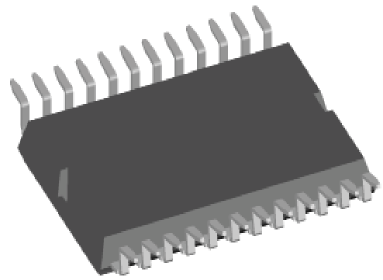
Three phase full Bridge

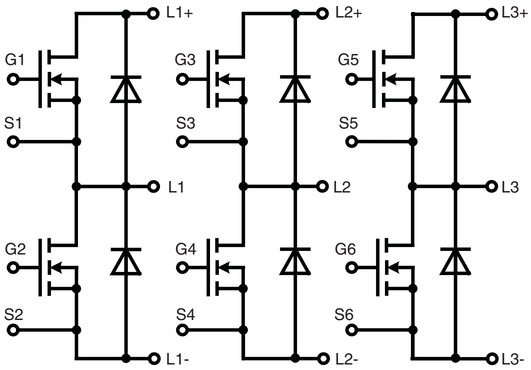
with Trench MOSFETs
in DCB-isolated high-current package

V_{DSS} = 100 V
I_{D25} = 190 A
$R_{DSon\ typ.}$ = 1.7 mΩ

Part number
MTI145WX100GD



Surface Mount Device



Features / Advantages:

- MOSFETs in trench technology:
  - low R_{DSon}
  - 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

Applications:

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

Package: ISOPLUS-DIL®

- High level of integration
- RoHS compliant
- High current capability
- Aux. Terminals for MOSFET control
- Terminals for soldering or welding connections
- Space and weight savings

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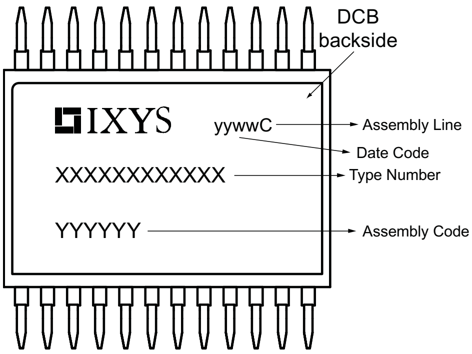
MOSFETs				Ratings		
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
V_{DSS}	*drain source breakdown voltage*	T_{VJ} = 25°C to 150°C			100	V
V_{GS}	*gate source voltage*				±15	V
V_{GSM}	*max. transient gate source voltage*				±20	V
I_{D25}	*continuous drain current*	T_C = 25°C			190	A
I_{D90}		T_C = 90°C			145	A
$R_{DS(on)}$ 1)	*static drain source on resistance*	on chip level at T_{VJ} = 25°C		1.7	2.2	mΩ
		I_D = 100 A; V_{GS} = 10 V T_{VJ} = 125°C		2.9		mΩ
$V_{GS(th)}$	*gate threshold voltage*	I_D = 275 µA; V_{DS} = V_{GS} T_{VJ} = 25°C	2.0	2.7	3.5	V
I_{DSS}	*drain source leakage current*	V_{DS} = V_{DSS}; V_{GS} = 0 V T_{VJ} = 25°C			1	µA
		T_{VJ} = 125°C		10	100	µA
I_{GSS}	*gate source leakage current*	V_{GS} = ±20 V; V_{DS} = 0 V			500	nA
R_G	*gate resistance*	on chip level		1.9		Ω
C_{iss}	*input capacitance*	V_{GS} = 0 V; V_{DS} = 50 V; f = 1 Mhz		11.1		nF
C_{oss}	*output capacitance*			1.94		nF
C_{rss}	*reverse transfer capacitance*			70		pF
Q_g	*total gate charge*	V_{GS} = 10 V; V_{DS} = 50 V; I_D = 100 A		155		nC
Q_{gs}	*gate source charge*			48		nC
Q_{gd}	*gate drain (Miller) charge*			27		nC
$t_{d(on)}$	*turn-on delay time*	inductive load T_{VJ} = 125°C		135		ns
t_r	*current rise time*	V_{GS} = 10 V; V_{DS} = 50 V		75		ns
$t_{d(off)}$	*turn-off delay time*	I_D = 100 A; R_G = 27 Ω		600		ns
t_f	*current fall time*			40		ns
E_{on}	*turn-on energy per pulse*			200		µJ
E_{off}	*turn-off energy per pulse*			600		µJ
$E_{rec(off)}$	*turn-off reverse recovery losses*			36		µJ
R_{thJC}	*thermal resistance junction to case*				0.85	K/W
R_{thJH}	*thermal resistance junction to heatsink*	with heat transfer paste (IXYS test setup)		1.1	1.4	K/W

