Lighting Design Manufacturing Service

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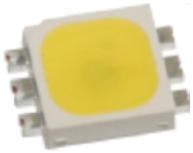
PLCC Series

ET-5050-BB1W-D 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 85 lm while driving at 350mA 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 constrains 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
- Based on Blue/Green : InGaN, Red : AlGaInP 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

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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.

Table 1. PLCC 5050 series Nomenclature

E	T	-	5050	W	-	B	B	1	W	-	D
X1			X2	X3		X4	X5	X6	X7		X8

X1 LED Item		X2 Package Type		X3 Emitting Color		X4 Chip Quantity		X5~X6 Serial No.
Code	Type	Code	Type	Code	Type	Code	Type	
ET	Edison TopLED	5050	5.0x5.0mm	W	Cool White	B	1W	

X7 Feature		X8 Serial No.	
Code	Type	Code	Type
W	White surface	D	Slug without polarity

LED Package Dimension and Polarity

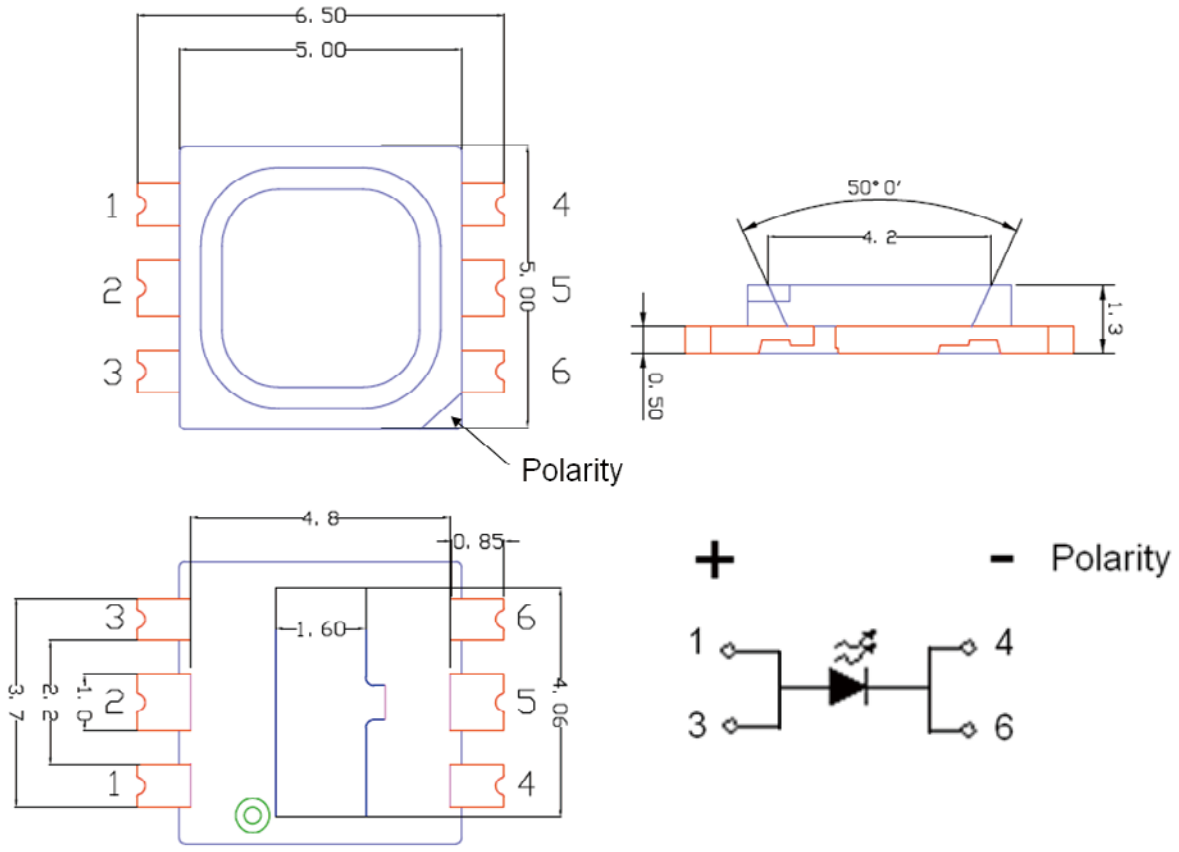


Figure 1. PLCC 5050 series Dimension, circuit diagram

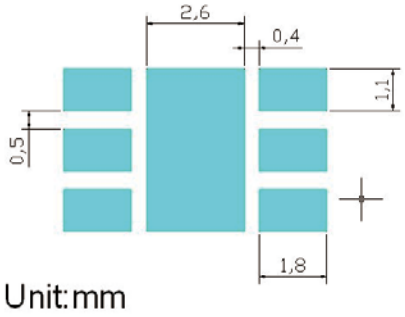


Figure 2. PLCC 5050 series recommended soldering pad

Notes:
1. All dimensions are measured in mm.
2. Tolerance : ± 0.20 mm

Absolute Maximum Ratings

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

Table 2. Absolute maximum ratings for PLCC 5050 series

Parameter	Rating	Units	Symbol
Forward Current	350	mA	I_F
Pulse Forward Current	1000	mA	I_{pulse}
Reverse Voltage	5	V	V_R
LED Junction Temperature	125	°C	T_J
Operating Temperature	-30 ~ +85	°C	
Storage Temperature	-40 ~ +120	°C	
ESD Sensitivity	2,000	V	V_B
Soldering Temperature	Reflow Soldering : 255~260°C/10~30sec Manual Soldering : 350°C/3sec		

Notes:
1. The values are based on 1-die performance.
2.* IFP condition: pulse width ≤0.1msec and duty ≤1/10.

Electro-Optical Characteristic

The following table describes luminous intensity of PLCC 5050 series.

Table 3 . Electro-optical characteristic

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V_F	I_F=350mA/die	2.8	-	3.8	V
