

SKM50GB12T4



SEMITRANS®2

Fast IGBT4 Modules

SKM50GB12T4

Features

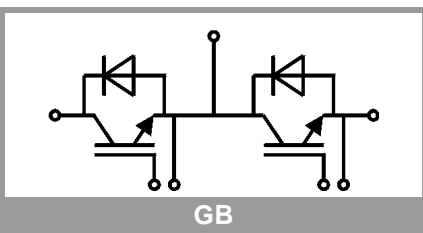
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_{Cnom}
- Fast & soft inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)

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.
 $T_{op} = -40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ$



Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			1200	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	81	A
		$T_c = 80^\circ\text{C}$	62	A
I_{Cnom}			50	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		150	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
T_j			-40 ... 175	$^\circ\text{C}$
Inverse diode				
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	65	A
		$T_c = 80^\circ\text{C}$	49	A
I_{Fnom}			50	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		150	A
I_{FSM}	$t_p = 10\text{ ms}$, $\sin 180^\circ$, $T_j = 25^\circ\text{C}$		270	A
T_j			-40 ... 175	$^\circ\text{C}$
Module				
$I_{t(RMS)}$			200	A
T_{stg}			-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50Hz, $t = 1\text{ min}$		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
$V_{CE(sat)}$	$I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.1		V
		$T_j = 150^\circ\text{C}$	2.2	2.4		V
V_{CE0}						
	$T_j = 25^\circ\text{C}$		0.8	0.9		V
r_{CE}						
	$T_j = 150^\circ\text{C}$		0.7	0.8		V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	21.0	24.0		$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	30.0	32.0		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 1.7\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3		mA
		$T_j = 150^\circ\text{C}$				mA
C_{ies}				2.77		nF
C_{oes}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		0.20		nF
C_{res}		$f = 1\text{ MHz}$		0.16		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$			280		nC
R_{Gint}	$T_j = 25^\circ\text{C}$			4.0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		98		ns
t_r	$I_C = 50\text{ A}$ $V_{GE} = \pm 15\text{ V}$	$T_j = 150^\circ\text{C}$		29		ns
E_{on}	$R_{Gon} = 8.2\ \Omega$			5.5		mJ
$t_{d(off)}$	$R_{Goff} = 8.2\ \Omega$			325		ns
t_f	$di/dt_{on} = 1700\text{ A}/\mu\text{s}$			75		ns
E_{off}	$di/dt_{off} = 670\text{ A}/\mu\text{s}$			4.5		mJ
$R_{th(j-c)}$	per IGBT				0.53	K/W



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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 50 \text{ A}$	$T_j = 25^\circ\text{C}$		2.22	2.54	V
	$V_{GE} = 0 \text{ V}$ chip	$T_j = 150^\circ\text{C}$		2.18	2.5	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		$T_j = 25^\circ\text{C}$		18.4	20.8	m Ω
		$T_j = 150^\circ\text{C}$		25.6	28.0	m Ω
I_{RRM}	$I_F = 50 \text{ A}$	$T_j = 150^\circ\text{C}$		35		A
Q_{rr}	$di/dt_{off} = 1380 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		8.7		μC
E_{rr}	$V_{GE} = \pm 15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		3.8		mJ
$R_{th(j-c)}$	per diode				0.84	K/W
Module						
L_{CE}					30	nH
$R_{CC'+EE'}$	terminal-chip	$T_c = 25^\circ\text{C}$		0.65		m Ω
		$T_c = 125^\circ\text{C}$		1		m Ω
$R_{th(c-s)}$	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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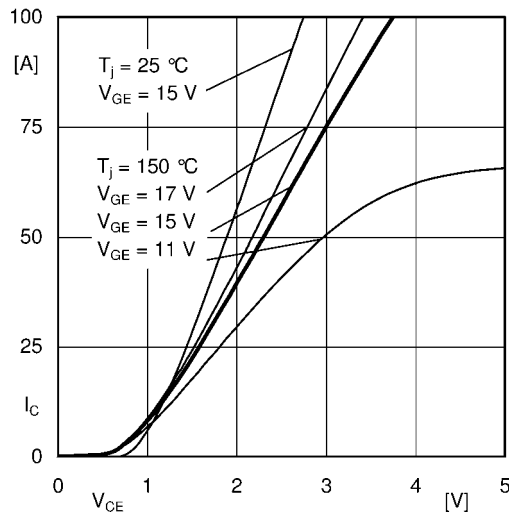


