LIGHT LED
M09 CoB Product Series

1. Description

The LiteON CoB Product series is a revolutionary, energy efficient and ultra-compact new light source, combining the lifetime and reliability advantages of Light Emitting Diodes with the brightness of conventional lighting. It gives you total design freedom and unmatched brightness, creating a new opportunities for solid state lighting to displace conventional lighting technologies.

1.1 Features

- Compact high flux density light source
- Uniform high quality illumination
- Streamlined thermal path
- MacAdam compliant binning structure
  More energy efficient than incandescent, halogen and fluorescent lamps
- Instant light with unlimited dimming
- RoHS compliant and Pb free

1.2 Benefits Features

- Enhanced optical control
- Clean white light without pixilation
- Uniform consistent white light
- Significantly reduced thermal resistance and increased operating temperatures
- Lower operating costs
- Reduced maintenance costs
- ESD rating is 8KV in HBM

1.3 Naming Rule

L	T	PL	-	M	0	9	8	X	X	X	S	X	X	-	T	0
		Code1		Code2			Code3	Code4		Code5		Code6			Code7	

Code 1: Product Line
PL: High Power LED.

Code 2: Package Type/Platform
M09: Ceramic substrate with 18x18mm square.

Code 3: Light Emitting Surface
8: 12.6mm excluding dam

Code 4: Product Series
30: 30 Series

Code5: CRI
Z: White Color Rendering Index 80 min
Q: White Color Rendering Index 90 min

Code6: Color Temperature
30: 3000K at 85degC
40: 4000K at 85degC
50: 5000K at 85degC
Note: The Color Temperature follow ANSI C78.377A Doc.

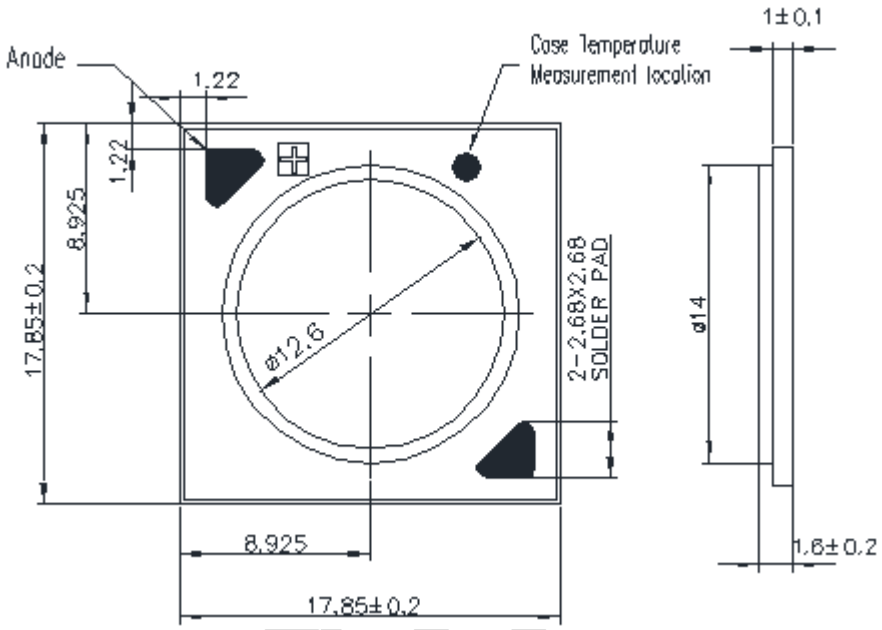
Code7: Hue Bin by MacAdam Ellipses Step
T0: MacAdam Ellipse / ANSI BIN

1.4 Product List

Part Number	Product Series	CCT	CRI	Color Bin			Lumen Bin	
				3SDCM	5SDCM	ANSI	-8%~+8%	-15%~+15%
LTPL-M09830ZS30-T0	30	3000K	80	☆	☆	☆	☆	☆
LTPL-M09830ZS40-T0	30	4000K	80	☆	☆	☆	☆	☆
LTPL-M09830ZS50-F1	30	5000K	80		☆	☆		☆
LTPL-M09830QS30-T0	30	3000K	90	☆	☆	☆	☆	☆

2. Outline Dimensions

2.1 Form Factor of M098 series CoB

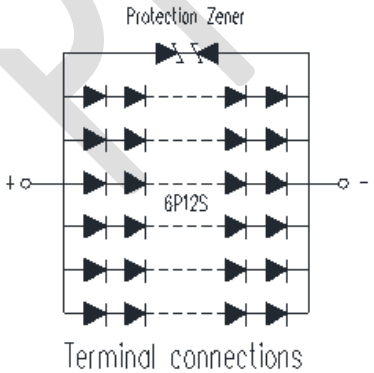


Notes

1. All dimensions are in millimeters.
2. Tolerance is ±0.3mm unless otherwise noted.
3. LED of equivalent circuit means all series/parallel in CoB package.

