Unilite Opto Technology

email: info@unilite-tech.com
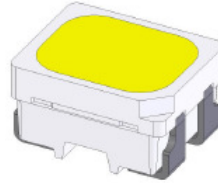
U-P3528W-XX-DS

RoHS
Compliant
Pb

■ **Description**

The PLCC2 type U-P3528W-XX-DS TOP VIEW LED, with its light weight , enables smaller board size, higher packing density, reduced storage space and miniature applications.

- ・ Dice Material ： InGaN
- ・ Light Color ： White
- ・ Lens Color ： Yellow phosphor

■ **Features**

・ 1 chips package
・ Compatible with automatic placement equipment
・ Compatible with reflow soldering process
・ Long operating life
・ Low forward voltage operated
・ Instant light
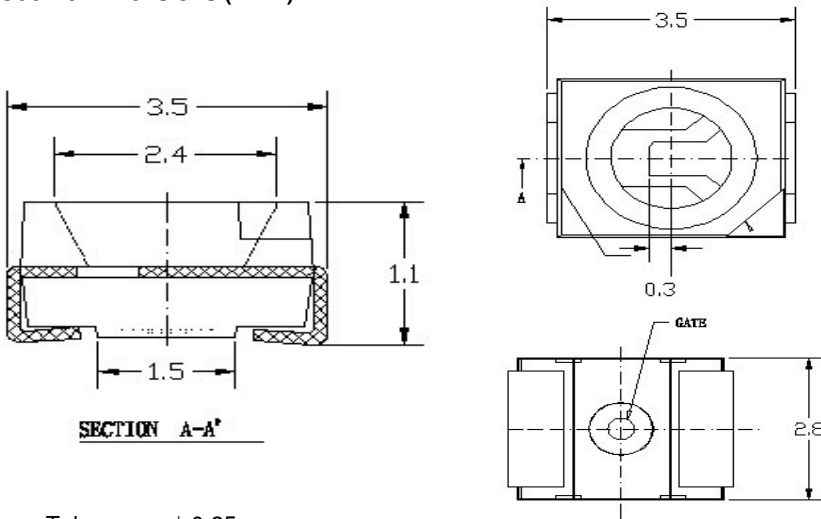・ Pb -free/ RoHS compliant

■ **Applications**

・ Information boards
・ Automotive Interior Lighting
・ Indoor and outdoor display
・ Indicator
・ Backlighting
・ Light bar
・ Gerneral applications

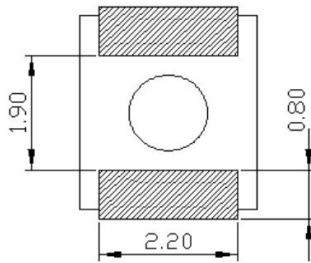# Unilite Opto Technology

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■ **Outline Dimensions (mm)**

SECTION A-A'

Tolerance：± 0.25 mm
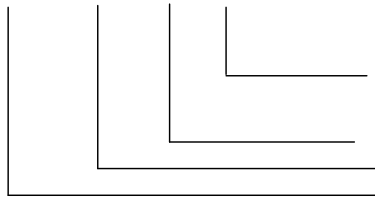
■ **Recommended Soldering Pad Design**

UNIT:mm

■ **Part Numbering System**

U - P 3 5 2 8 W - XX - DS

Color Code: WW: Warm White, NW: Natural White,
            CW: Cold White
Color : W: White
Package code
Product code

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■ **Absolute Maximum Ratings at Ta = 25 ℃**

PARAMETER	symbol	MAX.	UNIT
Power Dissipation *	P$_D$	84	mW
Continuous Forward Current *	I$_F$	30	mA
Peak Forward Current (1/10 Duty Cycle , 0.1ms Pulse Width) *	I$_{FP}$	100	mA
Reverse Voltage	V$_R$	5	V
Operating Temperature Range	Topr	-30 to $+$ 100	^{o}C
Storage Temperature Range	Tstg	-40 to $+$ 100	^{o}C
Reflow Soldering Condition	Tsld	260 ℃ for 10 sec. 2 time.	

