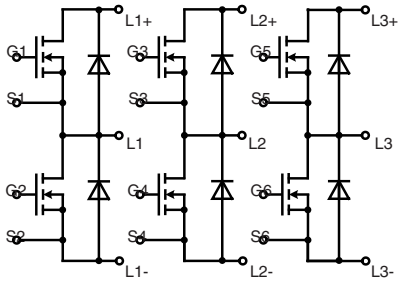
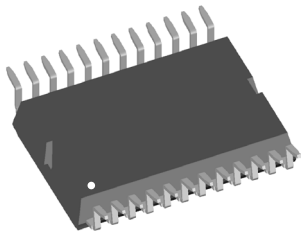
# Three phase full Bridge

with Trench MOSFETs
in DCB isolated high current package

$V_{DSS}$ = 150 V
$I_{D25}$ = 50 A
$R_{DSon\ typ.}$ = 19 mΩ



**MOSFETs**

| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_{VJ}$ = 25°C to 150°C | 150 | V |
| $V_{GS}$ | continous | ± 15 | V |
| | transient | ± 20 | V |
| $I_{D25}$ | $T_C$ = 25°C | 50 | A |
| $I_{D90}$ | $T_C$ = 90°C | 38 | A |
| $I_{D110}$ | $T_C$ = 110°C | 33 | A |
| $I_{F25}$ | $T_C$ = 25°C (diode) | 150 | A |
| $I_{F90}$ | $T_C$ = 90°C (diode) | 85 | A |
| $I_{F110}$ | $T_C$ = 110°C (diode) | 65 | A |

| Symbol | Conditions | | Characteristic Values ($T_{VJ}$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|---|
| $R_{DSon}$ [1] | on chip level at $V_{GS}$ = 10 V; $I_D$ = 38 A | $T_{VJ}$ = 25°C | | 19 | 24 | mΩ |
| | | $T_{VJ}$ = 125°C | | 38 | | mΩ |
| $V_{GS(th)}$ | $V_{DS}$ = 20 V; $I_D$ = 1 mA | | 2.5 | | 4.5 | V |
| $I_{DSS}$ | $V_{DS}$ = $V_{DSS}$; $V_{GS}$ = 0 V | $T_{VJ}$ = 25°C | | | 5 | µA |
| | | $T_{VJ}$ = 125°C | | 0.5 | | mA |
| $I_{GSS}$ | $V_{GS}$ = ± 20 V; $V_{DS}$ = 0 V | | | | 0.2 | µA |
| $Q_g$ | $V_{GS}$ = 10 V; $V_{DS}$ = 75 V; $I_D$ = 38 A | | | 97 | | nC |
| $Q_{gs}$ | | | | 29 | | nC |
| $Q_{gd}$ | | | | 30 | | nC |
| $C_{iss}$ | $V_{GS}$ = 10 V; $V_{DS}$ = 25 V; f = 1 MHz | | | 5800 | | pF |
| $C_{oss}$ | | | | 490 | | pF |
| $C_{rss}$ | | | | 85 | | pF |
| $t_{d(on)}$ | inductive load $V_{GS}$ = 10 V; $V_{DS}$ = 75 V $I_D$ = 38 A; $R_{G(on)}$ = 39 Ω; $R_{G(off)}$ = 4.7 Ω $T_J$ = 125°C | | | 120 | | ns |
| $t_r$ | | | | 50 | | ns |
| $t_{d(off)}$ | | | | 100 | | ns |
| $t_f$ | | | | 25 | | ns |
| $E_{on}$ | | | | 0.25 | | mJ |
| $E_{off}$ | | | | 0.05 | | mJ |
| $E_{recoff}$ | | | | 0.02 | | mJ |
| $R_{thJC}$ | | | | | 1.0 | K/W |
| $R_{thJH}$ | with heat transfer paste (IXYS test setup) | | | 1.3 | 1.6 | K/W |

[1] $V_{DS} = I_D \cdot (R_{DS(on)} + 2R_{Pin\ to\ Chip})$

### Applications

AC drives
- in automobiles
  - electric power steering
  - starter generator
- in industrial vehicles
  - propulsion drives
  - fork lift drives
- in battery supplied equipment

### Features

- MOSFETs in trench technology:
  - low RDSon
  - optimized intrinsic reverse diode
- package:
  - high level of integration
  - high current capability
  - aux. terminals for MOSFET control
  - terminals for soldering or welding connections
  - isolated DCB ceramic base plate with optimized heat transfer
- Space and weight savings

IXYS reserves the right to change limits, test conditions and dimensions.

