



SEMITRANS®2

Fast IGBT4 Modules

SKM50GB12T4

Features

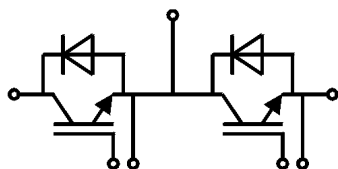
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_{Cnom}
- Fast & soft inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)

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 $T_j = 150^\circ$



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Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
IGBT			
V_{CES}		1200	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$ $T_c = 80^\circ\text{C}$	A A
I_{Cnom}		50	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	150	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	μs
T_j		-40 ... 175	$^\circ\text{C}$
Inverse diode			
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$ $T_c = 80^\circ\text{C}$	A A
I_{Fnom}		50	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	150	A
I_{FSM}	$t_p = 10\text{ ms}$, sin 180°, $T_j = 25^\circ\text{C}$	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	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	1.85 2.2	2.1 2.4	V
V_{CE0}		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	0.8 0.7	0.9 0.8	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	21.0 30.0	24.0 32.0	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 1.7\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	0.1	0.3	mA
C_{ies}	$V_{CE} = 25\text{ V}$	$f = 1\text{ MHz}$	2.77		nF
C_{oes}	$V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	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	$I_C = 50\text{ A}$	$T_j = 150^\circ\text{C}$	29		ns
E_{on}	$V_{GE} = \pm 15\text{ V}$ $R_{G on} = 8.2\text{ }\Omega$	$T_j = 150^\circ\text{C}$	5.5		mJ
$t_{d(off)}$	$R_{G off} = 8.2\text{ }\Omega$	$T_j = 150^\circ\text{C}$	325		ns
t_f	$di/dt_{on} = 1700\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	75		ns
E_{off}	$di/dt_{off} = 670\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	4.5		mJ
$R_{th(j-c)}$	per IGBT			0.53	K/W



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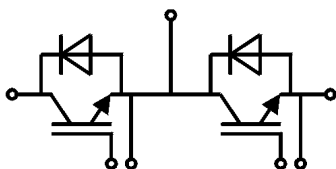
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 50 A	T _j = 25 °C		2.22	2.54	V
	V _{GE} = 0 V chip	T _j = 150 °C		2.18	2.5	V
V _{F0}		T _j = 25 °C		1.3	1.5	V
		T _j = 150 °C		0.9	1.1	V
r _F		T _j = 25 °C		18.4	20.8	mΩ
		T _j = 150 °C		25.6	28.0	mΩ
I _{RRM}	I _F = 50 A	T _j = 150 °C		35		A
Q _{rr}	di/dt _{off} = 1380 A/μs	T _j = 150 °C		8.7		μC
E _{rr}	V _{GE} = ±15 V	T _j = 150 °C		3.8		mJ
	V _{CC} = 600 V					
R _{th(j-c)}	per diode				0.84	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
w				160		g



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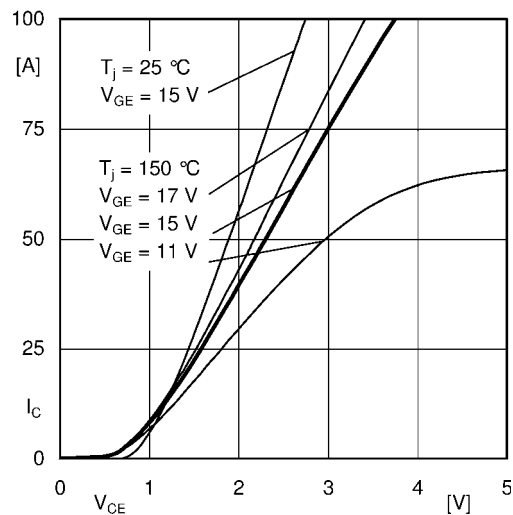


