ProLight AK2N-WA1HL-2
Power LED
Technical Datasheet
Version: 1.8

ProLight Opto AK2N Series

Features

· Best thermal material solution of the world
· Best Moisture Sensitivity: JEDEC Level 1
· RoHS compliant
· AEC-Q102 Qualified
· SAE/ECE/GB compliant

Main Applications

· Bending light
· Fog lamp
· Day Running light(DRL)
· Cornering light
· Working light
· Warning light

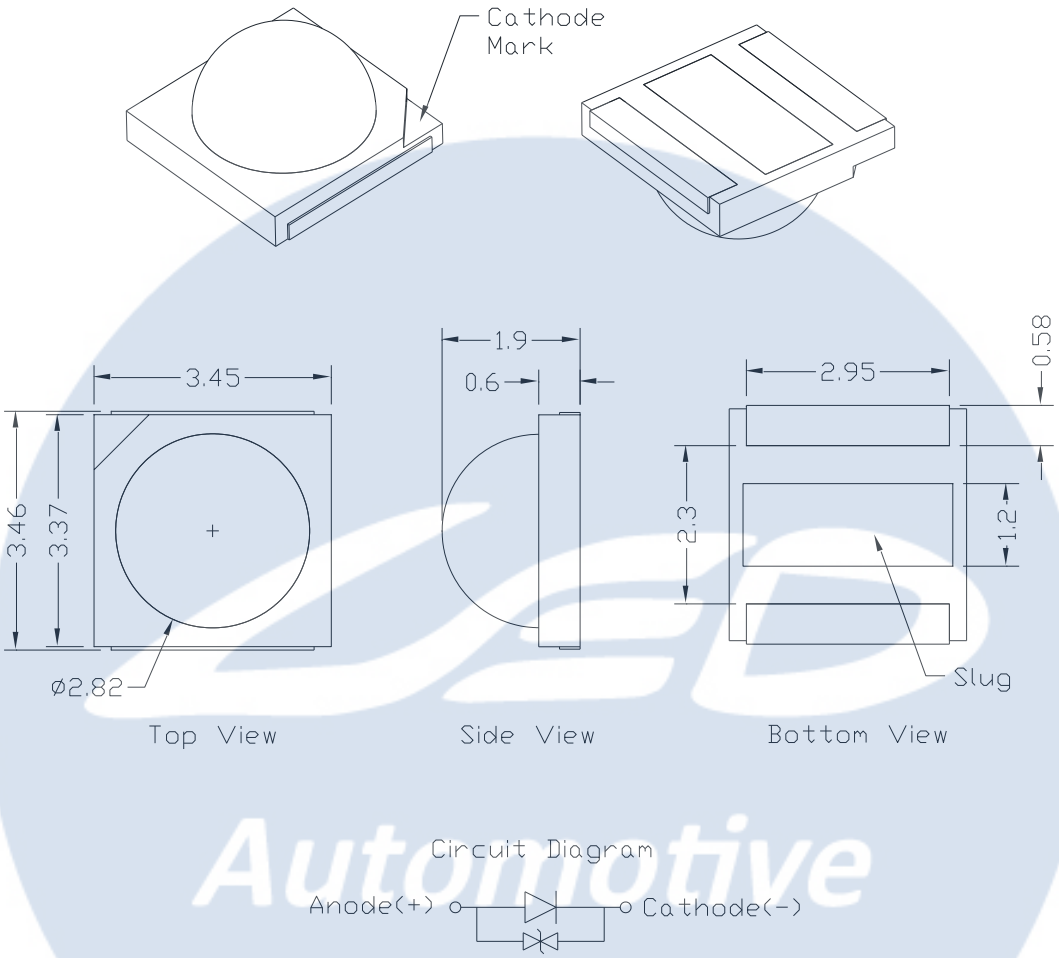
Automotive

Introduction

·Base on Prolight unique lead frame technology and silicone resign with lens, Phenix 3535 deliver high efficiency and best lumens per dollar which help customers to lower system cost and develop competitive outstanding automotive lighting.

Phenix 3535 offer multi colors solution to meet the needs of bending lighting, fog lamp, day running light, cornering light, working light, and warning light. Alone with high-quality materials, Phenix 3535 bring not only high performance but also good reliability to fulfil customer's requirements.

Emitter Mechanical Dimensions



Notes:
1. The cathode side of the device is denoted by the chamfer on the part body.
2. Electrical insulation between the case and the board is required. Do not electrically connect either the anode or cathode to the slug.
3. Drawing not to scale.
4. All dimensions are in millimeters.
5. Unless otherwise indicated, tolerances are ± 0.1mm.
6. Please do not solder the emitter by manual hand soldering, otherwise it will damage the emitter.
7. **Please do not use a force of over 0.3kgf impact or pressure on the lens of the LED, otherwise it will cause a catastrophic failure.**

*The appearance and specifications of the product may be modified for improvement without notice.

