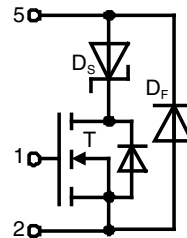


CoolMOS™ 1) Power MOSFET

with Series Schottky Diode and
Ultra Fast Antiparallel Diode

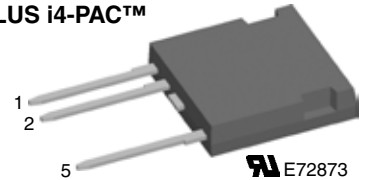
in High Voltage ISOPLUS i4-PAC™

Preliminary data



$V_{DSS} = 600\text{ V}$
 $I_{D25} = 41\text{ A}$
 $R_{DS(on) \text{ typ.}} = 60\text{ m}\Omega$
 $t_{rr} = 70\text{ ns}$

ISOPLUS i4-PAC™



| MOSFET T | | | | | |
|---|--|------------------------------|--|------------------|------------------|
| Symbol | Conditions | Maximum Ratings | | | |
| V_{DSS} | $T_{VJ} = 25^\circ\text{C to } 150^\circ\text{C}$ | 600 | V | | |
| V_{GS} | | ± 20 | V | | |
| I_{D25} | $T_C = 25^\circ\text{C}$ | 41 | A | | |
| I_{D90} | $T_C = 90^\circ\text{C}$ | 29 | A | | |
| Symbol | Conditions | Characteristic Values | | | |
| ($T_{VJ} = 25^\circ\text{C}$, unless otherwise specified) | | | | | |
| | | min. | typ. | max. | |
| R_{DSon} | MOSFET 'T' only: | | | | |
| | $V_{GS} = 10\text{ V}; I_D = 25\text{ A}$ | | 60 | 70 | $\text{m}\Omega$ |
| | | $T_{VJ} = 25^\circ\text{C}$ | | | |
| | | $T_{VJ} = 125^\circ\text{C}$ | | 135 | $\text{m}\Omega$ |
| | MOSFET 'T & D_S ' in series (pin 5, pin 2): | | | | |
| | $V_{GS} = 10\text{ V}; I_D = 10\text{ A}$ | $T_{VJ} = 25^\circ\text{C}$ | 120 | | $\text{m}\Omega$ |
| | $T_{VJ} = 125^\circ\text{C}$ | 170 | | $\text{m}\Omega$ | |
| | $V_{GS} = 10\text{ V}; I_D = 25\text{ A}$ | $T_{VJ} = 25^\circ\text{C}$ | 85 | | $\text{m}\Omega$ |
| | $T_{VJ} = 125^\circ\text{C}$ | 145 | | $\text{m}\Omega$ | |
| $V_{GS(th)}$ | $V_{DS} = 20\text{ V}; I_D = 3\text{ mA}$ | 2.1 | | 3.9 | V |
| I_{DSS} | $V_{DS} = V_{DSS}; V_{GS} = 0\text{ V}$ | | | 0.3 | mA |
| | | | 1 | | mA |
| I_{GSS} | $V_{GS} = \pm 20\text{ V}; V_{DS} = 0\text{ V}$ | | | 100 | nA |
| Q_g | $V_{GS} = 10\text{ V}; V_{DS} = 350\text{ V}; I_D = 50\text{ A}$ | | 250 | | nC |
| Q_{gs} | | | 25 | | nC |
| Q_{gd} | | | 120 | | nC |
| $t_{d(on)}$ | Inductive load $V_{GS} = 10\text{ V}; V_{DS} = 380\text{ V}$ $I_D = 25\text{ A}; R_G = 10\ \Omega$ | $T_{VJ} = 125^\circ\text{C}$ | | 30 | ns |
| t_r | | | | 18 | ns |
| $t_{d(off)}$ | | | | 500 | ns |
| t_f | | | | 50 | ns |
| E_{on} | | | | 0.7 | mJ |
| E_{off} | | | | 0.3 | mJ |
| $E_{rec(off)}$ | | | | 0.22 | mJ |
| R_{thJC} | | | with heatsink compound (IXYS test setup) | | 0.45 |
| R_{thJH} | 0.5 | 0.7 | | K/W | |

