Data Sheet

AUV3-Sxx2-0xx0K

3W 3535 Surface-Mount UV LED

Description

The Broadcom® 3W 3535 surface-mount UV LEDs are energy-efficient LEDs that can be driven with high currents and can dissipate heat efficiently, resulting in higher reliability. Their low-profile package design addresses a wide variety of applications where superior robustness and high efficiency are required. They are packaged with ceramic-based materials, and the quartz lens on top of the package provides the product longevity needed for the respective end applications.

To facilitate easy pick-and-place assembly, the LEDs are packed in tape and reel. Each reel is shipped in a single flux and single color bin to ensure close uniformity.

Features

- High-reliability package with quartz lens.
- High-radiant flux output using InGaN dice technology.
- Available in 360-nm to 400-nm wavelength range.
- Available in 35° and 60° viewing angles.
- Compatible with the reflow soldering process.
- JEDEC MSL 1

Applications

- Industrial curing
- Photocatalyst purification
- Medical applications
- Horticulture

CAUTION! This LED is ESD sensitive. Observe appropriate precautions during handling and processing. Refer to the *Premium InGaN LEDs: Safety Handling Fundamentals ESD Application Note*, AN-1142, for additional details.

Figure 1: Package Drawing for AUV3-Sx32-0xx0K

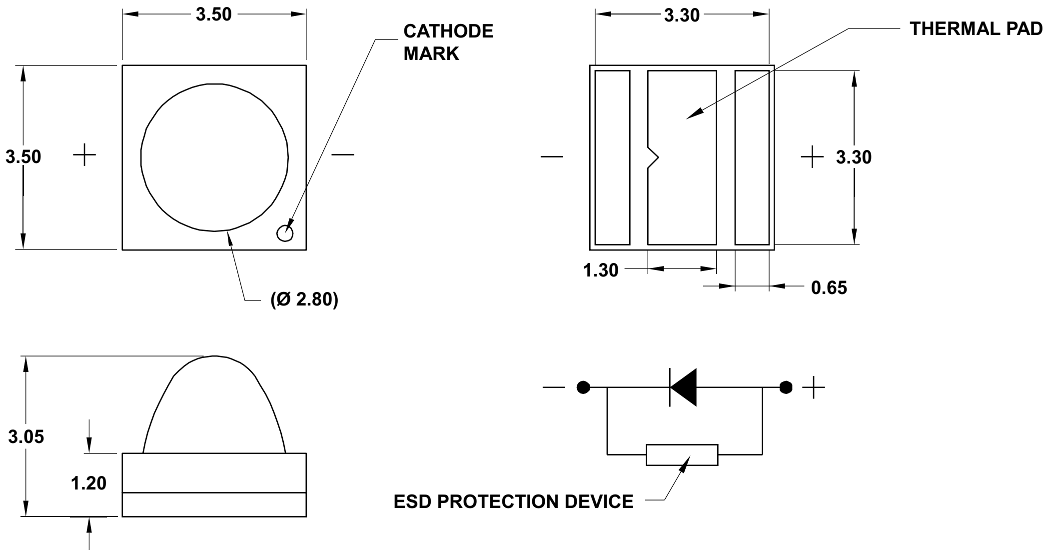
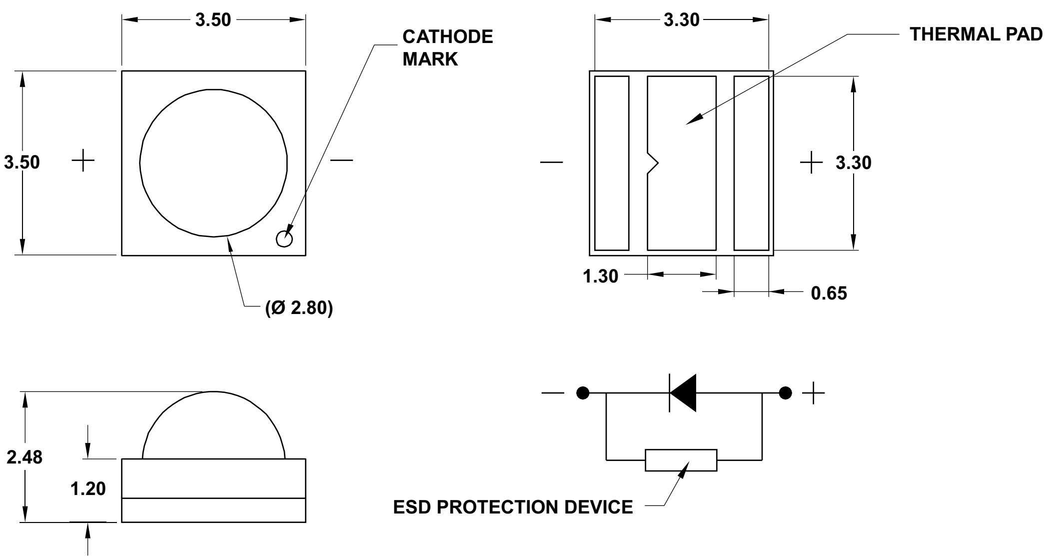


