

# Surface Mount Chip LEDs

## Technical Data

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

#### Features

- Small Size
- Industry Standard Footprint
- Compatible with IR Solder
- Diffused Optics
- Operating Temperature Range of -30°C to +85°C
- Right Angle Package Available
- Five Colors Available
- Available in 8 mm Tape on 7 in. (178 mm) Diameter Reels

#### Applications

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

#### Description

These chip LEDs are designed in an industry standard package for ease of handling and use. Five different LED colors are available in four compact, single color packages.

The HSMx-C150 has the industry standard 3.2 x 1.6 mm footprint that is excellent for all around use. The HSMx-C170 has the widely used 2.0 x 1.25 mm footprint. The HSMx-C190 has the industry standard 1.6 x 0.8 mm footprint, its low 0.8 mm profile and wide viewing angle make this LED exceptional for backlighting applications.

The HSMx-C110 is a right-angle package with the universally accepted dimensions of



3.2 x 1.0 x 1.5 mm. This part is ideal for LCD backlighting and sidelighting applications.

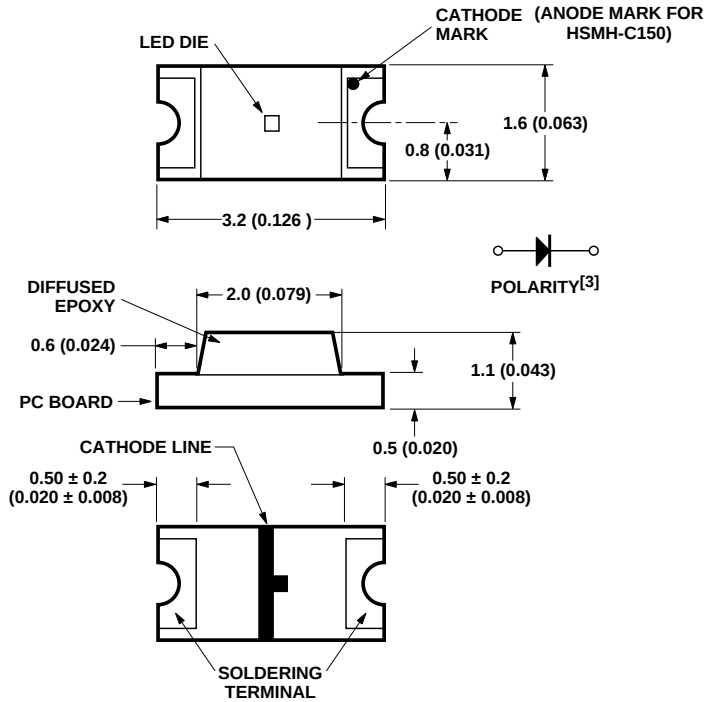
All packages are compatible with IR reflow solder processes. The small size and wide viewing angle make these LEDs prime choices for backlighting applications and front panel illumination especially where space is a premium.

#### Device Selection Guide

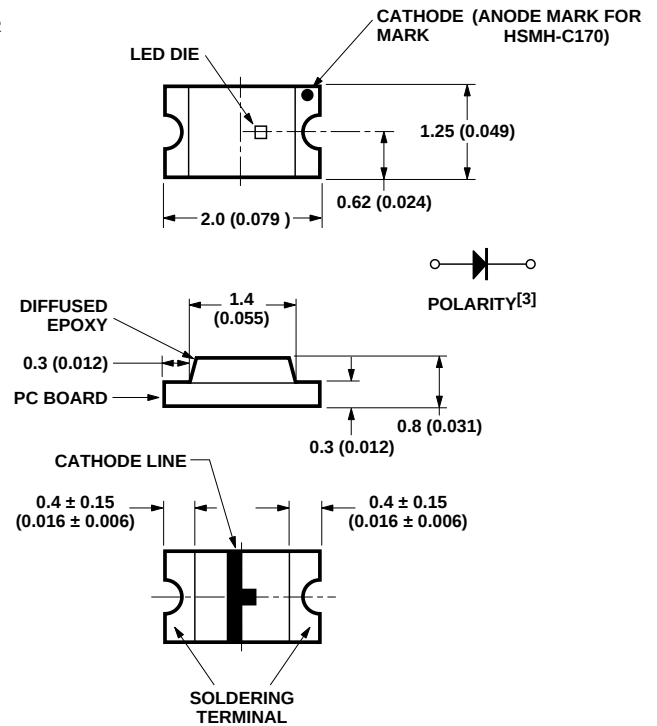
| Footprint (mm)             | HER       | Orange    | Yellow    | Green     | AS AlGaAs Red | Part per Reel |
|----------------------------|-----------|-----------|-----------|-----------|---------------|---------------|
| 3.20 x 1.60                | HSMS-C150 | HSMD-C150 | HSMY-C150 | HSMG-C150 | HSMH-C150     | 3000          |
| 2.00 x 1.25                | HSMS-C170 | HSMD-C170 | HSMY-C170 | HSMG-C170 | HSMH-C170     | 4000          |
| 1.60 x 0.80                | HSMS-C190 | HSMD-C190 | HSMY-C190 | HSMG-C190 | HSMH-C190     | 4000          |
| 3.20 x 1.00 <sup>[1]</sup> | HSMS-C110 | HSMD-C110 | HSMY-C110 | HSMG-C110 | HSMH-C110     | 3000          |