Features

- fast CoolMOS™ 1) power MOSFET 3rd generation
 - high blocking voltage
 - low on resistance
 - low thermal resistance due to reduced chip thickness
- Series Schottky diode prevents current flow through MOSFET's body diode
 - very low forward voltage
 - fast switching
- Ultra fast HiPerFRED™ anti parallel diode
 - low operating forward voltage
 - fast and soft reverse recovery
 - low switching losses
- ISOPLUS i4-PAC™ high voltage package
 - isolated back surface
 - low coupling capacity between pins and heatsink
 - enlarged creepage towards heatsink
 - enlarged creepage betw. high voltage pins
 - application friendly pinout
 - high reliability
 - industry standard outline
 - UL registered E 72873

Applications

- Converters with
- circuit operation leading to current flow through switches in reverse direction - e. g.
 - phaseleg with inductive load
 - resonant circuits
 - high switching frequency

Examples

- switched mode power supplies (SMPS)
- uninterruptable power supplies (UPS)
- DC-DC converters
- welding converters
- converters for inductive heating
- drive converters

1) CoolMOS™ is a trademark of Infineon Technologies AG.

Series Schottky Diode D_s

| Symbol | Conditions | Maximum Ratings | | |
|------------------|-----------------------|-----------------|----|---|
| I _{F25} | T _C = 25°C | | 77 | A |
| I _{F90} | T _C = 90°C | | 45 | A |

| Symbol | Conditions | Characteristic Values | | |
|--|--|-----------------------|------|------|
| (T _{VJ} = 25°C, unless otherwise specified) | | | | |
| | | min. | typ. | max. |
| V _F | I _F = 20 A; T _C = 25°C | | | 0.71 |
| | | | 0.5 | V |
| | T _C = 125°C | | | V |
| V _{T0} | } T _{VJ} = 150°C for power loss calculation only | | | 0.42 |
| r _T | | | | 4.1 |
| | | | | mΩ |
| R _{thJC} | with heatsink compound (IXYS test setup) | | | 2.2 |
| R _{thJH} | | 2.8 | | 3.5 |
| | | | | K/W |
| | | | | K/W |

Free Wheeling Diode D_F

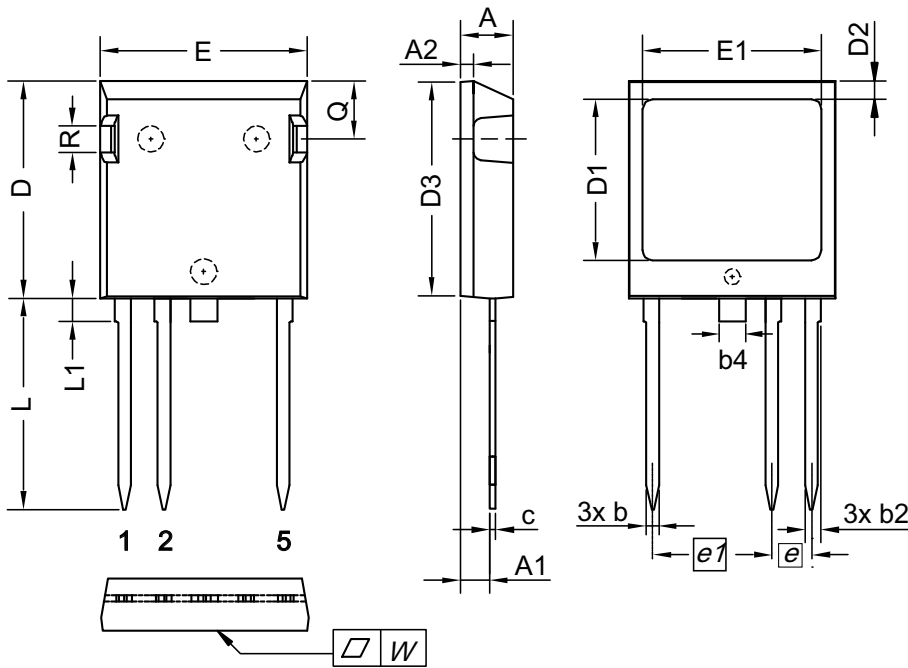
| Symbol | Conditions | Maximum Ratings | | |
|------------------|-----------------------|-----------------|----|---|
| I _{F25} | T _C = 25°C | | 40 | A |
| I _{F90} | T _C = 90°C | | 23 | A |

| Symbol | Conditions | Characteristic Values | | |
|--|---|---|------|-----|
| (T _{VJ} = 25°C, unless otherwise specified) | | | | |
| | | typ. | max. | |
| V _F | I _F = 30 A; T _C = 25°C | 2.1 | 2.5 | V |
| | | 1.4 | | V |
| | T _C = 125°C | | | |
| V _{T0} | } T _{VJ} = 150°C for power loss calculation only | | 1.0 | V |
| r _T | | | 17.3 | mΩ |
| | | | | |
| I _{RM} | } I _F = 25 A; di _F /dt = -400 A/μs; T _{VJ} = 125°C | 15 | | A |
| t _{rr} | | V _R = 380 V; V _{GE} = 0 V | 110 | |
| | | | | |
| R _{thJC} | with heatsink compound (IXYS test setup) | | 1.8 | K/W |
| R _{thJH} | | 2.3 | | 2.5 |
| | | | | K/W |

