New Release

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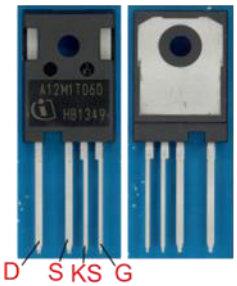
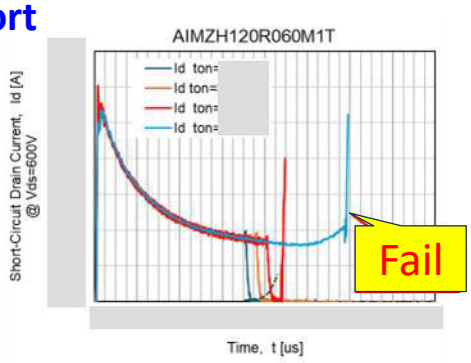
SiC MOSFET (1200V): INFINEON AIMZH120R060M1T
Short-Circuit (SC) Robustness Analysis Report



Package

SiC



SCWT result

Product : **AIMZH120R060M1T** Vds=1200V Id=38A
Product release date: November 2023 (datasheet)

Report Background

Infineon developed the MOSFET that adopted CoolSiC Gen.1 technology in 2017. This technology has been improving and improved version of Gen.1 was released in 2023. RonA FOM has been reduced by approximately 40% in new product. *Refer to the analysis report of Infineon_AIMBG120R010M1.

LTEC released new report evaluating the short circuit withstand time (SCWT) and comparing it with the previous generation and other companies' products.

Reports content and main results (Refer to P.2 for details)

Short-Circuit (SC) Robustness Analysis Report (46 pages)

- Analysis of evaluation data to identify physical mechanisms that limit SC tolerance
- Extraction of critical temperature (Tj, crit) and energy (Esc) to failure.
- Critical temperature at which the gate oxide film begins to deteriorate.
- Comparison of SC tolerance between INFINEON and other companies' 1200V transistors. Changes in transistor structure and process. Compare electrical characteristics (off-leakage current and temperature dependence).
- Extremely low on-resistance (RonA = 204mΩ × mm^2) ⇒ Compact chip can be realized

Importance and use of assessment results

- The necessary minimum response time of the SC protection circuitry.
- From the measured SC drain current waveform and withstand time ($t_{sc,f}$), the internal temperature of the transistor is estimated using SPICE electrothermal simulation.

Please contact us for report pricing.

* LTEC also released for Structural analysis and process analysis reports of this product.

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Release day : 2024.04.05

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Excerpt from analysis report (1)

Fig.2: SiC die

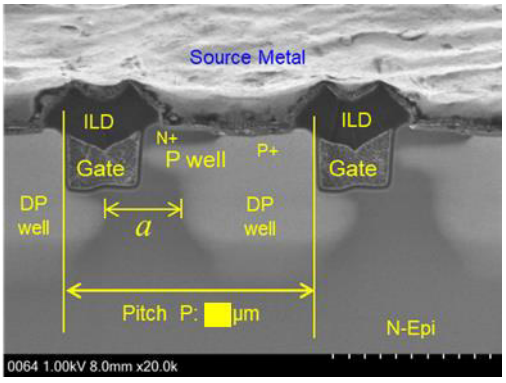

Fig.4: SiC transistor cross-sectional SEM

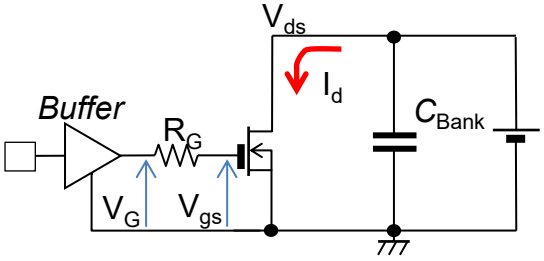

Table 2. Short circuit withstand test evaluation conditions

No.	V_{ds} [V]	$V_{gs(ON)}$ [V]	$V_{gs(OFF)}$ [V]	ton [ns]	Purpose
1	600	20	0	20	Basic short circuit characteristic
2	600	20	0	3~5	Check Pulse width dependence
3	400	20	0	20	Check Drain Voltage dependence
4	800	20	0	20	"
5	600	15	0	20	Check Gate Voltage dependence
6	600	18	0	20	"
7	600	22	0	20	"
8	800	18	0	20	"

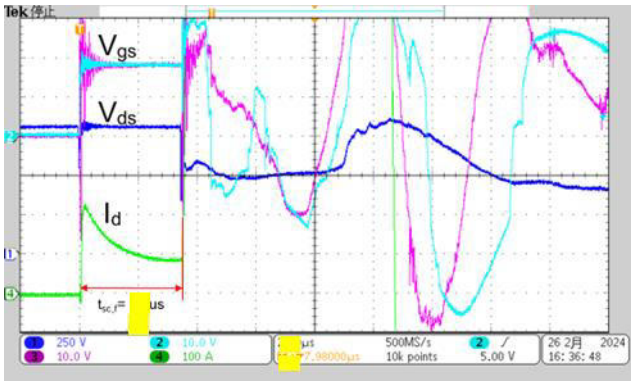

Fig.4-1-8 Voltage and current waveform results; Transistor destruction at Vds=800V

