1W PLCC RTB 3in1

High power PLCC is a surface mount, compact, high brightness LED that is built for various illumination needs. A RTB 3in1 high power PLCC can deliver typical luminous flux of 8, 15, 5lm respectively while driving each die at 100mA suitable for any kind of lighting sources, including architectural lighting, signage & Indirect lighting, commercial lighting, advertising light box. 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
- 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

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PLCC Nomenclature

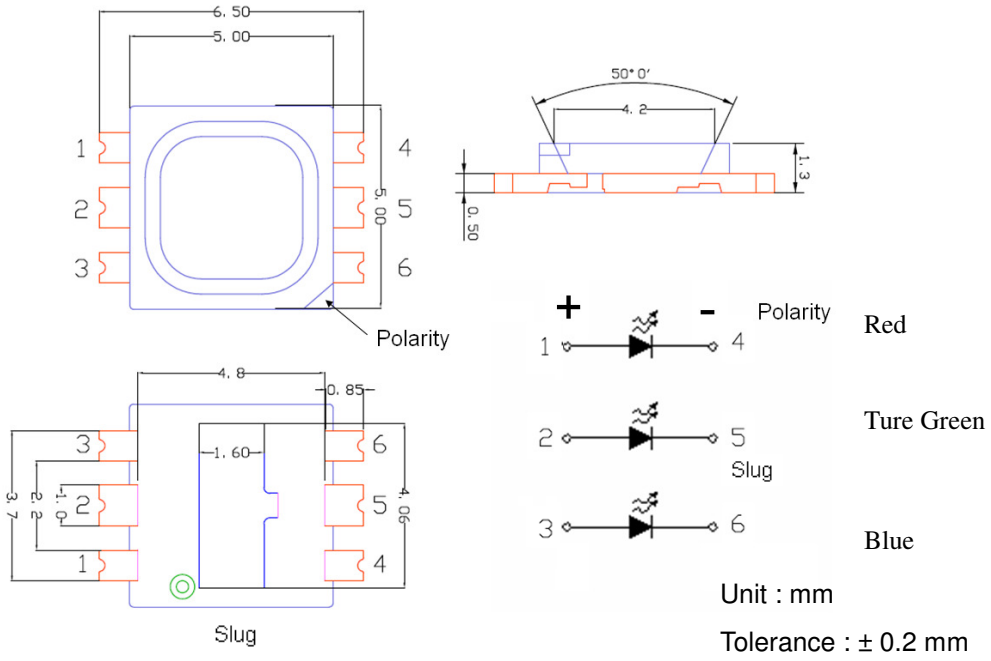
E T – 5050 RTB – B 1 1 W

X1 X2 X3 X4 X5 X6 X7

< Table 1. PLCC Nomenclature >

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
Edison Top LED		3528	3.5×2.8mm	W	Cool White	1	1pcs		W	White surface
		5050	5.0×5.0mm	H	Neutral White	3	3pcs		B	Black surface
				X	Warm White	A	0.5W		D	Black housing
				R	Red	B	1W			
				A	Amber (590nm)					
				T	True Green					
				B	Blue					
				RTB	RGB 3 chips					

Package Outlines



< Figure 1 5050RTB PLCC Dimension, circuit diagram and recommended soldering pad >

Notes:

1. 1W PLCC slug has polarity as true green 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(T_a=25℃)

< Table 2. PLCC Absolute maximum ratings >

Parameter	Symbol	Value	Unit
Forward Current	I_F	***R : 100*** ***T : 100*** ***B : 100***	**mA**
Pulse Forward Current	I_{FP}*	***R : 200*** ***T : 200*** ***B : 200***	**mA**
Reverse Voltage	V_R	***5***	**V**
LED Junction Temperature	T_J	***125***	℃
Operating Temperature	T_{op}	***-30 ~ +85***	℃
Storage Temperature	T_{stg}	***-40 ~ +120***	℃
ESD Sensitivity	V_B	**2,000**	V
Soldering Temperature	**Tsld**	**Reflow Soldering : 255~260℃/10~30sec** **Manual Soldering : 350℃/3sec**	

Notes:

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

Electro-Optical Characteristics(T_a=25℃)

