

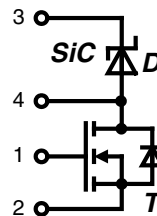
# CoolMOS™ 1) Power MOSFET with SiC Diode Boost topology

$$I_{D25} = 15 \text{ A}$$

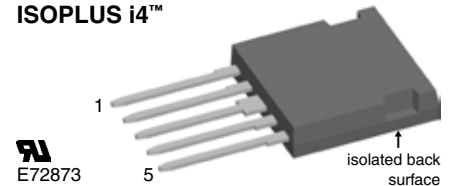
$$V_{DSS} = 600 \text{ V}$$

$$R_{DS(on) \text{ max}} = 0.165 \Omega$$

Electrically isolated back surface  
2500 V electrical isolation



ISOPLUS i4™



MOSFET T			
Symbol	Conditions	Maximum Ratings	
$V_{DSS}$	$T_{VJ} = 25^\circ\text{C}$	600	V
$V_{GS}$		$\pm 20$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	15	A
$I_{D90}$	$T_C = 90^\circ\text{C}$	11	A
$E_{AS}$	single pulse } $I_D = 7.9 \text{ A}; T_C = 25^\circ\text{C}$ repetitive	522	mJ
$E_{AR}$		0.79	mJ
$dV/dt$	MOSFET $dV/dt$ ruggedness $V_{DS} = 0 \dots 480 \text{ V}$	50	V/ns

## Features

- Silicon chip on Direct-Copper-Bond substrate
  - high power dissipation
  - isolated mounting surface
  - 2500 V electrical isolation
  - low drain to tab capacitance ( $< 40 \text{ pF}$ )
- Fast CoolMOS™ 1) power MOSFET 4<sup>th</sup> generation
  - high blocking capability
  - lowest resistance
  - avalanche rated for unclamped inductive switching (UIS)
  - low thermal resistance due to reduced chip thickness
- Enhanced total power density
- SiC Boost Diode
  - no reverse recovery current

Symbol	Conditions	Characteristic Values			
		$(T_{VJ} = 25^\circ\text{C}, \text{ unless otherwise specified})$			
		min.	typ.	max.	
$R_{DS(on)}$	$V_{GS} = 10 \text{ V}; I_D = 12 \text{ A}$		150	165	m $\Omega$
$V_{GS(th)}$	$V_{DS} = V_{GS}; I_D = 0.79 \text{ mA}$	2.5	3	3.5	V
$I_{DSS}$	$V_{DS} = 600 \text{ V}; V_{GS} = 0 \text{ V}$				$\mu\text{A}$
			10	1	$\mu\text{A}$
$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}; V_{DS} = 0 \text{ V}$			100	nA
$C_{iss}$	$V_{GS} = 0 \text{ V}; V_{DS} = 100 \text{ V}$ $f = 1 \text{ MHz}$		2000		pF
$C_{oss}$				100	
$Q_g$	$V_{GS} = 0 \text{ to } 10 \text{ V}; V_{DS} = 400 \text{ V}; I_D = 12 \text{ A}$		40	52	nC
$Q_{gs}$			9		nC
$Q_{gd}$			13		nC
$t_{d(on)}$	Inductive switching $T_{VJ} = 125^\circ\text{C}$ $V_{GS} = 0/10 \text{ V}; V_{DS} = 380 \text{ V}$ $I_D = 12 \text{ A}; R_G = 10 \Omega$		12		ns
$t_r$			6		ns
$t_{d(off)}$			75		ns
$t_f$			4		ns
$E_{on}$			0.09		mJ
$E_{off}$			0.01		mJ
$E_{rec off}$		no reverse recovery current due to absence of minority carrier injection			
$R_{thJC}$				1.1	K/W
$R_{thJH}$	with heat transfer paste (IXYS test setup)		1.35		K/W

## Applications

- Switched mode power supplies (SMPS)
- Uninterruptible power supplies (UPS)
- Power factor correction (PFC)

## Advantages

- Easy assembly: no screws or isolation foils required
- Space savings
- High power density
- High reliability

<sup>1)</sup> CoolMOS™ is a trademark of Infineon Technologies AG.