■ **Electro-Optical Characteristics**   Condition : I$_F$ = 20mA ,T$_a$ = 25℃

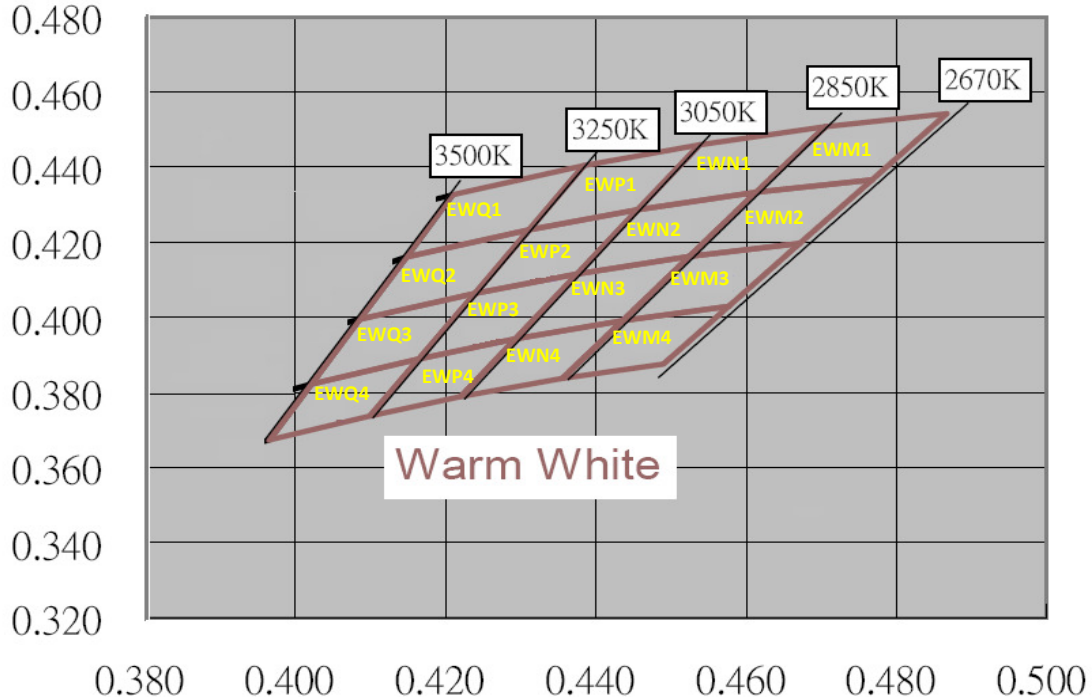| PARAMETER	SYMBOL	TEST CONDITION	VALUES			UNIT
			MIN.	TYP.	MAX.	
* Forward Voltage	V$_F$	I$_F$=20mA		3.3	3.6	V
Reverse Current	I$_R$	V$_R$= 5V			10	μA
Viewing Angle at 50％ Iv	2θ 1/2	I$_F$=20mA		120		Deg.

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U-P3528W-XX-DS

■ **White Color Binning of CCT**

UP3528W-WW-DS

Bin Code	Color Kelvin	1		2		3		4	
		X	Y	X	Y	X	Y	X	Y
WEM1		0.4705	0.4508	0.4866	0.4542	0.4767	0.4366	0.4614	0.4333
WEM2	2670-	0.4614	0.4333	0.4767	0.4366	0.4671	0.4196	0.4525	0.4126
WEM3	2850K	0.4525	0.4126	0.4671	0.4196	0.4577	0.4029	0.4436	0.3991
WEM4		0.4436	0.3991	0.4577	0.4029	0.4490	0.3875	0.4356	0.3837
WEN1		0.4538	0.4460	0.4705	0.4508	0.4614	0.4333	0.4456	0.4287
WEN2	2850-	0.4456	0.4287	0.4614	0.4333	0.4525	0.4162	0.4376	0.4116
WEN3	3050K	0.4376	0.4116	0.4525	0.4162	0.4436	0.3991	0.4294	0.3943
WEN4		0.4294	0.3943	0.4436	0.3991	0.4356	0.3837	0.4221	0.3970
WEP1		0.4312	0.4234	0.4385	0.4040	0.4538	0.4460	0.4456	0.4287
WEP2	3050-	0.4240	0.4065	0.4312	0.4234	0.4456	0.4287	0.4376	0.4116
WEP3	3250K	0.4165	0.3890	0.4240	0.4065	0.4376	0.4116	0.4294	0.3943
WEP4		0.4165	0.3890	0.4294	0.3943	0.4221	0.3790	0.4100	0.3738
WEQ1		0.4312	0.4234	0.4148	0.4161	0.4209	0.4326	0.4385	0.4405
WEQ2	3250-	0.4240	0.4065	0.4086	0.3955	0.4148	0.4161	0.4312	0.4234
WEQ3	3500K	0.4165	0.3890	0.4021	0.3822	0.4086	0.3995	0.4240	0.4065
WEQ4		0.4165	0.3890	0.4100	0.3738	0.3966	0.3673	0.4021	0.3822

