

## HSMQ-C1xx and HSMR-C1xx High-Performance Chip LED



### Description

These Broadcom<sup>®</sup> small chip-type LEDs use high-efficient and high-brightness InGaN material to deliver competitively priced high-performance blue and green. These 520-nm green and 470-nm blue are unique hues that provide color differentiation to a product.

These chipLEDs come in either top-emitting packages (HSMx-C130, C150, C170, C177, C190, C191, C197), in side-emitting packages (HSMx-C110, C120) or in a reverse-mount package (HSMx-C265). The side-emitting package is especially suitable for LCD backlighting application. The top-emitting packages, with their wide viewing angle, are suitable for direct backlighting application or being used with light pipes.

To facilitate pick-and-place operation, these chipLEDs are shipped in tape and reel with 4000 units per reel for HSMx-C120, C130, C170, C177, C190, C191, and C197 packages, and 3000 units per reel for HSMx-C110, C150, and C265 packages. All packages are compatible with IR soldering and binned by both color and intensity.

### Features

- High brightness
- Small size
- Industrial standard footprint
- Diffused optics
- Top-emitting or right-angle emitting
- Compatible with IR soldering
- Compatible for use with light piping
- Available in 8-mm tape on 7-in. diameter reels
- Reel sealed in zip-locked moisture barrier bags

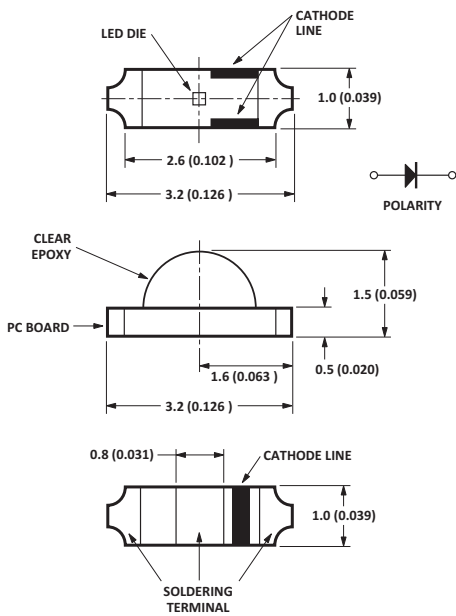
### Applications

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

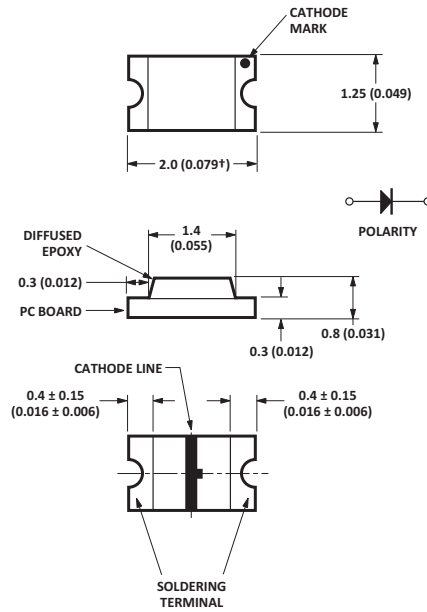
**CAUTION!** HSMQ-Cxxx and HSMR-Cxxx LEDs are Class 1A ESD sensitive per JESD22-A114C.01. Observe appropriate precautions during handling and processing. Refer to Broadcom Application Note AN-1142 for additional details.

