

Appendix A

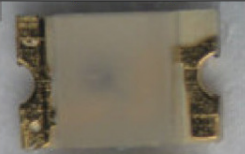
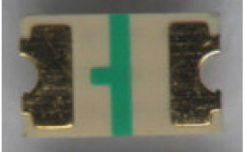
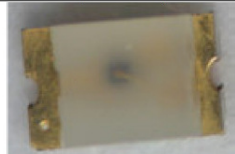
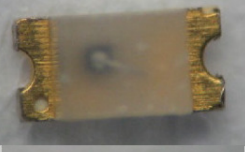
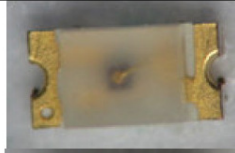
Category 1

HSM-A-C130	HSMZ-C190	QSM-L-C187	QSMW-C135
HSM-A-C170	QSM-A-C179	QSMC-C132	HSMW-C191-000L5
HSM-A-C190	QSM-A-C183	QSM-L-C196	QSMW-C19D
HSM-A-C191	QSM-A-C185	HSM-S-C191-000TW	QSMW-C137
HSMC-C130	QSM-A-C192	QSM-S-C192	QSMW-C138
HSMC-C170	QSM-A-C194	QSM-S-C198	QSMW-C13B
HSMC-C190	QSM-A-C198	QSMY-C173	QSMW-C143
HSMC-C191	QSM-A-C198-000TW	QSMY-C198	QSMW-C146
HSM-D-C170	QSM-A-C19B	QSM-M-C179	QSMW-C149
HSM-D-C190	QSM-A-C19F	QSMN-C185	QSMW-B188
HSM-D-C191	QSM-A-C19K	QSMN-C193	QSMW-B18A
HSM-E-C130	QSM-A-C19A	QSMN-C194	QSMW-B18B
HSM-E-C170	QSM-A-C19H	QSMN-C199	
HSM-E-C190	QSMC-C176	QSMQ-C171	
HSM-E-C191	HSMC-C190-000TW	QSMQ-C195	
HSMG-C170	QSMC-C183	QSMQ-C186	
HSMG-C190	QSMC-C185	QSMQ-C192	
HSMG-C191	QSMC-C192	QSMR-C188	
HSMH-C170	QSMC-C198	QSMR-C19B	
HSMH-C190	QSMC-C199	HSMN-C191-LMYL5	
HSMH-C191	QSMC-C19B	HSMR-C191-J00L5	
HSM-L-C130	QSMC-C19D	QSMN-C182	
HSM-L-C170	QSMC-C19G	QSMN-C183	
HSM-L-C190	QSM-D-C193	QSMN-C186	
HSM-L-C191	QSM-E-C186	QSMR-C116	
HSM-M-C170	QSM-E-C193	QSMR-C13G	
HSM-M-C190	QSM-E-C194	QSMR-C13H	
HSMN-C170	QSM-E-C198	QSMR-C13K	
HSMN-C190	QSM-E-C19A	QSMR-C13B	
HSMN-C191	QSM-E-C19B	QSMR-C13N	
HSMQ-C170	QSM-E-C19D	QSMR-C13Q	
HSMQ-C190	QSM-E-C19F	QSMR-C13T	
HSMQ-C191	HSMG-C190-000C1	QSMR-C13U	
HSMR-C130	QSMG-C174	QSMR-C13S	
HSMR-C170	QSMG-C173	QSMR-C132	
HSMR-C190	QSMG-C193	QSMR-C137	
HSMR-C191	QSMG-C198	QSMR-C140	
HSM-S-C170	QSMG-C199	QSMR-C143	
HSM-S-C190	QSMG-C19E	QSMR-C147	
HSM-S-C191	QSMG-C19L	QSMR-C139	
HSMW-C130	HSMH-C190-000C1	QSMR-C13F	
HSMW-C191	QSMH-C172	QSMR-C13L	
HSMY-C170	QSMH-C174	QSMR-C158	
HSMY-C190	QSMH-C198	QSMR-C199	
HSMY-C191	QSM-L-C19D	QSMR-C19C	

Category 2:

