Driving LEDs

1. Introduction

Prior to driving an LED, which is a kind of semiconductor product, it is necessary to thoroughly comprehend its properties. For instance, fluctuation of the forward voltage *Vf* on an LED causes steep variations in the forward current *If*. In the case of Fig. 1, if the temperature conditions are constant, a 10% rise in *Vf* results in an increase of *If* by more than 40%.

Fluctuations in the forward current have a significant effect on light emission, heat generation, and other phenomena on LEDs. Especially regarding high-output lighting LEDs driven by large current, strict control of the forward current is important. In addition, the forward voltage fluctuates due to temperature, and measures for heat release are therefore a crucial factor.

Thus, when driving our LEDs, be sure to read the specifications and application notes for the relevant products and take measures according to their properties.

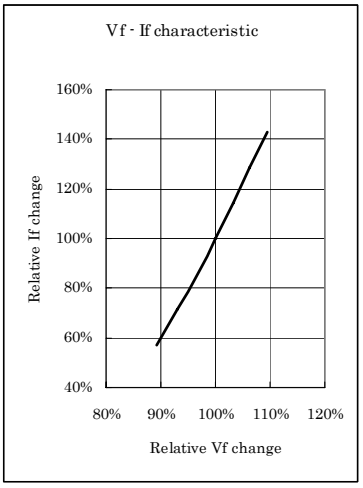


Fig. 1

2. Constant current driving system (recommended)

Even under the condition that the forward voltage fluctuates due to heat generation or other reasons, the constant current driving system supplies a certain current to LEDs and allows relatively stable driving under varying environmental conditions.

In general, as shown in the example of Fig. 2, the forward voltage to apply constant current to an LED tends to decrease as the temperature increases.

We recommend the constant current driving system with the object of stable light-emitting output and reliability.

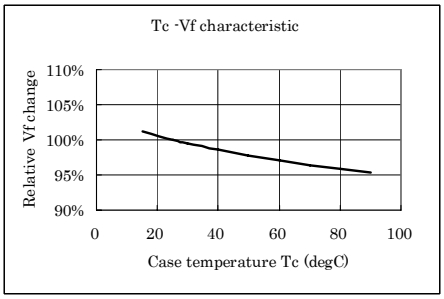


Fig. 2

3. Constant voltage driving system

As mentioned above, the forward voltage to apply constant current to an LED tends to decrease as the temperature increases. In the case of Fig. 2, when the case temperature *Tc* is 90°C, the same amount of current is achieved by the approx. 5% lower forward voltage than at *Tc* = 25°C. If constant voltage driving is provided under these conditions, comparative overvoltage and overcurrent driving status is possible.

If constant voltage driving is employed, assume the temperature in actual usage and implement appropriate measures to limit the current.

4. Precautions on inrush current

If an LED is connected to capacitive loads, such as capacitors, an instantaneous inrush current may occur when the system is turned on/off. (For instance, when the secondary side of a power supply circuit in the energized state is turned on/off.) Avoid any possible occurrence of inrush current. If it is unavoidable, implement measures so that the absolute maximum rating of the LED will not be exceeded.

5. Connection among multiple LEDs (Serial connection is recommended.)

When multiple units of identical LED products are connected, a serial connection makes the current through LEDs uniform. We recommend serial connections with the object of stable light-emitting output and reliability.

When they are connected in parallel, you need to consider variations in the forward voltage among the LEDs. To apply even current to each LED connected in parallel and which has different properties on forward voltage, implementation of measures is required such that an appropriate current-regulation resistor for the actual temperature conditions is connected to each LED in serial.