SEMITRANS® 3

IGBT M7 Modules

SKM600GB12M7

Features*

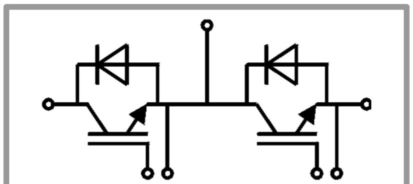
- $V_{CE(sat)}$ with positive temperature coefficient
- High overload capability
- Low loss, high density IGBTs
- Fast & soft switching inverse CAL diodes
- Large clearance (10 mm) and creepage distance (20 mm)
- Insulated copper baseplate using DCB Technology (Direct Copper Bonding)
- With integrated gate resistor

Typical Applications

- AC inverter drives
- UPS
- Renewable energy systems

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	779	A
		T_c = 80 °C	591	A
I_{Cnom}			600	A
I_{CRM}			1200	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V V_{GE} ≤ 15 V V_{CES} ≤ 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	688	A
		T_c = 80 °C	513	A
I_{FRM}			1200	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		3240	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 = 600 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.55	1.88	V
		T_j = 150 °C		1.80		V
V_{CE0}	chiplevel	T_j = 25 °C		0.87	0.95	V
		T_j = 150 °C		0.76		V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		1.13	1.55	mΩ
		T_j = 150 °C		1.73		mΩ
$V_{GE(th)}$	V_{CE} = 10 V, I_C = 60 mA		5.4	6	6.6	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				5	mA
C_{ies}	V_{CE} = 10 V V_{GE} = 0 V	f = 1 MHz		120		nF
C_{oes}		f = 1 MHz		3.66		nF
C_{res}		f = 1 MHz		1.28		nF
Q_G	V_{GE} = - 8V ... + 15 V			5360		nC
R_{Gint}	T_j = 25 °C			0.8		Ω
$t_{d(on)}$	V_{CC}= 600 V I_C= 600 A V_{GE} =+15/-15V R_{Gon}= 1.2 Ω R_{Goff}= 1 Ω di/dt$_{on}$= 8000 A/µs di/dt$_{off}$= 5240 A/µs dv/dt = 5960 V/µs	T_j = 150 °C		260		ns
t_r		T_j = 150 °C		85		ns
E_{on}		T_j = 150 °C		57		mJ
$t_{d(off)}$		T_j = 150 °C		436		ns
t_f		T_j = 150 °C		95		ns
E_{off}		T_j = 150 °C		68		mJ
$R_{th(j-c)}$	per IGBT				0.066	K/W
$R_{th(c-s)}$	per IGBT, P12 (reference)			0.037		K/W
$R_{th(c-s)}$	per IGBT, HP-PCM			0.02		K/W

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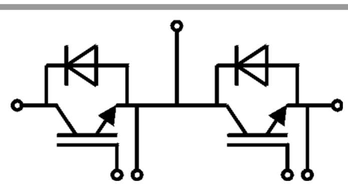

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	I_F = 600 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.14	2.46	V
		T_j = 150 °C		2.07		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		1.40	1.60	mΩ
		T_j = 150 °C		1.95		mΩ
I_{RRM}	V_{CC} = 600 V, I_F = 600 A, V_{GE} = -15 V, di/dt_{off} = 8000 A/µs	T_j = 150 °C		555		A
Q_{rr}		T_j = 150 °C		92		µC
E_{rr}		T_j = 150 °C		43		mJ
$R_{th(j-c)}$	per diode				0.09	K/W
$R_{th(c-s)}$	per diode, P12 (reference)			0.038		K/W
$R_{th(c-s)}$	per diode, HP-PCM			0.021		K/W
Module						
L_{CE}				15		nH
$R_{CC'+EE'}$	measured per switch	T_j = 25 °C		0.55		mΩ
		T_j = 150 °C		0.85		mΩ
$R_{th(c-s)1}$	calculated without thermal coupling, P12 (reference)			0.0093		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, P12 (reference)			0.015		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, HP-PCM			0.0078		K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminal M5	2.5		5	Nm
				-		Nm
w					325	g

