



SKiM® 93

Trench IGBT Modules

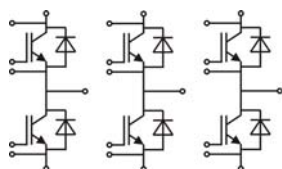
SKiM909GD066HD

Features

- IGBT 3 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Isolated by Al_2O_3 DCB (Direct Copper Bonded) ceramic substrate
- Pressure contact technology for thermal contacts and electrical contacts
- High short circuit capability, self limiting to $6 \times I_C$
- Integrated temperature sensor

Typical Applications*

- Automotive inverter
- High reliability AC inverter wind
- High reliability AC inverter drives



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V _{CES}			600	V
I _C	T _j = 175 °C	T _s = 25 °C	899	A
		T _s = 70 °C	715	A
I _{Cnom}			900	A
I _{CRM}	I _{CRM} = 2xI _{Cnom}		1800	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 360 V V _{GE} ≤ 15 V V _{CES} ≤ 600 V	T _j = 150 °C	6	μs
T _j			-40 ... 175	°C
Inverse diode				
I _F	T _j = 175 °C	T _s = 25 °C	712	A
		T _s = 70 °C	550	A
I _{Fnom}			900	A
I _{FRM}	I _{FRM} = 2xI _{Fnom}		1800	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		4320	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C		700	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 900\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25\text{ °C}$	1.45	1.85	V
		$T_j = 150\text{ °C}$	1.70	2.10	V
V_{CE0}		$T_j = 25\text{ °C}$	0.9	1	V
		$T_j = 150\text{ °C}$	0.85	0.9	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25\text{ °C}$	0.6	0.9	m Ω
		$T_j = 150\text{ °C}$	0.9	1.3	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 14.4\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 600\text{ V}$	$T_j = 25\text{ °C}$	0.1	0.3	mA
		$T_j = 150\text{ °C}$			mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	55.44		nF
C_{oes}		$f = 1\text{ MHz}$	3.46		nF
C_{res}		$f = 1\text{ MHz}$	1.64		nF
Q_G	$V_{GE} = -8\text{ V...} + 15\text{ V}$		7200		nC
R_{Gint}	$T_j = 25\text{ °C}$		0.3		Ω
$t_{d(on)}$	$V_{CC} = 300\text{ V}$ $I_C = 900\text{ A}$	$T_j = 150\text{ °C}$	570		ns
t_r		$T_j = 150\text{ °C}$	160		ns
E_{on}	$R_{G on} = 3\text{ }\Omega$	$T_j = 150\text{ °C}$	36		mJ
$t_{d(off)}$	$R_{G off} = 3\text{ }\Omega$	$T_j = 150\text{ °C}$	1290		ns
t_f	$di/dt_{on} = 5100\text{ A}/\mu s$	$T_j = 150\text{ °C}$	90		ns
	$di/dt_{off} = 9000\text{ A}/\mu s$	$T_j = 150\text{ °C}$	88		ns
E_{off}					mJ
$R_{th(j-s)}$	per IGBT			0.078	K/W



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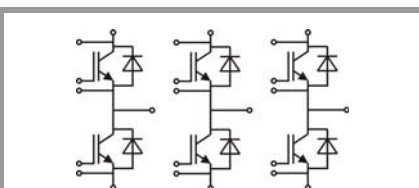
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Typical Applications*

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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 900 A	T _j = 25 °C		1.5	1.8	V
	V _{GE} = 0 V chip	T _j = 150 °C		1.6	1.8	V
V _{F0}		T _j = 25 °C	0.9	1	1.1	V
		T _j = 150 °C	0.75	0.85	0.95	V
r _F		T _j = 25 °C	0.4	0.6	0.7	mΩ
		T _j = 150 °C	0.7	0.8	0.9	mΩ
I _{RRM}	I _F = 900 A	T _j = 150 °C	500			A
Q _{rr}	di/dt _{off} = 4800 A/μs	T _j = 150 °C	118			μC
E _{rr}	V _{GE} = -15 V	T _j = 150 °C	29			mJ
	V _{CC} = 300 V					
R _{th(j-s)}	per diode		0.135			K/W
Module						
L _{CE}			10		15	nH
R _{CC'+EE'}	terminal-chip	T _s = 25 °C	0.3			mΩ
		T _s = 125 °C	0.5			mΩ
w			1042			g
Temperature sensor						
R ₁₀₀	T _{Sensor} = 100 °C (R ₂₅ = 5 kΩ)		339			Ω
B _{100/125}	R _(T) = R ₁₀₀ exp[B _{100/125} (1/T-1/373)]; T[K];		4096			K