# Package Dimensions

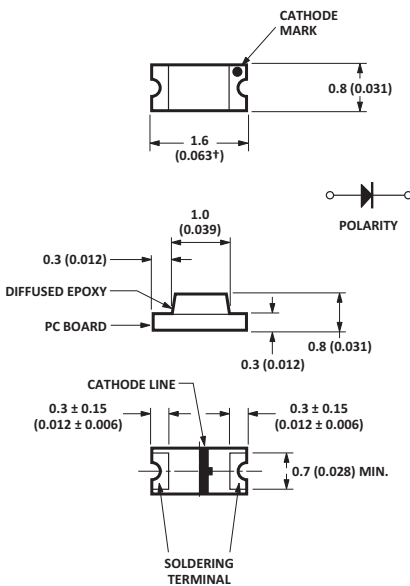
## HSMx-C110



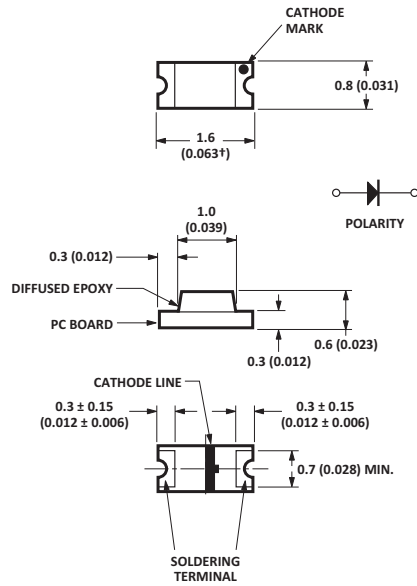
## HSMx-C170



## HSMx-C190



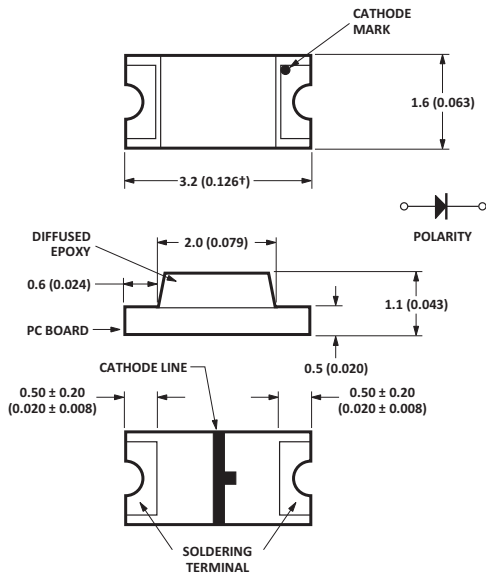
## HSMx-C191



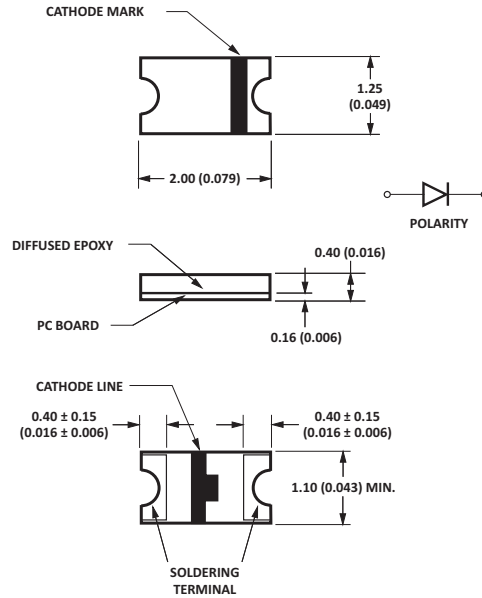
### NOTE:

1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.1 mm (± 0.004 in.) unless otherwise noted.

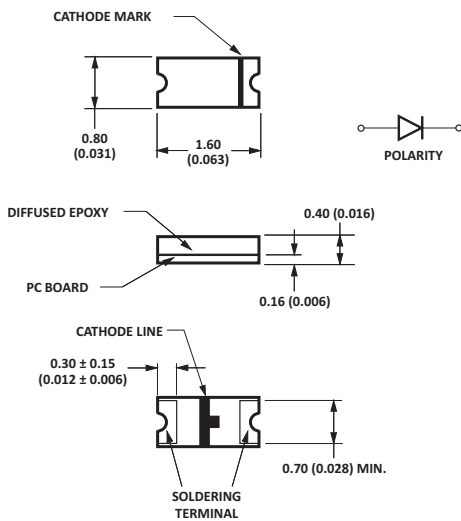
### HSMx-C150



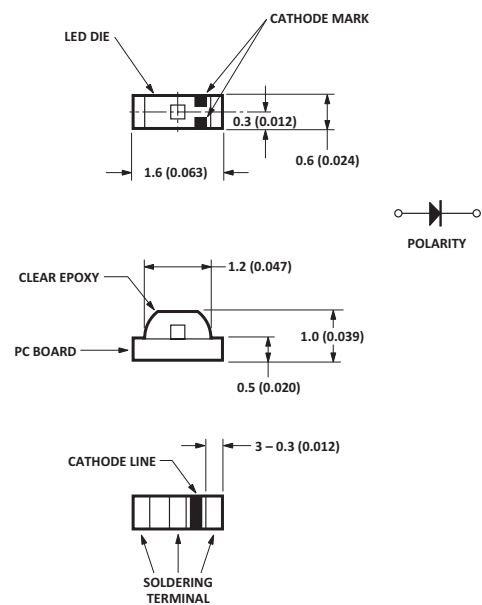
### HSMx-C177



### HSMx-C197



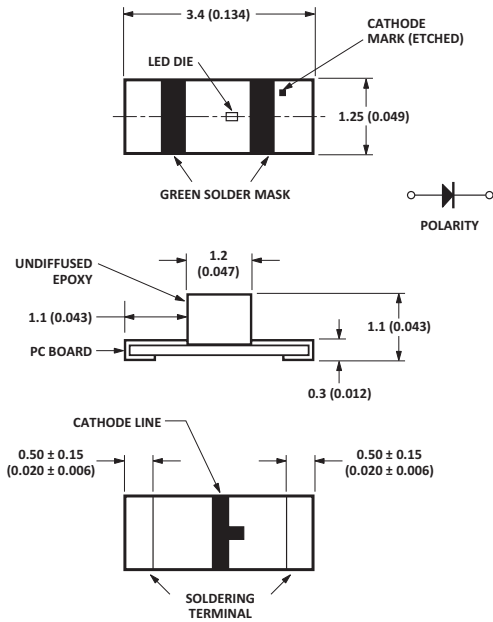
### HSMx-C120



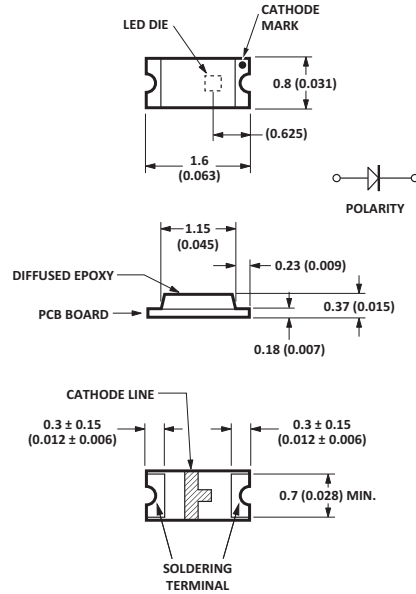
**NOTE:**

1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.1 mm (± 0.004 in.) unless otherwise noted.

## HSMx-C265



## HSMx-C130



**NOTE:**

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

## Device Selection Guide

Package Dimension (mm) <sup>a, b</sup>	InGaN Green	InGaN Blue	Package Description
3.2 (L) × 1.5 (W) × 1.0 (H)	HSMQ-C110	HSMR-C110	Untinted, Non-diffused
1.6 (L) × 1.0 (W) × 0.6 (H)	HSMQ-C120	HSMR-C120	Untinted, Non-diffused
1.6 (L) × 0.8 (W) × 0.37 (H)	—	HSMR-C130	Untinted, Diffused
3.2 (L) × 1.6 (W) × 1.1 (H)	HSMQ-C150	HSMR-C150	Untinted, Diffused
2.0 (L) × 1.25 (W) × 0.8 (H)	HSMQ-C170	HSMR-C170	Untinted, Diffused
2.0 (L) × 1.25 (W) × 0.4 (H)	HSMQ-C177	HSMR-C177	Untinted, Diffused
1.6 (L) × 0.8 (W) × 0.8 (H)	HSMQ-C190	HSMR-C190	Untinted, Diffused
1.6 (L) × 0.8 (W) × 0.6 (H)	HSMQ-C191	HSMR-C191	Untinted, Diffused
1.6 (L) × 0.8 (W) × 0.4 (H)	HSMQ-C197	HSMR-C197	Untinted, Diffused
3.4 (L) × 1.25 (W) × 1.1(H)	HSMQ-C265	HSMR-C265	Untinted, Non-diffused

a. Dimensions are in mm.

b. Tolerance is  $\pm 0.1$  mm unless otherwise noted.