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## Source-Drain Diode

| Symbol | Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $V_{SD}$ | (diode) $I_F$ = 38 A; $V_{GS}$ = 0 V | | 0.85 | 1.0 | V |
| $t_{rr}$ | $I_F$ = 38 A; -di$_F$/dt = 900 A/µs; $R_{G(on)}$ = 39 Ω; $V_R$ = 75 V; $T_{VJ}$ = 125°C | | 65 | | ns |
| $Q_{RM}$ | | | 1.6 | | µC |
| $I_{RM}$ | | | 40 | | A |

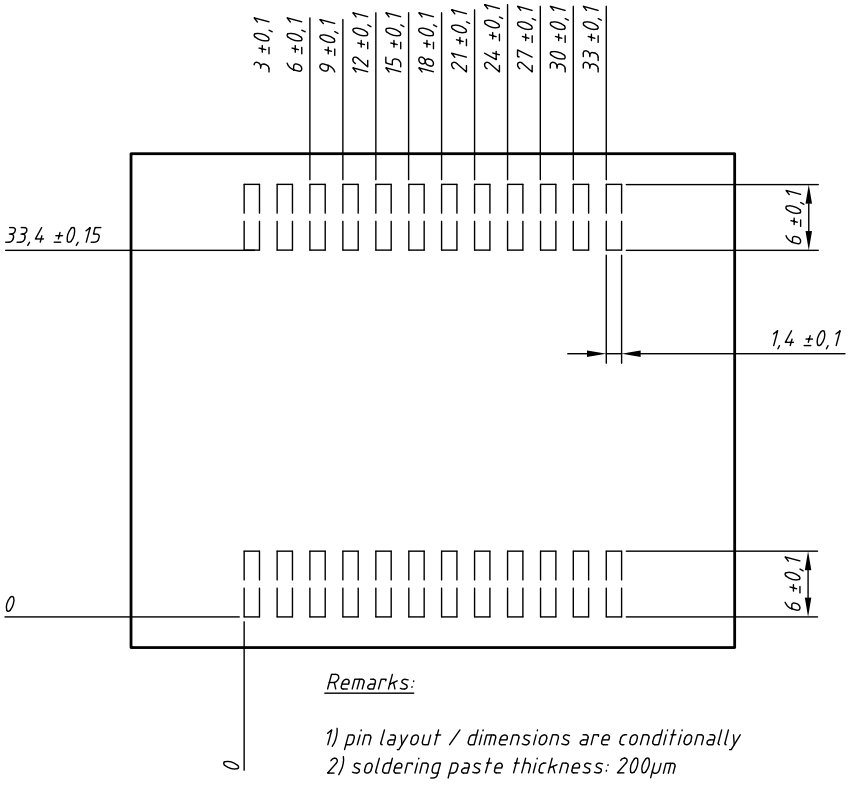
## Component

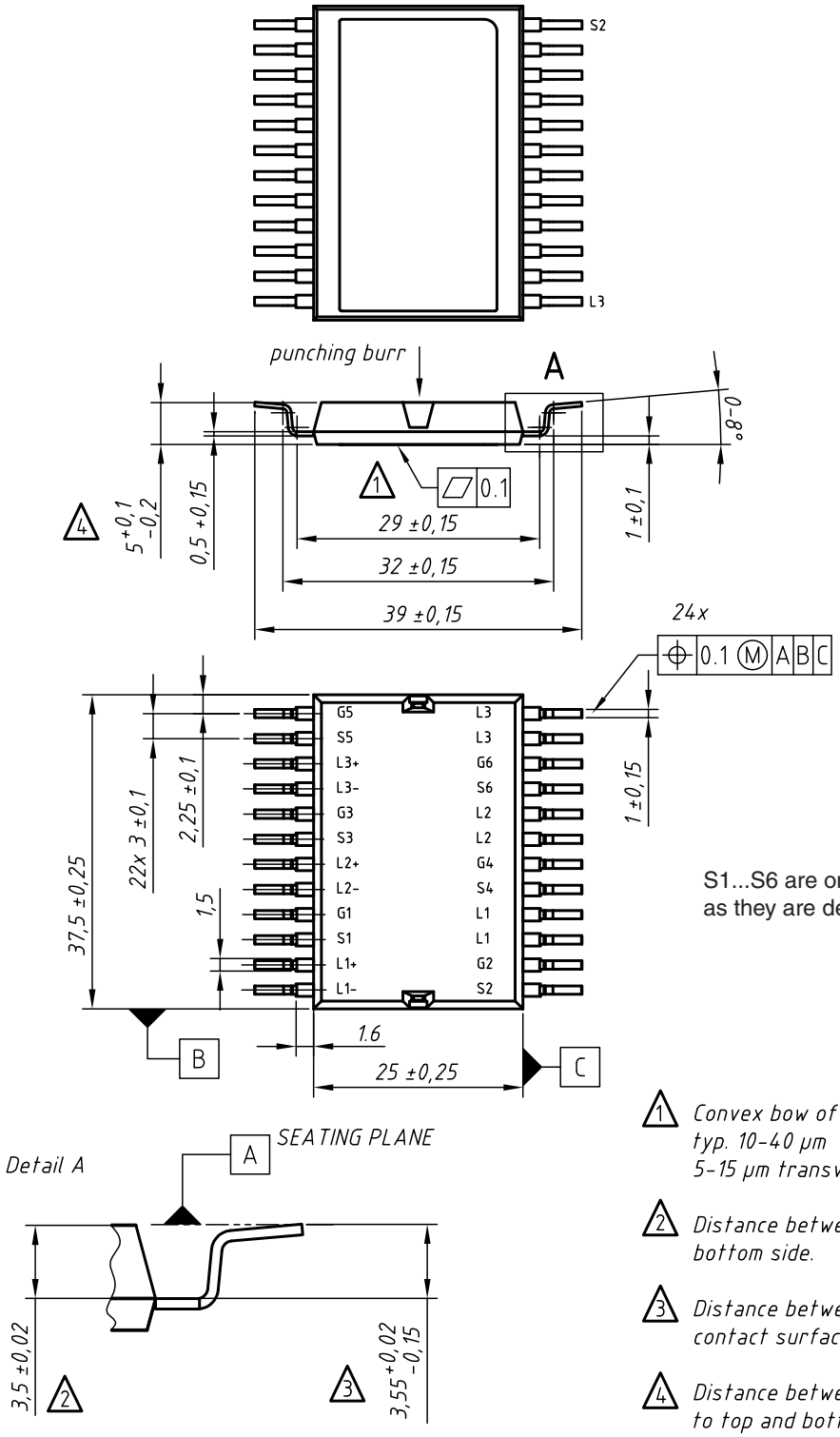
| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $I_{RMS}$ | per pin in main current paths (L+,L-, N-, L1, L2, L3) may be additionally limited by external connections 2 pins for output L1, L2, L3 | 75 | A |
| $T_J$ | | -55...+175 | °C |
| $T_{stg}$ | | -55...+125 | °C |
| $V_{ISOL}$ | $I_{ISOL} \leq$ 1 mA, 50/60 Hz, f = 1 minute | 1000 | V~ |
| $F_C$ | mounting force with clip | 50 - 250 | N |

| Symbol | Conditions | Characteristic Values min. | typ. | max. | |
|---|---|---|---|---|---|