**MOSFET T Source-Drain Diode**

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)					
$I_S$	$V_{GS} = 0\text{ V}$			12	A
$V_{SD}$	$I_F = 12\text{ A}; V_{GS} = 0\text{ V}$		0.9	1.2	V
$t_{rr}$	$I_F = 12\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s}; V_R = 400\text{ V}$		390		ns
$Q_{RM}$			7.5		$\mu\text{C}$
$I_{RM}$			38		A

**SiC Boost Diode D**

Symbol	Conditions	Maximum Ratings	
$V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$	600	V
$I_{F25}$	$T_C = 25^{\circ}\text{C}$	15	A
$I_{F90}$	$T_C = 90^{\circ}\text{C}$	9.5	A

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
$V_F$	$I_F = 8\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$	1.5	1.7	V
	$I_F = 8\text{ A}$	$T_{VJ} = 150^{\circ}\text{C}$		1.9	A
$I_R$	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$	1	100	$\mu\text{A}$
		$T_{VJ} = 150^{\circ}\text{C}$	10		$\mu\text{A}$
$I_{FSM}$	$t = 10\text{ ms}$ (50 Hz), sine;	$T_{VJ} = 25^{\circ}\text{C}$		59	A
$Q_C$	$I_F = I_{Fmax}; V_R = 400\text{ V};$ $di/dt = 200\text{ A}/\mu\text{s}^1$	$T_{VJ} = 150^{\circ}\text{C}$	19		nC
$t_C$				10	ns
$R_{thJC}$	} with heat transfer paste (IXYS test setup)		4.0	3.1	K/W
$R_{thJH}$					K/W

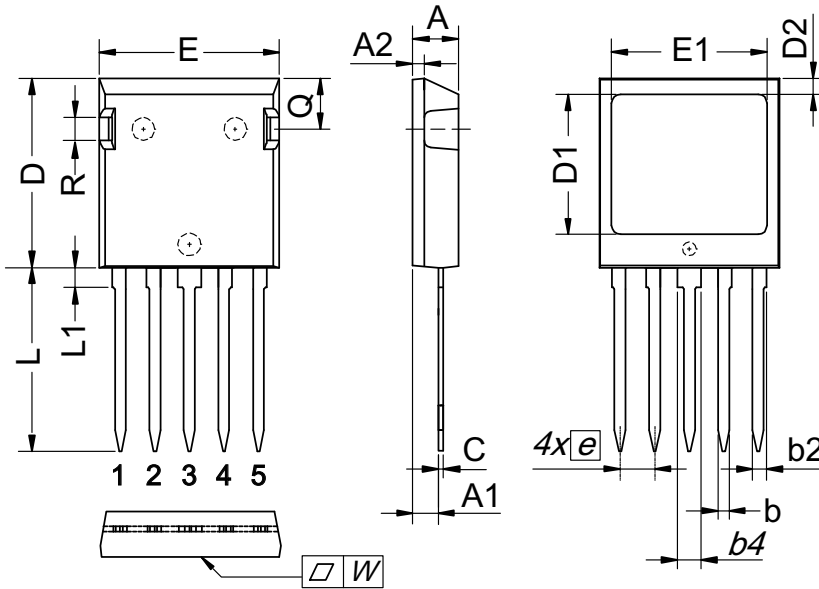
<sup>1)</sup>  $t_C$  is the time constant for the capacitive displacement current waveform (independent from  $T_{VJ}$ ,  $I_{LOAD}$  and  $di/dt$ ), different from  $t_{rr}$  which is dependent on  $T_{VJ}$ ,  $I_{LOAD}$  and  $di/dt$ .  
**No reverse recovery time constant  $t_{rr}$  due to absence of minority carrier injection**

