



SEMITRANS® 3

IGBT4 Modules

SKM400GM17E4

Features

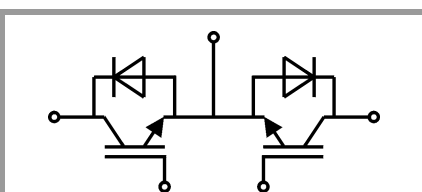
- IGBT4 = 4. generation medium fast trench IGBT (Infineon)
- CAL4 = Soft switching 4. Generation CAL-Diode
- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
- With integrated Gate resistor
- For switching frequencies up to 8kHz
- UL recognized, file no. E63532

Typical Applications*

- Matrix Inverter
- Bidirectional switch

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max.
- Recommended $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for $T_j = 150^\circ\text{C}$



GM

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	T _j = 175 °C	T _c = 25 °C	614	A
		T _c = 80 °C	474	A
I _{Cnom}			400	A
I _{CRM}	I _{CRM} = 3xI _{Cnom}		1200	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1000 V V _{GE} ≤ 15 V V _{CES} ≤ 1700 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C
Inverse diode				
I _F	T _j = 175 °C	T _c = 25 °C	443	A
		T _c = 80 °C	327	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		2340	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}			500	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	T _j = 25 °C		1.90	2.20	V
	V _{GE} = 15 V chipelevel	T _j = 150 °C		2.30	2.60	V
V _{CE0}	chipelevel	T _j = 25 °C		0.8	0.9	V
		T _j = 150 °C		0.7	0.8	V
r _{CE}	V _{GE} = 15 V chipelevel	T _j = 25 °C		2.75	3.25	mΩ
		T _j = 150 °C		4.00	4.50	mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 16 mA		5.2	5.8	6.4	V
I _{CES}	V _{GE} = 0 V	T _j = 25 °C			5	mA
	V _{CE} = 1700 V	T _j = 150 °C				mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		36		nF
C _{oes}		f = 1 MHz		1.36		nF
C _{res}		f = 1 MHz		1.16		nF
Q _G	V _{GE} = - 8 V...+ 15 V			3200		nC
R _{Gint}	T _j = 25 °C			1.9		Ω
t _{d(on)}	V _{CC} = 1200 V	T _j = 150 °C		280		ns
t _r	I _C = 400 A		T _j = 150 °C		45	
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		156.5		mJ
t _{d(off)}	R _{G on} = 2 Ω	T _j = 150 °C		760		ns
t _f	R _{G off} = 1 Ω	T _j = 150 °C		140		ns
E _{off}	di/dt _{on} = 10000 A/ μs	T _j = 150 °C		180		mJ
	di/dt _{off} = 2300 A/μs du/dt = 5600 V/μs					
R _{th(j-c)}	per IGBT				0.066	K/W



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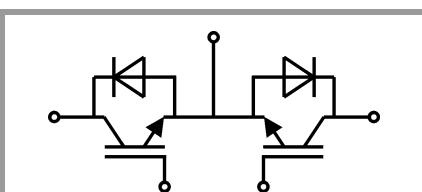
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- Matrix Inverter
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Remarks

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- Recommended $T_{op} = -40 \dots +150^\circ\text{C}$
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 400 A	T _j = 25 °C		2.00	2.40	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		2.15	2.57	V
V _{F0}	chiplevel	T _j = 25 °C		1.32	1.56	V
		T _j = 150 °C		1.08	1.22	V
r _F	chiplevel	T _j = 25 °C		1.7	2.1	mΩ
		T _j = 150 °C		2.7	3.4	mΩ
I _{RRM}	I _F = 400 A	T _j = 150 °C		615		A
Q _{rr}	di/dt _{off} = 10100 A/ μs	T _j = 150 °C		150		μC
E _{rr}	V _{GE} = ±15 V V _{CC} = 1200 V	T _j = 150 °C		130		mJ
R _{th(j-c)}	per diode				0.13	K/W
Module						
L _{CE}				15		nH
R _{CC'+EE'}	terminal-chip	T _C = 25 °C		0.55		mΩ
		T _C = 125 °C		0.85		mΩ
R _{th(c-s)}	per module			0.02	0.038	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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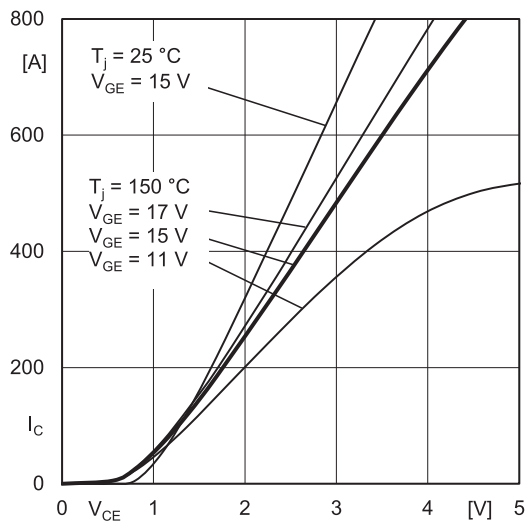


