



## STTA312B(-TR)

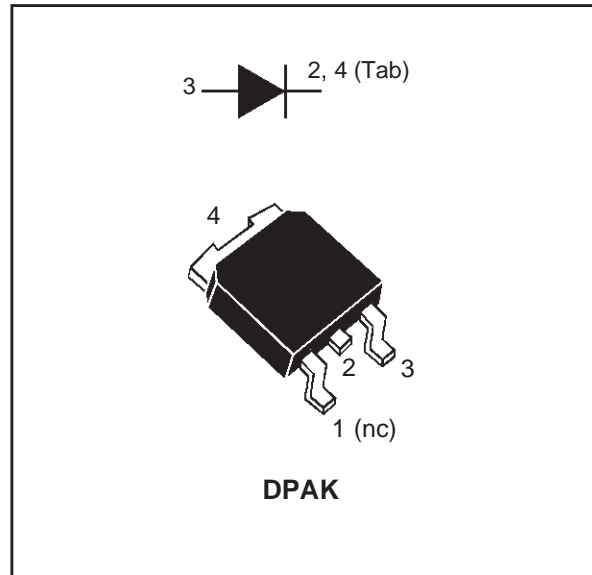
### TURBOSWITCH™ "A" . ULTRA-FAST HIGH VOLTAGE DIODE

#### MAIN PRODUCT CHARACTERISTICS

$I_{F(AV)}$	3 A
$V_{RRM}$	1200 V
$V_F (max)$	1.7 V
$t_{rr} (typ)$	65 ns

#### FEATURES AND BENEFITS

- SPECIFIC TO THE FOLLOWING OPERATIONS: SNUBBING OR CLAMPING, DEMAGNETIZATION AND RECTIFICATION
- ULTRA-FAST, VERY SOFT AND NOISE-FREE RECOVERY
- VERY LOW OVERALL POWER LOSSES AND PARTICULARLY LOW FORWARD VOLTAGE
- SURFACE MOUNT DEVICE
- TAPE AND REEL OPTION : -TR



#### DESCRIPTION

TURBOSWITCH 1200V drastically cuts losses in all high voltage operations which require extremely fast, soft and noise-free power diodes.

Due to their optimized switching performances they also highly decrease power losses in any associated switching IGBT or MOSFET in all "Freewheel Mode" operations.

They are particularly suitable in Motor Control circuitries, or in primary of SMPS as snubber, clamping or demagnetizing diodes, and also in at the secondary of SMPS as high voltage rectifier diodes.

#### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage	1200	V
$V_{RSM}$	Non repetitive surge reverse voltage	1200	V
$I_{F(RMS)}$	RMS forward current	8	A
$I_{FRM}$	Repetitive peak forward current	$t_p = 5 \mu s$ $F = 1 \text{ KHz}$	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10 \text{ ms Sine}$	A
$T_{stg}$	Storage temperature range	- 65 to + 150	°C
$T_j$	Maximum junction temperature	125	°C

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### THERMAL AND POWER DATA

Symbol	Parameter	Conditions	Value	Unit
$R_{th(j-c)}$	Junction to case thermal resistance		6.5	°C/W
$P_1$	Conduction power dissipation	$I_{F(AV)} = 3A, \delta = 0.5$ $T_c = 80^\circ C$	6.7	W
$P_{max}$	Total power dissipation $P_{max} = P_1 + P_3$ ( $P_3 = 10\% P_1$ )	$T_c = 76^\circ C$	7.5	W

### STATIC ELECTRICAL CHARACTERISTICS (see figure 6)

Symbol	Tests Conditions	Tests Conditions	Min.	Typ.	Max.	Unit
$I_R^*$	Reverse leakage current	$V_R = 0.8 \times V_{RRM}$ $T_j = 25^\circ C$			20	$\mu A$
		$T_j = 125^\circ C$		150	400	$\mu A$
$V_F^{**}$	Forward voltage drop	$I_F = 3 A$ $T_j = 25^\circ C$			1.8	V
		$I_F = 3 A$ $T_j = 125^\circ C$		1.15	1.7	
$V_{to}$	Threshold voltage	$T_j = 125^\circ C$			1.15	V
$r_d$	Dynamic resistance				185	m $\Omega$