**Component**

Symbol	Conditions	Maximum Ratings	
$T_{VJ}$	operating	-55...+150	$^{\circ}\text{C}$
$T_{stg}$	storage	-55...+125	$^{\circ}\text{C}$
$V_{ISOL}$	$I_{ISOL} < 1\text{ mA}; 50/60\text{ Hz}$	2500	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
$d_S, d_A$	pin - pin	1.7			mm
	pin - backside metal	5.5			mm
<b>Weight</b>			9		g

## ISOPLUS i4™ 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
E	19.56	20.29	0.770	0.799
E1	16.76	17.53	0.660	0.690
e	3.81 BSC		0.15 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

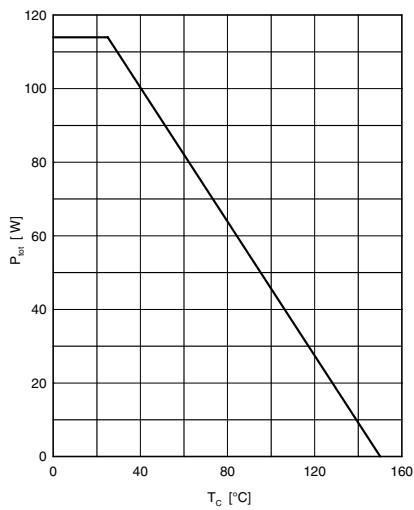


