SKM350MB120SCH17

SEMITRANS® 3

SiC MOSFET Module

Engineering Sample

SKM350MB120SCH17

Target Data

Features

- Full Silicon Carbide (SiC) power module
- Latest generation SiC MOSFETs
- External SiC Schottky Barrier Diode embedded
- Optimized for fast switching and lowest power losses
- 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

Remarks

- 1) max DC current limited by terminals to $500A_{rms}$
- Case temperature limited to T_C=125°C max.
- Recommended T_{op}= -40…+150°C

Absolute Maximum Ratings

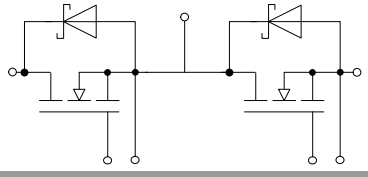
Symbol	Conditions		Values	Unit
MOSFET				
V_{DSS}			1200	V
I_D	T_j = 175 °C	T_c = 25 °C	523 [1)]	A
		T_c = 80 °C	416	A
I_{DM}			1280	A
I_{DRM}			904	A
V_{GS}			-6 ... 22	V
T_j			-40 ... 175	°C
Integrated body diode				
I_{FM}			1280	A
I_{FRM}			904	A

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	220	A
		T_c = 80 °C	169	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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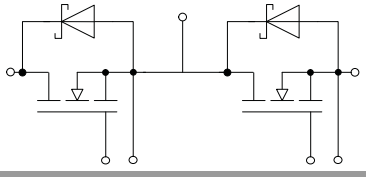

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
MOSFET						
$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 8 mA		1200			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 71.2 mA		1.6		4	V
I_{DSS}	V_{GS} = 0 V, V_{DS} = 1200 V, T_j = 25 °C				0.08	mA
I_{GSS}	V_{GS} = 22 V, V_{DS} = 0 V				600	nA
$R_{DS(on)}$	V_{GS} = 18 V	T_j = 25 °C		5.6	7.0	mΩ
	I_D = 176 A	T_j = 150 °C		9.5		mΩ
C_{iss}	V_{GS} = 0 V			34.5		nF
C_{oss}	V_{DS} = 800 V			1.10		nF
C_{rss}	f = 1 MHz			0.15		nF
R_{Gint}	25 °C			0.6		Ω
Q_G	V_{DS}=600V, V_{GS}=24V, I_D = 350 A			1800		nC
$t_{d(on)}$	V_{DD} = 600 V	T_j = 150 °C		73.5		ns
t_r	I_D = 350 A	T_j = 150 °C		101.9		ns
$t_{d(off)}$	V_{GS} = -5 ... 20 V	T_j = 150 °C		217.9		ns
t_f	R_{Gon} = 2.4 Ω	T_j = 150 °C		37.2		ns
E_{on}	R_{Goff} = 2.4 Ω	T_j = 150 °C		8.65		mJ
E_{off}	di/dt_{on} = 9.3 kA/µs	T_j = 150 °C		7.98		mJ
$R_{th(j-c)}$	per MOSFET				0.045	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				0.18	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(m*K))			0.12		K/W

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))			0.012		K/W
$R_{th(c-s)2}$	including thermal coupling, Ts underneath module (λ_{grease}=0.81 W/(m*K))			0.0189		K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminals M6	2.5		5	Nm
						Nm
w					325	g

