ASMD-FWG3-Nxxx6

0.2W 3014 Surface Mount LED

Data Sheet

Description

The ASMD-FWG3-Nxxx6 Surface Mount LEDs use InGaN chip technology with superior package design to enable them to produce higher light output with better flux performance. The product can be driven at high current and are able to dissipate the heat more efficiently resulting in better performance with reliability.

These LEDs are able to be operated under a wide range of environmental conditions making it 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 feel form. Every reel is shipped in single flux and color bin, to provide close uniformity.

Features

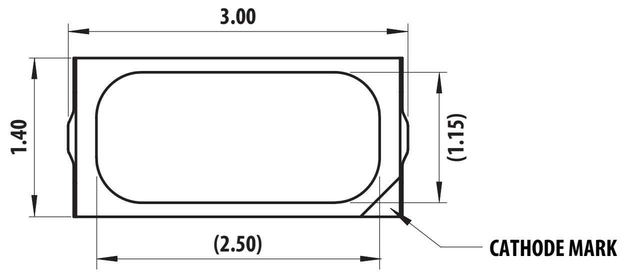
- High reliability package with enchanced silicone resin encapsulation.
- Available in 2700K, 3000K, 3500K, 4000K, 5000K, 5700K, 6200K, 6500K and 6800K CCT.
- Low Thermal Resistance at 28°C/W.
- Super wide viewing angle at 120°.
- Low package profile and large emitting area for better uniformity in linear lighting.
- JEDEC MSL 3.

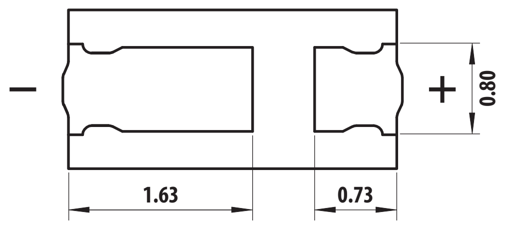
Applications

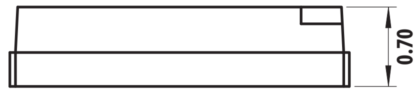
- For lightings and luminaires.
- Electronic signs and signals.
  - Channel lettering
  - Contour lighting
  - Advertisement board backlighting
- Office automations, home appliances, industrial equipments.
  - Front panel backlighting
  - Push button backlighting
  - Display backlighting
  - Scanner lighting

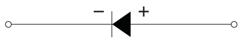
CAUTION: ASMD-FWG3-Nxxx6 LEDs are ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Avago Application Note AN-1142 for additional details.

Package Drawing









Notes:
1. All dimensions are in milimeters.
2. Dimensions in brackets are for reference only.
3. Tolerance is ±0.2 mm unless otherwise specified.
4. Terminal finish = silver plating.

Device Selection Guide at 60 mA ($T_J = 25°C$)

	Correlated Color Temperature, CCT (Kelvin)	Luminous Flux, Φ_V (lm)[1]				
Part Number	**Typ.**	**Min.**	**Typ.**	**Max.**	**Luminous Efficiency (lm/W)**	**Dice Technology**
ASMD-FWG3-NMSA6	2700	18.0	19.7	28.0	108.7	InGaN
ASMD-FWG3-NMSB6	3000	18.0	22.1	28.0	122.0	InGaN
ASMD-FWG3-NPTC6	3500	20.0	22.5	30.0	124.2	InGaN
ASMD-FWG3-NPTD6	4000	20.0	23.5	30.0	129.7	InGaN
ASMD-FWG3-NPTE6	5000	20.0	23.5	30.0	129.7	InGaN
ASMD-FWG3-NPTF6	5700	20.0	23.5	30.0	129.7	InGaN
ASMD-FWG3-NPTG6	6200	20.0	23.5	30.0	129.7	InGaN
ASMD-FWG3-NPTH6	6500	20.0	23.5	30.0	129.7	InGaN
ASMD-FWG3-NPTJ6	6800	20.0	22.9	30.0	126.4	InGaN

Notes:
1. Luminous flux, Φ_V is the total flux output as measured with an integrating sphere at a single current pulse condition.
2. Flux tolerance is ±12%.

Absolute Maximum Ratings

Parameters	ASMD-FWG3-Nxxx6	Unit
DC Forward Current[1]	90	mA
Peak Forward Current[2]	200	mA
Power Dissipation	297	mW
Junction Temperature	120	°C
Operating Temperature	-40 to +85	°C
Storage Temperature	-40 to +100	°C

Notes:
1. Derate Linearly as shown in Figure 13 and 14.
2. Duty Factor = 10%, Frequency = 1 kHz.

Optical and Electrical Characteristics at 60 mA ($T_J = 25°C$)

Parameters	Min.	Typ.	Max.	Unit
Viewing Angle, $2\theta_{1/2}$ [1]	-	120	-	°
Forward Voltage, V_F [2]	2.80	3.02	3.30	V
Reverse Voltage, V_R at 10µA	Not designed for reverse bias			
Color Rendering Index, CRI	80	-	-	V
Thermal Resistance, $R\theta_{J\text{-}S}$	-	28	-	°C/W

Notes:
1. θ½ is the off-axis angle where the luminous intensity is ½ the peak intensity.
2. Forward voltage tolerance is ±0.1V.

