SPECIFICATION FOR White LED

LML-LK-WZ-0.2W

- Serial Number : LML-LK-WZ-0.2W-RunNo-BinNo-C1.6T-CRI-CCT
- 0.5W maximum power capability
- Lead-free reflow soldering application
- Built-in ESD protection device
- RoHS compliant

Vendor		Customer
Written	Approval	Approval

Lumens CO., LTD.
456 Gomae-Dong, Giheung-Gu, Yongin-Si, Gyeonggi-Do 449-901 Korea
http://www.lumens.co.kr

1. Product description

*** Description**

- The LK series LED is designed for the high power operation to get the high flux output applications.
- It incorporates the state of the art SMD design and high reliable material.
- It is ideal for the light source for general illumination applications, custom designed solutions.

*** Features**

- Maximum drive current up to 150mA
- Low thermal resistance as low as 12 ℃/W
- Wide viewing angle of 120~140 degrees
- Reflow soldering with JEDEC JSTD-020C compatible
- RoHS compliant

*** Applications**

- General luminaire
- Bulb
- Downlight

2. Absolute maximum ratings

Parameters	Symbol	Min Value	Max Value	Unit
Power dissipated	Pd		0.46	W
Rated forward current	If		150	mA
Allowable peak forward current(1)	Ip		200	mA
Maximum junction temperature capability	Tj		110	℃
Electrostatic discharge threshold(2)	ESD		±5,000	V
Operating temperature	Topr	-40	+85	℃
Storage temperature	Tstg	-40	+85	℃
Soldering temperature(Reflow)	Tsol		260℃, 10s	℃, s
Soldering temperature(Hand)	Tsoh		350℃, 3s	℃, s

(1) Ip measured at 1/10 duty cycle, 0.1ms pulse width.
(2) ESD HBM class 2 per Mil-Std-883D method 3015.

3. Electro-optical characteristics (Ta=25℃, If=65mA)

Parameters	Symbol	Condition	Min.	Typ.	Max.	Unit
Luminous Flux	Φv	If=65mA	23		31	lm
Correlated Color Temperature	CCT	If=65mA	2,700		8,000	K
Color Rendering Index	CRI	If=65mA		80		-
Forward voltage	Vf	If=65mA	2.8		3.1	V
Viewing angle FWHM	2θ1/2	If=65mA		130		deg
Thermal resistance junction to solder pad	Rthj-s			12		℃/W
Reverse voltage	Vr	If=10uA		0.6		V
Temperature coefficient Vf	TCv	If=65mA		-3		mV/℃

(1) Parameters are measured by CAS-140 of Instrument System CO.,LTD.
(2) Measurement accuracy : **Φv**(±10%), Vf(±0.05V).

4. Electro-optical chart

CCT(K)	If(mA)	Vf(V)	Pd(W)	Φv(lm)	lm/W
2700	60	2.84	0.17	23.35	136.95
	65	2.86	0.19	25.14	135.45
	120	3.00	0.36	43.46	120.91
	150	3.06	0.46	52.84	115.05
3000	60	2.84	0.17	23.89	140.06
	65	2.86	0.19	25.71	138.53
	120	3.00	0.36	44.45	123.66
	150	3.06	0.46	54.04	117.66
4000	60	2.84	0.17	25.88	151.74
	65	2.86	0.19	27.86	150.07
	120	3.00	0.36	48.16	133.96
	150	3.06	0.46	58.55	127.47
5000	60	2.84	0.17	26.54	155.63
	65	2.86	0.19	28.57	153.92
	120	3.00	0.36	49.39	137.40
	150	3.06	0.46	60.05	130.73
5700	60	2.84	0.17	26.14	153.29
	65	2.86	0.19	28.14	151.61
	120	3.00	0.36	48.65	135.34
	150	3.06	0.46	59.15	128.77
6500	60	2.84	0.17	25.61	150.18
	65	2.86	0.19	27.57	148.53
	120	3.00	0.36	47.66	132.59
	150	3.06	0.46	57.95	126.16

(1) Parameters are measured by CAS-140 of Instrument System CO.,LTD.
(2) Measurement accuracy : **Φv**(±10%), Vf(±0.05V).

