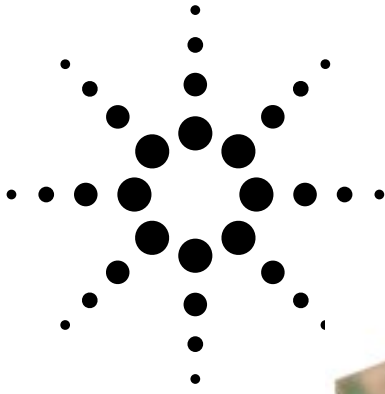


# Agilent HSMF-C165, C166, C167 Miniature Bi-Color Surface Mount Chip LEDs Data Sheet



## Description

The HSMF-C16x series of bicolor chip-type LEDs is designed in an ultra small package for miniaturization. It is the first of its kind to achieve such small packaging for 2 dies.

The small size, narrow footprint, and low profile make this series of LEDs excellent for backlighting, status indication, and front panel illumination applications.

## Features

- Small 1.6 x 0.8 mm footprint
- Diffused optics
- Operating temperature range of  $-30^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Compatible with reflow soldering
- Three color combinations available: red/green, yellow/green, orange/green
- Available in 8 mm tape on 7" (178 mm) diameter reels

## Applications

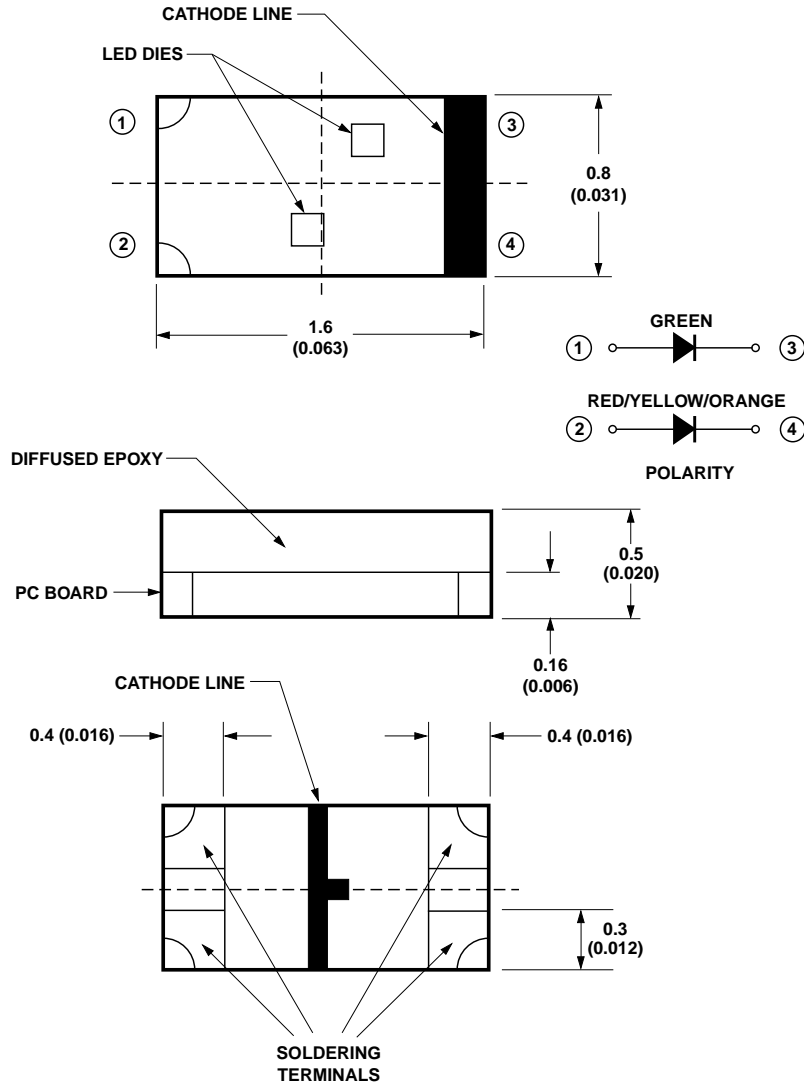
- Keypad backlighting
- Symbol backlighting
- LCD backlighting
- Status indication
- Front panel indicator

## Device Selection Guide

Part Number	Color	Parts per Reel
HSMF-C165	High Efficiency Red/Green	4000
HSMF-C166	Yellow/Green	4000
HSMF-C167	Orange/Green	4000



# Package Dimensions



- NOTES:**
1. ALL DIMENSIONS IN MILLIMETERS (INCHES).
  2. TOLERANCE IS  $\pm 0.1$  mm ( $\pm 0.004$  IN.) UNLESS OTHERWISE SPECIFIED.

