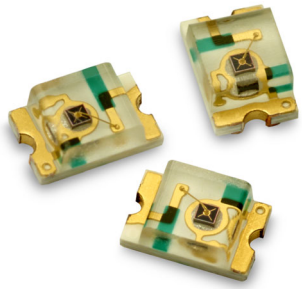
BROADCOM®

Data Sheet

HSM8-C170 and HSM9-C170

Top-Mount Infrared Emitter



Description

The Broadcom® HSMx-C170 is a top-view surface-mount infrared LED that comes in an industry-popular 2.0 mm x 1.3 mm footprint. This robust and high-quality infrared LED is versatile and easy to use.

This product comes with a wide viewing angle and is available in 850-nm and 940-nm peak wavelengths. This product is suitable for a wide range of applications such as home appliances, smart utility meters, light curtains in industrial automation, and smoke detectors. It is compatible with industry-standard automatic machine placement and IR reflow soldering.

Features

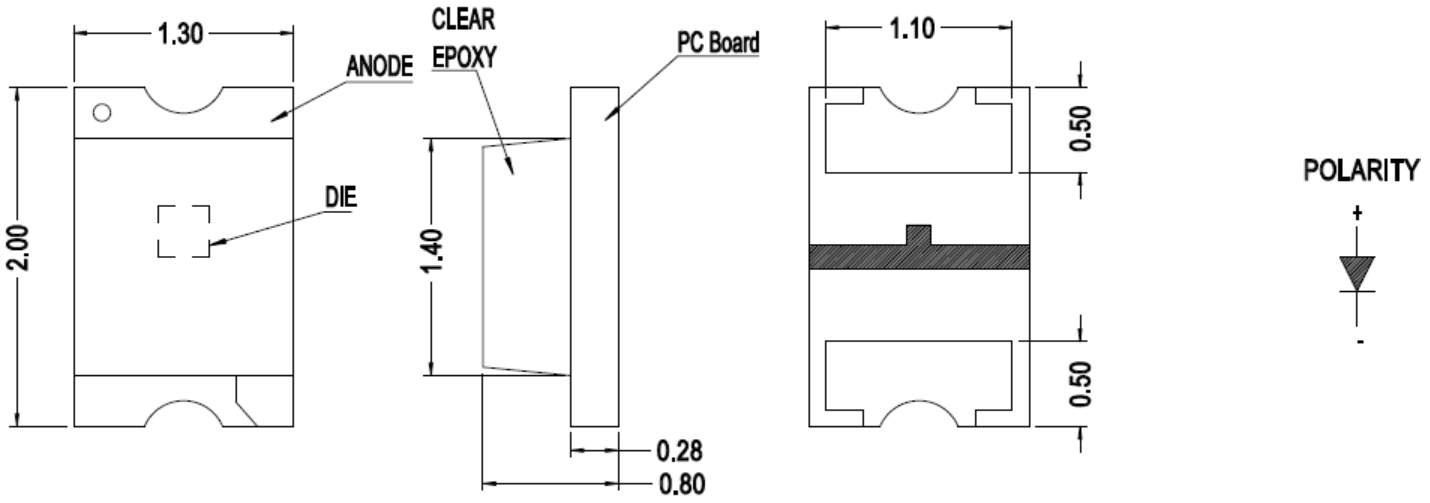
- Top view
- 0805 footprint
- Peak wavelengths of 850 nm and 940 nm
- Wide viewing angle

Applications

- Office automation
- Home appliances
- Light curtains

CAUTION! This LED is Class 1A ESD sensitive per ANSI/ESDA/JEDEC JS-001. Please 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 (mm).
2. The tolerance is ±0.10 mm unless otherwise specified.

