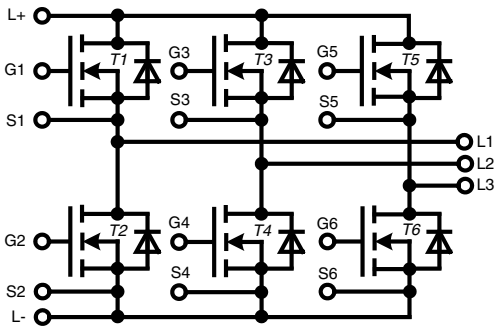
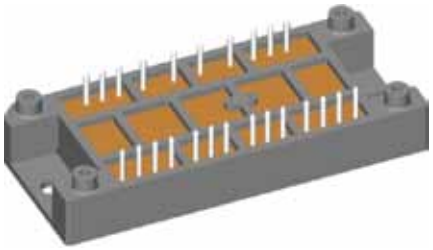
Three phase full bridge with Trench MOSFETs

V_{DSS} = 75 V
I_{D25} = 270 A
$R_{DS(on)}$ = 2.1 mΩ

https://www.digikey.dk/product-detail/en/ixys/VWM270-0075X2/VWM270-0075X2-ND/4321855





MOSFET T1 - T6

Symbol	Conditions	Maximum Ratings	
V_{DSS}	T_{VJ} = 25°C to 150°C	75	V
V_{GS}		± 20	V
I_{D25}	T_C = 25°C	270	A
I_{D80}	T_C = 80°C	215	A
I_{F25}	T_C = 25°C (diode)	280	A
I_{F80}	T_C = 80°C (diode)	180	A

Symbol	Conditions (T_{VJ} = 25°C, unless otherwise specified)		Characteristic Values min.	typ.	max.	
R_{DSon} [1]	V_{GS} = 10 V; I_D = 100 A; on chip level				2.1	mΩ
$V_{GS(th)}$	V_{DS} = 20 V; I_D = 0.5 mA		2		4	V
I_{DSS}	V_{DS} = 75 V; V_{GS} = 0 V	T_{VJ} = 25°C			10	µA
		T_{VJ} = 125°C			300	µA
I_{GSS}	V_{GS} = ± 20 V; V_{DS} = 0 V				0.4	µA
Q_g	V_{GS} = 10 V; V_{DS} = ½V_{DSS}; I_D = 230 A			360		nC
Q_{gs}				105		nC
Q_{gd}				80		nC
$t_{d(on)}$	inductive load			140		ns
t_r	V_{GS} = 10 V; V_{DS} = 37 V			225		ns
$t_{d(off)}$	I_D = 230 A; R_G = 10 Ω	T_{VJ} = 25°C		380		ns
t_f	R_G = $R_{G\ ext}$ + $R_{out\ driver}$			265		ns
E_{on}				0.23		mJ
E_{off}				3.49		mJ
E_{rec}				0.04		mJ
$t_{d(on)}$	inductive load			145		ns
t_r	V_{GS} = 10 V; V_{DS} = 37 V			240		ns
$t_{d(off)}$	I_D = 230 A; R_G = 10 Ω	T_{VJ} = 125°C		410		ns
t_f	R_G = $R_{G\ ext}$ + $R_{out\ driver}$			230		ns
E_{on}				0.3		mJ
E_{off}				2.95		mJ
E_{rec}				0.06		mJ
R_{thJC}					0.44	K/W
R_{thJH}	with heat transfer paste (IXYS test setup)			0.66		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 R_{DSon}
  - optimized intrinsic reverse diode
- package:
  - high level of integration
  - solder terminals for PCB mounting
  - isolated DCB ceramic base plate with optimized heat transfer

Source-Drain Diode

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified)			
		min.	typ.	max.	
V_{SD}	I_F = 100 A; V_{GS} = 0 V			1.1	V
t_{rr}	I_F = 230 A; V_R = 37 V $-di_F/dt$ = 820 A/µs: R_G = 10 Ω		85		ns
Q_{RM}			2.2		µC
I_{RM}			38		A

