BROADCOM®

Data Sheet

# HSM8-C120, HSM9-C120

## Side-View Infrared Emitter

## Overview

The Broadcom® HSM8-C120 and HSM9-C120 are side-emitting, surface-mount IR ChipLEDs available in an industry-popular package footprint of 1.6 mm × 0.93 mm. These robust and high-quality infrared emitters are versatile and easy to use.

These products are available in 850-nm and 940-nm peak wavelength. The compact footprint makes these products suitable for a wide range of applications such as consumer portable electronics, wearables, industrial automation, and office automation. It is compatible with industry-standard automatic machine placement and IR reflow soldering.

## Features

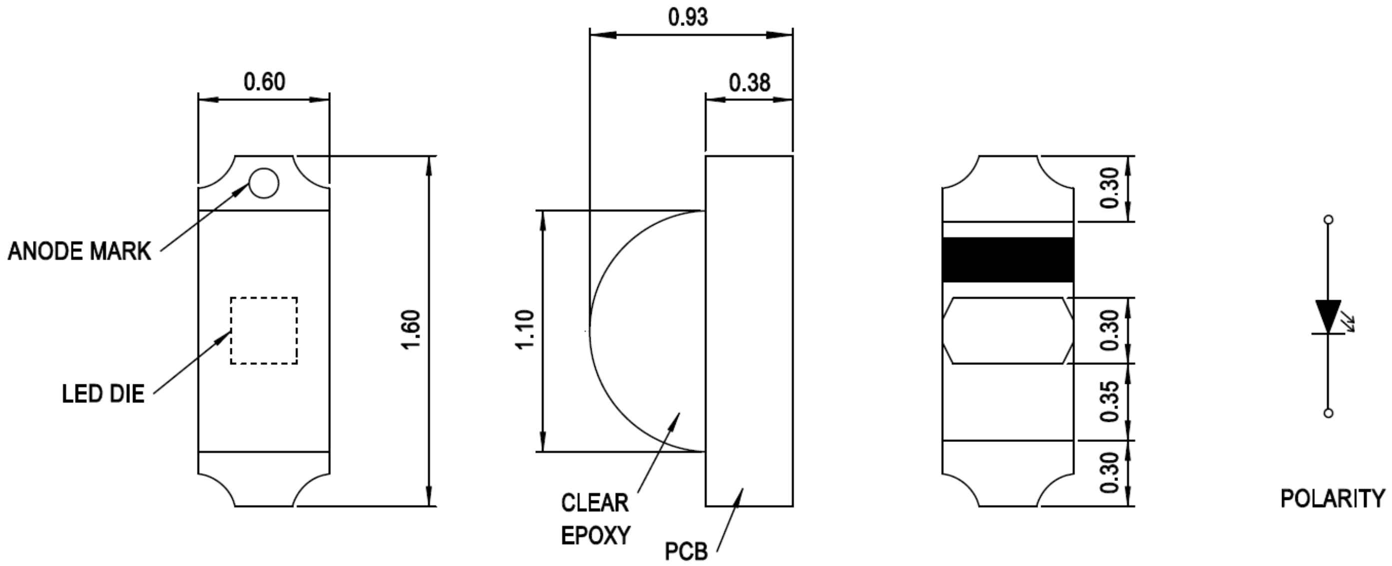
- Infrared emitter in side view package
- Compact package
- Available in 850-nm and 940-nm peak wavelength
- Compatible with reflow soldering

## Applications

- Home appliances
- Smart meter
- Light curtain
- Consumer electronics

**CAUTION!** LEDs are class 1A ESD sensitive per ANSI/ESDA/JEDEC JS-001. Observe appropriate precautions during handling and processing. Refer to Application Note 1142 for additional details.

**Figure 1: Package Dimensions**



**NOTE:**

1. All dimensions are in millimeters.
2. Tolerance is ±0.10 mm unless otherwise specified.

# Device Selection Guide

| Part Number | Peak Wavelength |
|---|---|
| HSM8-C120 | 850 nm |
| HSM9-C120 | 940 nm |

# Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| DC Forward Current[a] | 70 | mA |
| Peak Forward Current[b] | 350 | mA |
| Power Dissipation | 126 | mW |
| LED Junction Temperature | 100 | °C |
| Operating/Storage Temperature Range | –40 to +85 | °C |

a. Derate linearly as shown in Figure 6.

b. Frequency = 100 Hz, duty factor = 1%, $T_S$ = 25°C.

