



SEMITRANS® 3

IGBT M7 Modules

SKM600GB12M7

Features*

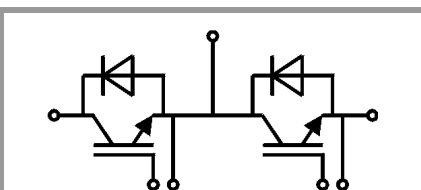
- $V_{CE(sat)}$ with positive temperature coefficient
- High overload capability
- Low loss high density IGBT's
- Fast & soft switching inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Insulated copper baseplate using DBC Technology (Direct Bonded Copper)
- UL recognized,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

Typical Applications

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

Remarks

- Max. case temperature limited to $T_C = T_S = 125^\circ\text{C}$
- Product reliability results are valid for $T_j = 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- 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	893	A
		T _c = 80 °C	676	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)}	T _{Terminal} ≤ 90°C, T _C = 90°C		650	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	T _j = 25 °C		1.55	1.88	V
	V _{GE} = 15 V chipelevel	T _j = 150 °C		1.80		V
V _{CE0}	chipelevel	T _j = 25 °C		0.85	1.02	V
		T _j = 150 °C		0.75		V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		1.17	1.43	mΩ
	chipelevel	T _j = 150 °C		1.75		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				1	mA
C _{ies}	V _{CE} = 10 V V _{GE} = 0 V	f = 1 MHz		120.0		nF
C _{oes}		f = 1 MHz		3.60		nF
C _{res}		f = 1 MHz		1.28		nF
Q _G	V _{GE} = -8V ... + 15V			5360		nC
R _{Gint}	T _j = 25 °C			0.8		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		260		ns
t _r	I _C = 600 A	T _j = 150 °C		85		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		57		mJ
t _{d(off)}	R _{G on} = 1.2 Ω	T _j = 150 °C		436		ns
t _f	R _{G off} = 1 Ω	T _j = 150 °C		95		ns
E _{off}	di/dt _{on} = 8000 A/μs di/dt _{off} = 5240 A/μs dv/dt = 5960 V/μs	T _j = 150 °C		68		mJ
R _{th(j-c)}	per IGBT				0.06	K/W
R _{th(c-s)}	per IGBT, P12 (reference)			0.037		K/W
R _{th(c-s)}	per IGBT, HP-PCM			0.020		K/W



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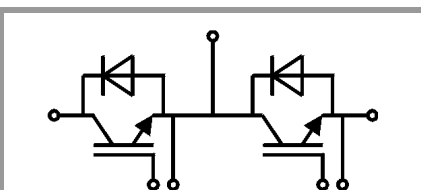
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 600 A	T _j = 25 °C		2.14	2.46	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		2.07		V
V _{F0}	chiplevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90		V
r _F	chiplevel	T _j = 25 °C		1.40	1.60	mΩ
		T _j = 150 °C		1.95		mΩ
I _{RRM}	I _F = 600 A	T _j = 150 °C		555		A
Q _{rr}	di/dt _{off} = 8000 A/μs	T _j = 150 °C		92		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _j = 150 °C		43		mJ
R _{th(j-c)}	per diode				0.09	K/W
R _{th(c-s)}	per diode, P12 (reference)			0.039		K/W
R _{th(c-s)}	per diode, HP-PCM			0.022		K/W
Module						
L _{CE}				15		nH
R _{CC'+EE'}	measured per	T _C = 25 °C		0.43		mΩ
	switch	T _C = 125 °C		0.6		mΩ
R _{th(c-s)1}	calculated without thermal coupling, P12 (reference)			0.0095		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module, P12 (reference)			0.0155		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module, HP-PCM			0.0086		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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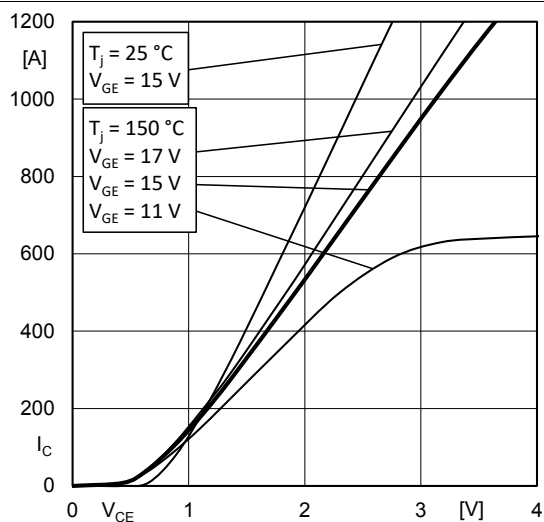


