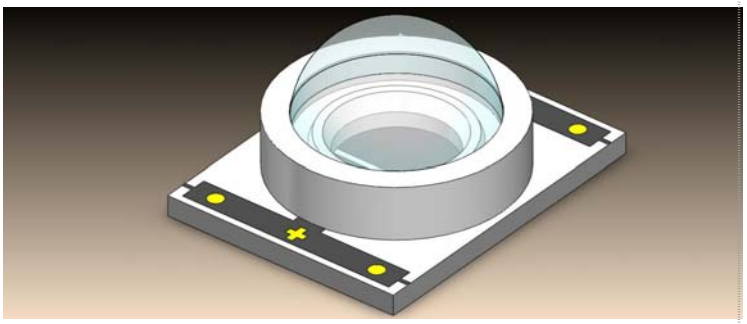
LTCC POWER LED Component
X Lamp
Lead (Pb) Free Product – RoHS Compliant

BIT Lighting Component

5W Cree Power LED

Technical Datasheet

Version 1.1



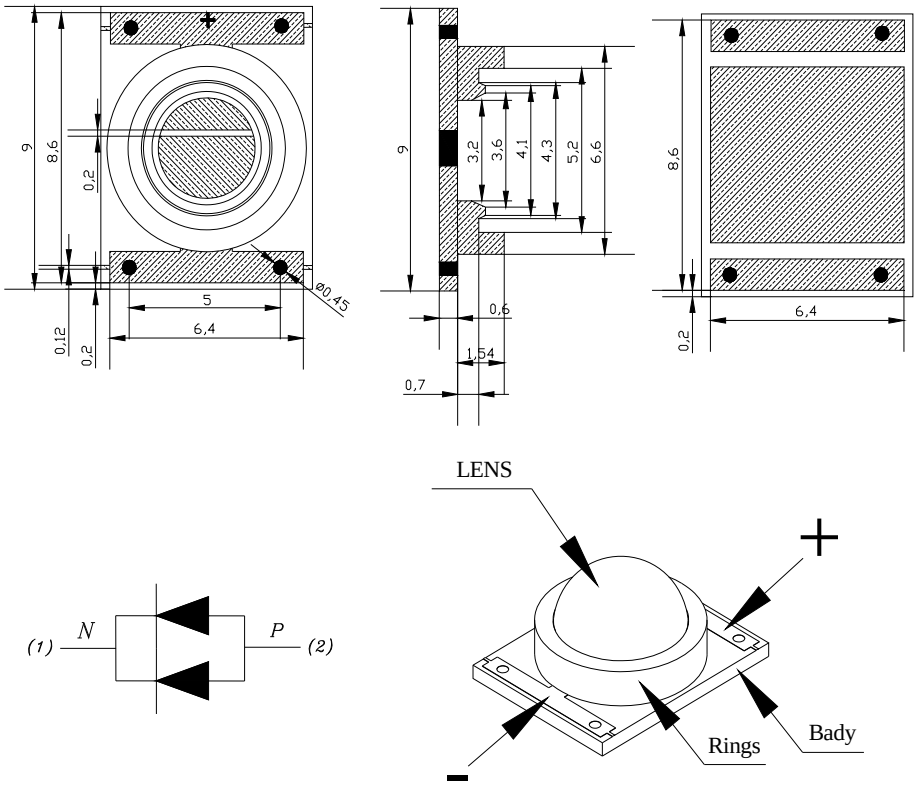
Features

- **High flux per LED**
- **Very long operating life (up to 100k hours)**
- **Various colors**
- **Viewing angle: 90 deg**
- **Good color uniformity**
- **Low-temp. & lead free reflow soldering**
- **RoHS compliant**
- **More energy efficient than incandescent and most halogen lamps**
- **Low Voltage DC operated**
- **Instant light (less than 100ns)**
- **No UV**
- **Superior ESD protection**

Typical Applications

- **Reading lights (car, bus, aircraft)**
- **Portable (flashlight, bicycle)**
- **Uplighters/Downlighters**
- **Decorative/Entertainment**
- **Bollards/Security/Garden**
- **Cover/Under shelf/Task**
- **Indoor/Outdoor Commercial and Residential Architectural**
- **Automotive Ext (Stop-Tail-Turn, CHMSL, Mirror Side Repeat)**
- **LCD backlights**

