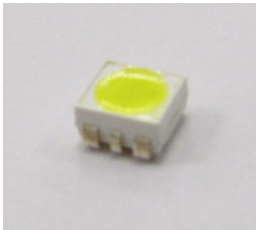


Advanced Power Top View LEDs EHP-A09K-BRTT-5670HEAFAD9K-1T8-AM



Features

- P-LCC-6 package
- Small package with high efficiency
- Colorless clear resin
- Wide viewing angle 120°
- Qualification according to AEC-Q101 rev. C
- IR reflow or wave soldering

Applications

- Interior and exterior automotive lighting (e.g. turn light, indicating sign, etc.)
- Warning signs applied
- Signal and symbol luminaries
- Portable light source
- Marker lights (e.g. steps, exit ways, etc.)
- Display for indoor and outdoor application
- Substitution of traditional light for automotive use
- General applications

Table of Content

Product Nomenclature	3
PN of the A09K Series: White LEDs	4
Absolute Maximum Ratings (Ta=25°C)	5
Electro-Optical Characteristics (Ta=25°C)	6
Color Bins	7
Bin Range of Forward Voltage	15
Bin Range of Luminous Intensity	16
Typical Electro-Optical Characteristics Curves	17
Package Dimension	20
Moisture Resistant Packing Materials	21
Moisture Resistant Packing Process and Precaution	22
Revision History	24

Product Nomenclature

EHP-A09K	-	B2T	T	-	7014T	DAEA	BA	K	-	1	T	8	-	AM
1		2	3		4	5	6	7		8	9	10		11

The product name is designated as below:

1.	Product type
2.	Chip code
3.	Resin color
4.	Wavelength or CIE coordinates
5.	Code of luminous intensity
6.	Forward voltage specification
7.	Operation current
8.	Packing quantities
9.	Packing method
10.	Forming types
11.	Automotive specified

PN of the A09K Series: White LEDs

The below table lists the binning options for the Everlight A09K series White LED. Standard Everlight white bins are listed according to CCT and represent the standard primary colors of the spectrum.

White, A09K series LEDs at 150mA are listed below.

Group	Type	Luminous Intensity (mcd)	CCT (K) Wavelength (nm)	Forward Voltage (V)
Cool White	EHP-A09K-BRTT-4556HEAFAD9K-1T8-AM	7100-14000	4500-5650k	2.75-4.25
	EHP-A09K-BRTT-5670HEAFAD9K-1T8-AM	7100-14000	5650-7000k	2.75-4.25
	EHP-A09K-BRTT-7090HEAFAD9K-1T8-AM	7100-14000	7000-9000k	2.75-4.25
	EHP-A09K-BRTT-9014HEAFAD9K-1T8-AM	7100-14000	9000-14000k	2.75-4.25
	EHP-A09K-BRTT-5063HEAFAD9K-1T8-AM	7100-14000	5000-6300k	2.75-4.25
	EHP-A09K-BRTT-6380HEAFAD9K-1T8-AM	7100-14000	6300-8000k	2.75-4.25
	EHP-A09K-BRTT-8010HEAFAD9K-1T8-AM	7100-14000	8000-1000k	2.75-4.25
Warm White	EHP-A09K-BRTT-2730HEAFAD9K-1T8-AM	7100-14000	2760-3050k	2.75-4.25
	EHP-A09K-BRTT-3035HEAFAD9K-1T8-AM	7100-14000	3050-3500k	2.75-4.25
	EHP-A09K-BRTT-3541HEAFAD9K-1T8-AM	7100-14000	3500-4100k	2.75-4.25
	EHP-A09K-BRTT-2832HEAFAD9K-1T8-AM	7100-14000	2850-3250k	2.75-4.25
	EHP-A09K-BRTT-3238HEAFAD9K-1T8-AM	7100-14000	3250-3800k	2.75-4.25
	EHP-A09K-BRTT-3845HEAFAD9K-1T8-AM	7100-14000	3800-4500k	2.75-4.25

Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Forward Current	I_F	150	mA
Peak Forward Current (Duty 1/10 @1KHz)	I_{FP}	450	mA
Power Dissipation	P_d	640	mW
Junction Temperature	T_j	150	°C
Operating Temperature	T_{opr}	-40 ~ +100	°C
Storage Temperature	T_{stg}	-40 ~ +110	°C
Thermal Resistance	$R_{th\ J-A}$	90	K/W
	$R_{th\ J-S}$	40	K/W
ESD (Classification acc. AEC Q101)	ESD_{HBM}	2000	V
	ESD_{MM}	200	V
Soldering Temperature	T_{sol}	Reflow Soldering : 260 °C for 30 sec. Hand Soldering : 350 °C for 3 sec.	

Electro-Optical Characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Viewing Angle	$2\theta_{1/2}$	-----	120	-----	deg	$I_F = 150\text{mA}$
Forward Voltage	V_F	2.75	----	4.25	V	$I_F = 150\text{mA}$
Temperature coefficient of C_x	TC_x	-----	see page 16	-----	nm/K	$I_F = 150\text{mA}$
Temperature coefficient of C_y	TC_y	-----	see page 16	-----	nm/K	$I_F = 150\text{mA}$
Temperature coefficient of V_F	TC_V	-----	-4.2	-----	mV/K	$I_F = 150\text{mA}$

Note:

1. Tolerance of Luminous Intensity: $\pm 10\%$
2. Tolerance of Dominant Wavelength: $\pm 1\text{nm}$
3. Tolerance of Forward Voltage: $\pm 0.1\text{V}$

Color Bins
Bin Range of Chromaticity Coordinates
For Cool White:

4500~5000K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
U4	0.364	0.383	U7	0.344	0.344	I _F =150mA
	0.367	0.400		0.343	0.331	
	0.348	0.385		0.357	0.343	
	0.347	0.372		0.360	0.357	
U5	0.364	0.383	U8	0.342	0.320	
	0.362	0.372		0.343	0.331	
	0.346	0.359		0.357	0.343	
	0.347	0.372		0.355	0.330	
U6	0.362	0.372	U9	0.342	0.320	
	0.360	0.357		0.355	0.330	
	0.344	0.344		0.353	0.315	
	0.346	0.359		0.341	0.305	

5000~5650K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
V4	0.329	0.357	V7	0.329	0.331	I _F =150mA
	0.329	0.369		0.344	0.344	
	0.348	0.385		0.343	0.331	
	0.347	0.372		0.329	0.320	
V5	0.329	0.345	V8	0.343	0.331	
	0.329	0.357		0.329	0.320	
	0.347	0.372		0.329	0.310	
	0.346	0.359		0.342	0.320	
V6	0.329	0.331	V9	0.329	0.310	
	0.329	0.345		0.342	0.320	
	0.346	0.359		0.341	0.305	
	0.344	0.344		0.330	0.300	

