SKM200GBD126D

SEMITRANS® 3

Trench IGBT Modules

SKM200GBD126D

Features

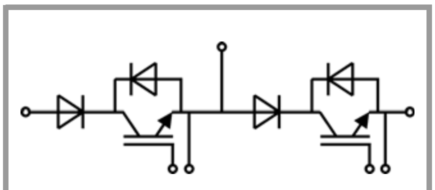
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_C
- UL recognized, file no. E63532

Typical Applications*

- Current source inverter

Remarks

- The Fig.1 to Fig.9 are based on measurements of the SKM200GB126D
- The series diodes (FWD) have the data of the inverse diodes of the SKM300GB126D



GBD

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	264	A
		T_c = 80 °C	186	A
I_{Cnom}			150	A
I_{CRM}	$I_{CRM} = 2xI_{Cnom}$		300	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 900 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 1200 V	T_j = 125 °C	10	µs
T_j			-40 ... 150	°C
Inverse diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 150 °C	T_c = 25 °C	34	A
		T_c = 80 °C	23	A
I_{Fnom}			30	A
I_{FRM}	$I_{FRM} = 2xI_{Fnom}$		60	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		414	A
T_j			-40 ... 150	°C
Freewheeling diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 150 °C	T_c = 25 °C	250	A
		T_c = 80 °C	169	A
I_{Fnom}			200	A
I_{FRM}	$I_{FRM} = 2xI_{Fnom}$		400	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		1656	A
T_j			-40 ... 150	°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		1.71	2.10	V
		T_j = 125 °C		2.00	2.45	V
V_{CE0}	chiplevel	T_j = 25 °C		1.00	1.20	V
		T_j = 125 °C		0.90	1.10	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		4.7	6.0	mΩ
		T_j = 125 °C		7.3	9.0	mΩ
$V_{GE(th)}$	$V_{GE}=V_{CE}$, I_C = 6 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				2.0	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		10.7		nF
C_{oes}		f = 1 MHz		0.56		nF
C_{res}		f = 1 MHz		0.48		nF
Q_G	V_{GE} = - 8 V...+ 20 V			1530		nC
R_{Gint}	T_j = 25 °C			5.0		Ω

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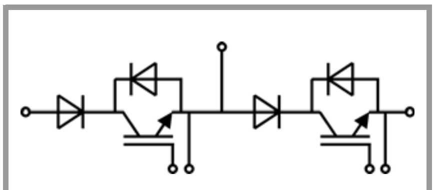

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
IGBT						
$t_{d(on)}$	V_{CC} = 600 V I_C = 150 A V_{GE} = +15/-15 V $R_{G\ on}$ = 1.5 Ω $R_{G\ off}$ = 1.5 Ω	T_j = 125 °C		260		ns
t_r		T_j = 125 °C		40		ns
E_{on}		T_j = 125 °C		18		mJ
$t_{d(off)}$		T_j = 125 °C		540		ns
t_f		T_j = 125 °C		110		ns
E_{off}		T_j = 125 °C		24		mJ
$R_{th(j-c)}$	per IGBT				0.13	K/W
$R_{th(c-s)}$	per IGBT (λ_{grease}=0.81 W/(m*K))			0.036		K/W
$R_{th(c-s)}$	per IGBT, pre-applied phase change material			0.033		K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 30 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.00	2.50	V
		T_j = 125 °C		1.80	2.30	V
V_{F0}	chiplevel	T_j = 25 °C		1.10	1.45	V
		T_j = 125 °C		0.85	1.20	V
r_F	chiplevel	T_j = 25 °C		30	35	mΩ
		T_j = 125 °C		32	37	mΩ
I_{RRM}	I_F = 15 A di/dt$_{off}$ = 150 A/µs V_{GE} = ±15 V V_{CC} = 600 V	T_j = 125 °C		12		A
Q_{rr}		T_j = 125 °C		1		µC
E_{rr}		T_j = 125 °C		-		mJ
$R_{th(j-c)}$	per diode				1.5	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(m*K))			0.078		K/W
$R_{th(c-s)}$	per diode, pre-applied phase change material			0.076		K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 200 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.60	1.80	V
		T_j = 125 °C		1.60	1.80	V
V_{F0}	chiplevel	T_j = 25 °C		1.00	1.10	V
		T_j = 125 °C		0.80	0.90	V
r_F	chiplevel	T_j = 25 °C		3.0	3.5	mΩ
		T_j = 125 °C		4.0	4.5	mΩ
I_{RRM}	I_F = 200 A di/dt$_{off}$ = 6200 A/µs V_{GE} = ±15 V V_{CC} = 600 V	T_j = 125 °C		290		A
Q_{rr}		T_j = 125 °C		44		µC
E_{rr}		T_j = 125 °C		18		mJ
$R_{th(j-c)}$	per diode				0.25	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(m*K))			0.043		K/W
$R_{th(c-s)}$	per diode, pre-applied phase change material			0.041		K/W