Flux Characteristics at 350mA, T_J = 25°C

Color	Part Number Emitter	Luminous Flux Φ_V (lm) Minimum	Typical
White	AK2N-WA1HL-2	130	150

- ProLight maintains a tolerance of ± 7% on flux and power measurements.
- Please do not drive at rated current more than 1 second without proper heat sink.

Electrical Characteristics at 350mA, T_J = 25°C

Color	Forward Voltage V_F (V) Min.	Typ.	Max.	Thermal Resistance Junction to Slug (°C/ W)
White	2.8	3.1	3.4	10

- ProLight maintains a tolerance of ± 0.1 for Voltage measurements.

Optical Characteristics at 350mA, T_J = 25°C

Color	Bin Code	Color Temperature CCT Min.	Typ.	Max.	Total included Angle (degrees) $\theta_{0.90V}$	Viewing Angle (degrees) $2\theta_{1/2}$
White	-	4100 K	5500 K	10000 K	160	130

- ProLight maintains a tolerance of ± 5% for CCT measurements.

Electro-Optical Characteristics, T_J = 25°C

I_F (mA)	V_F (V)	Power (W)	AK2N-WA1HL-2	
			Flux (lm)	lm/W
200	2.92	0.58	80.2	138.3
250	2.98	0.75	97.5	130.1
300	3.04	0.91	114.2	125.5
350	3.10	1.09	130.0	119.3
400	3.15	1.26	145.3	115.3
450	3.21	1.44	160.1	111.2
500	3.26	1.63	173.6	106.5

- All values are reference only.

Absolute Maximum Ratings

Parameter	White
DC Forward Current (mA)	500
Peak Pulsed Forward Current (mA)	600 (less than 1/10 duty cycle@1KHz)
ESD Sensitivity (HBM per MIL-STD-883E Method 3015.7)	±4000V (Class III)
LED Junction Temperature	120°C
Operating Board Temperature at Maximum DC Forward Current	-40°C - 105°C
Storage Temperature	-40°C - 120°C
Soldering Temperature	Reflow Soldering：260°C for 12 sec. Hand Soldering：350°C for 3 sec.
Allowable Reflow Cycles	3
Reverse Voltage	Not designed to be driven in reverse bias

Photometric Luminous Flux Bin Structure

Color	Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)	Available Color Bins
White	W1	130	140	All
	W2	140	155	Xx,Wx,Vx【1】
	X1	155	170	【1】
	X2	170	185	【1】

- ProLight maintains a tolerance of ± 7% on flux and power measurements.
- The flux bin of the product may be modified for improvement without notice.
- 【1】The rest of color bins are not 100% ready for order currently. Please ask for quote and order possibility.

Forward Voltage Bin Structure

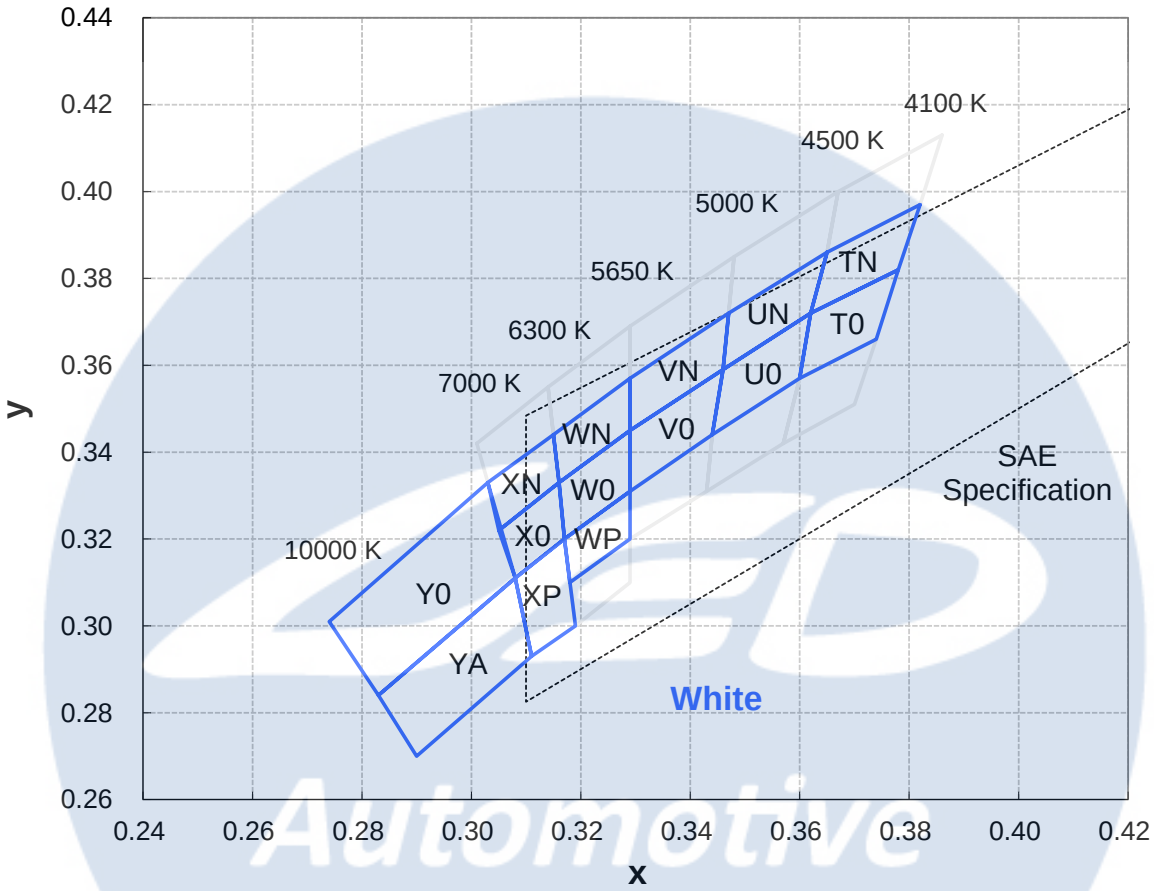
Color	Bin Code	Minimum Voltage (V)	Maximum Voltage (V)
White	A	2.8	2.9
	B	2.9	3.0
	D	3.0	3.1
	E	3.1	3.2
	F	3.2	3.3
	G	3.3	3.4