5650~6300K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
W4	0.329	0.369	W7	0.329	0.331	I _F =150mA
	0.329	0.357		0.329	0.320	
	0.315	0.344		0.318	0.310	
	0.314	0.355		0.317	0.320	
W5	0.329	0.345	W8	0.329	0.321	
	0.316	0.333		0.329	0.310	
	0.315	0.344		0.319	0.300	
	0.329	0.357		0.318	0.310	
W6	0.329	0.345	W9	0.321	0.290	
	0.329	0.331		0.330	0.300	
	0.317	0.320		0.329	0.310	
	0.316	0.333		0.319	0.300	

For Cool White:

6300~7000K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
X4	0.301	0.342	X7	0.308	0.311	I _F =150mA
	0.314	0.355		0.317	0.320	
	0.315	0.344		0.319	0.300	
	0.303	0.333		0.311	0.293	
X5	0.305	0.322	X8	0.321	0.290	
	0.303	0.333		0.319	0.300	
	0.315	0.344		0.311	0.293	
	0.316	0.333		0.313	0.285	
X6	0.308	0.311				
	0.305	0.322				
	0.316	0.333				
	0.317	0.320				

7000~8000K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
Y3-3	0.290	0.318	Y9-3	0.308	0.311	I _F =150mA
	0.303	0.333		0.311	0.293	
	0.301	0.342		0.290	0.270	
	0.286	0.333		0.283	0.284	
Y6-3	0.308	0.311	Y1-3	0.302	0.283	
	0.283	0.284		0.311	0.293	
	0.274	0.301		0.313	0.285	
	0.303	0.333		0.305	0.273	

8000~9000K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
Y3-2	0.281	0.309	Y9-2	0.308	0.311	I _F =150mA
	0.290	0.318		0.283	0.284	
	0.286	0.333		0.274	0.301	
	0.276	0.321		0.303	0.333	
Y6-2	0.302	0.283	Y1-2	0.299	0.265	
	0.311	0.293		0.295	0.276	
	0.313	0.285		0.302	0.283	
	0.305	0.273		0.305	0.273	

For Cool White:**9000~10000K**

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
Y3-1	0.274	0.301	Y9-1	0.290	0.270	$I_F = 150\text{mA}$
	0.281	0.309		0.283	0.284	
	0.276	0.321		0.289	0.291	
	0.269	0.309		0.295	0.276	
Y6-1	0.283	0.284	Y1-1	0.295	0.276	
	0.274	0.301		0.299	0.265	
	0.281	0.309		0.295	0.259	
	0.289	0.291		0.290	0.270	

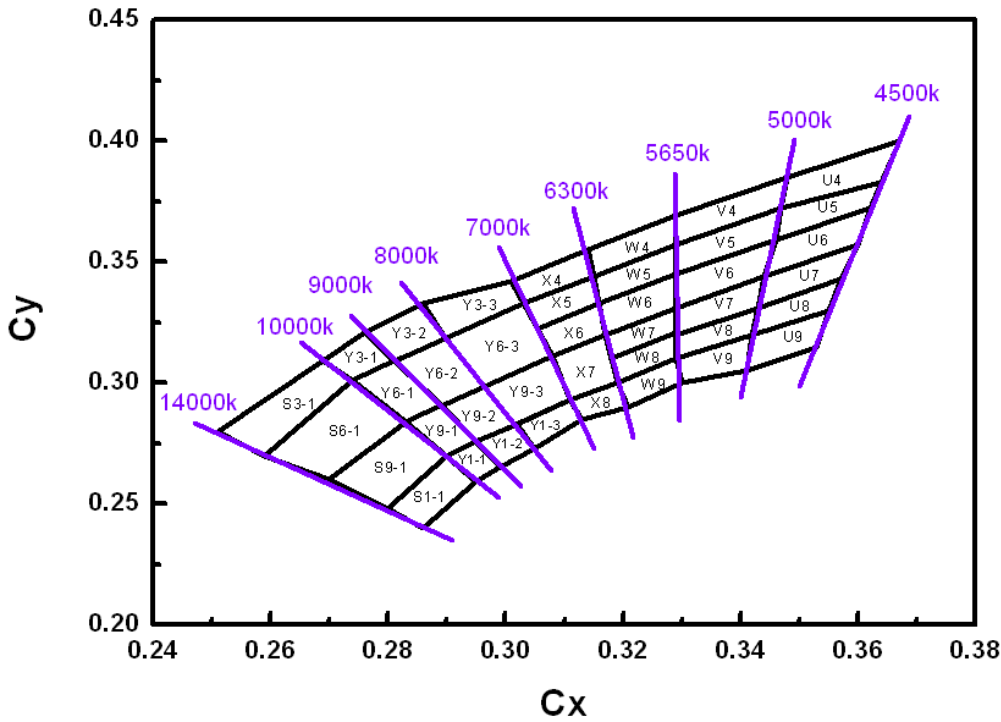
10000~14000K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
S3-1	0.259	0.270	S9-1	0.270	0.260	$I_F = 150\text{mA}$
	0.274	0.301		0.283	0.284	
	0.269	0.309		0.290	0.270	
	0.251	0.280		0.280	0.248	
S6-1	0.274	0.301	S1-1	0.280	0.248	
	0.283	0.284		0.290	0.270	
	0.270	0.260		0.295	0.259	
	0.259	0.270		0.286	0.240	

Note:

1. The standard shipping format for serial types includes a family bin of 4 individual CIE bins. Individual CIE bins cannot be ordered.
2. Only one bin will be shipped on each reel (there will be no mixing of two bins on each reel).
3. In order to ensure availability, single chromaticity coordinate bins will not be orderable.

The C.I.E. 1931 Chromaticity Diagram
Cool White



Series Code Table															Bin Code
H	J	L	M	N	P	Q	R	S	T	U	V	X	Y		
√	√		√			√						√			4
√	√	√	√	√		√	√					√	√		5
√	√	√	√	√	√	√	√	√					√	√	6
√	√	√	√	√	√		√	√	√		√			√	7
√	√	√		√	√			√	√	√	√				8
√		√			√				√	√					9

Note:
1. The standard shipping format for serial types includes a family bin of 4 individual CIE bins. Individual CIE bins cannot be ordered. (Available CIE bins please refer to table above.)
E.g. EHP-A09K-BRTT-5063YEAFAAD9K-1T8-AM means that only 1 chromaticity coordinate bin V5, V6, W5, W6 will be shippable.

