Agilent Technologies

# Surface Mount Lensed Chip LEDs

## Technical Data

**HSMA-L640**
**HSMC-L640**
**HSMH-L640**
**HSMG-L640**

### Features

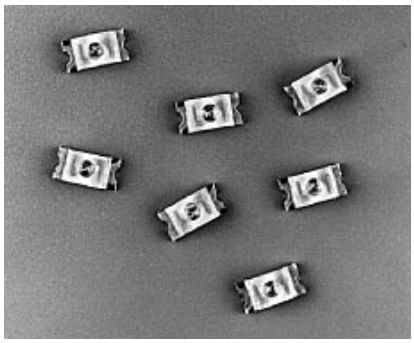
- **High Brightness AlInGaP Material (HSMA & HSMC)**
- **Various Colors Available**
- **Compatible with IR Solder Process**
- **Narrow Viewing Angle**
- **Small 3.0 x 1.5 mm Package**
- **Available in 8 mm Tape on 7" (180 mm) Diameter Reels**

### Applications

- **Keypad Backlighting**
- **Light Piping**
- **LCD Backlighting**
- **Front Panel Indicator**

### Description

The HSMx-L640 is a Chip LED with an integrated lens. The lens concentrates the emitted light into a narrow viewing angle, which has the effect of doubling the on-axis intensity. These LEDs are optimum for light piping, backlighting buttons and switches, and applications, where as much flux as possible is required on axis.



The available colors are AlInGap Amber, AlInGap Red, AlGaAs Red and GaP Green.

The 3.0 x 1.5 mm package closely matches industry standard sizes for chip capacitors which makes it compatible with automated pick and place equipment.

This package is compatible with IR and convective reflow soldering processes.

### Device Selection Guide

**AS AlInGaP**

| Product Part Number | Color | Package Description |
|---|---|---|
| HSMA-L640 | Amber 590 nm | Untinted, Non-diffused |
| HSMC-L640 | Red 626 nm | Untinted, Non-diffused |

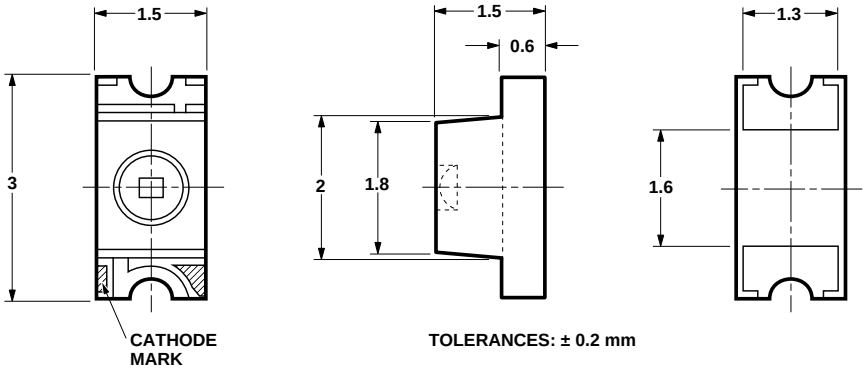
**GaP**

| Product Part Number | Color | Package Description |
|---|---|---|
| HSMG-L640 | Green 571 nm | Untinted, Non-diffused |

**AlGaAs**

| Product Part Number | Color | Package Description |
|---|---|---|
| HSMH-L640 | Red 639 nm | Untinted, Non-diffused |

## Package Dimensions




**Notes:**
1. Dimensions are in millimeters.
2. Tolerance, ± 0.2 mm

## Absolute Maximum Ratings at $T_A$ = 25°C

| Parameter | HSMA/C-L640 | HSG/H-L640 | Units |
|---|---|---|---|
| DC Forward Current[3][4][5] | 30 | 25 | mA |
| Power Dissipation | 81 | 65 | mW |
| Reverse Current $V_R$ = 5 V | 100 | 100 | µA |
| Operating Temperature Range | -30 to +85 | -30 to +85 | °C |
| Storage Temperature Range[6] | -40 to +100 | -40 to +100 | °C |

**Notes:**
3. Derate linearly as shown in Figure 4.
4. Drive currents between 1 mA and the specified maximum DC forward current are recommended for best long term performance.
5. Operating at currents below 1 mA is not recommended. Please contact your Agilent representative for further information.
6. Maximum temperature for tape and reel packaging is 60°C.