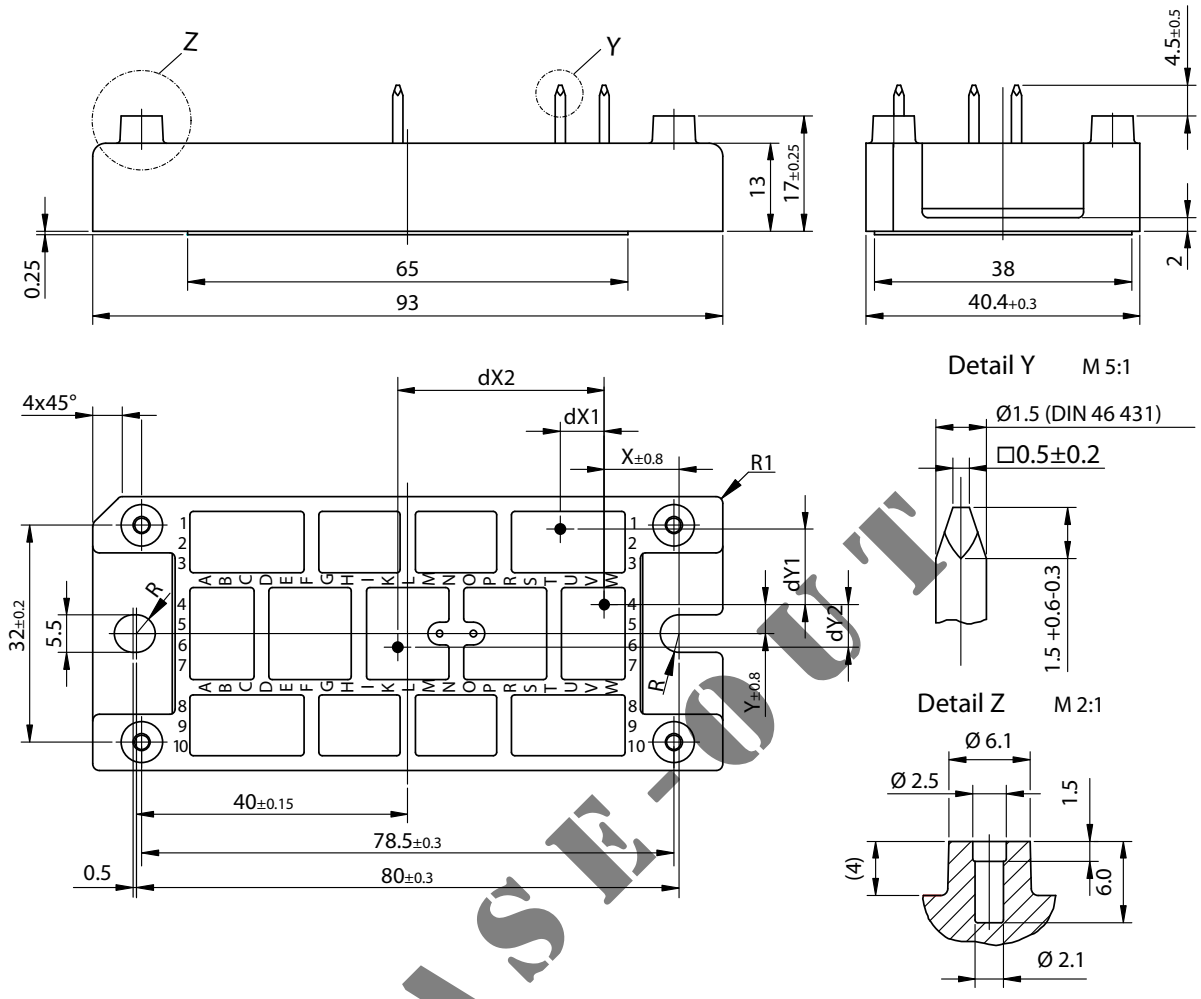
Module

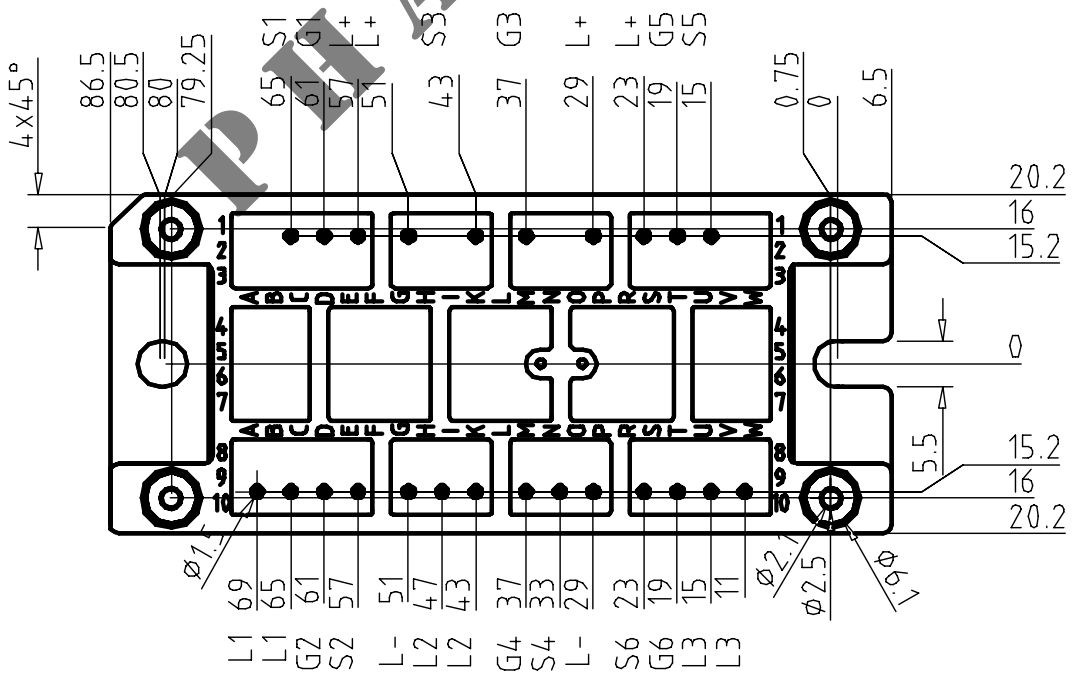
Symbol	Conditions	Maximum Ratings	
T_{VJ}		-40...+175	°C
T_{stg}		-40...+125	°C
V_{ISOL}	$I_{ISOL} \leq$ 1 mA, 50/60 Hz; t = 1 min	500	V~
M_d	Mounting torque (M5)	2 - 2.5	Nm

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
$R_{pin\ to\ chip}$ [1)]				0.7	mΩ
Weight			80		g

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

Dimensions in mm (1 mm = 0.0394“)





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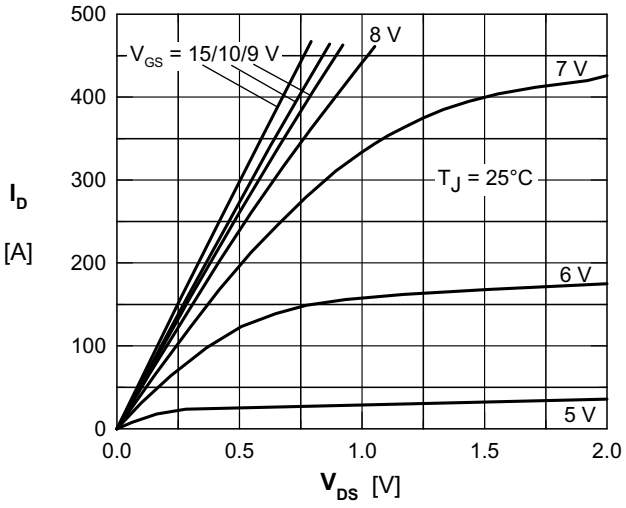

