

APPROVAL SHEET

MODEL NAME SMD LED, TOP VIEW

PART NUMBER A0A1CEBHANP7

CUSTOMER NAME

DATE 2012. 04. 10

[CUSTOMER APPROVAL]

APPROVAL NO.		
APPROVAL DATE		
APPROVAL	CHECK	APPROVAL
	/	/

[LUMENS APPROVAL]

ISSUED DEPT. APPR'D (R&D)	ISSUE	REVIEW	REVIEW	APPR'D
	2012. .	2012. .	2012. .	2012. .
DEPT. APPR'D	R&D	SALES	MANUFACTURE	QA/QC
	2012. .	2012. .	2012. .	2012. .

Lumens semiconductor lighting CO., LTD.

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: 1 of 20

Revision note

[illegible]

DATA SHEET

MODEL NAME	SMD LED
PART NUMBER	A0A1CEBHANP6
PACKAGE	PLCC 2 type
COLOR	White (InGaN)

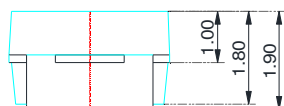
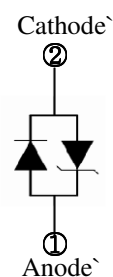
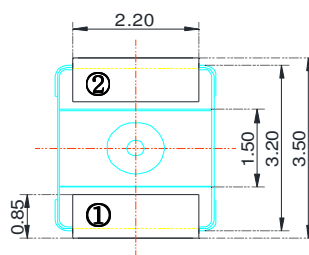
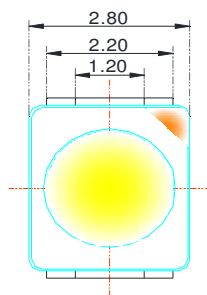
- Application
 - Display module lighting
 - Automotive backlighting
 - Traffic lighting
 - Maker lighting
 - Signal & symbol luminaire

Dimension

Type : 3528 PLCC 2

Unit : mm

- High brightness white-color surface mount LED.
 - 120° viewing angle.
 - Small package outline (LxWxH) of 3.5 x 2.8 x 1.9 mm.
 - Qualified according to JEDEC moisture sensitivity Level 2.
 - Compatible to both IR reflow soldering and TTV soldering.
 - Unit : mm
- General Tolerance : ± 0.10



Material

	Material
LED Chip	InGaN Base
Wire	Au Gold wire 1.2mil.
Lead-frame.	Cu Alloy With Ag Plating.
Encapsulation	Silicone
Package Polymer	PPA

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Absolute Maximum Ratings.

Parameters	Symbol	Maximum Value White	Unit	Test condition
DC forward current	IF	30	mA	
Pulse current; (tp ≤ 10 ms, Duty cycle = 1/10)	IFP	100	mA	
Power dissipation (at room temperature)	PDL	120	mW	
Reverse voltage.	VR	1.2	V	
	IR	5	mA	
Operating temperature.	TOPR	-40 ~ +100	°C	
Storage temperature.	TSTG	-40 ~ +100	°C	
Soldering Temperature	TSOL	Reflow Soldering :260°C /10s Hand Soldering : 350°C /3s	°C	
Chip junction temperature.	Tj	125	°C	

*I_{FP} Conditions : Pulse Width ≤10msec, and duty ≤1/10

Thermal Characteristics

(Ta=25°C)

Item	Symbol	Typical	Unit
Heat resistance	Rjs	55	K/W
	Rja	91	K/W

*Rjs = Heat resistance from Junction to Slug temperature (Ts)

*Rja = Heat resistance from Junction to ambient temperature (Ta)

* Using Lumens standard circuit board Al-PCB(2.0x2.0mm), T=1.6mm (T3Ster)

Electrical & Optical Characteristics at Ta=25°C.

Item	Symbol	Chip	Min.	Typ.	Max.	Condition	Unit
Intensity	IV	A	2.0		2.2	IF=20 mA	cd
		B	2.2		2.4		
		C	2.4		2.6		
		D	2.6		2.8		
		E	2.8		3.0		
		F	3.0		3.2		
		G	3.2		3.4		
Forward Voltage	VF	1	2.9		3.1	IF=20 mA	V
		2	3.1		3.3		
		3	3.3		3.5		
		4	3.5		3.7		
Viewing Angle	2θ 1/2	ALL	---	120	---	IF=20mA	deg