**For Warm White:
4100~4500K**

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
T4	0.367	0.400	T7	0.359	0.356	I _F =150mA
	0.386	0.413		0.374	0.366	
	0.381	0.394		0.371	0.352	
	0.364	0.383		0.357	0.343	
T5	0.364	0.383	T8	0.355	0.330	
	0.381	0.394		0.357	0.343	
	0.378	0.382		0.370	0.351	
	0.362	0.372		0.368	0.337	
T6	0.362	0.372	T9	0.353	0.315	
	0.378	0.382		0.355	0.330	
	0.374	0.366		0.368	0.337	
	0.359	0.356		0.364	0.322	

3800~4100K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
S4	0.386	0.413	S7	0.374	0.366	I _F =150mA
	0.402	0.423		0.387	0.374	
	0.396	0.404		0.383	0.360	
	0.381	0.394		0.371	0.352	
S5	0.381	0.394	S8	0.368	0.337	
	0.396	0.404		0.370	0.351	
	0.392	0.391		0.382	0.359	
	0.378	0.382		0.378	0.343	
S6	0.378	0.382	S9	0.364	0.322	
	0.392	0.391		0.368	0.337	
	0.387	0.374		0.378	0.343	
	0.374	0.366		0.373	0.327	

3500~3800K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
R4	0.402	0.423	R7	0.387	0.374	I _F =150mA
	0.421	0.433		0.402	0.382	
	0.415	0.416		0.397	0.367	
	0.396	0.404		0.383	0.360	
R5	0.396	0.404	R8	0.378	0.343	
	0.415	0.416		0.382	0.359	
	0.409	0.400		0.396	0.367	
	0.392	0.391		0.390	0.349	
R6	0.392	0.391	R9	0.373	0.327	
	0.409	0.400		0.378	0.343	
	0.402	0.382		0.390	0.349	
	0.387	0.374		0.384	0.331	

**For Warm White:
3250~3500K**

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
Q4	0.421	0.433	Q7	0.402	0.382	I _F =150mA
	0.438	0.440		0.416	0.389	
	0.431	0.423		0.410	0.374	
	0.415	0.416		0.397	0.367	
Q5	0.415	0.416	Q8	0.390	0.349	
	0.431	0.423		0.396	0.367	
	0.424	0.406		0.410	0.373	
	0.409	0.400		0.401	0.353	
Q6	0.409	0.400	Q9	0.384	0.331	
	0.424	0.406		0.390	0.349	
	0.416	0.389		0.401	0.353	
	0.402	0.382		0.393	0.333	

3050~3250K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
P4	0.438	0.440	P7	0.416	0.389	I _F =150mA
	0.454	0.446		0.429	0.394	
	0.446	0.429		0.422	0.379	
	0.431	0.423		0.410	0.374	
P5	0.431	0.423	P8	0.401	0.353	
	0.446	0.429		0.410	0.373	
	0.438	0.412		0.422	0.379	
	0.424	0.406		0.412	0.356	
P6	0.424	0.406	P9	0.393	0.333	
	0.438	0.412		0.401	0.353	
	0.429	0.394		0.412	0.356	
	0.416	0.389		0.402	0.334	

2850~3050K

Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
N4	0.454	0.446	N7	0.429	0.394	I _F =150mA
	0.471	0.451		0.444	0.399	
	0.461	0.433		0.436	0.384	
	0.446	0.429		0.422	0.379	
N5	0.446	0.429	N8	0.412	0.356	
	0.461	0.433		0.422	0.379	
	0.453	0.416		0.435	0.383	
	0.438	0.412		0.423	0.358	
N6	0.438	0.412	N9	0.402	0.334	
	0.453	0.416		0.412	0.356	
	0.444	0.399		0.423	0.358	
	0.429	0.394		0.411	0.334	

**For Warm White:
2760~2850K**

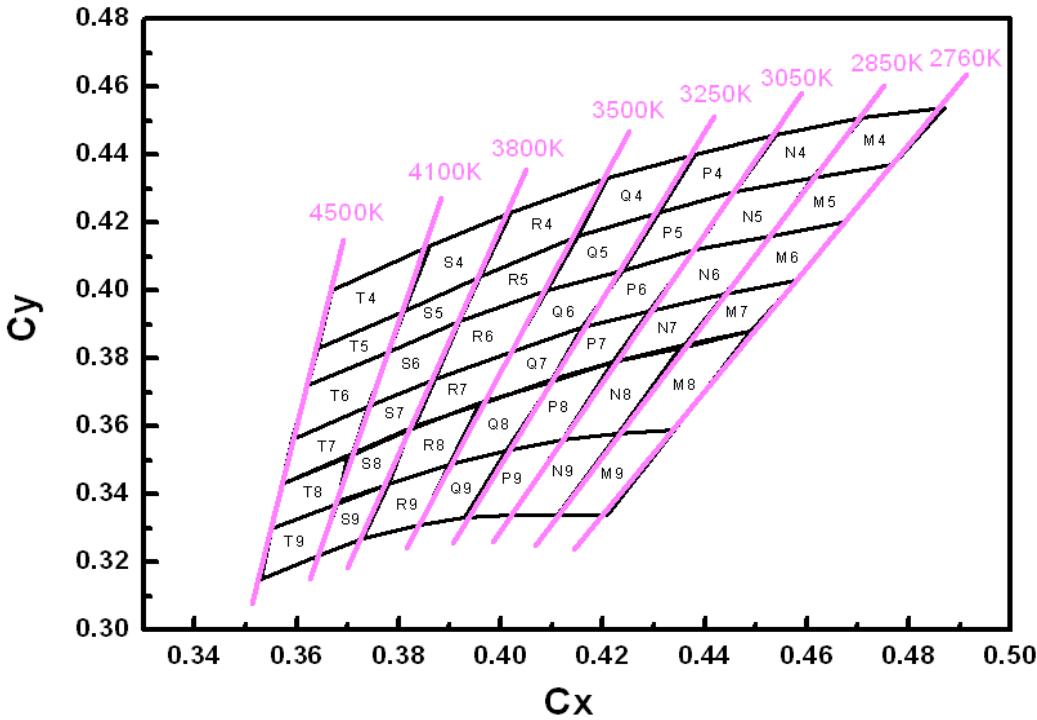
Rank	CIE_x	CIE_y	Rank	CIE_x	CIE_y	Condition
M4	0.471	0.451	M7	0.444	0.399	I _F =150mA
	0.487	0.454		0.458	0.403	
	0.477	0.437		0.449	0.388	
	0.461	0.433		0.436	0.384	
M5	0.461	0.433	M8	0.423	0.358	
	0.477	0.437		0.435	0.383	
	0.467	0.420		0.449	0.388	
	0.453	0.416		0.434	0.359	
M6	0.453	0.416	M9	0.411	0.334	
	0.467	0.420		0.423	0.358	
	0.458	0.403		0.434	0.359	
	0.444	0.399		0.421	0.334	

Note:

1. The standard shipping format for serial types includes a family bin of 4 individual CIE bin. Individual CIE bins cannot be ordered.
2. Only one bin will be shipped on each reel (there will be no mixing of two bins on each reel).
3. In order to ensure availability, single chromaticity coordinate bins will not be orderable.