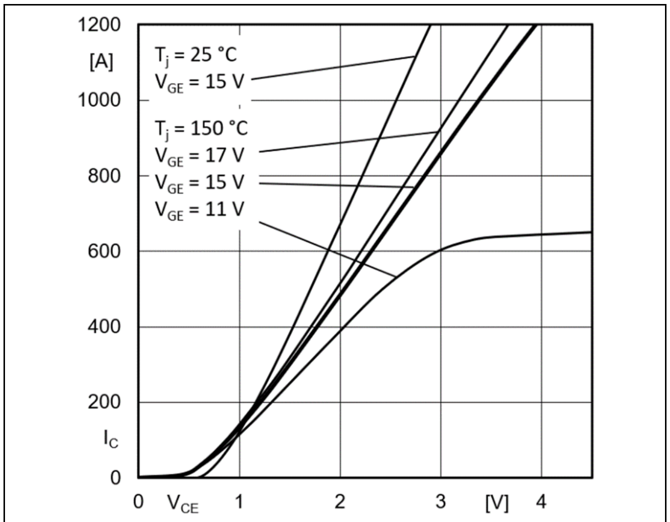


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

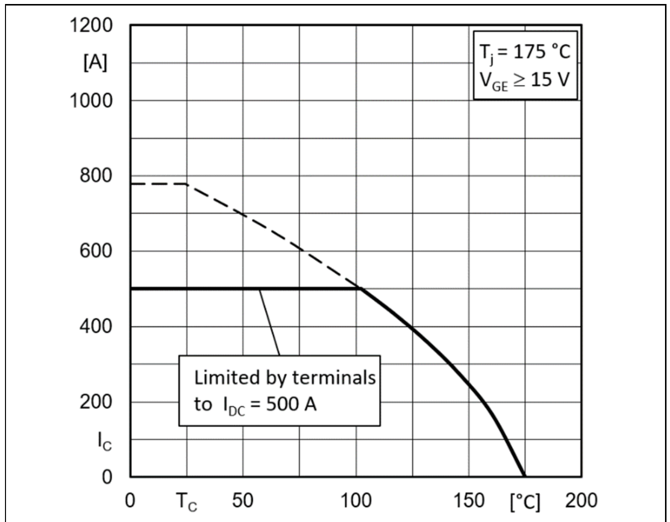


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

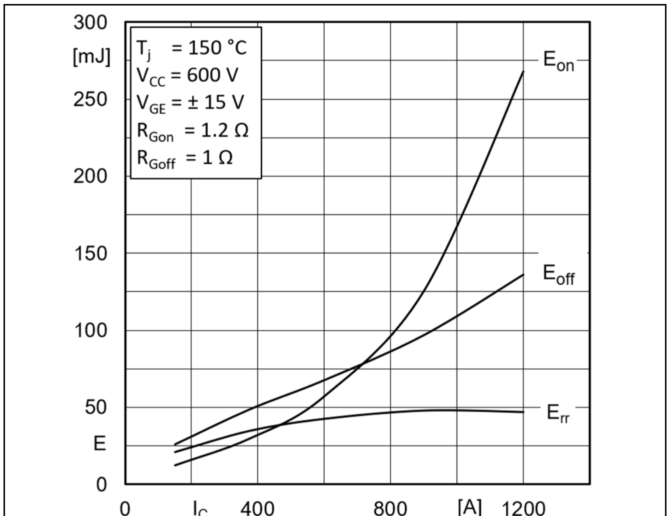


Fig. 3: Typ. turn-on /-off energy = f (I_C)