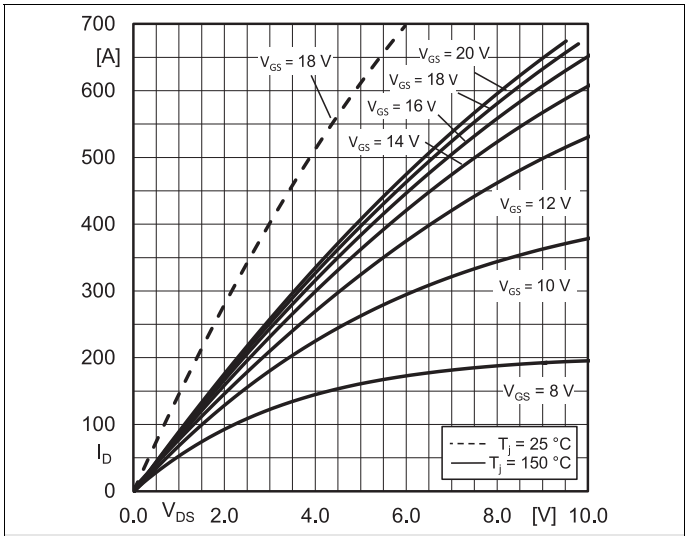


Fig.1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS'}$

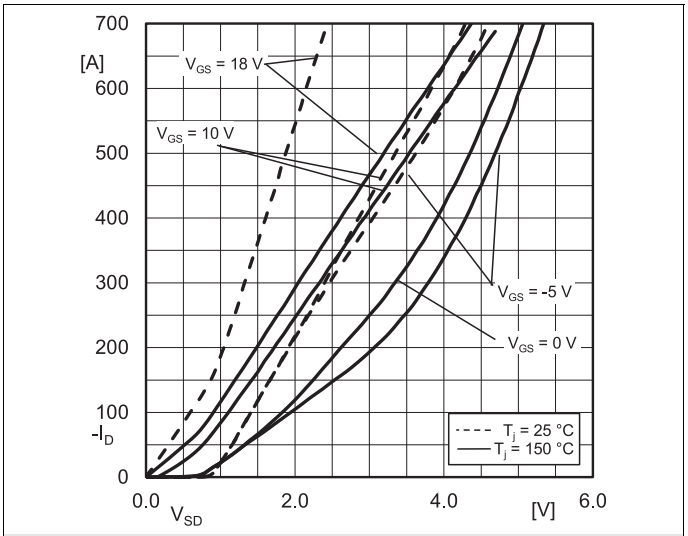


Fig. 2: Typ. MOSFET reverse output characteristic, incl. $R_{DD'+SS'}$

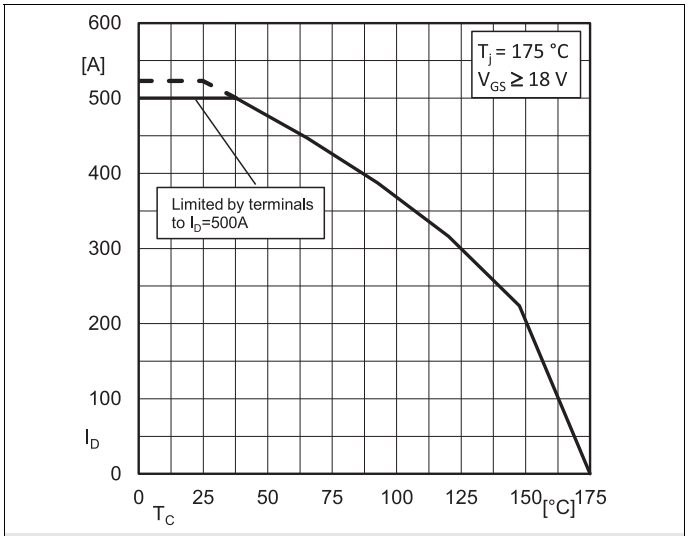


Fig. 3: Rated current vs. temperature $I_D = f(T_C)$

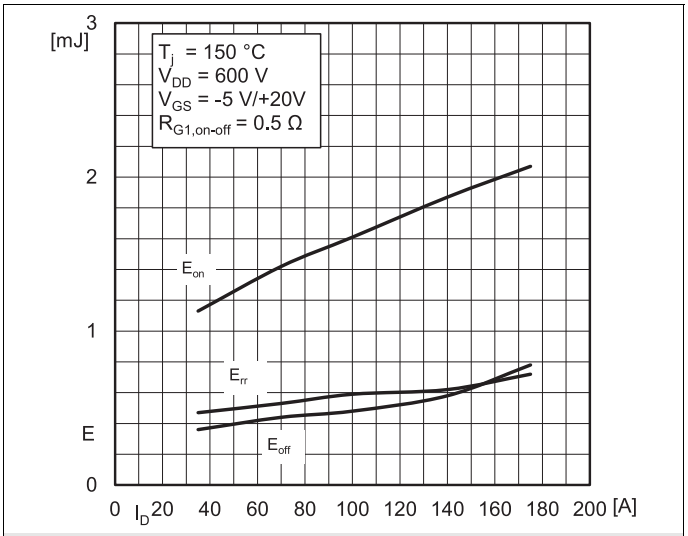