1. Intensity is measured by **CAS-140** of Instrument System Co.

2. Intensity is measured with an accuracy of +0 ~7%.

3. Forward voltage, Vf is measured with an accuracy of ± 0.05 V

Rank of full color LED

Luminous Intensity Rank

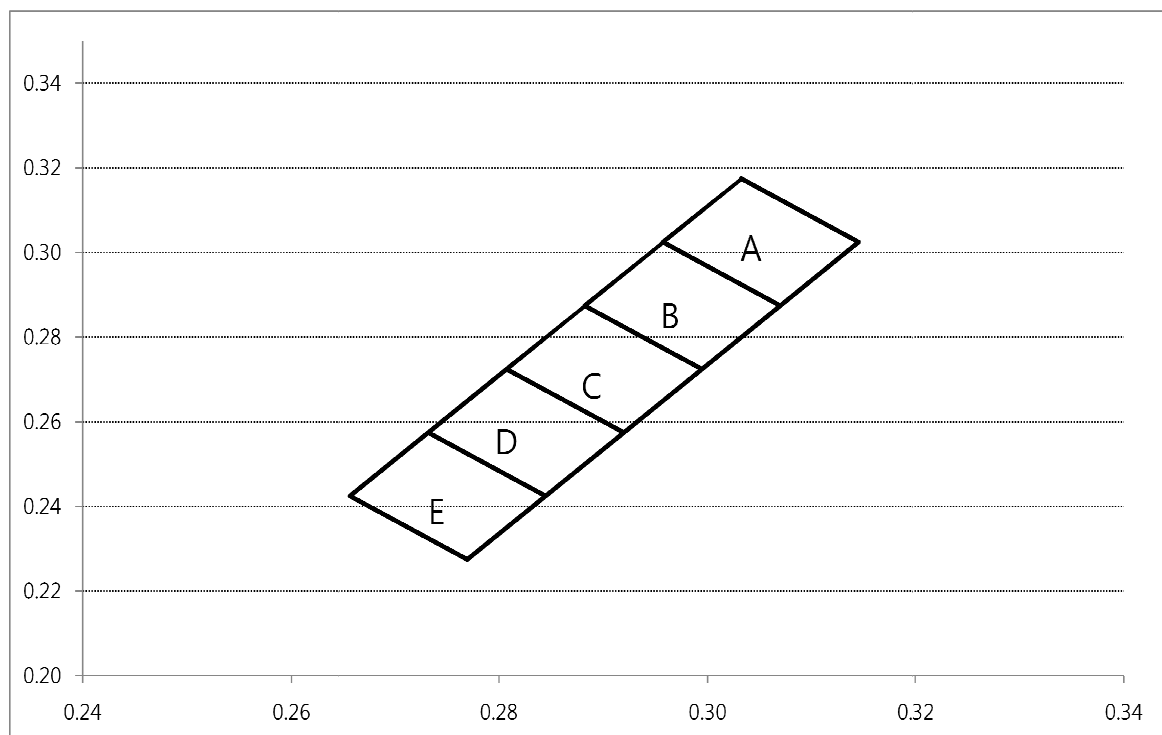
RANK	Unit	If = 20mA	
		MIN	MAX
A	cd	2.0	2.2
B		2.2	2.4
C		2.4	2.6
D		2.6	2.8
E		2.8	3.0
F		3.0	3.2
G		3.2	3.4

Forward Voltage Rank

RANK	Unit	If = 20mA	
		MIN	MAX
1	V	2.9	3.1
2		3.1	3.3
3		3.3	3.5
4		3.5	3.7

*Voltages are tested at a current pulse duration of 1 ms and accuracy of 0.05V.

Cool / Pure white Chromaticity Groups Standard Chromaticity Groups plotted on excerpt from CIE 1931 (2°) x-y Chromaticity Diagram



Color Chromaticity Groups

RANK	CIE		RANK	CIE		RANK	CIE	
	x	y		x	y		x	y
A	0.3032	0.3175	B	0.2957	0.3025	C	0.2882	0.2875
	0.3145	0.3025		0.307	0.2875		0.2995	0.2725
	0.307	0.2875		0.2995	0.2725		0.292	0.2575
	0.2957	0.3025		0.2882	0.2875		0.2807	0.2725
	0.3032	0.3175		0.2957	0.3025		0.2882	0.2875
D	0.2807	0.2725	E	0.2732	0.2575			
	0.292	0.2575		0.2845	0.2425			
	0.2845	0.2425		0.277	0.2275			
	0.2732	0.2575		0.2657	0.2425			
	0.2807	0.2725		0.2807	0.2725			

If color binning is required, only one color group is allowed for each chip within a reel.

Chromaticity coordinate groups are measured with an accuracy of ± 0.005 .

IPOC/JEDEC Moisture Sensitivity LevelTable 2.5 **IPC/JEDEC J-STD MSL Classification**

Level	Floor Life		Soak Requirements			
			Standard		Accelerated	
	Time	Conditions	Time (hrs)	Conditions	Time (hrs)	Conditions
2	1 Year	$\leq 30^{\circ}\text{C}/$ 60% RH	168 +5/-0	$30^{\circ}\text{C}/$ 60% RH	n/a	n/a

Notes : The standard soak time is the sum of the default value of 24 hours for the semiconductor manufacturer's exposure time (MET) between bake and bag and the floor life of maximum time allowed out of the bag at the end user of distributor's facility

Wire pull force test data

Wire Diameter : 30um,

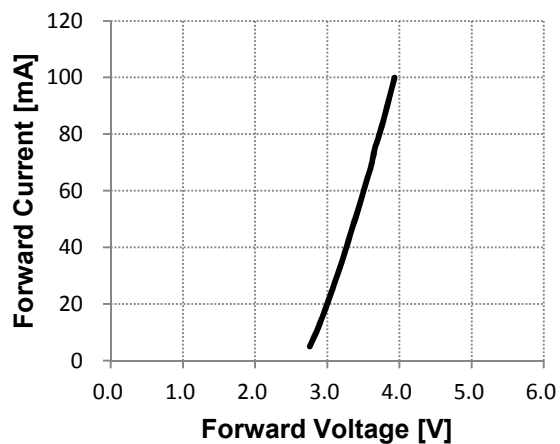
Spec : Min. 8gr

Wire Dia	30	30	30	30
D1	22.30	22.80	19.05	19.56
D2	19.84	19.84	21.16	20.48
D3	19.03	22.68	18.51	21.36
D4	19.44	18.57	21.40	19.65
D5	19.38	20.54	19.31	20.00

