

SKM600GM12E4D1



SEMITRANS 3

IGBT4 Modules

SKM600GM12E4D1

Features*

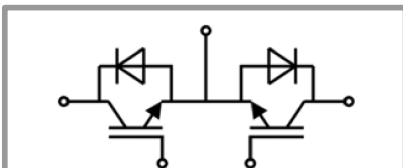
- IGBT4 = 4th generation medium fast trench IGBT (Infineon)
- CAL4HD = 4th generation high density (HD) CAL-diode optimized for low static losses
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Increased power cycling capability
- With integrated gate resistor
- For higher switching frequencies up to 8kHz
- UL recognized, file no. E63532

Typical Applications

- Matrix inverter
- Bidirectional switch

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max, recomm. $T_{op} = -40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ\text{C}$
- Max. operating DC link voltage limited to 800V



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Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V	
I_c	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	860	A
		$T_c = 80^\circ\text{C}$	702	A
I_{Cnom}		600	A	
I_{CRM}		1800	A	
V_{GES}		-20 ... 20	V	
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
T_j		-40 ... 175	$^\circ\text{C}$	
Inverse diode				
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V	
I_F	Continuous DC forward current	600	A	
I_{FRM}		1200	A	
I_{FSM}	10 ms, sin 180°, $T_j = 25^\circ\text{C}$	2736	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Module				
$I_{r(RMS)}$		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	$T_j = 25^\circ\text{C}$	1.80	2.05	V
		$T_j = 150^\circ\text{C}$	2.05	2.42	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V
		$T_j = 150^\circ\text{C}$	0.75	0.80	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.67	1.92	m Ω
		$T_j = 150^\circ\text{C}$	2.2	2.7	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_c = 24\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$, $V_{CE} = 1200\text{ V}$, $T_j = 25^\circ\text{C}$			5	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	37.2		nF
C_{oes}		$f = 1\text{ MHz}$	2.32		nF
C_{res}		$f = 1\text{ MHz}$	2.04		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		3400		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		1.3		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_c = 600\text{ A}$ $V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	175		ns
t_r		$T_j = 150^\circ\text{C}$	75		ns
E_{on}	$R_{Gon} = 1.8\ \Omega$ $R_{Goff} = 1.2\ \Omega$	$T_j = 150^\circ\text{C}$	55		mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$	530		ns
t_f	$di/dt_{on} = 8050\text{ A}/\mu\text{s}$ $di/dt_{off} = 4100\text{ A}/\mu\text{s}$ $dv/dt = 3500\text{ V}/\mu\text{s}$ $L_s = 25\text{ nH}$	$T_j = 150^\circ\text{C}$	120		ns
E_{off}		$T_j = 150^\circ\text{C}$	80		mJ
$R_{th(j-c)}$	per IGBT			0.049	K/W
$R_{th(c-s)}$	per IGBT, ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)		0.032		K/W

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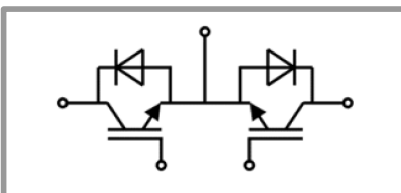
Typical Applications