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

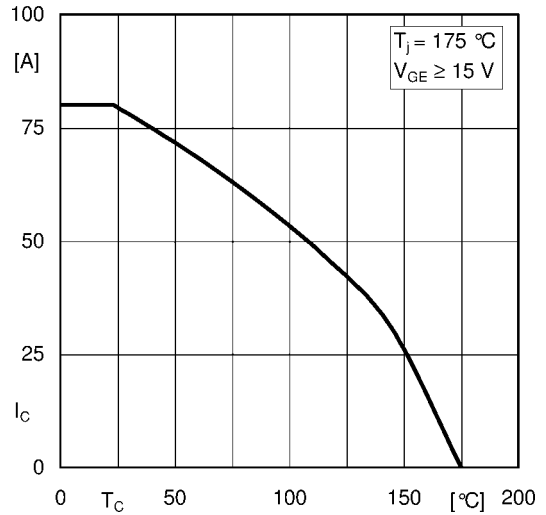


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

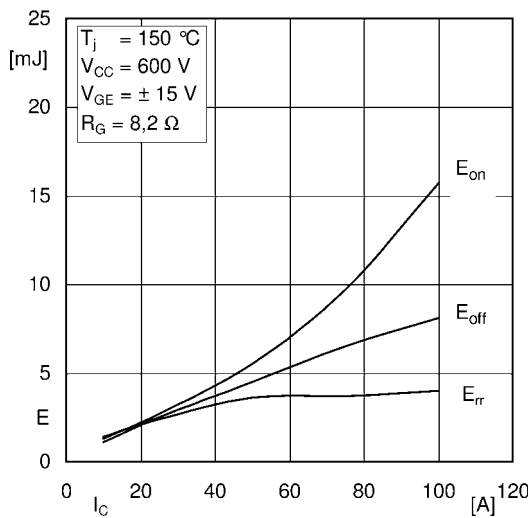


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

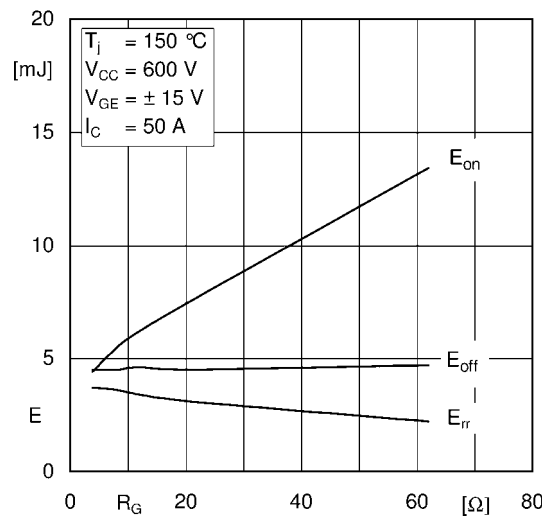


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

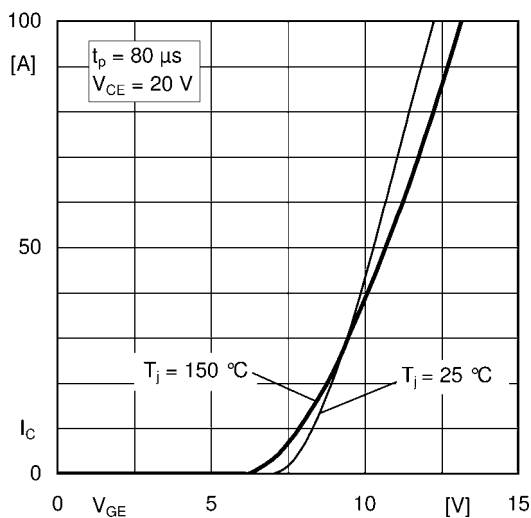


Fig. 5: Typ. transfer characteristic