The C.I.E. 1931 Chromaticity Diagram

Warm White



Series Code Table														Bin Code	
H	J	L	M	N	P	Q	R	S	T	U	V	X	Y		Z
✓	✓		✓			✓						✓			4
✓	✓	✓	✓	✓		✓	✓					✓	✓		5
✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	6
✓	✓	✓	✓	✓	✓		✓	✓	✓		✓			✓	7
✓	✓	✓		✓	✓			✓	✓	✓	✓				8
✓		✓			✓				✓	✓					9

Note:
 1. The standard shipping format for serial types includes a family bin of 4 individual CIE bins. Individual CIE bins cannot be ordered. (Available CIE bins please refer to table above.)
 E.g. EHP-A09K-BRTT-3238YEAFAAD9K-1T8-AM means that only 1 chromaticity coordinate bin Q5, Q6, R5, R6 will be shippable.

Bin Range of Forward Voltage

Group	Min.	Max.	Unit	Condition
1	1.70	1.85		
2	1.85	2.00		
3	2.00	2.15		
4	2.15	2.30		
5	2.30	2.45		
6	2.45	2.60		
7	2.60	2.75		
8	2.75	2.90		
9	2.90	3.05	V	$I_F = 150\text{mA}$
10	3.05	3.20		
11	3.20	3.35		
12	3.35	3.50		
13	3.50	3.65		
14	3.65	3.80		
15	3.80	3.95		
16	3.95	4.10		
17	4.10	4.25		

Note:

1. Forward Voltage Bins for Standard (AlGaInP $V_F = 1.7\sim 3.2\text{V}$, InGaN $V_F = 2.75\sim 4.25\text{V}$)

Bin Range of Luminous Intensity

Color	Min.	Max.	Unit	Luminous Flux(Φ_v)	Unit	Condition
Cool White	7100	14000	mcd	32000 (typ.)	mlm	$I_F = 150\text{mA}$
Warm White	7100	14000		27000 (typ.)		

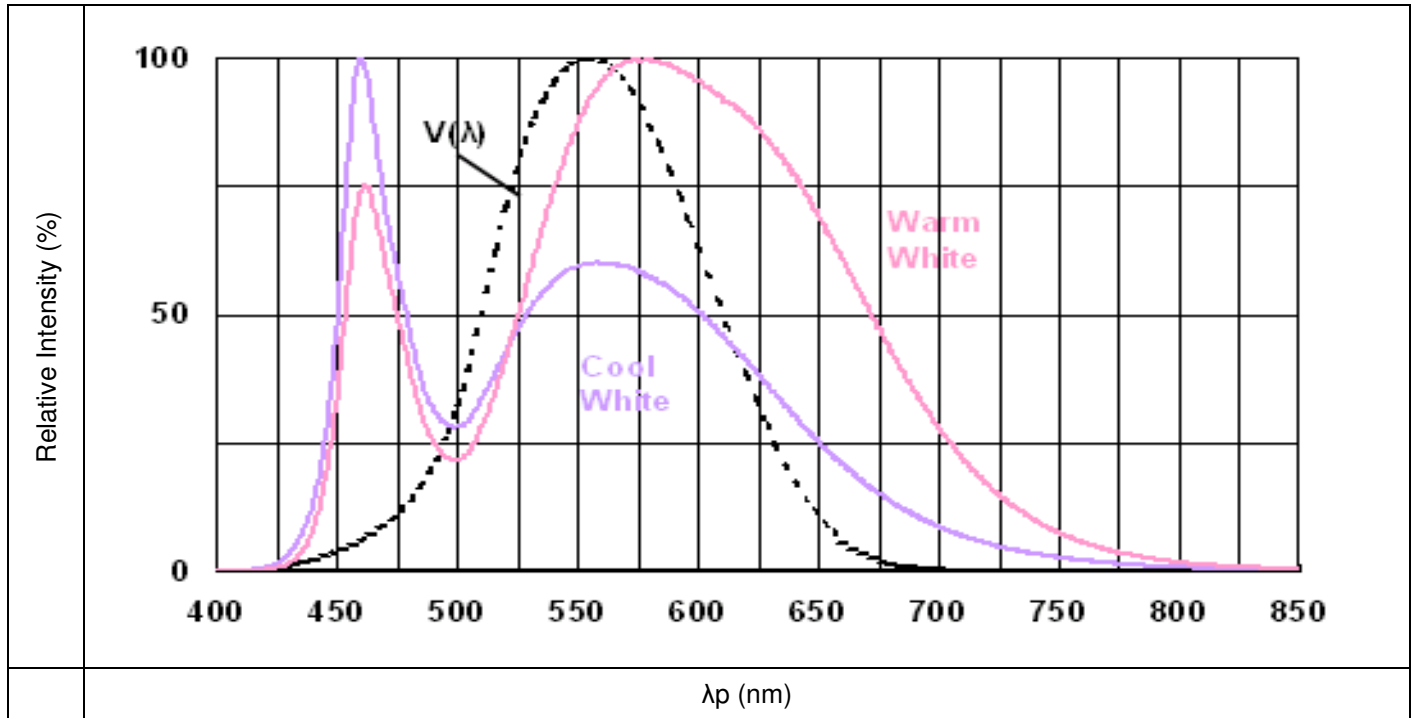
Bin Code of Luminous Intensity

Group	Min.	Max.	Unit	Condition
EA	7100	9000	mcd	$I_F = 150\text{mA}$
EB	9000	11200		
FA	11200	14000		

Note:

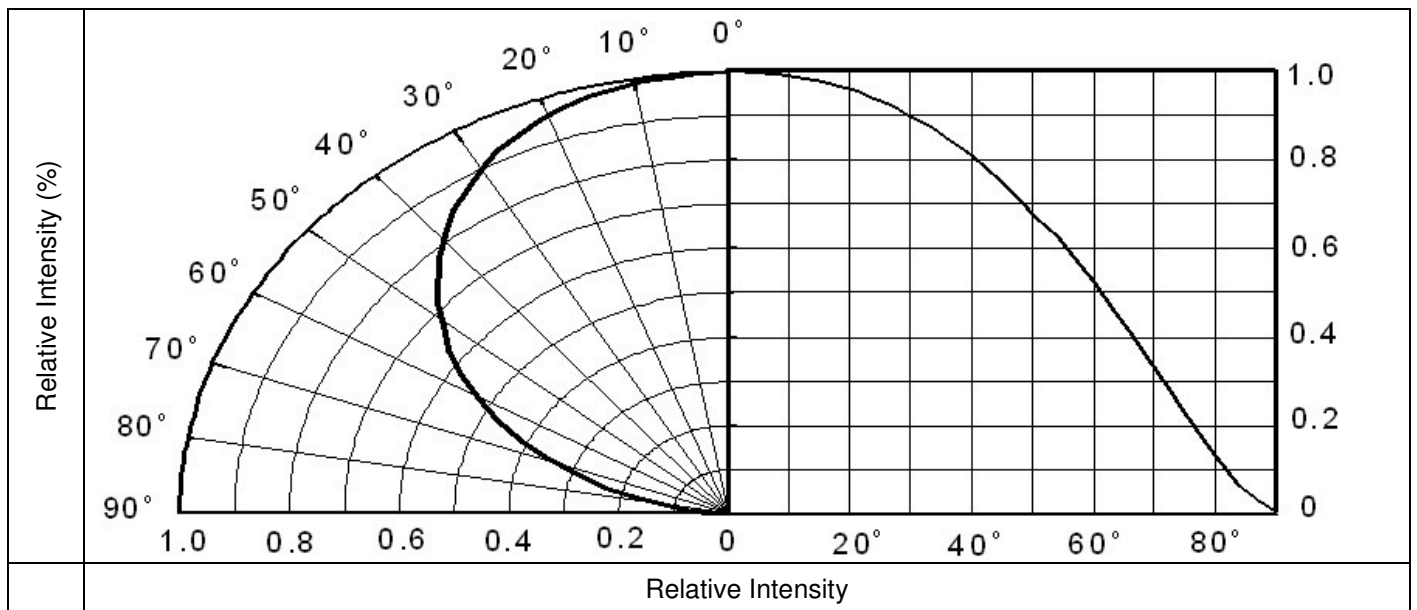
1. The standard shipping format for serial types includes a family bin of 3 individual brightness bins. Individual brightness bins cannot be ordered.
2. Only one bin will be shipped on each reel (there will be no mixing of two bin on each reel).

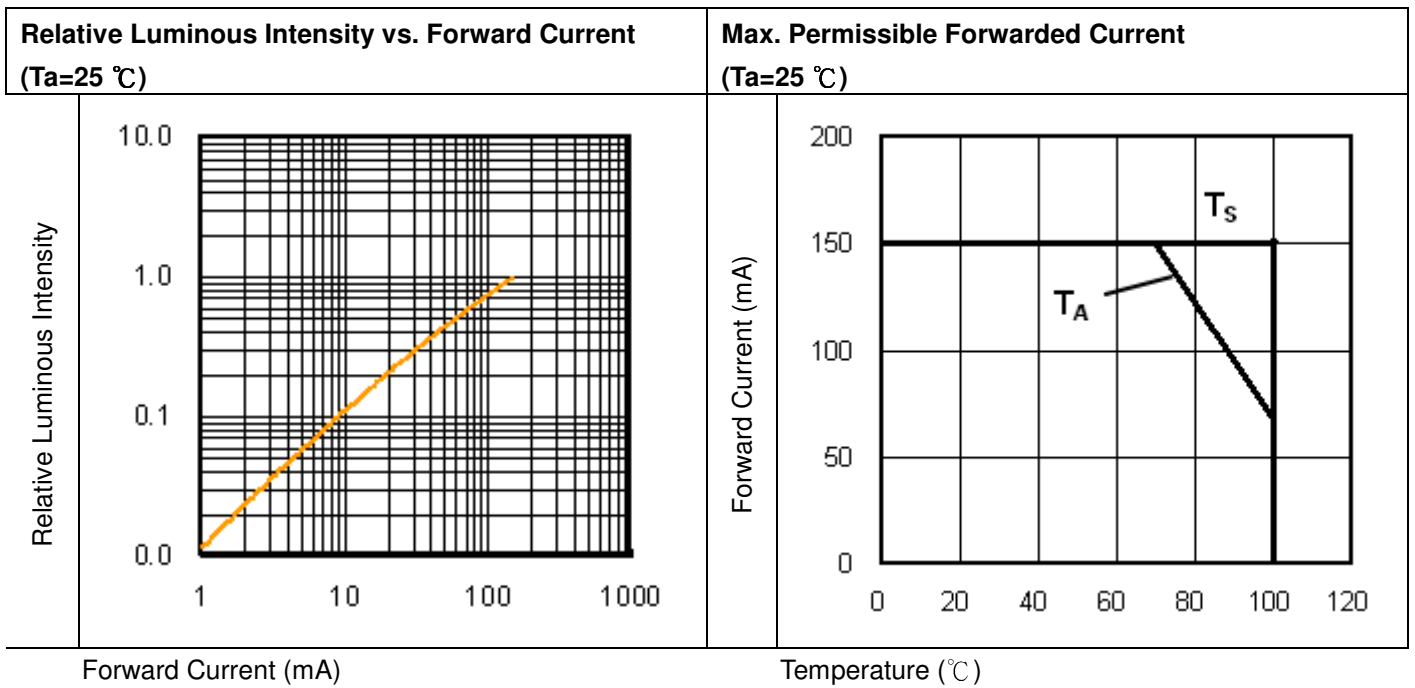
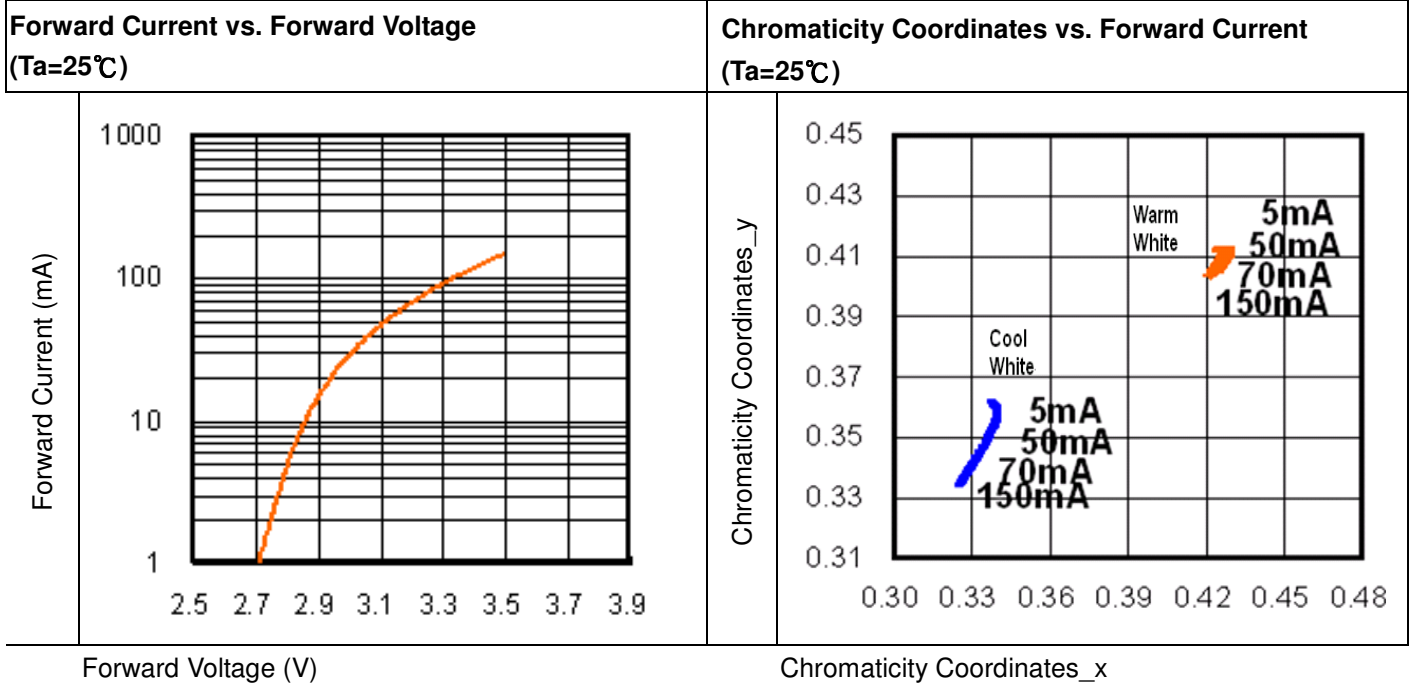
Typical Electro-Optical Characteristics Curves



