SEMITRANS® 3

SiC MOSFET Module

SKM350MB120SCH17

Features*

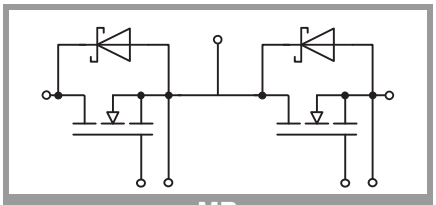
- Full Silicon Carbide (SiC) power module
- High reliability 2nd Generation SiC MOSFETs
- Optimized for fast switching and lowest power losses
- High humidity robustness (HV-H3TRB proof)
- External SiC Schottky Barrier Diode embedded
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- 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°C max.
- Recommended T_{jop} = -40 ... +150°C
- Gate-Source SURGE VOLTAGE (t_{surge}<300ns), V_{GS_surge} = -10V ... +26V



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
MOSFET				
V_{DSS}			1200	V
I_D	T_j = 175 °C	T_c = 25 °C	478	A
		T_c = 80 °C	380	A
I_{DM}			1280	A
I_{DRM}			904	A
V_{GS}			-6 ... 22	V
T_j			-40 ... 175	°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 °C		1200	V
I_F	T_j = 175 °C	T_c = 25 °C	187	A
		T_c = 80 °C	143	A
I_{Fnom}			100	A
I_{FRM}			300	A
I_{FSM}	t_p = 8.3 ms, sin 180°, T_j = 25 °C		373	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings

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

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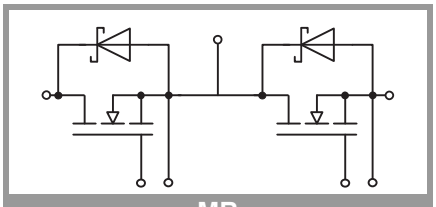

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Characteristics

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

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	I_F = 100 A	T_j = 25 °C		1.40	1.60	V
	chiplevel	T_j = 150 °C		1.80	2.10	V
V_{F0}	chiplevel	T_j = 25 °C		0.95	1.05	V
		T_j = 150 °C		0.80	0.90	V
r_F	chiplevel	T_j = 25 °C		4.5	5.5	mΩ
		T_j = 150 °C		10.0	12	mΩ
C_j	parallel to C_{oss}, f = 1 MHz, V_R = 800 V, T_j = 25 °C			0.42		nF
Q_c	V_R = 800 V, di/dt_{off} = 500 A/µs, T_j = 25 °C			0.33		µC
$R_{th(j-c)}$	per diode				0.24	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(m*K))			0.076		K/W

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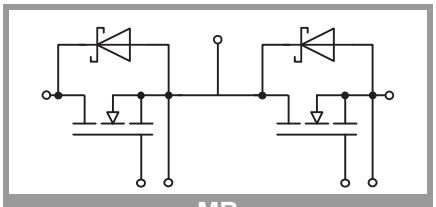

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Module						
L_{DS}				15		nH
$R_{DD'+SS'}$	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 (λ_{grease}=0.81 W/(m*K))			0.011		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module (λ_{grease}=0.81 W/(m*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

