



SEMITRANS®3

Fast IGBT4 Modules

SKM300GAL12T4

Features

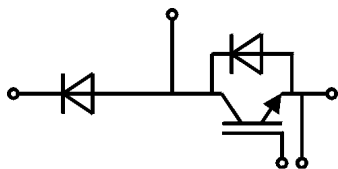
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_{Cnom}
- Fast & soft inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)

Typical Applications

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – motor

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 $T_j = 150^\circ$



GAL

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}			1200	V
I _C	T _j = 175 °C	T _c = 25 °C	422	A
		T _c = 80 °C	324	A
I _{Cnom}			300	A
I _{CRM}	I _{CRM} = 3xI _{Cnom}		900	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				
I _F	T _j = 175 °C	T _c = 25 °C	353	A
		T _c = 80 °C	264	A
I _{Fnom}			300	A
I _{FRM}	I _{FRM} = 3xI _{Fnom}		900	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		1548	A
T _j			-40 ... 175	°C
Freewheeling diode				
I _F	T _j = 175 °C	T _c = 25 °C	353	A
		T _c = 80 °C	264	A
I _{Fnom}			300	A
I _{FRM}	I _{FRM} = 3xI _{Fnom}		900	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		1548	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}			500	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC sinus 50Hz, t = 1 min		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
V _{CE(sat)}	I _C = 300 A	T _J = 25 °C		1.85	2.1	V
	V _{GE} = 15 V chiplevel	T _J = 150 °C		2.25	2.45	V
V _{CE0}		T _J = 25 °C		0.8	0.9	V
		T _J = 150 °C		0.7	0.8	V
r _{CE}	V _{GE} = 15 V	T _J = 25 °C		3.5	4.0	mΩ
		T _J = 150 °C		5.2	5.5	mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 12 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V	T _J = 25 °C		0.1	0.3	mA
	V _{CE} = 1200 V	T _J = 150 °C				mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		17.6		nF
C _{oes}		f = 1 MHz		1.16		nF
C _{res}		f = 1 MHz		0.94		nF
Q _G	V _{GE} = - 8 V...+ 15 V			1700		nC
R _{Gint}	T _J = 25 °C			2.5		Ω



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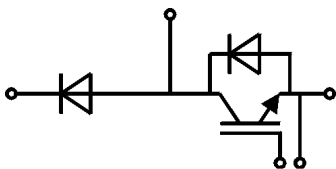
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Remarks

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Characteristics					
Symbol	Conditions		min.	typ.	max. Unit
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		200	ns
t_r	$I_C = 300\text{ A}$	$T_j = 150^\circ\text{C}$		44	ns
E_{on}	$V_{GE} = \pm 15\text{ V}$	$T_j = 150^\circ\text{C}$		27	mJ
$t_{d(off)}$	$R_{G\ on} = 1.5\ \Omega$	$T_j = 150^\circ\text{C}$		450	ns
t_f	$R_{G\ off} = 1.5\ \Omega$	$T_j = 150^\circ\text{C}$		90	ns
E_{off}	$di/dt_{on} = 7500\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		29	mJ
$R_{th(j-c)}$	$di/dt_{off} = 3350\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$			0.11 K/W
	per IGBT				
Inverse diode					
$V_F = V_{EC}$	$I_F = 300\text{ A}$	$T_j = 25^\circ\text{C}$		2.17	2.49 V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		2.11	2.42 V
	chip				
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		$T_j = 25^\circ\text{C}$		2.9	3.3 m Ω
		$T_j = 150^\circ\text{C}$		4.0	4.4 m Ω
I_{RRM}	$I_F = 300\text{ A}$	$T_j = 150^\circ\text{C}$		345	A
Q_{rr}	$di/dt_{off} = 7300\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		54	μC
E_{rr}	$V_{GE} = \pm 15\text{ V}$	$T_j = 150^\circ\text{C}$		23	mJ
	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$			
$R_{th(j-c)}$	per diode				0.17 K/W
Freewheeling diode					
$V_F = V_{EC}$	$I_F = 300\text{ A}$	$T_j = 25^\circ\text{C}$		2.17	2.49 V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		2.11	2.42 V
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	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$			
$R_{th(j-c)}$	per Diode				0.17 K/W
Module					
L_{CE}				15	20 nH
$R_{CC'+EE'}$	terminal-chip	$T_c = 25^\circ\text{C}$		0.25	m Ω
		$T_c = 125^\circ\text{C}$		0.5	m Ω
$R_{th(c-s)}$	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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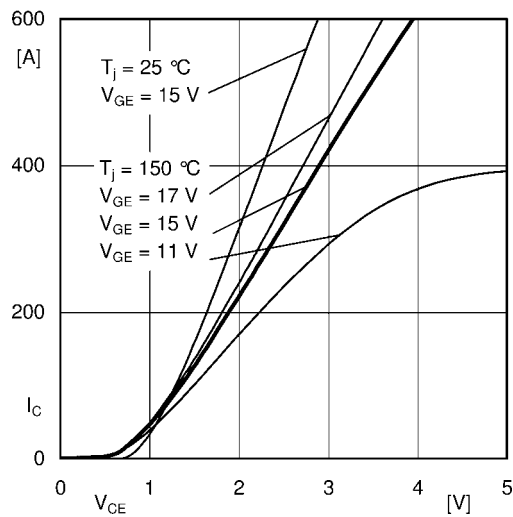


