SKM150GB12M7G



SEMITRANS® 3

IGBT M7 Modules

SKM150GB12M7G

Features*

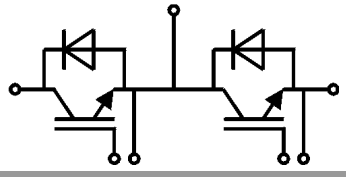
- $V_{CE(sat)}$ with positive temperature coefficient
- High overload capability
- Low loss high density IGBT´s
- Fast & soft switching inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Insulated copper baseplate using DBC Technology (Direct Bonded Copper)
- UL recognized, file no. E63532

Typical Applications

- AC inverter drives
- UPS
- Electronic welders
- Power supplies

Remarks

- Max. case temperature limited to $T_C = T_S = 125$ °C
- Product reliability results are valid for $T_j = 150$ °C (recommended $T_{j,op} = -40...+150$ °C)
- For storage and case temperature with TIM see document: "Technical Explanations Thermal Interface Materials"



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	$T_j = 25$ °C		1200	V
I_C	$T_j = 175$ °C	$T_c = 25$ °C	231	A
		$T_c = 80$ °C	175	A
I_{Cnom}			150	A
I_{CRM}			300	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800$ V $V_{GE} \leq 15$ V $V_{CES} \leq 1200$ V	$T_j = 150$ °C	8	µs
T_j			-40 ... 175	°C
Inverse diode				
V_{RRM}	$T_j = 25$ °C		1200	V
I_F	$T_j = 175$ °C	$T_c = 25$ °C	179	A
		$T_c = 80$ °C	134	A
I_{FRM}			300	A
I_{FSM}	$t_p = 10$ ms, sin 180°, $T_j = 25$ °C		774	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						
$V_{CE(sat)}$	$I_C = 150$ A $V_{GE} = 15$ V chiplevel	$T_j = 25$ °C		1.56	1.88	V
		$T_j = 150$ °C		1.80		V
V_{CE0}	chiplevel	$T_j = 25$ °C		0.85	1.01	V
		$T_j = 150$ °C		0.75		V
r_{CE}	$V_{GE} = 15$ V chiplevel	$T_j = 25$ °C		4.7	5.8	mΩ
		$T_j = 150$ °C		7.0		mΩ
$V_{GE(th)}$	$V_{CE} = 10$ V, $I_C = 15$ mA		5.4	6	6.6	V
I_{CES}	$V_{GE} = 0$ V, $V_{CE} = 1200$ V, $T_j = 25$ °C				1.5	mA
C_{ies}	$V_{CE} = 10$ V $V_{GE} = 0$ V	f = 1 MHz		32.0		nF
C_{oes}		f = 1 MHz		1.00		nF
C_{res}		f = 1 MHz		0.38		nF
Q_G	$V_{GE} = -8$V ... + 15V			1500		nC
R_{Gint}	$T_j = 25$ °C			2.5		Ω
$t_{d(on)}$	$V_{CC} = 600$ V $I_C = 150$ A $V_{GE} = +15/-15$ V $R_{G\,on} = 2\,\Omega$ $R_{G\,off} = 1\,\Omega$ $di/dt_{on} = 3100$ A/µs $di/dt_{off} = 1700$ A/µs $dv/dt = 4950$ V/µs $L_s = 25$ nH	$T_j = 150$ °C		217		ns
t_r		$T_j = 150$ °C		39		ns
E_{on}		$T_j = 150$ °C		15		mJ
$t_{d(off)}$		$T_j = 150$ °C		301		ns
t_f		$T_j = 150$ °C		69		ns
E_{off}		$T_j = 150$ °C		16		mJ
$R_{th(j-c)}$	per IGBT				0.228	K/W
$R_{th(c-s)}$	per IGBT, P12 (reference)			0.059		K/W
$R_{th(c-s)}$	per IGBT, HP-PCM			0.038		K/W