Component

| Symbol | Conditions | Maximum Ratings | | |
|-------------------|---|-----------------|------------|----|
| T _{VJ} | operating | | -40...+150 | °C |
| T _{stg} | storage | | -40...+125 | °C |
| V _{ISOL} | I _{ISOL} = 1 mA, 50/60 Hz, t = 1 min | | 3000 | 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 | D pin - S pin | 7 | | mm |
| d _s , d _A | pin - backside metal | 5.5 | | mm |
| Weight | | | 6 | g |

ISOPLUS i4-PAC™ 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 |
| D3 | 20.30 | 20.70 | 0.799 | 0.815 |
| E | 19.56 | 20.29 | 0.770 | 0.799 |
| E1 | 16.76 | 17.53 | 0.660 | 0.690 |
| e | 3.81 BSC | | 0.150 BSC | |
| e1 | 11.43 BSC | | 0.450 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 convex bow of substrate is typ. < 0.05 mm over plastic surface level of device bottom side

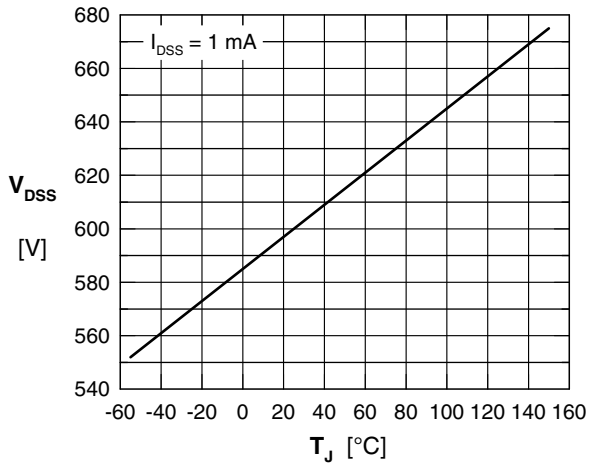


Fig. 1 Drain source breakdown voltage V_{DSS} vs. junction temperature T_J

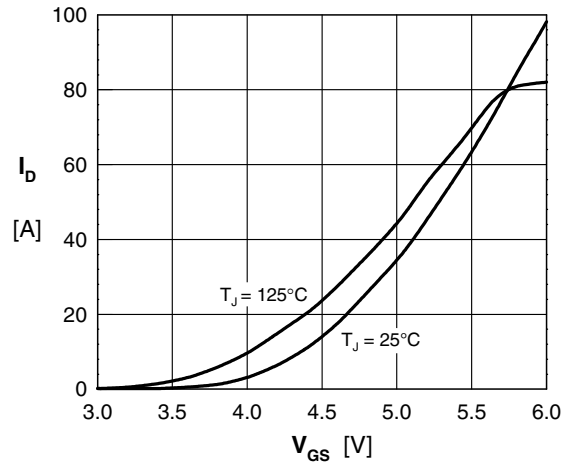


Fig. 2 Typical transfer characteristic

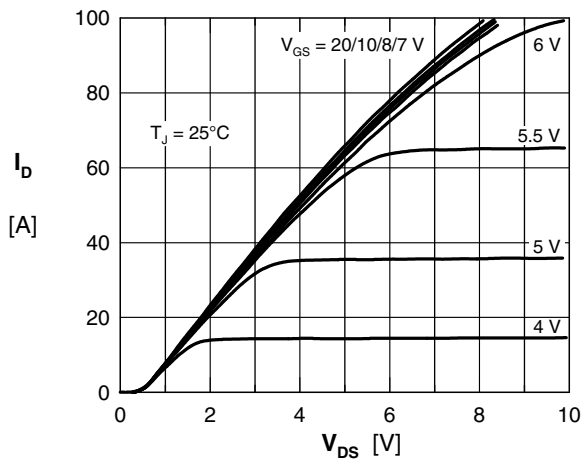


Fig. 3 Typical output characteristic (between pin 5 and pin 2)

