

SKM400GB12T4



SEMITRANS®3

Fast IGBT4 Modules

SKM400GB12T4

Features

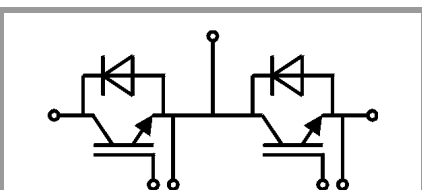
- IGBT4 = 4. Generation (Trench)IGBT
- VCEsat with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_{CNOM}
- Soft switching 4. Generation CAL diode (CAL4)

Typical Applications

- AC inverter drives
- UPS
- Electronic welders at fsw up to 20 kHz

Remarks

- Case temperature limited to T_c = 125°C max, recomm. Top = -40 ... +150°C, product rel. results valid for T_j = 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 T _c = 80 °C	618 475	A A
I _{Cnom}		400	A	
I _{CRM}	I _{CRM} = 3xI _{Cnom}	1200	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 T _c = 80 °C	440 329	A A
I _{Fnom}		400	A	
I _{FRM}	I _{FRM} = 3xI _{Fnom}	1200	A	
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C	1980	A	
T _j		-40 ... 175	°C	
Module				
I _{t(RMS)}		500	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 = 400 A V _{GE} = 15 V chiplevel		T _j = 25 °C T _j = 150 °C	1.8 2.2	2.05 2.4	V V
V _{CE0}			T _j = 25 °C T _j = 150 °C	0.8 0.7	0.9 0.8	V V
r _{CE}	V _{GE} = 15 V		T _j = 25 °C T _j = 150 °C	2.5 3.8	2.9 4.0	mΩ mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 15.2 mA	5	5.8	6.5	V	
I _{CES}	V _{GE} = 0 V V _{CE} = 1200 V		T _j = 25 °C T _j = 150 °C	0.1	0.3	mA mA
C _{ies}	V _{CE} = 25 V		f = 1 MHz	24.6	nF	
C _{oes}	V _{GE} = 0 V		f = 1 MHz	1.62	nF	
C _{res}			f = 1 MHz	1.38	nF	
Q _G	V _{GE} = - 8 V...+ 15 V		2260		nC	
R _{Gint}	T _j = 25 °C		1.9		Ω	
t _{d(on)}	V _{CC} = 600 V		T _j = 150 °C	220	ns	
t _r	I _C = 400 A		T _j = 150 °C	47	ns	
E _{on}	V _{GE} = ±15 V R _{G on} = 1 Ω		T _j = 150 °C	33	mJ	
t _{d(off)}	R _{G off} = 1 Ω		T _j = 150 °C	505	ns	
t _f	di/dt _{on} = 9700 A/µs		T _j = 150 °C	78	ns	
E _{off}	di/dt _{off} = 4300 A/µs		T _j = 150 °C	42	mJ	
R _{th(j-c)}	per IGBT			0.072	K/W	

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- Soft switching 4. Generation CAL diode (CAL4)

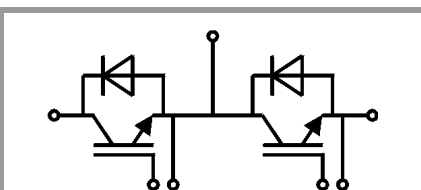
Typical Applications

- AC inverter drives
- UPS
- Electronic welders at fsw up to 20 kHz

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max, recomm.
Top = $-40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ$

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 400 \text{ A}$ $V_{GE} = 0 \text{ V}$ chip	$T_j = 25^\circ\text{C}$		2.2	2.52	V
		$T_j = 150^\circ\text{C}$		2.15	2.47	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$		2.3	2.5	m Ω
		$T_j = 150^\circ\text{C}$		3.1	3.4	m Ω
I_{RRM}	$I_F = 400 \text{ A}$	$T_j = 150^\circ\text{C}$		450		A
Q_{rr}	$di/dt_{off} = 8800 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		68		μC
E_{rr}	$V_{GE} = \pm 15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		30.5		mJ
$R_{th(j-c)}$	per diode				0.14	K/W
Module						
L_{CE}				15	20	nH
$R_{CC'+EE'}$	terminal-chip	$T_c = 25^\circ\text{C}$		0.25		m Ω
		$T_c = 125^\circ\text{C}$		0.5		m Ω
$R_{th(c-s)}$	per module			0.02	0.038	K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminals M6	2.5		5	Nm
						Nm
w					325	g