Figure 2: Package Drawing for AUV3-Sx62-0xx0K



NOTE:

1. All dimensions are in millimeters (mm).
2. Tolerance is ± 0.20 mm unless otherwise specified.
3. The thermal pad is electrically isolated.
4. Lens = Quartz.
5. Terminal finish = Gold plating
6. Dimensions in parentheses are for reference only.

Device Selection Guide (T_J = 25°C, I_F = 700 mA)

Part Number	Viewing Angle, $2\theta_{½}$ (°)[a]	Peak Wavelength, λ_p (nm)			Radiant Flux, Φ_e (mW)[b, c]			Dice Technology
	Typ.	Min.	Typ.	Max.	Min.	Typ.	Max.	
AUV3-SQ32-0RT0K	35	360	365	370	910	1020	1210	InGaN
AUV3-SS32-0RU0K	35	380	385	390	910	1020	1330	InGaN
AUV3-ST32-0SV0K	35	390	395	400	1000	1200	1460	InGaN
AUV3-SQ62-0RT0K	60	360	365	370	910	1020	1210	InGaN
AUV3-SS62-0RU0K	60	380	385	390	910	1020	1330	InGaN
AUV3-ST62-0SV0K	60	390	395	400	1000	1200	1460	InGaN

a. $\theta_{½}$ is the off-axis angle where the radiant flux is half of the peak intensity.

b. Radiant flux, Φ_e is the total output measured with an integrating sphere at a single current pulse condition.

c. Tolerance is ± 10%.

Absolute Maximum Ratings

Parameters	365 nm	385 nm	395 nm	Units
DC Forward Current[a]	700	1000	1000	mA
Power Dissipation	2800	4000	4000	mW
Reverse Voltage	Not designed for reverse bias operation			
LED Junction Temperature	90			°C
Operating Temperature Range	–40 to +100			°C
Storage Temperature Range	–40 to +100			°C

a. Derate linearly as shown in Figure 13, Figure 14, Figure 15, and Figure 16.

Optical and Electrical Characteristics (T_J = 25°C, I_F = 700 mA)

Parameters	Min.	Typ.	Max.	Units
Spectral Half-Width, $\Delta\lambda_{½}$				nm
365 nm	—	11	—	
385 nm	—	11	—	
395 nm	—	12	—	
Forward Voltage, V_F[a]				V
365 nm	3.40	3.70	4.00	
385 nm	3.20	3.45	4.00	
395 nm	3.20	3.45	4.00	
Thermal Resistance, $R_{\theta J\text{-}S}$[b]	—	6	—	°C/W

a. Forward voltage, V_F, tolerance is ± 0.1V.

b. Thermal resistance from the LED junction to the solder point.

Part Numbering System

A	U	V	3	-	S	x_1	x_2	2	-	0	x_3	x_4	x_5	x_6

Code	Description	Option	
x_1	Nominal Peak Wavelength	Q	365 nm
		S	385 nm
		T	395 nm
x_2	Viewing Angle	3	35°
		6	60°
x_3	Minimum Radiant Flux Bin	Refer to the Radiant Flux Bin Limits (CAT) table	
x_4	Maximum Radiant Flux Bin		
x_5	Color Bin Option	0	Full Distribution
x_6	Test Option	K	Test Current = 700 mA

Part Number Example

AUV3-SS32-0RU0K

x_1: S – Nominal peak wavelength = 385 nm
x_2: 3 – Viewing angle = 35°
x_3: R – Minimum radiant flux bin R
x_4: U – Maximum radiant flux bin U
x_5: 0 – Full distribution color bin
x_6: K – Test current = 700 mA

Bin Information

Radiant Flux Bin Limits (CAT)

Bin ID	Radiant Flux, Φ_e (mW)	
	Min.	Max.
Q	830	910
R	910	1000
S	1000	1100
T	1100	1210
U	1210	1330
V	1330	1460

Tolerance = ± 10%.

Forward Voltage Bin Limits (V_F)

Bin ID	Forward Voltage, V_F (V)	
	Min.	Max.
D	3.2	3.4
E	3.4	3.6
F	3.6	3.8
G	3.8	4.0

Tolerance = ± 0.1V.