Part Numbering System

ASMD-FW $\boxed{x_1}$ **3-N** $\boxed{x_2}$ $\boxed{x_3}$ $\boxed{x_4}$ $\boxed{x_5}$

Code	Description	Option
x_1	Color Rendering Index	G – CRI ≥ 80
x_2	Minimum Flux Bin	(Refer to CAT table)
x_3	Maximum Flux Bin	
x_4	Color Bin	A – 2700K
		B – 3000K
		C – 3500K
		D – 4000K
		E – 5000K
		F – 5700K
		G – 6200K
		H – 6500K
		J – 6800K
x_5	Test Option	6 – Test Current = 60 mA

Part number example:

ASMD-FWG3-NMSB6

x_1 – CRI ≥ 80
x_2 – Minimum flux bin M
x_3 – Maximum flux bin S
x_4 – Color bin CCT 3000K with bin ID 29S
x_5 – Test current = 60mA

Bin Information

Flux Bin (CAT) Limits (x_2, x_3)

	Luminous Flux, Φ_V (lm) at 60 mA	
Bin ID	**Min.**	**Max.**
M	18	19
N	19	20
P	20	22
Q	22	24
R	24	26
S	26	28
T	28	30

Tolerance: ±12%.

Forward Voltage, V_F Bin Limits

	Forward Voltage, V_F (V) at 60 mA	
Bin ID	**Min.**	**Max.**
G03	2.8	2.9
G04	2.9	3.0
G05	3.0	3.1
G06	3.1	3.2
G07	3.2	3.3

Tolerance: ±0.1 V.

Example of bin information on reel and packaging label:

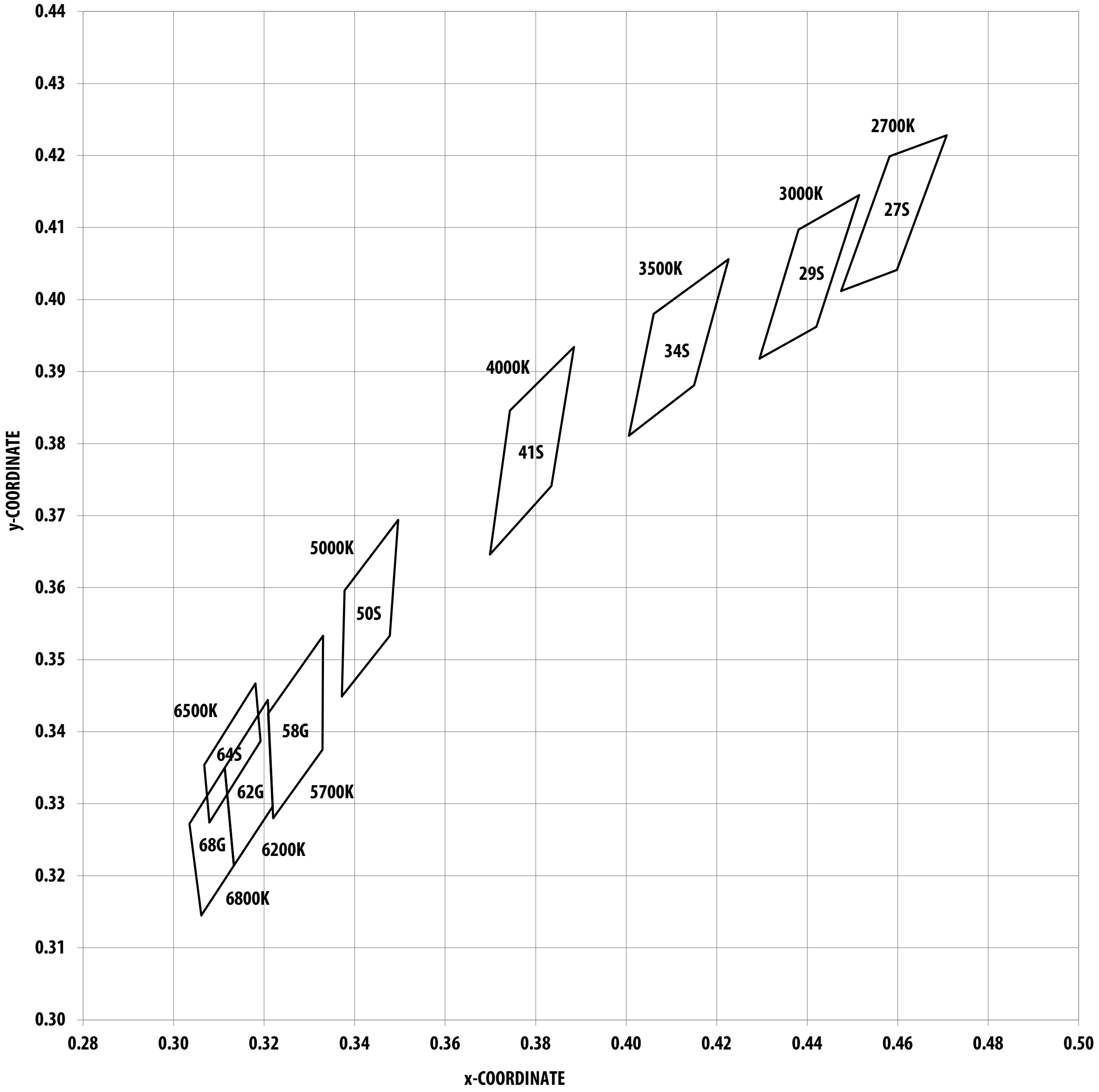
CAT: M – Flux bin M
BIN: 29S – Color bin 29S
VF: G05 – V_F bin G05

