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Data Sheet



Description

The Power PLCC-4 SMT LEDs with Lens are high-performance PLCC-4 package size SMT LEDs targeted mainly in Automotive and Electronic Signs and Signals (ESS) markets. These top-mount single-chip packages with focused radiation offer high brightness in beam direction and are excellent for interior automotive, indoor and outdoor sign and industrial applications. With additional lens in 30° variants, these products are especially fitting to applications for traffic lights, CHMSL, and displays.

The PLCC-4 package family is able to dissipate heat better compared to the PLCC-2 packages. In proportion to this increase in driving current, this family of LEDs is able to produce higher light output compared to the conventional PLCC-2 SMT LEDs.

As an extension of the standard flat top PLCC-4 SMT LEDs, the Power PLCC-4 with Lens device is able to provide focused beams within narrow viewing angles (30°) meeting the market's requirements for focused radiation and high brightness in beam directions.

The Power PLCC-4 SMT LED with 30° is ideal for panel, push button, or general backlighting in automotive interior and exterior, sign, office equipment, industrial equipment, and home appliances applications. This package design, coupled with careful selection of component materials, allows the Power PLCC-4 SMT LED with Lens to perform with higher reliability in a larger temperature range -40 °C to 100 °C. This high reliability feature is crucial to allow the Power PLCC-4 SMT LED with Lens to perform well in harsh environments, such as its target Automotive and ESS markets. The Power PLCC-4 SMT LED with Lens package is also designed to be compatible with both IR-solder re-flow and through-the-wave soldering.

CAUTION HSMN, HSMN-A43x-xxxxx LEDs are Class 2 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Avago Application Note AN-1142 for additional details.

Features

- Industry Standard PLCC-4
- High reliability LED package
- High brightness using AlInGaP and InGaN dice technologies
- High optical efficiency
- Narrow viewing angle at 30°
- Available in 8mm carrier tape on 7-inch reel
- Compatible with both IR and TTW soldering process

Applications

Interior automotive

- Instrument panel backlighting
- Central console backlighting
- Cabin backlighting
- Navigation and audio system
- Dome lighting
- Push button backlighting

Exterior automotive

- Turn signals
- CHMSL
- Rear Combination Lamp
- Side repeaters

Electronic signs and signals

- Interior and exterior full color sign
- Variable message sign
- Garden lighting

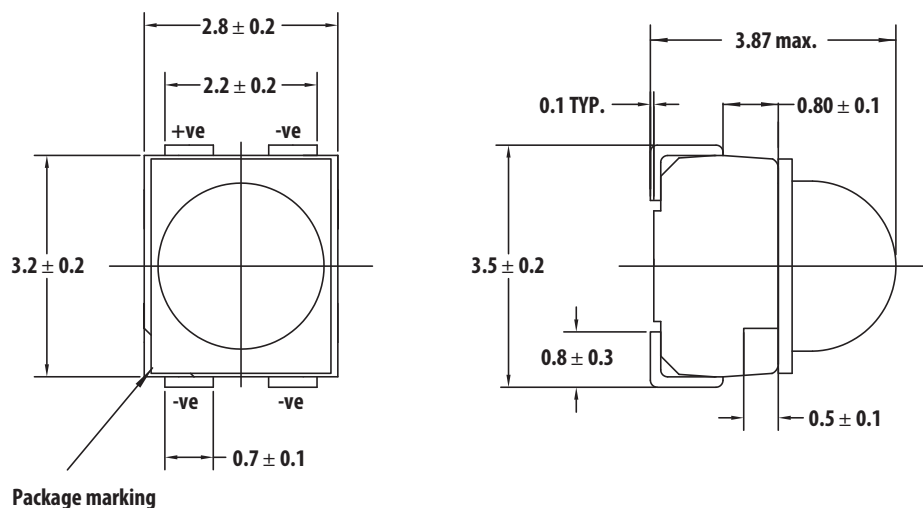
Office automation, home appliances, industrial equipment

- Front panel backlighting
- Push button backlighting
- Display backlighting

The new Avago Technologies Power PLCC-4 SMT LED with 30° Lens carries the part number HSMx- A43x-xxxxx. The high brightness AlInGaP and InGaN dice technologies used provide the product brightness that meets the Automotive and ESS market requirements. The Lens package will complement and complete the existing AlInGaP and InGaN color standard Power-PLCC-4 LED that Avago Technologies offers, providing customers an extra Lens option from one supplier.