**Note:** Right-angle package

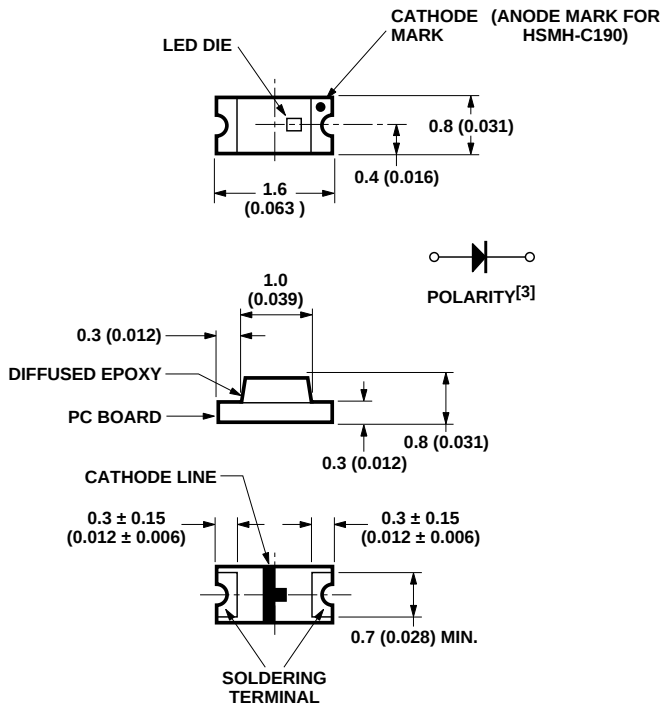
## Package Dimensions



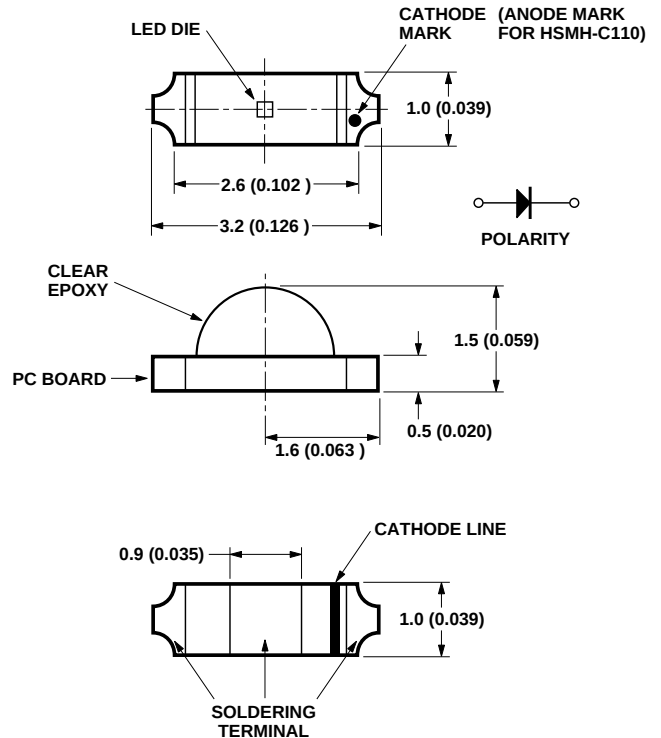
**HSMx-C150**



**HSMx-C170**



**HSMx-C190**



**HSMx-C110**

### Notes:

1. All dimensions in millimeters (inches).
2. Tolerance is  $\pm 0.1$  mm ( $\pm 0.004$  in.) unless otherwise specified.
3. Polarity for HSMH-C1 x 0 will be the opposite of what is shown on above drawings.

