

Half-Bridge (Full SiC)

SK200MB120CR03TE2

Features*

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

Typical Applications

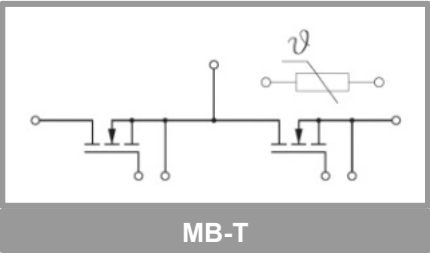
- Switched Mode Power Supplies
- Energy Storage Systems
- Electric Vehicle charging
- UPS
- Solar

Remarks

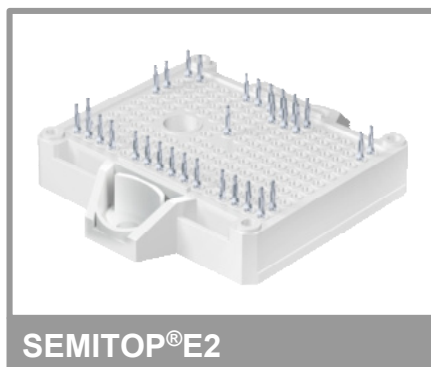
- Recommended $T_{jop} = -40^{\circ}\text{C} \dots +150^{\circ}\text{C}$
- Recommended turn-off / turn-on gate voltage $V_{GS} = -4 \dots 0/+15\text{V}$

| Absolute Maximum Ratings | | | | |
|--------------------------|---|------------------------|-------------|------|
| Symbol | Conditions | | Values | Unit |
| MOSFET | | | | |
| V _{DSS} | T _j = 25 °C | | 1200 | V |
| I _D | HPTP / HP-PCM T _j = 175 °C | T _s = 25 °C | 223 | A |
| | | T _s = 70 °C | 186 | A |
| I _{DM} | Pulse width t _p limited by T _{vjmax} | | 600 | A |
| V _{GS} | Transient Gate - Source voltage (t<100ns) | | -8 ... 19 | V |
| T _j | | | -40 ... 175 | °C |
| Integrated body diode | | | | |
| I _{FM} | Pulse width t _p limited by T _{vjmax} | | 600 | A |
| I _{FSM} | t _p = 10 ms, sin 180°, T _j = 150 °C | | 896 | A |

| Absolute Maximum Ratings | | | |
|--------------------------|---|-------------|------|
| Symbol | Conditions | Values | Unit |
| Module | | | |
| I _{t(RMS)} | ΔT _{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 |