Absolute Maximum Ratings

Parameters	HSM8-C170	HSM9-C170	Unit
DC Forward Current [a]	70		mA
Pulse Forward Current [b]	350		mA
Power Dissipation	126	112	mW
LED Junction Temperature	95		°C
Operating Temperature Range	–40 to +85		°C
Storage Temperature Range	–40 to +85	–40 to +100	°C

a. Derate linearly as shown in Figure 10.

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

Optical Characteristics (T_J = 25°C)

Part Number	Radiant Intensity (mW/sr), I_e [a] @ I_F = 20 mA			Peak Wavelength (nm), λ_p	Viewing Angle (deg), $2\theta_{1/2}$ [b]
	Min.	Typ. [c]	Max.	Typ. [c]	Typ. [c]
HSM8-C170	1	2	3	850	145
HSM9-C170	1	2	3	940	140

a. t_p = 20 ms.

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

c. The typical values are for reference only.

Electrical Characteristics (T_J = 25°C)

Part Number	Forward Voltage (V), V_F [a] @ I_F = 20 mA			Reverse Current (µA), I_R at V_R = 5V [b]
	Min.	Typ. [c]	Max.	Max.
HSM8-C170	1.2	1.4	1.8	10
HSM9-C170	1.2	—	1.6	10

a. The forward voltage tolerance is ±0.1V.

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

c. The typical values are for reference only.

