

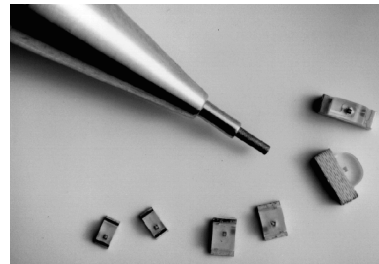
# HSMx-S660

High Performance Surface Mount Chip LEDs



## Data Sheet

SunPower Series: HSMx-S660 Series,  
HSMx-S670 Series, HSMx-S690 Series



### Description

These chip-type LEDs utilize aluminum indium gallium phosphide (AlInGaP) material technology. The AlInGaP material has a very high luminous efficiency, capable of producing high light output over a wide range of drive currents. The 590 nm amber, 605 nm orange, and 626 nm red colors are available in three compact, low profile packages.

The HSMx-S670 is the industry standard 2.0 x 1.25 mm package, and is an excellent all around package. The HSMx-S690 is the industry standard 1.6 x 0.8 mm package. Its low 0.7 mm profile and wide viewing angle make this LED excellent for backlighting applications. The HSMx-S660 right angle, 3.0 x 2.0 x 1.0 mm LED is optimum for side lighting applications where direct backlighting is not practical.

All packages are compatible with IR and convective reflow soldering processes.

### Features

- High Brightness AlInGaP Material
- Industry Standard 2.00 x 1.25 mm Package
- Industry Standard 1.6 x 0.8 mm (Low Profile) Package
- Right Angle Package
- Three Colors Available
- Diffused Optics
- Compatible with IR Solder Process
- Available in 8 mm Tape on 7" (178 mm) Diameter Reels

### Applications

- Keypad Backlighting
- LCD Backlighting
- Symbol Backlighting
- Front Panel Indicator

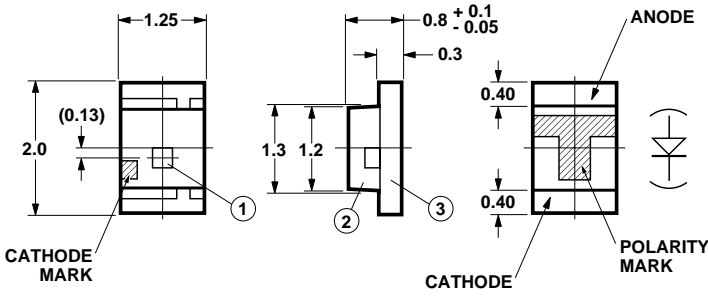
### Device Selection Guide

Footprint (mm) <sup>[1][2]</sup>	Amber 590 nm	Orange 605 nm	Red 626 nm
1.6 x 0.8 x 0.7	HSMA-S690	HSMD-S690	HSMC-S690
2.0 x 1.25 x 0.8	HSMA-S670	HSMD-S670	HSMC-S670
3.0 x 2.0 x 1.0	HSMA-S660	HSMD-S660	HSMC-S660

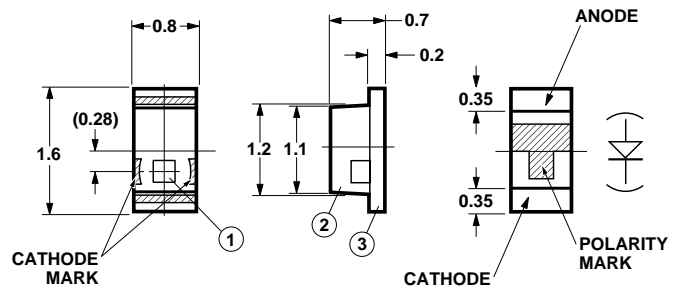
#### Notes:

1. Dimensions in mm.
2. Tolerance  $\pm 0.1$  mm unless otherwise noted.

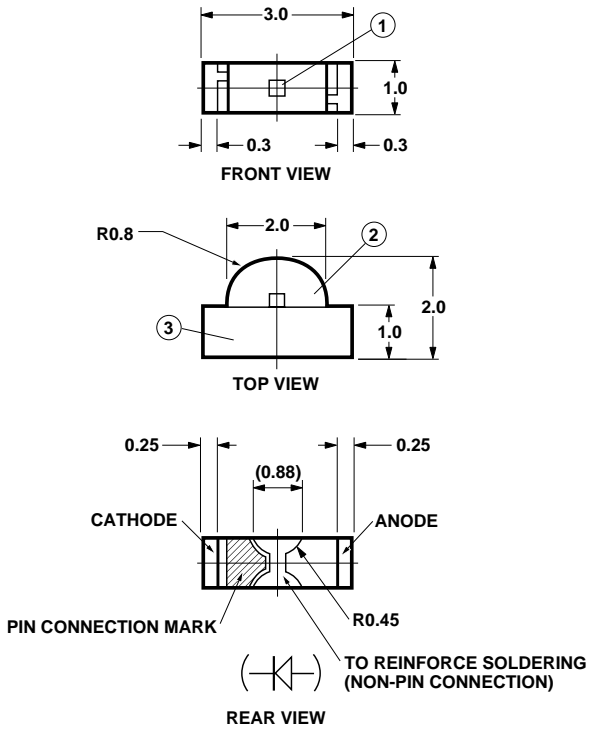
# Package Dimensions



**HSMx-S670 Series**



**HSMx-S690 Series**



**HSMx-S660 Series**

## Absolute Maximum Ratings at T<sub>A</sub> = 25°C

Parameter	HSMx-S660	HSMx-S670	HSMx-S690	Units
DC Forward Current [1][2][3][4]	30	30	30	mA
Power Dissipation	81	81	81	mW
Reverse Voltage (I <sub>R</sub> = 100 μA)	5	5	5	V
Operating Temperature Range	-40 to +85	-40 to +85	-40 to +85	°C
Storage Temperature Range	-40 to +100	-40 to +100	-40 to +100	°C

**Notes:**

- Derate linearly as shown in Figure 4.
- Drive currents between 1 mA and 30 mA are recommended for best long term performance.
- Operating at currents below 1 mA is not recommended. Please contact your Avago representative for further information.
- Maximum temperature for tape and reel packaging is 60°C.

## Optical Characteristics at $T_A = 25^\circ\text{C}$

Part Number	Color	Luminous Intensity $I_V$ (mcd) @ $I_F = 20 \text{ mA}^{[1]}$		Peak Wavelength $\lambda_{\text{peak}}$ (nm) Typ.	Color, Dominant Wavelength $\lambda_d^{[2]}$ (nm) Typ.	Viewing Angle $2\theta_{1/2}$ Degrees $^{[3]}$ Typ.	Luminous Efficacy $\eta_V$ (lm/W)
		Min.	Typ.				
HSMA-S660	Amber	16.0	65.0	592	590	155	480
HSMA-S670	Amber	16.0	65.0	592	590	165	480
HSMA-S690	Amber	16.0	65.0	592	590	165	480
HSMD-S660	Orange	16.0	65.0	609	605	155	370
HSMD-S670	Orange	16.0	65.0	609	605	165	370
HSMD-S690	Orange	16.0	65.0	609	605	165	370
HSMC-S660	Red	16.0	50.0	630	626	155	197
HSMC-S670	Red	16.0	50.0	630	626	165	197
HSMC-S690	Red	16.0	50.0	630	626	165	197

### Notes:

1. The luminous intensity  $I_V$  is measured at the peak of the spatial radiation pattern which may not be aligned with the mechanical axis of the lamp package.
2. The dominate wavelength  $\lambda_d$  is derived from the CIE Chromaticity Diagram and represents the perceived color of the device.
3.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

## Electrical Characteristics at $T_A = 25^\circ\text{C}$

Part Number	Color	Forward Voltage $V_F$ (Volts) @ $I_F = 20 \text{ mA}$		Reverse Breakdown $V_R$ (Volts) @ $I_R = 100 \mu\text{A}$ Min.	Capacitance $C$ (pF), $V_F = 0$ , $f = 1 \text{ MHz}$ Typ.	Thermal Resistance $R_{\theta_{J-PIN}}$ ( $^\circ\text{C}/\text{W}$ )
		Typ.	Max.			
HSMA-S660	Amber	1.9	2.4	5	45	600
HSMA-S670	Amber	1.9	2.4	5	45	300
HSMA-S690	Amber	1.9	2.4	5	45	300
HSMD-S660	Orange	1.9	2.4	5	45	600
HSMD-S670	Orange	1.9	2.4	5	45	300
HSMD-S690	Orange	1.9	2.4	5	45	300
HSMC-S660	Red	1.9	2.4	5	45	600
HSMC-S670	Red	1.9	2.4	5	45	300
HSMC-S690	Red	1.9	2.4	5	45	300

<b>Yellow/Amber Color Bins<sup>[1]</sup></b>		
<b>Dom. Wavelength (nm)</b>		
<b>Bin ID</b>	<b>Min.</b>	<b>Max.</b>
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

Tolerance:  $\pm 0.5$  nm.

