BROADCOM®

Data Sheet

HSMW-A100-V40J1

White Surface Mount LED Indicator SMT PLCC-2

Description

This family of SMT LEDs is packaged in the industry-standard PLCC-2 package. These SMT LEDs have high-reliability performance and are designed to work under a wide range of environmental conditions. This high-reliability feature makes them ideally suited to be used under harsh interior automotive as well as interior signs' application conditions.

To facilitate easy pick-and-place assembly, the LEDs are packed in EIA-compliant tape and reel. Every reel is shipped in single intensity and color bin.

These LEDs are compatible with IR solder reflow process.

The wide viewing angle at 120° makes these LEDs ideally suited for panel, push button, or general backlighting in automotive interior, office equipment, industrial equipment, and home appliances. The flat-top emitting surface makes it easy for these LEDs to mate with light pipes. With the built-in reflector pushing up the intensity of the light output, these LEDs are also suitable to be used as LED pixels in interior electronic signs.

The super high-brightness white PLCC-2 SMT LED is ideal for all kinds of backlighting applications in interior automotive, office automation, electrical appliance, and industrial instrument markets to offer a clear and attractive product differentiation. The wide viewing angle at 120° also enables this white PLCC-2 SMT LED to be used in localized area ambience lighting in applications, such as vanity mirror light, cabin light, and car door puddle light. The white color backlighting offered by this series of white PLCC-2 SMT LEDs is suitable to backlight color LCD screens in applications, such as GPS (global positioning system) screens in cars.

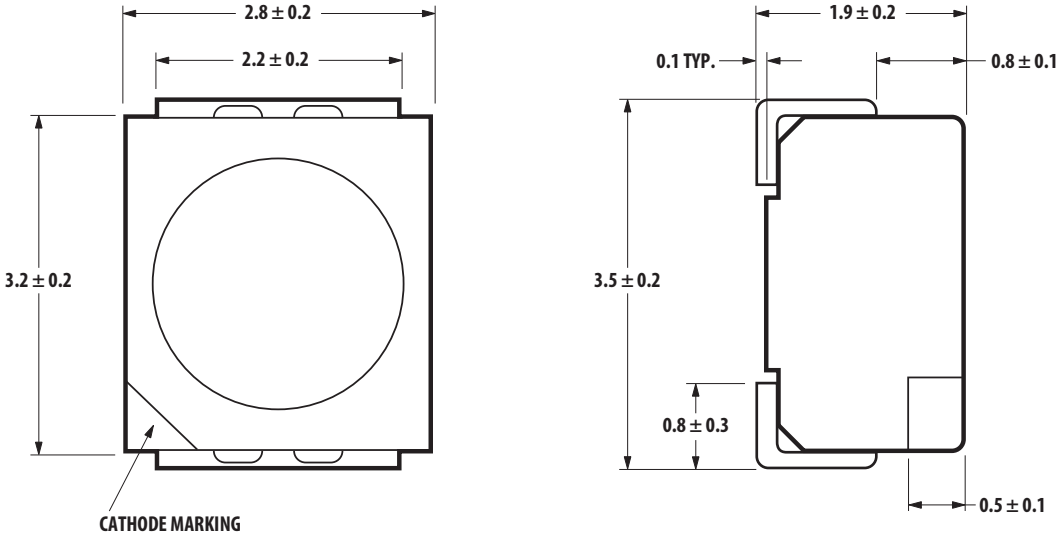
Features

- Industry-standard PLCC-2 package (plastic leaded chip carrier)
- High-reliability LED package with silicone encapsulation
- Tight white color binning
- Wide viewing angle at 120°
- Available in 8-mm carrier tape on a 7-inch reel (2000 pieces)

Applications

- Interior automotive
  - Instrument panel backlighting
  - Central console backlighting
  - Cabin backlighting
- Office automation, home appliances, industrial equipment
  - Front panel backlighting
  - Push button backlighting
  - Display backlighting

Package Dimensions



NOTE: All dimensions in millimeters.

