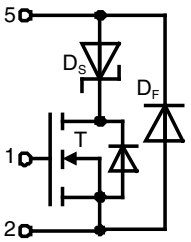
CoolMOS™ [1] Power MOSFET

with Series Schottky Diode and Ultra Fast Antiparallel Diode

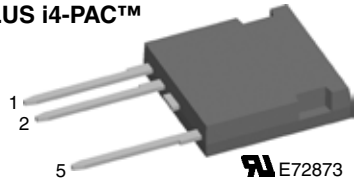
in High Voltage ISOPLUS i4-PAC™

Preliminary data

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



ISOPLUS i4-PAC™



MOSFET T						
Symbol	**Conditions**			**Maximum Ratings**		
V_{DSS}	T_{VJ} = 25°C to 150°C			600		V
V_{GS}				± 20		V
I_{D25}	T_C = 25°C			41		A
I_{D90}	T_C = 90°C			29		A
Symbol	**Conditions**			**Characteristic Values**		
	(T_{VJ} = 25°C, unless otherwise specified)			**min.**	**typ.**	**max.**
R_{DSon}	MOSFET 'T' only:					
	V_{GS} = 10 V; I_D = 25 A	T_{VJ} = 25°C			60	70 mΩ
		T_{VJ} = 125°C			135	mΩ
	MOSFET 'T & D_S' in series (pin 5, pin 2):					
	V_{GS} = 10 V; I_D = 10 A	T_{VJ} = 25°C			120	mΩ
		T_{VJ} = 125°C			170	mΩ
	V_{GS} = 10 V; I_D = 25 A	T_{VJ} = 25°C			85	mΩ
		T_{VJ} = 125°C			145	mΩ
$V_{GS(th)}$	V_{DS} = 20 V; I_D = 3 mA			2.1		3.9 V
I_{DSS}	V_{DS} = V_{DSS}; V_{GS} = 0 V	T_{VJ} = 25°C				0.3 mA
		T_{VJ} = 150°C			1	mA
I_{GSS}	V_{GS} = ± 20 V; V_{DS} = 0 V					100 nA
Q_g	V_{GS} = 10 V; V_{DS} = 350 V; I_D = 50 A				250	nC
Q_{gs}					25	nC
Q_{gd}					120	nC
$t_{d(on)}$	Inductive load	T_{VJ} = 125°C			30	ns
t_r	V_{GS} = 10 V; V_{DS} = 380 V				18	ns
$t_{d(off)}$	I_D = 25 A; R_G = 10 Ω				500	ns
t_f					50	ns
E_{on}					0.7	mJ
E_{off}					0.3	mJ
$E_{rec(off)}$					0.22	mJ
R_{thJC}						0.45 K/W
R_{thJH}	with heatsink compound (IXYS test setup)				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 (T_{VJ} = 25°C, unless otherwise specified)	Characteristic Values min.	typ.	max.	
V_F	I_F = 20 A; T_C = 25°C			0.71	V
	T_C = 125°C		0.5		V
V_{T0}	T_{VJ} = 150°C			0.42	V
r_T	for power loss calculation only			4.1	mΩ
R_{thJC}				2.2	K/W
R_{thJH}	with heatsink compound (IXYS test setup)		2.8	3.5	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 (T_{VJ} = 25°C, unless otherwise specified)	Characteristic Values typ.	max.	
V_F	I_F = 30 A; T_C = 25°C	2.1	2.5	V
	T_C = 125°C	1.4		V
V_{T0}	T_{VJ} = 150°C		1.0	V
r_T	for power loss calculation only		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		ns
R_{thJC}			1.8	K/W
R_{thJH}	with heatsink compound (IXYS test setup)	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