- Matrix inverter
- Bidirectional switch

Remarks

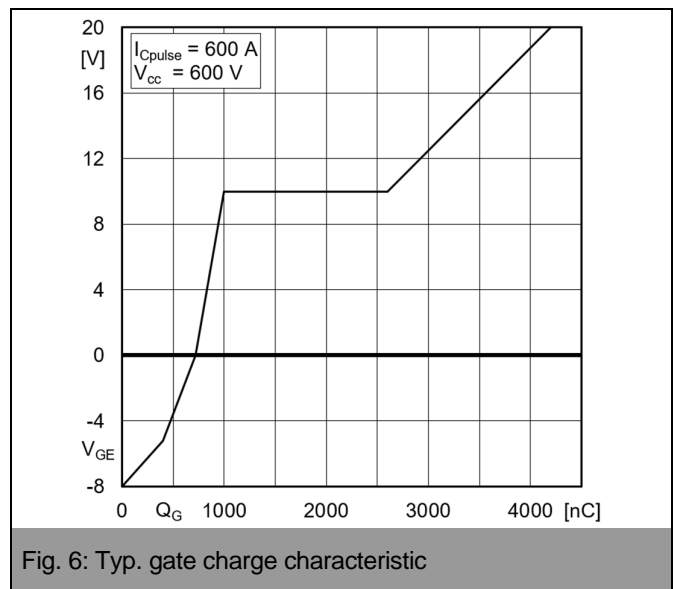
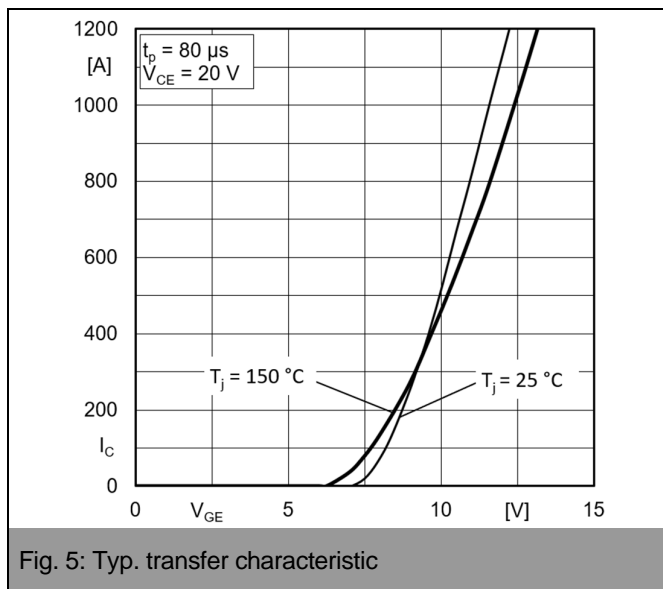
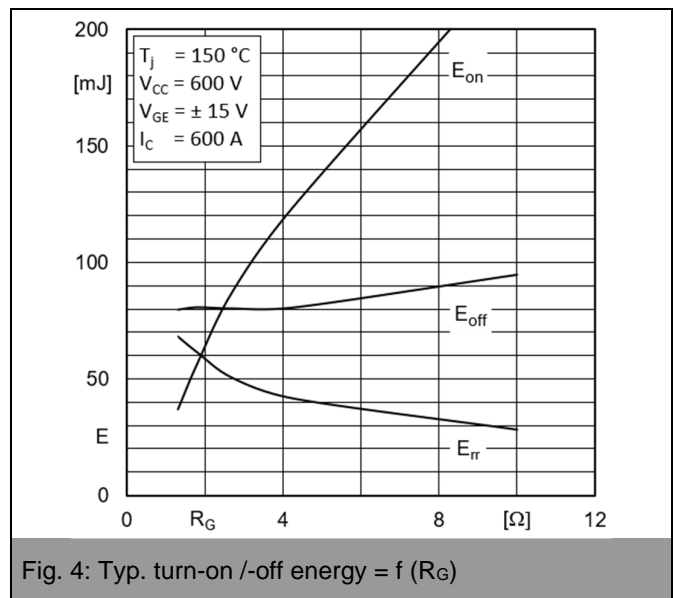
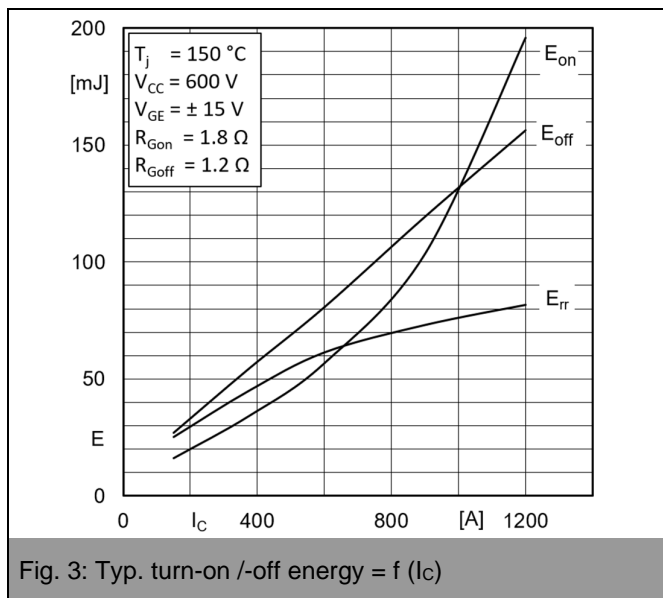
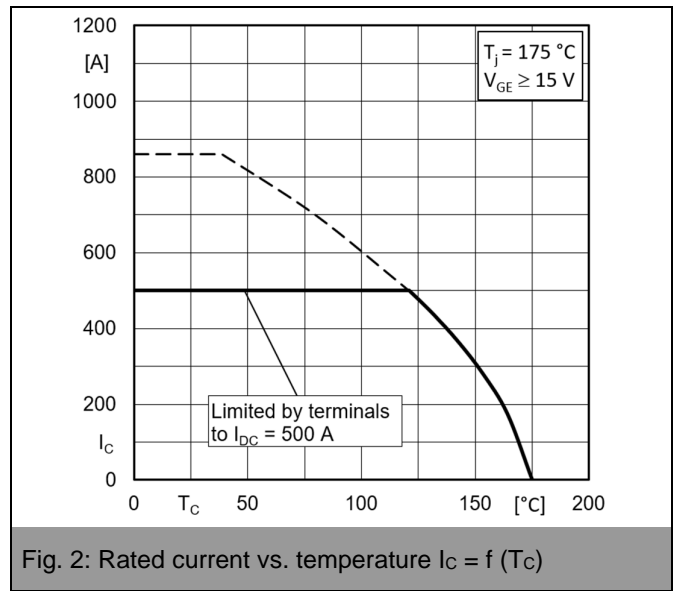
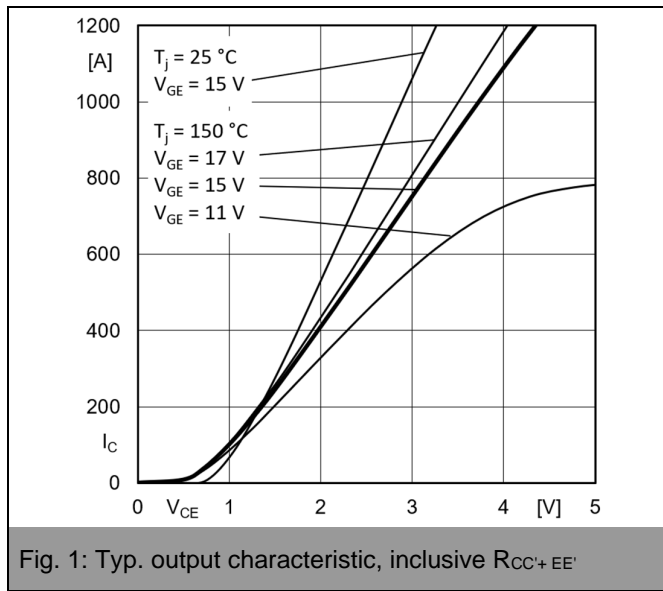
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- Max. operating DC link voltage limited to 800V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 600\text{ A}$ $V_{GE} = 0\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$		1.80	2.13	V
		$T_j = 150^\circ\text{C}$		1.83	2.17	V
V_{F0}	chiplevel	$T_j = 25^\circ\text{C}$		1.19	1.40	V
		$T_j = 150^\circ\text{C}$		0.97	1.10	V
r_F	chiplevel	$T_j = 25^\circ\text{C}$		1.02	1.21	m Ω
		$T_j = 150^\circ\text{C}$		1.44	1.79	m Ω
I_{RRM}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		680		A
Q_{rr}	$I_F = 600\text{ A}$	$T_j = 150^\circ\text{C}$		130		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $di/dt_{off} = 9200\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		60		mJ
$R_{th(j-c)}$	per diode				0.095	K/W
$R_{th(c-s)}$	per diode, ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)			0.039		K/W
Module						
L_{CE}				15		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 ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$)			0.0088		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$)			0.014		K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminal M6	2.5		5	Nm
					-	
w					325	g



