

SKM600GM12M7



SEMITRANS® 3

IGBT M7 Modules

SKM600GM12M7

Features*

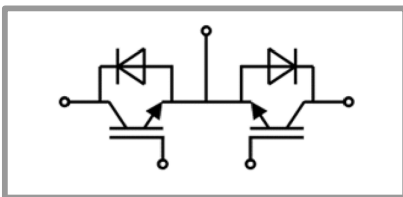
- $V_{CE(sat)}$ with positive temperature coefficient
- High overload capability
- Low loss, high density IGBTs
- Fast & soft switching inverse CAL diodes
- Large clearance (10 mm) and creepage distance (20 mm)
- Insulated copper baseplate using DCB Technology (Direct Copper Bonding)
- With integrated gate resistor

Typical Applications

- Matrix inverter
- Bidirectional switch

Remarks

- Max case temperature limited to $T_c = T_s = 125^\circ\text{C}$
- Product reliability results are valid for $T_j = 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- For storage and case temperature with TIM see document: "Technical Explanations Thermal Interface materials"



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Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
IGBT			
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	779
		$T_c = 80^\circ\text{C}$	591
I_{Cnom}		600	A
I_{CRM}		1200	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	8
T_j			-40 ... 175
Inverse diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	688
		$T_c = 80^\circ\text{C}$	513
I_{FRM}		1200	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	3240	A
T_j			-40 ... 175
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					
$V_{CE(sat)}$	$I_C = 600\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.55	1.88	V
		$T_j = 150^\circ\text{C}$	1.80		V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.87	0.95	V
		$T_j = 150^\circ\text{C}$	0.76		V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.13	1.55	m Ω
		$T_j = 150^\circ\text{C}$	1.73		m Ω
$V_{GE(th)}$	$V_{CE} = 10\text{ V, } I_C = 60\text{ mA}$	5.4	6	6.6	V
I_{CES}	$V_{GE} = 0\text{ V, } V_{CE} = 1200\text{ V, } T_j = 25^\circ\text{C}$			5	mA
C_{ies}	$V_{CE} = 10\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	120		nF
C_{oes}		$f = 1\text{ MHz}$	3.66		nF
C_{res}		$f = 1\text{ MHz}$	1.28		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		5360		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0.8		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 600\text{ A}$ $V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	260		ns
t_r		$T_j = 150^\circ\text{C}$	85		ns
E_{on}	$R_{Gon} = 1.2\ \Omega$	$T_j = 150^\circ\text{C}$	57		mJ
$t_{d(off)}$	$R_{Goff} = 1\ \Omega$	$T_j = 150^\circ\text{C}$	436		ns
t_f	$di/dt_{on} = 8000\text{ A}/\mu\text{s}$ $di/dt_{off} = 5240\text{ A}/\mu\text{s}$ $dv/dt = 5960\text{ V}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	95		ns
E_{off}		$T_j = 150^\circ\text{C}$	68		mJ
$R_{th(j-c)}$	per IGBT			0.066	K/W
$R_{th(c-s)}$	per IGBT, P12 (reference)		0.037		K/W
$R_{th(c-s)}$	per IGBT, HP-PCM		0.02		K/W

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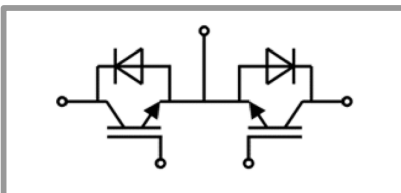
Typical Applications

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Remarks

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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 600\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.14	2.46	V
		$T_j = 150^\circ\text{C}$		2.07		V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90		V
r_F	chipelevel	$T_j = 25^\circ\text{C}$		1.40	1.60	m Ω
		$T_j = 150^\circ\text{C}$		1.95		m Ω
I_{RRM}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		555		A
Q_{rr}	$I_F = 600\text{ A}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		92		μC
E_{rr}	$di/dt_{off} = 8000\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		43		mJ
$R_{th(j-c)}$	per diode				0.09	K/W
$R_{th(c-s)}$	per diode, P12 (reference)			0.038		K/W
$R_{th(c-s)}$	per diode, HP-PCM			0.021		K/W
Module						
L_{CE}				31		nH
R_{CC+EE}	measured per switch	$T_j = 25^\circ\text{C}$		0.55		m Ω
		$T_j = 150^\circ\text{C}$		0.85		m Ω
$R_{th(c-s)1}$	calculated without thermal coupling, P12 (reference)			0.0093		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, P12 (reference)			0.015		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, HP-PCM			0.0078		K/W
M_s	to heat sink M6		3		5	Nm
M_t	to terminal M5		2.5		5	Nm
				-		Nm
w					325	g