<b>Orange Color Bins<sup>[1]</sup></b>		
<b>Dom. Wavelength (nm)</b>		
<b>Bin ID</b>	<b>Min.</b>	<b>Max.</b>
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
F	612.0	615.0

Tolerance:  $\pm 1$  nm.

**Note:**

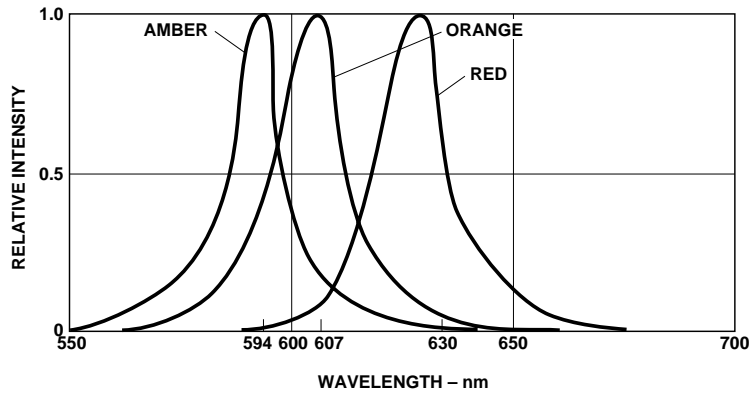
1. Bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your Avago representative for information on currently available bins.

<b>Light Intensity (Iv) Bin Limits<sup>[1]</sup></b>		
<b>Intensity (mcd)</b>		
<b>Bin ID</b>	<b>Min.</b>	<b>Max.</b>
A	0.11	0.18
B	0.18	0.29
C	0.29	0.45
D	0.45	0.72
E	0.72	1.10
F	1.10	1.80
G	1.80	2.80
H	2.80	4.50
J	4.50	7.20
K	7.20	11.20
L	11.20	18.00
M	18.00	28.50
N	28.50	45.00
P	45.00	71.50
Q	71.50	112.50
R	112.50	180.00
S	180.00	285.00
T	285.00	450.00
U	450.00	715.00
V	715.00	1125.00
W	1125.00	1800.00
X	1800.00	2850.00
Y	2850.00	4500.00

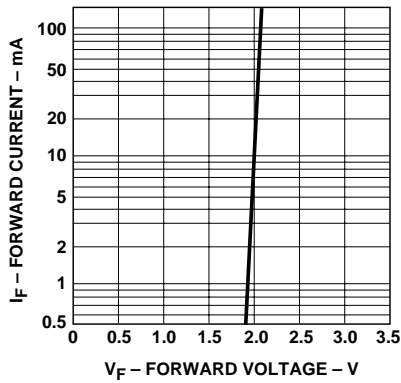
Tolerance  $\pm$  15%

**Note:**

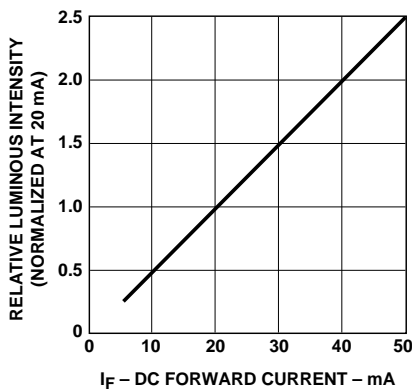
1. Bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your Avago representative for information on currently available bins.



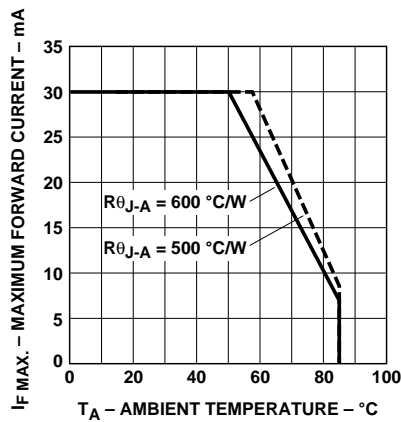
**Figure 1. Relative Intensity vs. Wavelength.**