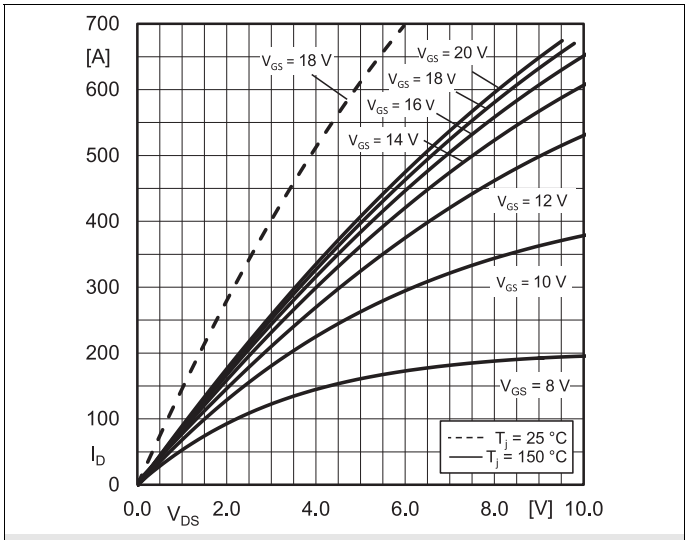


Fig.1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS'}$

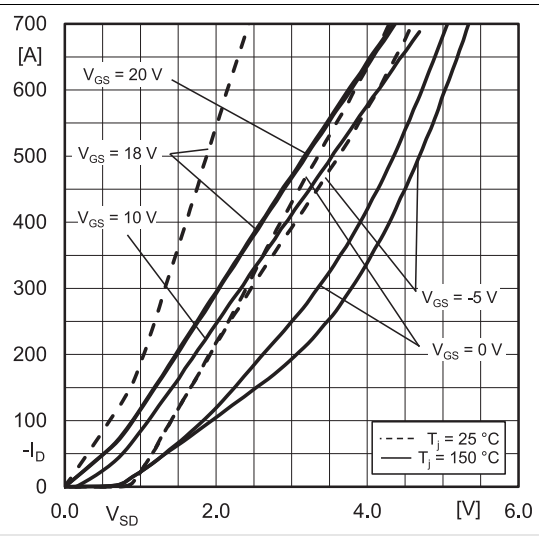


Fig. 2: Typ. reverse output characteristic, incl. $R_{DD'+SS'}$

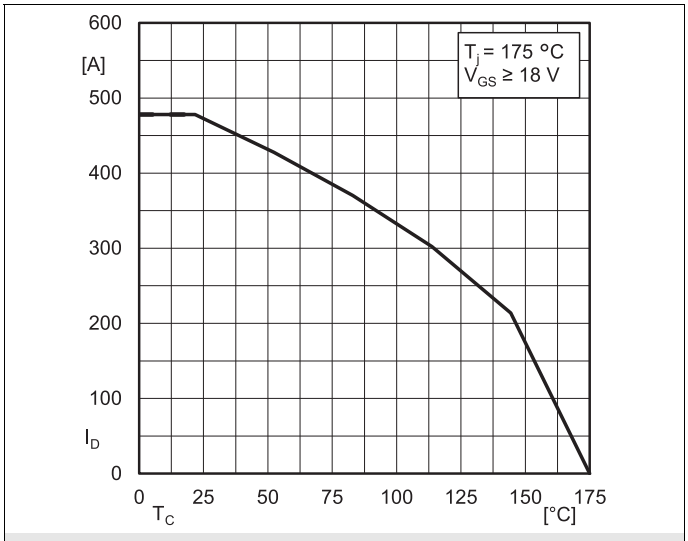


Fig. 3: Rated current vs. temperature $I_D = f(T_C)$

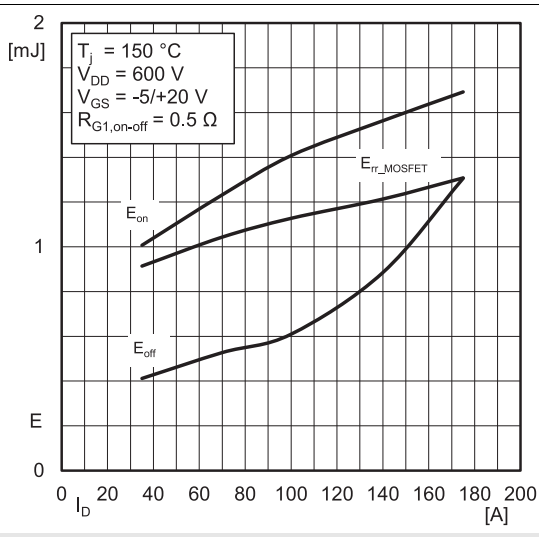


