



SEMITRANS® 2

High Speed IGBT4 Modules

SKM75GB12F4

Features*

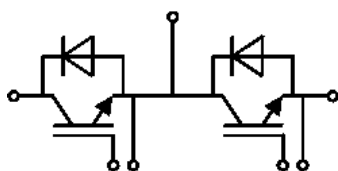
- High speed trench and field-stop IGBT
- CAL4 ultra-fast = soft switching 4. generation CAL-diode
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Increased power cycling capability
- For higher switching frequencies above 15kHz
- UL recognized, file no. E63532

Typical Applications

- UPS
- Electronic welders
- Inductive heating
- Switched mode power supplies

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max.
- Recommended $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for $T_j = 150^\circ\text{C}$



GB

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 175 °C	T _c = 25 °C	113	A
		T _c = 80 °C	87	A
I _{Cnom}			75	A
I _{CRM}	I _{CRM} = 2 x I _{Cnom}		150	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				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 175 °C	T _c = 25 °C	98	A
		T _c = 80 °C	72	A
I _{Fnom}			75	A
I _{FRM}	I _{FRM} = 2xI _{Fnom}		150	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		430	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}			200	A
T _{stg}	module without TIM		-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		4000	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	2.08	2.41	V
		$T_j = 150^\circ\text{C}$	2.60	2.93	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	1.10	1.28	V
		$T_j = 150^\circ\text{C}$	0.95	1.13	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	13	15	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	22	24	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 2.6\text{ mA}$	5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25^\circ\text{C}$			1	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	4.4		nF
C_{oes}		$f = 1\text{ MHz}$	0.29		nF
C_{res}		$f = 1\text{ MHz}$	0.24		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		425		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	9		ns
t_r	$I_C = 75\text{ A}$	$T_j = 150^\circ\text{C}$	21		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 6.2\text{ }\Omega$	$T_j = 150^\circ\text{C}$	6.8		mJ
$t_{d(off)}$	$R_{G off} = 6.2\text{ }\Omega$	$T_j = 150^\circ\text{C}$	285		ns
t_f	$di/dt_{on} = 3750\text{ A}/\mu\text{s}$ $di/dt_{off} = 1100\text{ A}/\mu\text{s}$ $dv/dt = 5370\text{ V}/\mu\text{s}$ $L_s = 25\text{ nH}$	$T_j = 150^\circ\text{C}$	61		ns
E_{off}		$T_j = 150^\circ\text{C}$	5.3		mJ
$R_{th(j-c)}$	per IGBT			0.325	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)		0.143		K/W



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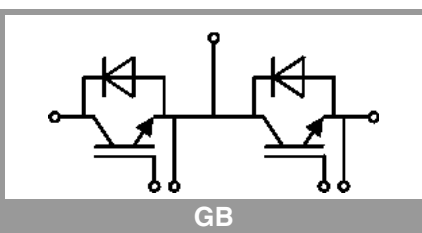
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Characteristics						
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Inverse diode						
V _F = V _{EC}	I _F = 75 A	T _j = 25 °C		2.43	2.80	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		2.29	2.65	V
V _{F0}	chiplevel	T _j = 25 °C		1.51	1.75	V
		T _j = 150 °C		1.16	1.40	V
r _F	chiplevel	T _j = 25 °C		12	14	mΩ
		T _j = 150 °C		15	17	mΩ
I _{RRM}	I _F = 75 A	T _j = 150 °C		120		A
Q _{rr}	di/dt _{off} = 3750 A/μs	T _j = 150 °C		12		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _j = 150 °C		3.7		mJ
R _{th(j-c)}	per diode				0.536	K/W
R _{th(c-s)}	per diode (λ _{grease} =0.81 W/(m*K))			0.144		K/W
Module						
L _{CE}				30		nH
R _{CC'+EE'}	measured per switch	T _C = 25 °C		0.65		mΩ
		T _C = 125 °C		1.09		mΩ
R _{th(c-s)1}	calculated without thermal coupling			0.0359		K/W
R _{th(c-s)2}	including thermal coupling, Ts underneath module (λ _{grease} =0.81 W/(m*K))			0.057		K/W
M _s	to heat sink M6		3		5	Nm
M _t		to terminals M5	2.5		5	Nm
					-	
w					160	g



