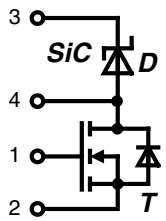
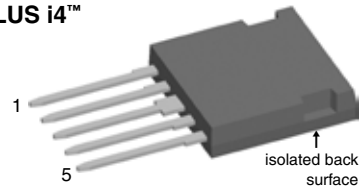
# CoolMOS™ [1] Power MOSFET
## with SiC Diode
## Boost topology

$I_{D25}$ = 15 A
$V_{DSS}$ = 600 V
$R_{DS(on)\ max}$ = 0.165 Ω

Electrically isolated back surface
2500 V electrical isolation




**ISOPLUS i4™**




E72873

| MOSFET T | | | | | |
|---|---|---|---|---|---|
| **Symbol** | **Conditions** | | | **Maximum Ratings** | |
| $V_{DSS}$ | $T_{VJ}$ = 25°C | | | 600 | V |
| $V_{GS}$ | | | | ± 20 | V |
| $I_{D25}$ | $T_C$ = 25°C | | | 15 | A |
| $I_{D90}$ | $T_C$ = 90°C | | | 11 | A |
| $E_{AS}$ | single pulse | $I_D$ = 7.9 A; $T_C$ = 25°C | | 522 | mJ |
| $E_{AR}$ | repetitive | | | 0.79 | mJ |
| dV/dt | MOSFET dV/dt ruggedness $V_{DS}$ = 0...480 V | | | 50 | V/ns |

| **Symbol** | **Conditions** | | **Characteristic Values** ($T_{VJ}$ = 25°C, unless otherwise specified) | | | |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| $R_{DSon}$ | $V_{GS}$ = 10 V; $I_D$ = 12 A | | | 150 | 165 | mΩ |
| $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$; $I_D$ = 0.79 mA | | 2.5 | 3 | 3.5 | V |
| $I_{DSS}$ | $V_{DS}$ = 600 V; $V_{GS}$ = 0 V | $T_{VJ}$ = 25°C | | | 1 | µA |
| | | $T_{VJ}$ = 125°C | | 10 | | µA |
| $I_{GSS}$ | $V_{GS}$ = ± 20 V; $V_{DS}$ = 0 V | | | | 100 | nA |
| $C_{iss}$ | $V_{GS}$ = 0 V; $V_{DS}$ = 100 V | | | 2000 | | pF |
| $C_{oss}$ | f = 1 MHz | | | 100 | | pF |
| $Q_g$ | $V_{GS}$ = 0 to 10 V; $V_{DS}$ = 400 V; $I_D$ = 12 A | | | 40 | 52 | nC |
| $Q_{gs}$ | | | | 9 | | nC |
| $Q_{gd}$ | | | | 13 | | nC |
| $t_{d(on)}$ | Inductive switching | $T_{VJ}$ = 125°C | | 12 | | ns |
| $t_r$ | $V_{GS}$ = 0/10 V; $V_{DS}$ = 380 V | | | 6 | | ns |
| $t_{d(off)}$ | $I_D$ = 12 A; $R_G$ = 10 Ω | | | 75 | | ns |
| $t_f$ | | | | 4 | | ns |
| $E_{on}$ | | | | 0.09 | | mJ |
| $E_{off}$ | | | | 0.01 | | mJ |
| $E_{rec\ off}$ | no reverse recovery current due to absence of minority carrier injection | | | | | mJ |
| $R_{thJC}$ | | | | | 1.1 | K/W |
| $R_{thJH}$ | with heat transfer paste (IXYS test setup) | | | 1.35 | | K/W |

### Features

- Silicon chip on Direct-Copper-Bond substrate
  - high power dissipation
  - isolated mounting surface
  - 2500 V electrical isolation
  - low drain to tab capacitance (< 40 pF)
- Fast CoolMOS™ [1] power MOSFET 4th generation
  - high blocking capability
  - lowest resistance
  - avalanche rated for unclamped inductive switching (UIS)
  - low thermal resistance due to reduced chip thickness
- Enhanced total power density
- SiC Boost Diode
  - no reverse recovery current

### Applications

- Switched mode power supplies (SMPS)
- Uninterruptible power supplies (UPS)
- Power factor correction (PFC)

### Advantages

- Easy assembly: no screws or isolation foils required
- Space savings
- High power density
- High reliability

[1] CoolMOS™ is a trademark of Infineon Technologies AG.