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

Source-Drain Diode			min.	typ.	max.	Unit
I_{F25}	*forward current*	T_C = 25°C			180	A
I_{F90}		T_C = 90°C			105	A
V_{SD}	*source drain voltage*	I_F = 100 A; V_{GS} = 0 V T_{VJ} = 25°C		0.9	1.2	V
Q_{RM}	*reverse recovery charge*	V_R = 50 V; I_F = 100 A T_{VJ} = 125°C		2		µC
I_{RM}	*max. reverse recovery current*	R_G = 27 Ω (di/dt = 1700 A/µs)		54		A
t_{rr}	*reverse recovery time*			60		ns

Package ISOPLUS-DIL®			Ratings			
Symbol	**Definitions**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per pin in main current paths (L1+...L3+, L1-...L3-, L1...L3) may be additionally limited by external connections (PCB tracks) 2 pins for output L1, L2, L3			75	A
T_{stg}	*storage temperature*		-55		125	°C
T_{op}	*operation temperature*		-55		150	°C
T_{VJ}	*virtual junction temperature*		-55		175	°C
Weight				13		g
F_C	*mounting force with clip*		50		250	N
V_{ISOL}	*isolation voltage*	t = 1 second; 50/60 Hz, RMS, $I_{ISOL} \leq 1$ mA	1200			V
		t = 1 minute; 50/60 Hz, RMS, $I_{ISOL} \leq 1$ mA	1000			V
$R_{pin\text{-}chip}$	*resistance terminal to chip*	$V_{DS} = I_D \cdot (R_{DS(on)} + 2 \cdot R_{pin\ to\ chip})$		0.5		mΩ
C_P	*coupling capacity*	between shorted pins and back side metallization		160		pF



Part number

M = Module
T = Trench MOSFET
I = OPTIMOS
145 = Current Rating [A]
WX = 6-Pack with separated Phase Legs
100 = Reverse Voltage [V]
GD = ISOPLUS-DIL

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MTI145WX100GD-SMD	MTI145WX100GD	Blister	28	513435

