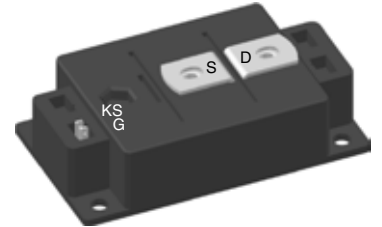
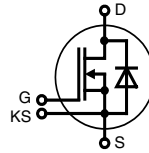


# PolarHT™ Module

N-Channel Enhancement Mode

$V_{DSS} = 200\text{ V}$   
 $I_{D80} = 1600\text{ A}$   
 $R_{DS(on)} = 1.7\text{ m}\Omega\text{ max.}$



MOSFET			
Symbol	Conditions	Maximum Ratings	
$V_{DSS}$	$T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$	200	V
$V_{GS}$		$\pm 20$	V
$I_{D25}$	$T_C = 25^{\circ}\text{C}$	1900	A
$I_{D80}$	$T_C = 80^{\circ}\text{C}$	1600	A
$I_{F25}$	$T_C = 25^{\circ}\text{C}$ (diode)	1900	A
$I_{F80}$	$T_C = 80^{\circ}\text{C}$ (diode)	1600	A

## Features

- PolarHT™ technology
  - low  $R_{DS(on)}$
  - dv/dt ruggedness
  - fast intrinsic reverse diode
- Package
  - low inductive current path
  - screw connection to high current main terminals
  - use of non interchangeable connectors for auxiliary terminals possible
  - Kelvin source terminals for easy drive
  - isolated ceramic base plate

Symbol	Conditions	Characteristic Values					
		$(T_{VJ} = 25^{\circ}\text{C}, \text{ unless otherwise specified})$					
		min.	typ.	max.			
$R_{DS(on)}$	$V_{GS} = 10\text{ V}; I_D = 1600\text{ A};$ $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.58 3.25	1.7 3.6	$\text{m}\Omega$ $\text{m}\Omega$		
$V_{GS(th)}$	$V_{DS} = 20\text{ V}; I_D = 5\text{ mA}$	2.5		5	V		
$I_{DSS}$	$V_{DS} = V_{DSS}; V_{GS} = 0\text{ V};$ $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		5.0	0.5	$\text{mA}$ $\text{mA}$		
$I_{GSS}$	$V_{GS} = \pm 20\text{ V}; V_{DS} = 0\text{ V}$			2	$\mu\text{A}$		
$Q_g$ $Q_{gs}$ $Q_{gd}$	$V_{GS} = 10\text{ V}; V_{DS} = 0.5 \cdot V_{DSS}; I_D = I_{D80}$		2900 600 1600		$\text{nC}$ $\text{nC}$ $\text{nC}$		
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$ $E_{on}$ $E_{off}$ $E_{rec}$		inductive load $V_{GS} = 10\text{ V}; V_{DS} = 100\text{ V}$ $I_D = 1600\text{ A}; R_G = 1.8\ \Omega$ $T_{VJ} = 25^{\circ}\text{C}$		320 1220 620 700 24 152 3.7		$\text{ns}$ $\text{ns}$ $\text{ns}$ $\text{ns}$ $\text{mJ}$ $\text{mJ}$ $\text{mJ}$	
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$ $E_{on}$ $E_{off}$ $E_{rec}$			inductive load $V_{GS} = 10\text{ V}; V_{DS} = 100\text{ V}$ $I_D = 1600\text{ A}; R_G = 1.8\ \Omega$ $T_{VJ} = 125^{\circ}\text{C}$		340 1220 740 580 28 147 4.9		$\text{ns}$ $\text{ns}$ $\text{ns}$ $\text{ns}$ $\text{mJ}$ $\text{mJ}$ $\text{mJ}$
$R_{thJC}$ $R_{thJH}$	with heat transfer paste				0.037 0.056	0.03 0.056	$\text{K/W}$ $\text{K/W}$

## Applications

- converters with high power density for
  - main & aux. AC drives of electric vehicles
  - DC drives
  - power supplies