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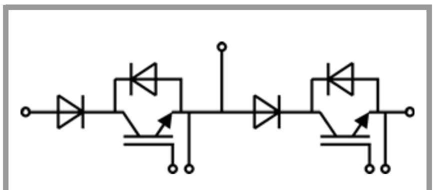

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Module						
L_{CE}				15		nH
$R_{CC'+EE'}$	measured per switch	T_C = 25 °C		0.35		mΩ
		T_C = 125 °C		0.5		mΩ
$R_{th(c-s)1}$	per module			0.01		K/W
$R_{th(c-s)2}$	including thermal coupling, Ts underneath module (λ_{grease}=0.81 W/(m*K))			0.015		K/W
$R_{th(c-s)2}$	including thermal coupling, Ts underneath module, pre-applied phase change material			0.014		K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminals M6	2.5		5	Nm
						Nm
w					325	g

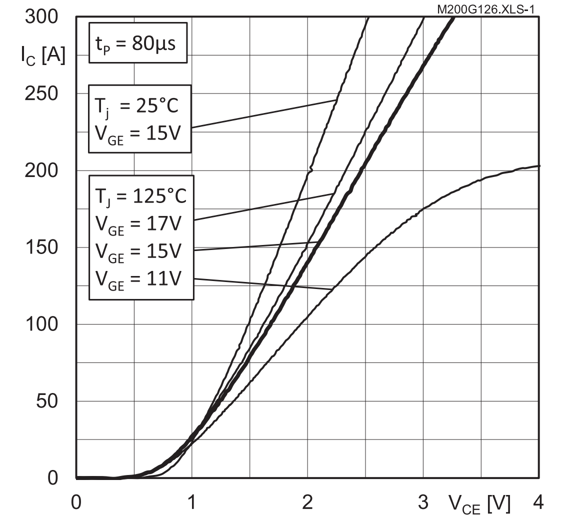


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

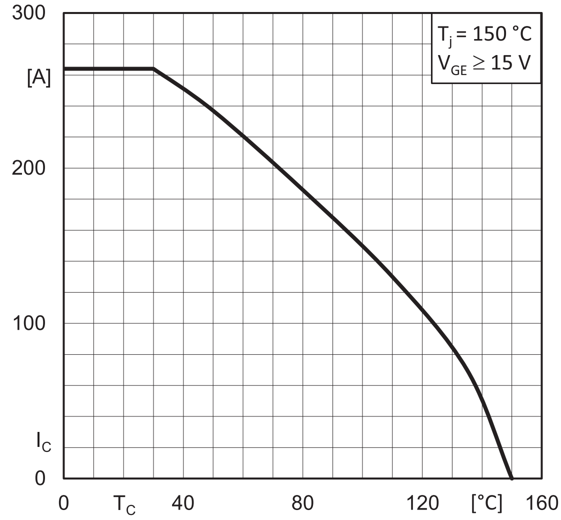


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

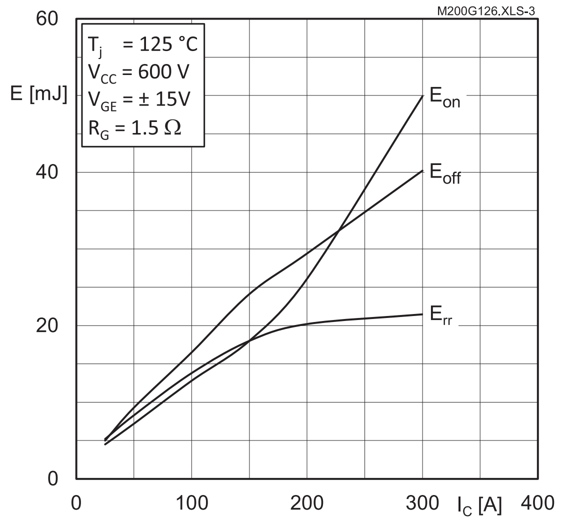


Fig. 3: Typ. turn-on /-off energy = f (I_C)