Reverse Current	I_R	V_R=5V	-	-	10	μA
Viewing Angle	2θ1/2*	I_F=350mA/die	-	120	-	deg.

Notes:
2θ1/2 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.

Table 4 . PLCC Luminous Flux characteristic

Power Consumption	Part Name	Color	V_F			Unit
			Min.	Typ.	Max.	
1W	ET-5050W-BB1W-D	Cool White	--	85	--	lm

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

Color Temperature or Dominant/Peak Wavelength Characteristic

The following table describes forward voltage of PLCC 5050 series

Table 5 . PLCC color temperature or dominant/peak wavelength characteristic

Power Consumption	Part Name	Color	CCT/Wavelength			Unit
			Min.	Typ.	Max.	
1W	ET-5050W-BB1W-D	Cool White	5,000	--	10,000	K

Color Rendering Index Characteristics at T_J=25°C:

Table 6 . Color Rendering Index Characteristics at T_J=25°C for High Power PLCC series

Part Name	Color	CRI
		Typ.
ET-5050W-BB1W-D	Cool White	68

Notes:
CRI is measured with an accuracy of ± 5

V_F Rank

Table 7 . PLCC forward voltage rank for Cool white, Neutral white& Warm white

V_F			
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

Notes:
* Forward voltage measurement allowance is ± 0.1V.

Luminous Intensity Rank

Table 8 . Luminous intensity rank

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

Notes:
Luminous Intensity Measurement Allowance is ± 10%.

Color Bin

Table 9. Color Bin V0-Y4

V0	0.3434	0.3320
	0.3425	0.3208
	0.3295	0.3105
	0.3294	0.3200
V1	0.3292	0.3313
	0.3444	0.3442
	0.3434	0.3320
	0.3294	0.3200
V2	0.3292	0.3313
	0.3290	0.3451
	0.3458	0.3592
	0.3444	0.3442
V3	0.3290	0.3451
	0.3288	0.3569
	0.3469	0.3717
	0.3458	0.3592
V4	0.3288	0.3569
	0.3286	0.3690
	0.3481	0.3856
	0.3469	0.3717

W1	0.3294	0.3202
	0.3295	0.3105
	0.3196	0.3013
	0.3186	0.3102
W2	0.3292	0.3313
	0.3294	0.3202
	0.3186	0.3102
	0.3175	0.3204
W3	0.3290	0.3451
	0.3292	0.3313
	0.3175	0.3204
	0.3160	0.3332
W4	0.3290	0.3451
	0.3160	0.3332
	0.3148	0.3444
	0.3288	0.3569
W5	0.3148	0.3444
	0.3136	0.3550
	0.3286	0.3690
	0.3288	0.3569