Color Bin Limits (BIN)

Bin ID	Peak Wavelength, λ_p (nm)	
	Min.	Max.
Q1	360	365
Q2	365	370
S1	380	385
S2	385	390
T1	390	395
T2	395	400

Tolerance = ± 1.0 nm.

Example of bin information on reel and packaging label:

CAT: S	–	Radiant flux bin S
BIN: S1	–	Color bin S1
VF: E	–	Forward voltage bin E

Figure 3: Spectral Power Distribution

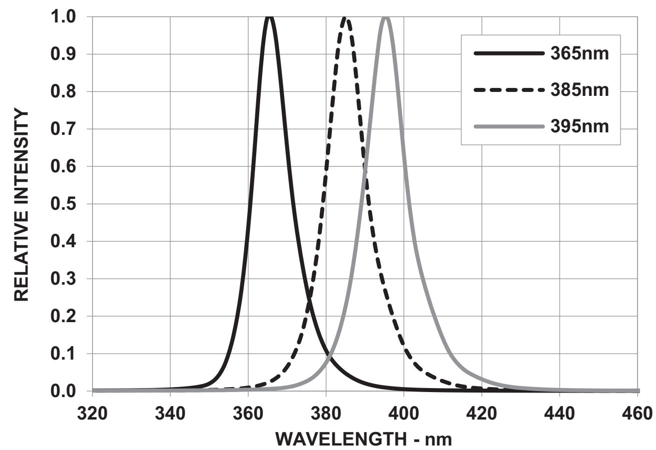


Figure 4: Forward Current vs. Forward Voltage

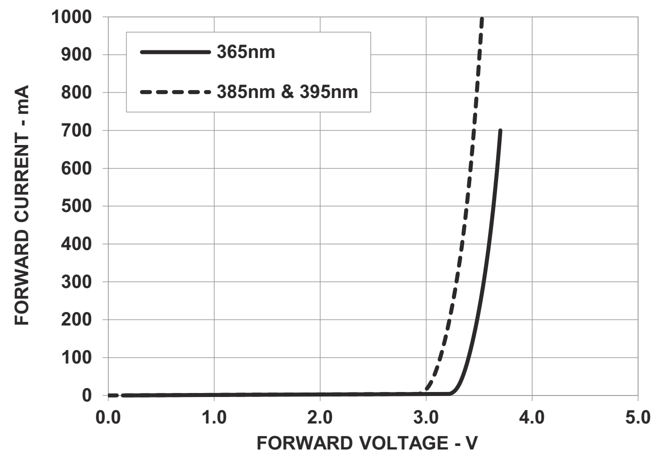