- ProLight maintains a tolerance of ± 0.1V for Voltage measurements.

Note: Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all colors.

Color Bin

White Binning Structure Graphical Representation



Color Bins

White Bin Structure

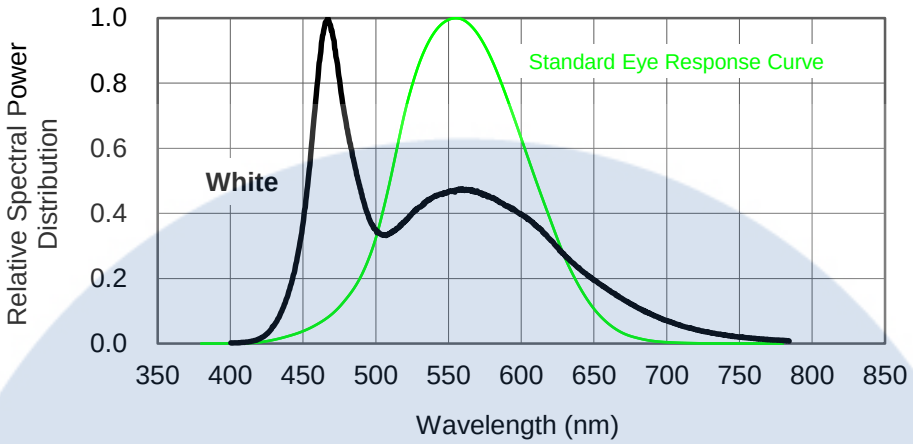
Bin Code	x	y	Typ. CCT (K)	Bin Code	x	y	Typ. CCT (K)
T0	0.378	0.382	4300	WN	0.329	0.345	5970
	0.374	0.366			0.316	0.333	
	0.360	0.357			0.315	0.344	
	0.362	0.372			0.329	0.357	
TN	0.382	0.397	4300	WP	0.329	0.331	5970
	0.378	0.382			0.329	0.320	
	0.362	0.372			0.318	0.310	
	0.365	0.386			0.317	0.320	
U0	0.362	0.372	4750	X0	0.308	0.311	6650
	0.360	0.357			0.305	0.322	
	0.344	0.344			0.316	0.333	
	0.346	0.359			0.317	0.320	
UN	0.365	0.386	4750	XN	0.305	0.322	6650
	0.362	0.372			0.303	0.333	
	0.346	0.359			0.315	0.344	
	0.347	0.372			0.316	0.333	
V0	0.329	0.331	5320	XP	0.308	0.311	6650
	0.329	0.345			0.317	0.320	
	0.346	0.359			0.319	0.300	
	0.344	0.344			0.311	0.293	
VN	0.329	0.345	5320	Y0	0.308	0.311	8000
	0.329	0.357			0.283	0.284	
	0.347	0.372			0.274	0.301	
	0.346	0.359			0.303	0.333	
W0	0.329	0.345	5970	YA	0.308	0.311	8000
	0.329	0.331			0.311	0.293	
	0.317	0.320			0.290	0.270	
	0.316	0.333			0.283	0.284	

- Tolerance on each color bin (x , y) is ± 0.005

Note: Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all colors.