## Optical Characteristics at $T_A$ = 25°C

| Part Number | Color | Luminous Intensity $I_V$ (mcd) @$I_F$ 20 mA[7] Min. | Typ. | Peak Wavelength $\lambda_{peak}$ (nm) Typ. | Color, Dominant Wavelength $\lambda_d$[8] (nm) Typ. | Viewing Angle $2\theta_{1/2}$ Degrees[9] Typ. |
|---|---|---|---|---|---|---|
| HSMA-L640 | AS AlInGaP Amber | 63 | 130 | 592 | 590 | 70 |
| HSMC-L640 | AS AlInGaP Red | 63 | 100 | 635 | 626 | 70 |
| HSMG-L640 | GaP Green | 10 | 18 | 570 | 572 | 70 |
| HSMH-L640 | AlGaAs Red | 10 | 32 | 650 | 639 | 70 |

**Notes:**
7. The luminous intensity, $I_V$, is measured at the peak of the spatial radiation pattern.
8. The dominant wavelength, $\lambda_d$, is derived from the CIE Chromaticity diagram, and represents the perceived color of the device.
9. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is $^1/_2$ the peak intensity.

## Electrical Characteristics at $T_A$ = 25°C

| Part Number | Color | Forward Voltage $V_F$ (Volts) @ $I_F$ = 20 mA Typ. | Forward Voltage $V_F$ (Volts) @ $I_F$ = 20 mA Max. | Reverse Breakdown $V_R$ (Volts) @ $I_R$ = 100 μA Min. | Capacitance C (pF) $V_F$ = 0 f = 1 MHz Typ. | Thermal Resistance $R\theta_{J\text{-}PIN}$ (°C/W) Typ. |
|---|---|---|---|---|---|---|
| HSMA-L640 | AS AlInGaP Amber | 2.02 | 2.40 | 5 | 40.0 | 500 |
| HSMC-L640 | AS AlInGaP Red | 1.90 | 2.40 | 5 | 40.0 | 500 |
| HSMG-L640 | GaP Green | 2.20 | 2.60 | 5 | 8.0 | 475 |
| HSMH-L640 | AlGaAs Red | 1.80 | 2.20 | 5 | 4.5 | 475 |