Color Bin (BIN) Limits

		Chromaticity Coordinates	
CCT	**Bin ID**	**x**	**y**
2700	27S	0.4475	0.4012
		0.4582	0.4199
		0.4708	0.4228
		0.4598	0.4041
3000	29S	0.4295	0.3918
		0.4381	0.4097
		0.4515	0.4145
		0.4420	0.3962
3500	34S	0.4006	0.3811
		0.4061	0.3980
		0.4226	0.4056
		0.4150	0.3881
4000	41S	0.3699	0.3646
		0.3743	0.3846
		0.3885	0.3934
		0.3835	0.3741
5000	50S	0.3372	0.3449
		0.3378	0.3596
		0.3496	0.3694
		0.3478	0.3533
5700	58G	0.3220	0.3280
		0.3209	0.3425
		0.3330	0.3533
		0.3329	0.3375
6200	62G	0.3133	0.3214
		0.3113	0.3350
		0.3208	0.3444
		0.3219	0.3296
6500	64S	0.3079	0.3274
		0.3068	0.3354
		0.3181	0.3467
		0.3192	0.3387
6800	68G	0.3061	0.3145
		0.3035	0.3272
		0.3113	0.3350
		0.3133	0.3214

Tolerance: ±0.01.

Chromaticity Diagram



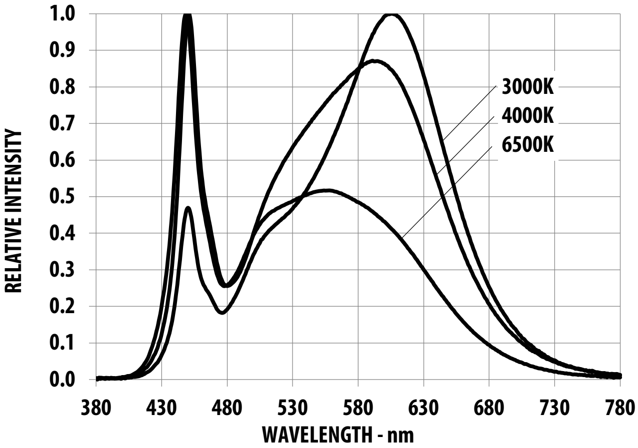


Figure 1: Spectral power distribution.

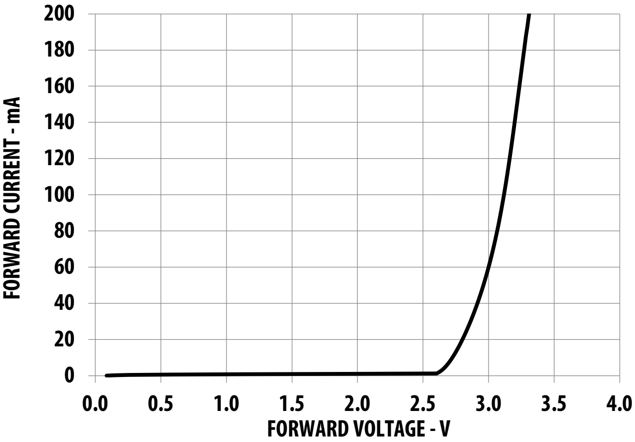


Figure 2: Forward Current vs. Forward Voltage.

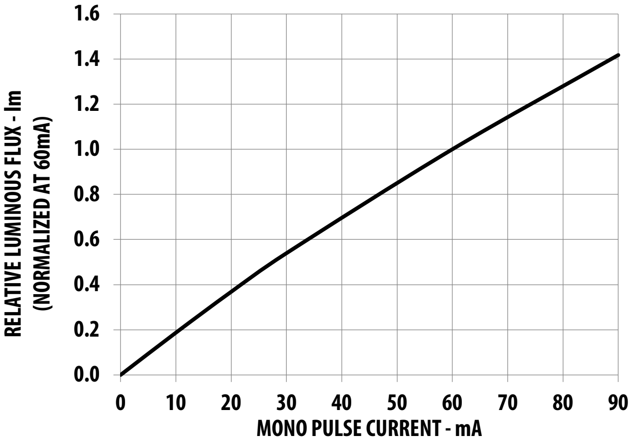


Figure 3: Relative Luminous Flux vs. Mono Pulse Current.