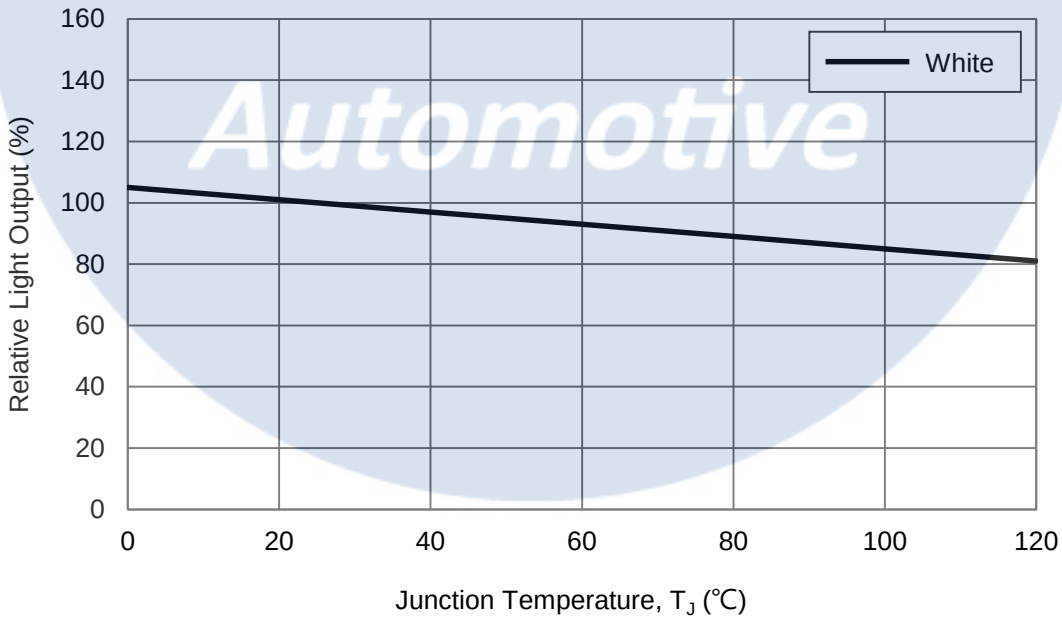
Color Spectrum, T_J = 25˚C

1. White

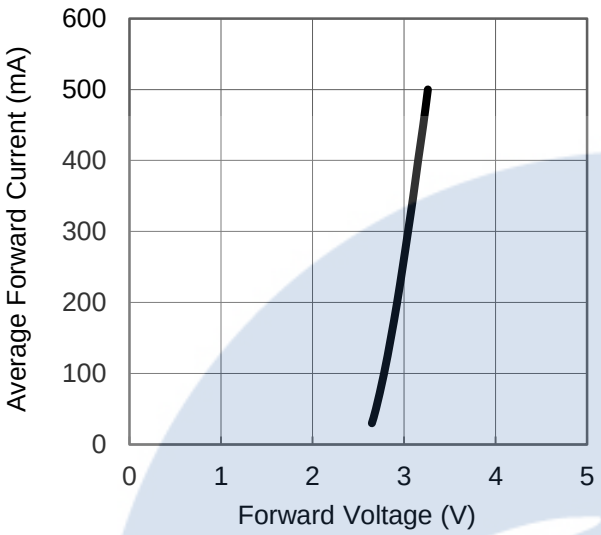


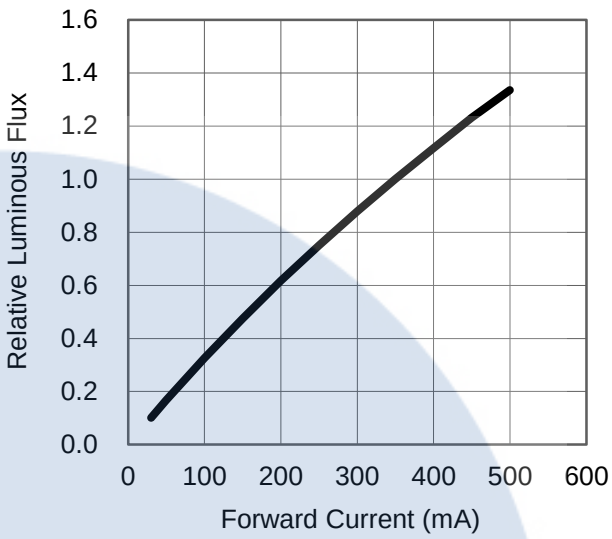
Light Output Characteristics

Relative Light Output vs. Junction Temperature at 350mA



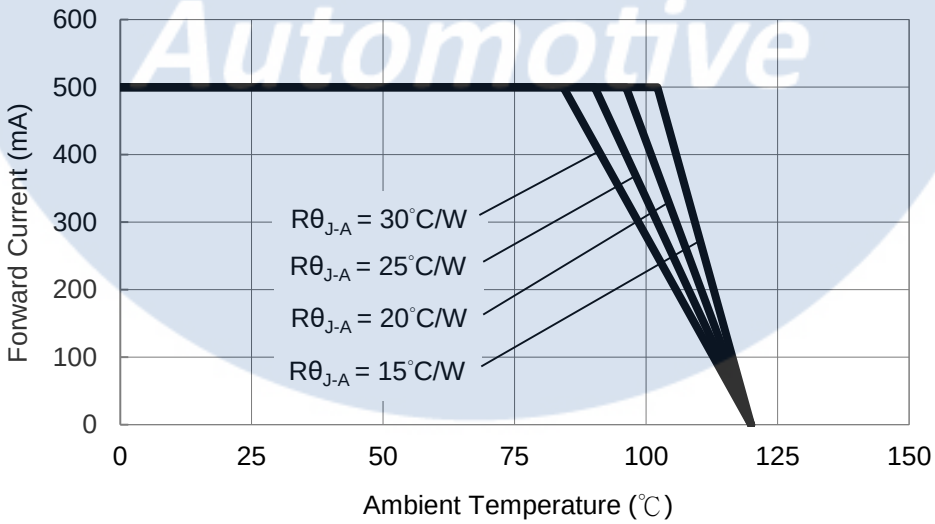
Forward Current Characteristics, T_J = 25˚C



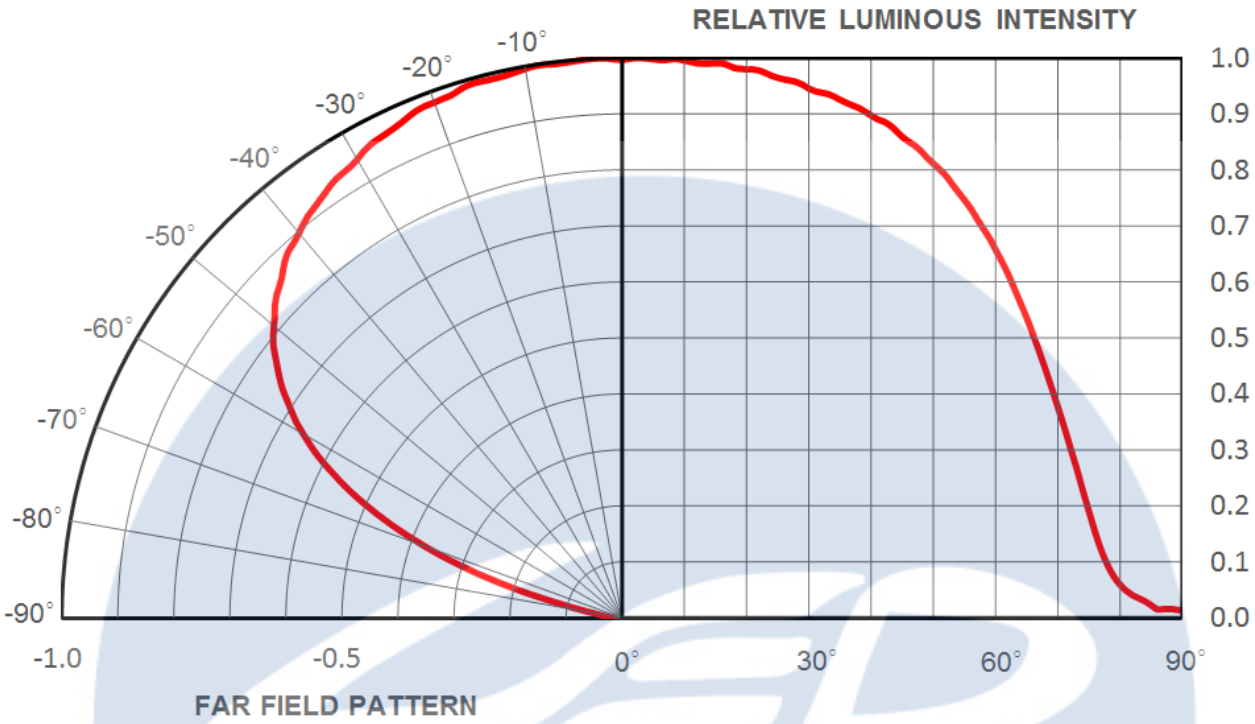


Ambient Temperature vs. Maximum Forward Current

1. White (T_{JMAX} = 120˚C)



Typical Representative Spatial Radiation Pattern



Moisture Sensitivity Level - JEDEC Level 1

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Conditions	Time (hours)	Conditions	Time (hours)	Conditions
1	Unlimited	≤30˚C / 85% RH	168 +5/-0	85˚C / 85% RH	NA	NA

- The standard soak time includes a default value of 24 hours for semiconductor manufature's exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor's facility.
- Table below presents the moisture sensitivity level definitions per IPC/JEDEC's J-STD-020C.