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

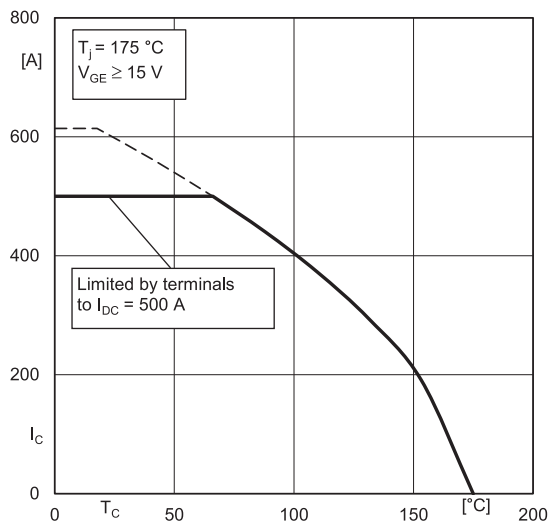


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

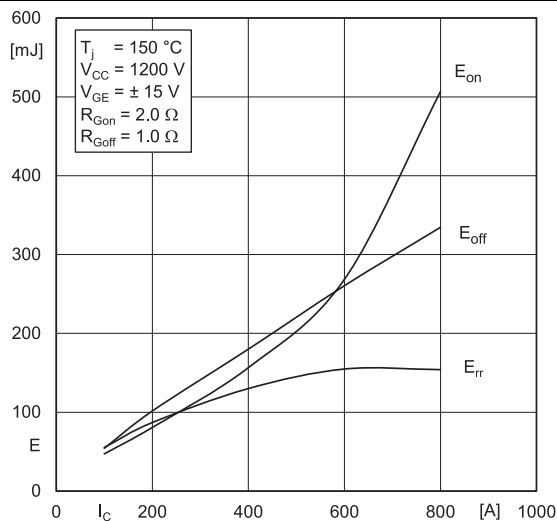


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

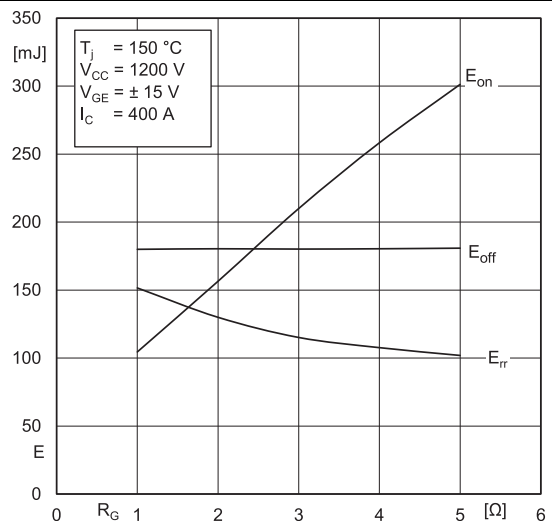