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

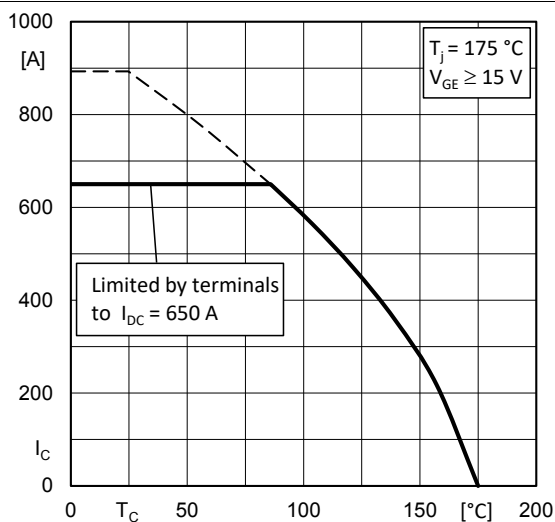


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

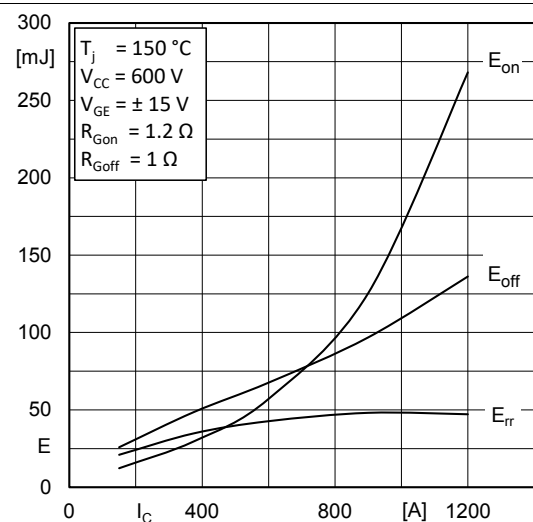


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

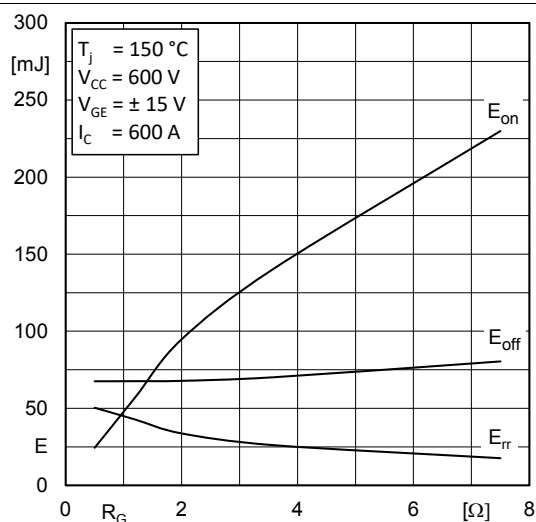


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