< Table 3. PLCC Electro-optical characteristics >

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V_F	**R=100mA/die**	**1.8**	**-**	**2.8**	**V**
		T=100mA/die	**2.8**		**3.8**	**V**
		B=100mA/die	**2.8**		**3.8**	**V**
Reverse Current	I_R	V_R=5V	**-**	**-**	**10**	**μA**
Viewing Angle	$2\theta_{1/2}$*	I_F=100mA/die	**-**	**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 Characteristics, I_F=100mA/Die:

< Table 4. PLCC Luminous Flux characteristics. >

Power Consumption	Part Name	Color	Flux			Units
			Min.	Typ.	Max.	
1W	ET-5050RTB-B11W	Red	--	*8*	--	lm
		True Green	--	*15*	--	lm
		Blue	--	*5*	--	lm

Color Temperature or Dominant/Peak Wavelength Characteristics, T_a=25℃ at 100mA/Die :

< Table 5. PLCC color temperature or dominant/peak wavelength characteristics. >

Power Consumption	Part Name	Color	CCT/Wavelength			Units
			Min.	Typ.	Max.	
1W	ET-5050RTB-B11W	Red	*620*	--	*630*	nm
		True Green	*520*	--	*535*	nm
		Blue	*460*	--	*475*	nm

Luminous Intensity Rank(T_a=25℃)

<Table 6.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

Note:
Luminous Intensity Measurement Allowance is ± 10%.

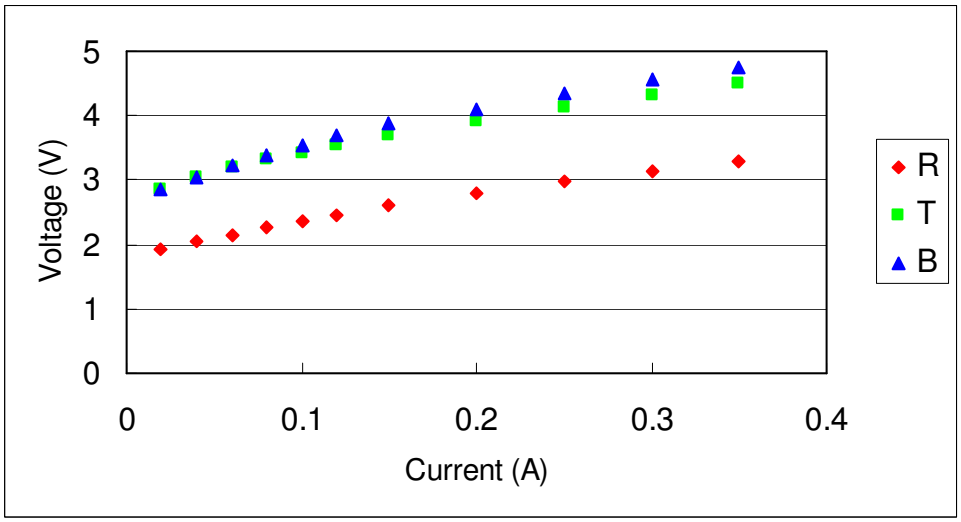
Dominant Wavelength Bin Structure

<Table 7.Dominant wavelength Bin rank >

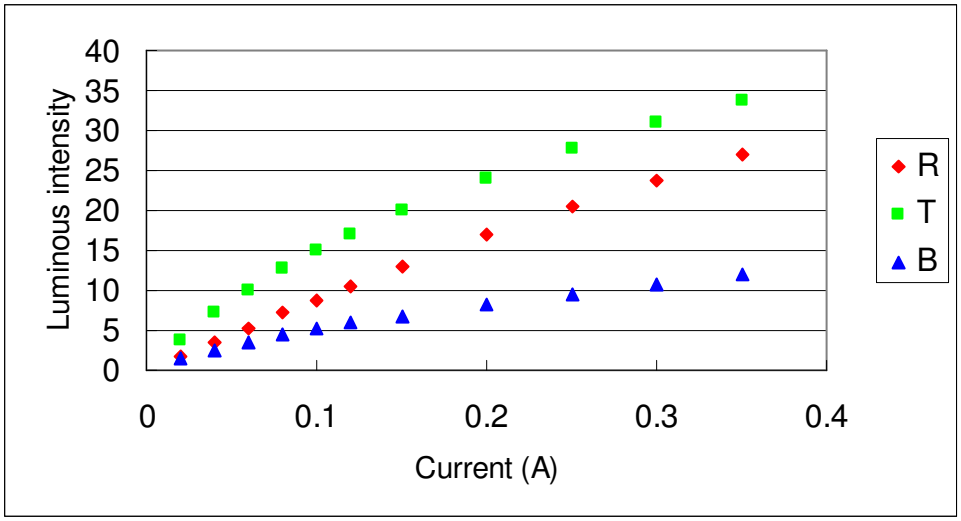
Group	λd(nm)
Blue	***460 — 475***
W	*460 — 465*
X	*465 — 470*
Y	*470 — 475*
True Green	***520 — 535***
W	*520 — 525*
X	*525 — 530*
Y	*530 — 535*
Red	***620 — 630***
F (Full)	*620 — 630*

