

SKM350MB120SCH17



SEMITRANS® 3

SiC MOSFET Module

SKM350MB120SCH17

Features*

- Full Silicon Carbide (SiC) power module
- High reliability 2nd Generation SiC MOSFETs
- Optimized for fast switching and lowest power losses
- High humidity robustness (HV-H3TRB proof)
- External SiC Schottky Barrier Diode embedded
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Improved thermal performances with Aluminium Nitride (AlN) substrate
- UL recognized, file no. E63532

Typical Applications

- High frequency power supplies
- AC inverters
- Traction APU
- EV Chargers
- Industrial Test Systems

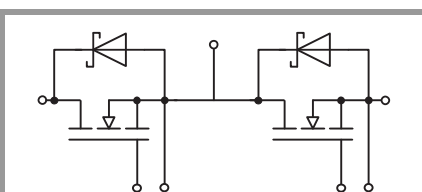
Remarks

- Case temperature limited to $T_C = 125^\circ\text{C}$ max.
- Recommended $T_{\text{job}} = -40 \dots +150^\circ\text{C}$
- Gate-Source SURGE VOLTAGE ($t_{\text{surge}} < 300\text{ns}$), $V_{\text{GS_surge}} = -10\text{V} \dots +26\text{V}$

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
MOSFET				
V_{DSS}			1200	V
I_{D}	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	478	A
		$T_c = 80^\circ\text{C}$	380	A
I_{DM}			1280	A
I_{DRM}			904	A
V_{GS}			-6 ... 22	V
T_j			-40 ... 175	$^\circ\text{C}$
Integrated body diode				
I_{FM}			1280	A
I_{FRM}			904	A

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverse diode				
V_{RRM}	$T_j = 25^\circ\text{C}$		1200	V
I_{F}	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	187	A
		$T_c = 80^\circ\text{C}$	143	A
I_{Fnom}			100	A
I_{FRM}			300	A
I_{FSM}	$t_p = 8.3 \text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$		373	A
T_j			-40 ... 175	$^\circ\text{C}$

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



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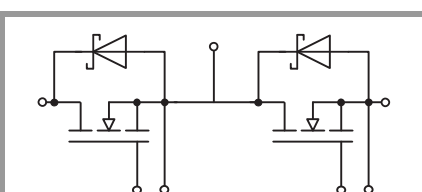
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Characteristics						
Symbol	Conditions	min.	typ.	max.	Unit	
MOSFET						
$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0\text{ V}, I_{\text{D}} = 1\text{ mA}, T_{\text{j}} = 25^\circ\text{C}$	1200			V	
$V_{\text{GS(th)}}$	$V_{\text{DS}} = V_{\text{GS}}, I_{\text{D}} = 71.2\text{ mA}$	1.6		4	V	
I_{DSS}	$V_{\text{GS}} = 0\text{ V}, V_{\text{DS}} = 1200\text{ V}, T_{\text{j}} = 25^\circ\text{C}$			2	mA	
I_{GSS}	$V_{\text{GS}} = 22\text{ V}, V_{\text{DS}} = 0\text{ V}$			800	nA	
$R_{\text{DS(on)}}$	$V_{\text{GS}} = 18\text{ V}$ $I_{\text{D}} = 176\text{ A}$ chipelevel	$T_{\text{j}} = 25^\circ\text{C}$		5.6	7.0	mΩ
		$T_{\text{j}} = 150^\circ\text{C}$			9.5	mΩ
C_{iss}	$V_{\text{GS}} = 0\text{ V}$			34.5	nF	
C_{oss}	$V_{\text{DS}} = 800\text{ V}$			1.10	nF	
C_{rss}	$f = 1\text{ MHz}$			0.15	nF	
R_{Gint}	$T_{\text{j}} = 25^\circ\text{C}$			0.6	Ω	
Q_{G}	$V_{\text{DD}} = 600\text{ V}, V_{\text{GS}} = -5 \dots 20\text{ V}, I_{\text{D}} = 350\text{ A}$			1850	nC	
$t_{\text{d(on)}}$	$V_{\text{DD}} = 600\text{ V}$			64	ns	
t_{r}	$I_{\text{D}} = 175\text{ A}$ $V_{\text{GS}} = -5 \dots 20\text{ V}$	$T_{\text{j}} = 150^\circ\text{C}$		10	ns	
		$T_{\text{j}} = 150^\circ\text{C}$		183	ns	
$t_{\text{d(off)}}$	$R_{\text{Gon}} = 0.5\ \Omega$			33	ns	
t_{f}	$R_{\text{Goff}} = 0.5\ \Omega$			1.69	mJ	
E_{on}	$di/dt_{\text{on}} = 13.5\text{ kA}/\mu\text{s}$			1.31	mJ	
E_{off}	$di/dt_{\text{off}} = 7.1\text{ kA}/\mu\text{s}$ $dv/dt_{\text{on}} = 10.5\text{ kV}/\mu\text{s}$ $dv/dt_{\text{off}} = 28\text{ kV}/\mu\text{s}$	$T_{\text{j}} = 150^\circ\text{C}$				
		$T_{\text{j}} = 150^\circ\text{C}$				
$R_{\text{th(j-c)}}$	per MOSFET			0.055	K/W	
$R_{\text{th(c-s)}}$	per MOSFET ($\lambda_{\text{grease}} = 0.81\text{ W}/(\text{m}^*\text{K})$)			0.03	K/W	

