

Data Sheet

Description

The surface mount LEDs use InGaN chip technology with superior package design to enable them to produce higher light output with better flux performance. They can be driven at high current and are able to dissipate the heat more efficiently resulting in better performance with higher reliability.

These LEDs are able to be operated under a wide range of environmental conditions making ideal for various applications including fluorescent replacement, under cabinet lighting, retail display lighting and panel lights.

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

Features

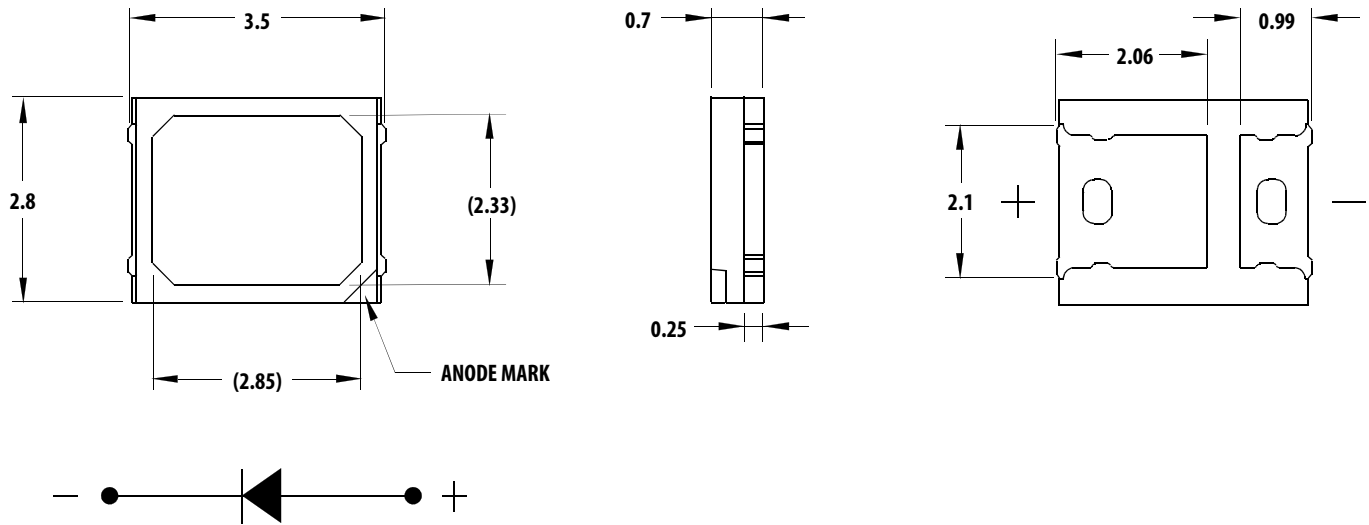
- Available in CCT 3000K, 4000K, 5000K and 6500K per ANSI
- CRI ≥ 80
- High reliability with silicone encapsulation
- Low package profile and large emitting area for better uniformity in linear lighting
- Moisture Sensitivity Level 3

Applications

- For lightings and luminaires
- Channel letter and advertisement board backlighting
- Office automations, home appliances, industrial equipment
 - Front panel backlighting
 - Push button backlighting
 - Display backlighting
 - Scanner lighting

CAUTION: This LED is ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to application note AN-1142 for additional details.

Figure 1 Package Dimensions



NOTE

1. Dimensions in bracket are for reference only.
2. Tolerance is $\pm 0.20\text{mm}$ unless otherwise specified.
3. Encapsulation = silicone.
4. Terminal finish = silver plating.
5. All dimensions in millimeters (mm).

Device Selection Guide ($T_J = 25^\circ\text{C}$, $I_F = 150\text{mA}$)

Part Number	Correlated Color Temperature, CCT (Kelvin)	Luminous Flux, Φ_V (lm) ^{a, b}		
	Typ.	Min.	Typ.	Max.
ASMW-LWG0-NDFHE	3000	55	59	70
ASMW-LWG0-NEGFE	4000	60	64	75
ASMW-LWG0-NEGDE	5000	60	64	75
ASMW-LWG0-NEGBE	6500	60	64	75

a. Luminous flux, Φ_V is the total flux output measured with an integrating sphere at a single current pulse condition.

b. Flux tolerance is $\pm 12\%$.