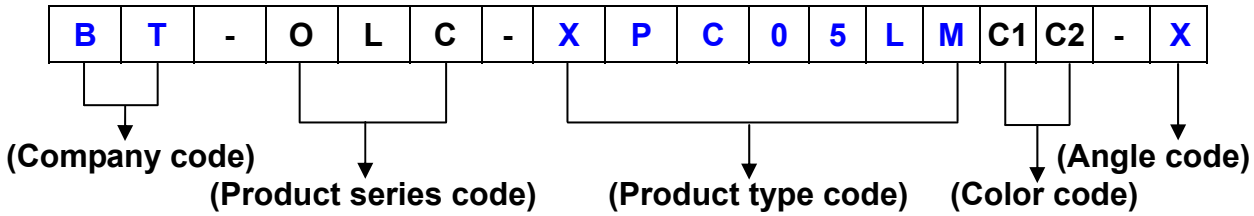
LTCC Mechanical Dimensions



Note:

- **The Anode side of the device is denoted in the lead frame.**
- **Electrical insulation between the case and the board is required --- slug of device is not electrically neutral. Do not electrically connect either the anode or cathode to the slug.**
- **Drawing not to scale.**
- **All dimensions are in millimeters.**
- **All dimensions without tolerances are for reference only.**
- **Please do not bend the leads of the LED, otherwise it will damage the LED.**
- **Please do not use a force of over 3kg impact or pressure on the lens of the LED, otherwise it will cause a catastrophic failure.**

LTCC High Power 5W series Nomenclature



Flux Characteristics of 1000mA, T_J = 25 ◦ C

Radiation Pattern	Color	Part Number Emitter	Luminous Flux Φ_V (lm) Minimum	Typical
Lambertian	White	XPC05LMNW-Q	147.7	200
	Warm White	XPC05LMWW-Q	130	187.6

- BIT maintains are tolerance of ± 10% on flux and power measurements.
- Please do not drive at rated current more than 1 second without proper heat sink.

Electrical Characteristics at 1000mA, T_J = 25 ◦ C

Color	Forward Voltage V_F (V) Min.	Typ.	Max.	Dynamic Resistance (Ω)	Temperature Coefficient of V_F (mV/ ◦ C) $\Delta V_F/\Delta T_J$	Thermal Resistance Junction to Slug (◦ C/W)
White	5.6	7.0	8.6	1.0	-4.0	6
Warm White	5.6	7.0	8.6	1.0	-4.0	6

Optical Characteristics at 1000mA, T_J = 25 ◦ C

Radiation Pattern	Color	Dominant Wavelength λ_D, or Color Temperature CCT Min.	Typ.	Max.	Spectral Half-width (nm) $\Delta\lambda_{1/2}$	Temperature Coefficient Of Dominant Wavelength (nm/ ◦ C) $\Delta\lambda_D/\Delta T_J$	Total Included Angle (degrees) $\theta_{0.90V}$	Viewing Angle (degrees) $2\theta_{1/2}$
Lambertian	White	4100K	5500K	10000K	---	---	140	90
	Warm White	2700K	3300K	4100K	---	---	140	90

- BIT maintains are tolerance of ± 1nm for dominant wavelength measurements.
- BIT maintains are tolerance of ± 5% for CCT measurements.

Absolute Maximum Ratings

Parameter	White/Warm White/ Green/Blue/Amber/Red
DC Forward Current (mA)	1000
Peak Pulsed Forward Current (mA)	1500
Average Forward Current (mA)	1000
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	±4000V (Class III)
LED Junction Temperature (◦ C)	145
Aluminum-core PCB Temperature (◦ C)	105
Storage & Operating Temperature (◦ C)	-40 to +105
Soldering Temperature (◦ C)	235 ◦ C

