



Trench IGBT Modules

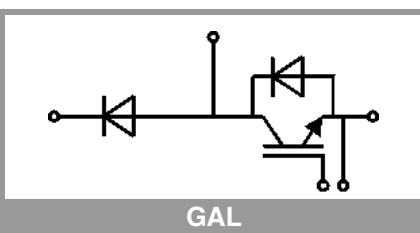
SKM400GAL126D

Features

- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_C$
- UL recognized, file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders



Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 150 °C	T _c = 25 °C	470	A
		T _c = 80 °C	327	A
I _{Cnom}			300	A
I _{CRM}	I _{CRM} = 2xI _{Cnom}		600	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 600 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 125 °C	10	μs
T _j			-40 ... 150	°C
Inverse diode				
I _F	T _j = 150 °C	T _c = 25 °C	352	A
		T _c = 80 °C	240	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		2844	A
T _j			-40 ... 150	°C
Freewheeling diode				
I _F	T _j = 150 °C	T _c = 25 °C	352	A
		T _c = 80 °C	240	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		2844	A
T _j			-40 ... 150	°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 = 300 A	T _j = 25 °C		1.69	2.10	V
	V _{GE} = 15 V chiplevel	T _j = 125 °C		2.01	2.45	V
V _{CE0}	chiplevel	T _j = 25 °C		1	1.2	V
		T _j = 125 °C		0.9	1.1	V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		2.3	3	mΩ
	chiplevel	T _j = 125 °C		3.7	4.5	mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 12 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V	T _j = 25 °C			4	mA
	V _{CE} = 1200 V	T _j = 125 °C				mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		21.4		nF
C _{oes}		f = 1 MHz		1.12		nF
C _{res}		f = 1 MHz		0.97		nF
Q _G	V _{GE} = - 8 V...+ 20 V			2800		nC
R _{Gint}	T _j = 25 °C			2.5		Ω



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SKM400GAL126D

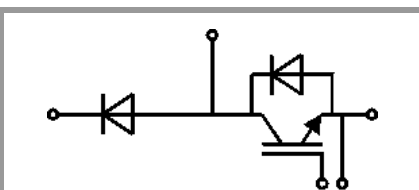
Features

- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_C$
- UL recognized, file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
t _{d(on)}	V _{CC} = 600 V	T _j = 125 °C		330		ns
t _r	I _C = 300 A	T _j = 125 °C		50		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 125 °C		29		mJ
t _{d(off)}	R _{G on} = 2 Ω	T _j = 125 °C		650		ns
t _f	R _{G off} = 2 Ω	T _j = 125 °C		110		ns
E _{off}		T _j = 125 °C		48		mJ
R _{th(j-c)}	per IGBT				0.08	K/W
Inverse diode						
V _F = V _{EC}	I _F = 300 A	T _j = 25 °C		1.60	1.80	V
	V _{GE} = 0 V chiplevel	T _j = 125 °C		1.60	1.80	V
V _{F0}	chiplevel	T _j = 25 °C		1	1.1	V
		T _j = 125 °C		0.8	0.9	V
r _F	chiplevel	T _j = 25 °C		2.00	2.3	mΩ
		T _j = 125 °C		2.7	3	mΩ
I _{RRM}	I _F = 300 A	T _j = 125 °C		390		A
Q _{rr}	di/dt _{off} = 6300 A/μs	T _j = 125 °C		77		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _j = 125 °C		27		mJ
R _{th(j-c)}	per diode				0.18	K/W
Freewheeling diode						
V _F = V _{EC}	I _F = 300 A	T _j = 25 °C		1.60	1.80	V
	V _{GE} = 0 V chiplevel	T _j = 125 °C		1.60	1.80	V
V _{F0}	chiplevel	T _j = 25 °C		1	1.1	V
		T _j = 125 °C		0.8	0.9	V
r _F	chiplevel	T _j = 25 °C		2.00	2.3	mΩ
		T _j = 125 °C		2.7	3	mΩ
I _{RRM}	I _F = 300 A	T _j = 125 °C		390		A
Q _{rr}	di/dt _{off} = 6300 A/μs	T _j = 125 °C		77		μC
E _{rr}	V _{GE} = ±15 V V _{CC} = 600 V	T _j = 125 °C		27		mJ
R _{th(j-c)}	per Diode				0.18	K/W
Module						
L _{CE}				15		nH
R _{CC'+EE'}	terminal-chip	T _C = 25 °C		0.35		mΩ
		T _C = 125 °C		0.5		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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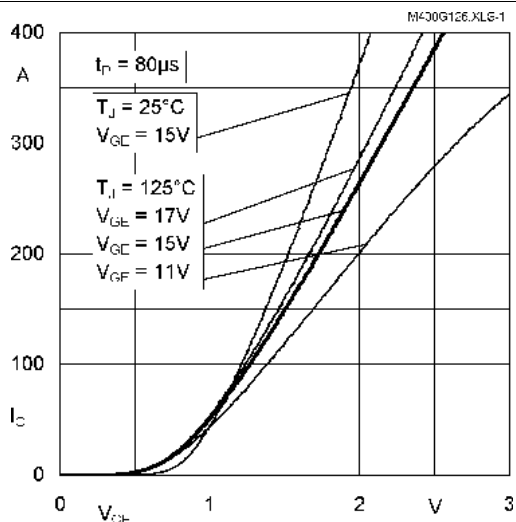