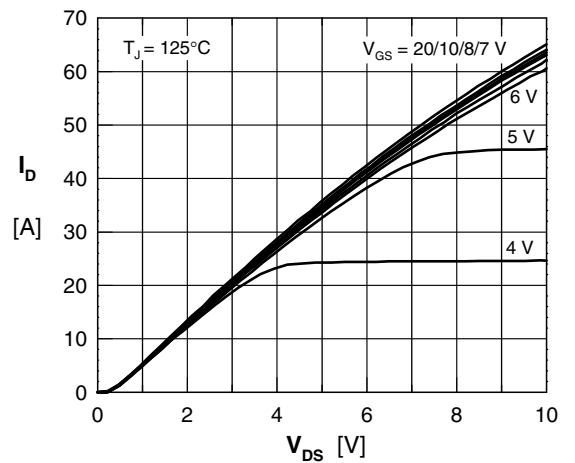


Fig. 4 Typical output characteristic (between pin 5 and pin 2)

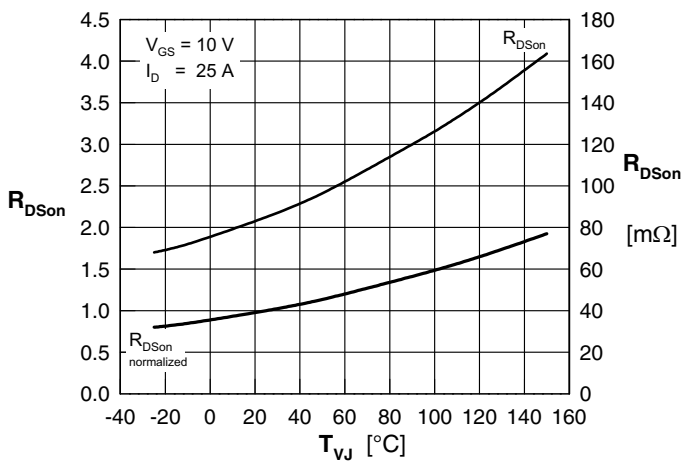


Fig. 5 Drain source on-state resistance $R_{DS(on)}$ versus junction temperature T_J (between pin 5 and pin 2)

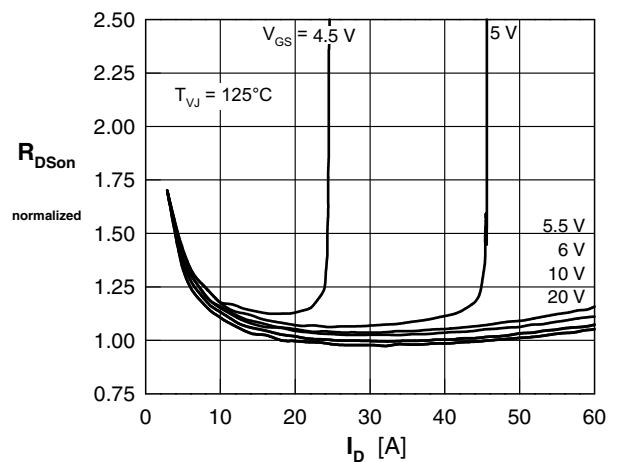


Fig. 6 Drain source on-state resistance $R_{DS(on)}$ versus I_D (between pin 5 and pin 2)

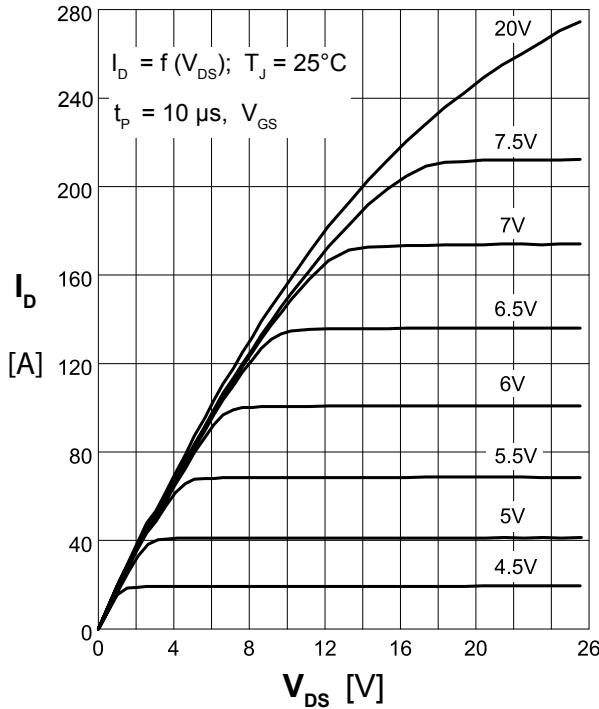


Fig. 7 Typical output characteristic (MOSFET only)