Photometric Luminous Flux Bin Structure

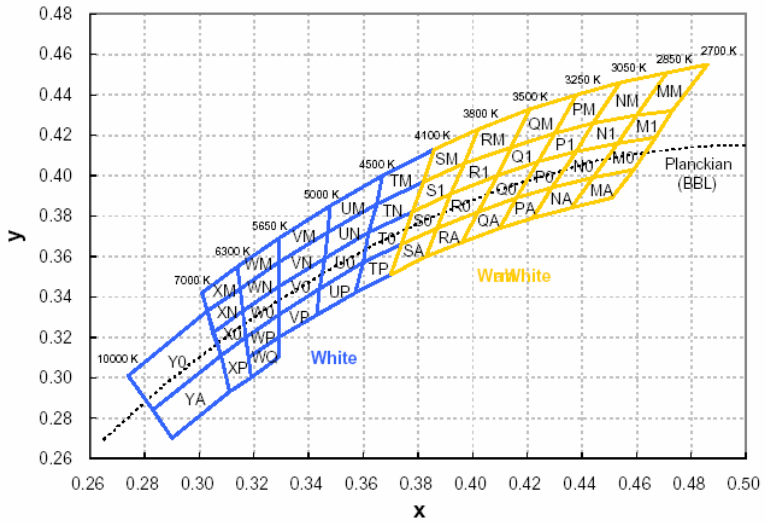
Color	Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)
White	V1	147.7	168.4
	V2	168.4	187.6
	W1	187.6	200
	W2	200	228
Warm White	U2	130	147.7
	V1	147.7	168.4
	V2	168.4	187.6
	W1	187.6	200

*When CCT is less than 3050K, W1 bin s not available.

- BIT maintains are tolerance of ± 10% on flux and power measurements.
- The flux bin of the product may be modified for improvement without notice.
-

Color Bin

White and Warm White Binning Structure Graphical Representation



- BIT maintains a tolerance of ± 1nm for dominant wavelength measurements.

Note: Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all colors.

Color Bins

White Bin Structure

Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
T0	0.378 0.374 0.360 0.362	0.382 0.366 0.357 0.372	4300	W0	0.329 0.329 0.317 0.316	0.345 0.331 0.320 0.333	5970
TN	0.382 0.378 0.362 0.365	0.397 0.382 0.372 0.386	4300	WN	0.329 0.316 0.315 0.329	0.345 0.333 0.344 0.357	5970
TP	0.374 0.370 0.357 0.360	0.366 0.351 0.342 0.357	4300	WP	0.329 0.329 0.318 0.317	0.331 0.320 0.310 0.320	5970
TM	0.386 0.382 0.365 0.367	0.413 0.397 0.386 0.400	4300	WQ	0.329 0.329 0.319 0.318	0.320 0.310 0.300 0.310	5970
U0	0.362 0.360 0.344 0.346	0.372 0.357 0.344 0.359	4750	WM	0.329 0.329 0.315 0.314	0.369 0.357 0.344 0.355	5970
UN	0.365 0.362 0.346 0.347	0.386 0.372 0.359 0.372	4750	X0	0.308 0.305 0.316 0.317	0.311 0.322 0.333 0.320	6650
UP	0.360 0.357 0.343 0.344	0.357 0.342 0.331 0.344	4750	XN	0.305 0.303 0.315 0.316	0.322 0.333 0.344 0.333	6650
UM	0.365 0.367 0.348 0.347	0.386 0.400 0.385 0.372	4750	XP	0.308 0.317 0.319 0.311	0.311 0.320 0.300 0.293	6650
V0	0.329 0.329 0.346 0.344	0.331 0.345 0.359 0.344	5320	XM	0.301 0.314 0.315 0.303	0.342 0.355 0.344 0.333	6650
VN	0.329 0.329 0.347 0.346	0.345 0.357 0.372 0.359	5320	Y0	0.308 0.283 0.274 0.303	0.311 0.284 0.301 0.333	8000
VP	0.329 0.344 0.343 0.329	0.331 0.344 0.331 0.320	5320	YA	0.308 0.311 0.290 0.283	0.311 0.293 0.270 0.284	8000
VM	0.329 0.329 0.348 0.347	0.357 0.369 0.385 0.372	5320				

- Tolerance on each color bin (x , y) is ± 0.01

Note: Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins available in all colors.