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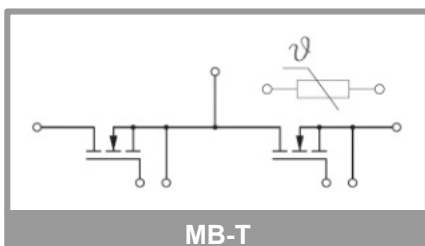
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| Characteristics | | | | | |
|------------------------------|--|-----------------------------|-------|------|------|
| Symbol | Conditions | min. | typ. | max. | Unit |
| MOSFET | | | | | |
| $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 0.5\text{ mA}, T_j = 25^{\circ}\text{C}$ | 1200 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 58\text{ mA}, T_j = 25^{\circ}\text{C}$ | 1.8 | 2.5 | 3.6 | V |
| I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 1200\text{ V}, T_j = 25^{\circ}\text{C}$ | | | 0.5 | mA |
| I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = 15\text{ V}, T_j = 25^{\circ}\text{C}$ | | | 400 | nA |
| $R_{DS(on)}$ | $V_{GS} = 15\text{ V}, I_D = 207\text{ A}, \text{chiplevel}$ | $T_j = 25^{\circ}\text{C}$ | | 6.4 | mΩ |
| | | $T_j = 150^{\circ}\text{C}$ | | 10 | mΩ |
| C_{iss} | $V_{GS} = 0\text{ V}, f = 0.1\text{ MHz}$ | | 17000 | | pF |
| C_{oss} | $V_{DS} = 1000\text{ V}, f = 0.1\text{ MHz}$ | | 650 | | pF |
| C_{rss} | $T_j = 25^{\circ}\text{C}, f = 0.1\text{ MHz}$ | | 50 | | pF |
| Q_G | $V_{GS} = -4 \dots 15\text{ V}, V_{DD} = 800\text{ V}, I_D = 207\text{ A}$ | | 590 | | nC |
| R_{Gint} | $T_j = 25^{\circ}\text{C}$ | | 2.7 | | Ω |
| $t_{d(on)}$ | $V_{DD} = 600\text{ V}, T_j = 150^{\circ}\text{C}$ | | 49 | | ns |
| $t_{d(off)}$ | $I_D = 200\text{ A}, T_j = 150^{\circ}\text{C}$ | | 120 | | ns |
| t_r | $V_{GS} = -4/+15\text{ V}, T_j = 150^{\circ}\text{C}$ | | 17 | | ns |
| t_f | $R_{Gon/off} = 0.6\text{ Ω}, T_j = 150^{\circ}\text{C}$ | | 29 | | ns |
| E_{on} | $di/dt_{off} = 13\text{ kA/μs}, T_j = 150^{\circ}\text{C}$ | | 2.47 | | mJ |
| E_{off} | $di/dt_{on} = 18\text{ kA/μs}, T_j = 150^{\circ}\text{C}$ | | | | |
| | $dv/dt = 32\text{ kV/μs}, T_j = 150^{\circ}\text{C}$ | | 2.14 | | mJ |
| $R_{th(j-s)}$ | per MOSFET, HPTP / HP-PCM | | 0.23 | | K/W |
| Integrated body diode | | | | | |
| $V_F = V_{SD}$ | $-I_D = 104\text{ A}, V_{GS} = -4\text{ V}, \text{chiplevel}$ | $T_j = 25^{\circ}\text{C}$ | 4.6 | | V |
| | | $T_j = 150^{\circ}\text{C}$ | 4.3 | | V |
| $V_{F0} = V_{SD0}$ | chiplevel | $T_j = 25^{\circ}\text{C}$ | 3.8 | | V |
| | | $T_j = 150^{\circ}\text{C}$ | 3.6 | | V |
| $r_F = r_{SD}$ | chiplevel | $T_j = 25^{\circ}\text{C}$ | 7.7 | | mΩ |
| | | $T_j = 150^{\circ}\text{C}$ | 6.8 | | mΩ |
| t_{rr} | $V_{DD} = 600\text{ V}, T_j = 150^{\circ}\text{C}$ | | 40 | | μs |
| Q_{rr} | $-I_D = 200\text{ A}, T_j = 150^{\circ}\text{C}$ | | 5.6 | | μC |
| I_{rr} | $V_{GS} = -4\text{ V}, T_j = 150^{\circ}\text{C}$ | | 281 | | A |
| E_{rr} | $R_{Gon} = 0.6\text{ Ω}, di/dt_{off} = 19\text{ kA/μs}, T_j = 150^{\circ}\text{C}$ | | 1.84 | | mJ |

| Characteristics | | | | | |
|-----------------|-------------|------|------|------|------|
| Symbol | Conditions | min. | typ. | max. | Unit |
| Module | | | | | |
| L_{CE} | | | 6 | | nH |
| M_s | to heatsink | 1.6 | | 2.3 | Nm |
| w | weight | | 35 | | g |

| Characteristics | | | | | |
|---------------------------|--|------|------------------|------|------|
| Symbol | Conditions | min. | typ. | max. | Unit |
| Temperature Sensor | | | | | |
| R_{100} | $T_r = 100^{\circ}\text{C}$ | | $493 \pm 5\%$ | | Ω |
| $B_{100/125}$ | $R_{(T)} = R_{100} \cdot \exp[B_{100/125} \cdot (1/T - 1/T_{100})], T[K];$ | | $3550 (\pm 2\%)$ | | K |