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

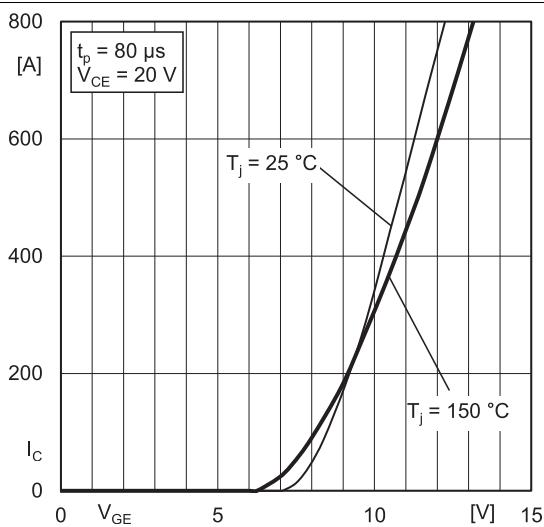


Fig. 5: Typ. transfer characteristic

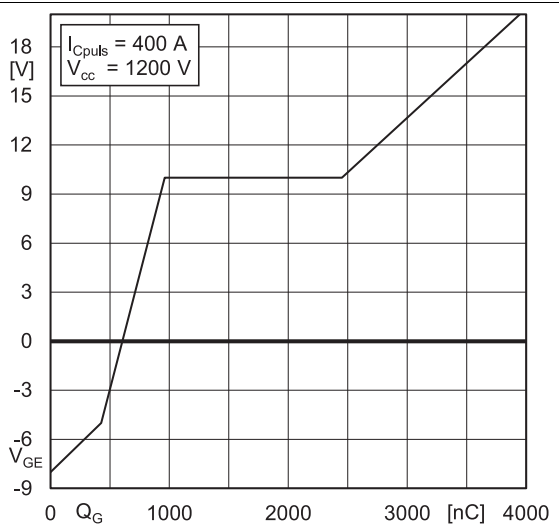


Fig. 6: Typ. gate charge characteristic

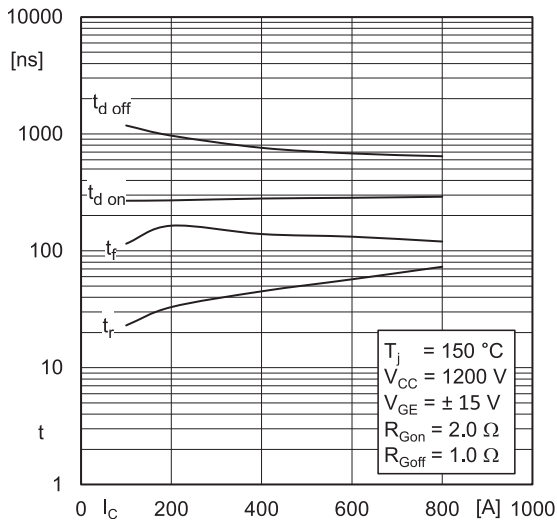


Fig. 7: Typ. switching times vs. I_C

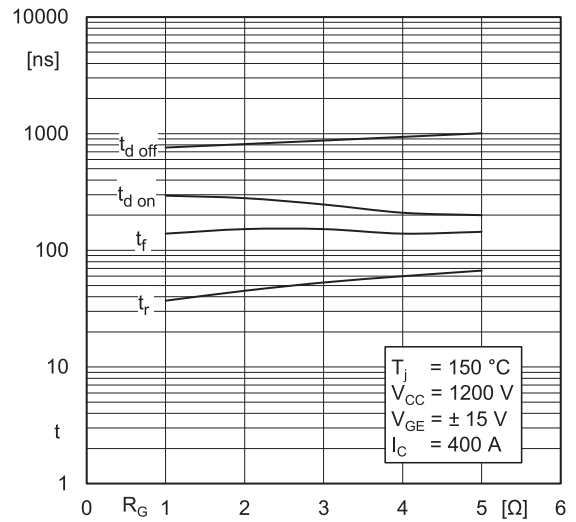