| $R_{pin\ to\ chip}$ [1] | L+ to L1/L2/L3 or L- to L1/L2/L3 | | 0.9 | | mΩ |
| $C_P$ | coupling capacity between shorted pins and back side metallization | | 160 | | pF |
| **Weight** | | | 13 | | g |

[1] $V_{DS} = I_D \cdot (R_{DS(on)} + 2R_{Pin\ to\ Chip})$

Recommended printed circuit board lay-out






S1...S6 are only for the use of the gate drive as they are designed as Kelvin contacts

1 *Convex bow of substrate, typ. 10-40 µm longitudinal and 5-15 µm transversal*

2 *Distance between pin and case bottom side.*

3 *Distance between pin and contact surface.*

4 *Distance between parallel planes aligned to top and bottom sides of the package*

*contact pin:*
- *galv. tin plating, per pin side: Sn 10...25 µm, undercoating Ni 0,2...1 µm*
- *stamping edges may be free of tin*
- *puching burr: ≤ 0,05mm*

| Leads | Ordering | Part Name & Packing Unit Marking | Part Marking | Delivering Mode | Base Qty. | Ordering Code |
|---|---|---|---|---|---|---|
| SMD | Standard | GMM 3x60-015X2 - SMD | GMM 3x60-015X2 | Tube | 13 | 518037 |

