



SKiM® 93

Trench IGBT Modules

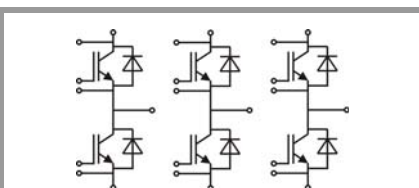
SKiM429GD17E4HD

Features

- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- 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}			1700	V
I _C	T _j = 175 °C	T _s = 25 °C	595	A
		T _s = 70 °C	479	A
I _{Cnom}			420	A
I _{CRM}	I _{CRM} = 3xI _{Cnom}		1260	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1200 V V _{GE} ≤ 15 V V _{CES} ≤ 1700 V	T _j = 150 °C	10	µs
T _j			-40 ... 175	°C
Inverse diode				
I _F	T _j = 150 °C	T _s = 25 °C	413	A
		T _s = 70 °C	298	A
I _{Fnom}			450	A
I _{FRM}	I _{FRM} = 2xI _{Fnom}		900	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		3699	A
T _j			-40 ... 150	°C
Module				
I _{t(RMS)}			700	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		3300	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
V _{CE(sat)}	I _C = 420 A	T _J = 25 °C		1.90	2.25	V
	V _{GE} = 15 V chipelevel	T _J = 125 °C		2.1	2.3	V
V _{CE0}		T _J = 25 °C		1.1	1.2	V
		T _J = 125 °C		1	1.1	V
r _{CE}	V _{GE} = 15 V	T _J = 25 °C		1.9	2.5	mΩ
		T _J = 125 °C		2.6	2.9	mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 16.8 mA		5.2	5.8	6.4	V
I _{CES}	V _{GE} = 0 V	T _J = 25 °C		0.15	0.45	mA
	V _{CE} = 1700 V					mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		33		nF
C _{oes}		f = 1 MHz		1.38		nF
C _{res}		f = 1 MHz		1.08		nF
Q _G	V _{GE} = - 8 V...+ 15 V			6660		nC
R _{Gint}	T _J = 25 °C			2.7		Ω
t _{d(on)}	V _{CC} = 1200 V I _C = 420 A	T _J = 125 °C		390		ns
t _r		T _J = 125 °C		80		ns
E _{on}	R _{G on} = 3.6 Ω	T _J = 125 °C		245		mJ
t _{d(off)}	R _{G off} = 3.6 Ω	T _J = 125 °C		1005		ns
t _f	di/dt _{on} = 5200 A/μs	T _J = 125 °C		170		ns
E _{off}	di/dt _{off} = 2200 A/μs	T _J = 125 °C		180		mJ
R _{th(l-s)}	per IGBT				0.079	K/W



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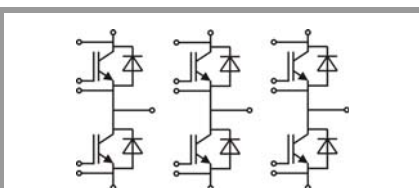
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Typical Applications

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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 420 A	T _j = 25 °C		1.7	1.9	V
	V _{GE} = 0 V chip	T _j = 125 °C		1.6	1.8	V
V _{F0}		T _j = 25 °C		1.1	1.3	V
		T _j = 125 °C		0.9	1.1	V
r _F		T _j = 25 °C		1.3	1.3	mΩ
		T _j = 125 °C		1.8	1.8	mΩ
I _{RRM}	I _F = 420 A	T _j = 125 °C		500		A
Q _{rr}	di/dt _{off} = 5990 A/μs	T _j = 125 °C		140		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 1200 V	T _j = 125 °C		99		mJ
R _{th(j-s)}	per diode				0.169	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
M _s	to heat sink (M4)		2.5		4	Nm
M _t		to terminals (M6)	3		5	Nm
						Nm
w					1100	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



