Lighting Design Manufacturing Service

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PLCC Series

ET-5050X-3F1W Warm White Datasheet

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 building

Features :

- High luminous Intensity and high efficiency
- Based on InGaN / GaN technology
- Wide beam angle : 120°
- Excellent performance and visibility
- Suitable for all SMT assembly methods
- IR reflow process compatible
- Environmental friendly; RoHS compliance
- High color rendering index

Typical Applications

- Signal and Symbol Luminaire
- Indoor and Outdoor Displays
- Backlighting (illuminated advertising, general lighting)
- Interior Automotive Lighting

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Product Nomenclature

The following table describes the available color, power, and lens type. For more flux and forward voltage information, please consult the Bin Group document.

E	T	-	5050	X	-	3	F	1	W
X1			X2	X3		X4	X5	X6	X7

X1 LED Item		X2 Package Type		X3 Emitting Color		X4 Chip Quantity		X5~X6 Serial No.	X7 Feature	
Code	Type	Code	Type	Code	Type	Code	Type		Code	Type
ET	Edison Top LED	3528	3.5x2.8mm	W	Cool White	1	1pcs		W	White surface
		5050	5.0x5.0mm	H	Neutral White	3	3pcs		B	Black surface
				X	Warm White	A	0.5W			
				R	Red	B	1W			
				A	Amber(615nm)					
				Y	Yellow(590nm)					
				T	True Green					
				B	Blue					
				RTB	RGB 3chips					

Figure 1. PLCC 5050 series Nomenclature

Environmental Compliance

PLCC 5050 series are compliant to the Restriction of Hazardous Substances Directive or RoHS. The restricted materials including lead, mercury cadmium hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ether (PBDE) are not used in PLCC 5050 series to provide an environmentally friendly product to the customers.

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Forward Voltage Characteristic

The following table describes forward voltage of PLCC 5050 series.

Table 3 . Forward voltage characteristic at I_F=20mA/chip and Ta=25°C for PLCC 5050

Part Name	Color	V_F			Unit
		Min.	Typ.	Max.	
ET-5050X-3F1W	Warm White	2.8	--	3.8	V

Note:
Forward Voltage is measured with an accuracy of ± 0.1V

Color Temperature Characteristic

The following table describes forward voltage of PLCC 5050 series

Table 4 . Color Rendering Index Characteristics at T_j=25°C for PLCC 5050 series

Part Name	Color	CRI
		Typ.
ET-5050X-3F1W	Warm White	80

Note:
CRI is measured with an accuracy of ± 5

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JEDEC Information

JEDEC is used to determine what classification level should be used for initial reliability qualification. Once identified, the LEDs can be properly packaged, stored and handled to avoid subsequent thermal and mechanical damage during the assembly solder attachment and/or repair operation. The present moisture sensitivity standard contains six levels, the lower the level ,the longer the devices floor life. PLCC 5050 series are certified at level 2a. This means PLCC 5050 series have a floor life of 4 weeks before PLCC 5050 series need to re-baked.

Table 5. JEDEC characteristics for PLCC 5050

Level	Floor Life		Soak Requirements			
	Time	Conditions	Standard		Accelerated Environment	
			Time (hours)	Conditions	Time (hours)	Conditions
2a	4 weeks	≤30˚C / 60% RH	696 +5/-0	30˚C / 60% RH	120 +1/-0	60˚C / 60% RH