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

Parameter	HSMF-C165/166/167	Units
DC Forward Current [1]	20	mA
Peak Pulsing Current[2]	100	mA
Power Dissipation	52	mW
Reverse Voltage ( $I_R = 100 \mu\text{A}$ )	5	V
LED Junction Temperature	95	$^\circ\text{C}$
Operating Temperature Range	-30 to +85	$^\circ\text{C}$
Storage Temperature Range	-40 to +85	$^\circ\text{C}$
Soldering Temperature	See reflow soldering profile (Figure 6)	

**Notes:**

1. Derate linearly as shown in Figure 4.
2. Pulse condition of 1/10 duty and 0.1 ms width.

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

Color	Forward Voltage $V_F$ (Volts) @ $I_F = 20 \text{ mA}$		Reverse Breakdown $V_R$ (Volts) @ $I_R = 100 \mu\text{A}$	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.
HER	2.1	2.6	5	5	325
Orange	2.2	2.6	5	7	325
Yellow	2.1	2.6	5	6	325
Green	2.2	2.6	5	9	325

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

Color	Luminous Intensity $I_V$ (mcd) @ 20 mA[1]		Peak Wavelength $\lambda_{\text{peak}}$ (nm)	Color, Dominant Wavelength $\lambda_d$ [2] (nm)	Viewing Angle $2 \theta_{1/2}$ Degrees[3]
	Min.	Typ.	Typ.	Typ.	Typ.
HER	2.5	10.0	630	626	120
Orange	2.5	8.0	605	604	120
Yellow	2.5	8.0	589	586	120
Green	4.0	15.0	570	572	120

**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.

**Color Bin Limits**

**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

**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
E	591.5	595.0
F	594.0	597.5

**Light Intensity (Iv) 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.

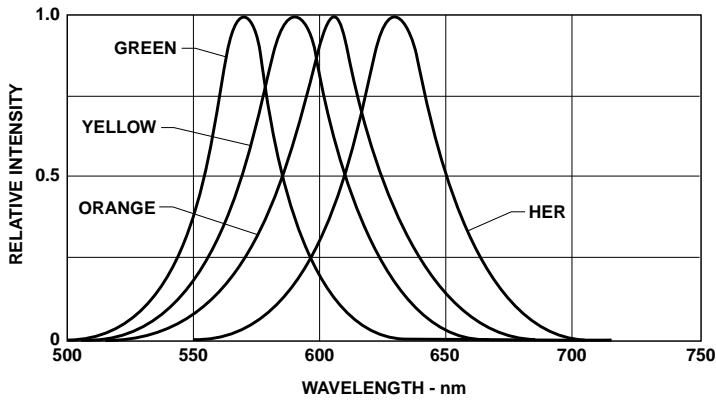


Figure 1. Relative intensity vs. wavelength.

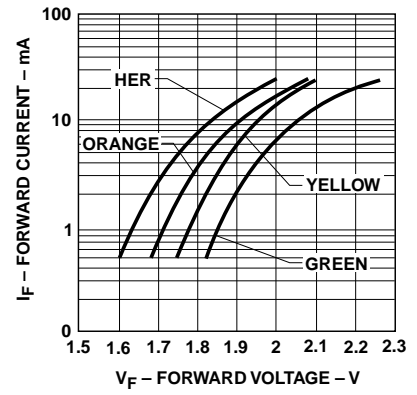


Figure 2. Forward current vs. forward voltage.

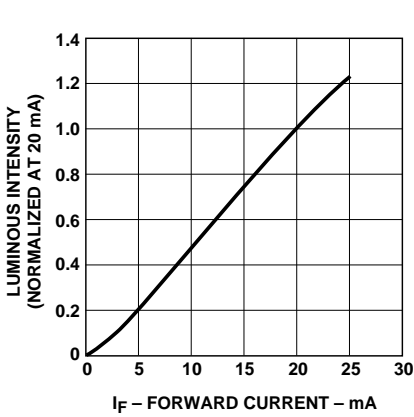


Figure 3. Luminous intensity vs. forward current.

