SK80MB120CR03TE1

SEMITOP®E1

Half-Bridge (Full SiC)

Engineering Sample

SK80MB120CR03TE1

Target Data

Features*

- Optimized design for superior thermal performance
- Extremely low inductance design
- Press-Fit contact technology
- 1200V Planar Gen3 SiC MOS
- Simple to drive with +15V gate voltage
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Switched Mode Power Supplies
- Energy Storage Systems
- Electric Vehicle charging
- UPS
- Solar
- Motor Drives

Remarks

- Recommended $T_{j,op}$=-40 ...+150 °C
- Recommended turn-off / turn-on gate voltage V_{GS} = -4...0/+15V

Footnotes

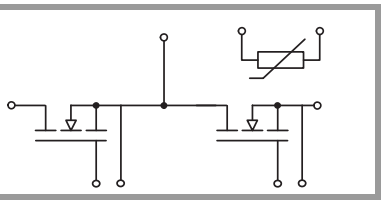
[1)] SEMIKRON Exclusive High Performance Thermal Paste (HPTP), available as pre-applied

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
MOSFET 1				
V_{DSS}			1200	V
I_D	T_j = 175 °C	T_s = 25 °C	98	A
		T_s = 70 °C	82	A
I_{DM}	Pulse width t_p limited by T_{jmax}		240	A
$I_{DM,repetitive}$			120	A
V_{GS}	Max. transient gate - source voltage		-8 ... 19	V
T_j			-55 ... 175	°C
Integrated body diode				
I_{FM}	Pulse width t_p limited by T_{jmax}		240	A
$I_{FM,repetitive}$			120	A

Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin	30	A
T_{stg}	module without TIM	-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min	2500	V



MB-T

SEMITOP®E1

Half-Bridge (Full SiC)

Engineering Sample

SK80MB120CR03TE1

Target Data

Features*

- Optimized design for superior thermal performance
- Extremely low inductance design
- Press-Fit contact technology
- 1200V Planar Gen3 SiC MOS
- Simple to drive with +15V gate voltage
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

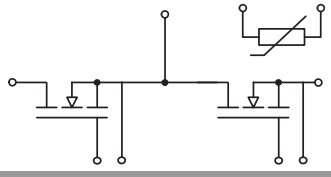
- Switched Mode Power Supplies
- Energy Storage Systems
- Electric Vehicle charging
- UPS
- Solar
- Motor Drives

Remarks

- Recommended $T_{j,op}$=-40 ...+150 °C
- Recommended turn-off / turn-on gate voltage V_{GS} = -4...0/+15V

Footnotes

[1)] SEMIKRON Exclusive High Performance Thermal Paste (HPTP), available as pre-applied