Pulse test : \*  $t_p = 5 \text{ ms}, \delta < 2\%$   
 \*\*  $t_p = 380 \mu s, \delta < 2\%$

### DYNAMIC ELECTRICAL CHARACTERISTICS

#### TURN-OFF SWITCHING (see figure 7)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{rr}$		$T_j = 25^\circ C$ $I_F = 0.5A$ $I_R = 1A$ $I_{rr} = 0.25A$ $I_F = 1A$ $di_F/dt = 50A/\mu s$ $V_R = 30V$		65	115	ns
$I_{RM}$	Maximum recovery current	$T_j = 125^\circ C$ $I_F = 3A$ $V_R = 600V$ $di_F/dt = -16A/\mu s$ $di_F/dt = -50A/\mu s$		6.0	3.6	A
S factor	Softness factor	$T_j = 125^\circ C$ $V_R = 600V$ $I_F = 3A$ $di_F/dt = -50A/\mu s$		1.2		-

#### TURN-ON SWITCHING (see figure 8)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{fr}$	Forward recovery time	$T_j = 25^\circ C$ $I_F = 2A$ $di_F/dt = 16A/\mu s$ Measured at $1.1 \times V_{Fmax}$			900	ns
$V_{FP}$	Peak forward voltage				35	V

## APPLICATION DATA

The 1200V TURBOSWITCH™ series has been designed to provide the lowest overall power losses in all frequency or high pulsed current operations.

In such application (fig. 1 to 5), the way of calculating the power losses is given below :

