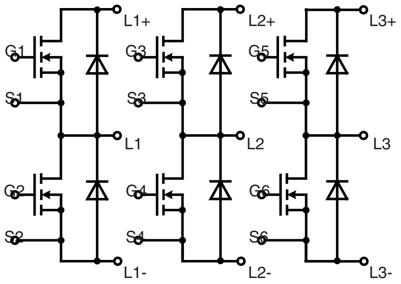
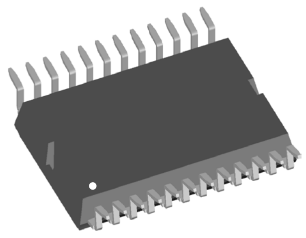
IXYS **GMM3x60-015X2**

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

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; $R_{G(on)} = 39\ \Omega$; $V_R = 75$ V; $T_{VJ} = 125°C$		65		ns
Q_{RM}			1.6		µC
I_{RM}			40		A

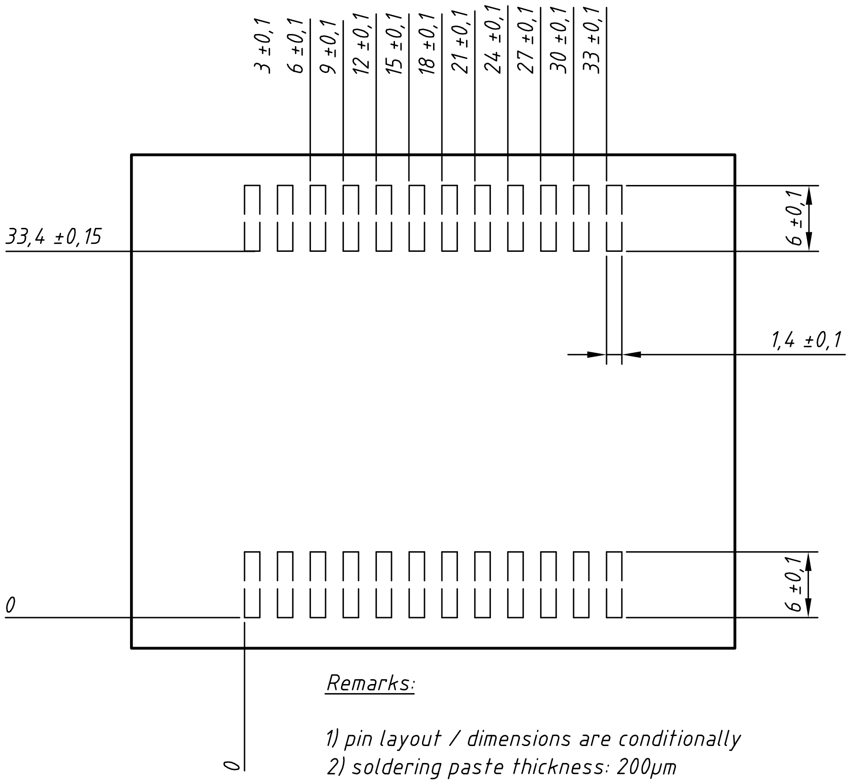
Component

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

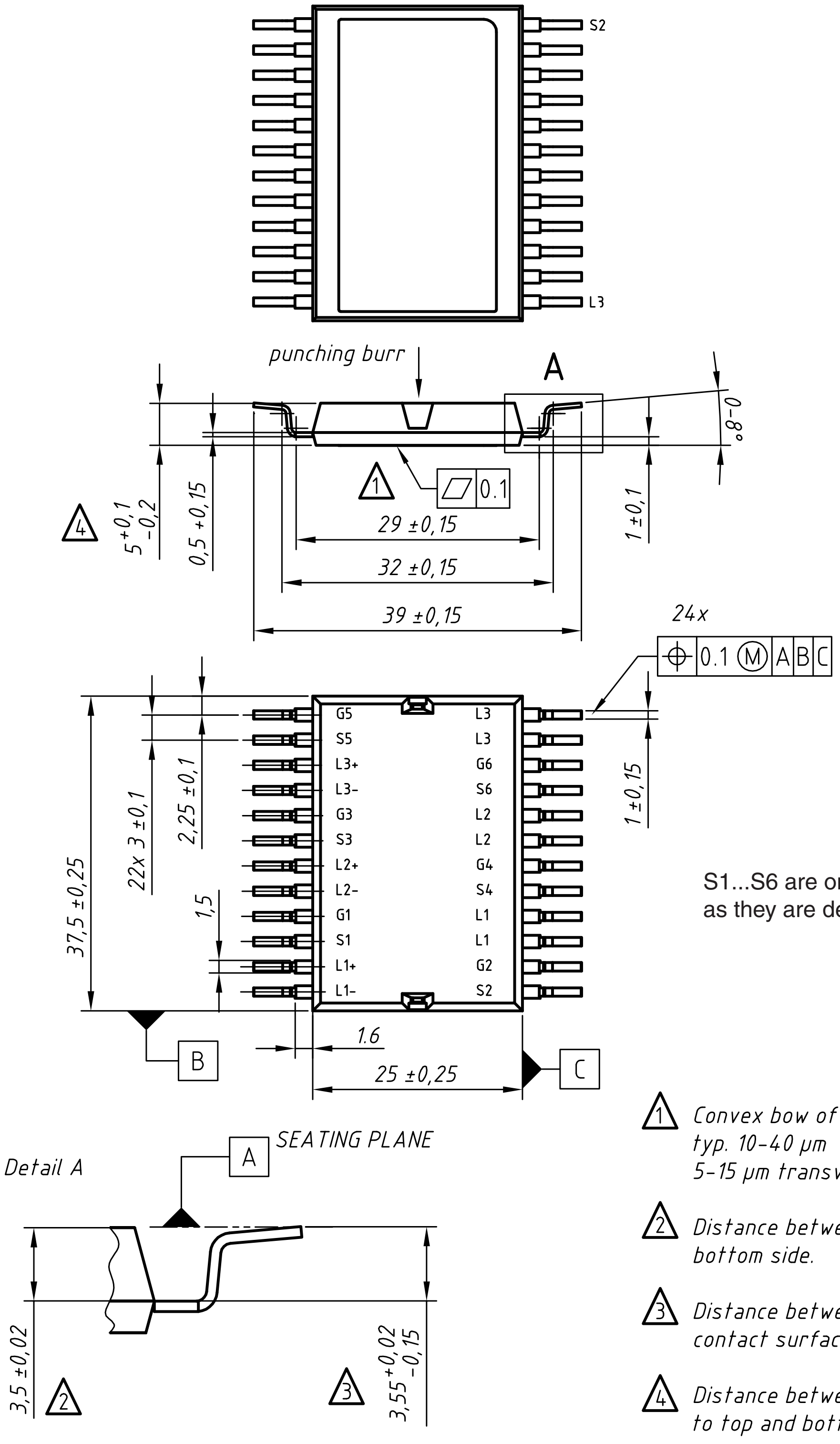
1) $V_{DS} = I_D \cdot (R_{DS(on)} + 2R_{Pin\ to\ Chip})$

Recommended printed circuit board lay-out



Remarks:

