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# HSMx-C110/C170/C190/C191/C150

## High Performance ChipLED

## Data Sheet



**HSMA-C110/C170/C190/C191/C150**
**HSML-C110/C170/C190/C191/C150**
**HSMC-C110/C170/C190/C191/C150**
**HSMZ-C110/C170/C190**

### 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 available colors in this surface mount series are 592 nm Amber, 605 nm Orange, 626/631 nm Red for AS AlInGaP.

All packages are binned by both color and intensity, except for red color.

These ChipLEDs come either in two top emitting packages (HSMx-C170/C190/C191/C150) or in a side emitting package (HSMx-C110). The right angle ChipLEDs are suitable for applications such as LCD backlighting. The top emitting ChipLEDs with wide viewing angle are suitable for light piping and direct backlighting of keypads and panels. In order to facilitate pick and place operation, these ChipLEDs are shipped in tape and reel, with 4000 units per reel for HSMx-C170/C190/C191 and 3000 units per reel for HSMx-C110/C150.

These packages are compatible with IR soldering process.

### Features

- High brightness AlInGaP material
- Small size
- Industry standard footprint
- Diffused optics
- Top emitting or right angle emitting
- Available in 3 colors (red, orange, amber)
- Compatible with IR soldering
- Available in 8 mm tape on 7" diameter reel
- Reel sealed in zip locked moisture barrier bags

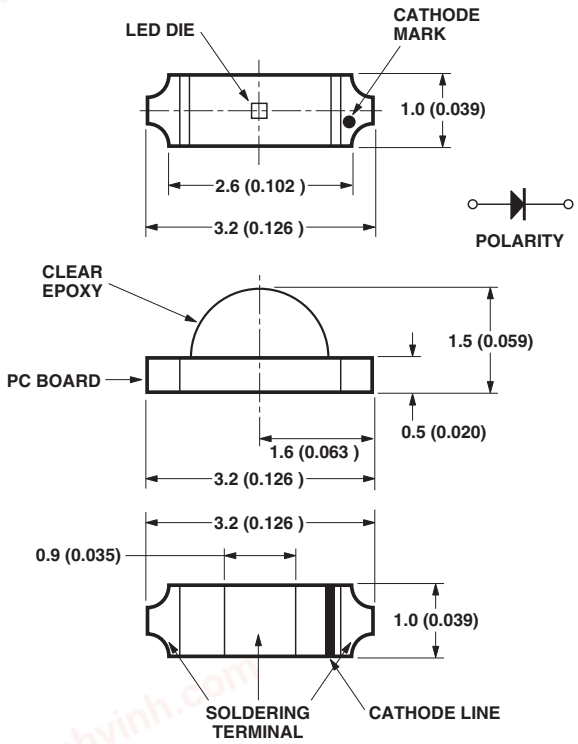
### Applications

- LCD backlighting
- Push button backlighting
- Front panel indicator
- Symbol indicator
- Microdisplays
- Small message panel signage

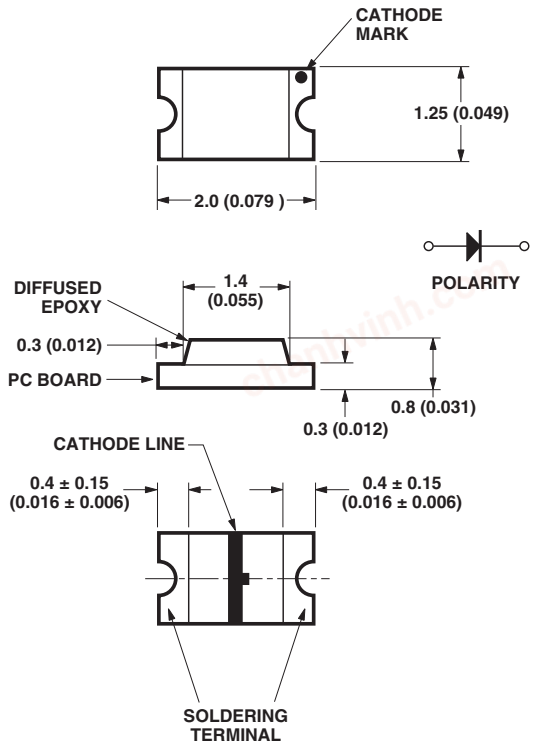
***CAUTION:*** *HSMA-Cxxx, HSMC-Cxxx, HSML-Cxxx and HSMZ-Cxxx LEDs are Class 1A ESD sensitive per JESD22-A114C.01. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.*