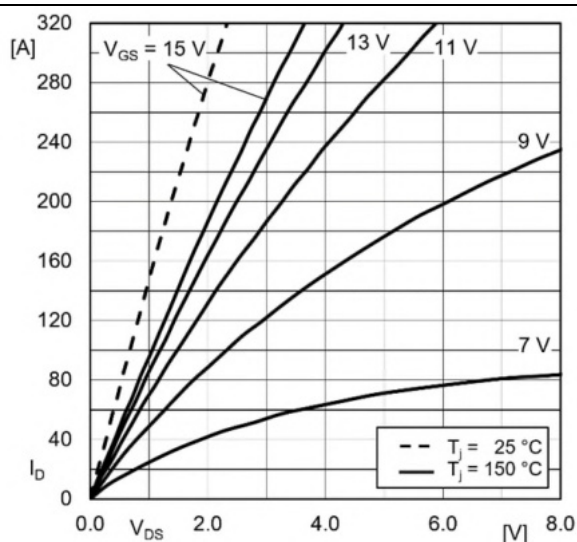


Fig. 1: Typ. MOSFET forward output characteristic, incl. $R_{DS(on)}$ vs V_{DS}

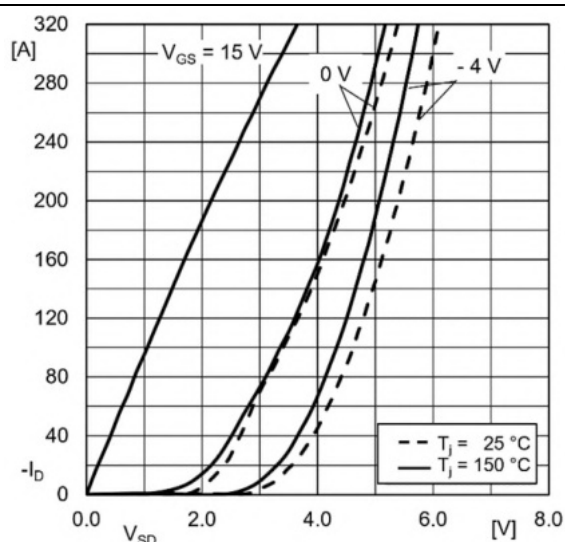


Fig. 1a: Typ. MOSFET reverse output characteristic, incl. $R_{DS(on)}$ vs V_{DS}

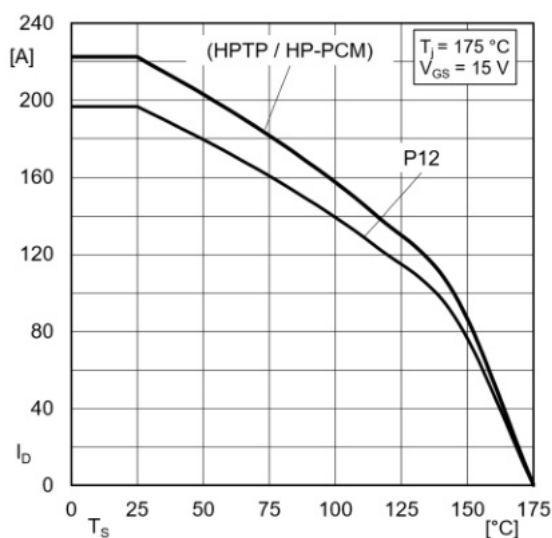


Fig. 2: MOSFET Rated current vs. temperature $I_D = f(T_S)$