Fig. 1: Typ. output characteristic, inclusive $R_{CC} + EE'$

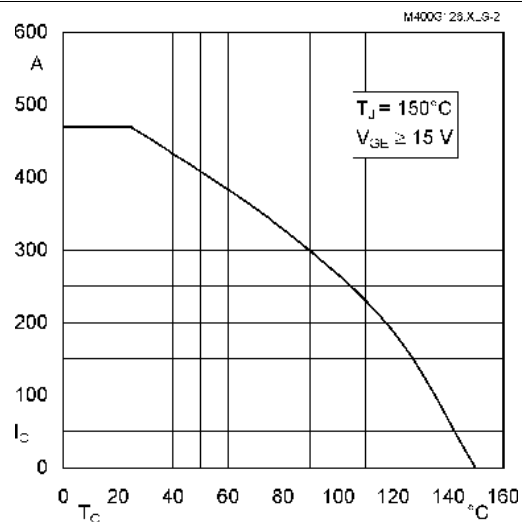


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

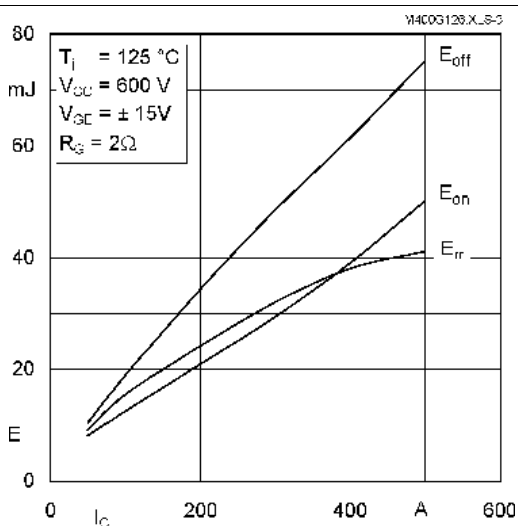


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

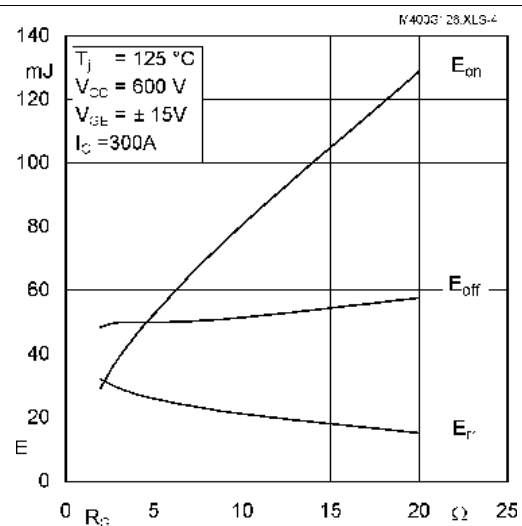