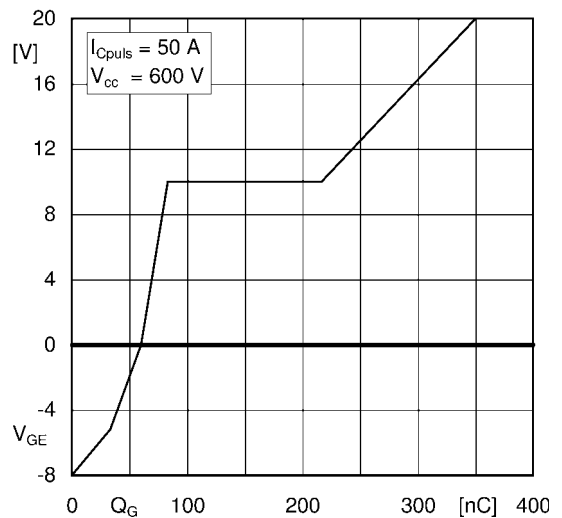


Fig. 6: Typ. gate charge characteristic

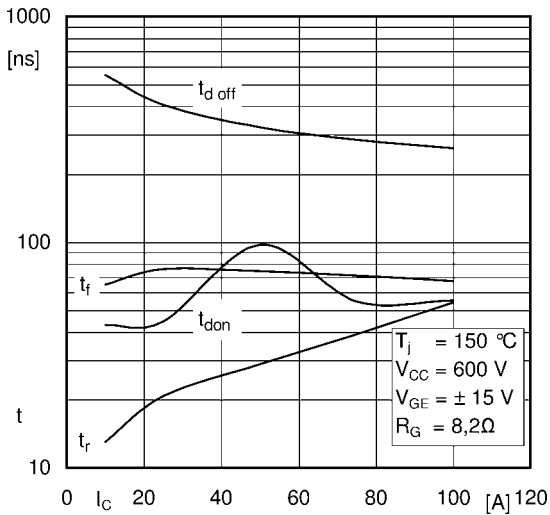


Fig. 7: Typ. switching times vs. I_C

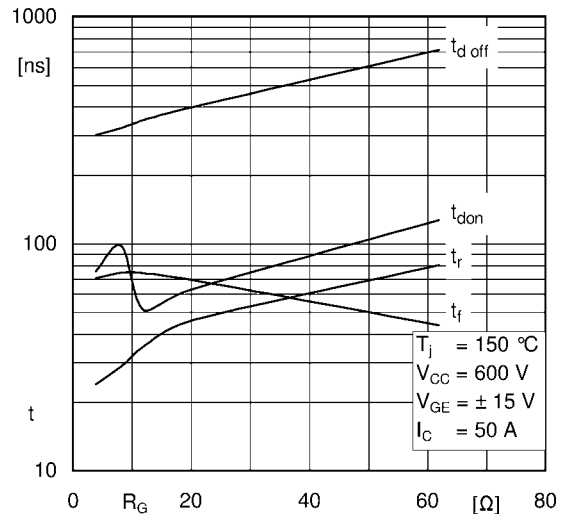


Fig. 8: Typ. switching times vs. gate resistor R_G

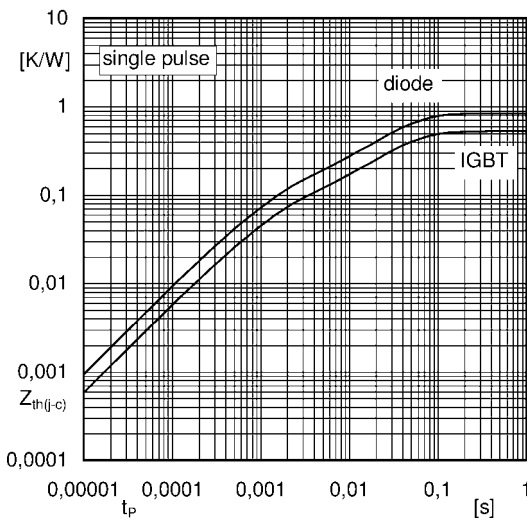


Fig. 9: Transient thermal impedance

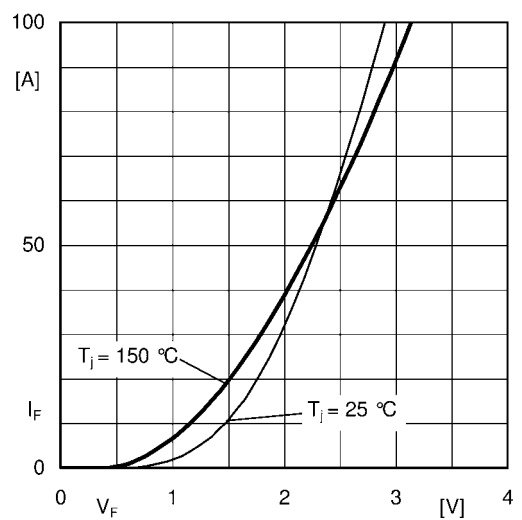


Fig. 10: CAL diode forward characteristic