1) pin layout / dimensions are conditionally
2) soldering paste thickness: 200µm



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

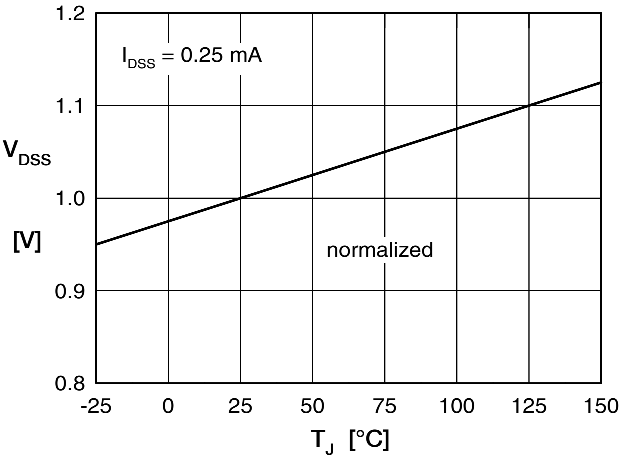


Fig.1 Drain source breakdown voltage V_{DSS} vs. junction temperature T_{VJ}

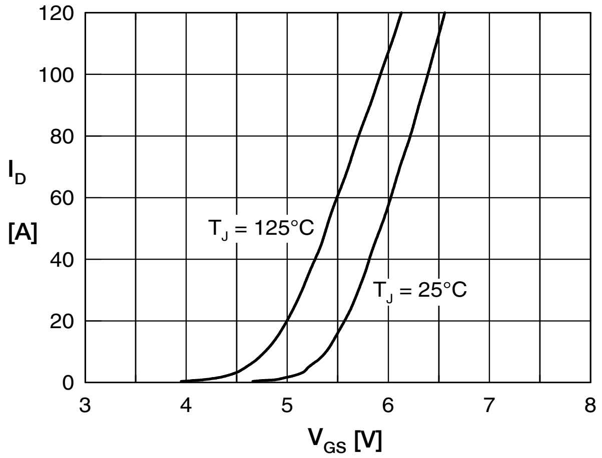


Fig. 2 Typ. transfer characteristics

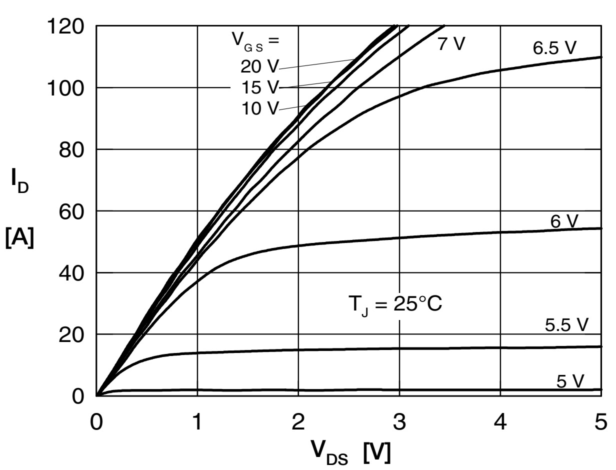


Fig. 3 Typ. output characteristics

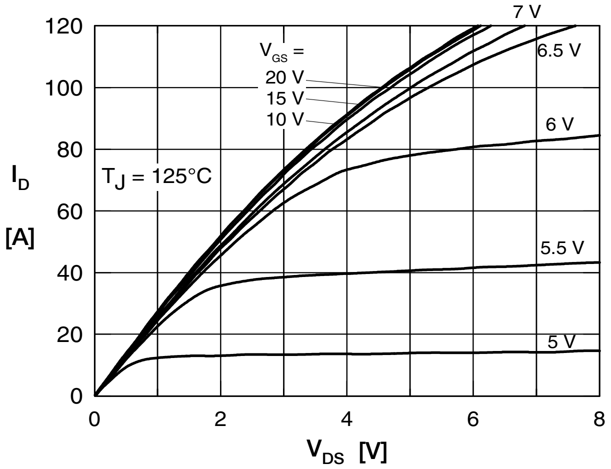


Fig. 4 Typ. output characteristics

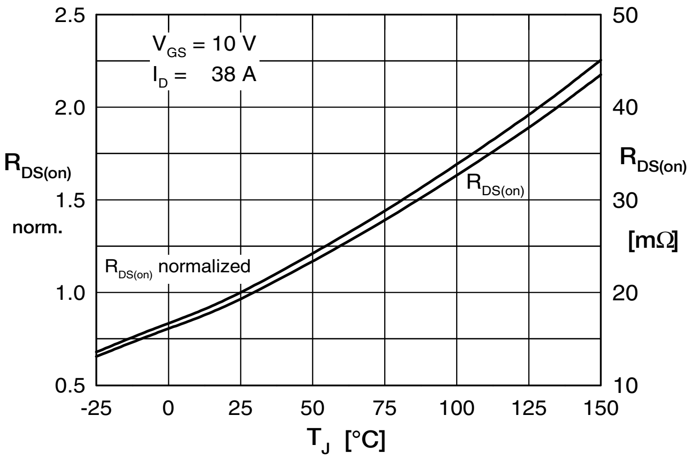


Fig.5 Drain source on-state resistance $R_{DS(on)}$ versus junction temperature T_{VJ}

