

# SKM75GB12T4



## SEMITRANS® 2

### Fast IGBT4 Modules

#### SKM75GB12T4

#### Features

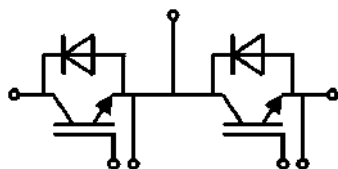
- IGBT4 = 4. generation fast trench IGBT (Infineon)
- CAL4 = Soft switching 4. generation CAL-diode
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Increased power cycling capability
- With integrated gate resistor
- For higher switching frequencies up to 20kHz
- UL recognized, file no. E63532

#### 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.
- Recommended  $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for  $T_j = 150^\circ\text{C}$



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#### Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
<b>IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200	V	
$I_C$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	115	A
		$T_c = 80^\circ\text{C}$	88	A
$I_{Cnom}$		75	A	
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	225	A	
$V_{GES}$		-20 ... 20	V	
$t_{psc}$	$T_j = 150^\circ\text{C}$	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	10	$\mu\text{s}$
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Inverse diode</b>				
$I_F$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	97	A
		$T_c = 80^\circ\text{C}$	73	A
$I_{Fnom}$		75	A	
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	150	A	
$I_{FSM}$	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	430	A	
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Module</b>				
$I_{t(RMS)}$		200	A	
$T_{stg}$		-40 ... 125	$^\circ\text{C}$	
$V_{isol}$	AC sinus 50 Hz, $t = 1\text{ min}$	4000	V	

#### Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
<b>IGBT</b>					
$V_{CE(sat)}$	$I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.28	2.45	V
$V_{CE0}$	chipelevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V
		$T_j = 150^\circ\text{C}$	0.70	0.80	V
$r_{CE}$	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	14	16	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	21	22	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 3\text{ mA}$	5	5.8	6.5	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$		1	$\text{mA}$
		$T_j = 150^\circ\text{C}$		-	$\text{mA}$
$C_{ies}$	$V_{CE} = 25\text{ V}$		4.4		nF
$C_{oes}$	$V_{GE} = 0\text{ V}$		0.29		nF
$C_{res}$			0.24		nF
$Q_G$	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		425		nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$		10		$\Omega$
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 75\text{ A}$		150		ns
$t_r$	$V_{GE} = +15/-15\text{ V}$		39		ns
$E_{on}$	$R_{Gon} = 1\ \Omega$		11		mJ
$t_{d(off)}$	$R_{Goff} = 1\ \Omega$		370		ns
$t_f$	$di/dt_{on} = 1600\text{ A}/\mu\text{s}$ $di/dt_{off} = 950\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	66		ns
		$T_j = 150^\circ\text{C}$			
$E_{off}$			6.9		mJ
$R_{th(j-c)}$	per IGBT			0.38	K/W

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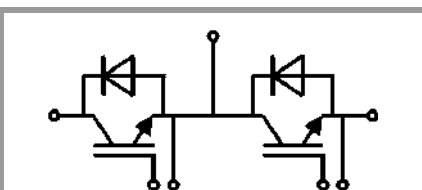
#### Typical Applications\*

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

#### 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  $T_j = 150^\circ\text{C}$

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverse diode</b>						
$V_F = V_{EC}$	$I_F = 75\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.17	2.49	V
		$T_j = 150^\circ\text{C}$		2.11	2.42	V
$V_{F0}$	chipelevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
$r_F$	chipelevel	$T_j = 25^\circ\text{C}$		12	13	mΩ
		$T_j = 150^\circ\text{C}$		16	18	mΩ
$I_{RRM}$	$I_F = 75\text{ A}$	$T_j = 150^\circ\text{C}$		37		A
$Q_{rr}$	$di/dt_{off} = 990\text{ A}/\mu\text{s}$ $V_{GE} = \pm 15\text{ V}$	$T_j = 150^\circ\text{C}$		12.6		μC
$E_{rr}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		4.7		mJ
$R_{th(j-c)}$	per diode				0.58	K/W
<b>Module</b>						
$L_{CE}$				30		nH
$R_{CC+EE}$	measured per switch	$T_c = 25^\circ\text{C}$		0.65		mΩ
		$T_c = 125^\circ\text{C}$		1.09		mΩ
$R_{th(c-s)}$	calculated without thermal coupling ( $\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$ )			0.04	0.05	K/W
$M_s$	to heat sink M6		3		5	Nm
$M_t$						Nm
	to terminals M5		2.5		5	Nm
$w$					160	g