Figure 2: Spectral Power Distribution: HSM8-C170

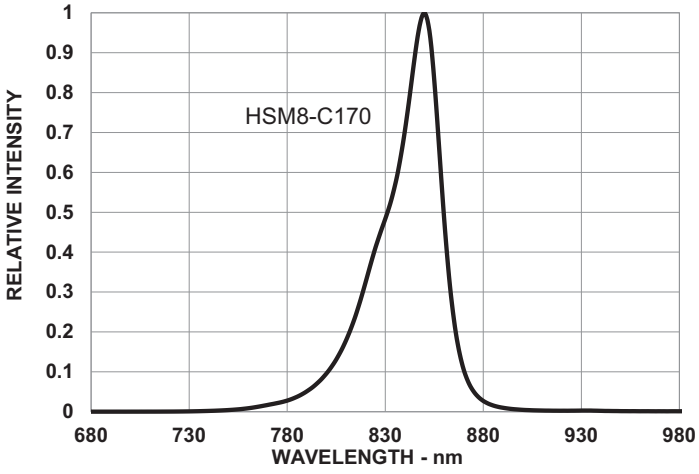


Figure 3: Spectral Power Distribution: HSM9-C170

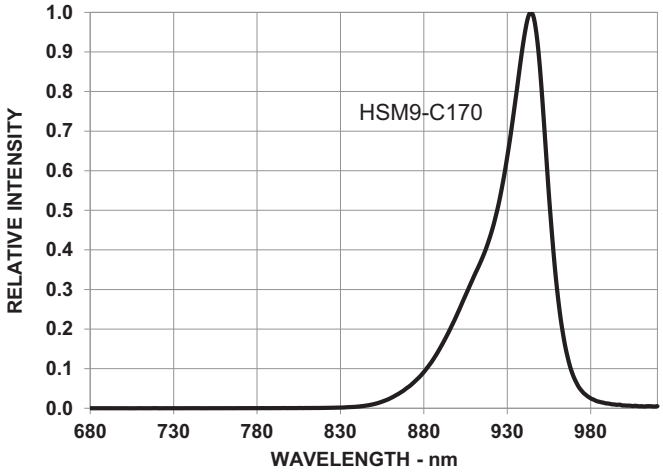


Figure 4: Forward Current vs. Forward Voltage: HSM8-C170

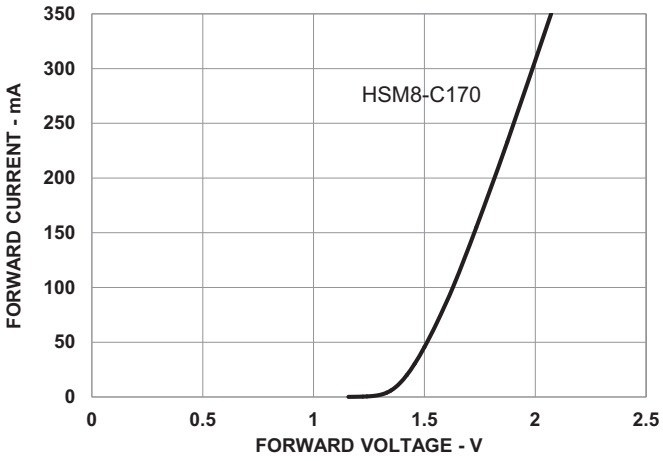


Figure 5: Forward Current vs. Forward Voltage: HSM9-C170