### Absolute Maximum Ratings at $T_A=25^\circ\text{C}$ for HER, Orange, Yellow and Green

| Parameter                                  | HSMx-C150                           | HSMx-C170  | HSMx-C190  | HSMx-C110  | Units            |
|--------------------------------------------|-------------------------------------|------------|------------|------------|------------------|
| DC Forward Current <sup>[1]</sup>          | 25                                  | 20         | 20         | 25         | mA               |
| Peak Pulsing Current <sup>[2]</sup>        | 100                                 | 100        | 100        | 100        | mA               |
| Power Dissipation                          | 65                                  | 52         | 52         | 65         | mW               |
| Reverse Voltage ( $I_R=100\ \mu\text{A}$ ) | 5                                   | 5          | 5          | 5          | V                |
| LED Junction Temperature                   | 95                                  | 95         | 95         | 95         | $^\circ\text{C}$ |
| Operating Temperature Range                | -30 to +85                          | -30 to +85 | -30 to +85 | -30 to +85 | $^\circ\text{C}$ |
| Storage Temperature Range                  | -40 to +85                          | -40 to +85 | -40 to +85 | -40 to +85 | $^\circ\text{C}$ |
| Soldering Temperature                      | See IR soldering profile (Figure 7) |            |            |            |                  |

### Absolute Maximum Ratings at $T_A=25^\circ\text{C}$ for AS AlGaAs Red

| Parameter                                  | HSMx-C150                           | HSMx-C170  | HSMx-C190  | HSMx-C110  | Units            |
|--------------------------------------------|-------------------------------------|------------|------------|------------|------------------|
| DC Forward Current <sup>[1]</sup>          | 30                                  | 25         | 25         | 30         | mA               |
| Peak Pulsing Current <sup>[2]</sup>        | 100                                 | 100        | 100        | 100        | mA               |
| Power Dissipation                          | 78                                  | 65         | 65         | 78         | mW               |
| Reverse Voltage ( $I_R=100\ \mu\text{A}$ ) | 5                                   | 5          | 5          | 5          | V                |
| LED Junction Temperature                   | 95                                  | 95         | 95         | 95         | $^\circ\text{C}$ |
| Operating Temperature Range                | -30 to +85                          | -30 to +85 | -30 to +85 | -30 to +85 | $^\circ\text{C}$ |
| Storage Temperature Range                  | -40 to +85                          | -40 to +85 | -40 to +85 | -40 to +85 | $^\circ\text{C}$ |
| Soldering Temperature                      | See IR soldering profile (Figure 7) |            |            |            |                  |

#### Notes:

1. Derate linearly as shown in Figure 4 for temperature above  $25^\circ\text{C}$ .
2. Pulse condition of 1/10 duty and 0.1 msec. width.

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

| Part Number                    | Color  | Forward Voltage<br>$V_F(\text{Volts})$<br>@ $I_F = 20\ \text{mA}$ |      | Reverse<br>Breakdown<br>$V_R(\text{Volts})$<br>@ $I_R = 100\ \mu\text{A}$<br>Min. | Capacitance<br>$C(\text{pF})$ ,<br>@ $V_F = 0\ \text{V}$ ,<br>$f = 1\ \text{MHz}$<br>Typ. | Thermal<br>Resistance<br>$R_{\theta_{J-P}}\ (^\circ\text{C/W})$<br>Typ. |
|--------------------------------|--------|-------------------------------------------------------------------|------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|                                |        | Typ.                                                              | Max. |                                                                                   |                                                                                           |                                                                         |
| HSMS-C150/110<br>HSMS-C170/190 | HER    | 2.1                                                               | 2.6  | 5                                                                                 | 5                                                                                         | 400<br>250                                                              |
| HSMD-C150/110<br>HSMD-C170/190 | Orange | 2.2                                                               | 2.6  | 5                                                                                 | 7                                                                                         | 400<br>250                                                              |
| HSMY-C150/110<br>HSMY-C170/190 | Yellow | 2.1                                                               | 2.6  | 5                                                                                 | 6                                                                                         | 400<br>250                                                              |
| HSMG-C150/110<br>HSMG-C170/190 | Green  | 2.2                                                               | 2.6  | 5                                                                                 | 9                                                                                         | 400<br>250                                                              |
| HSMH-C150/110<br>HSMH-C170/190 | AlGaAs | 1.8                                                               | 2.6  | 5                                                                                 | 18                                                                                        | 460<br>300                                                              |