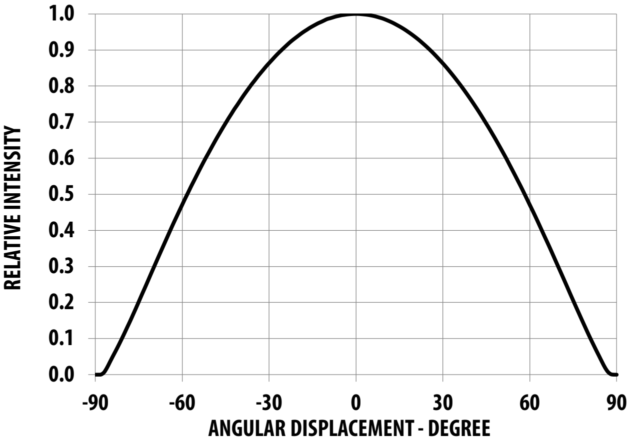


Figure 4: Radiation Pattern.

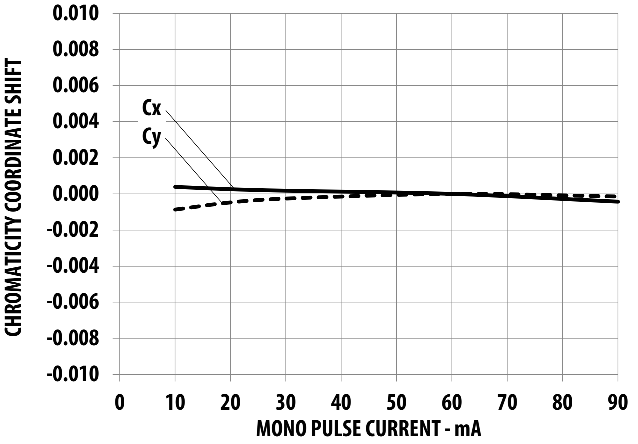


Figure 5: Chromaticity Coordinate Shift vs. Mono Pulse Current for 3000K.

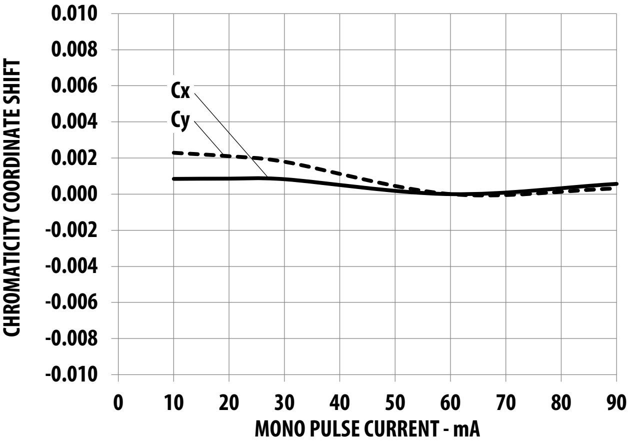


Figure 6: Chromaticity Coordinate Shift vs. Mono Pulse Current for 4000K.

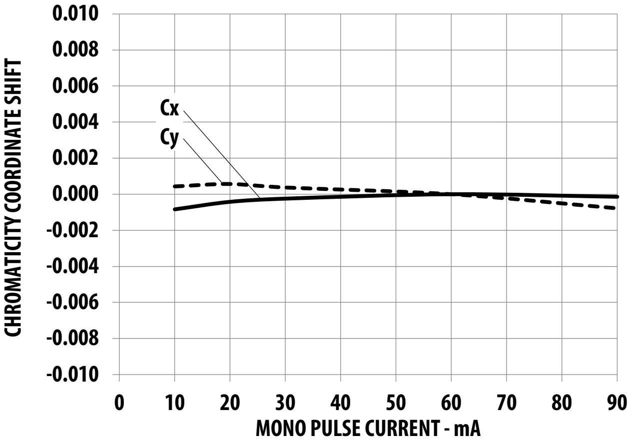


Figure 7: Chromaticity Coordinate Shift vs. Mono Pulse Current for 6500K.

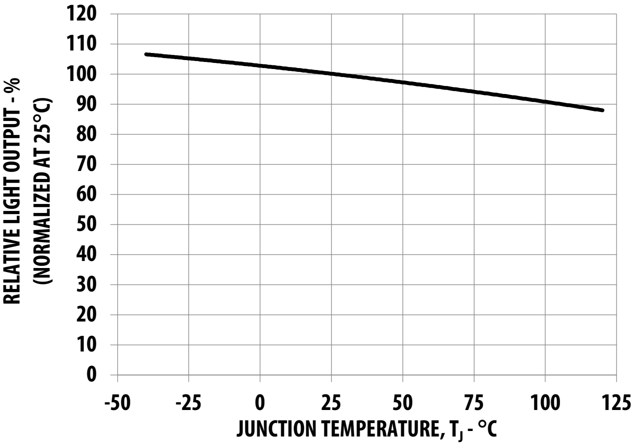


Figure 8: Relative Light Output vs. Junction Temperature.