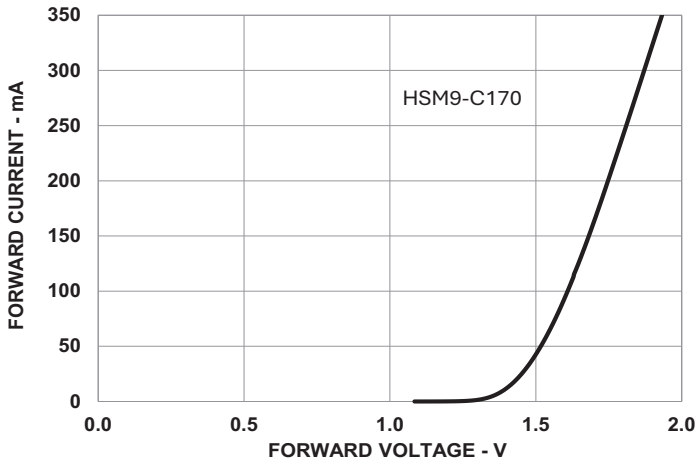


Figure 6: Relative Radiant Intensity vs. Forward Current: HSM8-C170

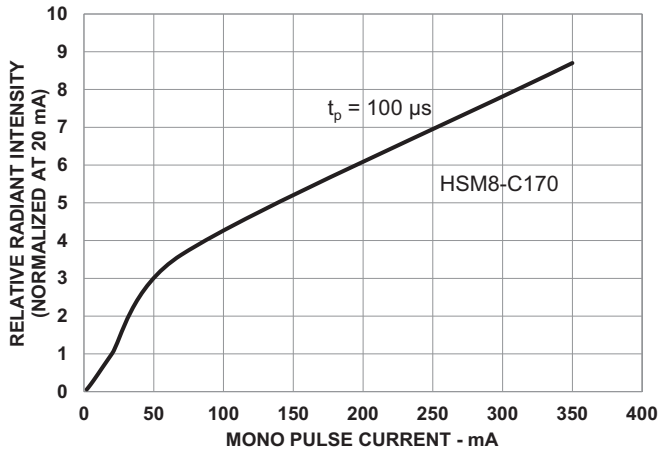


Figure 7: Relative Radiant Intensity vs. Forward Current: HSM9-C170

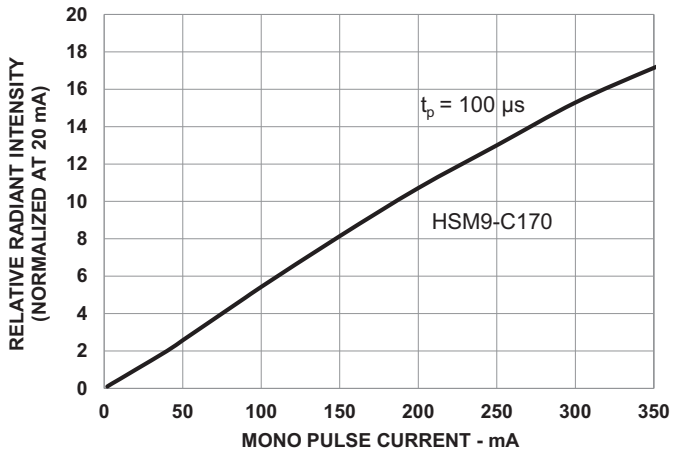


Figure 8: Radiation Pattern: HSM8-C170