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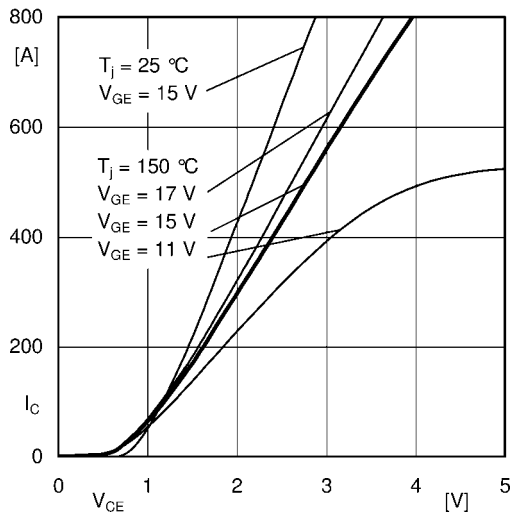


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

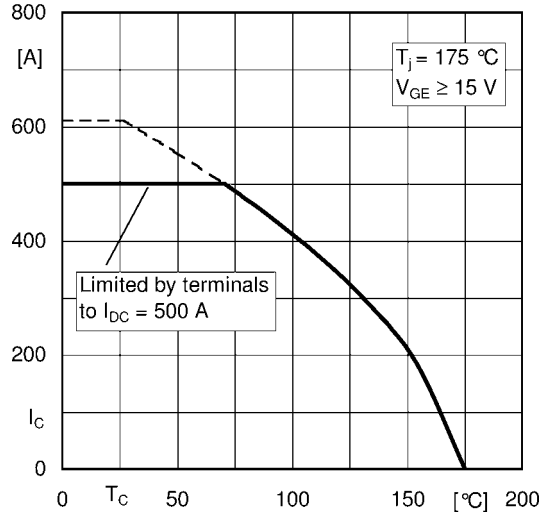


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

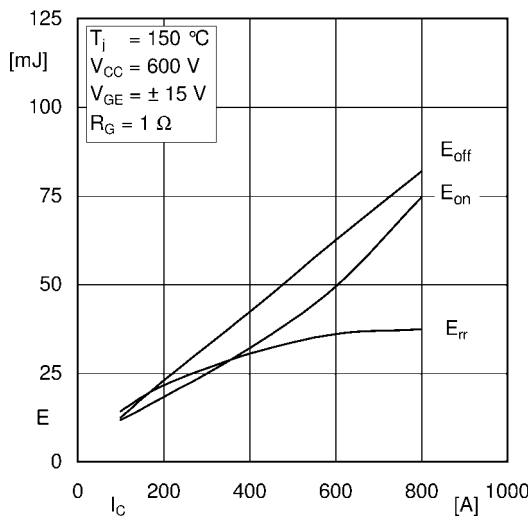


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

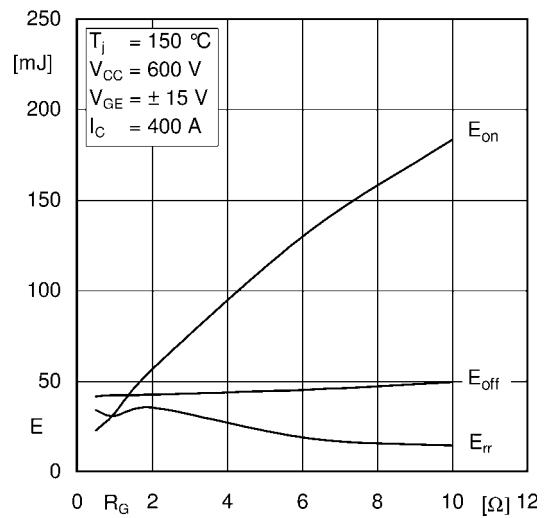


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