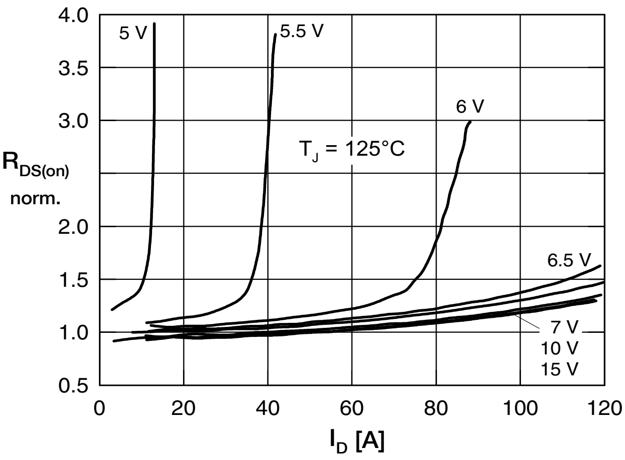


Fig. 6 Drain source on-state resistance $R_{DS(on)}$ versus I_D

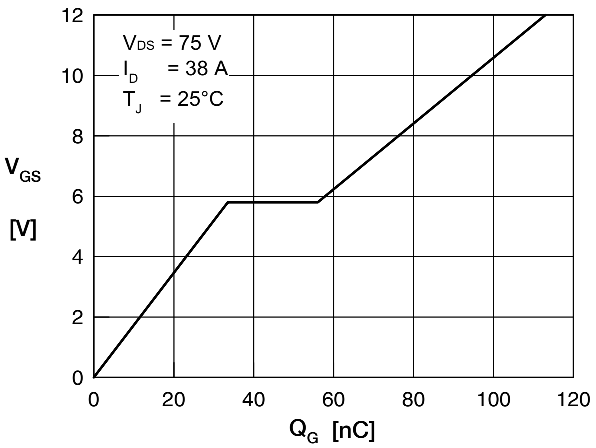


Fig.7 Typical turn on gate charge

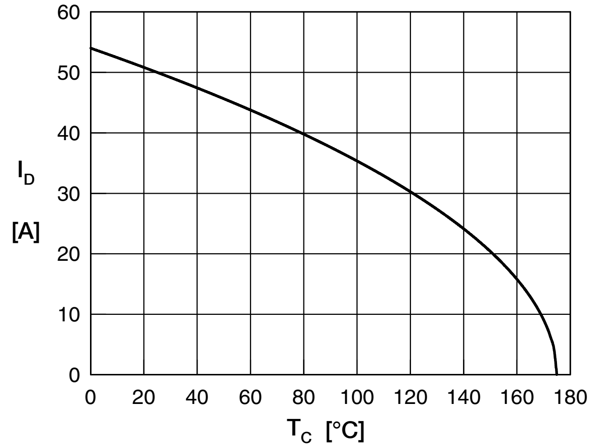


Fig. 8 Drain current I_D vs. case temperature T_C

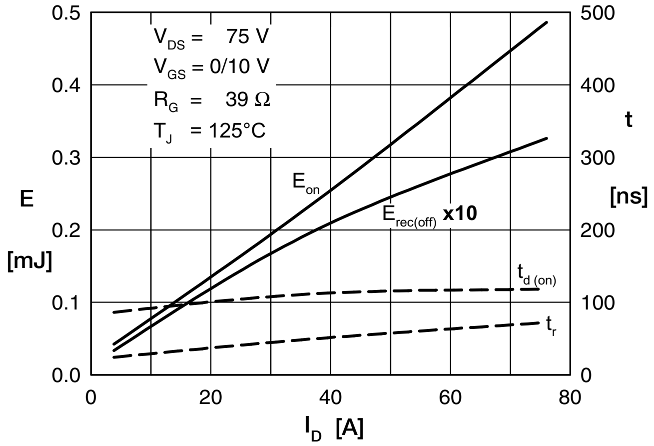


Fig. 9 Typ. turn-on energy and switching times versus drain current, inductive switching