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

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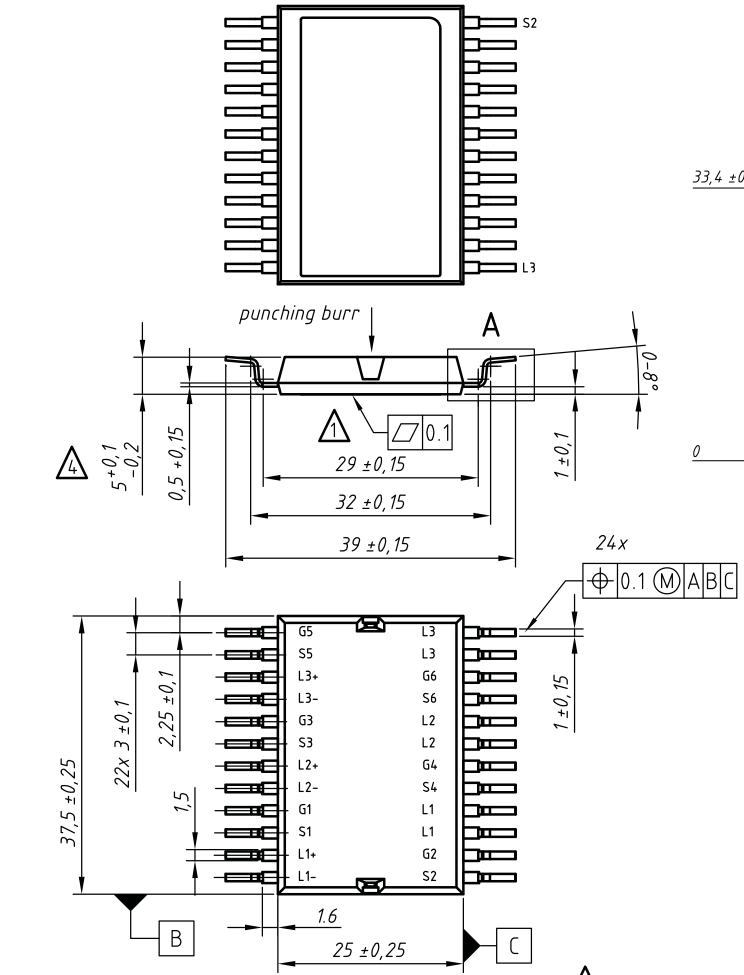
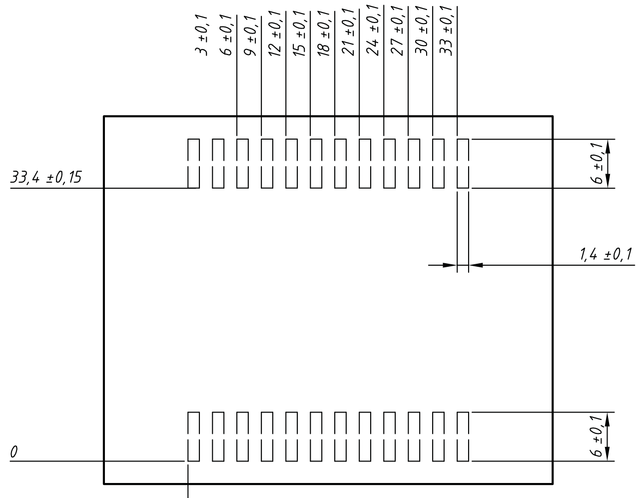
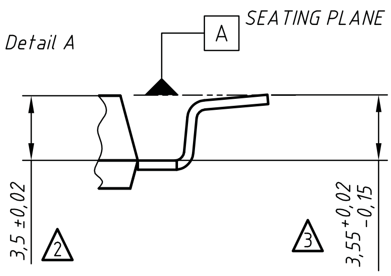
Outlines ISOPLUS-DIL®





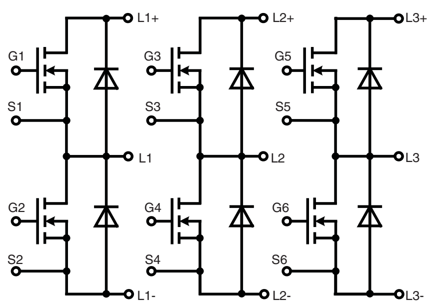
Remarks:

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



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*



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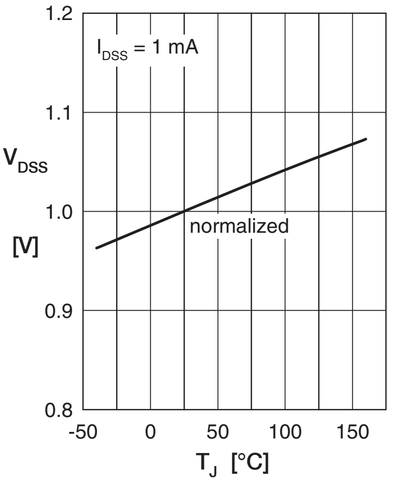