HSMA-C170	QSMN-C182
HSMA-C190	QSMN-C183
HSMA-C191	QSMN-C186
HSMC-C170	HSMN-C191-LMYL5
HSMC-C190	QSMR-C158
HSMC-C191	QSMR-C199
HSME-C170	HSMR-C191-J00L5
HSME-C190	QSMR-C19C
HSME-C191	QSMW-B188
HSMZ-C190	QSMW-B18A
QSMC-C176	QSMW-B18B
HSMC-C190-000TW	QSMW-C19D
QSMA-C19A	HSMW-C191-000L5
QSMA-C19H	QSMR-C116
QSMA-C183	QSMR-C132
QSMA-C185	QSMR-C137
QSMA-C192	QSMR-C139
QSMA-C194	QSMR-C13B
QSMA-C198	QSMR-C13F
QSMA-C198-000TW	QSMR-C13G
QSMA-C19B	QSMR-C13H
QSMA-C19F	QSMR-C13K
QSMA-C19K	QSMR-C13L
QSMC-C183	QSMR-C13N
QSMC-C185	QSMR-C13Q
QSMC-C192	QSMR-C13S
QSMC-C198	QSMR-C13T
QSMC-C199	QSMR-C13U
QSMC-C19B	QSMR-C140
QSMC-C19D	QSMR-C143
QSMC-C19G	QSMR-C147
QSME-C186	QSMW-C135
QSME-C193	QSMW-C137
QSME-C194	QSMW-C138
QSME-C198	QSMW-C13B
QSME-C19A	QSMW-C143
QSME-C19B	QSMW-C146
QSME-C19D	QSMW-C149
QSME-C19F	

Appendix B:

Package type	LED from existing site (Taiwan)	LED from existing site (China)	LED from new site (China)
C170	 	 	 
C190	 	 	 
C191	 	 	 
C130	 	 	 



Appendix C: Example of product data sheet

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 nm Red for AS AlInGaP and 631 nm red for TS 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

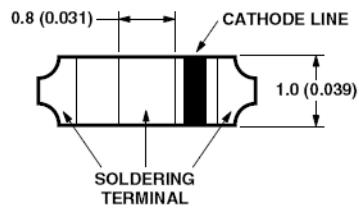
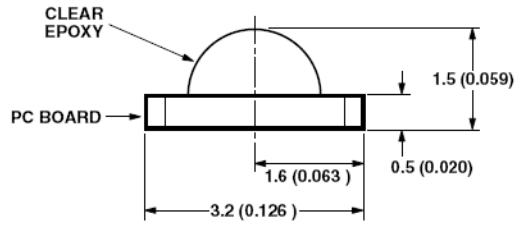
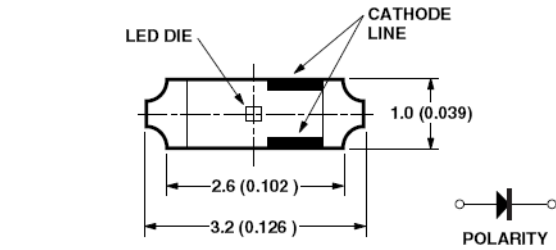
- High brightness AlInGaP material
- Small size
- Industry standard footprint
- Diffused optics
- Top emitting or right angle emitting
- Available in 3 colors (red, orange, amber)
- Compatible with IR soldering
- Available in 8 mm tape on 7" diameter reel
- Reel sealed in zip locked moisture barrier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

Applications

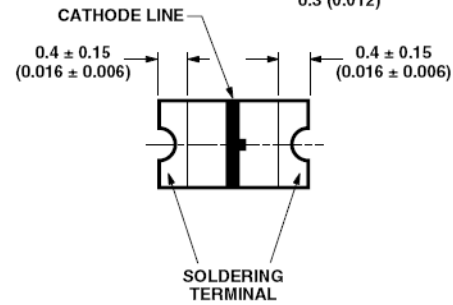
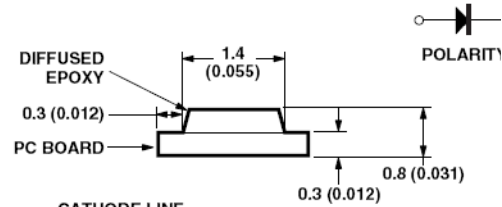
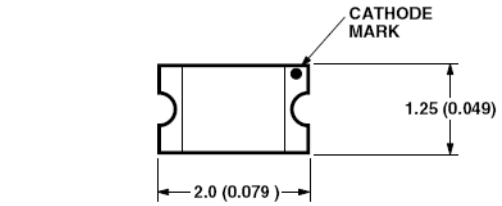
- LCD backlighting
- Push button backlighting
- Front panel indicator
- Symbol indicator
- Microdisplays
- Small message panel signage

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.