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

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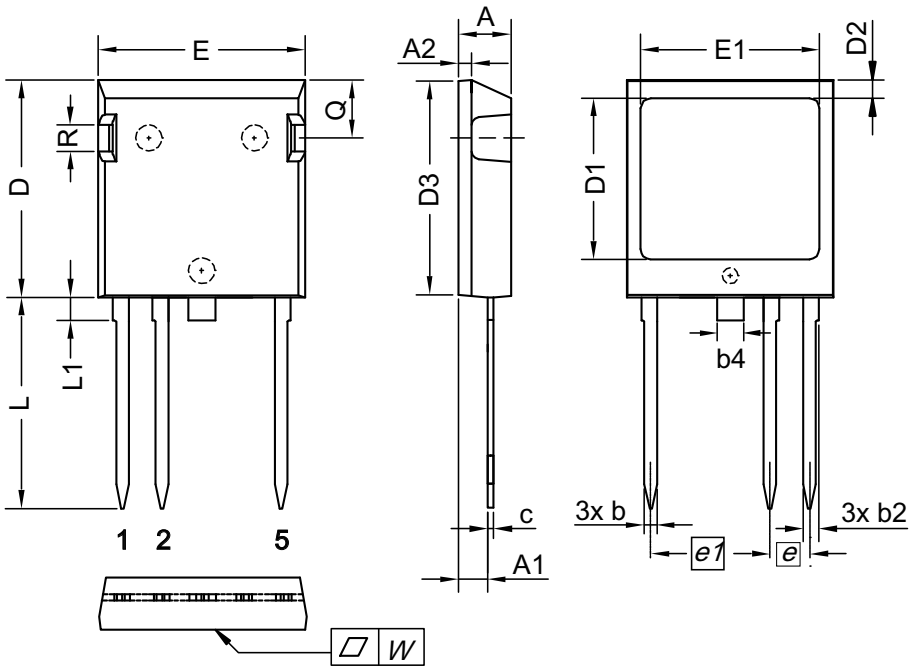
ISOPLUS i4-PAC™ Outline



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

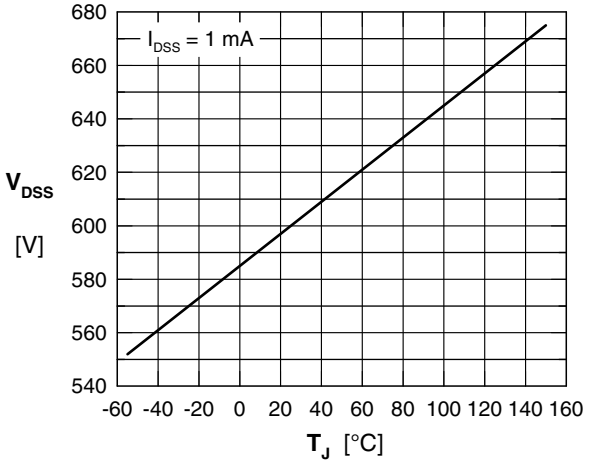


Fig. 1 Drain source breakdown voltage V_{DSS} vs. junction temperature T_J

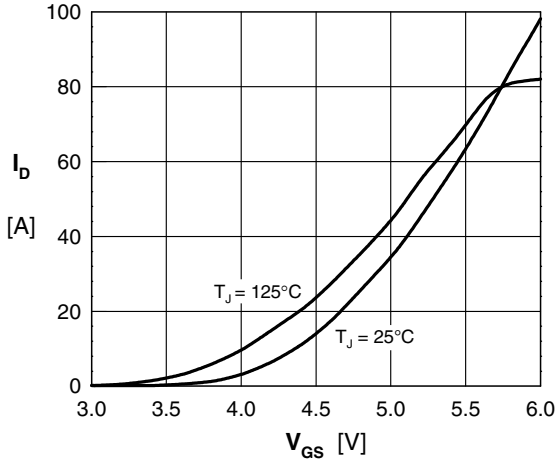


Fig. 2 Typical transfer characteristic

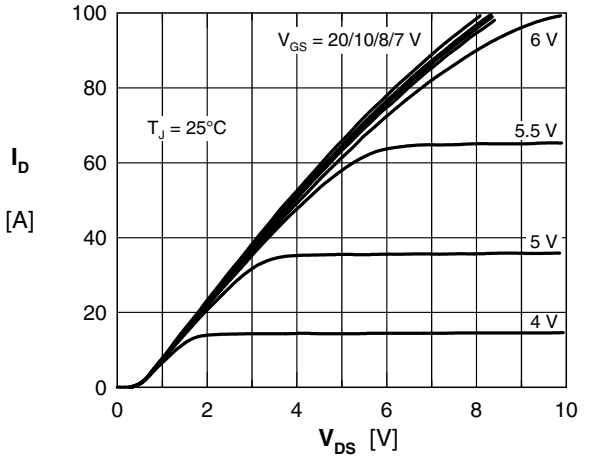


Fig. 3 Typical output characteristic (between pin 5 and pin 2)