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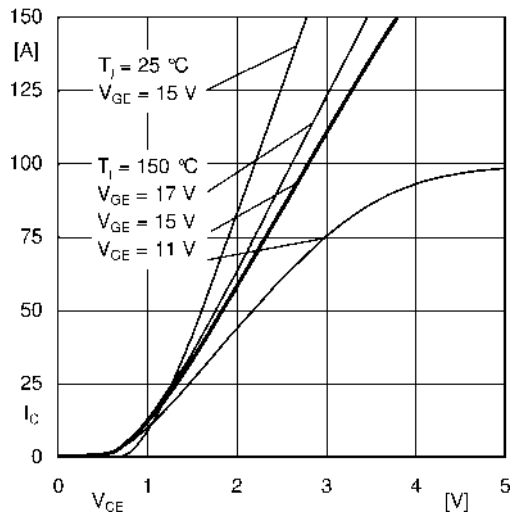


Fig. 1: Typ. output characteristic, inclusive R<sub>CC+EE</sub>

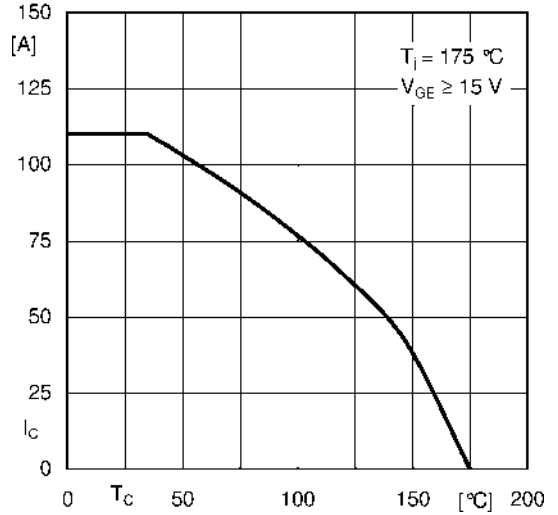


Fig. 2: Rated current vs. temperature I<sub>C</sub> = f(T<sub>C</sub>)

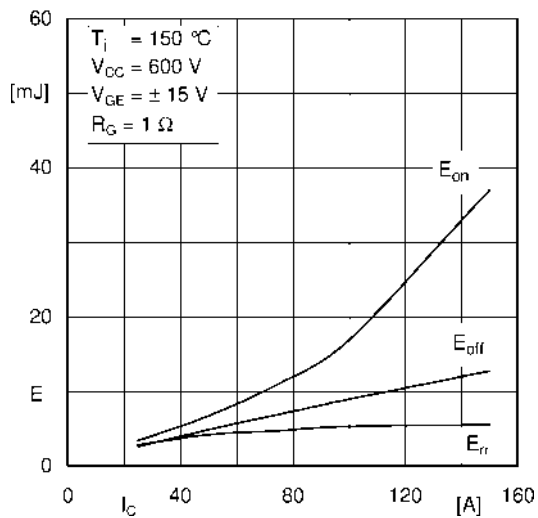


Fig. 3: Typ. turn-on /-off energy = f(I<sub>C</sub>)

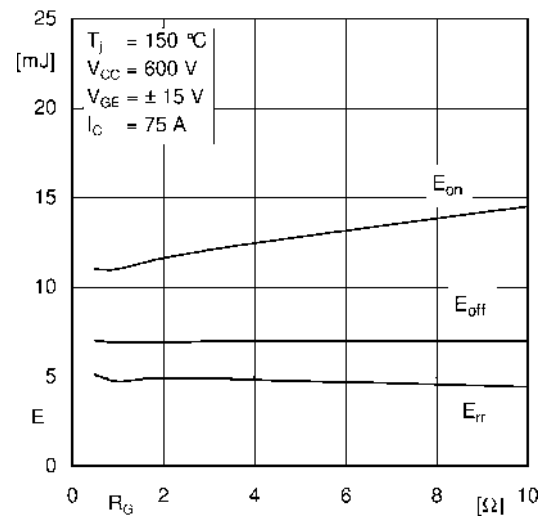


Fig. 4: Typ. turn-on /-off energy = f(R<sub>G</sub>)