## MOSFET T Source-Drain Diode

| Symbol | Conditions | Characteristic Values ($T_{VJ}$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0 V | | | 12 | A |
| $V_{SD}$ | $I_F$ = 12 A; $V_{GS}$ = 0 V | | 0.9 | 1.2 | V |
| $t_{rr}$ | $I_F$ = 12 A; -$di_F$/dt = 100 A/µs; $V_R$ = 400 V | | 390 | | ns |
| $Q_{RM}$ | | | 7.5 | | µC |
| $I_{RM}$ | | | 38 | | A |

## SiC Boost Diode D

| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{RRM}$ | $T_{VJ}$ = 25°C to 150°C | 600 | V |
| $I_{F25}$ | $T_C$ = 25°C | 15 | A |
| $I_{F90}$ | $T_C$ = 90°C | 9.5 | A |

| Symbol | Conditions | | Characteristic Values min. | typ. | max. | |
|---|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 8 A | $T_{VJ}$ = 25°C | | 1.5 | 1.7 | V |
| | $I_F$ = 8 A | $T_{VJ}$ = 150°C | | | 1.9 | A |
| $I_R$ | $V_R$ = $V_{RRM}$ | $T_{VJ}$ = 25°C | | 1 | 100 | µA |
| | | $T_{VJ}$ = 150°C | | 10 | | µA |
| $I_{FSM}$ | t = 10 ms (50 Hz), sine; | $T_{VJ}$ = 25°C | | | 59 | A |
| $Q_C$ | $I_F$ = $I_{Fmax}$; $V_R$ = 400 V; di/dt = 200 A/µs [1] | $T_{VJ}$ = 150°C | | 19 | | nC |
| $t_C$ | | | | | 10 | ns |
| $R_{thJC}$ | with heat transfer paste (IXYS test setup) | | | | 3.1 | K/W |
| $R_{thJH}$ | | | | 4.0 | | K/W |

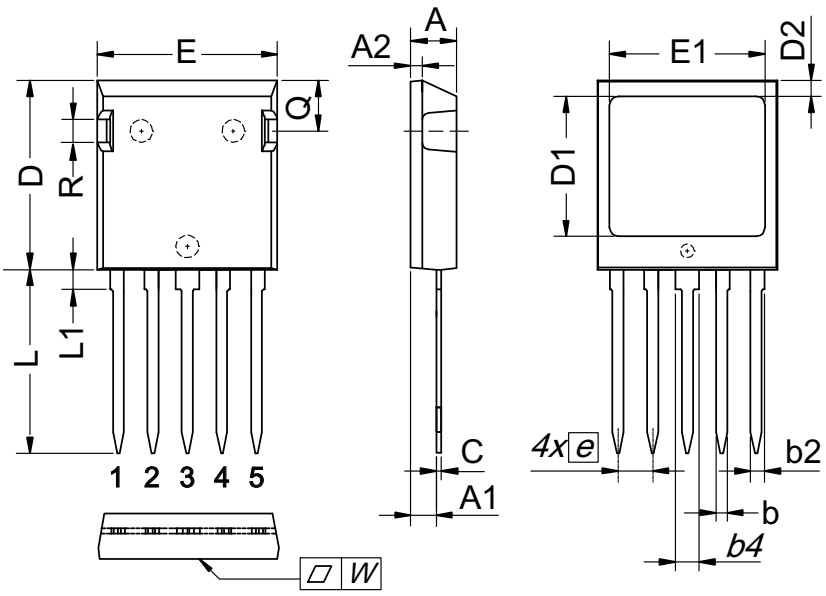
[1] $t_C$ is the time constant for the capacitive displacement current waveform (independent from $T_J$, $I_{LOAD}$ and di/dt), different from $t_{rr}$ which is dependent on $T_J$, $I_{LOAD}$ and di/dt.
**No reverse recovery time constant trr due to absence of minority carrier injection**