Leve	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Condition	Time (hours)	Condition	Time (hours)	Condition
1	Unlimited	≤30˚C /85% RH	168 +5/-0	85˚C/85% RH		
2	1 year	≤30˚C /60% RH	168 +5/-0	85˚C/60% RH		
2a	4 weeks	≤30˚C /60% RH	696[1] +5/-0	30˚C/60% RH	120 +1/-0	60˚C/60% RH
3	168 hours	≤30˚C /60% RH	192[1] +5/-0	30˚C/60% RH	40 +5/-0	60˚C/60% RH
4	72 hours	≤30˚C /60% RH	96[1] +5/-0	30˚C/60% RH	20 +5/-0	60˚C/60% RH
5	48 hours	≤30˚C /60% RH	72[1] +5/-0	30˚C/60% RH	15 +5/-0	60˚C/60% RH
5a	24 hours	≤30˚C /60% RH	48[1] +5/-0	30˚C/60% RH	10 +5/-0V	60˚C/60% RH
6	Time on tabel (TOL)	≤30˚C /60% RH	TOL	30˚C/60% RH		

Note:
The standard soak time includes a default value of 24 hours for semiconductor manufacturer's exposure time (MET) between bake and bag , and includes the maximumtime allowed out of the bag at the distributor's facility.

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Reliability Test Items

The following table describes operating life, mechanical, and environmental tests performed on PLCC 5050 series.

Table 6. Reliability Test 1

Stress Tes	Stress Conditions	Stress Duration	Failure Criteria
Temperature and Humidity	60°C / 60%RH	120 hours	No catastrophics
IR Reflow	Peak temp.=255~260°C*3 times	3 times	

Table 7. Reliability Test 2

Stress Tes	Stress Conditions	Stress Duration	Failure Criteria
Room Temperature Operating Life	25°C, I_F= max DC (Note 2)	1000 hours	No catastrophics
High Temperature and high Humidity Life	85°C / 85%RH, I_F= 5 mA	1000 hours	
Low Temperature Storage	-40°C	1000 hours	
High Temperature and high Humidity Storage	85°C / 85%RH	1000 hours	
Ambient Temperature Life	25°C, I_F= 20 mA	1000 hours	
Temperature Cycle	-40°C/100°C ,30 min dwell <15min transfer	200 cycles	
Thermal Shock	-40°C / 100°C, 15 min dwell <10 sec transfer	200 cycles	

Notes:
1. Reliability test 2 is performed after reliability test 1.
2. Depending on the maximum derating curve.
3. Failure Criteria:
   Electrical failures
   V_F Shift >=10%
   Luminous Intensity
   I_V Decay>= 35%

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Color Spectrum and Radiation Pattern

• Beam Angle Characteristic

Table 8. Beam angle Characteristic for PLCC 5050 series

Part Name	Color	2Θ½(Typ.) Lambertian	Unit
ET-5050X-3F1W	Warm White	120	Deg.

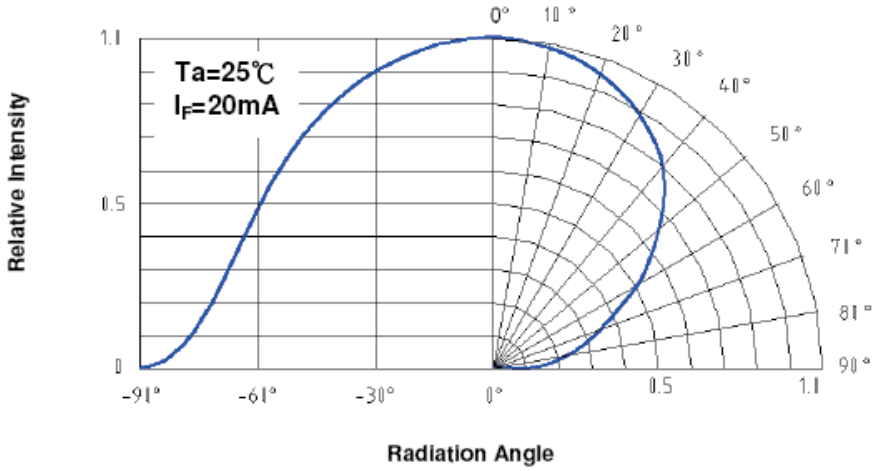

Figure 4. Beam pattern diagram for PLCC 5050 series

• Color Temperature or Dominant Wavelength Characteristics

Table 9. Dominant Wavelength or Peak wavelength or Color Temperature Characteristics at Ta=25°C for PLCC 5050 series