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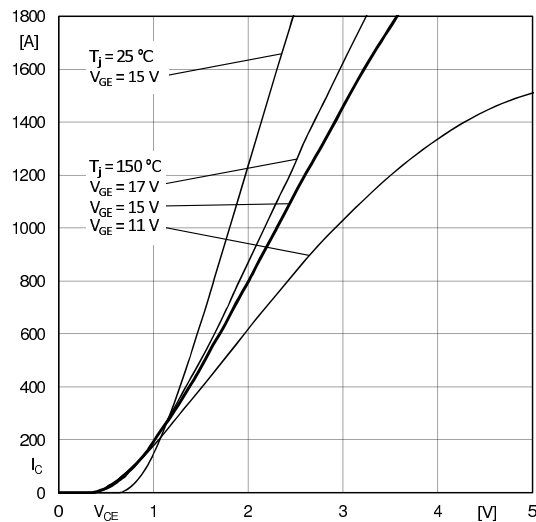


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + EE'$

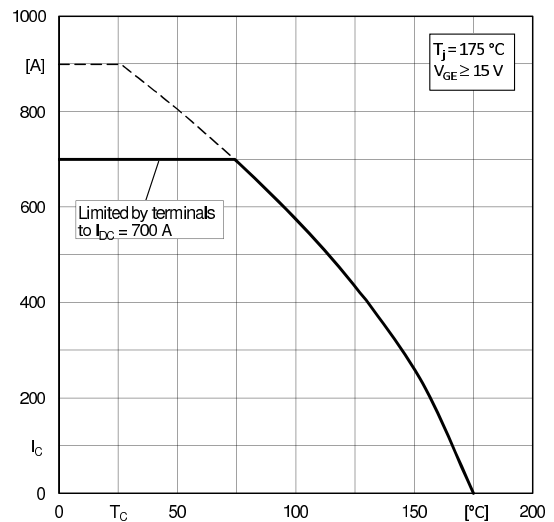


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

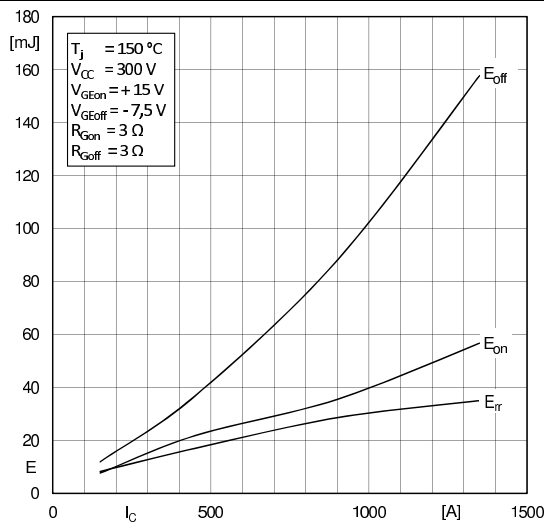


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