**Source Drain Diode**

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_{SD}$	$I_F = 1600 \text{ A}; V_{GS} = 0 \text{ V};$	$T_{VJ} = 25^\circ\text{C}$	1.17	V
		$T_{VJ} = 125^\circ\text{C}$	1.13	V
$t_{rr}$ $Q_{rr}$ $I_{RM}$	$V_{DS} = 100 \text{ V}; I_F = 1600 \text{ A}$ $dV_F/dt = 1300 \text{ A}/\mu\text{s}$	$T_{VJ} = 25^\circ\text{C}$	340	ns
			40	$\mu\text{C}$
			210	A
$t_{rr}$ $Q_{rr}$ $I_{RM}$	$V_{DS} = 100 \text{ V}; I_F = 1600 \text{ A}$ $dV_F/dt = 1300 \text{ A}/\mu\text{s}$	$T_{VJ} = 125^\circ\text{C}$	380	ns
			56	$\mu\text{C}$
			250	A

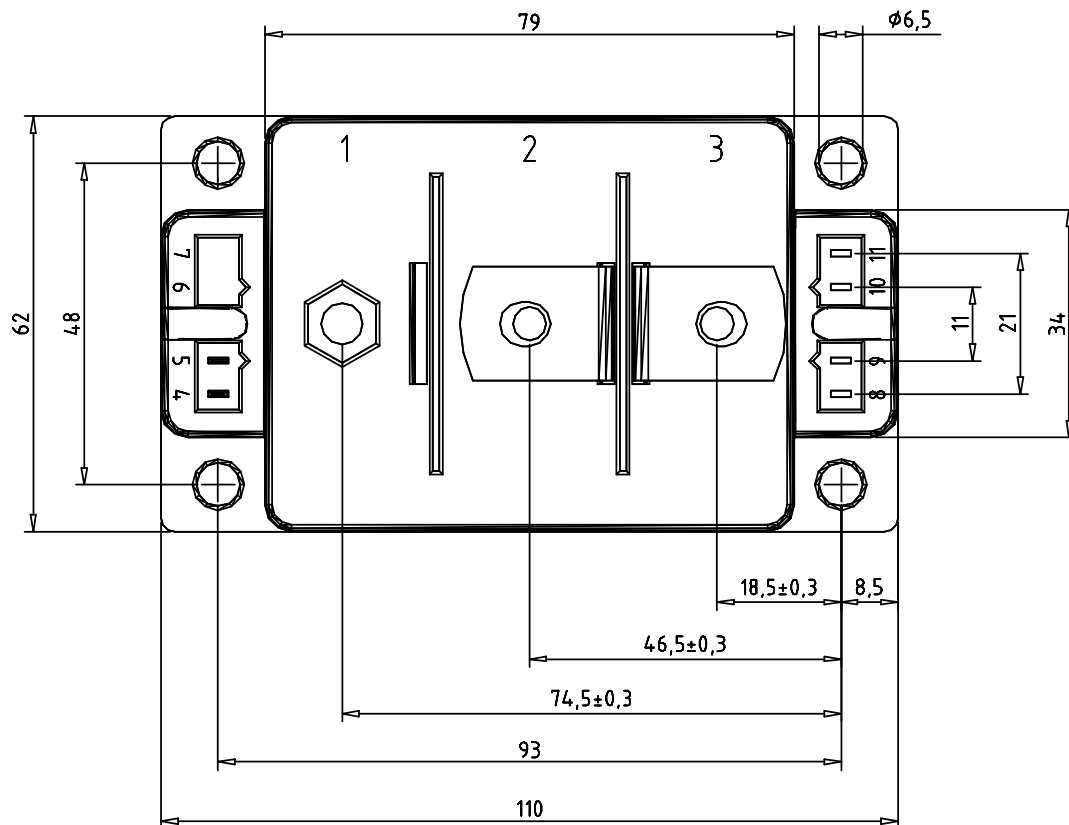
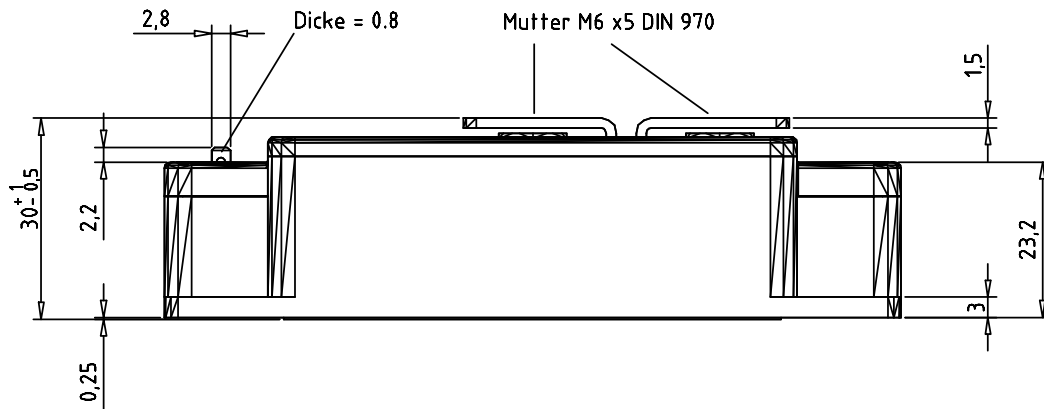
**Module**