Part Name	Color	CCT		Unit
		Min.	Max.	
ET-5050X-3F1W	Warm White	2,670	3,800	K

Note:
Color Temperature is measured with an accuracy of ± 200K

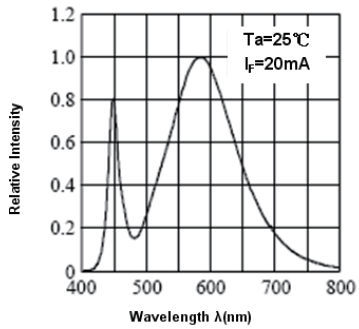

Figure 5. Wavelength & relative intensity for PLCC 5050 series

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Optical and Electric Characteristics

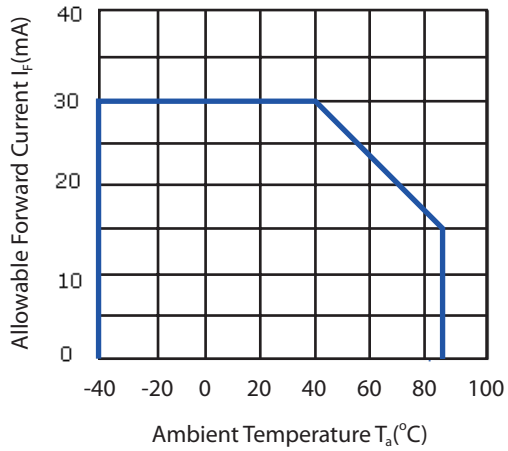

Figure 6. Ambient temperature & forward current for PLCC 5050 series

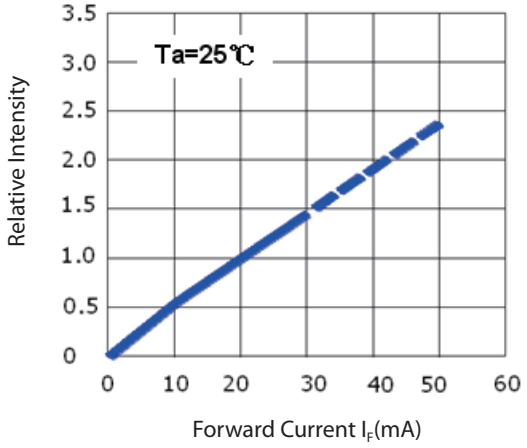

Figure 7. Forward current & relative intensity for PLCC 5050 series

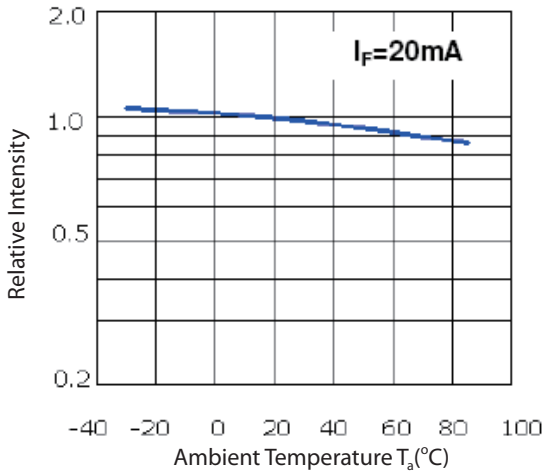

Figure 8. Ambient temperature & relative intensity for PLCC 5050 series

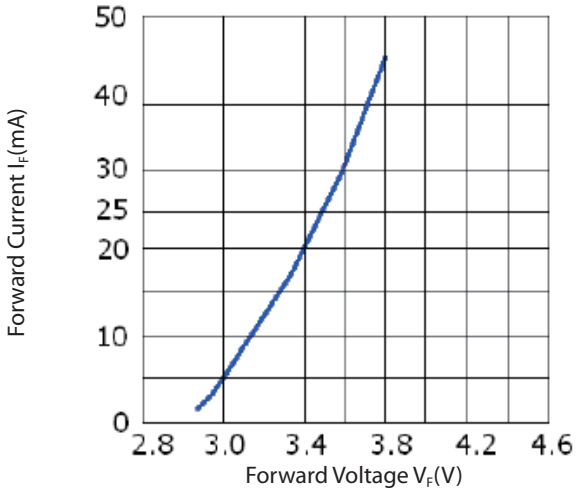

Figure 9. Forward current & forward voltage for PLCC 5050 series

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Product Soldering Instructions

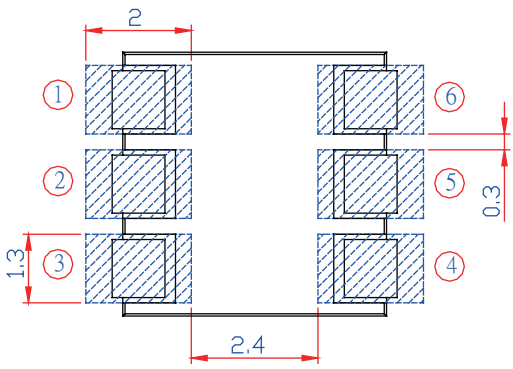

Figure 10. Pad Dimension

Note:
All dimensions are measured in mm.

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Reflow Profile