Absolute Maximum Ratings

Parameters	Rating	Unit
DC Forward Current ^a	200	mA
Peak Forward Current ^b	300	mA
Power Dissipation	760	mW
Reverse Voltage	Not designed for reverse bias operation	
LED Junction Temperature	125	°C
Operating Temperature Range	-40 to +100	°C
Storage Temperature Range	-40 to +100	°C

- a. Derate linearly as shown in Figure 11 and Figure 12.
- b. Duty factor = 10%, frequency = 1kHz.

Optical and Electrical Characteristics (T_J = 25°C, I_F = 150mA)

Parameters	Min.	Typ.	Max.	Unit
Viewing Angle, 2θ _{1/2} ^a	–	115	–	°
Forward Voltage, V _F ^b	2.8	3.1	3.8	V
Color Rendering Index, CRI	80	–	–	–
Thermal Resistance, R _{θJ-S} ^c	–	30	–	°C/W

- a. θ_{1/2} is the off-axis angle where the luminous intensity is ½ the peak intensity.
- b. Forward voltage, V_F tolerance is ±0.1V.
- c. Thermal resistance from LED junction to solder point.

Part Numbering System

A S M W - L W G 0 - N

x ₁	x ₂	x ₃
----------------	----------------	----------------

 E

Code	Description	Option
x ₁	Minimum Flux Bin	Refer to Flux Bin Limits (CAT) table
x ₂	Maximum Flux Bin	
x ₃	Correlated Color Temperature	B 6500K
		D 5000K
		F 4000K
		H 3000K

Part Number Example

ASMW-LWG0-NDFBE

- x₁ : D – Minimum flux bin D
- x₂ : F – Maximum flux bin F
- x₃ : B – 6500K with sub bins 2A, 2B, 2C, 2D

Bin Information

Flux Bin Limits (CAT)

Bin ID	Luminous Flux, Φ_v (lm)	
	Min.	Max.
D	55	60
E	60	65
F	65	70
G	70	75

Tolerance = $\pm 12\%$

Forward Voltage Bin Limits (VF)

Bin ID	Forward Voltage, V_F (V)	
	Min.	Max.
VF12	2.8	3.0
VF13	3.0	3.2
VF14	3.2	3.4
VF15	3.4	3.6
VF16	3.6	3.8

Tolerance = $\pm 0.1V$

Color Bin Limits (BIN)

CCT	Bin ID	Chromaticity Coordinates		CCT	Bin ID	Chromaticity Coordinates		CCT	Bin ID	Chromaticity Coordinates	
		x	y			x	y			x	y
6500K	2A	0.3048	0.3207	5000K	4A	0.3371	0.3490	4000K	6A	0.3670	0.3578
		0.3130	0.3290			0.3451	0.3554			0.3702	0.3722
		0.3144	0.3186			0.3440	0.3427			0.3825	0.3798
		0.3068	0.3113			0.3366	0.3369			0.3783	0.3646
	2B	0.3028	0.3304		4B	0.3376	0.3616		6B	0.3702	0.3722
		0.3115	0.3391			0.3463	0.3687			0.3736	0.3874
		0.3130	0.3290			0.3451	0.3554			0.3869	0.3958
		0.3048	0.3207			0.3371	0.3490			0.3825	0.3798
	2C	0.3115	0.3391		4C	0.3463	0.3687		6C	0.3825	0.3798
		0.3205	0.3481			0.3551	0.3760			0.3869	0.3958
		0.3213	0.3373			0.3533	0.3620			0.4006	0.4044
		0.3130	0.3290			0.3451	0.3554			0.3950	0.3875
	2D	0.3130	0.3290		4D	0.3451	0.3554		6D	0.3783	0.3646
		0.3213	0.3373			0.3533	0.3620			0.3825	0.3798
		0.3221	0.3261			0.3515	0.3487			0.3950	0.3875
		0.3144	0.3186			0.3440	0.3427			0.3898	0.3716