Figure 5: Relative Radiant Flux vs. Mono Pulse Current – 365 nm

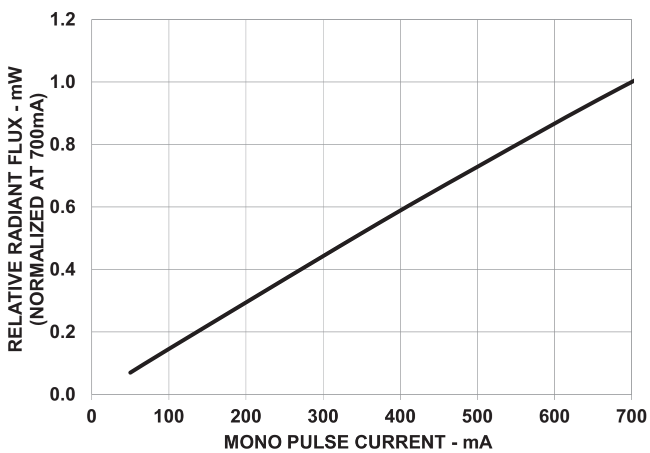


Figure 6: Relative Radiant Flux vs. Mono Pulse Current – 385 nm and395nm

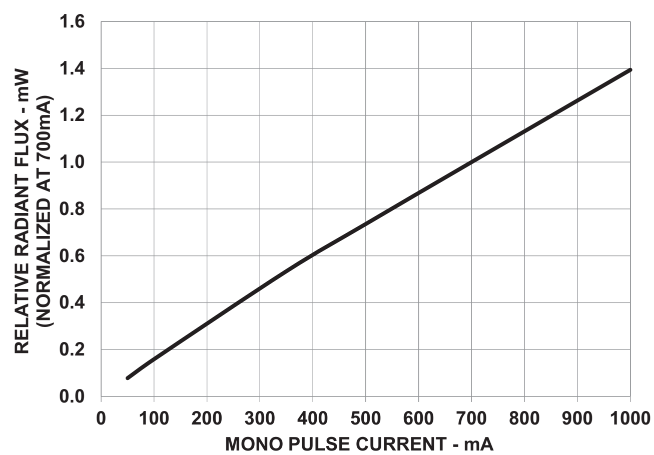


Figure 7: Relative Radiant Flux vs. Mono Pulse Current – 365 nm

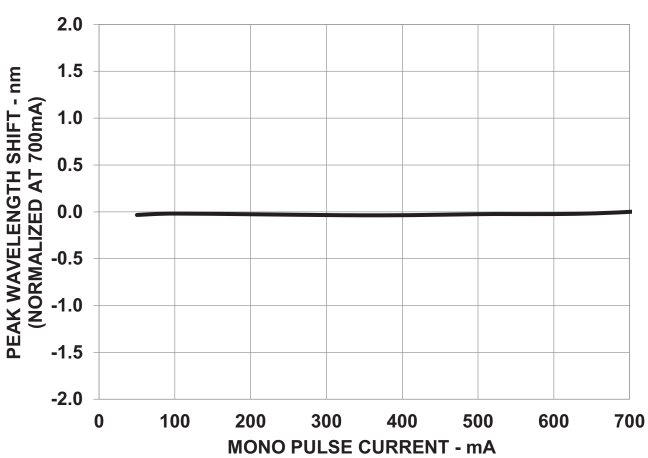


Figure 8: Peak Wavelength Shift vs. Mono Pulse Current – 385 nm and 395 nm

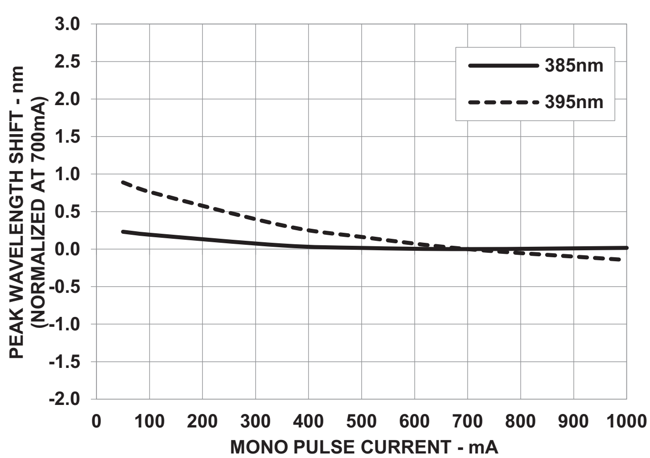