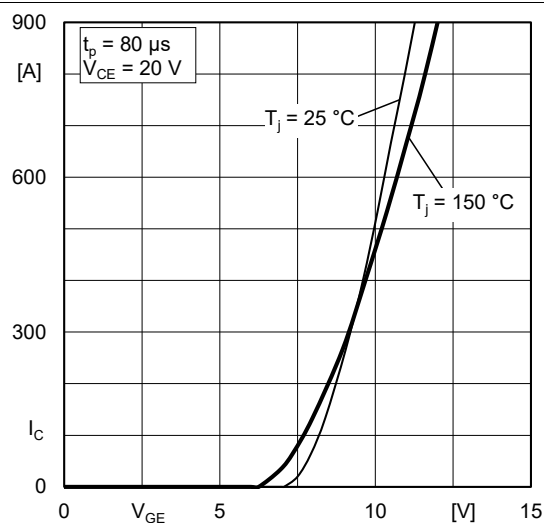


Fig. 5: Typ. transfer characteristic

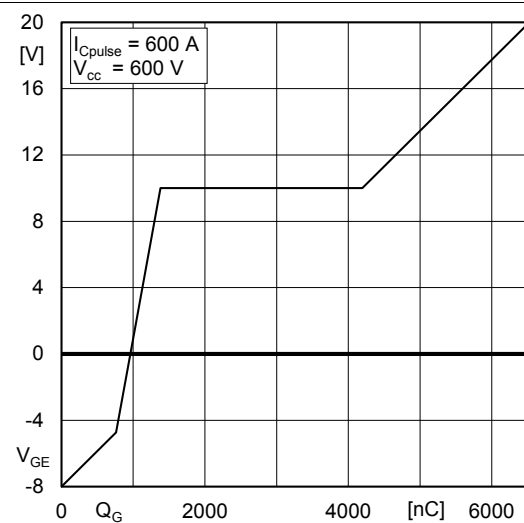


Fig. 6: Typ. gate charge characteristic

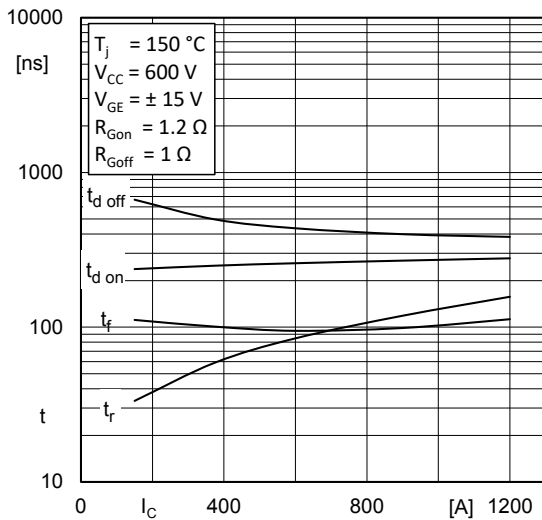


Fig. 7: Typ. switching times vs. I_C

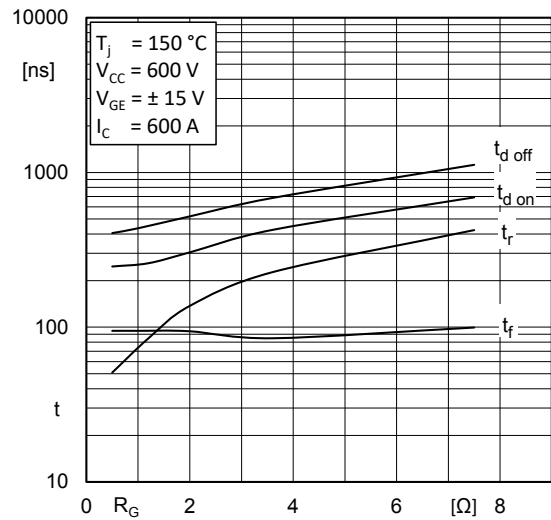


Fig. 8: Typ. switching times vs. gate resistor R_G

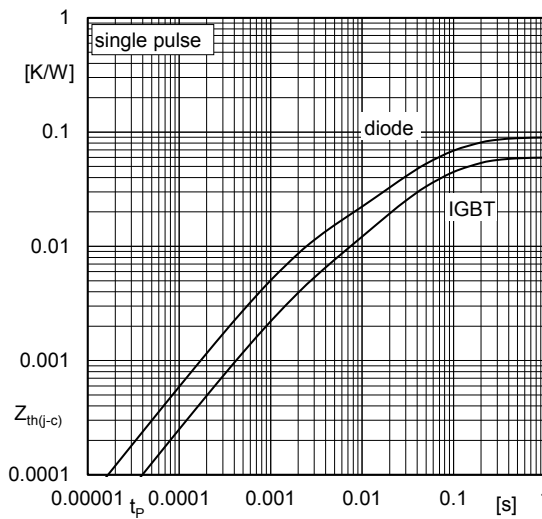