Fig. 1 Typ. Output Characteristics

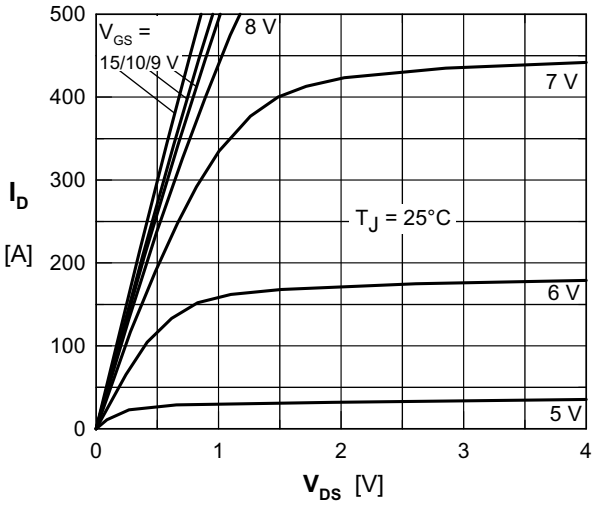

Fig. 2 Typ. Extended Output Characteristics

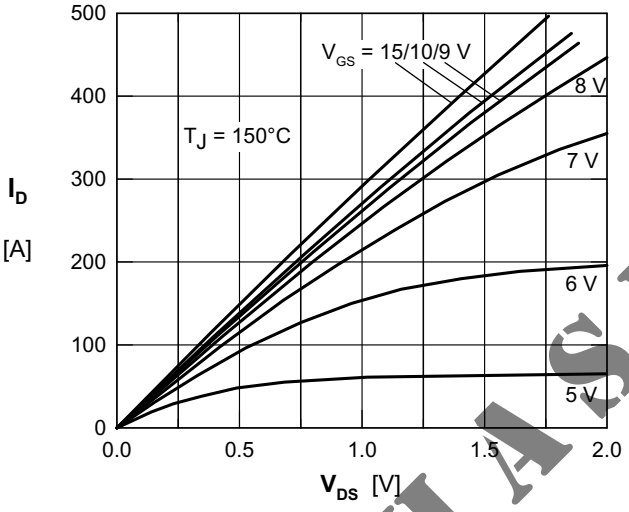

Fig. 3 Typ. Output Characteristics

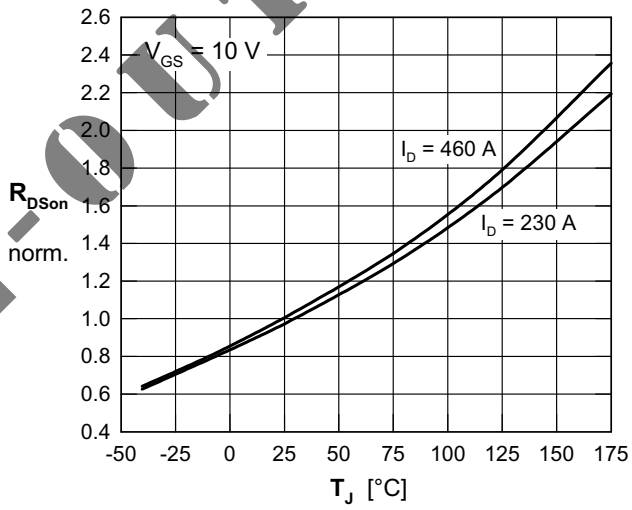

Fig. 4 $R_{DS(on)}$ Normalized to I_D = 230 A Value vs. Junction Temperature