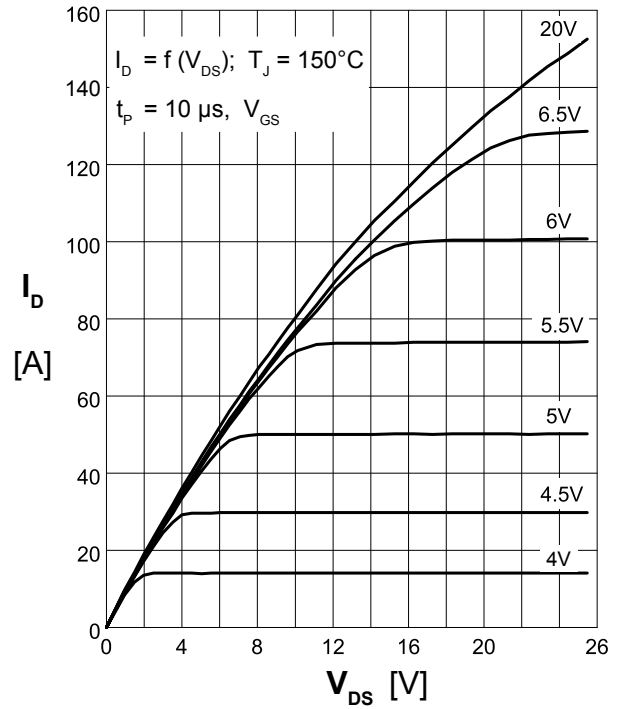


Fig. 8 Typical output characteristic (MOSFET only)

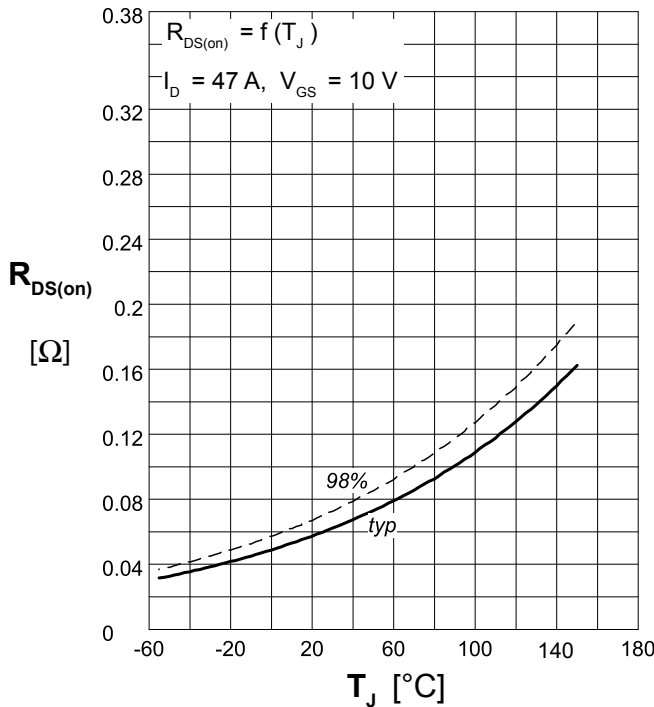


Fig. 9 Drain source on-state resistance $R_{DS(on)}$ versus junction temperature T_J (MOSFET only)

