

## APA-102-1515 Series

Preliminary

Top Mount IC+RGB Chip LED



### Features

- RGB Single point of control
- 8Bit(256 level)color set
- 5Bit(32 level)brightness adjustment
- IC input voltage 4.5v~5.5v
- 20mA,Contant current output
- Anti-Reflection resin
- View angle : >=120° (min 50% brightness)
- High contrast

### Main Applications

- Indoor display
- Full color display
- Advertising light boxes
- Soft light bar





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## ■ DISCLAIMER

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## ■ Product Specifications

	Specification	Material	Quantity
Luminous Intensity(Iv)	<b>Red :</b> 270~300 mcd <b>Green :</b> 500~550 mcd <b>Blue :</b> 200~220 mcd R/G/B@20mA, Ts= 25° C; Tolerance ±10%		
Wavelength	<b>Red :</b> 620~625 nm <b>Green :</b> 522.5~525 nm <b>Blue :</b> 462.5~472.5 nm R/G/B@20mA, Ts= 25° C; Tolerance ±10%		
Applied voltage	5V_DC		
Power consumption	0.2W		
View angle	140		
Refresh rate	400 Cycle		
Resin	Clear	Epoxy	
Carrier tape	EIA 481-1A specs	Conductive black tape	3000pcs/reel
Reel	EIA 481-1A specs	Conductive black	
Label	APA standard	Paper	
Packing bag	250x230mm	Aluminum laminated bag/Zipper	One reel per bag
Carton	APA standard	Paper	Non-specified



**Others:**

Each immediate box consists of 28 reels. The 28 reels may not necessarily have the same lot number or the same bin combinations of  $I_v$ ,  $\lambda_D$  and  $V_f$ . Each reel has a label identifying its specification; the immediate box consists of a product label.

**Note :**This is shipped test conditions

※**Remarks:** This product should be operated in forward bias. If a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

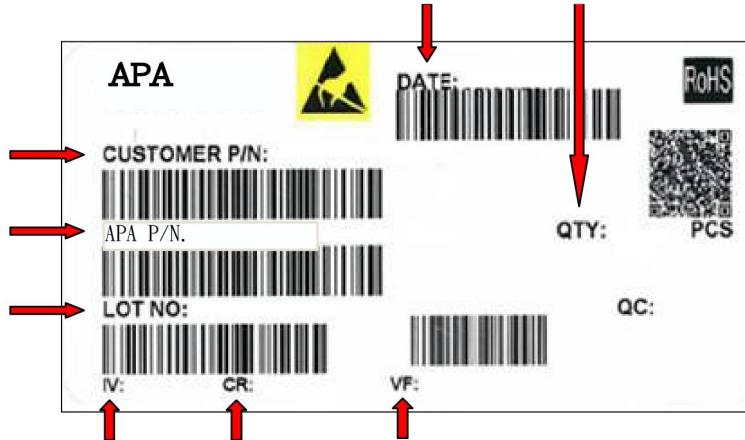
**ATTENTION: Electrostatic Discharge (ESD) protection**



The symbol to the left denotes that ESD precaution is needed. ESD protection for GaP and AlGaAs based chips is necessary even though they are relatively safe in the presence of low static-electric discharge. Parts built with AlInGaP, GaN, or/and InGaN based chips are STATIC SENSITIVE devices. ESD precaution must be taken during design and assembly.

If manual work or processing is needed, please ensure the device is adequately protected from ESD during the process.