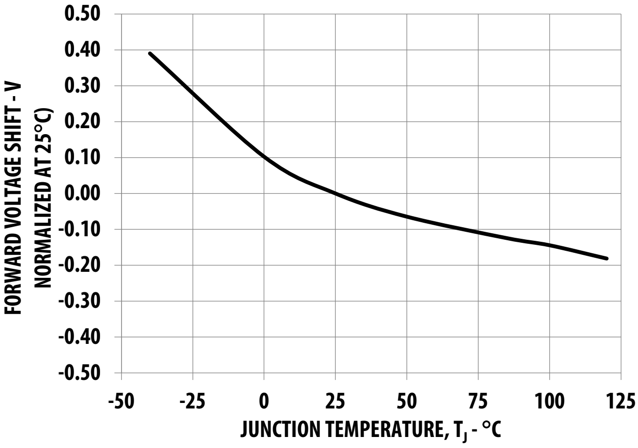


Figure 9: Forward Voltage Shift vs. Junction Temperature.

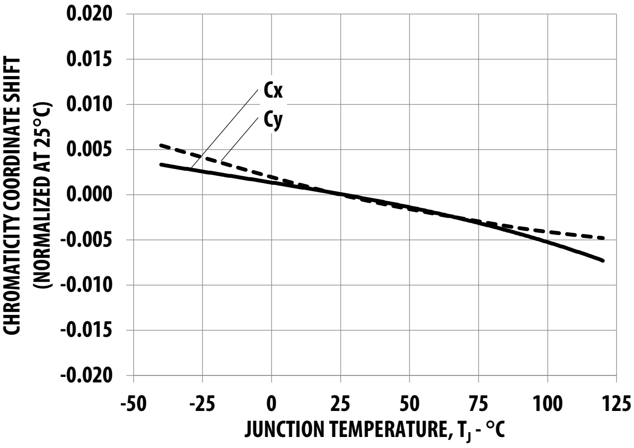


Figure 10: Chromaticity Coordinate Shift vs. Junction Temperature for 3000K.

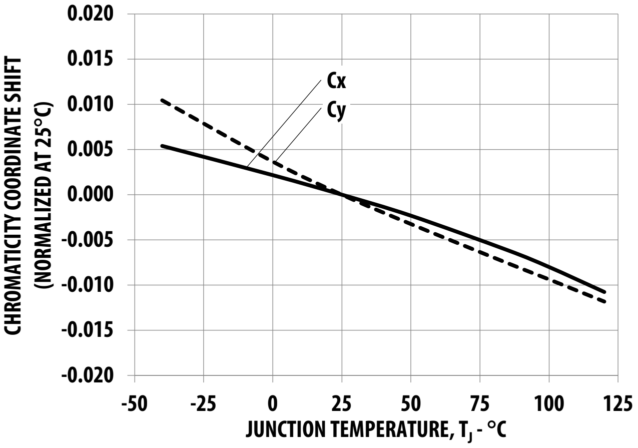


Figure 11: Chromaticity Coordinate Shift vs. Junction Temperature for 4000K.

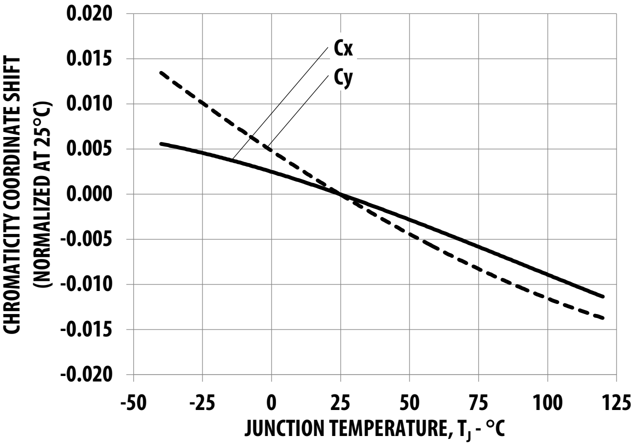


Figure 12: Chromaticity Coordinate Shift vs. Junction Temperature for 6500K.

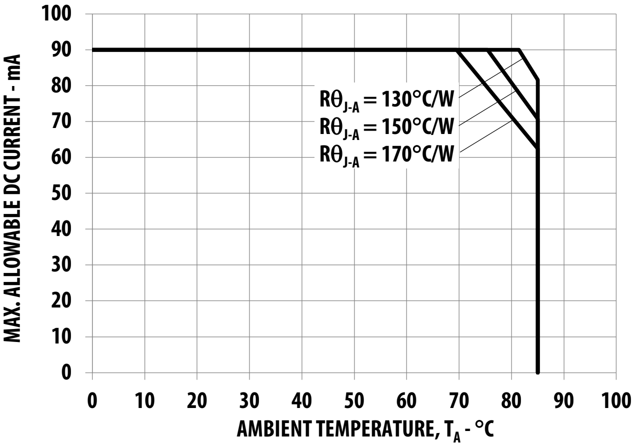


Figure 13: Maximum Forward Current vs. Ambient Temperature. Derated based on $T_{JMAX} = 120°C$, $R\theta_{J-A} = 130°C/W$, 150°C/W and 170°C/W.