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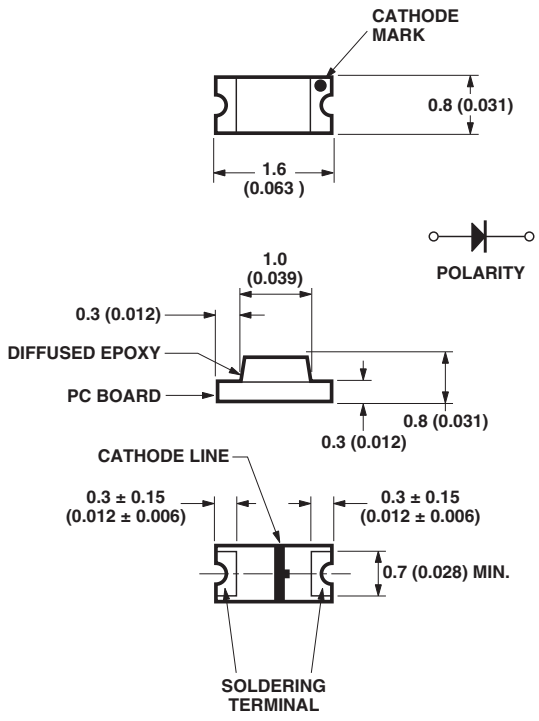
## Package Dimensions



