



# THE DATASHEET OF HSMC-C130



## Data Sheet

### Description

The HSMx-C130 ChipLEDs are designed specially for the membrane switch application. The request is to have as low as possible while retaining the footprint at the optimal size of a 0603 (1.6 x 0.8 mm) device. Apart from the membrane switch application, the HSMx-C130 is also suitable for use in applications where low height is required.

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.

Four different colors are available: amber, red, green, and orange. All parts are intensity binned and color binned (except for red color). They come in 8 mm conductive tape on a 7 inch diameter reel with 4000 units per reel which make them compatible for automatic placement.

### Features

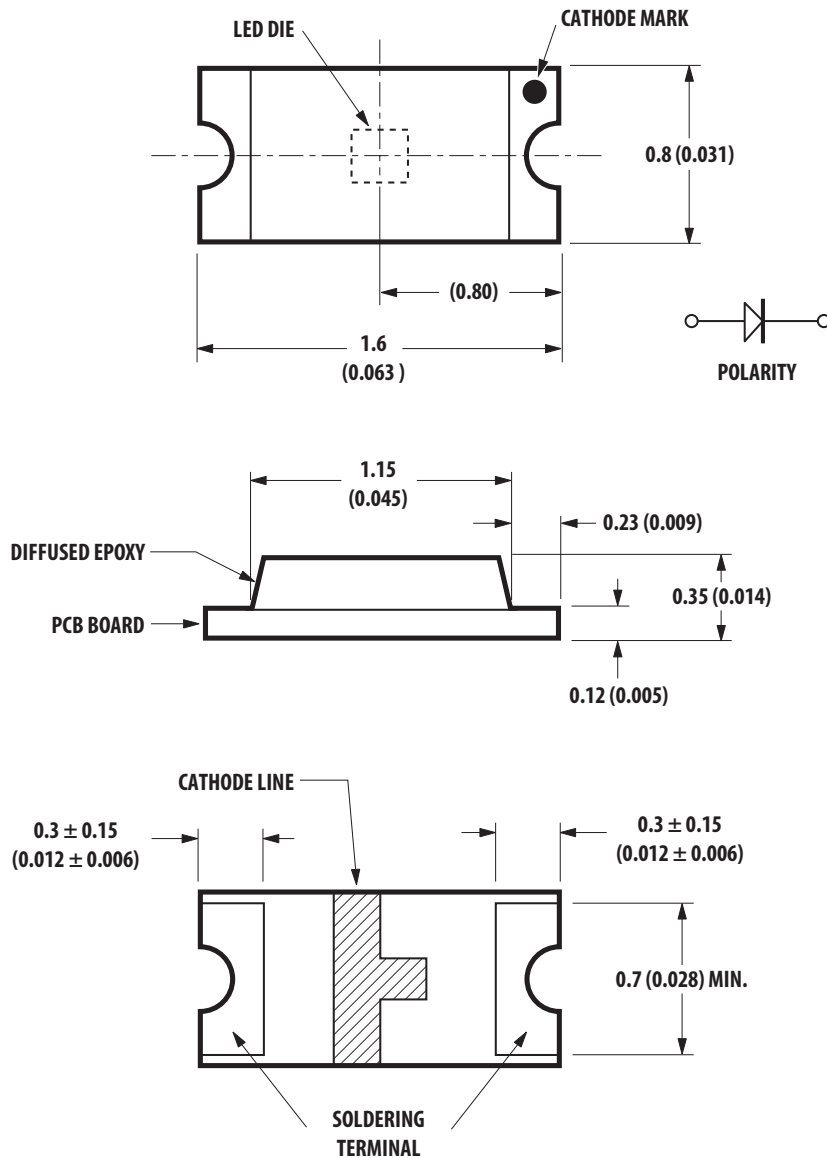
- High brightness AlInGaP material
- Small size with extremely low profile
- 0603 industry standard footprint with 0.35mm height
- Diffused optics
- Operating range of -40°C to 85°C
- Available in 4 colors
- Compatible with IR soldering
- Available in 8 mm conductive tape on 7" diameter reel
- Reel sealed in zip locked moisture barrier bags

### Applications

- Membrane switch indicator
- LCD backlighting
- Push button backlighting
- Front panel indicator
- Symbol backlighting
- Keypad backlighting

**CAUTION:** HSMx-C130 LEDs are Class 1A ESD sensitive per JESD22-A114C.01 standard. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.