Fig. 4: Typ. switching energy $E = f(I_D, R_{G1})$

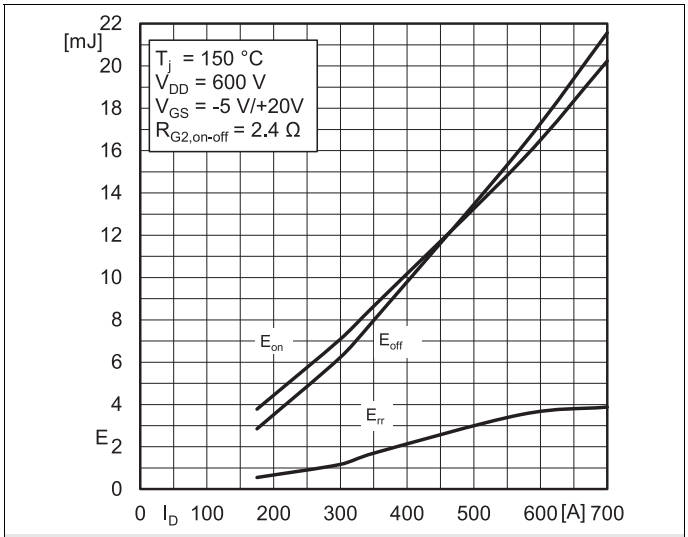


Fig. 5: Typ. switching energy $E = f(I_D, R_{G2})$

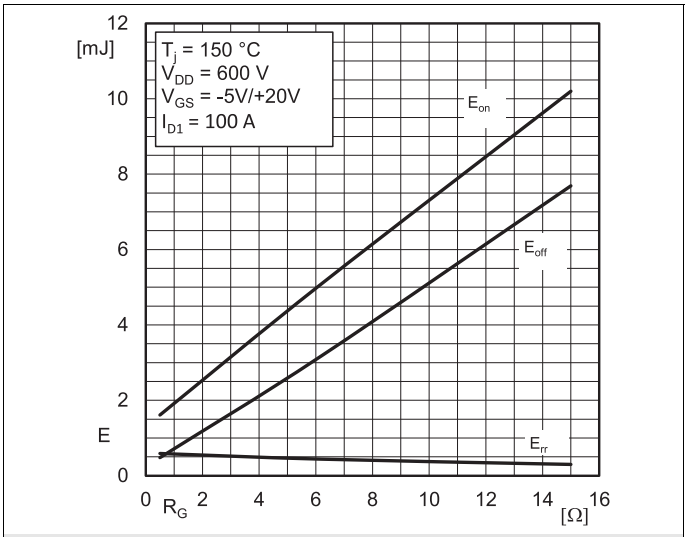


Fig. 6: Typ. switching energy $E = f(R_G, I_{D1})$

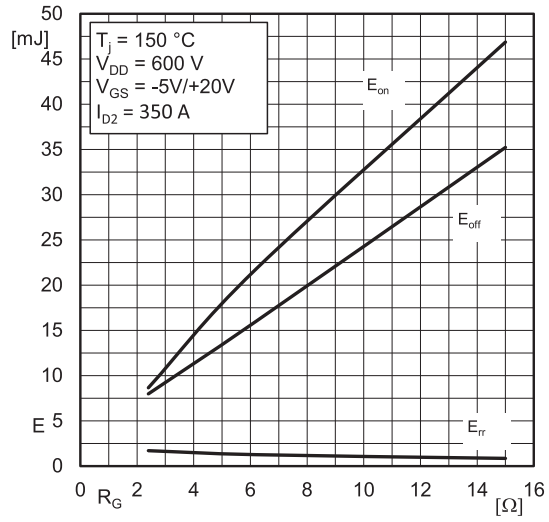


Fig. 7: Typ. switching energy E = f(R_G, I_{D2})