## ■ Label Specifications



## ■ APA P/N:

APA-102 - 1515 - 8192 -6

IC ITEM: APA-102

LED SIZE:15X15mm

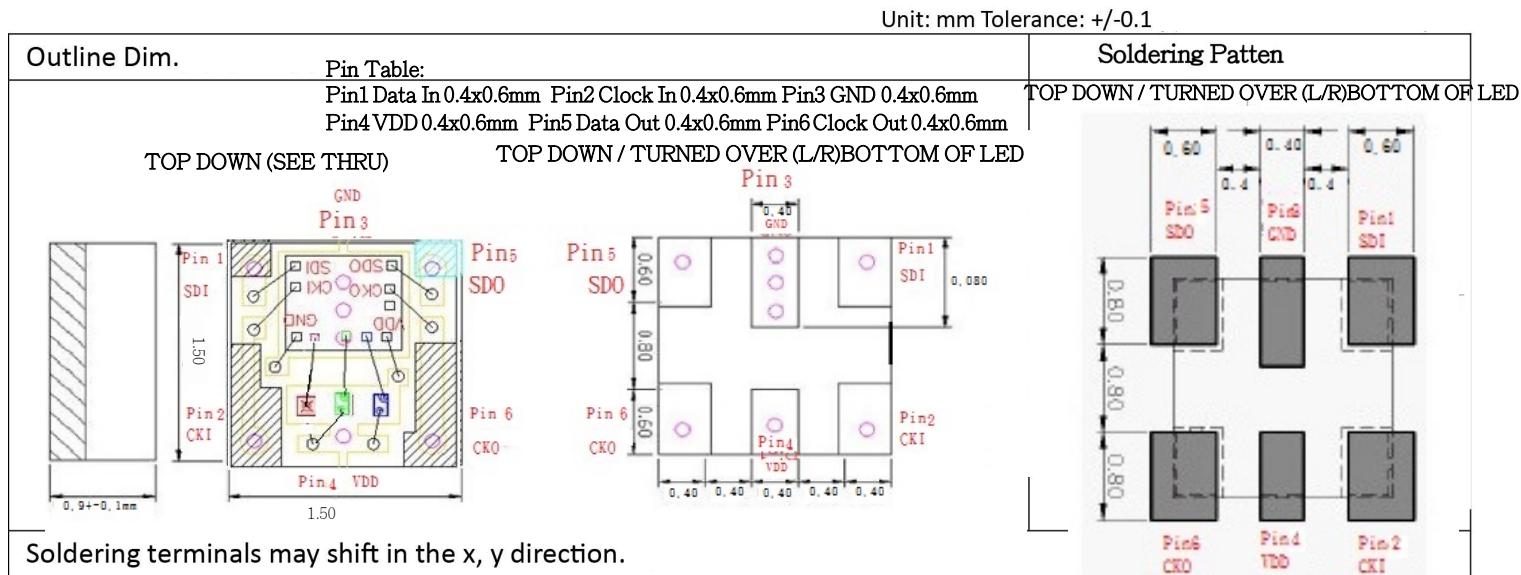
IC ITEM GRAY EFFECTS:8192

LED PAD QTY: 6

■ Lot No.

1	2	3	4	5	6	7	8	9	10
1	7	N	E	4	1	L	N	1	1
Code 1 2	Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9	Code 10	
		Mfg.Year	Mfg.Month	Consecutive number		Special code			
Internal Tracing Code	Mixing Lot No.	2010-A 2011-B 2012-C 2013-D 2014-E .	1:Jan 2:Feb ..... A:Oct B:Nov C:Dec	01~ZZ		000~ZZZ			

■ Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering



## ■ Absolute maximum ratings

Supply voltage -0.3 to 6.0V

Input voltage VSS -0.3 to VDD +0.3V

Operation temperature -40 to 85°C

Storage temperature -40 to 85°C

Note: Stress above those listed may cause permanent damage to the devices.