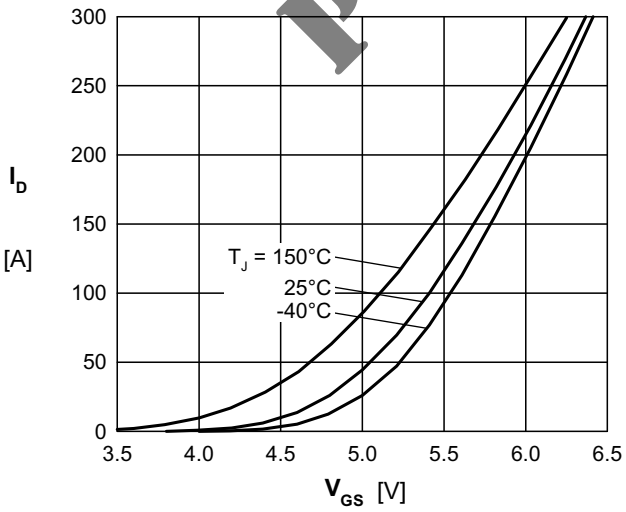

Fig. 5 Typ. Transfer Characteristics

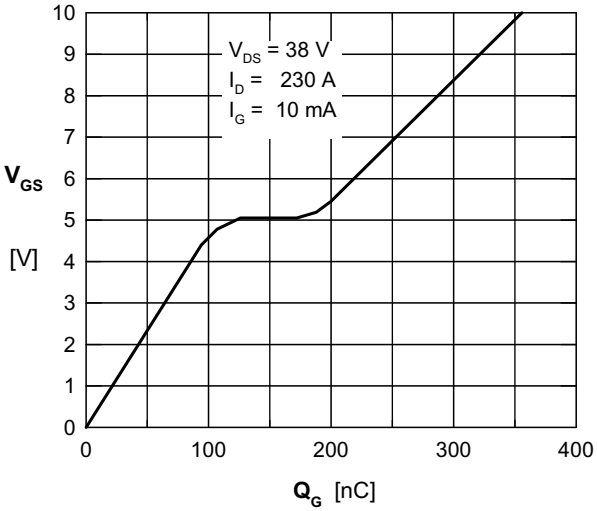

Fig. 6 Typ. Turn-on Gate Charge

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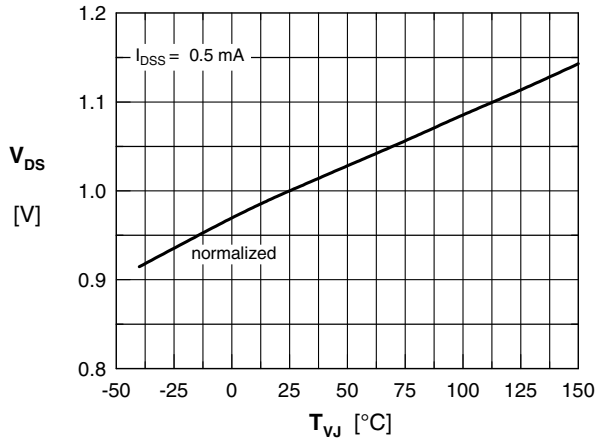