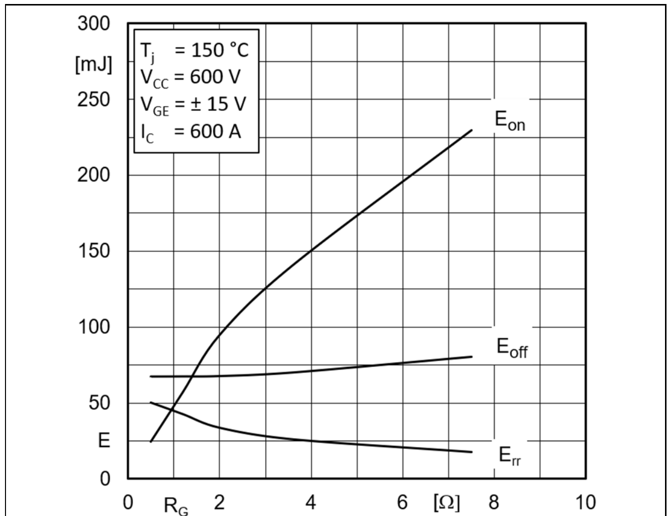


Fig. 4: Typ. turn-on /-off energy = f (R_G)

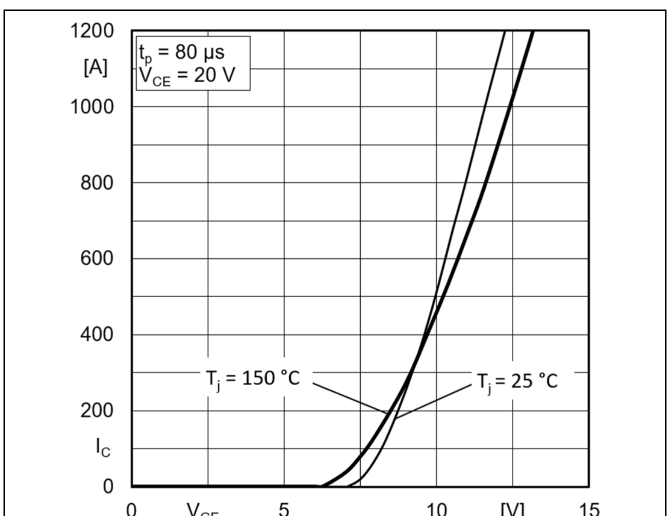


Fig. 5: Typ. transfer characteristic

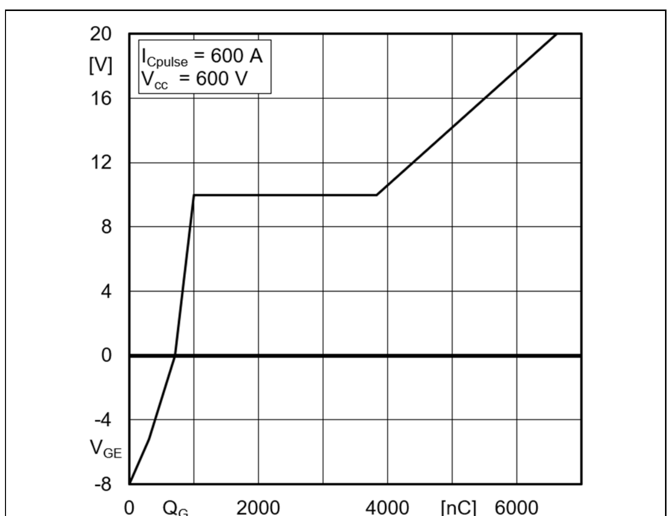


Fig. 6: Typ. gate charge characteristic

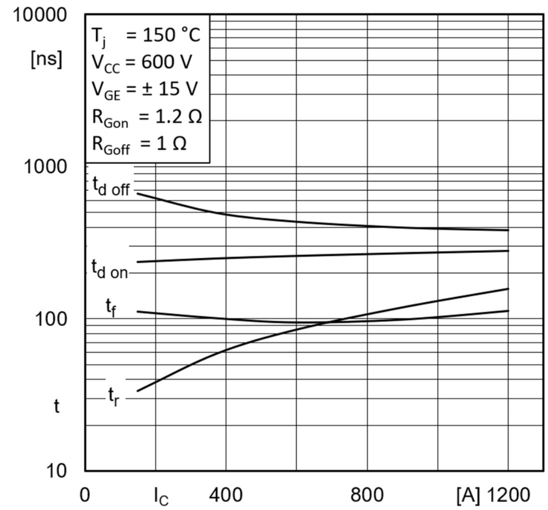


Fig. 7: Typ. switching times vs. I_C