Tolerance = ± 0.01

CCT	Bin ID	Chromaticity Coordinates	
		x	y
3000K	8A	0.4147	0.3814
		0.4221	0.3984
		0.4342	0.4028
		0.4259	0.3853
	8B	0.4221	0.3984
		0.4299	0.4165
		0.4430	0.4212
		0.4342	0.4028
	8C	0.4342	0.4028
		0.4430	0.4212
		0.4562	0.4260
		0.4465	0.4071
	8D	0.4259	0.3853
		0.4342	0.4028
		0.4465	0.4071
		0.4373	0.3893

Tolerance = ±0.01

Example of bin information on reel and packaging label:

- CAT : D – Flux bin D
- BIN : 2A – Color bin 2A
- VF : VF12 – VF bin VF12

Figure 2 Chromaticity Diagram

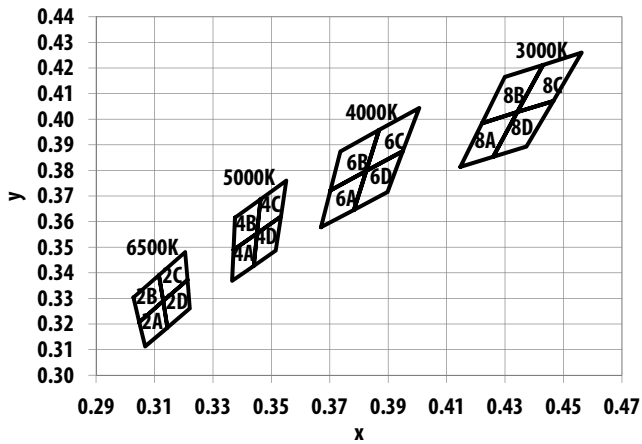


Figure 3 Spectral Power Distribution

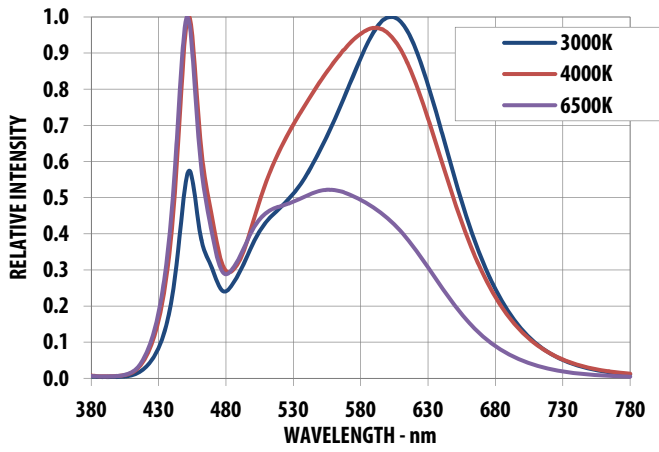


Figure 4 Forward Current vs. Forward Voltage

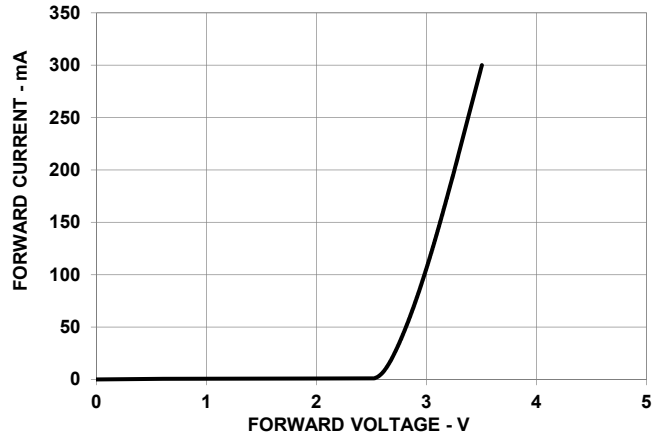


Figure 5 Relative Luminous Intensity vs. Mono Pulse Current

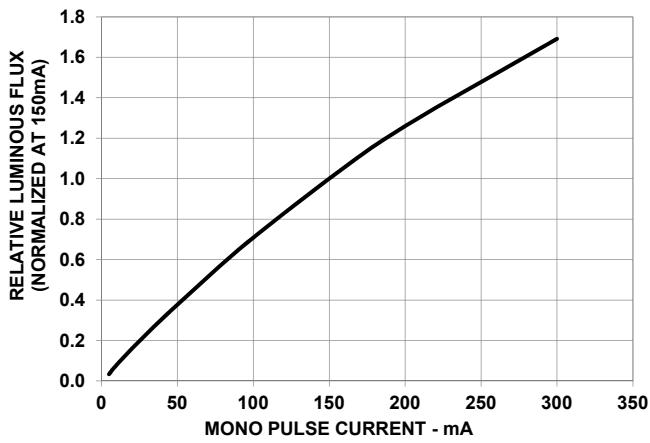


Figure 6 Radiation Pattern

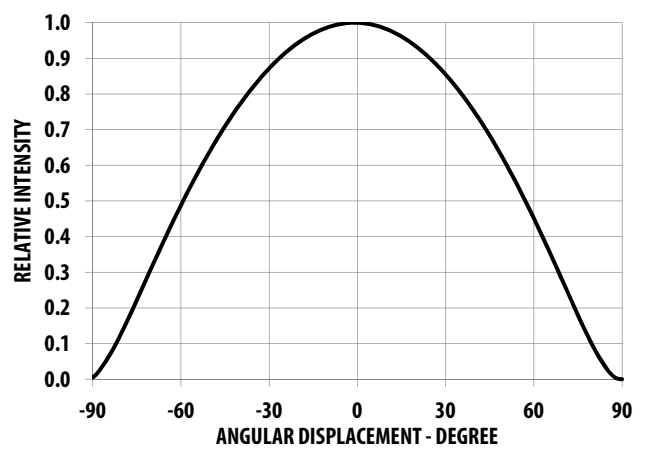


Figure 7 Chromaticity Coordinate Shift vs. Mono Pulse Current

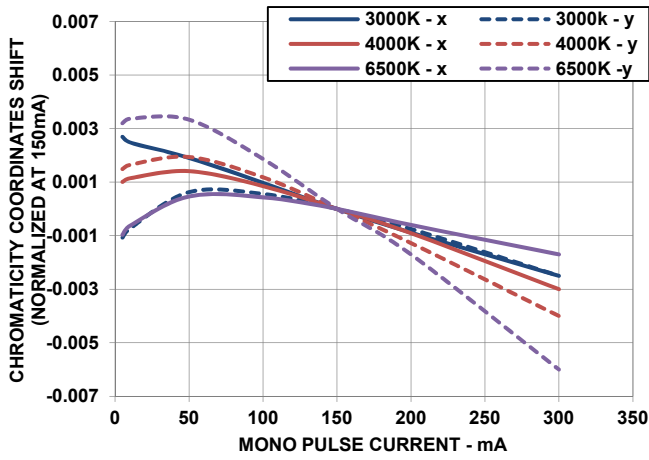


Figure 8 Relative Light Output vs. Junction Temperature