Device Selection Guide

Color	Part Number	Min. I_V (mcd)	Typ. I_V (mcd)	Max. I_V (mcd)	Test Current (mA)	Dice Technology
White	HSMW-A100-V40J1	715.0	—	1800.0	20	InGaN

NOTE:

1. The luminous intensity, I_V, is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. I_V tolerance = ±12%.

Part Numbering System

H S M [x_1] - A [x_2][x_3][x_4] - [x_5][x_6][x_7][x_8][x_9]

Code	Description	Option	
x_1	LED Chip Color	W	White
x_2	Package Type	1	Mono color
x_3x_4	Device Specific Configuration	—	
x_5	Minimum Intensity Bin Selection	Refer to Intensity Bin Select Table	
x_6	Number of Intensity Bins		
x_7	Color Bin Selection	Refer to Color Bin Select Table	
x_8x_9	Packaging Option	J1	Test current = 20 mA, Top Mount, 7-inch reel

Intensity Bin Select (x_5x_6)

Individual reel will contain parts from one half bin only.

x_5	Min I_v Bin
x_6	
0	Full Distribution
3	3 half bins starting from $x_5$1
4	4 half bins starting from $x_5$1
5	5 half bins starting from $x_5$1
7	3 half bins starting from $x_5$2
8	4 half bins starting from $x_5$2
9	5 half bins starting from $x_5$2

Intensity Bin Limits

Bin ID	Min. (mcd)	Max. (mcd)
Q1	71.50	90.00
Q2	90.00	112.50
R1	112.50	140.00
R2	140.00	180.00
S1	180.00	224.00
S2	224.00	285.00
T1	285.00	355.00
T2	355.00	450.00
U1	450.00	560.00
U2	560.00	715.00
V1	715.00	900.00
V2	900.00	1125.00
W1	1125.00	1400.00
W2	1400.00	1800.00

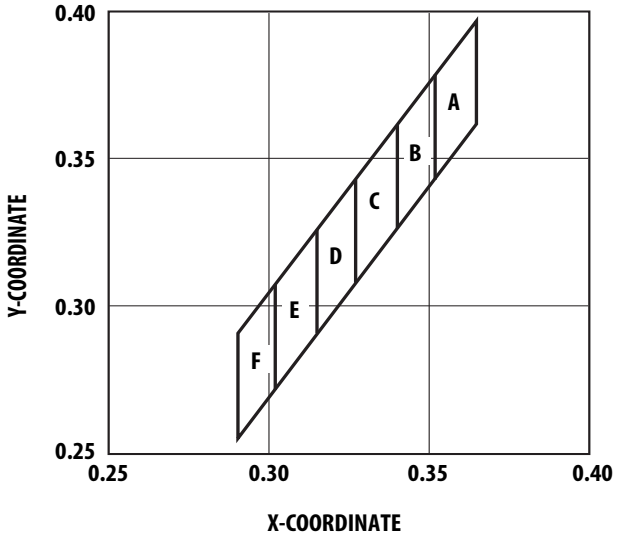
NOTE: Tolerance of each bin limit = ±12%.

Color Bin Limits

Bin ID		Limits (Chromaticity Coordinates)			
A	x	0.352	0.365	0.365	0.352
	y	0.377	0.395	0.360	0.341
B	x	0.340	0.352	0.352	0.340
	y	0.360	0.377	0.341	0.325
C	x	0.327	0.340	0.340	0.327
	y	0.342	0.360	0.325	0.306
D	x	0.315	0.327	0.327	0.315
	y	0.325	0.342	0.306	0.290
E	x	0.302	0.315	0.315	0.302
	y	0.307	0.325	0.290	0.271
F	x	0.290	0.302	0.302	0.290
	y	0.290	0.307	0.271	0.255

NOTE: Tolerance for each bin limit = ±0.02.

Figure 1: Color Bins



Color Bin Select (x_7)

Individual reel will contain parts from one full bin only.

x_7	
0	Full Distribution
Z	A and B only
Y	B and C only
W	C and D only
V	D and E only
U	E and F only
Q	A, B, and C only
P	B, C, and D only
N	C, D, and E only
M	D, E, and F only
1	A, B, C, and D only
3	B, C, D, and E only
4	C, D, E, and F only
5	A, B, C, D, and E only
6	B, C, D, E, and F only

Packaging Option (x_8x_9)

Option	Test Current	Package Type	Reel Size
J1	20 mA	Top Mount	7 inch

Absolute Maximum Ratings (T_A = 25°C)

Parameters	HSMW
DC Forward Current[a]	30 mA
Peak Forward Current[b]	90 mA
Power Dissipation	122 mW
Reverse Voltage	5 V
Junction Temperature	110°C
Operating Temperature	–40°C to +100°C
Storage Temperature	–40°C to +100°C

a. Derate linearly as shown in Figure 5.

b. Duty factor = 10%, frequency = 1 kHz.

