

SKiM® 63

Trench IGBT Modules

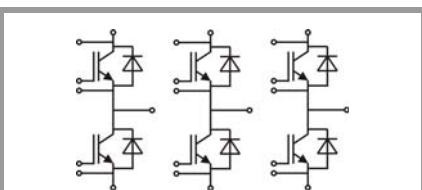
SKiM406GD066HD

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

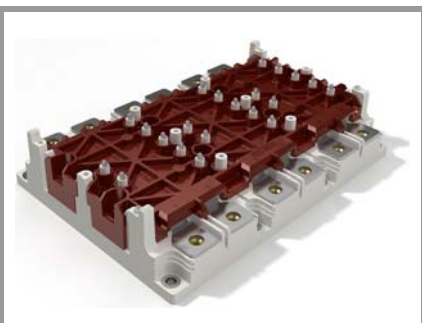
- Automotive inverter
- High reliability AC inverter wind
- High reliability AC inverter drives



GD

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
IGBT				
V_{CES}		600	V	
I_C	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	383	A
		$T_s = 70\text{ °C}$	304	A
I_{Cnom}		400	A	
I_{CRM}	$I_{CRM} = 2 \times I_{Cnom}$	800	A	
V_{GES}		-20 ... 20	V	
t_{psc}	$V_{CC} = 360\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 600\text{ V}$	$T_j = 150\text{ °C}$	6	μs
T_j		-40 ... 175	$^{\circ}C$	
Inverse diode				
I_F	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	320	A
		$T_s = 70\text{ °C}$	249	A
I_{Fnom}		300	A	
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	600	A	
I_{FSM}	$t_p = 10\text{ ms, sin } 180^{\circ}, T_j = 25\text{ °C}$	2340	A	
T_j		-40 ... 175	$^{\circ}C$	
Module				
$I_{t(RMS)}$		700	A	
T_{stg}		-40 ... 125	$^{\circ}C$	
V_{isol}	AC sinus 50 Hz, $t = 1\text{ min}$	2500	V	

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 400\text{ A}$ $V_{GE} = 15\text{ V}$ 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}	$V_{GE} = 15\text{ V}$	$T_j = 25\text{ °C}$	1.4	2.1	$m\Omega$
		$T_j = 150\text{ °C}$	2.1	3.0	$m\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 6.4\text{ mA}$	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}	$V_{CE} = 25\text{ V}$		24.64		nF
C_{oes}	$V_{GE} = 0\text{ V}$		1.54		nF
C_{res}			0.73		nF
Q_G	$V_{GE} = -8\text{ V...} + 15\text{ V}$		3200		nC
R_{Gint}	$T_j = 25\text{ °C}$		0.5		Ω
$t_{d(on)}$	$V_{CC} = 300\text{ V}$	$T_j = 150\text{ °C}$	180		ns
t_r	$I_C = 400\text{ A}$	$T_j = 150\text{ °C}$	80		ns
E_{on}	$R_{G on} = 3\text{ }\Omega$	$T_j = 150\text{ °C}$	8		mJ
$t_{d(off)}$	$R_{G off} = 5\text{ }\Omega$	$T_j = 150\text{ °C}$	950		ns
t_f	$di/dt_{on} = 5900\text{ A}/\mu s$ $di/dt_{off} = 6000\text{ A}/\mu s$	$T_j = 150\text{ °C}$	50		ns
E_{off}		$T_j = 150\text{ °C}$	25		mJ
$R_{th(j-s)}$	per IGBT			0.186	K/W



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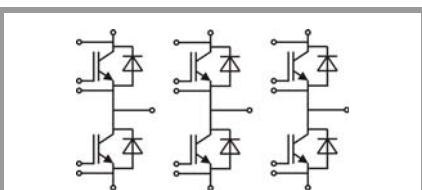
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GD