2.2 Internal Equivalent Circuit

30 Series Product

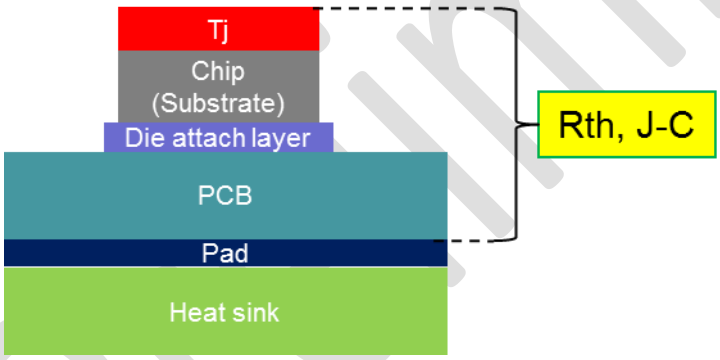


3. Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Product Series	Rating	Unit
Power Dissipation	P_O	30	49	W
Forward Current	I_F	30	1200	mA
Junction Temperature	T_j		125	°C
Thermal Resistance, Junction-Case	$R_{th, J-C}$	30	0.76	°C/W
Operating Temperature Range	T_{opr}		-40 to 85	°C
Storage Temperature Range	T_{stg}		-40 to 100	°C
Breakdown Voltage(DC)	V_B		2.25	KV
Electrostatic Discharge	ESD		8	KV

Notes

1. The pulse mode condition is 1/10 duty cycle with 100 msec pulse width.
2. Forbid to be operated at reverse voltage condition.
3. ESD spec is reference to AEC-Q101-001 HBM.
4. The unit of Rth is °C/W electrical.
5. The M09 CoB is recommended soldering temperature under 350degC and could not over 3.5sec.



4. Electro-Optical Characteristics

4.1 Typical Performance

■ 30 Series Product, CRI>80

Dominant CCT	Product Series	Current (mA)	V_F (V) @25°C	Flux(lm) @25°C	V_F (V) @85°C	Flux(lm) @85°C	Eff.(lm/W) @25°C	Eff.(lm/W) @85°C
3000K	30	800	36.8	3971	35.5	3496	135	123
4000K	30	800	36.8	4209	35.5	3705	143	130
5000K	30	800	36.8	4248	35.5	3740	145	132

■ 30 Series Product, CRI>90

Dominant CCT	Product Series	Current (mA)	V_F (V) @25°C	Flux(lm) @25°C	V_F (V) @85°C	Flux(lm) @85°C	Eff.(lm/W) @25°C	Eff.(lm/W) @85°C
3000K	30	800	36.8	3256	35.5	2866	110	101

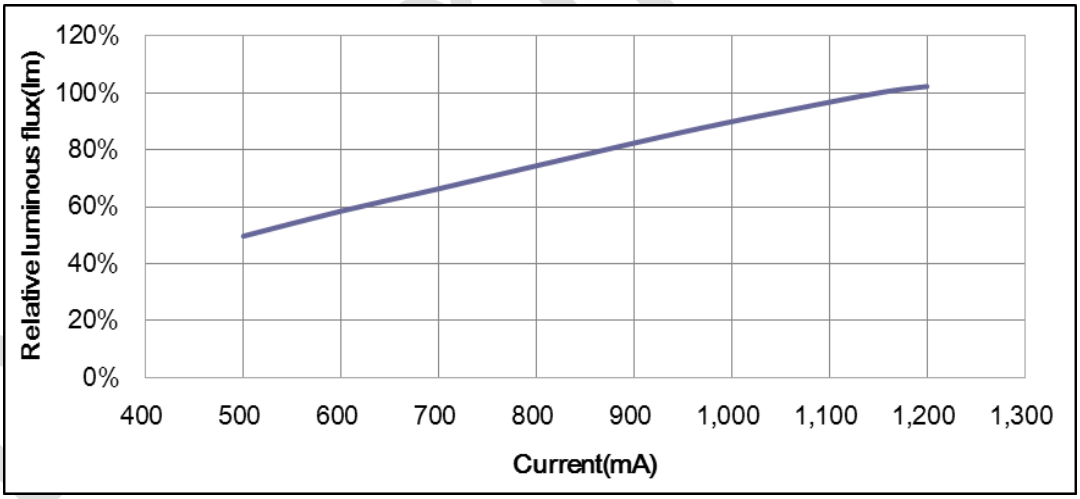
Notes

1. All of V_F value are typical, the real bin range please refer page 11 ” V_F Binning Parameter”.
2. All of flux value are typical, the real bin range please refer page 11 ”Flux Binning Parameter”.
3. Tolerance of flux is ±7%, tolerance of CCX/CCY is ±0.007, tolerance of CRI is ±2, and tolerance of V_F is ±3%.
4. Typical viewing angle is 120deg.

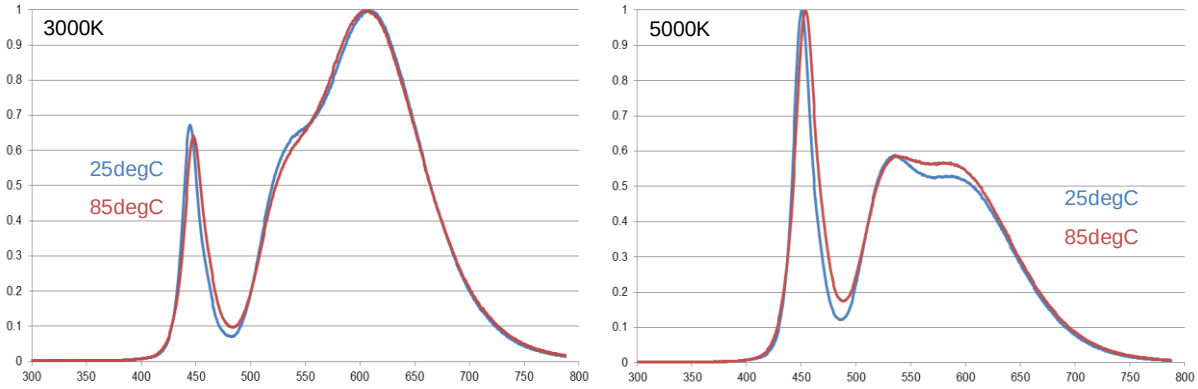
4.2 Forward Current vs. Lumen and Voltage