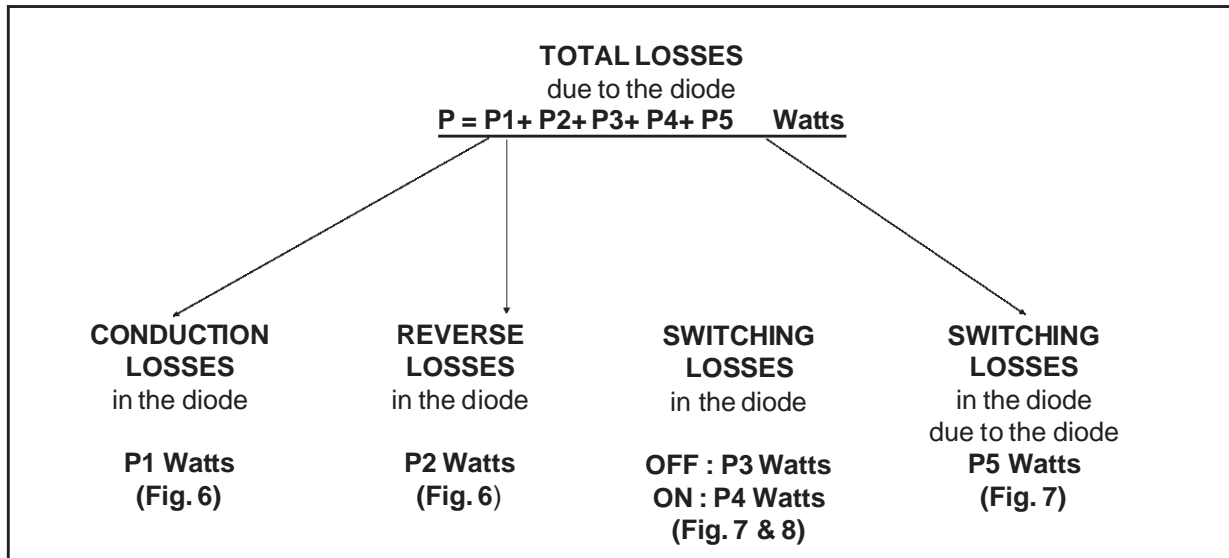
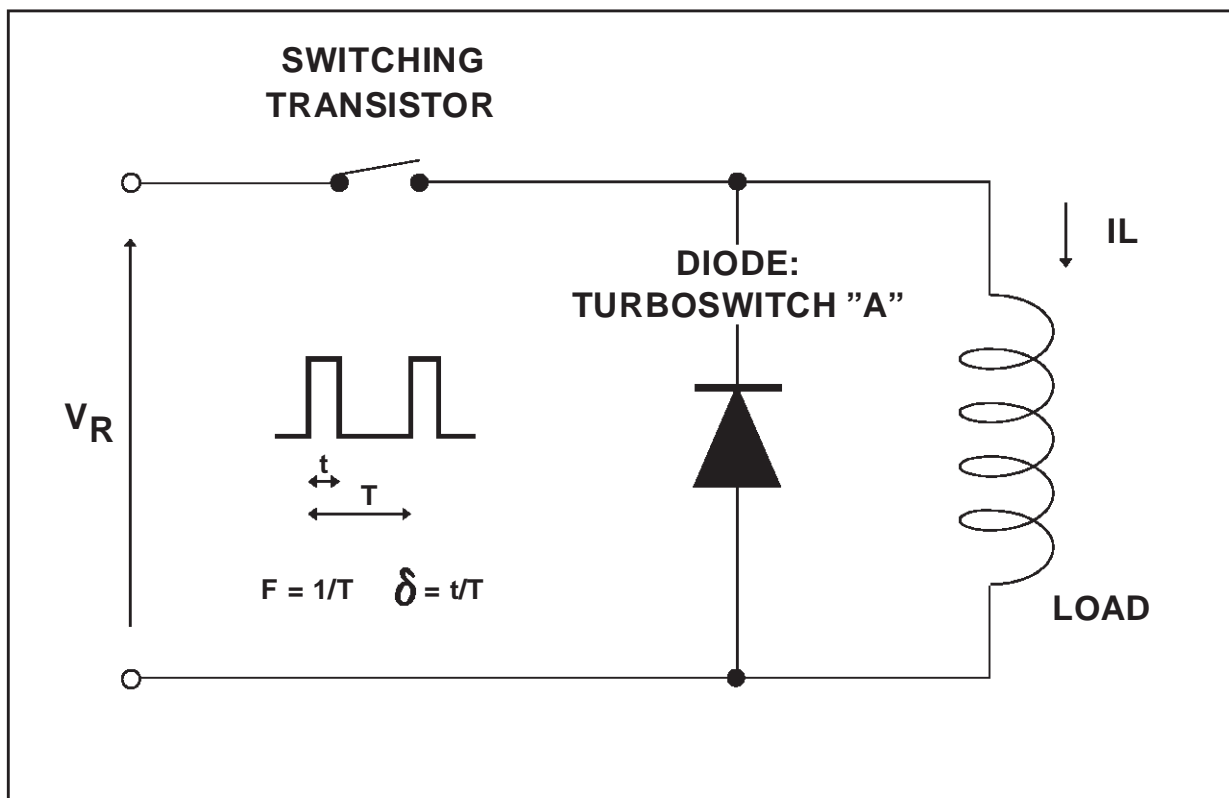


Fig. 1 : "FREEWHEEL MODE".



APPLICATION DATA (Cont'd)

Fig. 2 : SNUBBER DIODE.

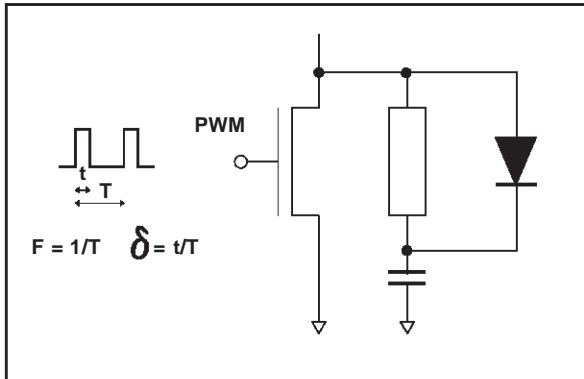


Fig. 3 : CLAMPING DIODE.