## Component

| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $T_{VJ}$ | operating | -55...+150 | °C |
| $T_{stg}$ | storage | -55...+125 | °C |
| $V_{ISOL}$ | $I_{ISOL}$ < 1 mA; 50/60 Hz | 2500 | V~ |
| $F_C$ | mounting force with clip | 20...120 | N |

| Symbol | Conditions | Characteristic Values min. | typ. | max. | |
|---|---|---|---|---|---|
| $C_P$ | coupling capacity between shorted pins and mounting tab in the case | | 40 | | pF |
| $d_S$, $d_A$ | pin - pin | 1.7 | | | mm |
| $d_S$, $d_A$ | pin - backside metal | 5.5 | | | mm |
| **Weight** | | | 9 | | g |

**ISOPLUS i4™ Outline**




| DIM. | MILLIMETER | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.83 | 5.21 | 0.190 | 0.205 |
| A1 | 2.59 | 3.00 | 0.102 | 0.118 |
| A2 | 1.17 | 2.16 | 0.046 | 0.085 |
| b | 1.14 | 1.40 | 0.045 | 0.055 |
| b2 | 1.47 | 1.73 | 0.058 | 0.068 |
| b4 | 2.54 | 2.79 | 0.100 | 0.110 |
| C | 0.51 | 0.74 | 0.020 | 0.029 |
| D | 20.80 | 21.34 | 0.819 | 0.840 |
| D1 | 14.99 | 15.75 | 0.590 | 0.620 |
| D2 | 1.65 | 2.03 | 0.065 | 0.080 |
| E | 19.56 | 20.29 | 0.770 | 0.799 |
| E1 | 16.76 | 17.53 | 0.660 | 0.690 |
| e | 3.81 BSC | | 0.15 BSC | |
| L | 19.81 | 21.34 | 0.780 | 0.840 |
| L1 | 2.11 | 2.59 | 0.083 | 0.102 |
| Q | 5.33 | 6.20 | 0.210 | 0.244 |
| R | 2.54 | 4.57 | 0.100 | 0.180 |
| W | — | 0.10 | — | 0.004 |

Die konvexe Form des Substrates ist typ. < 0.05 mm über der Kunststoffoberfläche der Bauteilunterseite
*The convexbow of substrate is typ. < 0.05 mm over plastic surface level ofdevice bottom side*