Fig. 9: Transient thermal impedance

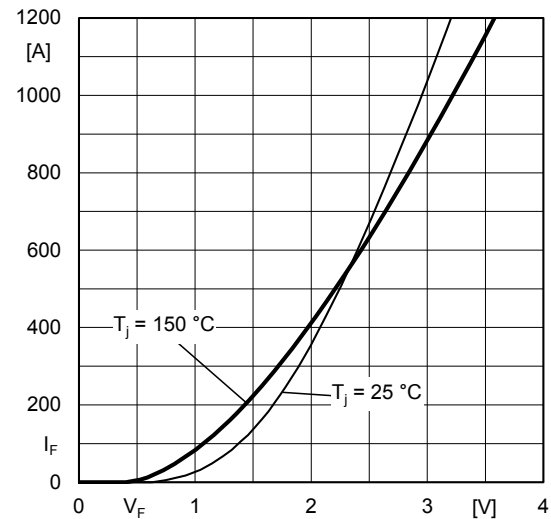


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'}+EE'$

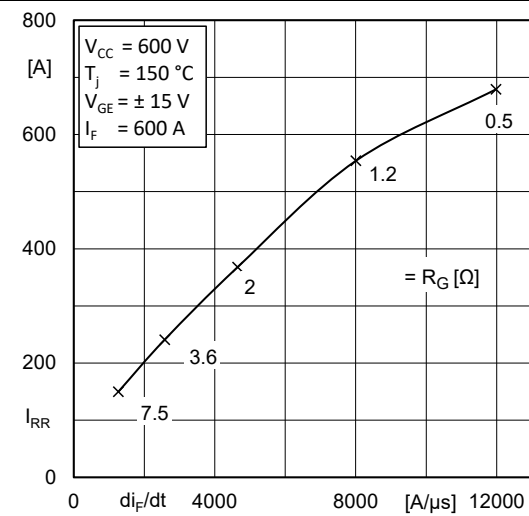


Fig. 11: Typ. CAL diode peak reverse recovery current

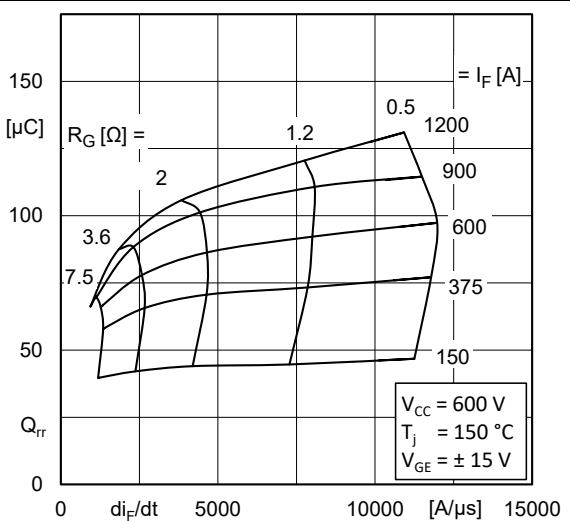
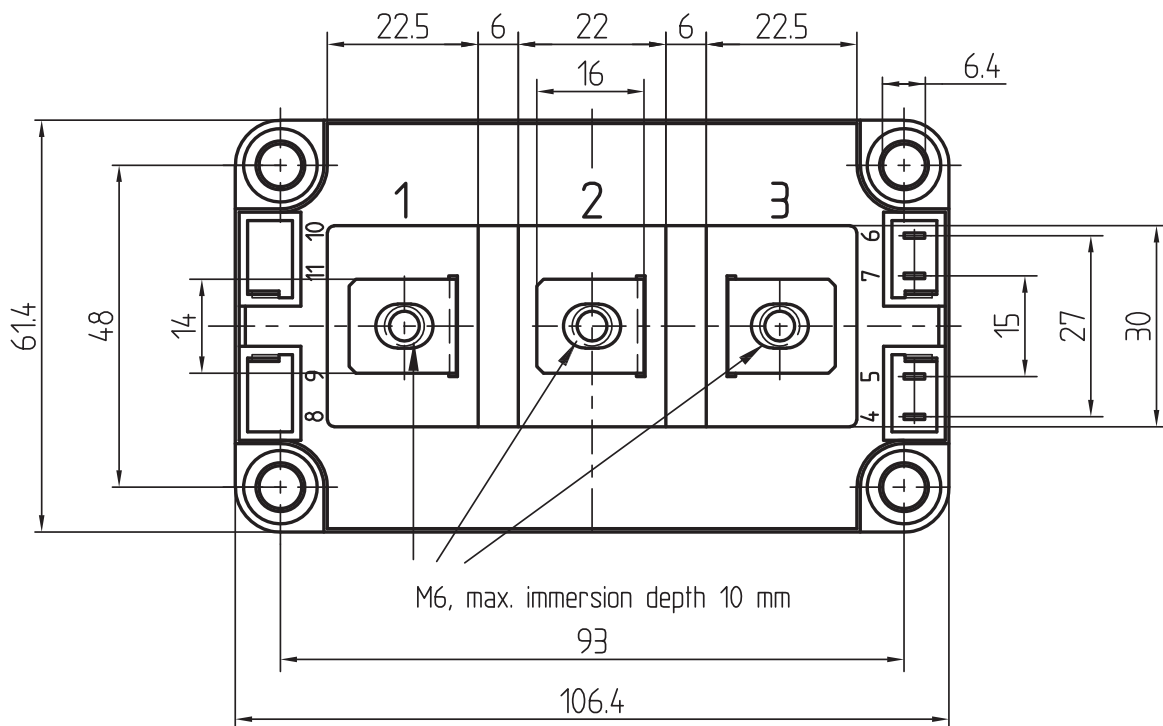
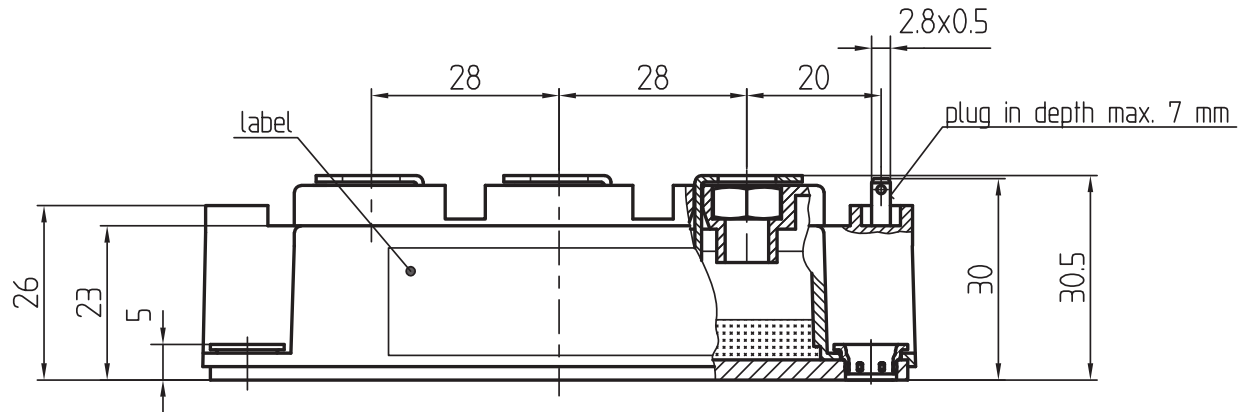


Fig. 12: Typ. CAL diode peak reverse recovery charge

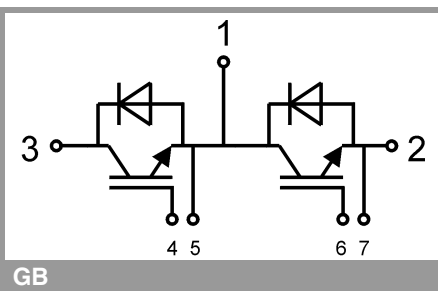
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Dimensions in mm



General tolerance +/- 0.5 mm

SEMITRANS 3



IMPORTANT INFORMATION AND WARNINGS

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

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