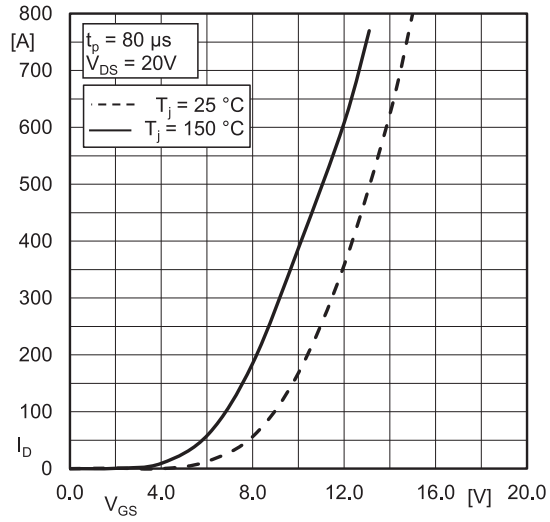


Fig. 8: Typ. MOSFET transfer characteristic

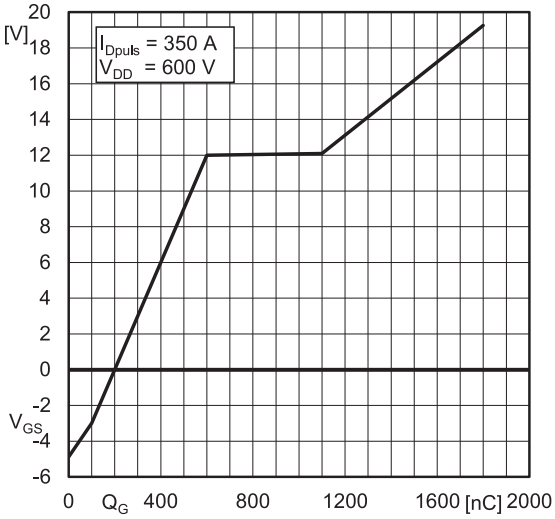


Fig. 9: Typ. gate charge characteristic

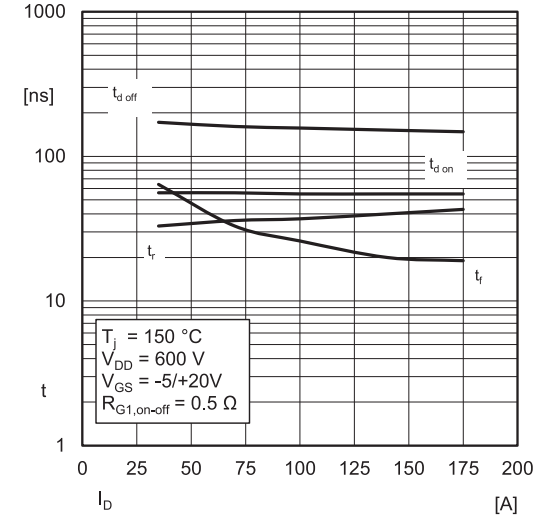


Fig. 10:Typ. switching times vs I_D at R_{G1}

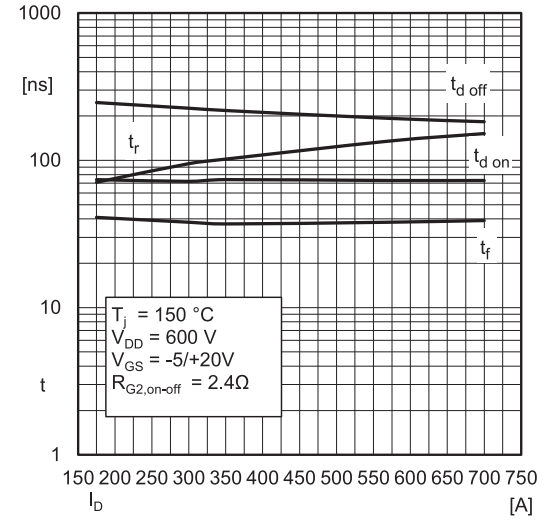