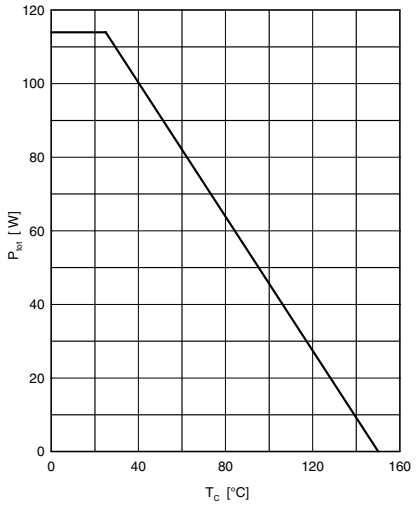



Fig. 1 Power dissipation

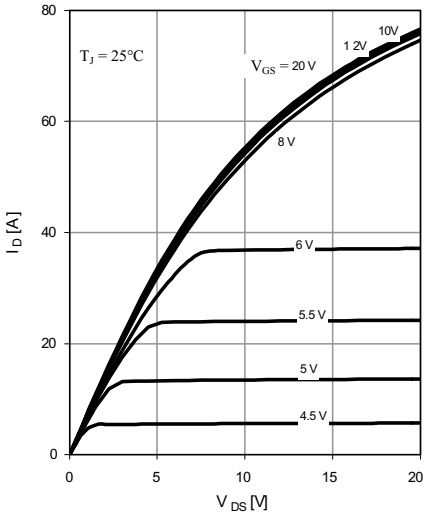



Fig. 2 Typ. output characteristics

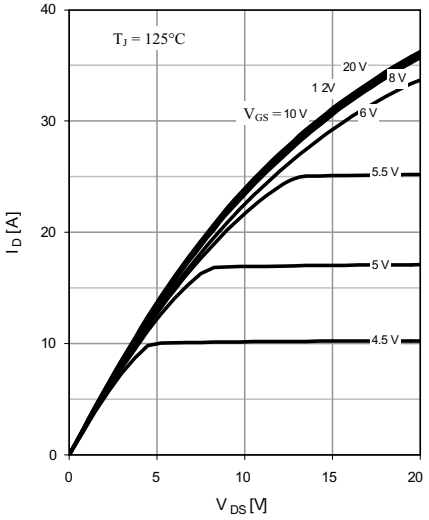



Fig. 3 Typ. output characteristics

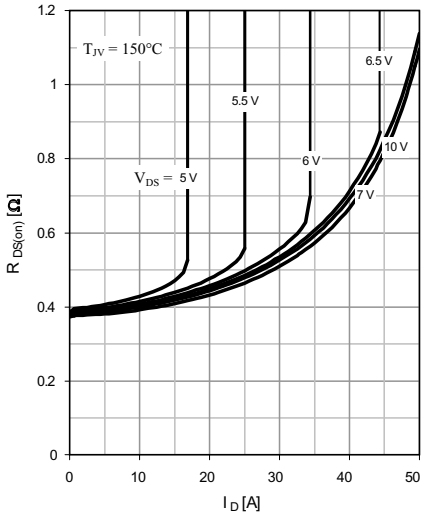



Fig. 4 Typ. drain-source on-state resistance

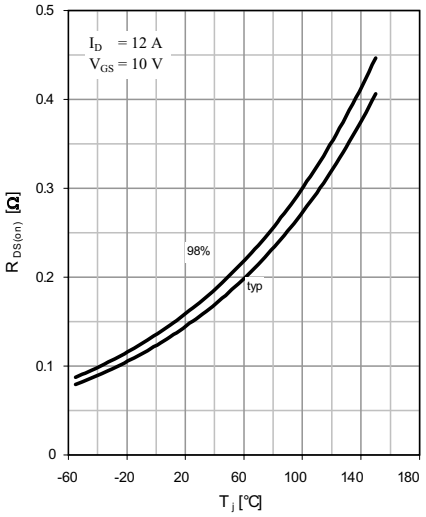



Fig. 5 Drain-source on-state resistance

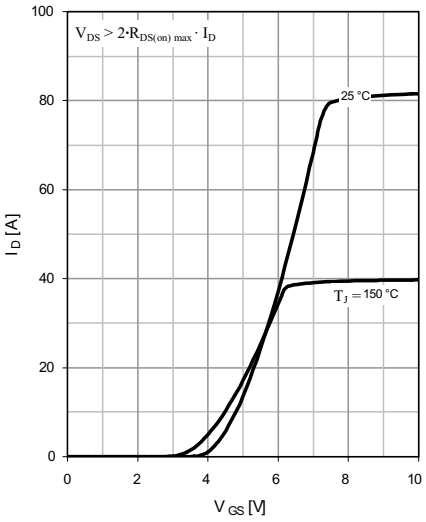



Fig. 6 Typ. transfer characteristics