Optical Characteristics (T_A = 25 °C)

Color	Part Number	Dice Technology	Typ. Chromaticity Coordinates[a]		Viewing Angle $2\theta_{1/2}$ Degrees[b]	Luminous Efficiency, ne (lm/W)	Total Flux/ Luminous Intensity (lm/W) FV (lm) /IV (mcd)
			x	y	Typ.	Typ.	Typ.
White	HSMW-A100	InGaN	0.31	0.31	120	18	2.4

a. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represent the perceived color of the device.

b. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

Electrical Characteristics (T_A = 25 °C)

Part Number	Forward Voltage, V_F (Volts) @ I_F = 20 mA		Reverse Voltage, V_R at 10 µA	Thermal Resistance $R\theta_{JP}$ (°C/W)
	Typ.	Max.	Min.	
HSMW -A100	3.4	4.05	5	280

Figure 2: Forward Current vs. Forward Voltage

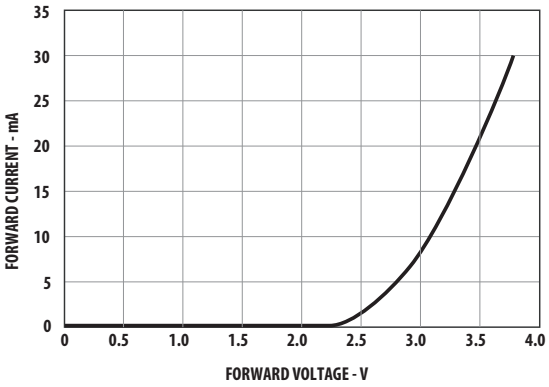


Figure 3: Relative Intensity vs. Forward Current

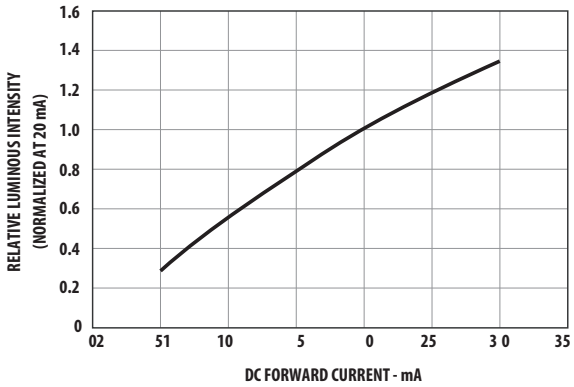


Figure 4: Chromaticity Shift vs. Current

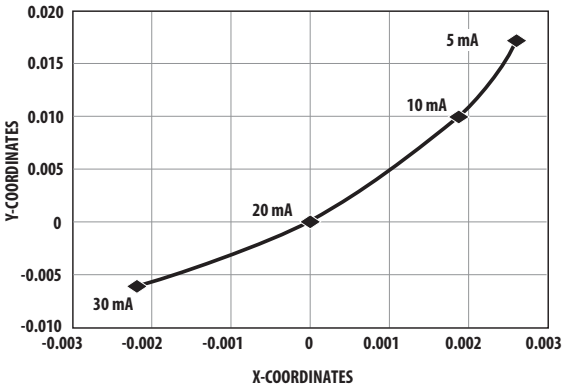
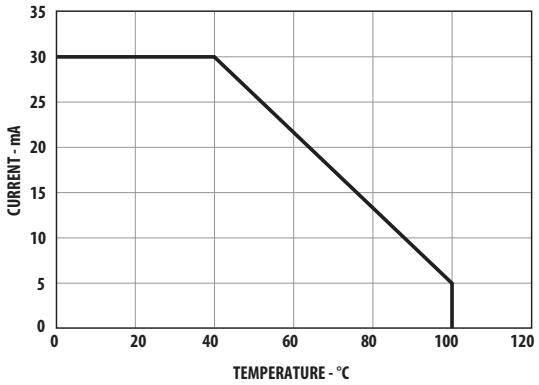


Figure 5: Maximum Forward Current vs. Ambient Temperature Derated based on T_jMAX – 110 °C, $R\theta_{JA}$ = 500 °CW



NOTE: (x,y) values at 20 mA reference to (0.0).