Symbol	Conditions	Maximum Ratings	
$T_{VJ}$		-40...+150	$^\circ\text{C}$
$T_{stg}$		-40...+125	$^\circ\text{C}$
$V_{ISOL}$	$I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}$	3600	V~
$M_d$	mounting torque (M6)	2.25 - 2.75	Nm
	terminal connection torque (M6)	4.5 - 5.5	Nm

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
Weight			250	g

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Code Key
Standard	VMO 1600-02P	VMO 1600-02P	Box	2	504288


**Optional accessories for modules**
**Dimensions in mm (1 mm = 0.0394")**

keyed twin plugs  
 (UL758, style 1385, CSA class 5851,  
 guide 460-1-1)

- Type ZY180L with wire length 350 mm  
 for pins 4 (Gate, yellow wire)  
 and 5 (Kelvin Source, red wire)

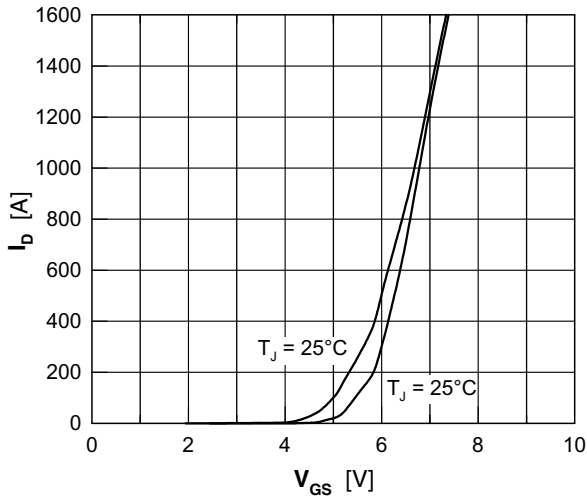


Fig. 1 Typical transfer characteristic

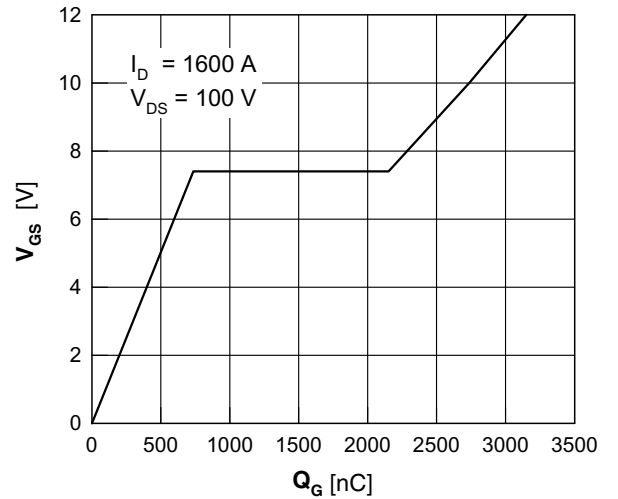


Fig. 2 Typical gate charge characteristic

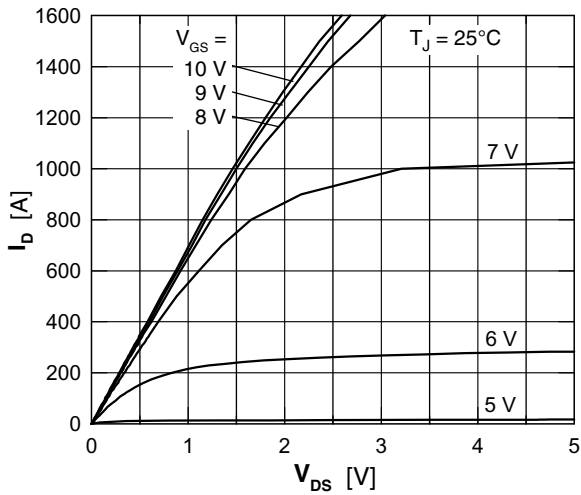


Fig. 3 Typical output characteristic

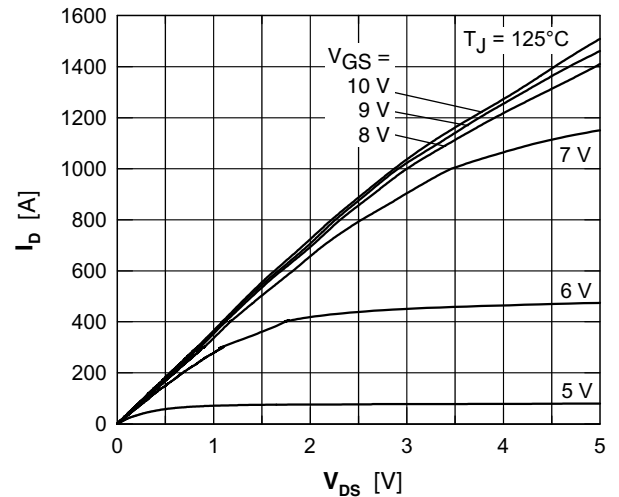


Fig. 4 Typical output characteristic

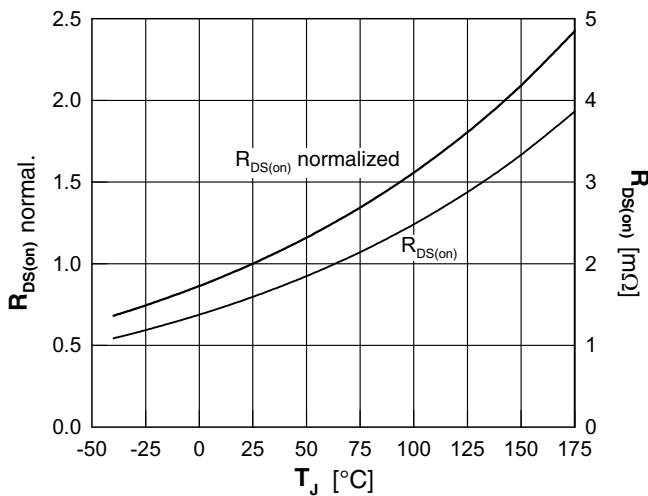


Fig. 5 Typ. drain source on-state resistance  $R_{DS(on)}$  versus junction temperature  $T_{J}$