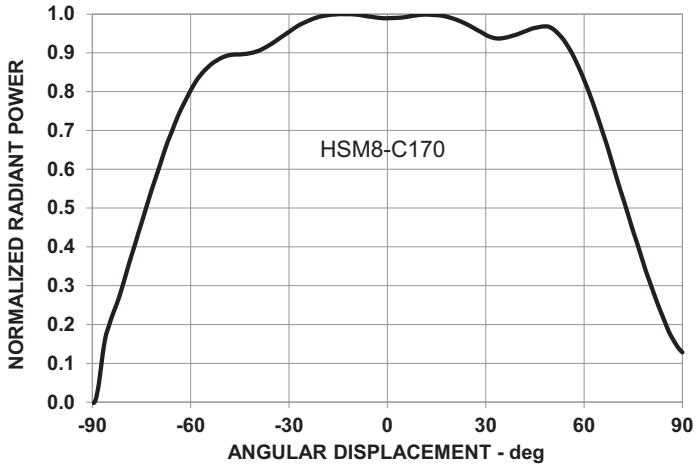


Figure 9: Radiation Pattern: HSM9-C170

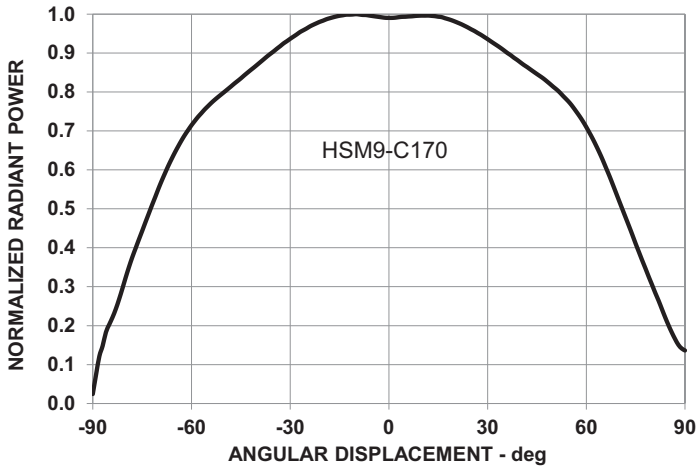


Figure 10: Derating Curve

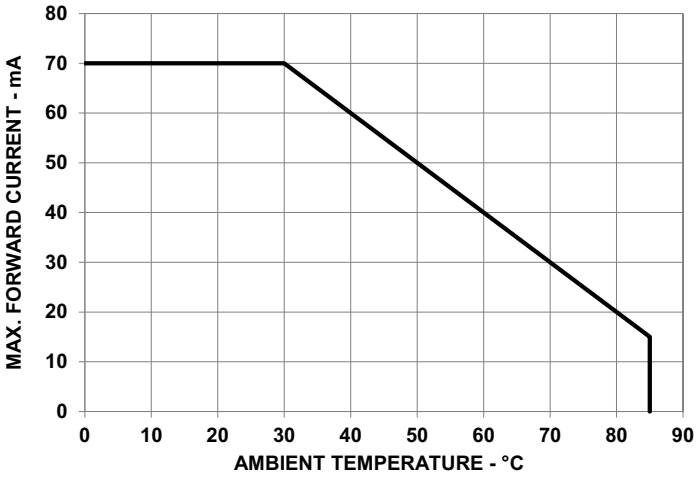


Figure 11: Recommended Soldering Land Pattern

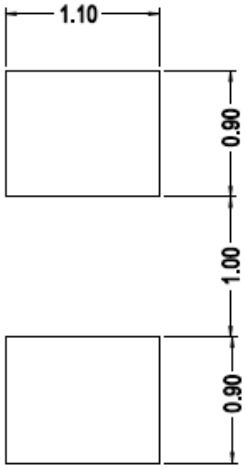
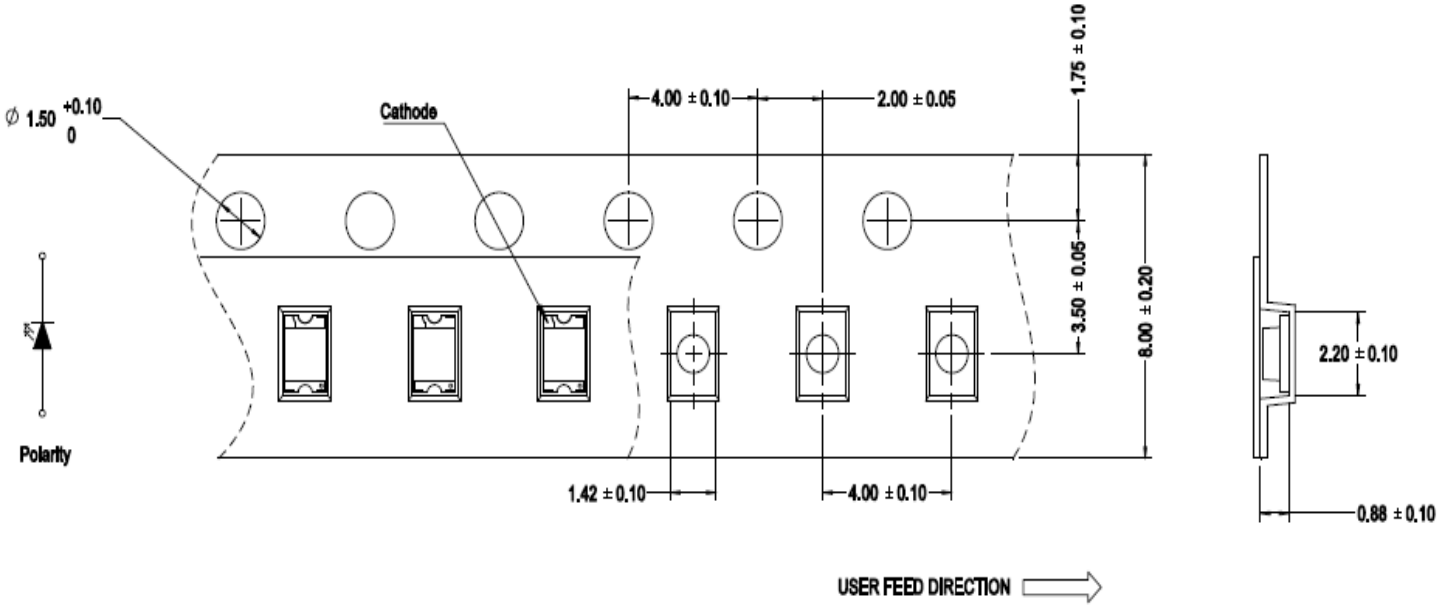