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

Parameter	HSMQ-Cxxx, HSMR-Cxxx	Units
DC Forward Current <sup>a</sup>	20	mA
Power Dissipation	78	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 11 and Figure 12)	

a. Derate linearly as shown in Figure 4.

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

Part Number	Forward Voltage $V_F$ (V) at $I_F = 20 \text{ mA}$ at $I_R = 100 \mu\text{A}$		Reverse Breakdown $V_R$ (V), $f = 1 \text{ MHz}$	Capacitance $C$ (pF), $V_F = 0$ , $R_{\theta\text{J-PIN}}$ ( $^\circ\text{C/W}$ )	Thermal Resistance
	Typ.	Max.	Min.	Typ.	Typ.
HSMQ-C110/C150	3.4	3.9	5	140	450
HSMR-C110/C150	3.4	3.9	5	140	450
HSMQ-C120	3.4	3.9	5	100	450
HSMR-C120/C130	3.4	3.9	5	100	450
HSMQ-C170/C190/C191	3.4	3.9	5	110	300
HSMR-C170/C190/C191	3.4	3.9	5	110	300
HSMQ-C177/C197	3.4	3.9	5	110	350
HSMR-C177/C197	3.4	3.9	5	110	350
HSMQ-C265	3.4	3.9	5	65	300
HSMR-C265	3.4	3.9	5	65	300

$V_F$  tolerance:  $\pm 0.1\text{V}$ .

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

Part Number	Color	Luminous Intensity, $I_V$ (mcd) at 20 mA <sup>a</sup>		Color Peak Wavelength, $\lambda_{\text{PEAK}}$ (nm)	Viewing Dominant Wavelength, $\lambda_D^b$ (nm)	Luminous Angle, $2\theta_{1/2}$ , Degrees <sup>c</sup>	Efficacy, $\eta_V$ , (lm/w)
		Min.	Typ.	Typ.	Typ.	Typ.	Typ.
HSMQ-C110	Green	45	150	520	527	130	500
HSMQ-C120	Green	45	145	520	527	155	500
HSMQ-C150/170/190/191	Green	45	145	520	527	140	500
HSMQ-C177/197	Green	45	145	520	527	130	500
HSMQ-C265	Green	45	140	520	527	150	500
HSMR-C110	Blue	18	60	469	473	130	88
HSMR-C120	Blue	18	55	469	473	155	88
HSMR-C130	Blue	18	55	469	473	145	88
HSMR-C150/170/190/191	Blue	18	55	469	473	140	88
HSMR-C177/197	Blue	18	55	469	473	130	88
HSMR-C265	Blue	18	45	469	473	150	88

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

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

### Blue Color Bins<sup>1</sup>

Bin ID	Dom. Wavelength (nm)	
	Min.	Max.
A	460.0	465.0
B	465.0	470.0
C	470.0	475.0
D	475.0	480.0

Tolerance:  $\pm 1$  nm.

### InGaN Green Color Bins<sup>1</sup>

Bin ID	Dominant Wavelength (nm)	
	Min.	Max.
A	515.0	520.0
B	520.0	525.0
C	525.0	530.0
D	530.0	535.0

Tolerance:  $\pm 1$  nm.

- Bin categories are established for classification of products. Products may not be available in all categories. Contact your Broadcom representative for information on currently available bins.

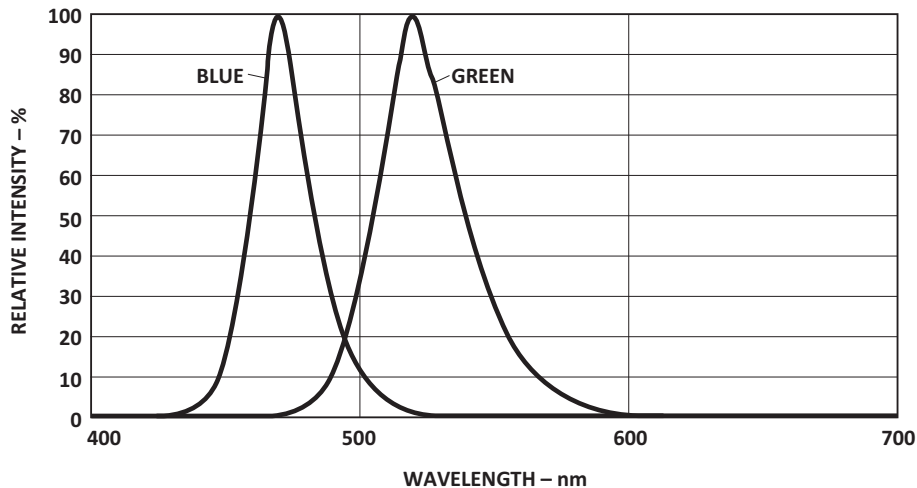
## Light Intensity (Iv) Bin Limits<sup>2, 3</sup>

Bin ID	Intensity (mcd)	
	Min.	Max.
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

Bin ID	Intensity (mcd)	
	Min.	Max.
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