Figure 9: Radiation Pattern – 60°

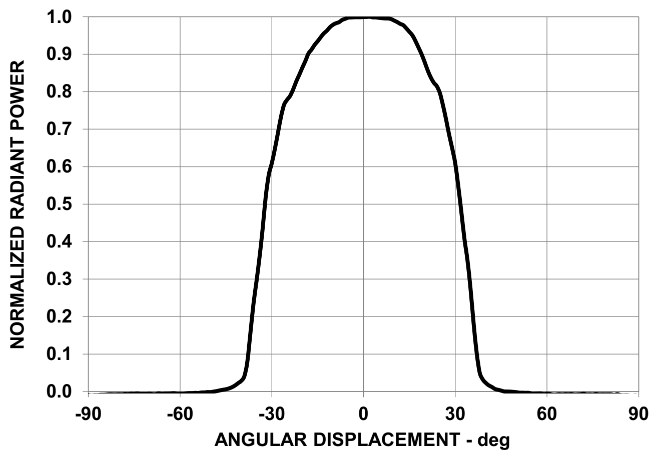


Figure 10: Radiation Pattern – 35°

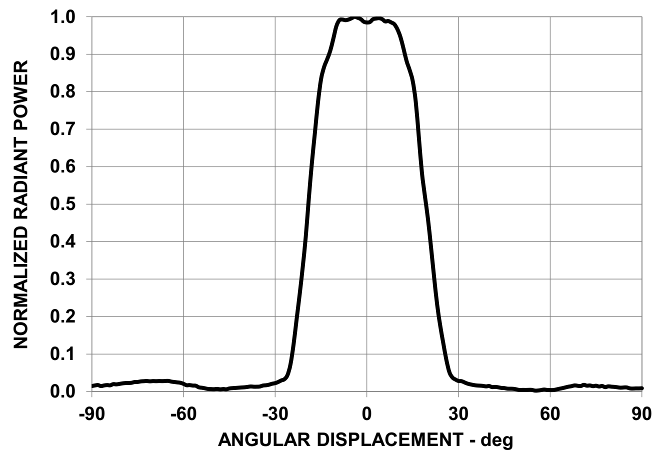


Figure 11: Forward Voltage Shift vs. Junction Temperature

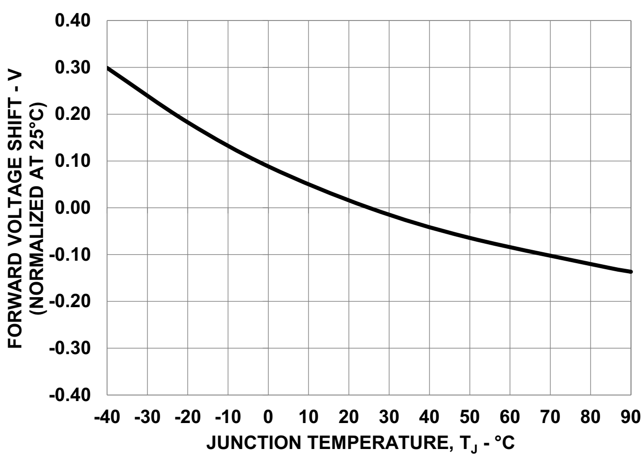


Figure 12: Peak Wavelength Shift vs. Junction Temperature

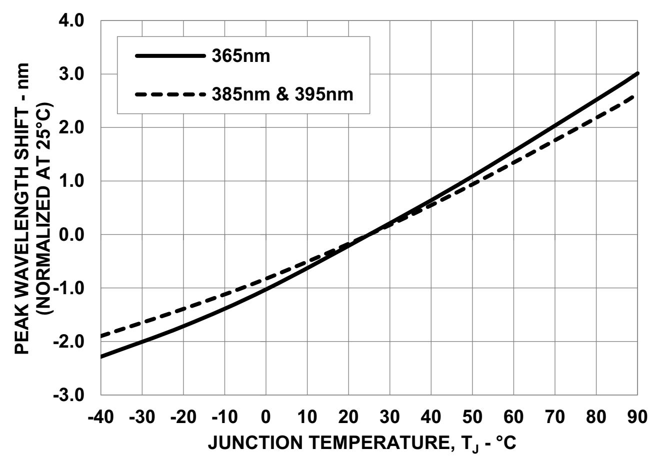


Figure 13: Maximum Forward Current vs. Ambient Temperature – 365 nm

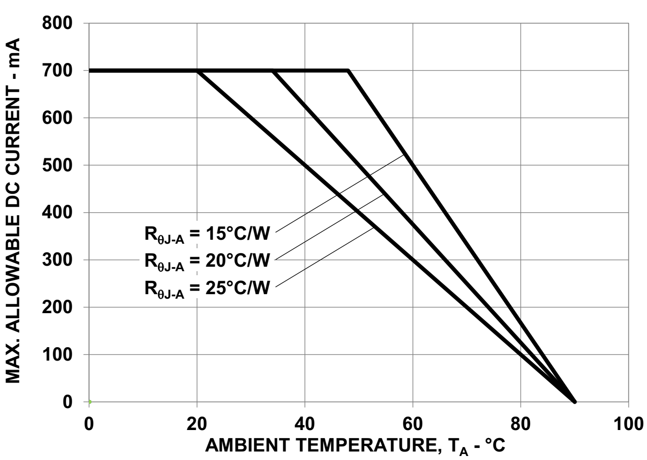