X1	0.3076	0.3108
	0.3174	0.3204
	0.3196	0.3013
	0.3112	0.2932
X2	0.3076	0.3108
	0.3052	0.3224
	0.3160	0.3332
	0.3175	0.3204
X3	0.3052	0.3224
	0.3031	0.3327
	0.3148	0.3444
	0.3160	0.3332
X4	0.3031	0.3327
	0.3011	0.3422
	0.3136	0.3550
	0.3148	0.3444

Y1	0.3040	0.2850
	0.2990	0.3010
	0.3076	0.3108
	0.3112	0.2932
Y2	0.2990	0.3010
	0.2920	0.3210
	0.3031	0.3327
	0.3076	0.3108
Y3	0.3040	0.2850
	0.2899	0.2703
	0.2830	0.2838
	0.2990	0.3010
Y4	0.2990	0.3010
	0.2830	0.2838
	0.2742	0.3007
	0.2920	0.3210

Notes:
Color coordinates measurement allowance is ± 0.01

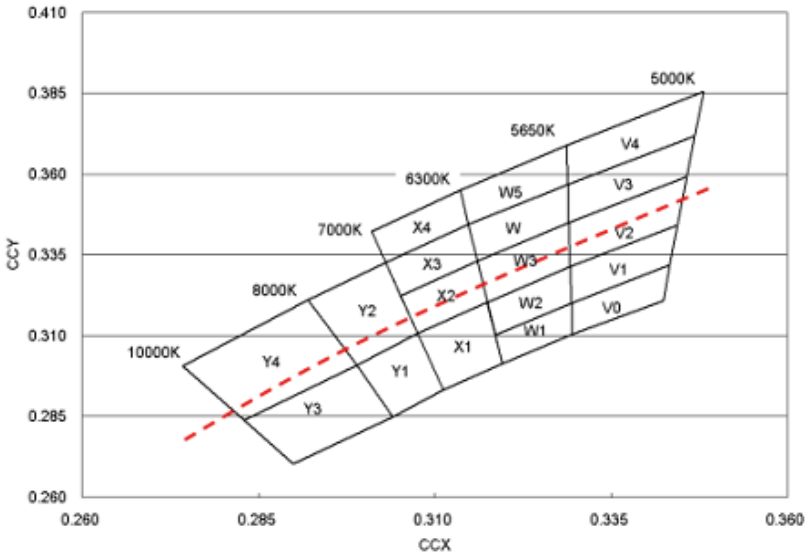