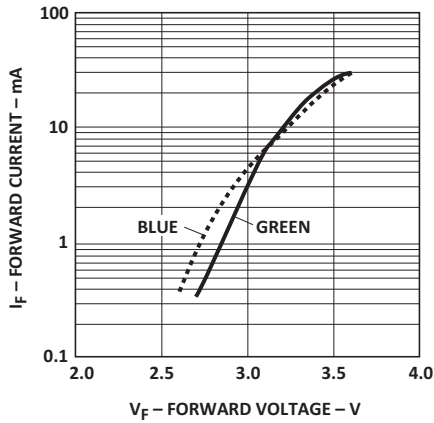
Tolerance:  $\pm 15\%$

Figure 1: Relative Intensity vs. Wavelength

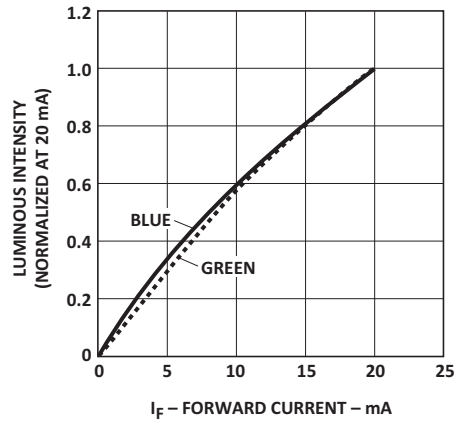


- Bin categories are established for classification of products. Products may not be available in all categories. Contact your Broadcom representative for information on currently available bins.
- The Iv binning specification setup is for lowest allowable Iv binning only. There are no upper Iv bin limits.

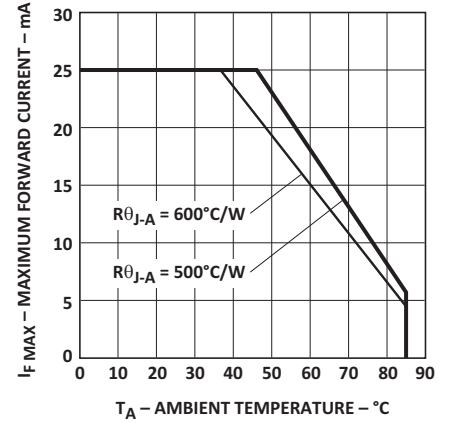
**Figure 2: Forward Current vs. Forward Voltage**



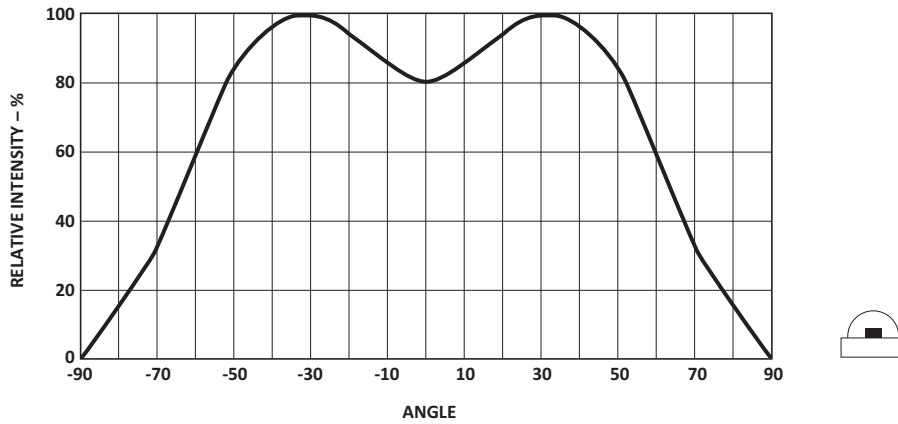
**Figure 3: Luminous Intensity vs. Forward Current**



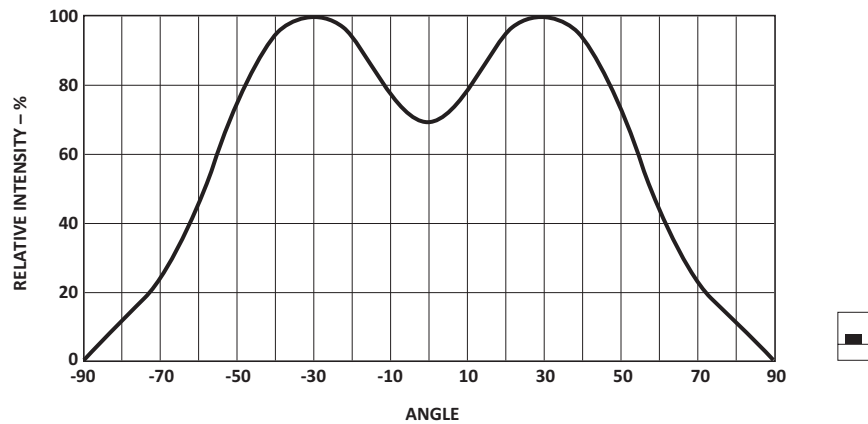
**Figure 4: Maximum Forward Current vs. Ambient Temperature**