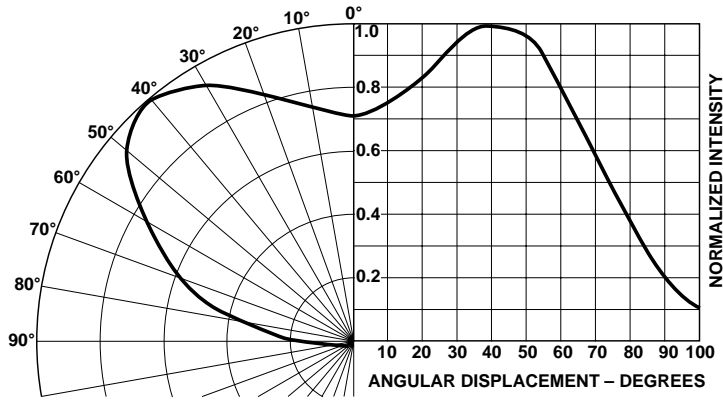
**Figure 2. Forward Current vs. Forward Voltage.**



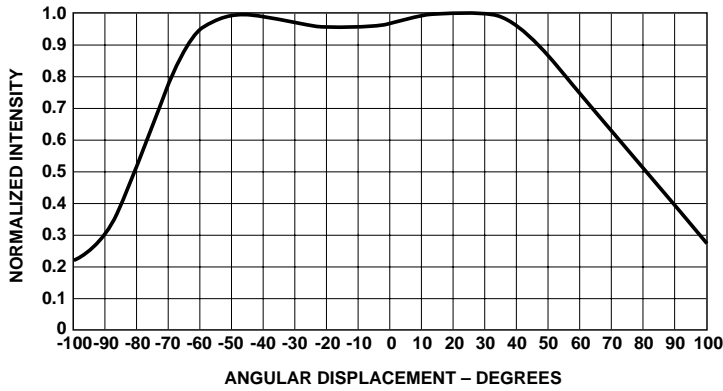
**Figure 3. Relative Luminous Intensity vs. Forward Current.**



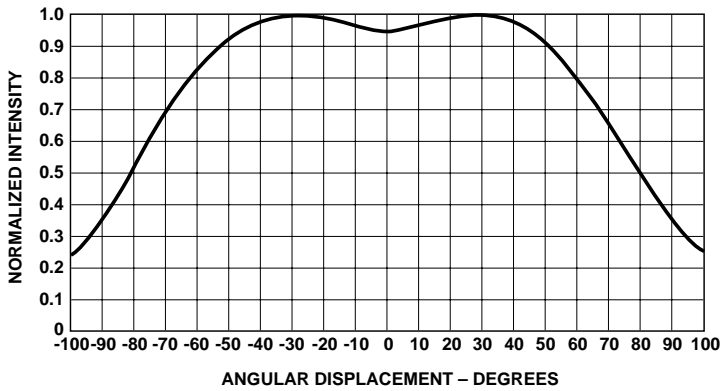
**Figure 4. Maximum Forward Current vs. Ambient Temperature.**



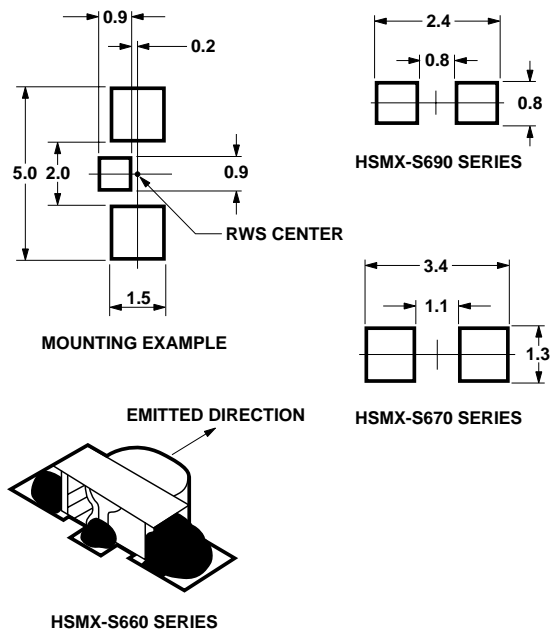
**Figure 5. Relative Luminous Intensity vs. Angular Displacement for HSMx-S660.**