Fig. 1: Typ. output characteristic, inclusive $R_{CC} + EE'$

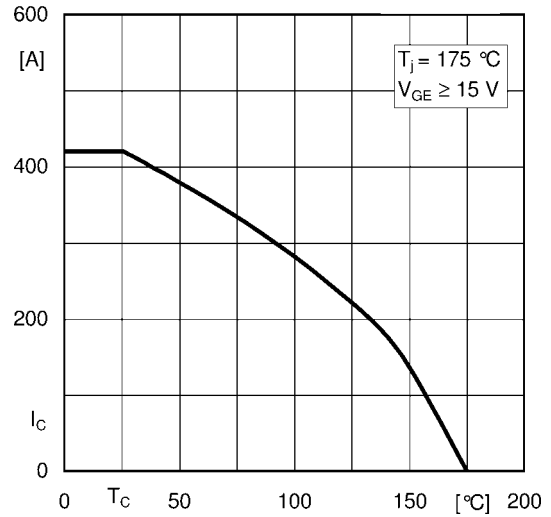


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

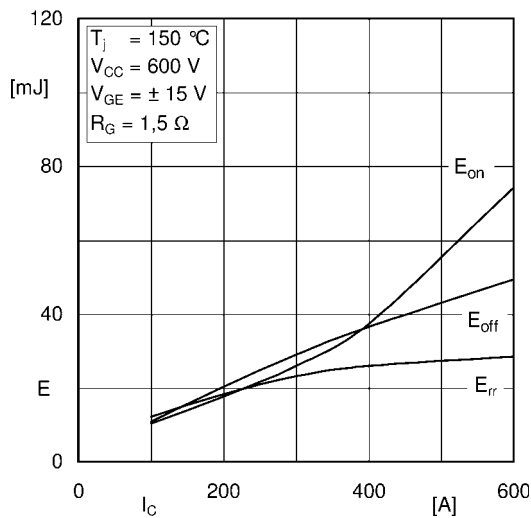


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

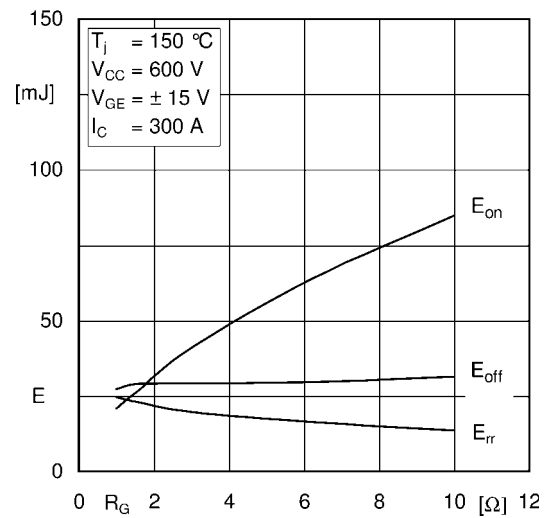