Characteristics						
Symbol	Conditions	min.	typ.	max.	Unit	
Inverse diode						
$V_{\text{F}} = V_{\text{EC}}$	$I_{\text{F}} = 100\text{ A}$ chipelevel	$T_{\text{j}} = 25^\circ\text{C}$		1.40	1.60	V
		$T_{\text{j}} = 150^\circ\text{C}$		1.80	2.10	V
V_{F0}	chipelevel	$T_{\text{j}} = 25^\circ\text{C}$		0.95	1.05	V
		$T_{\text{j}} = 150^\circ\text{C}$		0.80	0.90	V
r_{F}	chipelevel	$T_{\text{j}} = 25^\circ\text{C}$		4.5	5.5	mΩ
		$T_{\text{j}} = 150^\circ\text{C}$		10.0	12	mΩ
C_{j}	parallel to C_{oss} , $f = 1\text{ MHz}, V_{\text{R}} = 800\text{ V}, T_{\text{j}} = 25^\circ\text{C}$			0.42	nF	
Q_{c}	$V_{\text{R}} = 800\text{ V}, di/dt_{\text{off}} = 500\text{ A}/\mu\text{s}, T_{\text{j}} = 25^\circ\text{C}$			0.33	μC	
$R_{\text{th(j-c)}}$	per diode			0.24	K/W	
$R_{\text{th(c-s)}}$	per diode ($\lambda_{\text{grease}} = 0.81\text{ W}/(\text{m}^*\text{K})$)			0.076	K/W	

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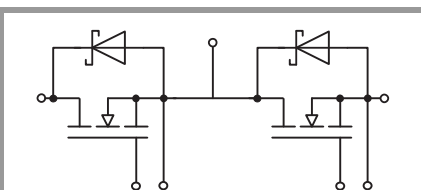
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Module						
L_{DS}				15		nH
$R_{\text{DD'+SS'}}$	measured per switch	$T_C = 25^\circ\text{C}$		0.55		mΩ
		$T_C = 125^\circ\text{C}$		0.85		mΩ
$R_{\text{th(c-s)1}}$	calculated without thermal coupling ($\lambda_{\text{grease}}=0.81 \text{ W}/(\text{m}^2\text{K})$)			0.011		K/W
$R_{\text{th(c-s)2}}$	including thermal coupling, T_s underneath module ($\lambda_{\text{grease}}=0.81 \text{ W}/(\text{m}^2\text{K})$)			0.015		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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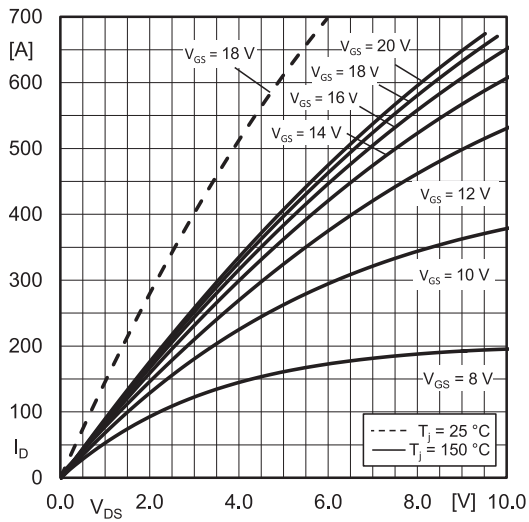