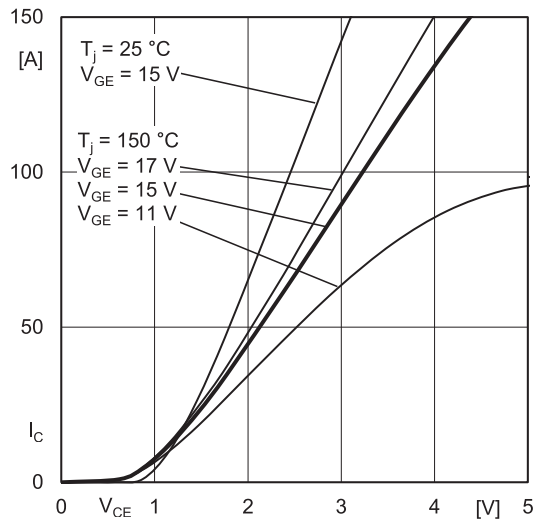


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

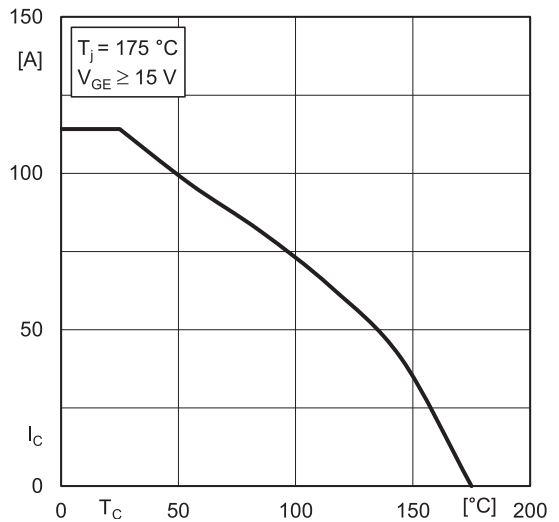


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

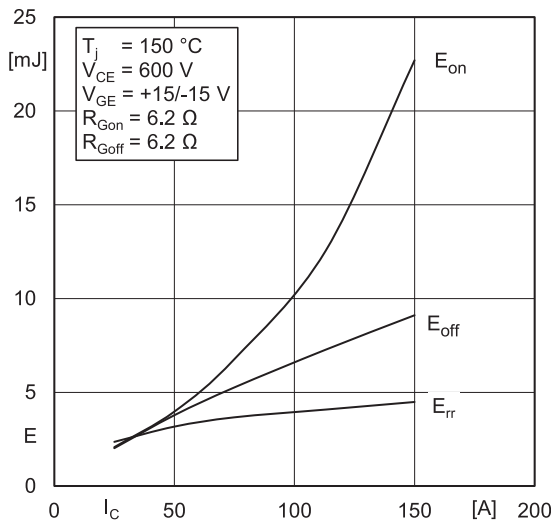


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

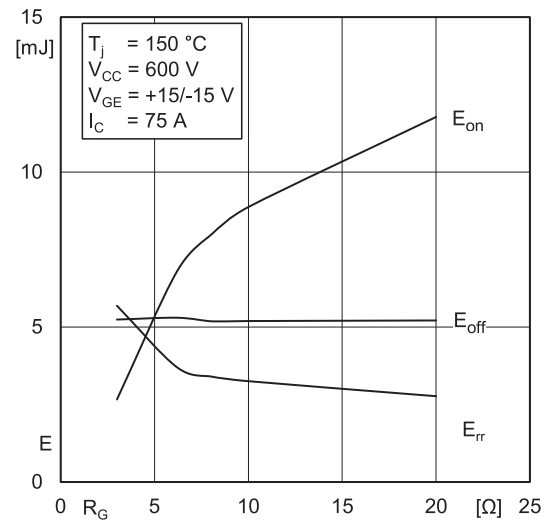