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■ **White Color Binning of CCT**
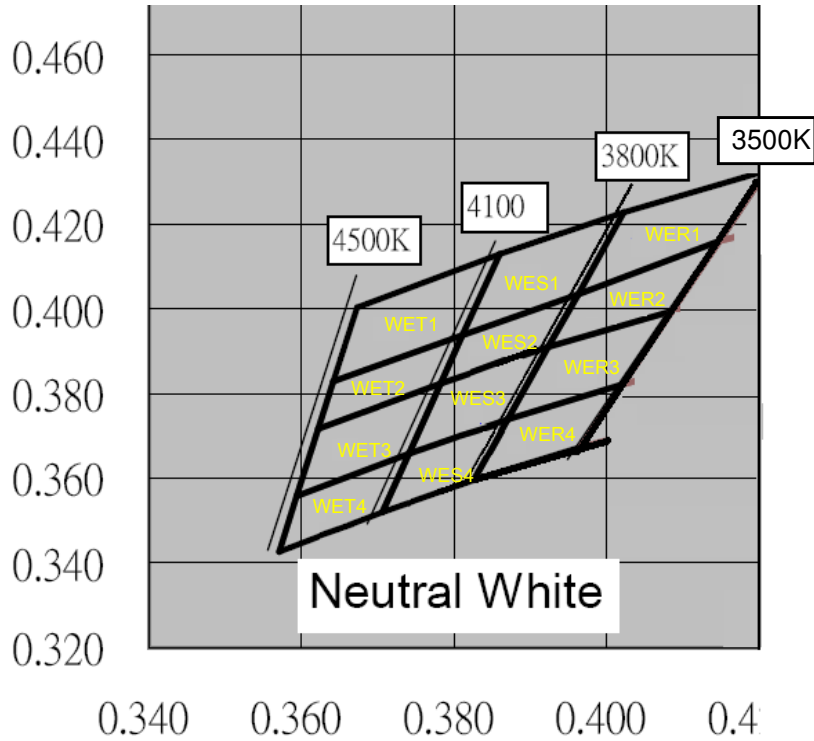
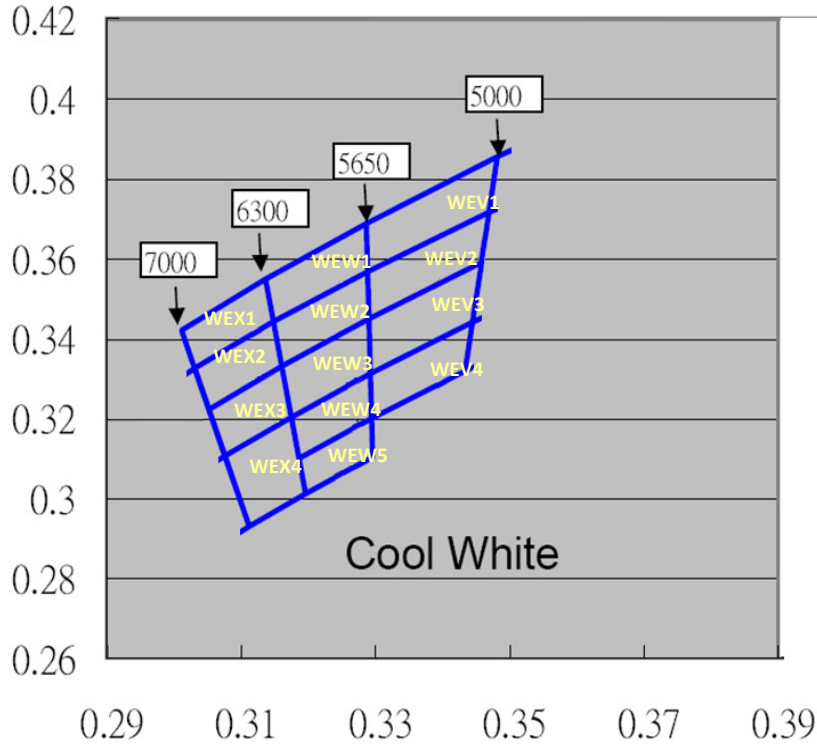| Bin Code	Color Kelvin	1		2		3		4	
		X	Y	X	Y	X	Y	X	Y
WER1		0.4023	0.4220	0.4209	0.4326	0.4148	0.4161	0.3963	0.4035
WER2	3500-	0.3963	0.4035	0.4148	0.4161	0.4086	0.3955	0.3924	0.3909
WER3	3800K	0.3924	0.3909	0.4086	0.3995	0.4021	0.3822	0.3871	0.3739
WER4		0.3871	0.3739	0.4021	0.3822	0.3966	0.3673	0.3826	0.3595
WES1		0.3811	0.3937	0.3860	0.4130	0.4023	0.4228	0.3963	0.4035
WES2	3800-	0.3783	0.3825	0.3811	0.3937	0.3963	0.4035	0.3924	0.3909
WES3	4100K	0.3741	0.3658	0.3783	0.3825	0.3924	0.3909	0.3871	0.3739
WES4		0.3741	0.3658	0.3871	0.3739	0.3826	0.3595	0.3706	0.3520
WET1		0.3811	0.3937	0.3642	0.3829	0.3673	0.4003	0.3860	0.4130
WET2	4100-	0.3783	0.3825	0.3622	0.3716	0.3642	0.3829	0.3811	0.3937
WET3	4500K	0.3741	0.3658	0.3594	0.3557	0.3622	0.3716	0.3783	0.3825
WET4		0.3741	0.3658	0.3706	0.3520	0.3571	0.3426	0.3594	0.3557