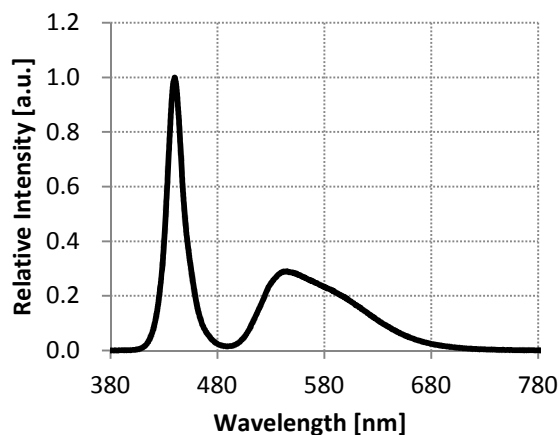
Average	20.245
Min	18.510
Max	22.800
Std Dev	1.408
CPK (LSL=8)	2.900

Optical and Electrical Characteristics @25°C

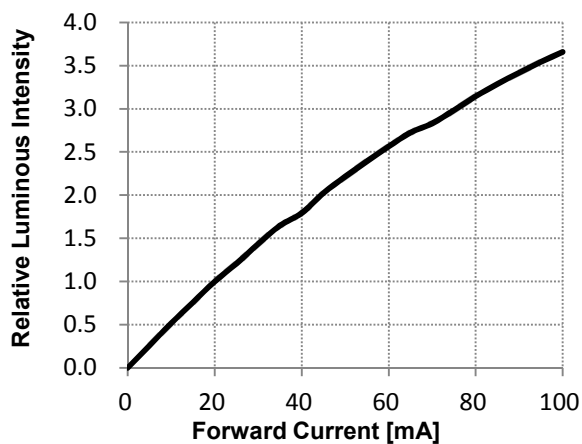
Forward Current vs Forward Voltage



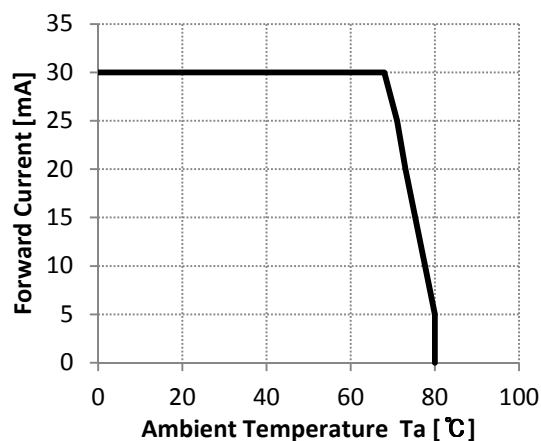
Relative Intensity vs. Wavelength



Relative Luminous Intensity vs. Forward Current

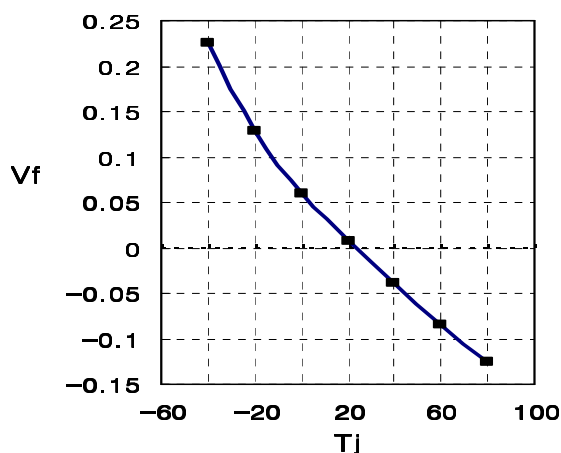


Relative Forward Current Vs. Ambient Temperature



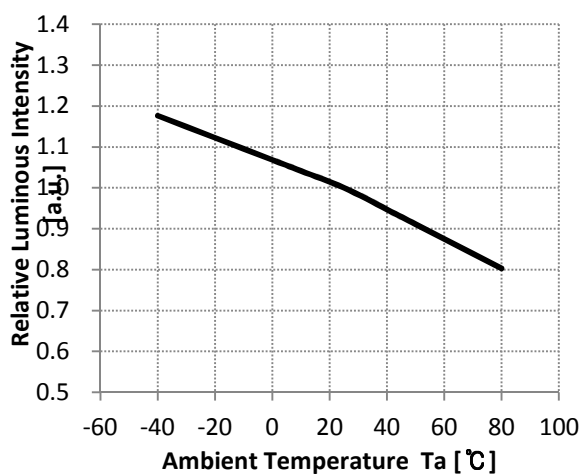
Relative Forward Voltage

$$V_F = V_F - V_{F(25^\circ\text{C})} = \phi(T_j); I_F = 20 \text{ mA}$$

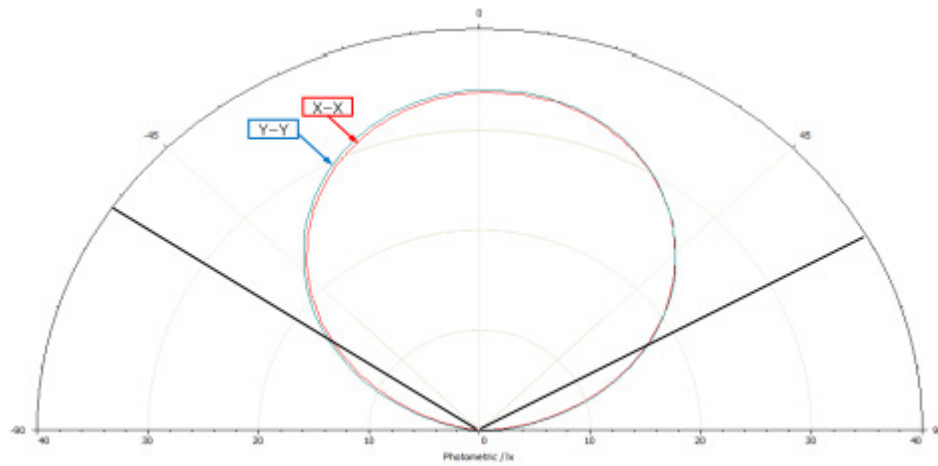


Relative Luminous Intensity

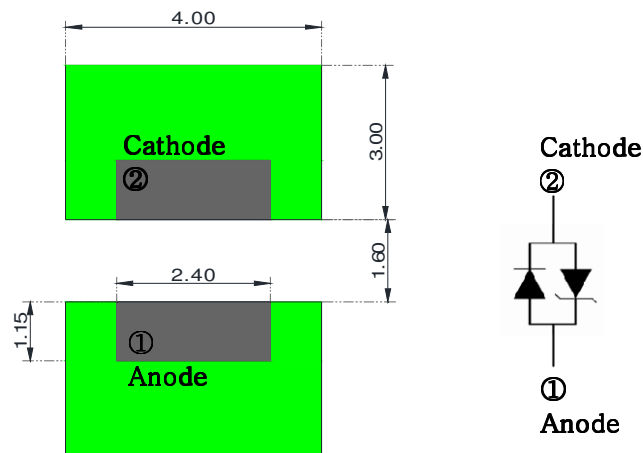
$$I_v = I_{v(25^\circ\text{C})} = \phi(T_j); I_F = 20 \text{ mA}$$



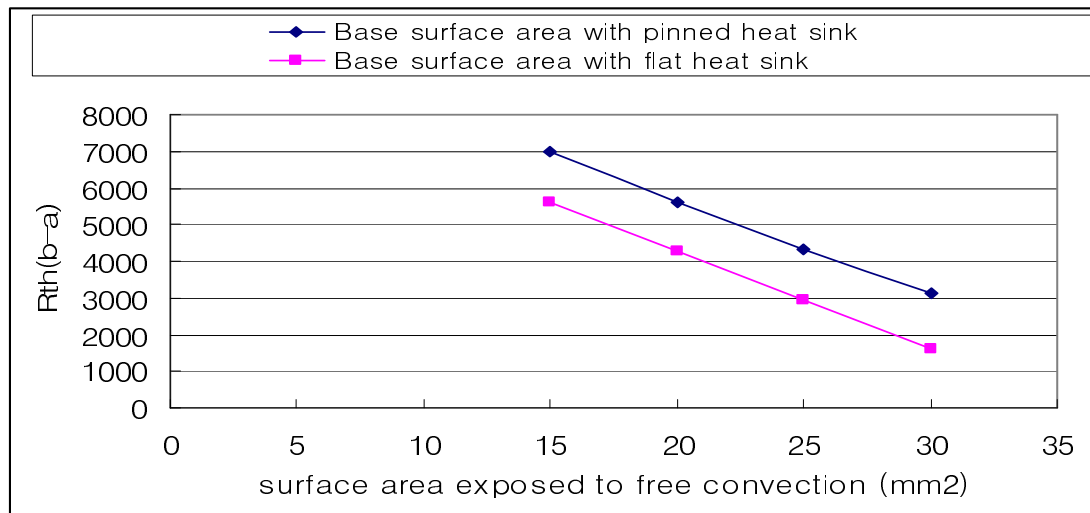
Radiation Characteristic @25 °C (20mA)



Recommended Solder Pad



Shown is recommended pad geometry only. Customer PCB design shall include adequate thermal heat sink design & thermal analysis.



Step 1) Determine allowable $R\theta_{J-A}$ With T_J as the constraining variable, you can use the following equation:

$$T_J = T_A + (P)(R\theta_{J-A})$$

The dissipated power per string, P, can be determined by:

$$P = (V_F)(I_F)$$

Solve for $R\theta_{J-A}$ using:

$$\frac{(T_{Junction} - T_{Ambient})}{P}$$

$$R\theta_{Junction_Ambient} = \frac{(T_{Junction} - T_{Ambient})}{P}$$

Step 2) Subtract the $R\theta_{J-B}$ of 3528 LED emitter from $R\theta_{J-A}$ to obtain the target $R\theta_{B-A}$.

