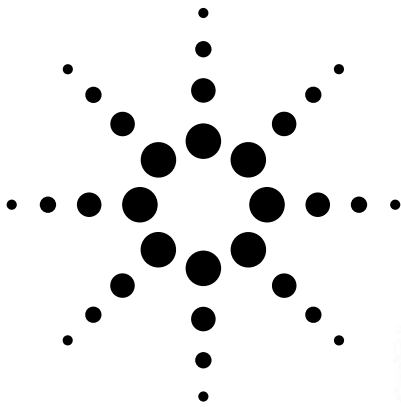


# Agilent HSMx-C540 Oval Lens High Performance Surface Mount LEDs

## Data Sheet



### LED Part Numbers HSMA-C540, HSMC-C540, HSMM-C540, HSMN-C540, HSMU-C540, HSMZ-C540

#### Description

These high performance HSMx-C540 surface mount LEDs are specifically designed for indoor full color signs and passenger information signs. The oval shaped radiation pattern (40° x 100°) and high luminous intensity ensure that these devices are excellent for wide field of view indoor applications.

These lamps have a very smooth matched radiation pattern that ensures consistent color mixing in full color applications, and message uniformity across the viewing angle of the sign.

High efficiency LED dice are used in these LED components. InGaN (Indium Gallium Nitride) for green and blue and AlInGaP (Aluminium Indium Gallium Phosphide) for red

and amber are capable of producing high light output.

The HSMx-C540 has an industry standard 2.0 x 1.25 mm footprint that is excellent for all-around use.

These solid state surface mount LEDs are designed with a reflector cup and oval shape dome which provides directional lighting. The reflector cup focuses the light more efficiently to provide higher intensity compared to a nonreflector cup equivalent part. The oval dome produces oval radiation pattern for wide field of view indoor applications.

All packages are compatible with IR soldering process and are shipped in tape and reel with 3000 units per reel.

#### Features

- Super wide viewing angle  
Major axis 100°  
Minor axis 40°
- Smooth, consistent spatial radiation pattern
- Small 2.0 x 1.25 mm footprint
- High luminous output
- Compatible with IR solder reflow
- Colors available: 626/629 nm red, 590 nm amber, 525 nm green, 470 nm blue
- Available in 8 mm tape on 7" (178 mm) diameter reels
- Tinted, non-diffused epoxy

#### Applications (Indoor)

- Indoor full color sign
- Commercial indoor advertising
- Indoor variable message sign
- Status indication
- Front panel indicator

#### Benefits

- Viewing angle designed for wide field of view application
- Red, green, blue radiation patterns matched for indoor full color signs
- Small package footprint enables small pitch size for full color signs
- Superior for indoor full color signs

**CAUTION:** HSMM-C540 and HSMN-C540 LEDs are Class 1 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Agilent Technologies Application Note AN-1142 for additional details.