Fig. 1 Power dissipation

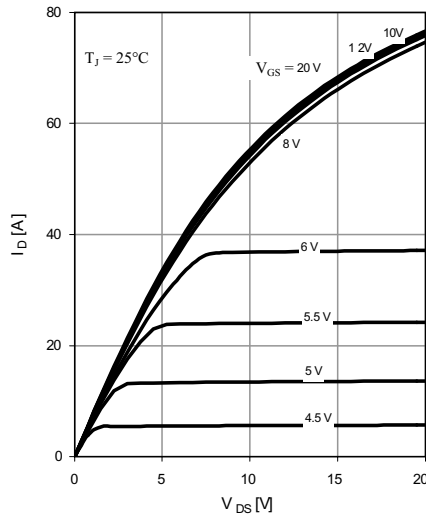


Fig. 2 Typ. output characteristics

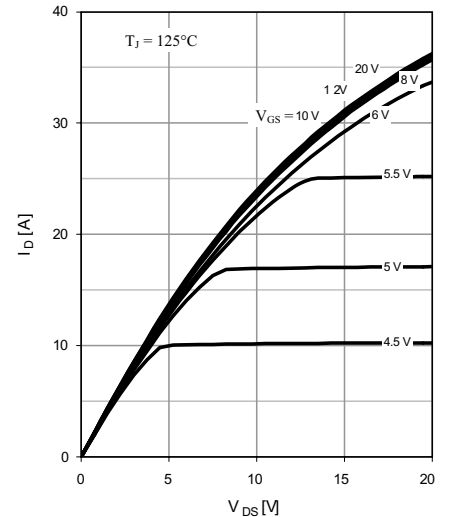


Fig. 3 Typ. output characteristics

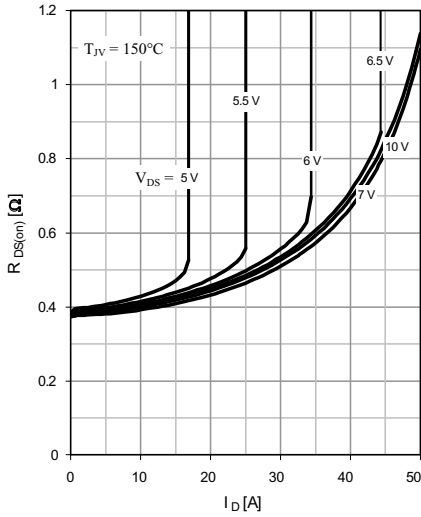


Fig. 4 Typ. drain-source on-state resistance

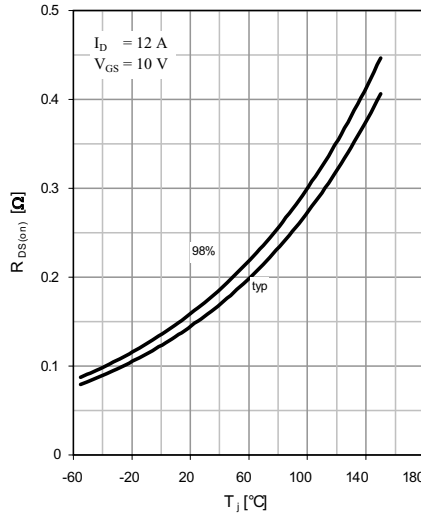


Fig. 5 Drain-source on-state resistance

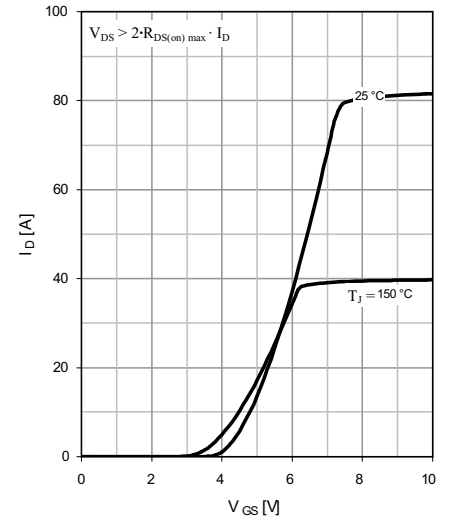


Fig. 6 Typ. transfer characteristics

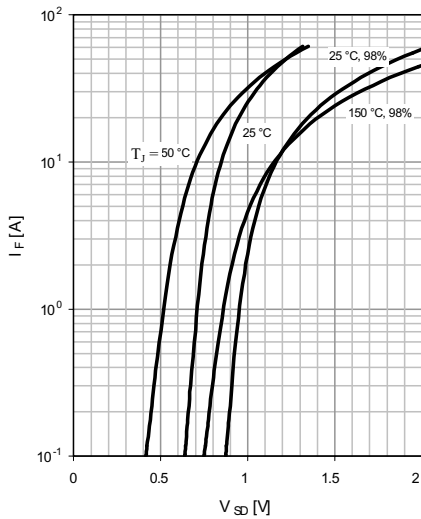


Fig. 7 Forward characteristic of reverse diode

