

SKiM429GD17E4HD



SKiM® 93

Trench IGBT Modules

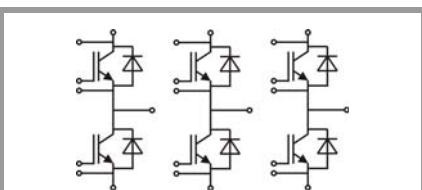
SKiM429GD17E4HD

Features

- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- Low inductance case
- Isolated by AL₂O₃ DCB (Direct Copper Bonded) ceramic substrate
- Pressure contact technology for thermal contacts and electrical contacts
- High short circuit capability, self limiting to 6 x 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	T _j = 150 °C	10	μs
	V _{GE} ≤ 15 V			
	V _{CES} ≤ 1700 V			
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 V _{GE} = 15 V chipelevel	T _j = 25 °C	1.90	2.25	V
		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 V _{CE} = 1700 V	T _j = 25 °C	0.15	0.45	mA
					mA
C _{ies}	V _{CE} = 25 V	f = 1 MHz	33		nF
C _{oes}	V _{GE} = 0 V	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	T _j = 125 °C	390		ns
t _r	I _C = 420 A	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 di/dt _{off} = 2200 A/μs	T _j = 125 °C	170		ns
		T _j = 125 °C	180		mJ
E _{off}			180		mJ
R _{th(j-s)}	per IGBT			0.079	K/W

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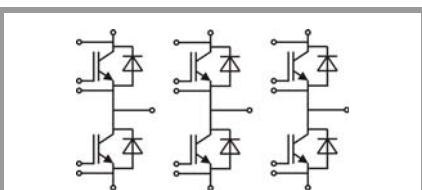
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 420\text{ A}$ $V_{GE} = 0\text{ V}$ chip	$T_j = 25\text{ °C}$		1.7	1.9	V
		$T_j = 125\text{ °C}$		1.6	1.8	V
V_{F0}		$T_j = 25\text{ °C}$		1.1	1.3	V
		$T_j = 125\text{ °C}$		0.9	1.1	V
r_F		$T_j = 25\text{ °C}$		1.3	1.3	mΩ
		$T_j = 125\text{ °C}$		1.8	1.8	mΩ
I_{RRM}	$I_F = 420\text{ A}$	$T_j = 125\text{ °C}$		500		A
Q_{rr}	$di/dt_{off} = 5990\text{ A}/\mu\text{s}$	$T_j = 125\text{ °C}$		140		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 1200\text{ V}$	$T_j = 125\text{ °C}$		99		mJ
$R_{th(j-s)}$	per diode				0.169	K/W
Module						
L_{CE}				10	15	nH
$R_{CC'+EE'}$	terminal-chip	$T_s = 25\text{ °C}$		0.3		mΩ
		$T_s = 125\text{ °C}$		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}	$T_{Sensor} = 100\text{ °C}$ ($R_{25} = 5\text{ k}\Omega$)			339		Ω
$B_{100/125}$	$R_{(T)} = R_{100} \exp[B_{100/125}(1/T - 1/373)]$; $T[\text{K}]$;			4096		K

