $t_p$ ) is defined as a supplier minimum and a user maximum.

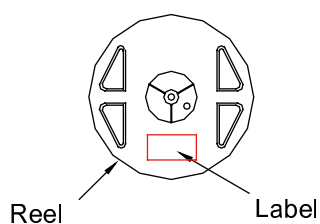
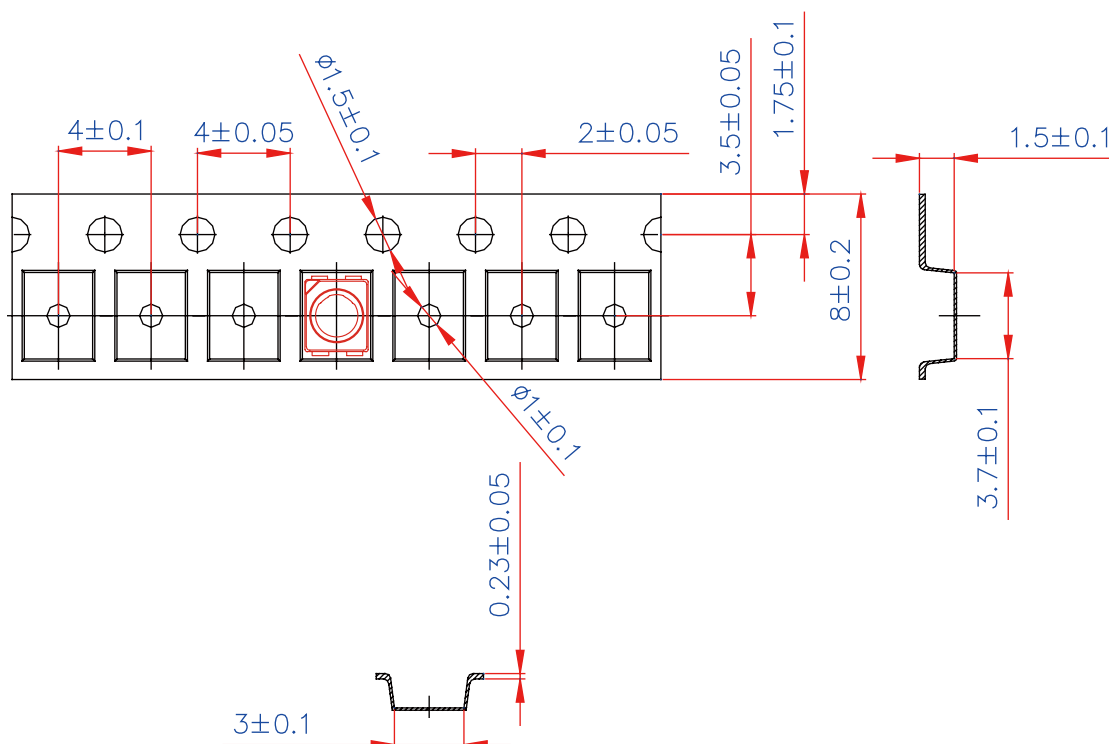
## Reliability

NO.	Test Item	Reference	Test Condition	Duration/ Cycle	Failure Criteria	Sample size
1	External Visual	JESD22 B-101	Visual Inspection	---	No visual damage	77
2	Physical Dimension	JESD22 B-100	Verify physical dimensions against device mechanical drawing	1 times	CPK>1.33	30
3	High Temperature Forward Bias	JESD22 A-108	Ta=100°C, IF=200mA	1,000 hrs	1. VF+/- 10% 2. Iv+/- 15% 3. Cx/Cy+/- 0.02	77
4	Temperature Cycle	JESD22 A-104	Ta=-40°C~100°C, 30min dwell, 5 min transfer	1000 Cycle	No dead lamps and visual damage	77
5	Thermal Shock	JESD22 A-104	-40°C/125°C, 20min dwell, <10sec transfer	1000 Cycle	No dead lamps and visual damage	77
6	High Temperature High Humidity Bias	JESD22 A-101	Ta=85°C RH=85%, IF=200mA	1,000 hrs	1. VF+/- 10% 2. Iv+/- 15% 3. Cx/Cy+/- 0.02	77
7	Intermittent Operational Life	MIL-750 1037	Ta=25°C, 3sec on, 3sec off, IF=200mA	10W times	No dead lamps and visual damage	77
8	Power and Temperature Cycle	JESD22 A-105	Ta=-40°C~100°C, 30min dwell, 5min transfer, IF=200mA	1,000 hrs	1. VF+/- 10% 2. Iv+/- 15% 3. Cx/Cy+/- 0.02	77
9	D.P.A.	AEC-Q101-004 Section 4	Random Sample TC	---	No visual damage	2
10	Resistance to Soldering Heat	MIL-202 Method 210	Solder iron temperature : 350 °C ± 10 °C. dwell time : 4~5 seconds	4~5 seconds	Desoldering performance	30
11	Solderability	J-STD-002	Ta=245°C±5°C, 3sec	5 seconds	Over 95% area	10
12	High Temperature storage	Jesd22A-103B	Ta=100°C	1,000 hrs	No dead lamps and visual damage	77
13	Low Temperature storage	Jesd22A-119	Ta=-40°C	1,000 hrs	No dead lamps and visual damage	77

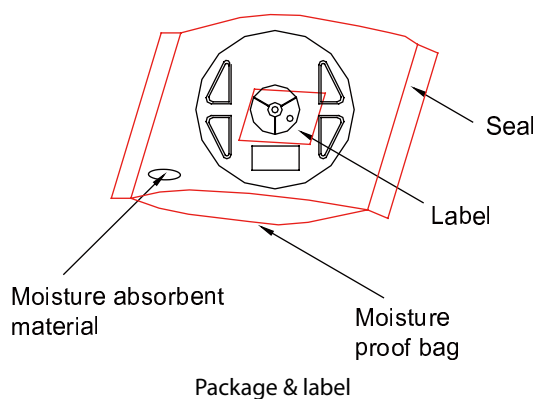
## Cautions

LED avoids being stored and lighted in the environment containing sulfur. Some materials, such as seals, printing ink, enclosure and adhesives, may contain sulfur, avoiding the exposure in acid or halogen environment.

## Product Packaging Information



Taping reel dimensions



Item	Quantity	Total	Dimensions(mm)
Reel	2,000pcs	2,000pcs	R=178
Starting with 150pcs empty, and 150pcs empty at the last			

## Revision History

Versions	Description	Release Date
1	Establish a Datasheet	2017/06/05
2	Modify the Reliability	2018/9/5
3	Increase Voltage	2018/12/20

## About Edison Opto

Edison Opto is a leading manufacturer of high power LED and a solution provider experienced in LDMS. LDMS is an integrated program derived from the four essential technologies in LED lighting applications- Thermal Management, Electrical Scheme, Mechanical Refinement, Optical Optimization, to provide customer with various LED components and modules. More Information about the company and our products can be found at [www.edison-opto.com](http://www.edison-opto.com)

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