Step 3) Using the calculated $R\theta_{B-A}$ as a target, review the Figures to determine the heat sink configuration that best suits your application. Look up the heat sink area that

Matters That Require Attention

(1) Safety Reminder

Do not look squarely at the product turned on.
(Light of the product would make your eyes hurt.)

(2) Static Electricity-handle with care

As the product is sensitive to static electricity, scrupulous attention is required in handling. Especially, if overvoltage is implied to the product, such as overvoltage higher than maximum forward voltage, the product will be damaged by energy due to the overvoltage. Do not touch terminals of the product directly with bare hands.

Also, complete measures against static electricity and/or surge should be established.

Furthermore, in order to keep down a surge current generated by ON-OFF operation below maximum rated value, it is recommended to insert an appropriate protection circuit to driver circuit.

With respect to measures against static electricity and/or surge during handling, there exist several effective measures or equipments such as human body ground connection (through 1M Ω), conductive mat, conductive working clothes, conductive shoes, anti-ESD gloves, and conductive container.

In certain circumstances or facilities in which static electricity is likely to occur, using ionizer is strongly recommended.

In case the product becomes defective by static electricity, confirm certainty of the measures.

(3) Drive Condition

The product should be driven by forward current. If reverse voltage drove the product, it would be damaged by electromigration, and thus, special cautions are needed.