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 400 \text{ A}$ $V_{GE} = 0 \text{ V}$ chip	$T_j = 25 \text{ }^\circ\text{C}$	1.5	1.8		V
		$T_j = 150 \text{ }^\circ\text{C}$	1.6	1.8		V
V_{F0}		$T_j = 25 \text{ }^\circ\text{C}$	1	1.1		V
		$T_j = 150 \text{ }^\circ\text{C}$	0.85	0.95		V
r_F		$T_j = 25 \text{ }^\circ\text{C}$	1.3	1.7		m Ω
		$T_j = 150 \text{ }^\circ\text{C}$	1.8	2.2		m Ω
I_{RRM}	$I_F = 400 \text{ A}$	$T_j = 150 \text{ }^\circ\text{C}$	350			A
Q_{rr}	$di/dt_{off} = 5900 \text{ A}/\mu\text{s}$	$T_j = 150 \text{ }^\circ\text{C}$	49			μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_{CC} = 300 \text{ V}$	$T_j = 150 \text{ }^\circ\text{C}$	12			mJ
$R_{th(j-s)}$	per diode				0.288	K/W
Module						
L_{CE}			9	13		nH
$R_{CC'+EE'}$	terminal-chip	$T_s = 25 \text{ }^\circ\text{C}$	0.3			m Ω
		$T_s = 125 \text{ }^\circ\text{C}$	0.5			m Ω
M_s	to heat sink (M4)		2.5	4		Nm
M_t		to terminals (M6)	3	5		Nm
w				750		g
Temperature sensor						
R_{100}	$T_{Sensor} = 100 \text{ }^\circ\text{C}$ ($R_{25} = 5 \text{ k}\Omega$)		339			Ω
$B_{100/125}$	$R_{(T)} = R_{100} \exp[B_{100/125}(1/T - 1/373)];$ $T[\text{K}];$		4096			K