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

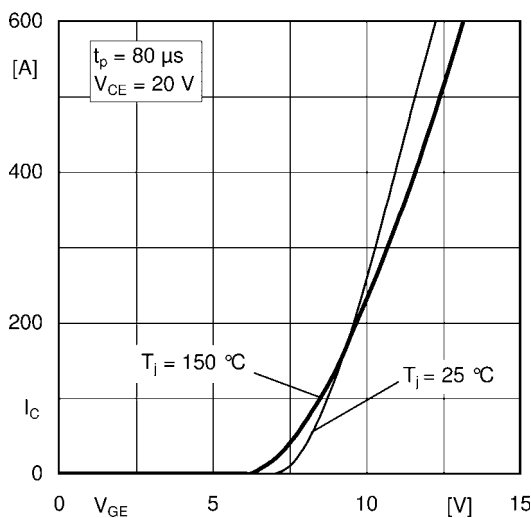


Fig. 5: Typ. transfer characteristic

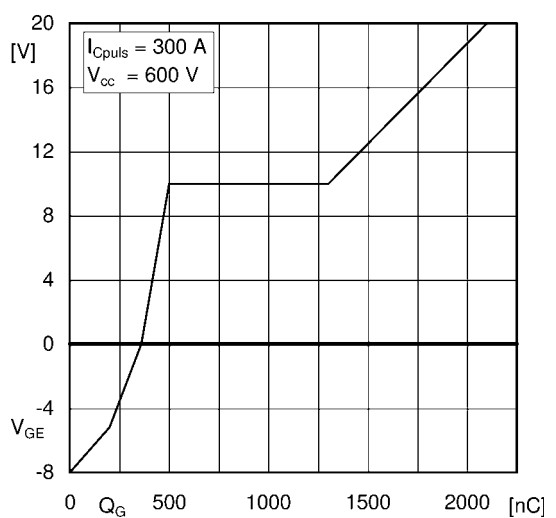


Fig. 6: Typ. gate charge characteristic

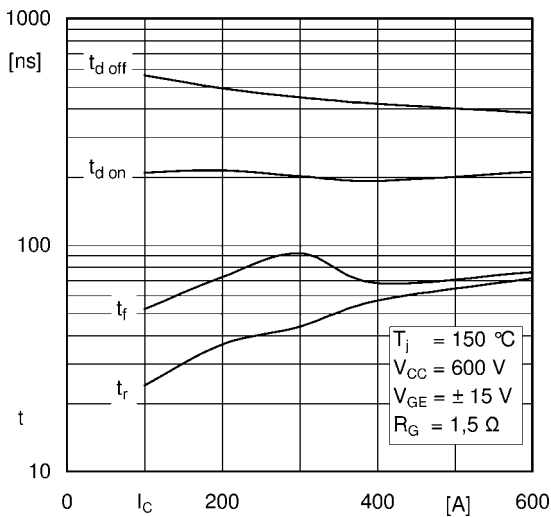


Fig. 7: Typ. switching times vs. I_C