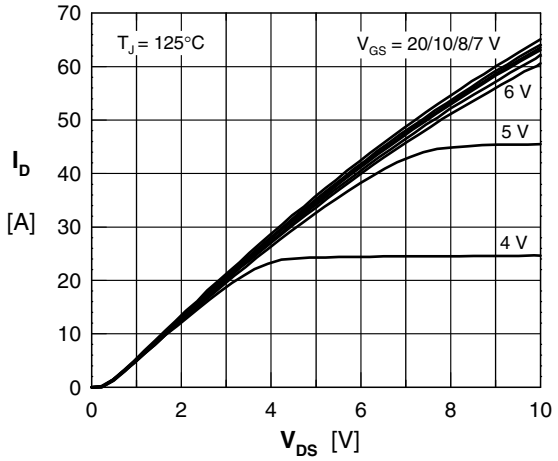


Fig. 4 Typical output characteristic (between pin 5 and pin 2)

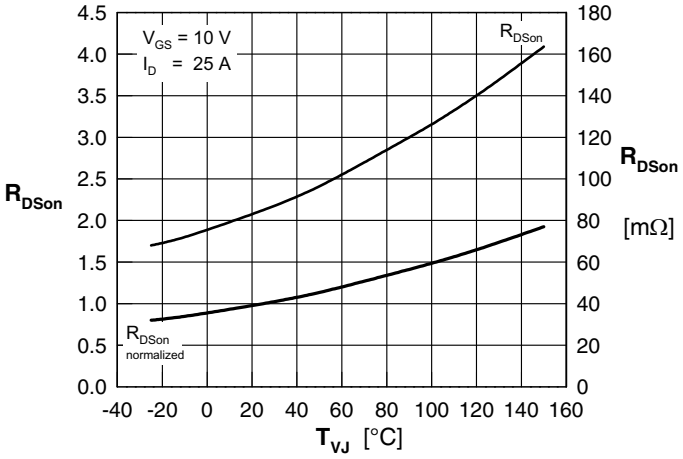


Fig. 5 Drain source on-state resistance $R_{DS(on)}$ versus junction temperature T_J (between pin 5 and pin 2)

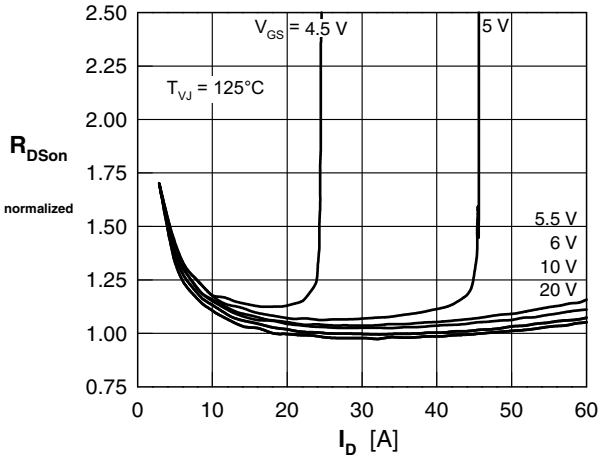


Fig. 6 Drain source on-state resistance $R_{DS(on)}$ versus I_D (between pin 5 and pin 2)

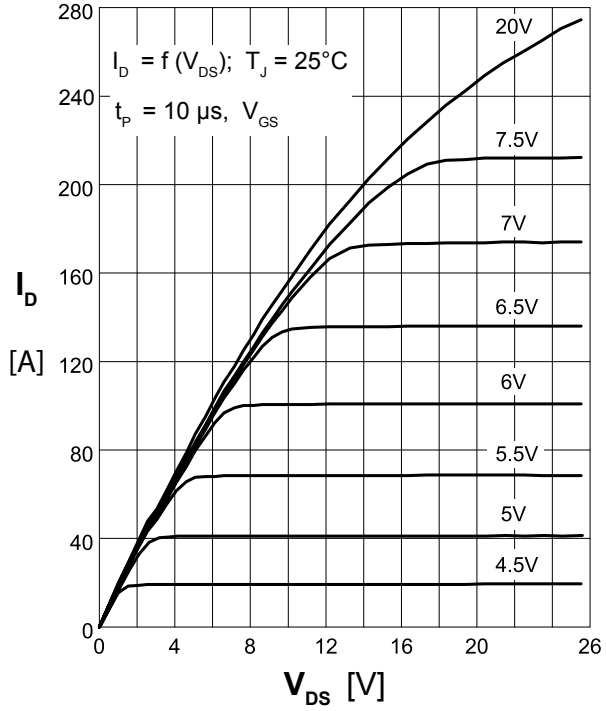


Fig. 7 Typical output characteristic (MOSFET only)