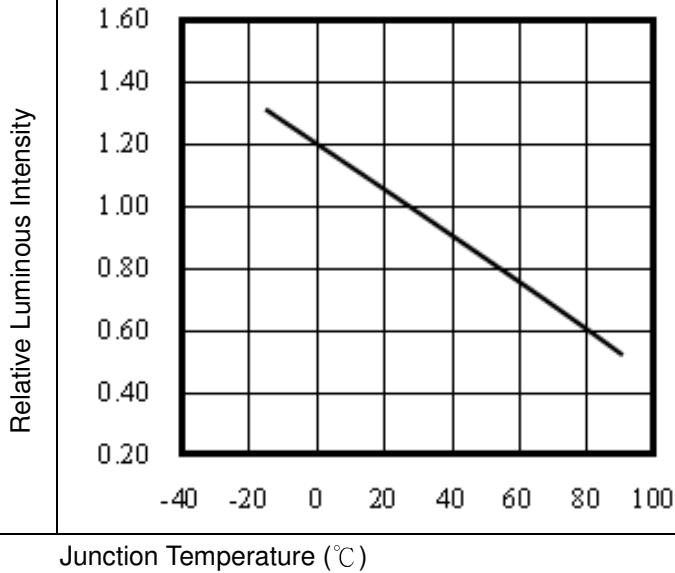
Note: $V(\lambda)$ =Standard eye response curve; $I_F = 150\text{mA}$

Diagram Characteristics of Radiation

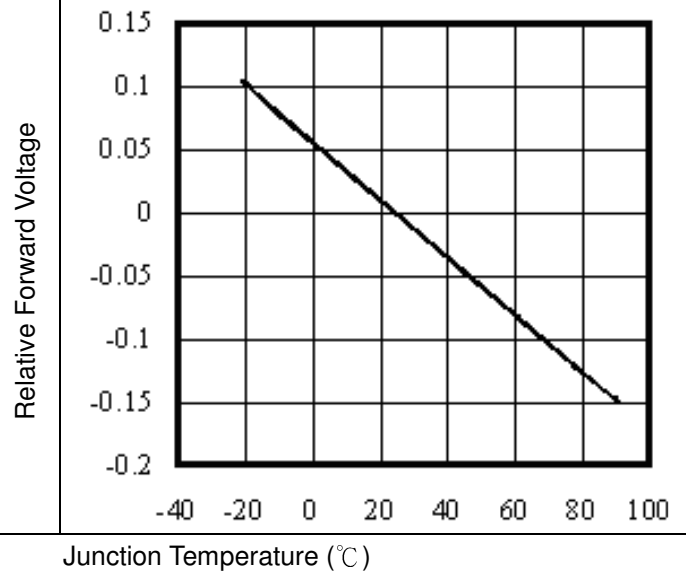




Relative Luminous Intensity vs. Junction Temperature



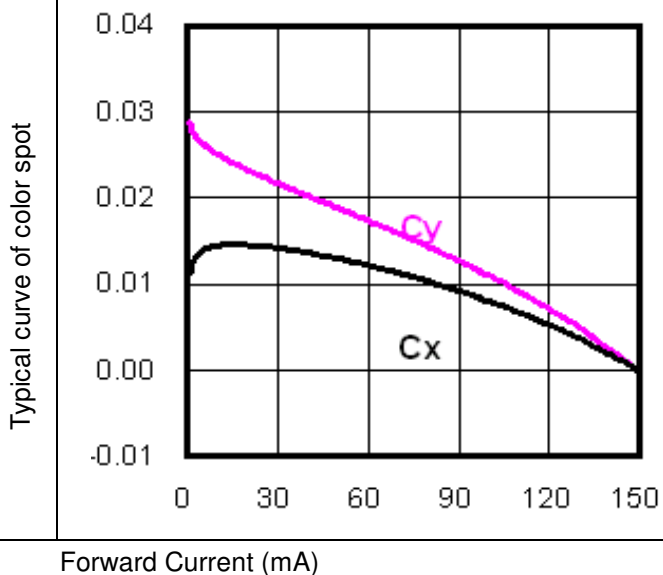
Relative Forward Voltage vs. Junction Temperature