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + EE'$

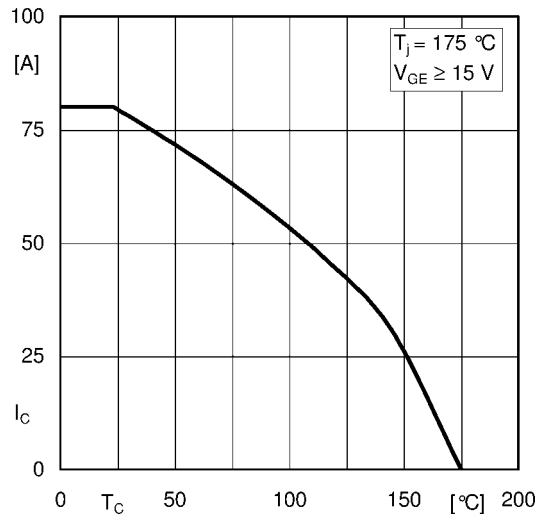


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

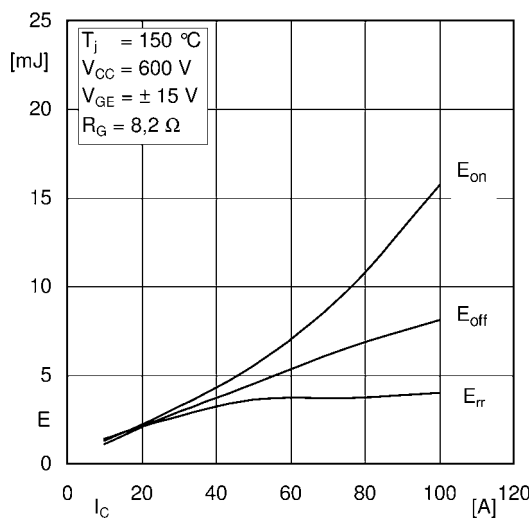


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

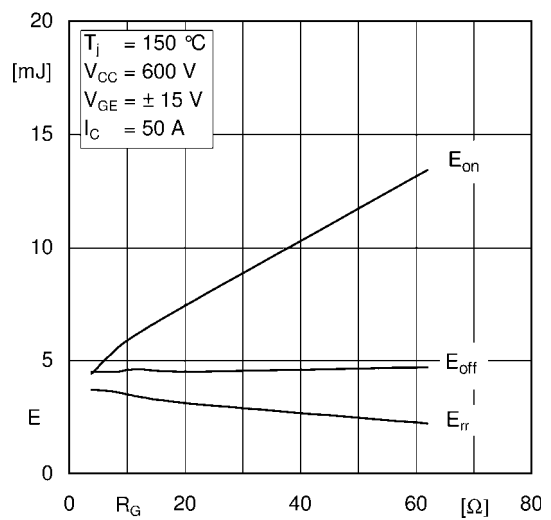


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

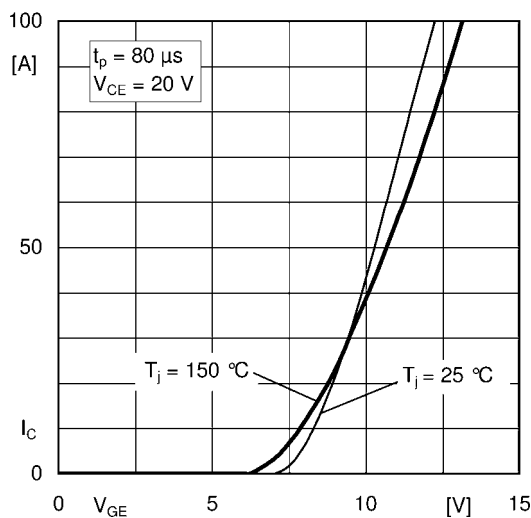


Fig. 5: Typ. transfer characteristic