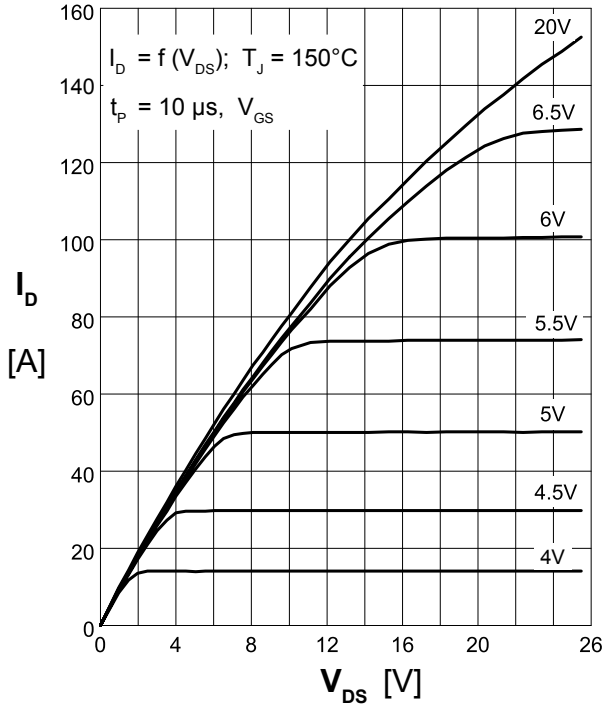


Fig. 8 Typical output characteristic (MOSFET only)

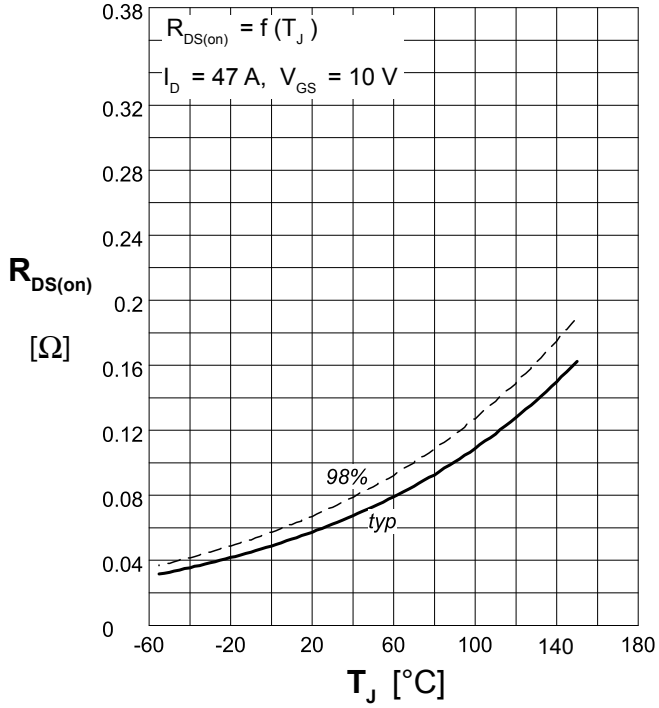


Fig. 9 Drain source on-state resistance $R_{DS(on)}$ versus junction temperature T_J (MOSFET only)