GD

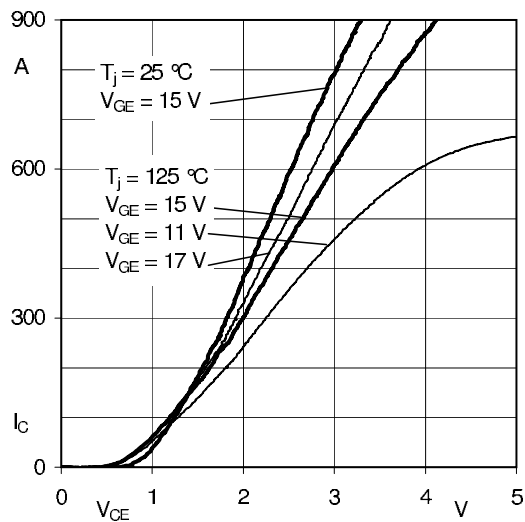


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_E$

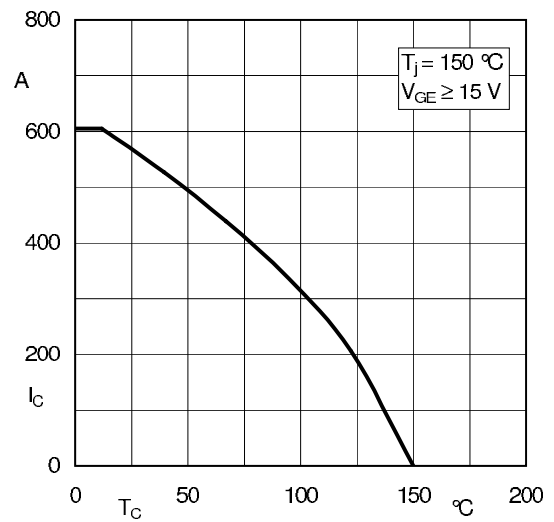


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

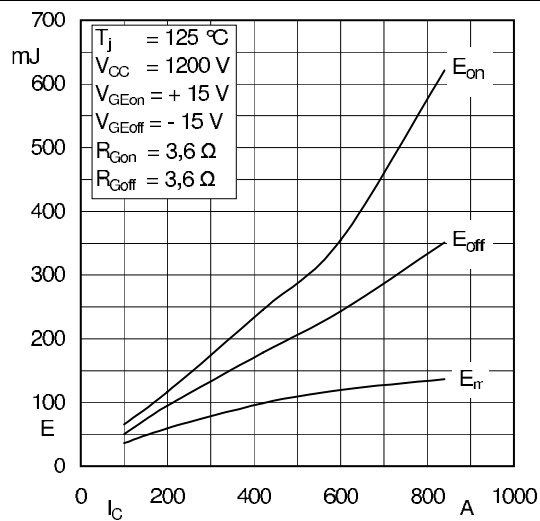


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