Figure 6: Radiation Pattern

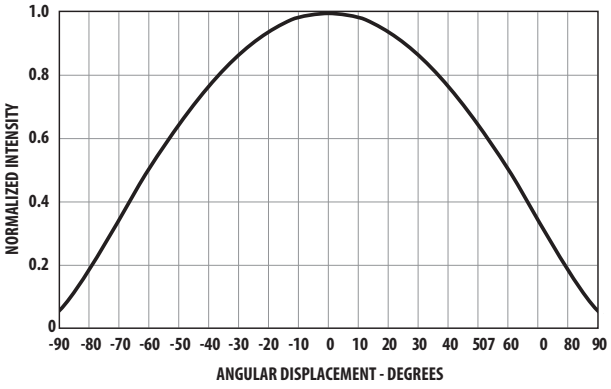
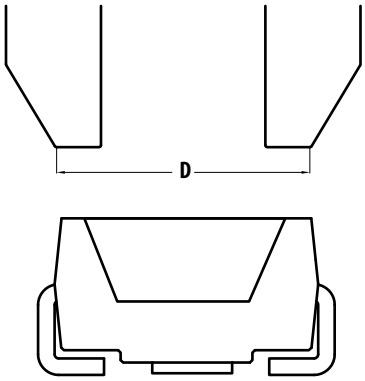
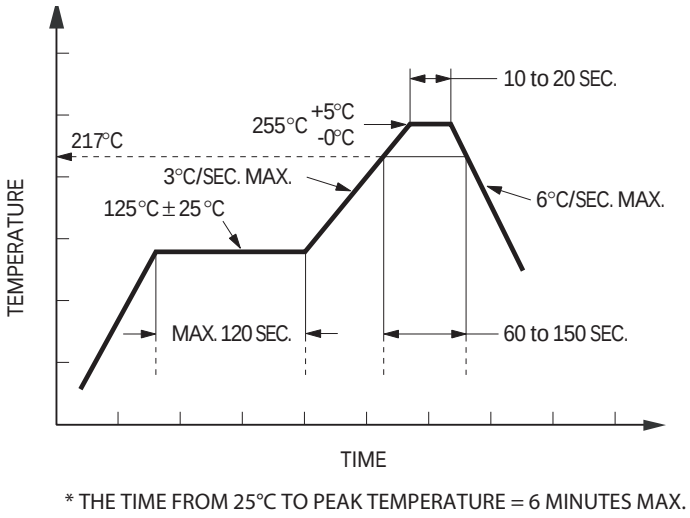


Figure 7: Recommended Pick and Place Nozzle Size



Note: Diameter "D" should be bigger than 2.3mm

Figure 8: Recommended Pb-Free Reflow Soldering Profile



* THE TIME FROM 25°C TO PEAK TEMPERATURE = 6 MINUTES MAX.