Figure 3. PLCC Chromaticity diagram

Characteristic Curves

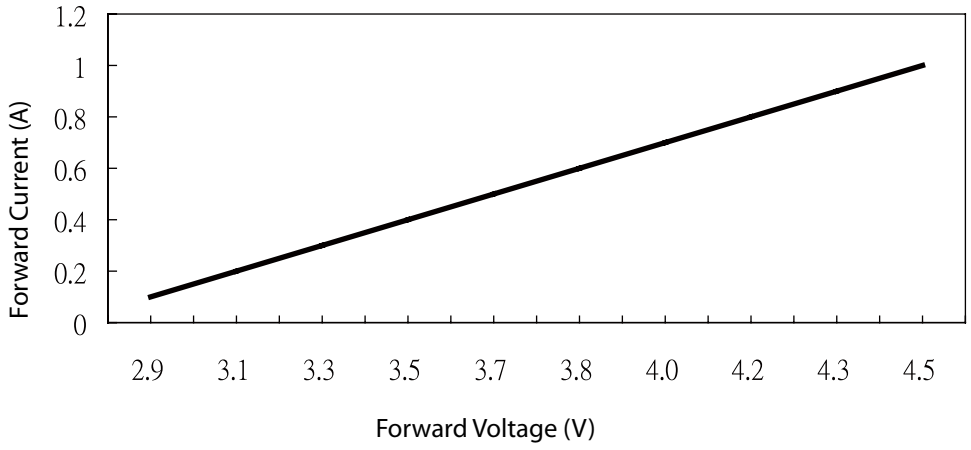


Figure 4. Forward current & forward voltage for 1W PLCC

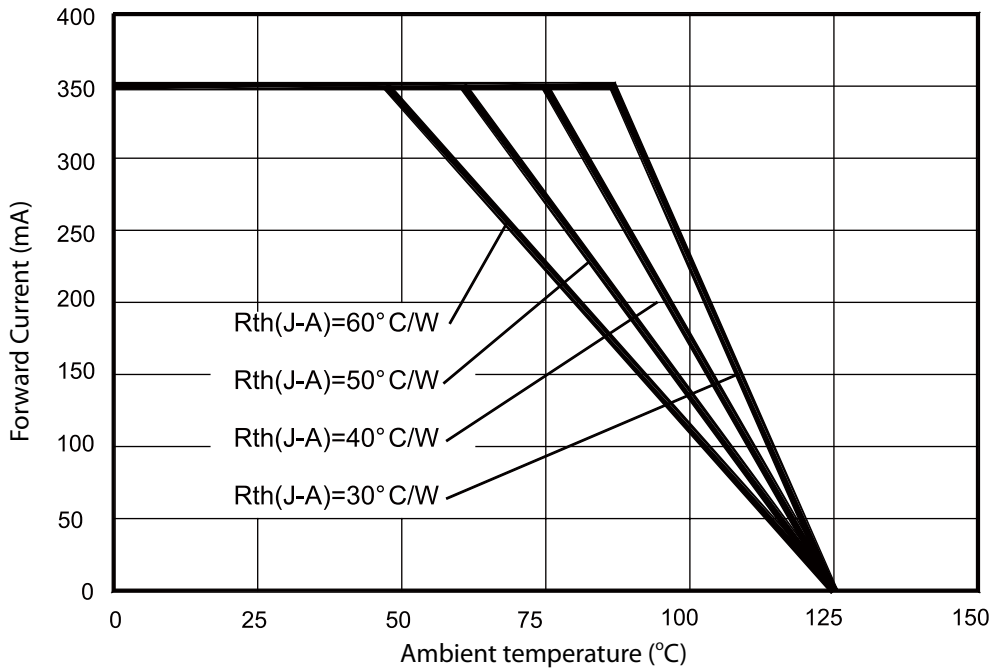


Figure 5. Operating current & ambient temperature for 1W PLCC

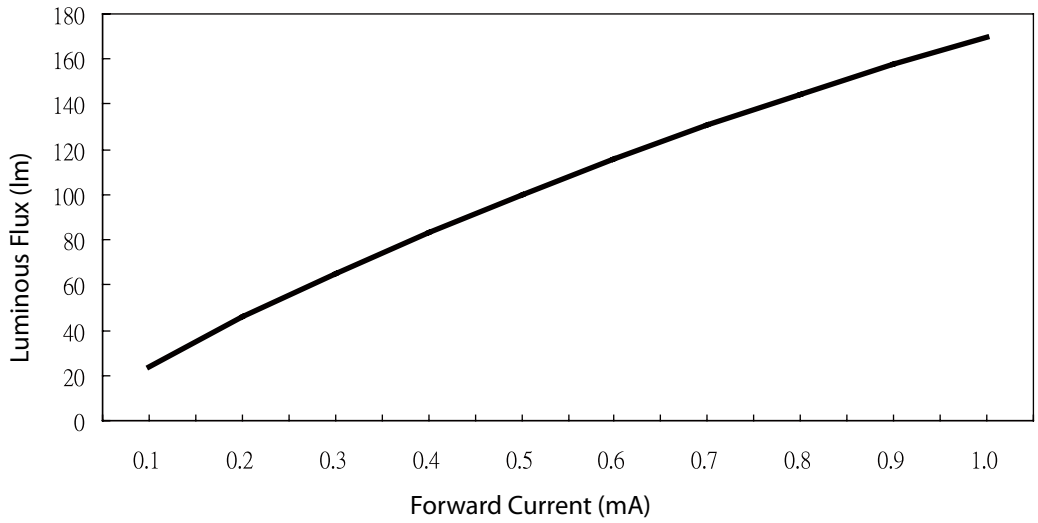


Figure 6. Forward current & relative luminous at Ta=25°C for 1W PLCC

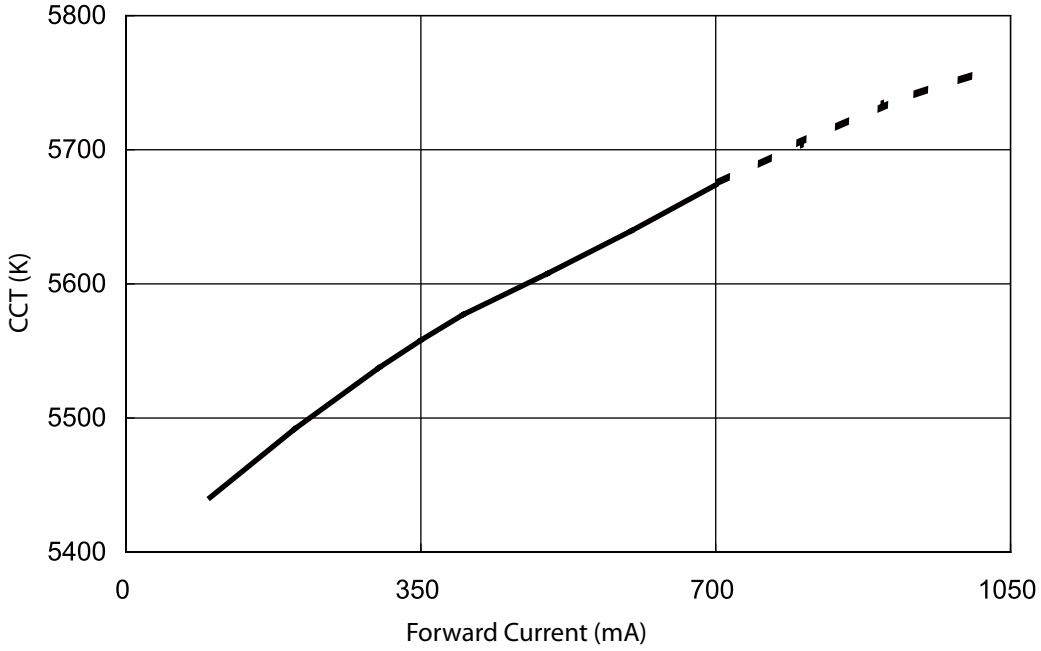


Figure 7. Forward current & CCT at Ta =25°C for PLCC cool white

PLCC Color Spectrum

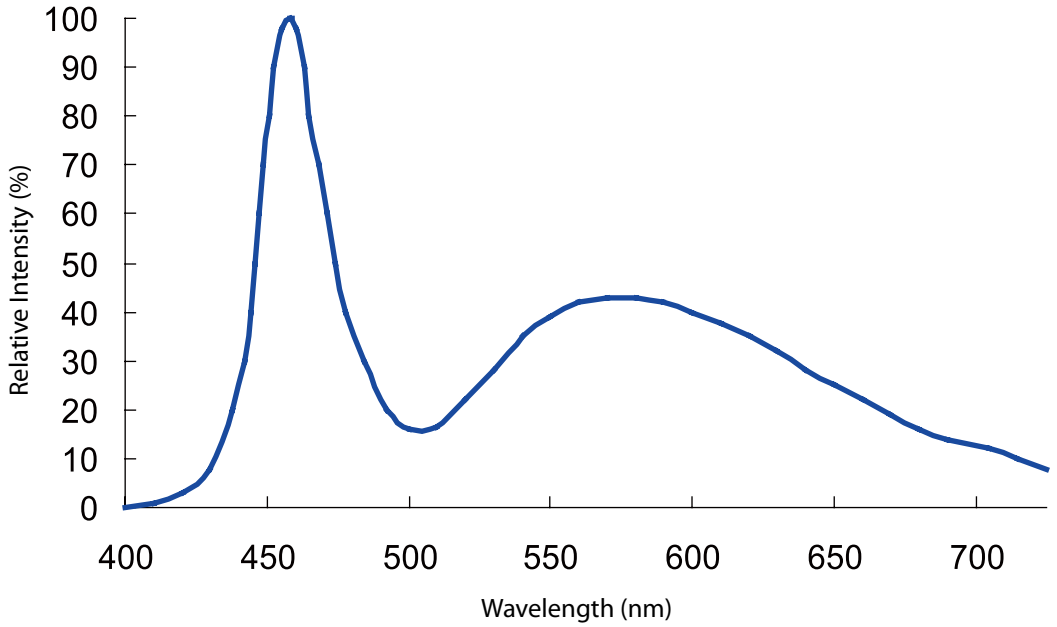


Figure 8. Color Spectrum for Cool White at a typical CCT. Dotted curve represents the standard eye response, Ta=25°C

Thermal Resistance

Table 10. 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 11. 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	85 °C / 85%RH, I_F = 150mA	1000 hours	Note 2
High Temperature Operating Life	85 °C, I_F =150mA	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 350mA for 1W PLCC.
2. Failure Criteria:
- Electrical failures: V_F shifts >= 10%
- Light Output Degradation: Percentage level shift >= 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.

