



SEMITRANS® 3

Fast IGBT4 Modules

SKM300GBD12T4

Features

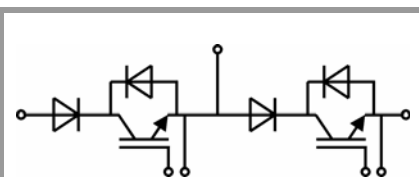
- IGBT4 = 4. Generation Fast Trench IGBT (Infineon)
- CAL4 = Soft switching 4. Generation CAL-Diode
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)
- UL recognized, file no. E63532
- Increased power cycling capability
- With integrated Gate resistor
- For higher switching frequencies up to 20kHz

Typical Applications*

- Current source inverter

Remarks

- The Fig.1 to Fig.9 are based on measurements of the SKM300GB12T4
- The series diodes (FWD) have the data of the inverse diodes of SKM400GB12T4
- 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}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	422
		$T_c = 80^\circ\text{C}$	324
I_{Cnom}		300	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	900	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
T_j		-40 ... 175	$^\circ\text{C}$
Inverse diode			
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	56
		$T_c = 80^\circ\text{C}$	43
I_{Fnom}		50	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	150	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	180	A
T_j		-40 ... 175	$^\circ\text{C}$
Freewheeling diode			
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	440
		$T_c = 80^\circ\text{C}$	329
I_{Fnom}		400	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	1200	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	1980	A
T_j		-40 ... 175	$^\circ\text{C}$
Module			
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$	500	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
IGBT					
$V_{CE(sat)}$	$I_C = 300\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	V
V_{CE0}		$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	3.50	4.00	m Ω
		$T_j = 150^\circ\text{C}$	5.17	5.50	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 12\text{ mA}$	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}	$V_{CE} = 25\text{ V}$	$f = 1\text{ MHz}$	18.6		nF
C_{oes}	$V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	1.16		nF
C_{res}		$f = 1\text{ MHz}$	1.02		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		1700		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		2.50		Ω



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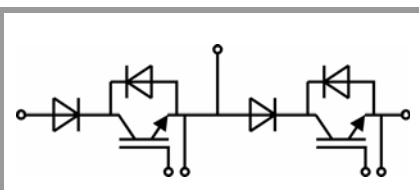
Typical Applications*

- Current source inverter

Remarks

- The Fig.1 to Fig.9 are based on measurements of the SKM300GB12T4
- The series diodes (FWD) have the data of the inverse diodes of SKM400GB12T4
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		200		ns
t _r	I _C = 300 A	T _j = 150 °C		44		ns
E _{on}	V _{GE} = ±15 V	T _j = 150 °C		27		mJ
t _{d(off)}	R _{G on} = 1.5 Ω	T _j = 150 °C		450		ns
t _f	R _{G off} = 1.5 Ω	T _j = 150 °C		90		ns
E _{off}	di/dt _{on} = 7500 A/μs	T _j = 150 °C		29		mJ
	di/dt _{off} = 3350 A/μs	T _j = 150 °C				
R _{th(j-c)}	per IGBT				0.11	K/W
Inverse diode						
V _F = V _{EC}	I _F = 50 A	T _j = 25 °C		2.41	2.74	V
	V _{GE} = 0 V chip	T _j = 150 °C		2.45	2.79	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	18.0	22.2	24.8	mΩ
		T _j = 150 °C		31.0	33.8	mΩ
I _{RRM}	I _F = 50 A	T _j = 150 °C				A
Q _{rr}	di/dt _{off} = 7300 A/μs	T _j = 150 °C				μC
E _{rr}	V _{GE} = 15 V	T _j = 150 °C		0		mJ
	V _{CC} = 600 V	T _j = 150 °C				
R _{th(j-c)}	per diode				0.94	K/W
Freewheeling diode						
V _F = V _{EC}	I _F = 400 A	T _j = 25 °C		2.20	2.52	V
	V _{GE} = 0 V chip	T _j = 150 °C		2.15	2.47	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		2.3	2.5	mΩ
		T _j = 150 °C		3.1	3.4	mΩ
I _{RRM}	I _F = 400 A	T _j = 150 °C		450		A
Q _{rr}	di/dt _{off} = 8800 A/μs	T _j = 150 °C		68		μC
E _{rr}	V _{GE} = ±15 V	T _j = 150 °C		30.5		mJ
	V _{CC} = 600 V	T _j = 150 °C				
R _{th(j-c)}	per Diode				0.14	K/W
Module						
L _{CE}				15	20	nH
R _{CC'+EE'}	terminal-chip	T _C = 25 °C		0.25		mΩ
		T _C = 125 °C		0.5		mΩ
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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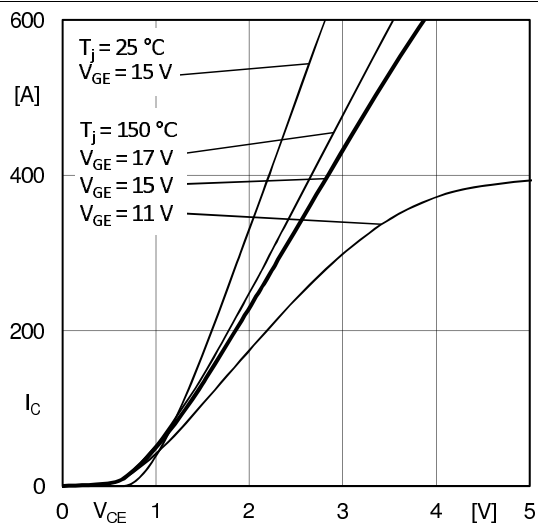