Fig. 11: Typ. switching times vs. I_D at R_{G2}

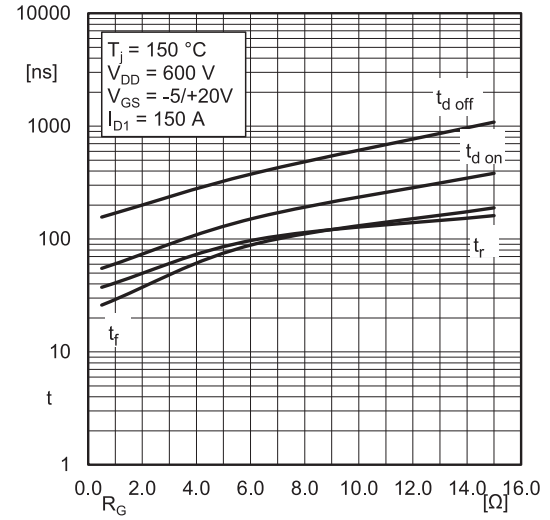


Fig. 12: Typ. switching times vs. gate resistor R_G at I_{D1}

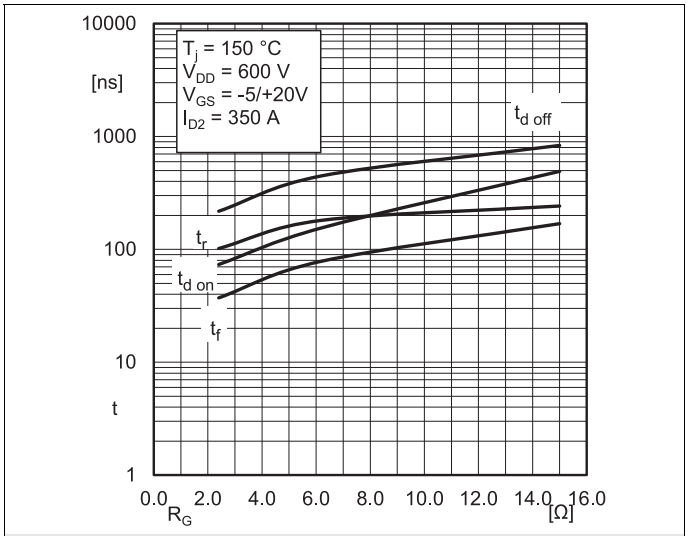


Fig. 13: Typ. switching times vs. gate resistor R_G at I_{D2}

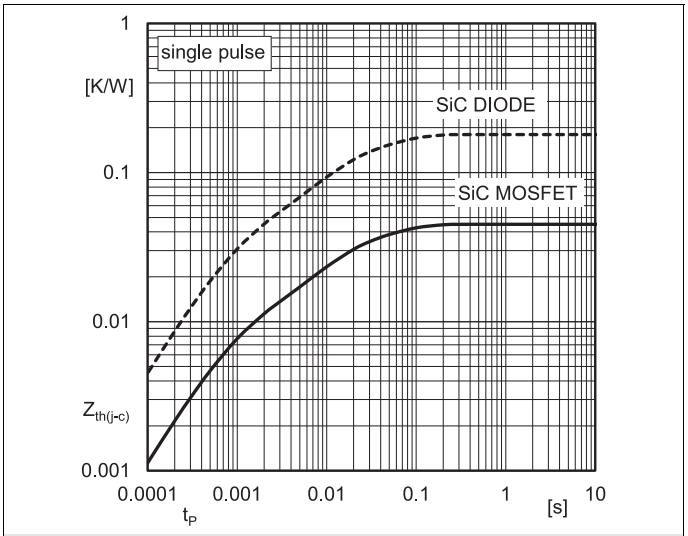