Note:
Dominant wavelength Measurement Allowance is ± 0.8nm

Characteristic Curves



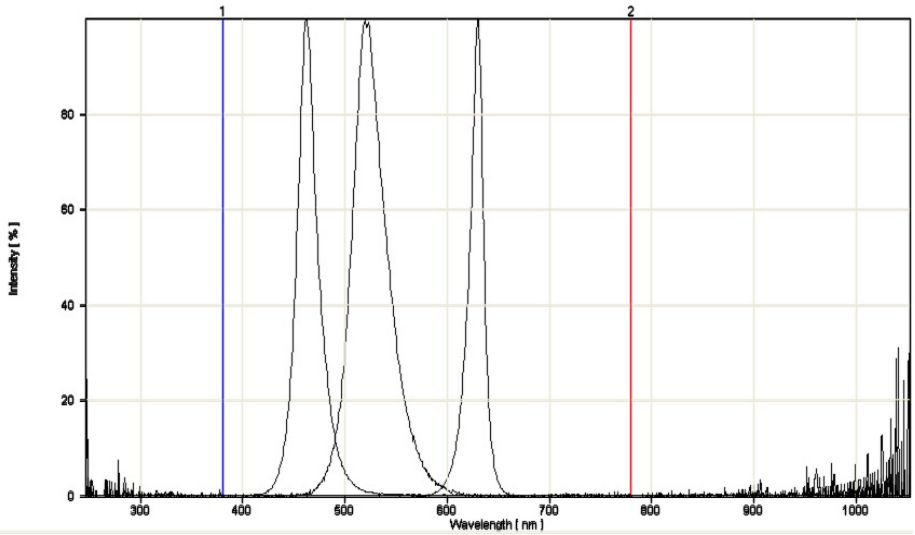
< Figure 2. Forward current vs. Forward voltage for High power PLCC RTB 3in1 >



< Figure 3. Operating current vs. Luminous intensity for High power PLCC RTB 3in1 >

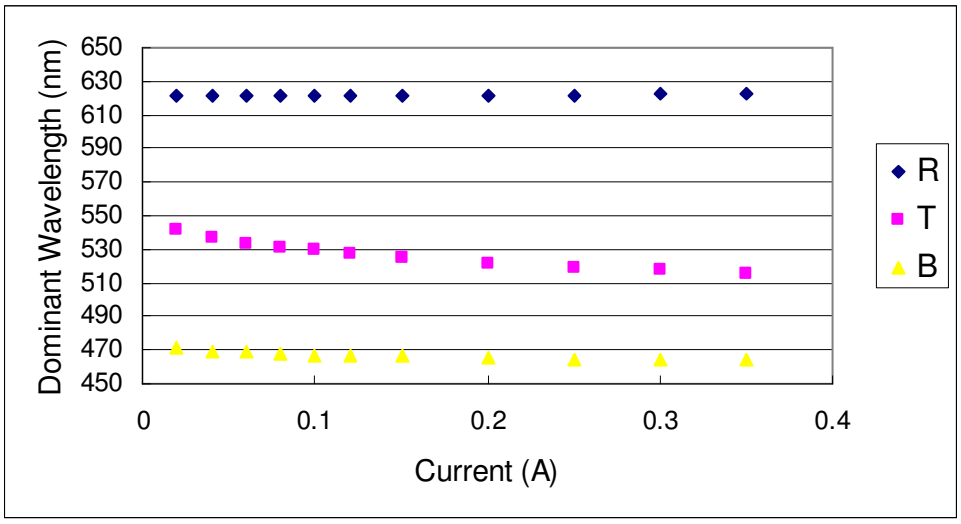
PLCC Color Spectrum, T_a = 25℃:

Typical Spectral characteristic for RTB 3in1, T_a = 25℃



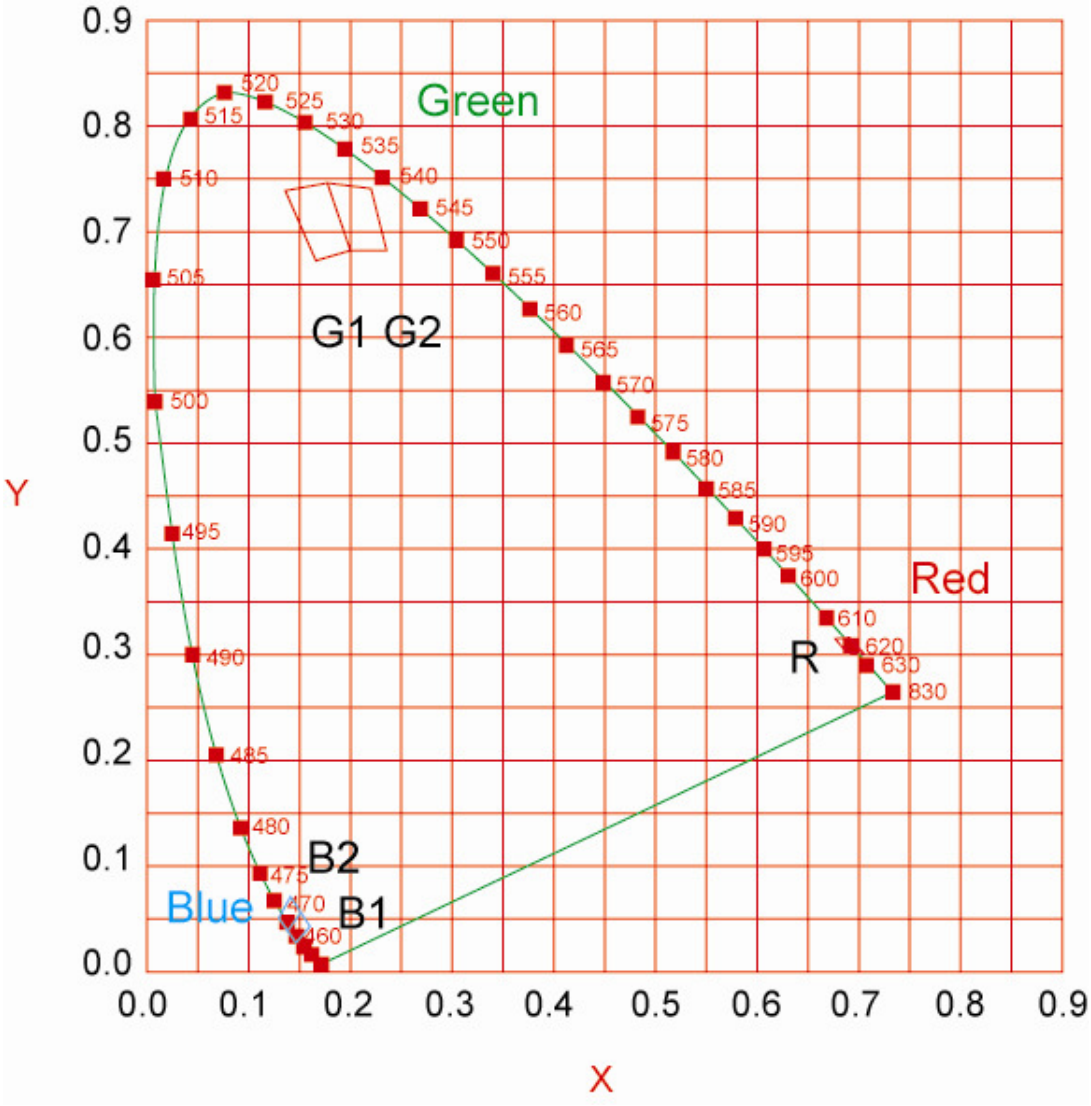
<Figure 4. Intensity vs. Wavelength length>