■ 30 Series Product

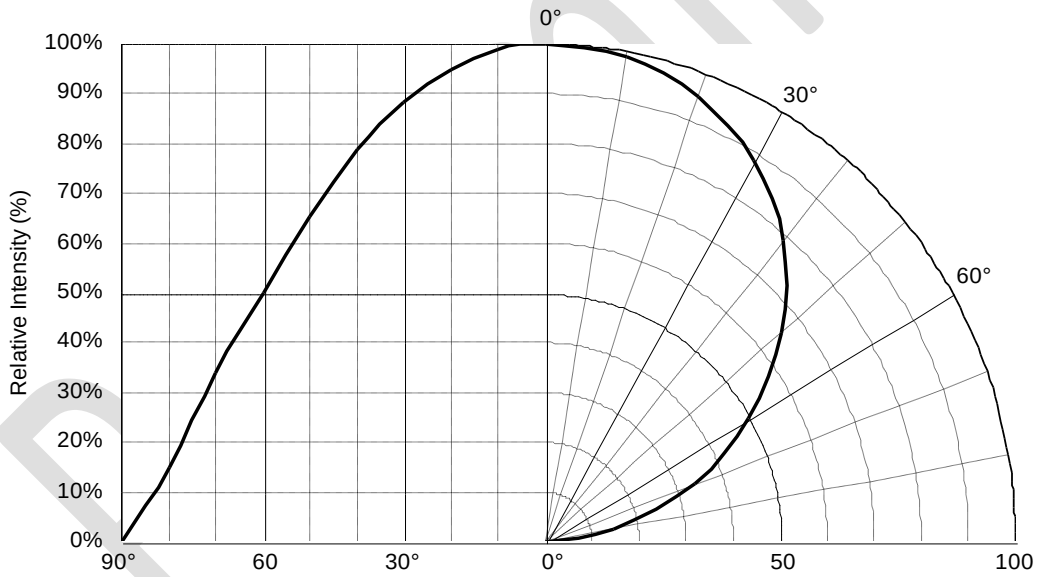
Current (mA)	V_F (V)	Flux (lm)			
		3000K	4000K	5000K	3000K
		CRI>80	CRI>80	CRI>80	CRI>90
500	34.5	2653	2812	2839	2175
600	35.3	3122	3309	3341	2560
700	35.9	3540	3752	3788	2903
800	36.7	3971	4209	4248	3256
900	37.6	4396	4660	4704	3605
1000	38.1	4798	5086	5134	3934
1100	38.8	5134	5442	5493	4210
1200	39.4	5458	5785	5840	4476



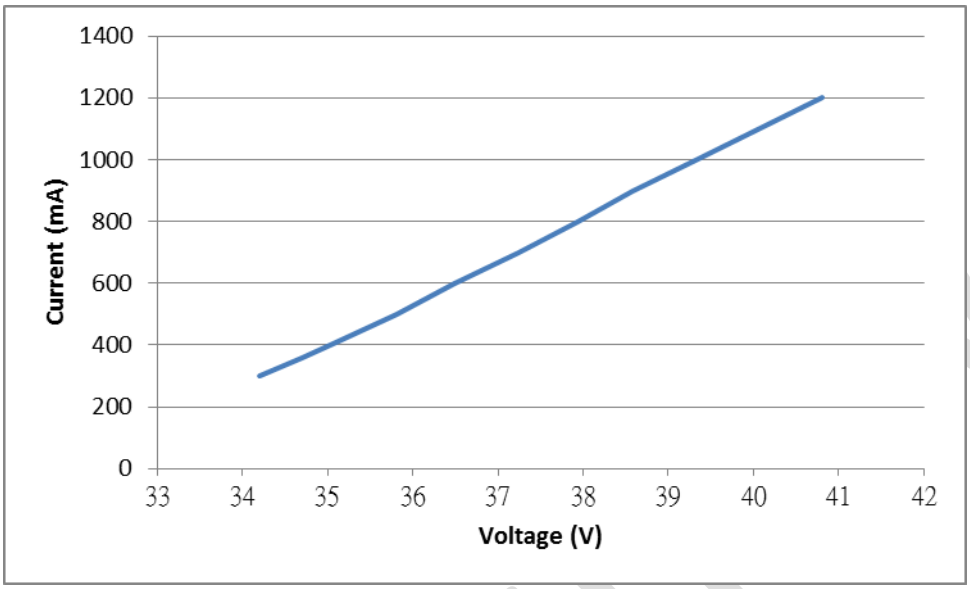
4.3 Relative Spectral Power Distribution at Typical Current