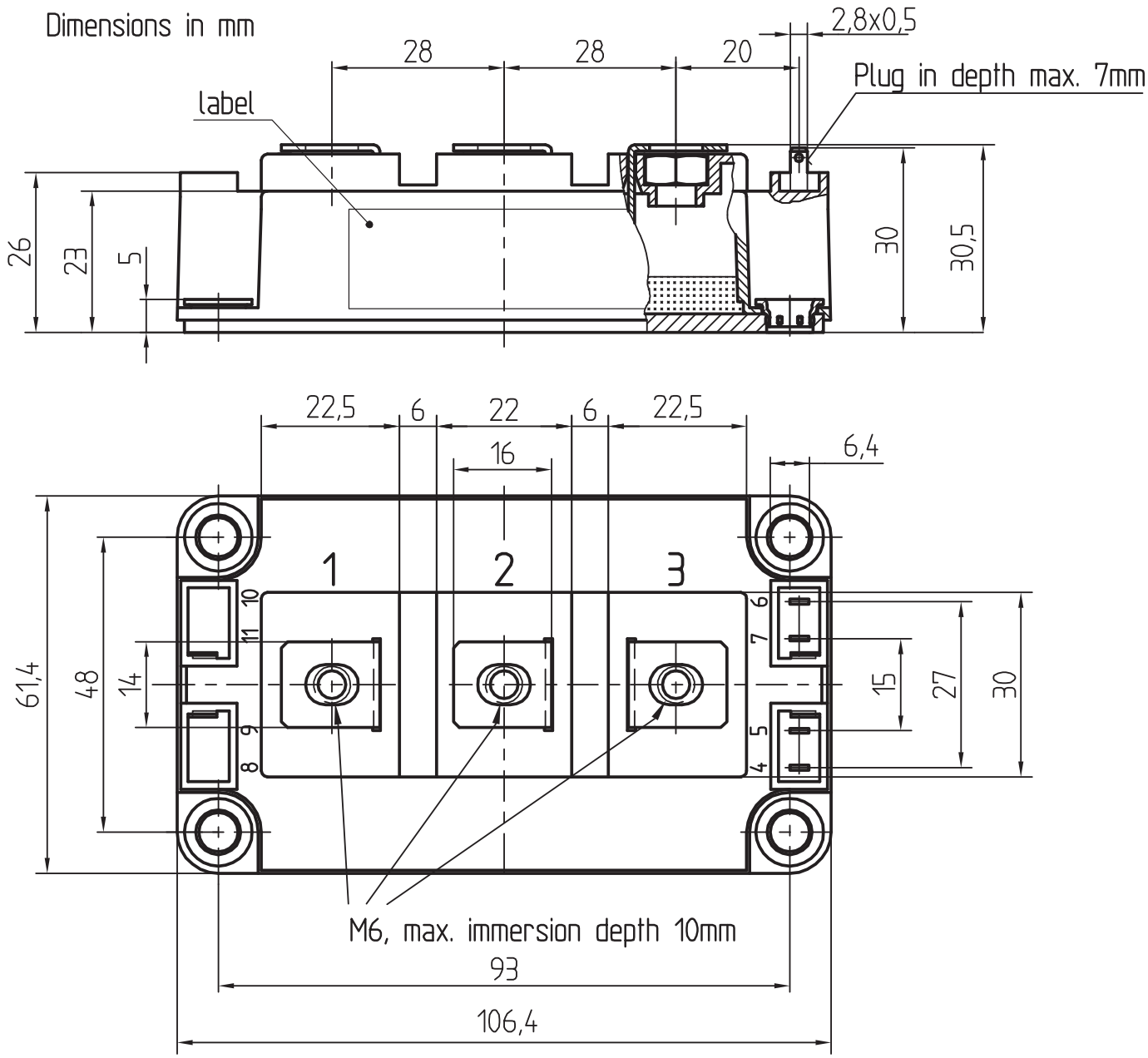


Fig. 14: Transient thermal impedance



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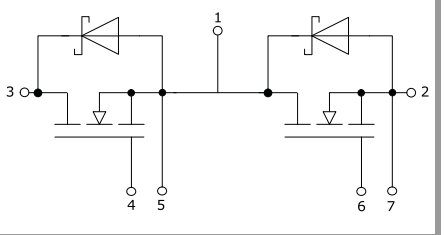

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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