Fig.1 Drain source breakdown voltage V_{DSS} vs. junction temperature T_{VJ}

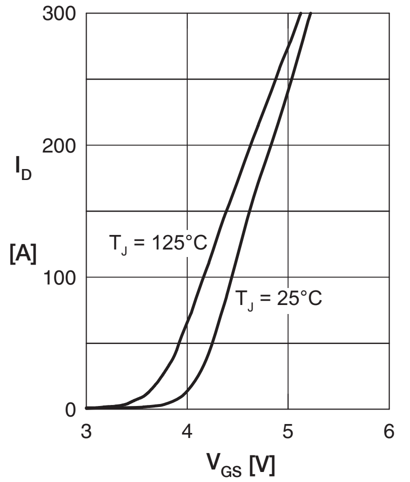

Fig. 2 Typ. transfer characteristics

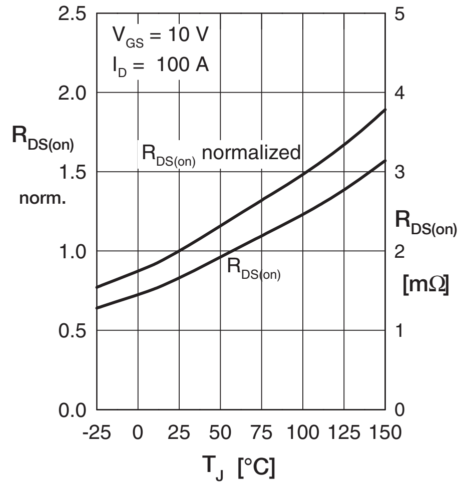

Fig.5 Drain source on-state resistance $R_{DS(on)}$ vs. junction temp. T_{VJ}

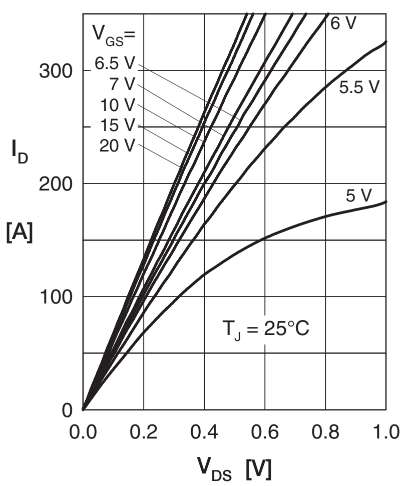

Fig. 4 Typ. output characteristics

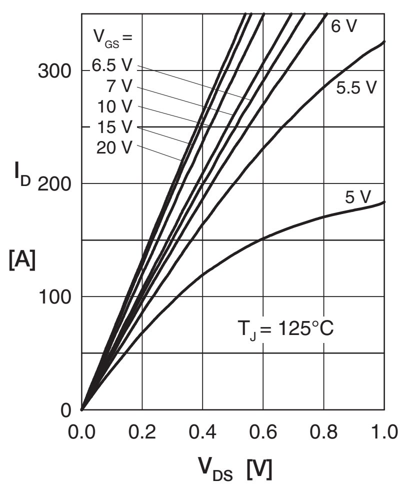

Fig. 5 Typ. output characteristics

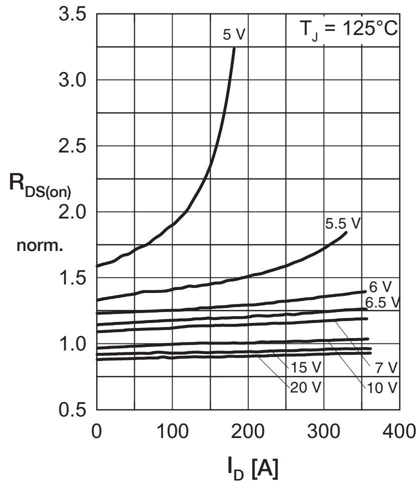

Fig. 6 Drain source on-state resistance $R_{DS(on)}$ versus I_D

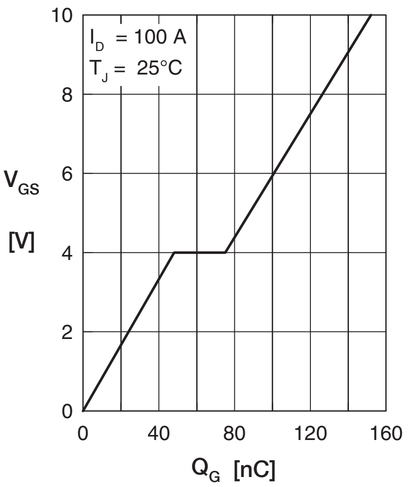

Fig.7 Typical turn on gate charge

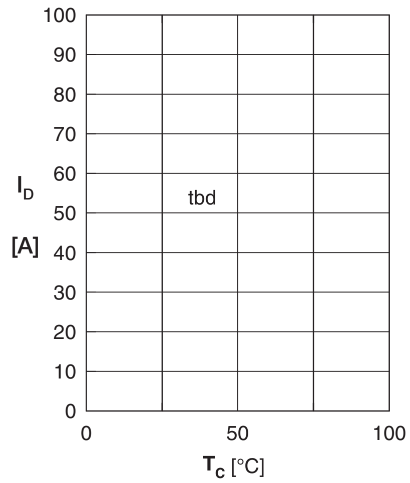