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

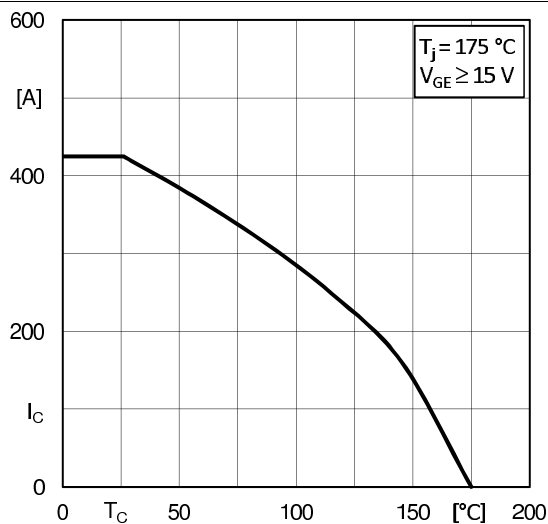


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

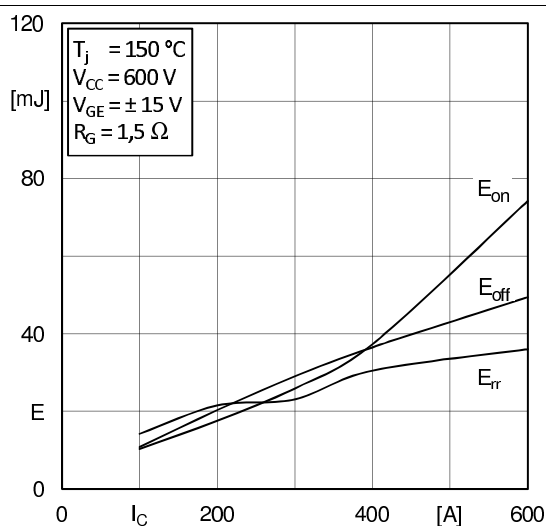


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

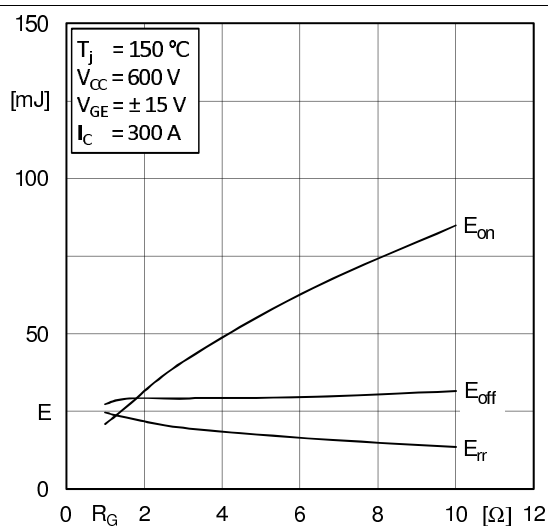


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

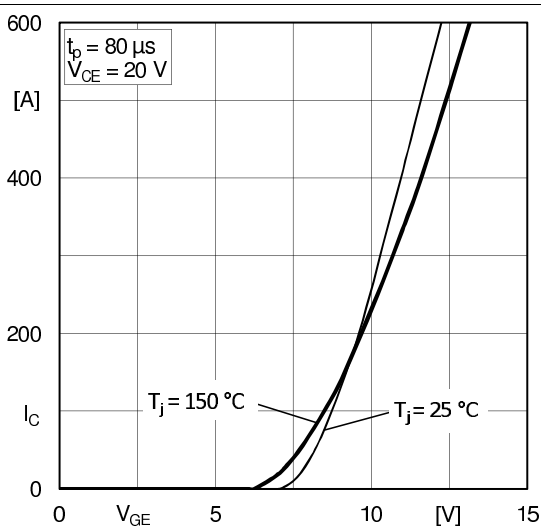