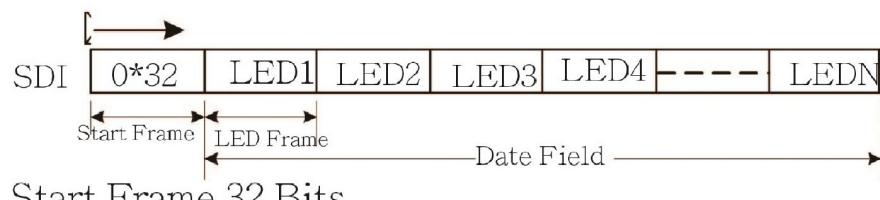
## ■ Electrical characteristics

Symbol	Parameter	Condition	Min	Typ.	Max	Units
VDD	Supply voltage			5.0	5.5	V
VIH	Input high voltage		0.7VDD		VDD+0.3	V
VH	Input low voltage		VSS-0.3		0.3VDD	V
LOL	Sink current voltage(RGB)	@VDD=5V,VOL>1V	22.5	24.5	26.5	mA
RIN	Pull high	@VDD=5V		570		KΩ
VREG	Regulator voltage(VREG)	@VDD>5V	4.4	4.5	4.7	V
FOSC	Oscillator frequency		800		1200	KHz

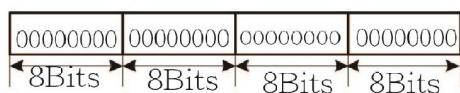
- (function description)

### (1) .cascading data structure

Tabdem N-LED



Start Frame 32 Bits



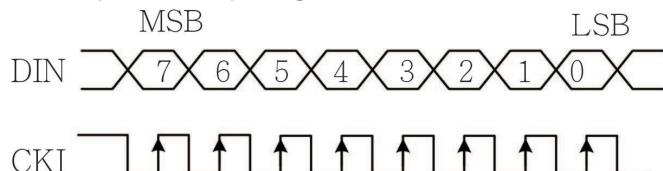
LED Frame 32 Bits



Global bit : 5-bit ( 32 level ) brightness setting , while controlling R, G, B three-color constant current output value , if set the Global bit for the 10000 ( 16/31 ) is the output current is half again the original PWM settings.

DATA MSB↔LSB	Driving Current
00000	0/31
00001	1/31
00010	2/31
...	
11110	30/31
11111	31/31(max)