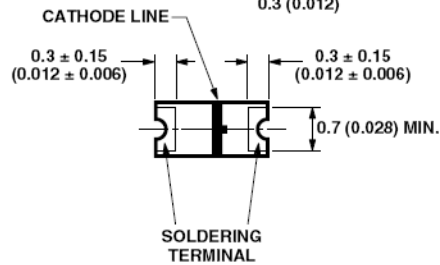
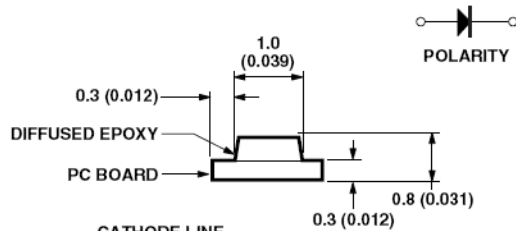
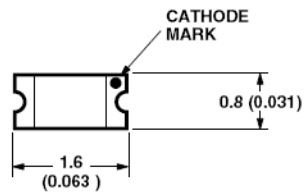
Package Dimensions



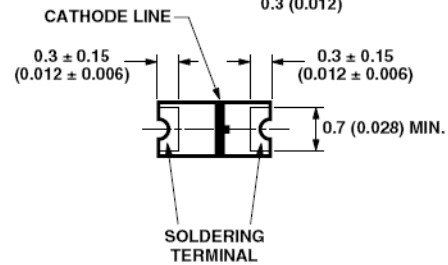
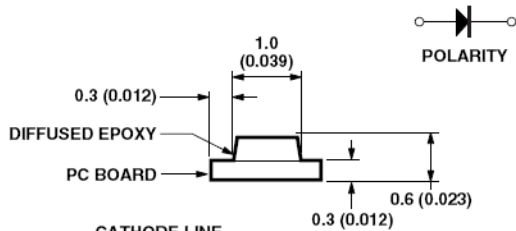
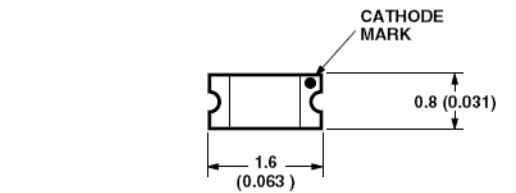
HSMx-C110



HSMx-C170



HSMx-C190

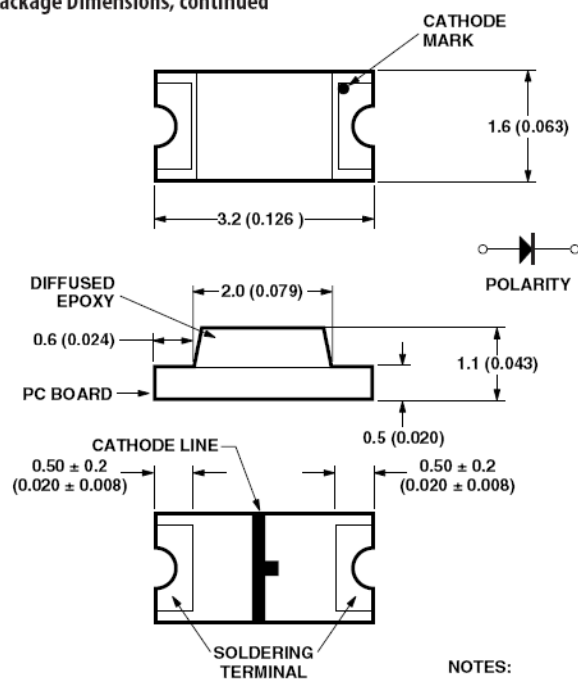


HSMx-C191

NOTES:

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

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	TS 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	HSMA-C110/170/190/191/150 HSML-C110/170/190/191/150 HSMC-C110/170/190/191/150	HSMZ-C110/170/190	Units
DC Forward Current ^[1,2]	25	25	mA
Power Dissipation	60	65	mW
Reverse Voltage (I _R = 100 μ A)	5	5	V
LED Junction Temperature	95	95	°C
Operating Temperature Range	-30 to +85	-30 to +85	°C
Storage Temperature Range	-40 to +85	-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.