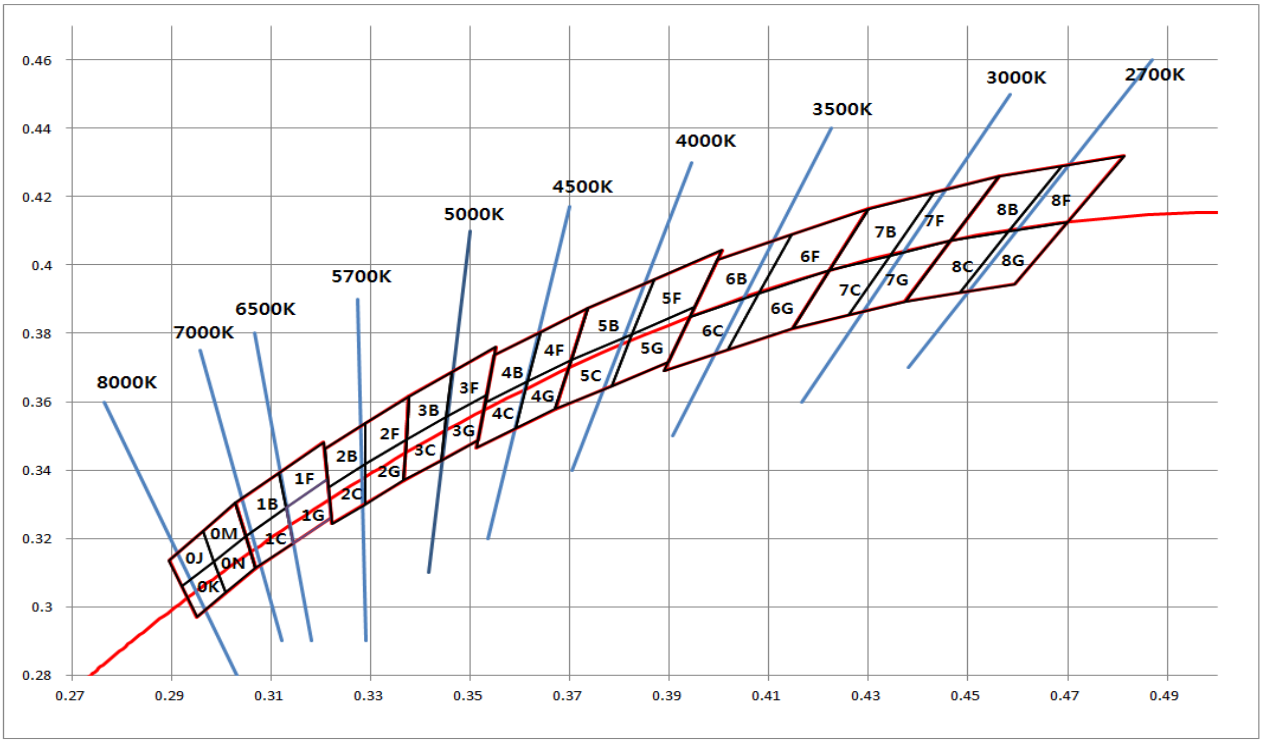
5. Ranks

Item	Symbol	CCT(K)	Rank	Min.	Typ.	Max.	Unit	Condition
Luminous Flux	Φv	2,700	A	23	-	25	lm	65mA
			B	25	-	27		
			C	27	-	29		
		3,000	A	23	-	25	lm	
			B	25	-	27		
			C	27	-	29		
		4,000	A	25	-	27	lm	
			B	27	-	29		
			C	29	-	31		
		5,000	A	25	-	27	lm	
			B	27	-	29		
			C	29	-	31		
		5,700	A	25	-	27	lm	
			B	27	-	29		
			C	29	-	31		
		6,500	A	25	-	27	lm	
			B	27	-	29		
			C	29	-	31		
Forward Voltage	Vf	-	1	2.8	-	2.9	V	
			2	2.9	-	3		
			3	3	-	3.1		

(1) Parameters are measured by CAS-140 of Instrument System CO.,LTD.

(2) Measurement accuracy : **Φv**(±10%), Vf(±0.05V).

6. Chromaticity diagram



(1) Chromaticity coordinate groups are measured with an accuracy of ±0.01

7. Correlated Color Temperature Ranges

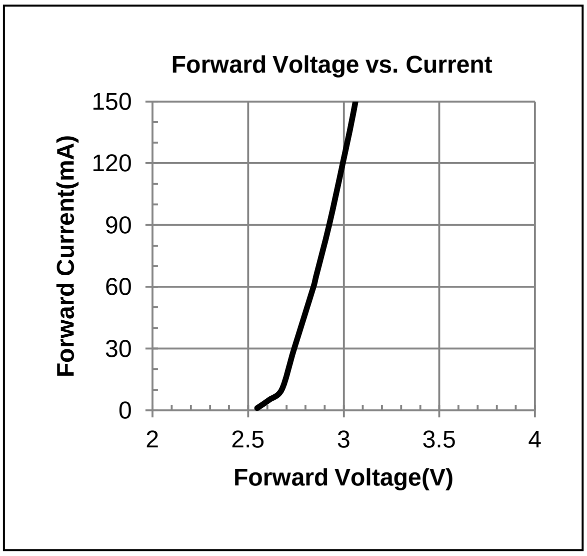
Item	CCT Ranges	CIE Ranges	Color bins
Cool-White	**8000K ~ 4750K**	**0J ~ 3G**	**16bin**
Neutral-White	**4750K ~ 3750K**	**4B ~ 5G**	**8bin**
Warm-White	**3750K ~ 2600K**	**6B ~ 8G**	**12bin**

