

SKM150GB17E4GH16



SEMITRANS® 3

IGBT4 Modules

SKM150GB17E4GH16

Features

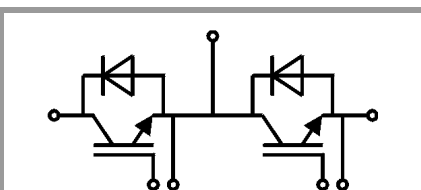
- **H16: IGBT-chip with improved robustness against moisture**
- IGBT4 = 4. generation medium fast trench IGBT (Infineon)
- CAL4 = Soft switching 4. Generation CAL-Diode
- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
- With integrated Gate resistor
- For switching frequencies up to 8kHz
- UL recognized, file no. E63532

Typical Applications*

- Medium voltage inverter market

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 $T_j = 150^\circ\text{C}$



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Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
IGBT			
V_{CES}	$T_j = 25^\circ\text{C}$	1700	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	255
		$T_c = 80^\circ\text{C}$	194
I_{Cnom}		150	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	450	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 1000\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1700\text{ V}$	$T_j = 150^\circ\text{C}$	10
			μs
T_j		-40 ... 175	$^\circ\text{C}$
Inverse diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1700	V
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	163
		$T_c = 80^\circ\text{C}$	121
I_{Fnom}		150	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	300	A
I_{FSM}	$t_p = 10\text{ ms}$, $\sin 180^\circ$, $T_j = 25^\circ\text{C}$	918	A
T_j		-40 ... 175	$^\circ\text{C}$
Module			
$I_t(\text{RMS})$		500	A
T_{stg}		-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					
$V_{CE(\text{sat})}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.96	2.27	V
		$T_j = 150^\circ\text{C}$	2.29	2.54	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	1.10	1.20	V
		$T_j = 150^\circ\text{C}$	1.00	1.10	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	5.7	7.1	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	8.6	9.6	$\text{m}\Omega$
$V_{GE(\text{th})}$	$V_{GE} = V_{CE}$, $I_C = 5.6\text{ mA}$	5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0\text{ V}$, $V_{CE} = 1700\text{ V}$, $T_j = 25^\circ\text{C}$			2.0	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	11.0		nF
C_{oes}		$f = 1\text{ MHz}$	0.46		nF
C_{res}		$f = 1\text{ MHz}$	0.36		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		1200		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		8.0		Ω
$t_{d(\text{on})}$	$V_{CC} = 1200\text{ V}$ $I_C = 150\text{ A}$	$T_j = 150^\circ\text{C}$	290		ns
t_r	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	38		ns
E_{on}	$R_{Gon} = 1\ \Omega$	$T_j = 150^\circ\text{C}$	69		mJ
$t_{d(\text{off})}$	$R_{Goff} = 1\ \Omega$	$T_j = 150^\circ\text{C}$	690		ns
t_f	$di/dt_{on} = 4530\text{ A}/\mu\text{s}$ $di/dt_{off} = 880\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	155		ns
			$du/dt = 4000\text{ V}/\mu\text{s}$		
E_{off}		$T_j = 150^\circ\text{C}$	59		mJ
$R_{th(j-c)}$	per IGBT			0.161	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)		0.064		K/W