Electrical Characteristics

$T_A = 25^\circ\text{C}$

Parameter Number	Forward Voltage V_F (Volts) @ $I_F = 20\text{ mA}$		Reverse Breakdown V_R (Volts) @ $I_R = 100\text{ }\mu\text{A}$	Capacitance C (pF), $V_F = 0$, $f = 1\text{ MHz}$	Thermal Resistance $R_{\theta J-PIN} = (^\circ\text{C/W})$
	Typ.	Max.	Min.	Typ.	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

$T_A = 25^\circ\text{C}$

Part Number	Color	Luminous Intensity I_v (mcd) @ $20\text{ mA}^{[1]}$		Peak Wavelength λ_{peak} (nm)	Color, Dominant Wavelength $\lambda_d^{[2]}$ (nm)	Viewing Angle $2\theta_{1/2}$ Degrees ^[3]	Luminous Efficacy η_v (lm/w)
		Min.	Typ.	Typ.	Typ.	Typ.	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	TS Red	45	170	643	631	130	122
HSMZ-C170/190	TS 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, λ_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.



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: $\pm 15\%$.

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 currently available bins.
2. The Iv binning specification set-up is for lowest allowable Iv binning only. There are no upper Iv bin limits.

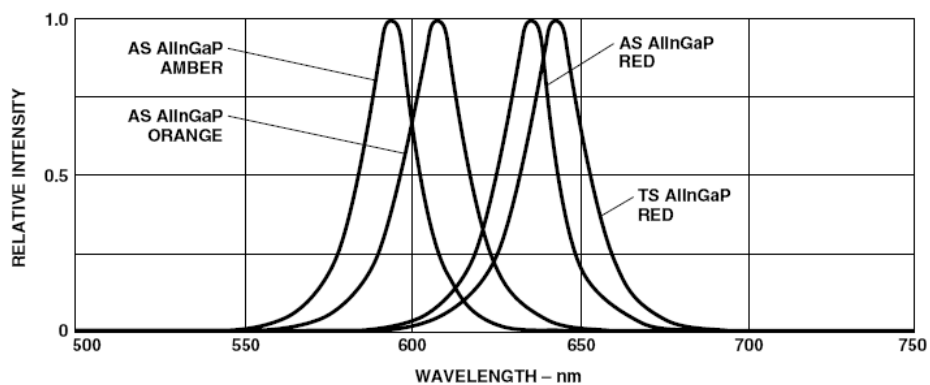


Figure 1. Relative intensity vs. wavelength.

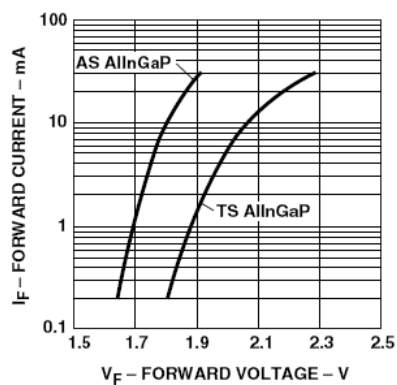


Figure 2. Forward current vs. forward voltage.

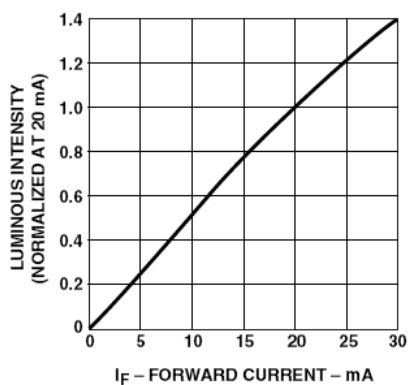


Figure 3. Luminous intensity vs. forward current.

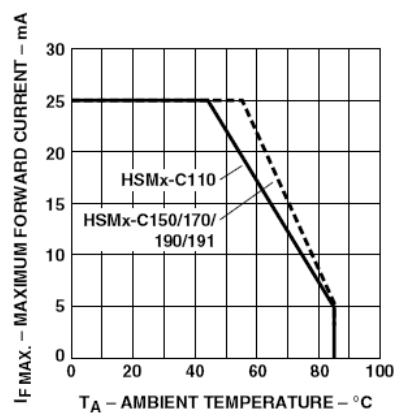


Figure 4. Maximum forward current vs. ambient temperature.