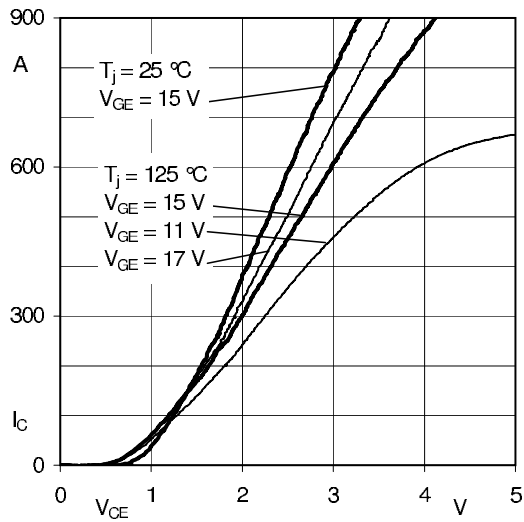


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

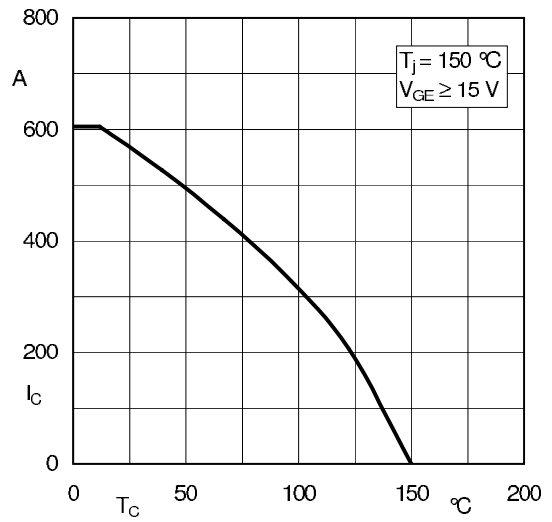


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

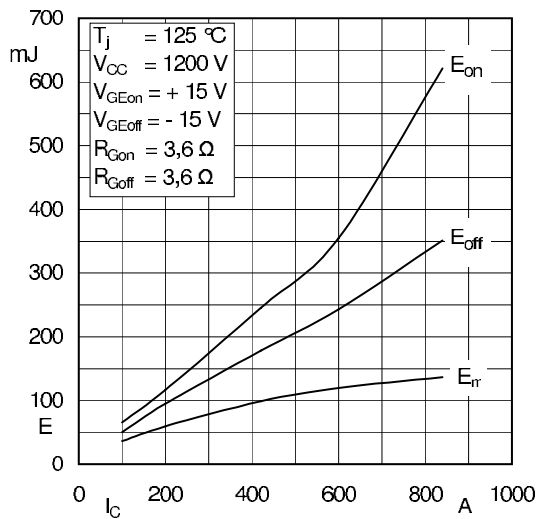


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

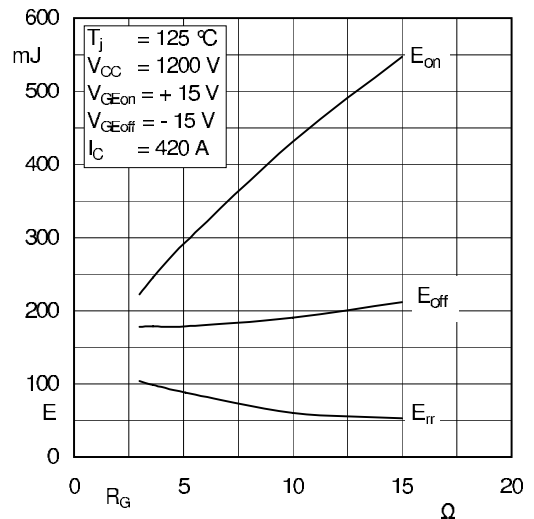


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