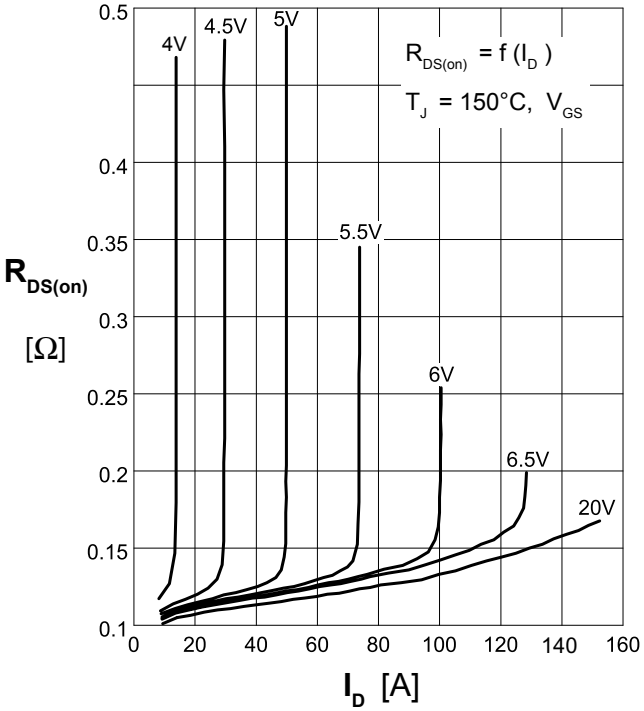


Fig. 10 Drain source on-state resistance $R_{DS(on)}$ versus I_D (MOSFET only)

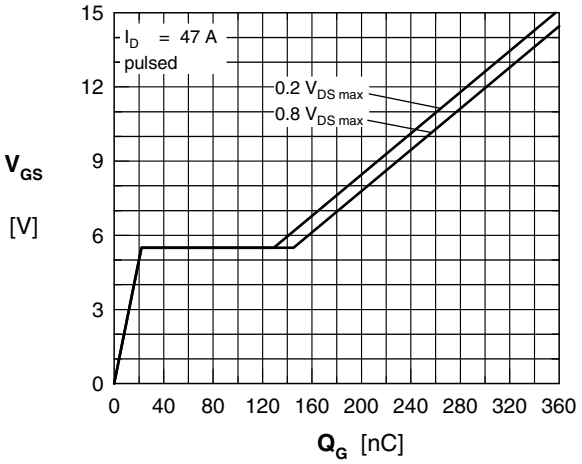


Fig.11 Gate charge characteristic

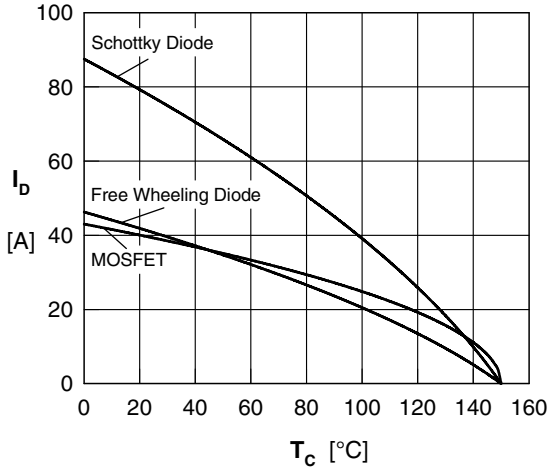


Fig. 12 Drain current I_D vs. case temperature T_C

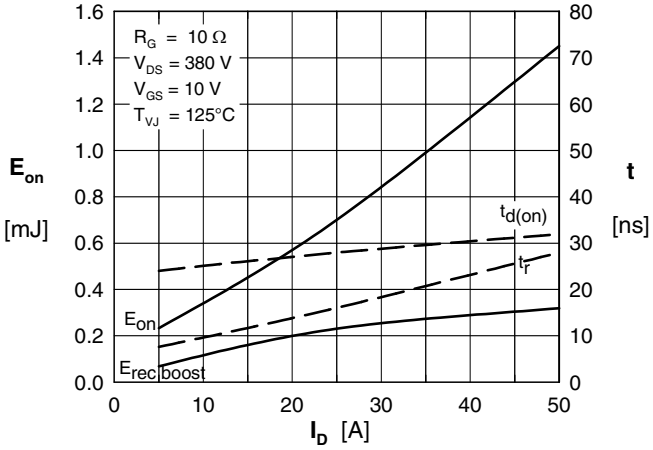


Fig. 13 Typ. turn-on energy & switching times vs. collector current, inductive switching

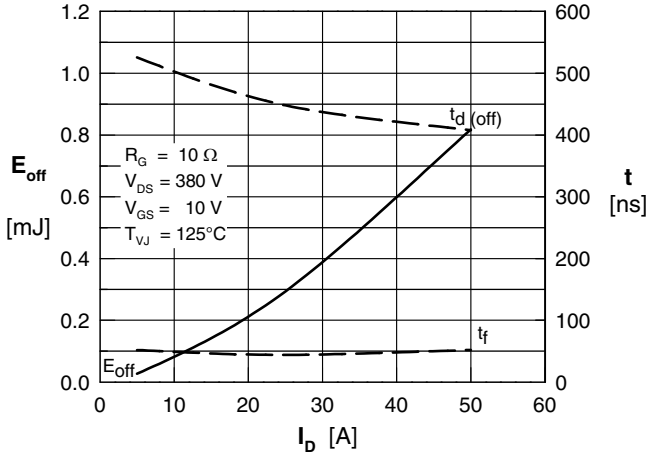


Fig. 14 Typ. turn-off energy & switching times vs. collector current, inductive switching