PWM input and output signals Relations

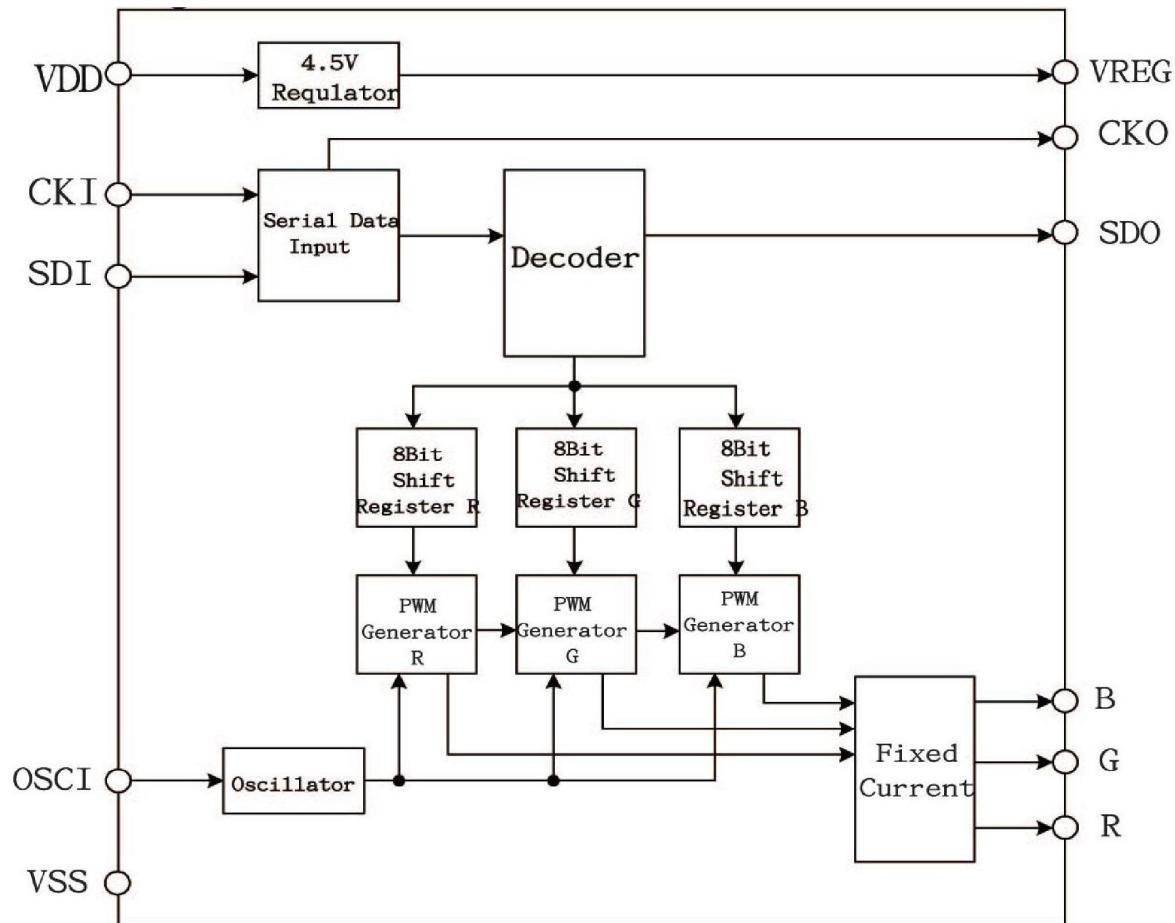


Data MSB—	Duty Cycle
00000000	0/256(min)
00000001	1/256
00000010	2/256
...	
11111101	253/256
11111110	254/256
11111111	255/256(max)

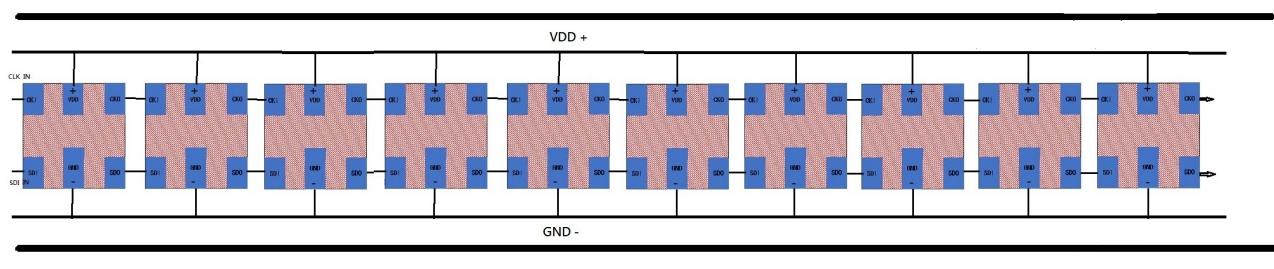
- 2).The number of pixels per second sent to CKI frequency ( FCKI ) minus the Start Frame bit divided by the number 40 the number of LED Frame bit 32, if CKI frequency ( FCKI ) to 512KHz, the pixel number  $( 512000-40 ) /32=15998$ , if the 50 second update Views can be connected in series LED number  $15998/50=319$ .To increase the number of cascaded IC CKI frequency to be increased.
- (3).POLAR to empty , R, G, B for the negative output; POLAR access VSS, R, G, B is positive output.
- (4).VEN: Self-detection



## ■ Block diagram



## ■ Application circuit



**▲Electrical parameters (Ta = 25°C, Vss = 0 V) ▲Limit parameters:**

parameters	symbol	range	unit
voltage	VCC	4.5 ~ 9	V
LED Lamp voltage	VLED	3-17	V
Data clock frequency	FCLK	20	MHZ
Maximum LED output	Iomax	25	m
Channel currentiation	DIO	On-chip <3%, Between pieces	%A
Power loss	PD	<400	mW
Welding temperature	TM	300(8S)	°C
Operating temperature	Topt	-40 ~ +80	°C
Storage temperature	Tstg	-65 ~ +120	°C