MB-T

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
MOSFET 1						
$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 0.1 mA, T_j = 25 °C		1200			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 23 mA, T_j = 25 °C		1.8	2.5	3.6	V
I_{DSS}	V_{GS} = 0 V, V_{DS} = 1200 V, T_j = 25 °C				1	mA
I_{GSS}	V_{DS} = 0 V, V_{GS} = 15 V, T_j = 25 °C				200	nA
$R_{DS(on)}$	V_{GS} = 15 V, I_D = 83 A, chiplevel	T_j = 25 °C		16	22	mΩ
		T_j = 150 °C		25		mΩ
C_{iss}	V_{GS} = 0 V, V_{DS} = 1000 V, f = 0.1 MHz			6800		pF
C_{oss}	V_{GS} = 0 V, V_{DS} = 1000 V, f = 0.1 MHz			260		pF
C_{rss}	V_{GS} = 0 V, V_{DS} = 1000 V, f = 0.1 MHz			20		pF
R_{Gint}	T_j = 25 °C			5.9		Ω
Q_G	V_{DD} = 800 V, V_{GS} = -4 V ... 15 V, I_D = 83 A			236		nC
$t_{d(on)}$	V_{DD} = 600 V, V_{GS} = 15/-4 V, I_D = 80 A, R_{Gon} = 1 Ω, R_{Goff} = 1 Ω, di/dt$_{off}$ = 5.6 kA/µs, di/dt$_{on}$ = 7.1 kA/µs, dv/dt = 28 kV/µs	T_j = 150 °C		36		ns
$t_{d(off)}$		T_j = 150 °C		90		ns
t_r		T_j = 150 °C		16		ns
t_f		T_j = 150 °C		23		ns
E_{on}		T_j = 150 °C		1.02		mJ
E_{off}		T_j = 150 °C		0.69		mJ
$R_{th(j-s)}$	per MOSFET, λ_{paste}=2.5 W/(mK) [1)]			0.51		K/W
Integrated body diode						
$V_F = V_{SD}$	-I_D = 41 A, V_{GS} = -4 V, chiplevel	T_j = 25 °C		4.58		V
		T_j = 150 °C		4.30		V
$V_{F0} = V_{SD0}$	chiplevel	T_j = 25 °C		3.80		V
		T_j = 150 °C		3.60		V
$r_F = r_{SD}$	chiplevel	T_j = 25 °C		19		mΩ
		T_j = 150 °C		17		mΩ
t_{rr}	V_{DD} = 600 V, -I_D = 80 A, V_{GS} = -4 V, R_{Gon} = 1 Ω, di/dt$_{off}$ = 7.3 kA/µs	T_j = 150 °C		33		ns
Q_{rr}		T_j = 150 °C		1.4		µC
I_{rr}		T_j = 150 °C		86		A
E_{rr}		T_j = 150 °C		0.81		mJ

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Module					
L_{CE}			9		nH
M_s	to heatsink	1.6		2.3	Nm
w	weight		25		g

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Temperature Sensor					
R_{100}	T_r = 100 °C		493 ± 5%		Ω
$B_{100/125}$	$R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; T[K];		3550 ±2%		K