Color Bins

Warm White Bin Structure

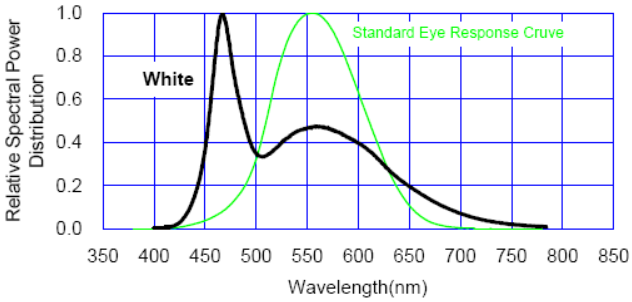
Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
M0	0.453	0.416	2770	Q0	0.409	0.400	3370
	0.444	0.399			0.402	0.382	
	0.459	0.403			0.416	0.389	
	0.467	0.419			0.424	0.407	
M1	0.460	0.430	2770	Q1	0.414	0.414	3370
	0.453	0.416			0.409	0.400	
	0.467	0.419			0.424	0.407	
	0.473	0.432			0.430	0.421	
MA	0.459	0.403	2770	QA	0.416	0.389	3370
	0.444	0.399			0.402	0.382	
	0.436	0.384			0.396	0.367	
	0.451	0.389			0.410	0.374	
MM	0.471	0.451	2770	QM	0.421	0.433	3370
	0.460	0.430			0.414	0.414	
	0.473	0.432			0.430	0.421	
	0.486	0.455			0.438	0.440	
N0	0.438	0.412	2950	R0	0.392	0.391	3650
	0.429	0.394			0.387	0.374	
	0.444	0.399			0.402	0.382	
	0.453	0.416			0.409	0.400	
N1	0.444	0.426	2950	R1	0.414	0.414	3650
	0.438	0.412			0.409	0.400	
	0.453	0.416			0.392	0.391	
	0.460	0.430			0.397	0.406	
NA	0.444	0.399	2950	RA	0.387	0.374	3650
	0.429	0.394			0.383	0.360	
	0.422	0.379			0.396	0.367	
	0.436	0.384			0.402	0.382	
NM	0.454	0.446	2950	RM	0.421	0.433	3650
	0.444	0.426			0.414	0.414	
	0.460	0.430			0.397	0.406	
	0.471	0.451			0.402	0.423	
P0	0.424	0.407	3150	S0	0.392	0.391	3950
	0.416	0.389			0.387	0.374	
	0.429	0.394			0.374	0.366	
	0.438	0.412			0.378	0.382	
P1	0.430	0.421	3150	S1	0.397	0.406	3950
	0.424	0.407			0.392	0.391	
	0.438	0.412			0.378	0.382	
	0.444	0.426			0.382	0.397	
PA	0.429	0.394	3150	SA	0.387	0.374	3950
	0.416	0.389			0.383	0.360	
	0.410	0.374			0.370	0.351	
	0.422	0.379			0.374	0.366	
PM	0.438	0.440	3150	SM	0.402	0.423	3950
	0.430	0.421			0.397	0.406	
	0.444	0.426			0.382	0.397	
	0.454	0.446			0.386	0.413	

- Tolerance on each color bin (x , y) is ± 0.01

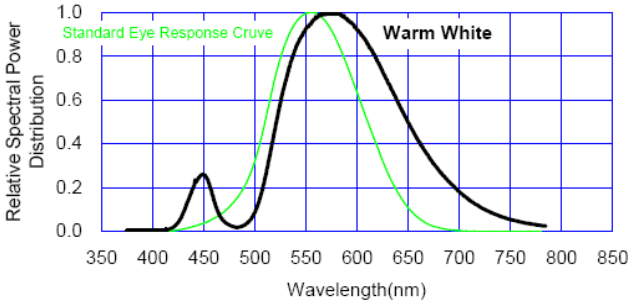
Note: Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins available in all colors.