Figure 14: Maximum Forward Current vs. Solder Point Temperature – 365 nm

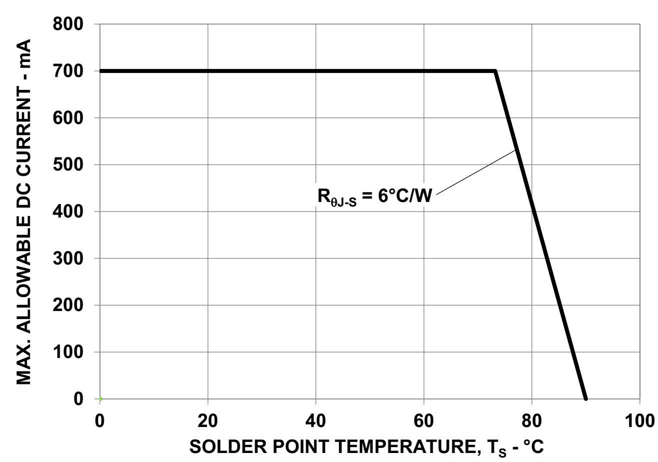


Figure 15: Maximum Forward Current vs. Ambient Temperature – 385 nm and 395 nm

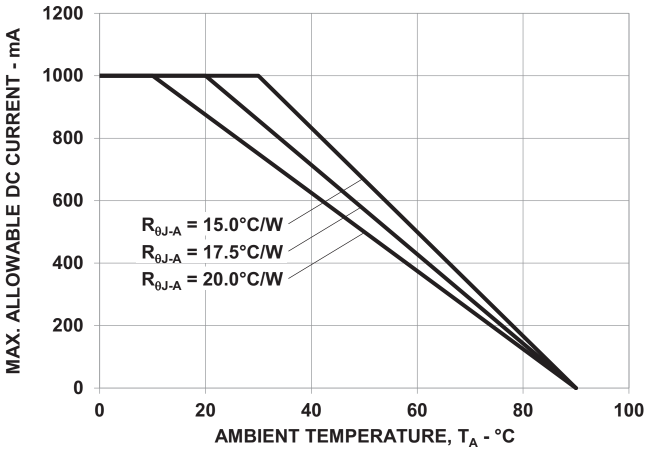


Figure 16: Maximum Forward Current vs. Solder Point Temperature – 385 nm and 395 nm

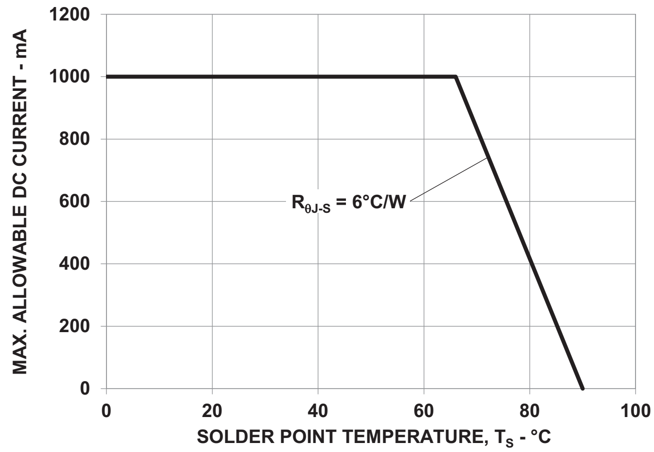
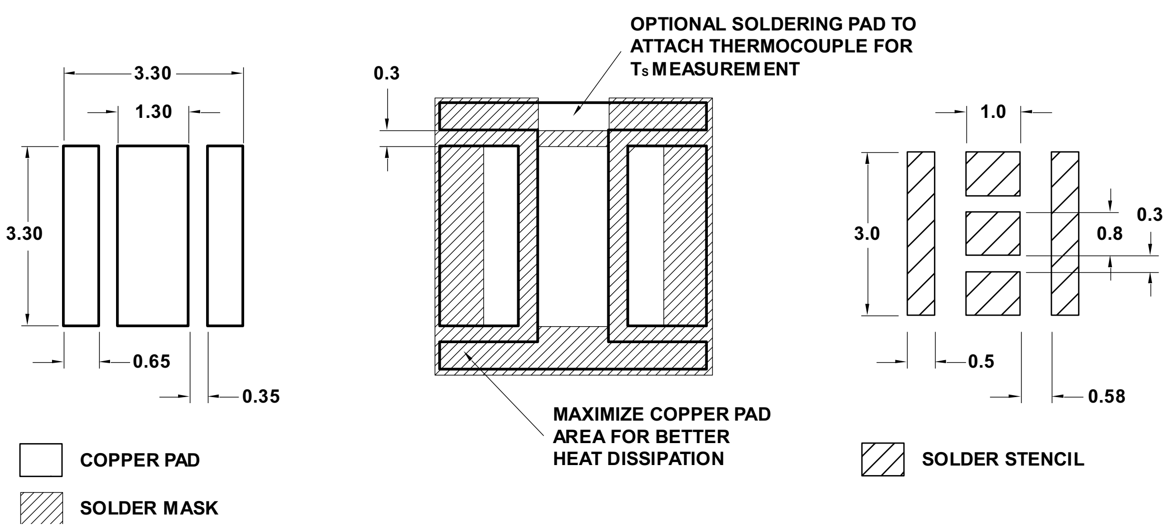
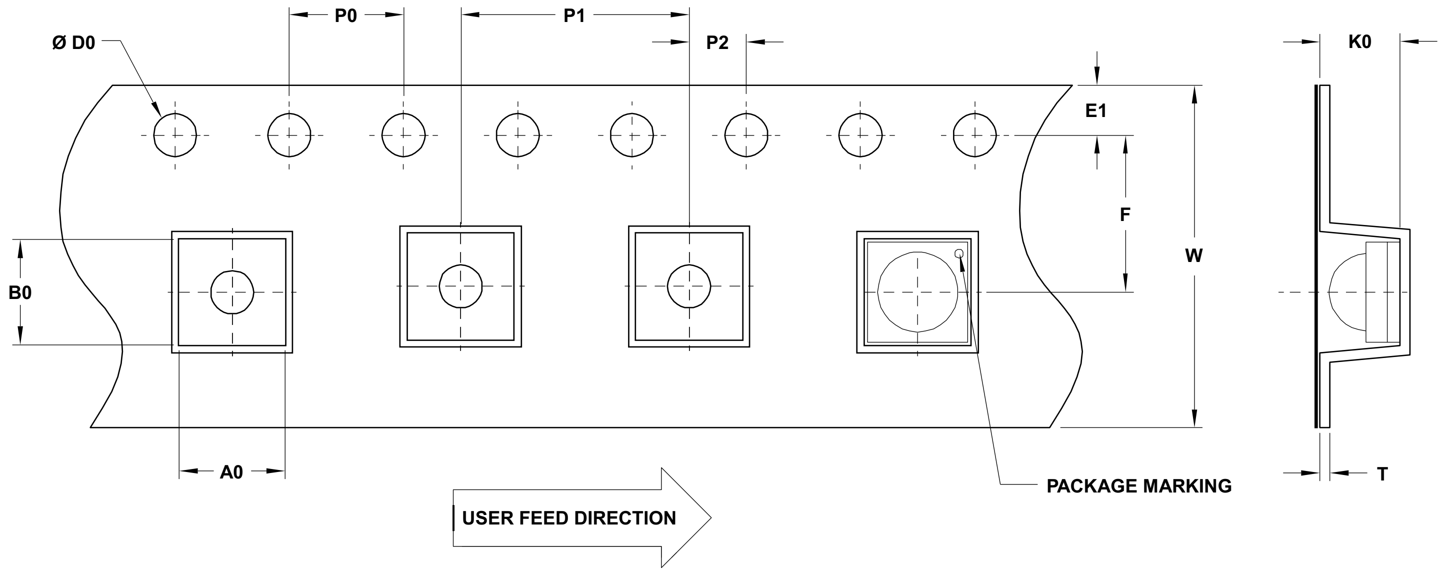