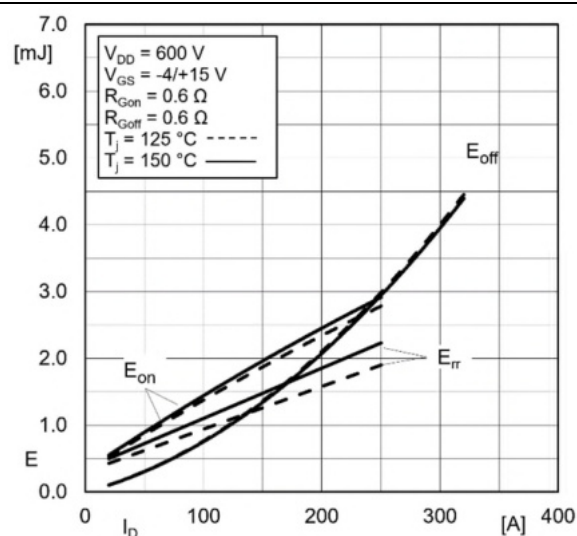


Fig. 3: Typ. MOSFET switching energy $E = f(I_D)$ at R_{G1}

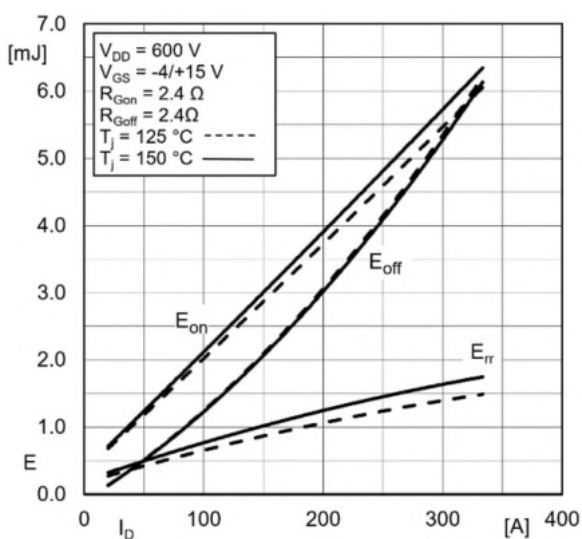


Fig. 3a: Typ. MOSFET switching energy $E = f(I_D)$ at R_{G2}

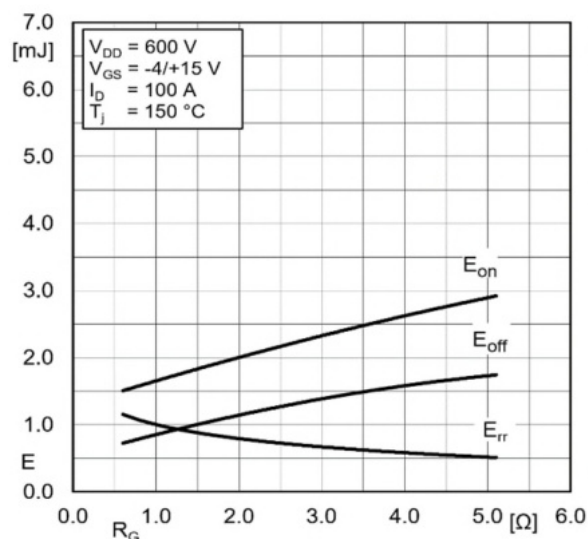


Fig. 4: Typ. MOSFET switching energy $E = f(R_G)$ at I_{D1}