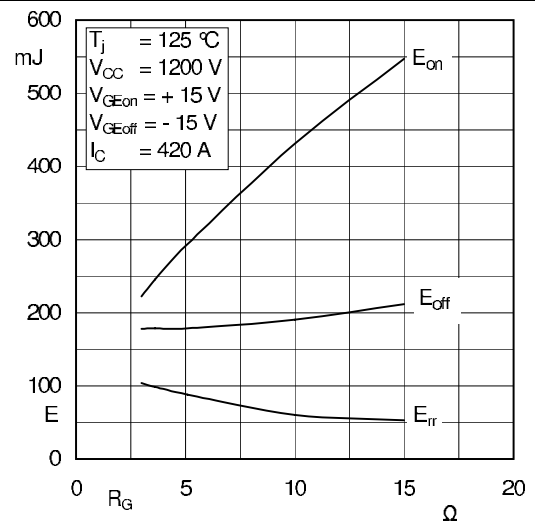


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

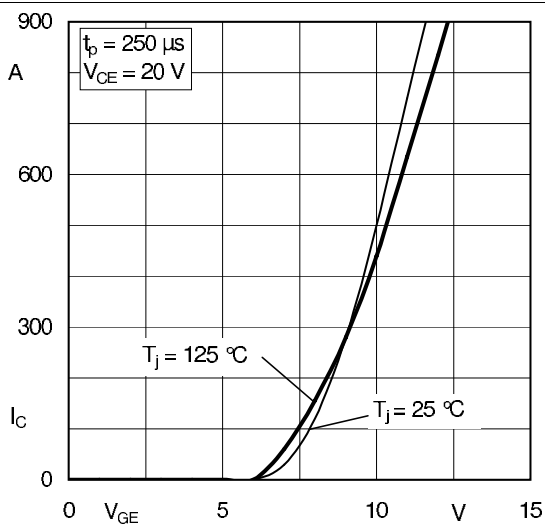


Fig. 5: Typ. transfer characteristic

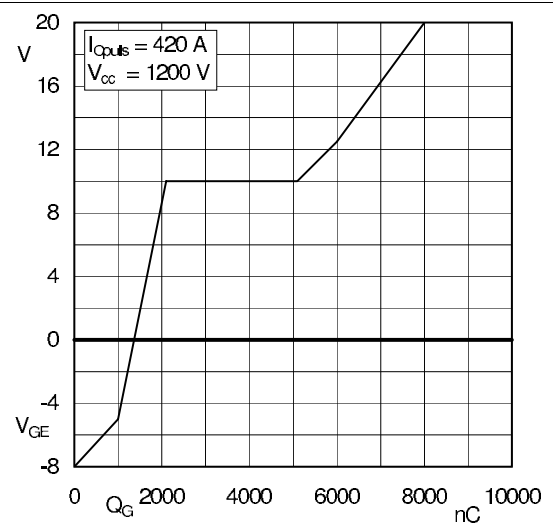


Fig. 6: Typ. gate charge characteristic

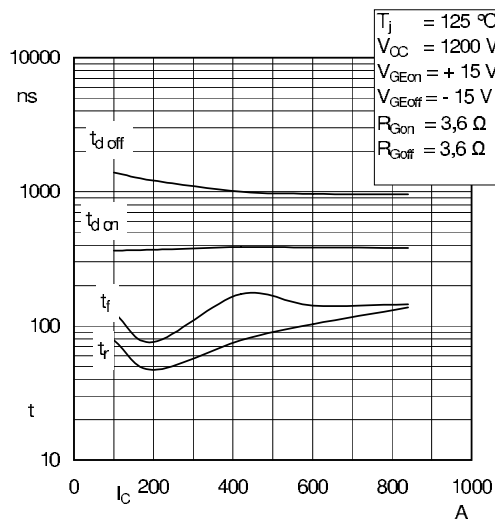