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 (except for red color), to provide close uniformity.

Package Dimensions



NOTE

1. All dimensions are in mm.
2. Electrical connection between all cathodes is recommended.

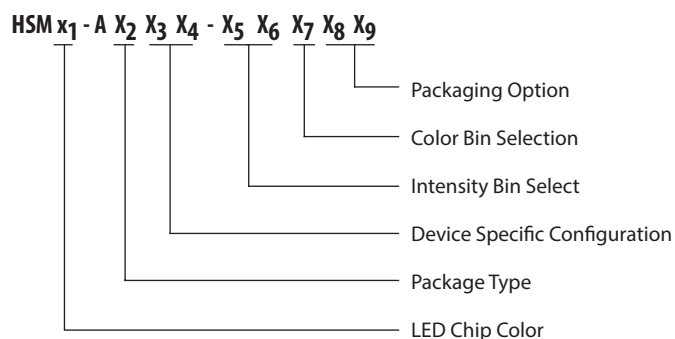
Device Selection Guide

Color	Part Number	Min. IV (mcd)	Typ. IV (mcd)	Max. IV (mcd)	Test Current (mA)	Dice Technology
Red	HSMC-A430-W50M1	1125	2300	3550	50	AlInGaP
	HSMC-A431-X90M1	2240	4000	7150	50	AlInGaP
	HSMC-A431-Y70M1	3550	-	7150	50	AlInGaP
	HSMC-A431-Y80M1	3550	-	9000	50	AlInGaP
Red Orange	HSMJ-A430-W50M1	1125	2300	3550	50	AlInGaP
	HSMJ-A431-X90M1	2240	4500	7150	50	AlInGaP
	HSMJ-A431-X90M1	2240	-	7150	50	AlInGaP
	HSMJ-A431-Y70M1	3550	-	7150	50	AlInGaP
Orange	HSML-A431-X90M1	2240	4500	7150	50	AlInGaP
Amber	HSMA-A430-W90M1	1400	3000	4500	50	AlInGaP
	HSMA-A431-Y00M1	2850	5000	-	50	AlInGaP
	HSMA-A431-X90M1	2240	4700	7150	50	AlInGaP
	HSMA-A431-13NM1	7150	-	14000	50	AlInGaP
	HSMA-A431-Z50M1	4500	-	14000	50	AlInGaP
	HSMA-A431-Z5WM1	4500	-	14000	50	AlInGaP
Green	HSMM-A430-X90M2	2240		7150	30	InGaN
	HSMM-A430-Y3YM2	2850	-	5600	30	InGaN
	HSMM-A430-Y7YM2	3550	-	7150	30	InGaN
Blue	HSMN-A430-V50M2	715		2240	30	InGaN
	HSMN-A430-V7YM2	900	-	1800	30	InGaN

NOTE

- 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.
- I_v tolerance is $\pm 12\%$.

Part Numbering System



Absolute Maximum Ratings ($T_A = 25\text{ }^{\circ}\text{C}$)

Parameters	HSMC/A	HSMV	HSMK/M/N
DC Forward Current ^a	70 mA	70 mA	30 mA
Peak Forward Current ^b	200 mA	200 mA	90 mA
Power Dissipation	180 mW	240 mW	114 mW
Reverse Voltage	5V	5V	4V
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 and Figure 6.

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

Optical Characteristics ($T_A = 25\text{ }^{\circ}\text{C}$)

Color	Part Number	Dice Technology	Peak Wavelength λ_{PEAK} (nm)	Dominant Wavelength λ_D^a (nm)	Viewing Angle $2\theta_{1/2}^b$ (Degrees)	Luminous Efficacy η_V^c (lm/W)
			Typical	Typical	Typical	Typical
Red	HSMC-A43x	AlInGaP	635	626	30	150
Red Orange	HSMJ-A43x	AlInGaP	621	615	30	240
	HSMV-A430	AlInGaP	623	617	30	263
Orange	HSML-A431	AlInGaP	609	605	30	320
Amber	HSMA-A43x	AlInGaP	592	590	30	480
Green	HSMM-A430	InGaN	518	525	30	500
Blue	HSMN-A43X	InGaN	468	470	30	75
Cyan	HSMK-A43X	InGaN	500	502	30	285

a. The dominant wavelength, λ_D , is derived from the CIE Chromaticity Diagram and represents the color of the device.