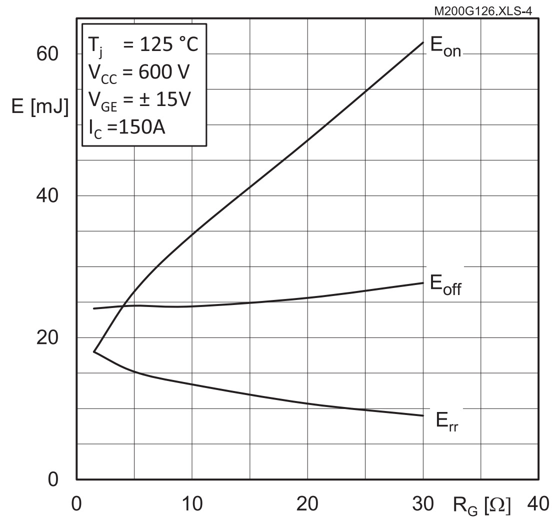


Fig. 4: Typ. turn-on /-off energy = f (R_G)

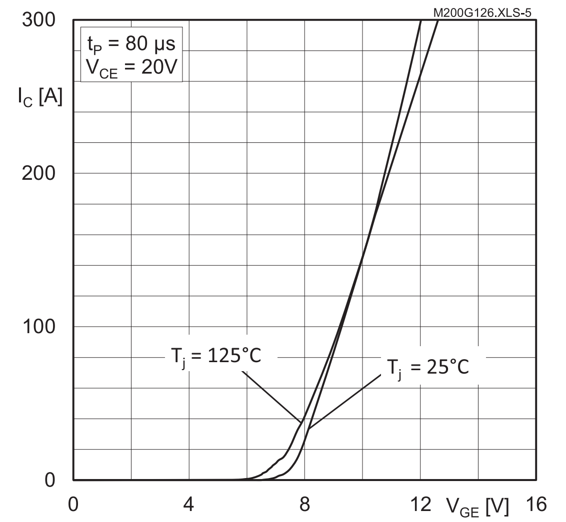


Fig. 5: Typ. transfer characteristic

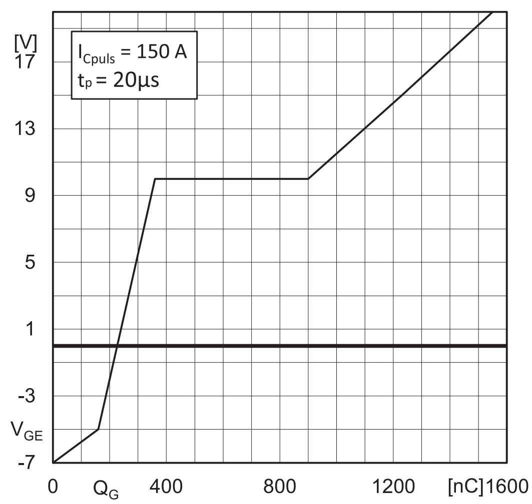


Fig. 6: Typ. gate charge characteristic

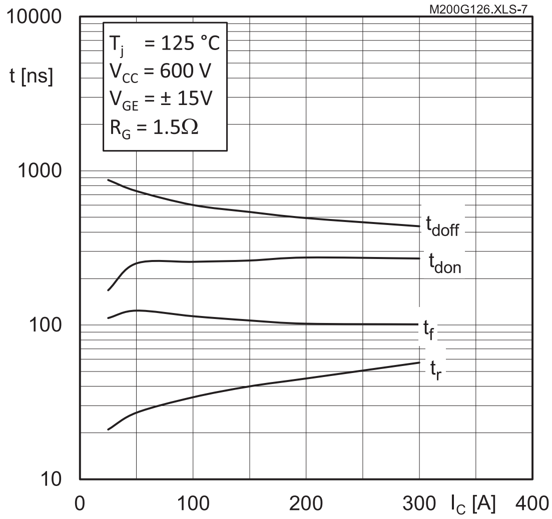


Fig. 7: Typ. switching times vs. I_C