Figure 9: Recommended Soldering Pad Pattern

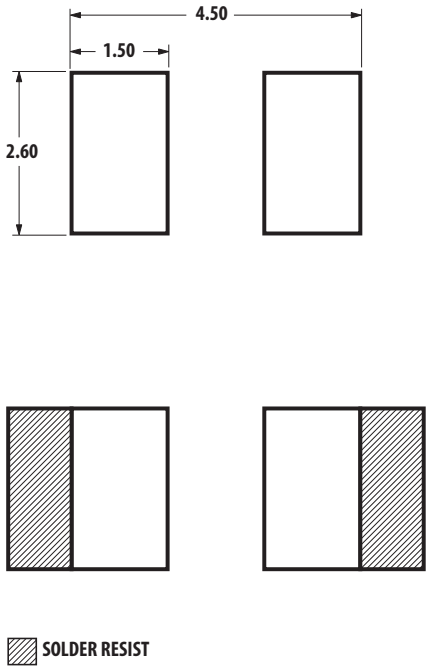


Figure 10: Tape Leader and Trailer Dimension

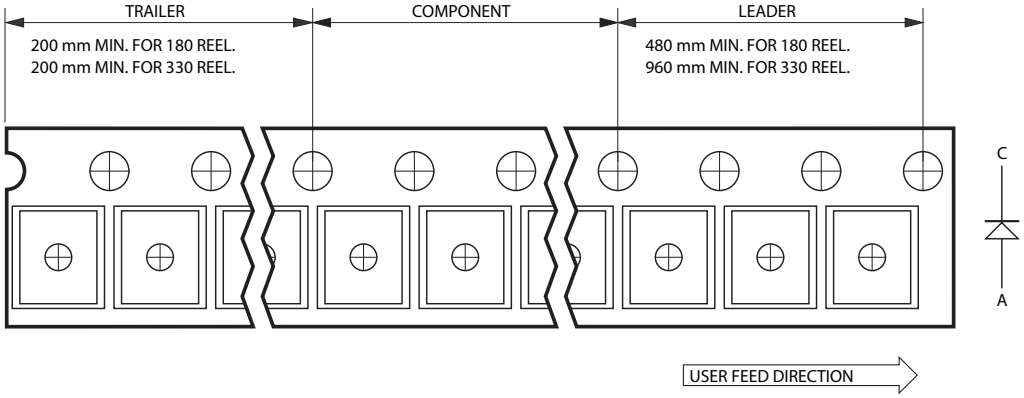


Figure 11: Tape Dimensions

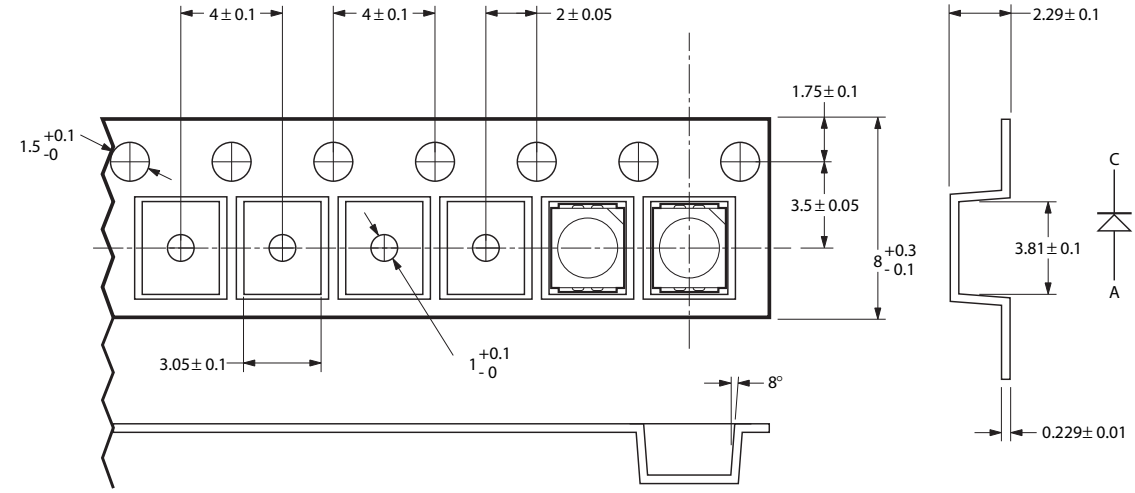


Figure 12: Reel Dimensions

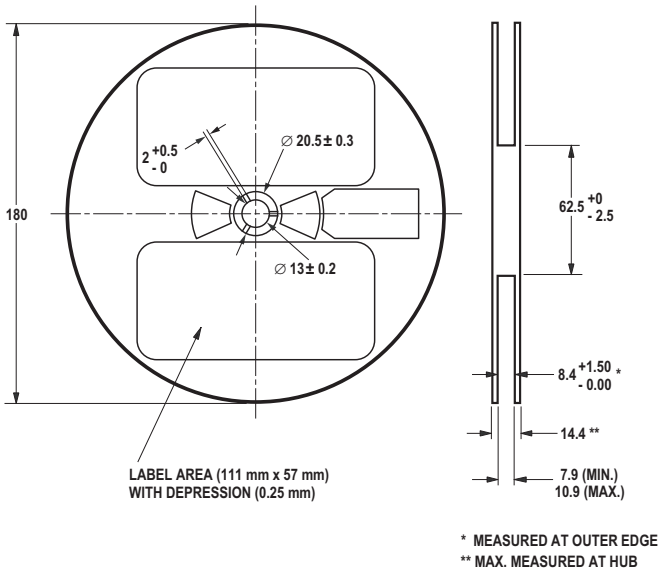
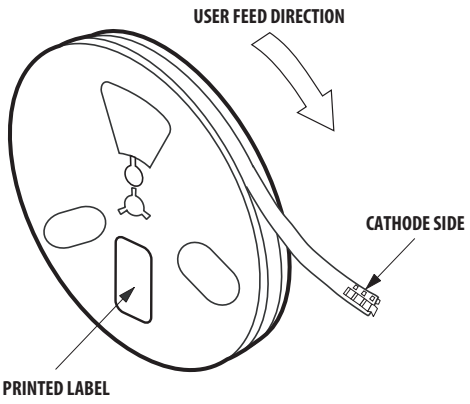