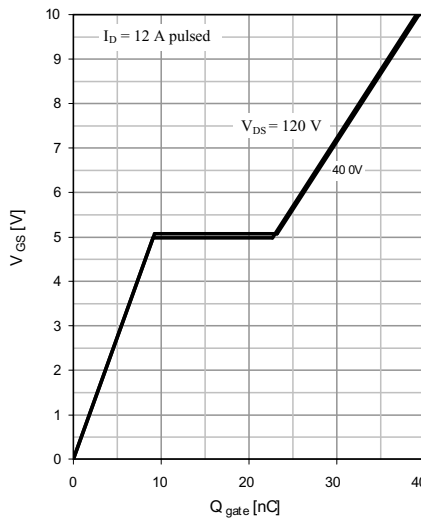


Fig. 8 Typ. gate charge

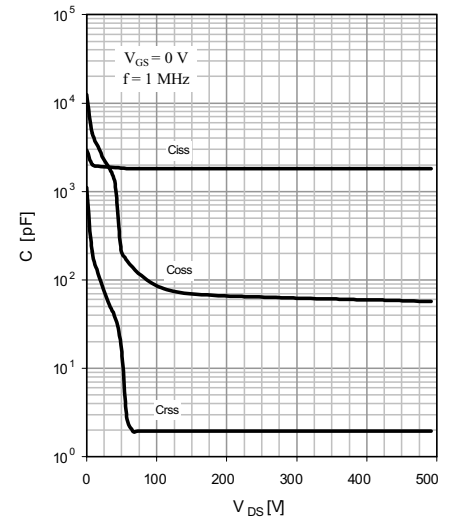


Fig. 9 Typ. capacitances

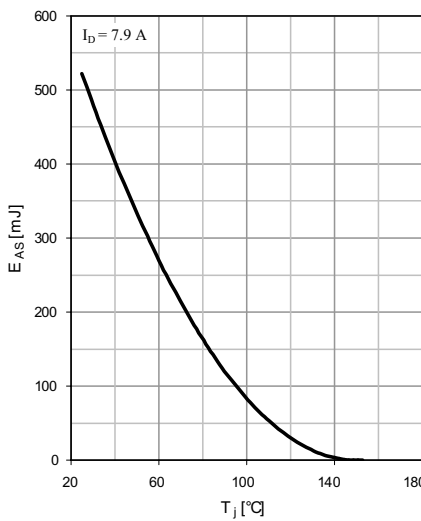


Fig. 10 Avalanche energy

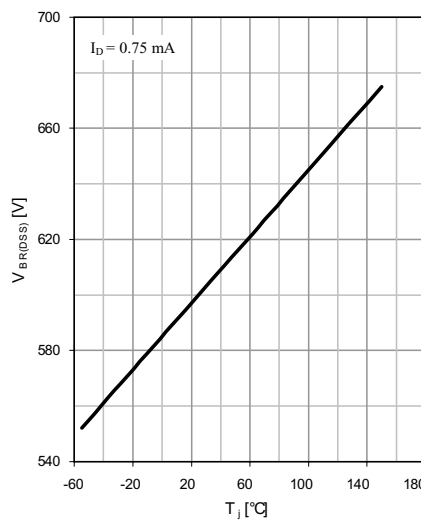


Fig. 11 Drain-source breakdown voltage

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

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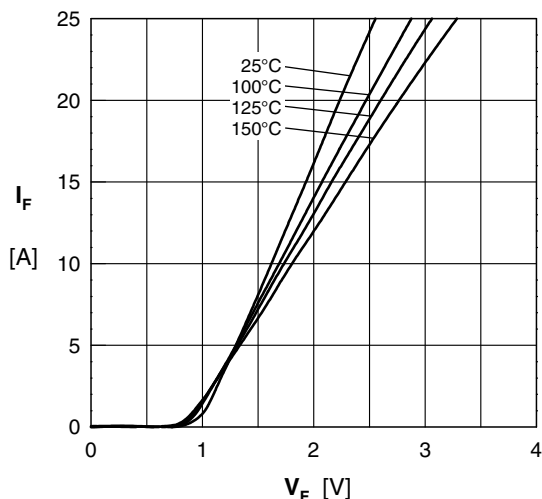


Fig. 12 Forward characteristic of boost diode

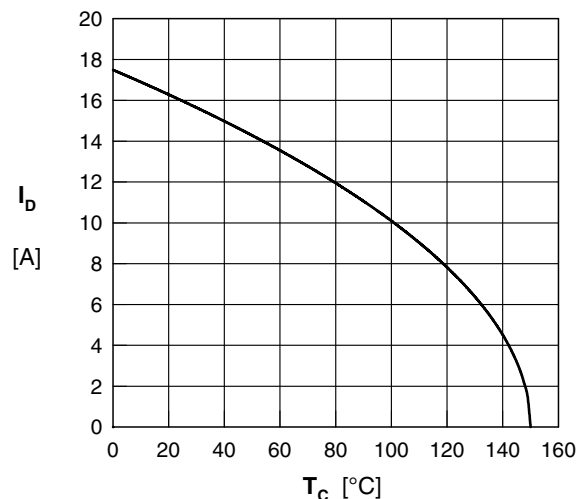
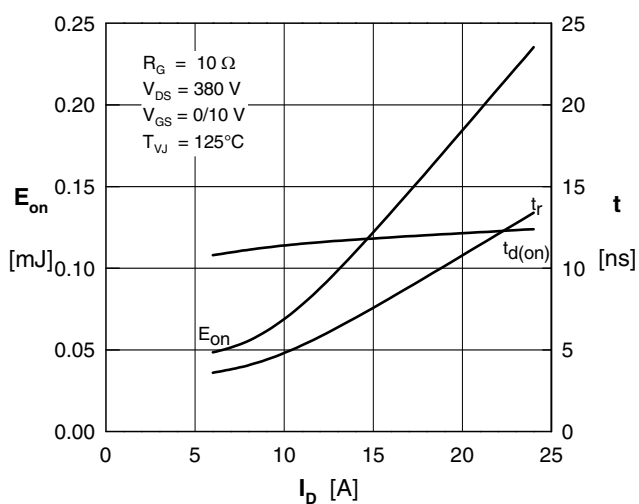