Fig. 4: Typ. switching energy $E = f(I_D)$ at R_{G1}

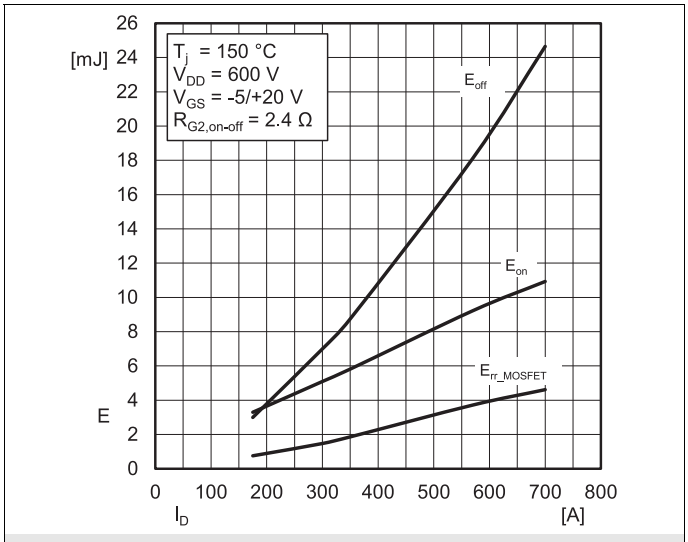


Fig. 5: Typ. switching energy $E = f(I_D)$ at R_{G2}

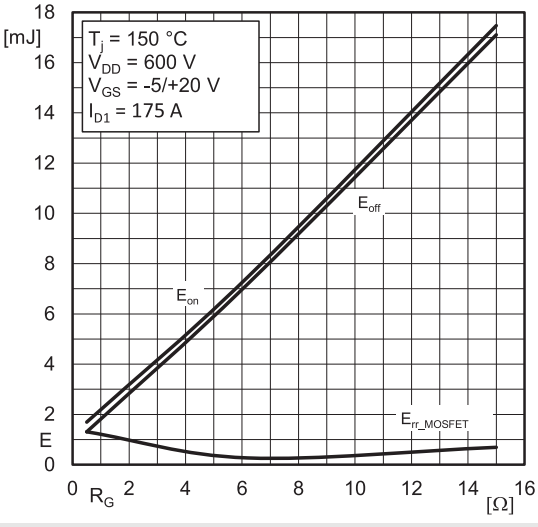


Fig. 6: Typ. switching energy $E = f(R_G)$ at I_{D1}

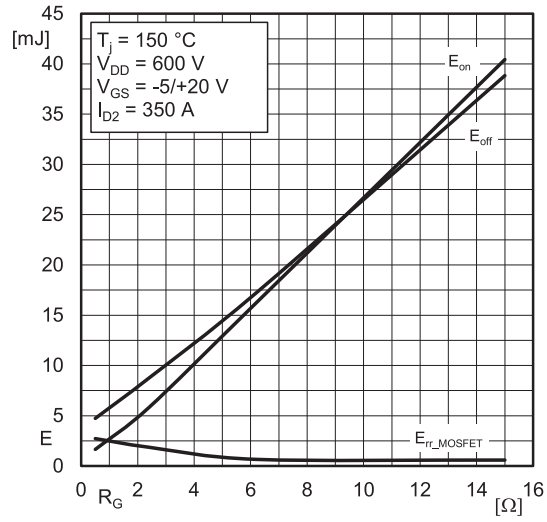


Fig. 7: Typ. switching energy E = f (R_G) at I_{D2}