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

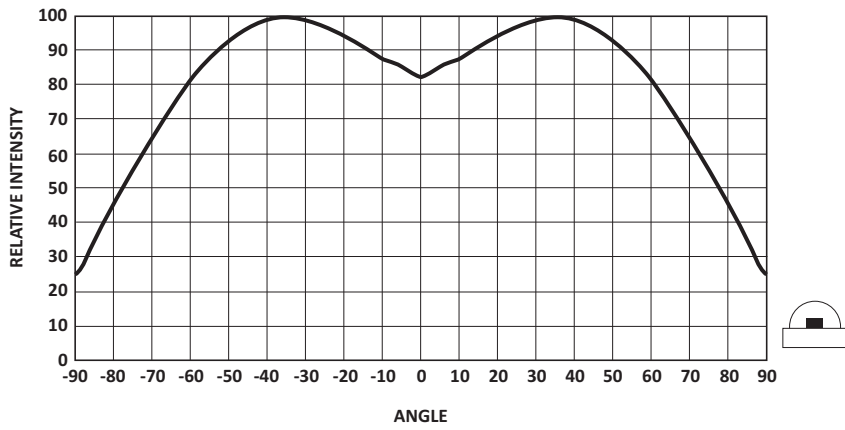


**Figure 6: Relative Intensity vs. Angle for HSMx-C110**

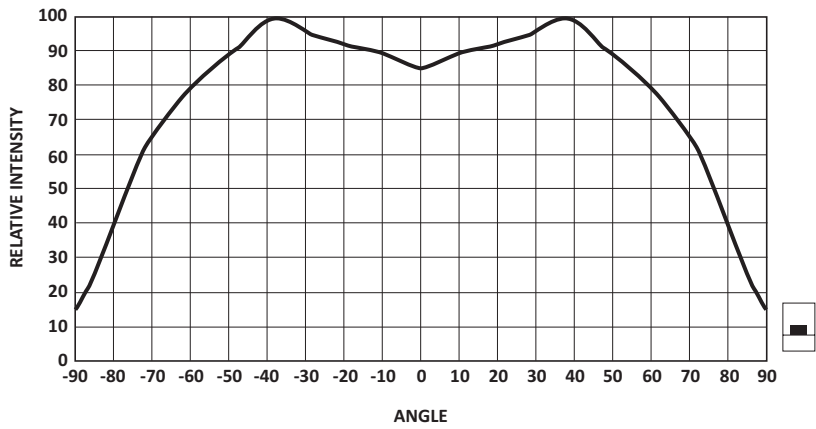




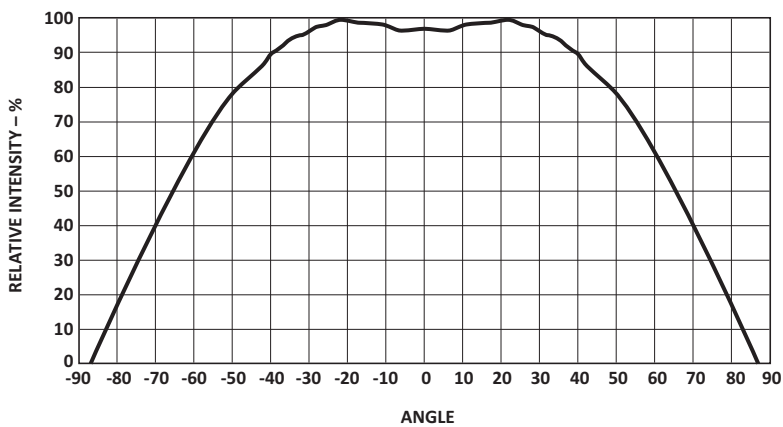
**Figure 7: Relative Intensity vs. Angle for HSMx-C120**



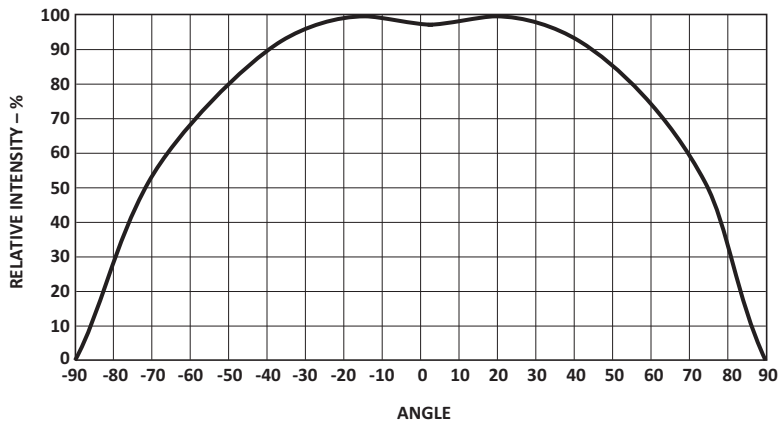
**Figure 8: Relative Intensity vs. Angle for HSMx-C120**



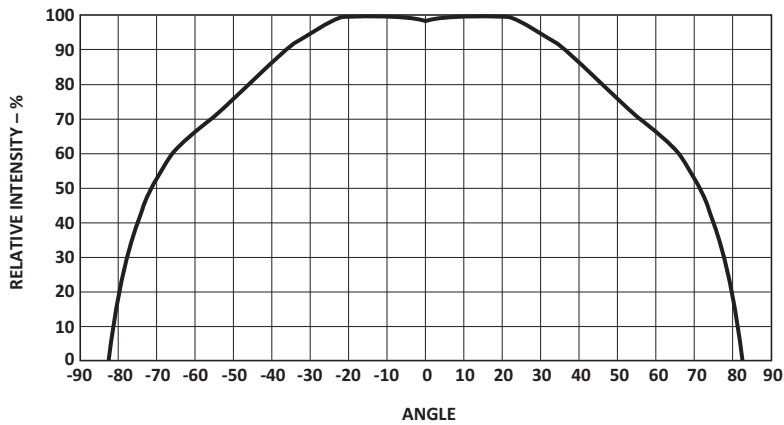
**Figure 9: Relative Intensity vs. Angle for HSMx-C177 and C197**