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U-P3528W-XX-DS

■ **White Color Binning of CCT**

UP3528W-CW-DS

Bin Code	Color Kelvin	1		2		3		4	
		X	Y	X	Y	X	Y	X	Y
WEV1	5000-5650K	0.3286	0.3690	0.3481	0.3856	0.3469	0.3717	0.3288	0.3102
WEV2		0.3288	0.3569	0.3469	0.3717	0.3458	0.3592	0.3290	0.3569
WEV3		0.3290	0.3451	0.3458	0.3592	0.3444	0.3442	0.3292	0.3451
WEV4		0.3292	0.3313	0.3444	0.3442	0.3434	0.3320	0.3294	0.3313
WEW1	5650-6300K	0.3136	0.3550	0.3286	0.3690	0.3288	0.3569	0.3148	0.3444
WEW2		0.3148	0.3444	0.3288	0.3569	0.3290	0.3451	0.3160	0.3332
WEW3		0.3160	0.3332	0.3290	0.3451	0.3292	0.3313	0.3175	0.3204
WEW4		0.3292	0.3313	0.3294	0.3202	0.3186	0.3102	0.3175	0.3204
WEW5		0.3294	0.3202	0.3295	0.3105	0.3469	0.3013	0.3186	0.3102
WEX1	6300-7000K	0.3031	0.3327	0.3011	0.3422	0.3136	0.3555	0.3148	0.3444
WEX2		0.3052	0.3224	0.3031	0.3327	0.3148	0.3444	0.3160	0.3332
WEX3		0.3076	0.3108	0.3052	0.3224	0.3160	0.3332	0.3175	0.3204
WEX4		0.3196	0.3013	0.3112	0.2932	0.3076	0.3108	0.3175	0.3204

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■ **Bin Grade of MCD (MCD @ IF = 20 mA)**