Fig. 1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS}$

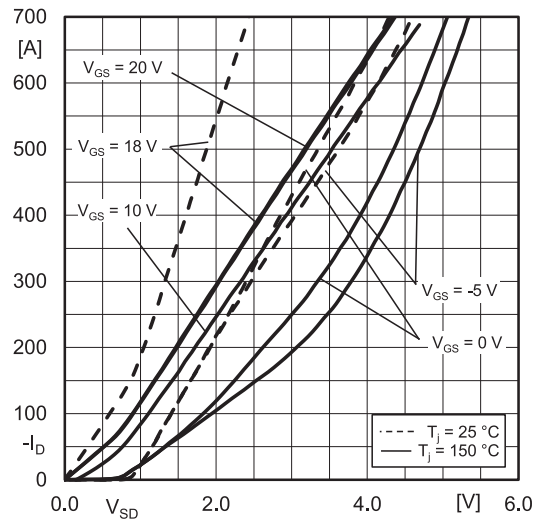


Fig. 2: Typ. reverse output characteristic, incl. $R_{DD'+SS}$

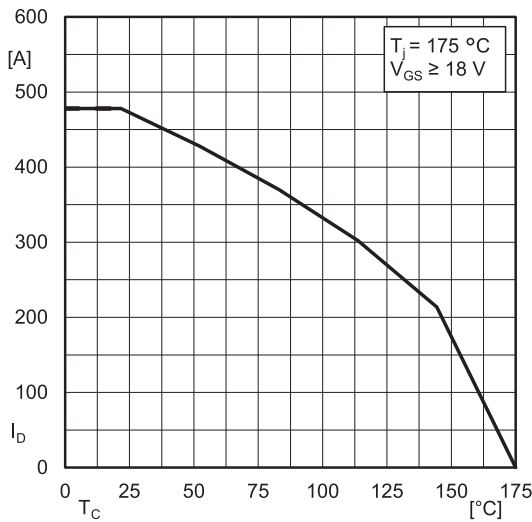


Fig. 3: Rated current vs. temperature $I_D = f(T_C)$

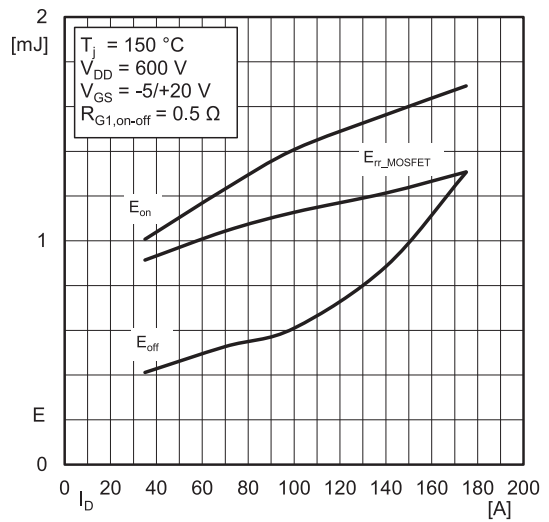