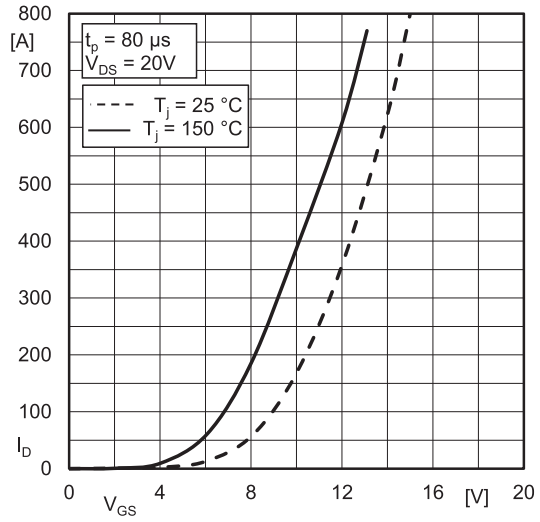


Fig. 8: Typ. MOSFET transfer characteristic

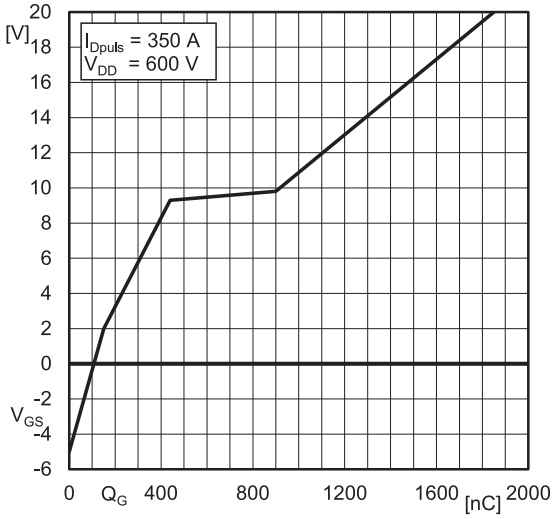


Fig. 9: Typ. gate charge characteristic

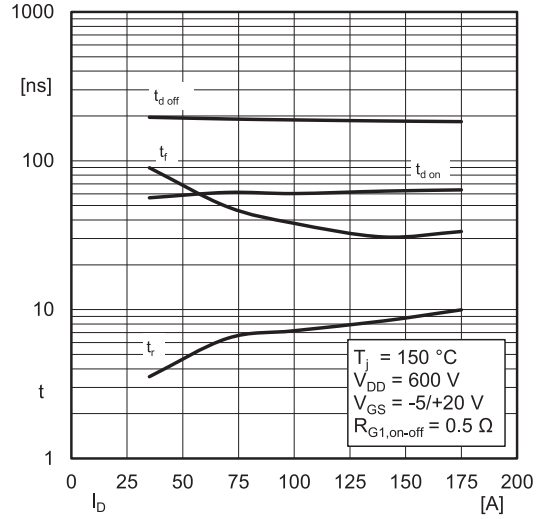


Fig. 10:Typ. switching times t = f (I_D) at R_{G1}

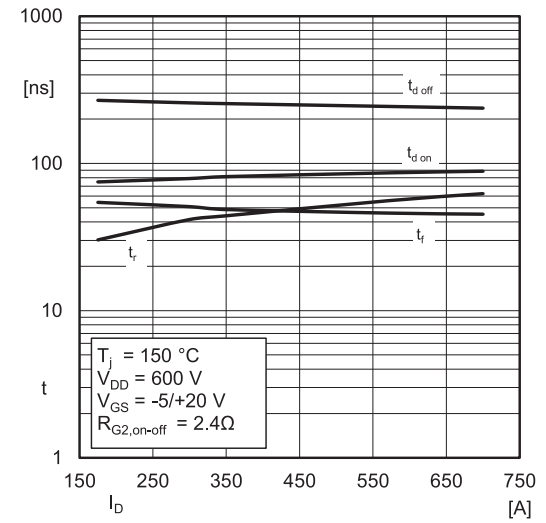


Fig. 11: Typ. switching times t = f (I_D) at R_{G2}

