DID YOU KNOW?

PHOTOTRIACS WHAT ARE THEY AND WHAT ARE THEY GOOD FOR?

Phototriacs are solid-state AC switches consisting of an infrared (IR) emitter on the input, an isolation path, and a TRIAC switch on the output (Fig. 1). The light emitted from the IR emitter triggers the output TRIAC, making it conductive. The advantages of phototriacs over mechanical relays include their solid-state reliability, elimination of contact bounce and arcing, small size, and the ability to isolate high voltage output from the triggering input control circuitry. Phototriacs are mostly used in applications such as AC load switches, drivers for a power TRIAC, and DC latches in very unique applications.

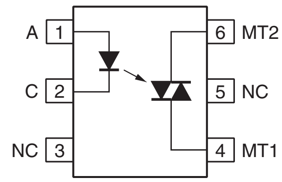

Fig. 1 - Example of a 6-Pin Phototriac

There are two different types of phototriacs based on how their output is triggered: zero-crossing and non-zero crossing.

In non-zero crossing phototriacs there is no zero-crossing detection of the AC load voltage; the output turns on immediately when the input signal triggers the phototriac. They are suitable for phase angle independent control and can be used in applications where triggering has to occur anywhere along the AC load waveform. Application examples include light dimmers, torque control in AC motors, or current regulation in welding equipment.

In zero-crossing phototriacs the output is only activated when the AC load voltage crosses the zero point. The zero-detection circuitry prevents the output from turning on when the voltage is below a certain value, almost “zero.” Typical applications include heater controls and solenoid drivers. In remote controlled sockets and lighting, the devices minimize current and voltage spikes that cause electromagnetic interference (EMI), thus reducing or eliminating snubber networks (Fig. 2).

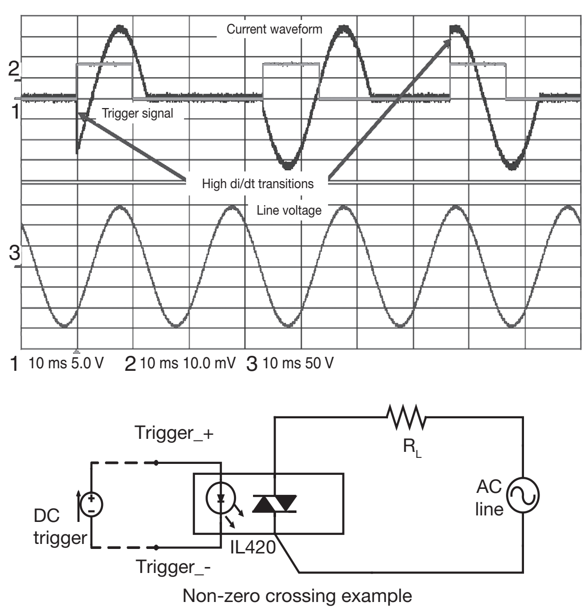

Fig. 2 - Non-Zero Crossing Example

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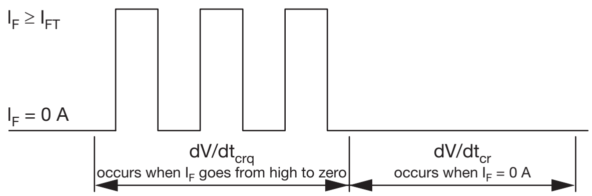
Two key phototriac performance parameters are static dV/dt and commutating dV/dt. Static dV/dt is the rated rise in voltage in the absence of a triggering signal (IFT). Exceeding this parameter will lead to the phototriac being triggered on without the presence of an input triggering signal; however, it will turn off again at the next zero-crossing of the load voltage. The commutating dV/dt rating should be taken into consideration when the forward current is changing. When the load voltage and current are not in phase with each other and the phototriac tries to turn off at zero current, the TRIAC might turn on again due to a sudden rise in voltage that exceeds the commutating dV/dt rating. For a successful turn-off, the current should drop at a rate slow enough to prevent the device from retriggering inadvertently.



dV/dt_{cr} Highest value of the “rate of rise of off-state voltage”, which does not cause any switching from the off-state to the on-state

dV/dt_{crq} Highest value of the “rate of rise of communicating voltage”, which does not switch on the device again, after the voltage has decreased to zero and the trigger current is switched from I_{FT} to zero

Fig. 3 - Graphic Explanation of Static and Commutating dV/dt

Finally, a key advantage of many Vishay phototriacs is the low level of input LED current required to trigger them. This makes the devices ideal for microcontroller-based applications such as IOT and home automation, where the triggering current to drive the power controlling devices is very limited. Vishay phototriacs’ triggering current starts at a very low 0.7 mA (typ.) for the industry-leading IL4xx series with 10 kV/μs performance. The series is available in zero-crossing versions – IL4116 (600 V) to IL4118 (800 V) – and non-zero crossing versions – IL4216 (600 V) to IL4218 (800 V).

If 5 kV/μs performance is sufficient, the VO4xxx series with very low trigger currents of 1.6 mA (typ.) is recommended. The series is available in zero-crossing versions – VO4156 (600 V) and VO4158 (800 V) – and non-zero crossing versions – VO4256 (600 V) and VO4258 (800 V).

Resources

- “Phototriac Basics” application note
- Phototriacs frequently asked questions (FAQs)
- Vishay phototriacs product listing
- Vishay phototriacs document library
- Vishay phototriacs design tools, including 3D models, SPICE models, and footprints

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