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

c. Radiant intensity, I_e in watts / steradian, may be calculated from the equation $I_e = I_V / \eta_V$, where I_V is the luminous intensity in candelas and η_V is the luminous efficacy in lumens / watt.

Electrical Characteristics ($T_A = 25\text{ }^{\circ}\text{C}$)

Part Number	Forward Voltage V_F (Volts)@ $I_F=50\text{ mA}$			Reverse Voltage $V_R@100\mu\text{A}$	Reverse Voltage $V_R@10\mu\text{A}$
	Minimum	Typical	Maximum	Minimum	Minimum
HSMC/J/L/A	1.7	2.2	2.5	5	-
HSMV	1.7	2.8	3.4	5	-

Part Number	Forward Voltage V_F (Volts)@ $I_F=30\text{ mA}$			Reverse Voltage $V_R@100\mu\text{A}$	Reverse Voltage $V_R@10\mu\text{A}$
	Minimum	Typical	Maximum	Minimum	Minimum
HSMK/M/N	2.7	3.9	4.6	-	5

Figure 1 Relative Intensity vs. Wavelength

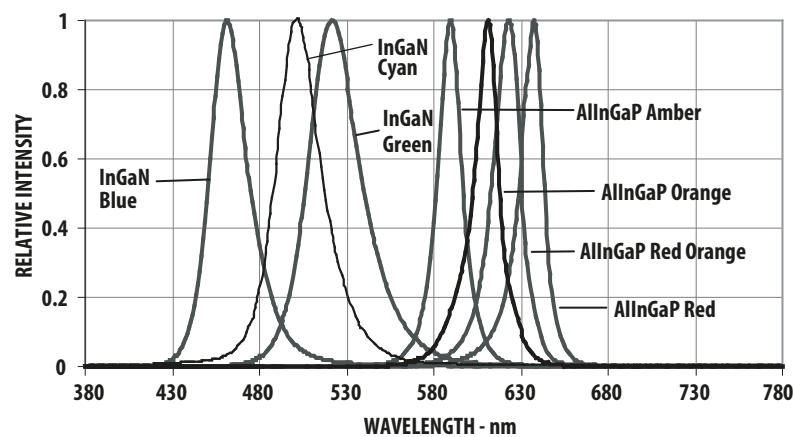


Figure 2 Forward Current vs. Forward Voltage

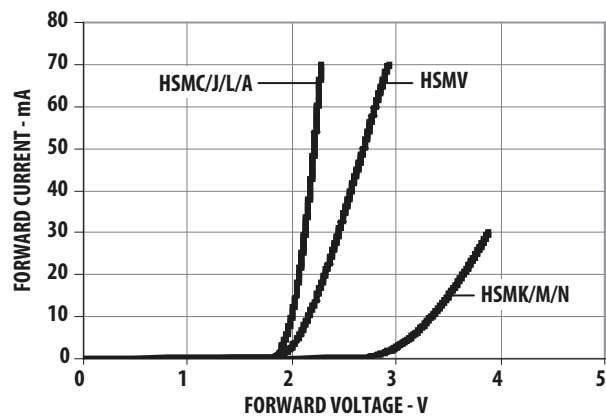


Figure 3 Relative Intensity vs. Forward Current (AlInGaP)

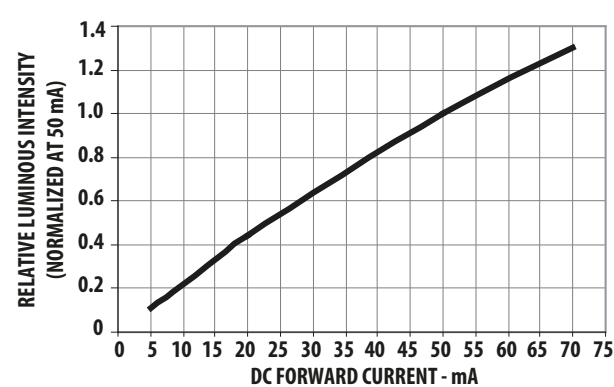


Figure 4 Relative Intensity vs. Forward Current (InGaN)