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

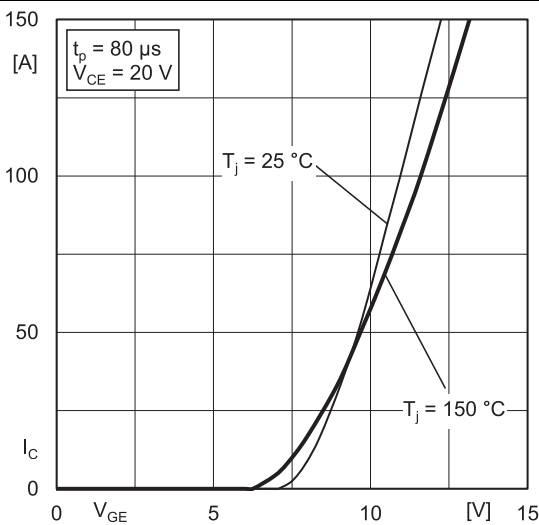


Fig. 5: Typ. transfer characteristic

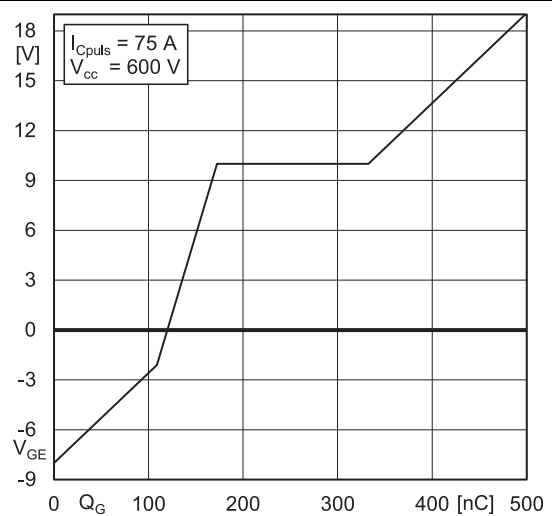


Fig. 6: Typ. gate charge characteristic

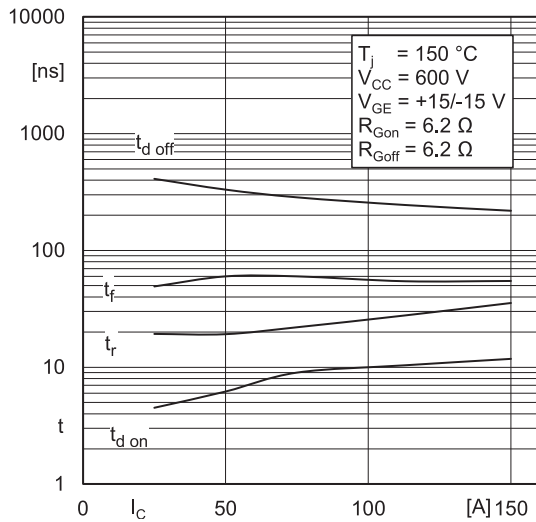


Fig. 7: Typ. switching times vs. I_C

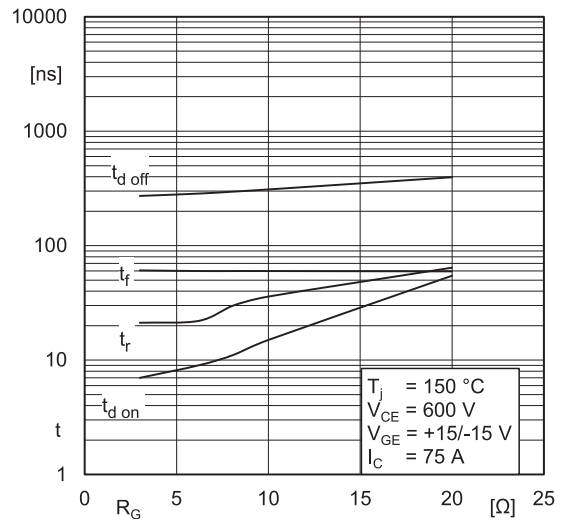


Fig. 8: Typ. switching times vs. gate resistor R_G