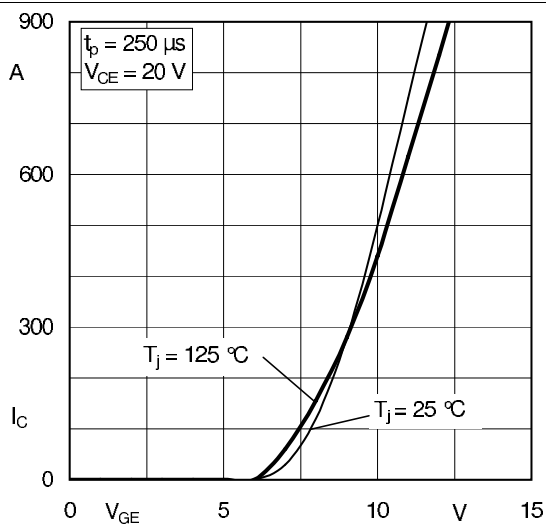


Fig. 5: Typ. transfer characteristic

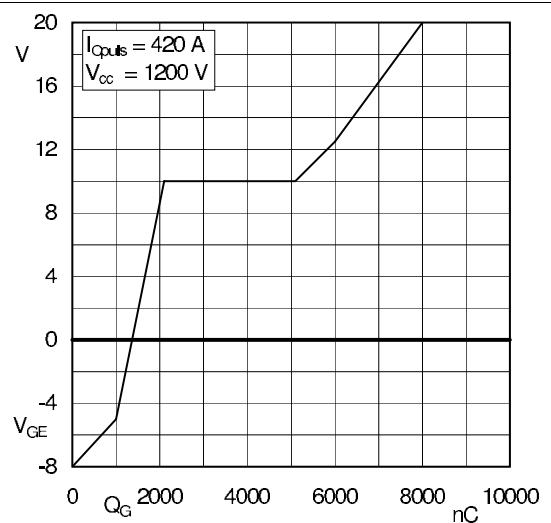


Fig. 6: Typ. gate charge characteristic

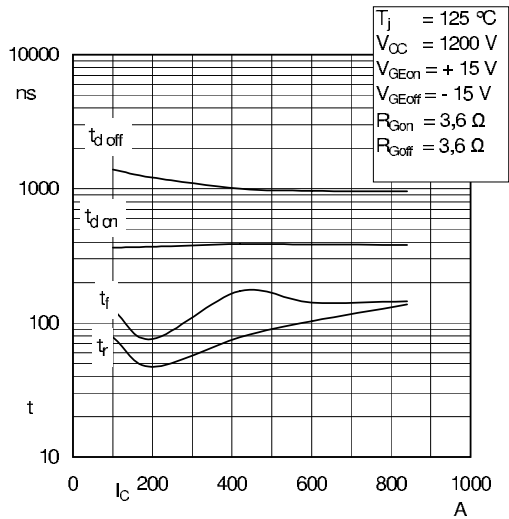


Fig. 7: Typ. switching times vs. I_C

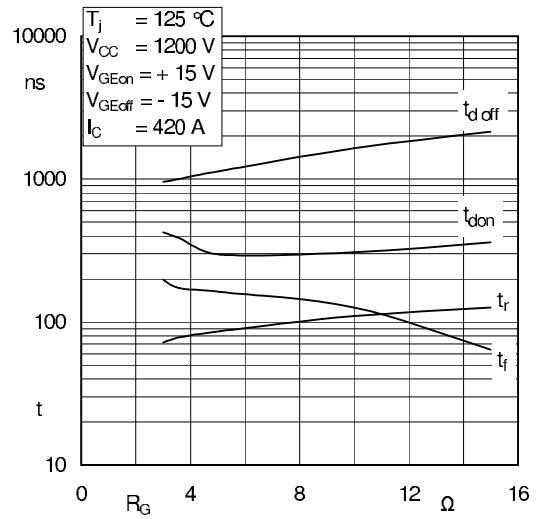


Fig. 8: Typ. switching times vs. gate resistor R_G

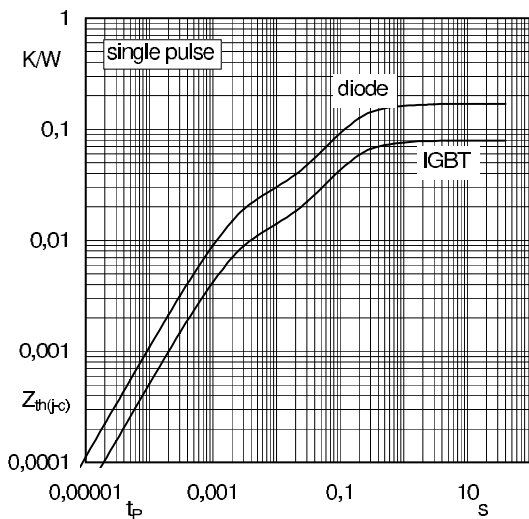


Fig. 9: Typ. transient thermal impedance