**▲Recommended working parameters:**

parameters	symbol	range	unit
voltage	VCC	4.5-6.5	V
Input voltage	VIN	-0.4-5	V
Data clock frequency	FCLK	0-15	MHZ
Clock high level width	TCLKH	>30	ns
Clock low level width	TCLKL	>30	ns
Data set up time	TSETUP	>10	ns
Data retention time	THOLD	>5	ns
Power consumption	PD	<350	mW
Operating temperature	TOP	-40-+80°C	°C

**▲Timing parameters: (T=25°C, VCC=5V)**

parameters	symbol	range		unit
Input signal maximum rise and fall time	TR	VCC=5V	<500	ns
	TF		<400	
Cascade output signal maximum rise time and fall time	TTHH	CL=30pF,RL=1K	<15	ns
	TTHL		<15	
Cascade output signal maximum delay time	TPD	CL=30pF,RL=1K	<12	ns
	TCO		<12	
Drive output minimum PWM on-width	TONMIN	IOUT=20mA	200	ns
Drive output signal maximum on and off time	TON	IOUT=20mA	<80	ns
	TOFF		<80	

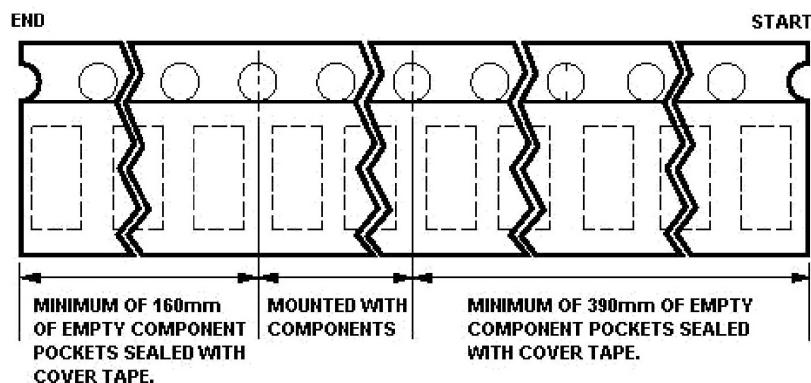
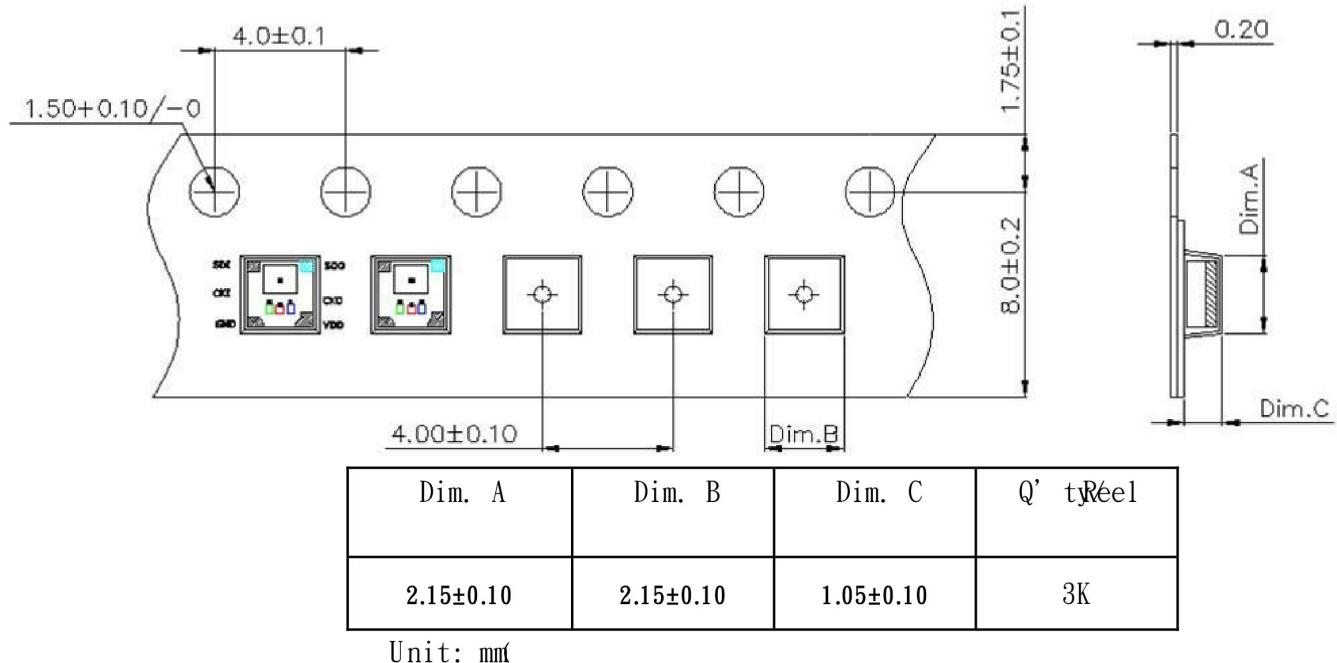
Logic level normal working range (Ta = -20~ +70°C, Vss = 0 V)