**Figure 10: Relative Intensity vs. Angle for HSMx-C130**



**Figure 11: Relative Intensity vs. Angle for HSMx-C170, C190, C191, and C150**



**Figure 12: Relative Intensity vs. Angle for HSMx-C265**

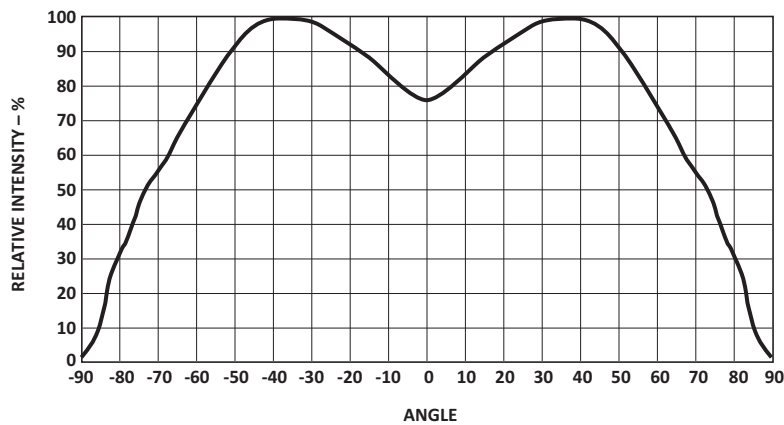


Figure 13: Recommended Reflow Soldering Profile

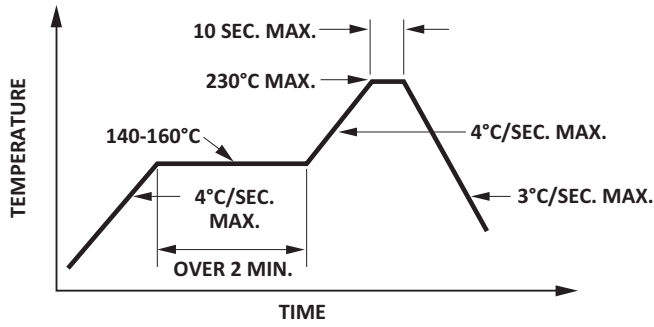


Figure 14: Recommended Pb-free Reflow Soldering Profile

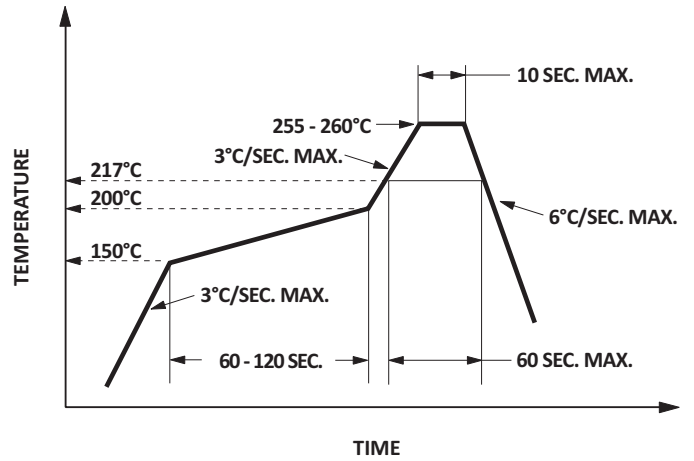


Figure 15: Recommended Soldering Pattern for HSMx-C110

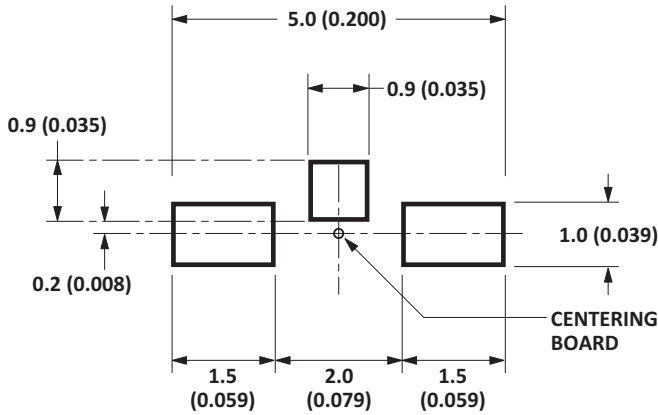


Figure 16: Recommended Soldering Pattern for HSMx-C170/177

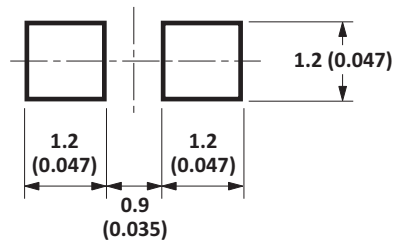


Figure 17: Recommended Soldering Pattern for HSMx-C130/190/191/197

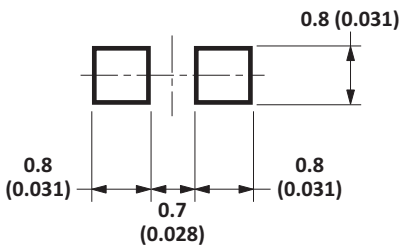
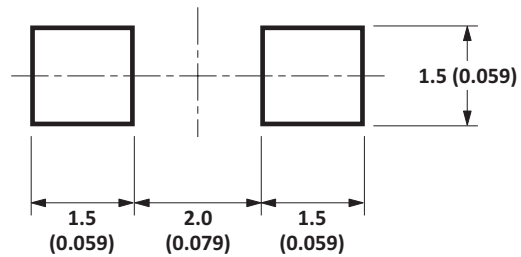


Figure 18: Recommended Soldering Pattern for HSMx-C150



NOTE: All dimensions are in millimeters (inches).

Figure 19: Recommended Soldering Pattern for HSMx-C120

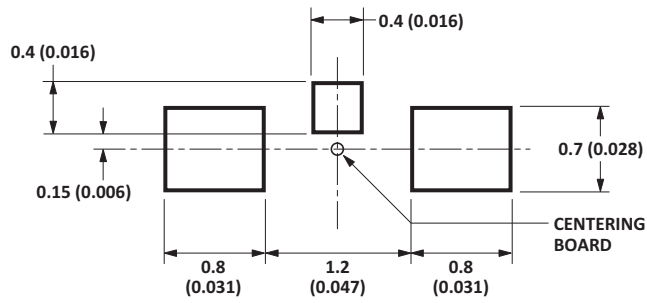
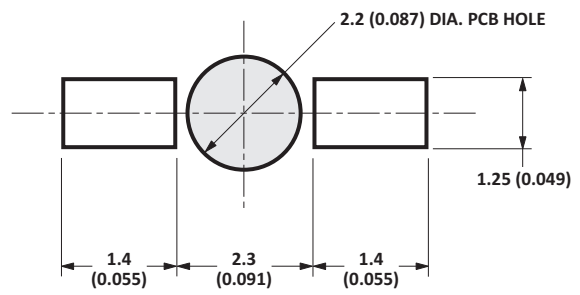