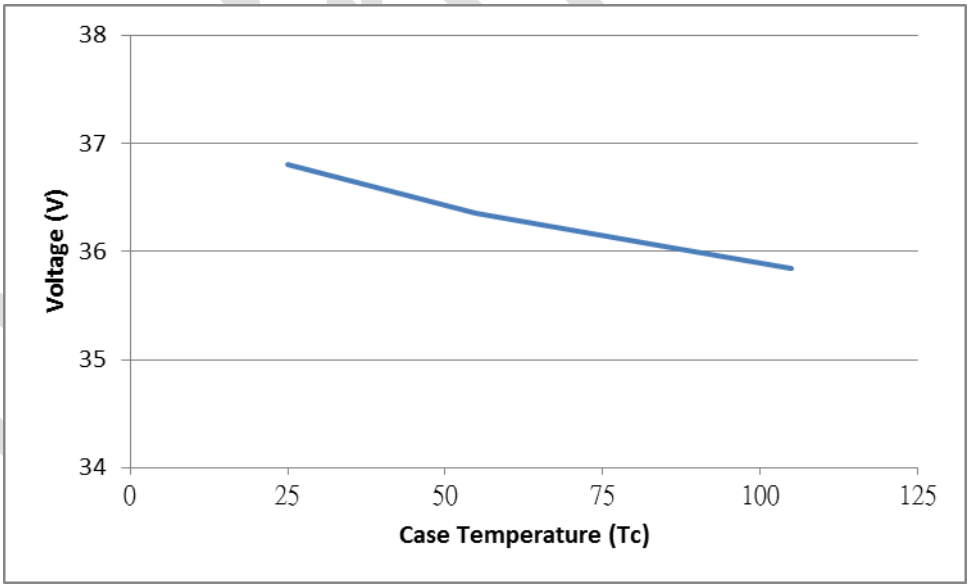
4.4 Radiation Characteristics



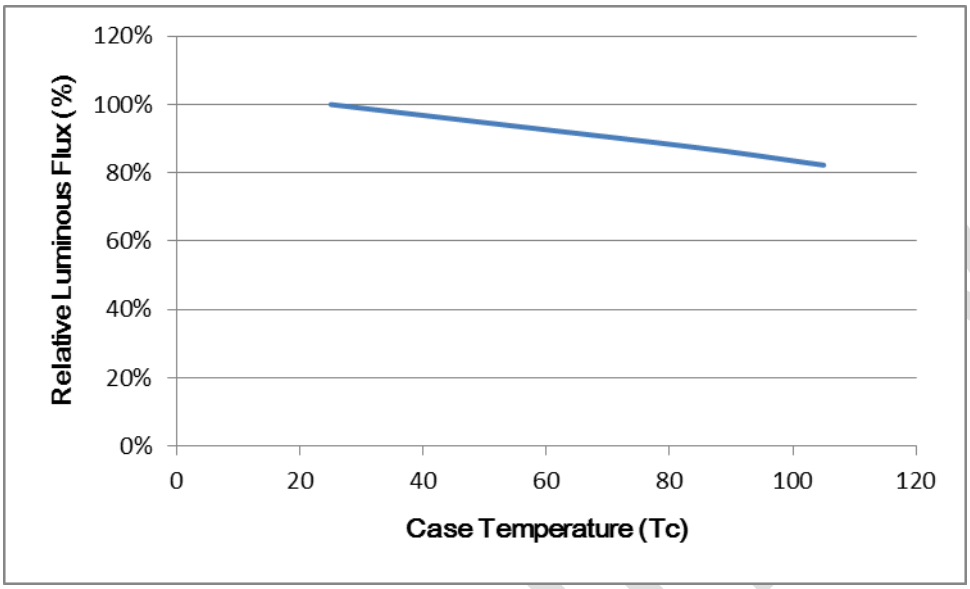
4.5 Forward Current vs. Forward Voltage



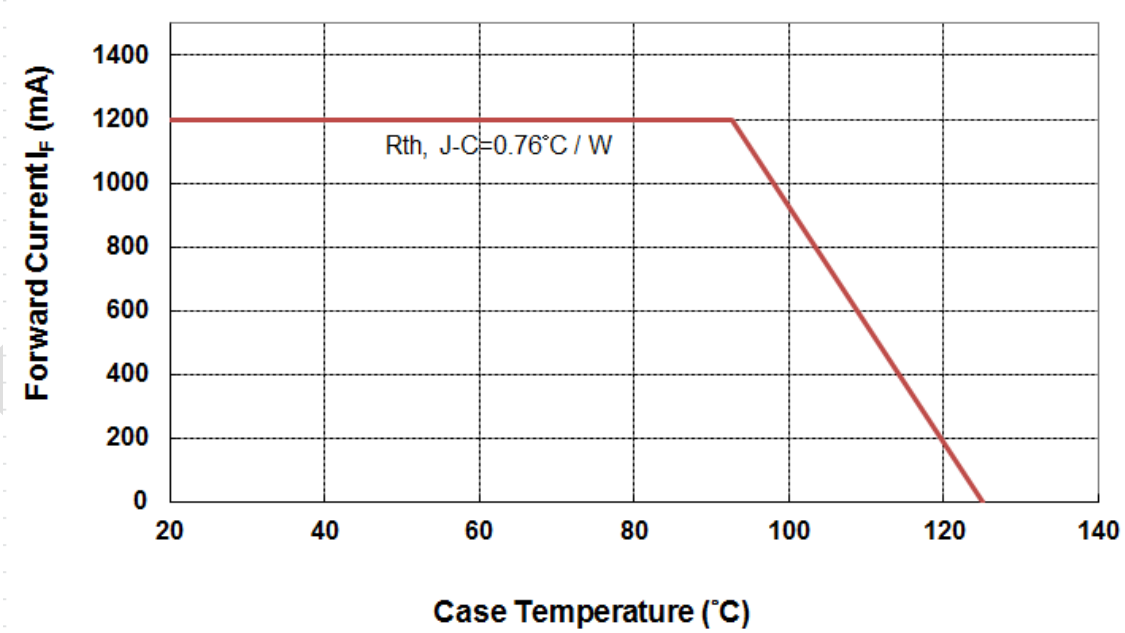
4.6 Forward Voltage vs. Case Temperature