Fig. 4: Typ. switching energy $E = f(I_D)$ at R_{G1}

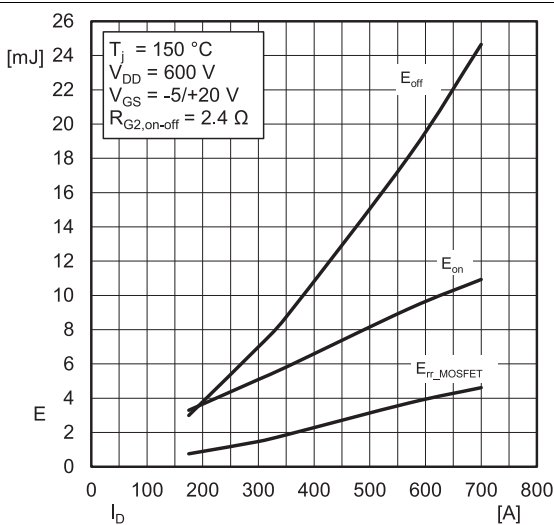


Fig. 5: Typ. switching energy $E = f(I_D)$ at R_{G2}

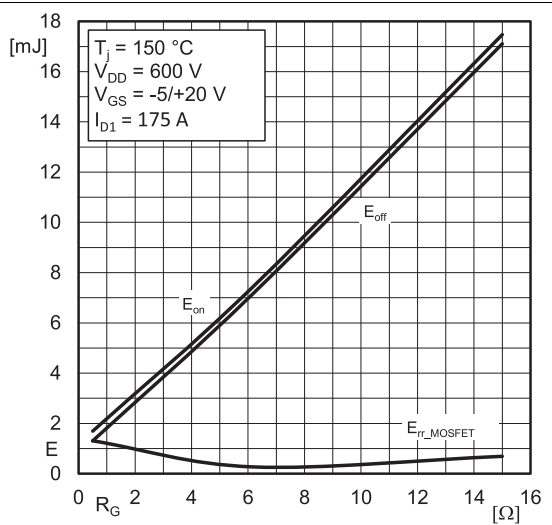


Fig. 6: Typ. switching energy $E = f(R_G)$ at I_{D1}

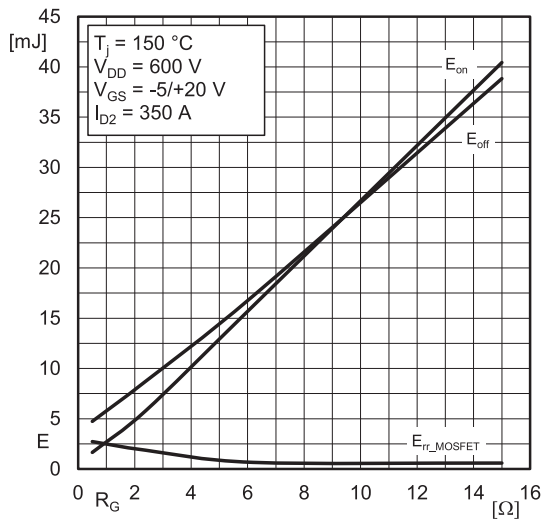


Fig. 7: Typ. switching energy $E = f (R_G)$ at I_{D2}