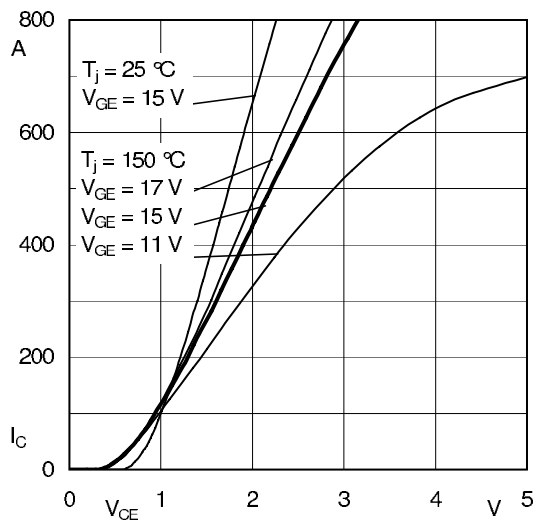


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

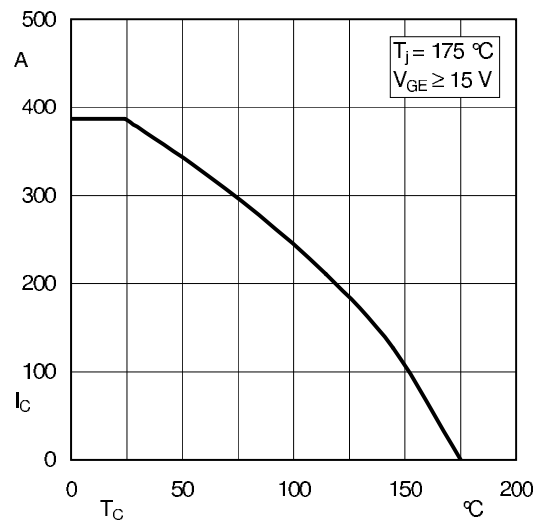


Fig. 2: Rated current vs. temperature $I_c = f(T_C)$

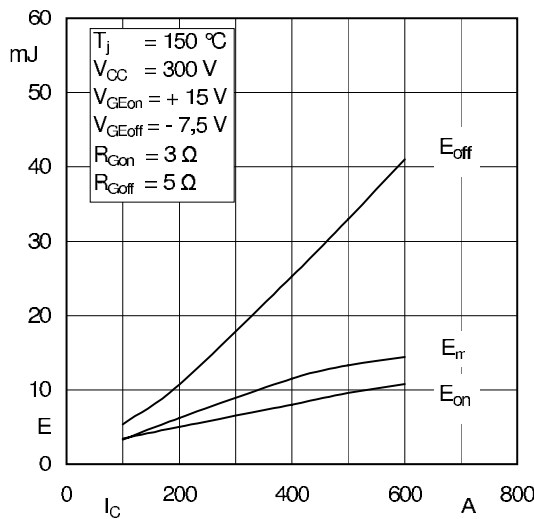


Fig. 3: Typ. turn-on /-off energy = $f(I_c)$

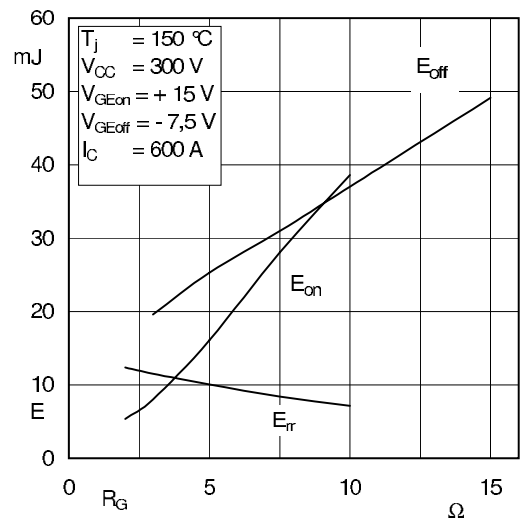


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

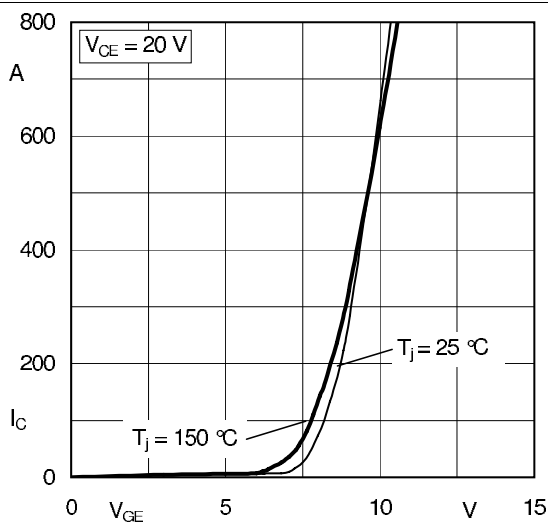