4.7 Relative Intensity vs. Case Temperature



4.8 Forward Current Degrading Curve



5. CoB Binning Definition

■ Flux Binning Parameter (25degC)

Lumen **CODE** List of M09 Series Product			
Parameter	**Code**	**Unit**	**Lumen**
Luminous Flux	D	lm	2300
	E		2485
	F		2680
	G		2890
	H		3120
	I		3370
	J		3640
	K		3925
	L		4240
	M		4575
	N		4940
	O		5330
	P		5755
	Q		6210

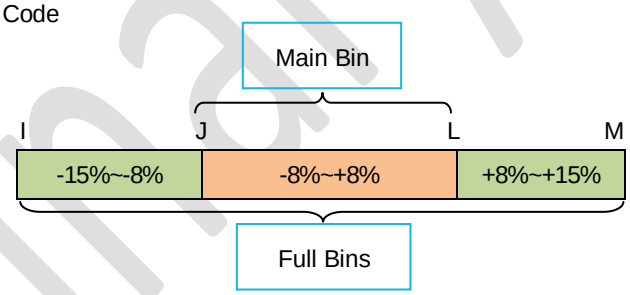
■ Example of M09 Series Product Bin (3000K 30 series)

Lumen (lm)	
30 Series @3000K	
Bin	**Range**
IJ	3370~3640
JL	3640~4240
LM	4240~4575

CCT

Lumen Range

Bin Code



■ Lumen Bin

Lumen (lm)							
3000K (CRI>80)		4000K (CRI>80)		5000K (CRI>80)		3000K (CRI>90)	
Bin	**Range**	**Bin**	**Range**	**Bin**	**Range**	**Bin**	**Range**
IJ	3370~3640	IJ	3370~3640	JK	3640~3925	FG	2680~2890
JL	3640~4240	JL	3640~4240	KM	3925~4575	GI	2890~3370
LM	4240~4575	LM	4240~4575	MN	4575~4940	IJ	3370~3640

■ Forward Voltage Binning Parameter (25decgC)

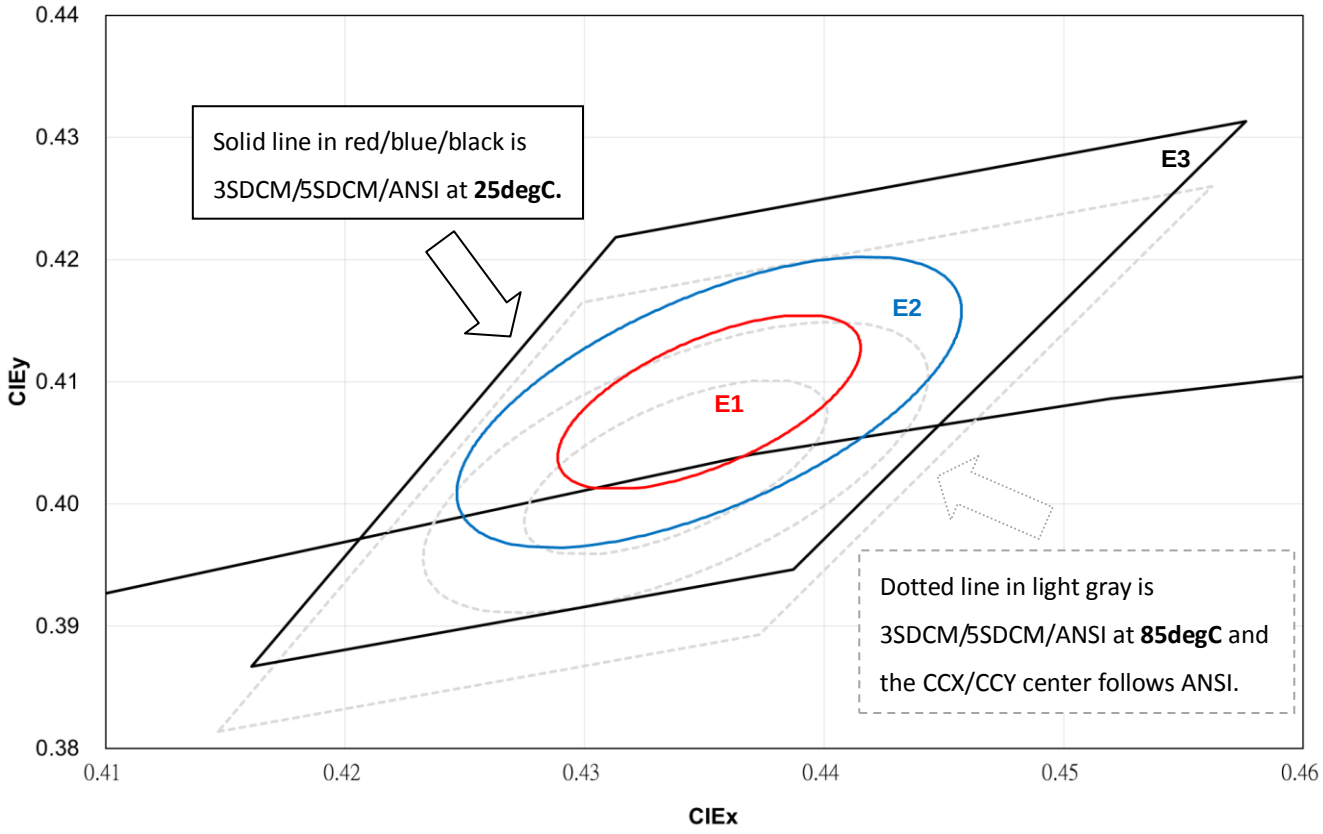
Parameter	Bin	Symbol	Min	Max	Unit	Condition
Forward Voltage	V1	V_F	33.6	42	V	I_F=Typical current