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Characteristics							
Symbol	Conditions		min.	typ.	max.	Unit	
Inverse diode							
$V_F = V_{EC}$	$I_F = 150\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.00	2.40	V	
		$T_j = 150^\circ\text{C}$		2.14	2.56	V	
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1.32	1.56	V	
		$T_j = 150^\circ\text{C}$		1.08	1.22	V	
r_F	chipelevel	$T_j = 25^\circ\text{C}$		4.5	5.6	m Ω	
		$T_j = 150^\circ\text{C}$		7.1	9.0	m Ω	
I_{RRM}	$I_F = 150\text{ A}$	$T_j = 150^\circ\text{C}$		185		A	
Q_{rr}	$di/dt_{off} = 4100\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		49		μC	
E_{rr}	$V_{GE} = \pm 15\text{ V}$ $V_{CC} = 1200\text{ V}$	$T_j = 150^\circ\text{C}$		36		mJ	
$R_{th(j-c)}$	per diode				0.356	K/W	
$R_{th(c-s)}$	per diode ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)			0.072		K/W	
Module							
L_{CE}				15		nH	
$R_{CC'+EE'}$	measured per switch	$T_c = 25^\circ\text{C}$		0.55		m Ω	
		$T_c = 125^\circ\text{C}$		0.85		m Ω	
$R_{th(c-s)1}$	calculated without thermal coupling ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)			0.017		K/W	
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)			0.027		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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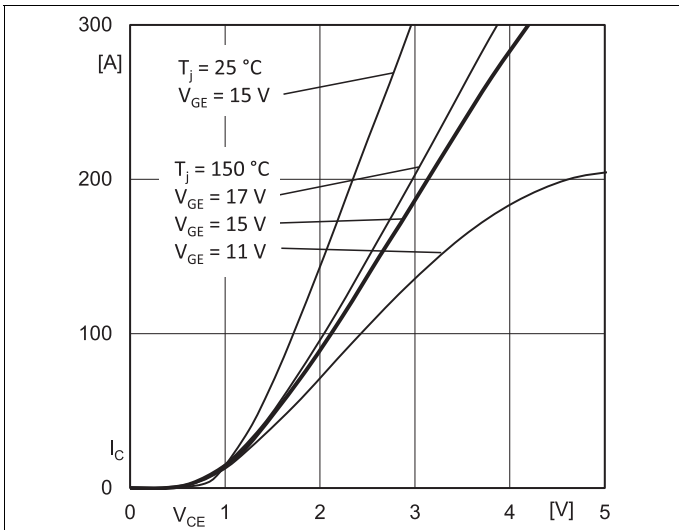