 Fig. 13 Drain current  $I_D$  versus case temperature  $T_C$ 


Fig. 14 Typ. turn-on energy and switching times versus drain current, inductive switching

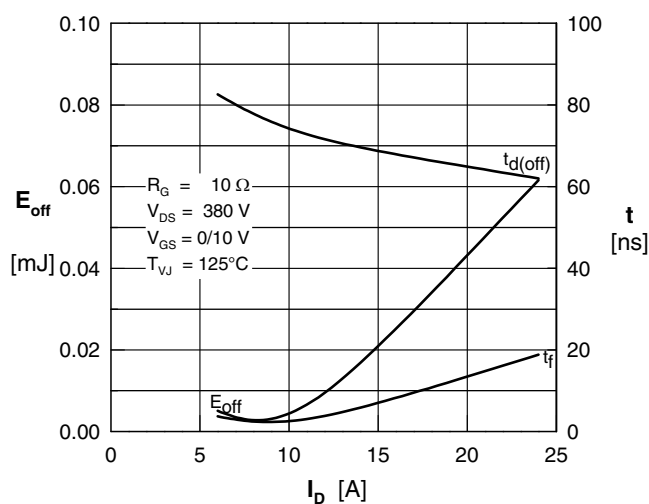


Fig. 15 Typ. turn-off energy and switching times versus drain current, inductive switching

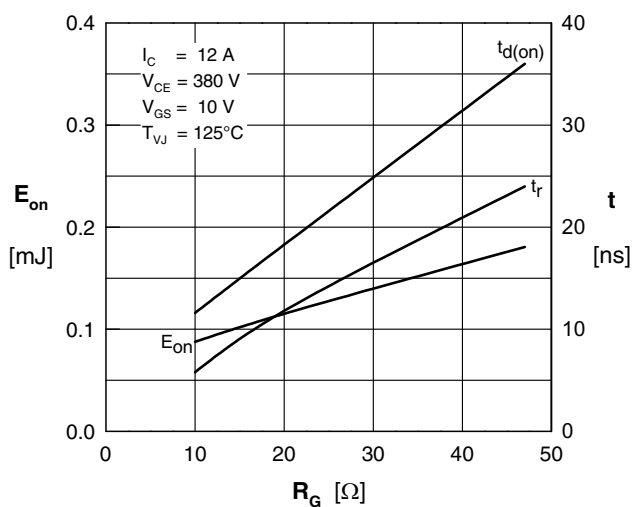


Fig. 16 Typ. turn-on energy and switching times versus gate resistor, inductive switching

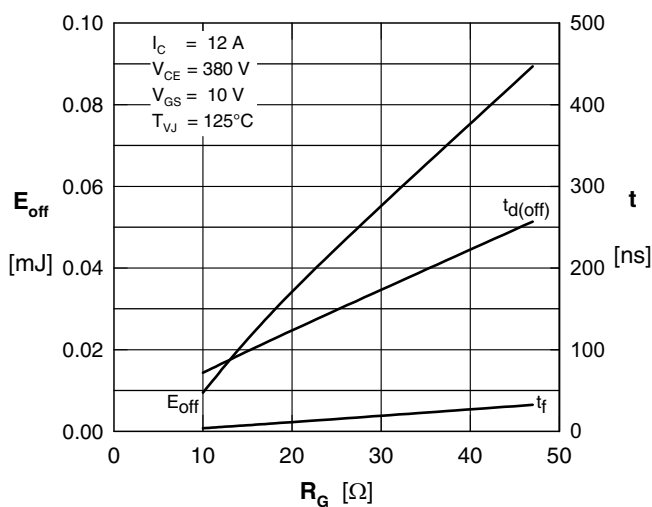


Fig. 17 Typ. turn-off energy and switching times versus gate resistor, inductive switching