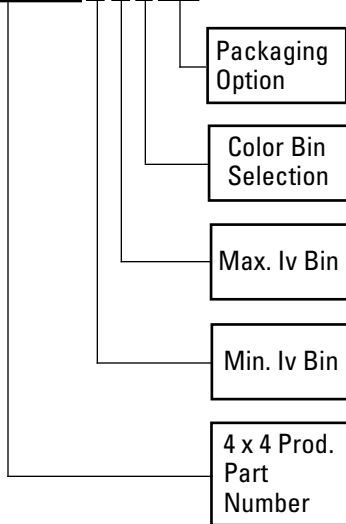


## Device Selection Guide

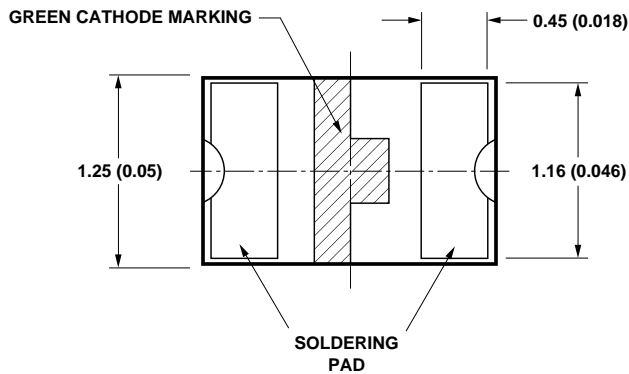
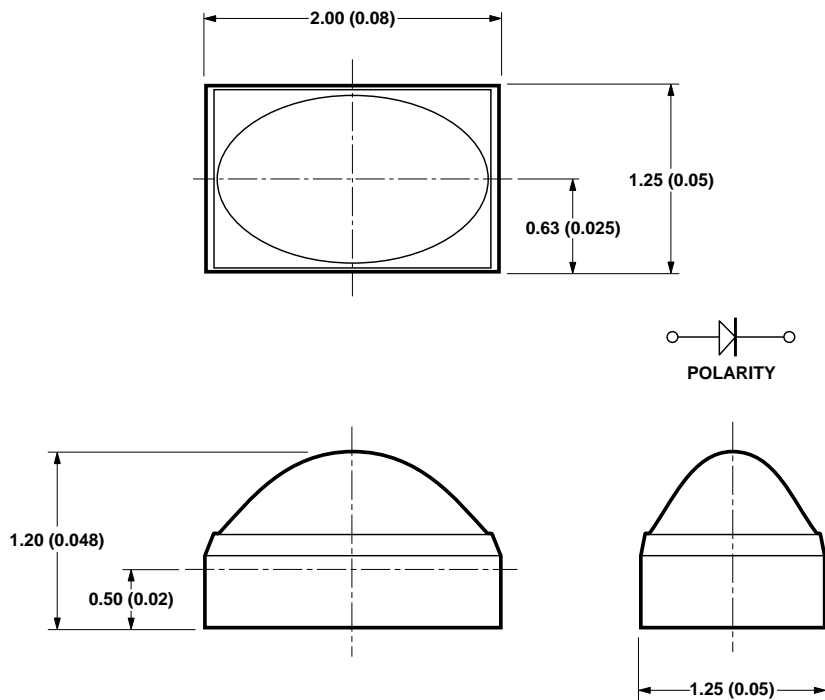
Part Number <sup>[1]</sup>	Color	Viewing Angle	Parts per Reel
HSMA-C540-F0001	AS AlInGaP Amber	100° / 40°	3000
HSMC-C540-F0001	AS AlInGaP Red	100° / 40°	3000
HSMH-C540-D0001	InGaN Green	100° / 40°	3000
HSMN-C540-A0001	InGaN Blue	100° / 40°	3000
HSMU-C540-H0001	TS AlInGaP Amber	100°/40°	3000
HSMZ-C540-J0001	TS AlInGaP Red	100°/40°	3000

## Ordering Information

HSM<sub>x</sub>-XXXX-X X X X X



## 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	AllInGaP	InGaN	Units
DC Forward Current <sup>[1]</sup>	30	25	mA
Peak Pulsing Current <sup>[2]</sup>	100	100	mA
Power Dissipation	78	105	mW
Reverse Voltage ( $I_R = 10 \mu\text{A}$ )	–	5	V
Reverse Voltage ( $I_R = 100 \mu\text{A}$ )	5	–	V
LED Junction Temperature	95	95	$^\circ\text{C}$
Operating Temperature Range	–40 to +85	–40 to +85	$^\circ\text{C}$
Storage Temperature Range	–40 to +100	–40 to +100	$^\circ\text{C}$
Soldering Temperature	See IR soldering profile (Figure 8)		

