



SEMITRANS® 3

Trench IGBT Modules

SKM300GB07E3

Features*

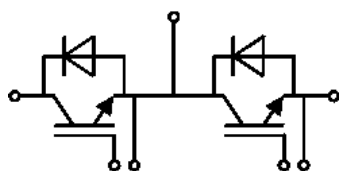
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_{Cnom}$
- Fast & soft inverse CAL diodes
- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
- With integrated gate resistor

Typical Applications

- AC inverter drives
- UPS

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 $T_j = 150^\circ\text{C}$
- Use of soft R_G necessary



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		650	V
I _C	T _j = 175 °C	T _c = 25 °C	394	A
		T _c = 80 °C	297	A
I _{Cnom}			300	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		900	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 360 V V _{GE} ≤ 15 V V _{CES} ≤ 650 V	T _j = 150 °C	6	μs
T _j			-40 ... 175	°C

Inverse diode

V _{RRM}	T _j = 25 °C		650	V
I _F	T _j = 175 °C	T _c = 25 °C	335	A
		T _c = 80 °C	244	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		2160	A
T _j			-40 ... 175	°C

Module

$I_{t(RMS)}$		500	A
T_{stg}	module without TIM	-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50 Hz, $t = 1\text{ min}$	4000	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 300\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.45	1.90	V
		$T_j = 150^\circ\text{C}$	1.69	2.10	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.90	1.00	V
		$T_j = 150^\circ\text{C}$	0.82	0.90	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.83	3.0	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	2.9	4.0	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 4.8\text{ mA}$	5.1	5.8	6.4	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 650\text{ V}, T_j = 25^\circ\text{C}$			0.3	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	18.5		nF
C_{oes}		$f = 1\text{ MHz}$	1.16		nF
C_{res}		$f = 1\text{ MHz}$	0.55		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		2400		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		1.0		Ω
$t_{d(on)}$	$V_{CC} = 300\text{ V}$	$T_j = 150^\circ\text{C}$	157		ns
t_r	$I_C = 300\text{ A}$	$T_j = 150^\circ\text{C}$	58		ns
E_{on}	$V_{GE} = +15/-7.5\text{ V}$ $R_{G on} = 2\text{ }\Omega$	$T_j = 150^\circ\text{C}$	4.7		mJ
$t_{d(off)}$	$R_{G off} = 5.6\text{ }\Omega$	$T_j = 150^\circ\text{C}$	813		ns
t_f	$di/dt_{on} = 6100\text{ A}/\mu\text{s}$ $di/dt_{off} = 4500\text{ A}/\mu\text{s}$ $dv/dt = 1700\text{ V}/\mu\text{s}$ $L_s = 22\text{ nH}$	$T_j = 150^\circ\text{C}$	67		ns
E_{off}		$T_j = 150^\circ\text{C}$	13.6		mJ
$R_{th(j-c)}$	per IGBT			0.15	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)		0.042		K/W
$R_{th(c-s)}$	per IGBT, pre-applied phase change material		0.038		K/W