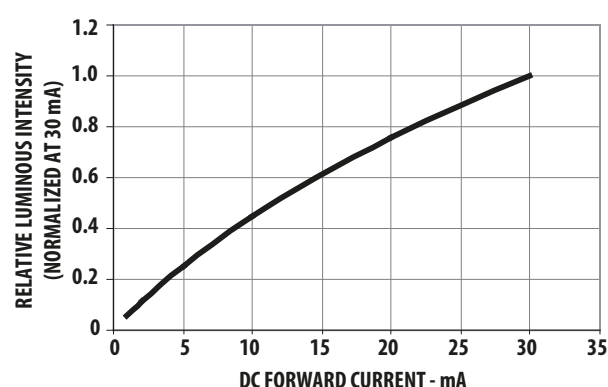


Figure 5 Maximum Forward Current vs. Ambient Temperature.
Drated Based on TJmax = 110 °C (AlInGaP)

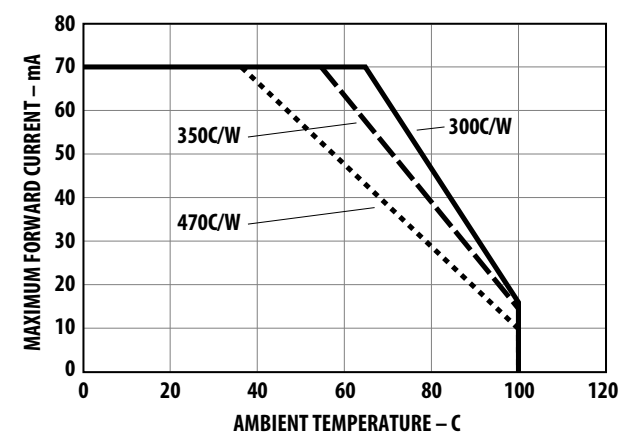


Figure 6 Maximum Forward Current vs. Ambient Temperature.
Drated Based on TJmax = 110 °C (InGaN)

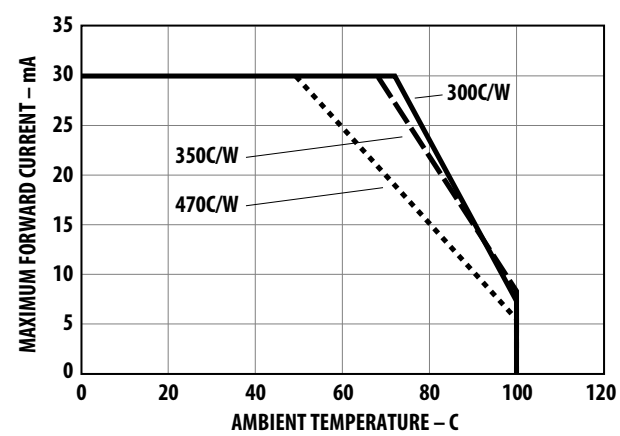


Figure 7 Radiation Pattern

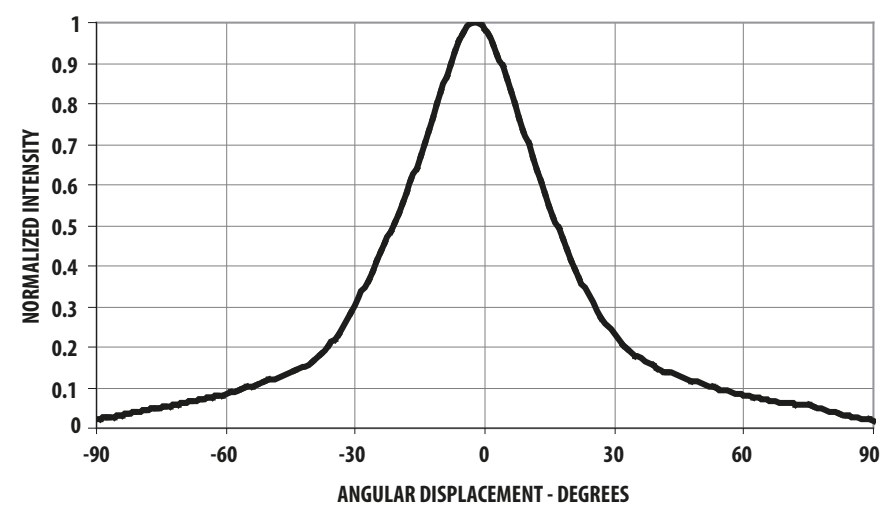


Figure 8 Recommended Soldering Pad Pattern (IR Reflow)

