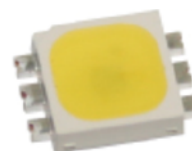


PLCC Series

0.5W PLCC White Light Datasheet

High power PLCC is a surface mount, compact, high brightness LED that is built for various illumination needs. A single Cool White high power PLCC can deliver typical luminous flux of 35 lm while driving at 150mA suitable for any kind of lighting sources, including general illumination, flashlights, streetlights, spotlights, residential lighting, tube light source, freezer lighting, industrial and commercial lightings. The small physical dimension can free customers from any constraints or limitations in these fields of applications. Furthermore, the reflow-solderable nature of high power PLCC provides an easy path towards the optimum thermal management to achieve a promising reliability.

**Features :**

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

Typical Applications

- Signal and symbol luminaire
- Indoor and outdoor displays
- Backlighting (illuminated advertising, general lighting)
- Interior automotive lighting
- Emergency lighting



Lighting Design Manufacturing Service

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Lighting Design Manufacturing Service

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 W - A B 1 W

X1		X2		X3	X4	X5	X6	X7		
X1 LED Item		X2 Package		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	5050	5.0x5.0mm	W	Cool White	A	0.5W		W	White surface
				H	Neutral White	B	1W			
				X	Warm White					
				R	Red					
				A	Amber(590nm)					
				T	True Green					
				B	Blue					
				RTB	RGB 3chips					

Figure 1. PLCC Nomenclature

LED Package Dimension and Polarity

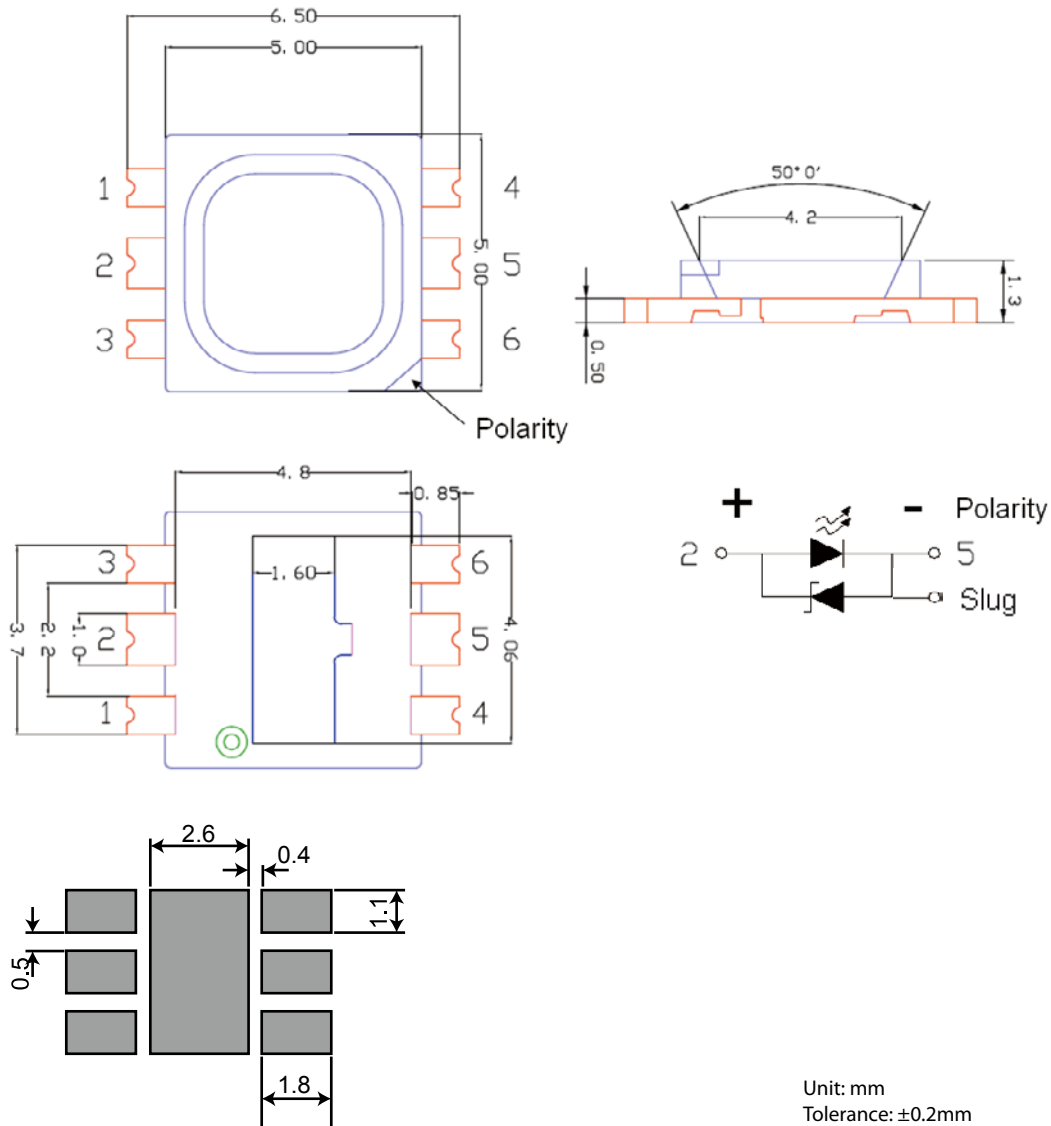


Figure 2. PLCC Dimension, circuit diagram and recommended soldering pad

Notes:

1. 1W PLCC slug has polarity as cathode.
2. It is important that the slug can not contact aluminum surface, it is strongly recommended that there should coat a uniform electrically isolated heat dissipation film on the aluminum surface.

Absolute Maximum Ratings

The following table describe absolute maximum ratings of PLCC 5050 series.

Table 1. PLCC Absolute maximum ratings ($T_a=25^{\circ}\text{C}$)

Parameter	Symbol	Value	Unit
Forward Current	I_F	150	mA
Pulse Forward Current	I_{FP}	250	mA
Reverse Voltage	V_R	5	V
LED Junction Temperature	T_J	125	$^{\circ}\text{C}$
Operating Temperature		-30 ~ +85	$^{\circ}\text{C}$
Storage Temperature		-40 ~ +120	$^{\circ}\text{C}$
ESD Sensitivity		2,000	V
Soldering Temperature		Reflow Soldering : 255~260 $^{\circ}\text{C}$ /10~30sec Manual Soldering : 350 $^{\circ}\text{C}$ /3sec	

Notes:

1. The values are based on 1-die performance.
2. * I_{FP} condition: pulse width $\leq 0.1\text{msec}$ and duty $\leq 1/10$.

Electro-Optical Characteristic

The following table describes luminous intensity of PLCC 5050 series.

Table 2 . PLCC Electro-optical characteristics ($T_a=25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	$I_F=150\text{mA/die}$	2.8	-	3.8	V
Reverse Current	I_R	$V_R=5\text{V}$	-	-	10	μA
Viewing Angle	$2\theta_{1/2}^*$	$I_F=150\text{mA}$	-	120	-	deg.

Note:

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

Luminous Flux Characteristic

The following table describes luminous intensity of PLCC 5050 series, $I_F=150\text{mA}$.

Table 3 . PLCC Luminous Flux characteristic

Power Consumption	Part Name	Color	Flux			Unit
			Min.	Typ.	Max.	
0.5W	ET-5050W-AB1W	Cool White	--	35	--	lm
	ET-5050H-AE1W	Neutral White	--	30	--	lm
	ET-5050X-AE1W	Warm White	--	25	--	lm

Color Temperature or Dominant/Peak Wavelength Characteristic

The following table describes forward voltage of PLCC 5050 series

Table 4. PLCC color temperature or dominant/peak wavelength characteristic, $T_a=25^\circ\text{C}$ at 150mA

Power Consumption	Part Name	Color	CCT/Wavelength			Unit
			Min.	Typ.	Max.	
0.5W	ET-5050W-AB1W	Cool White	5,000	--	10,000	K
	ET-5050H-AE1W	Neutral White	3,800	--	5,000	K
	ET-5050X-AE1W	Warm White	2,670	--	3,800	K

Color Rendering Index Characteristic

Table 5. Color Rendering Index Characteristic at $T_J=25^\circ\text{C}$ for High Power PLCC series, $T_a=25^\circ\text{C}$ at 150mA

Part Name	Color	CRI
		Min.
ET-5050W-AB1W	Cool White	70
ET-5050H-AE1W	Neutral White	75
ET-5050X-AE1W	Warm White	77

Note:

CRI is measured with an accuracy of ± 5

V_F Rank

Table 6. PLCC forward voltage rank

V _F (V)			
V01	2.8-3.1	V04	3.7-4.0
V02	3.1-3.4	V05	4.0-4.3
V03	3.4-3.7	V06	4.3-4.6

Note:

* Forward voltage measurement allowance is $\pm 0.1V$.

Luminous Intensity Rank

Table 7. Luminous intensity rank $T_a=25^{\circ}\text{C}$

Group	Min.	Max.
G	3.7	4.8
H	4.8	6.3
J	6.3	8.2
K	8.2	10.6
L	10.6	13.8
M	13.8	17.9
N	17.9	23.3
P	23.3	30.3
Q	30.3	39.4
R	39.4	51.2
S1	51.2	58.8
S2	58.8	66.5
T1	66.5	70
T2	70	80
T3	80	86.5
U1	86.5	90
U2	90	100
U3	100	112.5
V	112.5	146.2
W	146.2	190
X	190	247.1
Y	247.1	321.2
Z	321.2	417.5

Note:
Luminous Intensity Measurement Allowance is $\pm 10\%$.