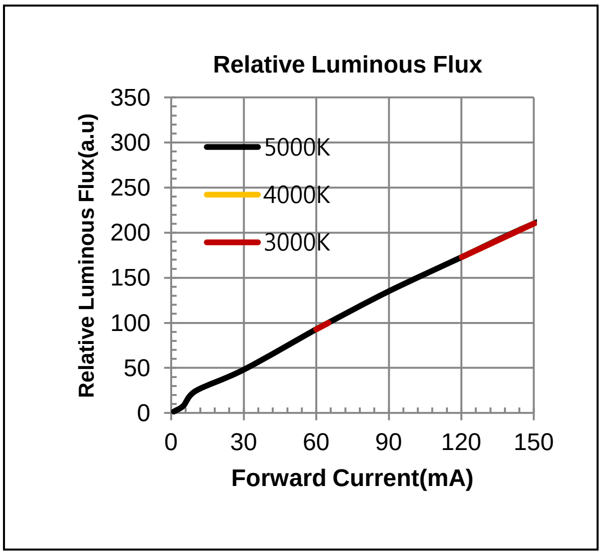
8. Chromaticity coordinates

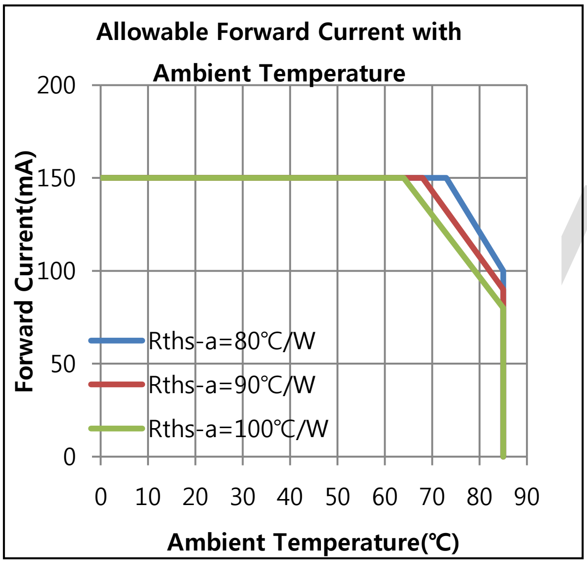
CCT	Rank	CIE X	CIE Y	CCT	Rank	CIE X	CIE Y	CCT	Rank	CIE X	CIE Y	CCT	Rank	CIE X	CIE Y
6500K	1B	0.3028	0.3304	5000K	3B	0.3376	0.3616	4000K	5B	0.3736	0.3874	3000K	7B	0.4299	0.4165
		0.3115	0.3391			0.3463	0.3687			0.3870	0.3958			0.4430	0.4212
		0.3130	0.3290			0.3451	0.3554			0.3825	0.3798			0.4342	0.4028
		0.3048	0.3207			0.3371	0.3490			0.3702	0.3722			0.4221	0.3985
	1C	0.3048	0.3207		3C	0.3371	0.3490		5C	0.3702	0.3722		7C	0.4221	0.3985
		0.3130	0.3290			0.3451	0.3554			0.3825	0.3798			0.4342	0.4028
		0.3144	0.3186			0.3440	0.3427			0.3783	0.3646			0.4260	0.3853
		0.3068	0.3113			0.3366	0.3369			0.3670	0.3578			0.4147	0.3814
	1F	0.3115	0.3391		3F	0.3463	0.3687		5F	0.3870	0.3958		7F	0.4430	0.4212
		0.3205	0.3481			0.3551	0.3760			0.4006	0.4044			0.4562	0.4260
		0.3213	0.3373			0.3533	0.3620			0.3951	0.3876			0.4465	0.4071
		0.3130	0.3290			0.3451	0.3554			0.3825	0.3798			0.4342	0.4028
	1G	0.3130	0.3290		3G	0.3451	0.3554		5G	0.3825	0.3798		7G	0.4342	0.4028
		0.3213	0.3373			0.3533	0.3620			0.3951	0.3876			0.4465	0.4071
		0.3221	0.3261			0.3515	0.3487			0.3898	0.3716			0.4373	0.3893
		0.3144	0.3186			0.3440	0.3427			0.3783	0.3646			0.4260	0.3853
5700K	2B	0.3207	0.3462	4500K	4B	0.3548	0.3736	3500K	6B	0.3996	0.4015	2700K	8B	0.4562	0.4260
		0.3290	0.3538			0.3641	0.3804			0.4146	0.4089			0.4687	0.4289
		0.3290	0.3417			0.3615	0.3659			0.4080	0.3916			0.4582	0.4099
		0.3215	0.3350			0.3530	0.3597			0.3941	0.3848			0.4465	0.4071
	2C	0.3215	0.3350		4C	0.3530	0.3597		6C	0.3941	0.3848		8C	0.4465	0.4071
		0.3290	0.3417			0.3615	0.3659			0.4080	0.3916			0.4582	0.4099
		0.3290	0.3300			0.3590	0.3521			0.4017	0.3752			0.4483	0.3918
		0.3222	0.3243			0.3512	0.3465			0.3889	0.3690			0.4373	0.3893
	2F	0.3290	0.3538		4F	0.3641	0.3804		6F	0.4146	0.4089		8F	0.4687	0.4289
		0.3376	0.3616			0.3736	0.3874			0.4299	0.4165			0.4813	0.4319
		0.3371	0.3490			0.3702	0.3722			0.4221	0.3985			0.4700	0.4126
		0.3290	0.3417			0.3615	0.3659			0.4080	0.3916			0.4582	0.4099
	2G	0.3290	0.3417		4G	0.3615	0.3659		6G	0.4080	0.3916		8G	0.4582	0.4099
		0.3371	0.3490			0.3702	0.3722			0.4221	0.3985			0.4700	0.4126
		0.3366	0.3369			0.3670	0.3578			0.4147	0.3814			0.4593	0.3944
		0.3290	0.3300			0.3590	0.3521			0.4017	0.3752			0.4483	0.3918