Fig. 8 Drain current I_D versus case temperature T_C

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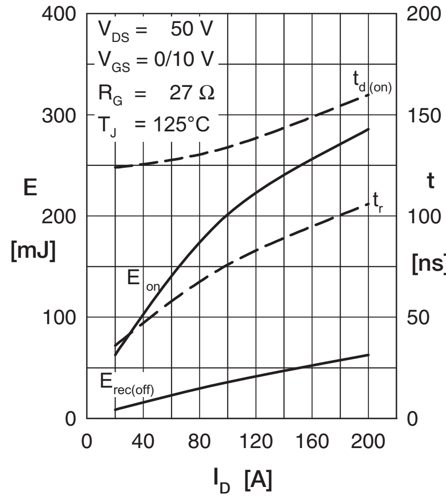

Fig. 9 Typ. turn-on energy & switching times vs. drain current, inductive switching

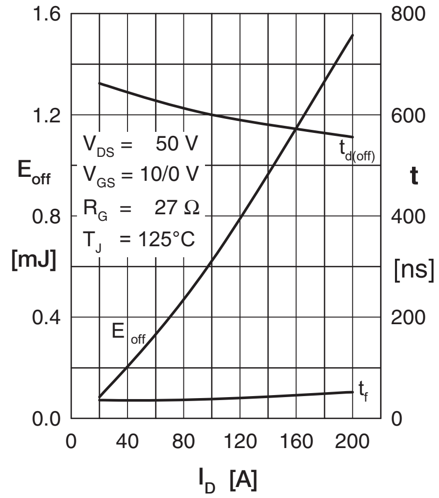

Fig. 10 Typ. turn-off energy & switching times vs. drain-current, inductive switching

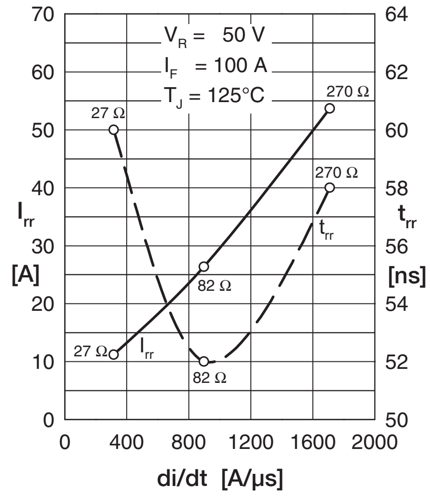

Fig. 11 Typ. reverse recovery characteristics

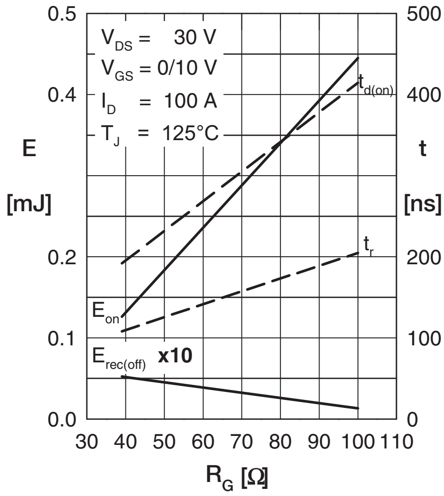

Fig. 12 Typ. turn-on energy & switching times vs. gate resistor, induktive switching

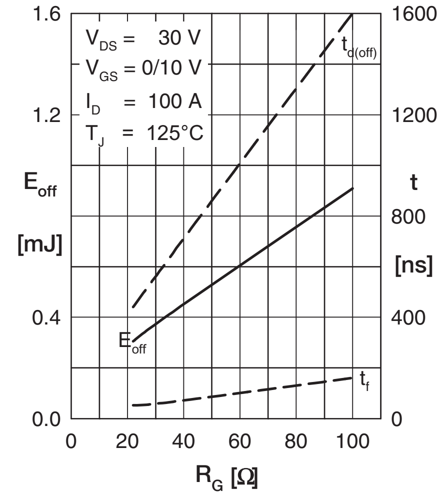

Fig. 13 Typ. turn-off energy & switching times vs. gate resistor, induktive switching