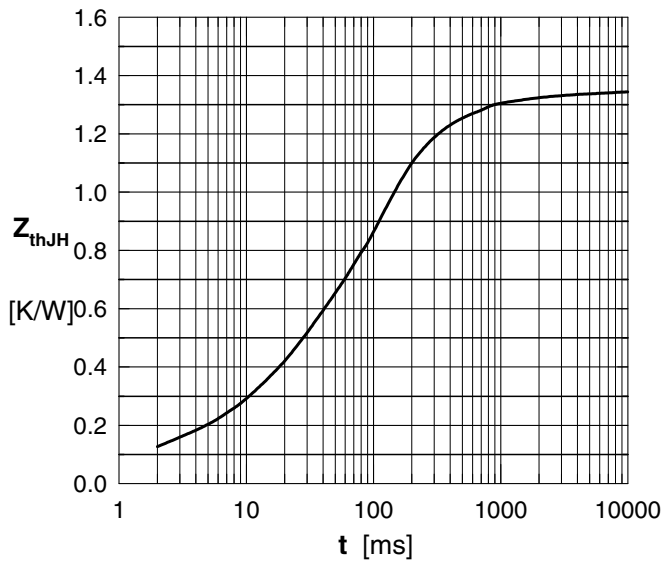


Fig. 18 Typ. transient thermal impedances of IGBT with heat transfer paste (IXYS test setup)

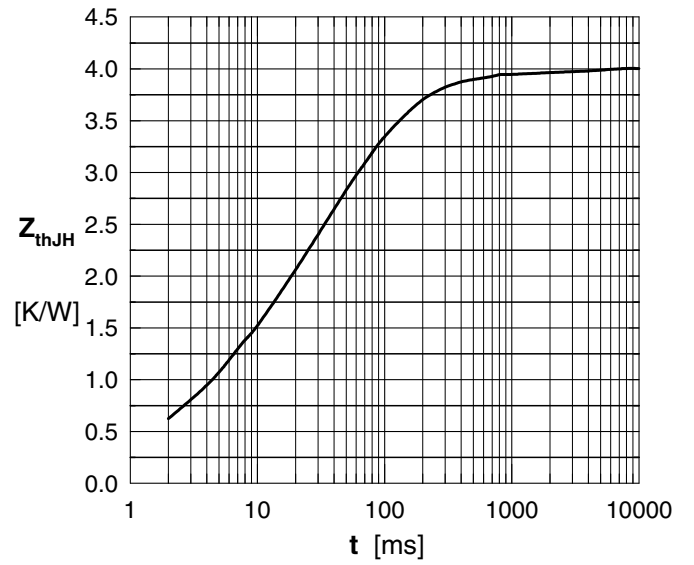


Fig. 19 Typ. transient thermal impedances of boost diode with heat transfer paste (IXYS test setup)

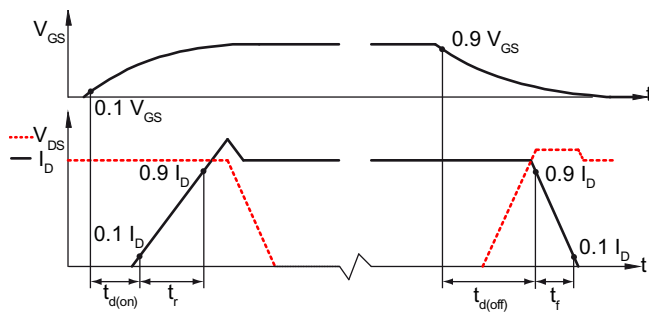


Fig. 20 Definition of switching times