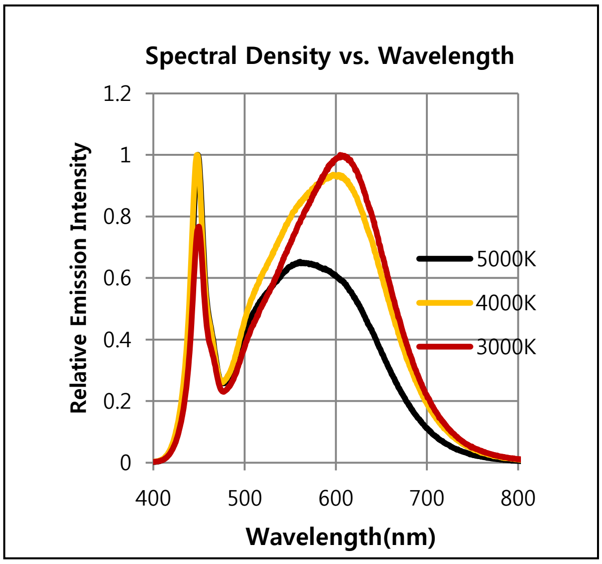
(1) Chromaticity coordinate groups are measured with an accuracy of ±0.01

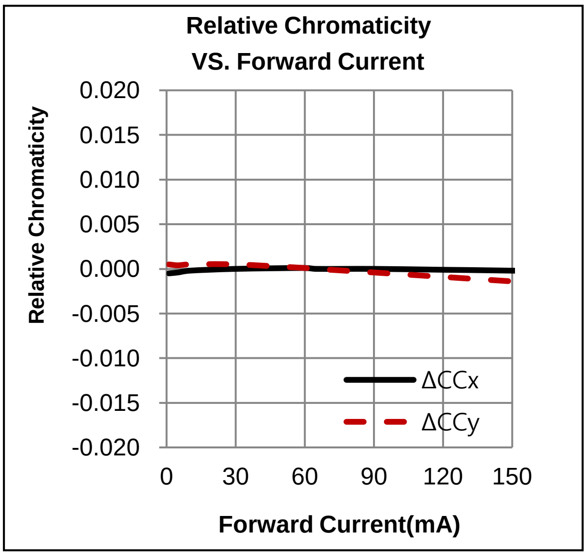
9. Characteristic Graphs(Ta=25℃)