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

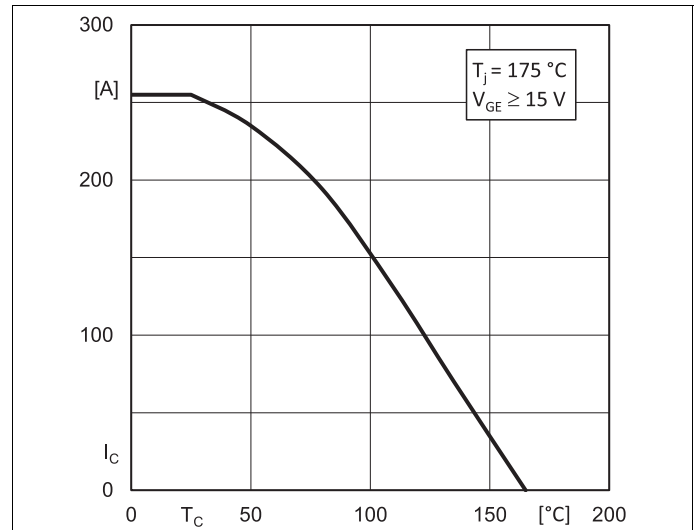


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

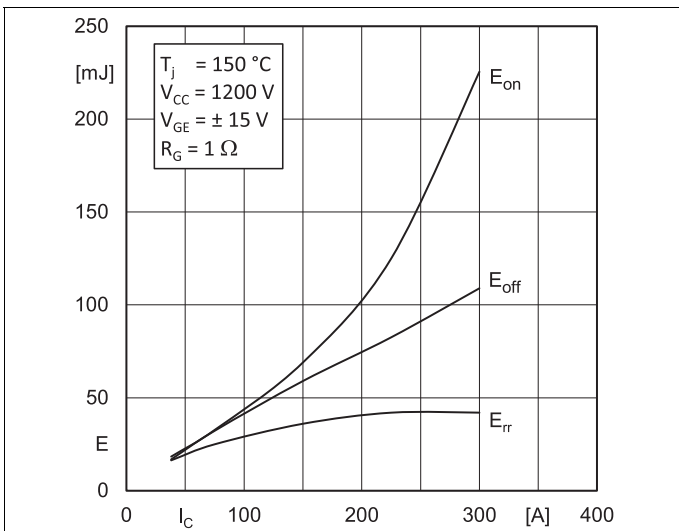


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

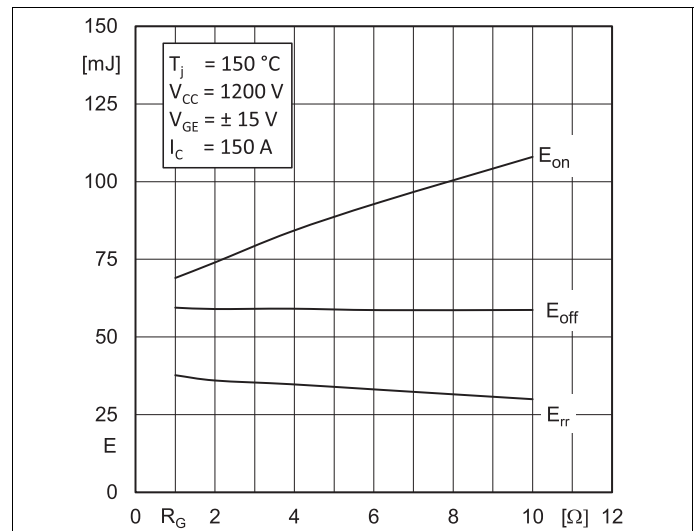


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

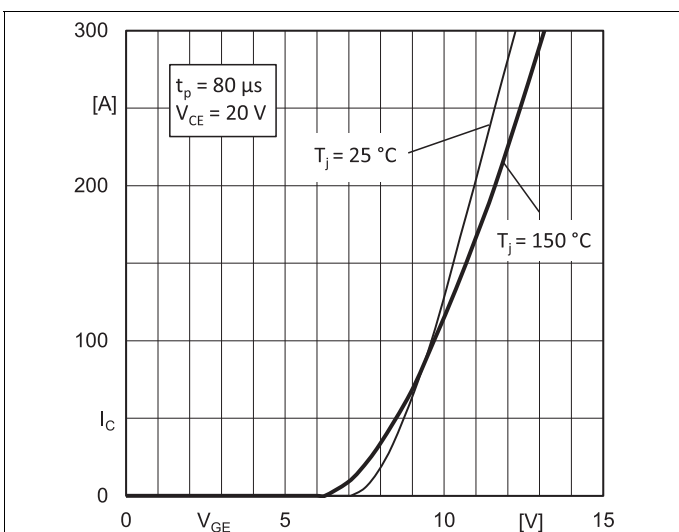


Fig. 5: Typ. transfer characteristic