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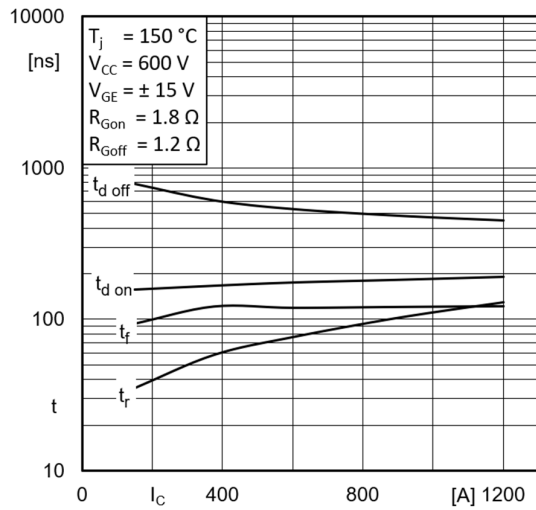


Fig. 7: Typ. switching times vs. I_c

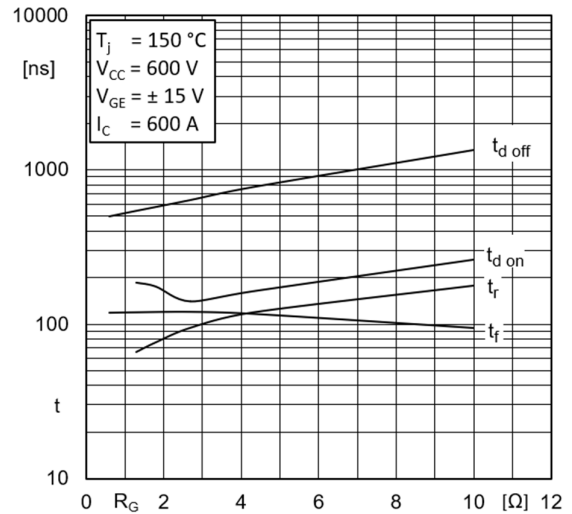


Fig. 8: Typ. switching times vs. gate resistor R_G

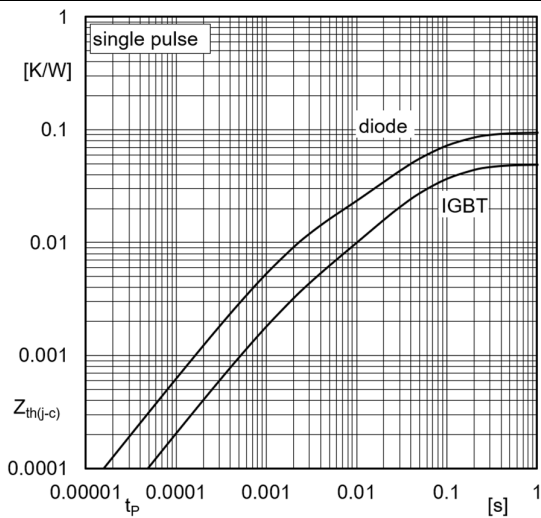


Fig. 9: Transient thermal impedance

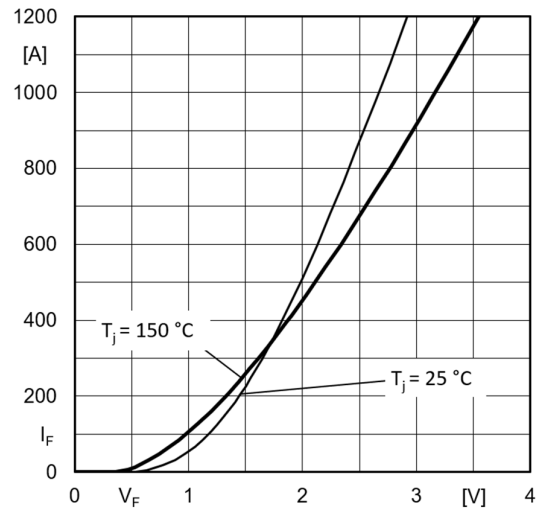


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

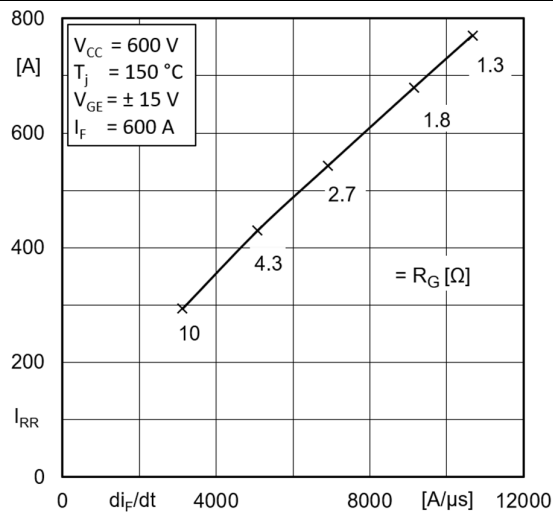