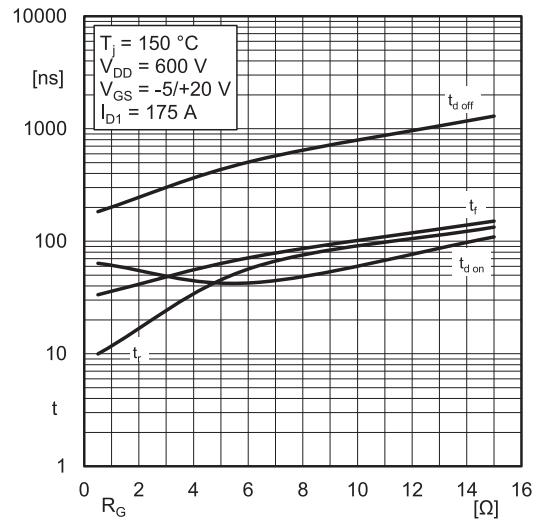


Fig. 12: Typ. switching times t = f (R_G) at I_{D1}

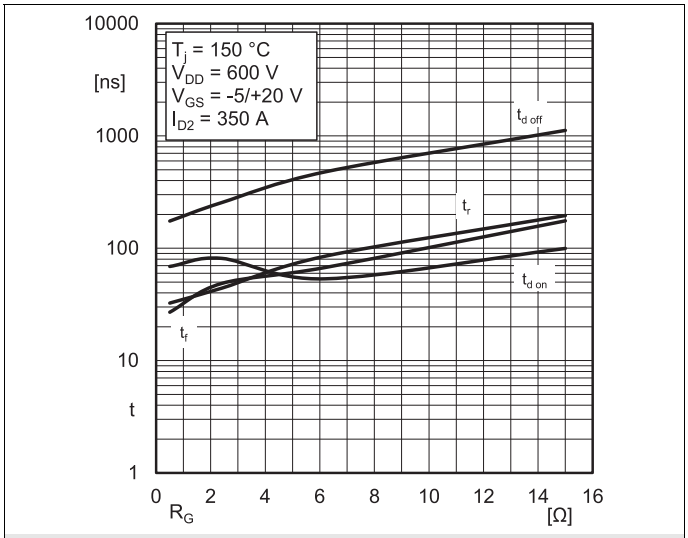


Fig. 13: Typ. switching times t = f (R_G) at I_{D2}

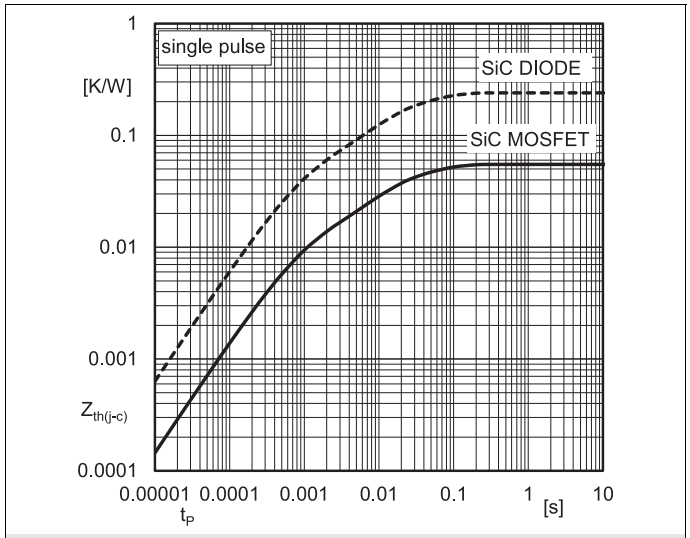


Fig. 14: Transient thermal impedance

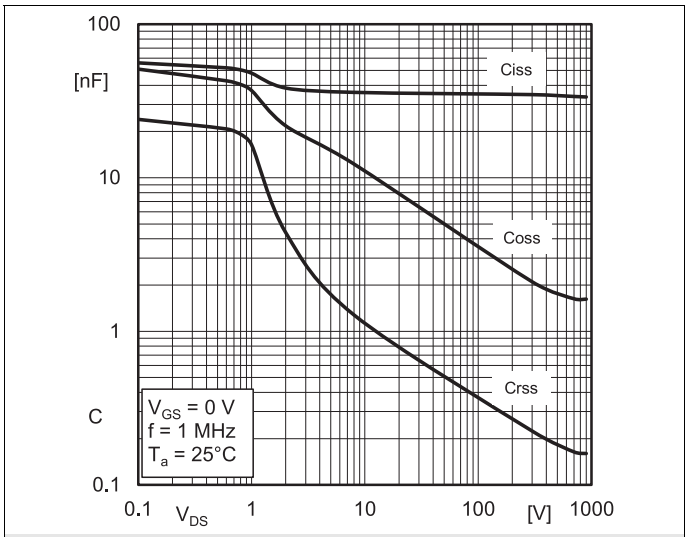
