SKM300GAL07E3

SEMITRANS® 3

Trench IGBT Modules

SKM300GAL07E3

Target Data

Features

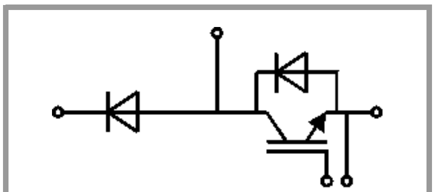
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x Icnom
- Fast & soft inverse CAL diodes
- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
- With integrated gate resistor

Typical Applications*

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

Remarks

- Case temperature limited to T_c = 125°C max.
- Recommended T_{op} = -40 ... +150°C
- Product reliability results valid for T_j = 150°C
- Use of soft R_G necessary



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 175 °C	T_c = 25 °C	382	A
		T_c = 80 °C	297	A
I_{Cnom}			300	A
I_{CRM}	I_{CRM} = 3xI_{Cnom}		900	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V V_{GE} ≤ 15 V V_{CES} ≤ 650 V	T_j = 150 °C	6	µs
T_j			-40 ... 175	°C
Inverse diode				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 175 °C	T_c = 25 °C	335	A
		T_c = 80 °C	244	A
I_{Fnom}			300	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2160	A
T_j			-40 ... 175	°C
Freewheeling diode				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 175 °C	T_c = 25 °C	335	A
		T_c = 80 °C	244	A
I_{Fnom}			300	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2160	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			500	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 = 300 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.45	1.90	V
		T_j = 150 °C		1.69	2.10	V
V_{CE0}	chiplevel	T_j = 25 °C		0.90	1.00	V
		T_j = 150 °C		0.82	0.90	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		1.83	3.0	mΩ
		T_j = 150 °C		2.9	4.0	mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 4.8 mA		5.1	5.8	6.4	V
I_{CES}	V_{GE} = 0 V V_{CE} = 650 V	T_j = 25 °C			0.3	mA
		T_j = 150 °C		-		mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		18.5		nF
C_{oes}		f = 1 MHz		1.16		nF
C_{res}		f = 1 MHz		0.55		nF
Q_G	V_{GE} = - 8 V...+ 15 V			2400		nC
R_{Gint}	T_j = 25 °C			1.0		Ω

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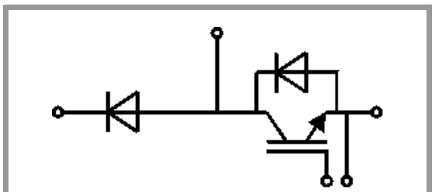

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
$t_{d(on)}$	V_{CC} = 300 V I_C = 300 A V_{GE} = +15/-15 V	T_j = 150 °C		150		ns
t_r		T_j = 150 °C		50		ns
E_{on}		T_j = 150 °C		3		mJ
$t_{d(off)}$		T_j = 150 °C		810		ns
t_f	di/dt_{on} = 7000 A/µs di/dt_{off} = 4500 A/µs du/dt = 1700 V/µs	T_j = 150 °C		67		ns
E_{off}		T_j = 150 °C		14		mJ
$R_{th(j-c)}$	per IGBT				0.15	K/W
$R_{th(c-s)}$	per IGBT (λ_{grease}=0.81 W/(m*K))			0.042		K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 300 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.40	1.76	V
		T_j = 150 °C		1.39	1.77	V
V_{F0}	chiplevel	T_j = 25 °C		1.04	1.24	V
		T_j = 150 °C		0.85	0.99	V
r_F	chiplevel	T_j = 25 °C		1.19	1.76	mΩ
		T_j = 150 °C		1.79	2.6	mΩ
I_{RRM}	I_F = 300 A di/dt_{off} = 5400 A/µs V_{GE} = ±15 V V_{CC} = 300 V	T_j = 150 °C		313		A
Q_{rr}		T_j = 150 °C		31.5		µC
E_{rr}		T_j = 150 °C		6.4		mJ
$R_{th(j-c)}$	per diode				0.25	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(m*K))			0.044		K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 300 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.40	1.76	V
		T_j = 150 °C		1.39	1.77	V
V_{F0}	chiplevel	T_j = 25 °C		1.04	1.24	V
		T_j = 150 °C		0.85	0.99	V
r_F	chiplevel	T_j = 25 °C		1.19	1.76	mΩ
		T_j = 150 °C		1.79	2.6	mΩ
I_{RRM}	I_F = 300 A di/dt_{off} = 5400 A/µs V_{GE} = ±15 V V_{CC} = 300 V	T_j = 150 °C		313		A
Q_{rr}		T_j = 150 °C		31.5		µC
E_{rr}		T_j = 150 °C		6.4		mJ
$R_{th(j-c)}$	per diode				0.25	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(m*K))			0.044		K/W
Module						
L_{CE}				15		nH
$R_{CC'+EE'}$	measured per switch	T_C = 25 °C		0.55		mΩ
		T_C = 125 °C		0.85		mΩ
$Rth_{(c-s)1}$	calculated without thermal coupling (λ_{grease}=0.81 W/(m*K))			0.021		K/W
$Rth_{(c-s)2}$	including thermal coupling, Ts underneath module (λ_{grease}=0.81 W/(m*K))			0.035		K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminals M6	2.5		5	Nm
						Nm
w					325	g