## Package Dimensions



### NOTES:

1. ALL DIMENSIONS IN MILLIMETERS (INCHES).
2. TOLERANCE IS +/-0.1 mm (+/-0.004 IN.) UNLESS OTHERWISE SPECIFIED.

## Device Selection Guide

| Part Number | Color        | Die Technology | Parts per Reel | Package Description |
|-------------|--------------|----------------|----------------|---------------------|
| HSMA-C130   | Amber        | AllnGaP        | 4000           | Untinted, Diffused  |
| HSMC-C130   | Red          | AllnGaP        | 4000           | Untinted, Diffused  |
| HSME-C130   | Yellow Green | AllnGaP        | 4000           | Untinted, Diffused  |
| HSML-C130   | Orange       | AllnGaP        | 4000           | Untinted, Diffused  |

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

| Parameter                                  | AllnGaP                                     | Units            |
|--|---|------------------|
| DC Forward Current <sup>[1]</sup>          | 20  | mA               |
| Power Dissipation                          | 48  | mW               |
| Reverse Voltage ( $I_R = 100\mu\text{A}$ ) | 5   | V                |
| LED Junction Temperature                   | 95  | $^\circ\text{C}$ |
| Operating Temperature Range                | -40 to +85 $^\circ\text{C}$                 |                  |
| Storage Temperature Range                  | -40 to +85 $^\circ\text{C}$                 |                  |
| Soldering Temperature                      | See reflow soldering profile (Figure 5 & 6) |                  |

Notes:

1. Derate linearly as shown in Figure 4.

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

| Part Number | Forward Voltage<br>$V_F$ (Volts)<br>@ $I_F = 20\text{mA}$ |      | Reverse Breakdown<br>$V_R$ (Volts)<br>@ $I_R = 100\mu\text{A}$ | Thermal Resistance<br>$R_{\theta_{JP}}$ ( $^\circ\text{C}/\text{W}$ )<br>Typical |
|-------------|---|------|--|--|
|             | Typ.  | Max. | Min.   |  |
| HSMA-C130   | 2.05  | 2.40 | 5  | 500  |
| HSMC-C130   | 1.94  | 2.40 | 5  | 500  |
| HSME-C130   | 1.94  | 2.40 | 5  | 500  |
| HSML-C130   | 1.94  | 2.40 | 5  | 500  |

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

| Part Number | Luminous Intensity<br>$I_V$ <sup>[1]</sup> (mcd)<br>@ 20mA |       | Peak Wavelength<br>$\lambda_{\text{peak}}$ (nm)<br>Typical | Color, Dominant Wavelength<br>$\lambda_d$ <sup>[2]</sup> (nm)<br>Typical | Viewing Angle<br>$2\theta_{1/2}$ <sup>[3]</sup><br>(Degrees)<br>Typical |
|-------------|--|-------|--|--|---|
|             | Min.   | Typ.  |  |  |   |
| HSMA-C130   | 28.5   | 87.0  | 591  | 589  | 110   |
| HSMC-C130   | 28.5   | 131.0 | 635  | 626  | 110   |
| HSME-C130   | 18.0   | 54.0  | 575  | 573  | 110   |
| HSML-C130   | 28.5   | 139.0 | 612  | 606  | 110   |

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 LED package.
2. The dominant wavelength,  $\lambda_d$  are derived from the CIE Chromaticity Diagram and represents the perceived color of the device.
3.  $\lambda_{1/2}$  is the off-axis angle where the luminous intensity is  $1/2$  the peak intensity.

### Light Intensity (IV) Bin Limits

| Bin ID | Intensity (mcd) |         |
|--------|-----------------|---------|
|        | Minimum         | Maximum |
| 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  |

Tolerance :  $\pm 15\%$

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 current available bins.