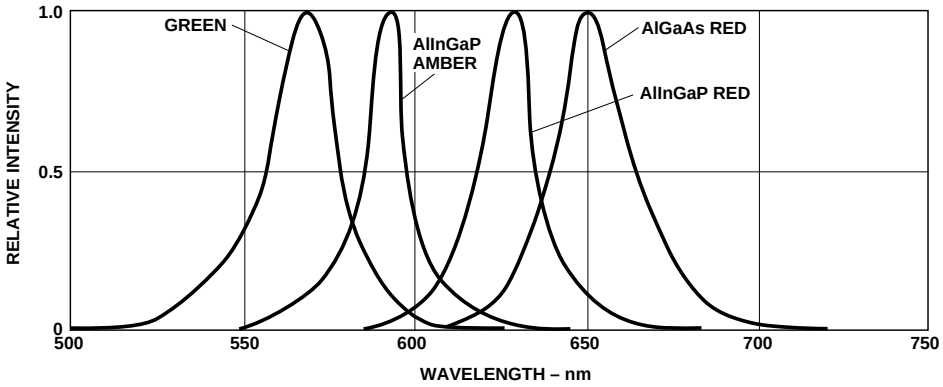



**Figure 1. Relative Intensity vs. Wavelength.**

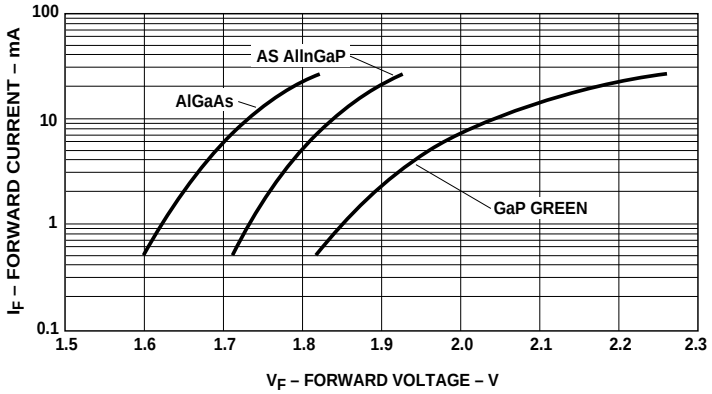



**Figure 2. Forward Current vs. Forward Voltage.**

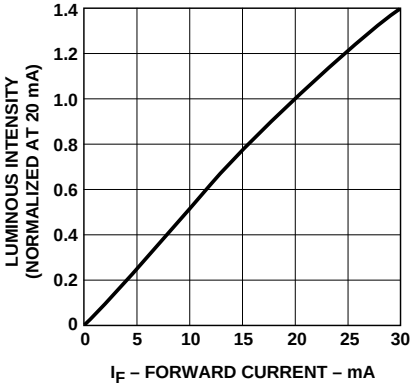



**Figure 3a. Relative Luminous Intensity vs. DC Forward Current for AlInGaP.**

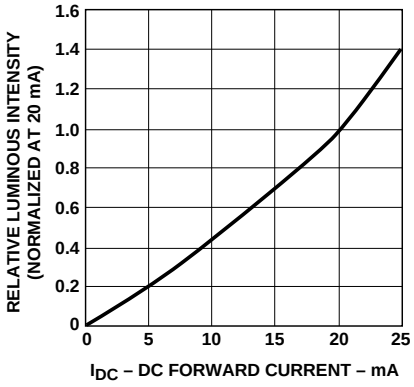



**Figure 3b. Relative Luminous Intensity vs. DC Forward Current for GaP and AlGaAs.**

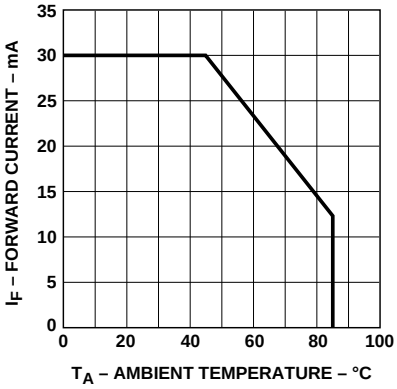



**Figure 4a. Maximum DC Current vs. Ambient Temperature for AlInGaP.**

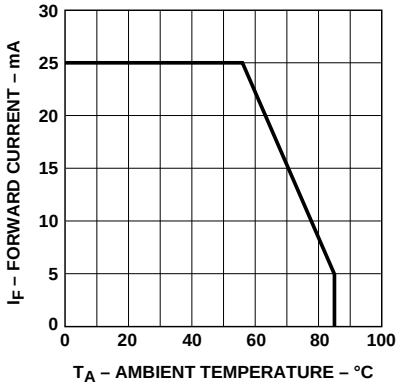



**Figure 4a. Maximum DC Current vs. Ambient Temperature for AlGaAs and GaP.**

## Light Intensity (Iv) Bin Limits[1]

| Bin ID | Intensity (mcd) Min. | Max. | Bin ID | Intensity (mcd) 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: ± 15%

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.