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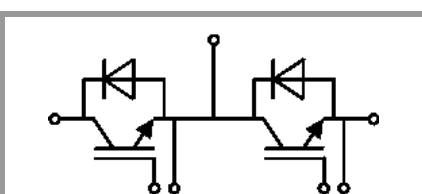
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 300 A	T _j = 25 °C		1.40	1.76	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		1.39	1.77	V
V _{F0}	chiplevel	T _j = 25 °C		1.04	1.24	V
		T _j = 150 °C		0.85	0.99	V
r _F	chiplevel	T _j = 25 °C		1.19	1.76	mΩ
		T _j = 150 °C		1.79	2.6	mΩ
I _{RRM}	I _F = 300 A	T _j = 150 °C		313		A
Q _{rr}	di/dt _{off} = 5400 A/μs	T _j = 150 °C		31.5		μC
E _{rr}	V _{GE} = +15 /-7.5 V	T _j = 150 °C		6.4		mJ
	V _{CC} = 300 V					
R _{th(j-c)}	per diode				0.25	K/W
R _{th(c-s)}	per diode (λ _{grease} =0.81 W/(m*K))			0.044		K/W
R _{th(c-s)}	per diode, pre-applied phase change material			0.041		K/W
Module						
L _{CE}				15		nH
R _{CC'+EE'}	measured per switch	T _C = 25 °C		0.55		mΩ
		T _C = 125 °C		0.85		mΩ
R _{th(c-s)1}	calculated without thermal coupling			0.01074		K/W
R _{th(c-s)2}	including thermal coupling, Ts underneath module (λ _{grease} =0.81 W/(m*K))			0.018		K/W
R _{th(c-s)2}	including thermal coupling, Ts underneath module, pre-applied phase change material			0.016		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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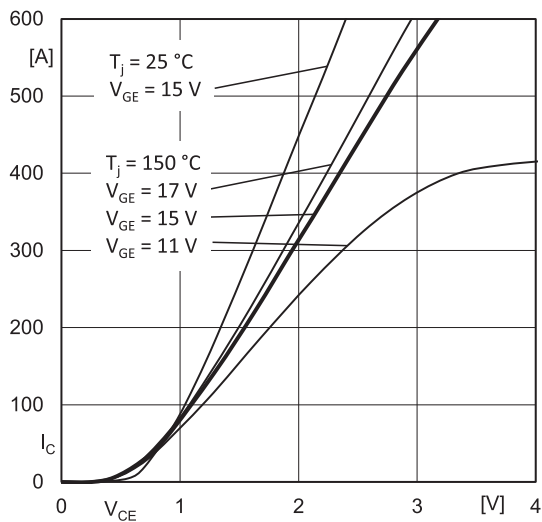


