SKM200GAL12E4

SEMITRANS®3

IGBT4 Modules

SKM200GAL12E4

Features

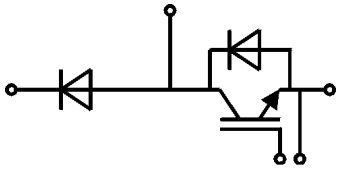
- IGBT4 = 4. Generation (Trench)IGBT
- VCEsat with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_{CNOM}
- Soft switching 4. Generation CAL diode (CAL4)

Typical Applications

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – Motor

Remarks

- Case temperature limited to Tc = 125°C max, recomm. Top = -40 ... +150°C, product rel. results valid for Tj = 150°



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Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
IGBT				
V_{CES}			1200	V
I_C	T_j = 175 °C	T_c = 25 °C	314	A
		T_c = 80 °C	242	A
I_{Cnom}			200	A
I_{CRM}	I_{CRM} = 3xI_{Cnom}		600	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse diode				
I_F	T_j = 175 °C	T_c = 25 °C	229	A
		T_c = 80 °C	172	A
I_{Fnom}			200	A
I_{FRM}	I_{FRM} = 3xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		990	A
T_j			-40 ... 175	°C
Freewheeling diode				
I_F	T_j = 175 °C	T_c = 25 °C	229	A
		T_c = 80 °C	172	A
I_{Fnom}			200	A
I_{FRM}	I_{FRM} = 3xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		990	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			500	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50Hz, t = 1 min		4000	V

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
IGBT						
$V_{CE(sat)}$	I_C = 200 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.8	2.05	V
		T_j = 150 °C		2.2	2.4	V
V_{CE0}		T_j = 25 °C		0.8	0.9	V
		T_j = 150 °C		0.7	0.8	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		5.0	5.8	mΩ
		T_j = 150 °C		7.5	8.0	mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 7.6 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V V_{CE} = 1200 V	T_j = 25 °C		0.1	0.3	mA
		T_j = 150 °C				mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		12.3		nF
C_{oes}		f = 1 MHz		0.81		nF
C_{res}		f = 1 MHz		0.69		nF
Q_G	V_{GE} = - 8 V...+ 15 V			1130		nC
R_{Gint}	T_j = 25 °C			3.8		Ω

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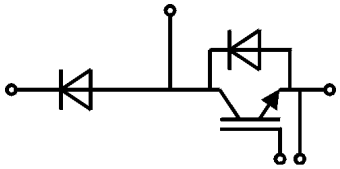
Remarks

- Case temperature limited to Tc = 125°C max, recomm. Top = -40 ... +150°C, product rel. results valid for Tj = 150°

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
$t_{d(on)}$	V_{CC} = 600 V	T_j = 150 °C		204		ns
t_r	I_C = 200 A	T_j = 150 °C		40		ns
E_{on}	V_{GE} = ±15 V	T_j = 150 °C		21		mJ
$t_{d(off)}$	$R_{G\ on}$ = 1 Ω $R_{G\ off}$ = 1 Ω	T_j = 150 °C		490		ns
t_f	di/dt_{on} = 5500 A/µs	T_j = 150 °C		107		ns
E_{off}	di/dt_{off} = 2300 A/µs	T_j = 150 °C		27		mJ
$R_{th(j-c)}$	per IGBT				0.14	K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 200 A V_{GE} = 0 V chip	T_j = 25 °C		2.2	2.52	V
		T_j = 150 °C		2.15	2.47	V
V_{F0}		T_j = 25 °C		1.3	1.5	V
		T_j = 150 °C		0.9	1.1	V
r_F		T_j = 25 °C		4.5	5.1	mΩ
		T_j = 150 °C		6.3	6.8	mΩ
I_{RRM}	I_F = 200 A di/dt_{off} = 4450 A/µs V_{GE} = ±15 V V_{CC} = 600 V	T_j = 150 °C		174		A
Q_{rr}		T_j = 150 °C		33		µC
E_{rr}		T_j = 150 °C		13		mJ
$R_{th(j-c)}$	per diode				0.26	K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 200 A V_{GE} = 0 V chip	T_j = 25 °C		2.2	2.52	V
		T_j = 150 °C		2.15	2.47	V
V_{F0}		T_j = 25 °C		1.3	1.5	V
		T_j = 150 °C		0.9	1.1	V
r_F		T_j = 25 °C		4.5	5.1	mΩ
		T_j = 150 °C		6.3	6.8	mΩ
I_{RRM}	I_F = 200 A di/dt_{off} = 4450 A/µs V_{GE} = ±15 V V_{CC} = 600 V	T_j = 150 °C		174		A
Q_{rr}		T_j = 150 °C		33.1		µC
E_{rr}		T_j = 150 °C		13		mJ
$R_{th(j-c)}$	per Diode				0.26	K/W
Module						
L_{CE}				15	20	nH
$R_{CC'+EE'}$	terminal-chip	T_C = 25 °C		0.25		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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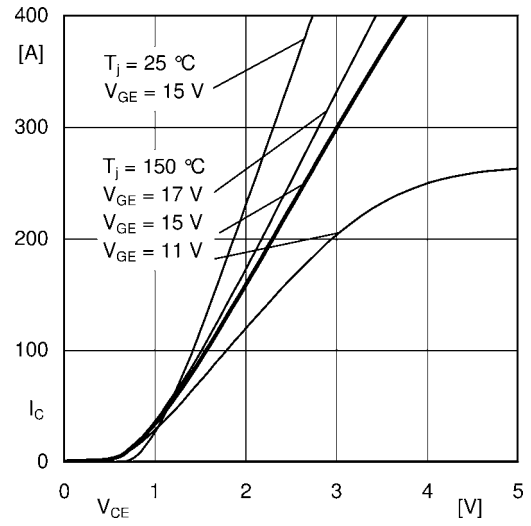