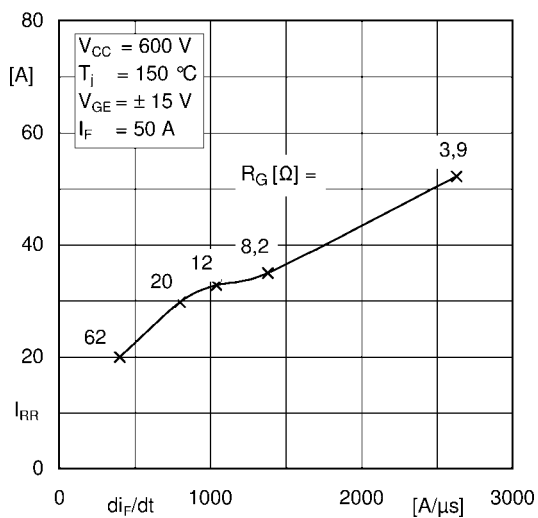


Fig. 11: CAL diode peak reverse recovery current

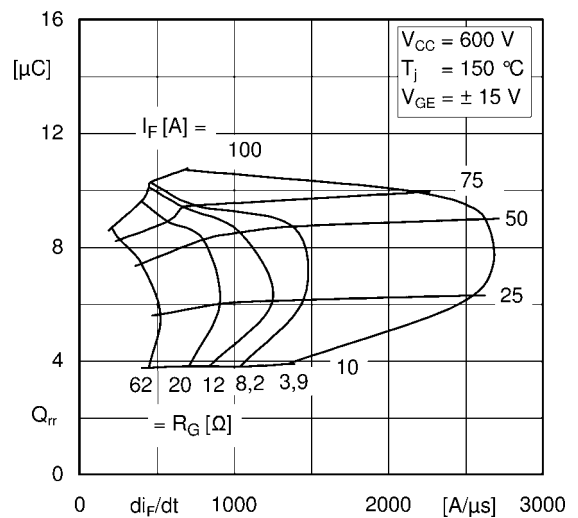
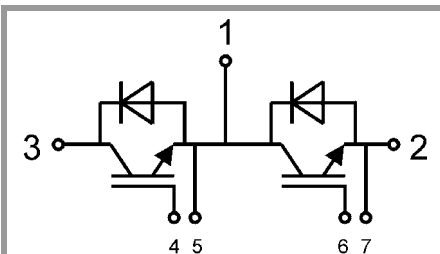


Fig. 12: Typ. CAL diode peak reverse recovery charge

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Semitrans 2



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

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