PN No#: UP3528W-WW-DS

PN	Bin Code	Color Kelvin	W8		W9		W10		W11	
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
			2290	2400	2400	2700	2700	3000	3000	3500
UP3528W-WW-DS	WEM1 WEM2 WEM3 WEM4	2670-2850K	Available		Available		NA		NA	
	WEN1 WEN2 WEN3 WEN4	2850-3050K	Available		Available		NA		NA	
	WEP1 WEP2 WEP3 WEP4	3050-3250K	Available		Available		NA		NA	
	WEQ1 WEQ2 WEQ3 WEQ4	3250-3500K	Available		Available		NA		NA	

PN No#: UP3528W-NW-DS

PN	Bin Code	Color Kelvin	W8		W9		W10		W11	
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
			2290	2400	2400	2700	2700	3000	3000	3500
UP3528W-NW-DS	WER1 WER2 WER3 WER4	3500-3800K	Available		Available		NA		NA	
	WES1 WES2 WES3 WES4	3800-4100K	Available		Available		NA		NA	
	WET1 WET2 WET3 WET4	4100-4500K	Available		Available		NA		NA	

PN No#: UP3528W-CW-DS

PN	Bin Code	Color Kelvin	W8		W9		W10		W11	
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
			2290	2400	2400	2700	2700	3000	3000	3500
UP3528W-CW-DS	WEV1 WEV2 WEV3 WEV4	5000-5650K	Available		Available		NA		NA	
	WEW1 WEW2 WEW3 WEW4 WEW5	5650-6300K	Available		Available		NA		NA	
	WEX1 WEX2 WEX3 WEX4	6300-7000K	Available		Available		Available		NA	

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■ **Bin Grade Limits (I $_F$ = 20 mA) Forward Voltage / v**

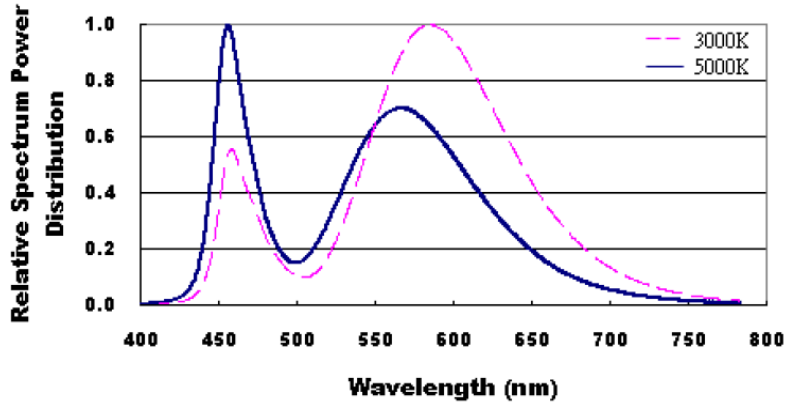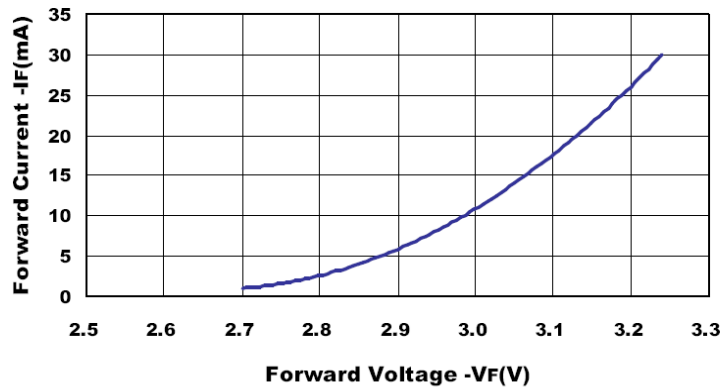| Bin Code	Min	Max	Unit
V16	1.6	1.8	V
V18	1.8	2.0	V
V20	2.0	2.2	V
V22	2.2	2.4	V
V24	2.4	2.6	V
V26	2.6	2.8	V
V28	2.8	3.0	V
V30	3.0	3.2	V
V32	3.2	3.4	V
V33	3.4	3.6	V
V34	3.6	3.8	V

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■ **Typical Electronical/Optical Charateristic curve**