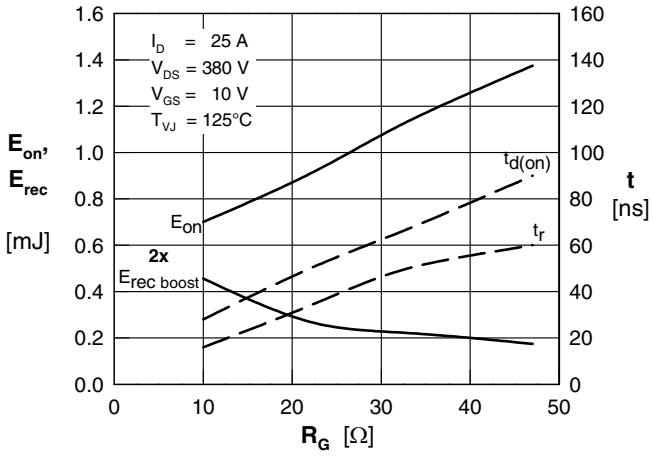


Fig. 15 Typ. turn-on energy & switching times vs. gate resistor, inductive switching

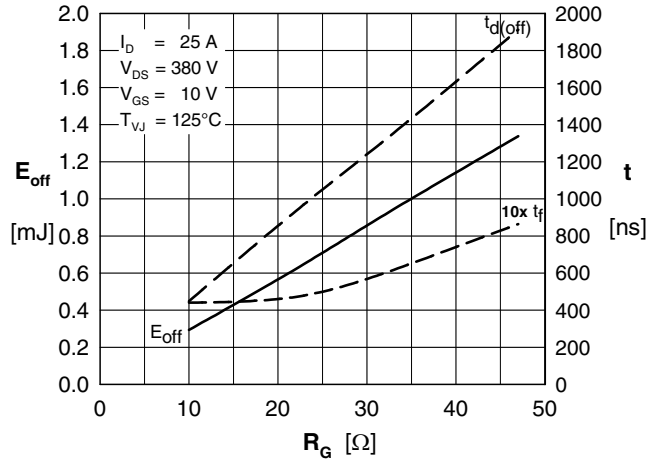


Fig. 16 Typ. turn-off energy & switching times vs. gate resistor, inductive switching