Fig. 7: Typ. switching times vs. I_C

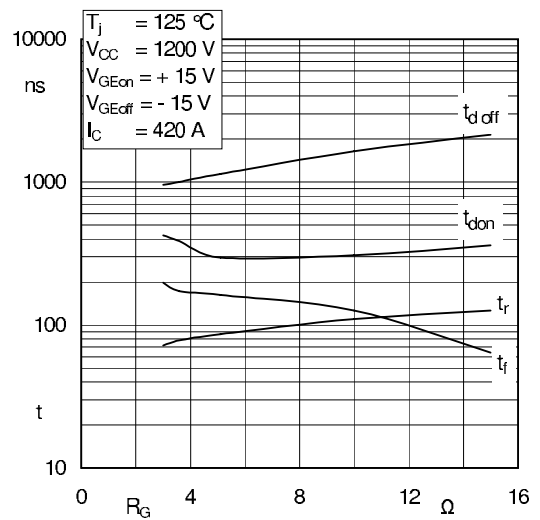


Fig. 8: Typ. switching times vs. gate resistor R_G

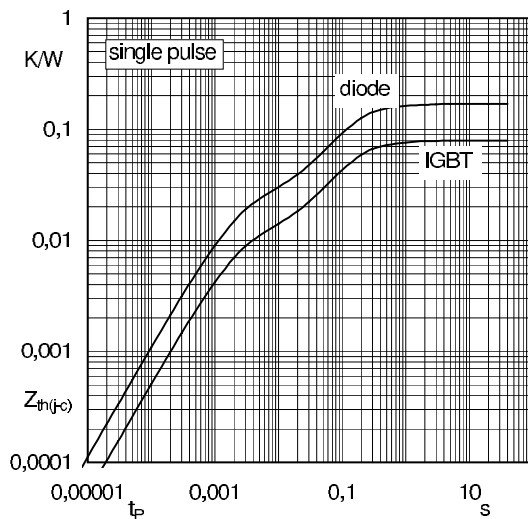


Fig. 9: Typ. transient thermal impedance

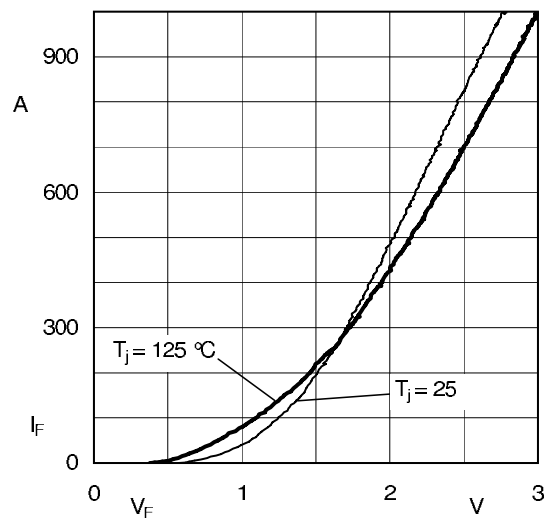


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