Fig. 5: Typ. transfer characteristic

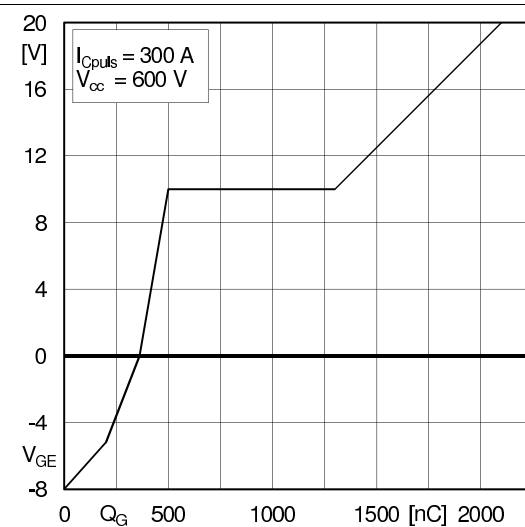


Fig. 6: Typ. gate charge characteristic

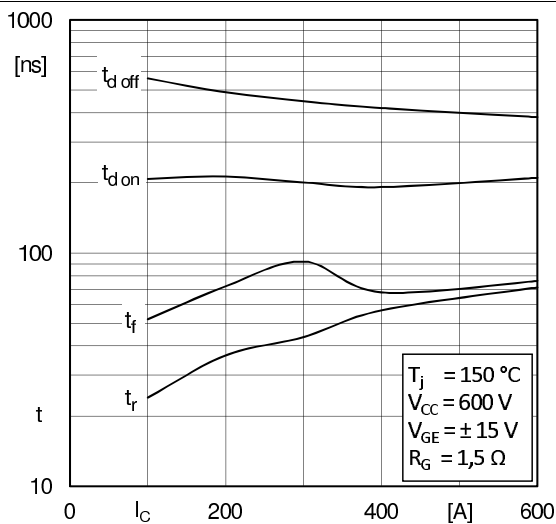


Fig. 7: Typ. switching times vs. I_C

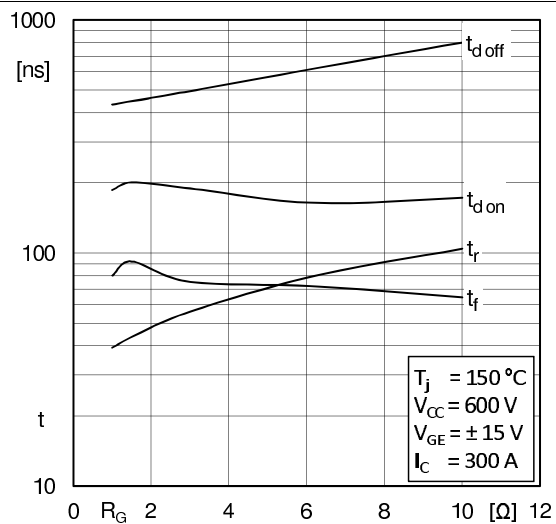


Fig. 8: Typ. switching times vs. gate resistor R_G

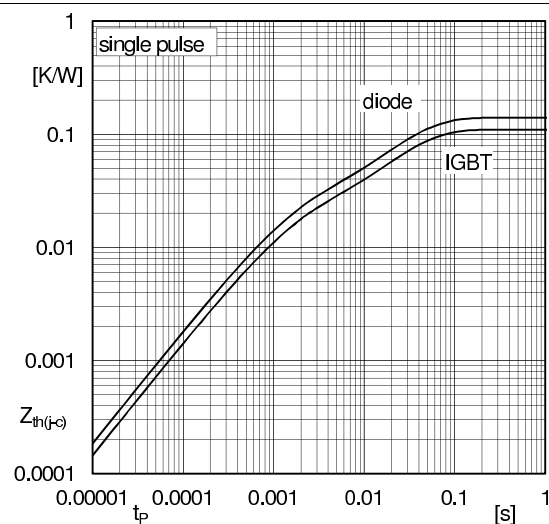


Fig. 9: Transient thermal impedance

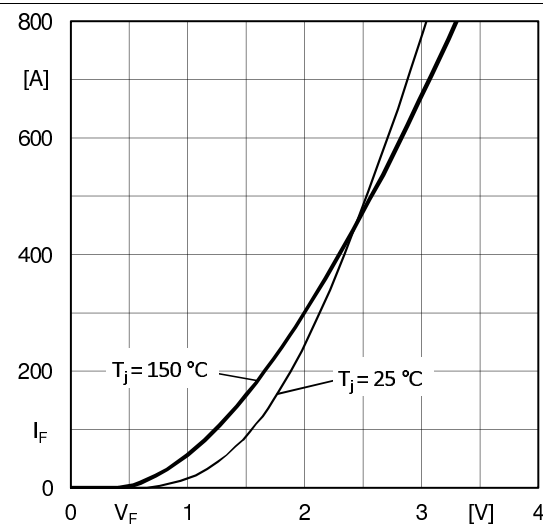