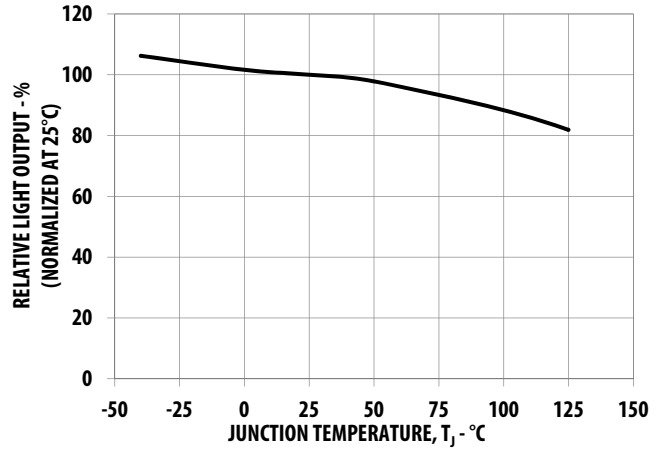


Figure 9 Forward Voltage Shift vs. Junction Temperature

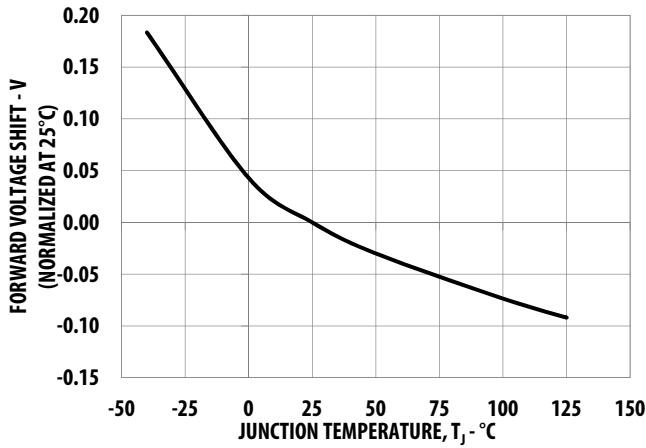


Figure 10 Chromaticity Coordinate Shift vs. Junction Temperature

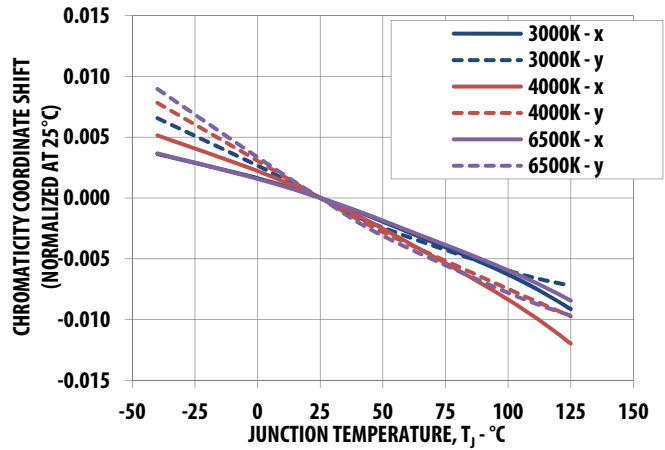


Figure 11 Maximum Forward Current vs. Ambient Temperature. Derated based on $T_{JMAX} = 125^{\circ}C$

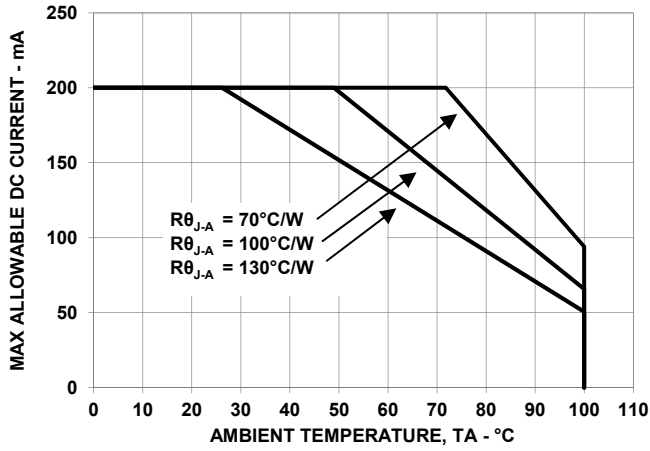


Figure 12 Maximum Forward Current vs. Solder Point Temperature. Derated based on $T_{JMAX} = 125^{\circ}C$, $R_{\theta J-S} = 30^{\circ}C/W$