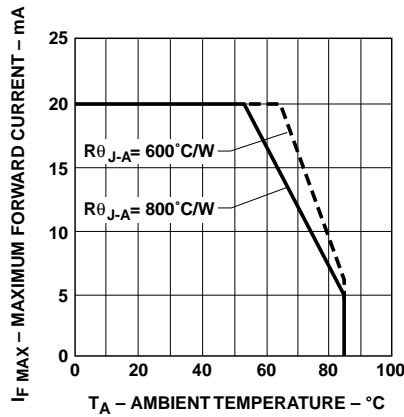


Figure 4. Maximum forward current vs. ambient temperature.

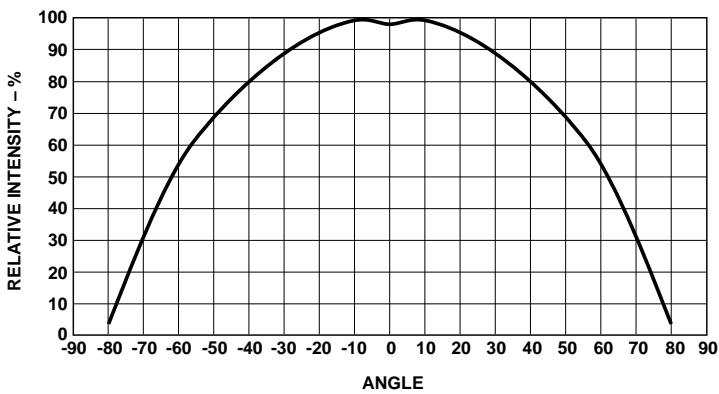


Figure 5. Relative intensity vs. angle.

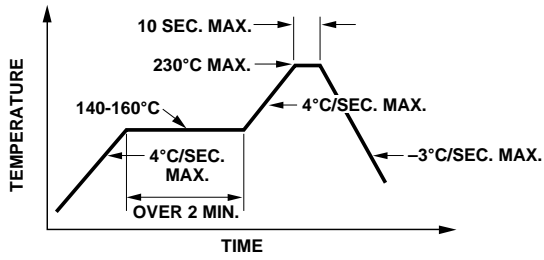


Figure 6. Recommended reflow soldering profile.

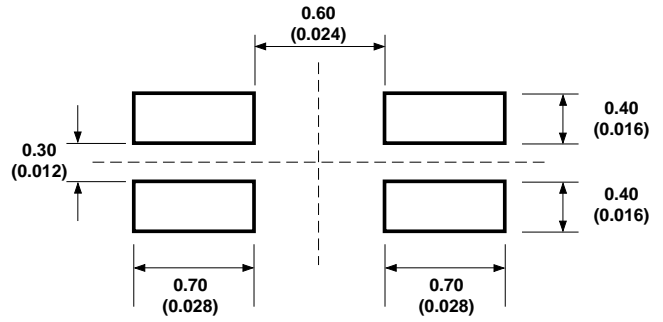


Figure 7. Recommended soldering pad pattern.

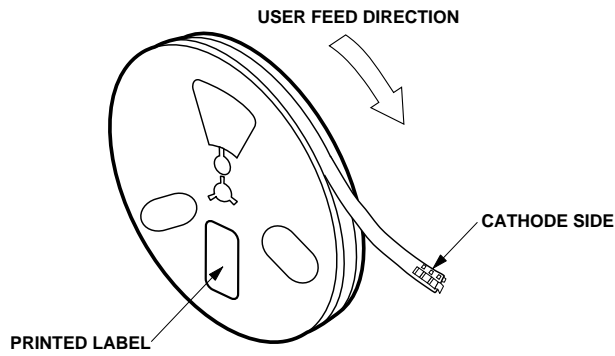


Figure 8. Reeling orientation.