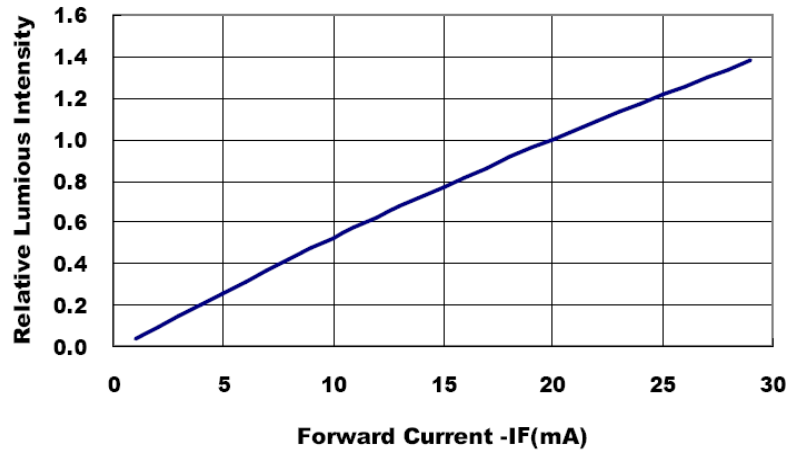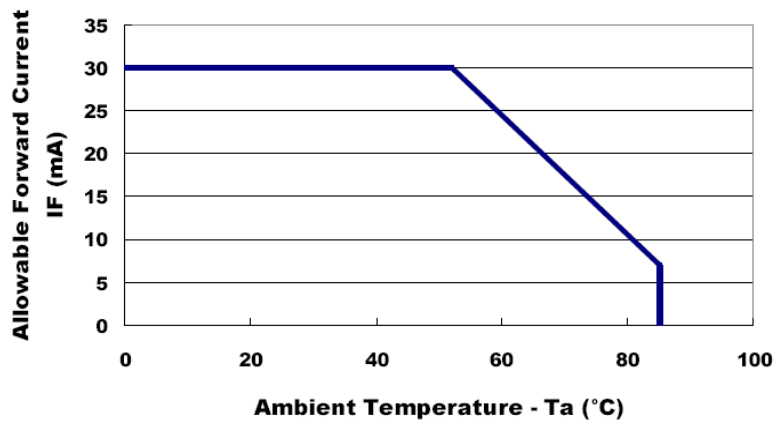Spectrum Distribution

Forward Voltage vs Forward Current

Forward Current vs Relative Lumious intensity

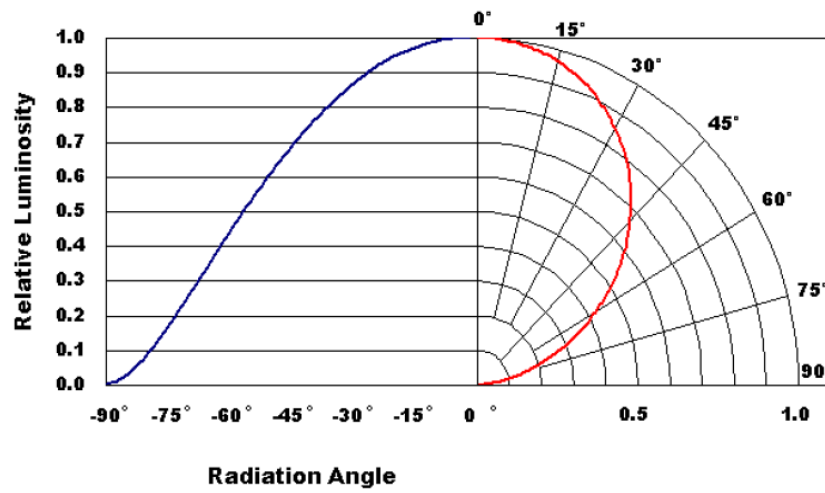Ambient Temp. vs allowable Forward current