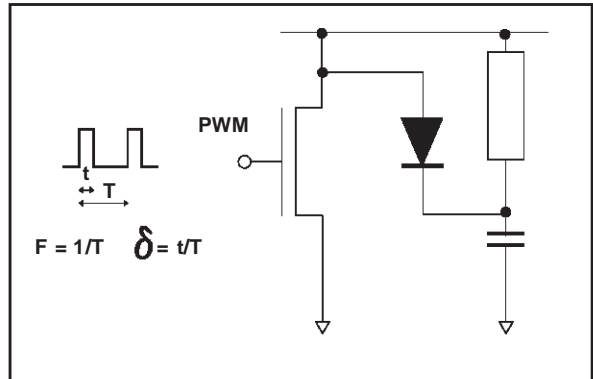


Fig. 4 : DEMAGNETIZING DIODE.

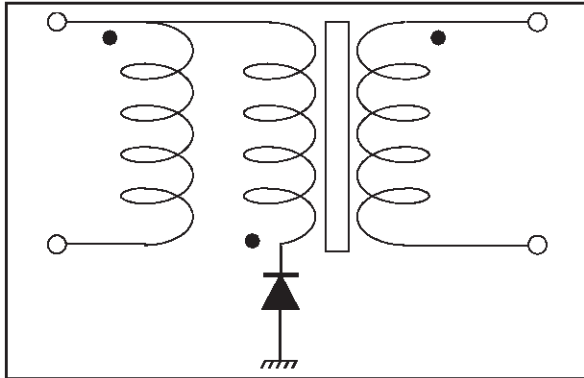


Fig. 5 : RECTIFIER DIODE.

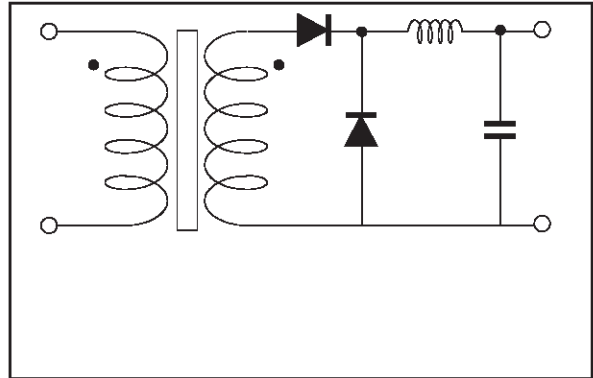
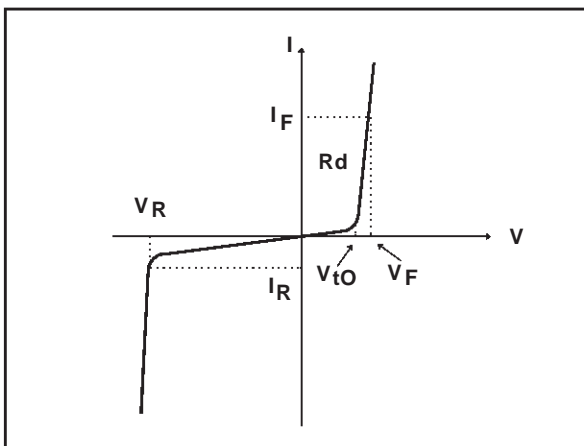


Fig. 6 : STATIC CHARACTERISTICS.