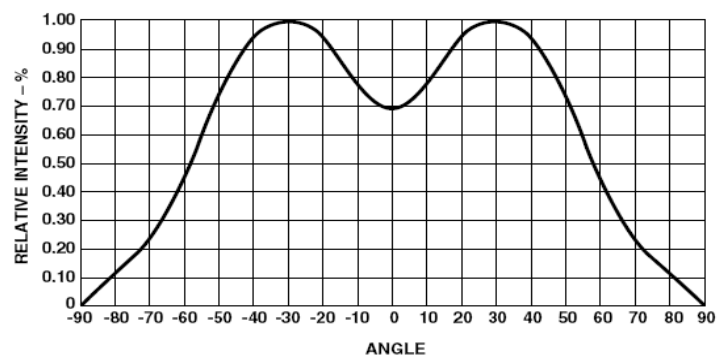
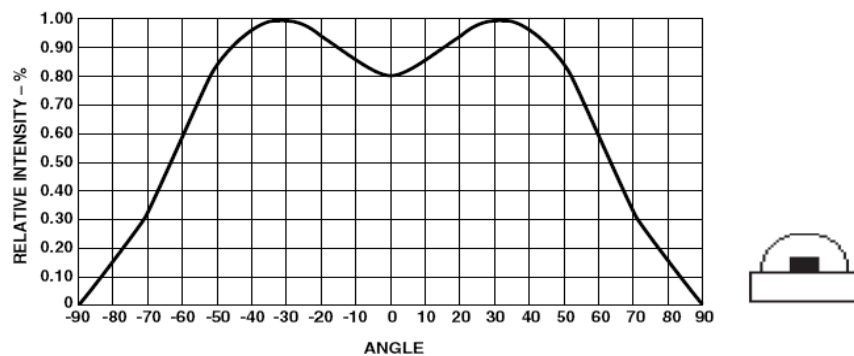


Figure 5. Relative intensity vs. angle for HSMx-C110.

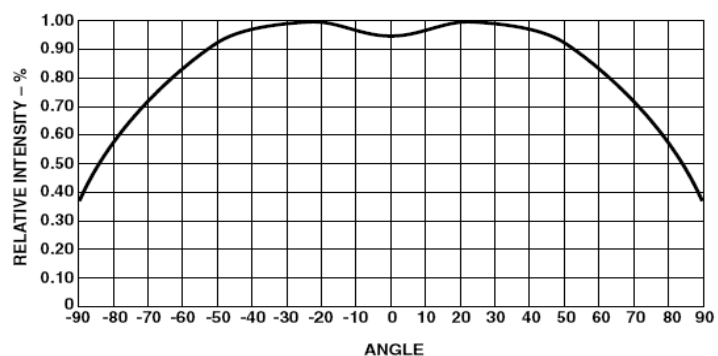


Figure 6. Relative intensity vs. angle for HSMx-C170, C190, C191, and C150.

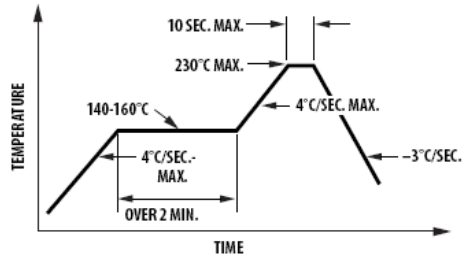


Figure 7. Recommended reflow soldering profile.

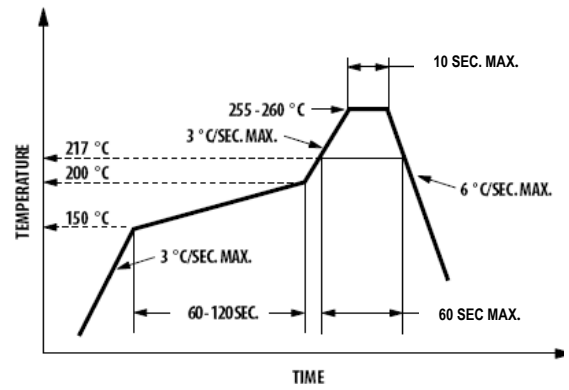


Figure 8. Recommended Pb-free reflow soldering profile.