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

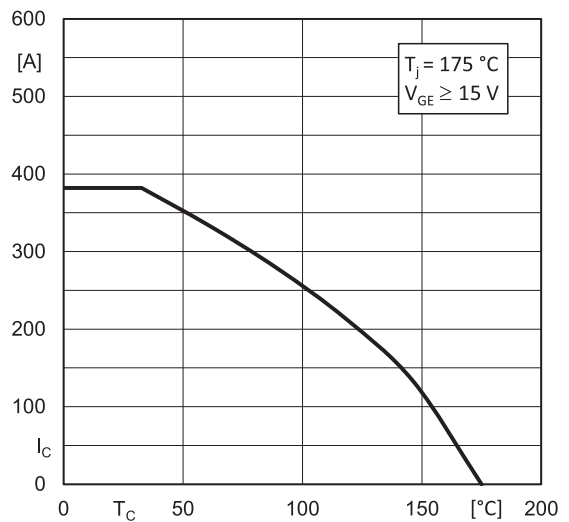


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

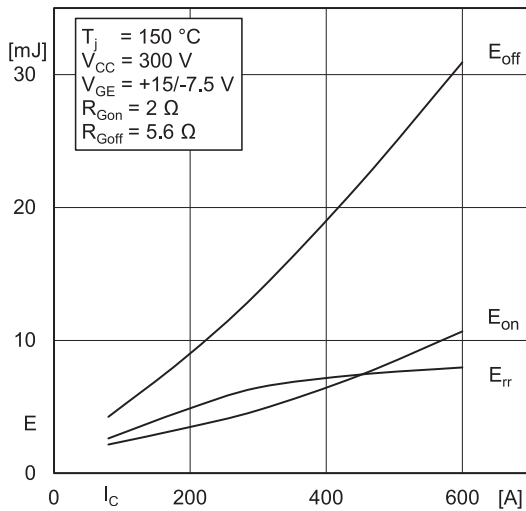


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

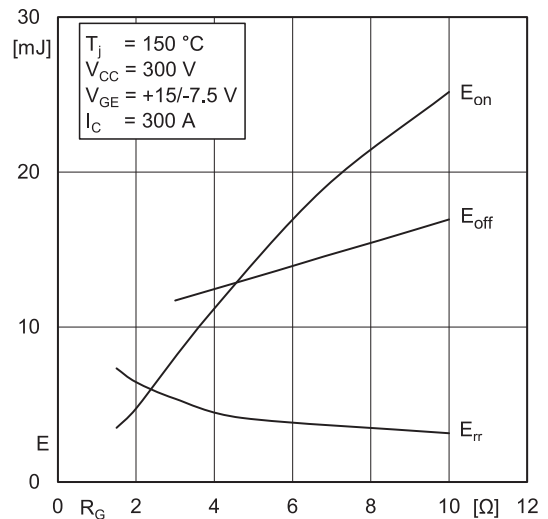


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

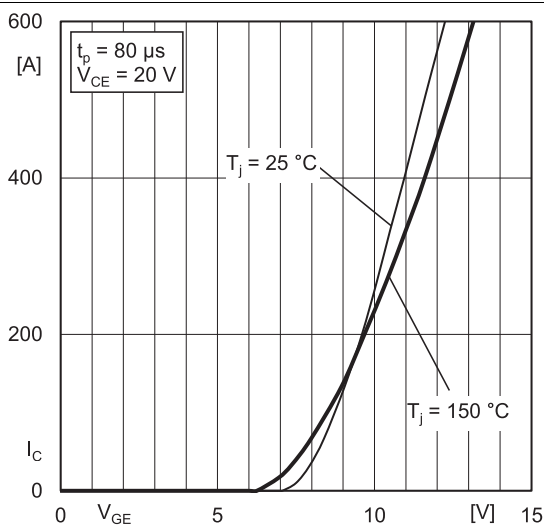


Fig. 5: Typ. transfer characteristic