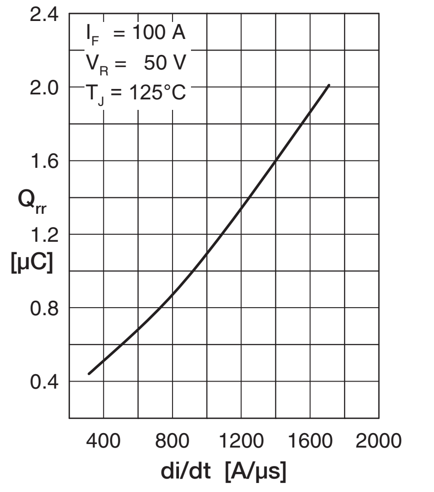

Fig. 14 Typ. reverse recovery characteristics

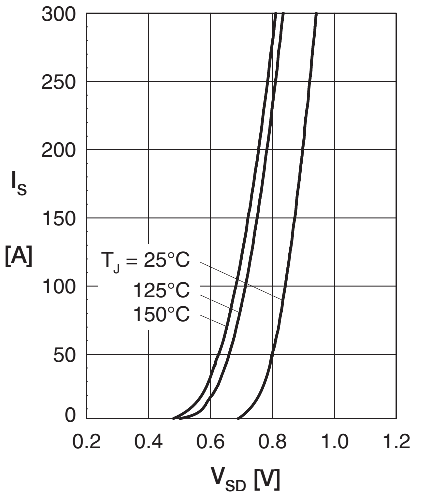

Fig.15 Source current I_S versus
source-drain voltage V_{SD} (body diode)