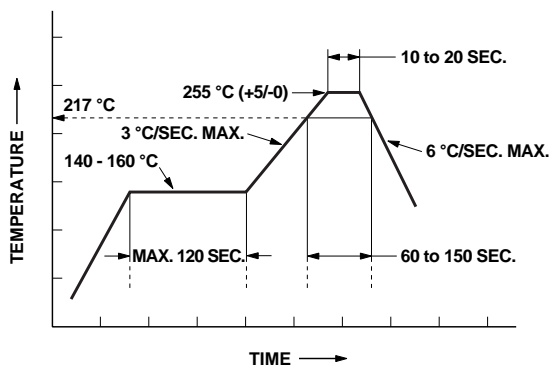
**Figure 6. Relative Luminous Intensity vs. Angular Displacement for HSMx-S670.**



**Figure 7. Relative Luminous Intensity vs. Angular Displacement for HSMx-S690.**



**Figure 8. Recommended Solder Patterns.**



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

**Figure 9. Recommended Pb-Free IR Reflow Profile.**



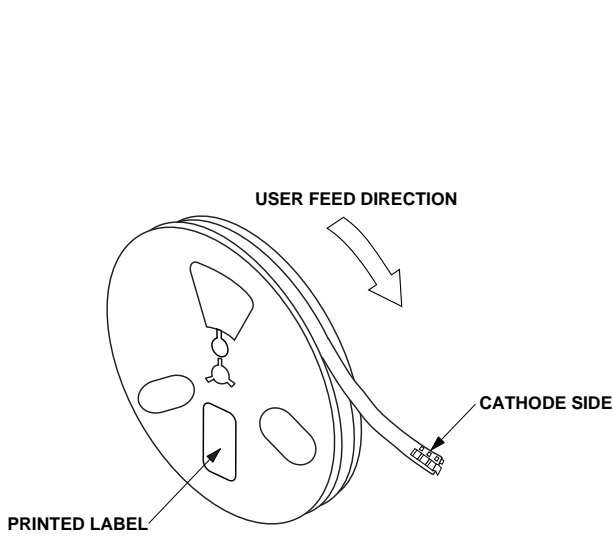


Figure 10. Reeling Orientation.

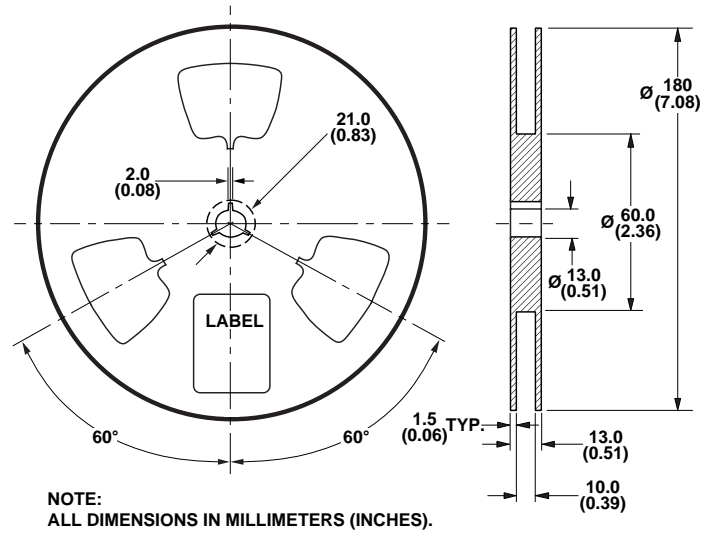


Figure 11. Reel Dimensions.