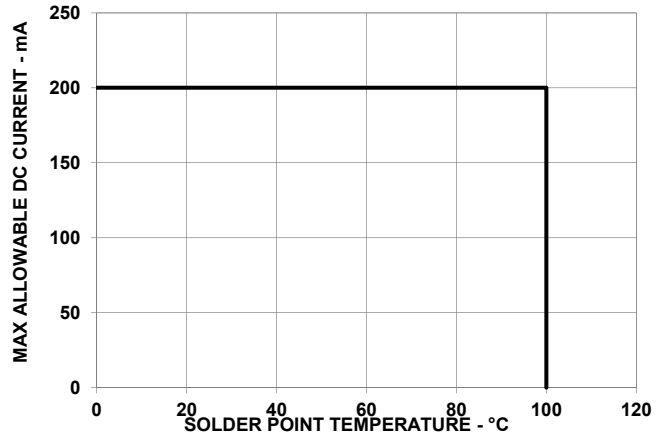
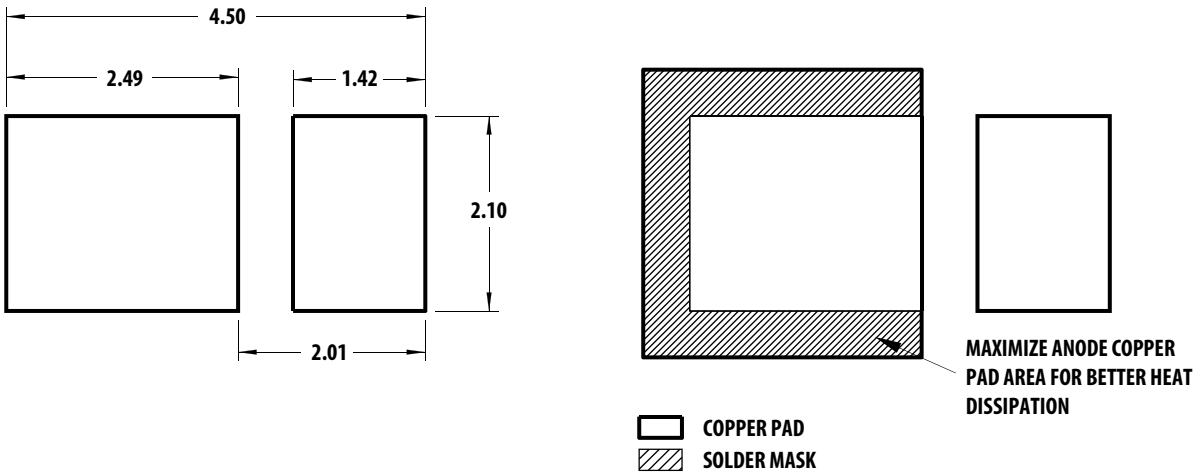
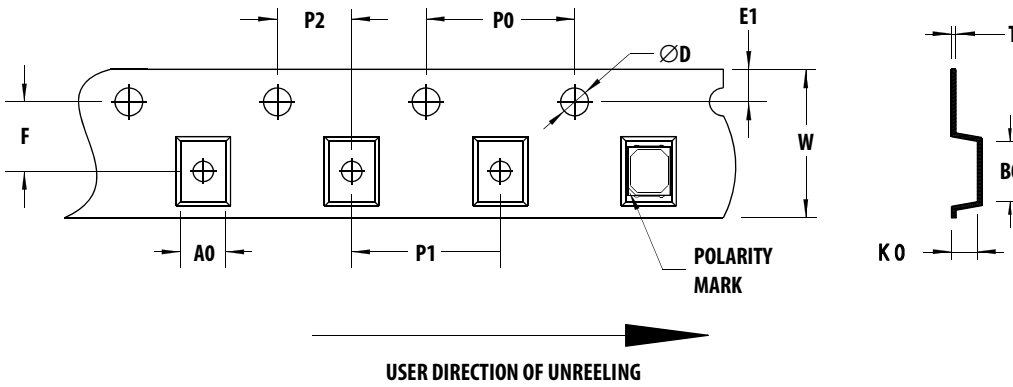


Figure 13 Recommended Soldering Land Pattern



NOTE All dimensions are in millimeters (mm).