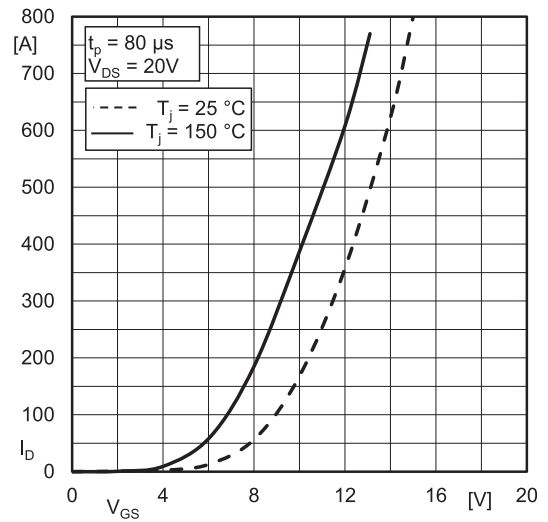


Fig. 8: Typ. MOSFET transfer characteristic

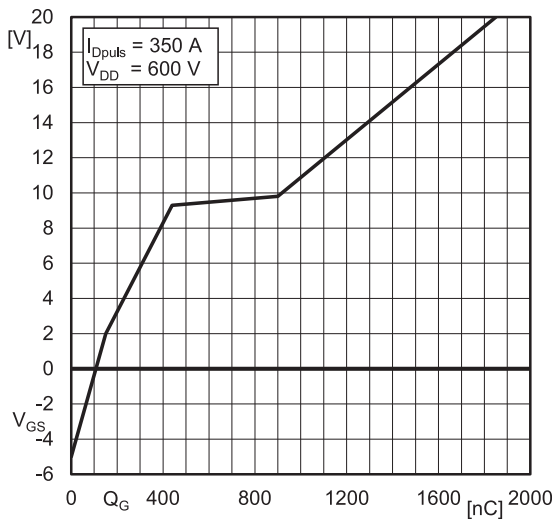


Fig. 9: Typ. gate charge characteristic

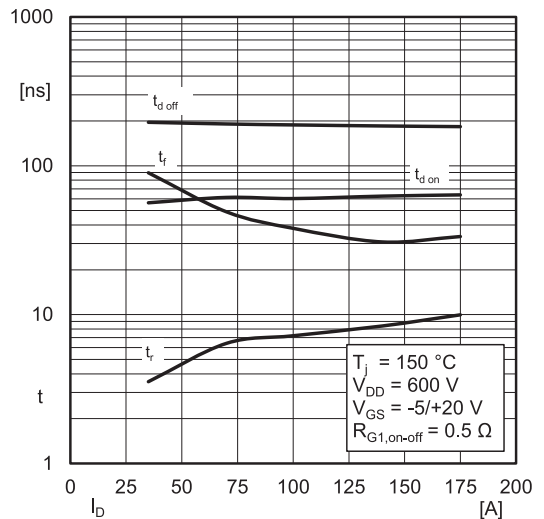


Fig. 10: Typ. switching times $t = f (I_D)$ at R_{G1}

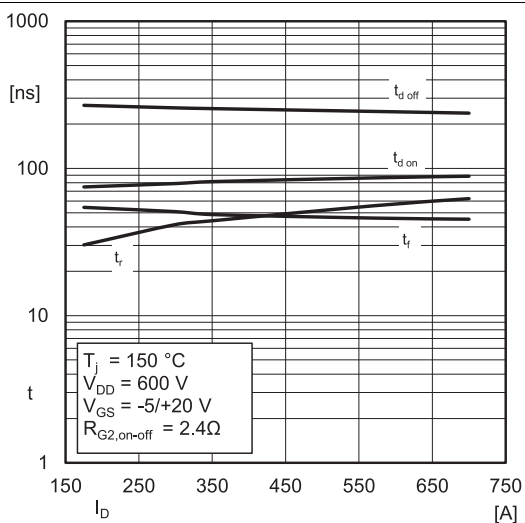