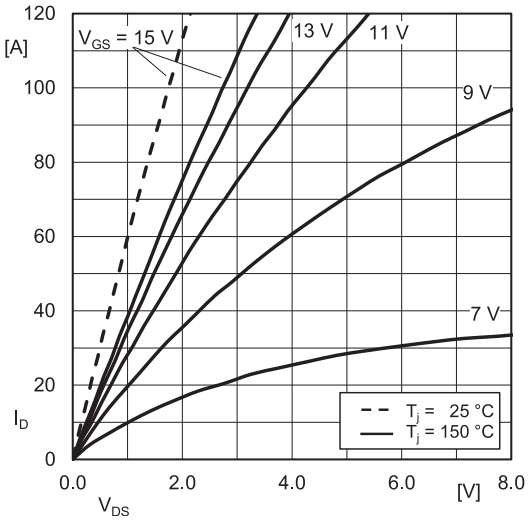


Fig.1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS'}$

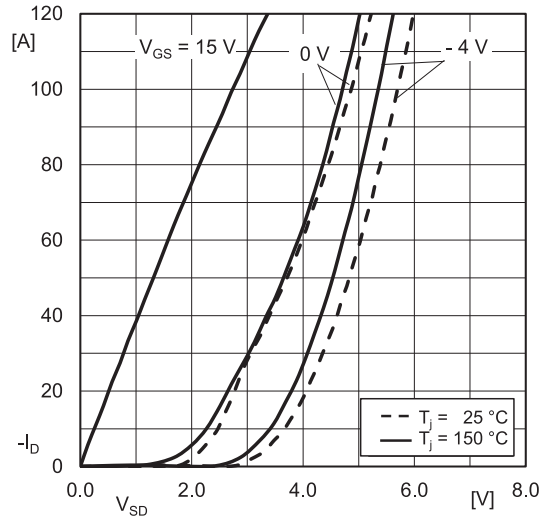


Fig. 1a: Typ. MOSFET reverse output characteristics, incl. $R_{DD'+SS'}$

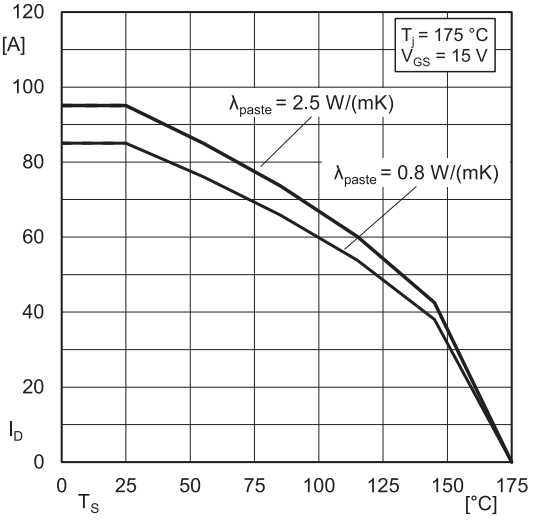


Fig. 2: Rated current vs. temperature $I_D = f(T_S)$

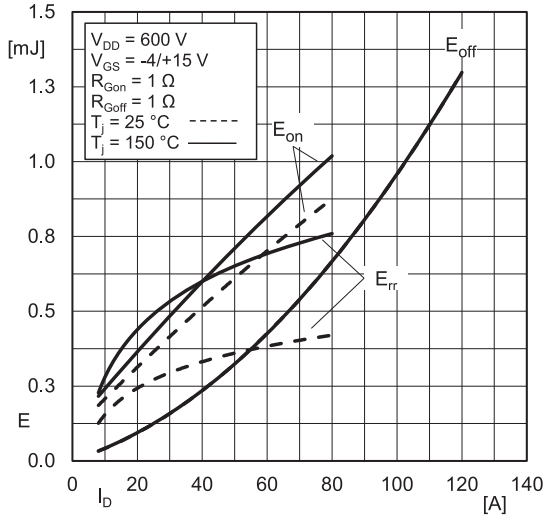