Figure 14 Carrier Tape Dimensions

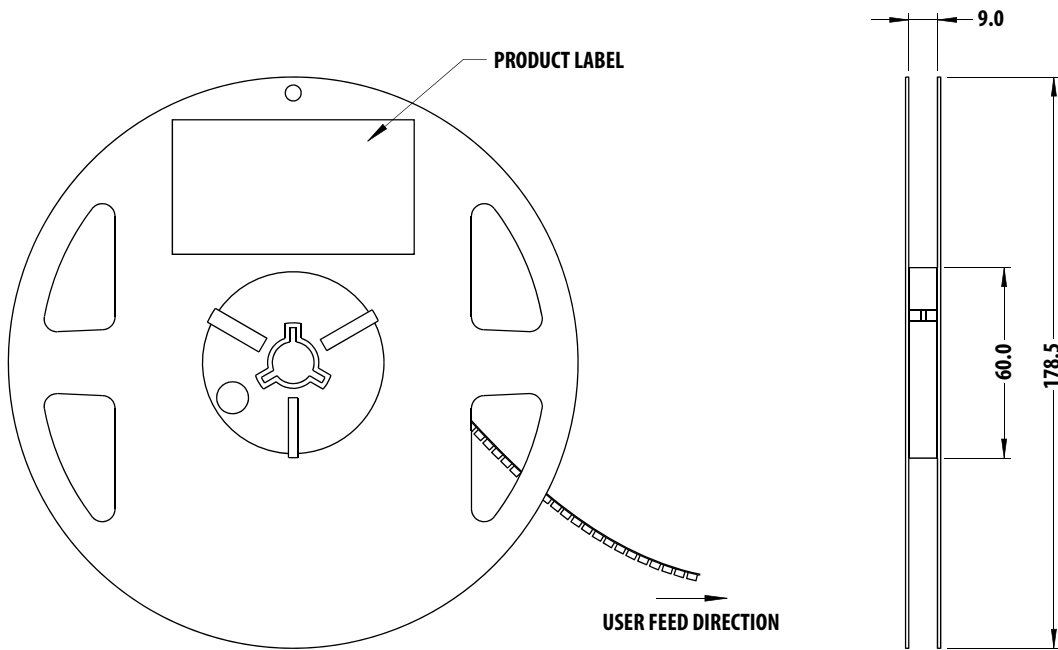


F	P0	P1	P2	D0	E1	W
3.5±0.05	4.0±0.1	4.0±0.1	2.0±0.05	1.55±0.05	1.75±0.1	8.0±0.2

T	B0	K0	A0
0.2±0.05	3.8±0.1	1.05±0.1	3.1±0.1

NOTE All dimensions are in millimeters (mm).

Figure 15 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 device 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.
- Use reflow soldering to solder the LED. Use hand soldering only for rework if unavoidable, but it must be strictly controlled to following conditions:
 - Soldering iron tip temperature = 315°C max.
 - Soldering duration = 3sec max.
 - Number of cycles = 1 only
 - Power of soldering iron = 50W max.
- Do not touch the LED package body with the soldering iron except for the soldering terminals, as it may cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED is affected by soldering with hand soldering.

Figure 16 Recommended Lead-Free Reflow Soldering Profile

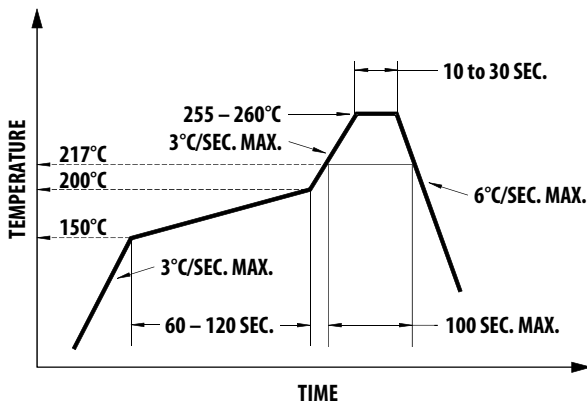
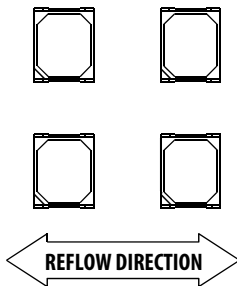


Figure 17 Recommended Board Reflow Direction



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.
- For automated pick and place, Broadcom has tested a nozzle size with OD 3.5 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 3 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.