### Forward Voltage Limits

| Bin ID | Forward Voltage (V) |         |
|--------|---------------------|---------|
|        | Minimum             | Maximum |
| 1      | 1.60                | 1.80    |
| 2      | 1.80                | 2.00    |
| 3      | 2.00                | 2.20    |
| 4      | 2.20                | 2.40    |

Tolerance :  $\pm 0.1V$

### AllnGaP Amber Color Bin Limits

| Bin ID | Dominant Wavelength (nm) |         |
|--------|--------------------------|---------|
|        | Minimum                  | Maximum |
| 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 :  $\pm 1nm$

### AllnGaP Red Color Bin Limits

| Bin ID | Dominant Wavelength (nm) |         |
|--------|--------------------------|---------|
|        | Minimum                  | Maximum |
| -      | 620.0                    | 635.0   |

Tolerance :  $\pm 1nm$

### AllnGaP Yellow Green Color Bin Limits

| Bin ID | Dominant Wavelength (nm) |         |
|--------|--------------------------|---------|
|        | Minimum                  | Maximum |
| A      | 561.5                    | 564.5   |
| B      | 564.5                    | 567.5   |
| C      | 567.5                    | 570.5   |
| D      | 570.5                    | 573.5   |
| E      | 573.5                    | 576.5   |

Tolerance :  $\pm 1nm$

### AllnGaP Orange Color Bin Limits

| Bin ID | Dominant Wavelength (nm) |         |
|--------|--------------------------|---------|
|        | Minimum                  | Maximum |
| 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 :  $\pm 1nm$

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 current available bins.