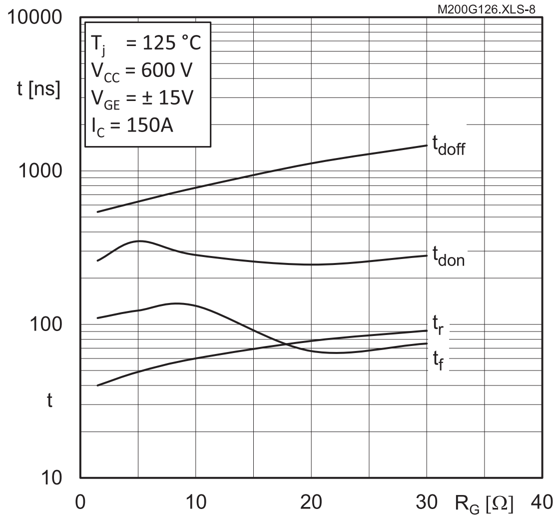


Fig. 8: Typ. switching times vs. gate resistor R_G

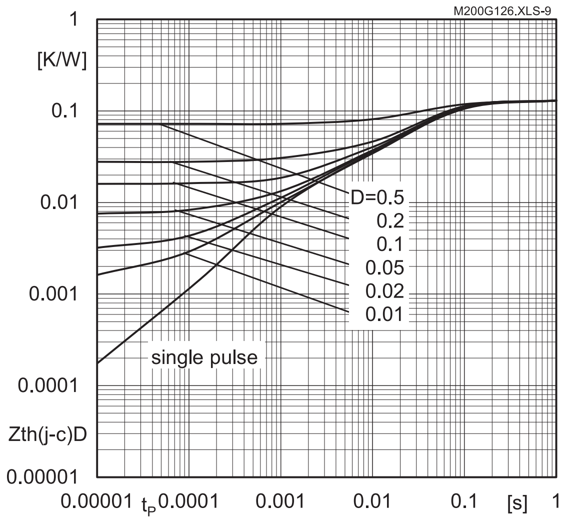


Fig. 9: Transient thermal impedance of IGBT
$Z_{thp(j-c)} = f(t_p)$; $D = t_p/t_c = t_p*f$

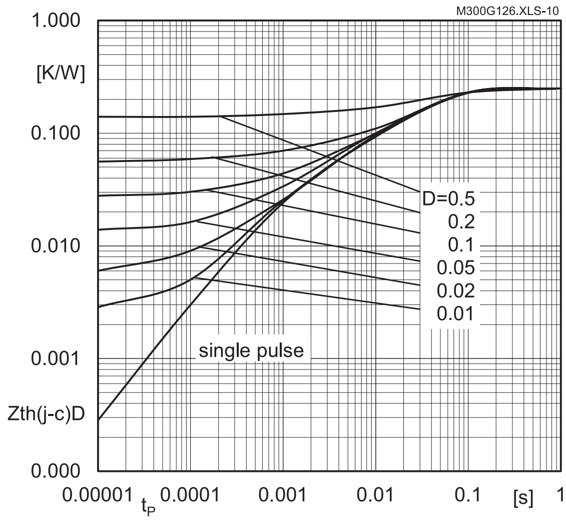


Fig. 10: Transient thermal impedance of FWD
$Z_{thp(j-c)}=f(t_p)$: $D=t_p/t_c=t_p*f$