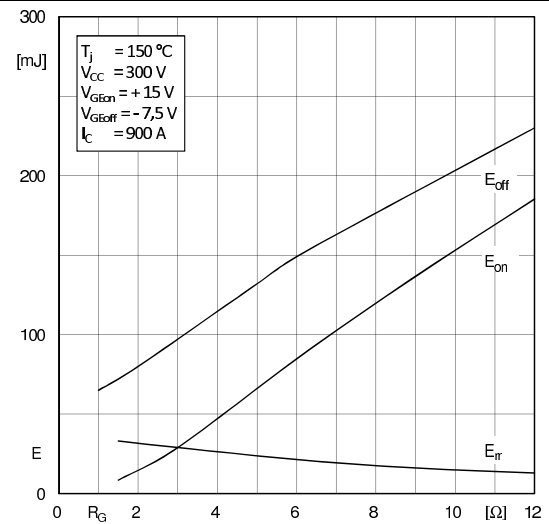


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

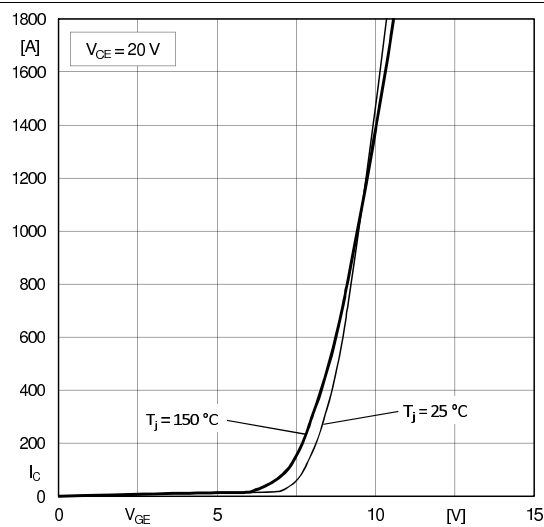


Fig. 5: Typ. transfer characteristic

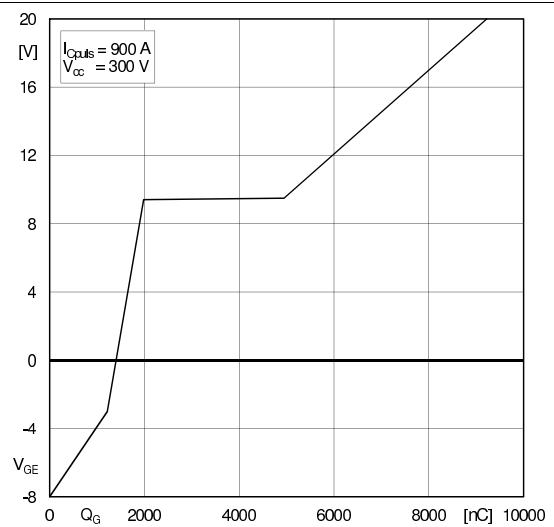


Fig. 6: Typ. gate charge characteristic

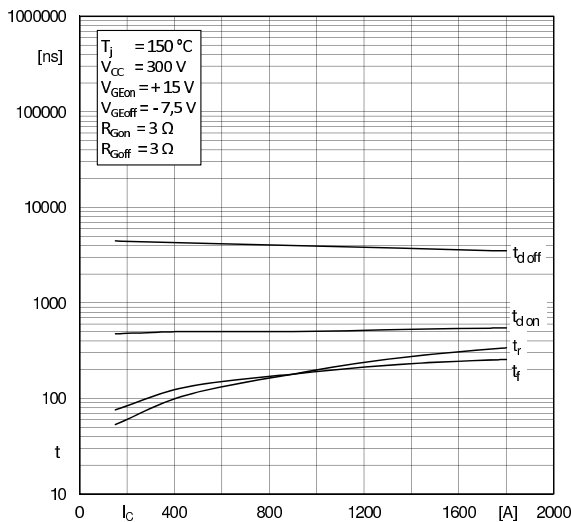