Fig. 3: Typ. switching energy $E = f(I_D)$ at R_{G1}

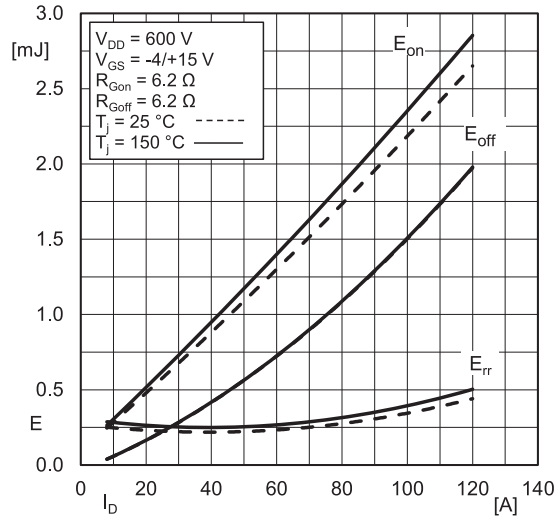


Fig. 3a: Typ. switching energy $E = f(I_D)$ at R_{G2}

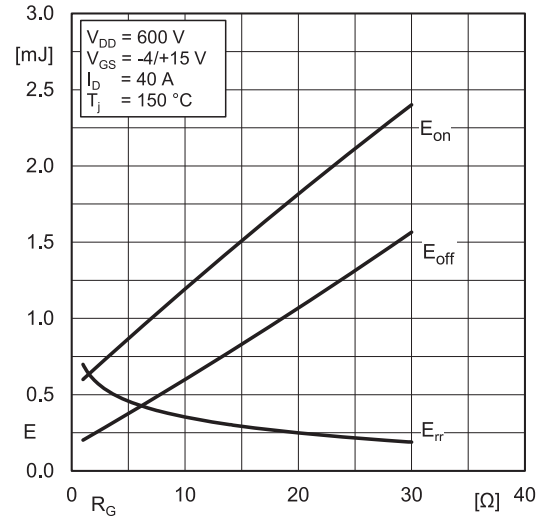


Fig. 4: Typ. switching energy $E = f(R_G)$ at I_{D1}

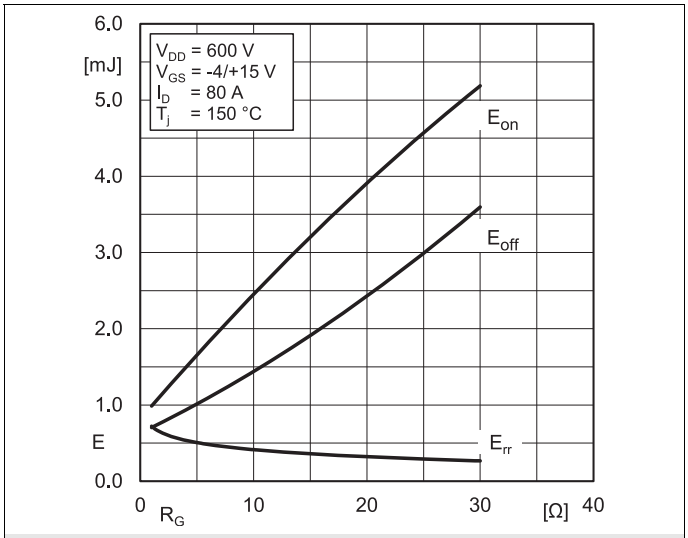


Fig. 4a: Typ. switching energy E = f (R_G) at I_{D2}

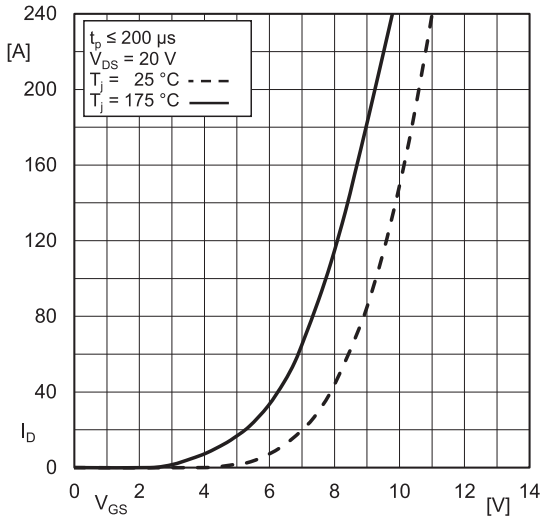