Fig. 11: Typ. CAL diode peak reverse recovery current

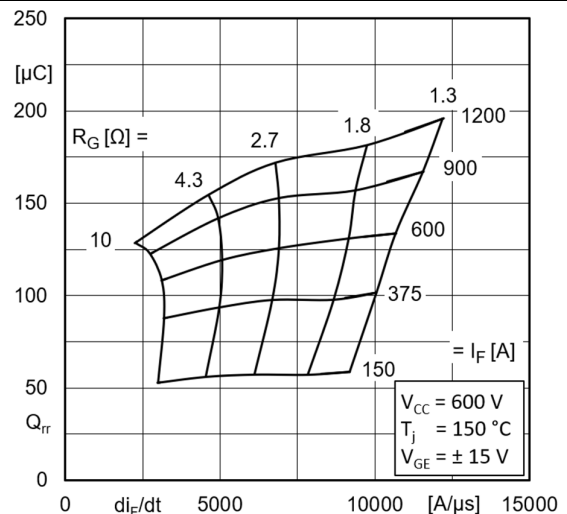
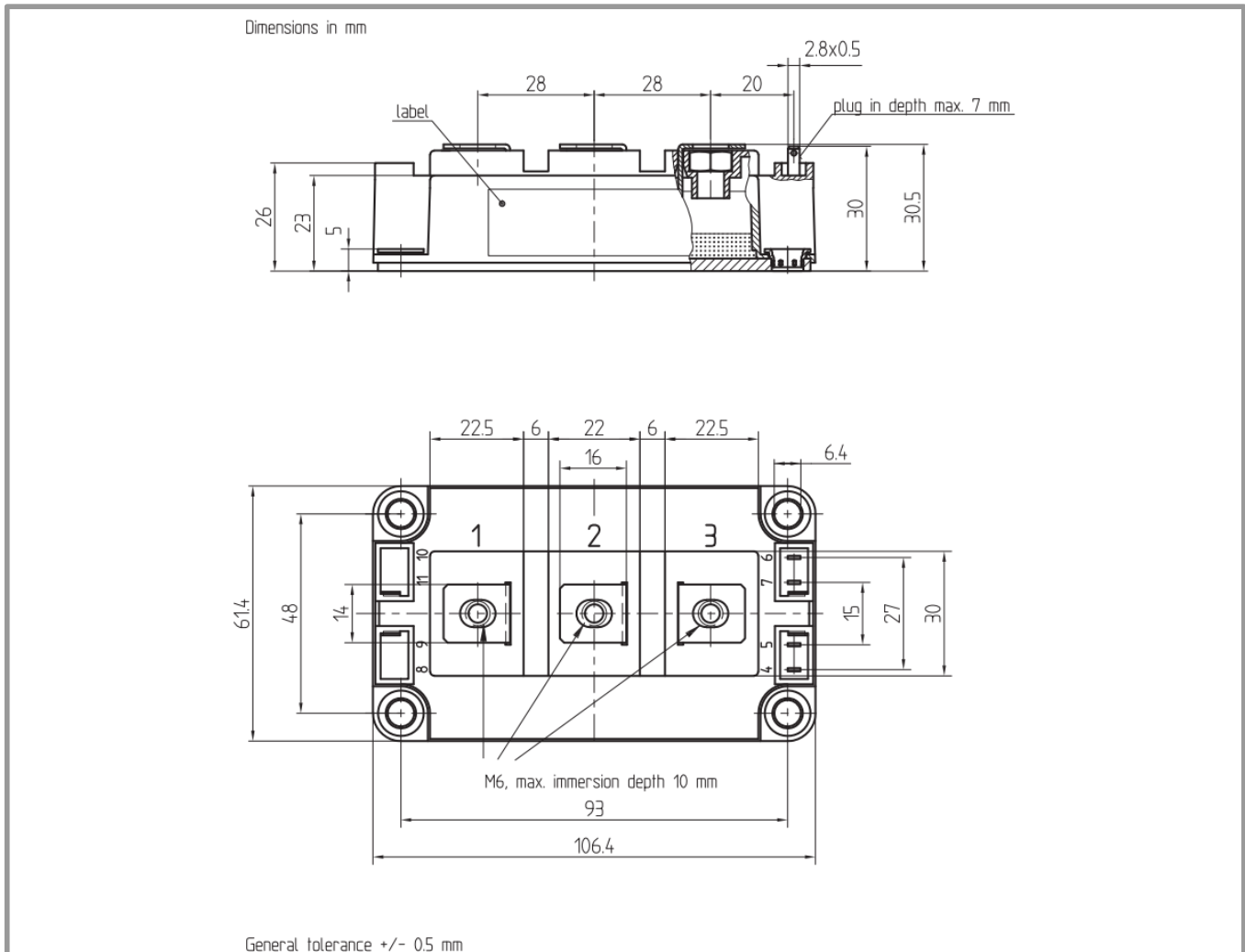
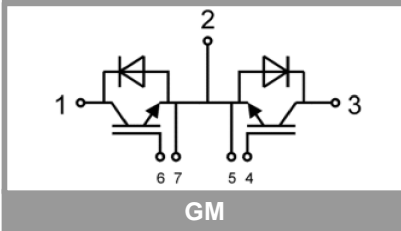


Fig. 12: Typ. CAL diode peak reverse recovery charge

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Pinout and Dimensions



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

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