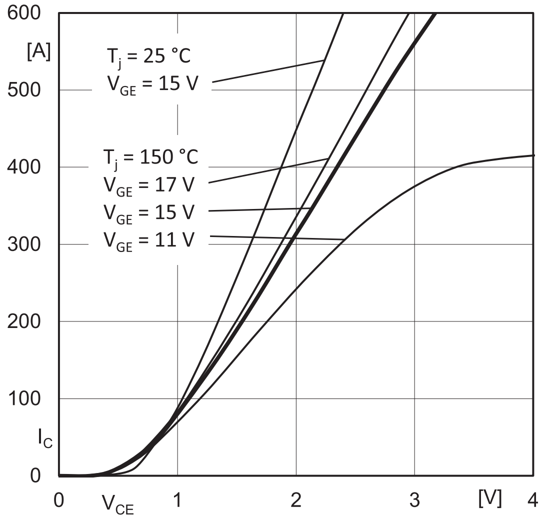


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

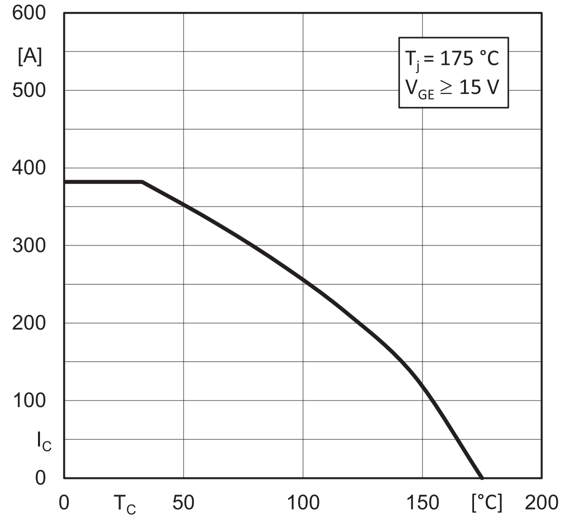


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

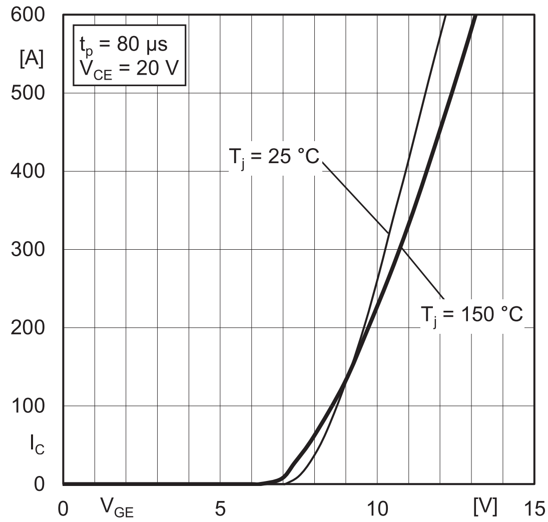


Fig. 5: Typ. transfer characteristic

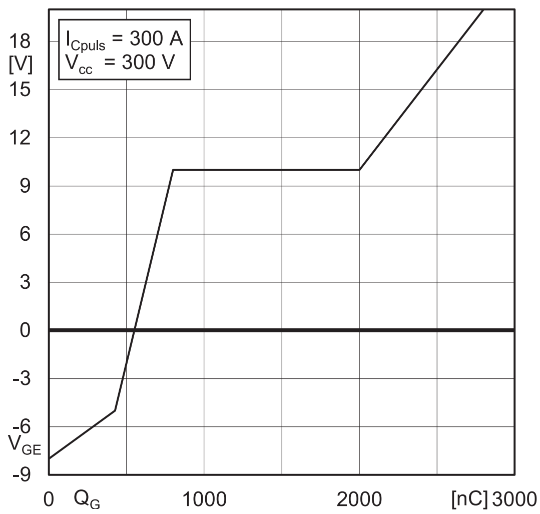