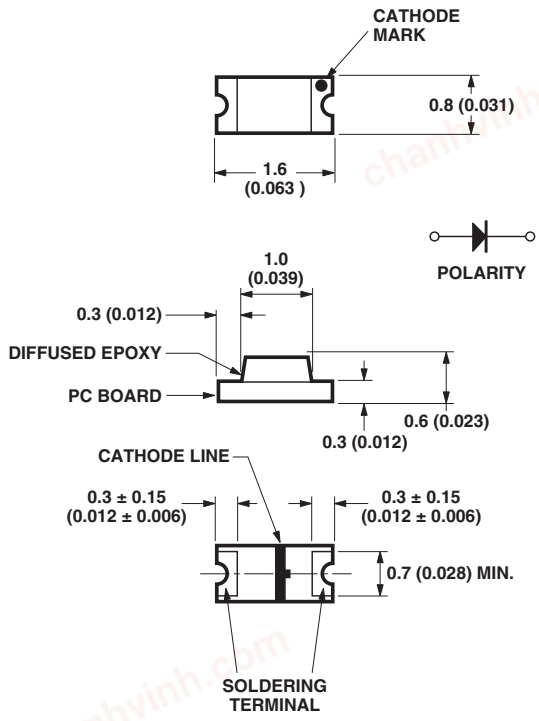

HSMx-C110




HSMx-C170




HSMx-C190

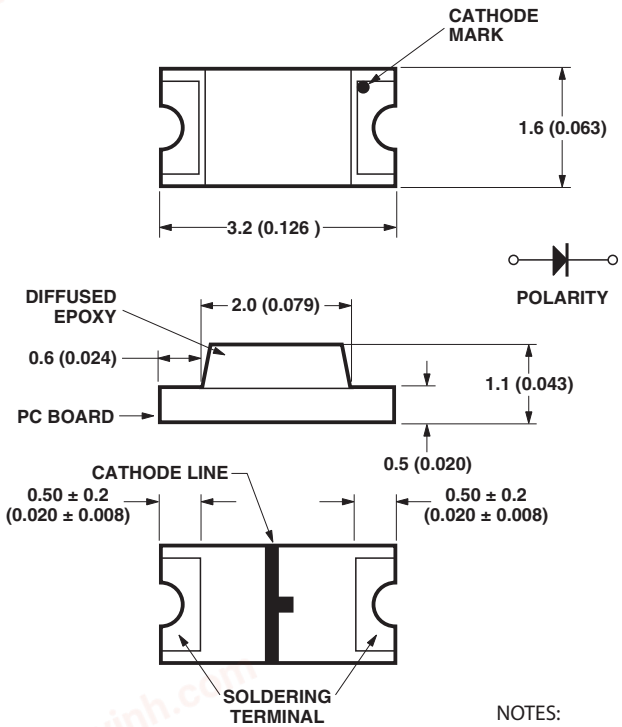



HSMx-C191

NOTES:
1. ALL DIMENSIONS IN MILLIMETERS (INCHES).
2. TOLERANCE IS ± 0.1 mm (± 0.004 IN.) UNLESS OTHERWISE SPECIFIED

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## Package Dimensions, continued




HSMx-C150

NOTES:
1. ALL DIMENSIONS IN MILLIMETERS (INCHES).
2. TOLERANCE IS ± 0.1 mm (± 0.004 IN.) UNLESS OTHERWISE SPECIFIED

## Device Selection Guide

| Footprint (mm)[1,2] | AS AlInGaP Amber | AS AlInGaP Orange | AS AlInGaP Red | AS AlInGaP Red | Package Description |
|---|---|---|---|---|---|
| 1.6 x 0.8 x 0.8 | HSMA-C190 | HSML-C190 | HSMC-C190 | HSMZ-C190 | Untinted, Diffused |
| 2.0 x 1.25 x 0.8 | HSMA-C170 | HSML-C170 | HSMC-C170 | HSMZ-C170 | Untinted, Diffused |
| 3.2 x 1.5 x 1.0 | HSMA-C110 | HSML-C110 | HSMC-C110 | HSMZ-C110 | Untinted, Non-diffused |
| 1.6 x 0.8 x 0.6 | HSMA-C191 | HSML-C191 | HSMC-C191 | | Untinted, Diffused |
| 3.2 x 1.6 x 1.1 | HSMA-C150 | HSML-C150 | HSMC-C150 | | Untinted, Diffused |

**Notes:**
1. Dimensions in mm.
2. Tolerance ± 0.1 mm unless otherwise noted.

## Absolute Maximum Ratings

$T_A$ = 25°C

| Parameter | HSMx-C1xx | Units |
|---|---|---|
| DC Forward Current[1,2] | 25 | mA |
| Power Dissipation | 60 | mW |
| Reverse Voltage ($I_R$ = 100 µA) | 5 | V |
| LED Junction Temperature | 95 | °C |
| Operating Temperature Range | –40 to +85 | °C |
| Storage Temperature Range | –40 to +85 | °C |
| Soldering Temperature | See reflow soldering profile (Figure 7 & 8) | |

**Notes:**
1. Derate linearly as shown in Figure 4.
2. Drive currents above 5 mA are recommended for best long term performance.

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## Electrical Characteristics

$T_A = 25°C$

| Parameter Number | Forward Voltage $V_F$ (Volts) @ $I_F = 20$ mA Typ. | Max. | Reverse Breakdown $V_R$ (Volts) @ $I_R = 100$ µA Min. | Capacitance C (pF), $V_F = 0$, f = 1 MHz Typ. | Thermal Resistance $R\theta_{J\text{-}PIN}$ = (°C/W) Typ. |
|---|---|---|---|---|---|
| HSMA-C110 | 1.9 | 2.4 | 5 | 45 | 600 |
| HSML-C110 | 1.9 | 2.4 | 5 | 45 | 600 |
| HSMC-C110 | 1.9 | 2.4 | 5 | 45 | 600 |
| HSMZ-C110 | 2.2 | 2.8 | 5 | 35 | 600 |
| HSMA-C170/190/191/150 | 1.9 | 2.4 | 5 | 45 | 300 |
| HSML-C170/190/191/150 | 1.9 | 2.4 | 5 | 45 | 300 |
| HSMC-C170/190/191/150 | 1.9 | 2.4 | 5 | 45 | 300 |
| HSMZ-C170/190 | 2.2 | 2.6 | 5 | 35 | 300 |