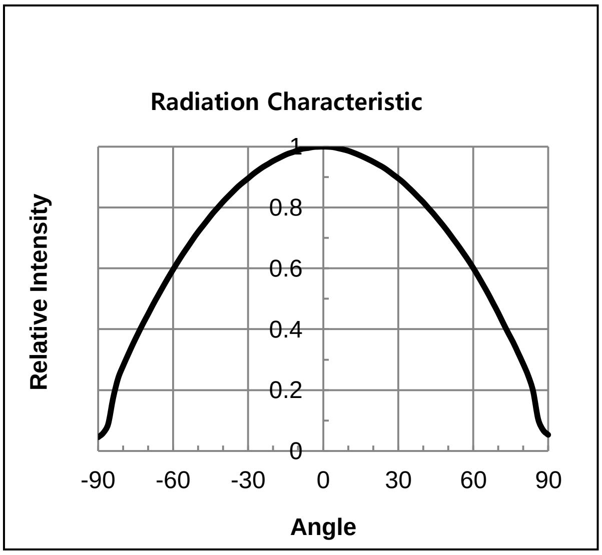










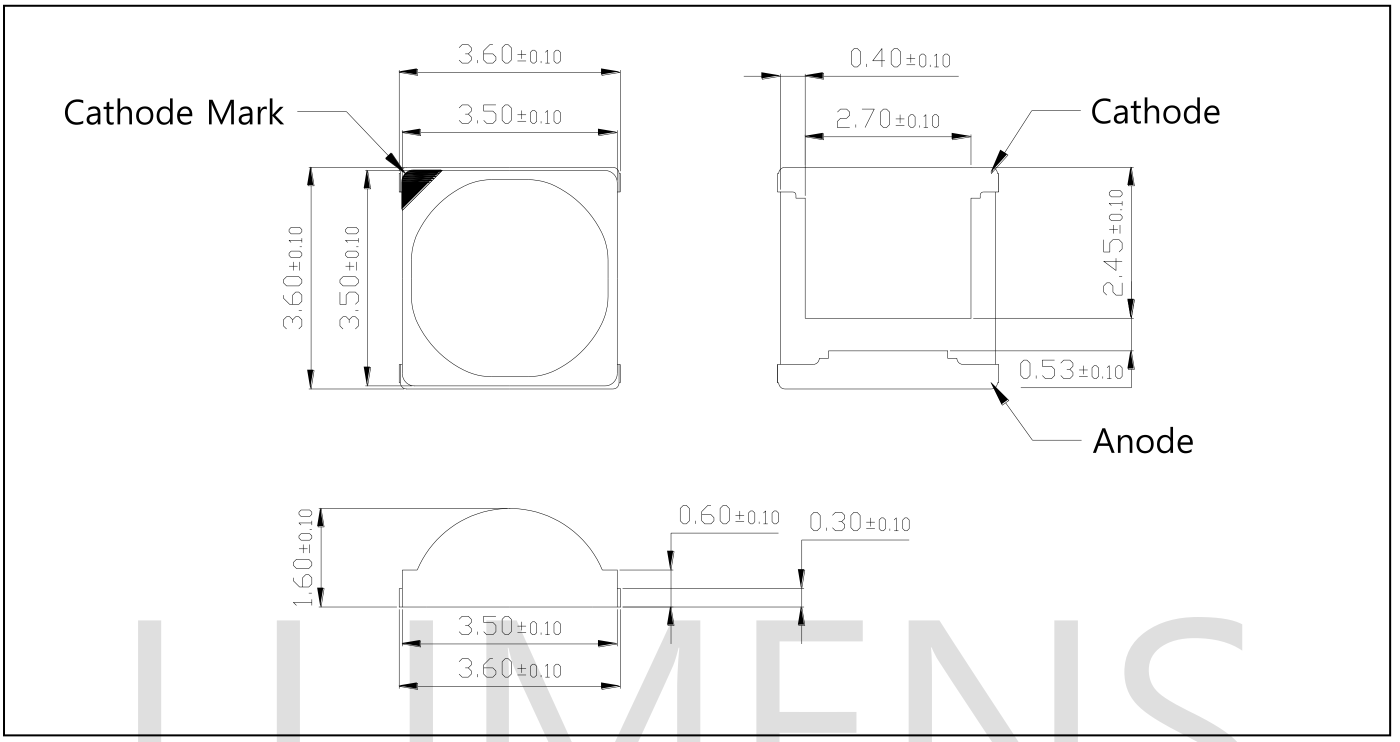


10. Outline Dimensions

Unit : mm

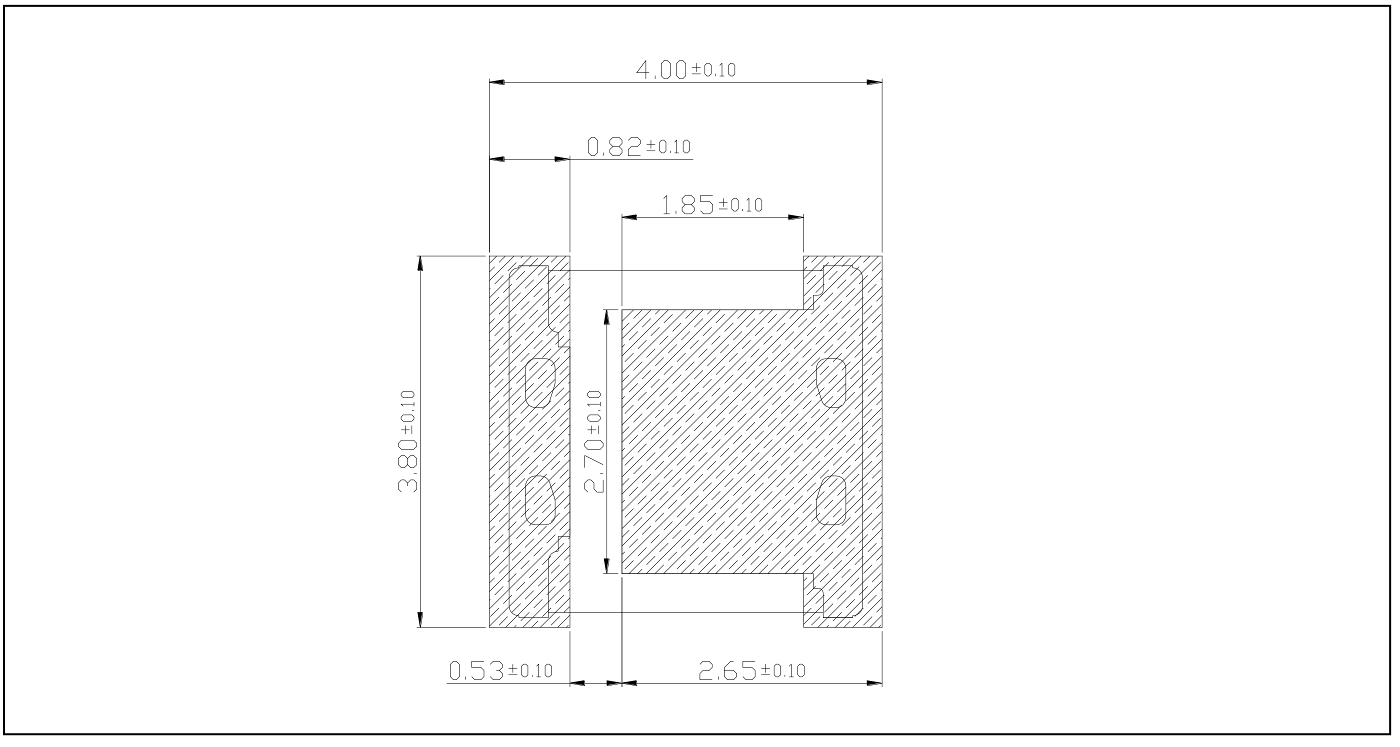
1) Package outline : (LxWxH) of 3.5 x 3.5 x 1.6 mm.