Color Bin

Table 8. Color Bin V0-Y4, $I_f=150\text{mA/die}$, $T_a=25^\circ\text{C}$

V0	0.3434	0.3320	W1	0.3294	0.3202	X1	0.3076	0.3108	Y1	0.3040	0.2850
	0.3425	0.3208		0.3295	0.3105		0.3174	0.3204		0.2990	0.3010
	0.3295	0.3105		0.3196	0.3013		0.3196	0.3013		0.3076	0.3108
	0.3294	0.3200		0.3186	0.3102		0.3112	0.2932		0.3112	0.2932
V1	0.3292	0.3313	W2	0.3292	0.3313	X2	0.3076	0.3108	Y2	0.2990	0.3010
	0.3444	0.3442		0.3294	0.3202		0.3052	0.3224		0.2920	0.3210
	0.3434	0.3320		0.3186	0.3102		0.3160	0.3332		0.3031	0.3327
	0.3294	0.3200		0.3175	0.3204		0.3175	0.3204		0.3076	0.3108
V2	0.3292	0.3313	W3	0.3290	0.3451	X3	0.3052	0.3224	Y3	0.3040	0.2850
	0.3290	0.3451		0.3292	0.3313		0.3031	0.3327		0.2899	0.2703
	0.3458	0.3592		0.3175	0.3204		0.3148	0.3444		0.2830	0.2838
	0.3444	0.3442		0.3160	0.3332		0.3160	0.3332		0.2990	0.3010
V3	0.3290	0.3451	W4	0.3290	0.3451	X4	0.3031	0.3327	Y4	0.2990	0.3010
	0.3288	0.3569		0.3160	0.3332		0.3011	0.3422		0.2830	0.2838
	0.3469	0.3717		0.3148	0.3444		0.3136	0.3550		0.2742	0.3007
	0.3458	0.3592		0.3288	0.3569		0.3148	0.3444		0.2920	0.3210
V4	0.3288	0.3569	W5	0.3148	0.3444						
	0.3286	0.3690		0.3136	0.3550						
	0.3481	0.3856		0.3286	0.3690						
	0.3469	0.3717		0.3288	0.3569						

Note:

Color coordinates measurement allowance is ± 0.01

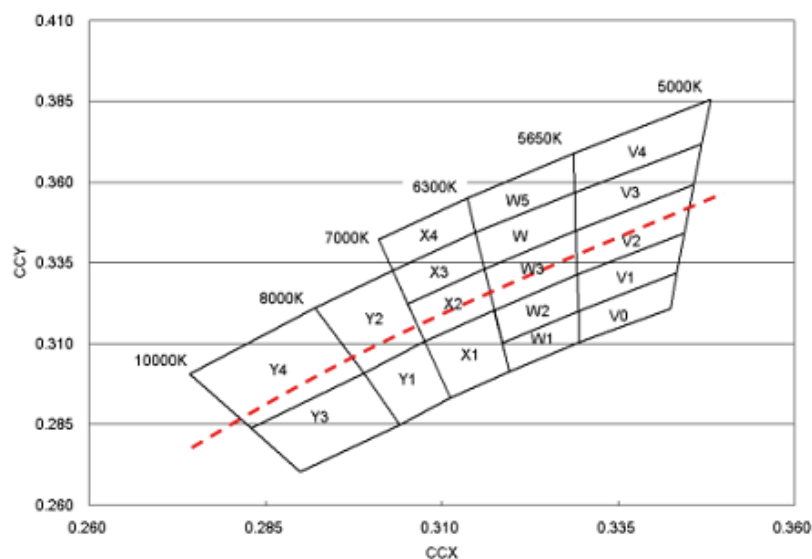


Figure 3. PLCC Chromaticity diagram

Table 9. Color Bin M0-R4, $I_f=150\text{mA/die}$, $T_j=25^\circ\text{C}$

M0	0.4370	0.3840	N0	0.4356	0.3837	P0	0.4220	0.3790	Q0	0.4100	0.3740	R0	0.3966	0.3673
	0.4490	0.3875		0.4280	0.3700		0.4150	0.3635		0.4035	0.3580		0.3917	0.3530
	0.4420	0.3750		0.4150	0.3635		0.4035	0.3580		0.3917	0.3530		0.3785	0.3460
	0.4280	0.3700		0.4220	0.3790		0.4100	0.3740		0.3966	0.3673		0.3826	0.3595
M1	0.4436	0.3991	N1	0.4294	0.3943	P1	0.4294	0.3943	Q1	0.4165	0.3890	R1	0.3871	0.3739
	0.4577	0.4029		0.4436	0.3991		0.4221	0.3790		0.4100	0.3738		0.4021	0.3822
	0.4490	0.3875		0.4356	0.3837		0.4100	0.3738		0.4100	0.3738		0.3966	0.3673
	0.4356	0.3837		0.4221	0.3790		0.4165	0.3890		0.3966	0.3673		0.3826	0.3595
M2	0.4525	0.4162	N2	0.4525	0.4162	P2	0.4240	0.4065	Q2	0.4086	0.3995	R2	0.4086	0.3995
	0.4671	0.4196		0.4436	0.3991		0.4376	0.4116		0.4240	0.4065		0.4021	0.3822
	0.4577	0.4029		0.4294	0.3943		0.4294	0.3943		0.4165	0.3890		0.3871	0.3739
	0.4436	0.3991		0.4376	0.4116		0.4165	0.3890		0.4021	0.3822		0.3924	0.3909
M3	0.4614	0.4333	N3	0.4614	0.4333	P3	0.4312	0.4234	Q3	0.4086	0.3995	R3	0.4086	0.3995
	0.4767	0.4366		0.4525	0.4162		0.4456	0.4287		0.4148	0.4161		0.3924	0.3909
	0.4671	0.4196		0.4376	0.4116		0.4376	0.4116		0.4312	0.4234		0.3963	0.4035
	0.4525	0.4162		0.4456	0.4287		0.4240	0.4065		0.4240	0.4065		0.4148	0.4161
M4	0.4705	0.4508	N4	0.4538	0.4460	P4	0.4385	0.4404	Q4	0.4385	0.4404	R4	0.4023	0.4228
	0.4866	0.4542		0.4705	0.4508		0.4538	0.4460		0.4312	0.4234		0.4209	0.4326
	0.4767	0.4366		0.4614	0.4333		0.4456	0.4287		0.4148	0.4161		0.4148	0.4161
	0.4614	0.4333		0.4456	0.4287		0.4312	0.4234		0.4209	0.4326		0.3963	0.4035

Note:

Color coordinates measurement allowance is ± 0.01

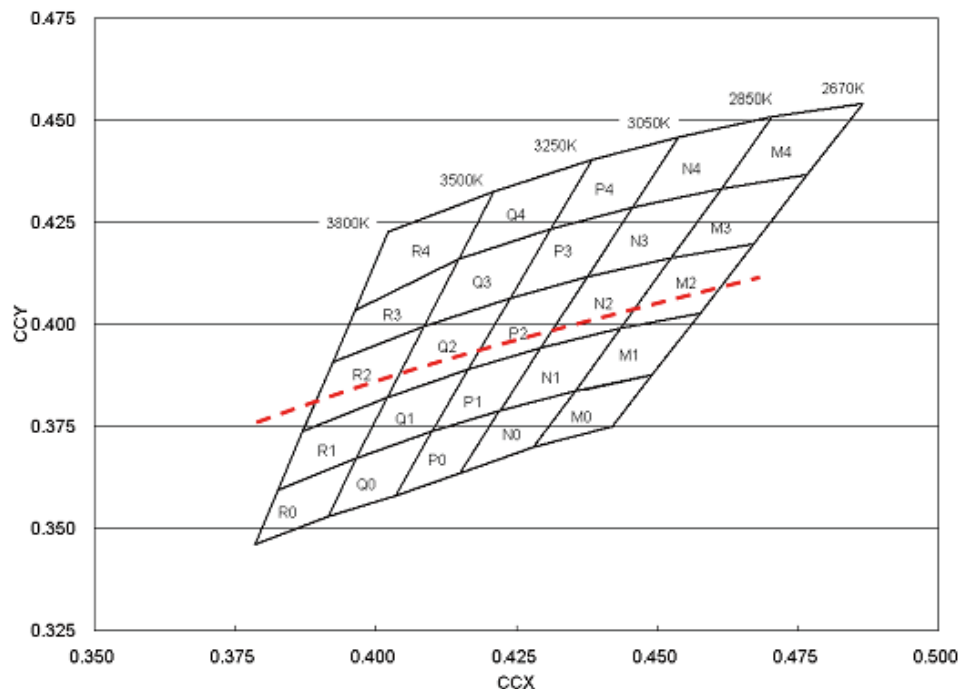


Figure 4. PLCC Chromaticity diagram

Table 10. Color Bin S0-U4, $I_f=150\text{mA/die}$, $T_a=25^\circ\text{C}$

S0	0.3826	0.3595	T0	0.3706	0.3520	U0	0.3571	0.3426
	0.3785	0.3460		0.3670	0.3377		0.3548	0.3290
	0.3670	0.3377		0.3548	0.3290		0.3425	0.3208
	0.3706	0.3520		0.3571	0.3426		0.3434	0.3320
S1	0.3741	0.3658	T1	0.3741	0.3658	U1	0.3594	0.3557
	0.3871	0.3739		0.3706	0.3520		0.3571	0.3426
	0.3826	0.3595		0.3571	0.3426		0.3434	0.3320
	0.3706	0.3520		0.3594	0.3557		0.3444	0.3442
S2	0.3783	0.3825	T2	0.3622	0.3716	U2	0.3622	0.3716
	0.3924	0.3909		0.3783	0.3825		0.3594	0.3557
	0.3871	0.3739		0.3741	0.3658		0.3444	0.3442
	0.3741	0.3658		0.3594	0.3557		0.3458	0.3592
S3	0.3783	0.3825	T3	0.3642	0.3829	U3	0.3642	0.3829
	0.3811	0.3937		0.3811	0.3937		0.3622	0.3716
	0.3963	0.4035		0.3783	0.3825		0.3458	0.3592
	0.3924	0.3909		0.3622	0.3716		0.3469	0.3717
S4	0.3860	0.4130	T4	0.3673	0.4003	U4	0.3469	0.3717
	0.4023	0.4228		0.3860	0.4130		0.3481	0.3856
	0.3963	0.4035		0.3811	0.3937		0.3673	0.4003
	0.3811	0.3937		0.3642	0.3829		0.3642	0.3829

Note:

Color coordinates measurement allowance is ± 0.01

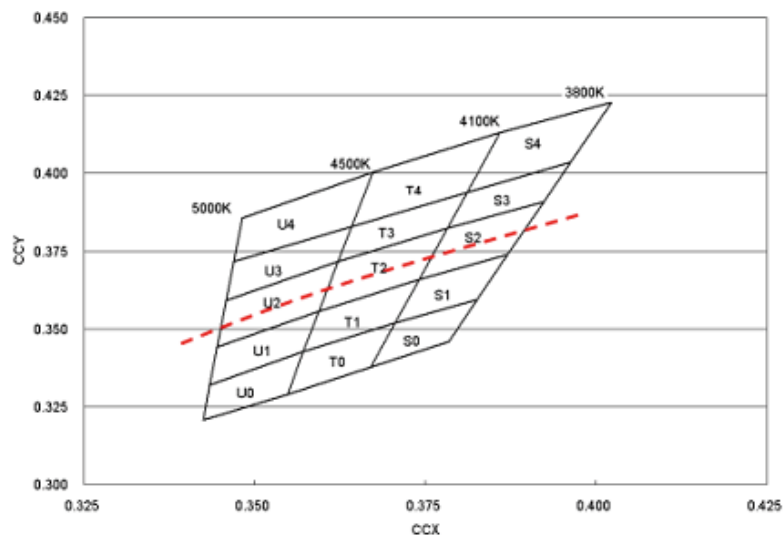


Figure 5. PLCC Chromaticity diagram

Characteristic Curves

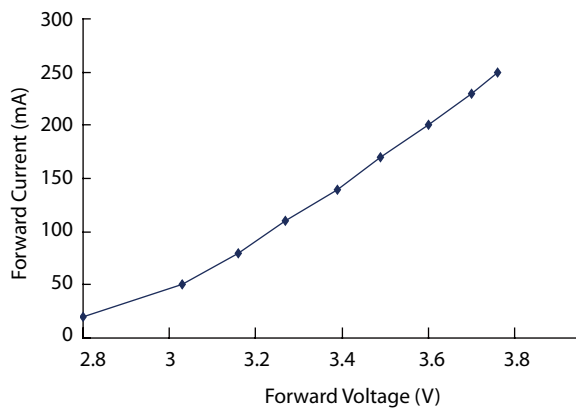


Figure 6. Forward current & forward voltage for 0.5W PLCC

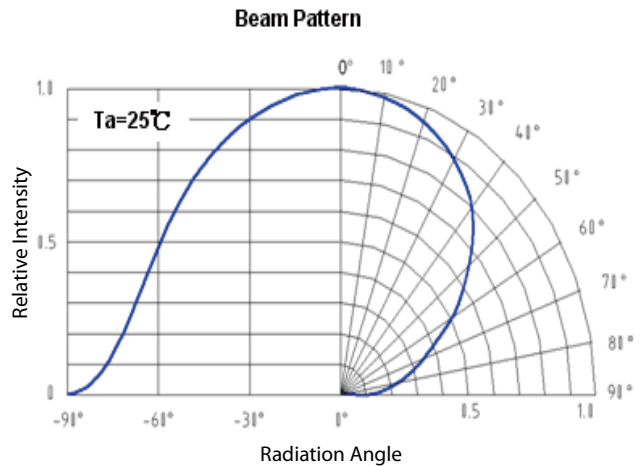


Figure 7. Beam pattern diagram for 0.5W PLCC

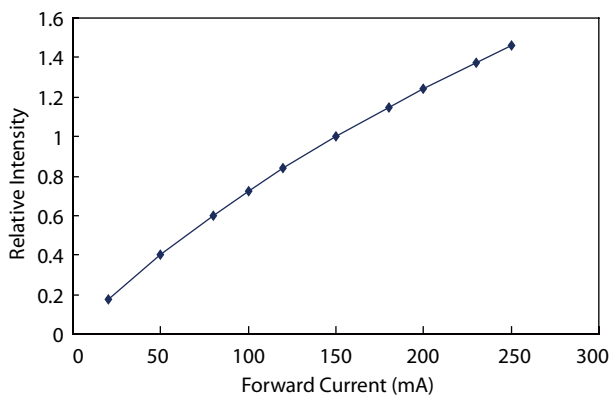


Figure 8. Forward current & normalized intensity at $T_a=25^\circ\text{C}$ for 0.5W PLCC

