

SKM150GAR12T4



SEMITRANS®2

Fast IGBT4 Modules

SKM150GAR12T4

Features

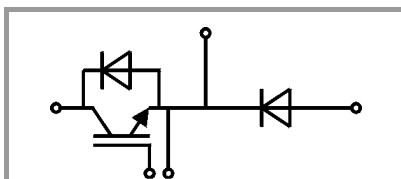
- IGBT4 = 4. Generation (Trench)IGBT
- VCEsat with positive temperature coefficient
- High short circuit capability, self limiting to 6 x ICNOM
- Soft switching 4. Generation CAL diode (CAL4)

Typical Applications

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – Motor

Remarks

- Case temperature limited to Tc = 125°C max, recomb. Top = -40 ... +150°C, product rel. results valid for Tj = 150°



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Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
IGBT				
V _{CES}		1200	V	
I _C	T _j = 175 °C	T _c = 25 °C	232	A
		T _c = 80 °C	179	A
I _{Cnom}		150	A	
I _{CRM}	I _{CRM} = 3xI _{Cnom}	450	A	
V _{GES}		-20 ... 20	V	
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 150 °C	10	µs
T _j		-40 ... 175	°C	
Inverse diode				
I _F	T _j = 175 °C	T _c = 25 °C	189	A
		T _c = 80 °C	141	A
I _{Fnom}		150	A	
I _{FRM}	I _{FRM} = 3xI _{Fnom}	450	A	
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C	900	A	
T _j		-40 ... 175	°C	
Freewheeling diode				
I _F	T _j = 175 °C	T _c = 25 °C	189	A
		T _c = 80 °C	141	A
I _{Fnom}		150	A	
I _{FRM}	I _{FRM} = 3xI _{Fnom}	450	A	
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C	900	A	
T _j		-40 ... 175	°C	
Module				
I _{t(RMS)}		200	A	
T _{stg}		-40 ... 125	°C	
V _{isol}	AC sinus 50Hz, t = 1 min	4000	V	

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
V _{CE(sat)}	I _C = 150 A V _{GE} = 15 V chiplevel	T _j = 25 °C	1.8	2.05	V
		T _j = 150 °C	2.2	2.4	V
V _{CE0}		T _j = 25 °C	0.8	0.9	V
		T _j = 150 °C	0.7	0.8	V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C	6.7	7.7	mΩ
		T _j = 150 °C	10.0	10.7	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 6 mA	5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V V _{CE} = 1200 V	T _j = 25 °C	0.1	0.3	mA
		T _j = 150 °C			mA
C _{ies}	V _{CE} = 25 V	f = 1 MHz	9.3		nF
C _{oes}	V _{GE} = 0 V	f = 1 MHz	0.58		nF
C _{res}		f = 1 MHz	0.51		nF
Q _G	V _{GE} = - 8 V...+ 15 V		850		nC
R _{Gint}	T _j = 25 °C		5.0		Ω

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- Soft switching 4. Generation CAL diode (CAL4)

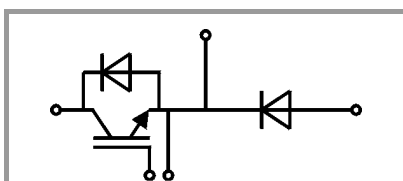
Typical Applications

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – Motor

Remarks

- Case temperature limited to T_C = 125°C max, recomm. Top = -40 ... +150°C, product rel. results valid for T_j = 150°