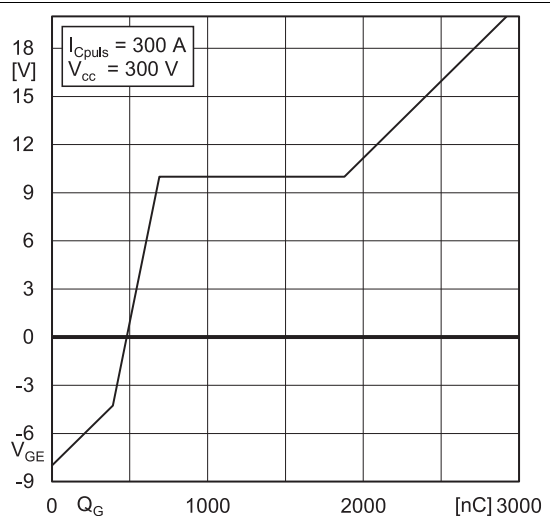


Fig. 6: Typ. gate charge characteristic

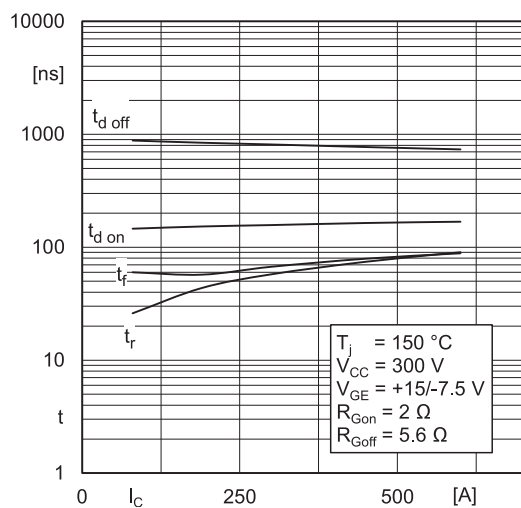


Fig. 7: Typ. switching times vs. I_C

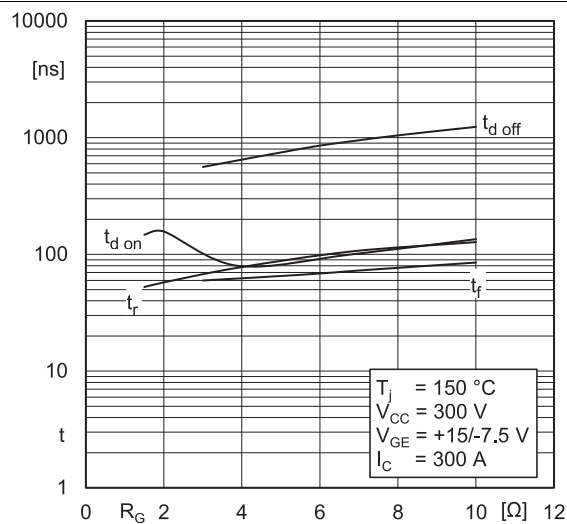


Fig. 8: Typ. switching times vs. gate resistor R_G

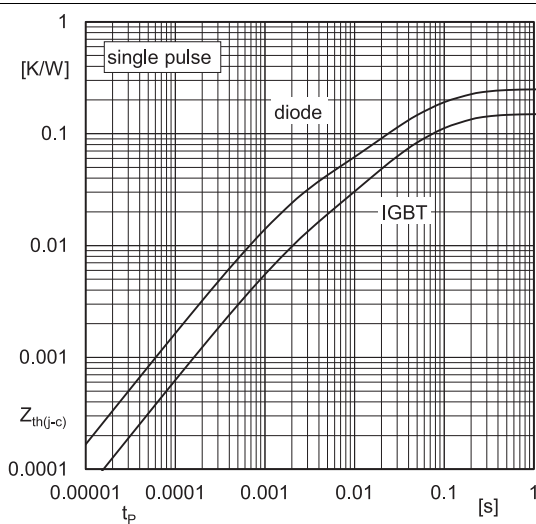


Fig. 9: Transient thermal impedance

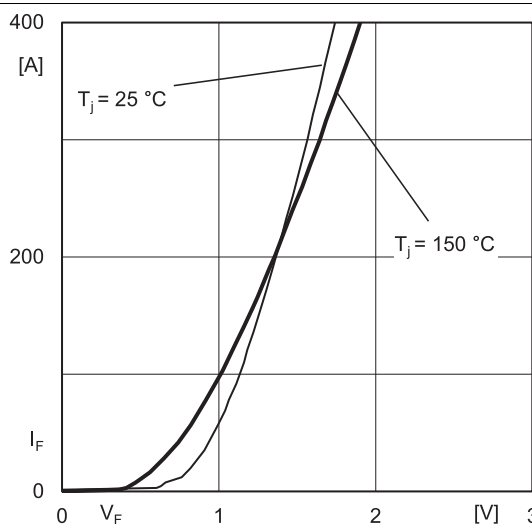


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'}+EE'$