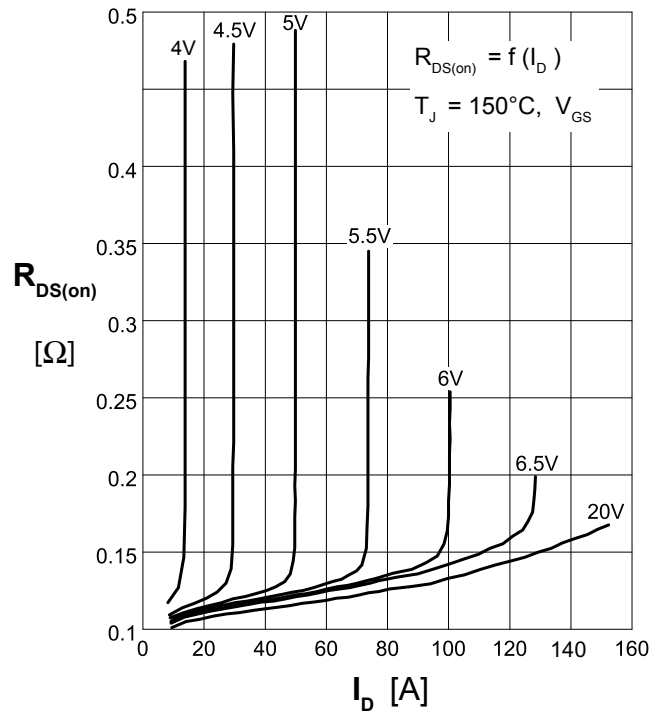


Fig. 10 Drain source on-state resistance $R_{DS(on)}$ versus I_D (MOSFET only)

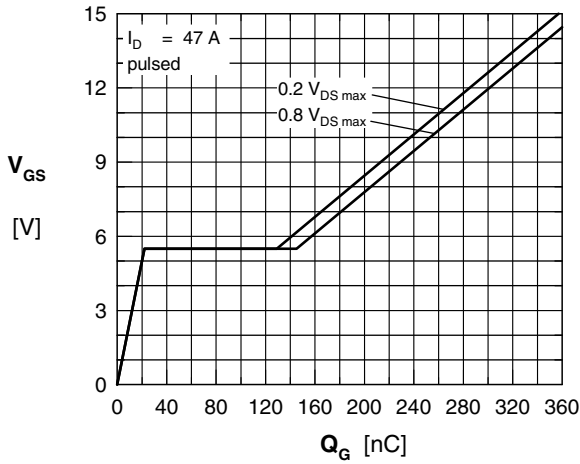


Fig. 11 Gate charge characteristic

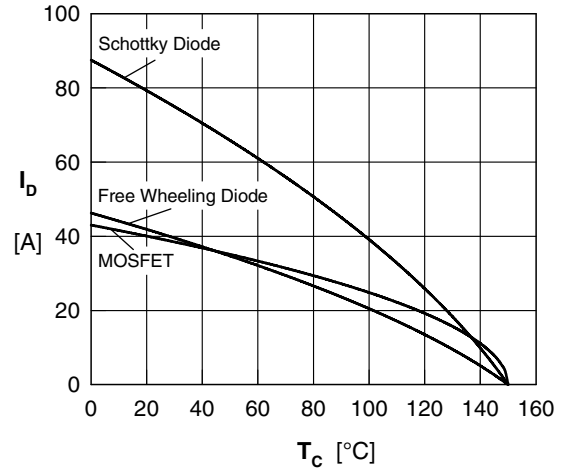


Fig. 12 Drain current I_D vs. case temperature T_C

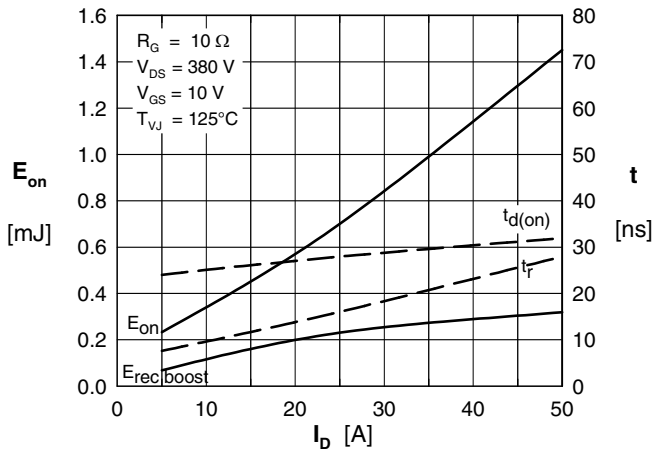


Fig. 13 Typ. turn-on energy & switching times vs. collector current, inductive switching

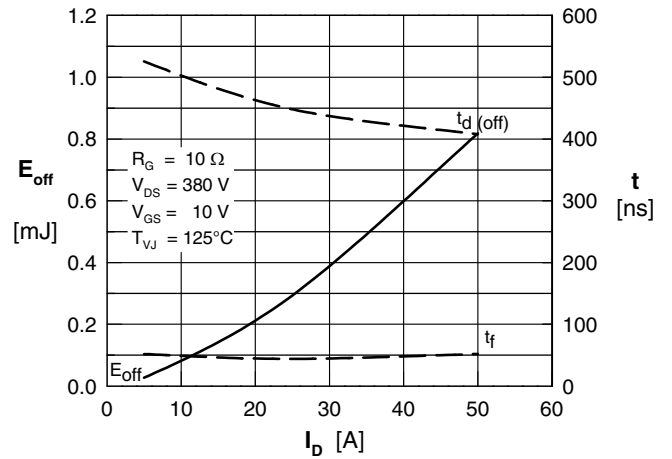


Fig. 14 Typ. turn-off energy & switching times vs. collector current, inductive switching