Note: Full Rank on Label

Example: V1/JL/E1

Forward Voltage Rank	Luminous Flux Rank	Color Rank
V1	JL	E1

■ Example of LiteOn CoB MacAdam Ellipse Color Definition (Ex: 3000K)



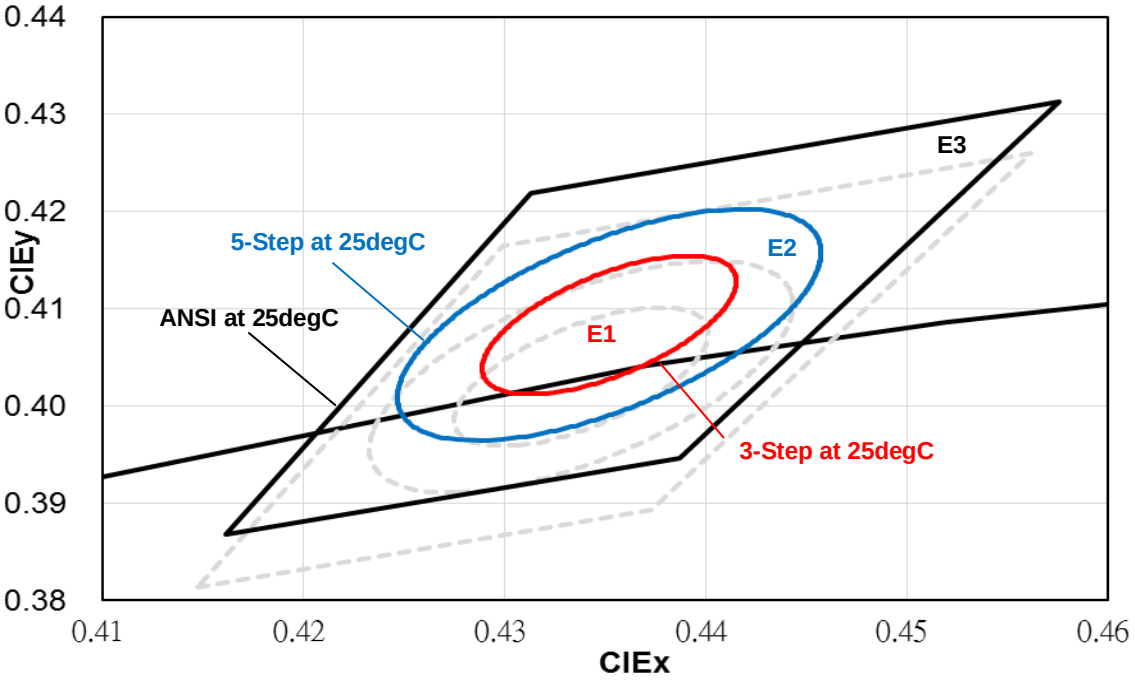
CIE Center Point						
CCT	25degC (LiteOn Spec.)		85degC (ANSI)		Hot/Cold Factor	
	CCX	CCY	CCX	CCY	CCX	CCY
3000	0.4392	0.4072	0.4338	0.4030	-0.0054	-0.0042
4000	0.3849	0.3856	0.3818	0.3797	-0.0031	-0.0059
5000	0.3486	0.3670	0.3447	0.3553	-0.0039	-0.0117

Notes

- LiteOn tester and shipping spec follow the color bin with 25degC CCX/CCY center.
- The Hot/Cold factor means the CCX/CCY shift from 25degC to 85degC.
- The Hot/Cold shift is measured by LiteOn CAS 140B instrument system.
- The ellipse equation expression: $SDCM = (g11*(x-x_0)^2 + 2*g12*(x-x_0)*(y-y_0) + g22*(y-y_0)^2)^{0.5}$