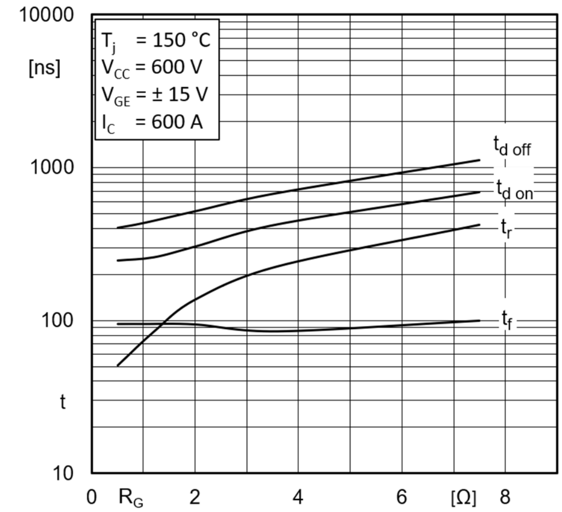


Fig. 8: Typ. switching times vs. gate resistor R_G

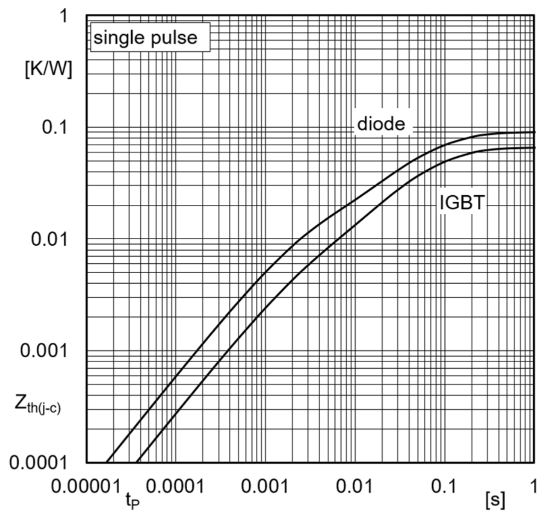


Fig. 9: Transient thermal impedance

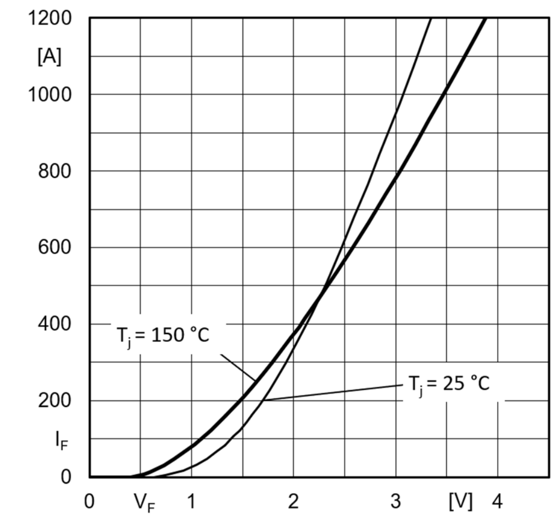


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

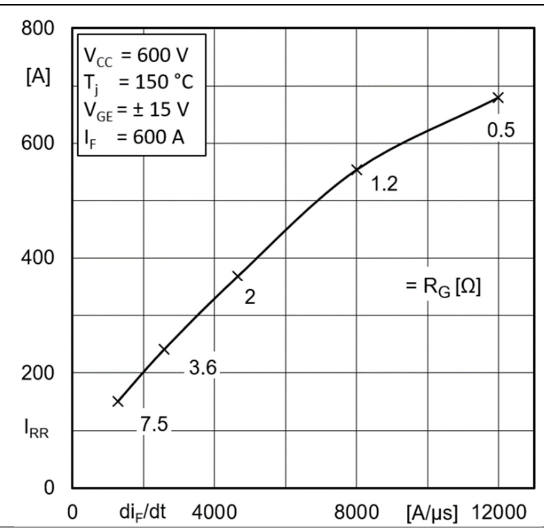


Fig. 11: CAL diode peak reverse recovery current