## Color Bin Limits[1]

### Amber Color Bins[1]

| Bin ID | Dom. Wavelength (nm) 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: ± 0.5 nm

### Green Color Bins[1]

| Bin ID | Dom. Wavelength (nm) Min. | Max. |
|---|---|---|
| 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: ± 0.5 nm

**Note:**
1. Bin categories are established for classification or products. Products may not be available in all bin categories. Pleae contact your Agilent representative for information of currently available bins.

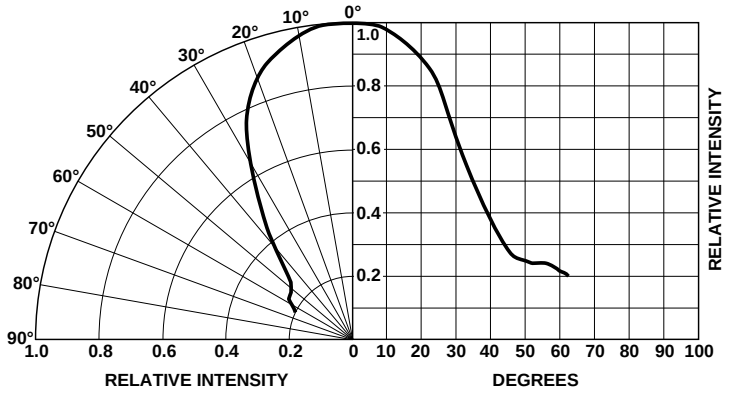



**Figure 5. Intensity vs. Angle.**

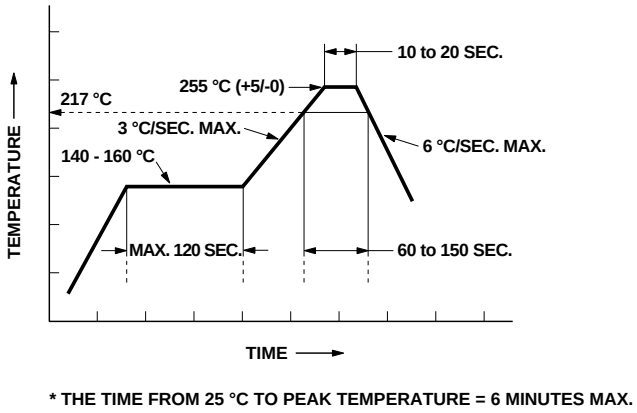