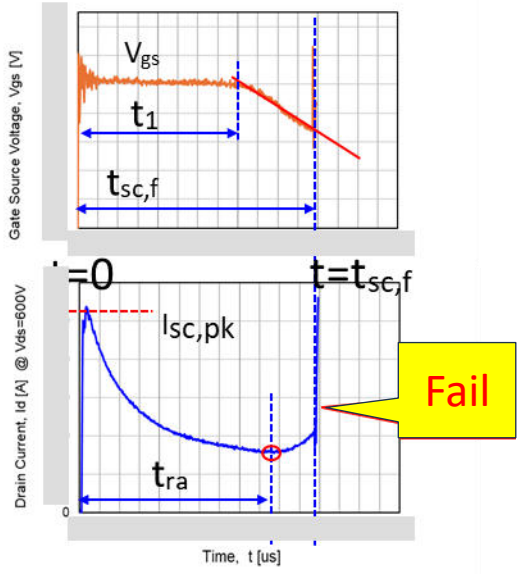

Fig.4-1-10 Typical measured Vgs, drain current Id waveform

Excerpt from analysis report (2)

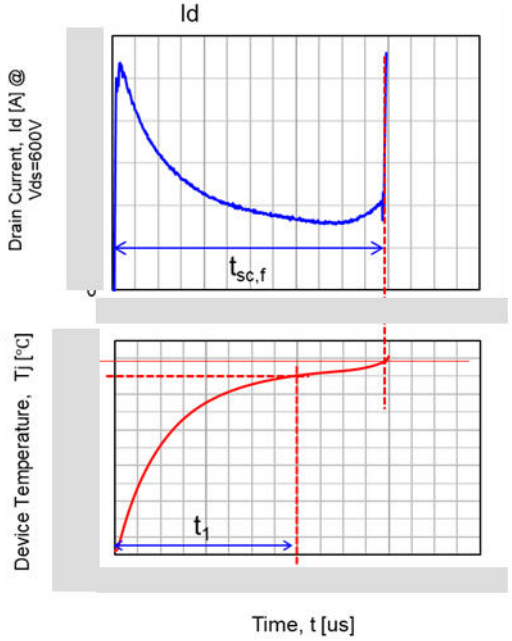

Fig.4-5-2: Short-circuit transient SPICE modeling and extracted transistor temperature rise.

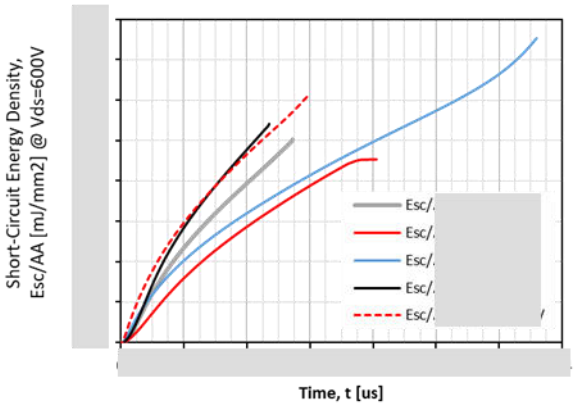

Fig.5-2-3: Comparison of ROHM 4G, Wolfspeed 3G (WLFSPD C3M075120K), STMicro 3G (ST3G), and INFINEON (Gen1 and Gen1+) SiC MOSFETs short-circuit dissipated energy density (Esc/AA).

Table 5: Short-circuit robustness comparison (@ Vds=600V)

	INFINEON	INFINEON	Wolfspeed
	IMW120R045M1	AIMZH120R060M1T	C3M0075120K
Process Generation	1st (Gen1)	1st + (Gen1+)	3rd
MOSFET Channel width W [mm]			
Active area AA [mm2]			
Width-Area ratio W/A [mm/mm2]			
Transconductance parameter, β [A/V^2]			
β/AA [S/V·mm2]			
β/W [x10^{-3} S/V·mm]			
Vp JFET pinch-off voltage [V]			
Vgs [V]			
Peak I_{sc} [A]			
Peak I_{sc}/AA [A/mm2]			
Avg Power Density, P_d/AA [W/mm2]			
$T_{j,crit}$ [°C]			
Thermal Impedance at t=5us (Reference time) [W/°C]			
Specific thermal impedance ZthxAA [W·mm^2/°C]			
Measured time-to-failure (SCWT) $t_{sc,f}$ [us]			
Measured time-to-runaway, t_{ra} [us]			