SKM400GARL066T

SEMITRANS® 5

Trench IGBT Modules

SKM400GARL066T

Features

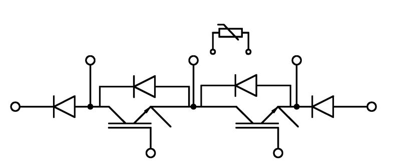
- Homogeneous Si
- Trench = trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Integrated NTC temperature sensor
- UL recognized, file no. E63532

Typical Applications*

- UPS
- Inverter

Remarks

- Case temperature limited to Tc=125°C max
- Reccomended Top=-40..+150°C



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	T_j = 25 °C		600	V
I_C	T_j = 175 °C	T_c = 25 °C	504	A
		T_c = 80 °C	379	A
I_{Cnom}			400	A
I_{CRM}	I_{CRM} = 2xI_{Cnom}		800	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V V_{GE} ≤ 15 V V_{CES} ≤ 600 V	T_j = 150 °C	6	µs
T_j			-40 ... 175	°C
Inverse diode				
I_F	T_j = 175 °C	T_c = 25 °C	46	A
		T_c = 80 °C	33	A
I_{Fnom}			50	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		100	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		345	A
T_j			-40 ... 175	°C
Freewheeling diode				
I_F	T_j = 175 °C	T_c = 25 °C	421	A
		T_c = 80 °C	301	A
I_{Fnom}			400	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		800	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2880	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$				A
T_{stg}			-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 = 400 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.45	1.85	V
		T_j = 150 °C		1.70	2.10	V
V_{CE0}	chiplevel	T_j = 25 °C		0.9	1	V
		T_j = 150 °C		0.85	0.9	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		1.38	2.13	mΩ
		T_j = 150 °C		2.13	3.00	mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 6.4 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V V_{CE} = 600 V	T_j = 25 °C			0.21	mA
		T_j = 150 °C				mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		24.7		nF
C_{oes}		f = 1 MHz		1.54		nF
C_{res}		f = 1 MHz		0.73		nF
Q_G	V_{GE} = - 8 V...+ 15 V			3800		nC
R_{Gint}	T_j = 25 °C			1		Ω

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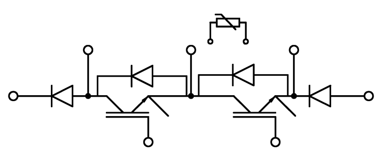
Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
$t_{d(on)}$	V_{CC} = 300 V I_C = 400 A V_{GE} = +15/-8 V $R_{G\ on}$ = 0.5 Ω $R_{G\ off}$ = 0.5 Ω di/dt_{on} = 2000 A/µs di/dt_{off} = 2000 A/µs	T_j = 150 °C		93		ns
t_r		T_j = 150 °C		72		ns
E_{on}		T_j = 150 °C		4.48		mJ
$t_{d(off)}$		T_j = 150 °C		317		ns
t_f		T_j = 150 °C		102		ns
E_{off}		T_j = 150 °C		15.78		mJ
$R_{th(j-c)}$	per IGBT				0.12	K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 50 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.54	1.78	V
		T_j = 150 °C		1.59	1.83	V
V_{F0}	chiplevel	T_j = 25 °C		1	1.1	V
		T_j = 150 °C		0.85	0.95	V
r_F	chiplevel	T_j = 25 °C		10.8	13.5	mΩ
		T_j = 150 °C		14.9	17.6	mΩ
I_{RRM}	I_F = 50 A V_{GE} = ±15 V V_{CC} = 300 V	T_j = 150 °C				A
Q_{rr}		T_j = 150 °C				µC
E_{rr}		T_j = 150 °C				mJ
$R_{th(j-c)}$	per diode				1.87	K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 400 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.35	1.53	V
		T_j = 150 °C		1.33	1.52	V
V_{F0}	chiplevel	T_j = 25 °C		1	1.1	V
		T_j = 150 °C		0.85	0.95	V
r_F	chiplevel	T_j = 25 °C		0.9	1.1	mΩ
		T_j = 150 °C		1.2	1.4	mΩ
I_{RRM}	I_F = 400 A di/dt_{off} = 2000 A/µs V_{GE} = -8 V V_{CC} = 300 V	T_j = 150 °C		350		A
Q_{rr}		T_j = 150 °C		24		µC
E_{rr}		T_j = 150 °C		8		mJ
$R_{th(j-c)}$	per Diode				0.23	K/W
Module						
L_{CE}						nH
$R_{CC'+EE'}$	terminal-chip	T_C = 25 °C				mΩ
		T_C = 125 °C				mΩ
$R_{th(c-s)}$	per module				0.038	K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminals M6	2.5		5	Nm
						Nm
w					310	g
Temperature Sensor						
R_{100}	T_c=100°C (R_{25}=5 kΩ)			493 ± 5%		Ω
$B_{100/125}$	$R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; T[K];			3550 ±2%		K