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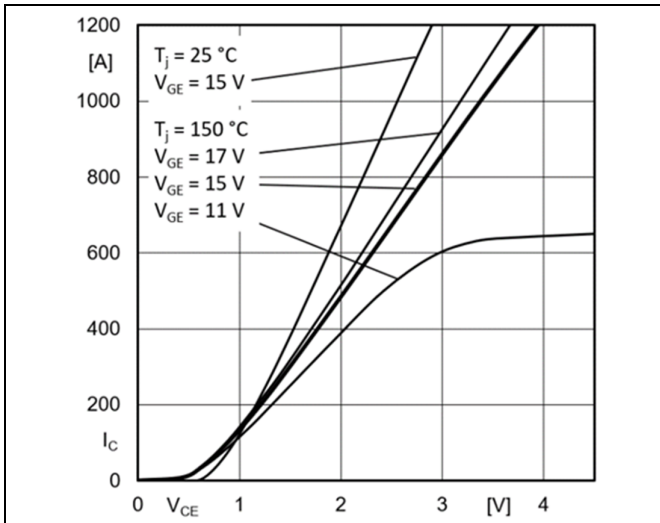


Fig. 1: Typ. output characteristic, inclusive $R_{CC+EE'}$

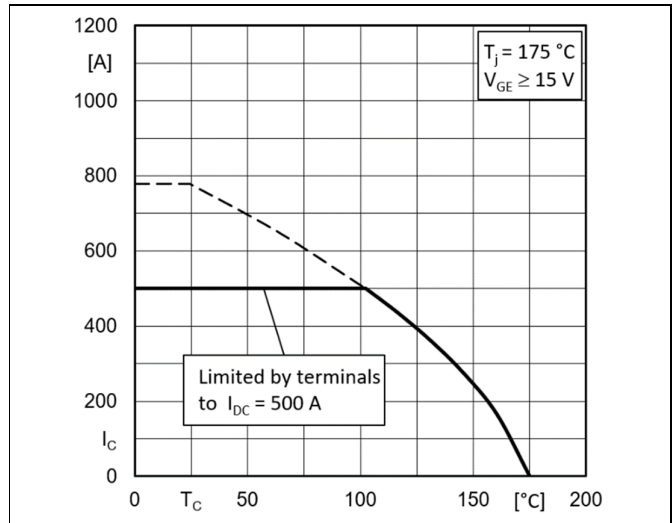


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

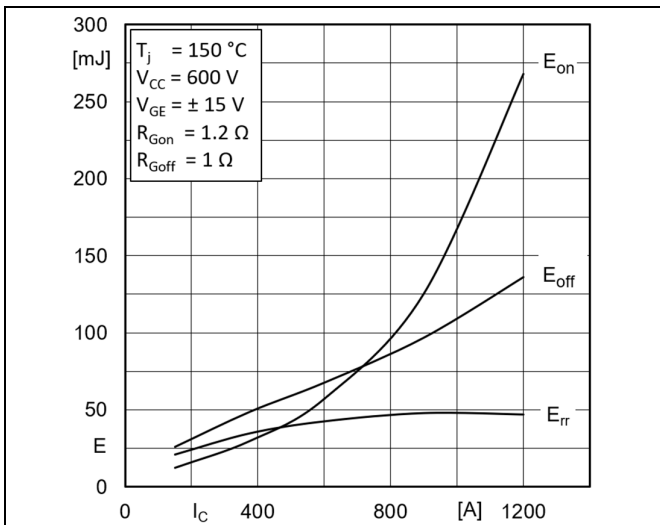


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