# Optical Characteristics ($T_J$ = 25°C)

| Part Number | Radiant Intensity, $I_e$ (mW/sr)[a] at $I_F$ = 20 mA | | Peak Wavelength, $\lambda_p$ (nm) | Viewing Angle, $2\theta_{1/2}$ (°)[b] |
|---|---|---|---|---|
| | Min. | Max. | Typ.[c] | Typ.[c] |
| HSM8-C120 | 1 | 3 | 855 | 150 |
| HSM9-C120 | 1 | 3 | 945 | 150 |

a. $t_p$ = 20 ms.

b. $\theta_{1/2}$ is the off axis angle where the radiant intensity is ½ the peak intensity.

c. Typ. value is for reference only.

# Electrical Characteristics ($T_J$ = 25°C)

| Part Number | Forward Voltage, $V_F$ (V)[a] at $I_F$ = 20 mA | | Reverse Current, $I_R$ (µA) at $V_R$ = 5V[b] |
|---|---|---|---|
| | Min. | Max. | Max. |
| HSM8-C120 | 1.2 | 1.8 | 10 |
| HSM9-C120 | 1.2 | 1.8 | 10 |

a. Forward voltage tolerance is ±0.1V.

b. Indicates product final test condition. Long-term reverse bias is not recommended.

**Figure 2: Spectral Power Distribution**

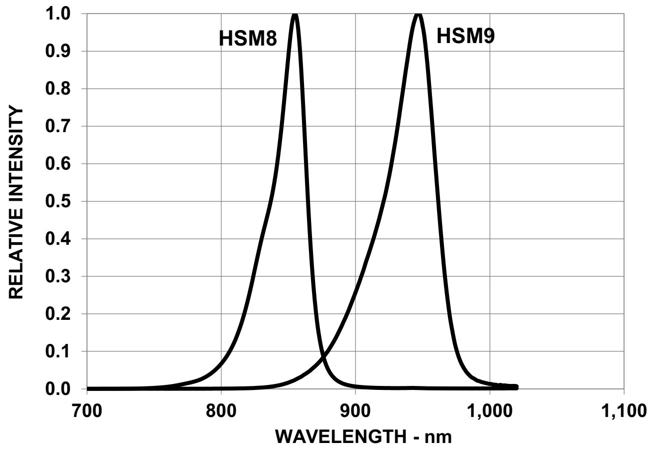