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

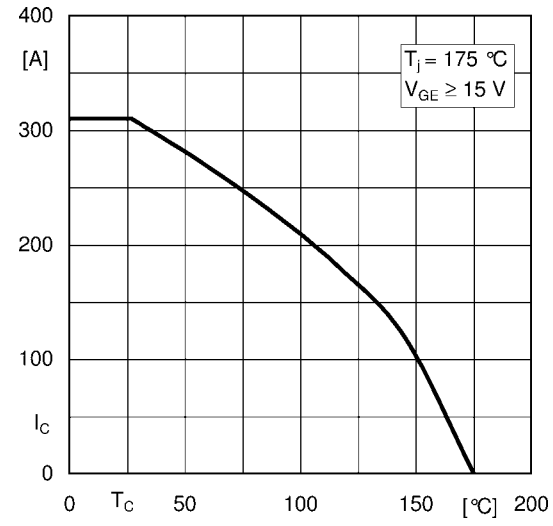


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

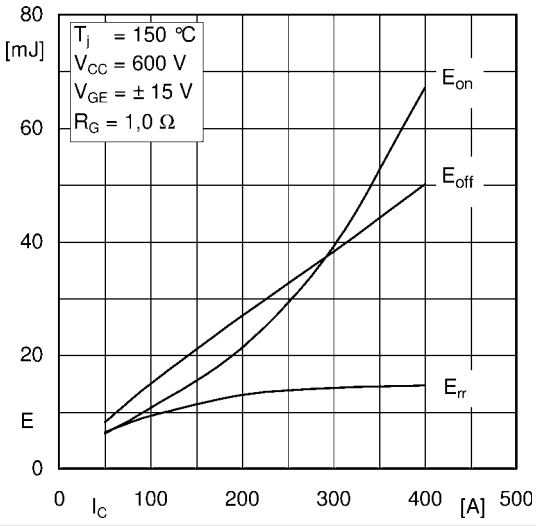


Fig. 3: Typ. turn-on /-off energy = f (I_C)

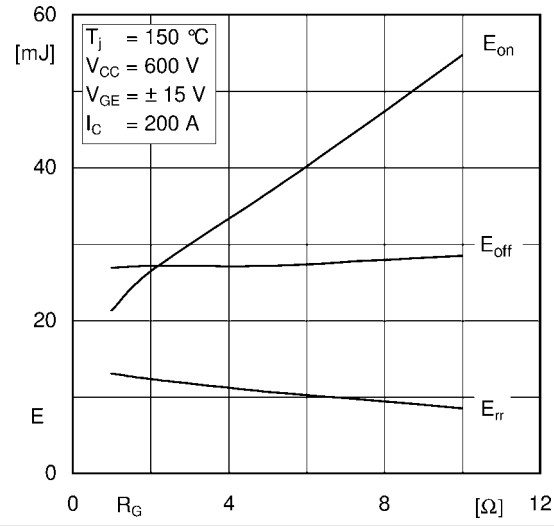


Fig. 4: Typ. turn-on /-off energy = f (R_G)