Fig. 8: Typ. switching times vs. gate resistor R_G

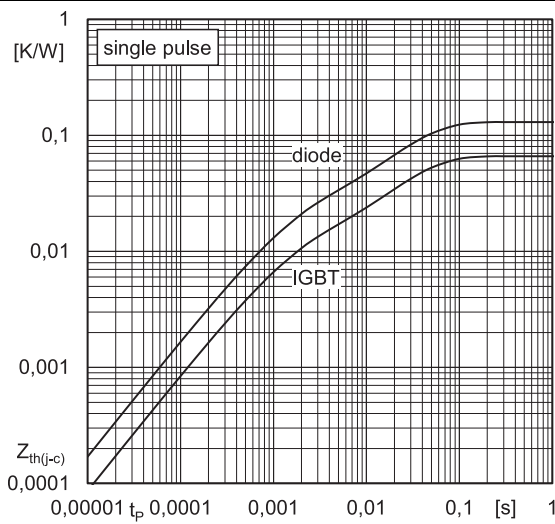


Fig. 9: Transient thermal impedance

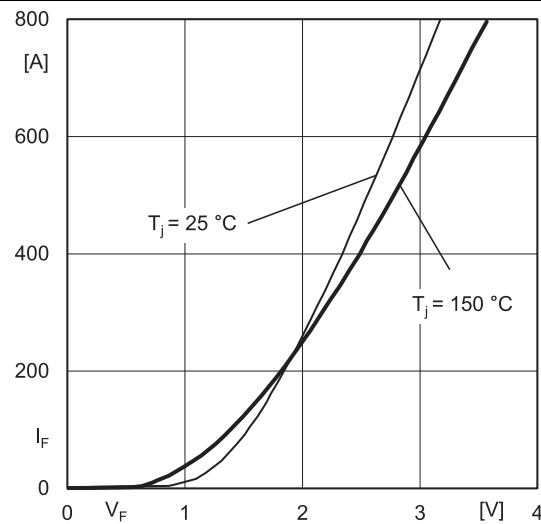


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

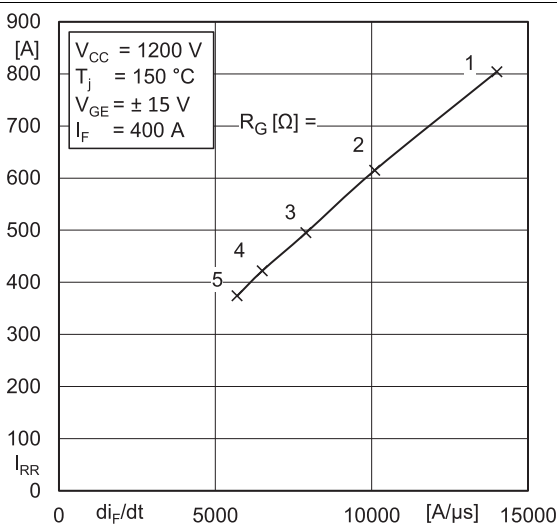


Fig. 11: CAL diode peak reverse recovery current