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

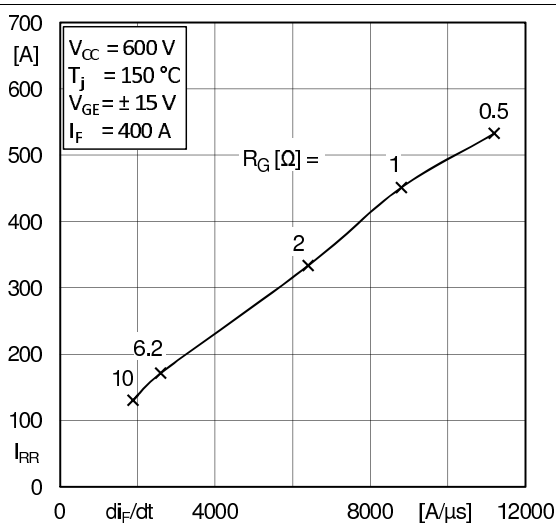


Fig. 11: CAL diode peak reverse recovery current

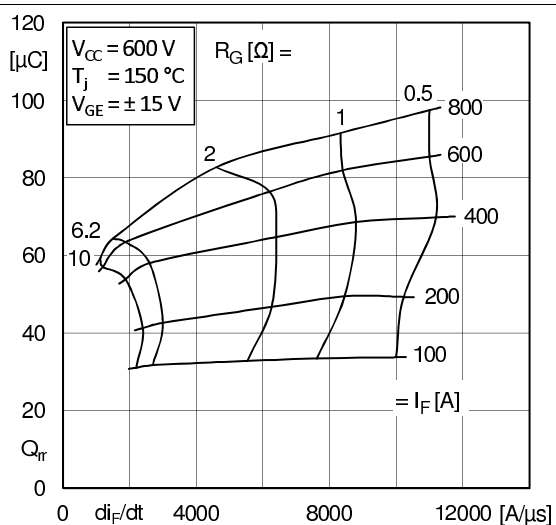
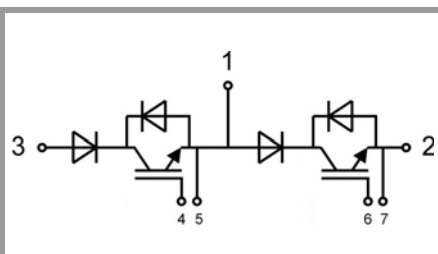


Fig. 12: Typ. CAL diode peak reverse recovery charge



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

* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.