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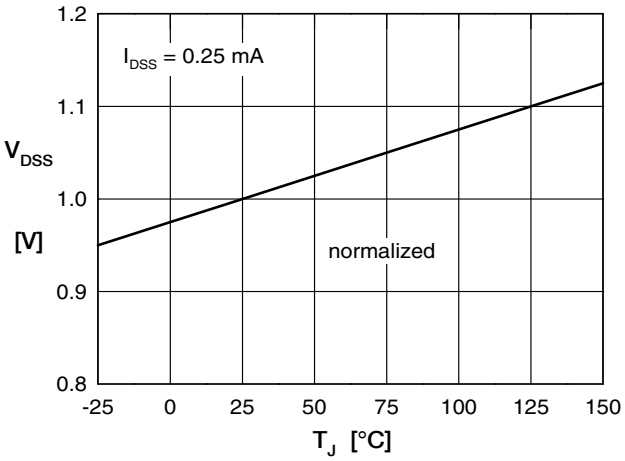


Fig.1 Drain source breakdown voltage $V_{DSS}$ vs. junction temperature $T_{VJ}$

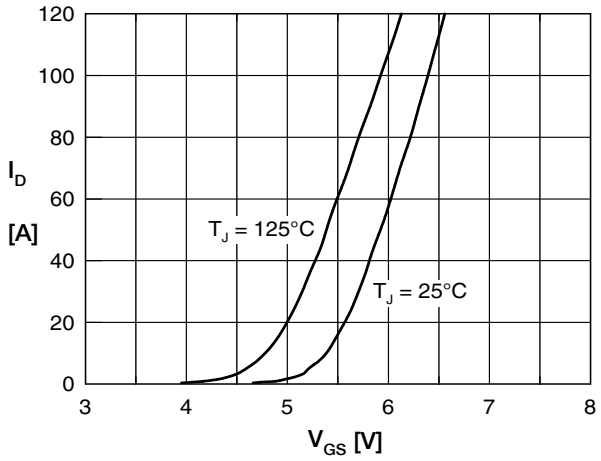


Fig. 2 Typ. transfer characteristics

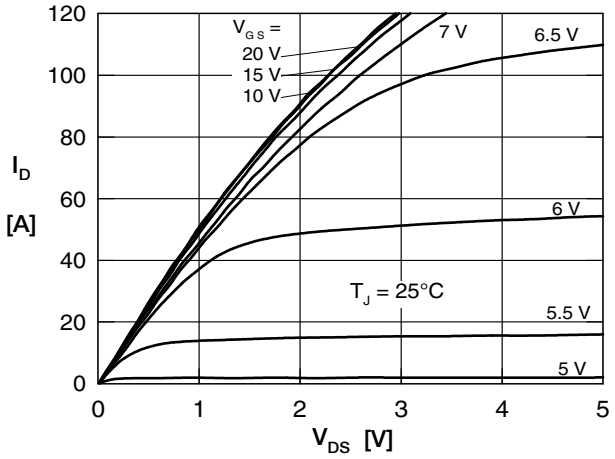


Fig. 3 Typ. output characteristics

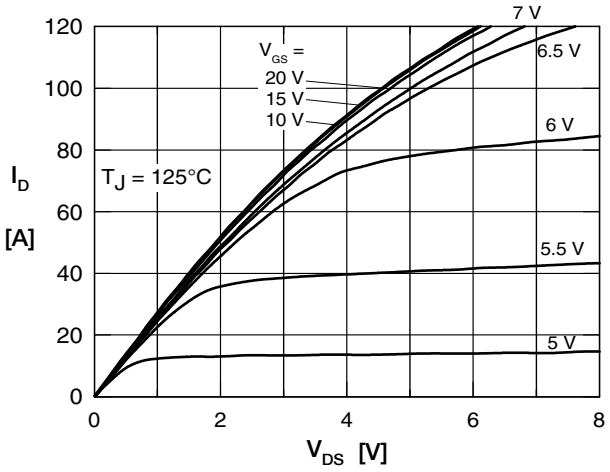


Fig. 4 Typ. output characteristics

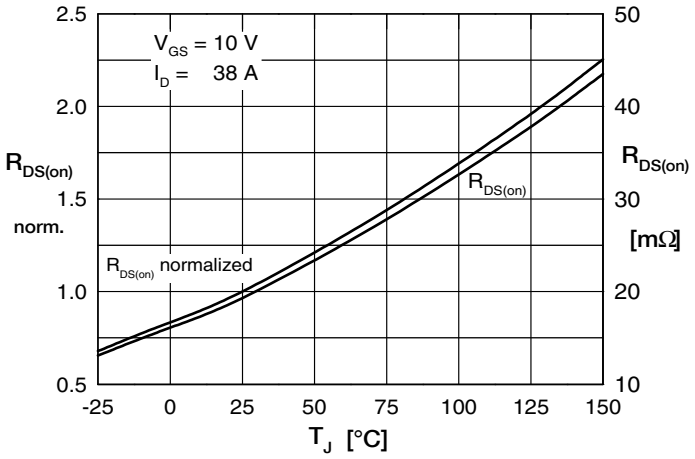