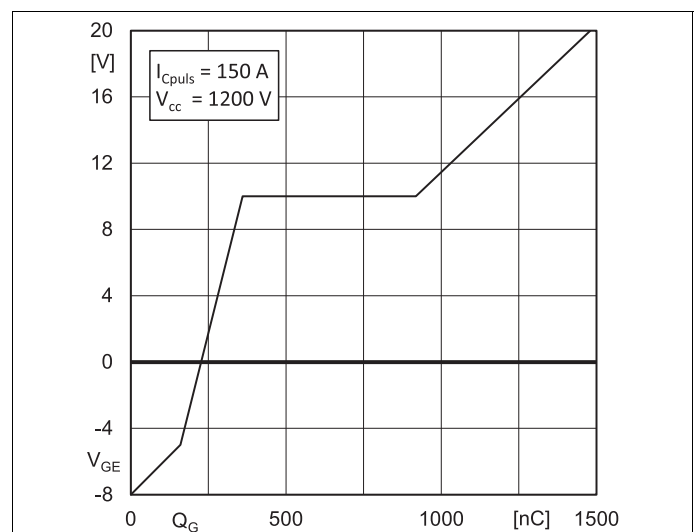


Fig. 6: Typ. gate charge characteristic

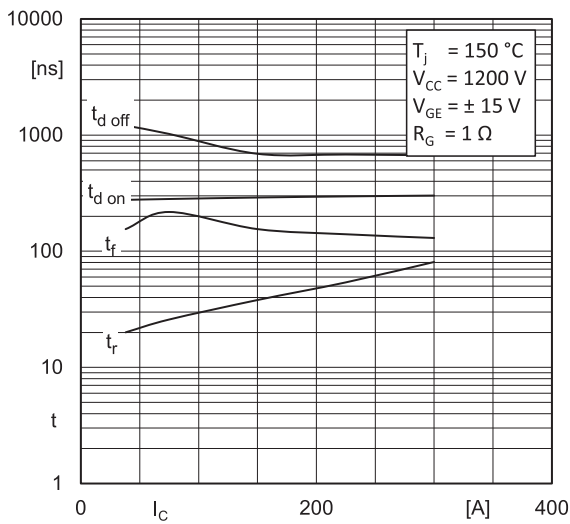


Fig. 7: Typ. switching times vs. I_C

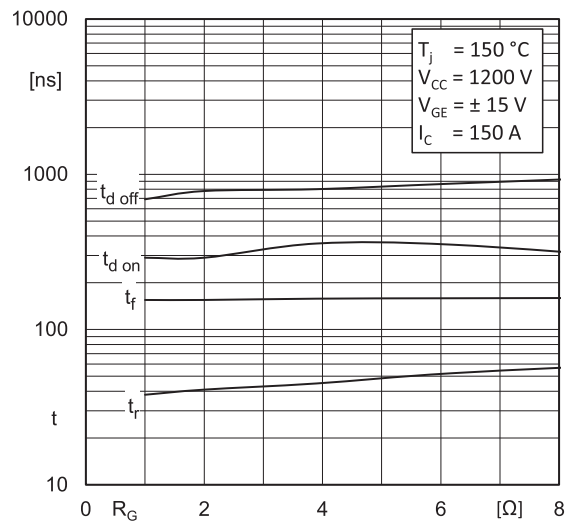


Fig. 8: Typ. switching times vs. gate resistor R_G

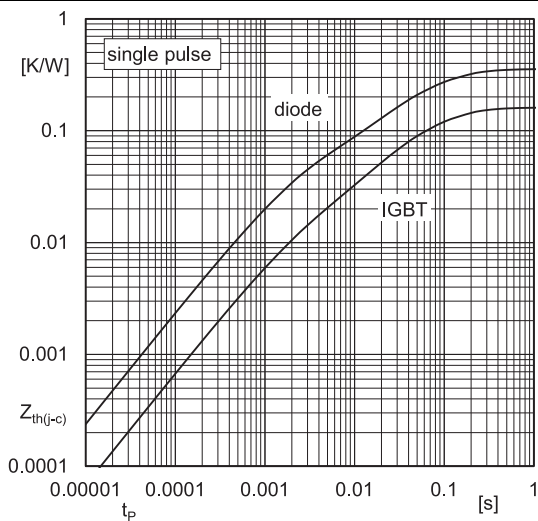


Fig. 9: Transient thermal impedance

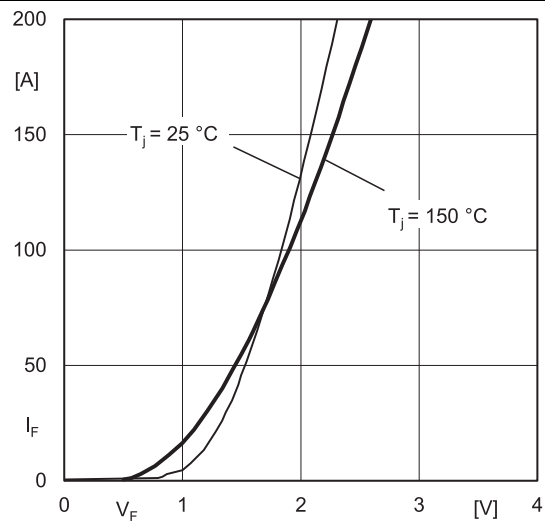