2) Tolerance - All measurements are ± 0.15 mm unless otherwise indicated.



11. Recommended solder pad

(unit : mm)



12. Reliability test items and conditions

Item	**Reference**	**Test Conditions**	**Duration / Cycle**	**Number of Damaged**
Thermal Shock	EIAJ ED-4701	Ta =-40℃ (30min) ~ 100℃ (30min)	150 Cycle	0/30
Operating Endurance Test	Internal Reference	Ta =25℃, IF =150mA	1,000 Hours	0/30
High Temperature High Humidity Life Test	Internal Reference	Ta =60℃, RH=90%, IF =150mA	500 Hours	0/30
High Temperature Life Test	Internal Reference	Ta =85℃, IF =90mA	500 Hours	0/30
ESD(HBM)		±5KV at 1.5kΩ, 100pF	5 Time	0/5
Reflow	Tsor	260℃< 10sec, Reflow Soldering	3 Time	0/30

- Test Board : Metal board thickness=1.6mm, Copper layer thickness=0.07mm, Rth ≒100 ℃/W

◆ CRITERIA FOR JUDGING THE DAMAGE

Item	**Symbol**	**Condition**	**Criteria for Judgment**	
			MIN	**MAX**
Forward Voltage	Vf	IF =65mA	-	USL (1) × 1.1
Radiant Power	Po	IF =65mA	LSL (2) × 0.7	-

(1) USL : Upper Standard Level
(2) LSL : Lower Standard Level

13. Recommended soldering temperature – time profile for reflow soldering

Surface Mounting Condition

In automatic mounting of the SMD LEDs on printed circuit boards, any bending, expanding and pulling forces or shock against the SMD LEDs should be kept minimum to prevent them from electrical failures and mechanical damages of the devices.

Soldering Reflow

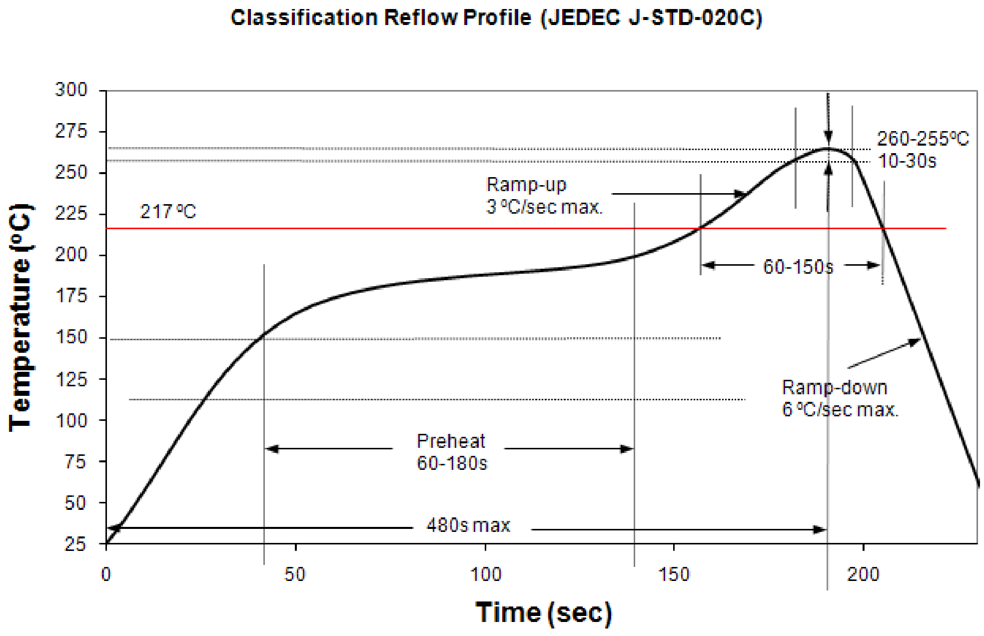
-Soldering of the SMD LEDs should conform to the soldering condition in the individual specifications.