#### Notes:

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

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

Part Number	Forward Voltage $V_F$ (Volts) @ $I_F = 20 \text{ mA}$		Reverse Breakdown $V_R$ (Volts) @ $I_R = 100 \mu\text{A}$	Reverse Breakdown $V_R$ (Volts) @ $I_R = 10 \mu\text{A}$	Capacitance C (pF), $V_F = 0$ , $f = 1 \text{ MHz}$	Thermal Resistance $R_{\theta J-PIN}$ ( $^\circ\text{C/W}$ )
	Typ.	Max.	Min.	Min.	Typ.	Typ.
HSMA-C540	2.0	2.6	5	–	17	485
HSMC-C540	2.0	2.6	5	–	17	485
HSMM-C540	3.8	4.2	–	5	50	380
HSMN-C540	3.8	4.2	–	5	50	380
HSMU-C540	2.2	2.6	5	–	30	485
HSMZ-C540	2.2	2.6	5	–	30	485

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

Part Number	Color	Luminous Intensity $I_V$ (mcd) @ 20 mA <sup>[1]</sup>		Peak Wavelength $\lambda_{peak}$ (nm)	Color, Dominant Wavelength $\lambda_d$ <sup>[2]</sup> (nm)	Viewing Angle $2 \theta_{1/2}$ Degrees <sup>[3]</sup>	Luminous Efficacy $\eta_V$ (lm/w)
		Min.	Typ.	Typ.	Typ.	Typ.	Typ.
HSMA-C540	As AllInGaP Amber	96	160	592	590	100 $^\circ$ /40 $^\circ$	470
HSMC-C540	As AllInGaP Red	96	210	635	626	100 $^\circ$ /40 $^\circ$	175
HSMM-C540	InGaN Green	57	230	523	525	100 $^\circ$ /40 $^\circ$	475
HSMN-C540	InGaN Blue	26	55	468	470	100 $^\circ$ /40 $^\circ$	70
HSMU-C540	TS AllInGaP Amber	157	270	592	590	100 $^\circ$ /40 $^\circ$	550
HSMZ-C540	TS AllInGaP Red	209	350	641	629	100 $^\circ$ /40 $^\circ$	145

#### Notes:

- 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.

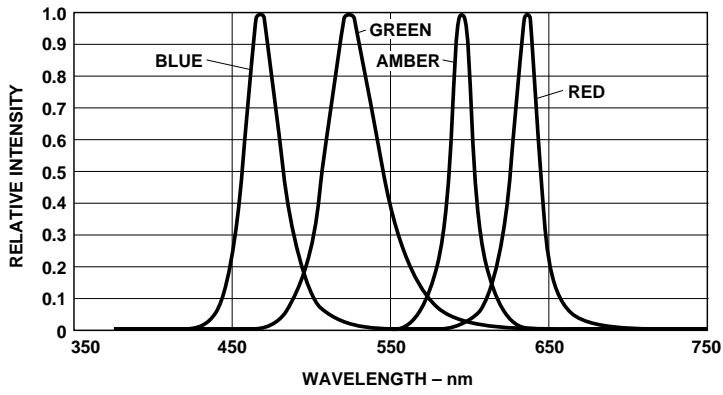


Figure 1. Relative intensity vs. wavelength.

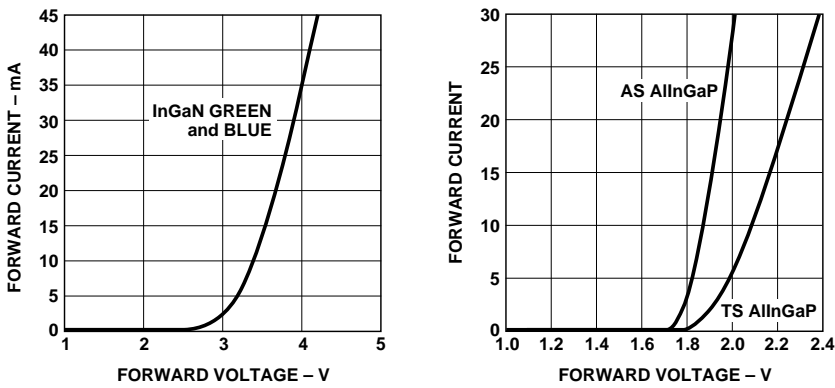


Figure 2. Forward current vs. forward voltage.