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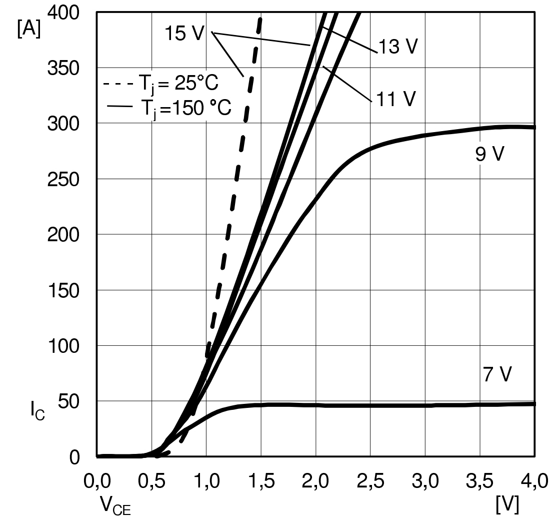


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

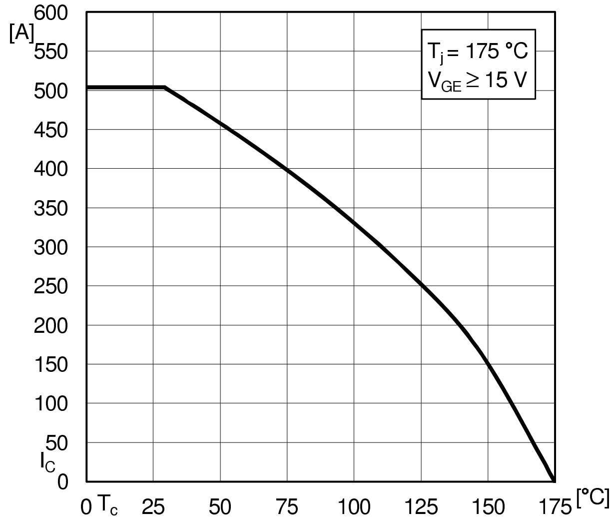


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

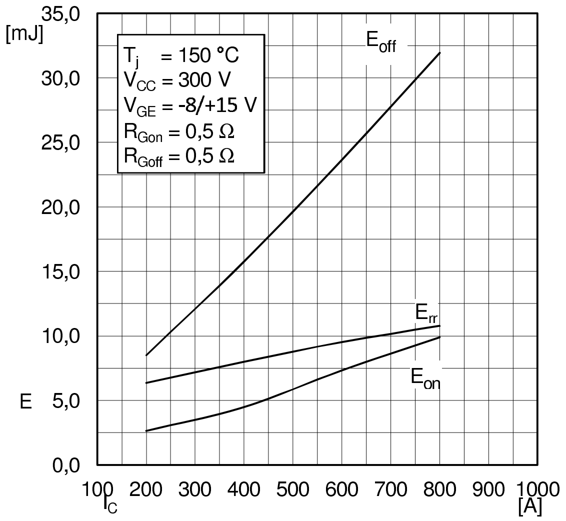


Fig. 3: Typ. turn-on /-off energy = f (I_C)

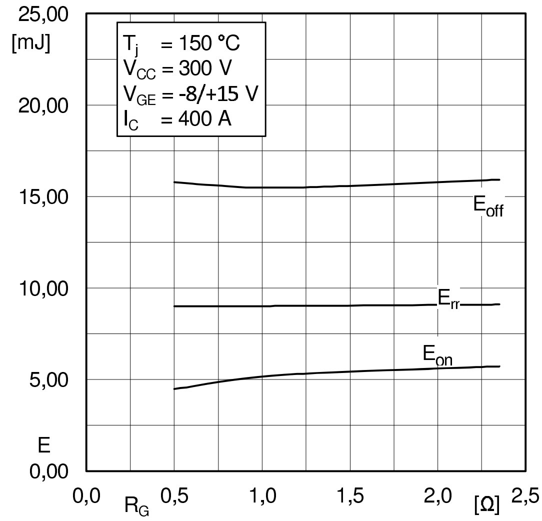


Fig. 4: Typ. turn-on /-off energy = f (R_G)

