

MOSFET & IGBT Protection: Over Current Detectors



An Introduction to Over Current Detectors

When considering incorporation of over current protection into circuits, one of the first considerations is the technique to detect the over current condition. Among the popular techniques are current sense transformers, Hall effect current sensors, current sensing resistors, and de-sat sensing on power transistors. For each method, you are faced with trade-offs between cost, size, simplicity, isolation, noise immunity, power dissipation, and robustness.

E-T-A's over current detectors (OCDs) are each fully integrated with an output factory programmed to go low at a specific input current level. They are designed to be mounted directly to a printed circuit board and like other Hall effect current sensors,

provide isolation between the sensed current and the output. Features include:

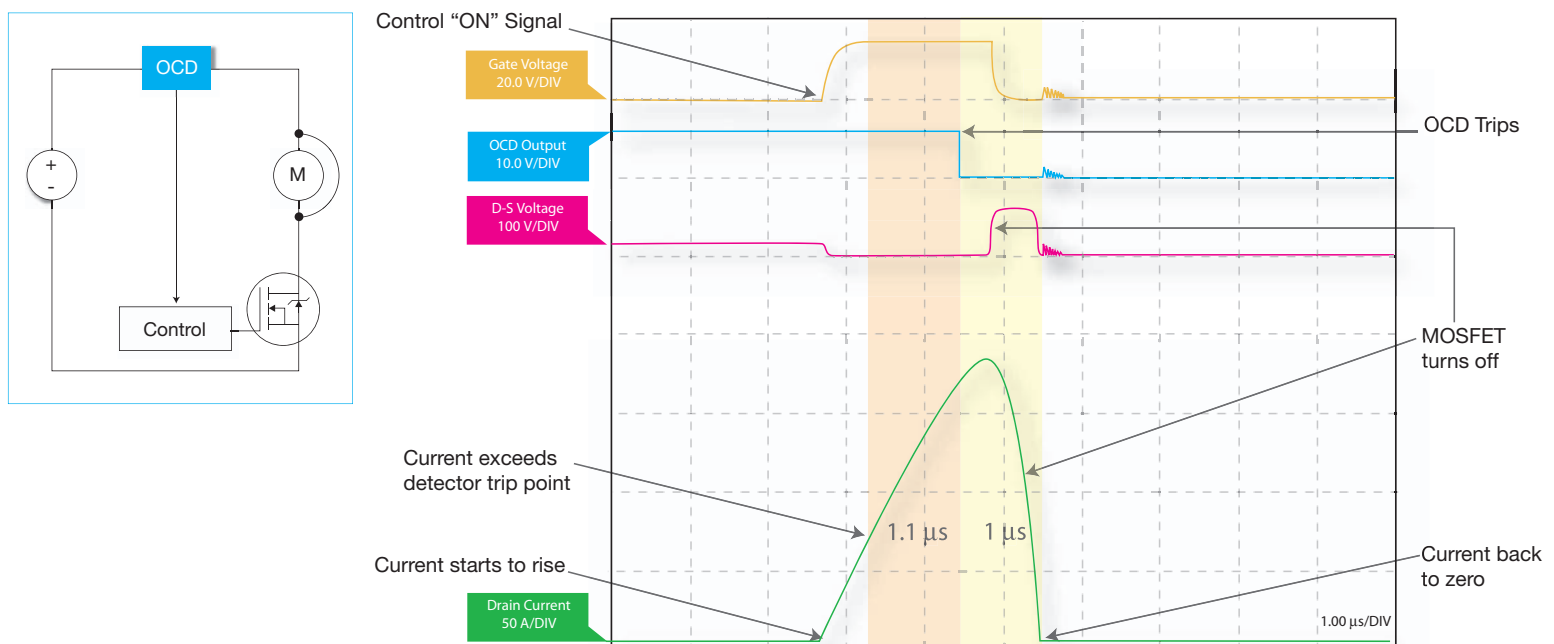
- Ultra Fast (1 μ s)
- Fully Isolated
- Open Collector Digital Output
- Low Power Dissipation
- Near Zero Insertion Loss
- Wide Trip Point Range in a Single Package
- Inexpensive
- Fail-safe Protection
- Small Footprint

An OCD in Action: A Circuit Example

This circuit example demonstrates the OCD protection scheme during a low impedance short circuit condition. This circuit is a brush DC motor drive circuit. The output terminals on the printed circuit board have been shorted to maximize the current rise time and demonstrate the OCD's effectiveness with a near worst case over current event.

In this circuit, when the MOSFET is turned on by the control circuit (yellow wave form below), a direct short occurs across the power supply with only the impedance of the MOSFET, circuit conductors, power supply, and the OCD opposing the current.