Fig. 5: Typ. transfer characteristic

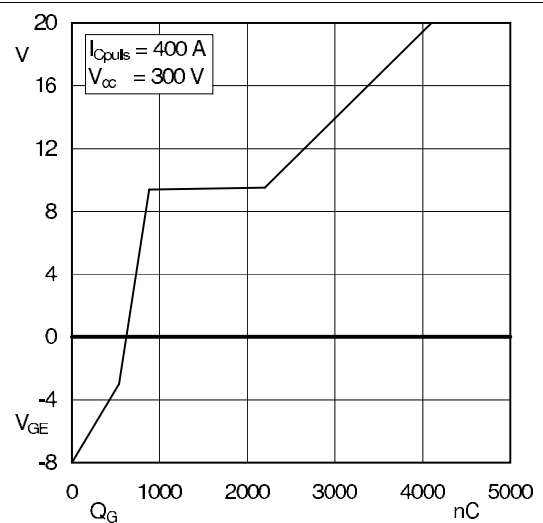


Fig. 6: Typ. gate charge characteristic

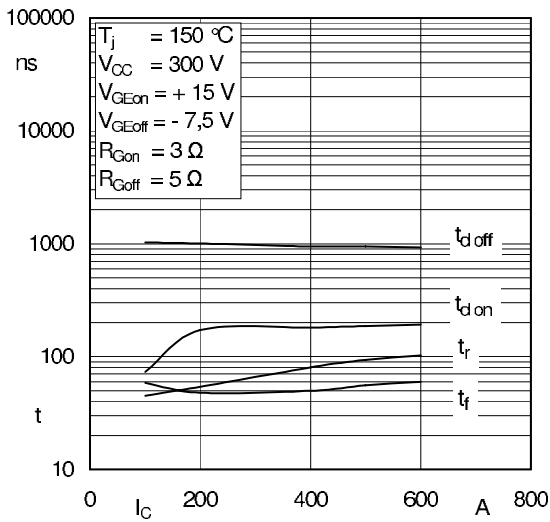


Fig. 7: Typ. switching times vs. I_C

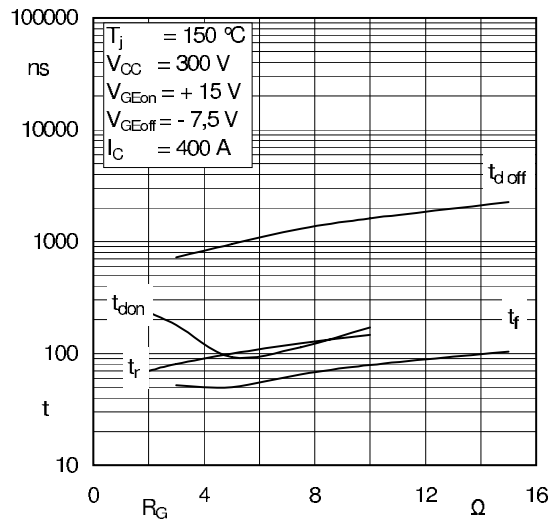


Fig. 8: Typ. switching times vs. gate resistor R_G

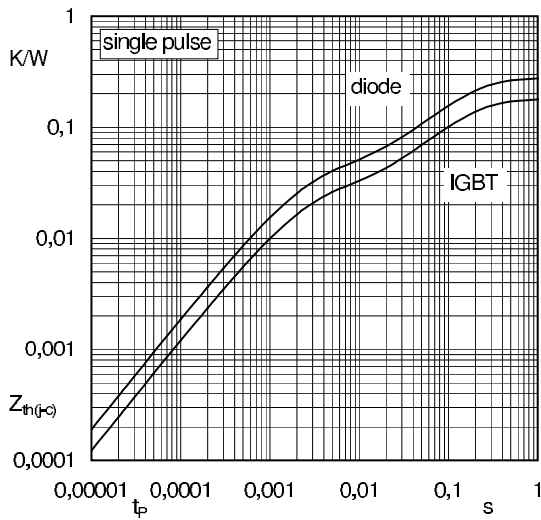


Fig. 9: Typ. transient thermal impedance

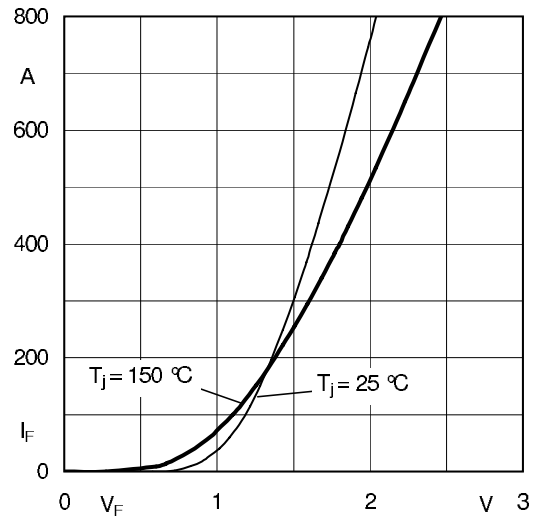