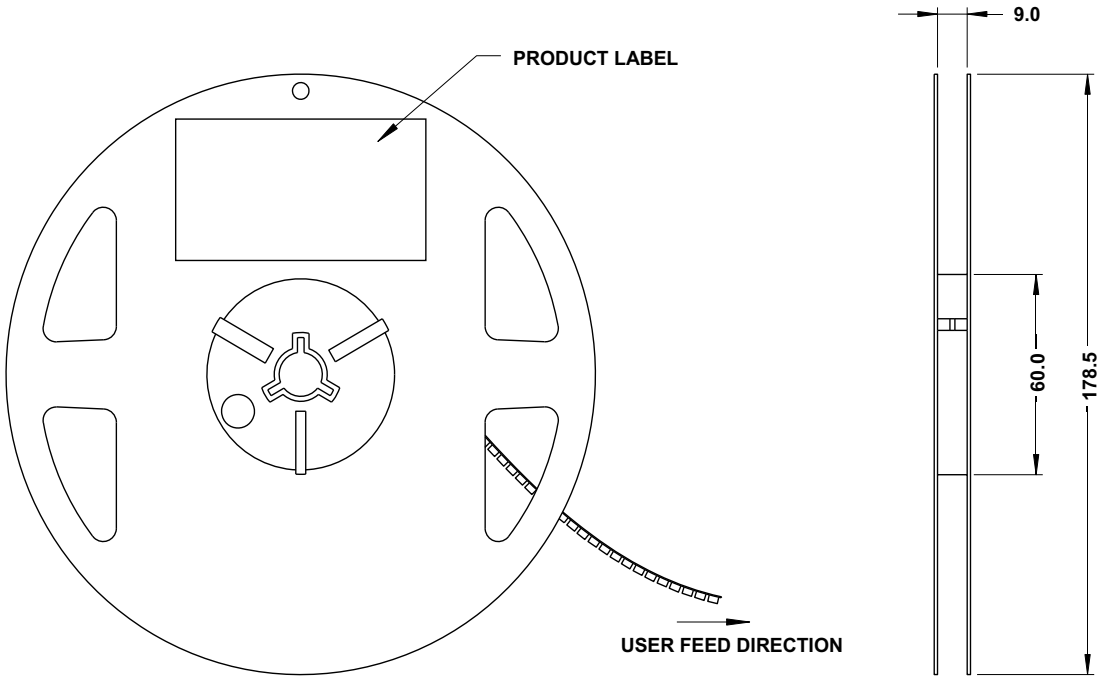
Figure 12: Carrier Tape Dimensions



NOTE:

1. All dimensions in are millimeters (mm).
2. The tolerance is ±0.10 mm unless otherwise specified.

Figure 13: Reel Dimensions



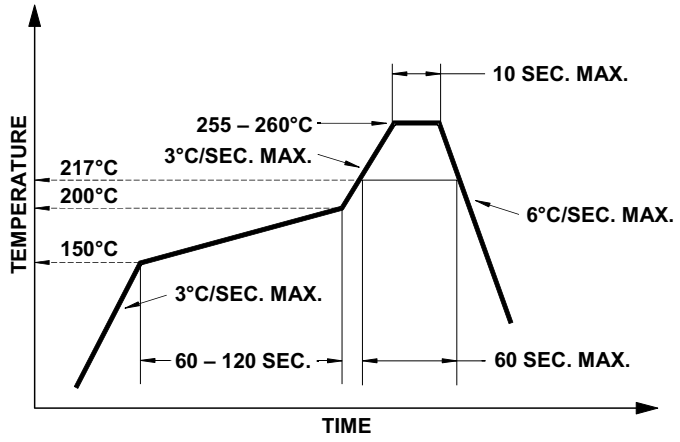
NOTE: All dimensions are in millimeters (mm).

Precautionary Notes

Soldering

- Do not perform reflow soldering more than twice.
- Observe necessary precautions of handling moisture-sensitive devices 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, because it can cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED are affected by soldering with hand soldering.

Figure 14: Recommended Lead-Free Reflow Soldering Profile



Handling Precautions

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

- 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, the 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 the 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 reels:

  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 a desiccator at <5% RH to ensure that all LEDs have not exceeded their floor life of 168 hours.
- Baking is required if:
  - The HIC 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 60ºC ± 5ºC for 20 hours.

  Baking can be done only 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 that the intended drive current can always be achieved.
- The LED exhibits slightly different characteristics at different drive currents, which can result in a larger variation of performance (meaning 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 changes in ambient temperature, especially in high-humidity environments, because they cause condensation on the LED.
- If the LED is intended to be used in a 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 can 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.

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