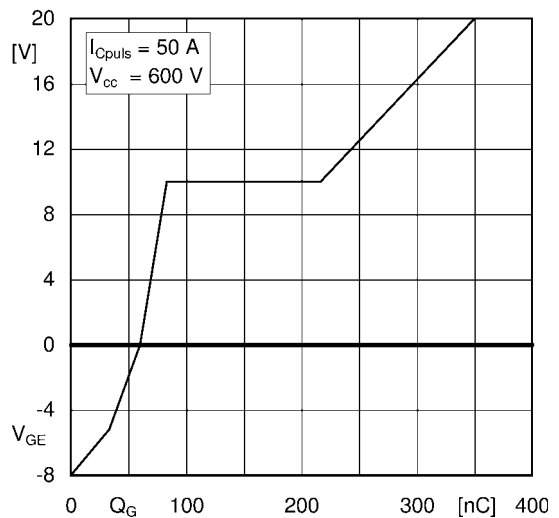


Fig. 6: Typ. gate charge characteristic

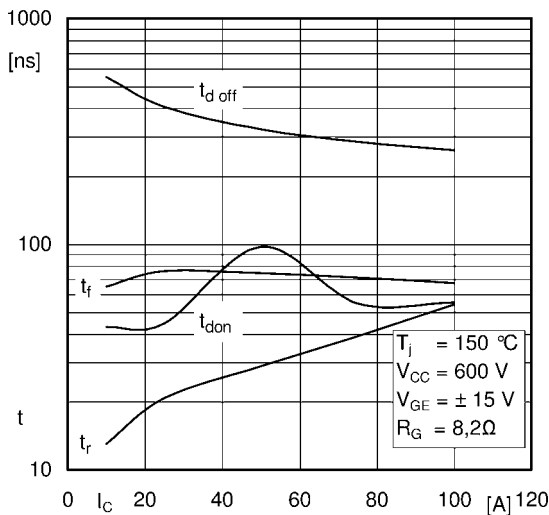


Fig. 7: Typ. switching times vs. I_C

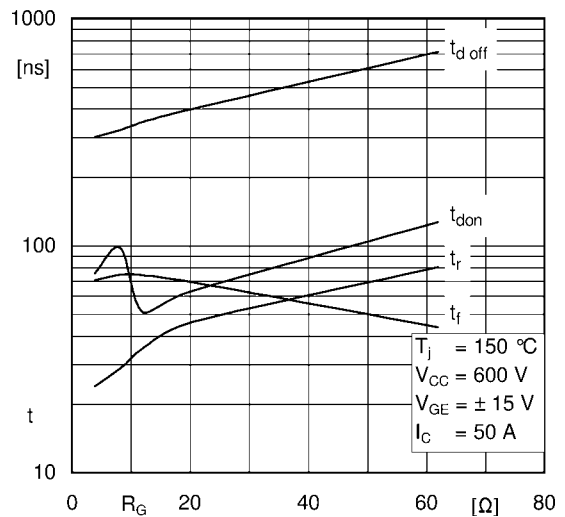


Fig. 8: Typ. switching times vs. gate resistor R_G

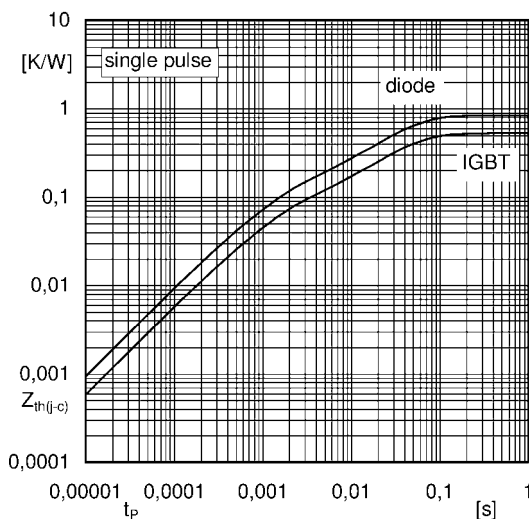


Fig. 9: Transient thermal impedance

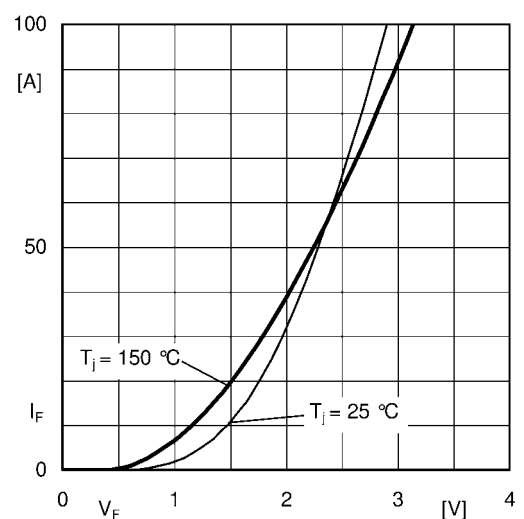