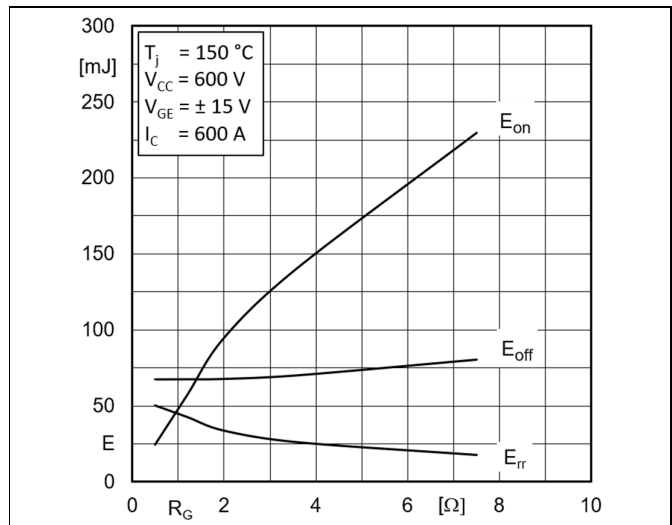


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

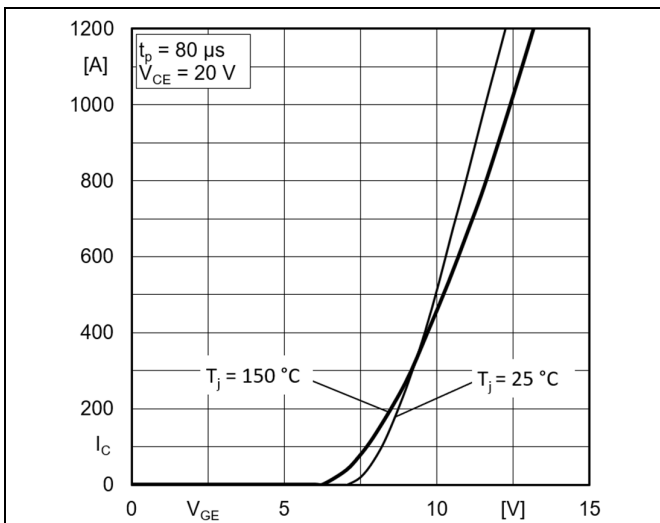


Fig. 5: Typ. transfer characteristic

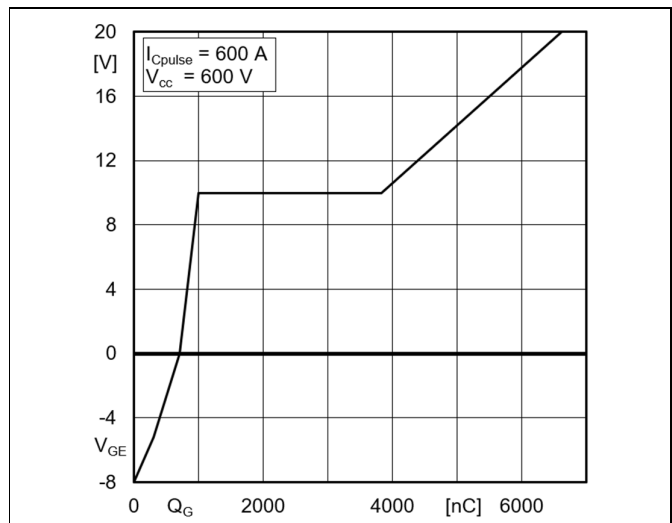


Fig. 6: Typ. gate charge characteristic

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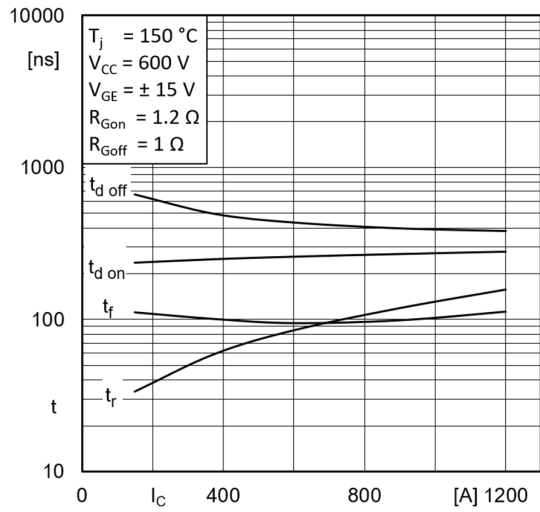