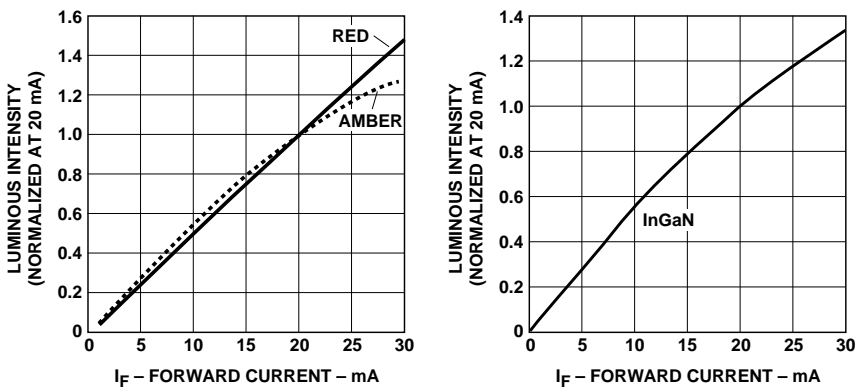


Figure 3. Luminous intensity vs. forward current.

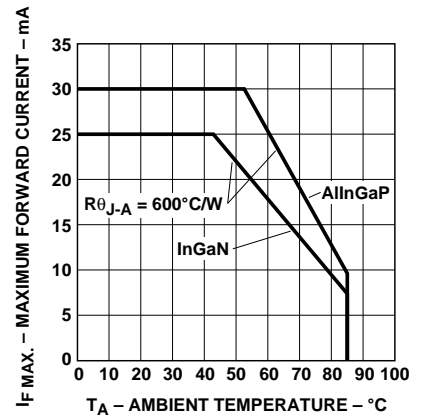


Figure 4. Maximum forward current vs. ambient temperature.

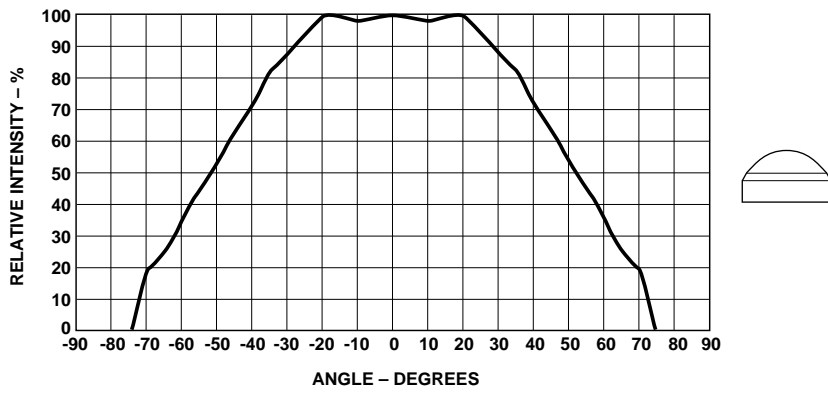


Figure 5. Spatial radiation pattern.

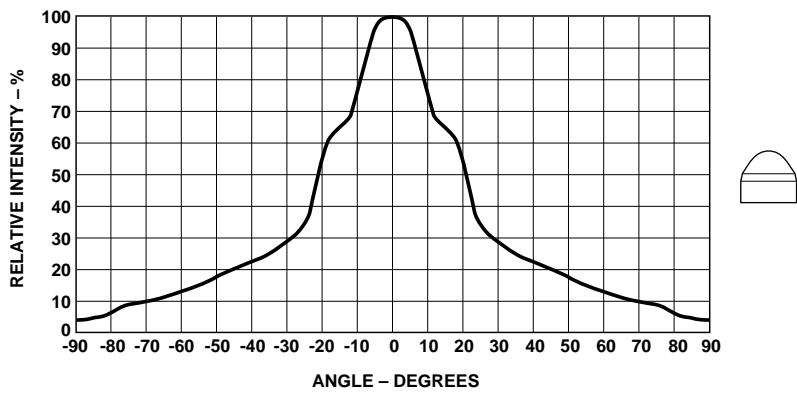


Figure 6. Spatial radiation pattern.