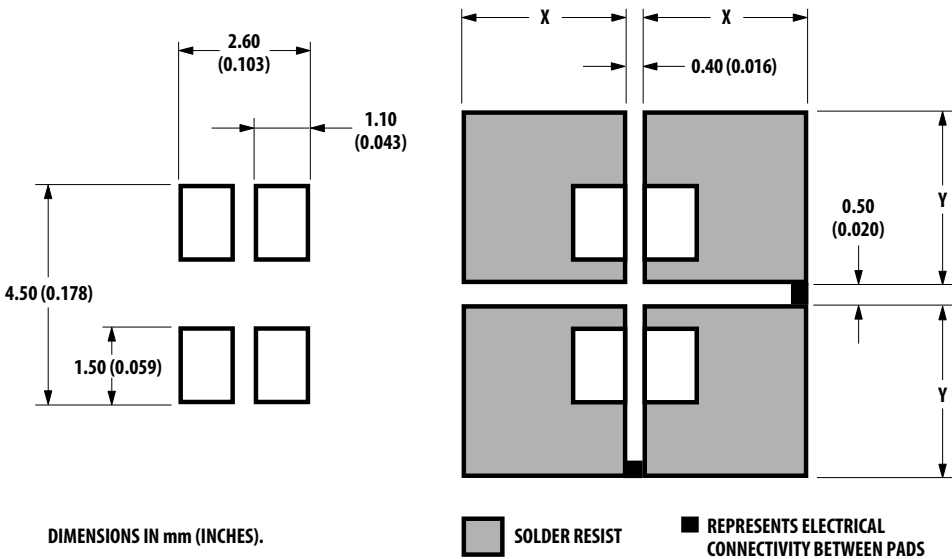


Figure 9 Recommended Soldering Pad Pattern (TTW)

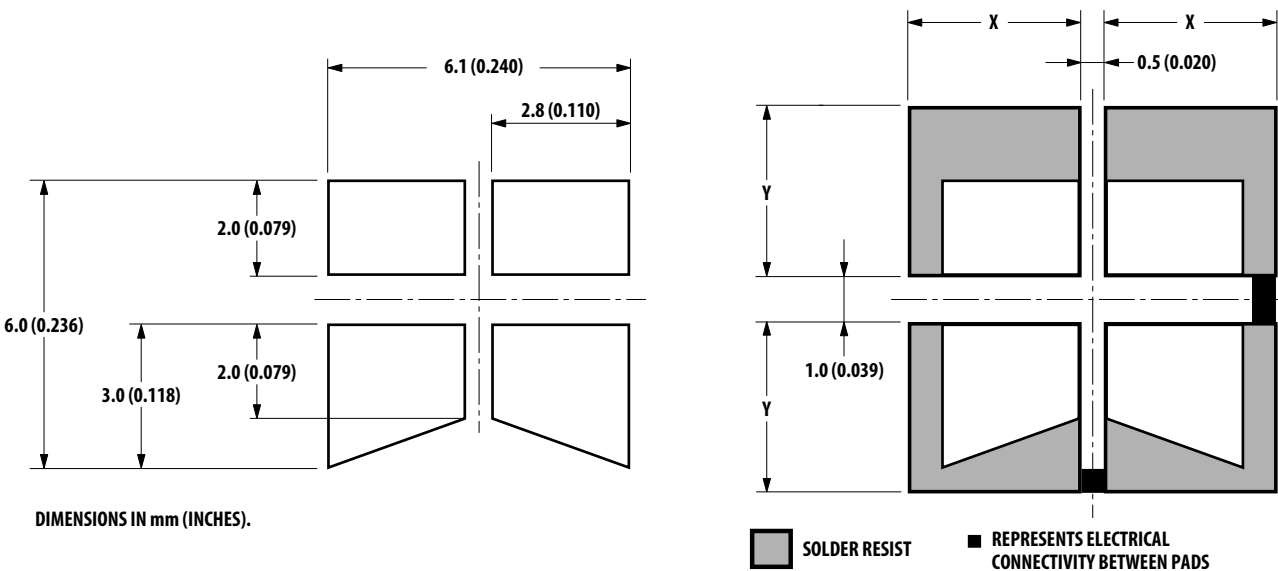


Figure 10 Soft Tip Vacuum Pick-Up Tool for Extracting SMD LED Components from Carrier Tape