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

| Part Number       | Color  | Luminous Intensity <sup>[1]</sup><br>$I_v(\text{mcd})@20\text{mA}$ |      | Peak Wavelength<br>$\lambda_{\text{peak}}(\text{nm})$<br>Typ. | Dominant Wavelength<br>$\lambda_d(\text{nm})$<br>Typ. | Viewing Angle $2\theta_{1/2}(^\circ)^{[2]}$<br>Typ. |
|-------------------|--------|--------------------------------------------------------------------|------|---------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------|
|                   |        | Min.                                                               | Typ. |                                                               |                                                       |                                                     |
| HSMS-C150/170/190 | HER    | 2.50                                                               | 10.0 | 630                                                           | 626                                                   | 170                                                 |
| HSMD-C150/170/190 | Orange | 2.50                                                               | 8.0  | 605                                                           | 604                                                   | 170                                                 |
| HSMY-C150/170/190 | Yellow | 2.50                                                               | 8.0  | 589                                                           | 586                                                   | 170                                                 |
| HSMG-C150/170/190 | Green  | 4.00                                                               | 15.0 | 570                                                           | 572                                                   | 170                                                 |
| HSMH-C150/170/190 | AlGaAs | 6.30                                                               | 17.0 | 660                                                           | 639                                                   | 170                                                 |
| HSMS-C110         | HER    | 2.50                                                               | 11.0 | 630                                                           | 626                                                   | 130                                                 |
| HSMD-C110         | Orange | 2.50                                                               | 9.0  | 605                                                           | 604                                                   | 130                                                 |
| HSMY-C110         | Yellow | 2.50                                                               | 9.0  | 589                                                           | 586                                                   | 130                                                 |
| HSMG-C110         | Green  | 4.00                                                               | 16.0 | 570                                                           | 572                                                   | 130                                                 |
| HSMH-C110         | AlGaAs | 6.30                                                               | 19.0 | 660                                                           | 639                                                   | 130                                                 |

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

## Color Bin Limits<sup>[1]</sup>

### Green Color Bins<sup>[1]</sup>

| Bin ID | Dom. Wavelength (nm) |      |
|--------|----------------------|------|
|        | Min.                 | Max. |
| A      | 561                  | 565  |
| B      | 564                  | 568  |
| C      | 567                  | 571  |
| D      | 570                  | 574  |
| E      | 573                  | 577  |

### Orange Color Bins<sup>[1]</sup>

| Bin ID | Dom. Wavelength (nm) |       |
|--------|----------------------|-------|
|        | Min.                 | Max.  |
| A      | 596.0                | 601.0 |
| B      | 599.0                | 604.0 |
| C      | 602.0                | 607.0 |
| D      | 605.0                | 610.0 |
| E      | 608.0                | 613.0 |
| F      | 611.0                | 616.0 |
| J      | 594.0                | 597.5 |

### Yellow/Amber Color Bins<sup>[1]</sup>

| Bin ID | Dom. Wavelength (nm) |       |
|--------|----------------------|-------|
|        | Min.                 | Max.  |
| A      | 581.5                | 585.0 |
| B      | 584.0                | 587.5 |
| C      | 586.5                | 590.0 |
| D      | 589.5                | 592.5 |
| H      | 591.5                | 595.0 |
| J      | 594.0                | 597.5 |