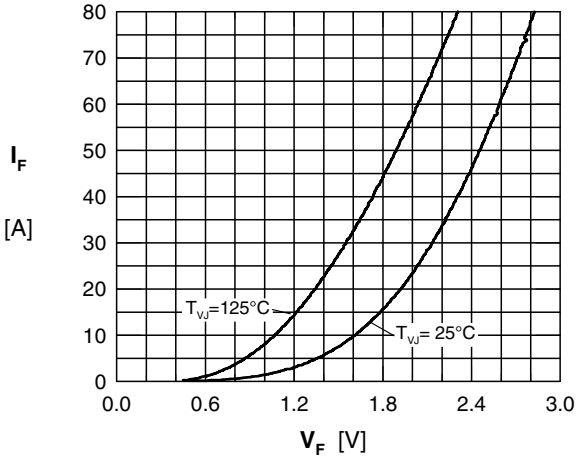


Fig. 17 Typ. forward characteristics of reverse diode

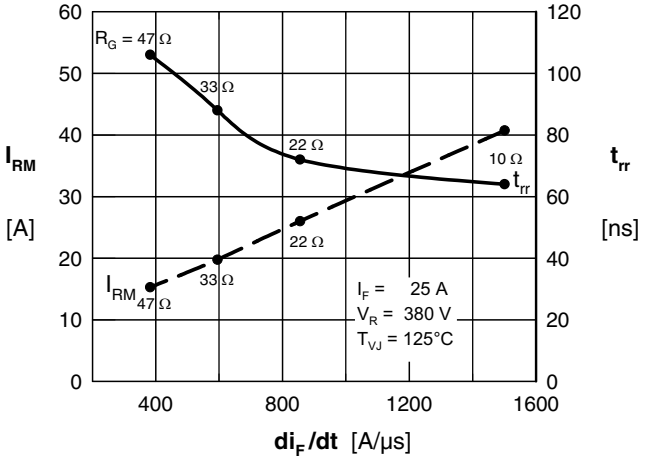


Fig. 18 Typ. reverse recovery characteristics of antiparallel diode

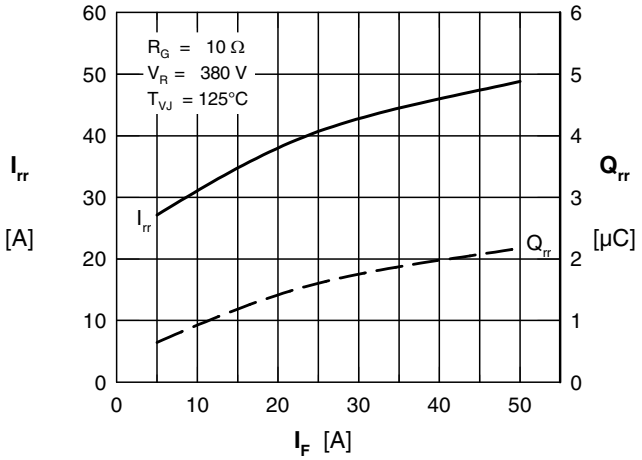


Fig. 19 Typ. reverse recovery characteristics

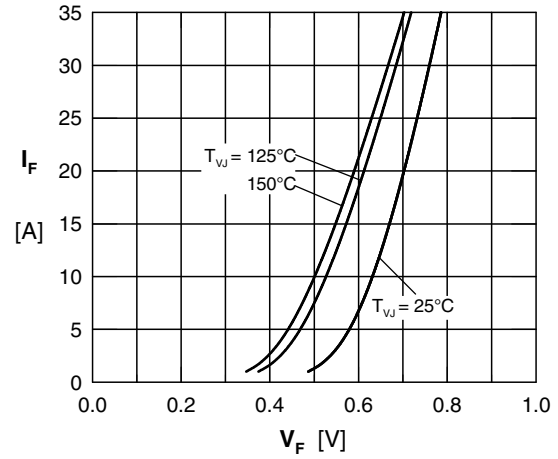


Fig. 20 Typ. forward characteristics of diode D_S

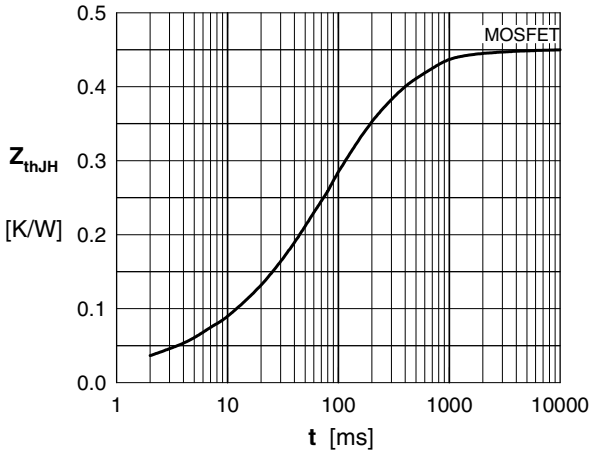


Fig. 21 Typ. thermal impedance junction to heatsink Z_{thJH} of the MOSFET with heat transfer paste

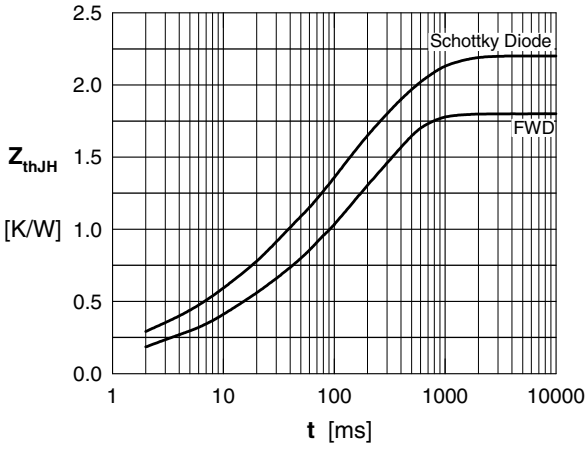


Fig. 22 Typ. thermal impedance junction to heatsink Z_{thJH} of the Diodes with heat transfer paste