## Optical Characteristics

$T_A = 25°C$

| Part Number | Color | Luminous Intensity $I_v$ (mcd) @ 20 mA[1] Min. | Typ. | Peak Wavelength $\lambda_{peak}$ (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) Typ. |
|---|---|---|---|---|---|---|---|
| HSMA-C110 | AS Amber | 28.5 | 95 | 595 | 592 | 130 | 480 |
| HSMA-C170/190/191/150 | AS Amber | 28.5 | 90 | 595 | 592 | 170 | 480 |
| HSML-C110 | AS Orange | 28.5 | 95 | 609 | 605 | 130 | 370 |
| HSML-C170/190/191/150 | AS Orange | 28.5 | 90 | 609 | 605 | 170 | 370 |
| HSMC-C110 | AS Red | 28.5 | 95 | 637 | 626 | 130 | 155 |
| HSMC-C170/190/191/150 | AS Red | 28.5 | 90 | 637 | 626 | 170 | 155 |
| HSMZ-C110 | AS Red | 45 | 170 | 643 | 631 | 130 | 122 |
| HSMZ-C170/190 | AS Red | 45 | 165 | 643 | 631 | 170 | 122 |

**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 dominant 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.

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## Color Bin Limits[1]

| | Orange Color Bins[1] | |
|---|---|---|
| | Dom. Wavelength (nm) | |
| Bin ID | Min. | Max. |
| 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: ± 1 nm.

| | Amber Color Bins[1] | |
|---|---|---|
| | Dom. Wavelength (nm) | |
| Bin ID | Min. | Max. |
| 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: ± 1 nm.

| | Red Color Bins [1] | |
|---|---|---|
| | Dom. Wavelength (nm) | |
| Bin ID | Min. | Max. |
| - | 620.0 | 635.0 |

Tolerance: ±1 nm

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

## Light Intensity (Iv) Bin Limits[1]

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

Tolerance: ± 15%.

**Notes:**
1. Bin categories are established for classification of products. Products may not be available in all categories. Please contact your Avago representative for information on currently available bins.
2. The Iv binning specification set-up is for lowest allowable Iv binning only. There are no upper Iv bin limits.

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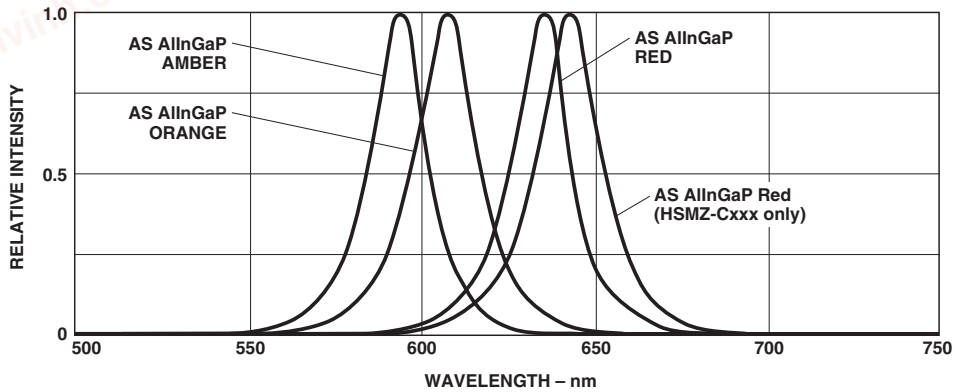