parameters	symbol	Min	Typical	maximu	unit	Test
Logic supply voltage	VCC		5		V	—
High level input voltage	VIH	0.7 VCC	—	VCC	V	—
Low level input voltage			—	0.3VCC	V	—

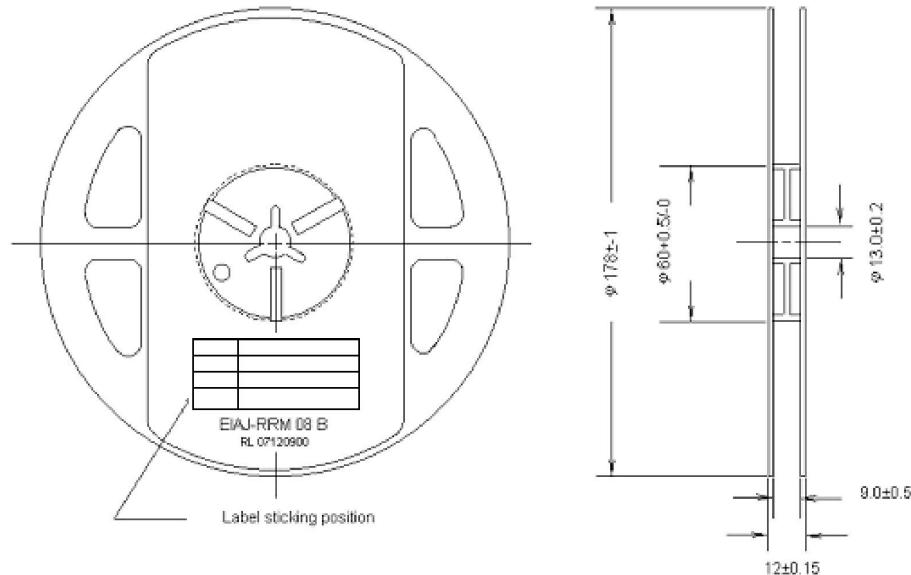
## Precaution for Use

1. The chips should not be used directly in any type of fluid such as water, oil, organic solvent, etc.
2. When the LEDs are illuminating, the maximum ambient temperature should be first considered before operation.
3. LEDs must be stored in a clean environment. A sealed container with a nitrogen atmosphere is necessary if the storage period is over 3 months after shipping.
4. The LEDs must be used within seven days after unpacked. Unused products must be repacked in an anti-electrostatic package, folded to close any opening and then stored in a dry and cool space.
5. The appearance and specifications of the products may be modified for improvement without further notice.
6. The LEDs are sensitive to the static electricity and surge. It is strongly recommended to use a grounded wrist band and anti-electrostatic glove when handling the LEDs. If a voltage over the absolute maximum rating is applied to LEDs, it will damage LEDs. Damaged LEDs will show some abnormal characteristics such as remarkable increase of leak current, lower turn-on voltage and getting unlit at low current.