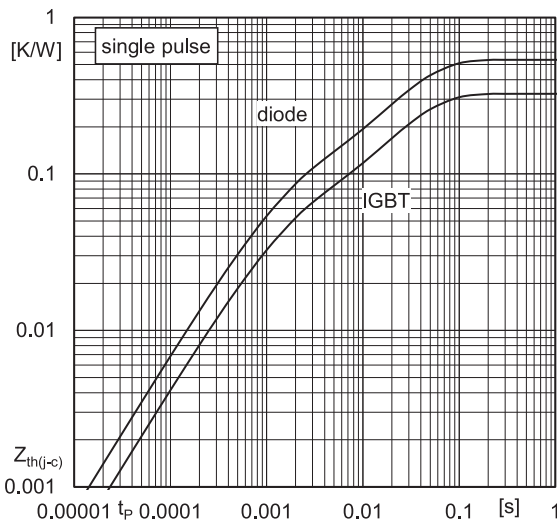


Fig. 9: Transient thermal impedance

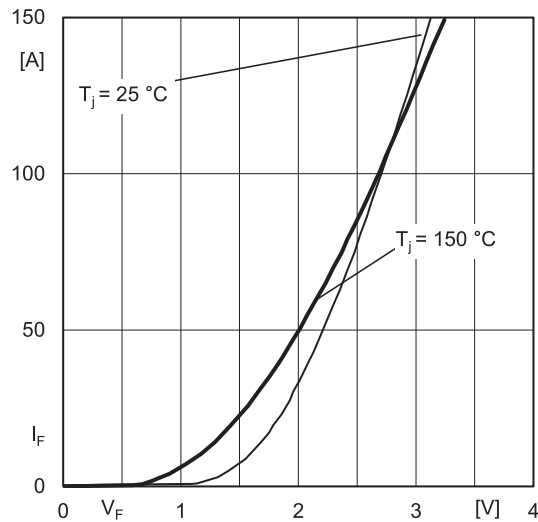


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'}+EE'$

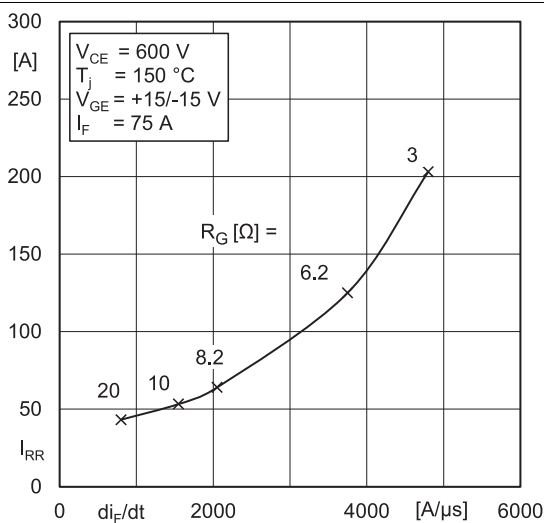


Fig. 11: Typ. CAL diode peak reverse recovery current

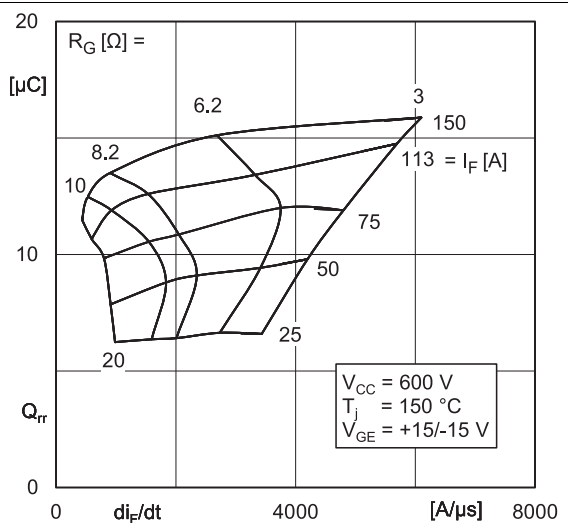