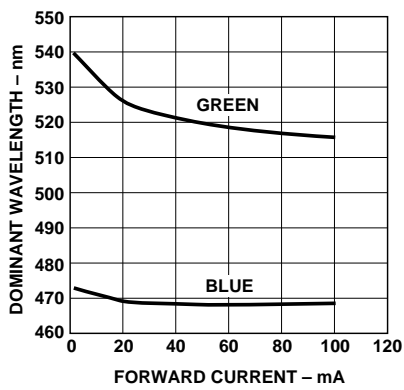


Figure 7. Color vs. forward current.

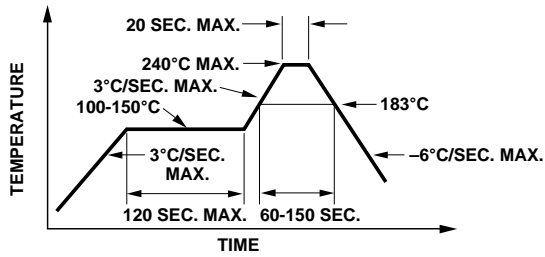


Figure 8. Recommended reflow soldering profile.  
(JEDEC J-STD-020-A)

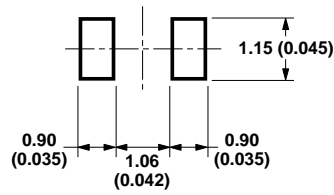


Figure 9. Recommended soldering pad pattern.

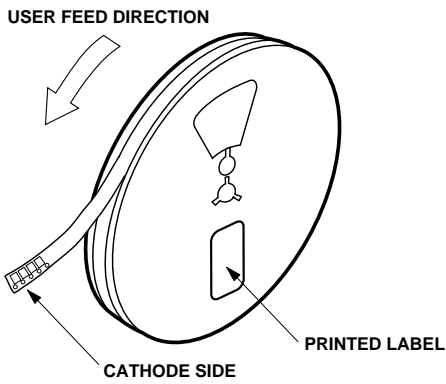


Figure 10. Reeling orientation.

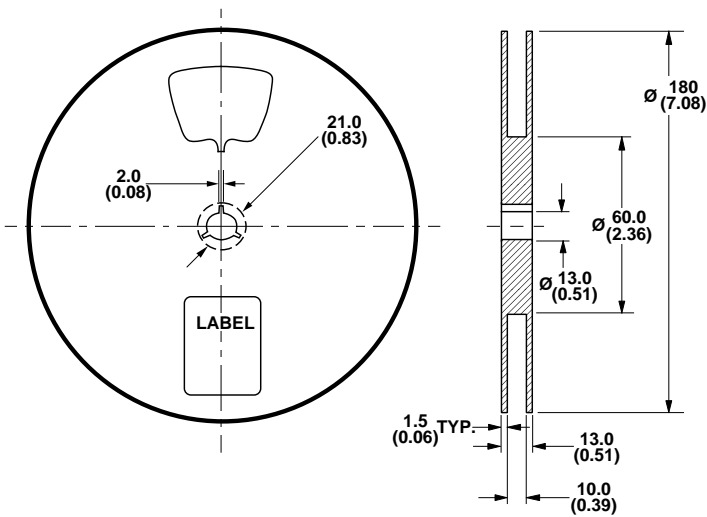


Figure 11. Reel dimensions.