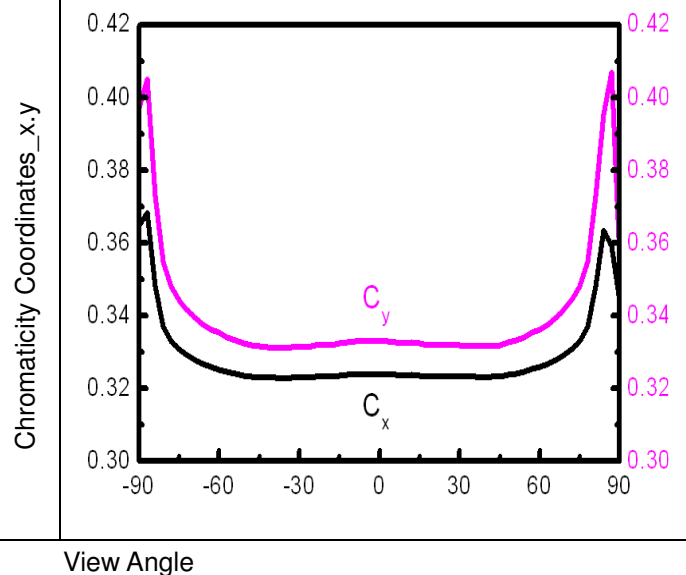
Note: $f(T_j) = I_v / I_v(25^\circ\text{C})$; $I_F = 150\text{mA}$

Note: $\Delta V_F = V_F - V_F(25^\circ\text{C}) = f(T_j)$; $I_F = 150\text{mA}$

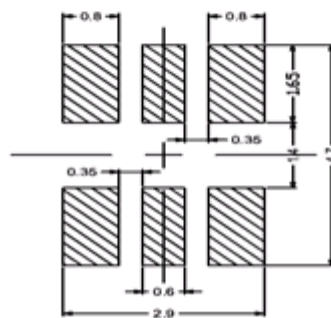
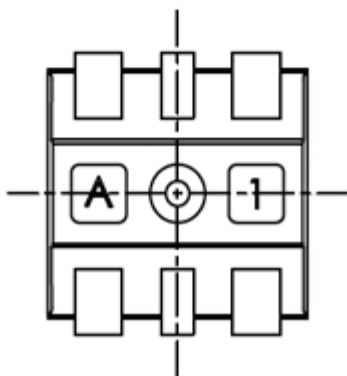
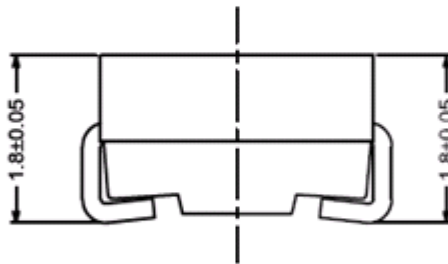
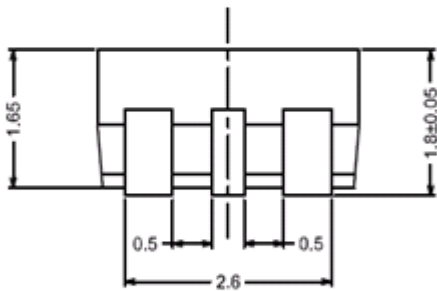
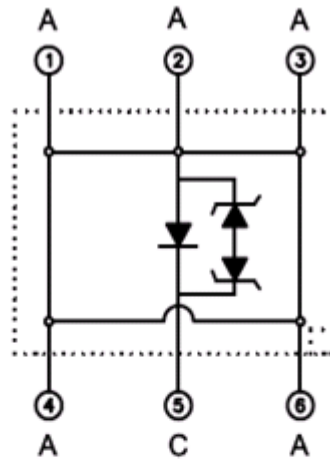
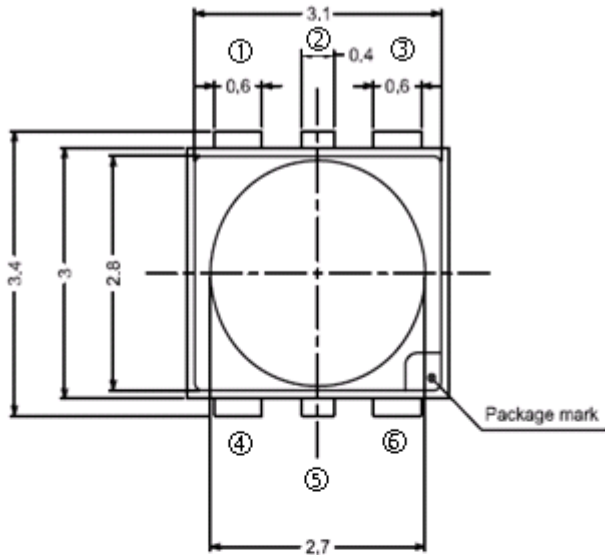
Chromaticity Coordinate Shift vs. Forward Current



Chromaticity Coordinates vs. Angle (Ta=25°C)



Package Dimension



Note: Tolerances unless mentioned ±0.1mm. Unit = mm

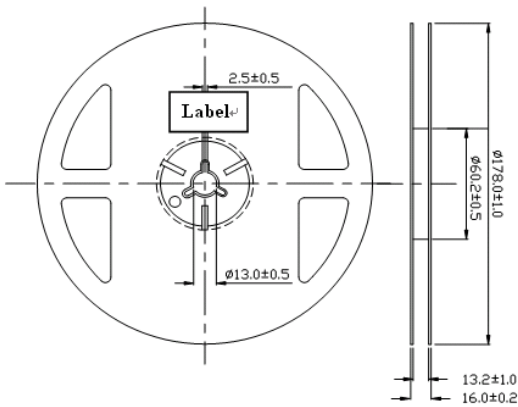
Moisture Resistant Packing Materials

Label Explanation

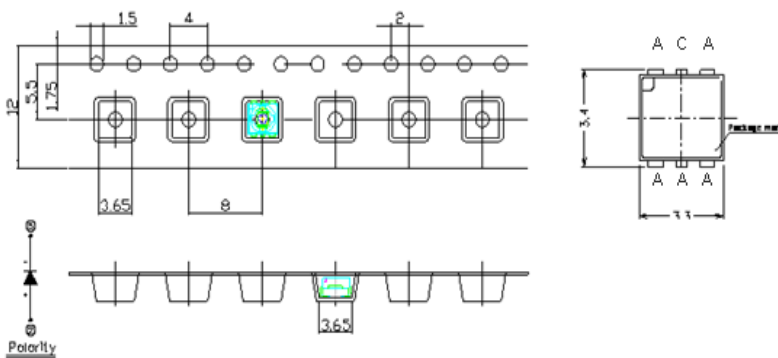


- CPN: Customer's Product Number
- P/N: Product Number
- QTY: Packing Quantity
- CAT: Luminous Intensity Rank
- HUE: Dom. Wavelength Rank
- REF: Forward Voltage Rank
- LOT No: Lot Number