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

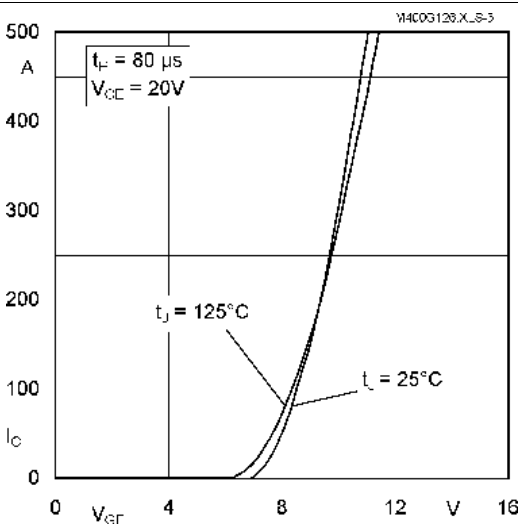


Fig. 5: Typ. transfer characteristic

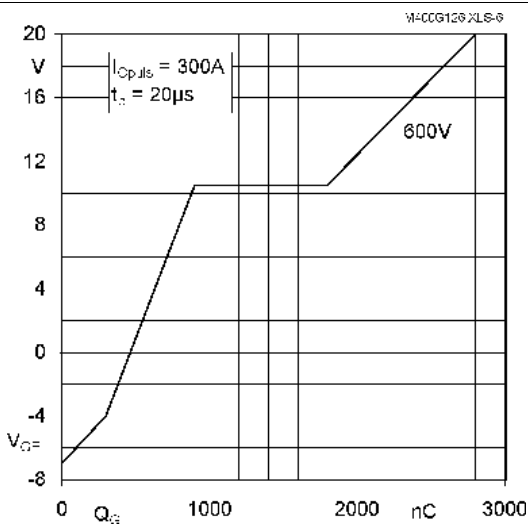


Fig. 6: Typ. gate charge characteristic

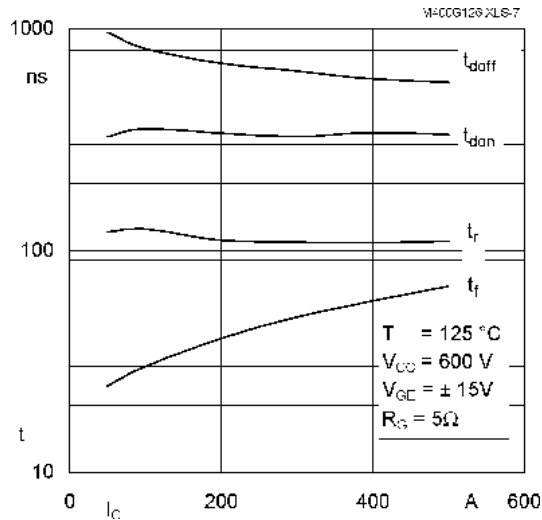


Fig. 7: Typ. switching times vs. I_C

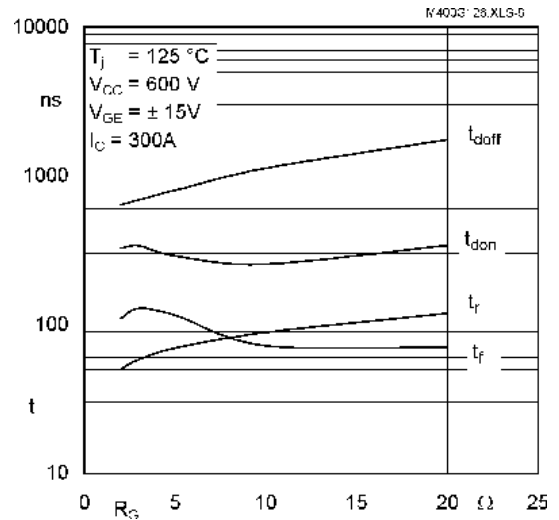