**Figure 1. Relative intensity vs. wavelength.**

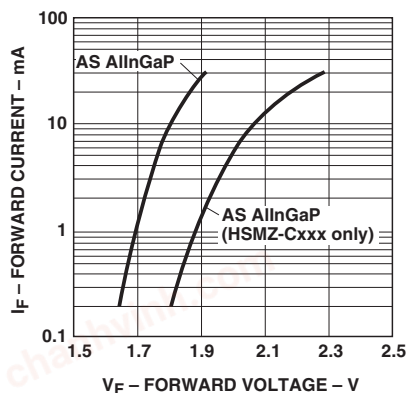



**Figure 2. Forward current vs. forward voltage.**

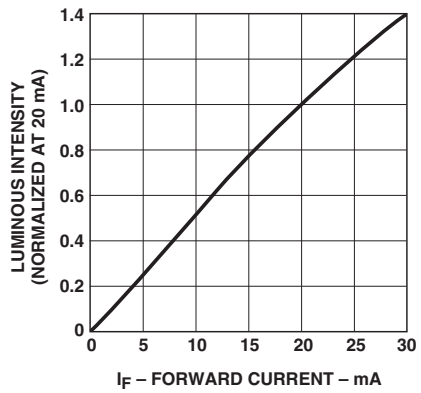



**Figure 3. Luminous intensity vs. forward current.**

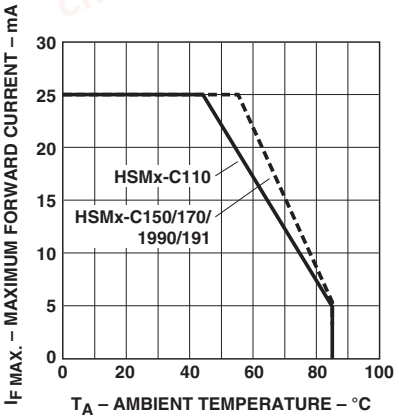



**Figure 4. Maximum forward current vs. ambient temperature.**

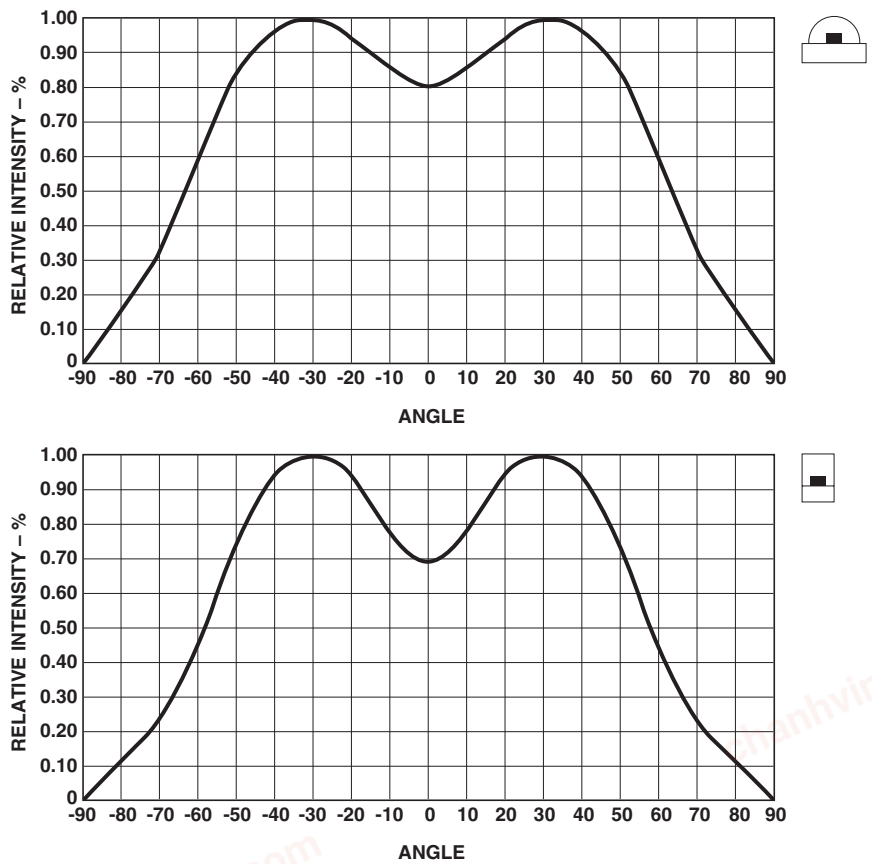



**Figure 5. Relative intensity vs. angle for HSMx-C110.**

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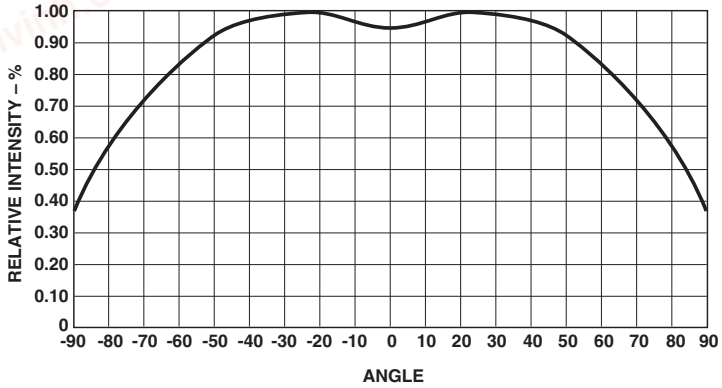