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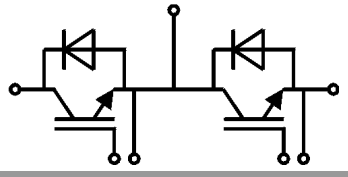
Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	I_F = 150 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.17	2.49	V
		T_j = 150 °C		2.12		V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90		V
r_F	chiplevel	T_j = 25 °C		5.8	6.6	mΩ
		T_j = 150 °C		8.1		mΩ
I_{RRM}	I_F = 150 A di/dt_{off} = 3100 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		122		A
Q_{rr}		T_j = 150 °C		25		µC
E_{rr}		T_j = 150 °C		10		mJ
$R_{th(j-c)}$	per diode				0.332	K/W
$R_{th(c-s)}$	per diode, P12 (reference)			0.061		K/W
$R_{th(c-s)}$	per diode, HP-PCM			0.042		K/W
Module						
L_{CE}				15		nH
$R_{CC'+EE'}$	measured per switch	T_C = 25 °C		0.43		mΩ
		T_C = 125 °C		0.6		mΩ
$R_{th(c-s)1}$	calculated without thermal coupling, P12 (reference)			0.015		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, P12 (reference)			0.0245		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, HP-PCM			0.0163		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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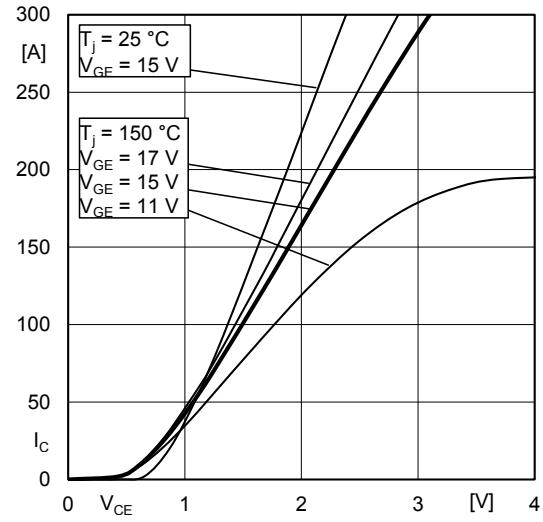

Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

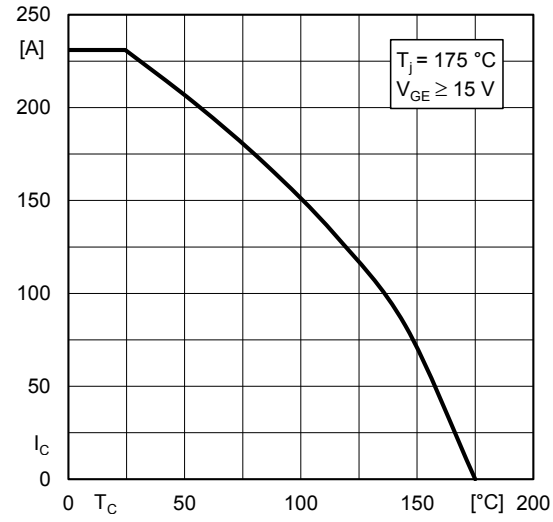

Fig. 2: Rated current vs. temperature $I_c = f(T_c)$

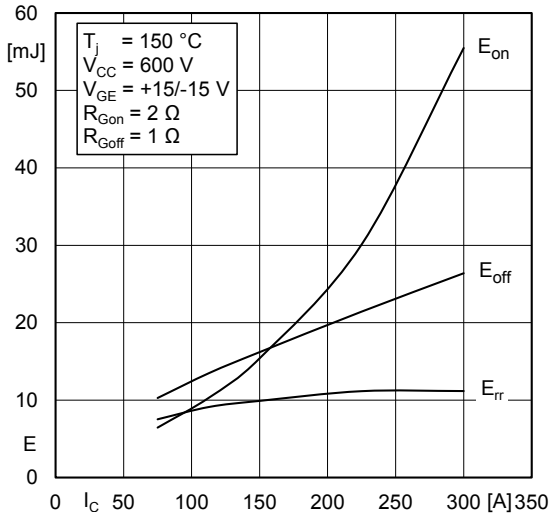

Fig. 3: Typ. turn-on /-off energy = f (I_C)

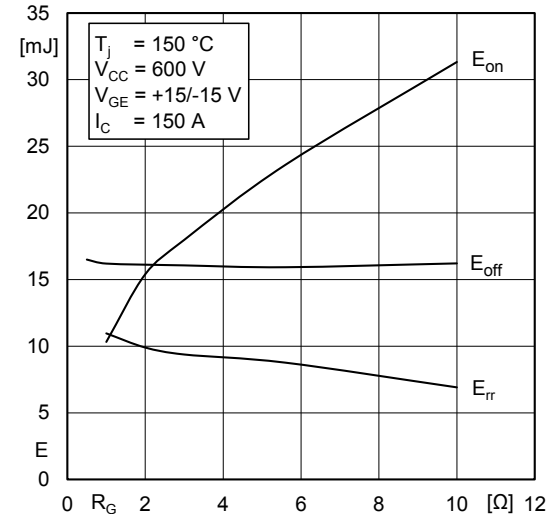

Fig. 4: Typ. turn-on /-off energy = f (R_G)