**Figure 3: Forward Current vs. Forward Voltage**

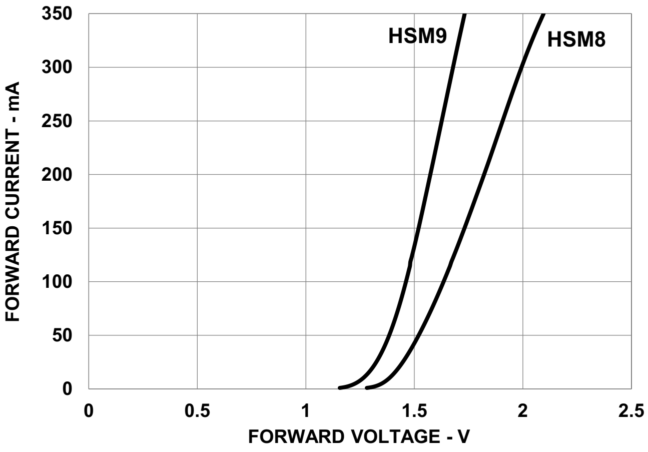


**Figure 4: Relative Radiant Intensity vs. Forward Current**

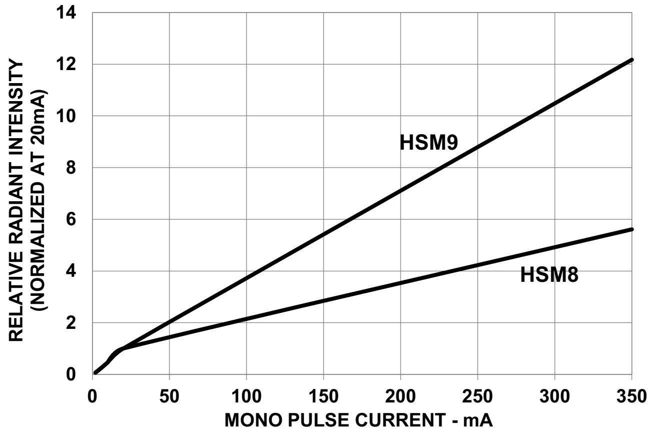


**Figure 5: Radiation Pattern**

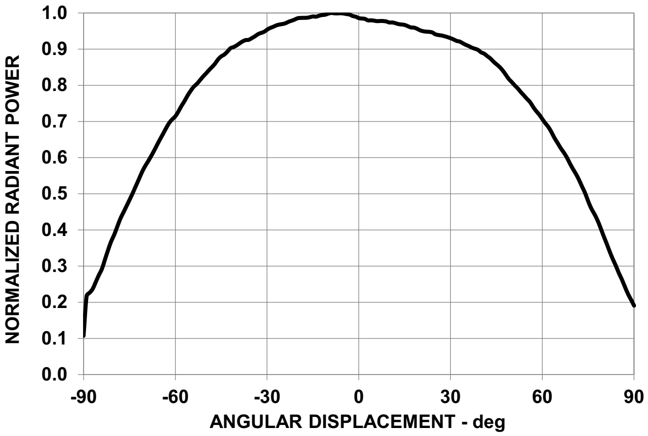


**Figure 6: Derating Curve**

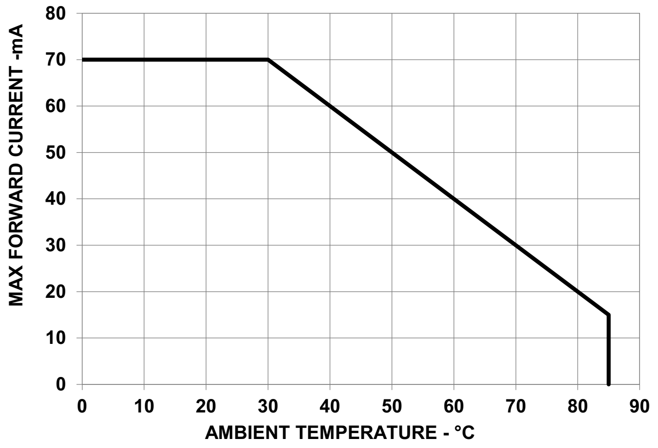


**Figure 7: Recommended Soldering Land Pattern**

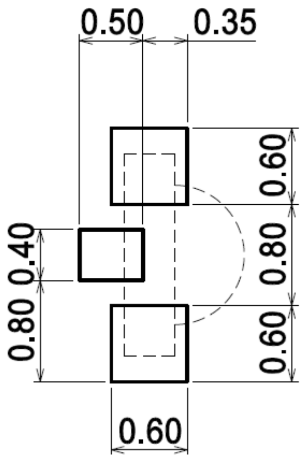
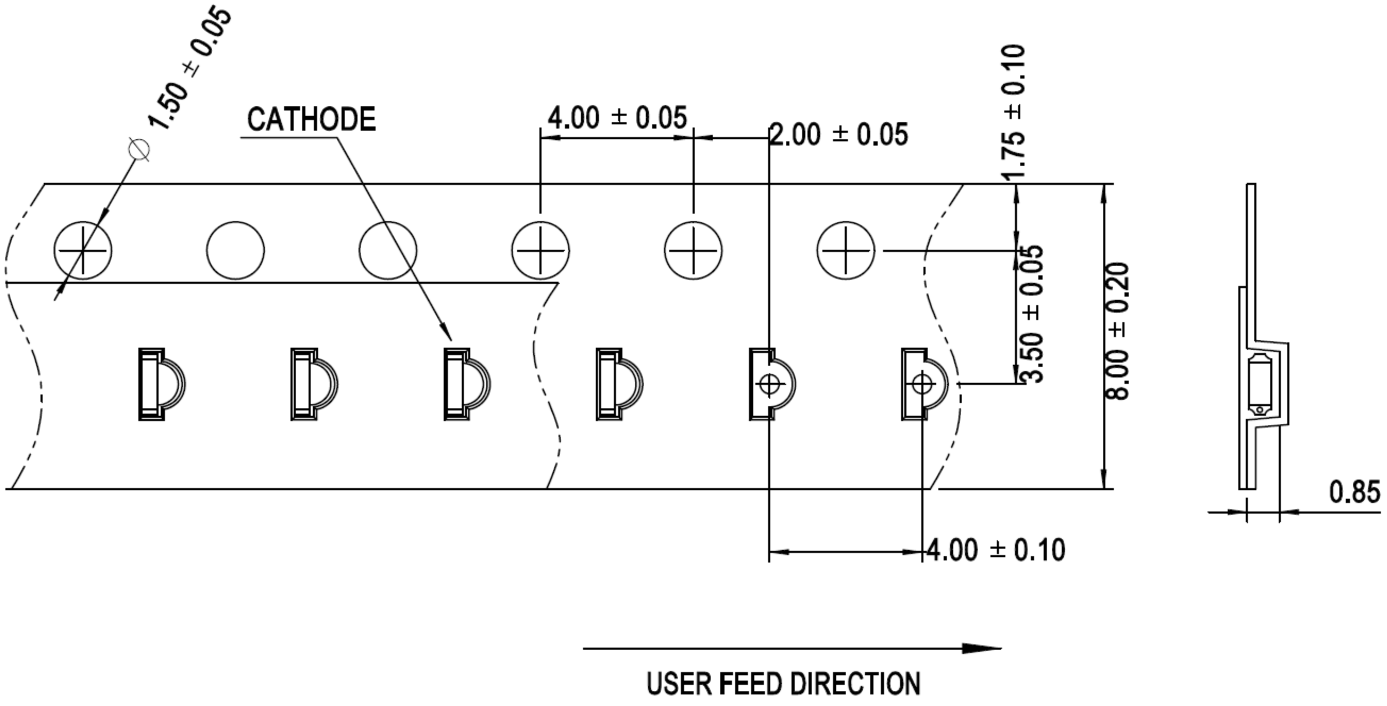
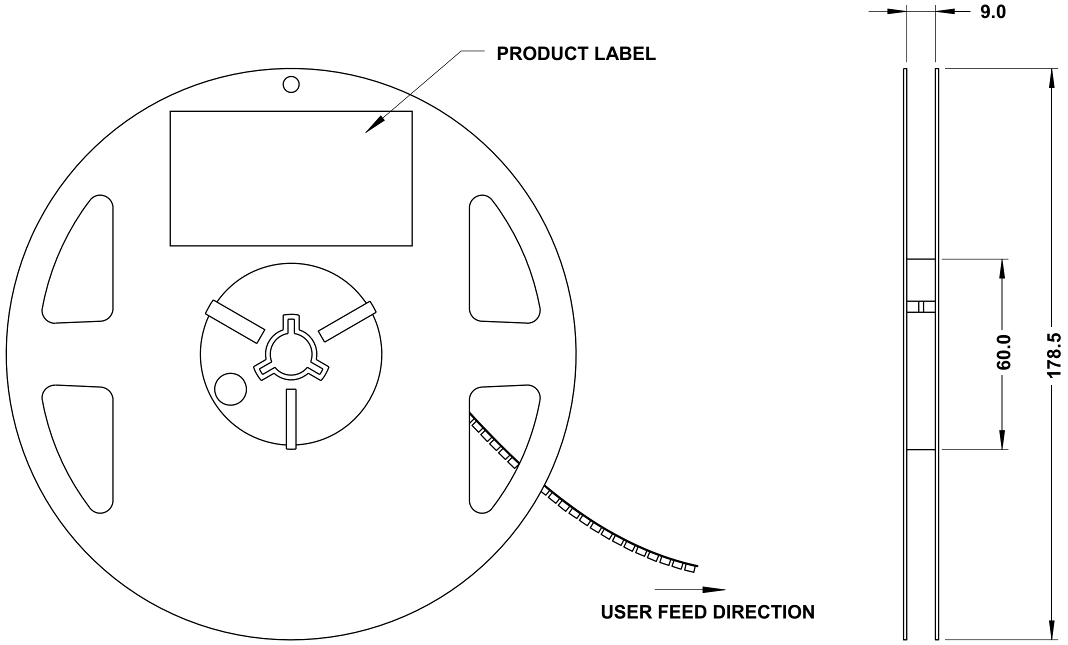