### Note:

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

## Light Intensity ( $I_v$ ) Bin Limits<sup>[1]</sup>

| Bin ID | Intensity (mcd) |      | Bin ID | Intensity (mcd) |        |
|--------|-----------------|------|--------|-----------------|--------|
|        | Min.            | Max. |        | Min.            | Max.   |
| A      | 0.10            | 0.20 | K      | 6.30            | 12.50  |
| B      | 0.16            | 0.32 | L      | 10.00           | 20.00  |
| C      | 0.25            | 0.50 | M      | 16.00           | 32.00  |
| D      | 0.40            | 0.80 | N      | 25.00           | 50.00  |
| E      | 0.63            | 1.25 | P      | 40.00           | 80.00  |
| F      | 1.00            | 2.00 | Q      | 63.00           | 125.00 |
| G      | 1.60            | 3.20 | R      | 100.00          | 200.00 |
| H      | 2.50            | 5.00 | S      | 160.00          | 320.00 |
| J      | 4.00            | 8.00 | T      | 250.00          | 500.00 |

### Note:

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

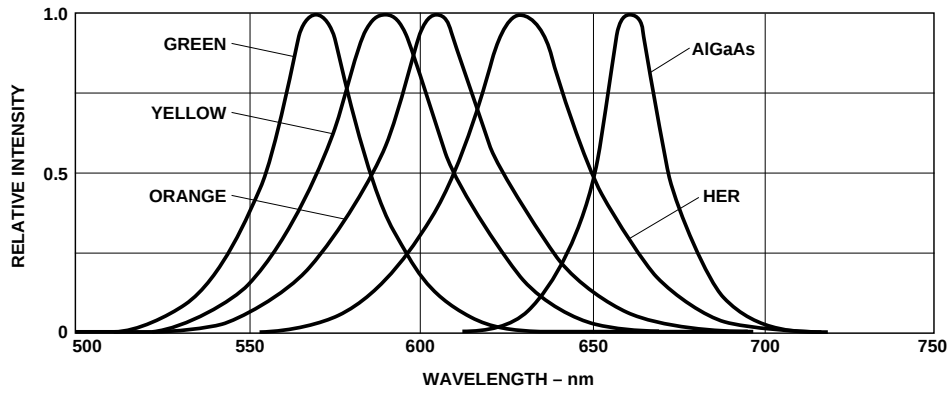


Figure 1. Relative Intensity vs. Wavelength.

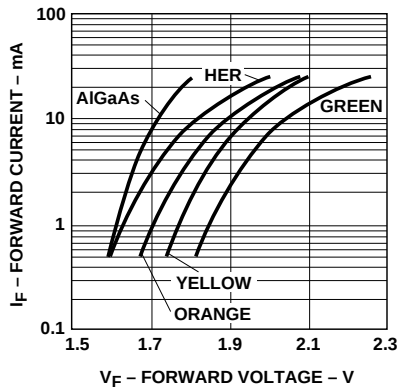


Figure 2. Forward Current vs. Forward Voltage.

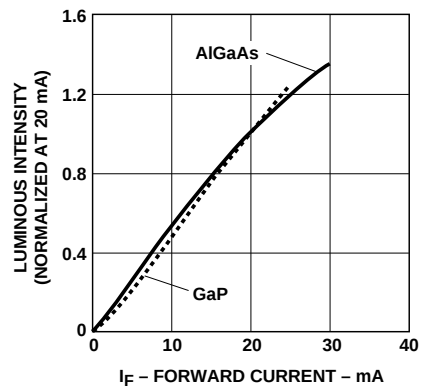


Figure 3. Luminous Intensity vs. Forward Current.

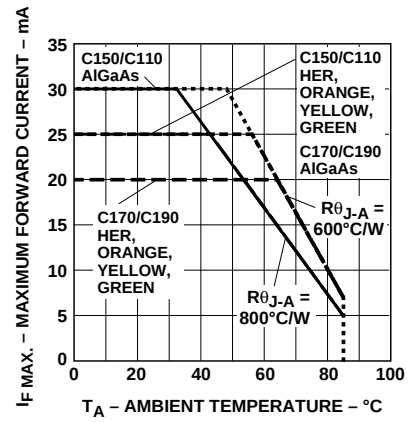


Figure 4. Maximum Forward Current vs. Ambient Temperature.