-SMD LEDs are designed for reflow soldering.

-In the reflow soldering, too high temperature and too large temperature gradient such as rapid heating/cooling may cause electrical & optical failures and damages of the devices.

-Lumens cannot guarantee the LEDs after they have been assembled using the solder dipping method.

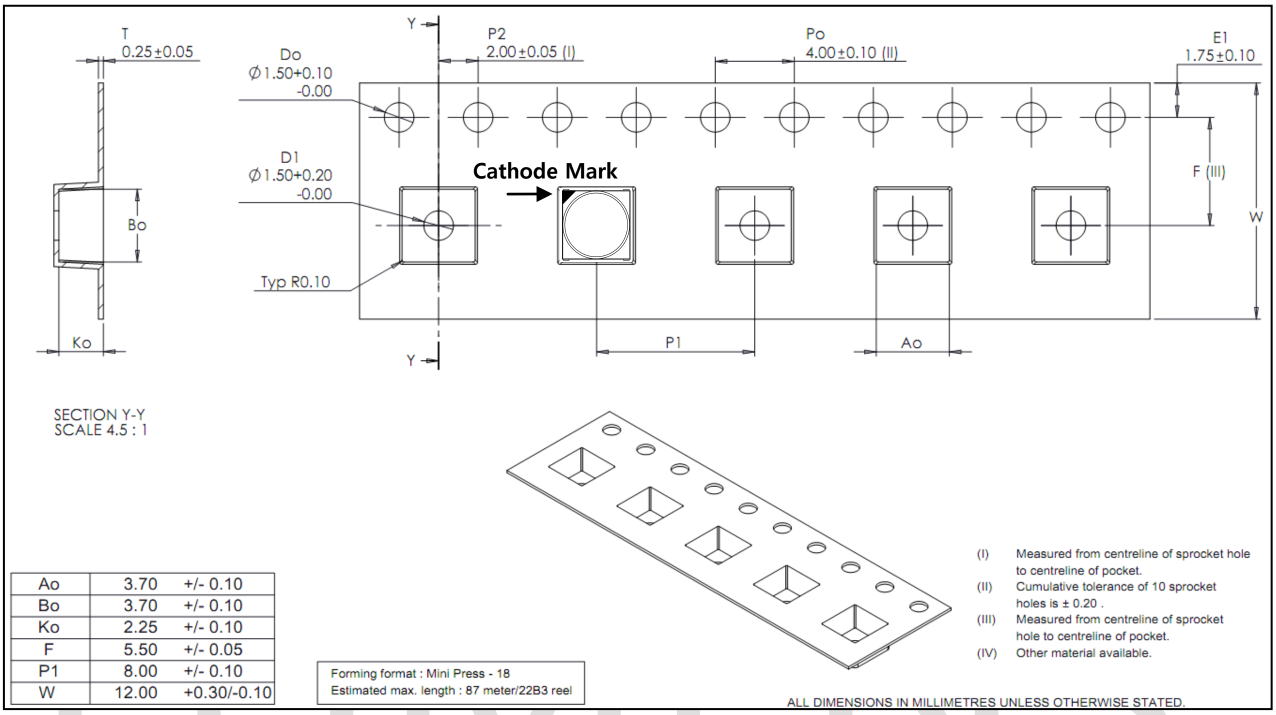
Recommended Pb Free IR-Reflow Soldering Profile.