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC+EE'}$

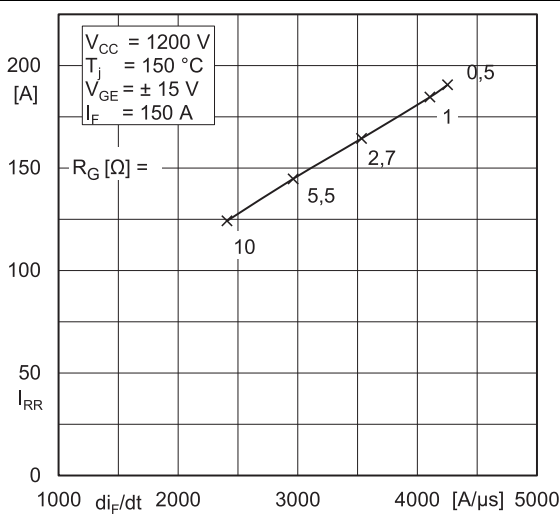


Fig. 11: CAL diode peak reverse recovery current

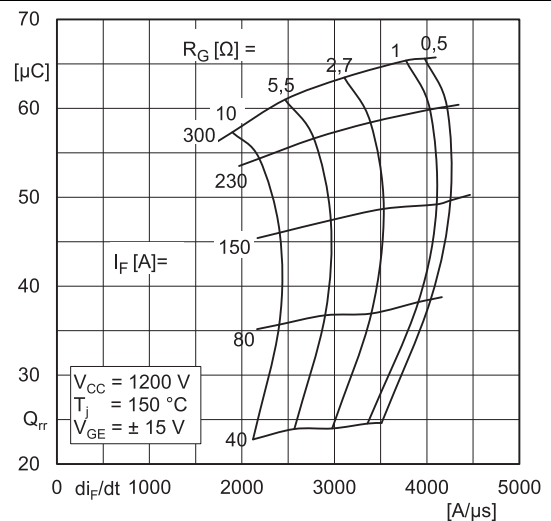
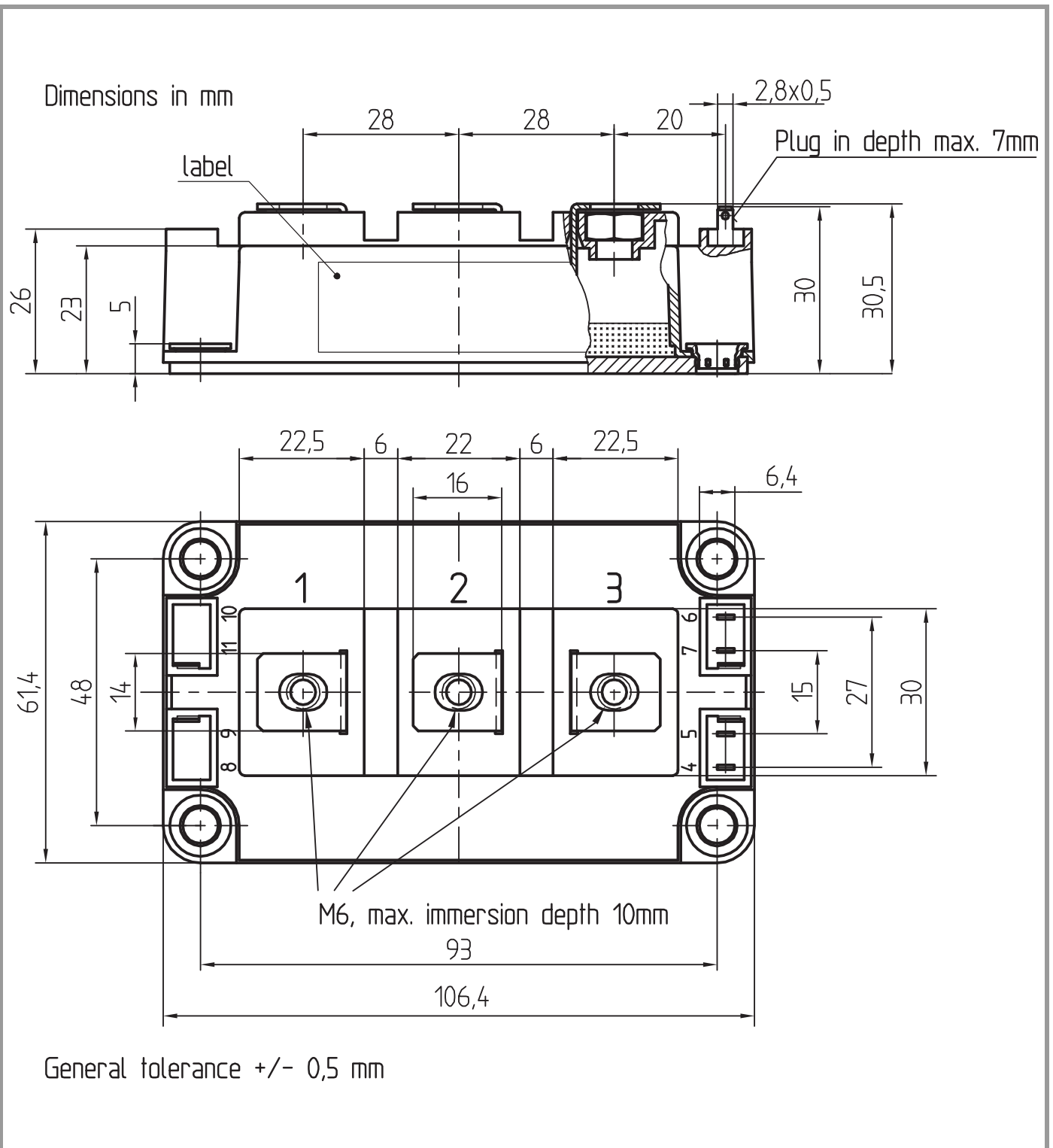
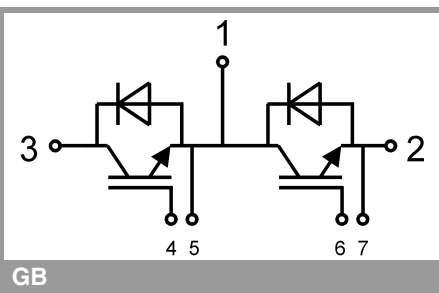


Fig. 12: Typ. CAL diode peak reverse recovery charge

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

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