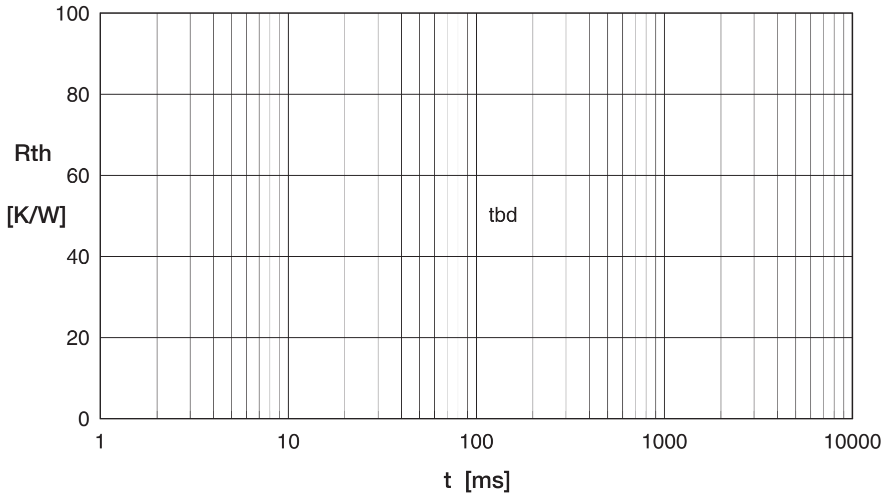

Fig.16 Thermal response

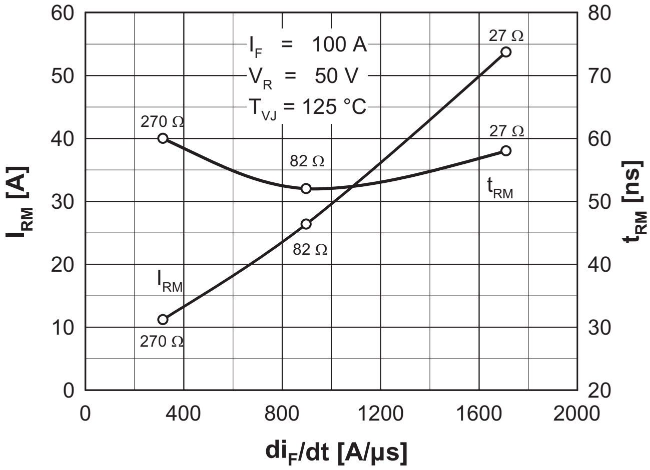

Fig. 13 Reverse recovery time t_{RM} of the body diode vs. di_F/dt

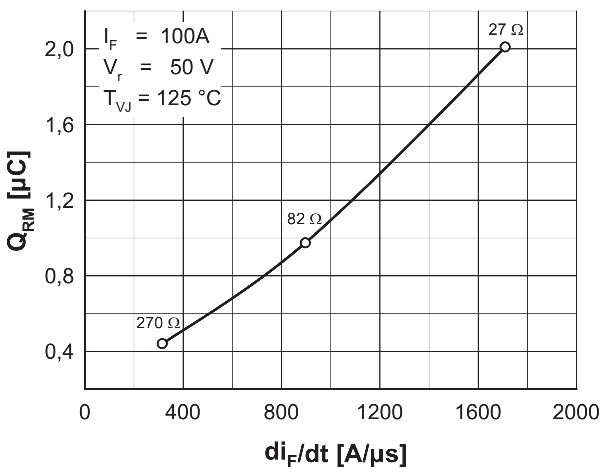

Fig. 14 Reverse recovery charge Q_{RM} of the body diode vs. di_F/dt

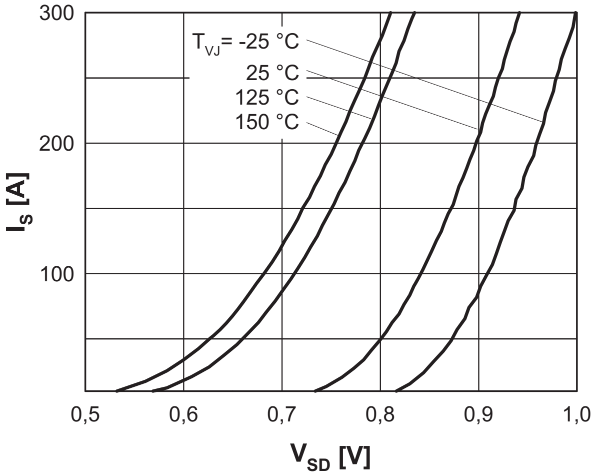

Fig.15 Source current I_S vs. source drain voltage V_{SD} (body diode)

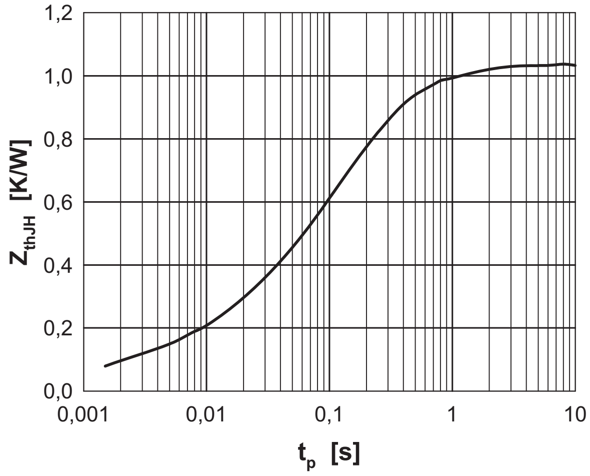

Fig. 16 Typ. thermal impedance junction to heatsink Z_{thJH} with heat transfer paste (IXYS test setup)

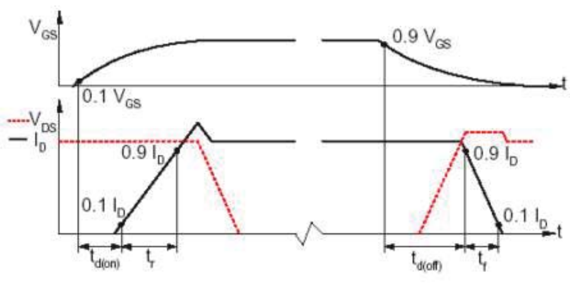

Fig. 17 Definition of switching times