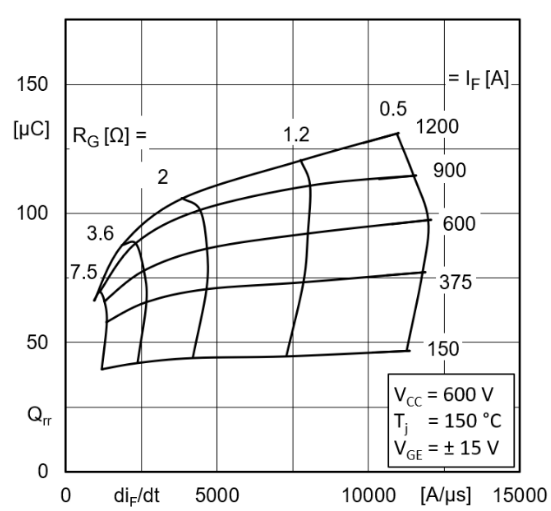
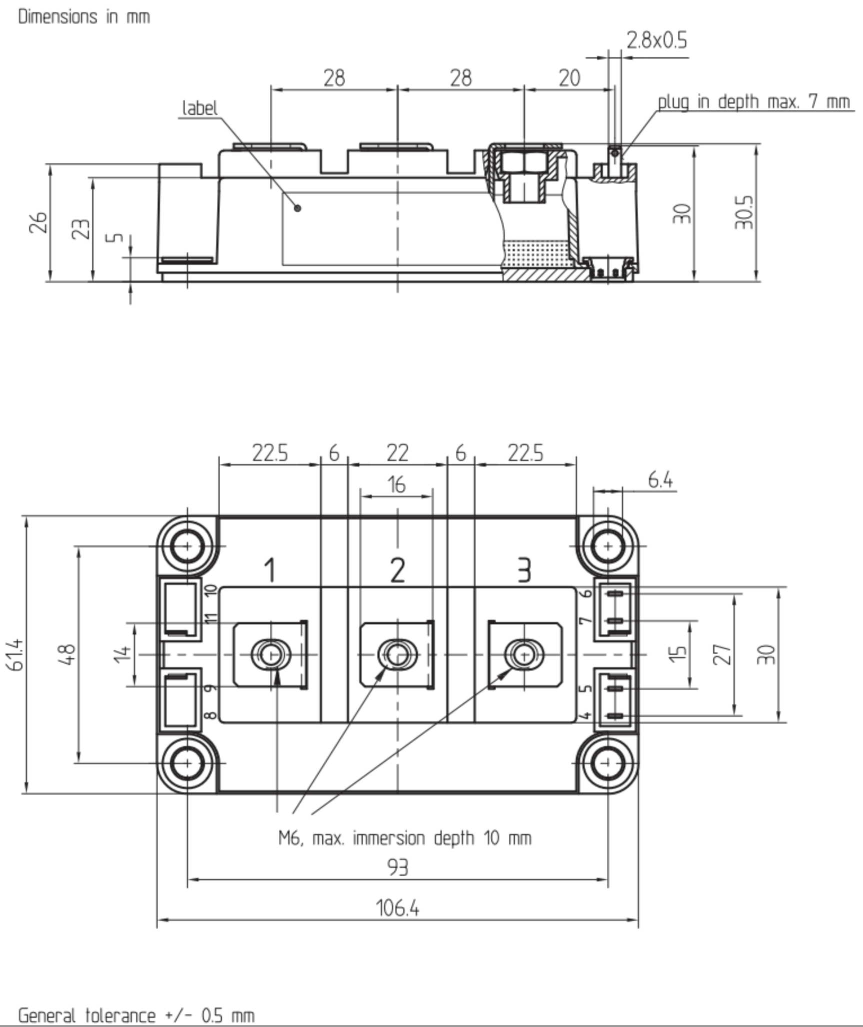
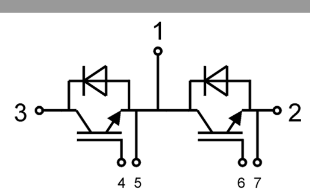


Fig. 12: Typ. CAL diode peak reverse recovery charge



Pinout and Dimensions



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

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