Fig. 5: Typ. MOSFET transfer characteristic

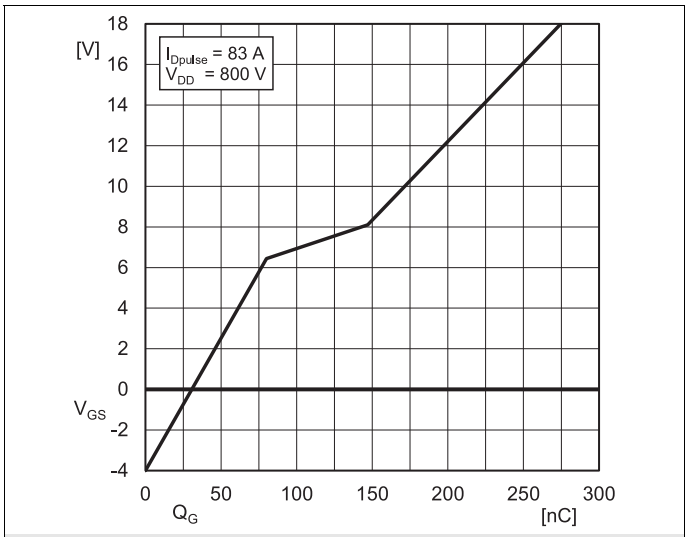


FIg. 6: Typ. MOSFET gate charge characteristic

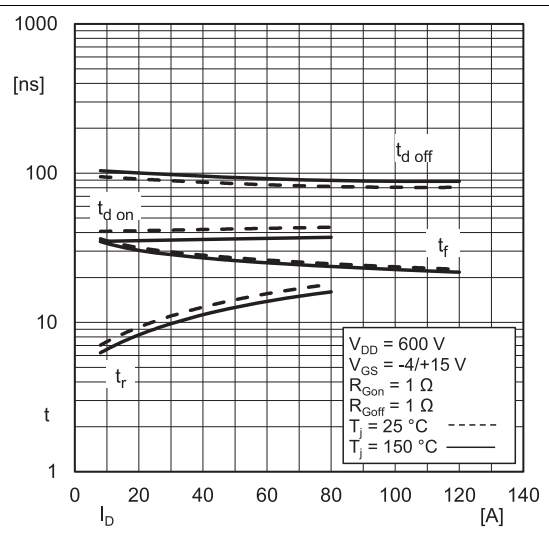


Fig. 7: Typ. switching times t = f (I_D) at R_{G1}

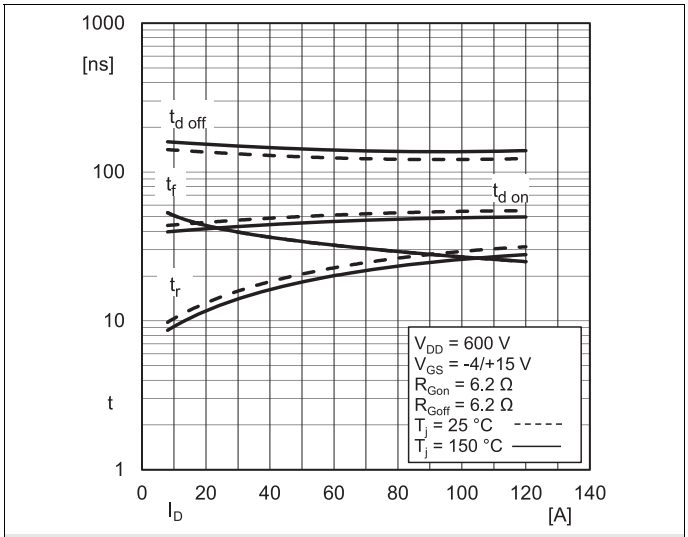


Fig. 7a: Typ. switching times t = f (I_D) at R_{G2}

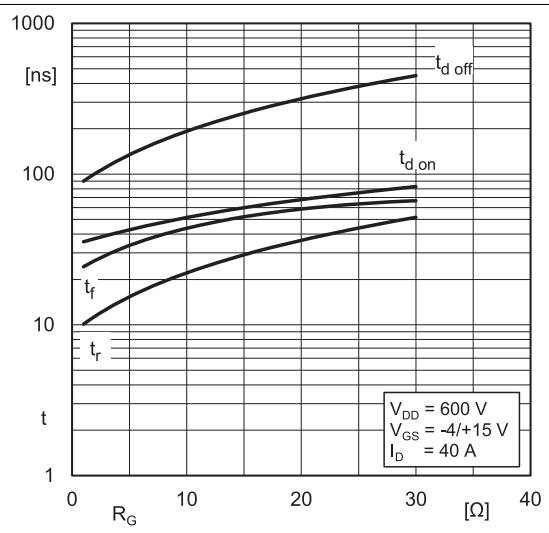