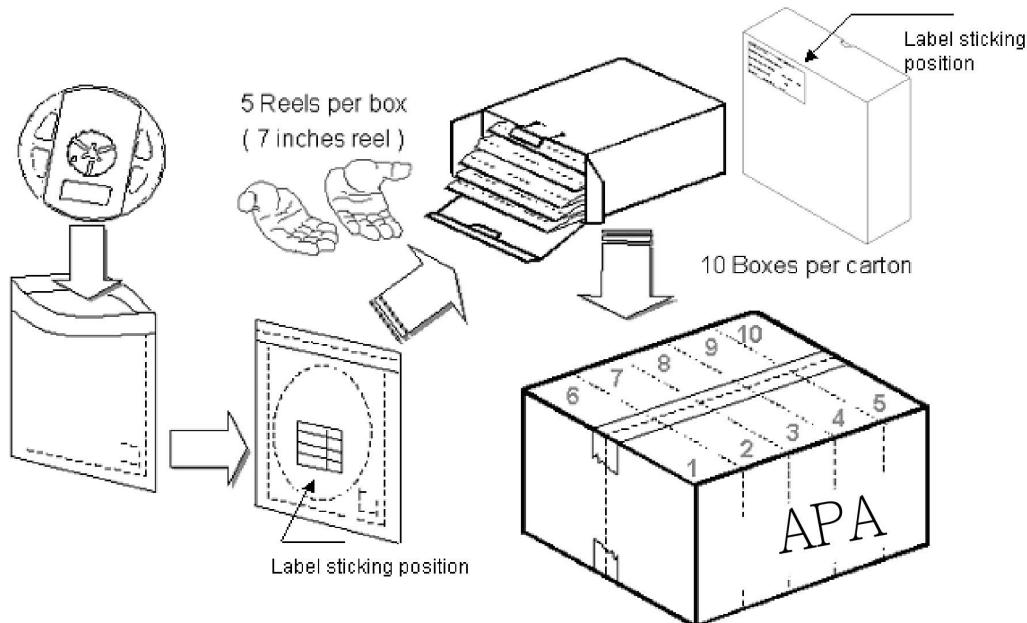
Packaging  
Tape Dimension



## Reel Dimension



## Packing





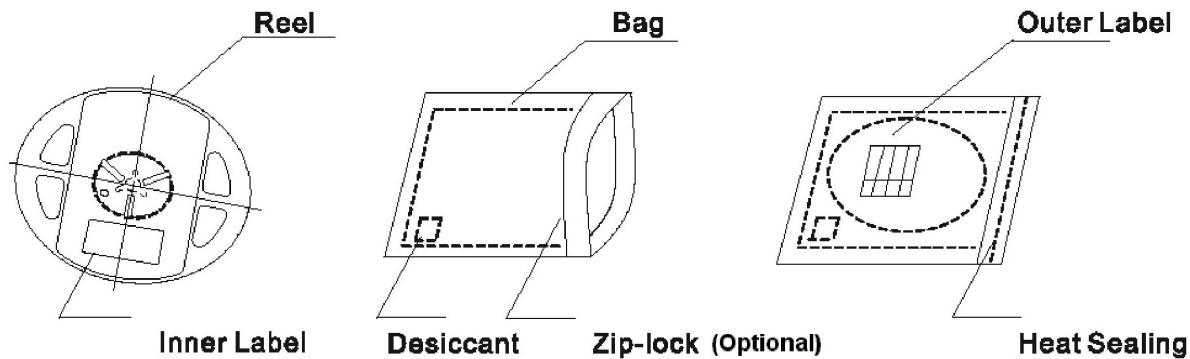
5 boxes per carton is available depending on shipment quantity.

### Dry Pack

All SMD optical devices are MOISTURE SENSITIVE Avoid exposure to moisture at all times during transportation or storage. Every reel is packaged in a moisture protected anti-static bag. Each bag is properly sealed prior to shipment.