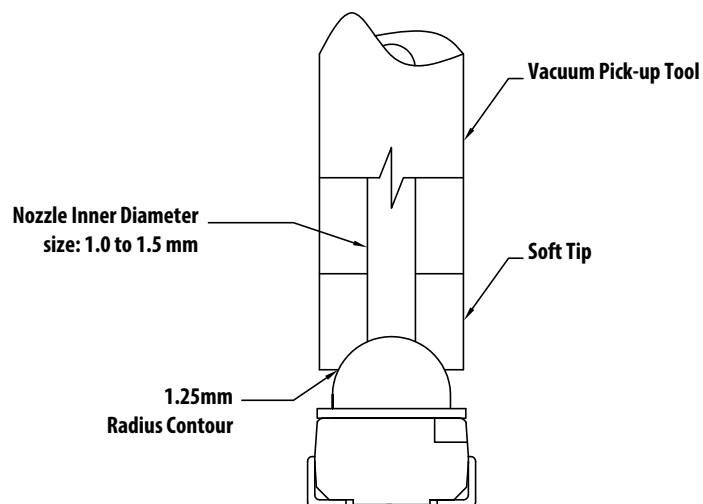


Figure 11 Recommended SnPb Reflow Soldering Profile

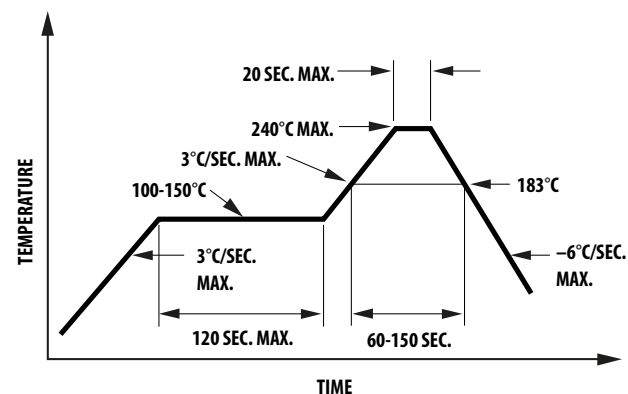


Figure 12 Recommended Pb-Free Reflow Soldering Profile

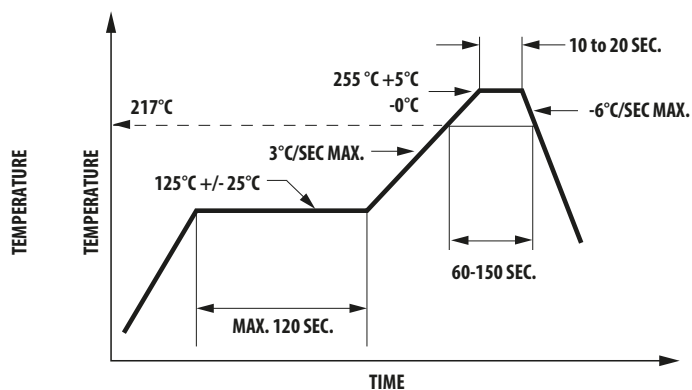


Figure 13 Recommended Wave Soldering Profile