Wavelength Shift Characteristic for High power PLCC RTB 3in1, T_a = 25℃



<Figure 5. Dominant wavelength length vs. Forward current for RTB 3in1>

CIE Chromaticity Diagram of R.G.B



< Figure 6 High power PLCC RTB 3in1 CIE Chromaticity Diagram of R.G.B >

Note:

1. The figure is only for reference

Thermal Resistance – Junction to Thermal Pad:

< Table 8.Thermal Resistance >

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

Reliability Test Item and Condition

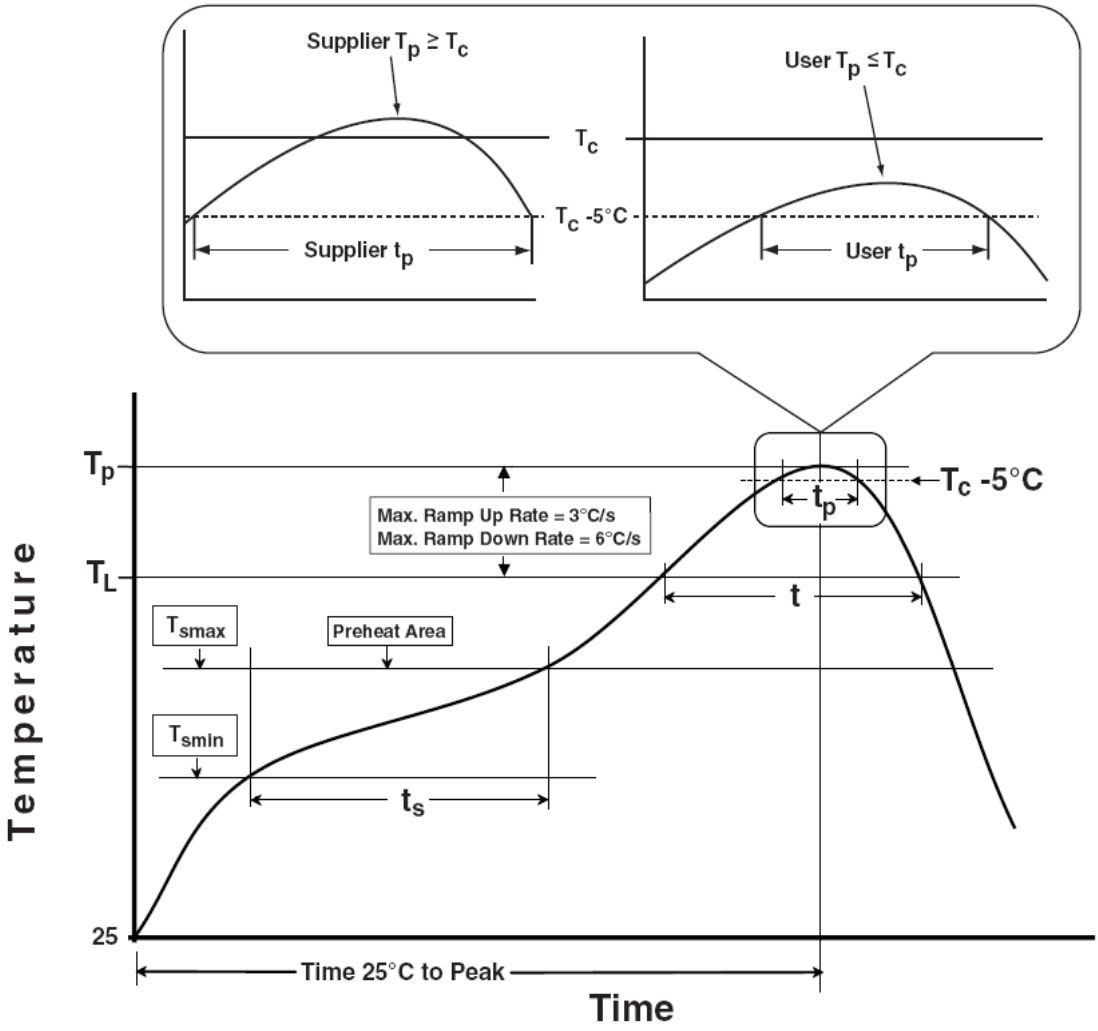
< Table 9.Test items >

Stress Test	Stress Conditions	Stress Duration	Failure Criteria
IR reflow	Peak temp.=255~260℃ 10sec (Pre treatment 60℃/60%RH,168hrs)	3 times	No catastrophic
Room Temperature Operating Life	25 °C, R T B I_F = DC max	1000 hours	Note 2
High Temperature High Humidity Operating Life	85 °C / 85%RH, R T B I_F = 50mA	1000 hours	Note 2
High Temperature Operating Life	85 °C, R T B I_F = 50mA	1000 hours	Note 2
Low Temperature Operating Life	-40 °C, R T B 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 / 125℃, 20 min dwell ＜10 sec transfer	300 cycles	No catastrophic