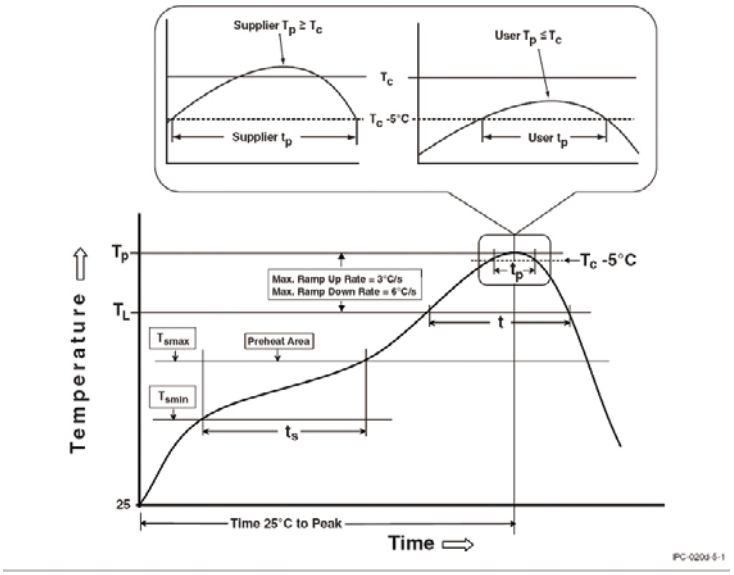


Figure 9. Reflow Profiles

Table 12. 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.

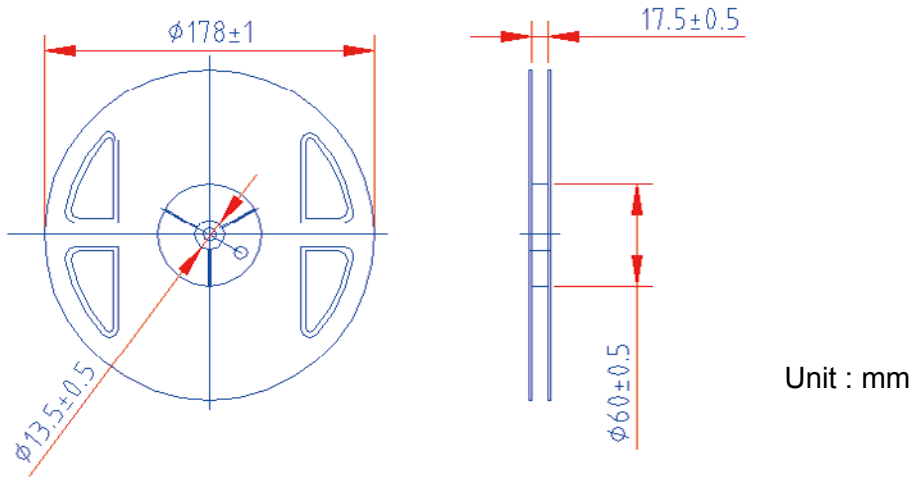
Notes:
* Tolerance for peak profile temperature (Tp) is defined as a supplier minimum and a user maximum.
** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum.