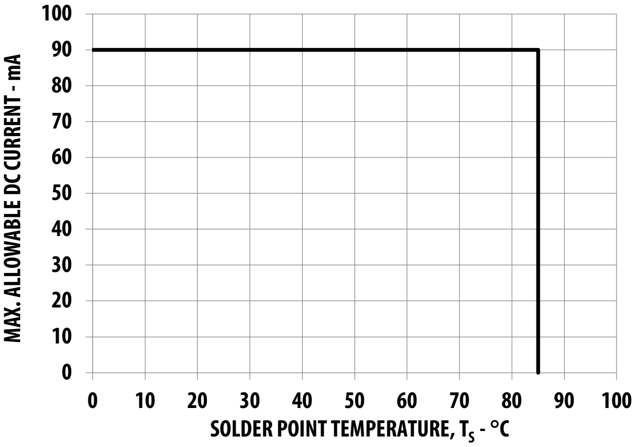


Figure 14: Maximum Forward Current vs. Solder Point Temperature. Derated based on $T_{JMAX} = 120°C$, $R\theta_{J-S} = 28°C/W$.

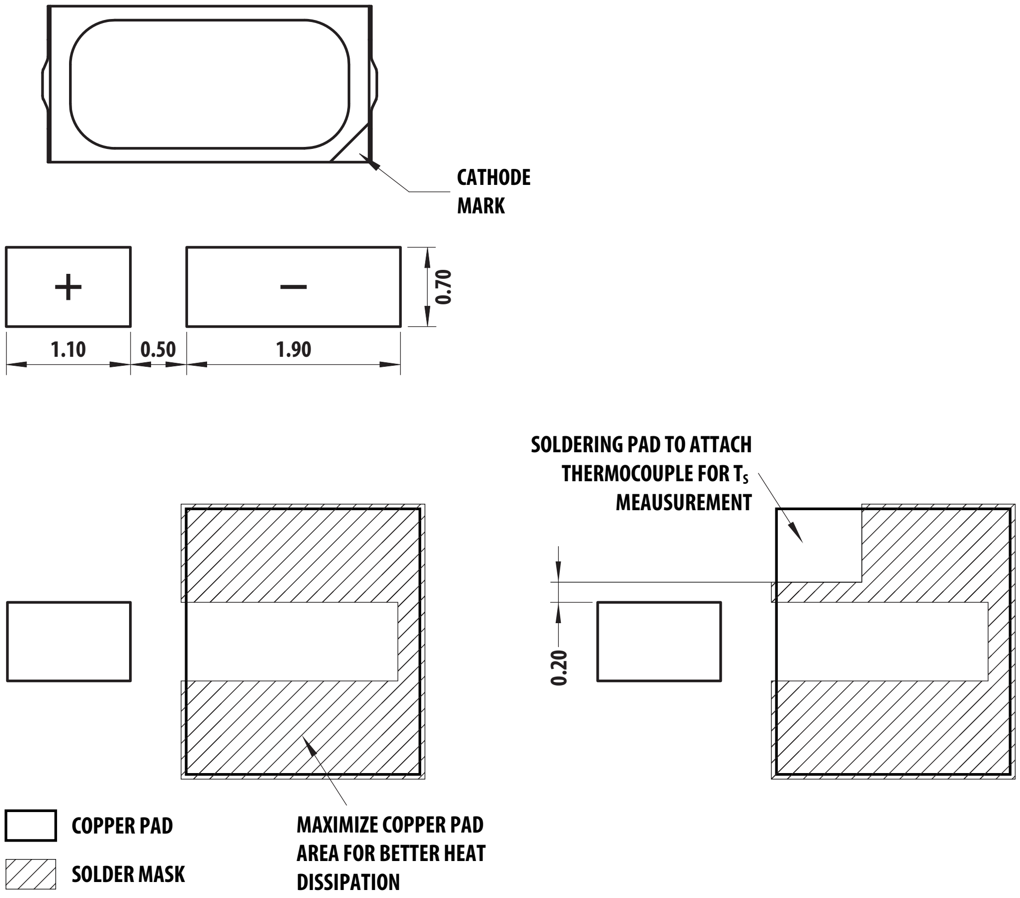
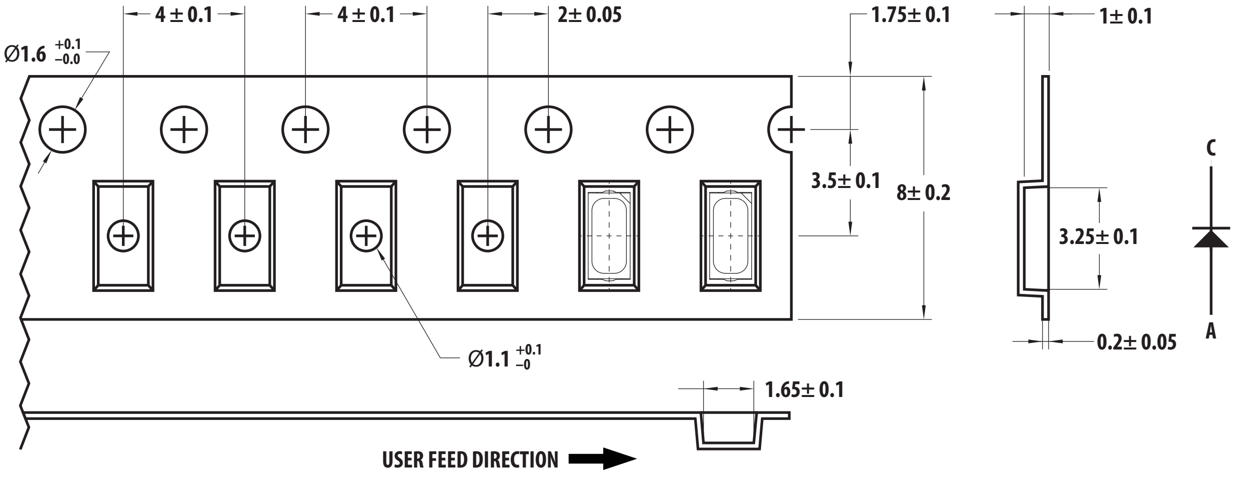