The following reflow soldering profiles are provided for reference. It is recommended that users follow the recommended soldering profile provided by the manufacturer of the solder paste used

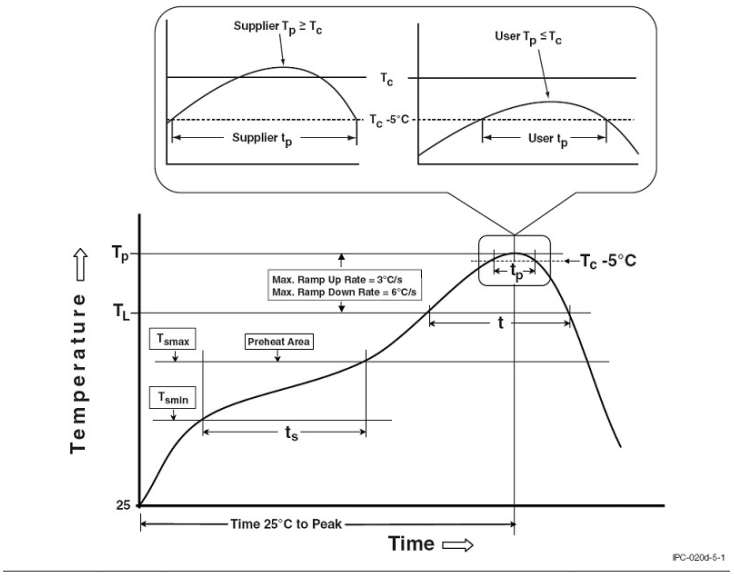

Figure 11. Reflow Profiles

Table 10. Table of Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (Tsmin) Temperature max (Tsmax) Time (Tsmin to Tsmax) (ts)	100°C 150°C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3 °C/second max.
Liquidous temperature (TL) Time at liquidous (tL)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body temperature (Tp)*	230 °C ~235°C *	255 °C ~260 °C *
Classification temperature (Tc)	235°C	260 °C
Time (tp)** within 5 °C of the specified classification temperature (Tc)	20** seconds	30** seconds
Average ramp-down rate (Tp to Tsmax)	6°C/second max.	6°C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.

Notes:
* Tolerance for peak profile temperature (Tp) is defined as a supplier minimum and a user maximum.
** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum.