Fig. 7: Typ. switching times vs. I_C

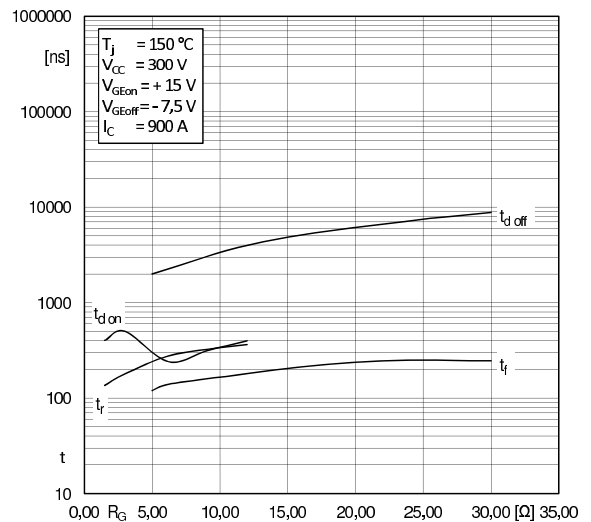


Fig. 8: Typ. switching times vs. gate resistor R_G

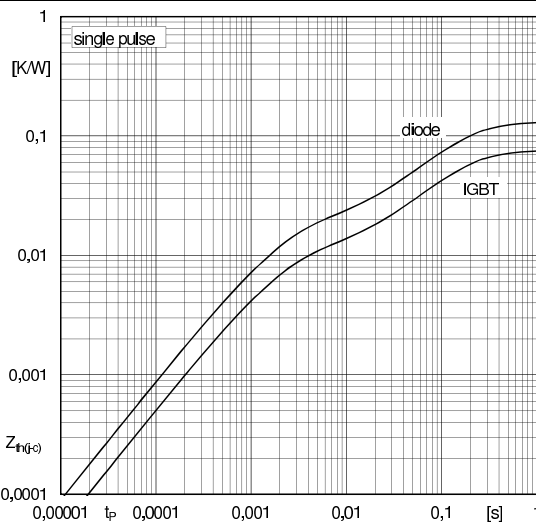


Fig. 9: Typ. transient thermal impedance

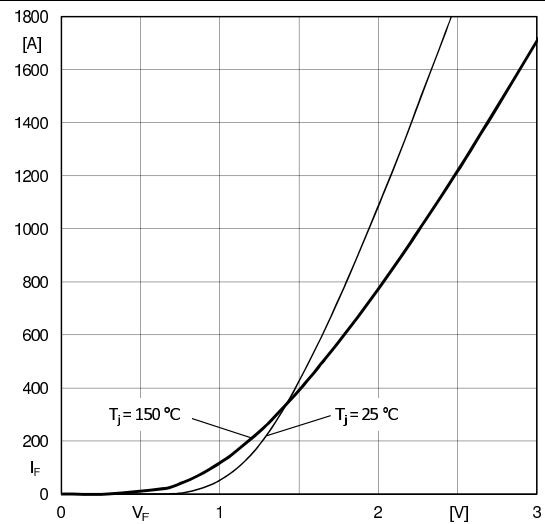


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

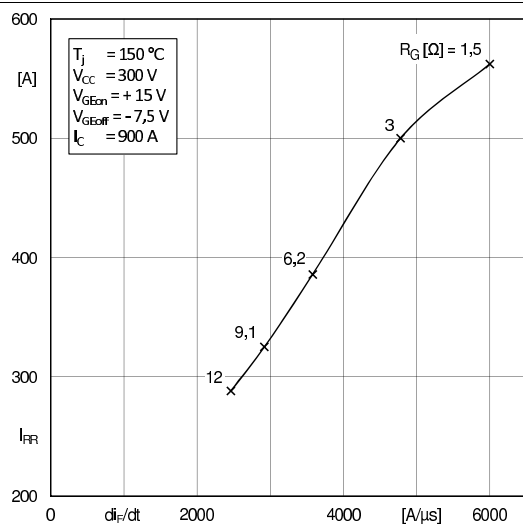