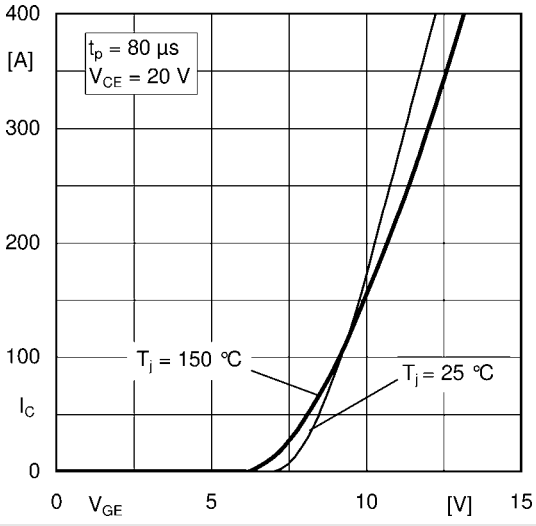


Fig. 5: Typ. transfer characteristic

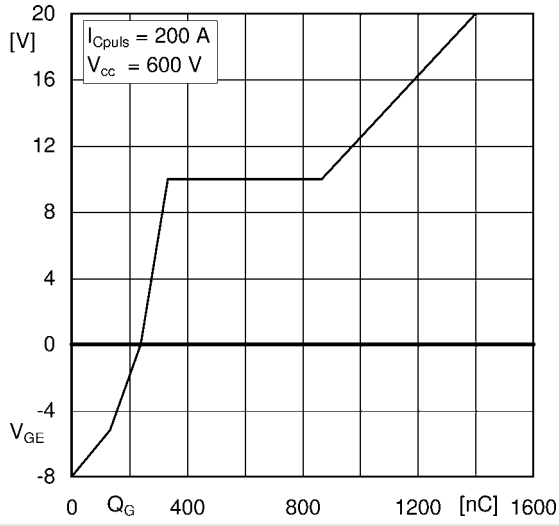


Fig. 6: Typ. gate charge characteristic

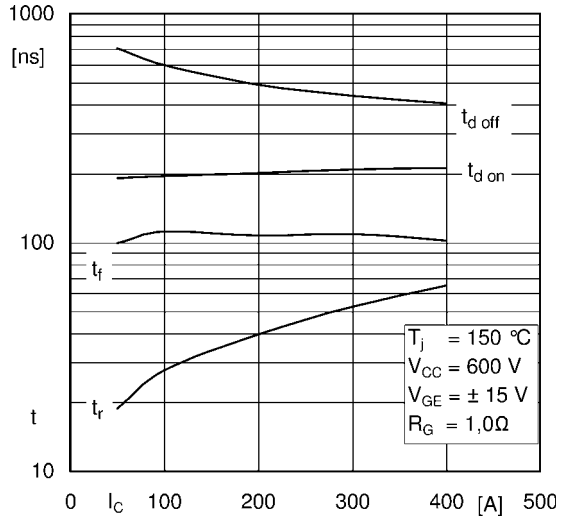


Fig. 7: Typ. switching times vs. I_C

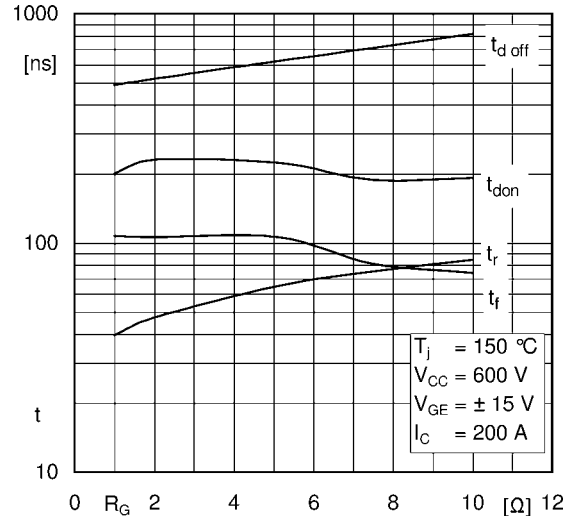