Fig. 8: Typ. switching times t = f (R_G) at I_{D1}

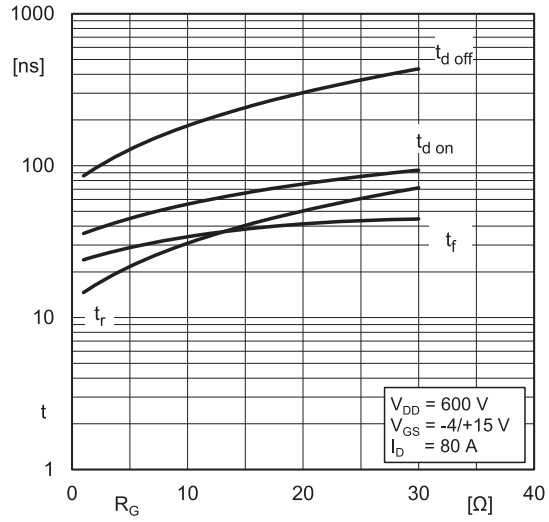


Fig. 8a: Typ. switching times t = f (R_G) at I_{D2}

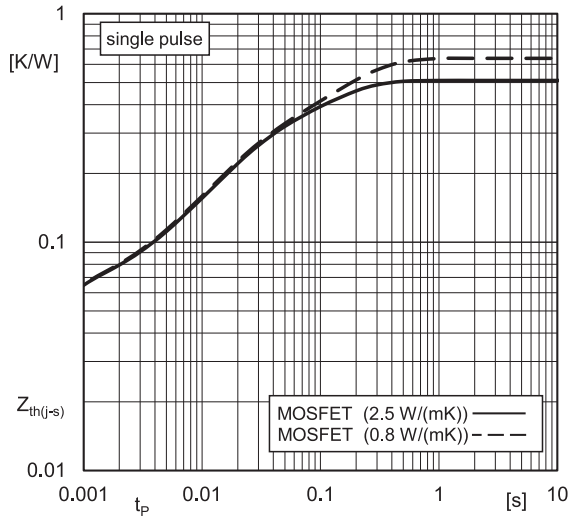


Fig. 9: Typ. transient thermal impedance

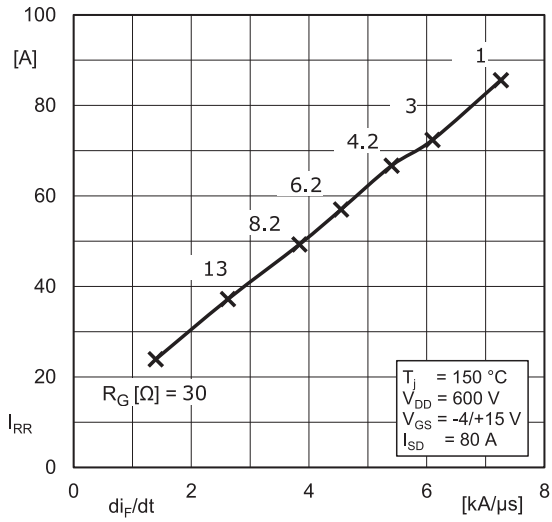


Fig. 11: Typ. diode peak reverse recovery current I_{RR} = f (di_F/dt)