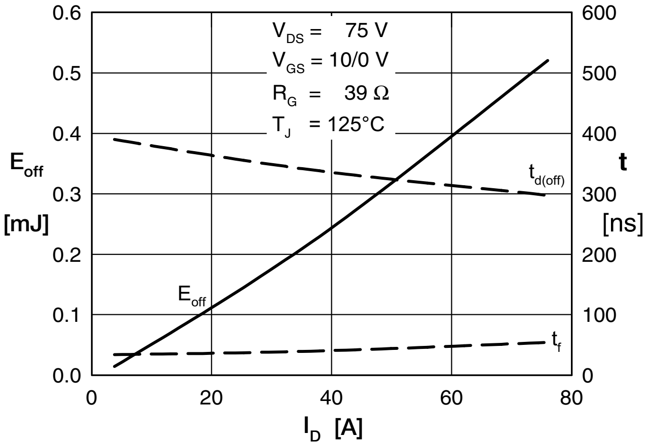


Fig. 10 Typ. turn-off energy and switching times versus drain-current, inductive switching

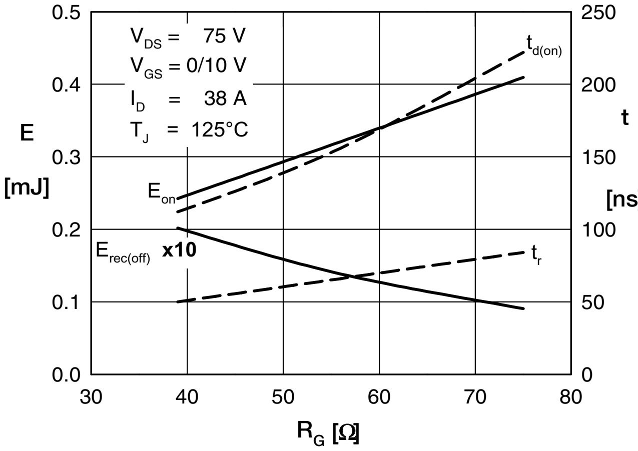


Fig. 11 Typ. turn-on energy and switching times versus gate resistor, induktive switching

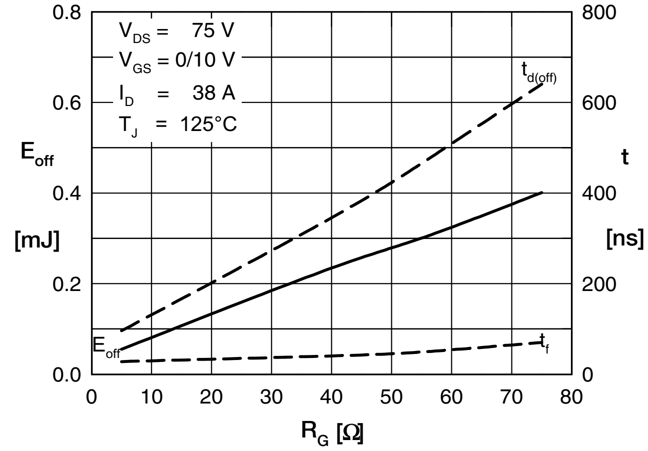


Fig. 12 Typ. turn-off energy and switching times versus gate resistor, induktive switching