**Figure 6. Recommended Pb-Free Reflow Soldering Profile.**

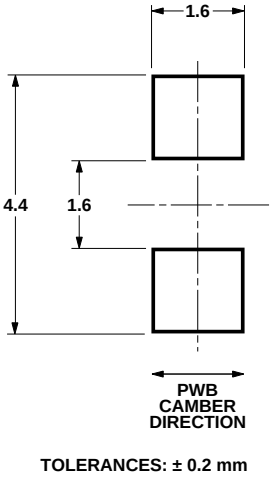



**Figure 7. Recommended Solder Patterns.**

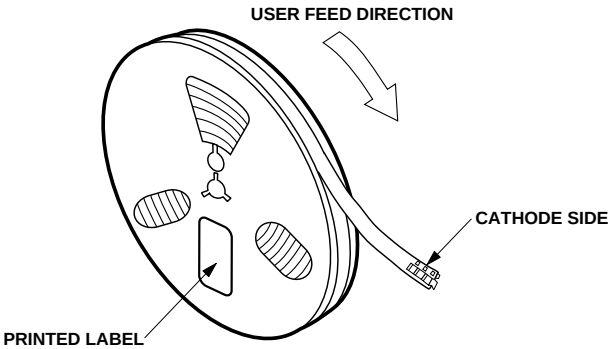



**Figure 8. Reeling Orientation.**

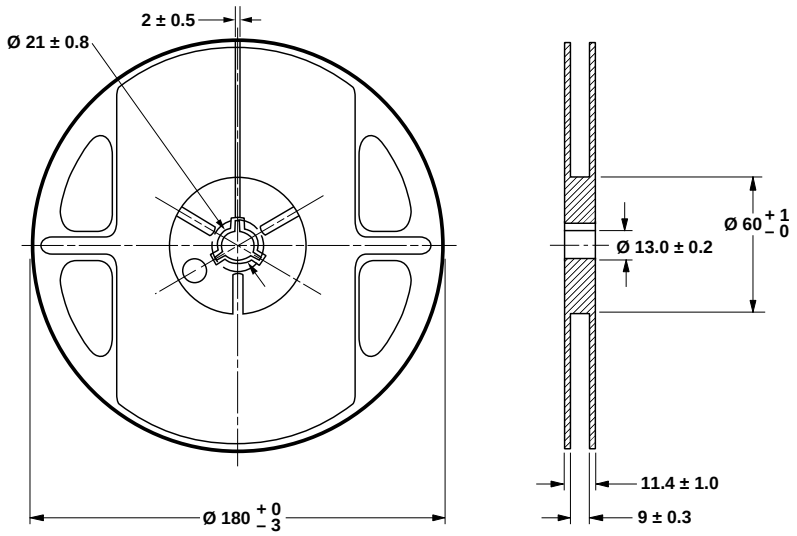



**Figure 9. Reel Dimensions.**

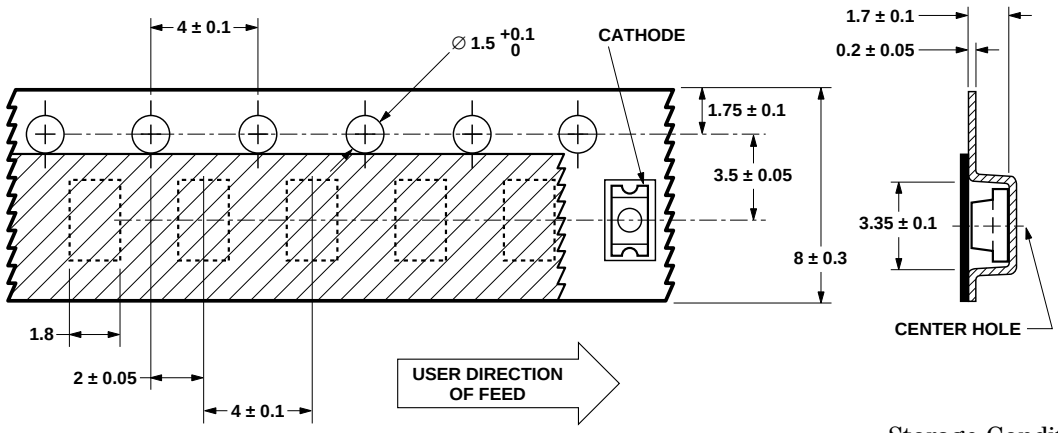



**Figure 10. Tape Dimensions.**

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 +/– 5°C for 20 hours.

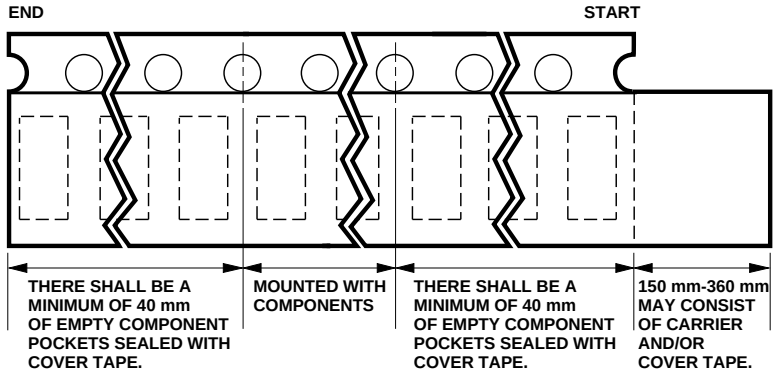



**Figure 11. Tape Leader and Trailer Dimensions.**

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