Fig. 6: Typ. gate charge characteristic

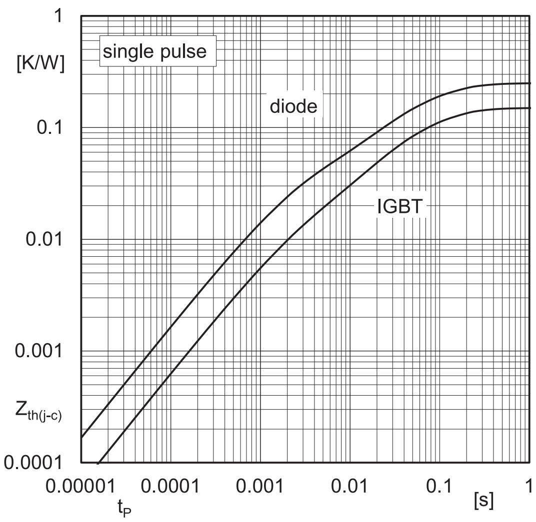


Fig. 9: Transient thermal impedance

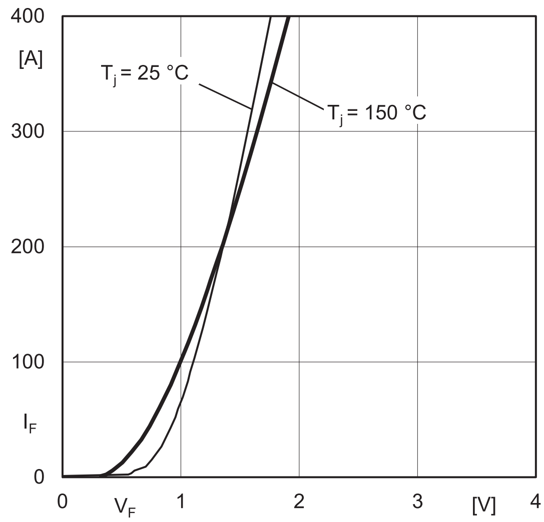


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

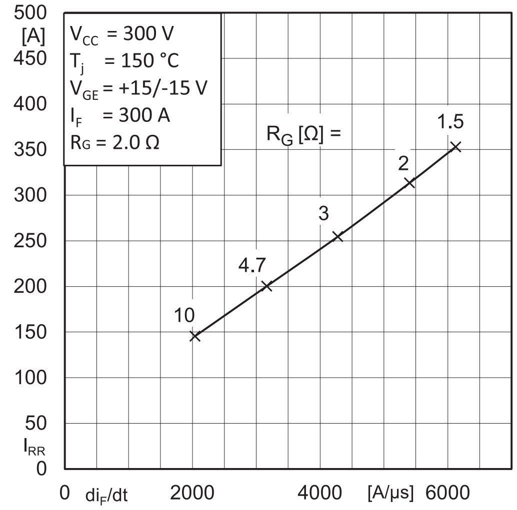


Fig. 11: CAL diode peak reverse recovery current