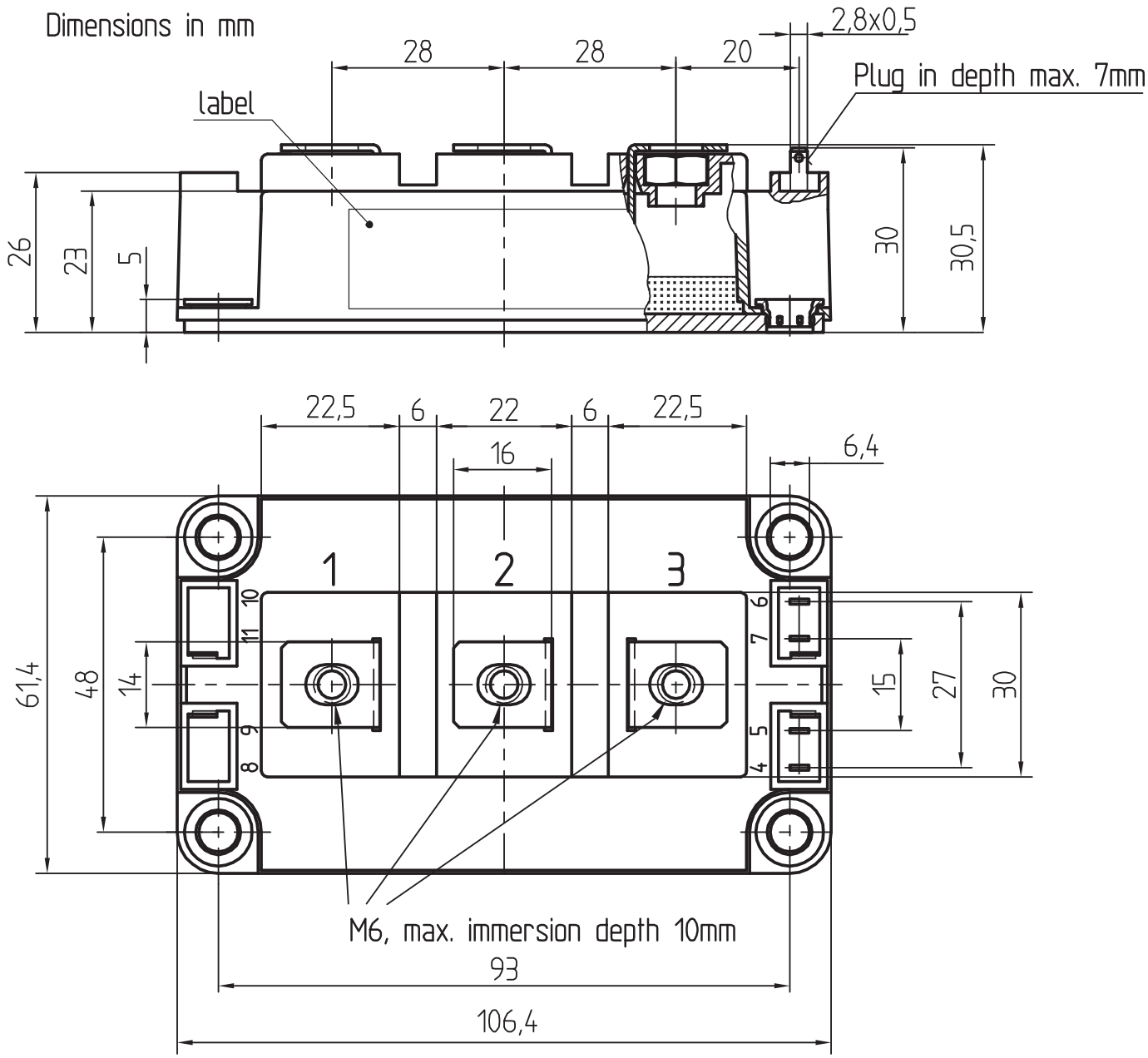


Fig. 19: Capacitances vs. drain-source voltage



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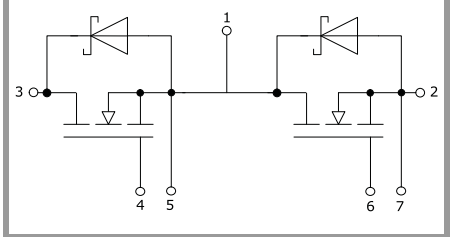

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This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

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