**Figure 6. Relative intensity vs. angle for HSMx-C170, C190, C191, and C150.**

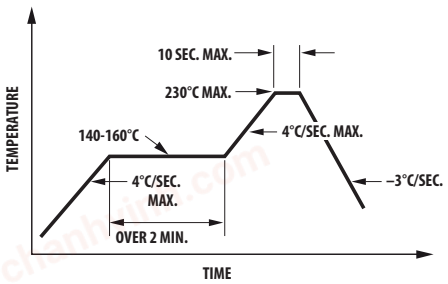



**Figure 7. Recommended reflow soldering profile.**

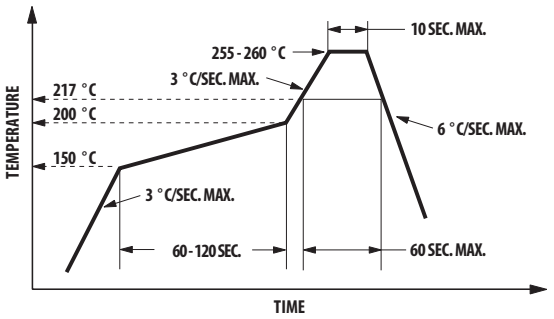



**Figure 8. Recommended Pb-free reflow soldering profile.**

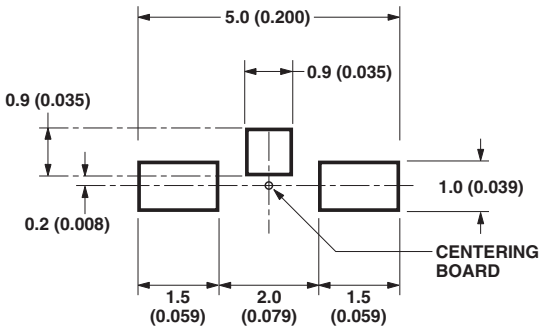



**Figure 9. Recommended soldering pattern for HSMx-C110.**

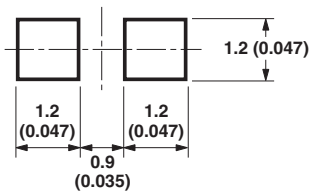



**Figure 10. Recommended soldering pattern for HSMx-C170.**

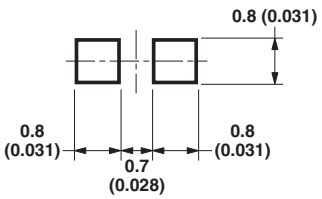



**Figure 11. Recommended soldering pattern for HSMx-C190 and C191.**

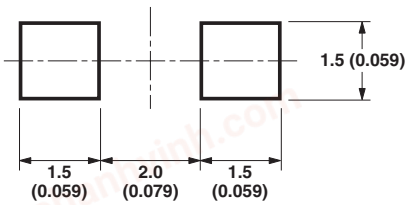



**Figure 12. Recommended soldering pattern for HSMx-C150.**

Note: All dimensions in millimeters (inches).

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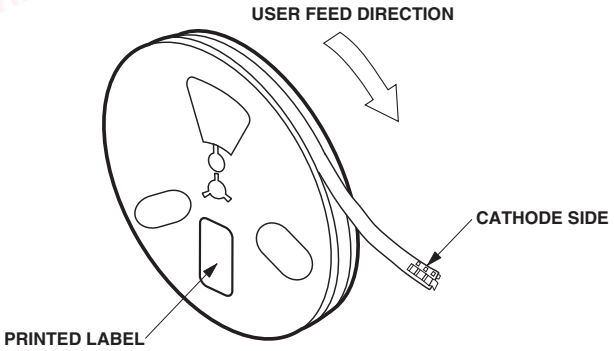