Fig.5 Drain source on-state resistance $R_{DS(on)}$ versus junction temperature $T_{VJ}$

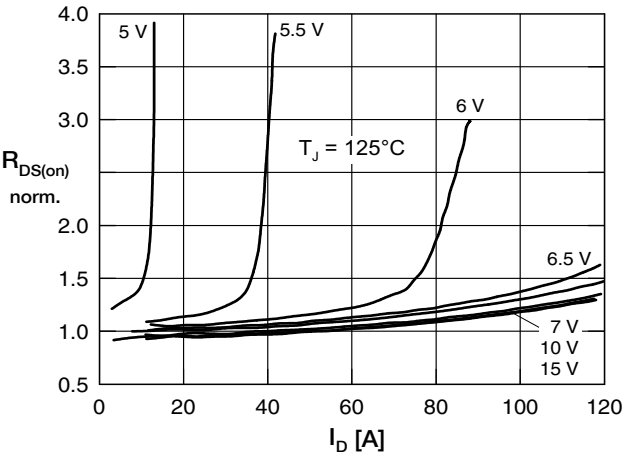


Fig. 6 Drain source on-state resistance $R_{DS(on)}$ versus $I_D$

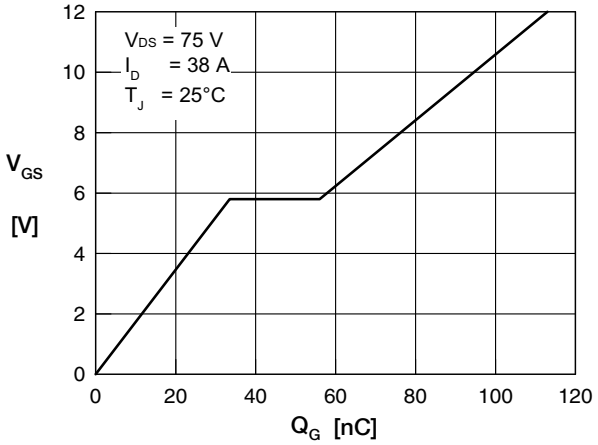


Fig.7 Typical turn on gate charge

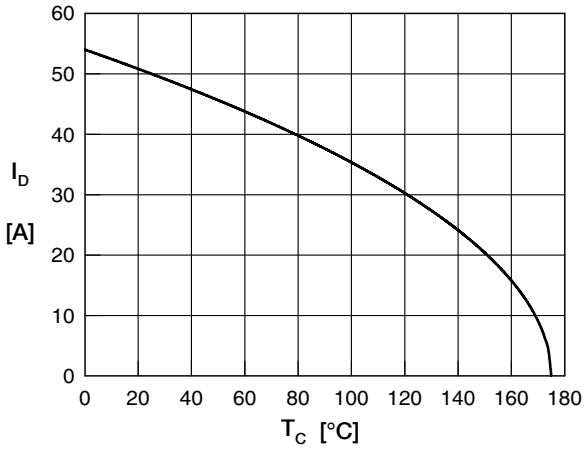


Fig. 8 Drain current $I_D$ vs. case temperature $T_C$

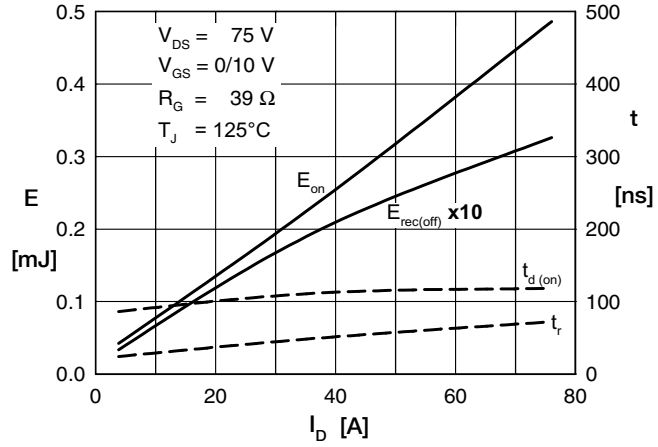


Fig. 9 Typ. turn-on energy and switching times versus drain current, inductive switching