(4) Handling of Silicone Resin LED Products

As the product comprises silicone encapsulation material, there is a high probability that the properties and the reliability of the product are negatively influenced by an external force, circumstances, and etc. Before using the product, please be informed of below precautions:

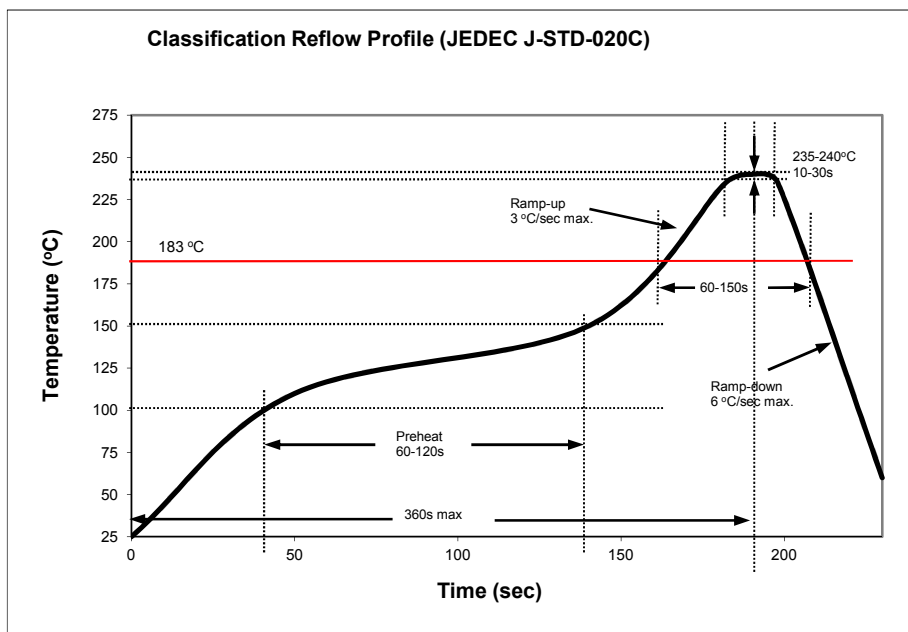
- The encapsulated material of the product is silicone resin, which is low strength material compared to epoxy resin. Therefore, the product requires special care in handling and precautions should be taken in designing other manufactures comprised of the product to avoid the strong pressure or stress on the encapsulated part. For instance, in case of employing surface mounter, it is required to use an adhesion nozzle which does not imply stress to the encapsulation material.
- Compared with epoxy encapsulation material, the silicone encapsulation material is prone to be stained with dust, which is deleterious to the optical characteristics of the product. Before using the product, therefore, it is required to check several circumstances including storage, handling, implement process, and usage circumstances.

(5) Soldering

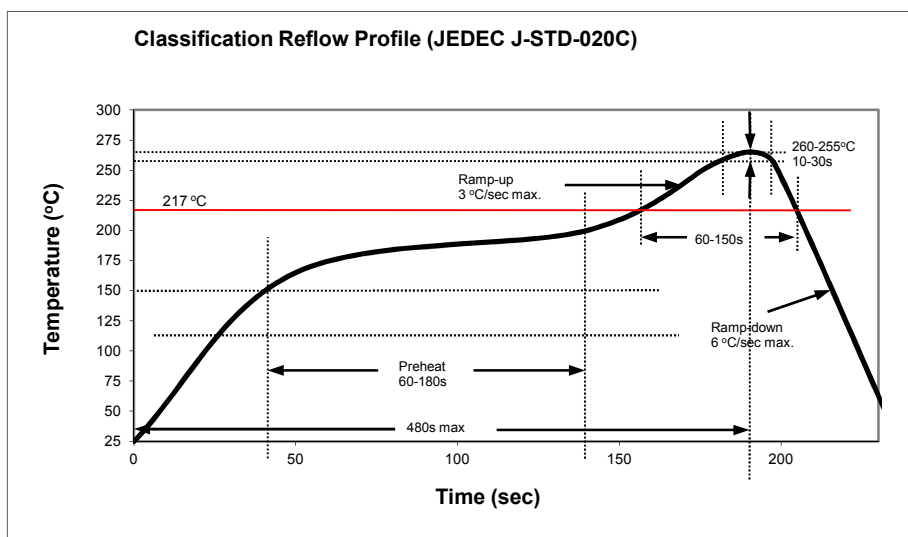
In case of soldering LED product, interface detachment can take place depending on moisture absorption status of the resin. It is well-known that vaporization expansion of the absorbed moisture due to sudden heat change causes this detachment. By this detachment, the optical characteristics of the product are changed, or the reliability of the product can be declined, and thus, special cautions are required.

- Do not imply a stress to the resin at high temperature.
- In mounting the product on board (substrate) or transporting the product, it must not be contacted with other components.
- In reflow soldering, it is required that reflow process should be taken within the scope of below "Suggested Reflow Temperature Profile."
- In case reflow soldering is executed twice, the reflow soldering process should be taken at 30°C/70% RH within 168 hours.
- Flow soldering should be prohibited.
- When modification by hand soldering is needed, use a hot plate whose temperature is set below 150°C. Also, after putting mount board on the hot plate, execute hand soldering with a soldering iron (25W, below 350°C) within 3 seconds.

Recommended Sn-Pb IR-Reflow Soldering Profile.



Recommended Pb Free IR-Reflow Soldering Profile.