Upon request, a humidity indicator will be included in the moisture protected anti-static bag prior to shipment.

The packaging sequence is as follows:



### Baking

Baking before soldering is recommended when the package has been unsealed for 72hours.

The conditions are as followings:

$60 \pm 3^\circ\text{C} \times (12 \sim 24\text{hrs})$  and  $< 5\%$  RH, taped reel type.

$100 \pm 3^\circ\text{C} \times (45\text{min} \sim 1\text{hr})$ , bulk type.

$130 \pm 3^\circ\text{C} \times (15\text{min} \sim 30\text{min})$ , bulk type.

## PRECAUTIONS

1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a current limiting resistor of the proper size. Avoid applying a reverse voltage beyond the specified limit.
4. Avoid operation beyond the limits as specified by the absolute maximum ratings.
5. Avoid direct contact with the surface through which the LED emits light.
6. If possible, assemble the unit in a clean room or dust-free environment.

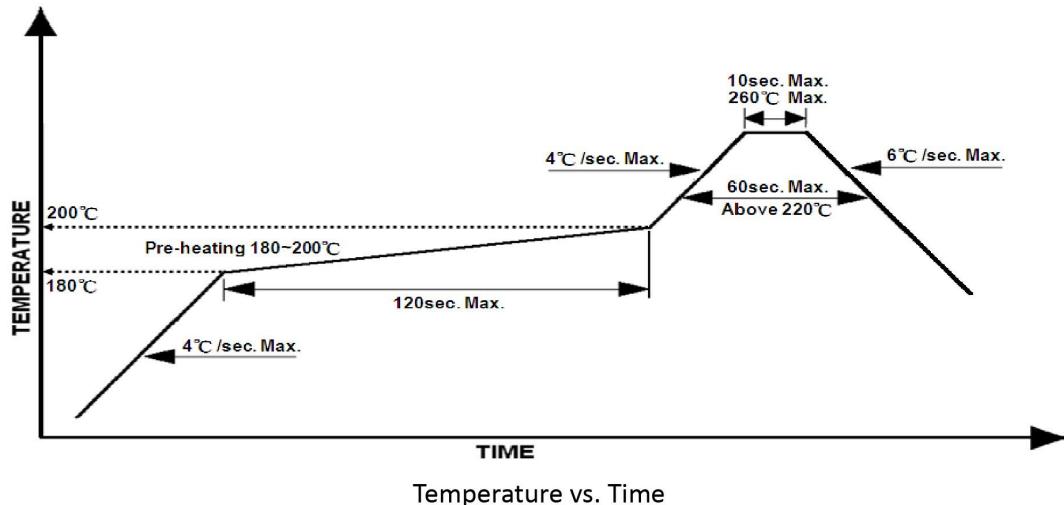
## Reflow Soldering

Recommend soldering paste specifications:

1. Operating temp.: Above 220 °C ,60sec
2. Peak temp.:260 °CMax.,10sec Max.
3. Never take next process until the component is cooled down to room temperature after reflow.
4. The recommended reflow soldering profile (measuring on the surface of the LED terminal) is following:

### Lead-free Solder Profile

5. Reflow soldering should not be done more than two times



### Reworking

- Rework should be completed within 5 seconds under 260 °C.
- The iron tip must not come in contact with the copper foil.
- Twin-head type is preferred.

### Cleaning

Following are cleaning procedures after soldering:

- An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended.
- Temperature x Time should be 50°C x 30sec. or <30°C x 3min
- Ultra sonic cleaning: < 15W/ bath; bath volume ≤ 1liter
- Curing: 100 °C max, <3min

### Cautions of Pick and Place

- Avoid stress on the resin at elevated temperature.
- Avoid rubbing or scraping the resin by any object.
- Electric-static may cause damage to the component. Please ensure that the equipment is properly grounded. Use of an ionizer fan is recommended.