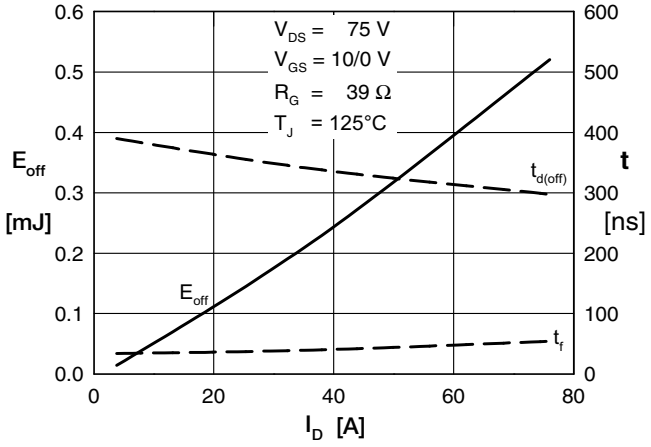


Fig. 10 Typ. turn-off energy and switching times versus drain-current, inductive switching

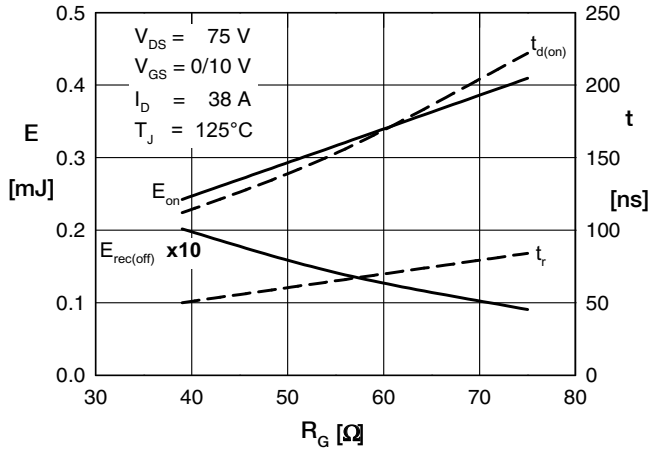


Fig. 11 Typ. turn-on energy and switching times versus gate resistor, induktive switching

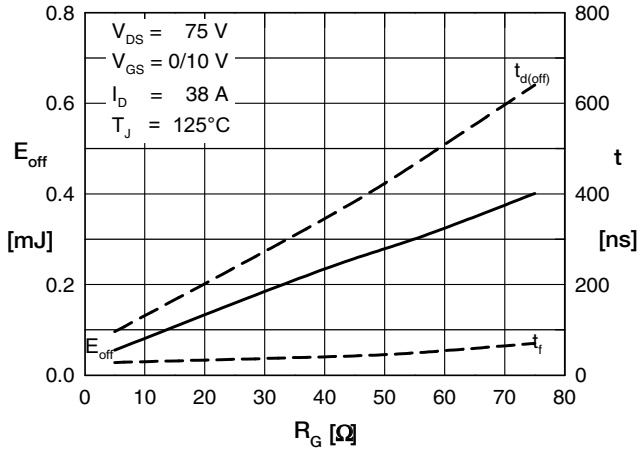


Fig. 12 Typ. turn-off energy and switching times versus gate resistor, induktive switching