Fig. 11: Typ. CAL diode peak reverse recovery current

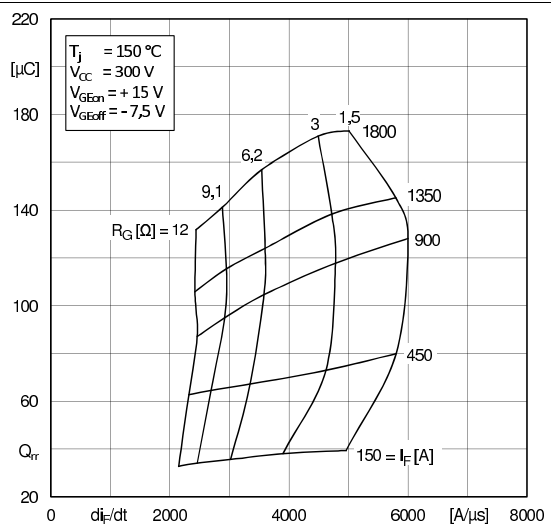
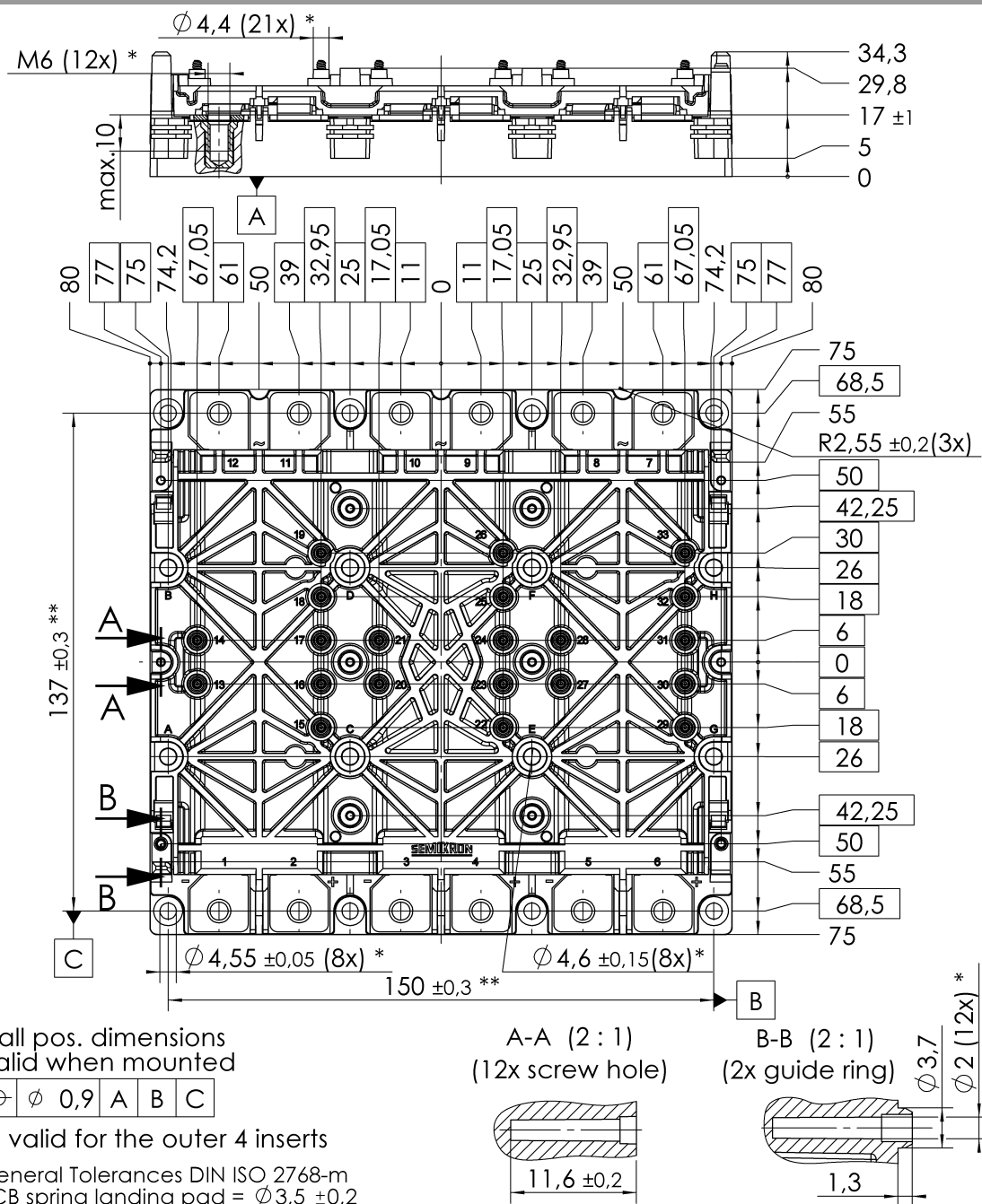
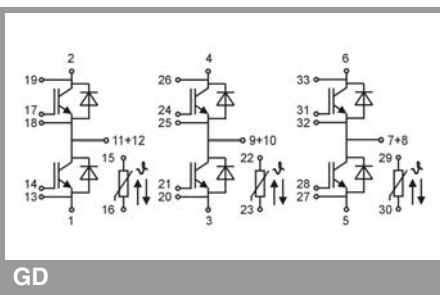


Fig. 12: Typ. CAL diode recovery charge



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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.