Notes:
1. DC max is defined to be 100mA for RTB 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.

Recommended Reflow Soldering Profile

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



< Figure 7 Time-temperature of JEDEC J-STD-020D >

< Table 10.Classification reflow profile>

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

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

1. Soldering conditions

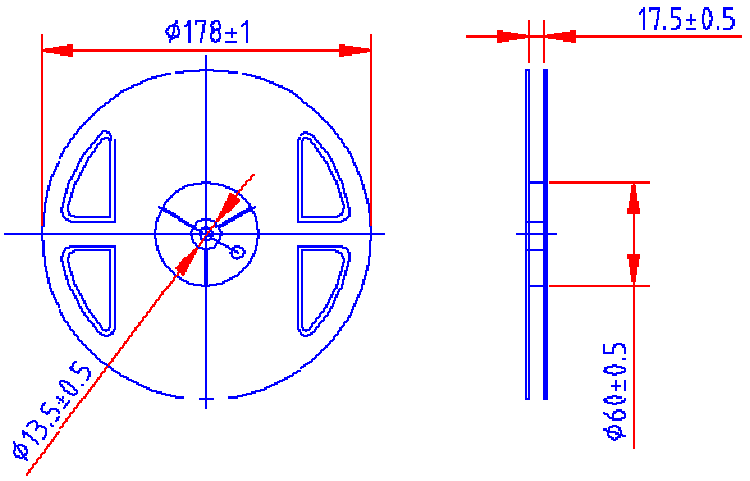
- Reflow soldering should not be done more than twice.
- When soldering, do not put stress on the LEDs during heating.
- After soldering, do not warp the circuit board.
- Repair should not be done after the LEDs have been soldered. When repair is unavoidable, a double-head soldering iron should be used. 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.

Taping Reel Packaging

1. Taping Reel



Unit : mm

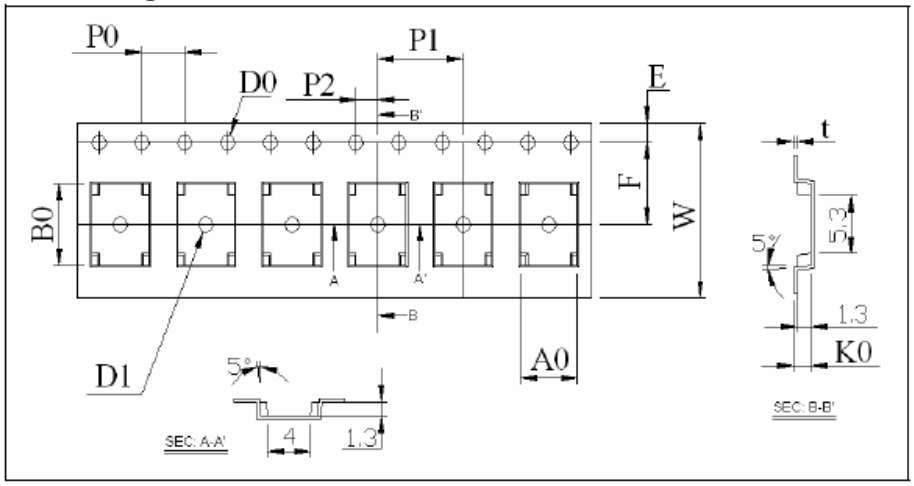
1. Common dimensions.