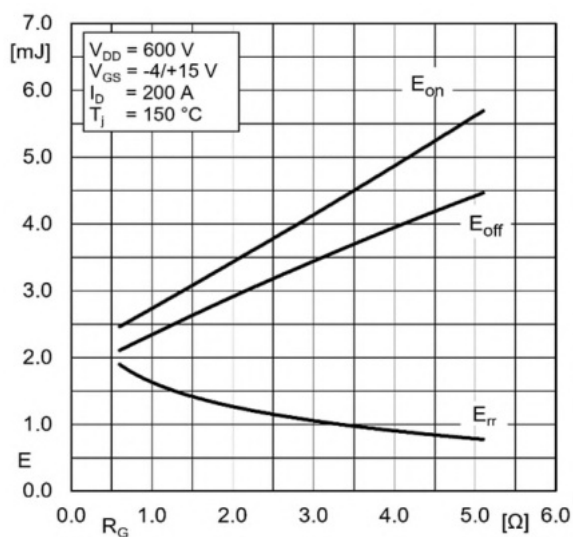


Fig. 4a: Typ. MOSFET switching energy $E = f(R_G)$ at I_{D2}

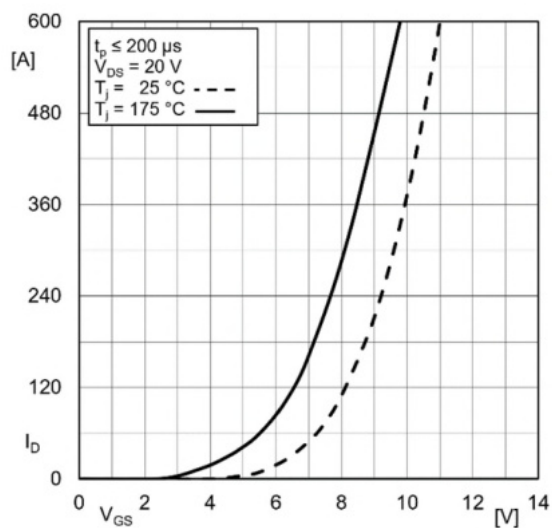


Fig. 5: Typ. MOSFET transfer characteristic

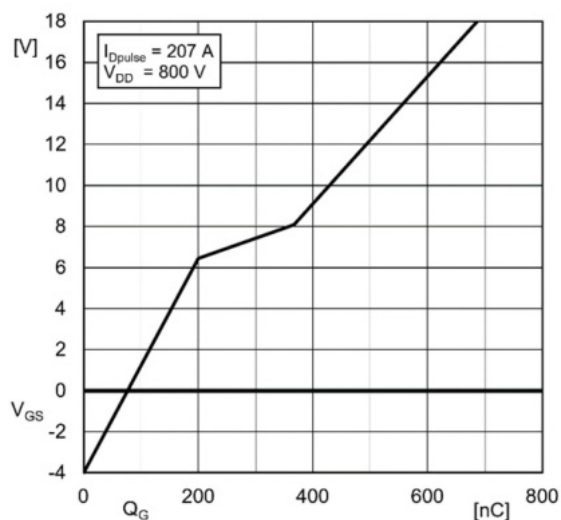


Fig. 6: Typ. MOSFET gate charge characteristic

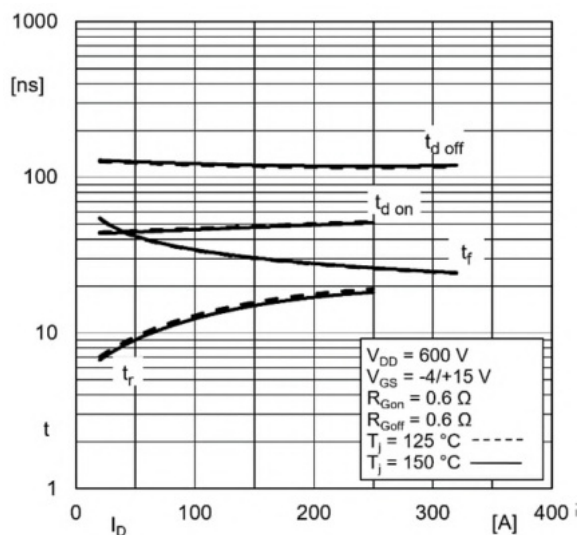