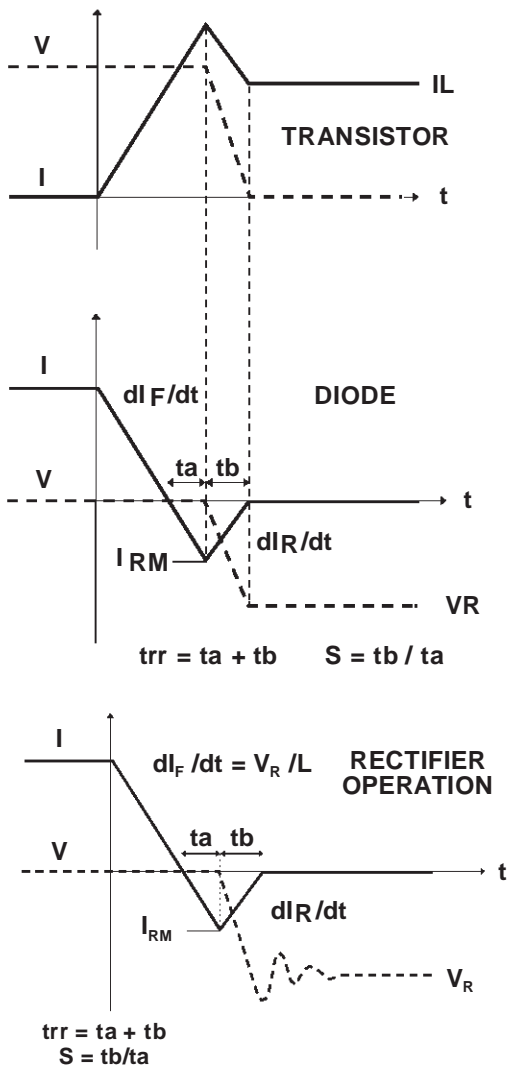
**Conduction losses :**

$$P1 = V_{t0} \times I_{F(AV)} + R_d \times I_F^2(\text{RMS})$$

**Reverse losses :**

$$P2 = V_R \times I_R \times (1 - \delta)$$

APPLICATION DATA (Cont'd)



**Turn-on losses :**  
(in the transistor, due to the diode)

$$P5 = \frac{V_R \times I_{RM}^2 \times (3+2 \times S) F}{6 \times dI_F/dt} + \frac{V_R \times I_{RM} \times I_L \times (S+2) \times F}{2 \times dI_F/dt}$$

**Turn-off losses :**

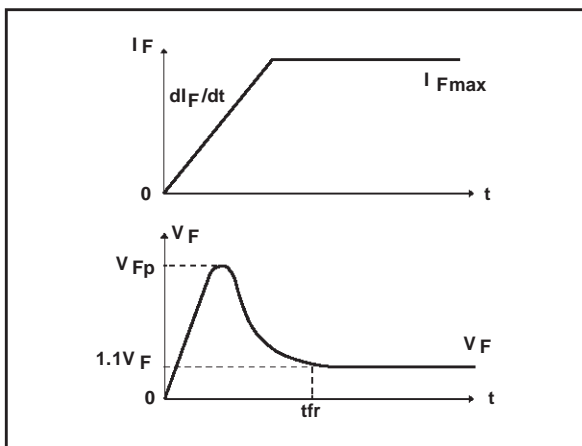
$$P3 = \frac{V_R \times I_{RM}^2 \times S \times F}{6 \times dI_F/dt}$$

**Turn-off losses :**  
with non negligible serial inductance

$$P3' = \frac{V_R \times I_{RM}^2 \times S \times F \times L \times I_{RM}^2 \times F}{6 \times dI_F/dt + 2}$$

P3, P3' and P5 are suitable for power MOSFET and IGBT

Fig.8 : TURN-ON CHARACTERISTICS.



**Turn-on losses :**  
 $P4 = 0.4 (V_{FP} - V_F) \times I_{Fmax} \times t_{fr} \times F$

Ratings and characteristics curves are ON GOING.



Fig. 9: Conduction losses versus average current.

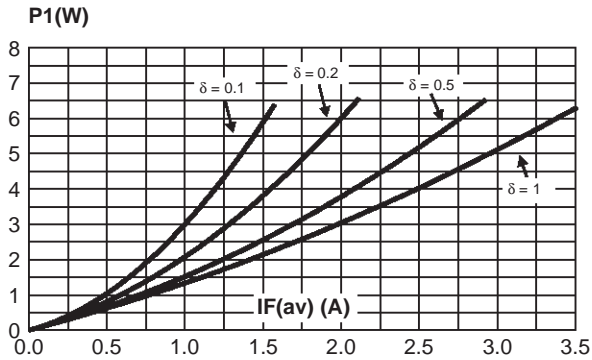


Fig. 10: Switching OFF losses versus  $dIF/dt$ .