Figure 13: Reeling Orientation



Precautionary Notes

Moisture Sensitivity

This product is qualified as Moisture Sensitive Level 2a per JEDEC J-STD-020. Precautions when handling this moisture sensitive product is important to ensure the reliability of the product. Refer to Broadcom Application Note AN5305, *Handling of Moisture Sensitive Surface Mount Devices*, for details.

Storage before use

- An unopen moisture barrier bag (MBB) can be stored at <40°C/90% RH for 12 months. If the actual shelf life has exceeded 12 months and the HIC indicates that baking is not required, it is safe to reflow the LEDs per the original MSL rating.
- Do not open the MBB prior to assembly (for example, for IQC).

Control after opening the MBB

- Read the humidity indicator card (HIC) immediately upon opening of MBB.
- The LEDs must be kept at <30°C / 60% RH at all time and all high temperature related process including soldering, curing or rework need to be completed within 672 hours.

Control for unfinished reel

Any unused LEDs must be stored in a sealed MBB with desiccant or desiccator at <5% RH.

Control of assembled boards

If the PCB soldered with the LEDs is to be subjected to other high-temperature processes, the PCB must be stored in a sealed MBB with desiccant or desiccator at <5% RH to ensure that no LEDs have exceeded their floor life of 672 hours.

Baking is required if the following conditions exist

- The “10%” or “15%” HIC indicator turns pink.
- The LEDs are exposed to conditions of >30°C / 60% RH at any time.
- The LEDs’ floor life exceeded 672 hours.

Recommended baking condition: 60°C ± 5°C for 20 hours.

Handling Precautions

The encapsulation material of the LED is made of silicone for better product reliability. Compared to epoxy encapsulant, which is hard and brittle, silicone is softer and flexible. Observe special handling precautions during assembly of silicone encapsulated LED products. Failure to comply might lead to damage and premature failure of the LED. Refer to Broadcom Application Note AN5288, *Silicone Encapsulation for LED: Advantages and Handling Precautions*, for additional information.

- Do not poke sharp objects into the silicone encapsulant. Sharp objects, such as tweezers or syringes, might apply excessive force or even pierce through the silicone and induce failures to the LED die or wire bond.
- Do not touch the silicone encapsulant. Uncontrolled force acting on the silicone encapsulant might result in excessive stress on the wire bond. Hold the LED only by the body.
- Do not stack assembled PCBs together. Use an appropriate rack to hold the PCBs.
- Surface of silicone material attracts dust and dirt easier than epoxy due to its surface tackiness. To remove foreign particles on the surface of silicone, use a cotton bud with isopropyl alcohol (IPA). During cleaning, rub the surface gently without putting too much pressure on the silicone. Ultrasonic cleaning is not recommended.

Application Precautions

- The drive current of the LED must not exceed the maximum allowable limit across temperature as stated in the data sheet. Constant current driving is recommended to ensure consistent performance.
- Circuit design must cater to the whole range of forward voltage (VF) of the LEDs to ensure the intended drive current can always be achieved.
- The LED exhibits slightly different characteristics at different drive currents, which may result in a larger variation of performance (meaning: intensity, wavelength, and forward voltage). Set the application current as close as possible to the test current to minimize these variations.
- Do not use the LED in the vicinity of material with sulfur content or in environments of high gaseous sulfur compounds and corrosive elements. Examples of material that might contain sulfur are rubber gaskets, room- temperature vulcanizing (RTV) silicone rubber,

rubber gloves, and so on. Prolonged exposure to such environments may affect the optical characteristics and product life.

- White LEDs must not be exposed to acidic environments and must not be used in the vicinity of any compound that may have acidic outgas, such as, but not limited to, acrylate adhesive. These environments have an adverse effect on LED performance.
- Avoid rapid change in ambient temperature, especially in high-humidity environments, because they cause condensation on the LED.
- If the LED is intended to be used in harsh or outdoor environment, protect the LED against damages caused by rain water, water, dust, oil, corrosive gases, external mechanical stresses, and so on.

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