Fig. 7 Typ. Drain source breakdown voltage V_{DSS} versus junction temperature

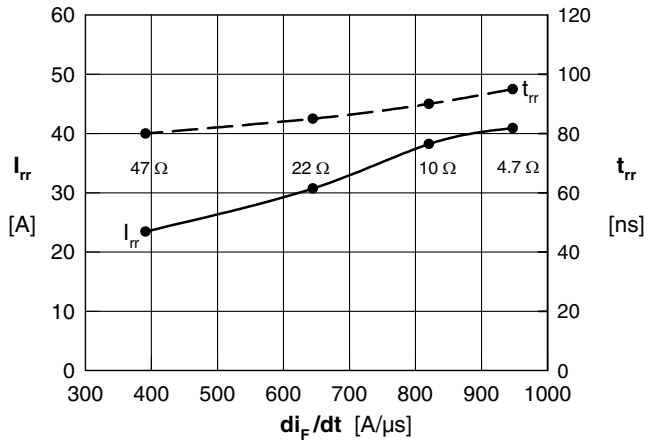

Fig. 8 Typ. Reverse recovery time and current of the body diode versus di_F/dt

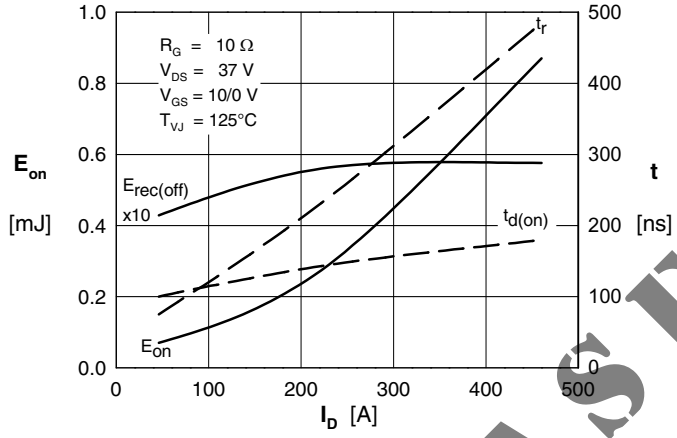

Fig. 9 Typ. turn-on energy & switching times vs. drain current, inductive switching

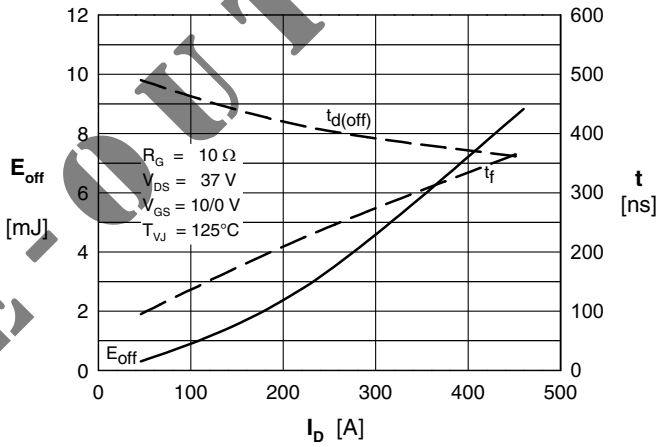

Fig. 10 Typ. turn-off energy & switching times vs. drain current, inductive switching

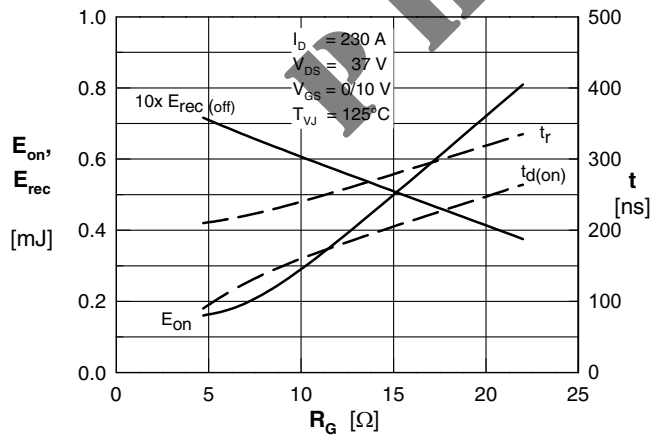

Fig. 11 Typ. turn-on energy & switching times vs. gate resistor, inductive switching

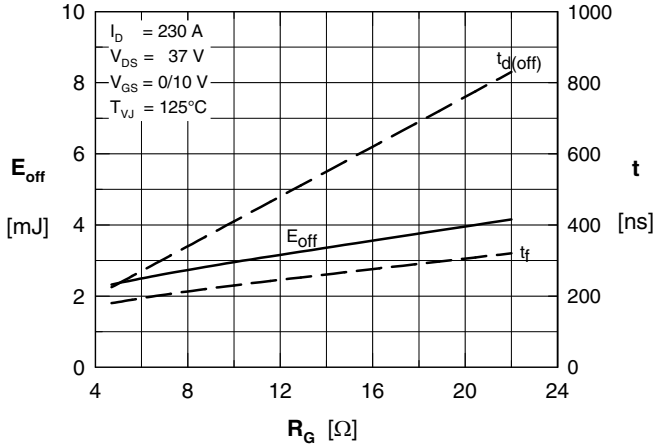

Fig. 12 Typ. turn-off energy & switching times vs. gate resistor, inductive switching