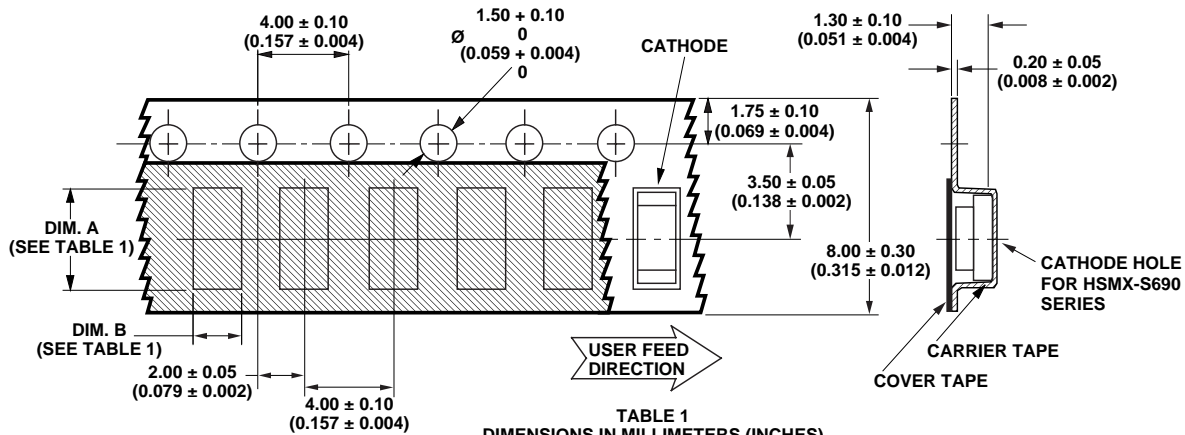
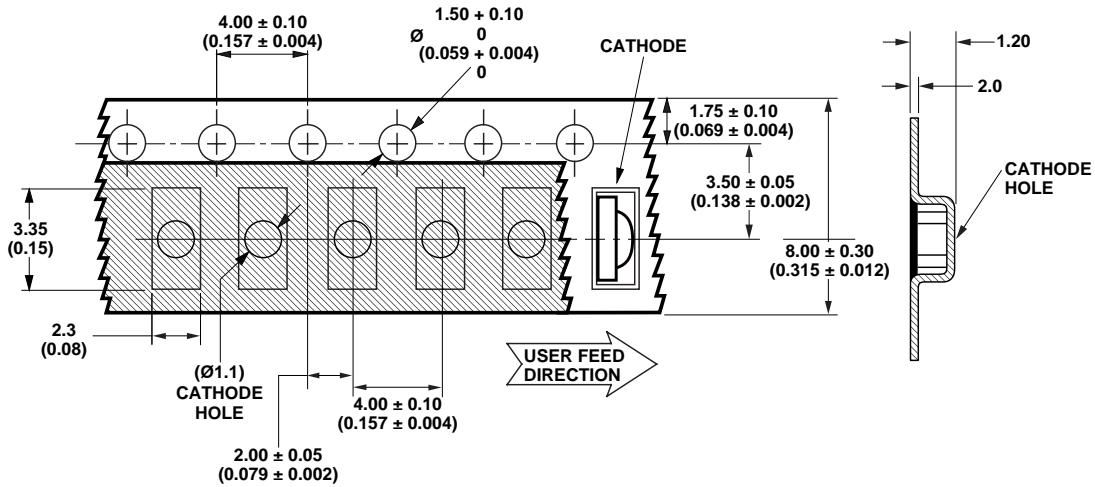


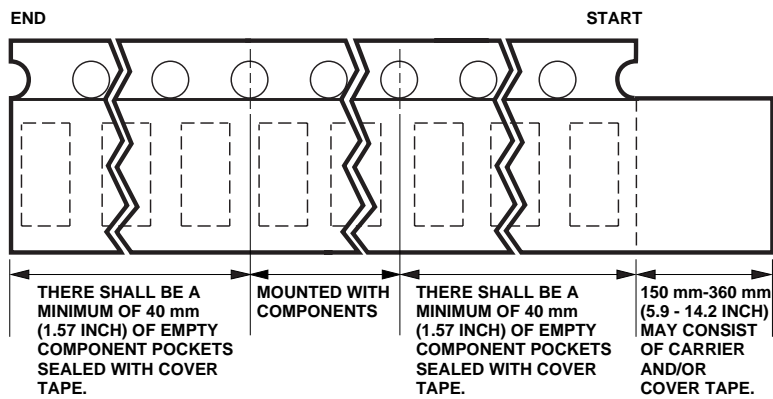
TABLE 1  
DIMENSIONS IN MILLIMETERS (INCHES)

PART NUMBER	DIM. A ± 0.10 (0.004)	DIM. B ± 0.10 (0.004)
HSMX-S670 SERIES	2.25 (0.089)	1.45 (0.057)
HSMX-S690 SERIES	1.85 (0.073)	1.00 (0.039)

Figure 12. Tape Dimensions HSMx-S670, HSMx-S690.



**Figure 13. Tape Dimensions HSMx-S660.**



**Figure 14. Tape Leader and Trailer Dimensions.**

Storage Condition: 5 to 30° C @ 60% RH max.

Baking is required under the condition:

- a) the blue silica gel indicator becoming white/transparent color
- b) the pack has been opened for more than 1 week

Baking recommended condition: 60 +/- 5° C for 20 hours.

For product information and a complete list of distributors, please go to our website: [www.avagotech.com](http://www.avagotech.com)

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