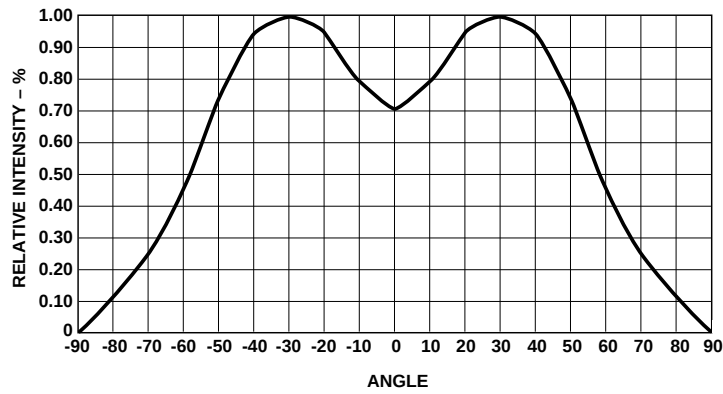
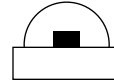
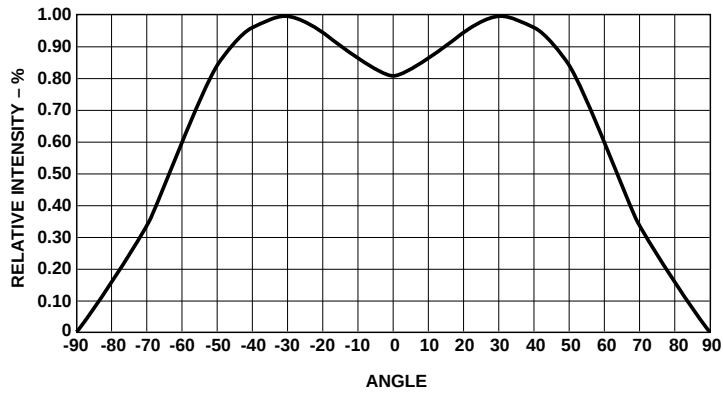


Figure 5. Relative Intensity vs. Angle for HSMx-C110.

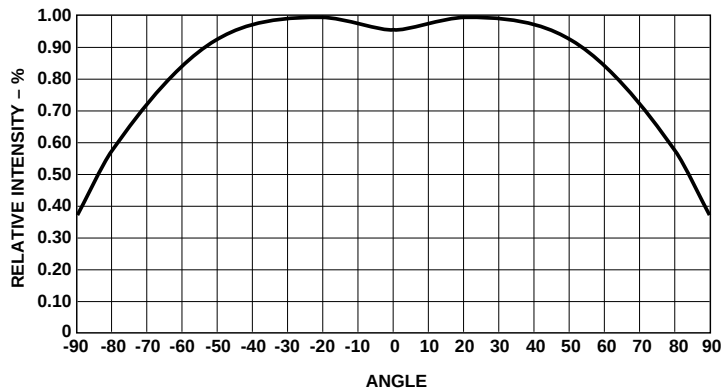


Figure 6. Relative Intensity vs. Angle for HSMx-C150, C170 and C190.

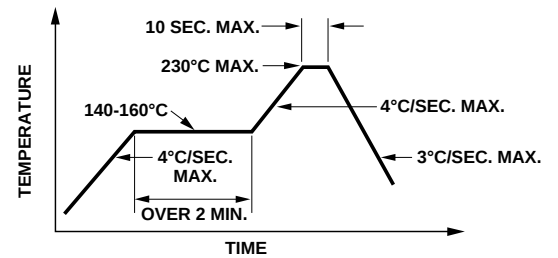
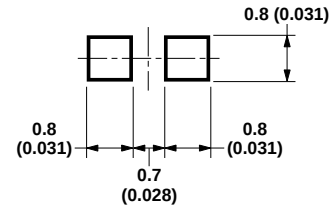
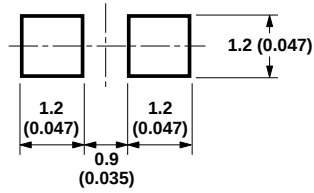


Figure 7. Recommended Reflow Soldering Profile.