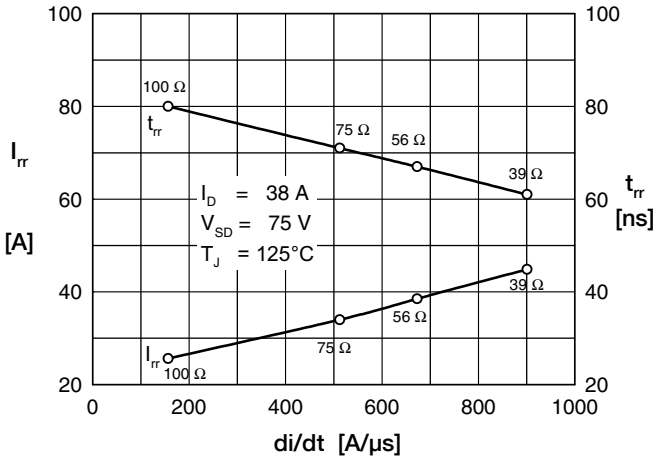


Fig. 13 Typ. reverse recovery characteristics

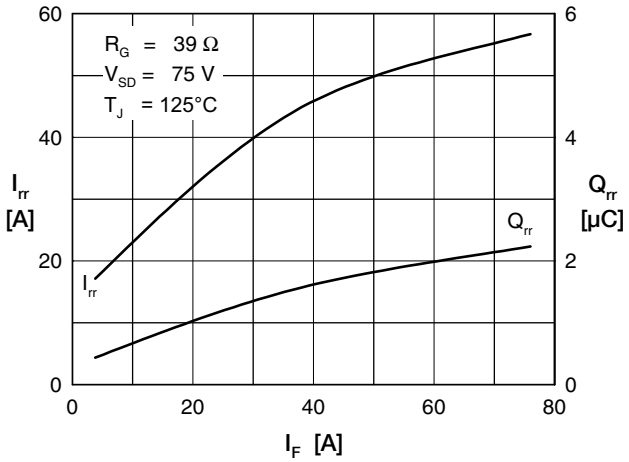


Fig. 14 Typ. reverse recovery characteristics

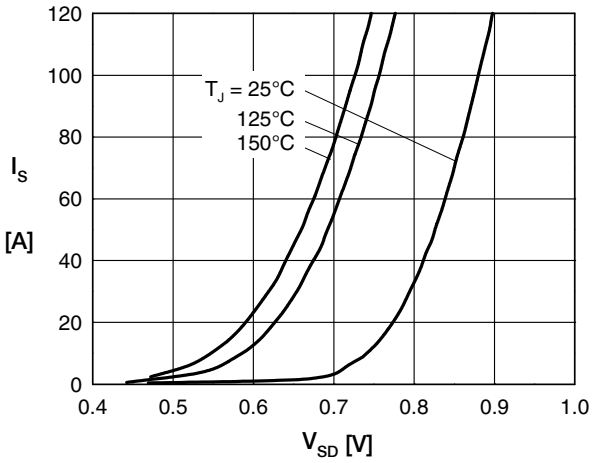


Fig.15 Source current $I_S$ versus source drain voltage $V_{SD}$ (body diode)

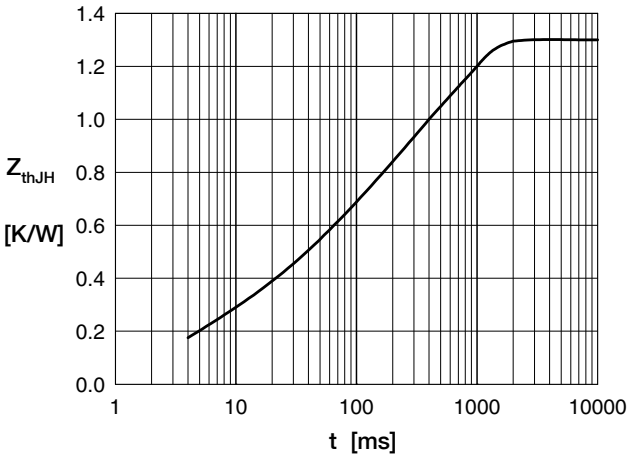


Fig. 16 Typ. thermal impedance junction to heatsink $Z_{thJH}$ with heat transfer paste (IXYS test setup)

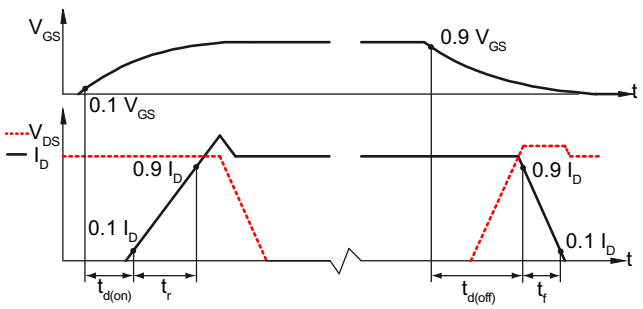


Fig. 17 Definition of switching times