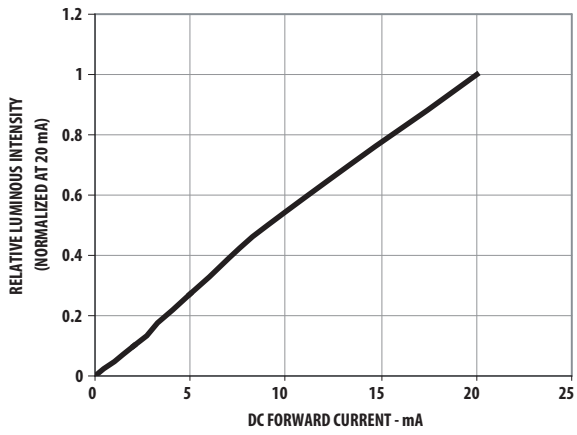


Figure 1. Luminous Intensity vs. Forward Current

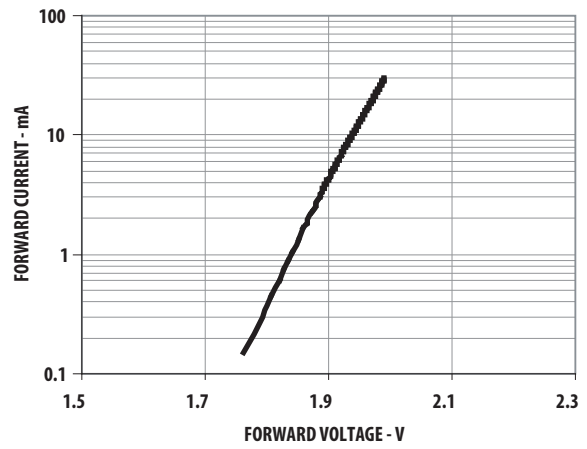


Figure 2. Forward Current vs. Forward Voltage

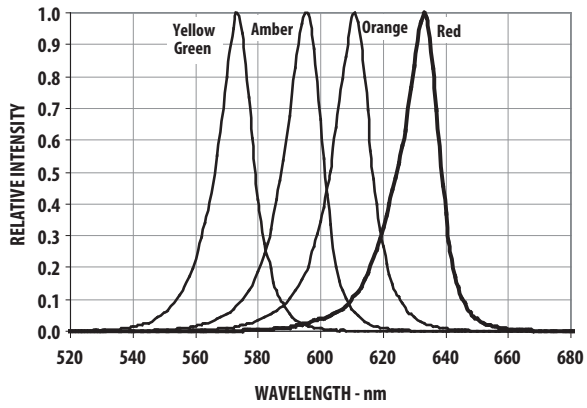


Figure 3. Relative Intensity vs. Peak Wavelength

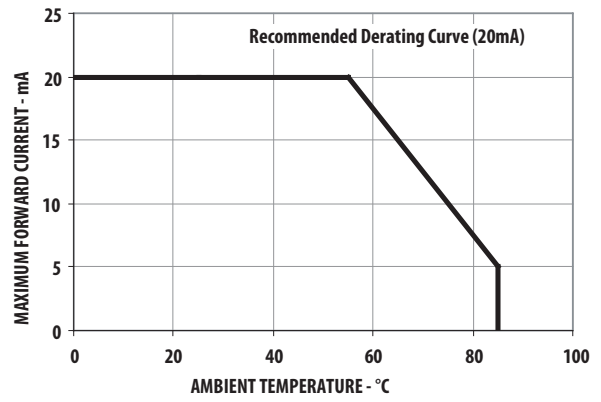


Figure 4. Maximum DC Forward Current vs. Ambient Temperature

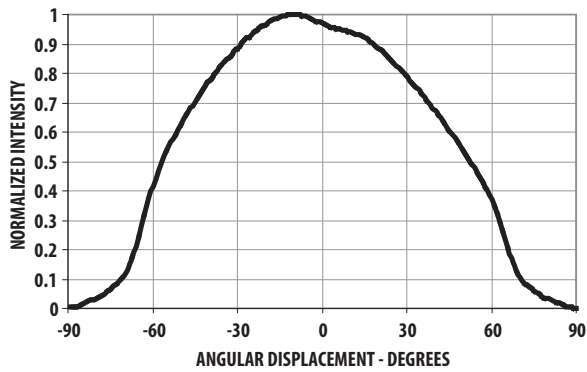


Figure 5. Radiation Pattern

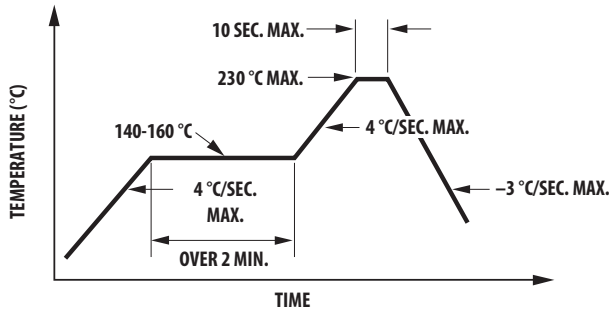


Figure 6. Recommended Lead Reflow Soldering Profile

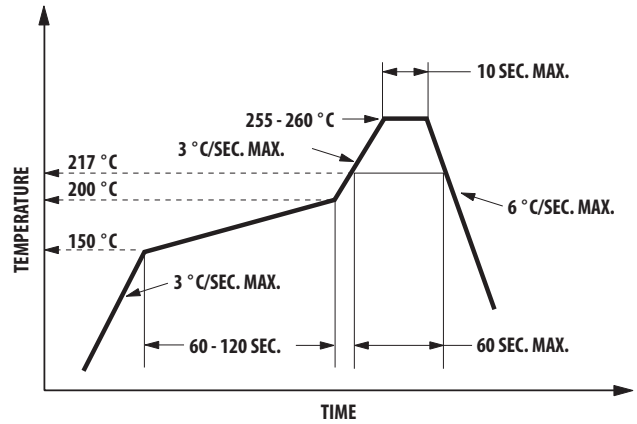


Figure 7. Recommended Pb Free Reflow Soldering Profile

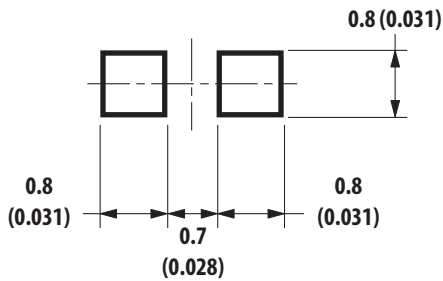


Figure 8. Recommended Soldering Land Pattern

Notes:

1. All dimensions are in millimeters (inches).
2. Tolerance is  $\pm 0.1\text{mm}$  ( $\pm 0.004\text{in.}$ ) unless otherwise specified.