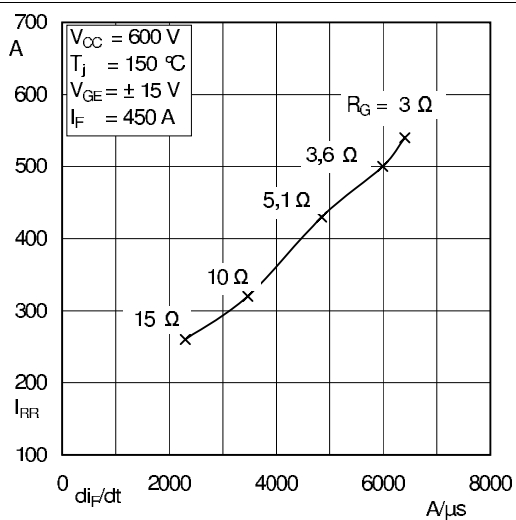


Fig. 11: Typ. CAL diode peak reverse recovery current

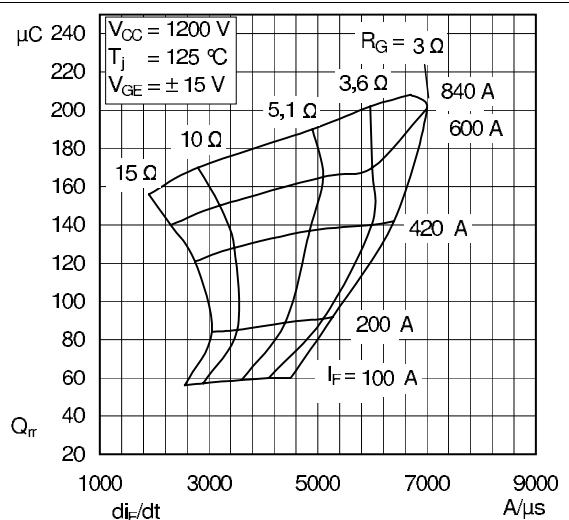
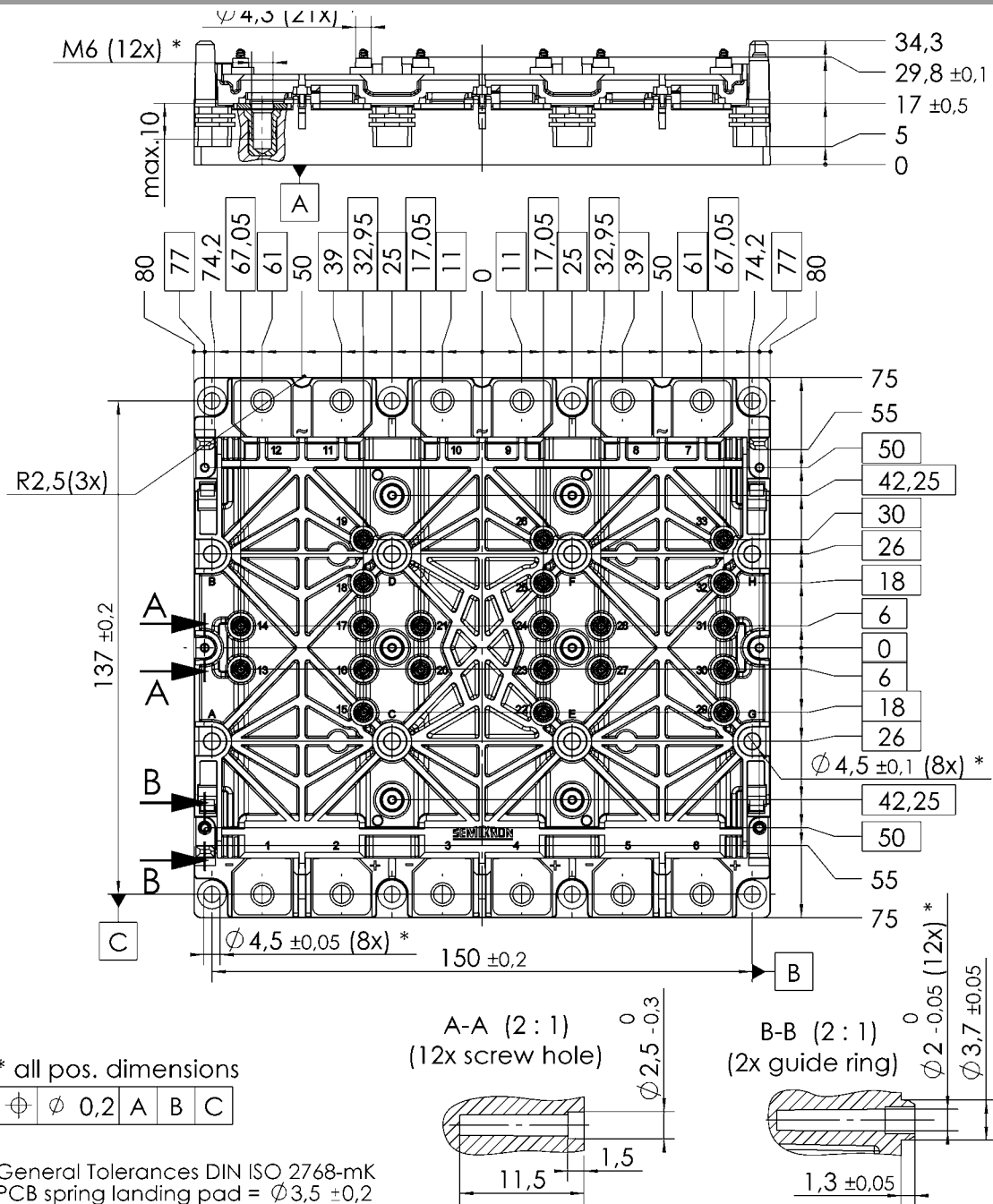
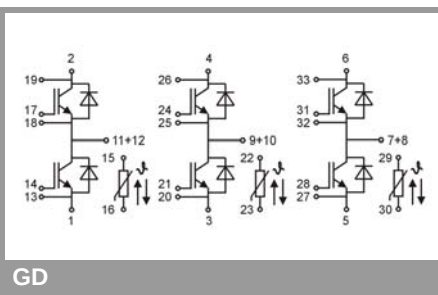


Fig. 12: Typ. CAL diode recovery charge



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