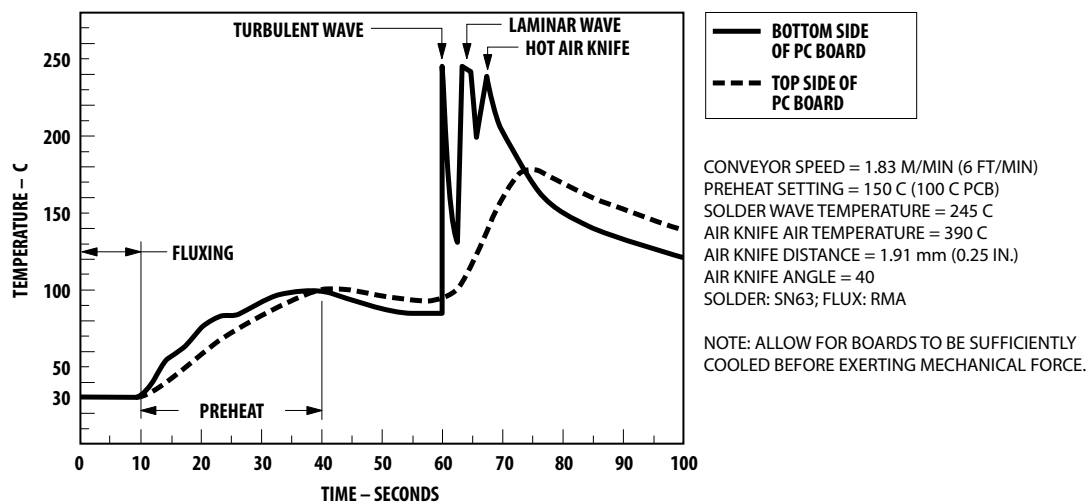


Figure 14 Tape Leader and Trailer Dimensions

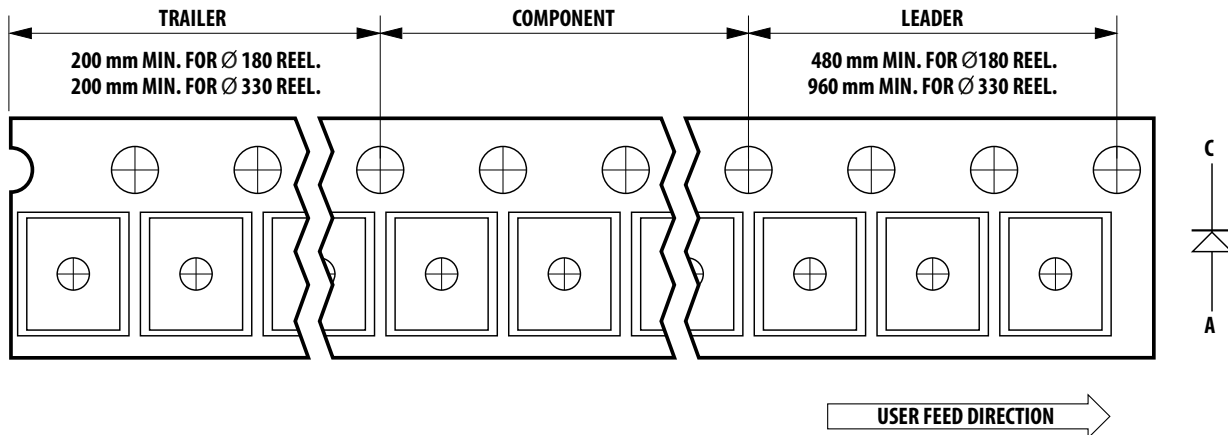


Figure 15 Tape Dimensions

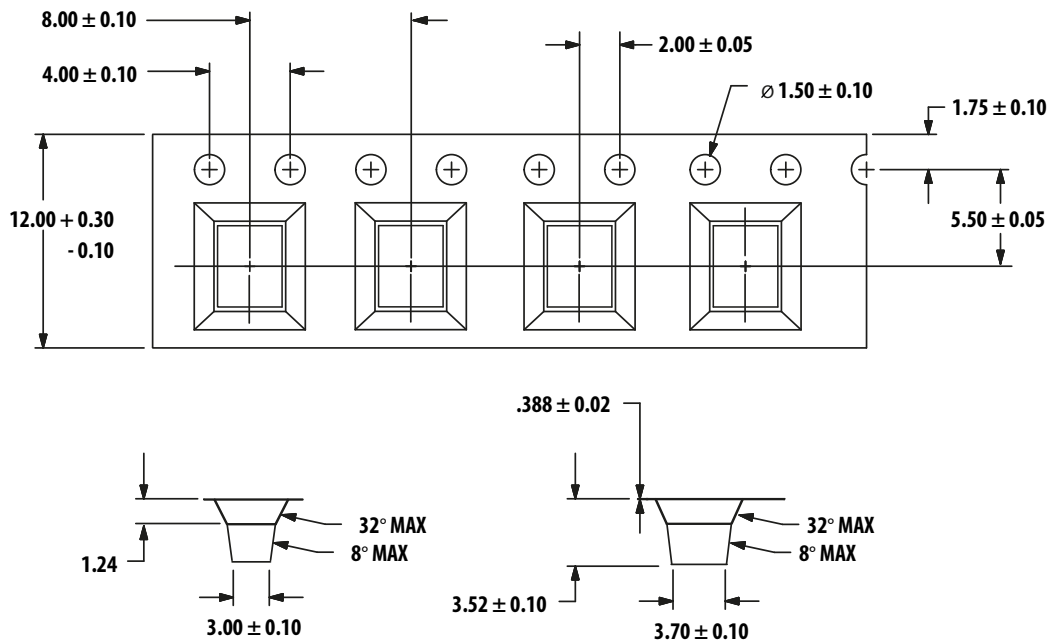
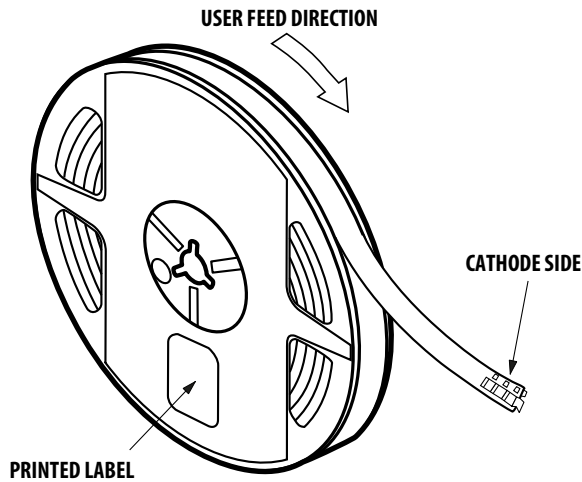