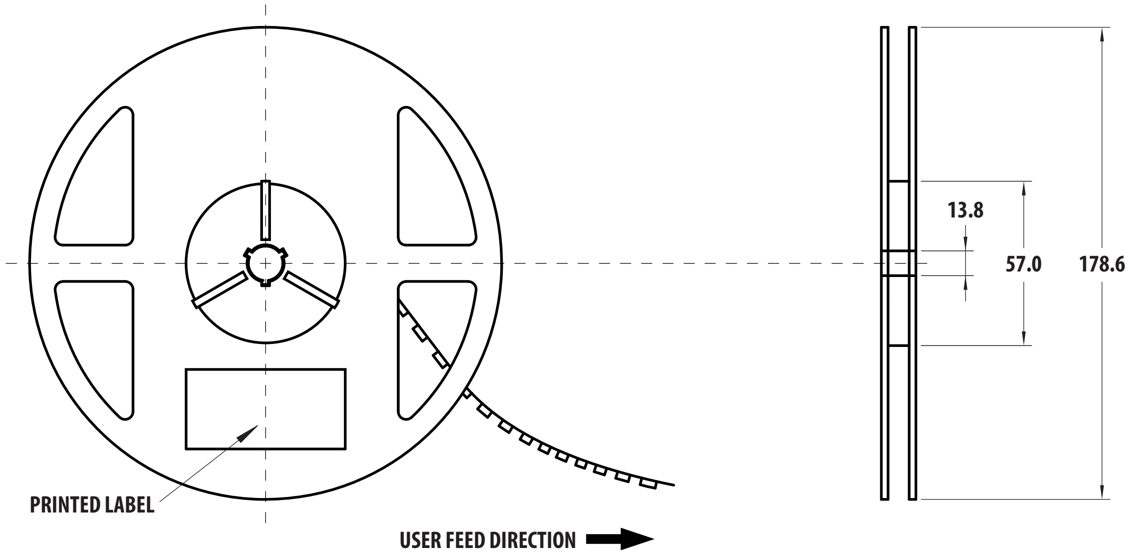
Figure 15: Recommended soldering pad pattern.



Notes:

1. All dimensions are in milimeters.

Figure 16: Carrier Tape dimensions.



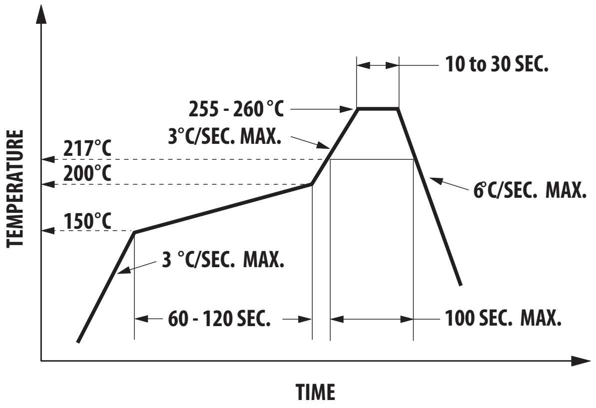
Notes:

1. All dimensions are in milimeters.

Figure 17: Reel dimensions.

Soldering

Recommended Lead-free reflow soldering condition:



a. Reflow soldering must not be done more than 2 times.

b. Do not apply any pressure or force on the LED during reflow and after reflow when the LED is still hot.

c. It is preferred to use reflow soldering to solder the LED. Hand soldering shall only be used for rework if unavoidable, but it must be strictly controlled to conditions below:
  - Solder iron tip temperature = 315°C max.
  - Solder duration = 3sec max.
  - After hand soldering, the LED must be allowed to cool down prior to touch up soldering.

d User is advised to confirm before hand whether the functionality and performance of the LED is affected by soldering with hand soldering.