**Figure 13. Reeling orientation.**

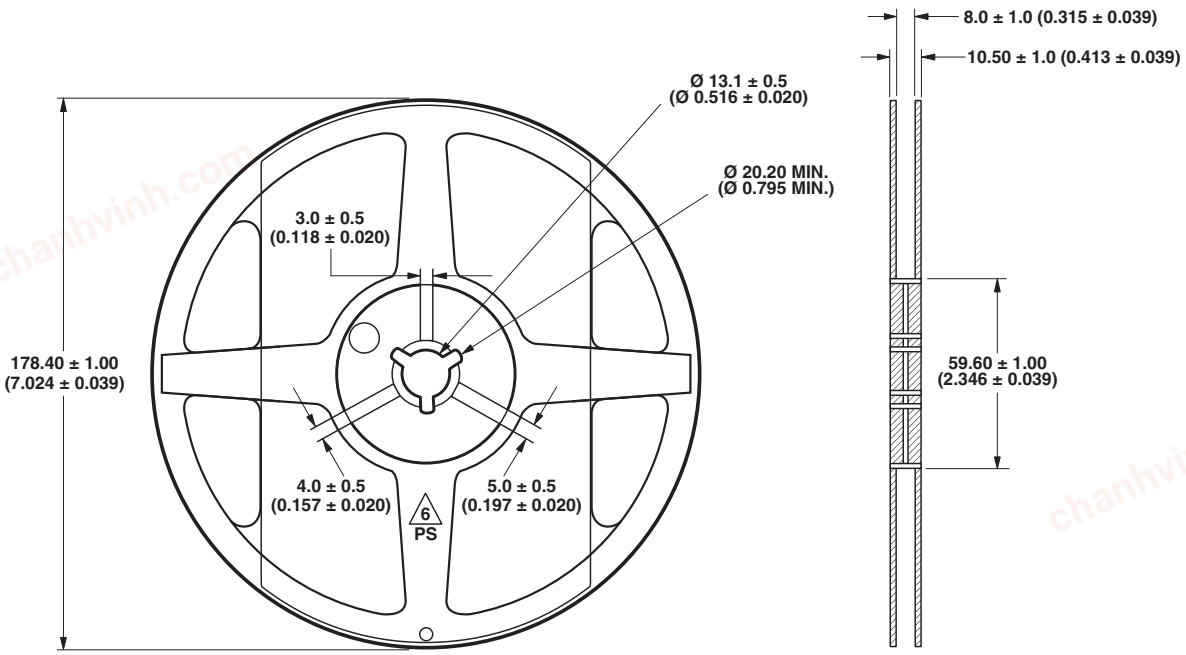



**Figure 14. Reel dimensions.**

Note: All dimensions in millimeters (inches).