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Product Packaging Information

Taping Reel

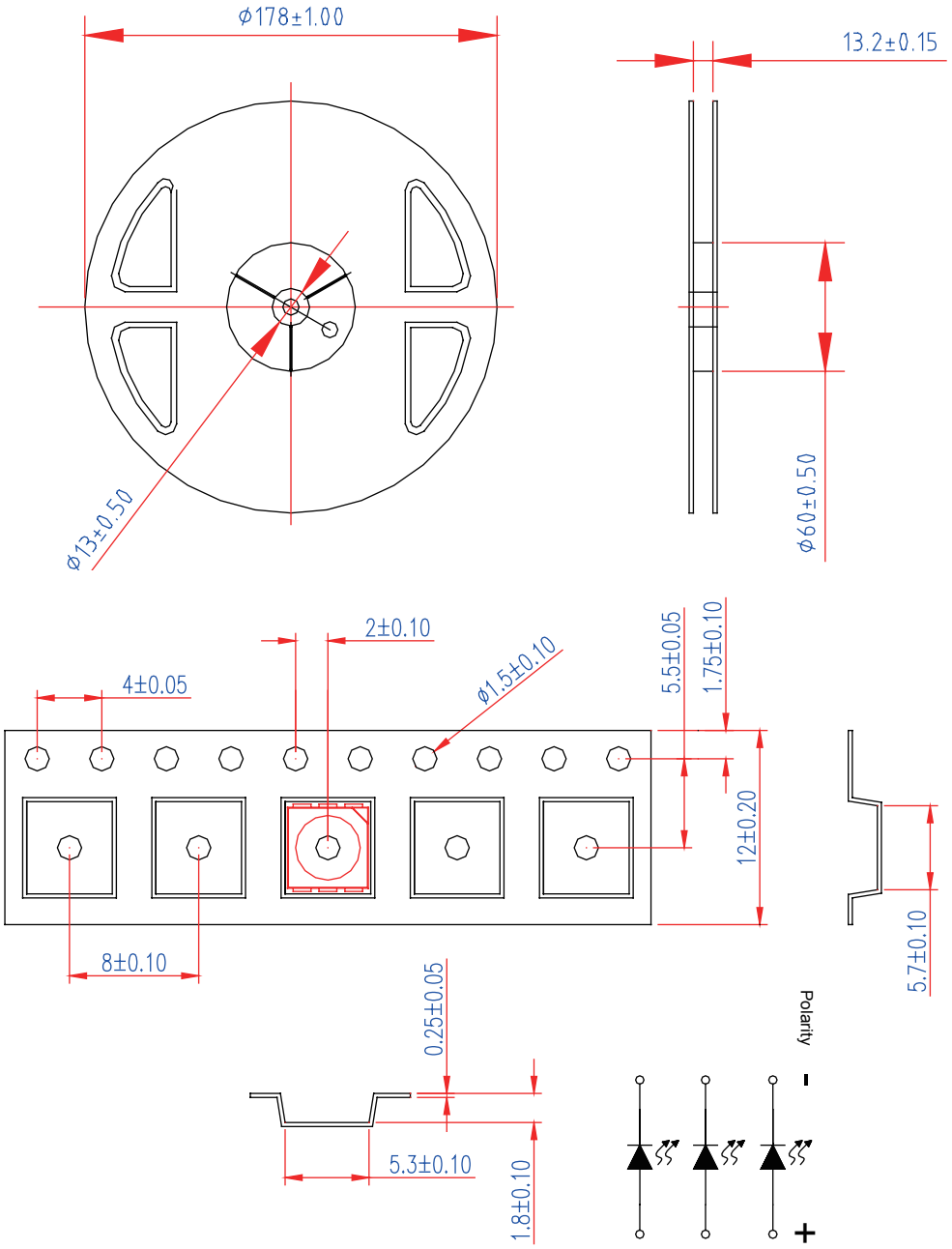

Figure 12. Taping reel dimensions

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Packaging

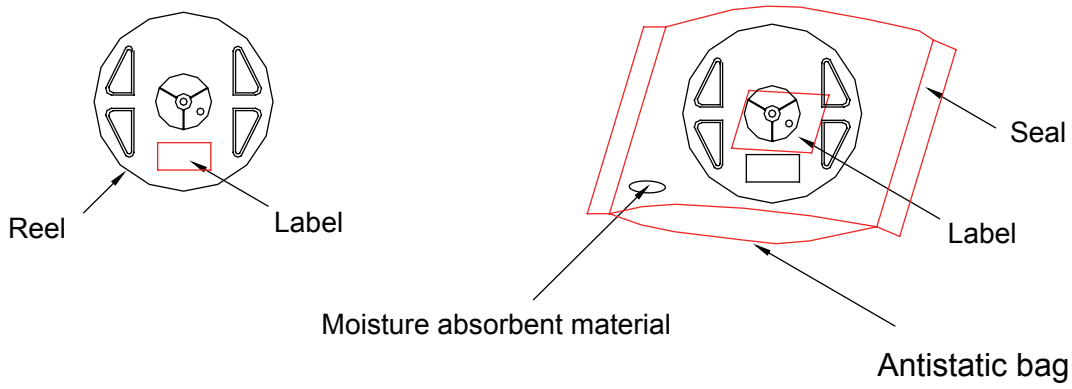

Figure 13. Packaging diagram

Package Label

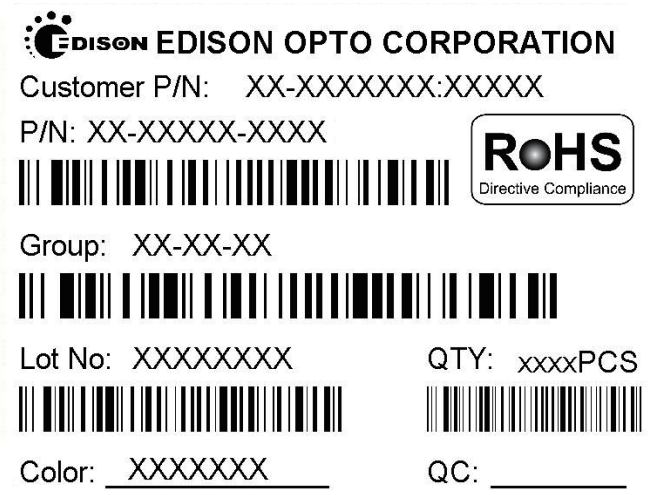

Figure 14. Package label

Table 11. Package dimensions and quantity

Item	Quantity	Total	Dimensions(mm)
Reel	1,000pcs	1,000pcs	Diameter=178
Box	5 reels	5,000pcs	240*235*67
Carton	10 boxes	50,000pcs	500*260*355

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Precaution for Use

Storage

1.1 Before opening the package

The LEDs should be kept at <40°C & <90%RH. The LEDs should be used within a year. When storing the LEDs, moisture proof package with absorbent material (silica gel) is recommended.

1.2 After opening the package

The LEDs should be kept at <=30°C & <=60%RH. The LEDs should be soldered within 4 weeks after opening the moisture proof package.

If unused LEDs remain, they should be stored in moisture proof packages, such as sealed containers with moisture proof package within absorbent material (silica gel).It is also recommended to return the unused LEDs to the original moisture proof package and to seal the moisture proof package again.

If the moisture absorbent material (silica gel) vapors or expires the expiration date, baking treatment should be performed by using the following conditions : 60°C for 20 hours.

The LEDs electrode and leadframe comprise a silver plated copper alloy. The silver surface may be affected by environments. Please avoid conditions which may cause the LEDs being corroded or discolored. The corrosion or discoloration might lower solderability or affect optical characteristics.

Please avoid rapid transition in ambient temperature, especially in high humidity environments where condensation can occur.

Static electricity

The products are sensitive to static electricity and highly taken care when handling them.