Color Spectrum, T_J = 25 ◦ C

1. White

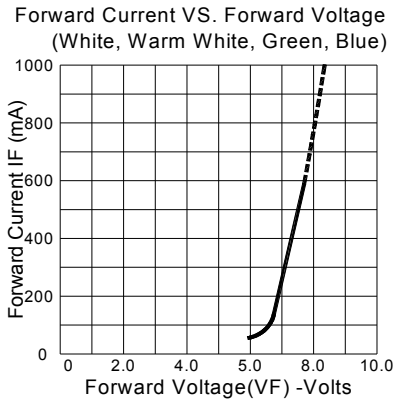


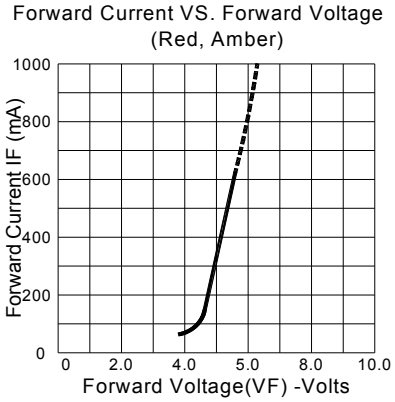
2. Warm White



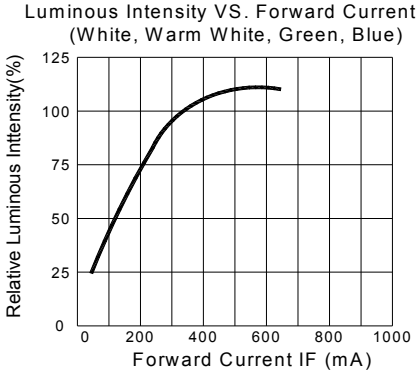
Forward Current vs. Forward Current, T_J = 25 ◦ C