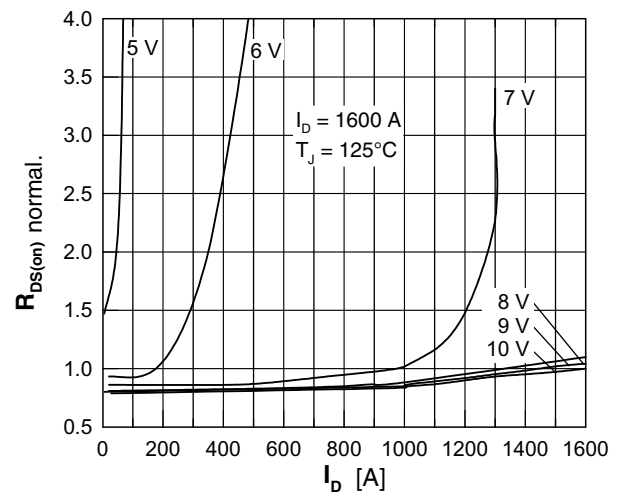


Fig. 6 Typ. drain source on-state resistance  $R_{DS(on)}$  versus  $I_D$

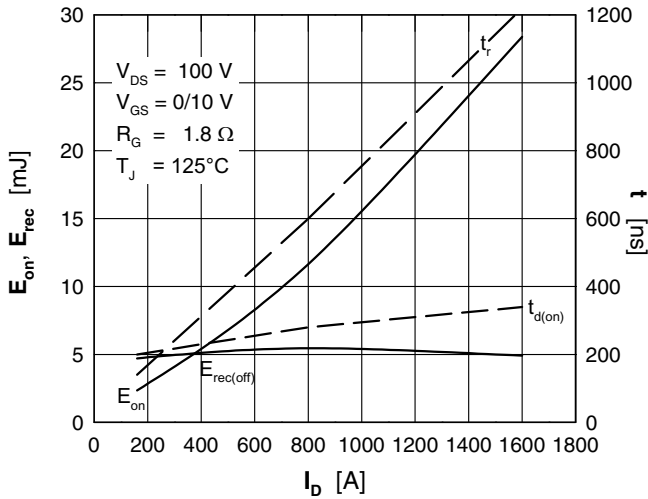


Fig.7 Typ. turn-on energy &amp; switching times vs. drain source current, inductive switching

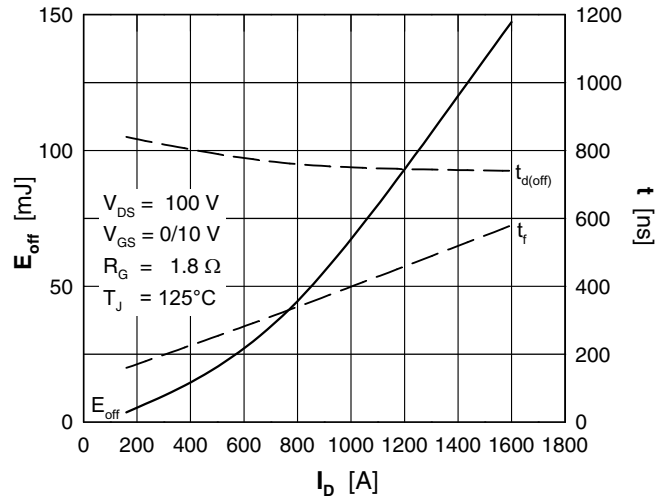


Fig. 8 Typ. turn-off energy &amp; switching times vs. drain source current, inductive switching

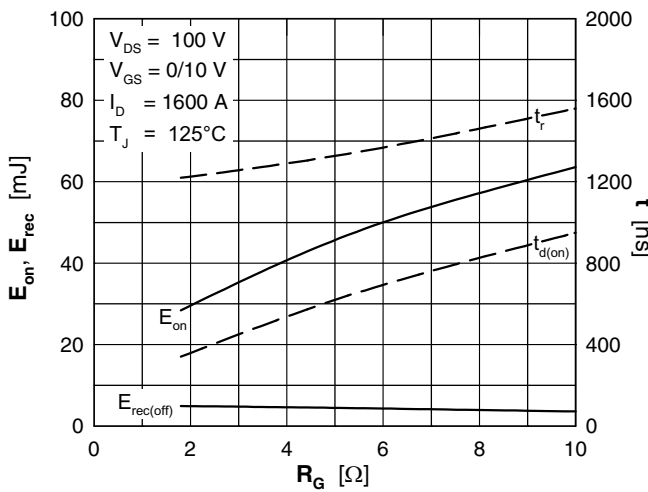


Fig. 9 Typ. turn-on energy &amp; switching times vs. gate resistor, inductive switching