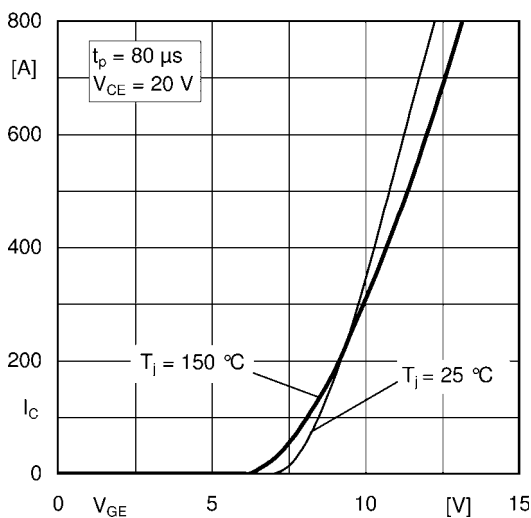


Fig. 5: Typ. transfer characteristic

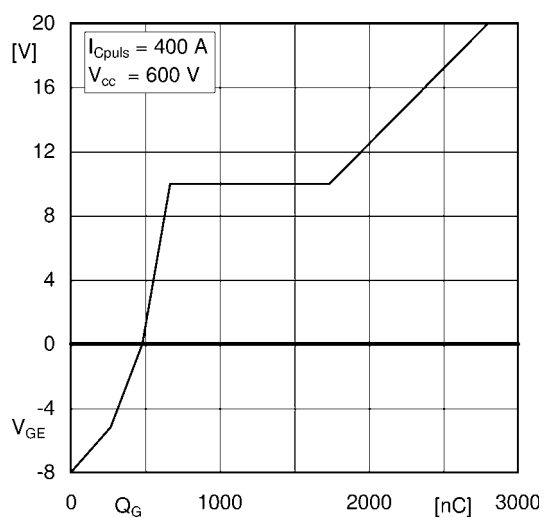


Fig. 6: Typ. gate charge characteristic

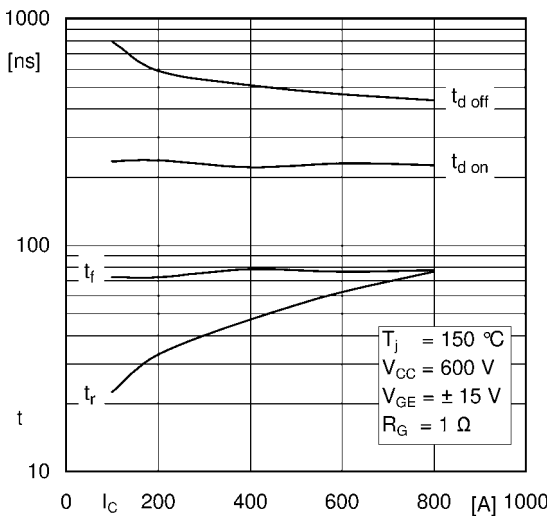


Fig. 7: Typ. switching times vs. I_C

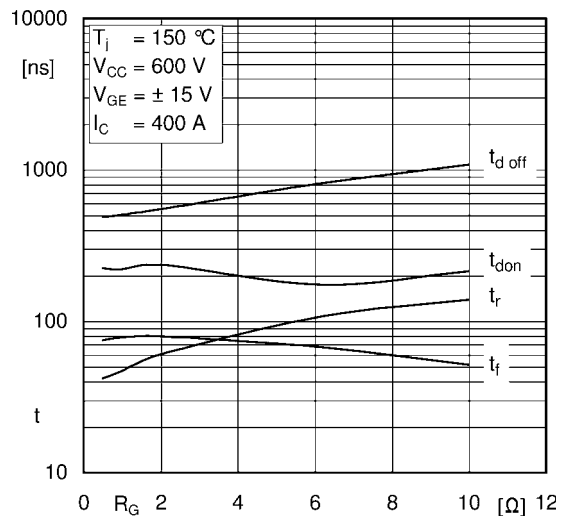


Fig. 8: Typ. switching times vs. gate resistor R_G

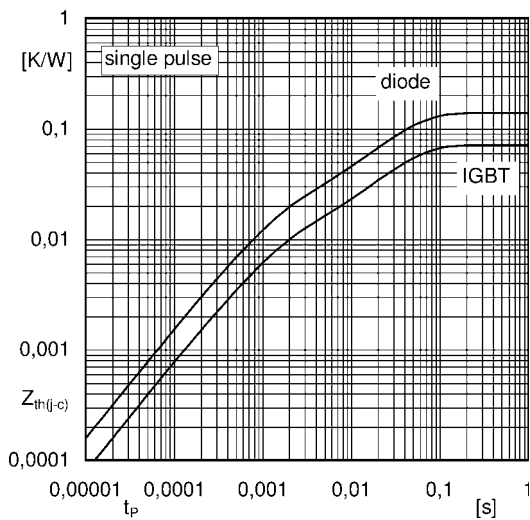


Fig. 9: Transient thermal impedance