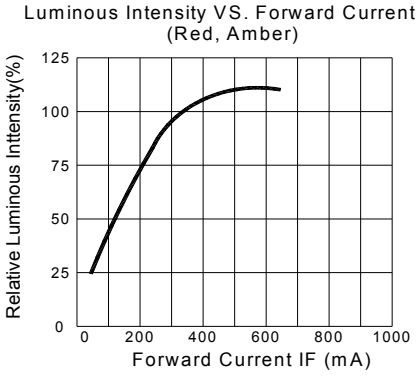
1. Forward Voltage vs. Forward Current



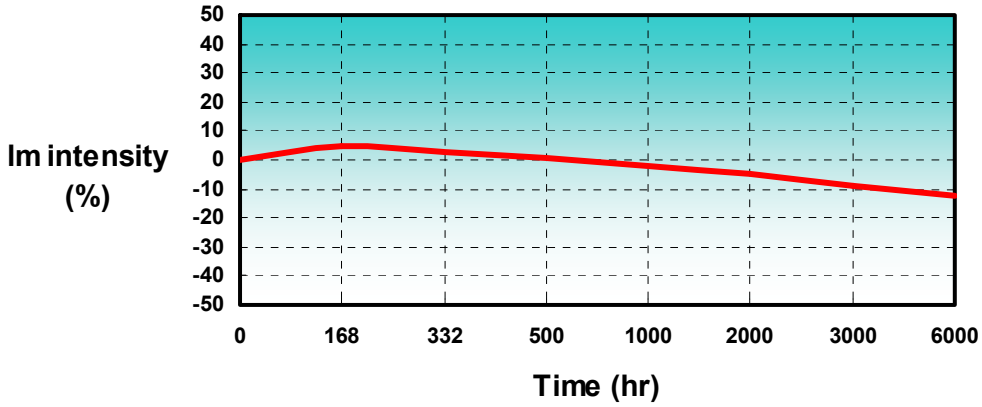


2. Forward Current vs. Normalized Relative Luminous Inttensity



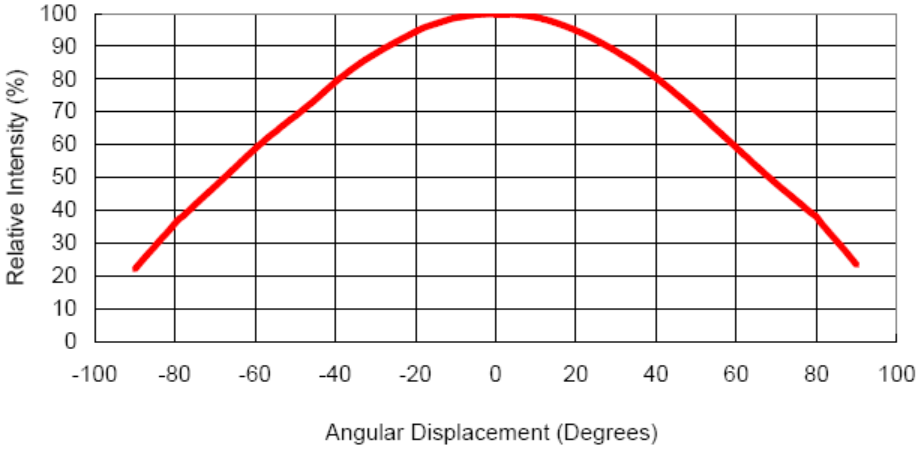


Life Intensity

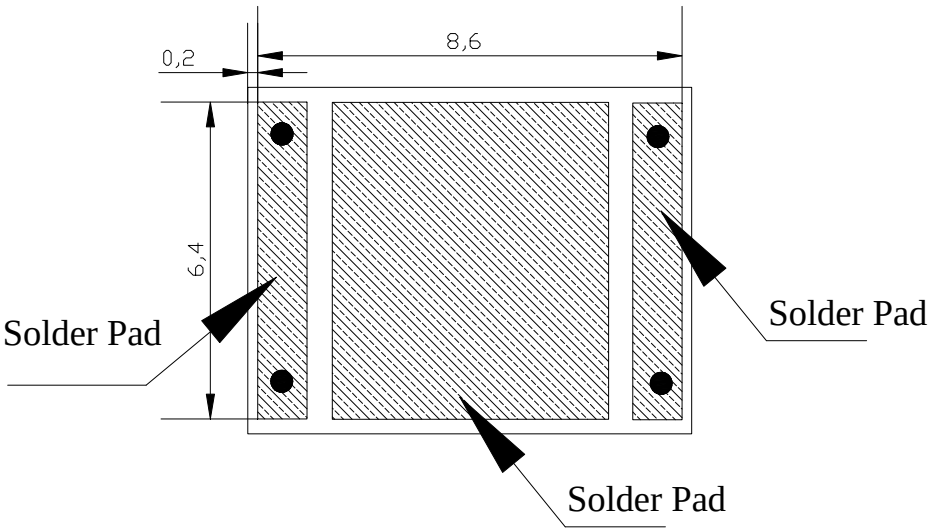


Typical Representative Spatial Radiation Pattern

Lambertian Radiation Pattern



Recommended Solder Pad Design



Qualification Reliability Testing

Stress Test	Stress Condition	Stress Duration	Failure Criteria
Room Temperature Operating Life (RTOL)	25 ◦ C, I_F = max DC (Note 1)	1000 hours	Note 2
Wet High Temperature Operating Life (WHTOL)	85 ◦ C/60%RH, I_F = max DC (Note 1)	1000 hours	Note 2
Wet High Temperature Storage Life (WHTSL)	85 ◦ C/85%RH, non-operating	1000 hours	Note 2
High Temperature Storage Life (HTSL)	110 ◦ C, non-operating	1000 hours	Note 2
Low Temperature Storage Life (LTSL)	-40 ◦ C, non-operating	1000 hours	Note 2
Non-operating Temperature Cycle (TMCL)	-40 ◦ C TO 120 ◦ C, 30min. dwell, <5 min. transfer	200 cycle	Note 2
Non-operating Thermal Shock (TMSK)	-40 ◦ C TO 120 ◦ C, 20min.dwell, <20 sec.. transfer	200 cycle	Note 2
Mechanical Shock	1500 G, 0.5 msec. pulse, 5 shocks each 6 axis		Note 3
Natural Drop	On concrete from 1.2m, 3X		Note 3
Variable Vibration Frequency	10-2000-10 Hz, log or liner sweep rate, 20 G about 1 min., 1.5mm, 3X/asis		Note 3
Solder Heat Resistance (SHR)	260 ◦ C ± 5 ◦ C, 10sec		Note3
Solder ability	Steam age for 16hrs., then solder dip at 260 ◦ C for 5 sec.		Solder coverage on lead