Fig. 7: Typ. switching times vs. I_c

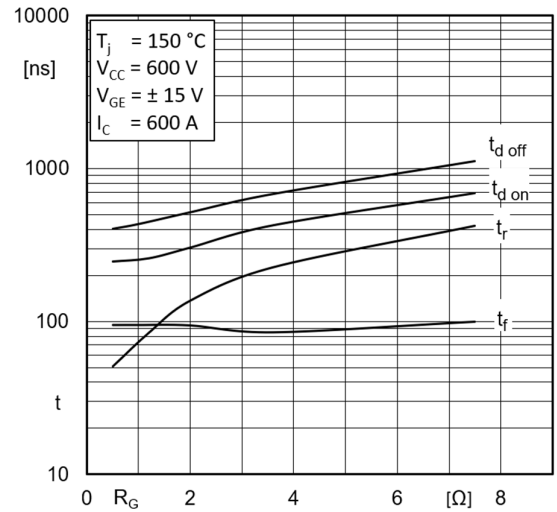


Fig. 8: Typ. switching times vs. gate resistor R_G

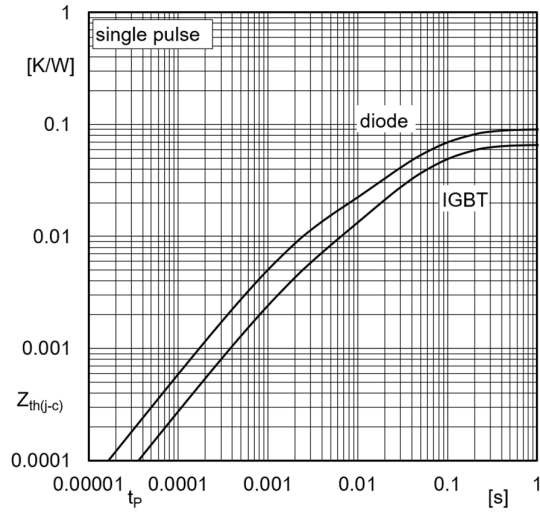


Fig. 9: Transient thermal impedance

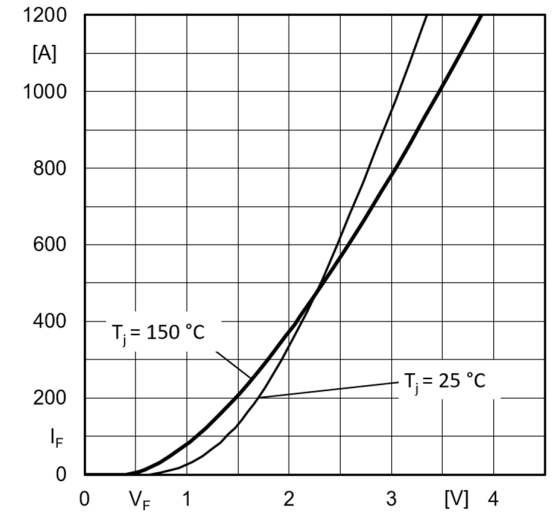


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

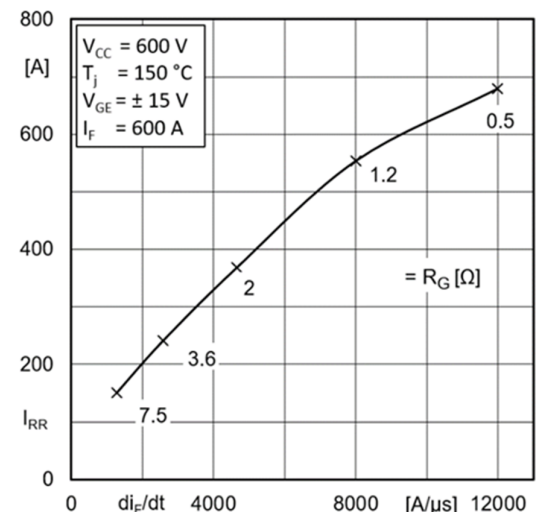


Fig. 11: CAL diode peak reverse recovery current