Fig. 7: Typ. MOSFET switching times $t = f(I_D)$ at R_{G1}

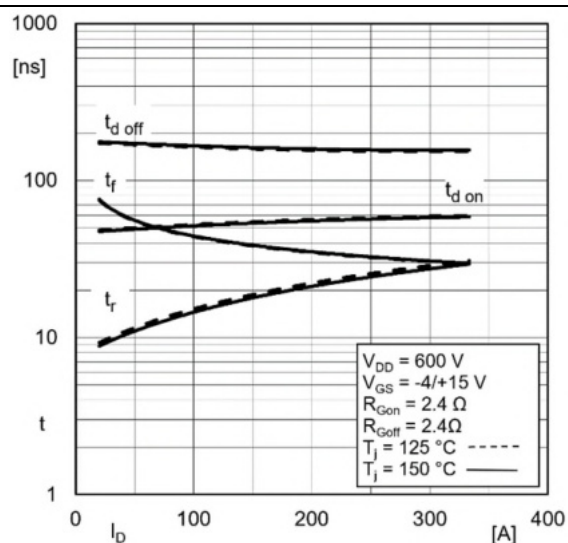


Fig. 7a: Typ. MOSFET switching times $t = f(I_D)$ at R_{G2}

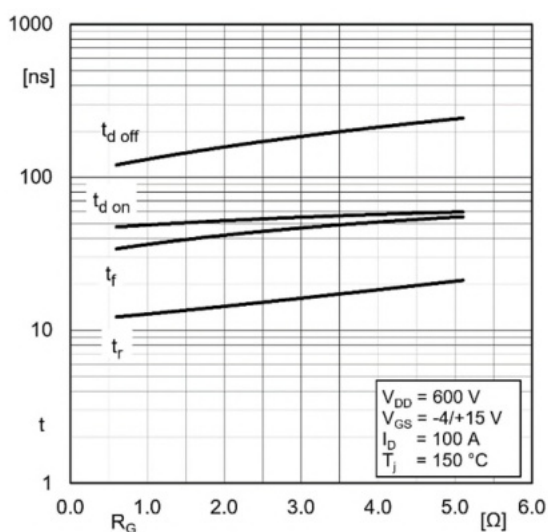
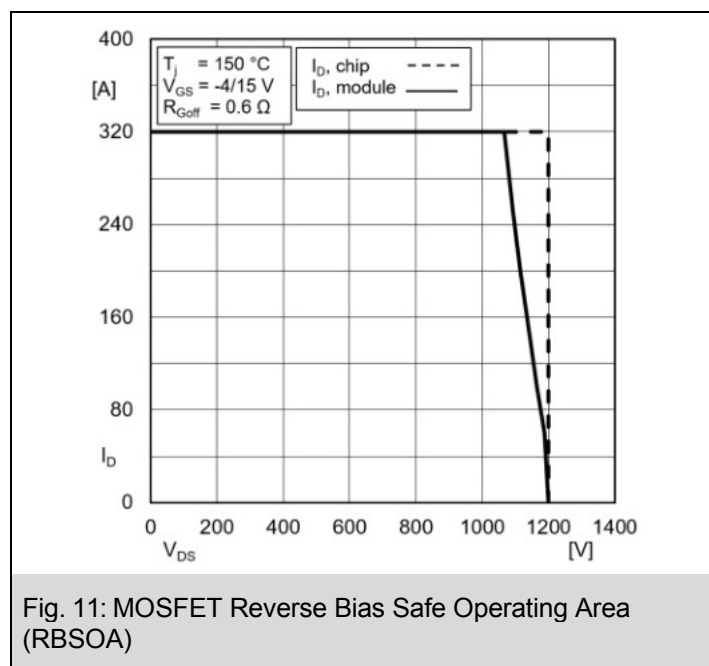
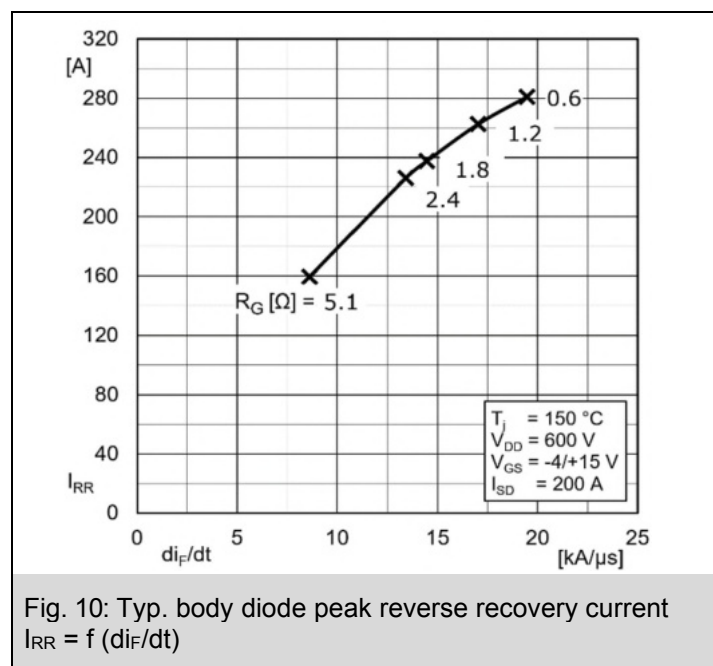
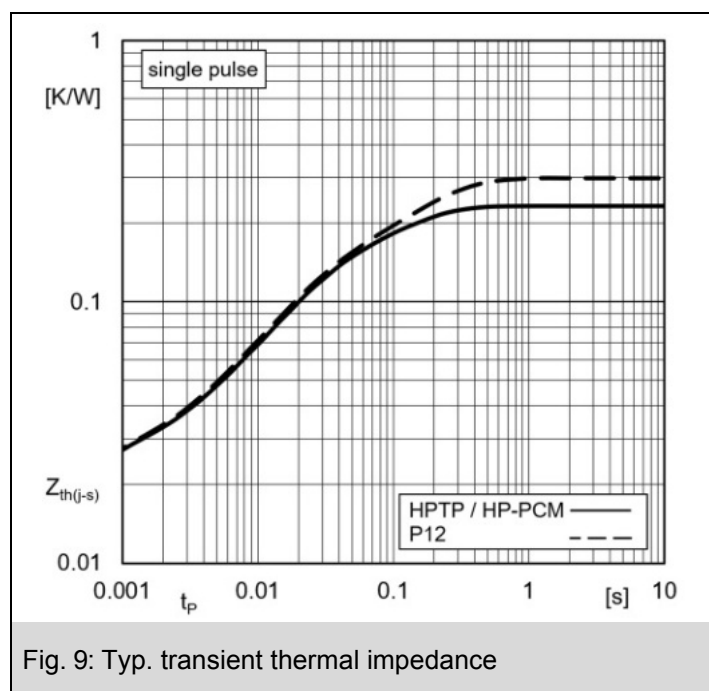
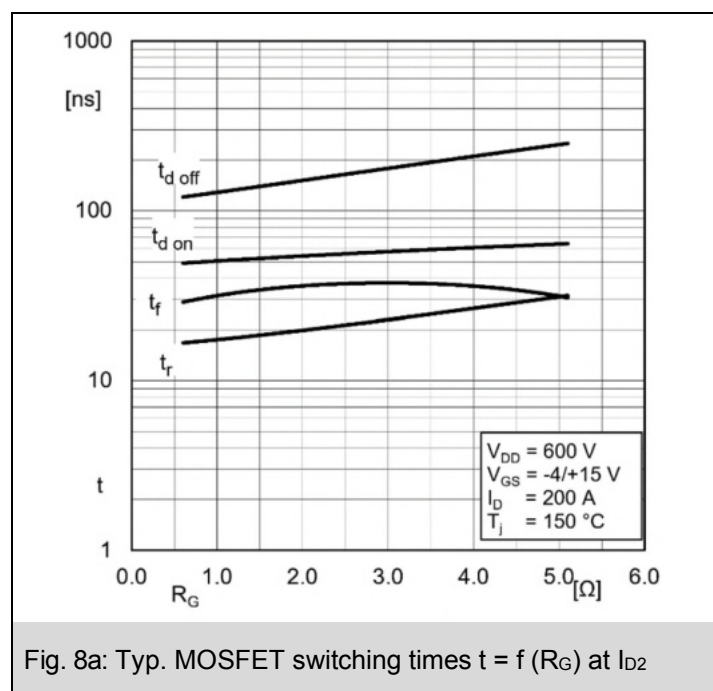