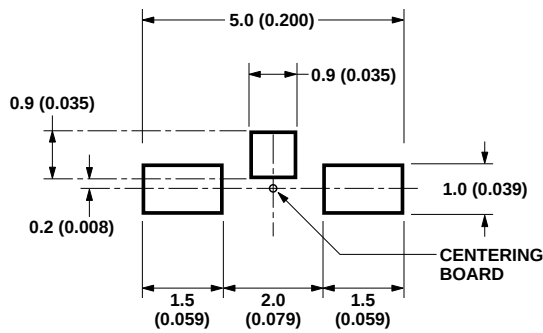
**Note:** All dimensions in millimeters (inches).



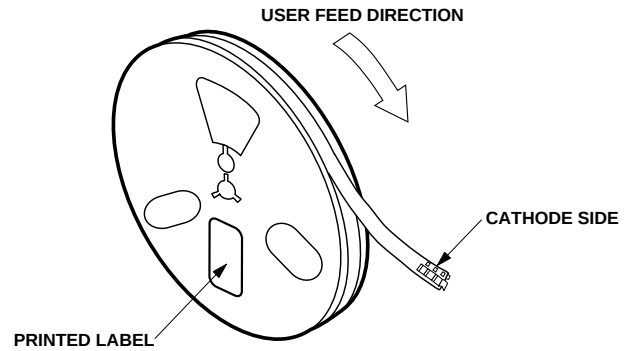
**Figure 8. Recommended Soldering Pattern for HSMx-C150.**

**Figure 9. Recommended Soldering Pattern for HSMx-C170.**

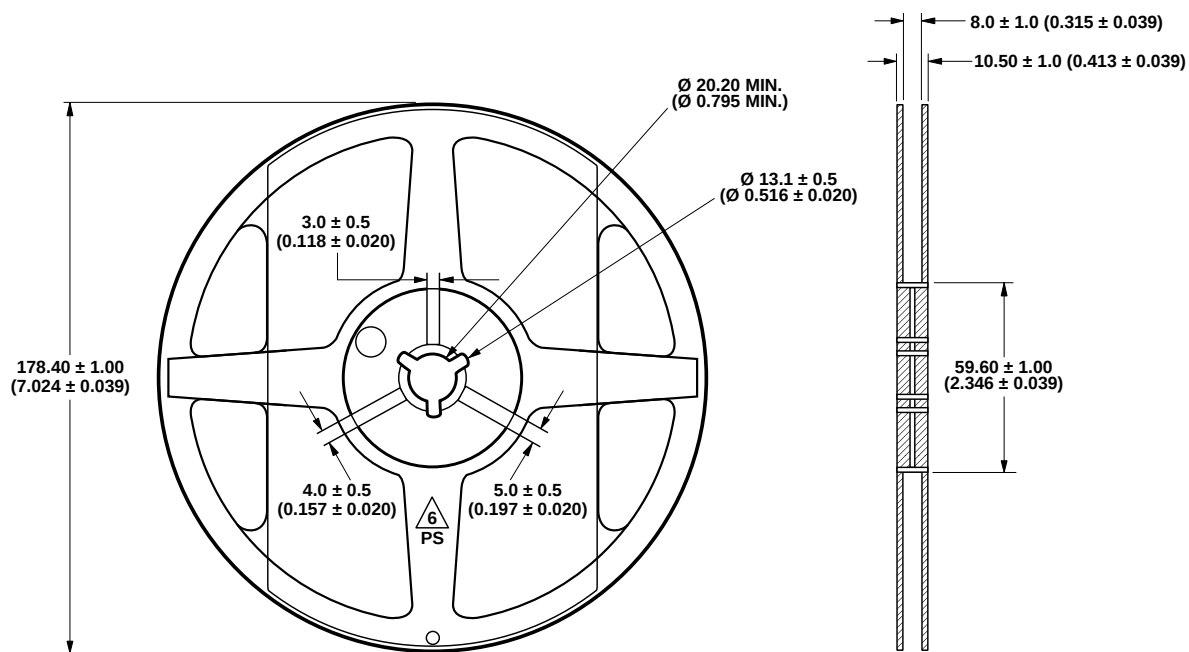
**Figure 10. Recommended Soldering Pattern for HSMx-C190.**