Fig. 8: Typ. switching times vs. gate resistor R_G

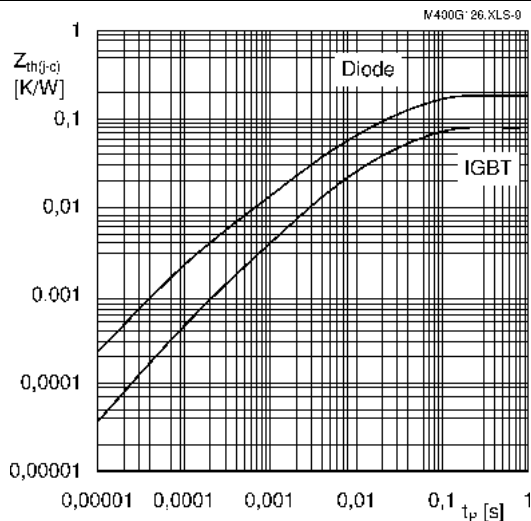


Fig. 9: Transient thermal impedance

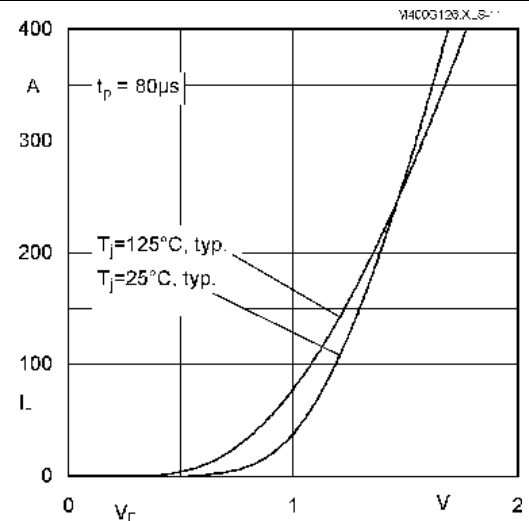


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'} + EE'$

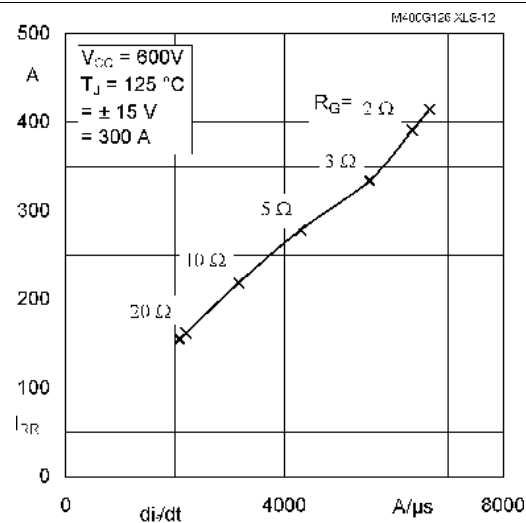