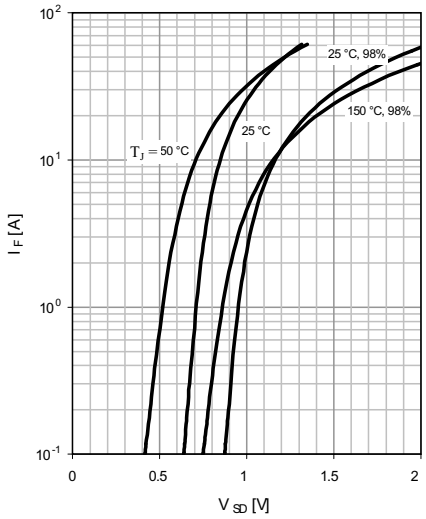



Fig. 7 Forward characteristic of reverse diode

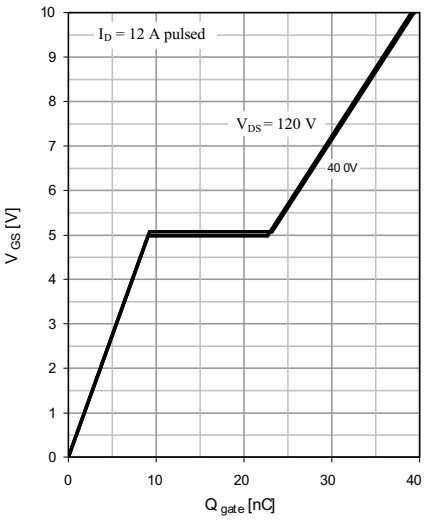



Fig. 8 Typ. gate charge

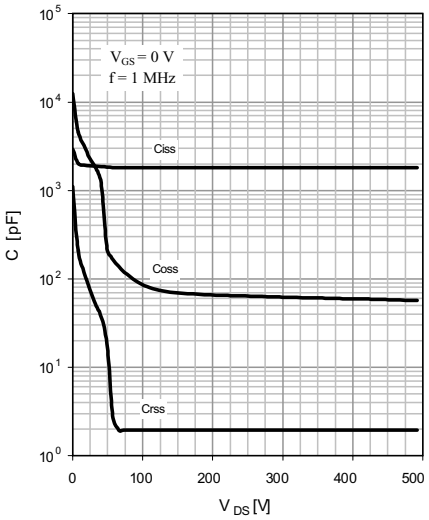



Fig. 9 Typ. capacitances

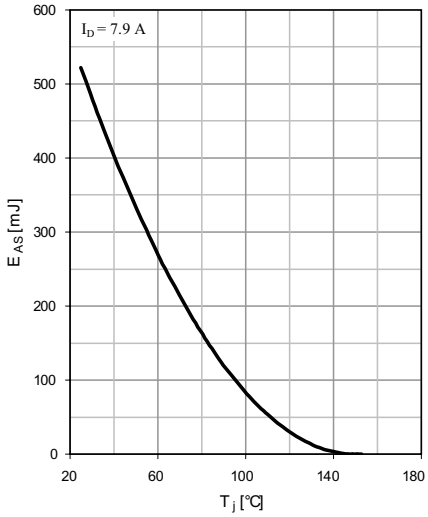



Fig. 10 Avalanche energy

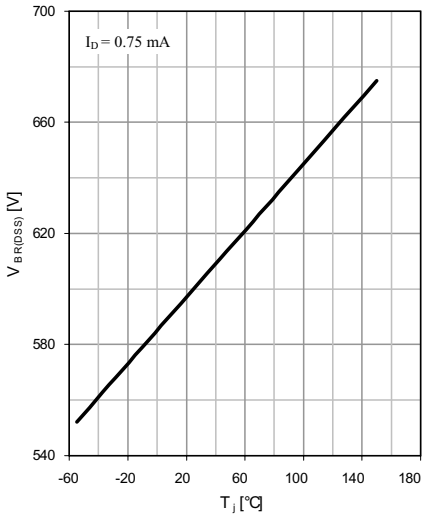



Fig. 11 Drain-source breakdown voltage

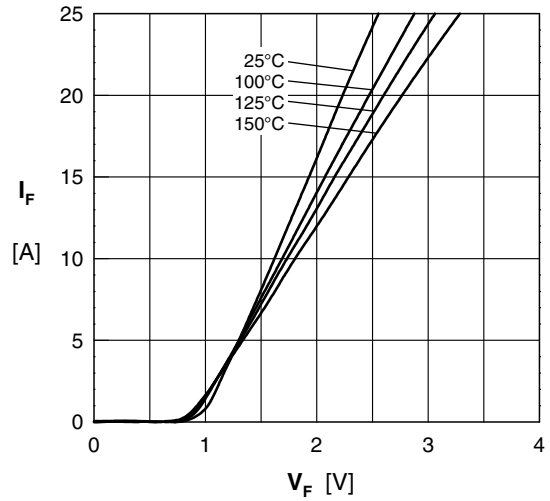



Fig. 12 Forward characteristic of boost diode