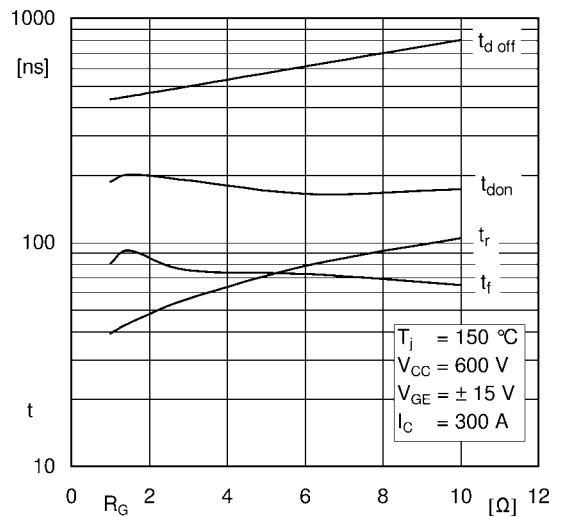


Fig. 8: Typ. switching times vs. gate resistor R_G

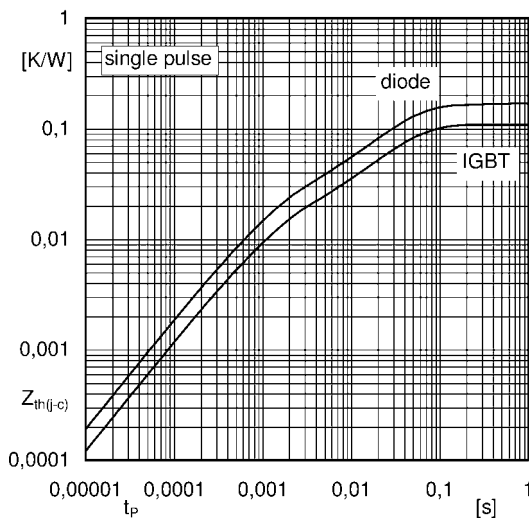


Fig. 9: Transient thermal impedance

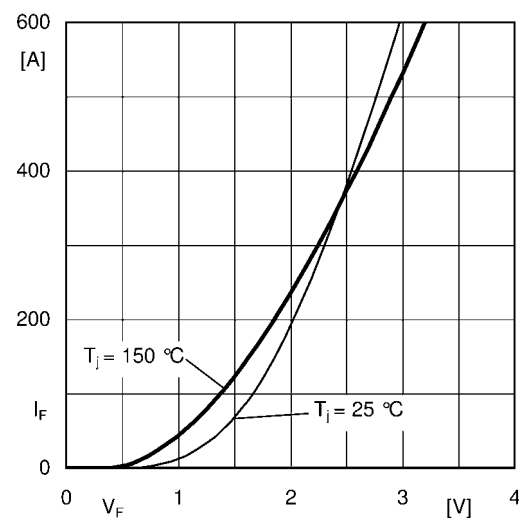


Fig. 10: CAL diode forward characteristic

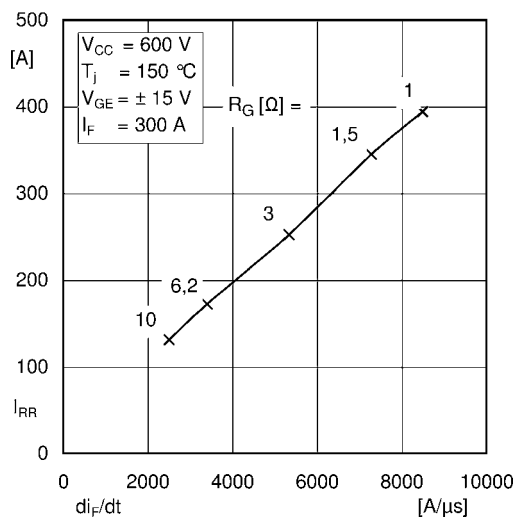


Fig. 11: CAL diode peak reverse recovery current