(6) Dampproof Packaging

In order to prevent moisture absorption of the resin, the product is packaged by aluminum pack including silica gel. After unsealing the pack, please use the product under below conditions:

1. In case the pack is still sealed, it is required to keep the product at 5~30°C room temperature and below 90% relative humidity, and to use the product within twelve months.
2. After unsealing the pack, it is required to implement the product at 5~30°C room temperature and below 60% relative humidity within 168 hours.
3. After unsealing the pack, in case 168 hours elapsed in above circumstances, or the term of validity has already expired, bake the product 24~48 hours at 60±5°C before usage. After baking, use the product within 72 hours.
The term of validity: twelve months from the seal date (recited in NOTE of aluminum pack label)
4. If baking process were repeated several times, there would be a possibility that detachment resistance of taping becomes weak and some disturbances can take place during mounting process. In case baking process is repeated, therefore, preventive measures are required for avoiding product destruction by static electricity.
5. Do not throw or bump down the product. If laminate packing material tore, the airtightness of the product would get damaged.

6. Indicator in the dampproof packaging functions as a hygrometer. Be advised that this indicator does not represent moisture absorption of resin.

(7) Ambient

If the product were exposed to ambient including corrosiveness gas and etc, this ambient can be a bad influence on the properties of the product.

The product is not designated to be used in special circumstances. So, prior to usage, reliability test should be taken in advance, provided that the product is used under below conditions:

- Condensation (moisture), chloride water, corrosive gas(the gas including sulfur such as SO_x, H₂S, the gas including chlorine, NO_x, NH₃, and etc.), and etc.
- Organic solvent, oil, acidic/alkaline potion, and etc.
- Outdoor use, dust, and etc.

(8) Cleaning

In case cleaning is required after board (substrate) mounting, isopropyl alcohol must be used for cleaning. However, there is a possibility that the encapsulated resin swells according to cleaning condition, and thus, checking the condition of the product is recommended before usage. Meanwhile, since a hydrochloric solvent cause corrosion of a terminal, dissolution of the resin, and/or deterioration of the product, using the hydrochloric solvent should be avoided.

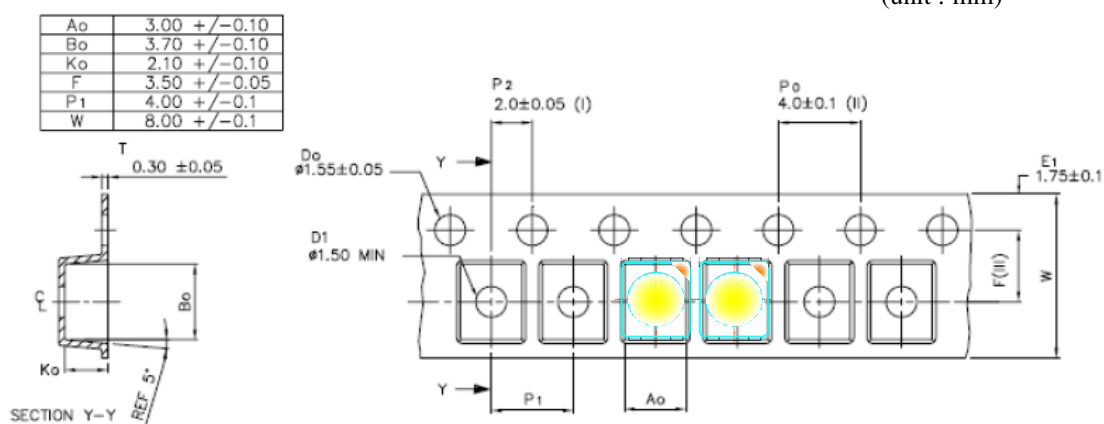
- In ultrasonic waves cleaning, prior to cleaning, make sure that the product doesn't have any problem to be cleaned.
- As brushing sometimes damage a light emitting surface, it should be prohibited.

Tape And Orientation.

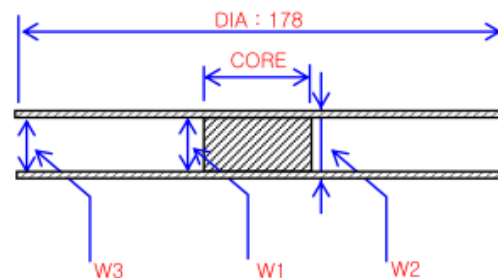
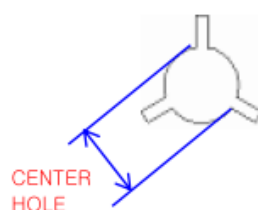
Reels come in quantity of

2,000 units. Reel diameter is 180 mm.

(unit : mm)



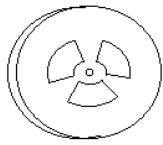
w1	9.0 ± 0.5
w2	11.5 ± 0.5
w3	9.0 ± 0.5
center	13.3 ± 0.3
core	60.0 ± 0.5



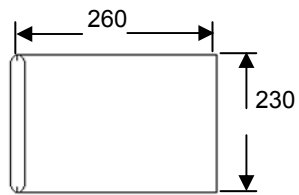
Materials and Characteristics

Carrier Tape			Cover Tape		
Description	Typical Value	Unit	Description	Typical Value	Unit
Material	Polycarbonate		Thickness	0.061+-0.013	mm
Tensile Strength(yield)	63	Mpa	Tensile Strength(break)	70	Mpa
Impact strength(notched)	10.2	Kg-cm/cm	Elongation(length)	150	%
Elongation	105	%	Elongation(lateral)	145	%
Shrinkage	<1.0	%	Tear Strength(length)	0.20	N
Surface resistivity	10E4-10E6	Ohm/sq	Tear Strength(lateral)	0.19	N
Volume resistivity	<10E6	Ohm-cm	Surface resistivity (surface)	<2.0E+09	Ohm/sq
			Surface resistivity (sealing)	<2.0E+09	Ohm/sq