Figure 17: Recommended Soldering Land Pattern



NOTE: All dimensions are in millimeters (mm).

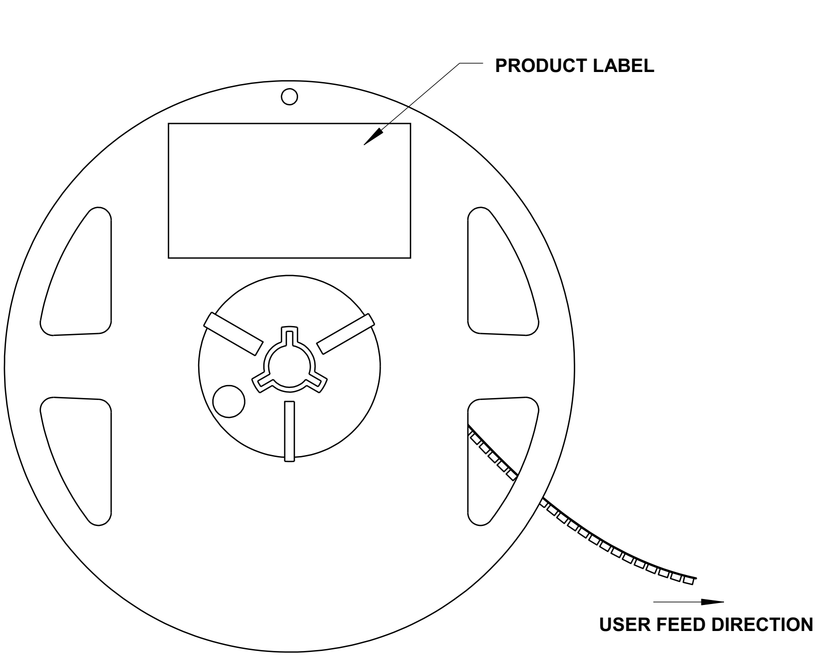
Figure 18: Carrier Tape Dimensions



F	P0	P1	P2	D0	E1	W
5.50 ± 0.05	4.00 ± 0.10	8.00 ± 0.10	2.00 ± 0.05	1.50 + 0.1	1.75 ± 0.10	12.00 ± 0.20
T	**B0**	**A0**	**K0**			
0.35 ± 0.05	3.75 ± 0.10	3.75 ± 0.10	2.80 ± 0.10			

NOTE: All dimensions are in millimeters (mm).