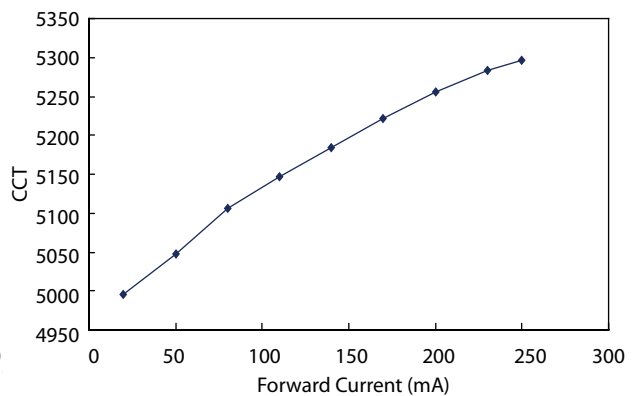


Figure 9. Forward current & CCT at $T_a=25^\circ\text{C}$ for PLCC cool white

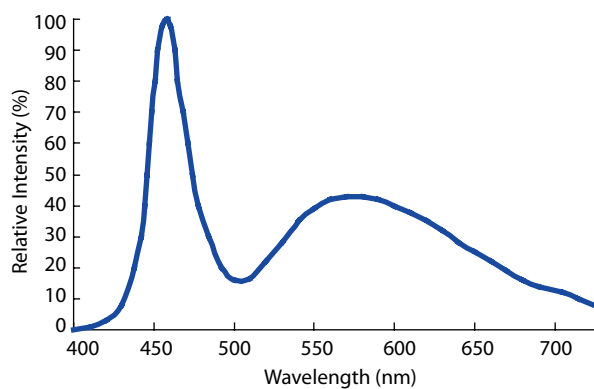


Figure 10. Color Spectrum for Cool White at a typical CCT, $T_a=25^\circ\text{C}$

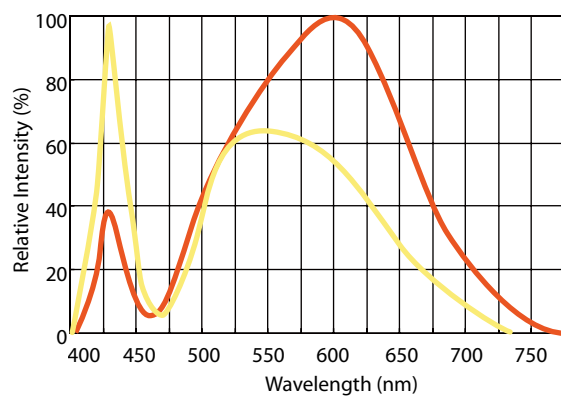


Figure 11. Color Spectrum for Neutral White and Warm White at a typical CCT, $T_a=25^\circ\text{C}$

Thermal Resistance

Table 11. Thermal Resistance

Thermal Resistance from Junction to Thermal Pad	Units
10	°C / W

Reliability Test Items

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

Table 12. Test Items

Stress Tes	Stress Conditions	Stress Duration	Failure Criteria
IR reflow	Peak temp.=255~260°C 10sec (Pre treatment 60°C/60%RH,168hrs)	3 times	No catastrophic
Room Temperature Operating Life	25 °C, $I_F = DC \max^{[1]}$	1000 hours	Note 2
High Temperature High Humidity Operating Life	60 °C / 60%RH, $I_F = 120mA$	1000 hours	Note 2
Low Temperature Operating Life	-40 °C, $I_F = DC \max^{[1]}$	1000 hours	Note 2
High Temperature Storage Life	150 °C	1000 hours	Note 2
Low Temperature Storage Life	-40 °C	1000 hours	Note 2
Non-Operating Thermal Shock	-40°C / 125°C, 20 min dwell ≤10 sec transfer	300 cycles	No catastrophic

Notes:

1. DC max is defined to be 150mA for 0.5W PLCC.

2. Failure Criteria:

- Electrical failures: V_F shifts $\geq 10\%$
- Light Output Degradation: Percentage level shift $\geq 50\%$ at 1,000hrs or 500cycle
- Visual failures: Broken or damaged package on lens or substrate