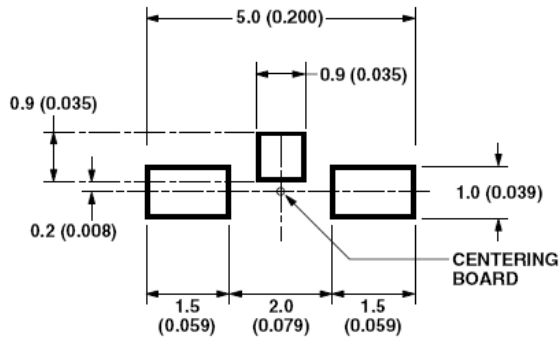


Figure 9. Recommended soldering pattern for HSMx-C110.

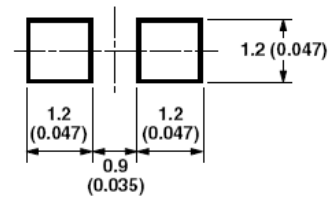


Figure 10. Recommended soldering pattern for HSMx-C170.

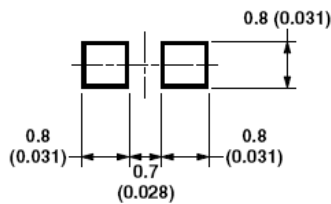


Figure 11. Recommended soldering pattern for HSMx-C190 and C191.

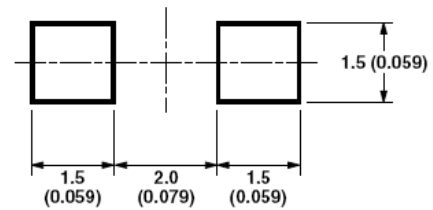


Figure 12. Recommended soldering pattern for HSMx-C150.

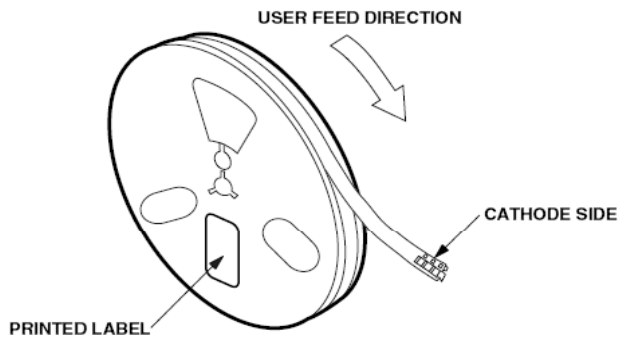


Figure 13. Reeling orientation.

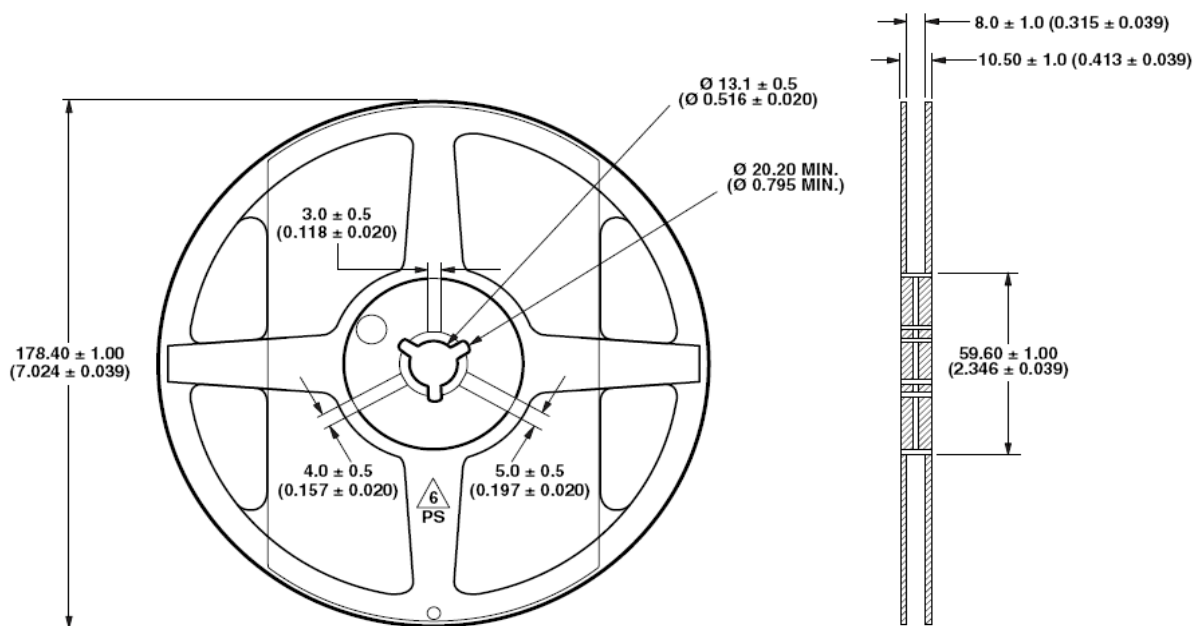


Figure 14. Reel dimensions.