Fig. 8: Typ. switching times vs. gate resistor R_G

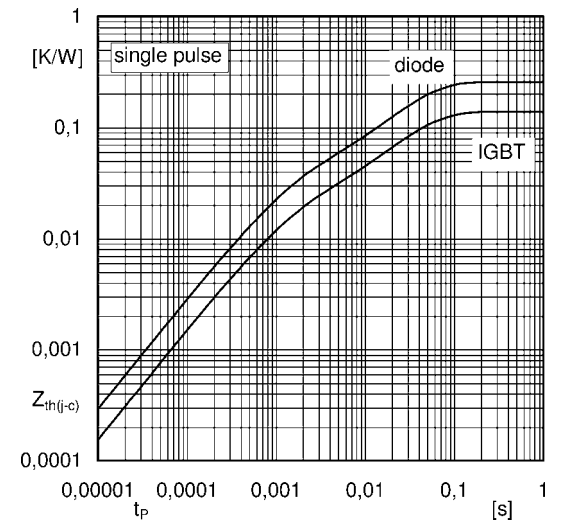


Fig. 9: Transient thermal impedance

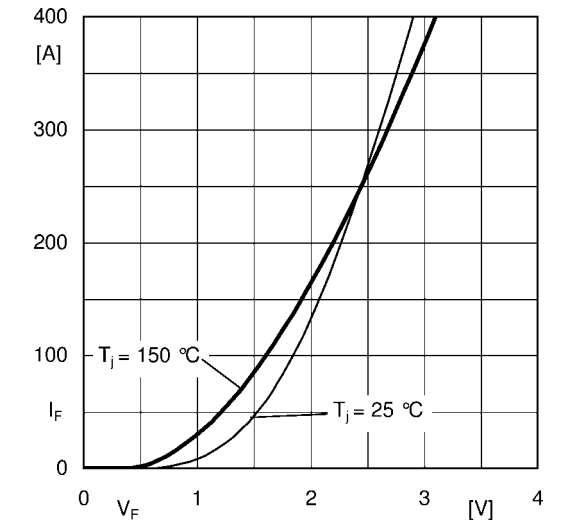


Fig. 10: CAL diode forward characteristic

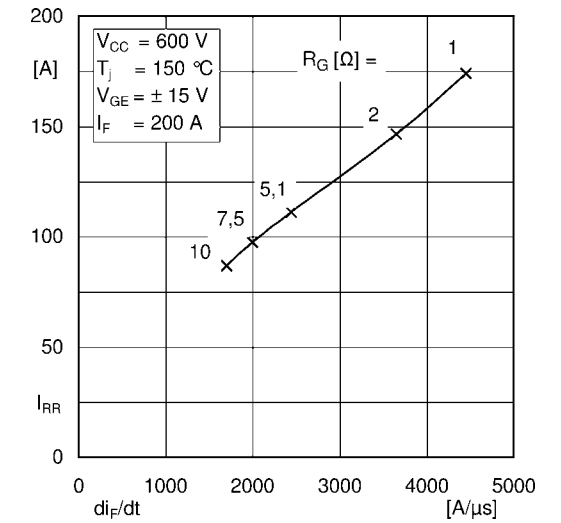


Fig. 11: CAL diode peak reverse recovery current

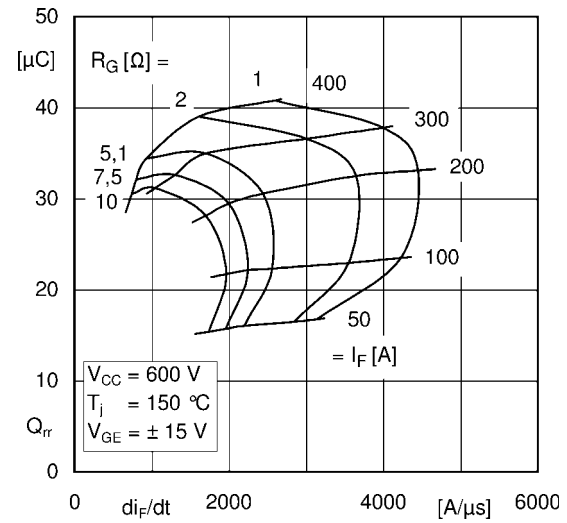