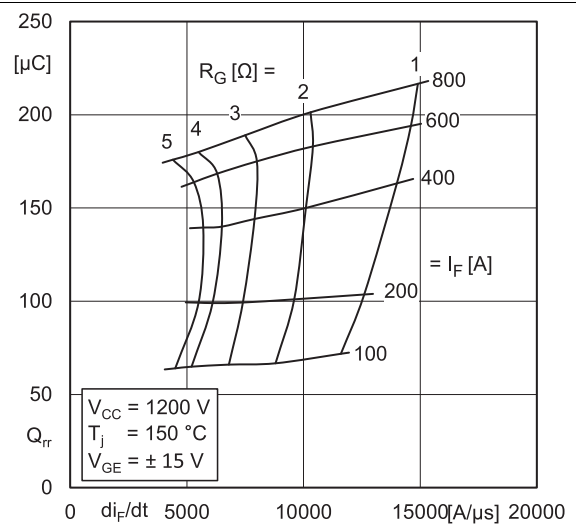
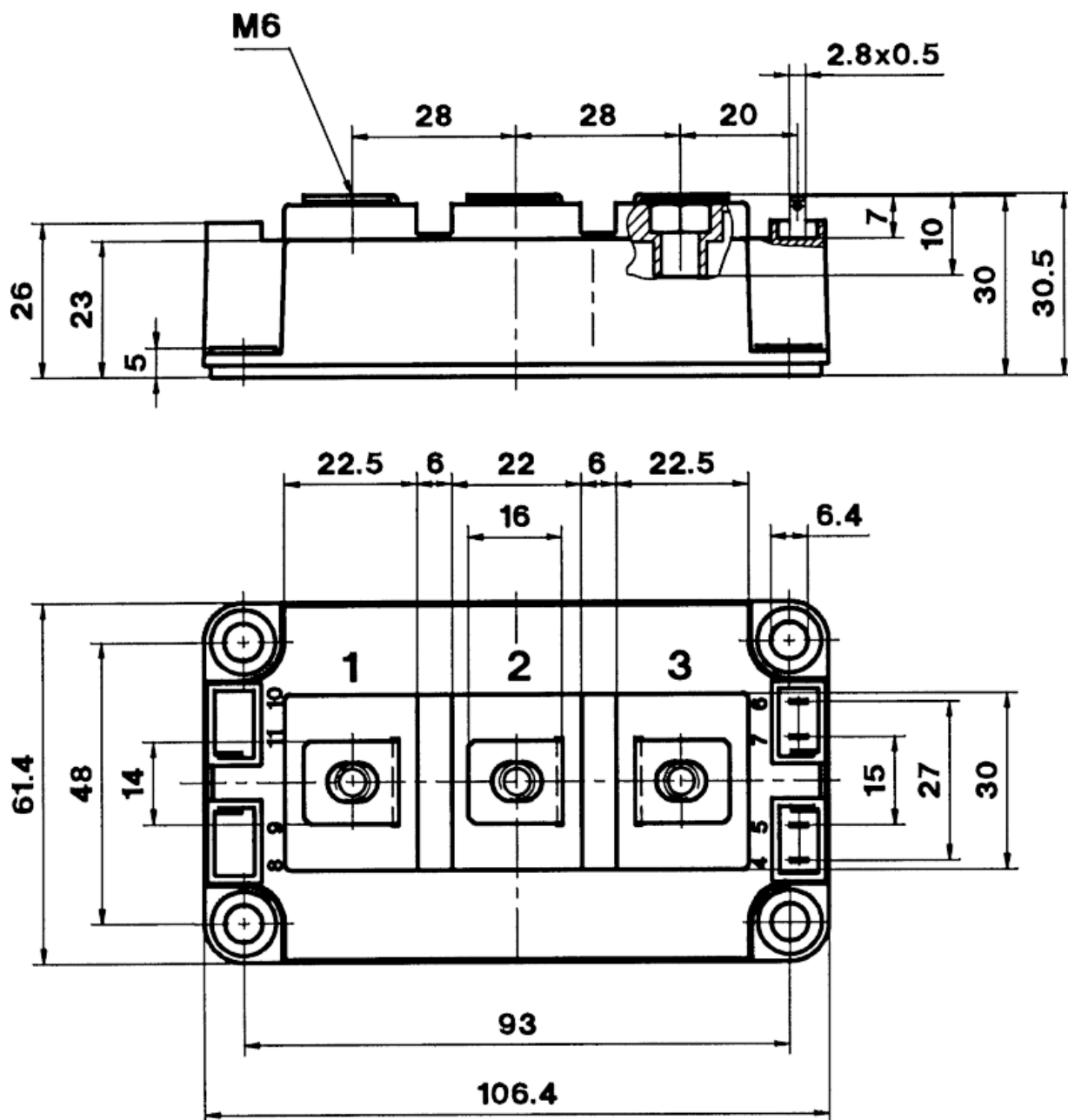
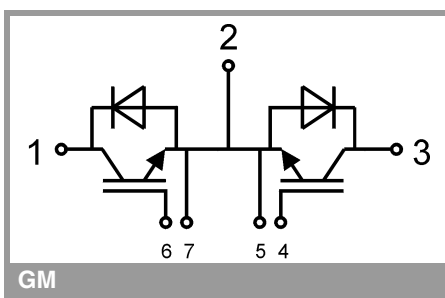


Fig. 12: Typ. CAL diode peak reverse recovery charge



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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.