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Conditions	Time (hours)	Conditions	Time (hours)	Conditions
1	Unlimited	≤30˚C / 85% RH	168 +5/-0	85˚C / 85% RH	NA	NA
2	1 year	≤30˚C / 60% RH	168 +5/-0	85˚C / 60% RH	NA	NA
2a	4 weeks	≤30˚C / 60% RH	696 +5/-0	30˚C / 60% RH	120 +1/-0	60˚C / 60% RH
3	168 hours	≤30˚C / 60% RH	192 +5/-0	30˚C / 60% RH	40 +1/-0	60˚C / 60% RH
4	72 hours	≤30˚C / 60% RH	96 +2/-0	30˚C / 60% RH	20 +0.5/-0	60˚C / 60% RH
5	48 hours	≤30˚C / 60% RH	72 +2/-0	30˚C / 60% RH	15 +0.5/-0	60˚C / 60% RH
5a	24 hours	≤30˚C / 60% RH	48 +2/-0	30˚C / 60% RH	10 +0.5/-0	60˚C / 60% RH
6	Time on Label (TOL)	≤30˚C / 60% RH	Time on Label (TOL)	30˚C / 60% RH	NA	NA

Reliability testing in accordance with AEC-Q102

The development of this product included extensive operational life-time testing and environmental testing. Table 1 summarizes the tests applied and cumulative test results obtained from testing performed in accordance with AEC-Q102.

Table 1. Operating life, mechanical and environmental tests performed on it's package in accordance with AEC-Q102.

Abrb Stress	Conditions	Duration	Failure Criteria	Rejects
TEST Pre- and Post-Stress Electrical Test	T_J = 25°C	N/A	See notes [2]	0
PC Pre-conditioning	JESD22-A113 Soak Tamb = 85°C, RH = 85% Reflow soldering	168 hours 3 cycles	See notes [2]	0
EV External Visual	JESD22 B-101	N/A	See notes [2]	0
HTFB High Temperature Forward Bias	JESD22-A108 Tamb =85°C, IF = max. DC [1]	1000 hours	See notes [2]	0
TC Temperature Cycling	JESD22-A104 -30°C to 80°C	1000 cycles	See notes [2]	0
HTHHB High temp. & High Humidity Bias	JESD22-A101 Tamb = 85°C, RH = 85%, IF = max. DC [1]	1000 hours	See notes [2]	0
PTC Power and Temperature cycle	-30°C to 85°C, 10 minutes dwell, 20 minutes transfer (1 hour cycle), 2 minutes ON/2 minutes OFF, IF = max. DC [1]	1000 hours	See notes [2]	0
ESD	AEC Q101-001	8000V	See notes [2]	0
VVF Vibration Variable Frequency	10-2000-10 Hz, log or linear sweep rate, 20 G about 1 min., 1.5 mm, 3X/axis	--	See notes [3]	0
MS Mechanical Shock	1500 G, 0.5 msec. pulse, 5 shocks each 6 axis	--	See notes [3]	0
RSH Resistance to Solder Heat	JESD22-A111 / JESD22-B106 260 °C ± 5 °C	10 s	See notes [3]	0
SD Solderability	J-STD-002 245 °C ± 5 °C	3 s	See notes [3]	0

Notes:

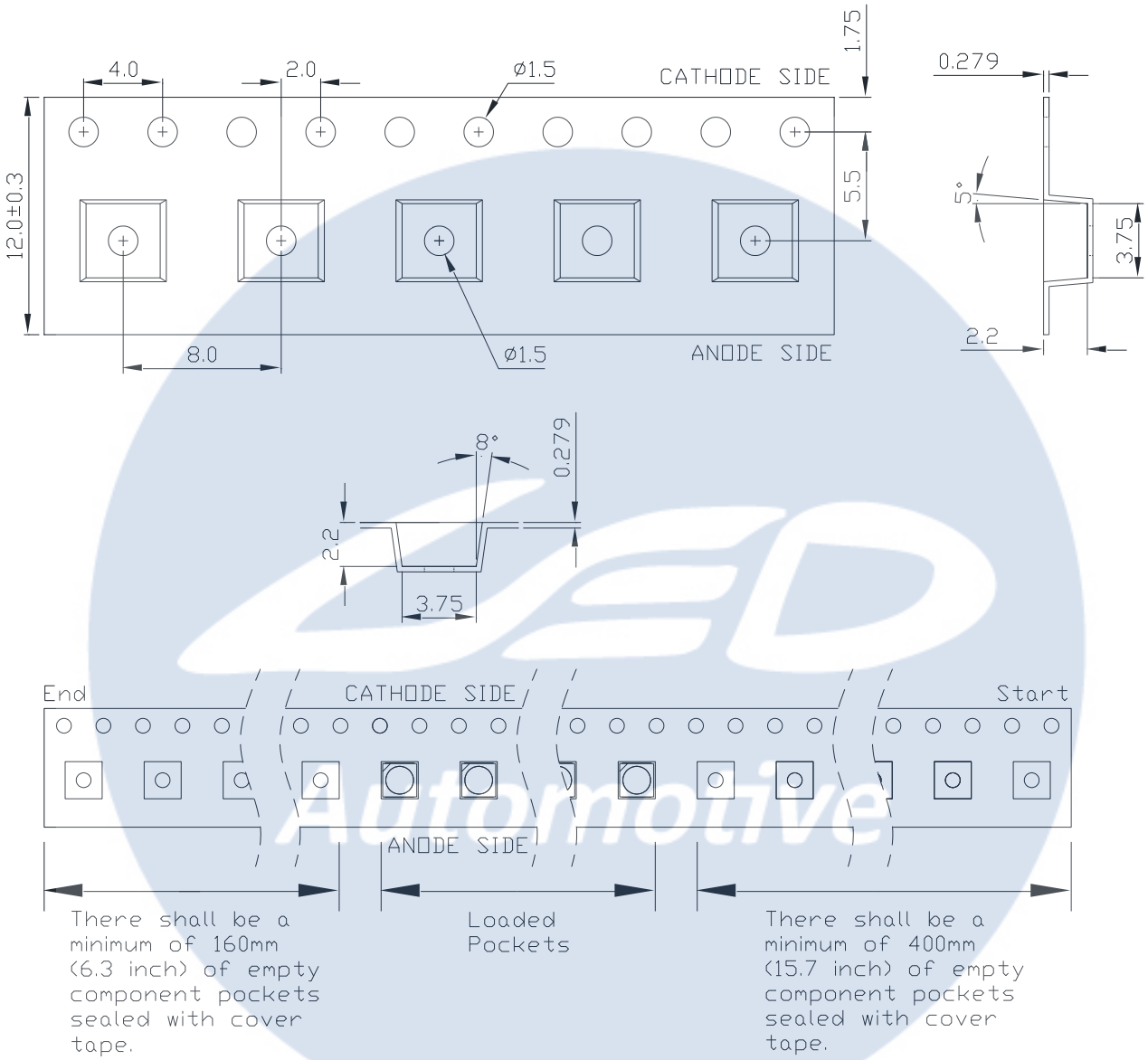
1. Depending on the maximum derating curve.
2. Criteria for judging failure

Item	Test Condition	Criteria for Judgement	
		Min.	Max.
Forward Voltage (V_F)	I_F = max DC	--	Initial Level x 1.1
Luminous Flux or Radiometric Power (Φ_V)	I_F = max DC	Initial Level x 0.8	--
Reverse Current (I_R)	V_R = 5V	--	50 μA

* The test is performed after the LED is cooled down to the room temperature.