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC+EE'}$

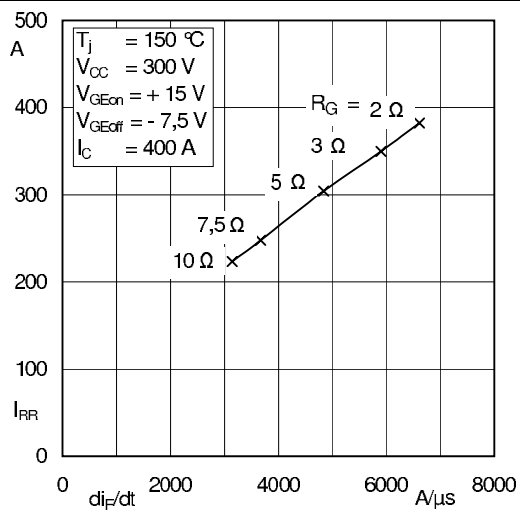


Fig. 11: Typ. CAL diode peak reverse recovery current

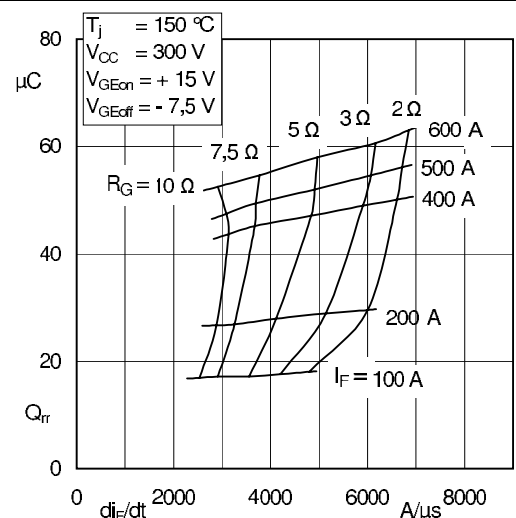
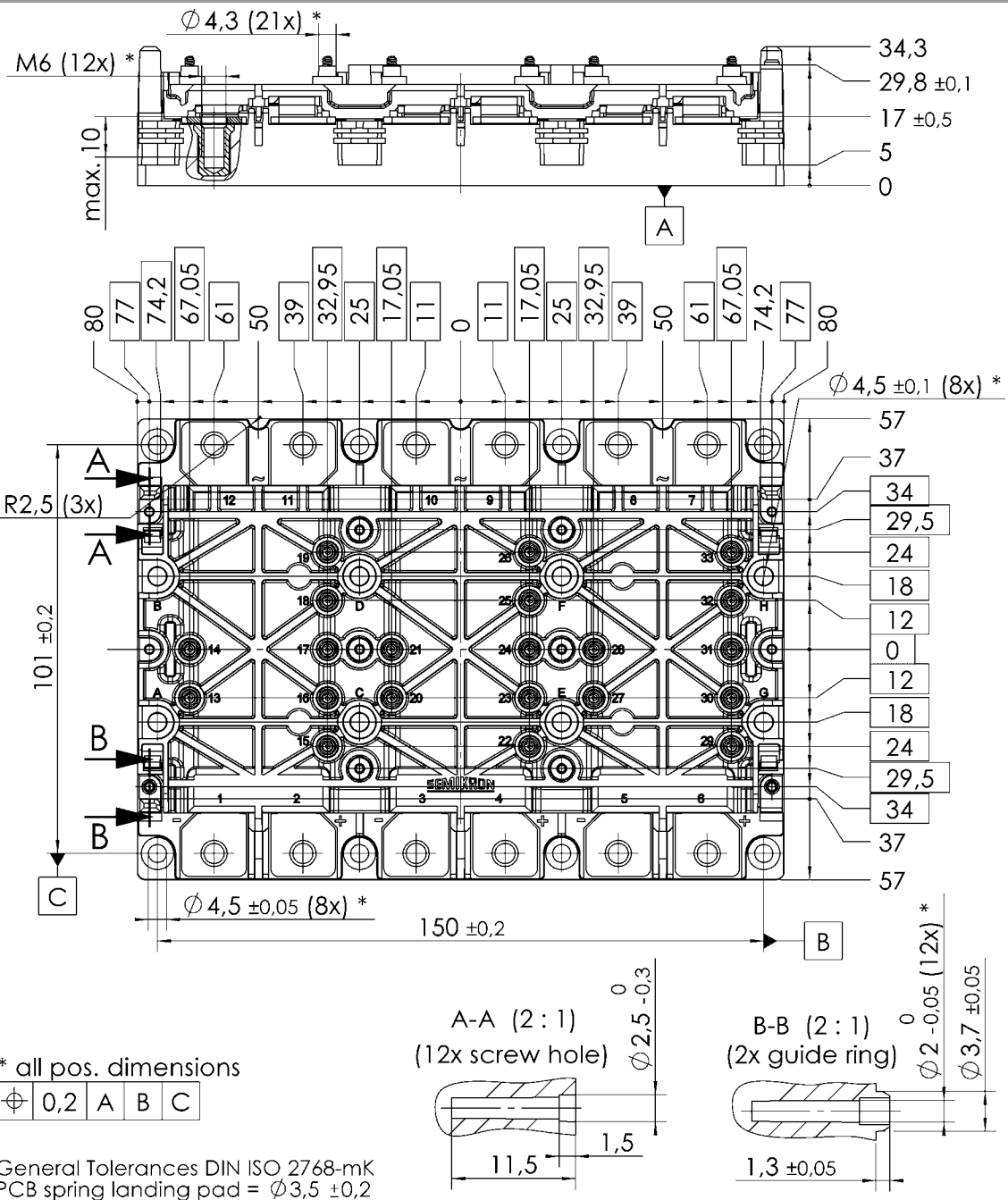
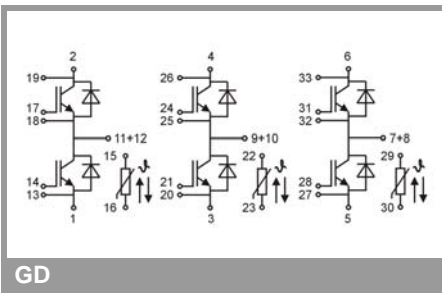


Fig. 12: Typ. CAL diode recovery charge

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

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