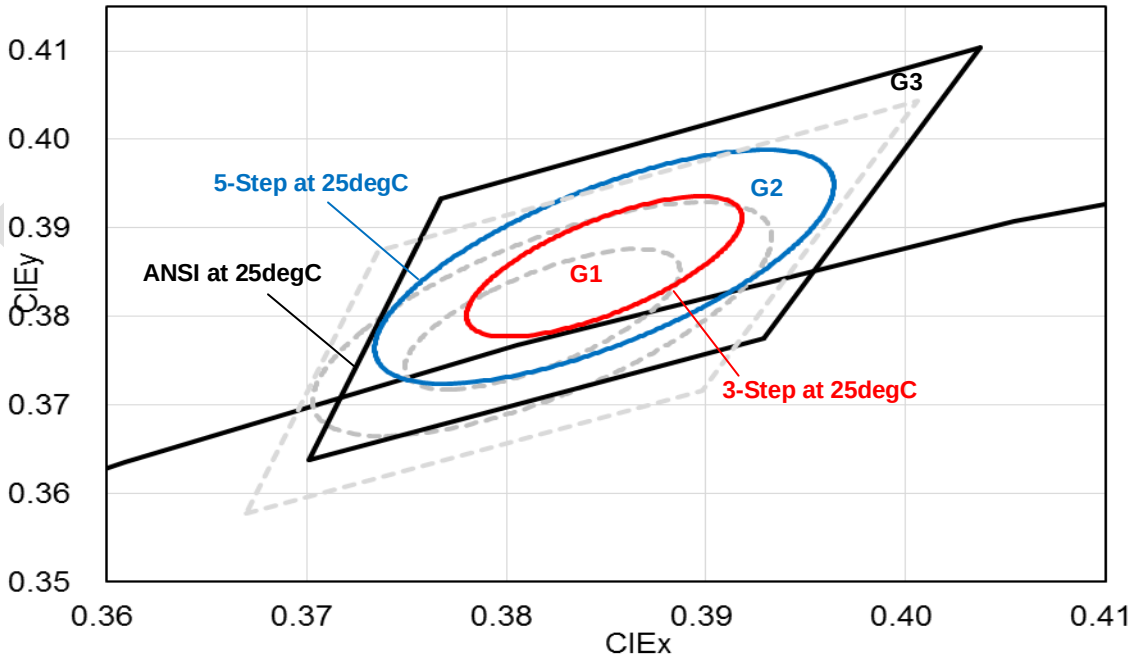
■ M09 CRI80、CRI90 3000K

PN: LTPL-M098xxxS30-T0



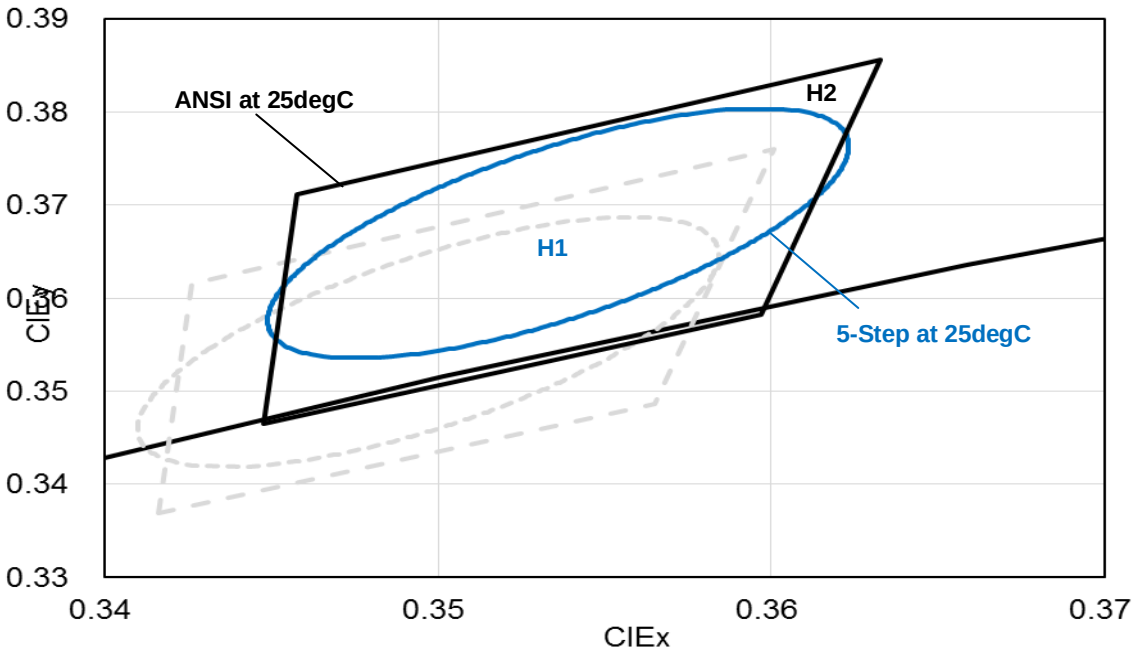
■ M09 CRI80 4000K

PN: LTPL-M098xxZS40-T0



M09 CRI80 5000K

PN: LTPL-M098xxZS50-F1



6. Reliability Test Plan

No	Test item	Condition	Duration	Number of Failed	Result
1	High Temperature Operating Life	Tc=85°C, I_F =Typical Current	1K hours	0/10	Pass
2	Wet High Temperature Operating Life	60°C/90%RH, I_F =Typical Current(DC) 30 mins ON/OFF	1K hours	0/10	Pass
3	Thermal Shock	-40°C to 125°C, 15minutes dwell, <10 seconds transfer, measurement in every 250 cycles	500 cycles	0/10	Pass
4	Fast Switch Cycling Test	40000cycles, 2 mins On/Off, Room temperature(25˚C+/-5˚C), measurement in every 5000 cycles	40K cycles	0/10	Pass
5	High Temperature Storage Life	Ta=120°C	1K hours	0/10	Pass
6	Low Temperature Storage Life	Ta=-55°C	1K hours	0/10	Pass
7	Mechanical Shock	1500G, 0.5ms pulse, 5 shocks each 6 axis	30 Times (5 shocks each 6 axis)	0/10	Pass
8	Variable Vibration Frequency	10-2000-10 Hz, log or linear sweep rate, 20G for approximately minute 1.5mm, each applied three times per axis over 6 hrs.	18 hrs (3 times per axis over 6 hrs)	0/10	Pass