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		180		ns
t _r	I _C = 150 A	T _j = 150 °C		42		ns
E _{on}	V _{GE} = ±15 V	T _j = 150 °C		19.2		mJ
t _{d(off)}	R _{G on} = 1 Ω	T _j = 150 °C		410		ns
	R _{G off} = 1 Ω	T _j = 150 °C		410		ns
t _f	di/dt _{on} = 3400 A/μs	T _j = 150 °C		72		ns
E _{off}	di/dt _{off} = 1750 A/μs	T _j = 150 °C		15.8		mJ
R _{th(j-c)}	per IGBT				0.19	K/W
Inverse diode						
V _F = V _{EC}	I _F = 150 A	T _j = 25 °C		2.14	2.46	V
	V _{GE} = 0 V chip	T _j = 150 °C		2.07	2.38	V
V _{F0}		T _j = 25 °C		1.3	1.5	V
		T _j = 150 °C		0.9	1.1	V
r _F		T _j = 25 °C		5.6	6.4	mΩ
		T _j = 150 °C		7.8	8.5	mΩ
I _{RRM}	I _F = 150 A	T _j = 150 °C		120		A
Q _{rr}	di/dt _{off} = 3100 A/μs	T _j = 150 °C		31.3		μC
E _{rr}	V _{GE} = ±15 V	T _j = 150 °C		13		mJ
	V _{CC} = 600 V	T _j = 150 °C		13		mJ
R _{th(j-c)}	per diode				0.31	K/W
Freewheeling diode						
V _F = V _{EC}	I _F = 150 A	T _j = 25 °C		2.14	2.46	V
	V _{GE} = 0 V chip	T _j = 150 °C		2.07	2.38	V
V _{F0}		T _j = 25 °C		1.3	1.5	V
		T _j = 150 °C		0.9	1.1	V
r _F		T _j = 25 °C		5.6	6.4	mΩ
		T _j = 150 °C		7.8	8.5	mΩ
I _{RRM}	I _F = 150 A	T _j = 150 °C		120		A
Q _{rr}	di/dt _{off} = 3100 A/μs	T _j = 150 °C		31.3		μC
E _{rr}	V _{GE} = ±15 V	T _j = 150 °C		13		mJ
	V _{CC} = 600 V	T _j = 150 °C		13		mJ
R _{th(j-c)}	per Diode				0.31	K/W
Module						
L _{CE}					30	nH
R _{CC'+EE'}	terminal-chip	T _C = 25 °C		0.65		mΩ
		T _C = 125 °C		1		mΩ
R _{th(c-s)}	per module			0.04	0.05	K/W
M _s	to heat sink M6			3	5	Nm
M _t		to terminals M5		2.5	5	Nm
						Nm
w					160	g



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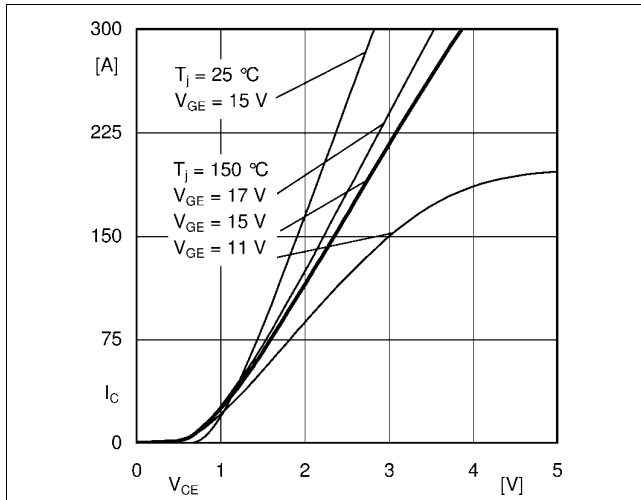