Fig. 11: Typ. switching times $t = f (I_D)$ at R_{G2}

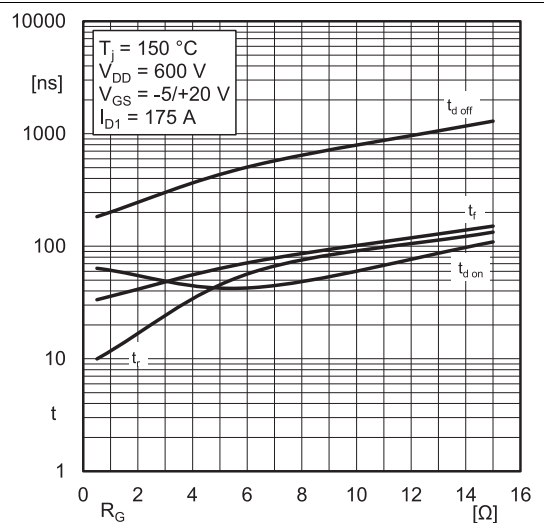


Fig. 12: Typ. switching times $t = f (R_G)$ at I_{D1}

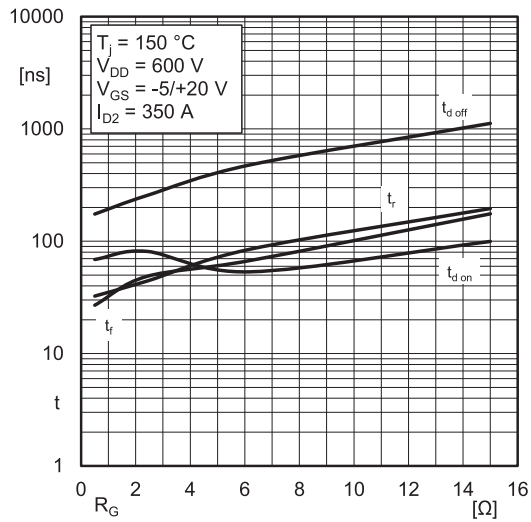


Fig. 13: Typ. switching times $t = f(R_G)$ at I_{D2}

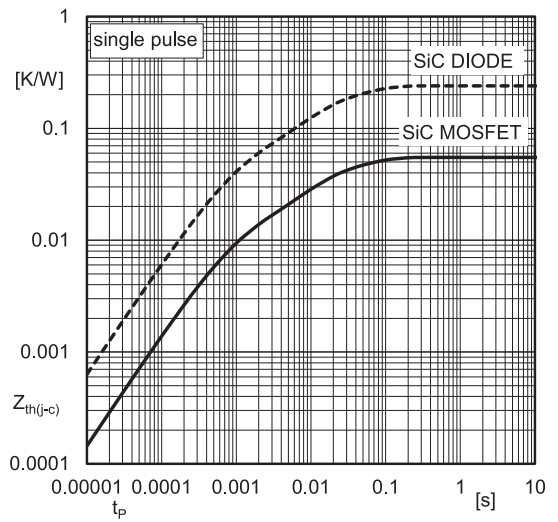