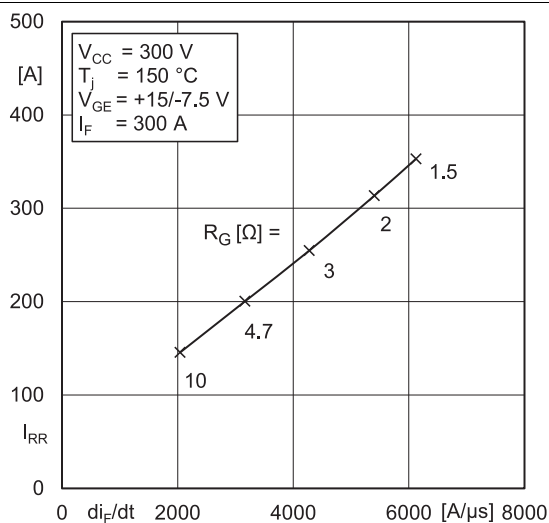


Fig. 11: Typ. CAL diode peak reverse recovery current

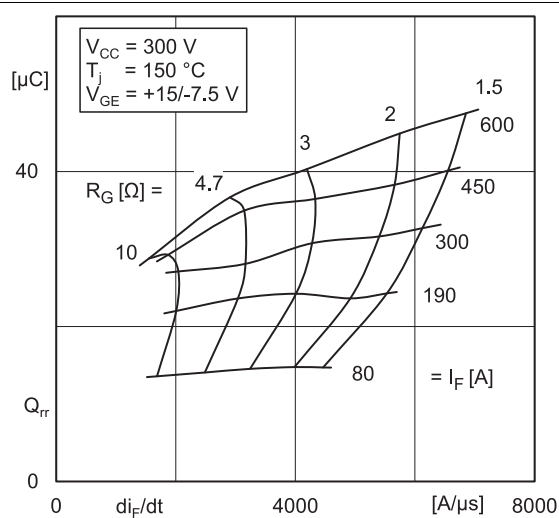
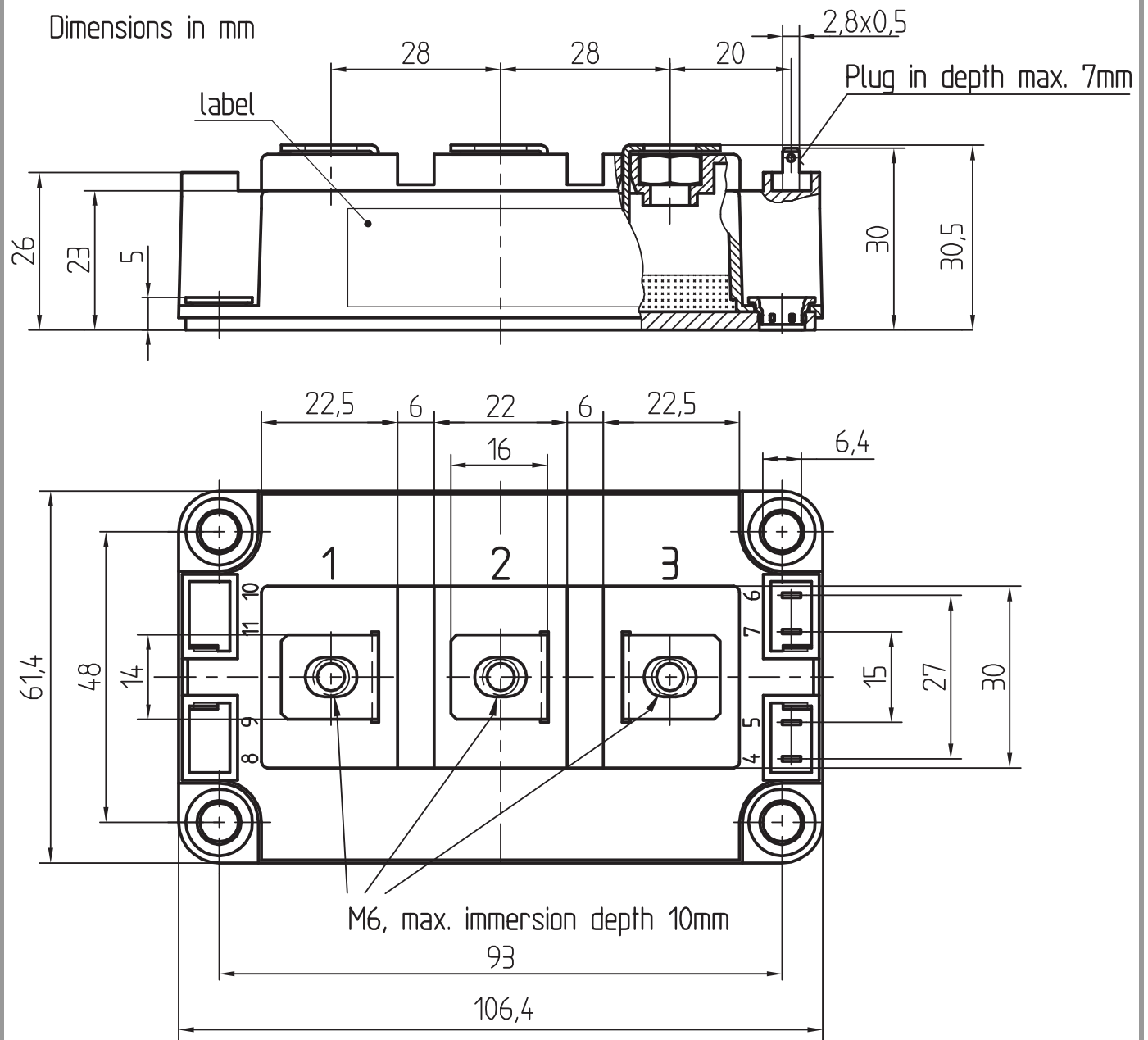
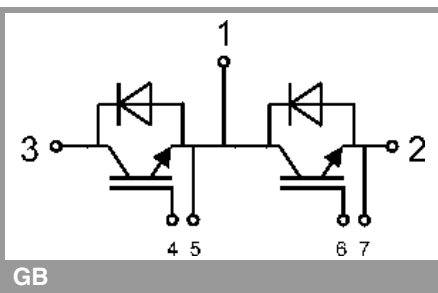


Fig. 12: Typ. CAL diode peak reverse recovery charge



General tolerance $\pm 0,5$ mm

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

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