Fig. 1: Typ. output characteristic, inclusive $R_{CC+EE'}$

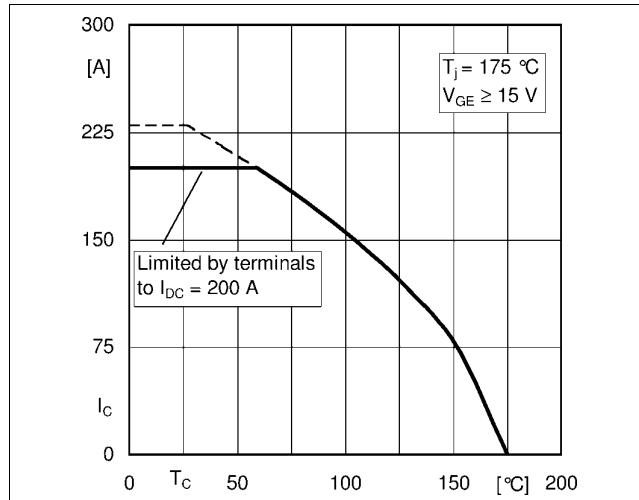


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

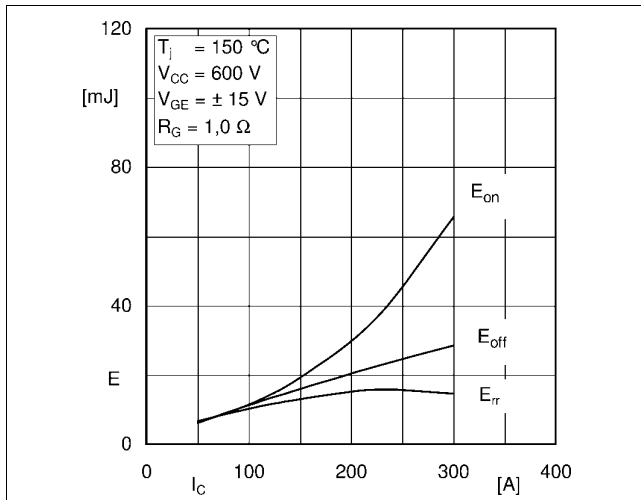


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

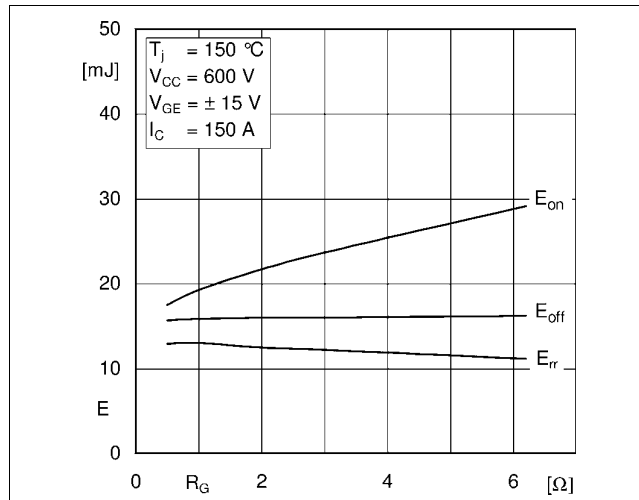


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

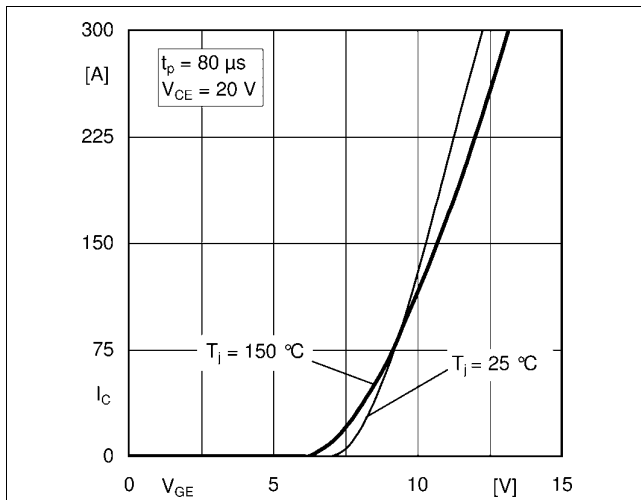


Fig. 5: Typ. transfer characteristic

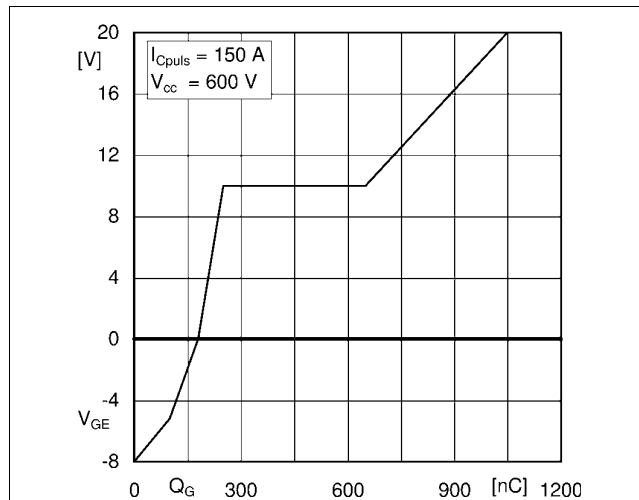


Fig. 6: Typ. gate charge characteristic