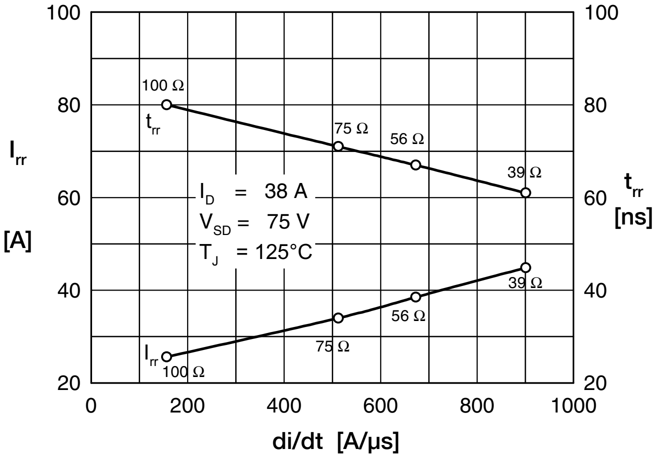


Fig. 13 Typ. reverse recovery characteristics

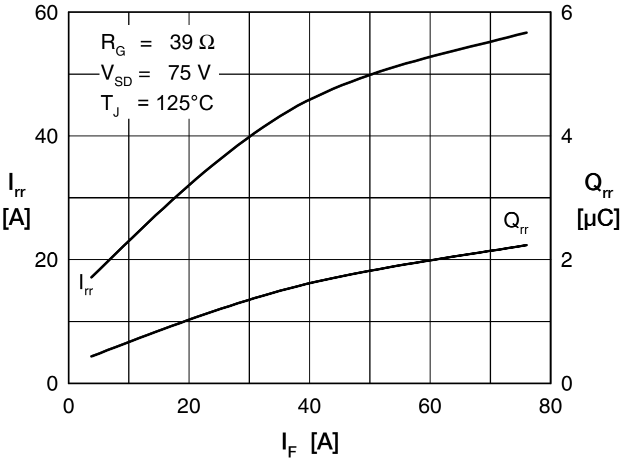


Fig. 14 Typ. reverse recovery characteristics

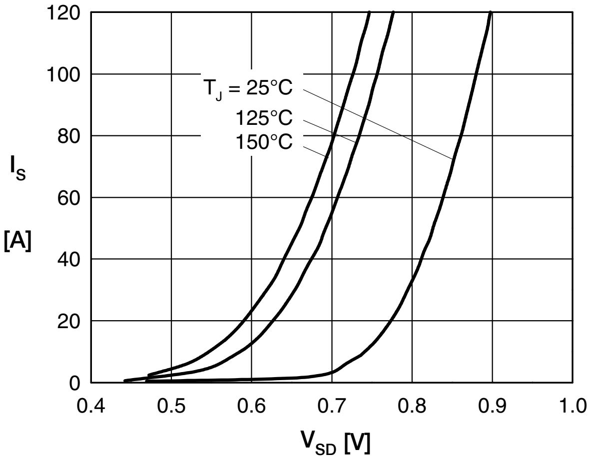


Fig.15 Source current I_S versus source drain voltage V_{SD} (body diode)

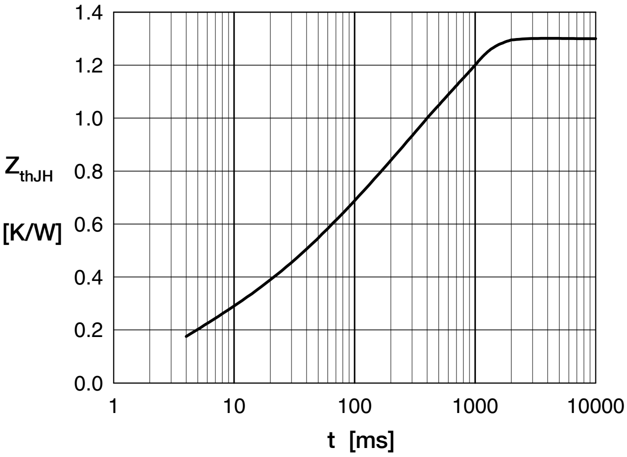


Fig. 16 Typ. thermal impedance junction to heatsink Z_{thJH} with heat transfer paste (IXYS test setup)

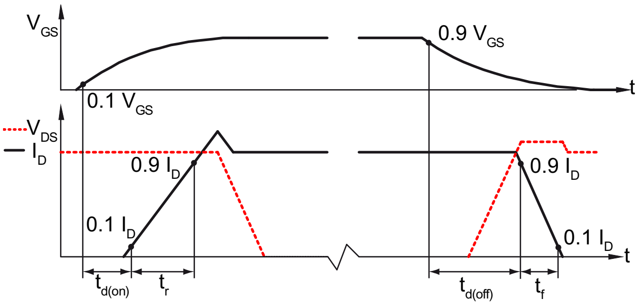


Fig. 17 Definition of switching times