Note: All dimensions in millimeters (inches).

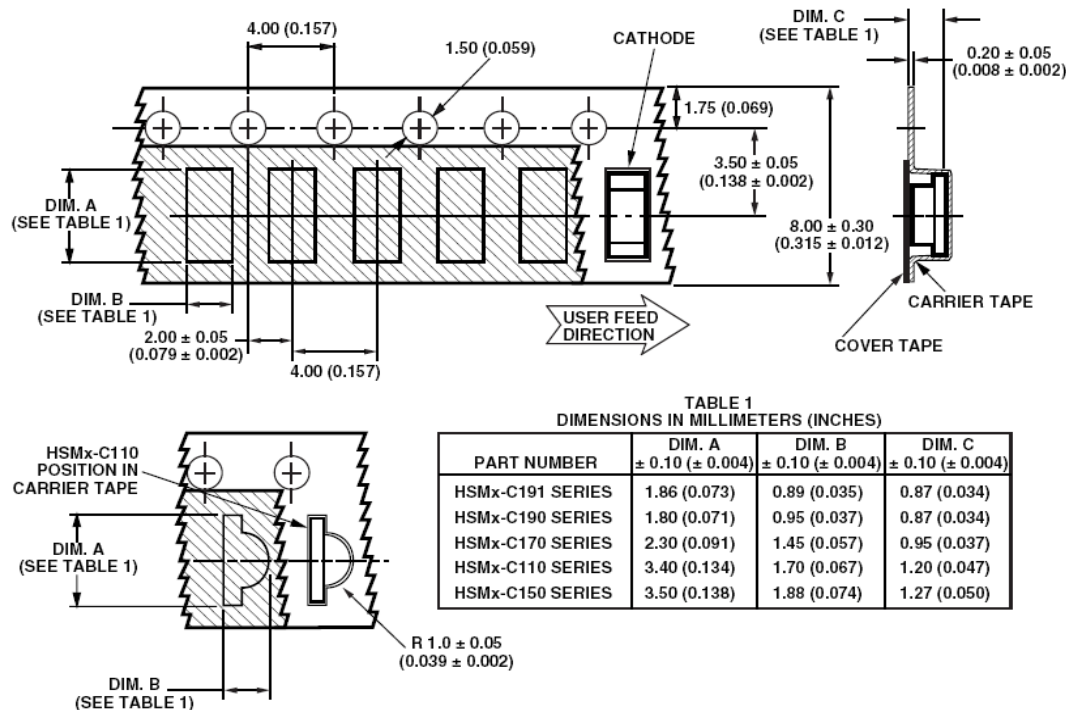


Figure 15. Tape dimensions.

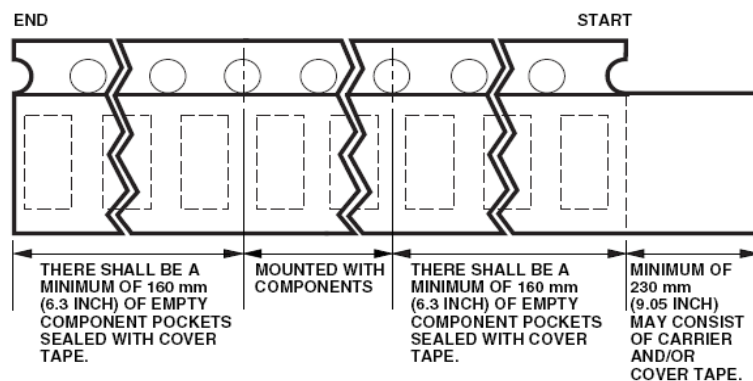


Figure 16. Tape leader and trailer dimensions.

NOTES:

- ALL DIMENSIONS IN MILLIMETERS (INCHES).
- 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:

- Humidity Indicator Card is >10% when read at 23±5°C.
- 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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