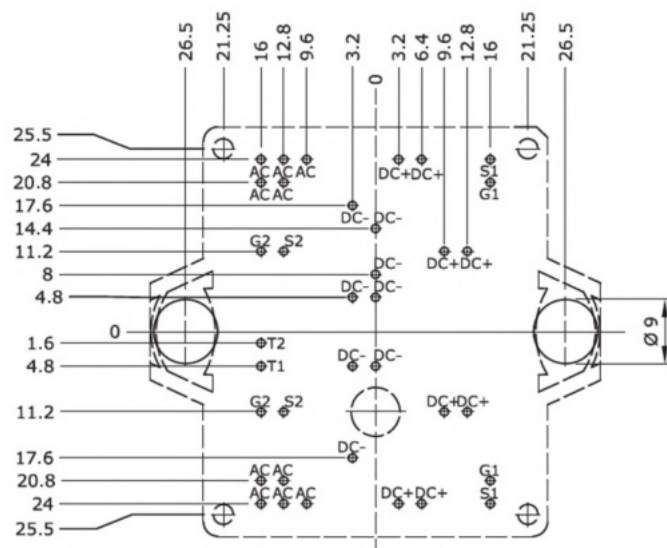
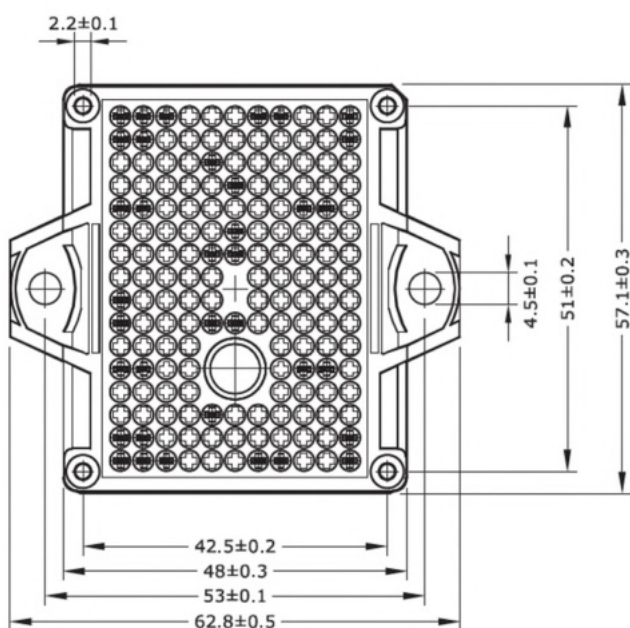
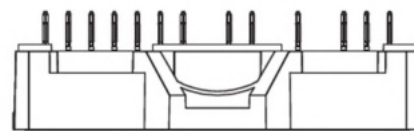
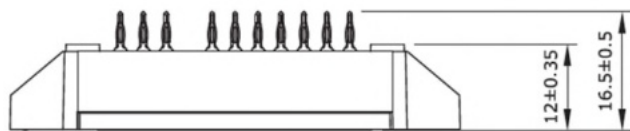


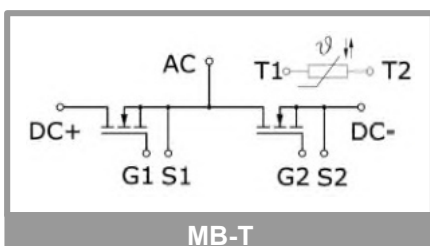
Fig. 8: Typ. MOSFET switching times $t = f(R_G)$ at I_{D1}





- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern $\boxed{\oplus \varnothing 0.1}$
- Diameters of drill $\varnothing 1.15\text{mm}$
- Copper thickness in hole 25 - 50 μm
- Hole specification for contacts:
refer to SEMITOP E1/E2 Mounting Instruction

Pinout and Dimensions



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

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