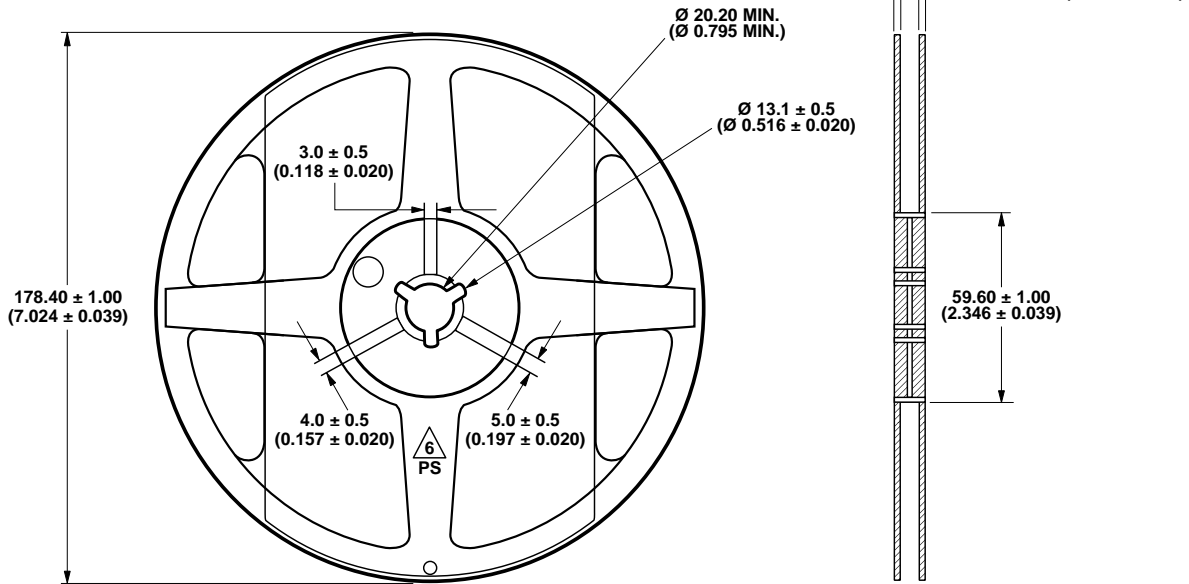
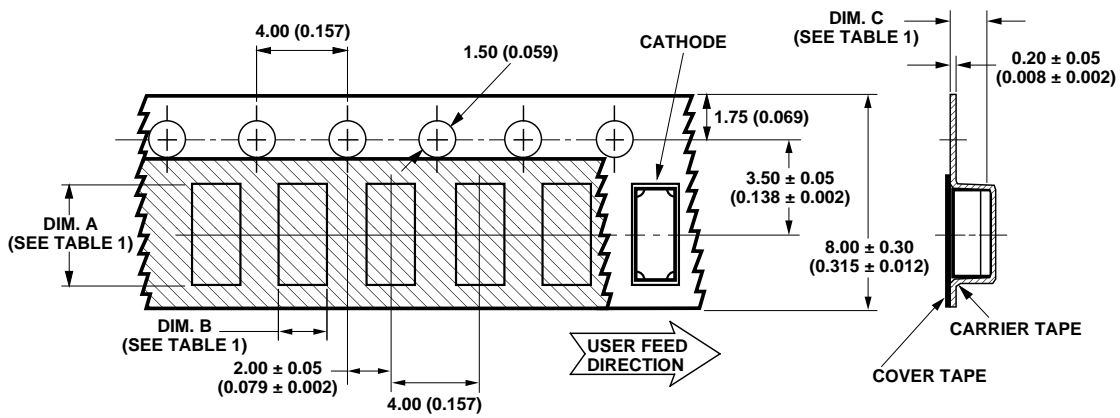


Figure 9. Reel dimensions.

NOTE:

1. ALL DIMENSIONS IN MILLIMETERS (INCHES).



**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)
HSMF-C16x SERIES	1.80 (0.071)	0.95 (0.037)	0.60 (0.024)

Figure 10. Tape dimensions.

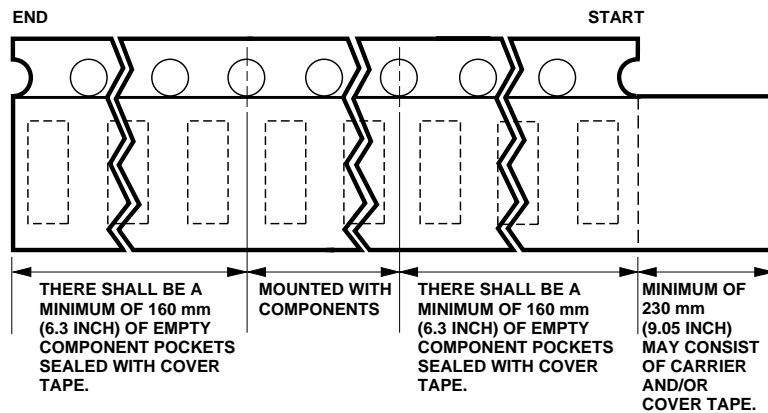


Figure 11. Tape leader and trailer dimensions.

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

**Reflow Soldering**

For more information on 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 open for more than 1 week

Baking recommended condition:  
60 ± 5°C for 20 hours.

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