Figure 20: Recommended Soldering Pattern for HSMx-C265



**NOTE:** All dimensions are in millimeters (inches).

Figure 21: Reeling Orientation

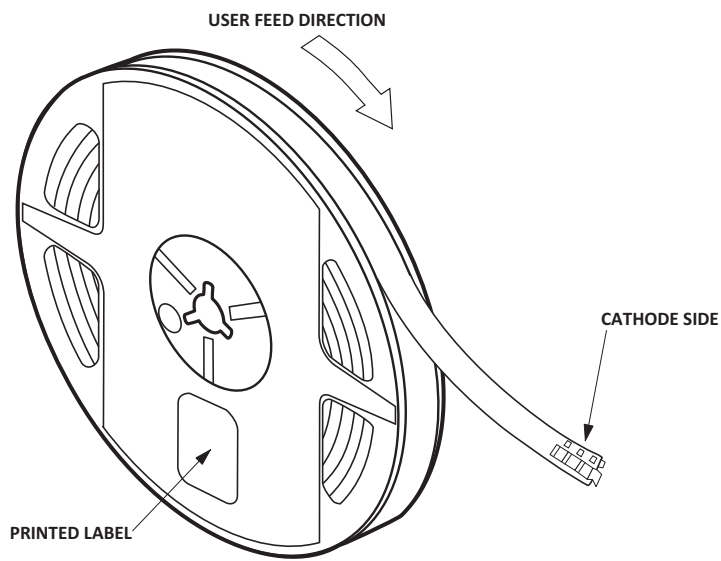
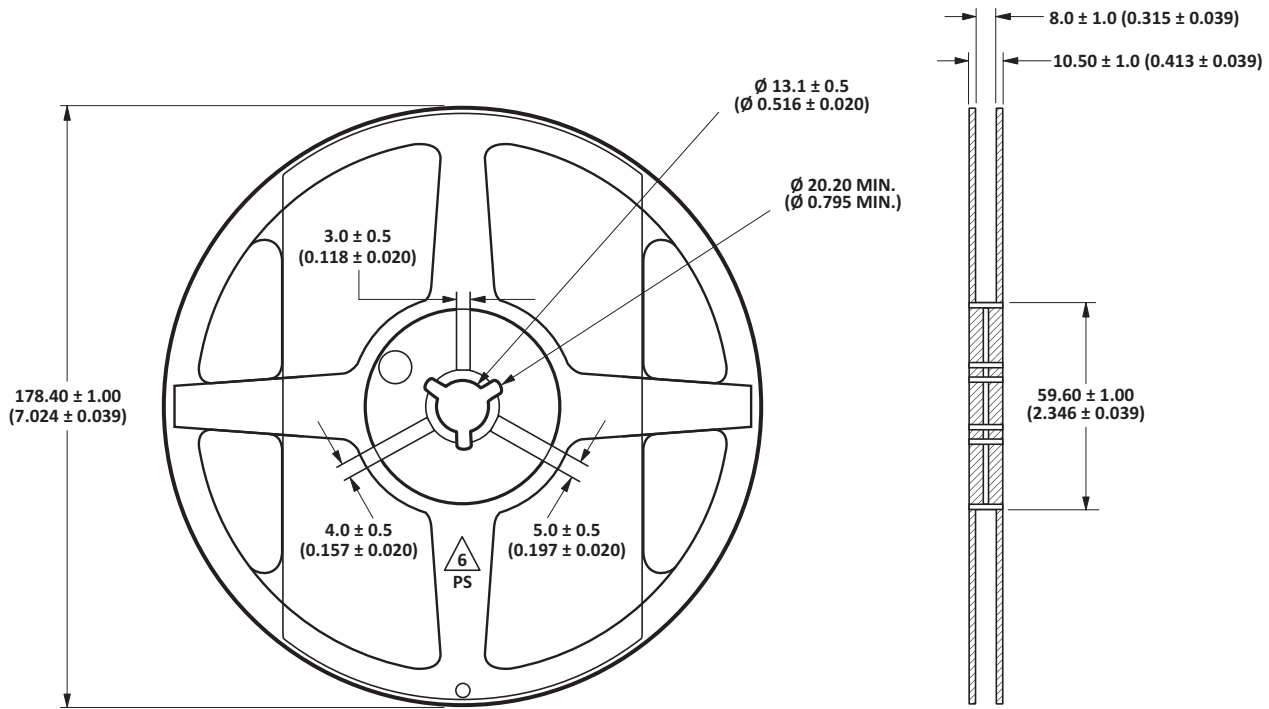


Figure 22: Reel Dimensions



**NOTE:** All dimensions are in millimeters (inches).

Figure 23: Tape Dimensions

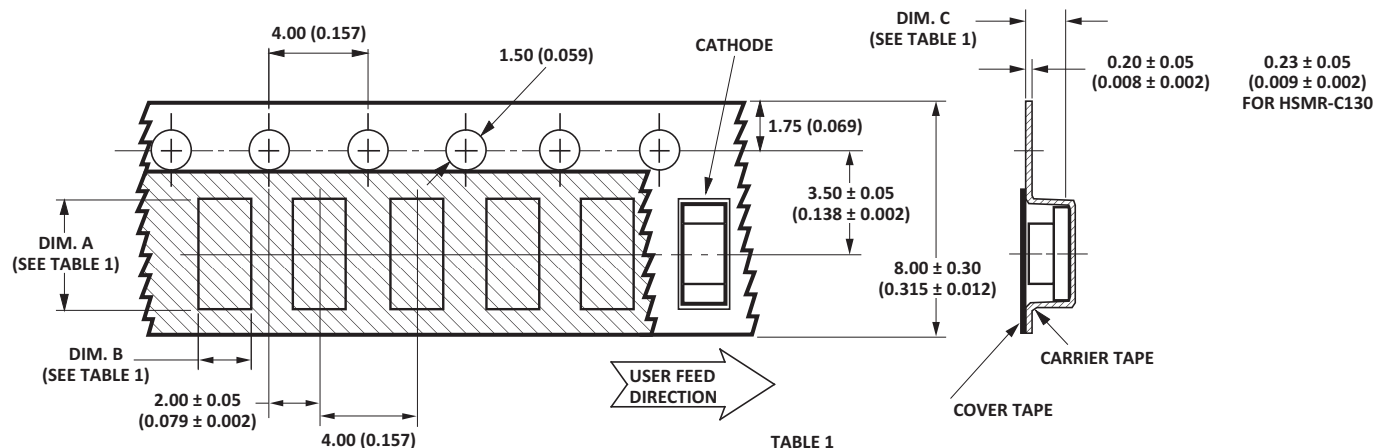


TABLE 1  
DIMENSIONS IN MILLIMETERS (INCHES)