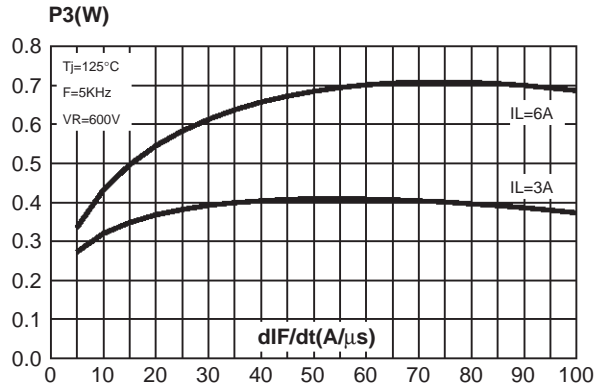


Fig. 11: Switching ON losses versus  $dIF/dt$ .

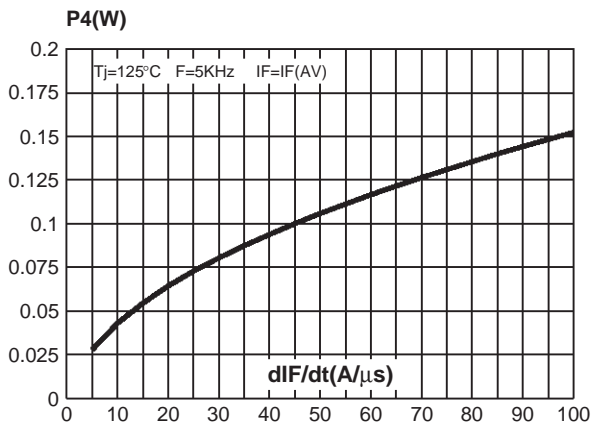


Fig. 12: Switching losses in transistor due to the diode.

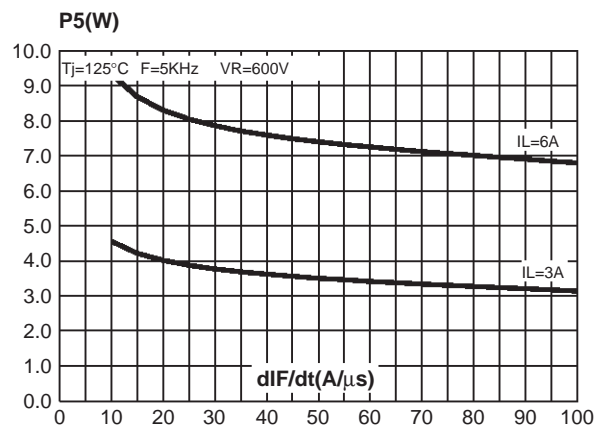


Fig. 13: Forward voltage drop versus forward current (maximum values).