**Figure 11. Recommended Soldering Pattern for HSMx-C110.**

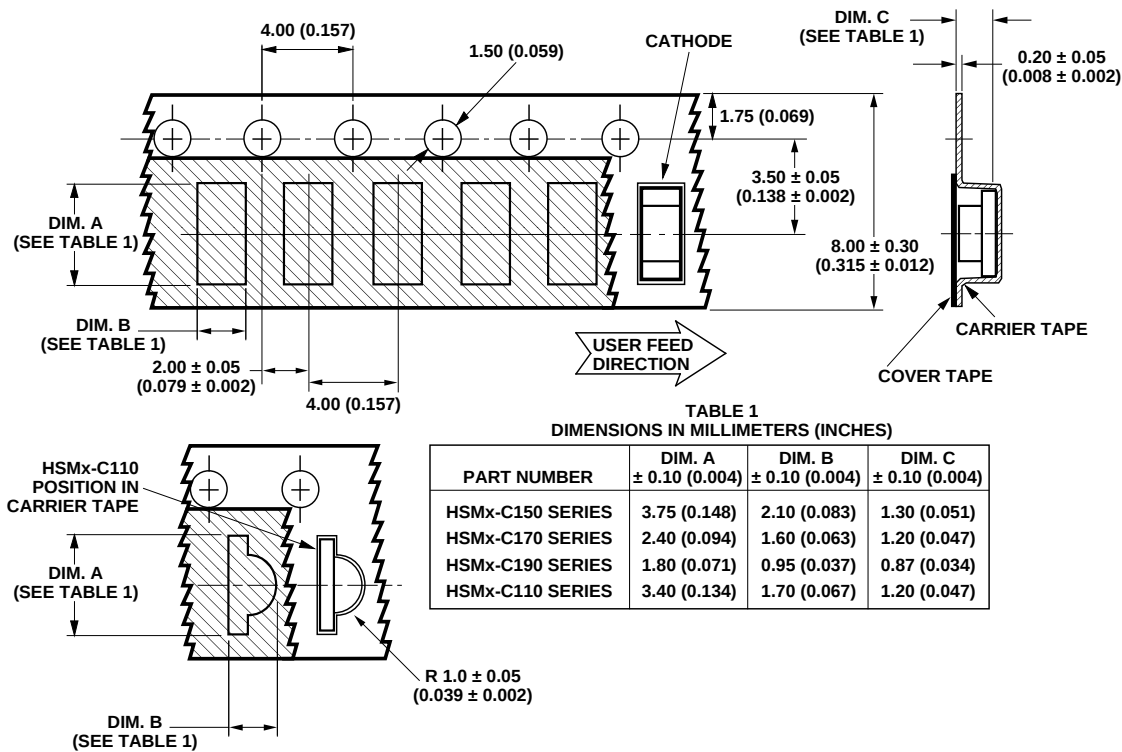


**Figure 12. Reeling Orientation.**

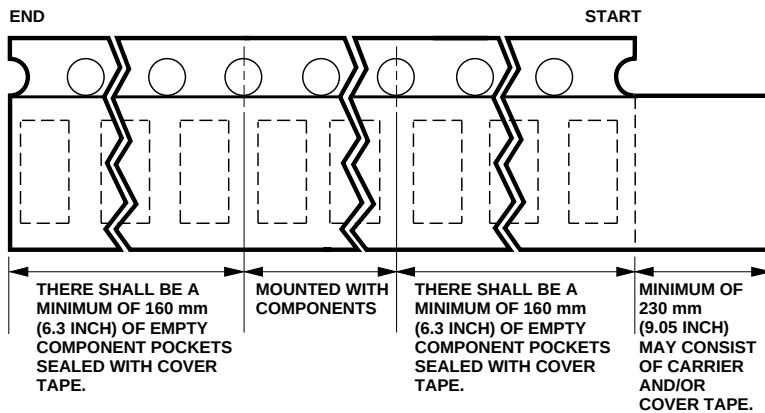


**Figure 13. Reel Dimensions.**

**Note:** All dimensions in millimeters (inches).



**Figure 14. Tape Dimensions.**



**Figure 15. Tape Leader and Trailer Dimensions.**

**Notes:**

1. All dimensions in millimeters (inches).
2. Tolerance is  $\pm 0.1$  mm ( $\pm 0.004$  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) the blue silica gel indicator becoming white/transparent color
- b) the pack has been opened for more than 1 week

Baking recommended condition: 60  $\pm$  5° C for 20 hours.

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Obsoletes 5980-2430E (9/00)  
5988-1858EN