3. The IR reflow test can pass through JEDEC level 2a criterion.

Reflow Profile

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

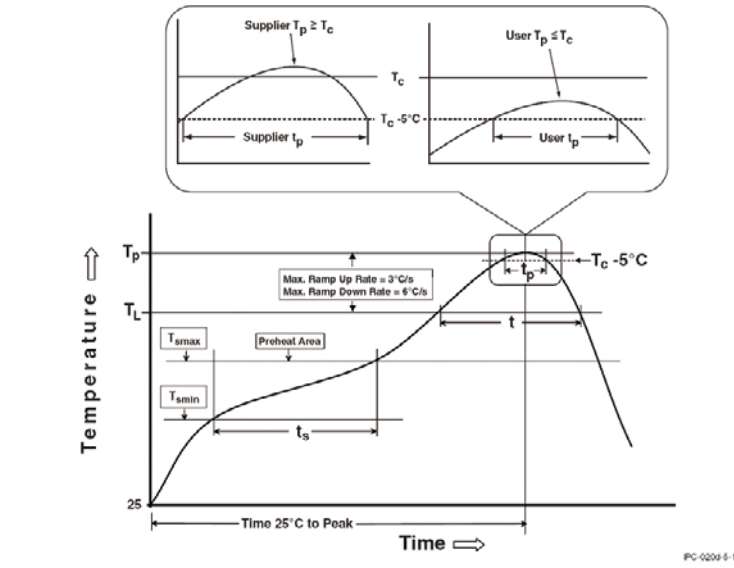


Figure 12. Reflow Profiles

Table 13. Table of Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T _{min})	100°C	150 °C
Temperature max (T _{max})	150°C	200 °C
Time (T _{min} to T _{max}) (t _s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T _{max} to T _p)	3°C/second max.	3 °C/second max.
Liquidous temperature (T _L)	183 °C	217 °C
Time at liquidous (t _L)	60-150 seconds	60-150 seconds
Peak package body temperature (T _p)*	230 °C ~235°C *	255 °C ~260 °C *
Classification temperature (T _c)	235°C	260 °C
Time (t _p)** within 5 °C of the specified classification temperature (T _c)	20** seconds	30** seconds
Average ramp-down rate (T _p to T _{max})	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 (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.



Lighting Design Manufacturing Service

1. Soldering conditions

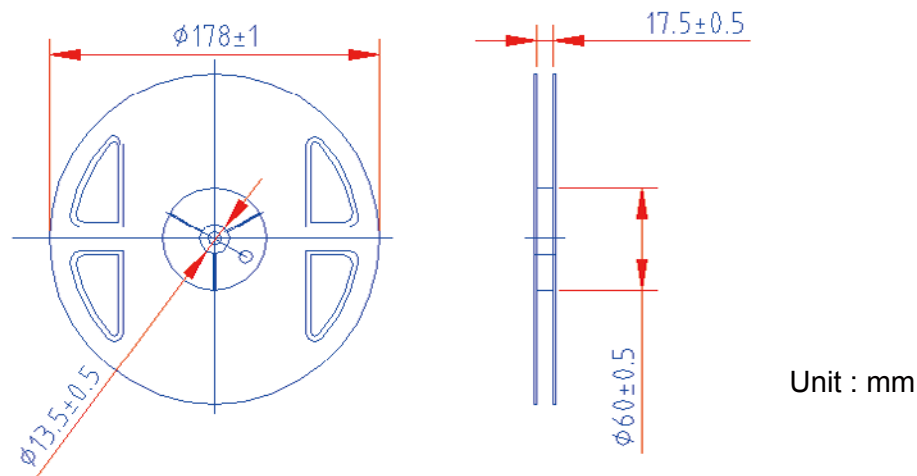
- Reflow soldering should not be done more than twice.
- When soldering, do not put stress on the LEDs during heating.
- After soldering, do not warp the circuit board.
- Repair should not be done after the LEDs have been soldered. When repair is unavoidable, a double-head soldering iron should be used. It should be confirmed beforehand whether the characteristics of the LEDs will be damaged by repairing or not.
- The encapsulated material of the LEDs is silicone. Therefore precautions should be taken to avoid the strong pressure on the encapsulated part.

2. Cleaning

- It is recommended to use isopropyl alcohol as a solvent to clean the LEDs. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin or not.

Product Packaging Information

Taping Reel



1. Common dimensions.

Item	Specification	Tol. (+/-)
W	16.00	± 0.30
E	1.75	± 0.10
F	7.50	± 0.10
D0	1.50	± 0.10
D1	1.50	± 0.10
P0	4.00	± 0.10
P1	8.00	± 0.10
P2	2.00	± 0.10
P0 x10	40.00	± 0.20

2. Pocket & other dimensions.

Item	Specification	Tol. (+/-)
t	0.30	± 0.05
A0	5.30	± 0.10
B0	7.50	± 0.10
K0	1.60	± 0.10