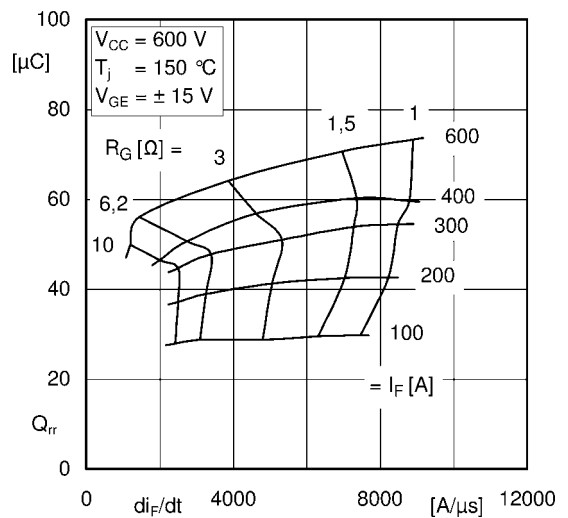
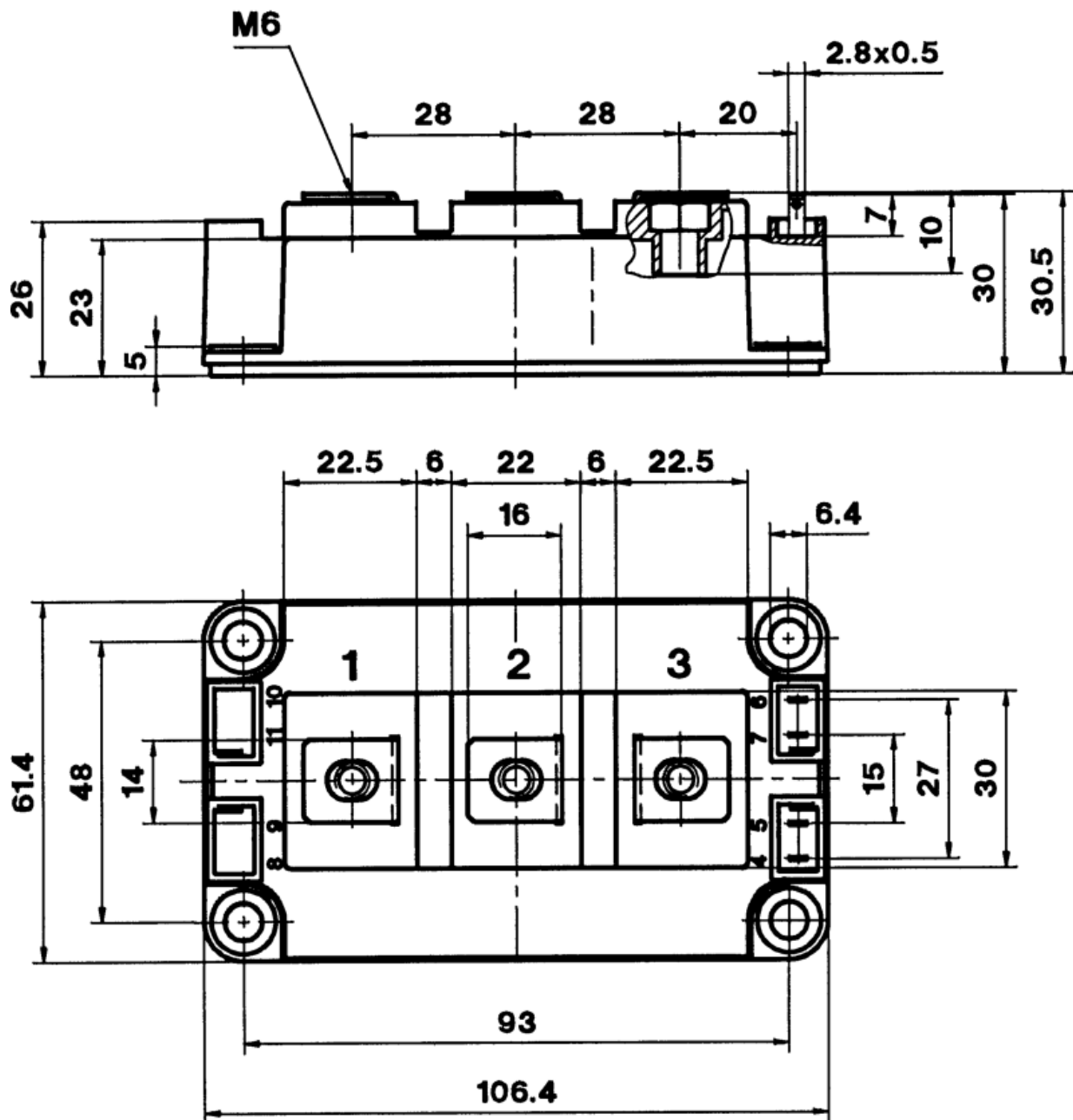
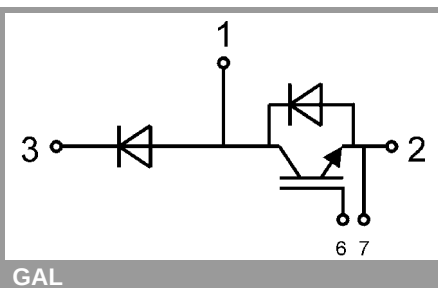


Fig. 12: Typ. CAL diode peak reverse recovery charge



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

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