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



Unit : mm

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)

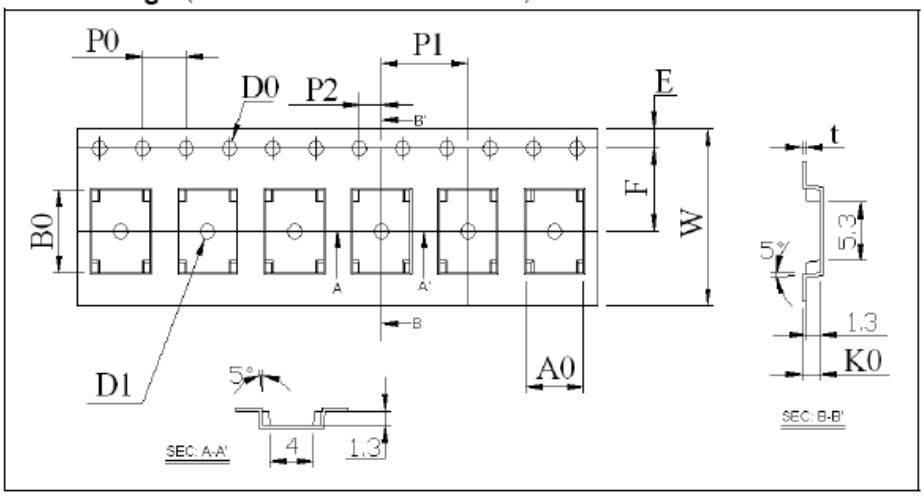


Figure 10. Taping reel dimensions

• Packaging

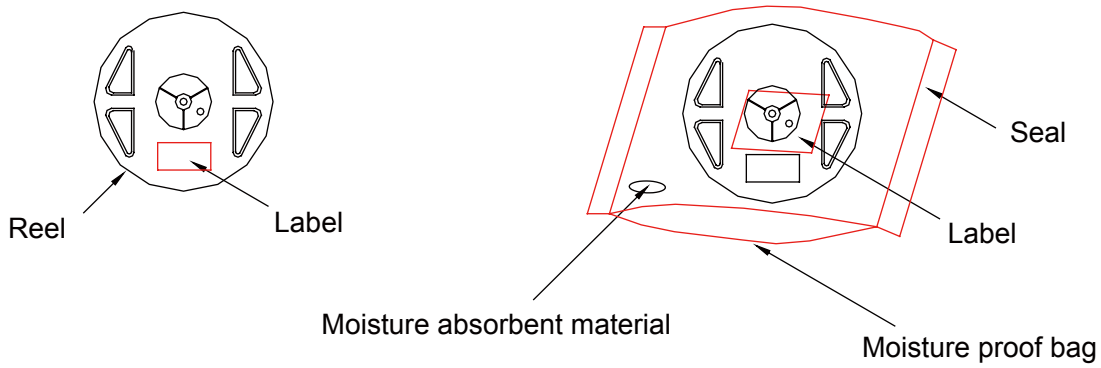


Figure 11. Taping reel dimensions

• Package Label

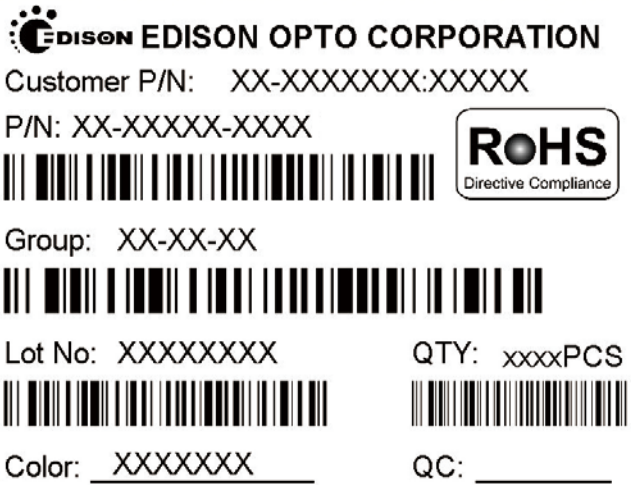


Figure 12. Package label

Table 13. Package dimensions and quantity

Item	Quantity	Total	Dimensions(mm)
Reel	1,000pcs	1,000pcs	Diameter=178
Box	3 reels	3,000pcs	240*235*67mm
Carton	5 boxes	15,000pcs	353*254*256mm

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.

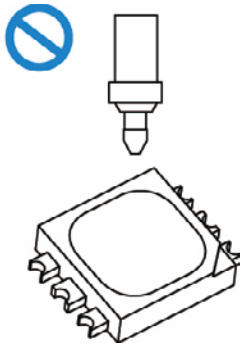
Static electricity or surge voltage will damage the LEDs. It is recommended to wear an anti-electrostatic wristband or an anti-electrostatic glove when handling the LEDs.

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>ψ2.4 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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