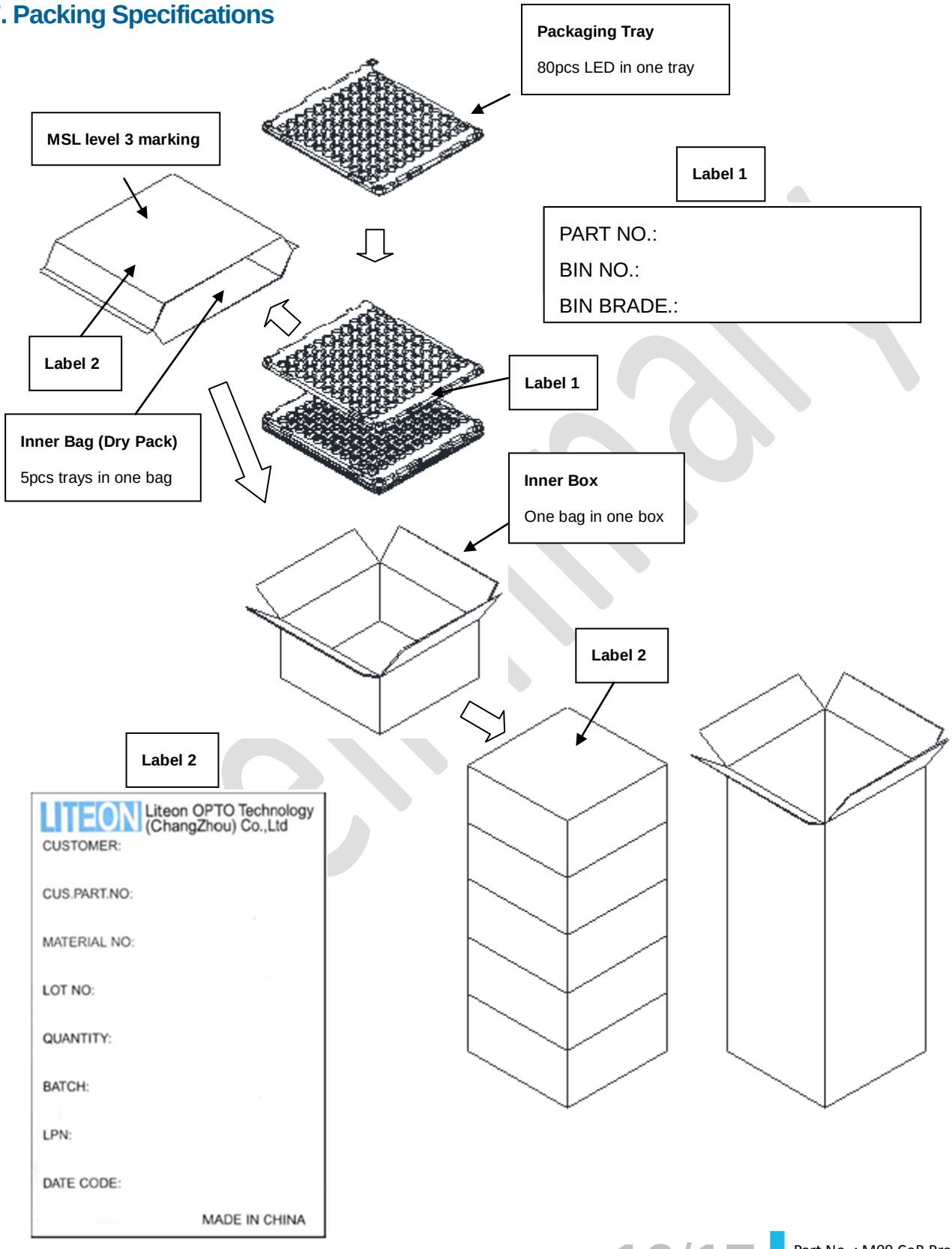
■ Criteria for Judging the Damage

Item	Symbol	Test Condition	Criteria for Judgment	
			Min.	Max.
Forward Voltage	V_F	I_F =Typical Current		U.S.L. x 1.1
Luminous Flux	Lm	I_F =Typical Current	L.S.L. x 0.7	
CCX & CCY	X,Y	I_F =Typical Current		Shift<0.02

Notes

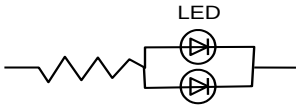
1. Operating life tests are mounted on thermal heat sink
2. Storage items are only component, not put on heat sink.

7. Packing Specifications



8. Cautions

7.1 An LED is a current-operated device. In order to ensure intensity uniformity on multiple LEDs connected in parallel in an application, it is recommended that a current limiting resistor be incorporated in the drive circuit, in series with each LED as shown in circuit below.



(A) Recommended circuit.

(B) The brightness of each LED might appear different due to the differences in the I-V characteristics of those LEDs.

7.2 Do not put any pressure on the light emitting surface either by finger or any hand tool and do not stack the COB products. Stress or pressure may cause damage to the wires of the LED array.

7.3 This product is not designed for the use under any of the following conditions, please confirm the performance and reliability are well enough if you use it under any of the following conditions

・Do not use sulfur-containing materials in commercial products including the materials such as seals and adhesives that may contain sulfur.

・Do not put this product in a place with a lot of moisture (over 85% relative humidity), dew condensation, briny air, and corrosive gas (Cl, H2S, NH3, SO2, NOX, etc.), exposure to a corrosive environment may affect silver plating.

ESD (Electrostatic Discharge)

Static Electricity or power surge will damage the LED. Suggestions to prevent ESD damage:

- Use of a conductive wrist band or anti-electrostatic glove when handling these LEDs.
- All devices, equipment, and machinery must be properly grounded.
- Work tables, storage racks, etc. should be properly grounded.
- Use ion blower to neutralize the static charge which might have built up on surface of the LED's plastic lens as a result of friction between LEDs during storage and handling.

ESD-damaged LEDs will exhibit abnormal characteristics such as high reverse leakage current, low forward voltage, or "no light up" at low currents.

To verify for ESD damage, check for "light up" and V_F of the suspect LEDs at low currents.