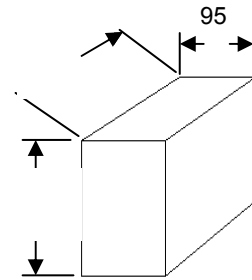
Packing Formation



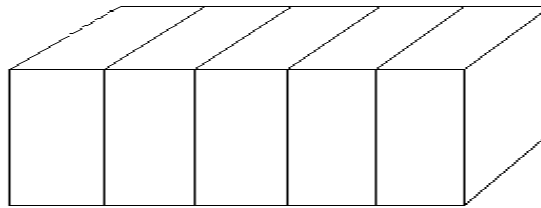
Diameter : 178 mm
Width : 17 mm
3528 \Rightarrow 2000 pcs/Reel
Anti-Static Shielding
Black Reel



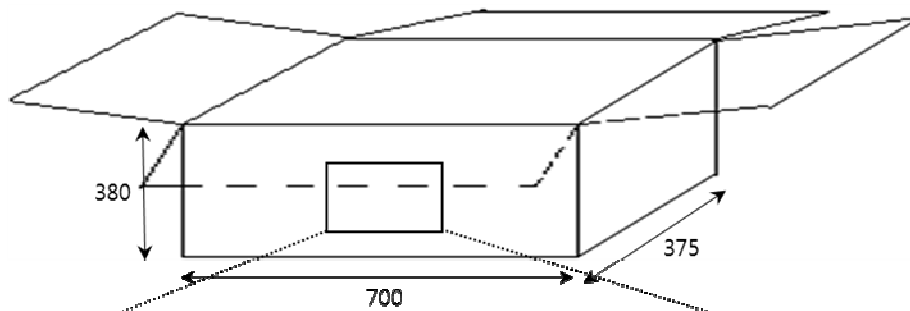
Anti-Static Shielding
1 Reel / Bag (T = 0.1 mm)




Inner Box
0000 pcs/ 1 Inner Box



3ox/1 Carton
50000 pcs/ 1Carton



	#456, Gonsae-Dong, Gihuang-Gu Yongin-Si, Gyeonggi-Do, 449-901, Korea / Tel : +82-31-218-1473
Customer	
Part No	
Quantity	
Date	
Carton No	

Label Format and Serial Number

Part Number	: GGG
Lot No.	: AAA
VF / IV / CIE	: BBB / CCC / DDD
Quantity	: EEE ea
Serial No	: FFF yymmddxxxx

AAA : Lot. number

BBB : Forward voltage(V)

CCC : Brightness of LED

DDD : CIE Rank(CIE-P)

EEE : Quantity of LED

FFF : yymmddxxxx (yy:year, mm:month, dd:day, xxxx:real no)

GGG : A0A1CEBHANP6

LUMENS Reliability Standard

Test Item	Lumens	REF	Test Conditions	Test time	Number of Damaged
			Lumens	Lumens	Lumens
Resistance to Soldering Heat (Reflow Soldering)	O	JESD22-B102	Tsld=260℃, 10sec (Pre treatment 30℃, 70%, 168hrs.)	2 times	0/50
Solderability(Reflow Soldering)	O	JESD22-B102	Tsld=215±5℃, 3sec. (Lead Solder)	1 time over 95%	0/50
Thermal Shock	O	JEITA ED-4701 300 307	0℃~100℃ 15sec. 15sec.	20cycles	0/50
Temperature Cycle	O	JESD22-A 1-6	(-) 40℃~25℃~100℃~25℃ 30min. 5min. 30min. 5min.	100cycles	0/50
Moisture Resistance Cyclic	O	JEITA ED-4701 200 203	25℃ ~ 65℃ ~ -10℃ 90%RH 24hrs./1cycle	10 cycles	0/50
High Temperature Storage	O	JESD22-A103	Ta=100℃	1000hrs.	0/50
Temperature HumidityStorage	O	JESD22-A101	Ta=85℃, RH=85%	1000hrs.	0/50
Low Temperature Storage	O	Internal ref	Ta=-40℃	1000hrs.	0/50
Steady State Operating Life condition 1	O	Internal ref	Ta=25℃, IF=20mA	1000hrs.	0/50
Steady State Operating Life condition 2	O	Internal ref	Ta=25℃, IF=20mA	500hrs.	0/50
On/Off Test	O	Internal ref	1min on 1min off, IF=20mA, Ta= -25℃, 60℃, 25℃	50000 cycle	0/50
Steady State Operating Life condition 3	O	Internal ref	Ta=25℃, IF=20mA	500hrs.	0/50
Steady State Operating Life of High Temperature	O	Internal ref	Ta=85℃, IF=20mA	1000hrs	0/50
Steady State Operating Life of High Humidity Heat	O	Internal ref	85℃, RH=85%, , IF=20mA	1000hrs	0/50
Steady State Operating Life of Low temperature	O	Internal ref	Ta=-30℃, IF=20mA	1000hrs.	0/50
Vibration	O	JEITA ED-4701 400 403	100~2000~100Hz Sweep 4min. 200m/s 23direction, 4cycles	48min	0/50
Substrate Bending	O	JEITA ED-4702	3mm, 5±1sec	1time	0/50
Adhesion Strength	O	JEITA ED-4702	5N, 10±1sec	1time	0/50
Push/Pull test	O			1 time	0/50
Pressure Cooker	O	JESD22-A102B	Ta= 120℃, RH = 100% Pressure = 2atm	1time , 4hrs	0/50

Reliability Test :

Title: **A0A1CEBHANP6 LED (PLCC2) Product Qualification for flashlighting**

Purpose: To qualify the A0A1CEBHANP6 package for display applications.