Reel Dimensions

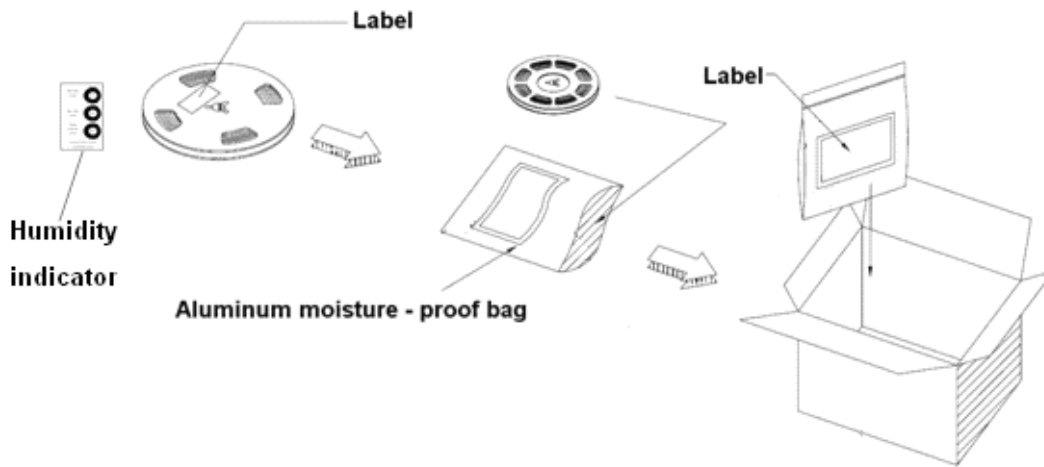


Carrier Tape Dimensions: Loaded Quantity 1000 pcs Per Reel



Note: Tolerances unless mentioned ± 0.1 mm. Unit = mm

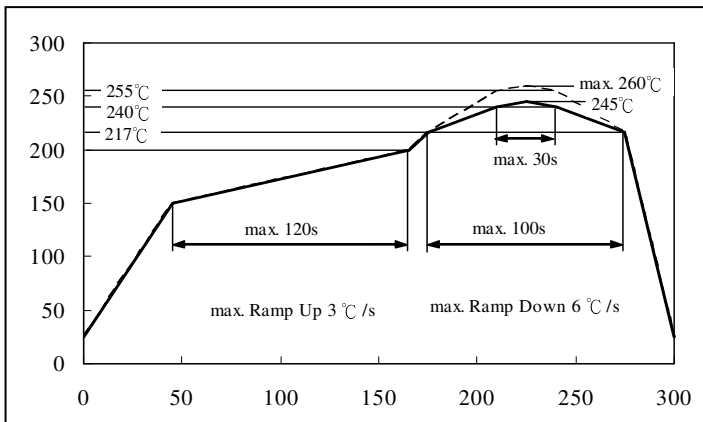
Moisture Resistant Packing Process



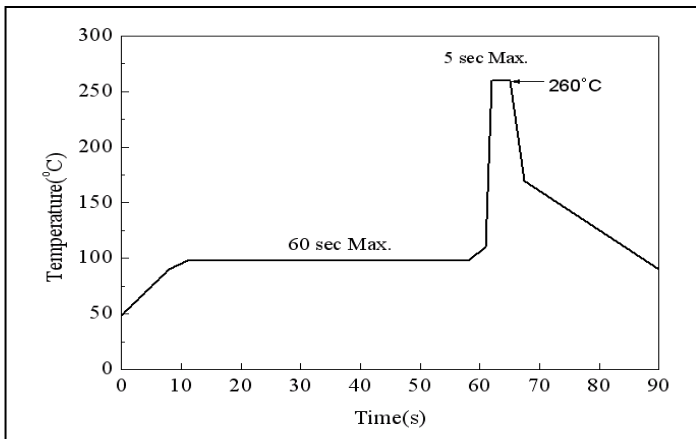
Note: Tolerances unless mentioned $\pm 0.1\text{mm}$. Unit = mm

Precautions

**1. Soldering Condition (Reference: IPC/JEDEC J-STD-020D)
IR Reflow**



2. Wave Soldering Reflow



2. Current Limiting

Though A09K has conducted ESD protection mechanism, customers must not use the device in reverse and should apply resistors for extra protection. Otherwise, slight voltage difference may cause enormous current shift and burn out failure would happen.

3. Storage

3.1 Moisture proof bag should only be opened immediately prior to usage.

3.2 Environment should be less than 30 °C and 60 % RH when moisture proof bag is opened.

3.3 If the moisture sensitivity card indicates higher than acceptable moisture, the component should be baked at min. 60 deg +/-5 deg for 24 hours.

4. Thermal Management

4.1 For maintaining the high flux output and achieving reliability, A09K series LEDs should be mounted on a metal core printed circuit board (MCPCB) or other kinds of heat sink with proper thermal connection to dissipate approximate 0.5 W of thermal energy at 150 mA operation.

4.2 Sufficient thermal management must be implemented. Otherwise, the junction temperature of dies might be over the limit at high current driving condition and LEDs' lifetime might be decreases dramatically.

5. Iron Soldering

Hand soldering is not recommended for regular production. These guidelines are for rework only. Soldering iron tip should contact each terminal no more than 3 sec at 350 °C, using soldering iron with nominal power less than 25 W. Allow min. 2 sec. between soldering intervals.

6. Usage

Do not exceed the values given in this specification.

Application Restrictions

High reliability applications such as military/aerospace, automotive safety/security systems, and medical equipment may require different product. If you have any concerns, please contact Everlight before using this product in your application. This specification guarantees the quality and performance of the product as an individual component. Do not use this product beyond the specification described in this document.