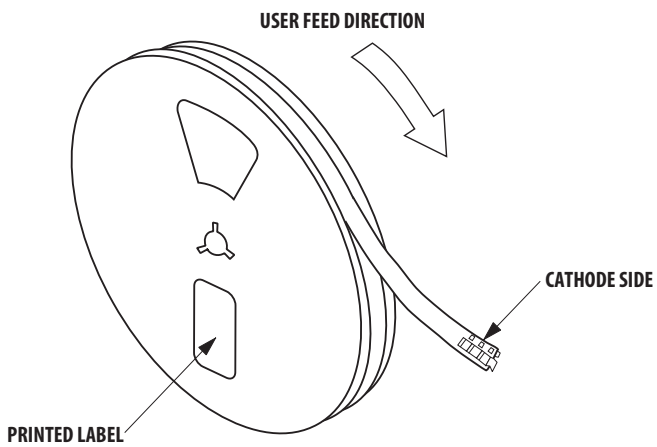


Figure 9. Reeling Orientation

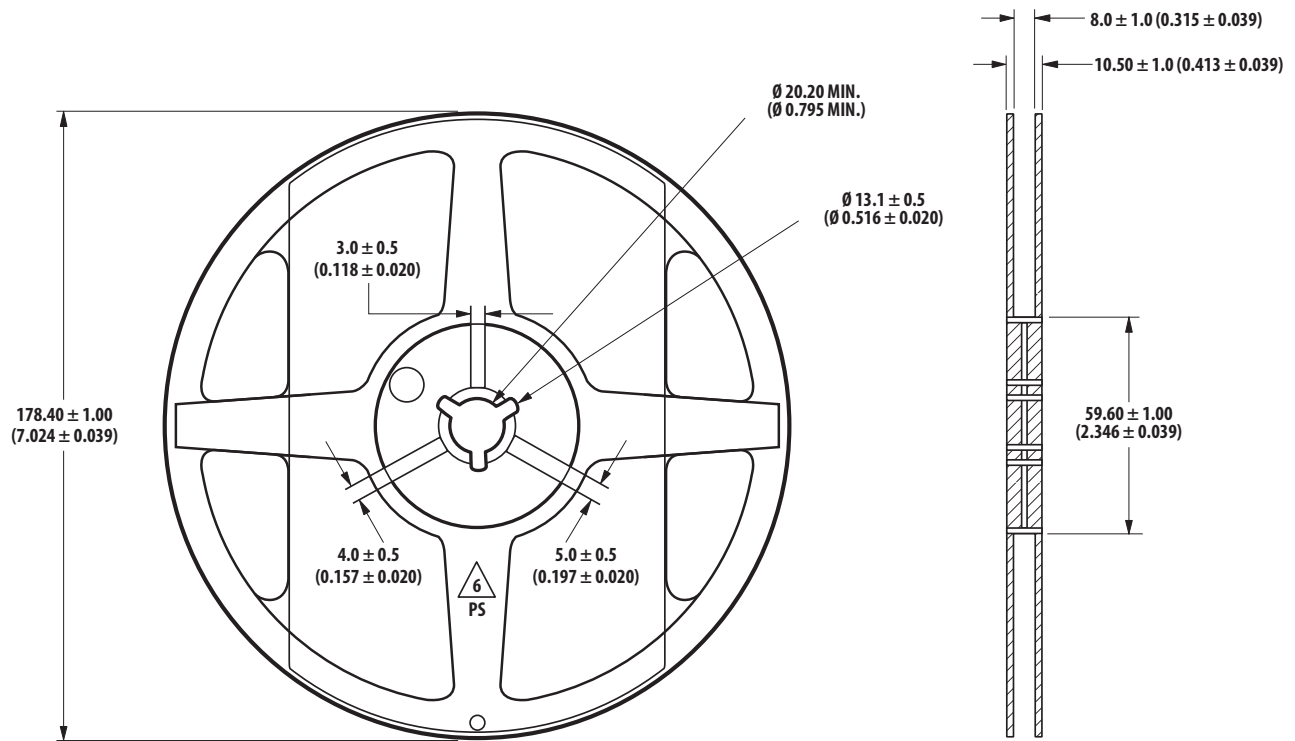


Figure 10. Reel Dimensions

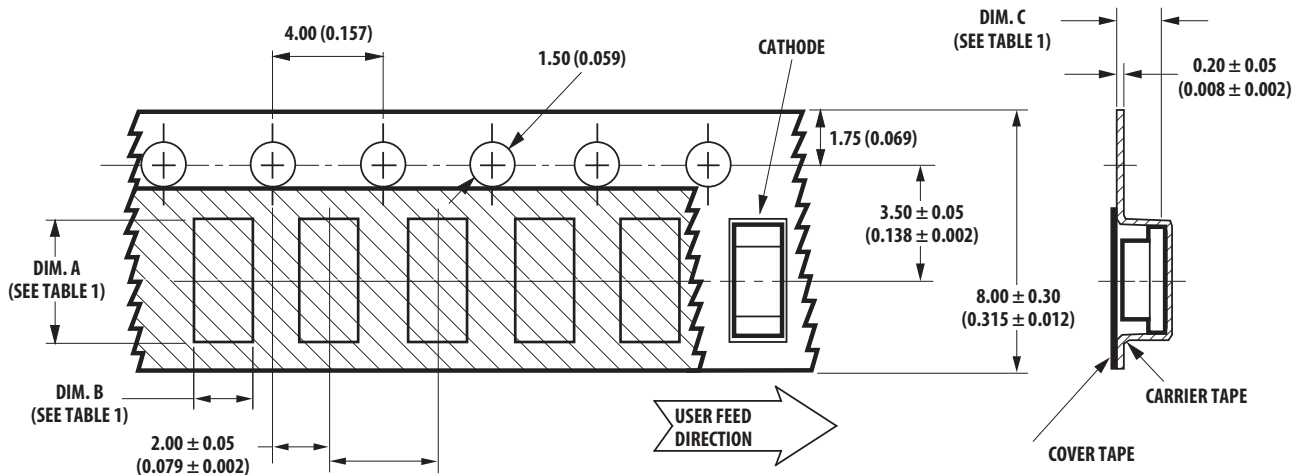


TABLE 1

| PART NUMBER | DIM. A<br>± 0.10 (± 0.004) | DIM. B<br>± 0.10 (± 0.004) | DIM. C<br>± 0.10 (± 0.004) |
|-------------|----------------------------|----------------------------|----------------------------|
| HSMx-C130   | 1.75 (0.069)               | 0.90 (0.035)               | 0.60 (0.024)               |

DIMENSIONS IN MILLIMETERS (INCHES)