Precautionary Notes

1. Handling precautions

The encapsulation material of the LED is made of silicone for better product reliability. Compare to epoxy encapsulant that is hard and brittle, silicone is softer and flexible. Special handling precautions need to be observed during assembly of silicone encapsulated LED products. Failure to comply might lead to damage and premature failure of the LED. Do refer to Avago Application Note AN5288, Silicone Encapsulation for LED: Advantages and Handling Precautions for more information.

a. Do not poke sharp objects into the silicone encapsulant. Sharp object like tweezers or syringes might apply excessive force or even pierce through the silicone and induce failures to the LED die or wire bond.

b. Do not touch the silicone encapsulant. Uncontrolled force acting on the silicone encapsulant might result in excessive stress on the wire bond. The LED should only be held by the body.

c. Do not stack assembled PCBs together. Use an appropriate rack to hold the PCBs.

d. Surface of silicone material attracts dusk and dirt easier than epoxy due to its surface tackiness. To remove foreign particles on the surface of silicone, a cotton bud can be used with isopropyl alcohol (IPA). During cleaning, rub the surface gently without putting much pressure on the silicone. Ultrasonic cleaning is not recommended.

e. For automated pick and place, Avago has tested nozzle size with OD 1.5mm to be working fine 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, customer is recommended to verify the nozzle selected will not cause damage to the LED.

2. Handling of moisture sensitive device

This product has a Moisture Sensitive Level 3 rating per JEDEC J-STD-020. Refer to Avago Application Note AN5305, Handling of Moisture Sensitive Surface Mount Devices for additional details and a review of proper handling procedures.

a. 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.
  - It is recommended that the MBB not be opened prior to assembly (e.g. for IQC)

b. Control after opening the MBB
  - The Humidity Indicator Card (HIC) shall be read immediately upon opening of MBB.
  - The LEDs must be kept at <30°C/60% RH at all times and all high temperature related processes including soldering, curing or rework need to be completed within 168 hours.

c. Control for unfinished reel
  - Unused LEDs must be stored in a sealed MBB with desiccant or desiccator at <5% RH.

d. Control of assembled boards
  - If the PCB soldered with the LEDs is to be subjected to other high temperature processes, the PCB need to be stored in sealed MBB with desiccant or desiccator at <5% RH to ensure that

all LEDs have not exeeded their floor life of 168 hours.

e. Baking is required if:
  - The HIC indicator is not BLUE at 10% and is PINK at 5%.
  - The LEDs are exposed to condition of >30°C/60% RH at any time.
  - The LEDs floor life exceeded 168 hours.

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

Baking should only be done once.

f. Storage
  - The soldering terminals of these Avago LEDs are silver plated. If the LEDs are being exposed in ambient environment for too long, the silver plating might be oxidized and thus affecting its solderability performance. As such, unused LED must be kept in sealed MBB with dessicant or in dessicator at <5% RH.

3. Application precautions

a. Drive current of the LED must not exceed the maximum allowable limit across temperature as stated in the datasheet. Constant current driving is recommended to ensure consistent performance.

b. LED is not intended for reverse bias. Do use other appropriate components for such purpose. When driving the LED in matrix form, it is crucial to ensure that the reverse bias voltage is not exceeding the allowable limit of the LED.

c. Do not use the LED in the vicinity of material with sulfur content, in environment of high gaseous sulfur compound and corrosive elements. Examples of material that may contain sulfur are rubber gasket, RTV (room temperature vulcanizing) silicone rubber, rubber gloves, etc. Prolonged exposure to such environment may affect the optical characteristics and product life.

d. White LED must not be exposed to acidic environment and must not be used in the vicinity of compound that may have acidic outgas such as but not limited to acrylate adhesive. It will have adverse effect on the LED performance.

e. Avoid rapid change in ambient temperature especially in high humidity environment as this will cause condensation on the LED.

f. If the LED is intended to be used in outdoor or harsh environment, the LED must be protected against damages caused by rain water, water, dust, oil, corrosive gases, external mechanical stress, etc.

4. Thermal management

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

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

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.

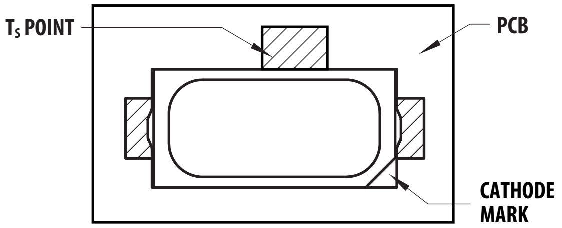
Another way of calculating T_J is using solder point temperature, T_S as shown below:

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

where;

T_S = LED solder point temperature as shown in illustration below [°C]

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



T_S can be measured easily by mounting a thermocouple on the soldering joint as shown in illustration above, while $R_{\theta J\text{-}S}$ is provided in the datasheet. User is advised to verify the T_S of the LED in the final product to ensure that the LEDs are operated within all maximum ratings stated in the datasheet.

4. Eye safety precautions

LEDs may pose optical hazards when in operation. It is not advisable to view directly at operating LEDs as it may be harmful to the eyes. For safety reasons, use appropriate shielding or personal protective equipments.

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

January 22, 2016

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