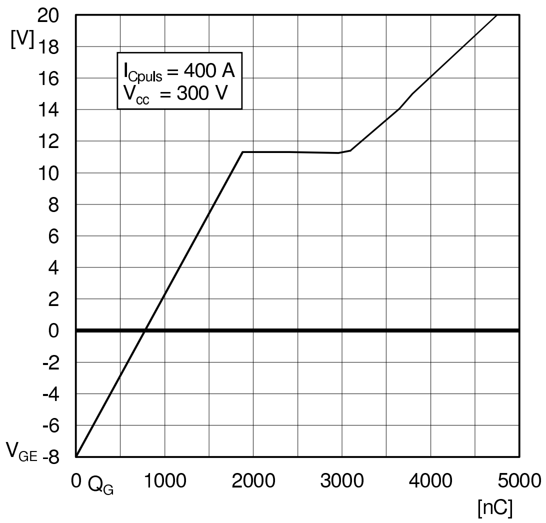


Fig. 6: Typ. gate charge characteristic

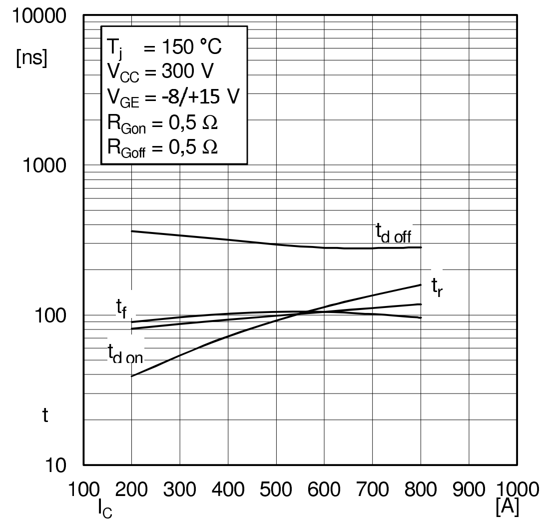


Fig. 7: Typ. switching times vs. I_C

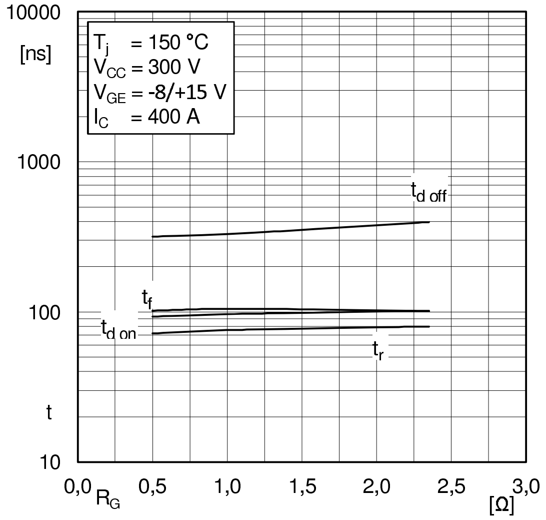


Fig. 8: Typ. switching times vs. gate resistor R_G

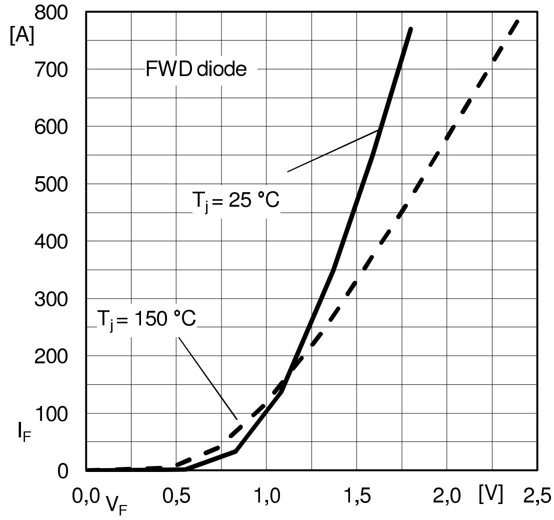