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Radiation Pattern

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U-P3528W

■ **Reliability Test Items and Conditions**

(1)TEST ITEMS AND RESULTS

Test Item	Standard Test Method	Test Conditions	Note	Number of Damaged
Resistance to Soldering Heat (Reflow Soldering)	JEITA ED-4701 300 301	Tsd=260℃ , 10secs	2 times	0/60
Thermal Shock	—	-40℃ ～ 100℃ 30min. 30min.	100 cycles	0/60
Temperature Cycle	JEITA ED-4701 100 105	-40℃ ～ 25℃ ～ 100℃ ～ 25℃ 30min. 5min. 30min. 5min.	100 cycles	0/60
High Temperature Storage	JEITA ED-4701 200 201	Ta=100℃	1000 hrs.	0/60
Low Temperature Storage	JEITA ED-4701 200 202	Ta=-40℃	1000 hrs.	0/60
Steady State Operating Life	—	Ta=25℃ , I_F=30mA, DC	1000 hrs.	0/60
Steady State Operating Life of High Temperature	—	Ta=85℃ , I_F=25mA, DC	1000 hrs.	0/60
Steady State Operating Life of High Humidity Heat	—	60℃ , RH=90%, I_F=20mA, DC	1000 hrs.	0/60

(2)CRITERIA FOR JUDGING DAMAGE

Item	Symbol	Test Conditions	Criteria for Judgement
Forward Voltage	V_F	I_F=20mA	$\Delta\% < 10\%$
Reverse Current	I_R	V_R=5V	$\Delta\% < 30\%$
Luminous Intensity	I_V	I_F=20mA	$< 10\mu A$

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■ **Cautions**

(1) Moisture Proof Package
    A) The moisture proof package, a plastic bag with a zipper, is used to keep moisture to a minimum in the package.
    B) A package of a moisture absorbent material (silica gel) is also inserted into the plastic moisture proof bag and the silica gel changes its color from blue to pink as it absorbs moisture.
    C) The absorbed moisture in the SMT package may vaporize and expand during soldering. This may cause exfoliation of the contacts and damage to the optical characteristics of the LEDs.

(2) Storage Conditions
    A) Before opening the package：
    The LEDs should be kept at 30℃ or less and 45~60% RH or less and should be used within a year. When storing the LEDs, moisture proof package with absorbent material (silica gel) is recommended.
    B) After opening the package：
    The LEDs should be kept at 30℃ or less and 55% RH or less and should be soldered within 168 hours (7days) after opening the package. The unused LEDs should be stored in moisture proof packages.
    C) It's also recommended to return the LEDs to the original moisture proof bag and to reseal the moisture proof bag again.
    D) If the moisture absorbent material (silica gel) has faded away or the SMD LEDs have exceeded the storage time, baking treatment (more than 24 hours at 65+/-5℃) should be performed before soldering.

(3) Heat Generation
    A) The thermal design of the end product is very important. It is necessary to avoid intense heat generation and operate within the maximum ratings given in this specification.
    B) The operating current should be decided after considering the ambient maximum temperature of LEDs.

(4) Cleaning
    A) Isopropyl alcohol is recommended to be used as a solvent for cleaning the LEDs.
    B) Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.
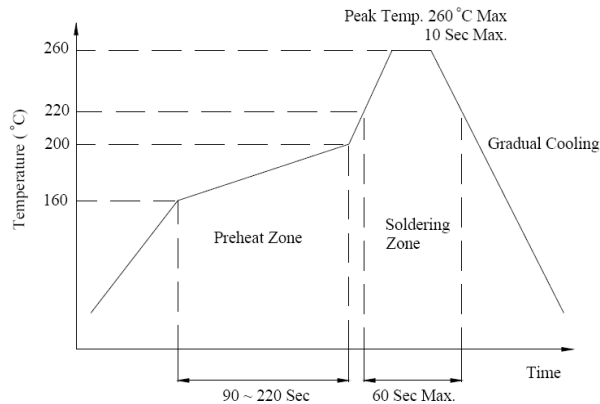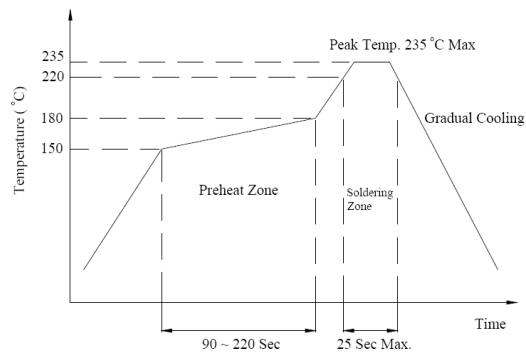
(5) Soldering