14. Taping and orientation

1. Moisture proof bag.
2. 1 Reel/bag.
3. Quantity : 800ea/Reel.

<Carrier tape Dimension>



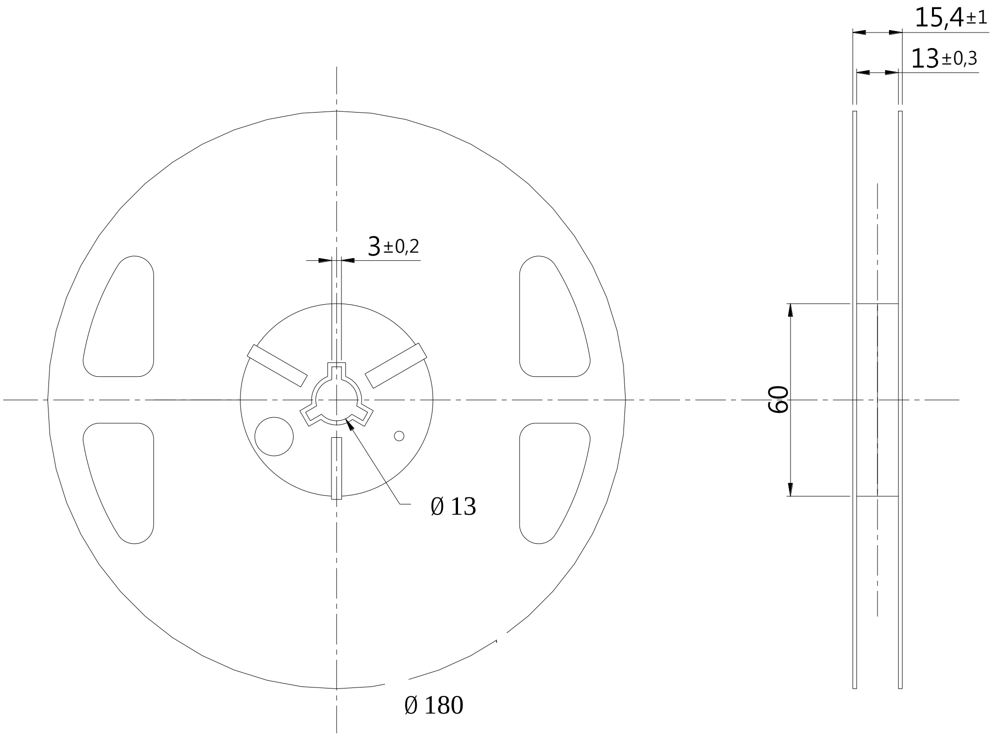
Ao	3.70	+/- 0.10
Bo	3.70	+/- 0.10
Ko	2.25	+/- 0.10
F	5.50	+/- 0.05
P1	8.00	+/- 0.10
W	12.00	+0.30/-0.10

Forming format : Mini Press - 18
Estimated max. length : 87 meter/22B3 reel

(I) Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
(III) Measured from centreline of sprocket hole to centreline of pocket.
(IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

<Reel Dimension>



15. Cautions

1 Moisture-Proof Package

1.1 When moisture is absorbed into the LED package it may vaporize and expand products during soldering. There is a possibility that this may cause exfoliation of the contacts and damage to the optical characteristics of the LEDs. For this reason, the moisture-proof package is used to keep moisture to a minimum in the package.

1.2 A package of a moisture-absorbent material (silica gel) is inserted into the shielding bag. The silica gel changes its color from blue to pink as it absorbs moisture.

2 Current limiting

A resistor should be used to limit current spikes that can be caused by voltage fluctuations.
Otherwise damage could occur.

3 Iron Soldering

3.1 Hand soldering is not recommended for regular production. These guidelines are for rework only.

3.2 Soldering iron tip should contact each terminal no more than 3 sec at 120℃, using soldering iron with nominal power less than 25W. Allow min. 2 sec. between soldering intervals.

4 Storage Conditions

4.1 Before opening the package: The LEDs should be kept at 30℃ or less and 90%RH or less. The LEDs should be used within a year. When storing the LEDs, moisture-proof packaging with moisture-absorbent material (silica gel) is recommended.

4.2 After opening the package: The LEDs should be kept at 30℃ or less and 70%RH or less. The LEDs should be soldered within 168 hours (7 days) after opening the package. If unused LEDs remain, they should be stored in moisture-proof packages, such as sealed containers with packages of moisture-absorbent material (silica gel). It is also recommended to return the LEDs to the original moisture-proof bag and to reseal the moisture-proof bag again.

4.3 If the moisture-absorbent material (silica gel) has faded away or the LEDs have exceeded the recommended storage time, baking treatment should be performed using the following conditions. Baking treatment: more than 24 hours at 65±5℃

4.4 Lumens LED electrode sections are comprised of a silver-plated copper alloy. The silver surface may be affected by environments which contain corrosive gases and so on. Please avoid condition which may cause difficulty environments during soldering operations. It is recommended that the user uses the LEDs as soon as possible.

4.5 Please avoid rapid transitions in ambient temperature, especially in high humidity environments where condensation can occur.

5 Handling of Silicone Lens LEDs

5.1 Avoid silicone resin parts especially with sharp tools such as pincette(tweezers).

5.2 Avoid leaving fingerprints on silicone lens part.

5.3 Do not apply the silicone lens part with pressure especially in SMT production. So use a proper nozzle not to press the lens part of the LED to pick and place.

6 Usage

6.1 Do not exceed the values given in this specification.

NOTE :

All the information published is considered to be reliable. However, Lumens does not assume any liability arising out of the application or use of any product described herein.

Lumens reserves the right to make changes at any time without notice to any products in order to improve reliability, function or design.

Lumens products are not authorized for use as critical components in life support devices or systems without the express written approval from the managing director of Lumens.