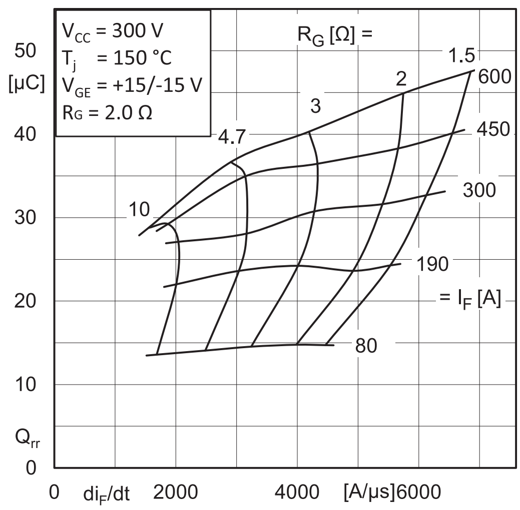
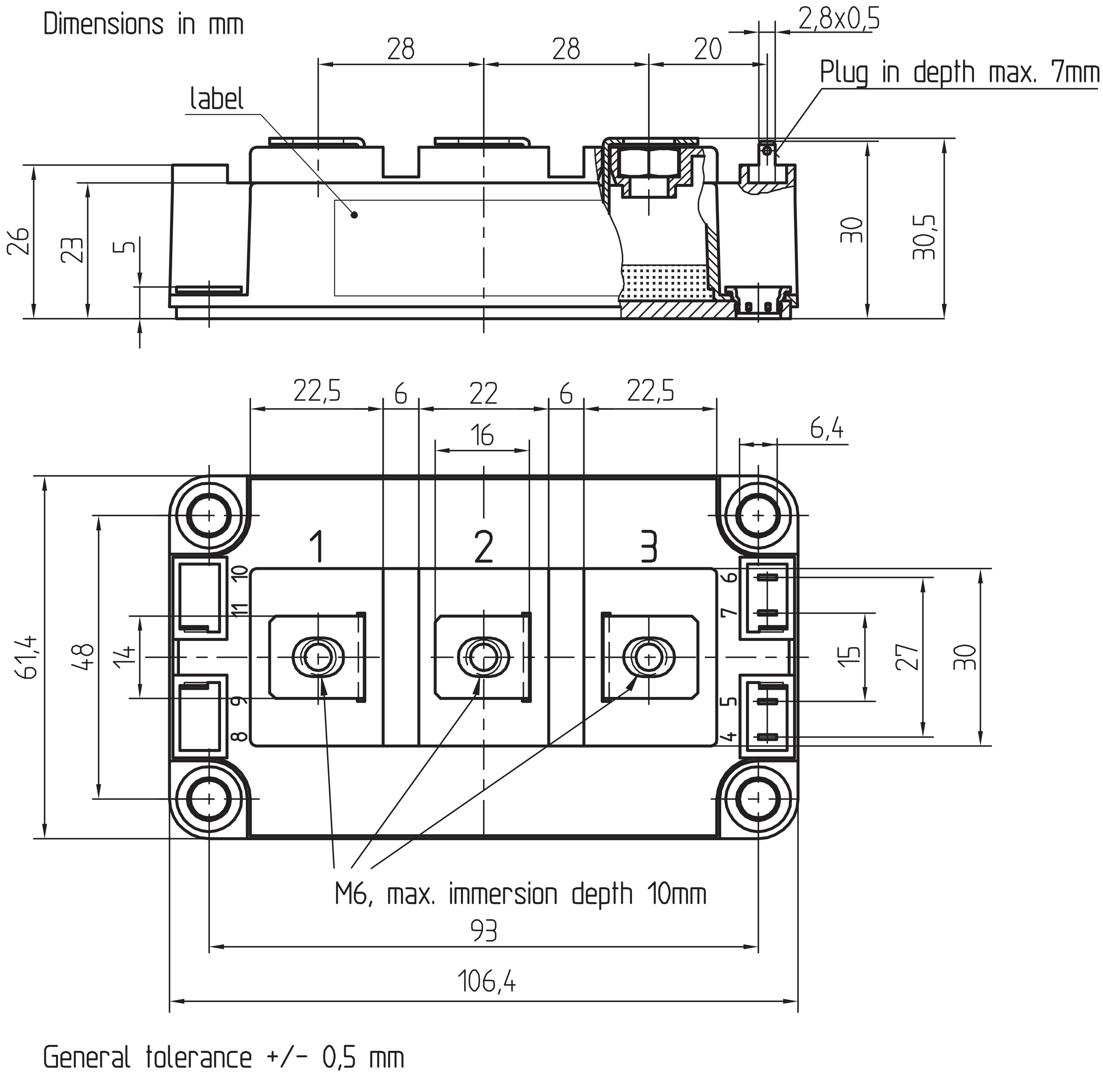


Fig. 12: Typ. CAL diode peak reverse recovery charge



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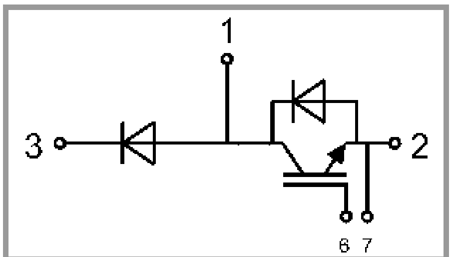

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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