PART NUMBER	DIM. A ± 0.10 (0.004)	DIM. B ± 0.10 (0.004)	DIM. C ± 0.10 (0.004)
HSMx-C110 SERIES	3.40 (0.134)	1.70 (0.067)	1.20 (0.047)
HSMx-C120 SERIES	1.90 (0.075)	1.15 (0.045)	0.75 (0.030)
HSMx-C130 SERIES	1.75 (0.069)	0.88 (0.035)	0.50 (0.020)
HSMx-C150 SERIES	3.50 (0.138)	1.88 (0.074)	1.27 (0.050)
HSMx-C170 SERIES	2.30 (0.091)	1.45 (0.057)	0.95 (0.037)
HSMx-C177 SERIES	2.30 (0.091)	1.40 (0.055)	0.60 (0.024)
HSMx-C190 SERIES	1.75 (0.069)	0.90 (0.035)	0.90 (0.035)
HSMx-C191 SERIES	1.85 (0.073)	0.88 (0.035)	0.85 (0.033)
HSMx-C197 SERIES	1.75 (0.069)	0.95 (0.037)	0.60 (0.024)

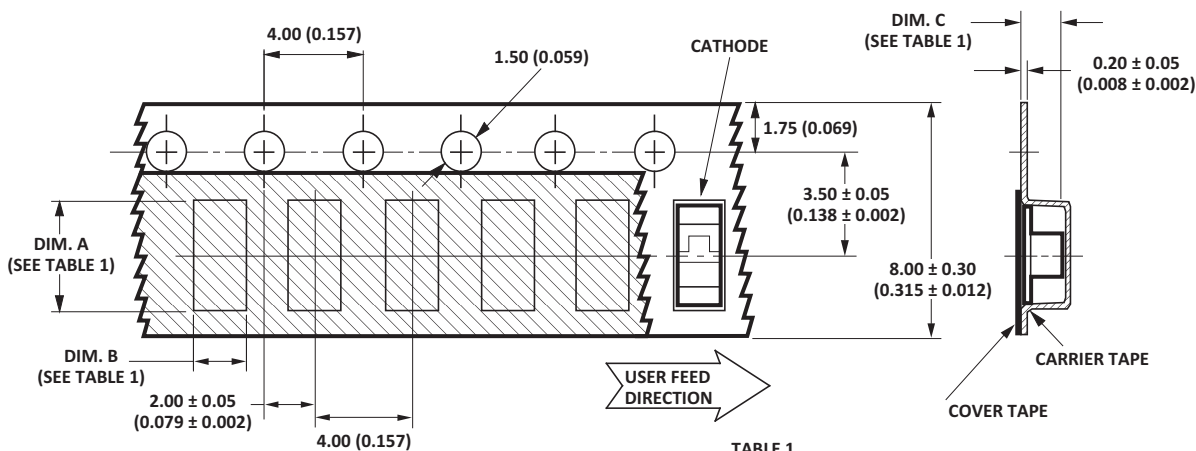
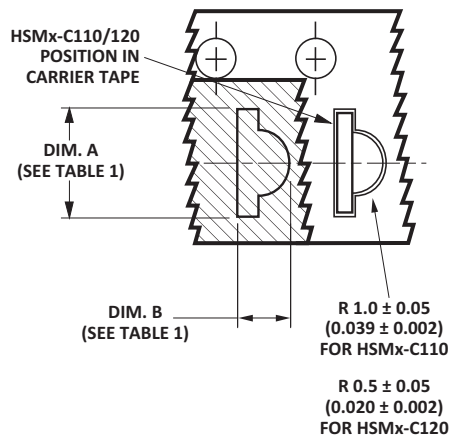
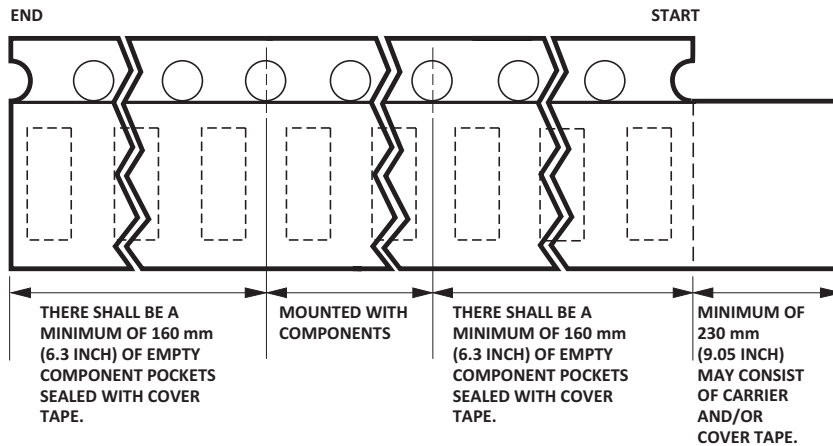


TABLE 1  
DIMENSIONS IN MILLIMETERS (INCHES)

PART NUMBER	DIM. A ± 0.10 (0.004)	DIM. B ± 0.10 (0.004)	DIM. C ± 0.10 (0.004)
HSMx-C265 SERIES	3.70 (0.146)	1.45 (0.057)	1.30 (0.051)

NOTE: All dimensions are in millimeters (inches).

Figure 24: Tape Leader and Trailer Dimensions

**NOTE:**

1. All dimensions are 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°C to 30°C @ 60% RH maximum.

Baking is required under the following conditions:

1. The humidity indicator card is  $>10\%$  when read at 23°C  $\pm 5^\circ\text{C}$ .
2. The device is exposed to factory conditions  $<30^\circ\text{C}/60\%$  RH for more than 672 hours.

Baking recommended conditions: 60°C  $\pm 5^\circ\text{C}$  for 20 hours.

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