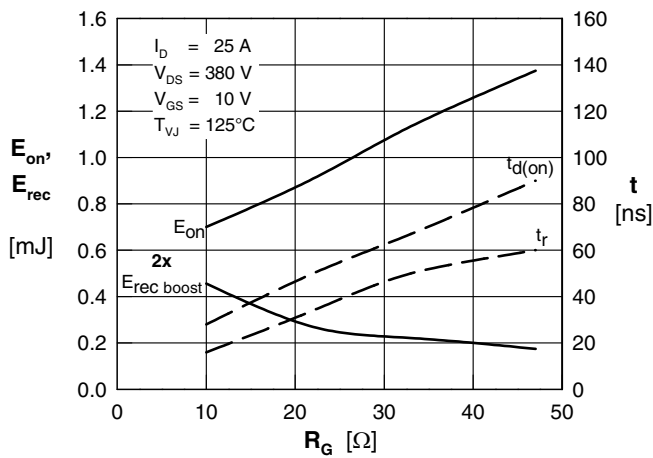


Fig. 15 Typ. turn-on energy & switching times vs. gate resistor, inductive switching

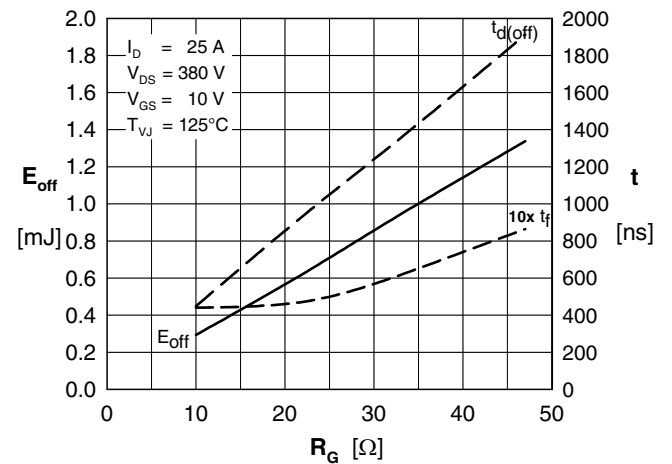


Fig. 16 Typ. turn-off energy & switching times vs. gate resistor, inductive switching

