New Release

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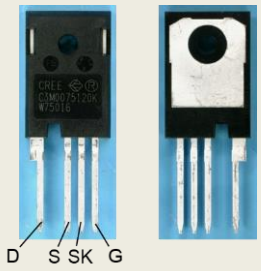
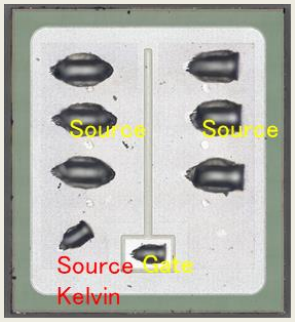
WOLFSPEED C3M0075120K 1,200V SiC MOSFET SHORT CIRCUIT ROBUSTNESS ANALYSIS REPORT

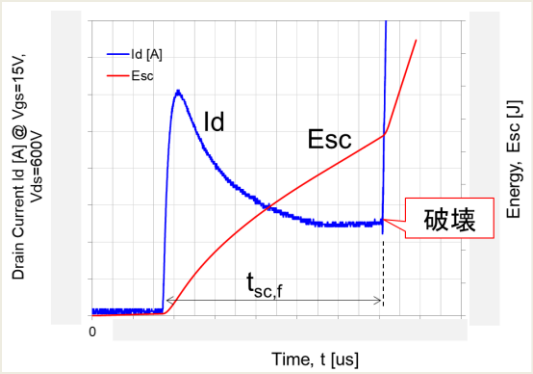
February 2020. The short-circuit (SC) capability of power transistors, especially SiC power MOSFETs, is one of the most critical reliability-related specifications. Compared to Si-based IGBTs, the size of the SiC transistor is smaller. This leads to significant reduction in SC endurance time (tsc).



Package



Die image



Drain current waveform and short-circuit energy (Esc)

Abstract

This is the first published short-circuit robustness analysis report that examines the correlation between short circuit robustness and the physical structure of the C3M0075120K device, which the 3rd gen. of Wolfspeed.

The report includes:

- Identification of the mechanisms limiting short-circuit capability, measurements, physical analysis results, and extraction of the critical temperature (Tj(crit)) at the onset of failure.
- Comparison of short-circuit robustness with 2nd gen 1200V SiC MOSFETs.
- Examination of the differences in semiconductor structure, process, and their effect on short circuit robustness.
- **Use value of the evaluation results in this report**
- The minimum response time of the short-circuit protection circuit can be estimated.
- The internal device temperature can be estimated by performing electrothermal SPICE simulation using measured short-circuit drain current waveform and endurance time ($t_{sc,f}$).

Note: The report price may change over time. For current price contact **info@ltecusa.com**.

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Table of Contents

Excerpts from the report

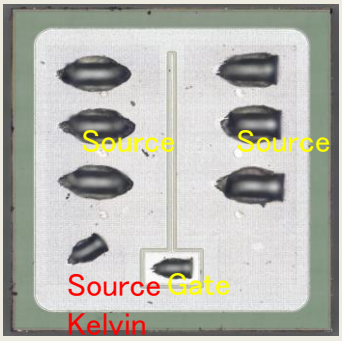

Fig.2: Die

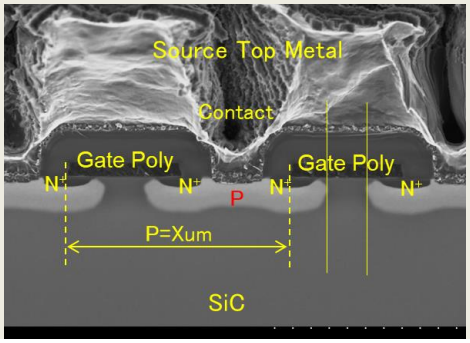

Fig.4: Cross-sectional image of SiC transistor

Table 2 : Evaluation Conditions

#	Vds [V]	Vgs [V]	Purpose
1	600		Basic SC characteristics
2	600		Check reproducibility
3	400		Drain voltage effect
4	800		“
5	600		Gate-Source voltage effect
6	600		“

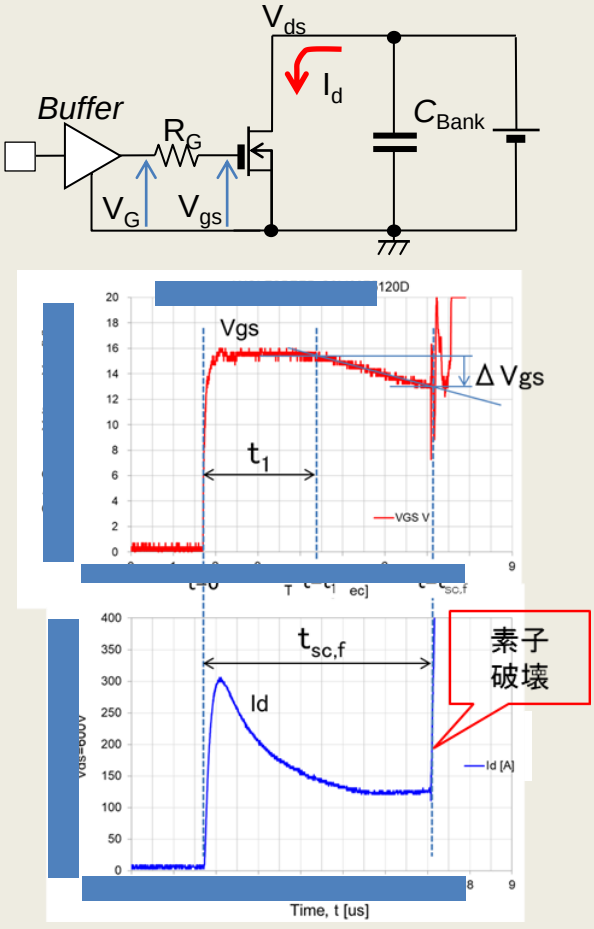

Fig.17: Measured gate-source voltage and drain current waveforms during SC event.

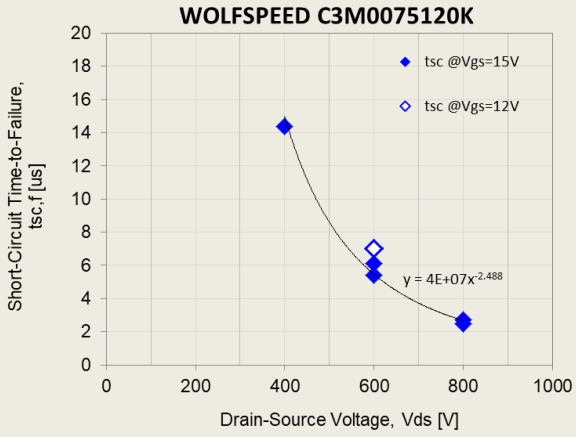

Fig.18: Measured dependence of the SC time to failure $t_{sc,f}$ vs the drain voltage Vds.

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