Fig. 12: Typ. CAL diode peak reverse recovery charge

max. 7mm

2,8x0,5

23±0,3

23±0,3

5,5

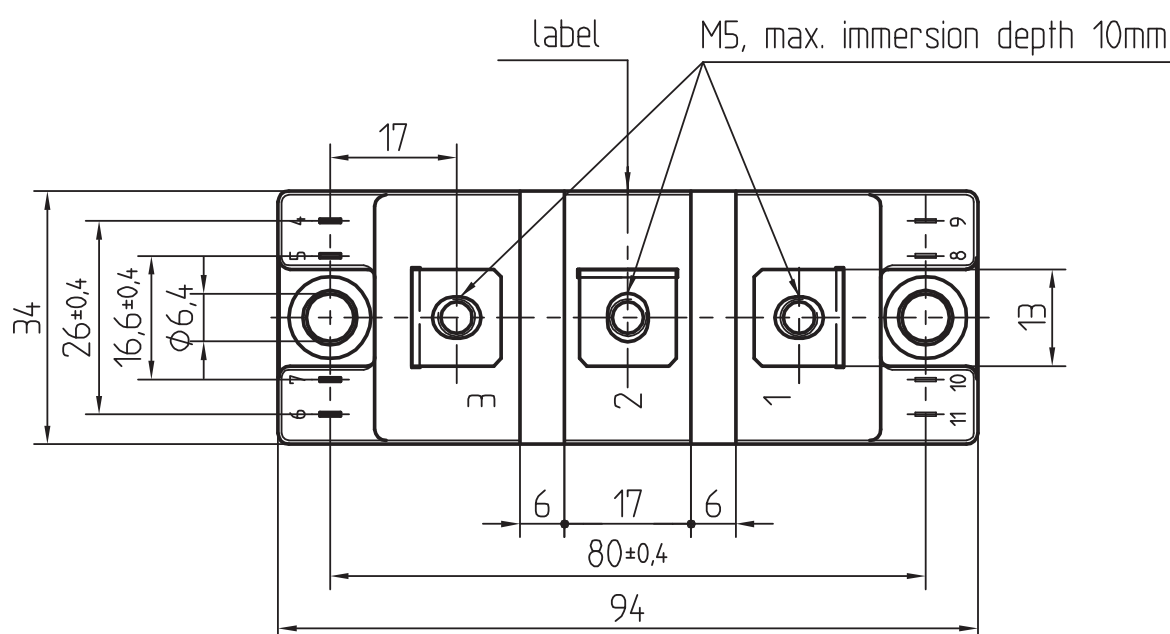
29,5^{+0,5}_{-0,2}

22,1±0,5

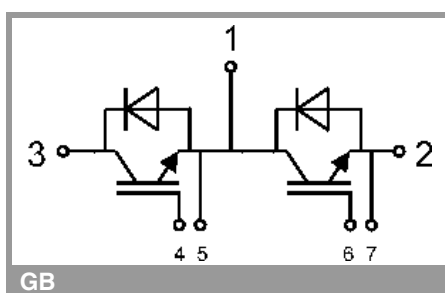
5,3^{+0,1}_{-0,2}

28,9±0,5

30,1±0,5



SEMITRANS 2



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

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