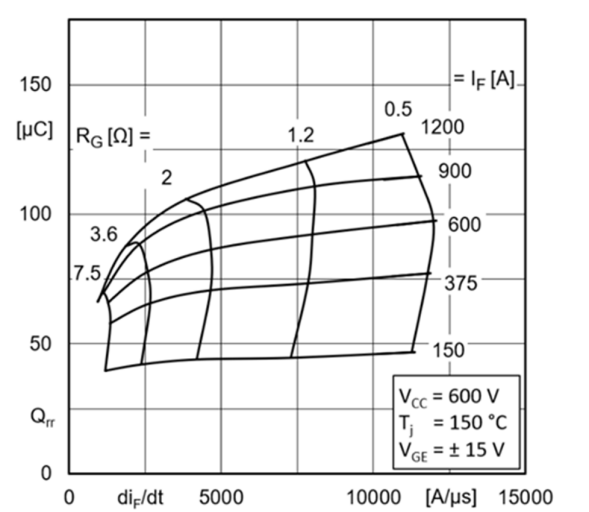
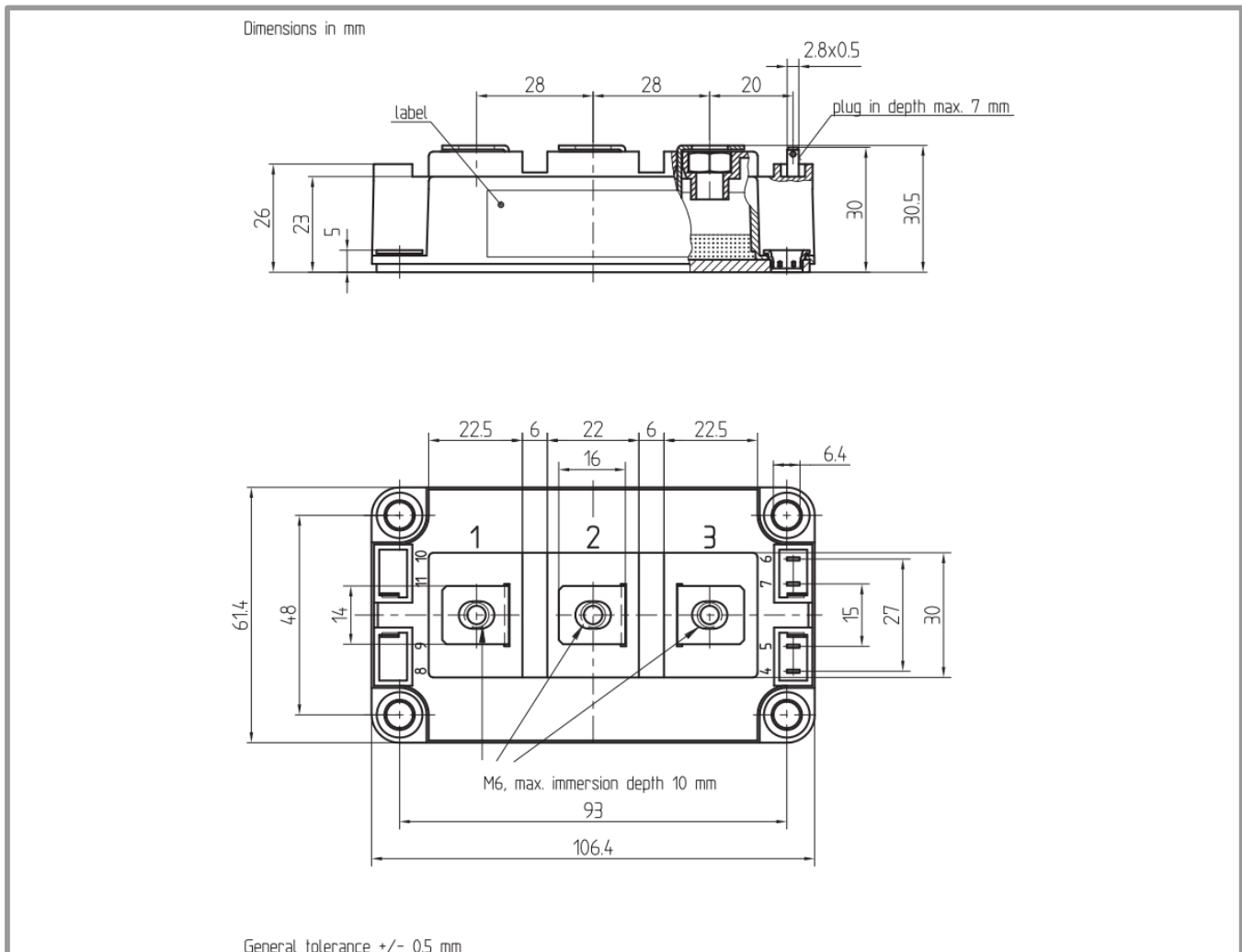
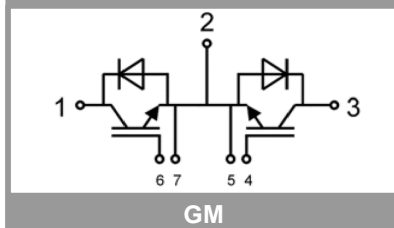


Fig. 12: Typ. CAL diode peak reverse recovery charge



Pinout and Dimensions



This is an electrostatic discharge sensitive device (ESDS) according to international standard IEC 61340.

*IMPORTANT INFORMATION AND WARNINGS

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