Fig. 14: Transient thermal impedance

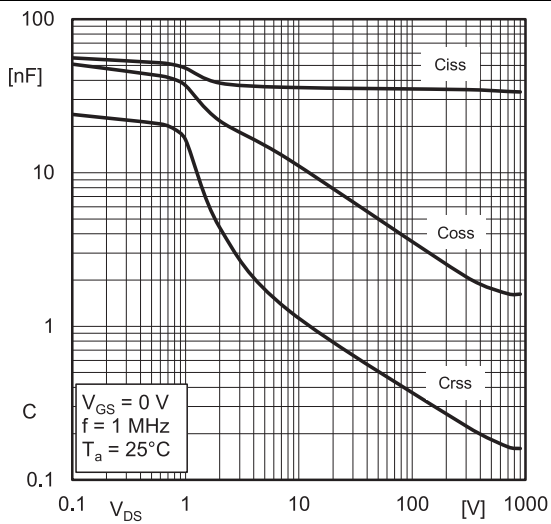
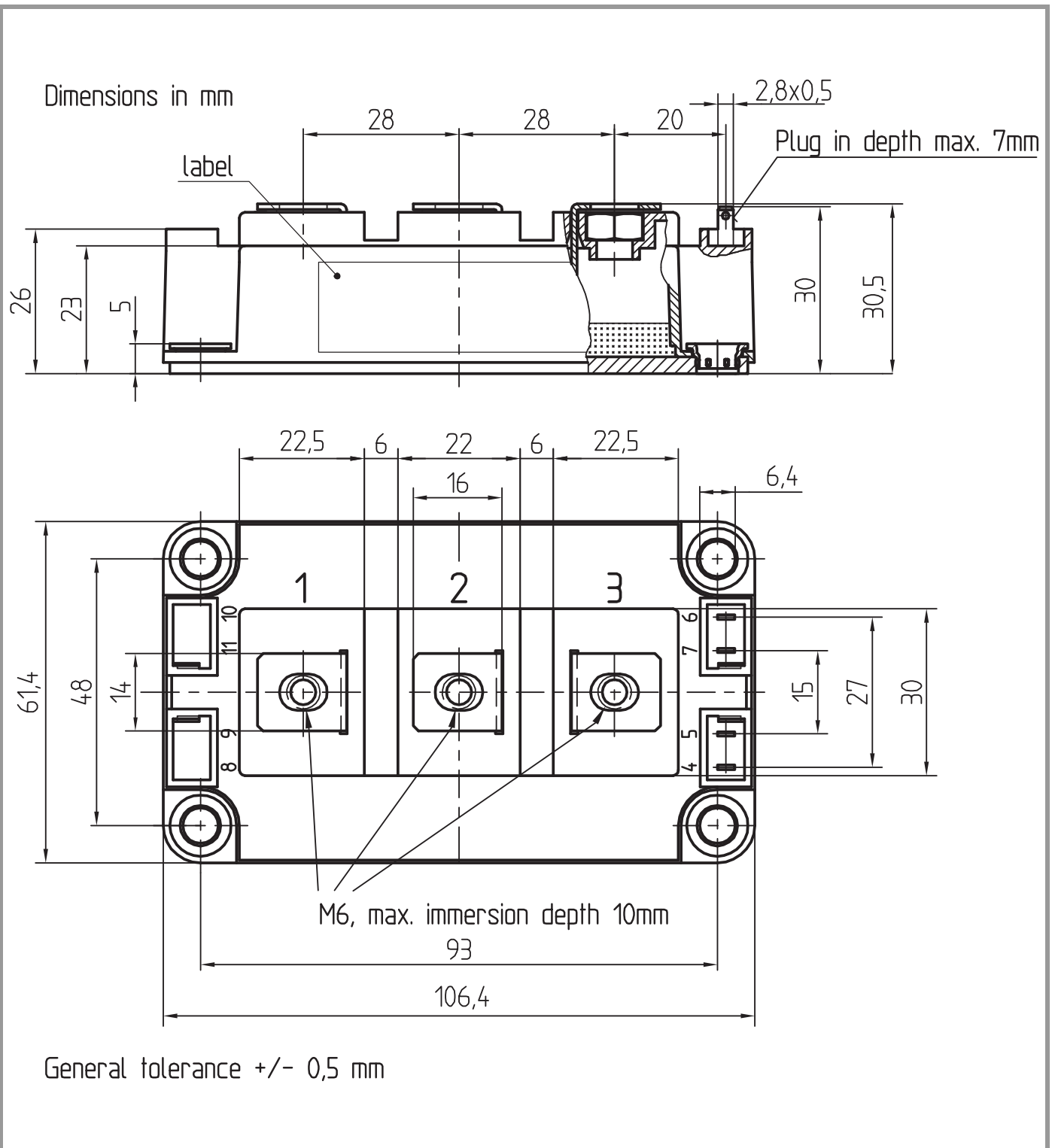
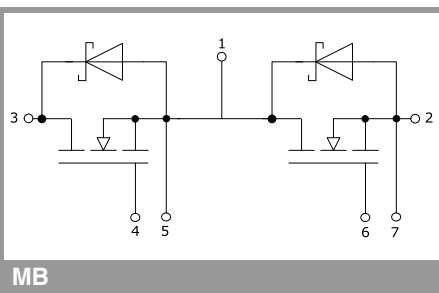


Fig. 19: Capacitances vs. drain-source voltage

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

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