3. Drawing. (Conform to EIA-481 standard)

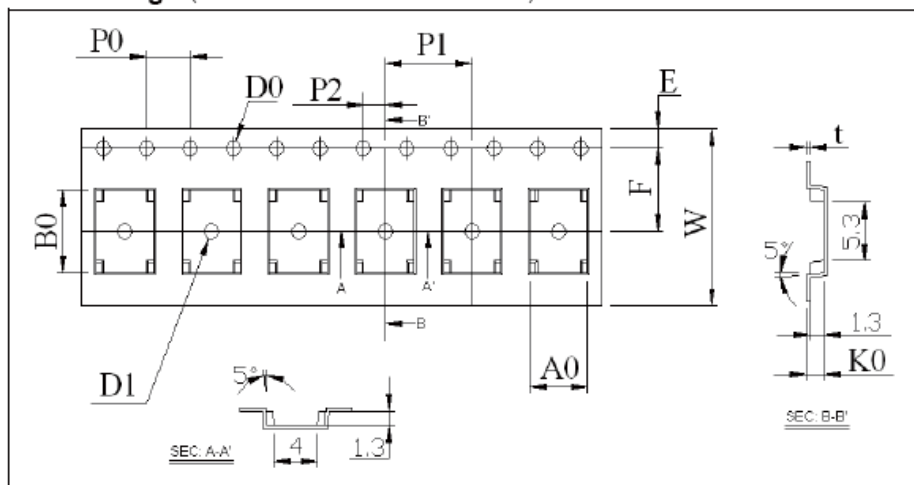


Figure 13. Taping reel dimensions

Packaging

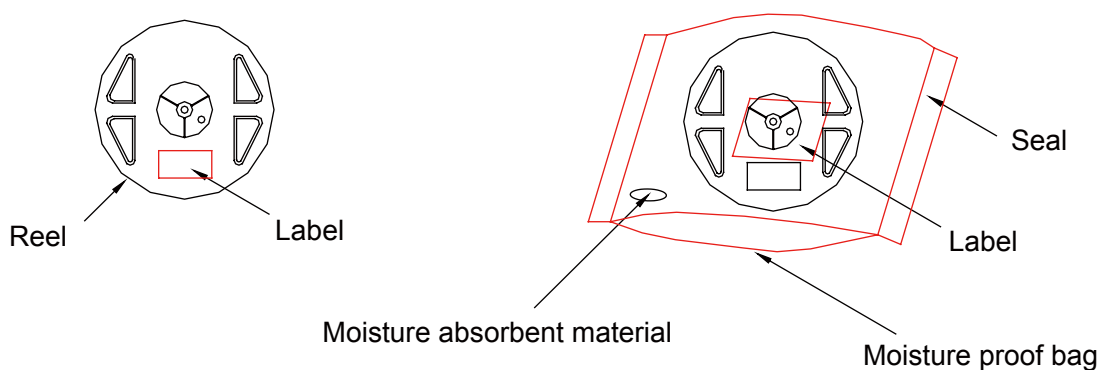


Figure 14. Packaging diagram

Package Label

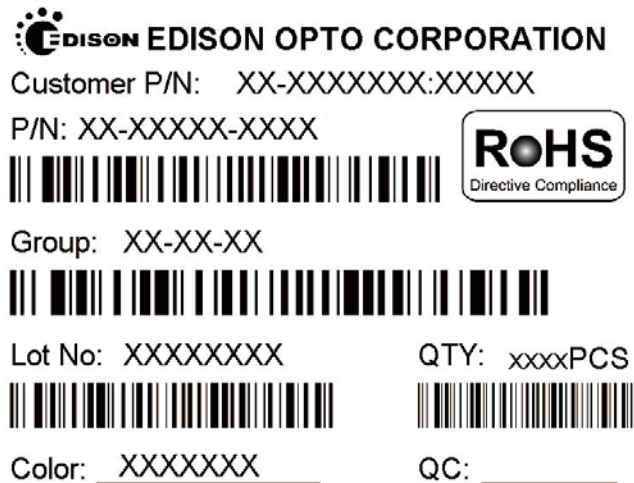


Figure 15. Package label

Table 14. Package dimensions and quantity

Item	Quantity	Total	Dimensions(mm)
Reel	1,000pcs	1,000pcs	Diameter=178
Box	3 reels	3,000pcs	240*235*67
Carton	10 boxes	30,000pcs	500*260*355

Precaution for Use

Storage

1.1 Before opening the package

The LEDs should be kept at $<40^{\circ}\text{C}$ & $<90\%\text{RH}$. 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 $\leq 30^{\circ}\text{C}$ & $\leq 60\%\text{RH}$. 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.

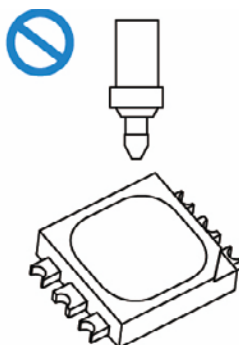
Static electricity or surge voltage will damage the LEDs. It is recommended to wear an anti-electrostatic wristband or an anti-electrostatic glove when handling the LEDs.

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 $> \phi 4.2\text{ mm}$

*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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