Fig. 11: Typ. CAL diode peak reverse recovery current

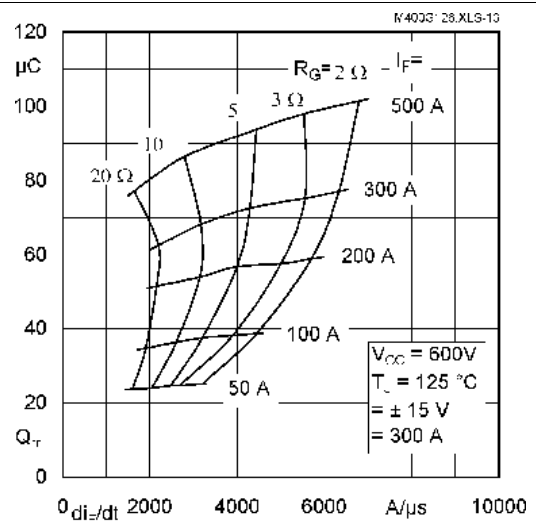
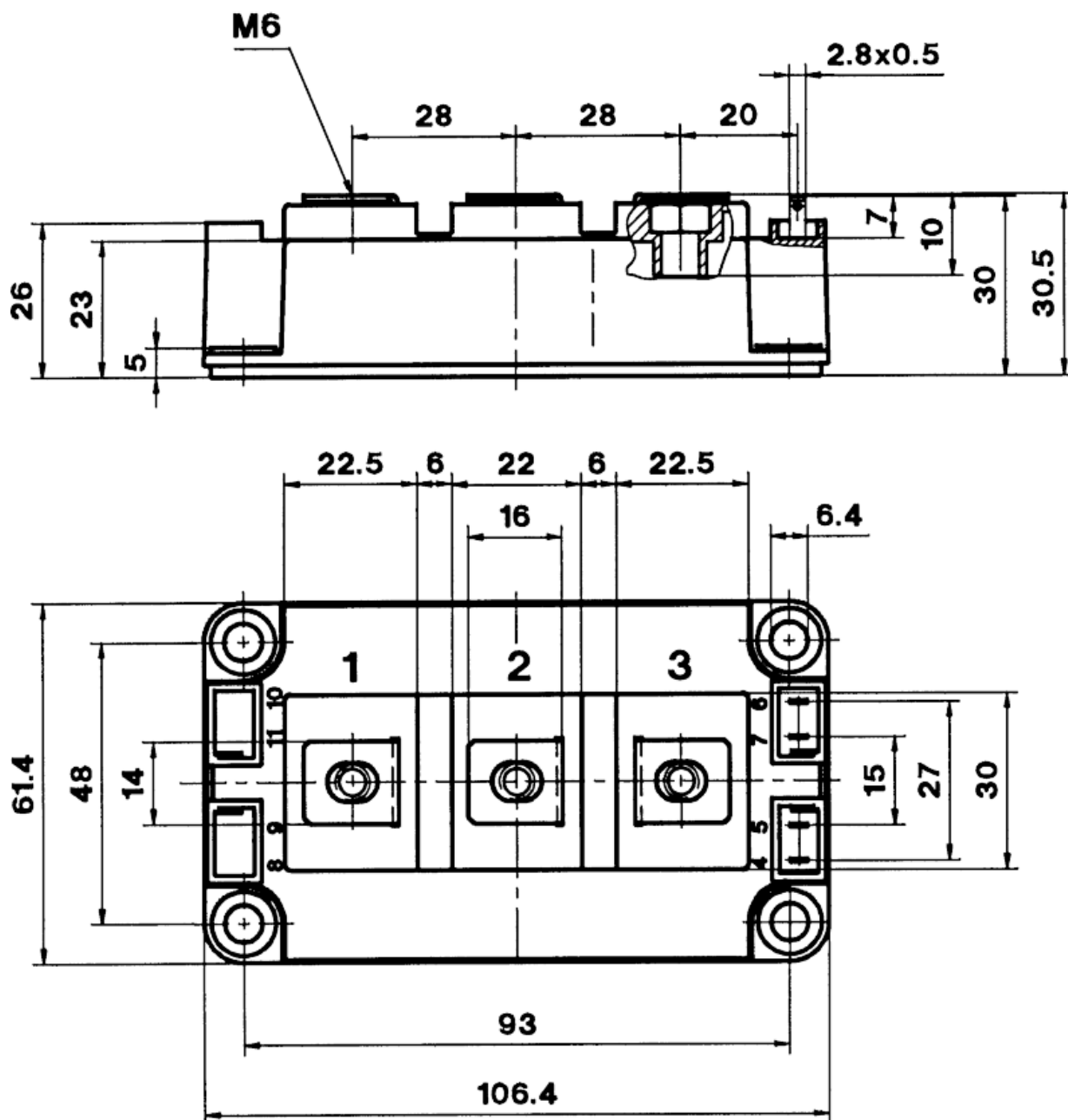
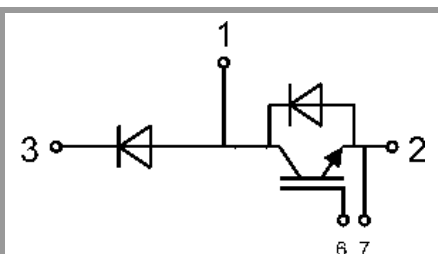


Fig. 12: Typ. CAL diode peak reverse recovery charge

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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.