Figure 16 Reeling Orientation



Moisture Sensitivity

This product is qualified as Moisture Sensitive Level 2a per JEDEC J-STD-020. The following precautions for handling this moisture-sensitive product will help to ensure the reliability of the product. Refer to Avago Application Note AN5305, *Handling of Moisture Sensitive Surface Mount Devices*, for details.

A. Storage 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 (e.g., for IQC).

B. Control after opening the MBB

- Read the humidity indicator card (HIC) immediately upon opening the MBB.
- Keep the LEDs at < 30 °C / 60% RH at all times. Complete all high-temperature-related processes, including soldering, curing, or rework, within 672 hours.

C. Control for unfinished reel

- Store any unused LEDs in a sealed MBB with desiccant or desiccator at <5% RH.

D. Control of assembled boards

- If the PCB that is 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 the LEDs have exceeded their floor life of 672 hours.

E. Baking is required if:

- "10%" is *not* blue and "5%" HIC indicator turns pink.
- The LEDs are exposed to conditions of >30 °C / 60% RH at any time.
- The LEDs' floor life has exceeded 672 hours.

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

Intensity Bin Select (X₅X₆)

The individual reel contains parts from one half bin only.

X ₅	Min Iv Bin
X ₆	
0	Full Distribution
2	2 half bins starting from X51
3	3 half bins starting from X51
4	4 half bins starting from X51
5	5 half bins starting from X51
6	2 half bins starting from X52
7	3 half bins starting from X52
8	4 half bins starting from X52
9	5 half bins starting from X52

Intensity Bin Limits

Bin ID	Min (mcd)	Max (mcd)
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
X1	1800.00	2240.00
X2	2240.00	2850.00
Y1	2850.00	3550.00
Y2	3550.00	4500.00
Z1	4500.00	5600.00
Z2	5600.00	7150.00
11	7150.00	9000.00
12	9000.00	11250.00
21	11250.00	14000.00
22	14000.00	18000.00

Tolerance of each bin limit = ± 12%.

Color Bin Select (X₇)

The individual reel contains 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
T	F and G only
S	G and H 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
L	E, F and G only
K	F, G and H only
1	A, B, C and D only
2	E, F G and H only

Color Bin Limits

Blue	Min. (nm)	Max. (nm)
A	460.0	465.0
B	465.0	470.0
C	470.0	475.0
D	475.0	480.0

Cyan	Min. (nm)	Max. (nm)
A	490.0	495.0
B	495.0	500.0
C	500.0	505.0
D	505.0	510.0

Green	Min. (nm)	Max. (nm)
A	515.0	520.0
B	520.0	525.0
C	525.0	530.0
D	530.0	535.0

Amber	Min. (nm)	Max. (nm)
A	582.0	584.5
B	584.5	587.0
C	587.0	589.5
D	589.5	592.0
E	592.0	594.5
F	594.5	597.0

Orange	Min. (nm)	Max. (nm)
A	597.0	600.0
B	600.0	603.0
C	603.0	606.0
D	606.0	609.0
E	609.0	612.0

Red/ Orange	Min. (nm)	Max. (nm)
A	611.0	616.0
B	616.0	620.0

Red	Min. (nm)	Max. (nm)
Full Distribution		

Packaging Option (X₈X₉)

Option	Test Current	Package Type	Reel Size
M1	50mA	Top Mount	13 inch
M2	30mA	Top Mount	13 inch

Forward Voltage Bin Table

For HSMV-A43x-xxxxx only.

Bin	Min.	Max.
VA	1.9	2.2
VB	2.2	2.5
VC	2.5	2.8
VD	2.8	3.1
VE	3.1	3.4

Tolerance for each bin limit = $\pm 0.1V$.

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

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AV02-0208EN – April 21, 2016

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