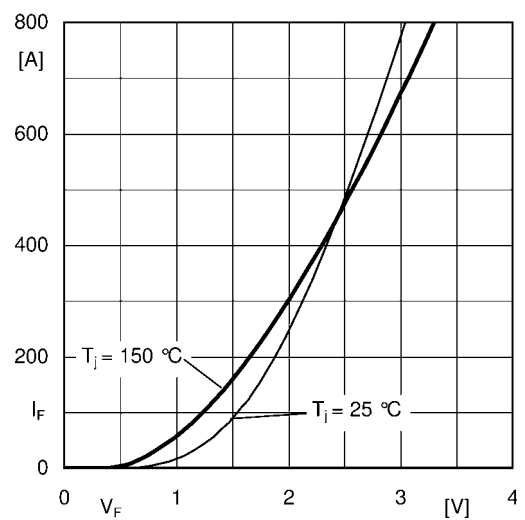


Fig. 10: CAL diode forward characteristic

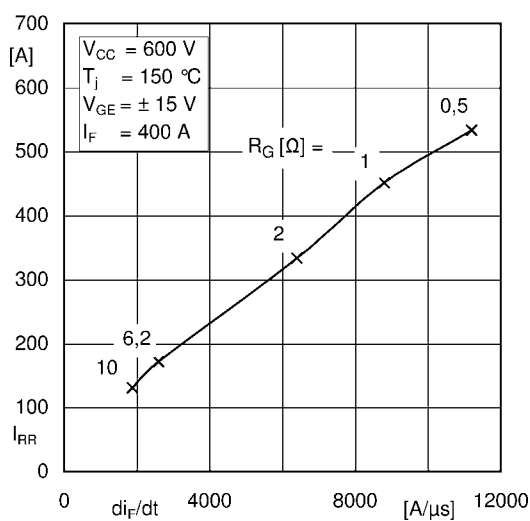


Fig. 11: CAL diode peak reverse recovery current

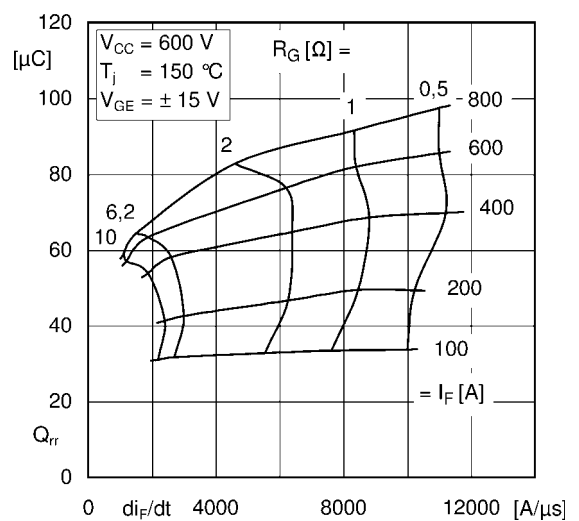
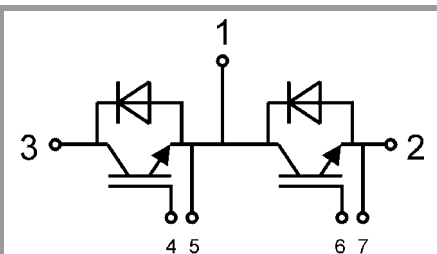


Fig. 12: Typ. CAL diode peak reverse recovery charge



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

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