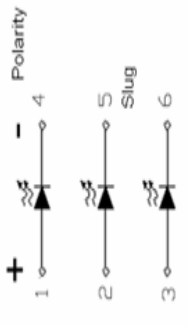
Item	Specification	Tol. (+/-)
W	16.00	± 0.30
E	1.75	± 0.10
F	7.50	± 0.10
D0	1.50	± 0.10
D1	1.50	± 0.10
P0	4.00	± 0.10
P1	8.00	± 0.10
P2	2.00	± 0.10
P0 x10	40.00	± 0.20

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
A1		
B1		
K1		

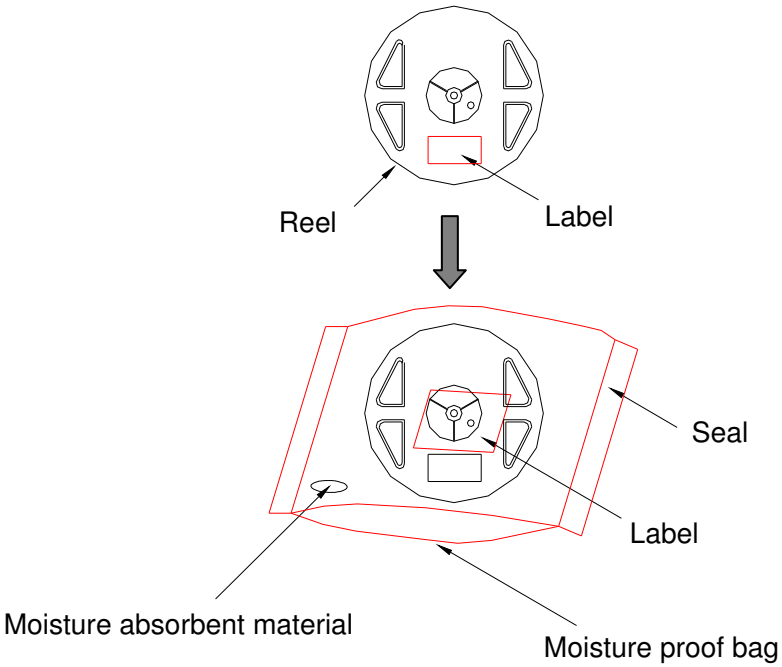
3. Drawing. (Conform to EIA-481 standard)





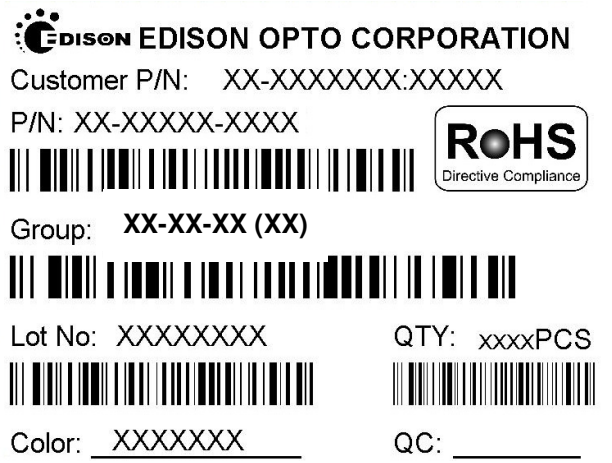
< Figure 8 Taping reel dimension >

2. Packaging



< Figure 8 Packaging diagram >

3. Package Label



< Figure 9 Package label >

< Table 11 Package dimensions and quantity >

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

Precaution for Use

1. Storage

1.1 Before opening the package

- The LEDs should be kept at <40℃ & <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 opening the package

- The LEDs should be kept at ≦30℃ & ≦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℃ 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.

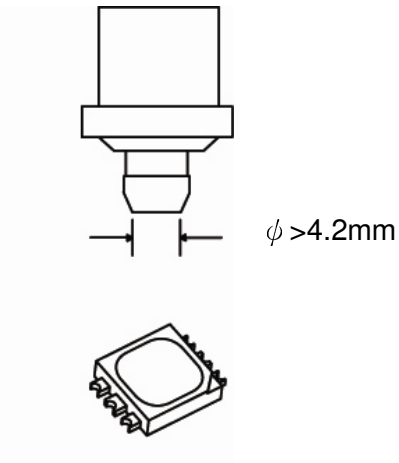
2. Static electricity

- 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.

3. Pick and Place

- Recommended conditions：Outer nozzle> ϕ 4.2 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.



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