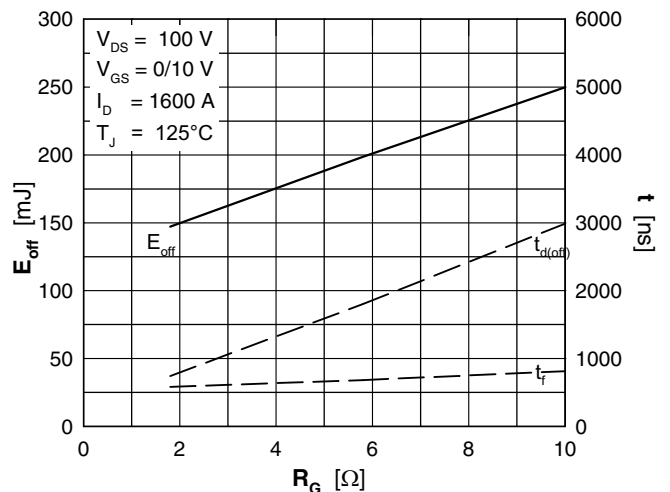
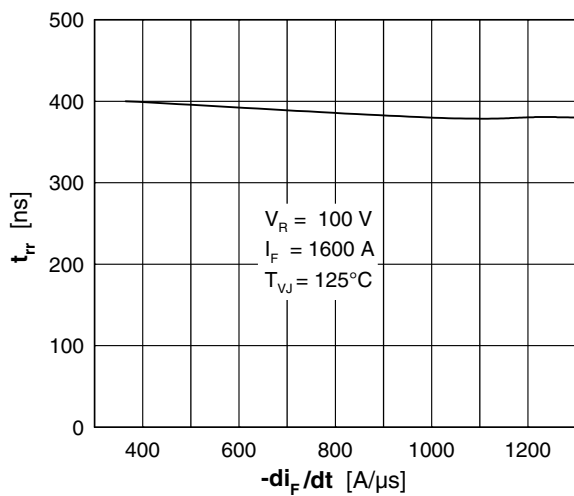
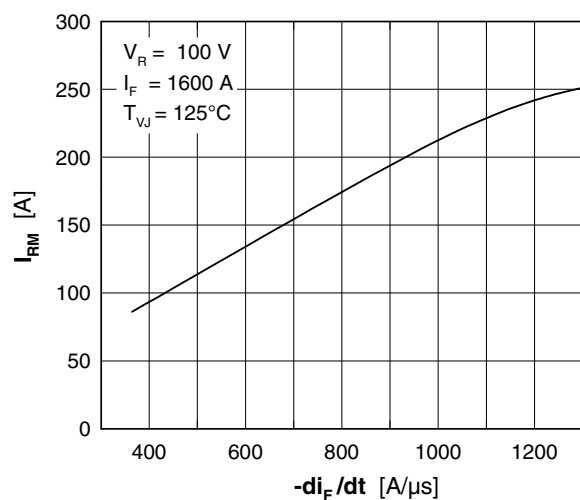


Fig. 10 Typ. turn-off energy &amp; switching times vs. gate resistor, inductive switching


 Fig.11 Typ. reverse recovery time  $t_{rr}$  of the body diode versus  $di/dt$ 

 Fig. 12 Typ. reverse recovery current  $I_{RM}$  of the body diode versus  $di/dt$