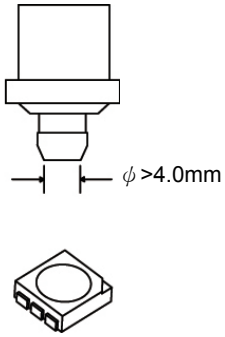
Static electricity or surge voltage will damage the LEDs. It is recommended to wear an anti-electrostatic wristband or an anti-electrostatic glove when handling the LEDs.

All devices, equipments and machinery must be properly grounded. It is recommended that measures be taken against surge voltage to the equipment that mounts the LEDs.

Pick and Place

Recommended conditions: Outer nozzle>ψ4.0 mm

*Avoid direct contact to the encapsulant with picking up nozzle. Failure to comply might result in pick and place processes or damage to encapsulant. In the worst cases, catastrophic failure of the LEDs due to wire deformation and/or breakage.



Notes:

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Forward Voltage Ranks

Table 12. Forward voltage rank at Ta=25°C

Bin	Condition	Min	Max	Unit
UJ		2.8	3.0	
UK		3.0	3.2	
UL	I_F=20mA/chip	3.2	3.4	V
UM		3.4	3.6	
UN		3.6	3.8	

Note:
Forward voltage measurement allowance is ± 0.1V.

Luminous Intensity Ranks

Table 13.Luminous intensity rank at Ta=25°C

Bin	Condition	Min	Max	Unit
ZL		2,650	3,250	
ZM		3,250	3,950	
ZN	I_F=20mA/chip	3,950	4,850	mcd
ZO		4,850	5,950	
ZP		5,950	7,250	