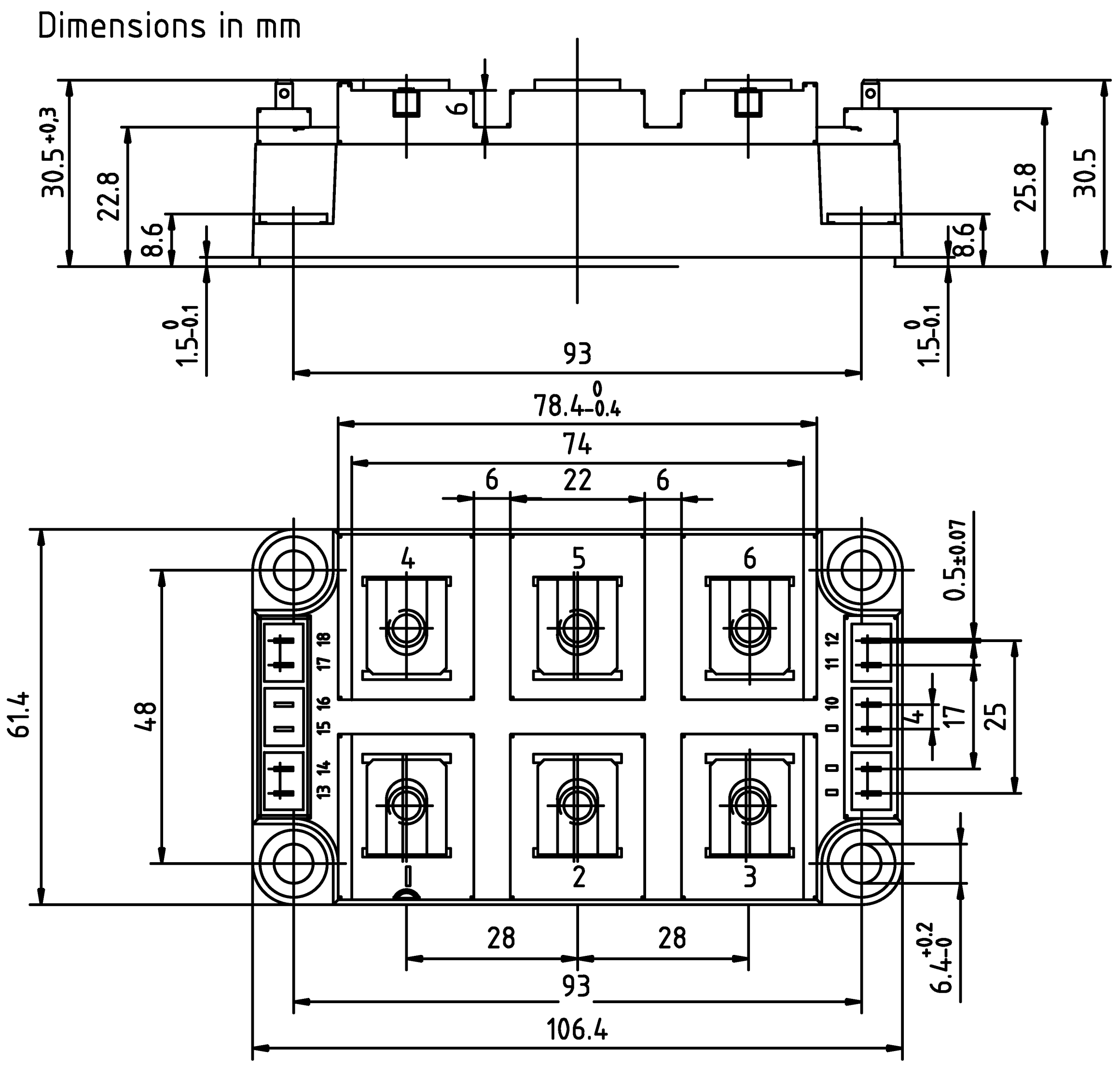


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$



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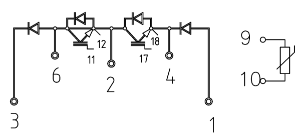

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

* 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.