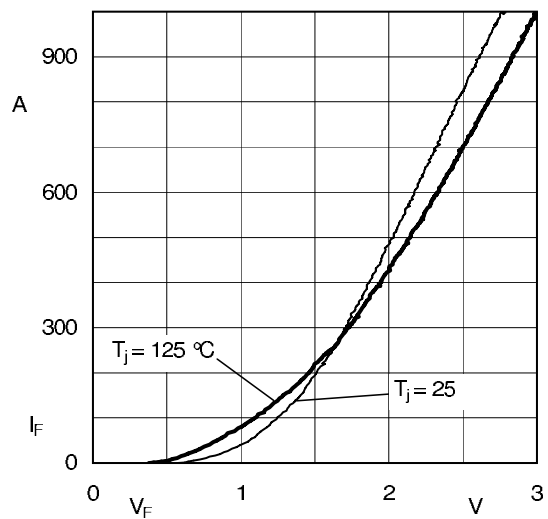


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC+EE'}$

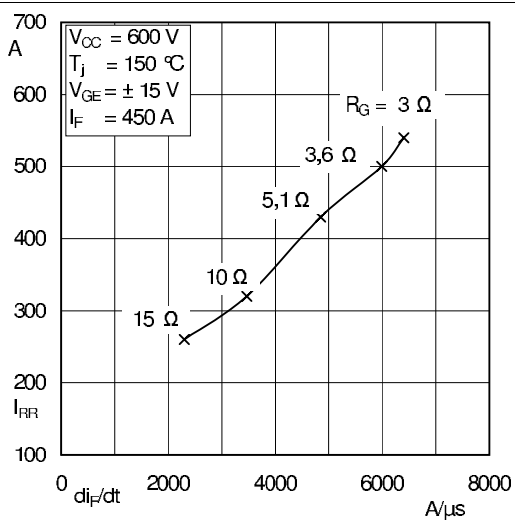


Fig. 11: Typ. CAL diode peak reverse recovery current

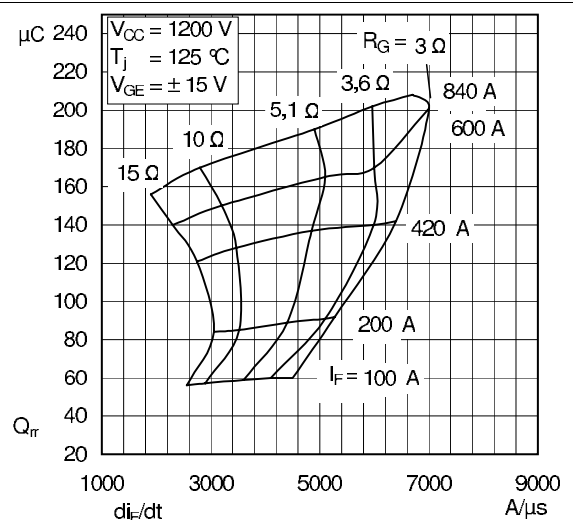
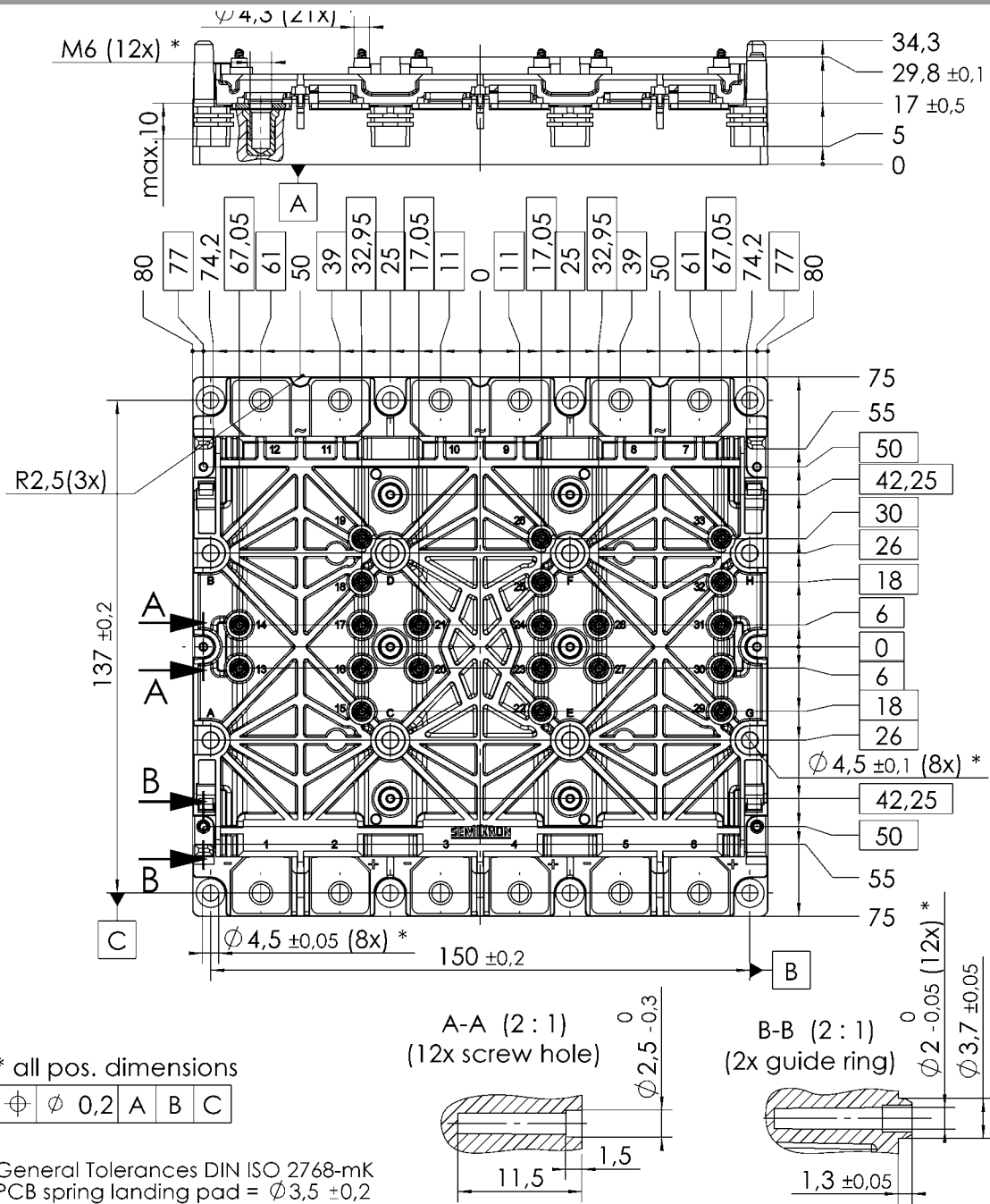
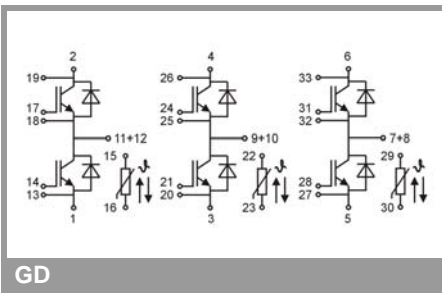


Fig. 12: Typ. CAL diode recovery charge

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