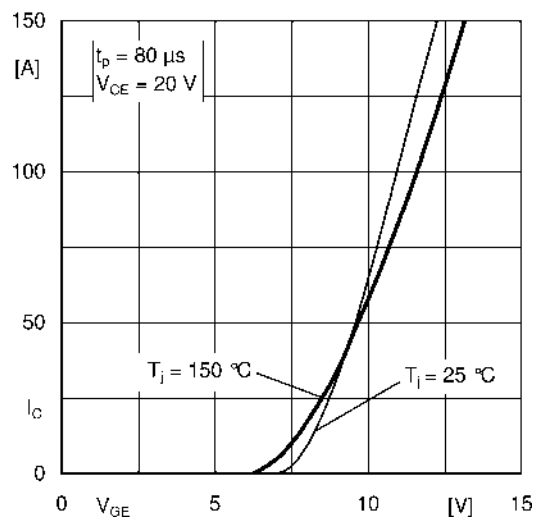


Fig. 5: Typ. transfer characteristic

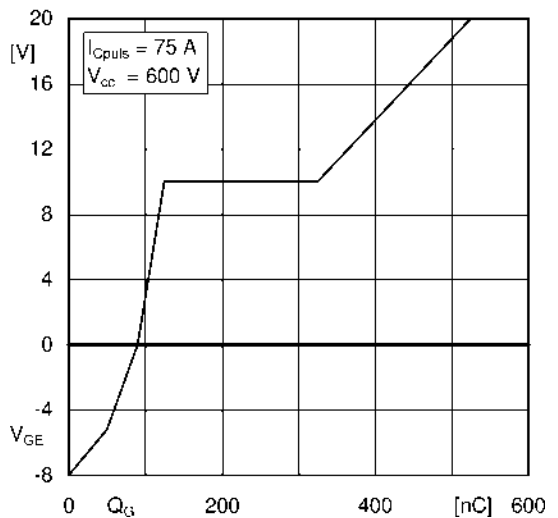


Fig. 6: Typ. gate charge characteristic

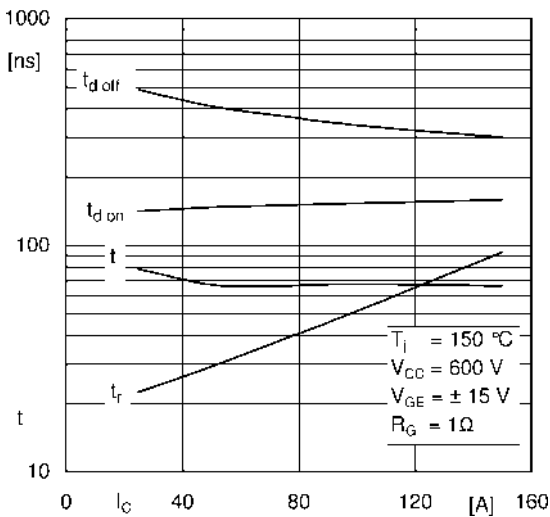


Fig. 7: Typ. switching times vs.  $I_C$

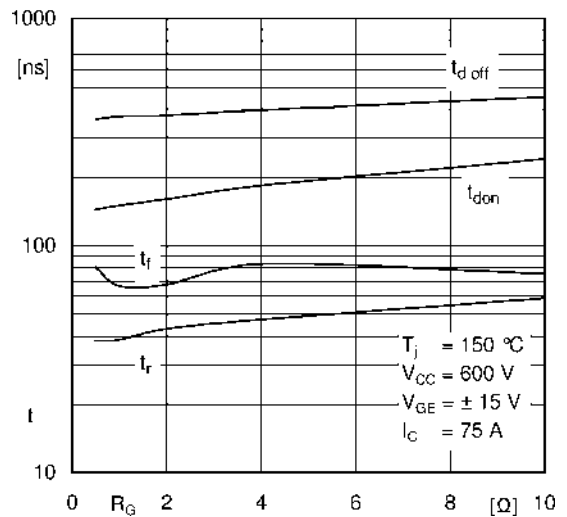


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

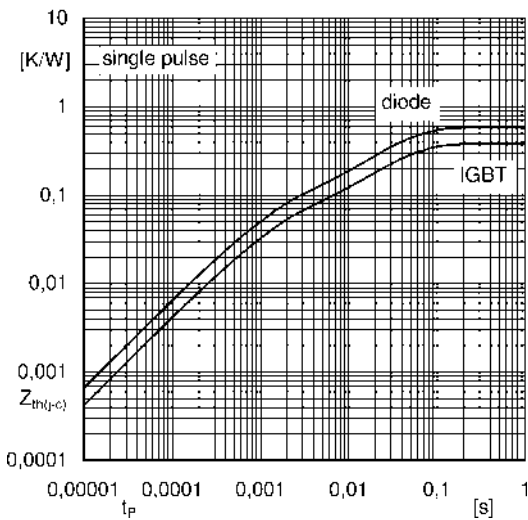


Fig. 9: Transient thermal impedance