Figure 19: Reel Dimensions



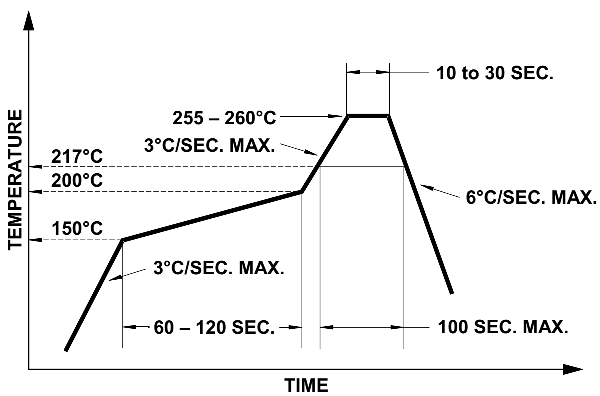
NOTE: All dimensions are in millimeters (mm).

Precautionary Notes

Soldering

- Do not perform reflow soldering more than twice. Observe necessary precautions of handling moisture-sensitive devices as stated in the following section.
- Do not apply any pressure or force on the LED during reflow and after reflow when the LED is still hot.

Figure 20: Recommended Lead-Free Reflow Soldering Profile



Handling Precautions

- Do not stack assembled PCBs together. Use an appropriate rack to hold the PCBs.
- For automated pick and place, Broadcom has tested a nozzle size with OD 3.7 mm and ID 3.00 mm to work with this LED. However, due to the possibility of variations in other parameters such as pick and place machine maker/model, and other settings of the machine, verify that the selected nozzle will not cause damage to the LED.

Handling of Moisture-Sensitive Devices

This product has a Moisture Sensitive Level 1 rating per JEDEC J-STD-020. Refer to Broadcom Application Note AN5305, *Handling of Moisture Sensitive Surface Mount Devices*, for additional details and a review of proper handling procedures.

Storage:

Keep unused LEDs in a sealed moisture barrier bag (MBB) with desiccant or in a desiccator at <5% RH as prolonged exposure to ambient temperature might affect the solderability performance.

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.
- The circuit design must cater to the whole range of forward voltage (V_F) 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 (such as 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.
- Avoid rapid changes in ambient temperatures, especially in high-humidity environments, because they cause condensation on the LED.
- If the LED is intended to be used in a harsh or an outdoor environment, protect the LED against damages caused by rain water, water, dust, oil, corrosive gases, external mechanical stresses, and so on.

Thermal Management

The optical, electrical, and reliability characteristics of the LED are affected by temperature. Keep the junction temperature (T_J) of the LED below the allowable limit at all times. T_J can be calculated as follows:

$T_J = T_A + R_{\theta J\text{-}A} \times I_F \times V_{Fmax}$

where:

T_A = Ambient temperature (°C)

$R_{\theta J\text{-}A}$ = Thermal resistance from LED junction to ambient (°C/W)

I_F = Forward current (A)

V_{Fmax} = Maximum forward voltage (V)

The complication of using this formula lies in T_A and $R_{\theta J\text{-}A}$. Actual T_A is sometimes subjective and hard to determine. $R_{\theta J\text{-}A}$ varies from system to system depending on design and is usually not known.

Another way of calculating T_J is by using the solder point temperature, T_S, as follows:

$T_J = T_S + R_{\theta J\text{-}S} \times I_F \times V_{Fmax}$

where:

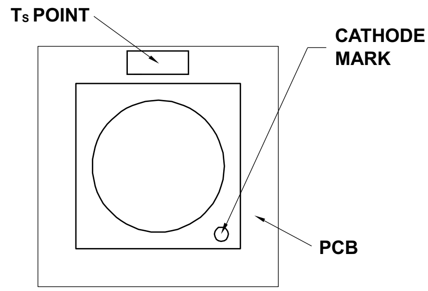
T_S = LED solder point temperature as shown in the following figure (°C)

$R_{\theta J\text{-}S}$ = Thermal resistance from junction to solder point (°C/W)

I_F = Forward current (A)

V_{Fmax} = Maximum forward voltage (V)

Figure 21: Solder Point Temperature on PCB



T_S can be easily measured by mounting a thermocouple on the soldering joint as shown in preceding figure, while $R_{\theta J\text{-}S}$ is provided in the data sheet. Verify the T_S of the LED in the final product to ensure that the LEDs are operating within all maximum ratings stated in the data sheet.

Eye Safety Precautions

These devices are UV LEDs that may pose optical hazards when in operation. **Do not** look directly into an emitting UV LED because it might be harmful to human eyes. For safety precautions, use appropriate shielding or personal protective equipment (for example, glasses, gloves, face shield). Use appropriate warning signs and labels to indicate the presence of potential UV radiation hazard.

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