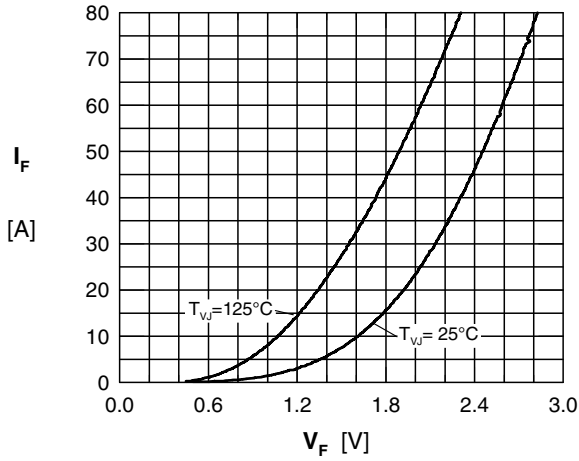


Fig. 17 Typ. forward characteristics of reverse diode

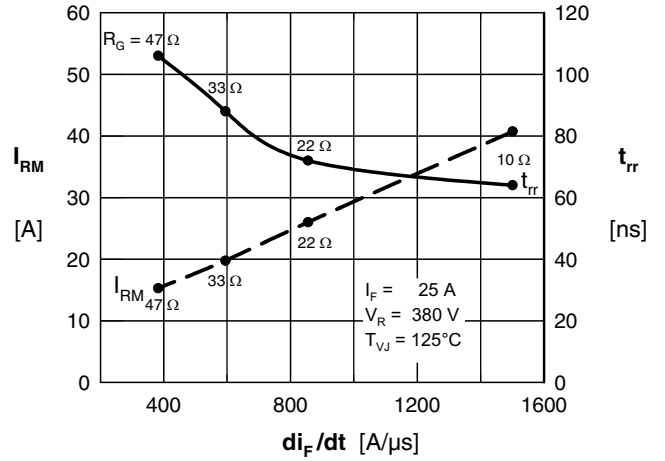


Fig. 18 Typ. reverse recovery characteristics of antiparallel diode

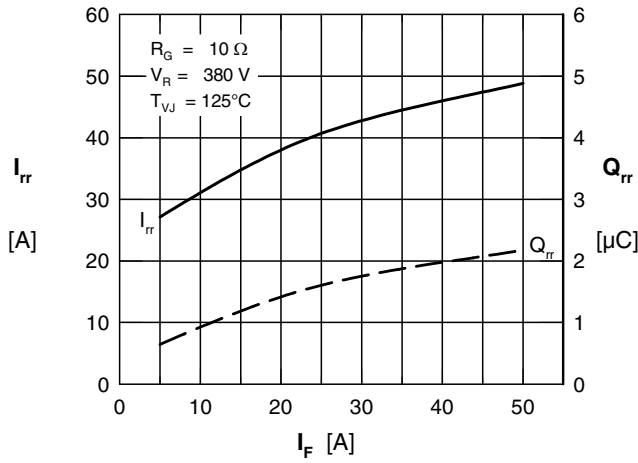


Fig. 19 Typ. reverse recovery characteristics

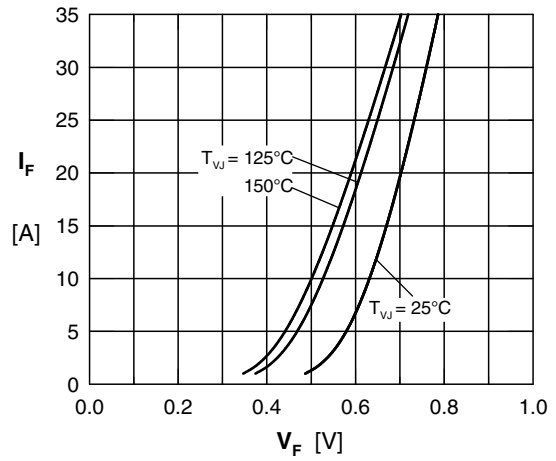


Fig. 20 Typ. forward characteristics of diode D_S

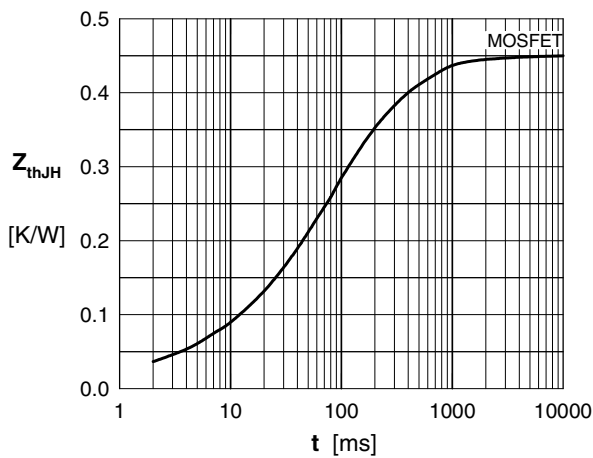


Fig. 21 Typ. thermal impedance junction to heatsink Z_{thJH} of the MOSFET with heat transfer paste

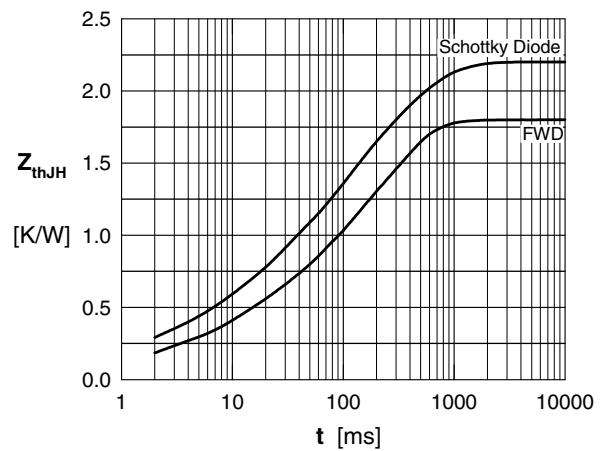


Fig. 22 Typ. thermal impedance junction to heatsink Z_{thJH} of the Diodes with heat transfer paste