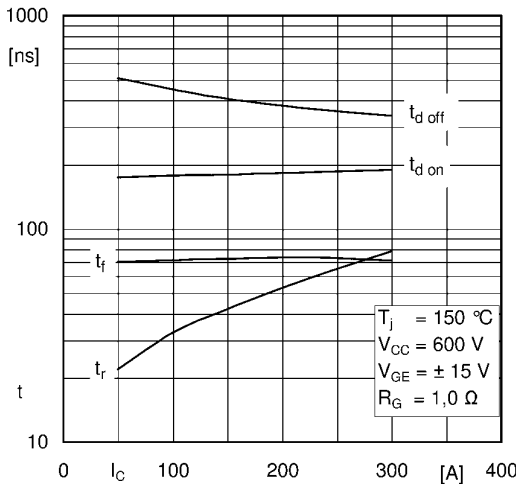


Fig. 7: Typ. switching times vs. I_C

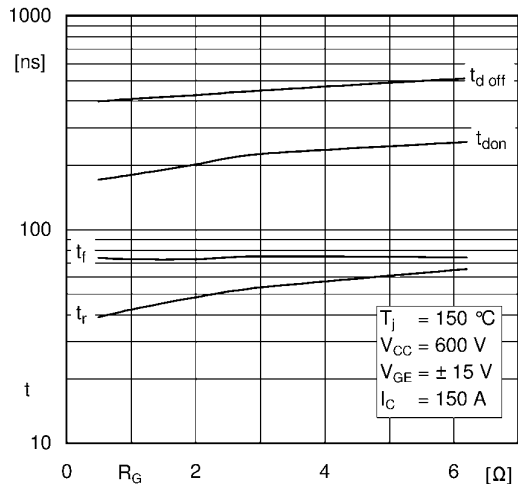


Fig. 8: Typ. switching times vs. gate resistor R_G

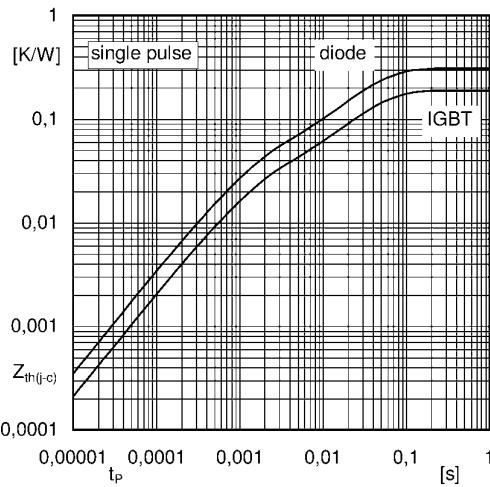


Fig. 9: Transient thermal impedance

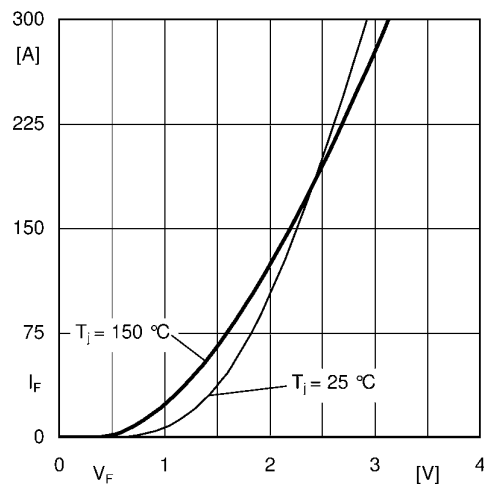


Fig. 10: CAL diode forward characteristic

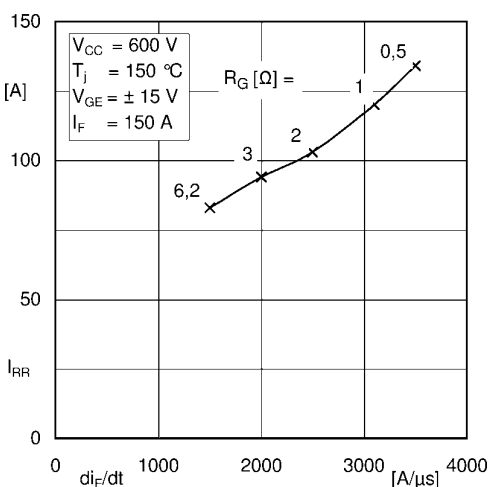


Fig. 11: CAL diode peak reverse recovery current

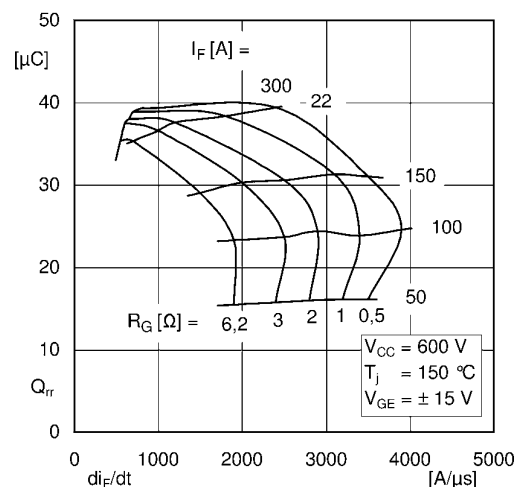


Fig. 12: Typ. CAL diode peak reverse recovery charge