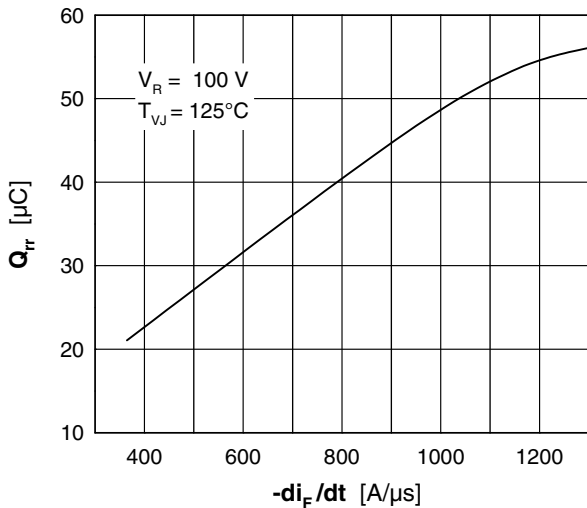


Fig. 13 Typical reverse recovery charge  $Q_{rr}$  of the body diode versus  $di/dt$

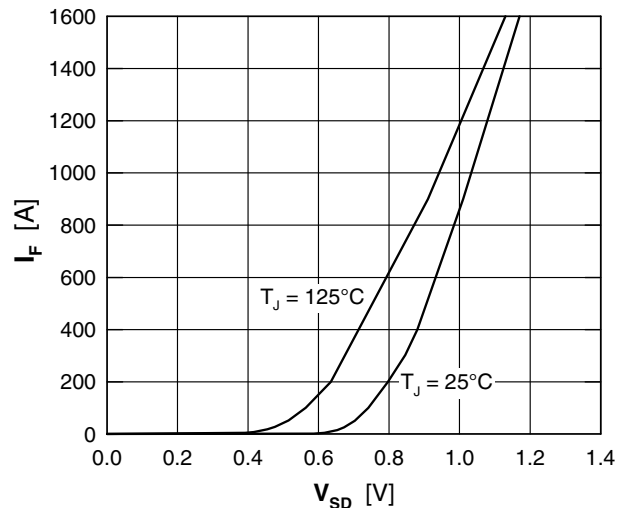


Fig. 14 Source drain current  $I_F$  (body diode) vs. typical source drain voltage  $V_{SD}$

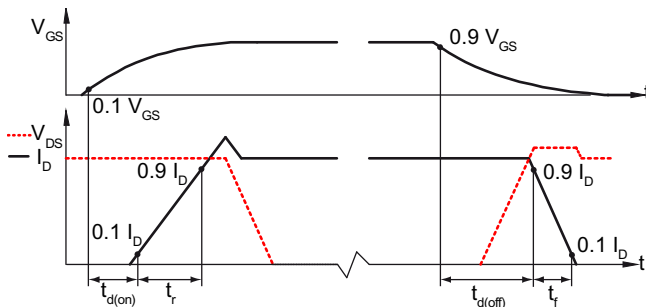


Fig. 15 Definition of switching times

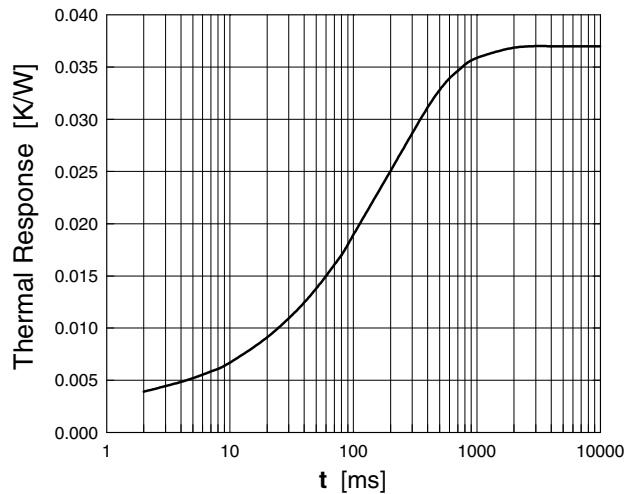


Fig. 16 Typ. thermal impedance junction to heatsink  $Z_{th,JH}$  with heat transfer paste