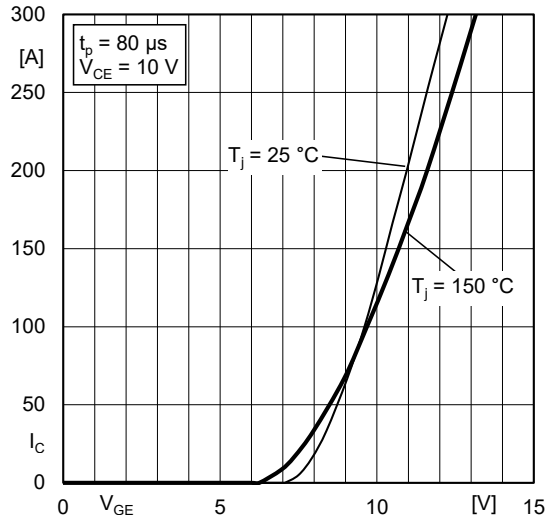

Fig. 5: Typ. transfer characteristic

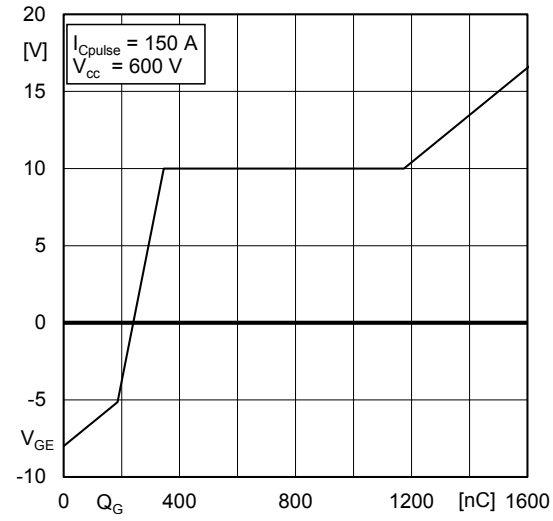

Fig. 6: Typ. gate charge characteristic

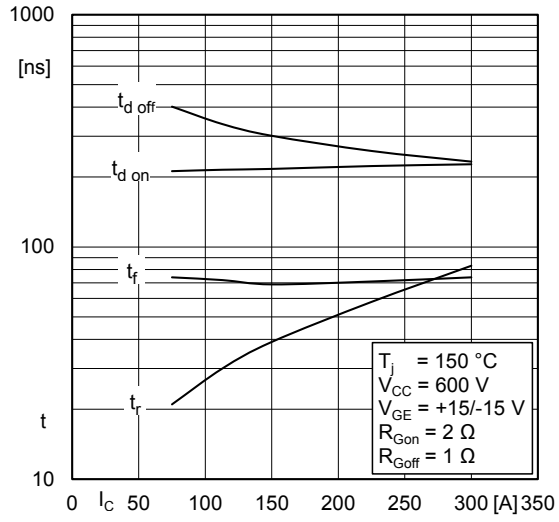

Fig. 7: Typ. switching times vs. I_C

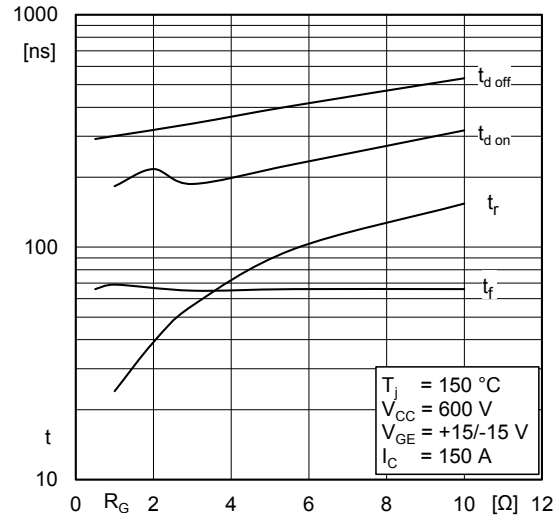

Fig. 8: Typ. switching times vs. gate resistor R_G

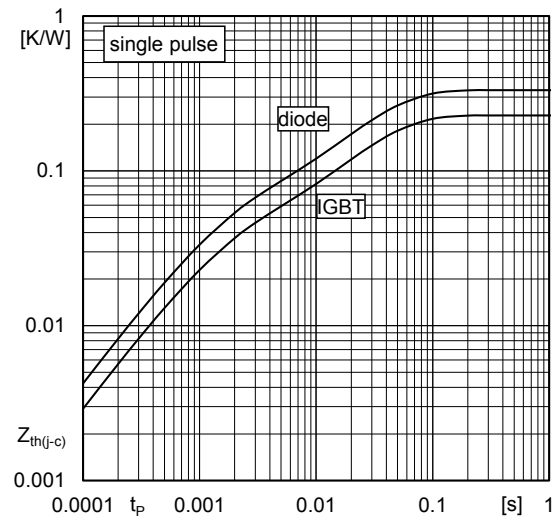

Fig. 9: Transient thermal impedance