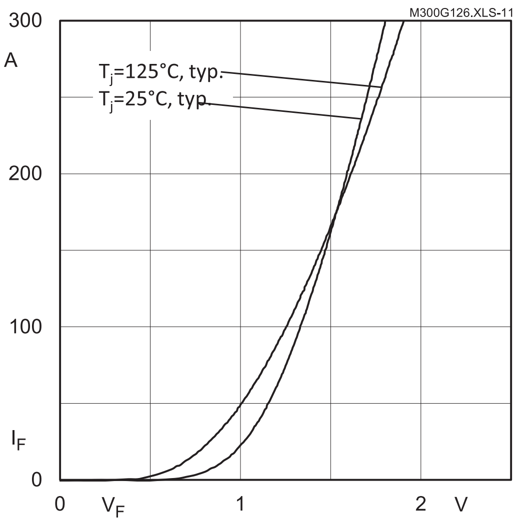


Fig. 11: CAL diode forward charact., incl. $R_{CC'+EE'}$

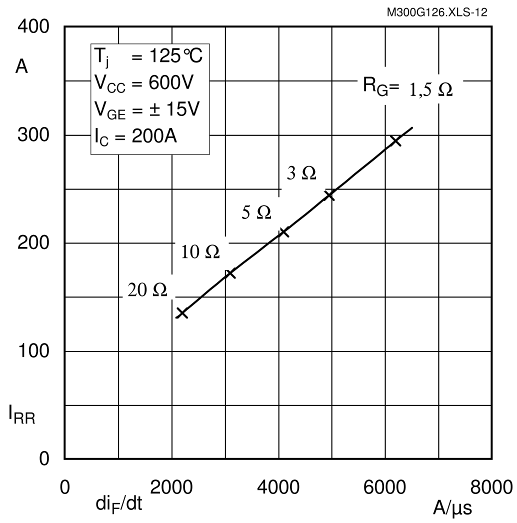
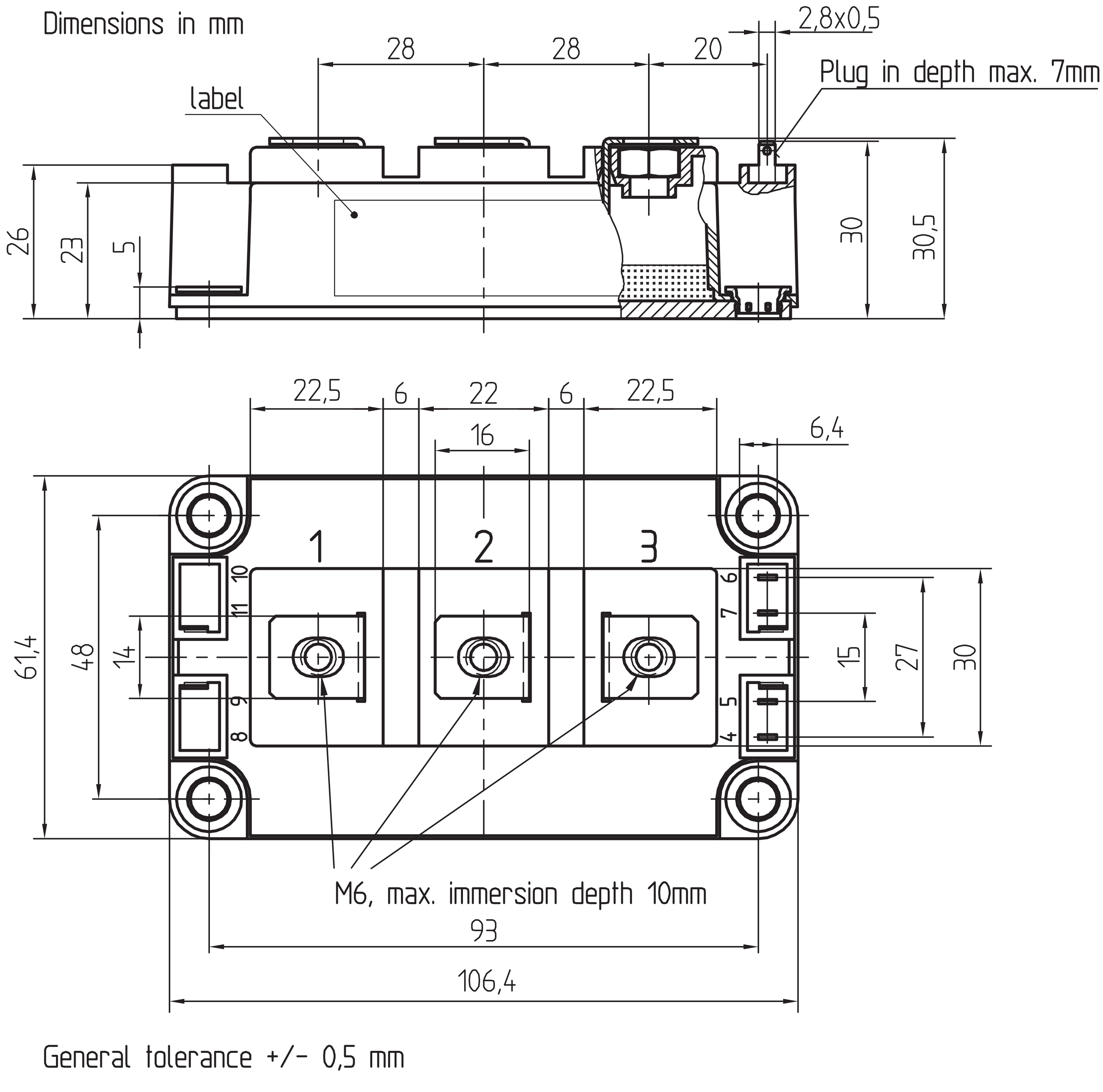


Fig. 12: Typ. CAL diode peak reverse recovery current



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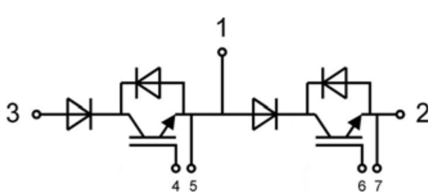

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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