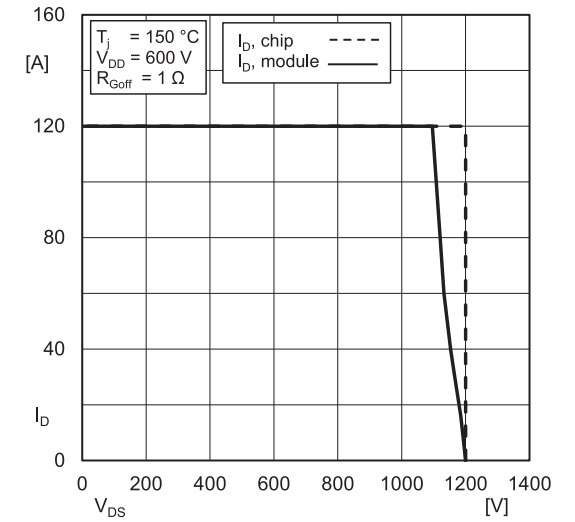
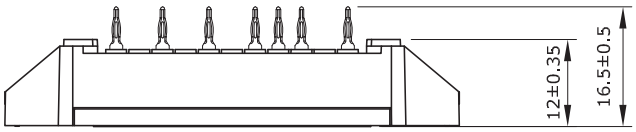
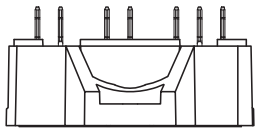
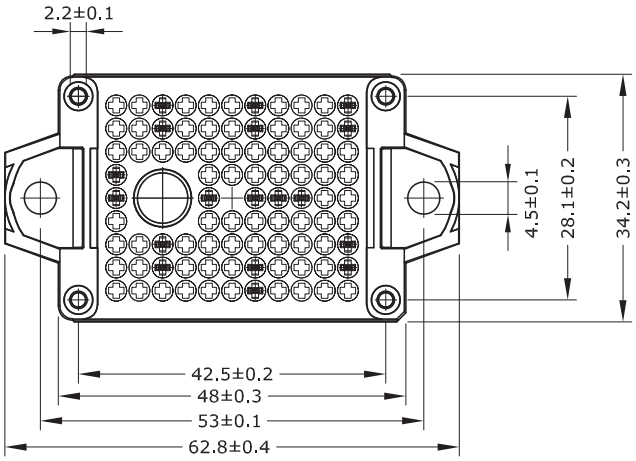
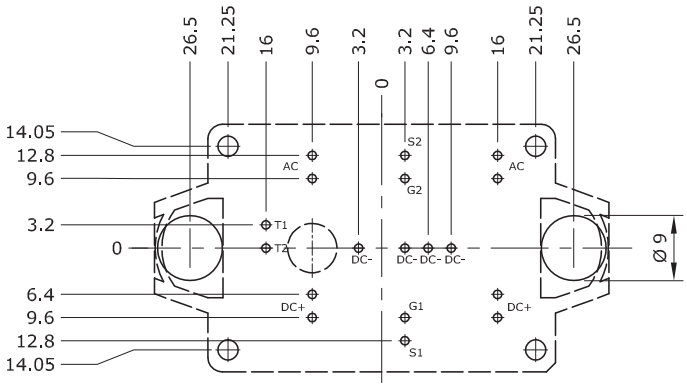


Fig. 13: MOSFET Reverse Bias Safe Operating Area (RBSOA)



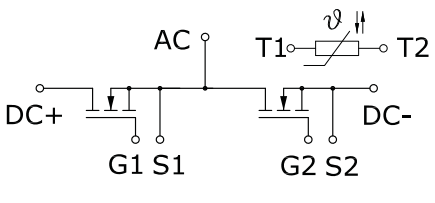






- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern ⌖ Ø0.1
- Diameters of drill ∅ 1.15mm
- Copper thickness in hole 25 - 50 µm
- Hole specification for contacts:
  refer to SEMITOP E1/E2 Mounting Instruction

SEMITOP®E1



MB-T

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

***IMPORTANT INFORMATION AND WARNINGS**

The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics ("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.

In accordance with the quality guidelines of SEMIKRON, we would like to point out that the products are engineering samples. These engineering samples are not yet produced under quality conditions approaching those of series production, and are at the present time not included in the SEMIKRON quality monitoring and control process. Neither the product nor the production process has to date gone completely through the SEMIKRON internal authorization procedure. SEMIKRON may make any amendments without any prior notification. SEMIKRON cannot and shall not promise or commit itself to release and/or make available a final version or series product after the development phase. SEMIKRON cannot and will not assume any responsibility with regard to freedom from defects, functionality, and adaptation to and interaction with possible applications of the user or with regard to any other potential risks resulting from the use of engineering samples. Therefore SEMIKRON explicitly excludes any warranty and liability; as far as legally possible. The customer shall fully indemnify and hold harmless SEMIKRON from any and all risks, damages, losses, expenses and costs directly or indirectly resulting out of or in connection with the commissioning, operation, system integration, sale, dissemination or any other kind of use of engineering samples by the customer and/or any third party, which has come into possession of engineering samples through or because of the customer. All know-how and all registerable and non-registerable copyrights and industrial property rights arising from or in connection with these engineering samples remain the exclusive property of SEMIKRON.