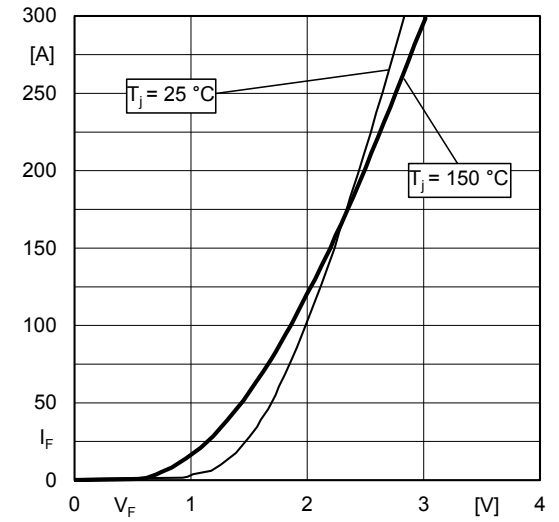

Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

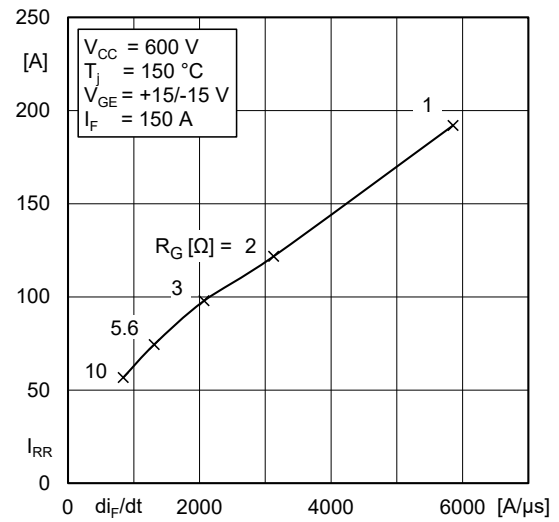

Fig. 11: Typ. CAL diode peak reverse recovery current

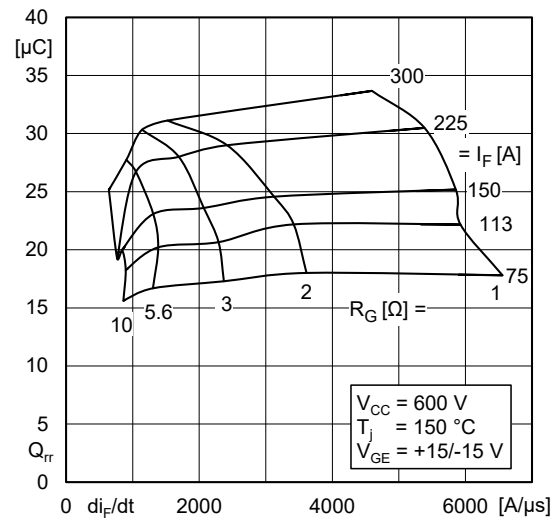

Fig. 12: Typ. CAL diode peak reverse recovery charge

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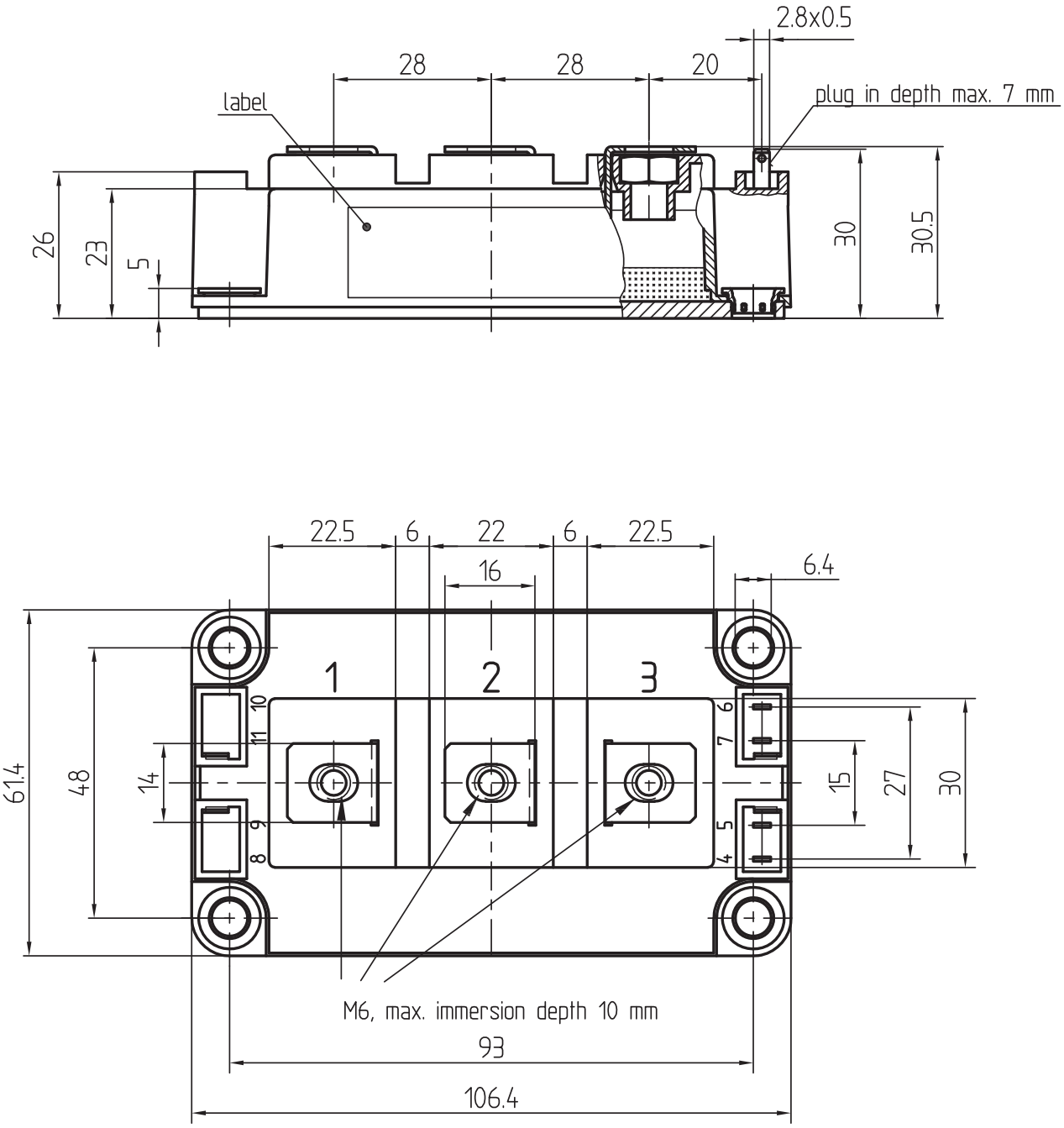
Dimensions in mm



General tolerance +/- 0.5 mm

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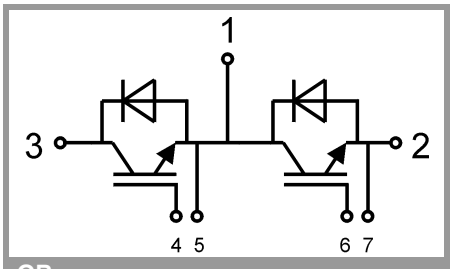

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IMPORTANT INFORMATION AND WARNINGS

This is an electrostatic discharge sensitive device (ESDS) according to international standard IEC 61340.

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