The result is a very fast rising, quickly destructive current as shown in the current waveform (green). The OCD detects the over current event, and its output sends a shutdown signal (blue waveform) to the circuit control. The control then acts to drive the gate voltage (yellow) to zero which results in the MOSFET turning off (pink and green waveforms). The result is a response time of 2.1 μ s from the time the current exceeds the detector trip point to the complete turn off of the MOSFET. This ultrafast response time minimizes the current and avalanche energy the MOSFET has to support and ensures maximum circuit protection robustness.



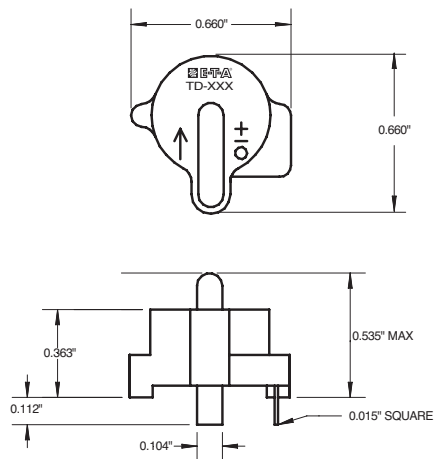
Absolute Maximum Ratings

	TD Over Current Detector	9001 Over Current Detector
Supply voltage	- 1.0 to + 25 VDC	- 1.0 to + 25 VDC
Voltage externally applied to output	+ 25 VDC max (output high, current below I_{trip}) -0.5 VDC min (output high or low)	+ 25 VDC max (output high, current below I_{trip}) -0.5 VDC min (output high or low)
Output ON current (sink)	50 mA	50 mA
Operating temp. range	- 40 to + 125 °C	- 40 to + 125 °C
Sensed current	+/- 500 Amp peak	+/- 500 Amp peak
RMS voltage for AC isolation test, 50/60 Hz, 1 min	2.5 kVac	

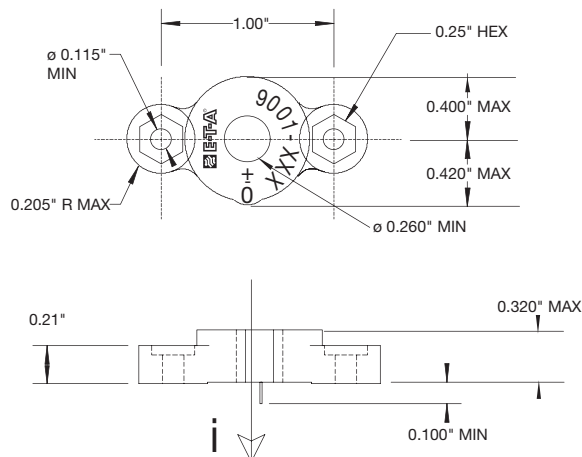
Absolute maximum ratings are the extreme limits that the detector will withstand without damage. Electrical operation and characteristics are not guaranteed as the maximum limits are approached. Proper application of the detector must ensure that the detector operates within the operating characteristics.

Mechanical Dimensions

TD Over Current Detector



9001 Over Current Detector



Ordering Guide

TD Over Current Detector



Type No

TD Over Current Detector

Trip Point

015	15 Amp
020	20 Amp
025	25 Amp
030	30 Amp
035	35 Amp
040	40 Amp
045	45 Amp
050	50 Amp
055	55 Amp
060	60 Amp
065	65 Amp
070	70 Amp
075	75 Amp
080	80 Amp
085	85 Amp
090	90 Amp
095	95 Amp
100	100 Amp
105	105 Amp
110	110 Amp
115	115 Amp
120	120 Amp
125	125 Amp

TD - 025 = ordering example

9001 Over Current Detector



Type No

9001 Over Current Detector

Trip Point

050	50 Amp
075	75 Amp
100	100 Amp
125	125 Amp
150	150 Amp

9001 - 050 = ordering example

9002 Accessories

Code

001 Accessory busbar

9002 - 001 = ordering example

Need More Information?

Visit www.e-t-a.com/OCD

Application Notes

- Recommended Mounting and Interface Notes
- Over Current Detector Circuit Examples
- Fast Acting Over Current Power Circuit Protection Scheme

Technical Datasheets

- TD Over Current Detector
- 9001 Over Current Detector

Additional Resources

- Power Electronics Technology Magazine Feature Article:
Protecting MOSFETs Against Overcurrent Events
- Product Sample Request Form



E-T-A Circuit Breakers
1551 Bishop Ct.
Mt. Prospect, IL 60056
Phone (847) 827-7600 Fax (847) 827-7655
usinfo@e-t-a.com