Notes:

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

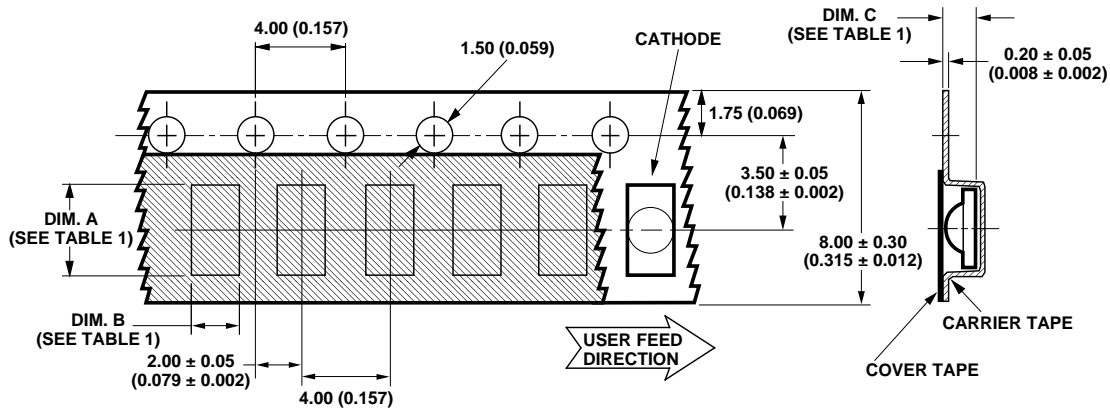


TABLE 1  
DIMENSIONS IN MILLIMETERS (INCHES)

PART NUMBER	DIM. A ± 0.10 (0.004)	DIM. B ± 0.10 (0.004)	DIM. C ± 0.10 (0.004)
HSMx-C540 SERIES	2.44 (0.096)	1.68 (0.066)	1.30 (0.051)

Figure 12. Tape dimensions.

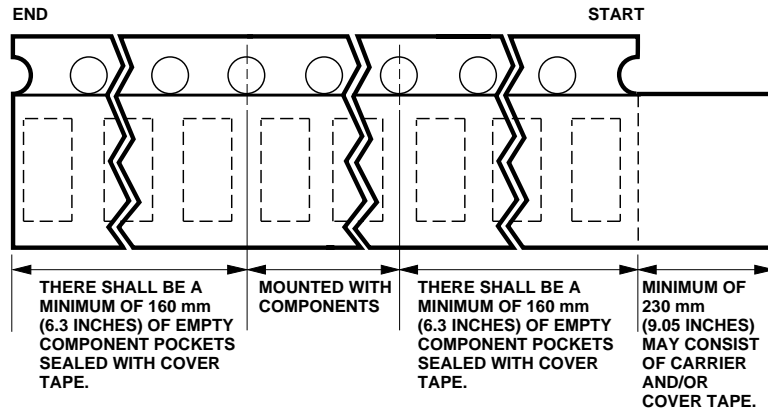


Figure 13. Tape leader and trailer dimensions.

Notes:

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

**Intensity Bin Limits (mcd @ 20 mA)**

Bin ID	Min.	Max.
A	30	40
B	40	50
C	50	65
D	65	85
E	85	110
F	110	140
G	140	180
H	180	240
J	240	310
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150

Tolerance of each minimum and maximum =  $\pm 15\%$

**Color Bin Limits (nm @ 20 mA)**

Color Category	Bin ID	Min.	Max.
Blue	0	full dist.	
	1	460	464
	2	464	468
	3	468	472
	4	472	476
	5	476	480
Green	0	full dist.	
	3	520	525
	4	525	530
	5	530	535
	6	535	540
	Amber	0	full dist.
1		584.5	587.0
2		587.0	589.5
4		589.5	592.0
6		592.0	594.5
Red		no color binning	

Tolerance of each bin limit =  $\pm 0.5$  nm

**Convective IR Reflow Soldering**

For more information on soldering and pick and place, refer to Application Note 1060, *Surface Mounting SMT LED Indicator Components* and Application Note 1217 *Pick and Place and Soldering of the Agilent HSMx-C540, HSMx-C220 Surface Mount LEDs* respectively.

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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