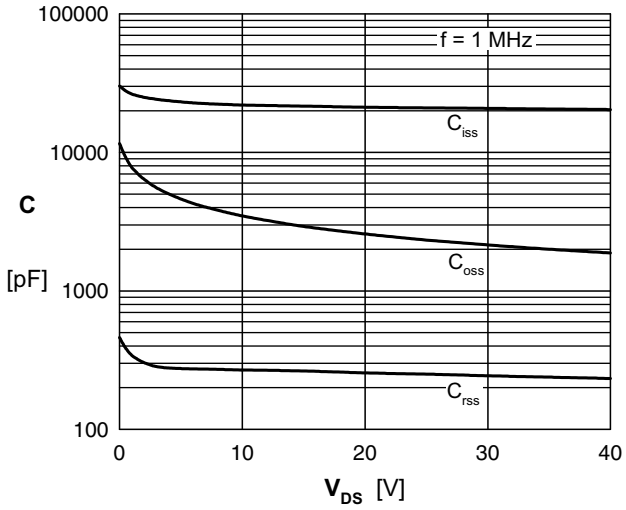

Fig. 13 Typ. Capacitances

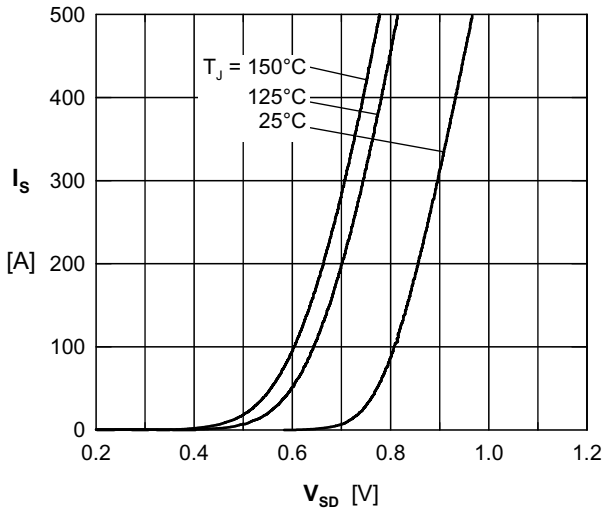

Fig. 14 Typ. Forward Voltage Drop of Intrinsic Diode

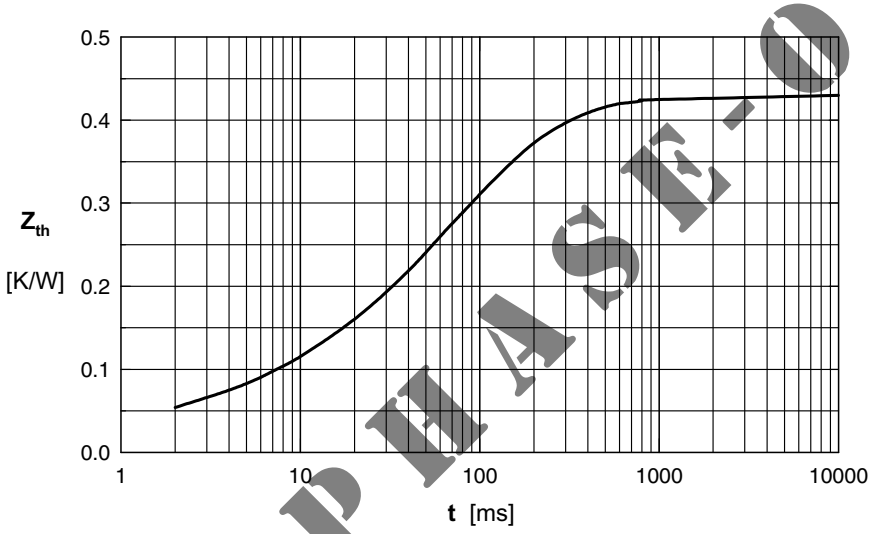

Fig. 15 Typ. Transient Thermal Resistance per MOSFET