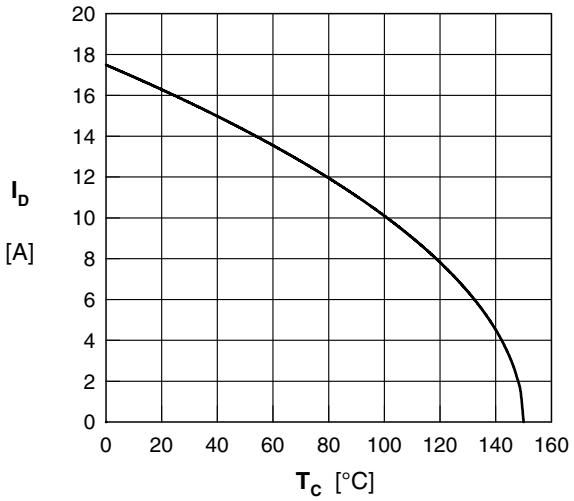



Fig. 13 Drain current $I_D$ versus case temperature $T_C$

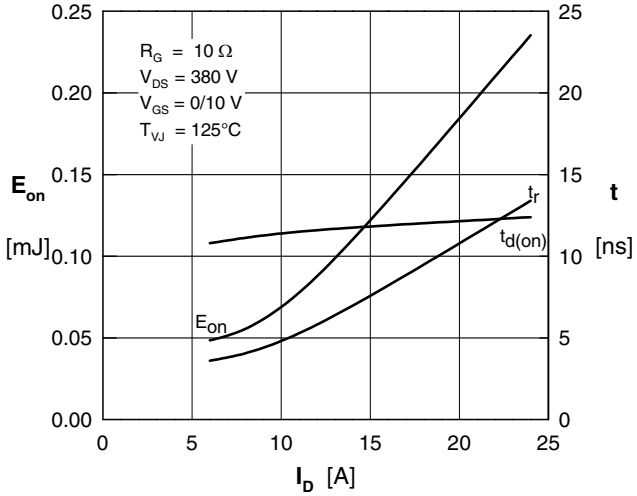



Fig. 14 Typ. turn-on energy and switching times versus drain current, inductive switching

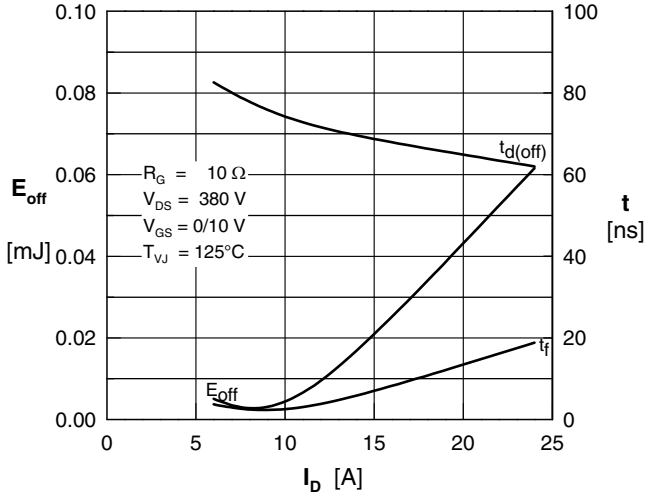



Fig. 15 Typ. turn-off energy and switching times versus drain current, inductive switching

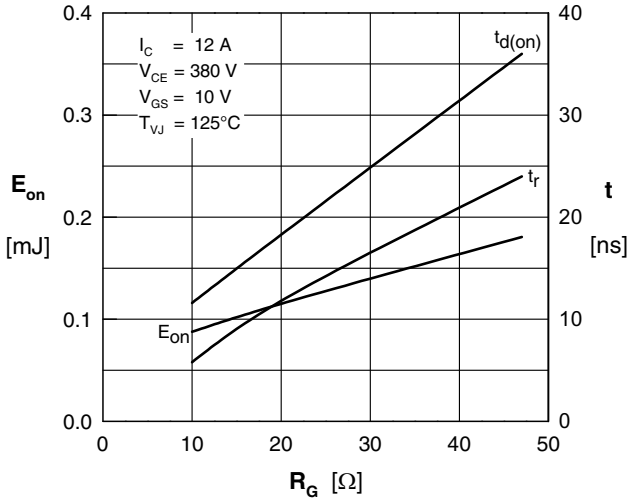



Fig. 16 Typ. turn-on energy and switching times versus gate resistor, inductive switching