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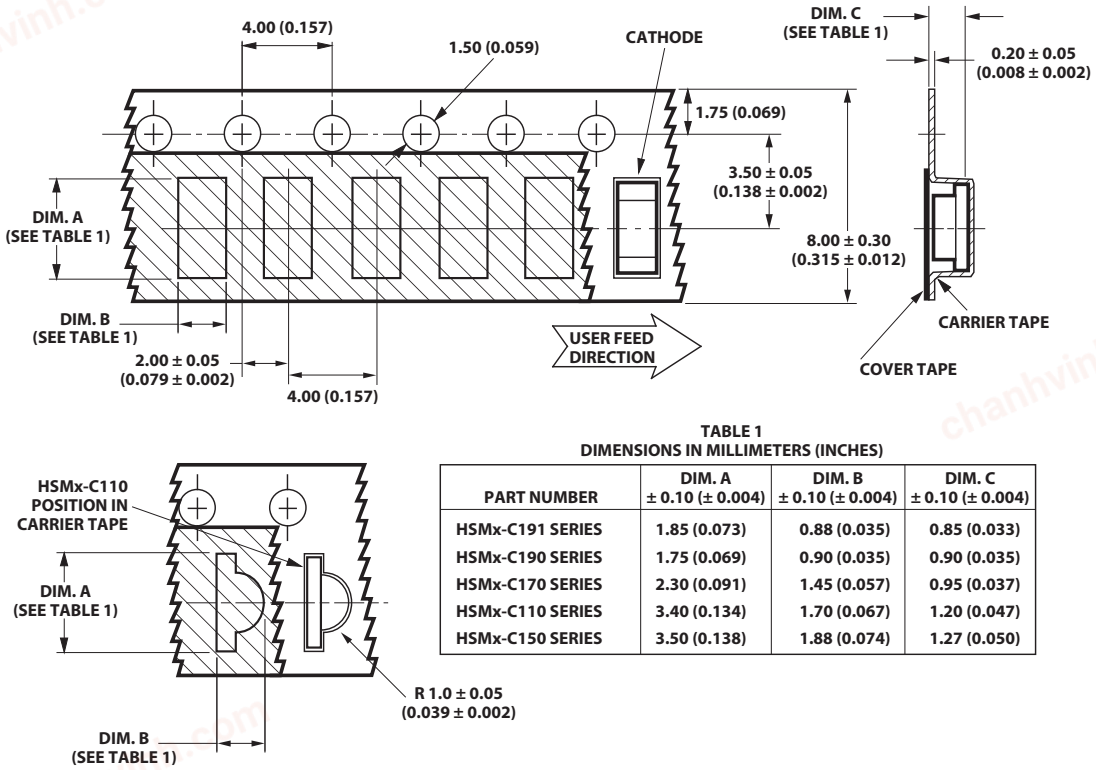



**TABLE 1**
**DIMENSIONS IN MILLIMETERS (INCHES)**

| PART NUMBER | DIM. A ± 0.10 (± 0.004) | DIM. B ± 0.10 (± 0.004) | DIM. C ± 0.10 (± 0.004) |
|---|---|---|---|
| HSMx-C191 SERIES | 1.85 (0.073) | 0.88 (0.035) | 0.85 (0.033) |
| HSMx-C190 SERIES | 1.75 (0.069) | 0.90 (0.035) | 0.90 (0.035) |
| HSMx-C170 SERIES | 2.30 (0.091) | 1.45 (0.057) | 0.95 (0.037) |
| HSMx-C110 SERIES | 3.40 (0.134) | 1.70 (0.067) | 1.20 (0.047) |
| HSMx-C150 SERIES | 3.50 (0.138) | 1.88 (0.074) | 1.27 (0.050) |

**Figure 15. Tape dimensions.**

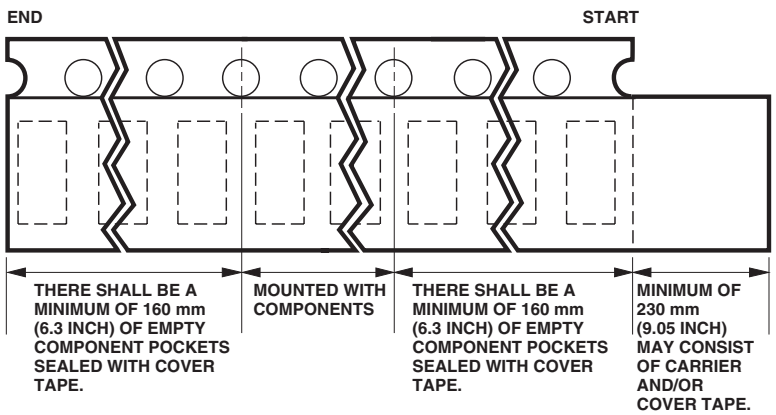



**Figure 16. Tape leader and trailer dimensions.**

NOTES:
1. ALL DIMENSIONS IN MILLIMETERS (INCHES).
2. TOLERANCE IS ± 0.1 mm (± 0.004 IN.) UNLESS OTHERWISE SPECIFIED.

### Convective IR Reflow Soldering

For more information on IR reflow soldering, refer to Application Note 1060, *Surface Mounting SMT LED Indicator Components.*

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

Baking is required under the condition:

a) Humidity Indicator Card is >10% when read at 23±5°C.
b) Device exposed to factory conditions <30°C/60% RH more than 672 hours.

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**

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