Figure 11. Tape Dimensions

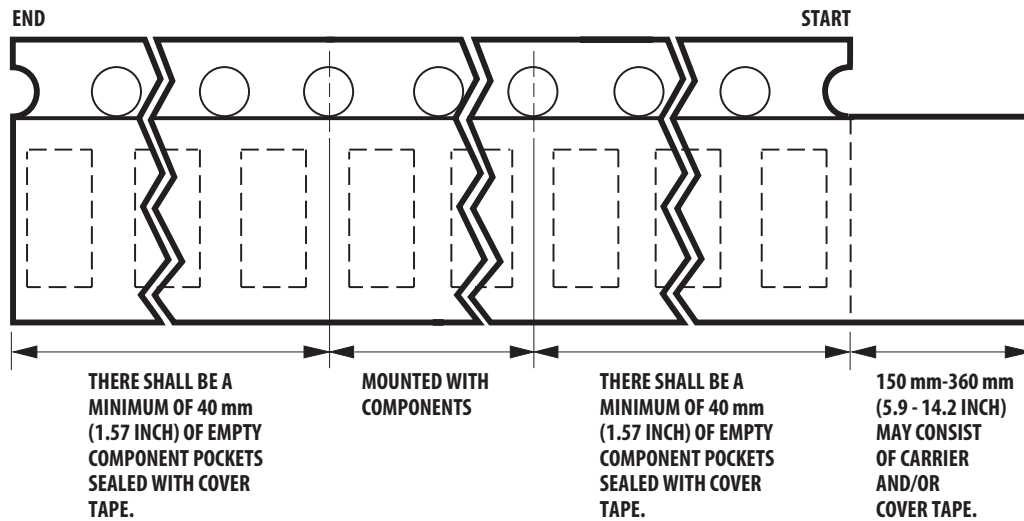


Figure 12. Tape leader and trailer dimensions

### Reflow Soldering:

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

### Storage Condition:

5 to 30°C @ 60%RH max.

Baking is required before mounting, if:

1. Humidity Indicator Card is > 10% when read at 23 ± 5°C.
2. Device expose to factory conditions <30°C/60%RH more than 168 hours.

### Recommended baking condition:

60±5°C for 20 hours.

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