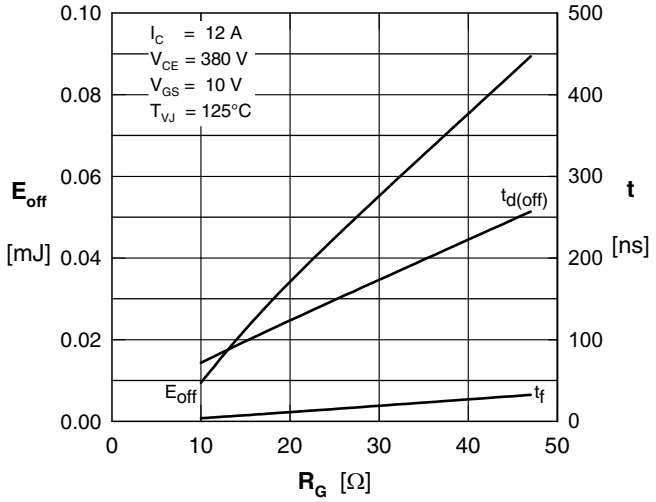



Fig. 17 Typ. turn-off energy and switching times versus gate resistor, inductive switching

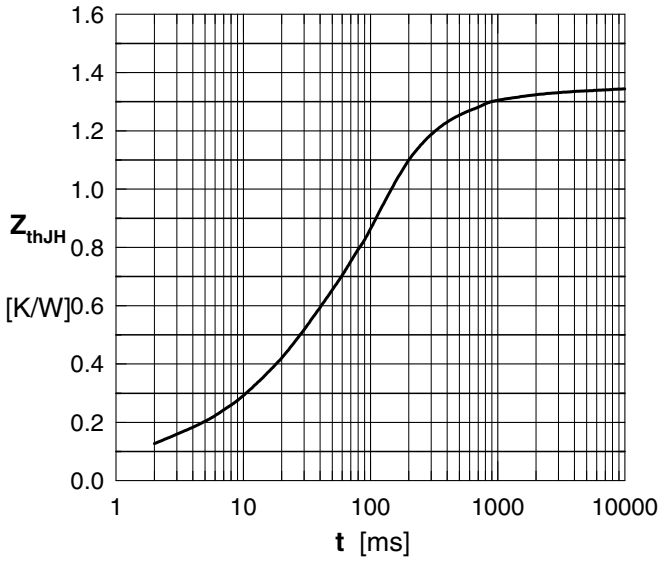



Fig. 18 Typ. transient thermal impedances of IGBT with heat transfer paste (IXYS test setup)

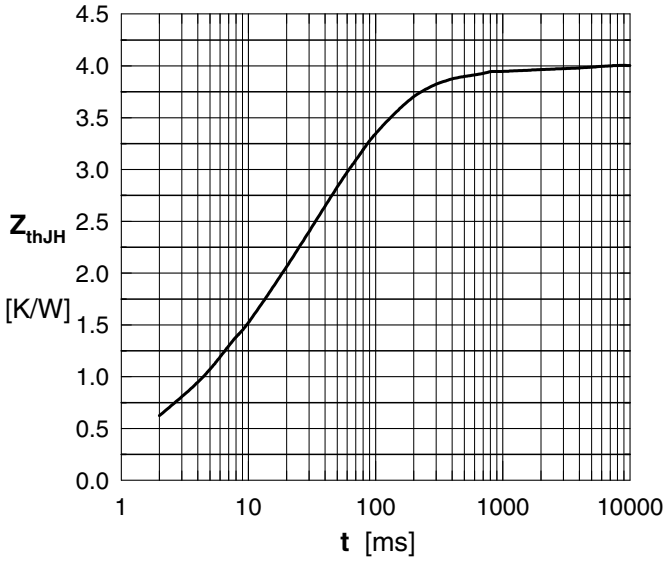



Fig. 19 Typ. transient thermal impedances of boost diode with heat transfer paste (IXYS test setup)

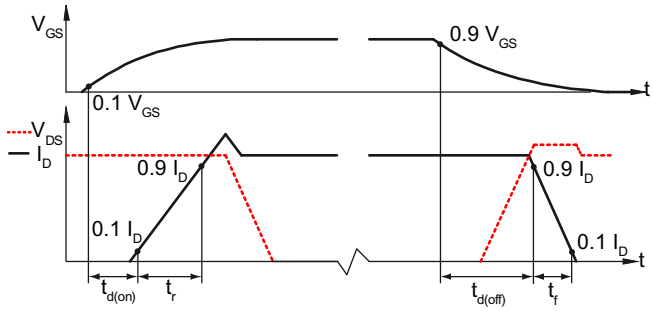



Fig. 20 Definition of switching times