Sample History: All parts are assembled and tested in Lumens

Product Reliability Qualification Plan:

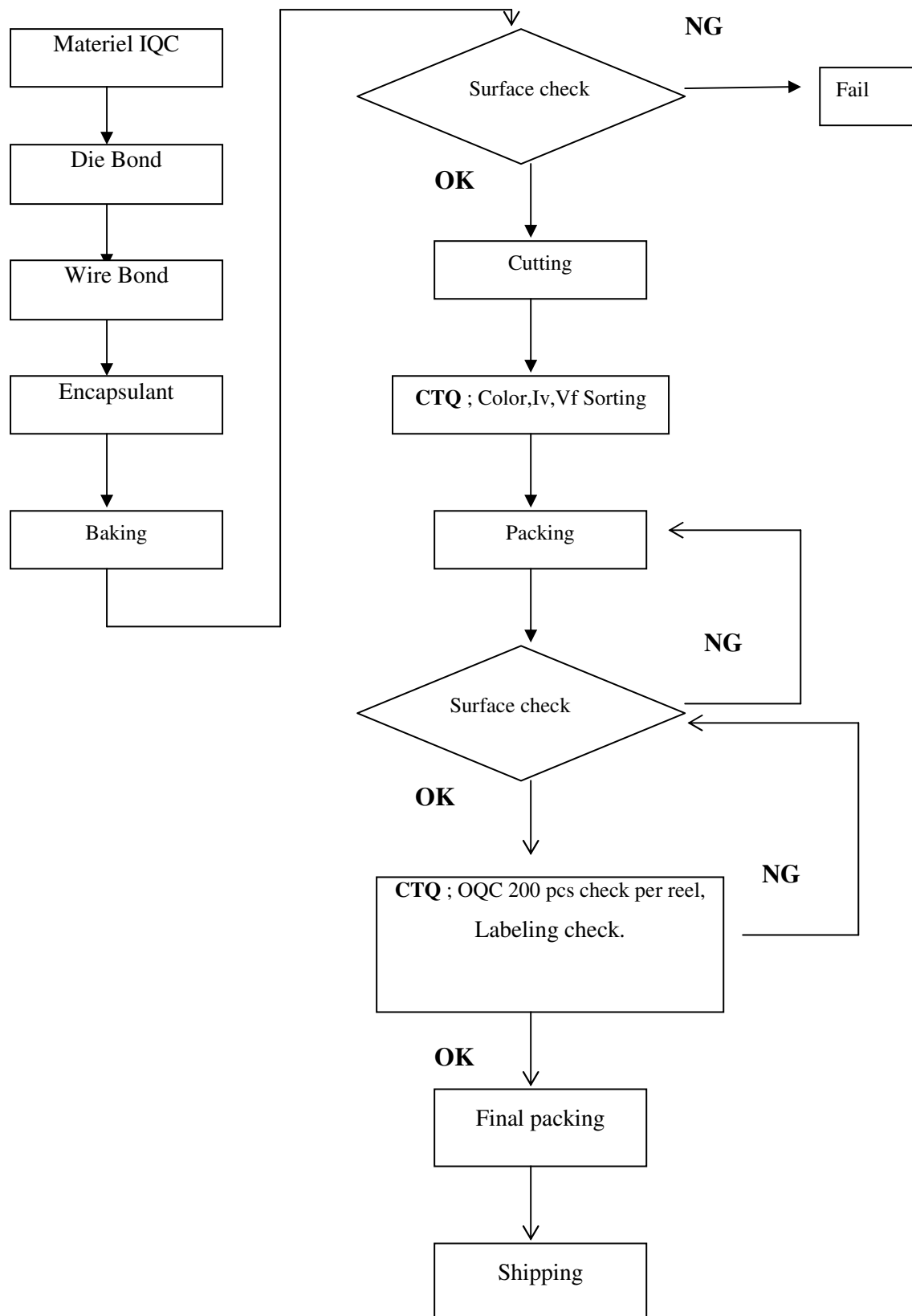
All units are to be pre-conditioned before proceeding to the respective test.

	Conditions
<ul style="list-style-type: none">• Pre-conditioning as per JEDEC L 2A requirement (JESD22-A113-B)	<ul style="list-style-type: none">- Bake @ 125°C, 24 hrs.- Moisture soak @ 60°C/60% RH, 120 hrs.
<ul style="list-style-type: none">• IR re-flow soldering on FR4 board.	<ul style="list-style-type: none">- 3xIR re-flow soldering at 235°C/10 sec. min.(Jedec)

Failure criteria:

- Electrical failures:
 - Vf shift >=10%
- Light Output Degradation:
 - % Iv shift <= -30%
- Visual failures:
 - Broken or damaged package or lead
 - Solderability < 95% wetting
 - Dimension out of tolerance

Process Flow



Cautions:

1. After open the package, the LED should be kept at 30°C, 60%RH or less. The LED should be soldered within 4weeks after opening the package.
2. Heat generation must be taken into design consideration when using the LED.
3. Power must be applied resistors for protection, over current would be caused the optic damage to the devices and wavelength shift.
4. Manual tip solder may cause the damage to Chip devices, so advised that heat of iron should be lower than 15W with temperature control under 5 seconds at 230-260 deg. C. (The device would be got damage in re working process, recommended under 5 seconds at 230-260 deg. C)
5. All equipment and machinery must be properly grounded. It is recommended to use a wristband or anti-electrostatic glove when handling the LED.
6. Use IPA as a solvent for cleaning the LED. The other solvent may dissolve the LED package and the epoxy, Ultrasonic cleaning should not be done.
7. Damaged LED will show unusual characteristics such as leak current remarkably increase, turn-on voltage becomes lower and the LED get unlight at low current.

NOTE :

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