- Before use:
 - An unopened 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 Humidity Indicator Card (HIC) indicates that baking is not required, then it is safe to reflow the LEDs per the original MSL rating.
 - Do not open the MBB prior to assembly (for example, for IQC). If unavoidable, MBB must be properly resealed with fresh desiccant and HIC. The exposed duration must be taken in as floor life.

- Control after opening the MBB:
 - Read the HIC immediately upon opening of MBB.
 - Keep the LEDs at <30°/60%RH at all times, and complete all high temperature-related processes, including soldering, curing or rework within 168 hours.
- Control for unfinished reel:

Store unused LEDs in a sealed MBB with desiccant or a desiccator at <5% RH.
- Control of assembled boards:

If the PCB soldered with the LEDs is to be subjected to other high-temperature processes, store the PCB in a sealed MBB with desiccant or desiccator at <5% RH to ensure that all LEDs have not exceeded their floor life of 168 hours.
- Baking is required if:
 - The HIC indicator indicates a change in color for 10% and 5%, as stated on the HIC.
 - The LEDs are exposed to conditions of >30°C/60% RH at any time.
 - The LED's floor life exceeded 168 hours.

The recommended baking condition is: 60±5°C for 20 hours.

Baking can only be done once.
- Storage:

The soldering terminals of these Broadcom LEDs are silver plated. If the LEDs are exposed in ambient environment for too long, the silver plating might be oxidized, thus affecting its solderability performance. As such, keep unused LEDs in a sealed MBB with desiccant or in a desiccator at <5% RH.

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 (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 (meaning: intensity, wavelength, and forward voltage). Set the application current as close as possible to the test current to minimize these variations.
- The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving

the LED in matrix form, ensure that the reverse bias voltage does not exceed the allowable limit of the LED.

- 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.

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:

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

where;

T_A = ambient temperature (°C)

$R_{\theta J-A}$ = 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 $R_{\theta J-A}$. Actual T_A is sometimes subjective and hard to determine. $R_{\theta J-A}$ 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:

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

where;

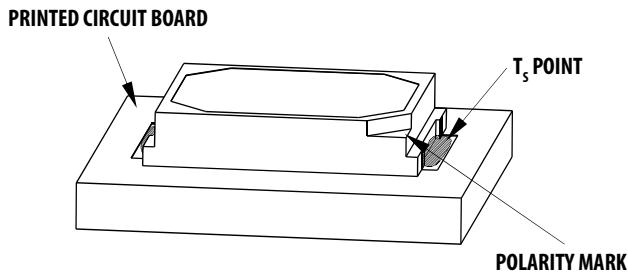
T_S = LED solder point temperature as shown in the following figure (°C)

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

I_F = forward current (A)

V_{Fmax} = maximum forward voltage (V)

Figure 18 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 $R_{\theta J-S}$ 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

LEDs may pose optical hazards when in operation. Do not look directly at operating LEDs because it might be harmful to the eyes. For safety reasons, use appropriate shielding or personal protective equipment.

Disclaimer

Broadcom's products and software are not specifically designed, manufactured, or authorized for sale as parts, components, or assemblies for the planning, construction, maintenance, or direct operation of a nuclear facility or for use in medical devices or applications. The customer is solely responsible, and waives all rights to make claims against Broadcom or its suppliers, for all loss, damage, expense, or liability in connection with such use.

For product information and a complete list of distributors, please go to our web site: www.broadcom.com

Broadcom, the pulse logo, Connecting Everything, Avago Technologies, Avago, and the A logo are among the trademarks of Broadcom and/or its affiliates in the United States, certain other countries and/or the EU.

Copyright © 2018 by Broadcom. All Rights Reserved.

The term "Broadcom" refers to Broadcom Limited and/or its subsidiaries. For more information, please visit www.broadcom.com.

Broadcom reserves the right to make changes without further notice to any products or data herein to improve reliability, function, or design.

Information furnished by Broadcom is believed to be accurate and reliable. However, Broadcom does not assume any liability arising out of the application or use of this information, nor the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.

July 27, 2018