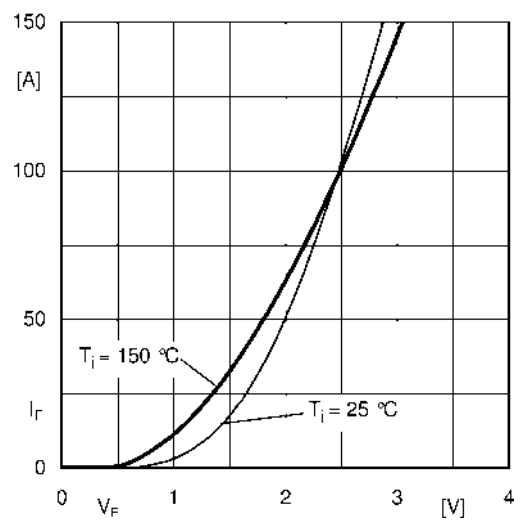


Fig. 10: Typ. CAL diode forward charact., incl.  $R_{CC+EE}$

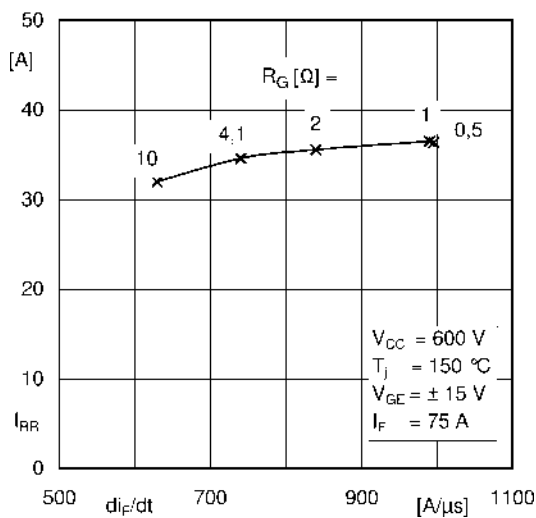


Fig. 11: CAL diode peak reverse recovery current

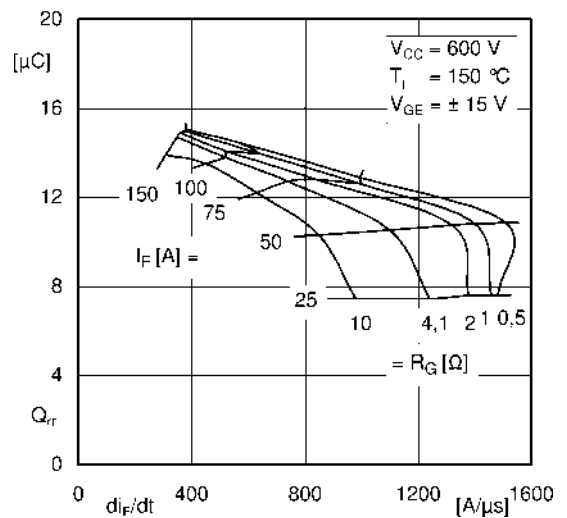


Fig. 12: Typ. CAL diode peak reverse recovery charge



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

## **\*IMPORTANT INFORMATION AND WARNINGS**

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