Reflow Soldering (recommended)：
A) To prevent from cracking, please bake (65℃, 24hrs)before soldering.
B) When soldering, do not load stress on the LEDs during heating.
C) Never take next process until the component is cooled down to room temperature after reflow.
D) After soldering, do not warp the circuit board.
E) The recommended reflow soldering profile (measuring on the surface of the LED resin) is the following:

(a) Lead-Free Solder

(b) Lead Solder

Manual Soldering (not recommended)：
A) To prevent from cracking, please bake (65℃, 24hrs) before soldering.
B) Temperature at tip of iron: 250℃ Max. (25W).
C) It's banned to load any stress on the resin during soldering.
D) Soldering time: 3 sec. Max.(one time only).

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(6) ESD (eletrostatic discharge) protection (base on machine mode)
  A) The product is Gallium Nitride (GaN) based light emitting diode (LED) and is extremely sensitive to ESD. Users are strongly recommended to take necessary meter to test the static electricty and avoid ESD when handling this product.
  B) Proper grounding of machines (via 1MΩ), using static disspative mats, containers, working uniforms and shoes are considered to be effective against ESD.
  C) An ionizer is recommended in the facility or environment where ESD may be generated easily, and soldering iron with a grounded tip is also recommended.
  D) When inspecting the final products in which LEDs are assembled, it is recommended to check whether the assembled LEDs are damaged by ESD or not. It is simple to find damaged LEDs by light-on or VF test at lower current (below 1mA is recommended).
  E) ESD damaged LEDs will show some unusual characteristics such as the remarkable increasing of leak current, the decreasing of forward voltage, or the LEDs do not light on at the low current.

(7) Other
  A) Care must be taken to ensure that the reverse voltage will not exceed the absolute maximum rating when using the LEDs with matrix drive.
  B) The LED light output is strong enough to injure human eyes. Precaution must be taken to prevent looking directly at the LEDs with unaided eyes for more than a few seconds.
  C) The LEDs described here are intended to be used for ordinary electronic equipment, please consult Unilite Opto in advance for information on applications.
  D) Installing a protection device in the LED driving circuit to avoid surge current exceeding the max rating during on/off switching.
  E) The appearance and specifications of the product may be modified for improvement without notice.
  F) Please use the product within 168 hours after opening the seal and keep under 30 ℃ and 70% humidity.
  G) Unilite Opto Technology will not be responsible for any claim for damage if the user use the product without following the caution or instruction of the specification.

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■ **Handling Precautions**

(1) Compare to epoxy encapsulant that is hard and brittle, silicone is softer and flexible. Although its characteristic significantly reduces thermal stress, it is more prone to damage by external mechanical force. As a result, special handling precautions must be observed during assembling using silicone encapsulated LED proucts, failure to comply might leads to damage and premature failure of the LED.

A) Pick up the component along the side surface by using forces or appropriate tools. Do not directly touch or pick the silicone lens surface as it could cause the damage the internal circuit.
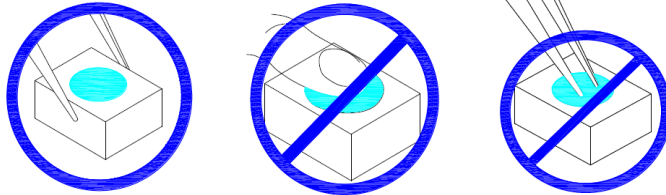
B) The outer diameter of the SMD pickup nozzle should not exceed the size of the LED in order to prevent from the air leaking. The inner diameter of the nozzle should be as large as possible. A pliable material is suggested that the nozzle tip to avoid scratching or damaging of the LED surface during pickup. The dimensions of the component must be accurately programmed in the pick-and-place machine to insure precise pickup and avoid damage during producion.
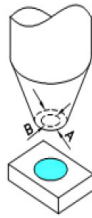
C) Do not stack the assembled PCB with LED together. The impact could scratch the silicone lens or damage the internal circuit.
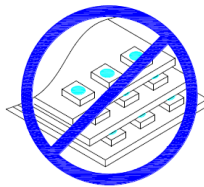
D) Not suitable to operate in acidic environment, PH<7