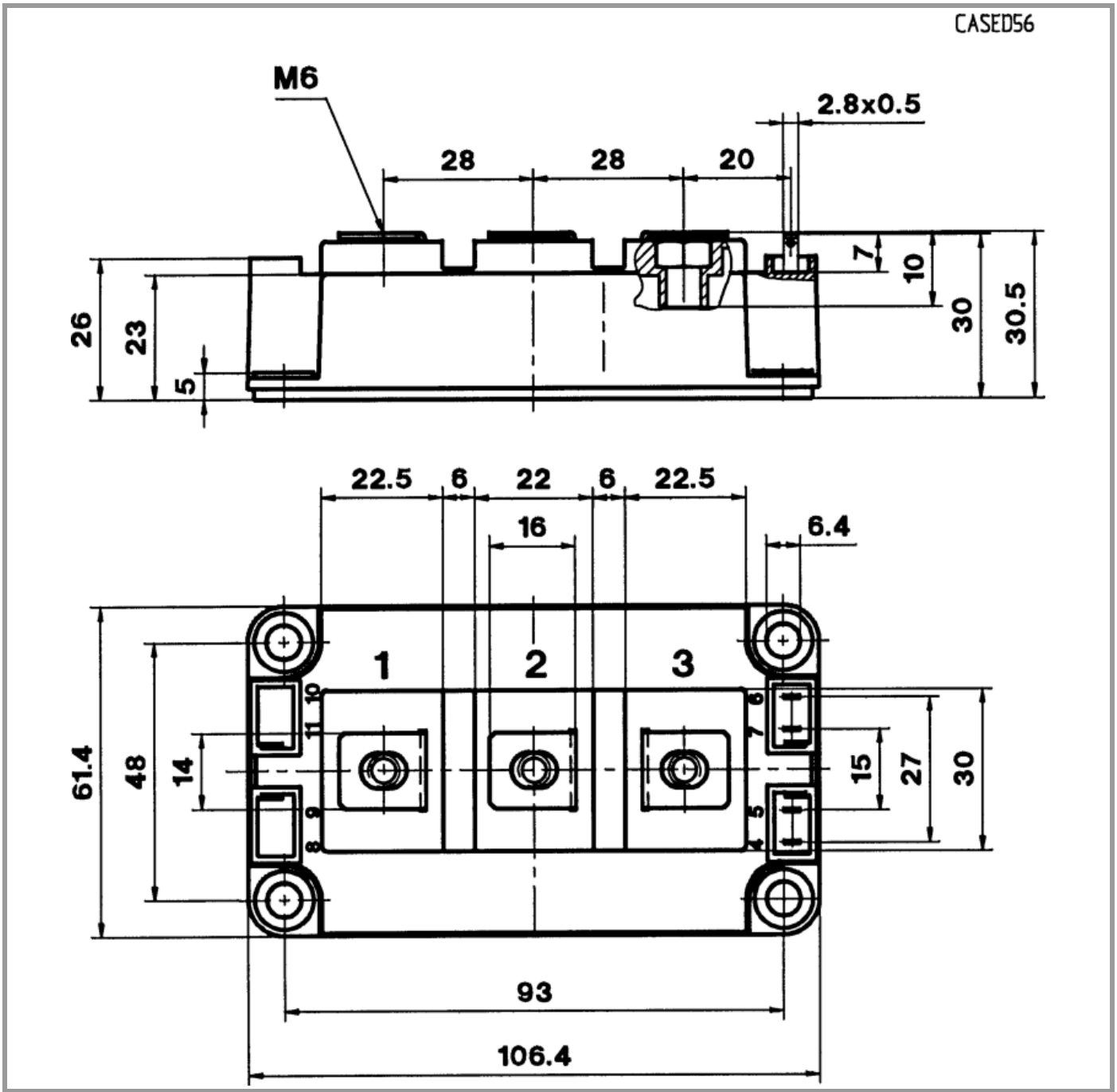


Fig. 12: Typ. CAL diode peak reverse recovery charge



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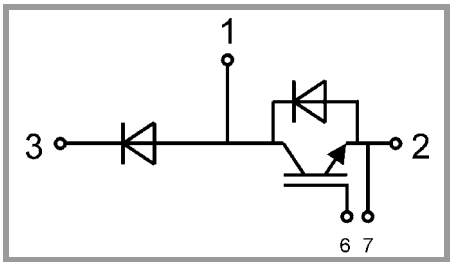

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX.

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