Note:
1. **Depending on the maximum derating curve.**
2. **Criteria for judging failure.**

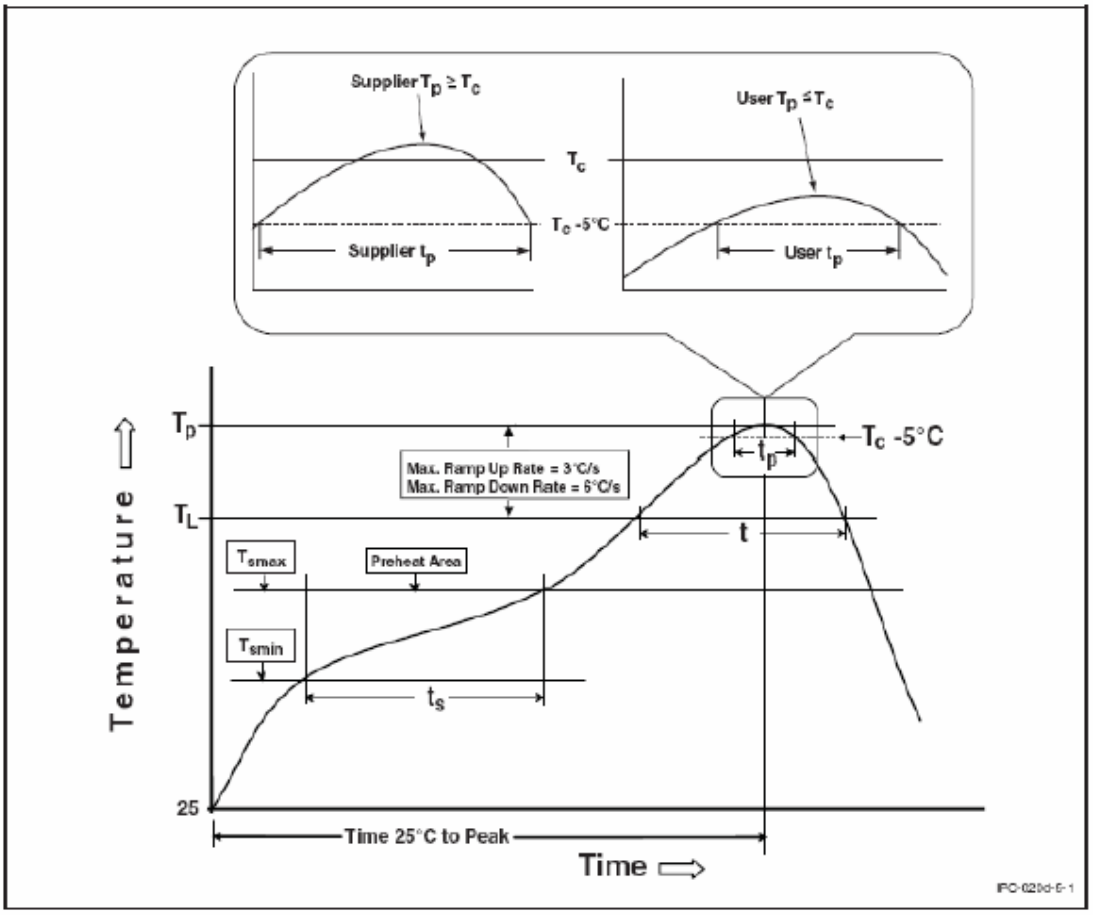
3.A failure is an LED that open or shorted.