Note:
Luminous Intensity Measurement Allowance is ± 10%

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CIE Chromaticity Diagram

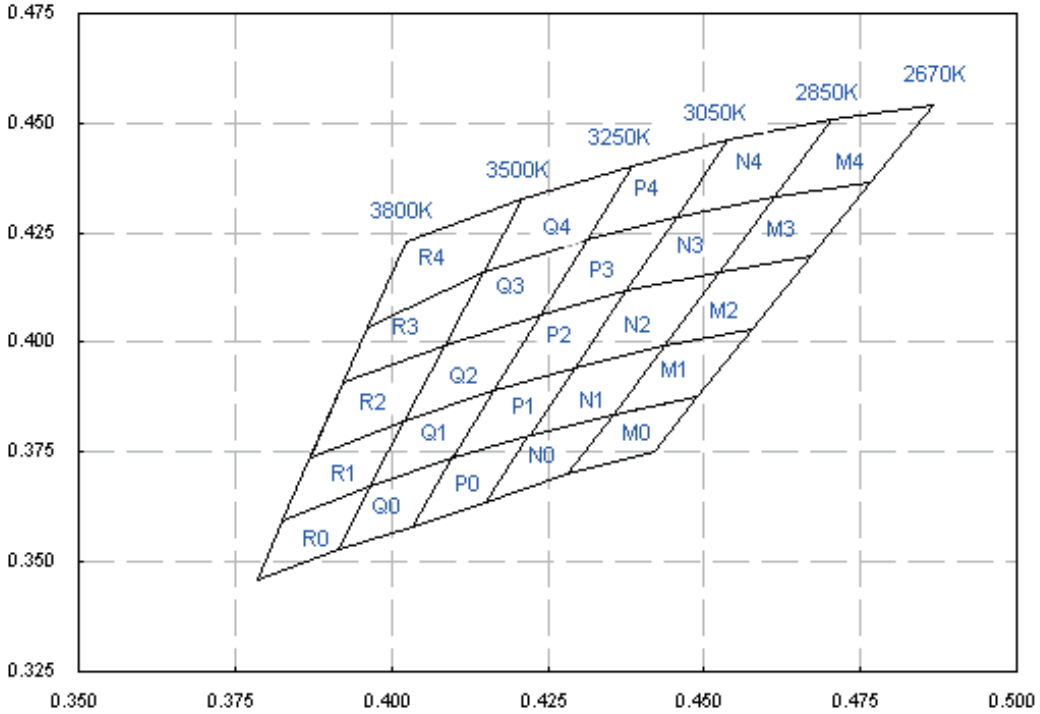

Figure 15. PLCC 5050 series chromaticity diagram

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Color Bin

Table 14. Color Bin R0-P4 at I_F=20mA ,Ta=25°C for PLCC 5050 series

Bin	Chromaticity Coordinate				
R0	X	0.3965	0.3916	0.3785	0.3826
	Y	0.3672	0.3530	0.3460	0.3595
R1	X	0.3870	0.4021	0.3965	0.3826
	Y	0.3739	0.3821	0.3672	0.3595
R2	X	0.3923	0.3870	0.4021	0.4085
	Y	0.3909	0.3739	0.3821	0.3995
R3	X	0.4085	0.3923	0.3962	0.4147
	Y	0.3995	0.3909	0.4035	0.4161
R4	X	0.4022	0.4209	0.4147	0.3962
	Y	0.4227	0.4326	0.4161	0.4035
Q0	X	0.4100	0.4035	0.3916	0.3965
	Y	0.3740	0.3580	0.3530	0.3672
Q1	X	0.4164	0.4021	0.4100	0.3965
	Y	0.3890	0.3821	0.3738	0.3672
Q2	X	0.4085	0.4239	0.4164	0.4021
	Y	0.3995	0.4064	0.3890	0.3821
Q3	X	0.4085	0.4147	0.4311	0.4239
	Y	0.3995	0.4161	0.4233	0.4064
Q4	X	0.4384	0.4311	0.4147	0.4209
	Y	0.4404	0.4233	0.4161	0.4326
P0	X	0.4220	0.4150	0.4035	0.4100
	Y	0.3790	0.3635	0.3580	0.3740
P1	X	0.4293	0.4221	0.4100	0.4164
	Y	0.3942	0.3789	0.3738	0.3890
P2	X	0.4239	0.4375	0.4293	0.4164
	Y	0.4064	0.4116	0.3942	0.3890
P3	X	0.4311	0.4456	0.4375	0.4239
	Y	0.4233	0.4286	0.4116	0.4064
P4	X	0.4384	0.4538	0.4456	0.4311
	Y	0.4404	0.4459	0.4286	0.4233

Note:
Color coordinates measurement allowance is ± 0.01

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Table 15. Color Bin N0-M4 at I_F=20mA ,Ta=25°C for PLCC 5050 series

Bin	Chromaticity Coordinate				
N0	X	0.4355	0.4280	0.4150	0.4220
	Y	0.3837	0.3700	0.3635	0.3790
N1	X	0.4293	0.4436	0.4355	0.4221
	Y	0.3942	0.3991	0.3837	0.3789
N2	X	0.4375	0.4293	0.4436	0.4525
	Y	0.4116	0.3942	0.3991	0.4162
N3	X	0.4614	0.4525	0.4375	0.4456
	Y	0.4333	0.4162	0.4116	0.4286
N4	X	0.4538	0.4705	0.4614	0.4456
	Y	0.4459	0.4508	0.4333	0.4286
M0	X	0.4370	0.4489	0.4420	0.4280
	Y	0.3840	0.3875	0.3750	0.3700
M1	X	0.4436	0.4576	0.4489	0.4355
	Y	0.3991	0.4028	0.3875	0.3837
M2	X	0.4525	0.4671	0.4576	0.4436
	Y	0.4162	0.4196	0.4028	0.3991
M3	X	0.4614	0.4767	0.4671	0.4525
	Y	0.4333	0.4366	0.4196	0.4162
M4	X	0.4705	0.4866	0.4767	0.4614
	Y	0.4508	0.4541	0.4366	0.4333

Note:
Color coordinates measurement allowance is ± 0.01

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