**Figure 8: Carrier Tape Dimensions**



**NOTE:** All dimensions in millimeters.

**Figure 9: Reel Dimensions**



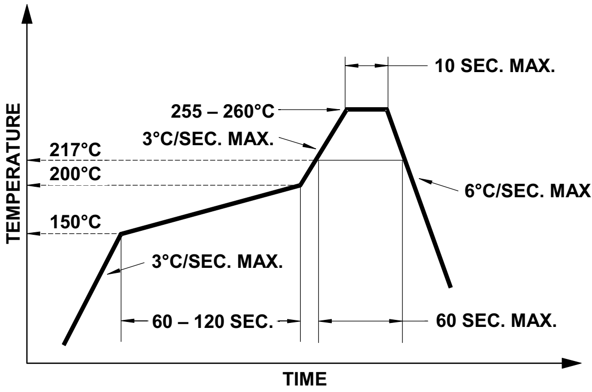
**NOTE:** All dimensions in millimeters.

# Precautionary Notes

## Soldering

- Do not perform reflow soldering more than twice. Observe necessary precautions of handling moisture-sensitive device as stated in the following section.
- Do not apply any pressure or force on the LED during reflow and after reflow when the LED is still hot.
- Use reflow soldering to solder the LED. Use hand soldering only for rework if unavoidable, but it must be strictly controlled to following conditions:
  - Soldering iron tip temperature = 310°C maximum
  - Soldering duration = 2 seconds maximum
  - Number of cycles = 1 only
  - Power of soldering iron = 50W maximum
- Do not touch the LED package body with the soldering iron except for the soldering terminals, as it may cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED is affected by soldering with hand soldering.

**Figure 10: Recommended Lead-Free Reflow Soldering Profile**



## Handling Precautions

This product has a Moisture Sensitive Level 3 rating per JEDEC J-STD-020. Refer to Broadcom Application Note 5305, *Handling of Moisture-Sensitive Surface-Mount Devices*, for additional details and a review of proper handling procedures.

- Before use:
  - An unopened moisture barrier bag (MBB) can be stored at <40°C/90% RH for 12 months. If the actual shelf life has exceeded 12 months and the humidity indicator card (HIC) indicates that baking is not required, then it is safe to reflow the LEDs per the original MSL rating.
  - Do not open the MBB prior to assembly (for example, for IQC). If unavoidable, MBB must be properly resealed with fresh desiccant and HIC. The exposed duration must be taken in as floor life.
- Control after opening the MBB:
  - Read the HIC immediately upon opening of MBB.
  - Keep the LEDs at <30°/60%RH at all times, and complete all high temperature-related processes, including soldering, curing, or rework within 168 hours.
- Control for unfinished reel:

  Store unused LEDs in a sealed MBB with desiccant or a desiccator at <5%RH.
- Control of assembled boards:

  If the PCB soldered with the LEDs is to be subjected to other high-temperature processes, store the PCB in a sealed MBB with desiccant or desiccator at <5% RH to ensure that all LEDs have not exceeded their floor life of 168 hours.
- Baking is required if any of these conditions exist:
  - The HIC indicator indicates a change in color for 10% and 5%, as stated on the HIC.
  - The LEDs are exposed to conditions of >30°C/60% RH at any time.
  - The LED's floor life exceeded 168 hours.

  The recommended baking condition is 60 ± 5°C for 20 hours.

  Baking can only be done once.

## Application Precautions

- The drive current of the LED must not exceed the maximum allowable limit across temperature as stated in the data sheet. Constant current driving is recommended to ensure consistent performance.
- Circuit design must cater to the whole range of forward voltage ($V_F$) of the LEDs to ensure the intended drive current can always be achieved.
- The LED exhibits slightly different characteristics at different drive currents, which may result in a larger variation of performance (such as intensity, wavelength, and forward voltage). Set the application current as close as possible to the test current to minimize these variations.
- The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving the LED in matrix form, ensure that the reverse bias voltage does not exceed the allowable limit of the LED.
- Avoid rapid change in ambient temperature, especially in high-humidity environments, because they cause condensation on the LED.
- If the LED is intended to be used in harsh or outdoor environment, protect the LED against damages caused by rainwater, water, dust, oil, corrosive gases, external mechanical stresses, and so on.

## Eye Safety Precautions

LEDs may pose optical hazards when in operation. Do not look directly at operating LEDs because it might be harmful to the eyes. For safety reasons, use appropriate shielding or personal protective equipment.

**Disclaimer**

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