Item	Test Condition	Criteria for Judgement	
		Min.	Max.
Forward Voltage (V_F)	I_F = max DC	-	Initial Level x 1.1
Luminous Flux or Radiometric Power (Φ_V)	I_F = max DC	Initial Level x 0.7	-
Reverse Current (I_R)	V_R = 5V	-	50μA

*** The test is performed after the LED is cooled down to the room temperature.**

Reflow Soldering Condition

Profile Feature	Sn-Pb Eutectic Assembly	Low-Temp. & Pb-Free Assembly (58Bi-42Sn Eutectic Alloy)
Preheat & Soak Temperature Min (T_{Smin}) Temperature Max (T_{Smax}) Time (T_{Smin} to T_{Smax})	 100 ◦ C 150 ◦ C 60-120 seconds	 90 ◦ C 120 ◦ C 60-120 seconds
Average Ramp-Up Rate (T_{Smax} to T_P)	3 ◦ C / second max.	2 ◦ C / second max.
Liquidous temperature (T_L)	183 ◦ C	138 ◦ C
Time at liquidous (t_L)	60-150 seconds	20-50 seconds
Peak package body temperature (T_P)	235 ◦ C	185 ◦ C
Time (t_p) within 5 ◦ C of the specified classification temperature (T_C)	20 seconds	20 seconds
Average ramp-down Rate (T_P to T_{smax})	6 ◦ C/seconds max.	3 ◦ C/seconds max.
Time 25 ◦ C to Peak Temperature	6 minutes max.	4 minutes max.



- **All temperature refer to topside of the package, measured on the package body surface.**
- **Repairing should not be done after the LEDs have been soldered. When repairing is unavoidable, a heat plate should be used. It should be confirmed beforehand whether the characteristics of LEDs will or will not be damaged by repairing.**
- **Reflow soldering should not done more than two times.**
- **When soldering, do not put stress on the LEDs during heating.**
- **After soldering, do not warp the circuit board.**

Handling of Silicone Resin LEDs

Handling Indications

During processing, mechanical stress on the surface should be minimized as much as possible.
Sharp objects of all types should not be to pierce the sealing compound.

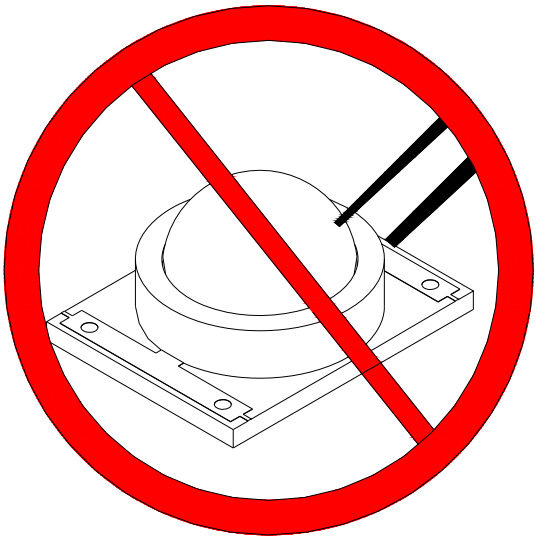


Figure 1.

In general, LEDs should only be handled from the side. By the way, this also applies to LEDs without a silicone sealant, since surface can also become scratched.

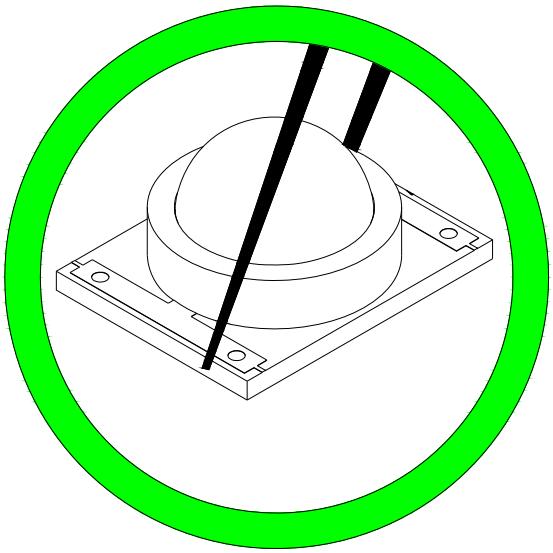


Figure 2.

When populating boards in SMT production, there are basically no restrictions regarding the from of the pick and place nozzle, except that mechanical pressure on the surface of the resin must be prevented.
This is assured by choosing a pick and place nozzle which is large than LEDs reflector area.