Fig. 10: CAL diode forward characteristic

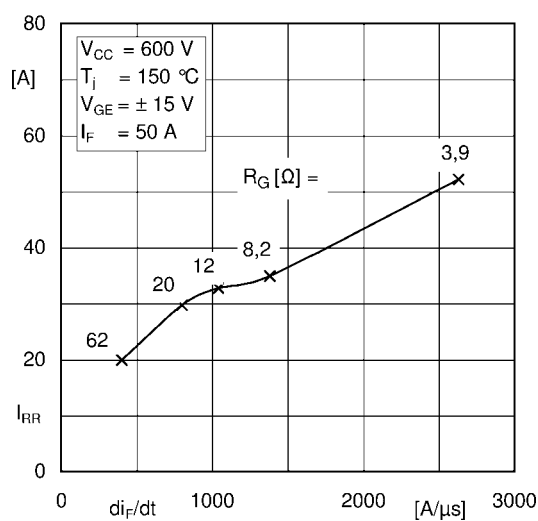


Fig. 11: CAL diode peak reverse recovery current

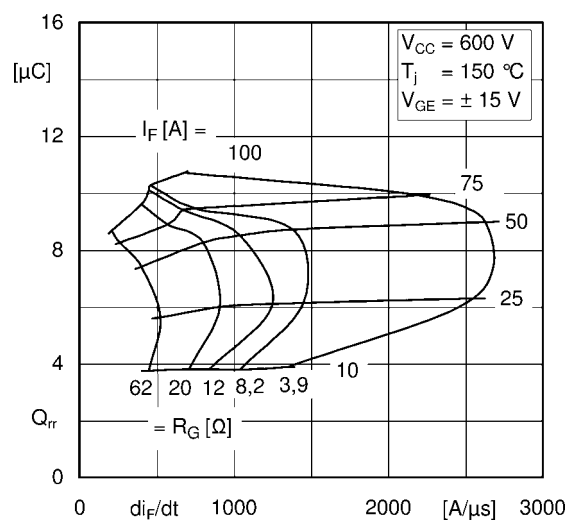
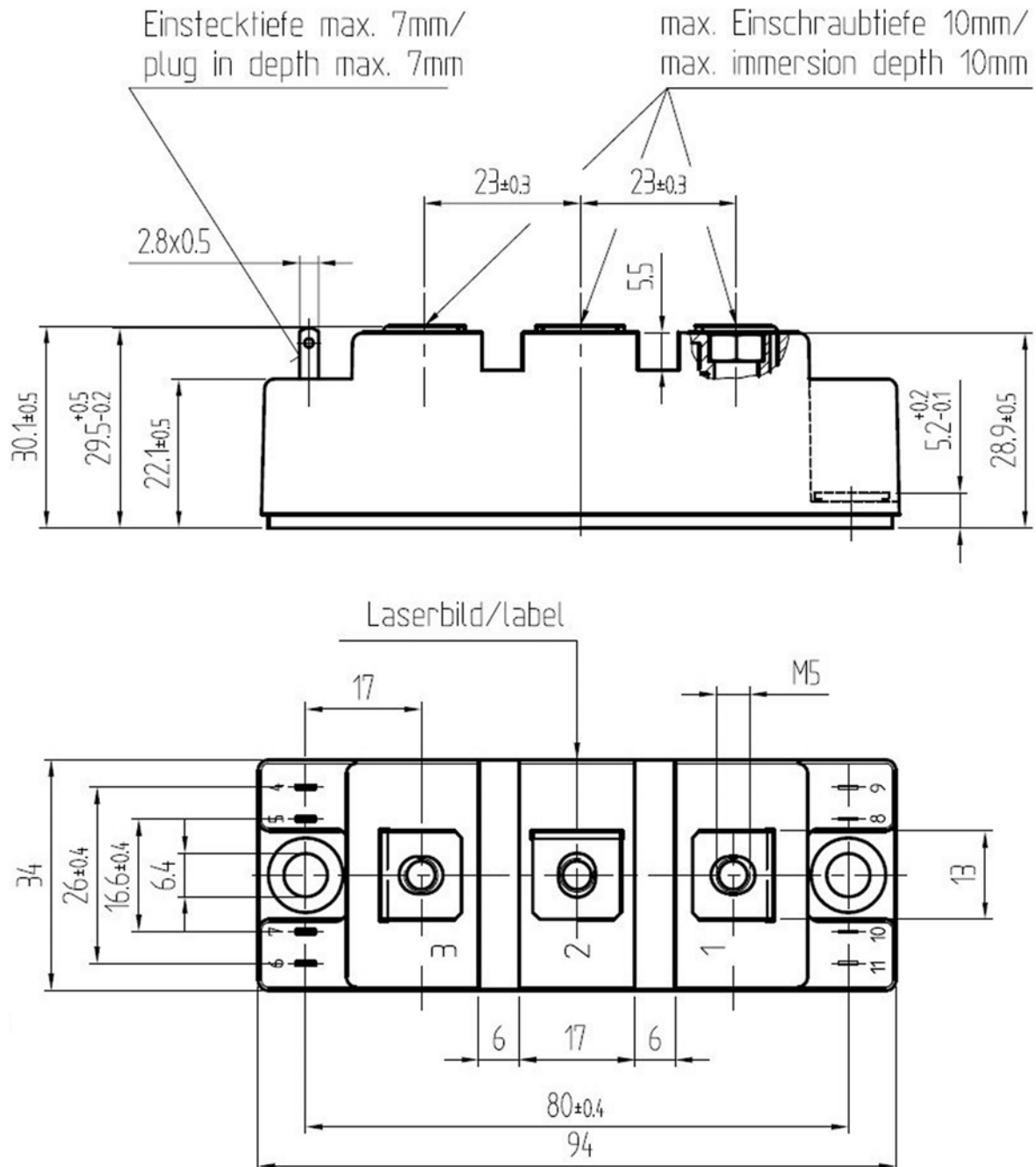
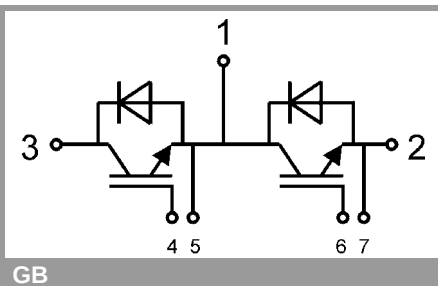


Fig. 12: Typ. CAL diode peak reverse recovery charge



Semitrans 2



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

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