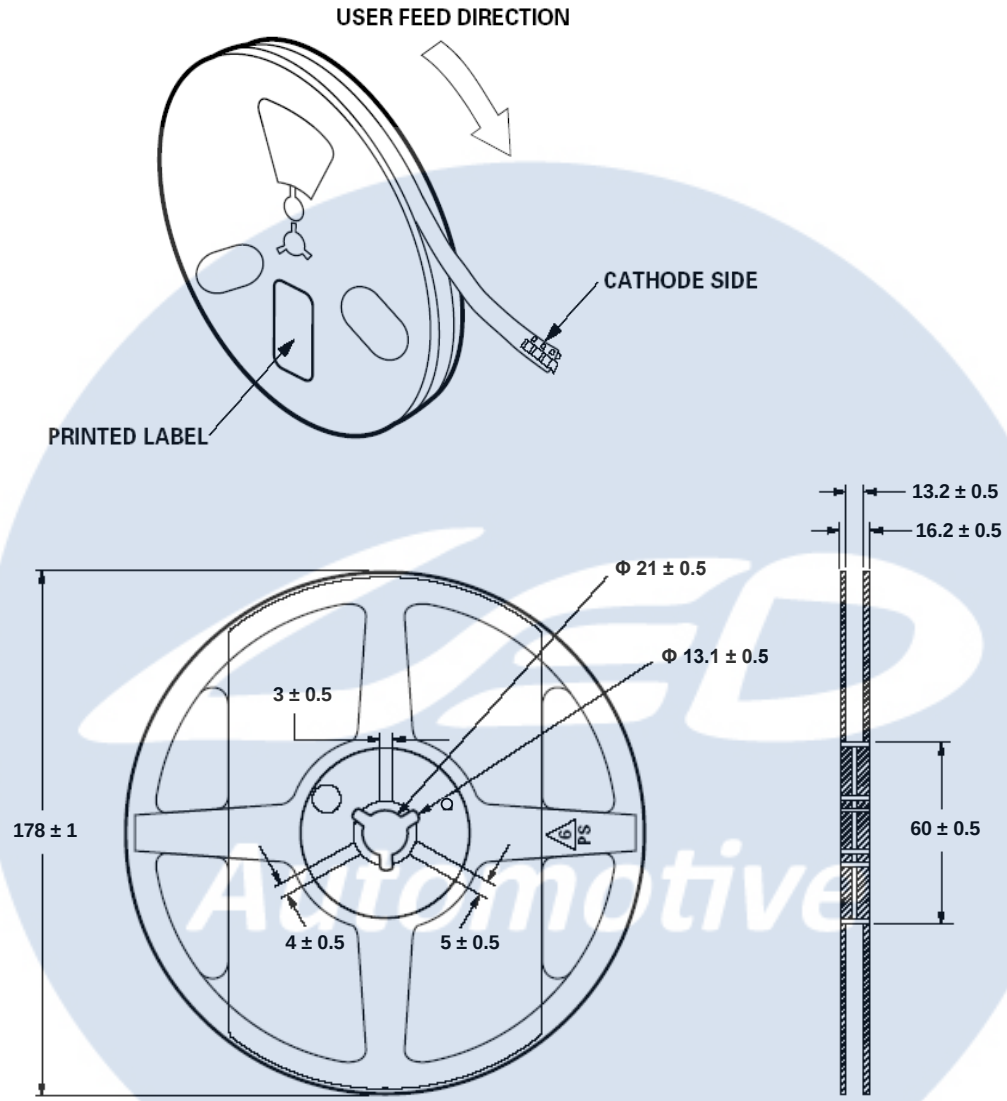
3. A failure is an LED that is open or shorted.

Emitter Reel Packaging



Notes:
1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Unless otherwise indicated, tolerances are ± 0.1mm.

Emitter Reel Packaging



Notes:
1. Empty component pockets sealed with top cover tape.
2. 1000 pieces per reel.
3. Drawing not to scale.
4. All dimensions are in millimeters.

Precaution for Use

- Storage
  Please do not open the moisture barrier bag (MBB) more than one week. This may cause the leads of LED discoloration. We recommend storing ProLight's LEDs in a dry box after opening the MBB. The recommended storage conditions are temperature 5 to 30°C and humidity less than 40% RH. It is also recommended to return the LEDs to the MBB and to reseal the MBB.
- The slug is is not electrically neutral. Therefore, we recommend to isolate the heat sink.
- **We recommend using the M705-S101-S4 solder paste from SMIC (Senju Metal Industry Co., Ltd.) for lead-free soldering.**
- **Do not use solder pastes with post reflow flux residue>47%. (58Bi-42Sn eutectic alloy, etc) This kind of solder pastes may cause a reliability problem to LED.**
- Any mechanical force or any excess vibration shall not be accepted to apply during cooling process to normal temperature after soldering.
- Please avoid rapid cooling after soldering.
- Components should not be mounted on warped direction of PCB.
- Repairing should not be done after the LEDs have been soldered. When repairing is unavoidable, a heat plate should be used. It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.
- This device should not be used in any type of fluid such as water, oil, organic solvent and etc. When cleaning is required, isopropyl alcohol should be used.
- When the LEDs are illuminating, operating current should be decide after considering the package maximum temperature.
- The appearance, specifications and flux bin of the product may be modified for improvement without notice. Please refer to the below website for the latest datasheets.
  http://www.prolightopto.com/

Handling of Silicone Lens LEDs

Notes for handling of silicone lens LEDs

- Please do not use a force of over 0.3kgf impact or pressure on the silicone lens, otherwise it will cause a catastrophic failure.
- The LEDs should only be picked up by making contact with the sides of the LED body.
- Avoid touching the silicone lens especially by sharp tools such as Tweezers.
- Avoid leaving fingerprints on the silicone lens.
- Please store the LEDs away from dusty areas or seal the product against dust.
- When populating boards in SMT production, there are basically no restrictions regarding the form of the pick and place nozzle, except that mechanical pressure on the silicone lens must be prevented.
- Please do not mold over the silicone lens with another resin. (epoxy, urethane, etc)