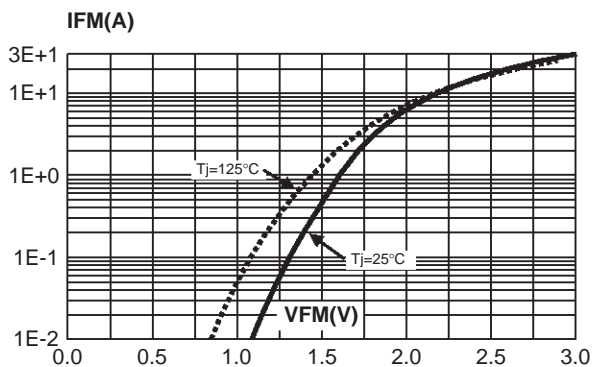
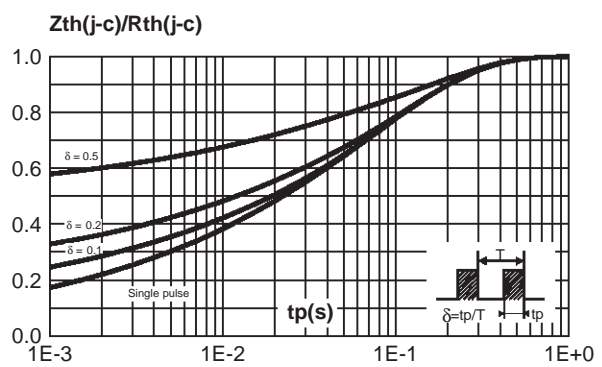
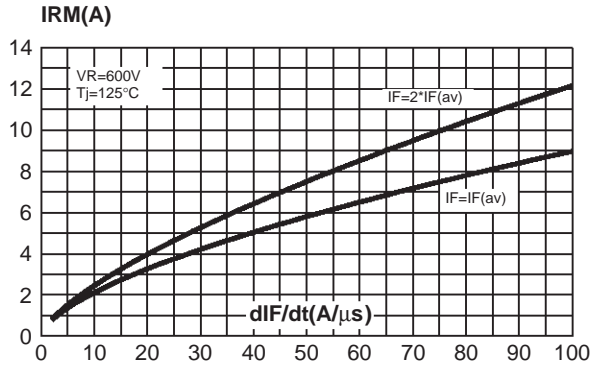


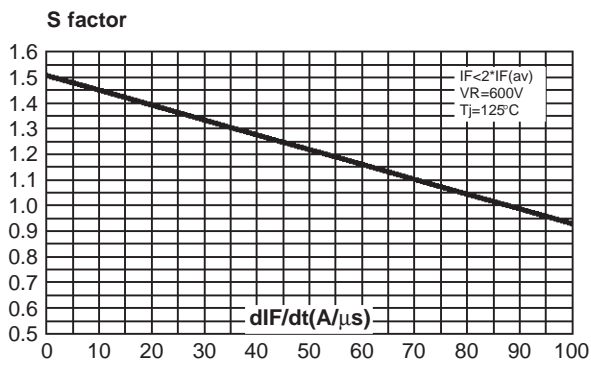
Fig. 14: Relative variation of thermal impedance junction to case versus pulse duration.



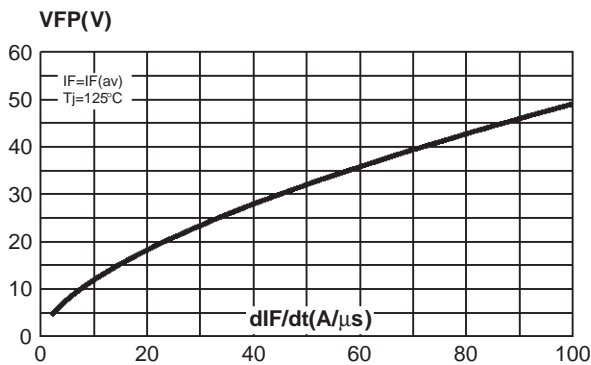
**Fig. 15:** Peak reverse recovery current versus  $di_F/dt$  (90% confidence).



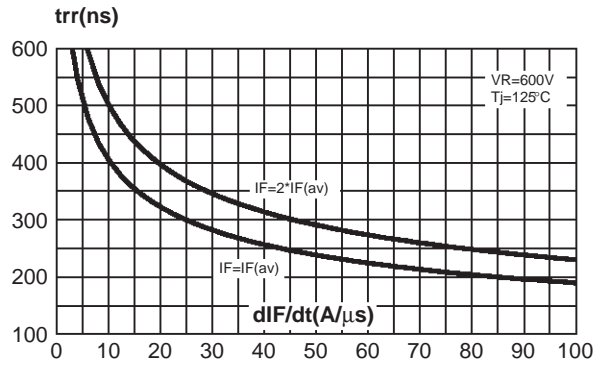
**Fig. 17:** Softness factor  $t_b/t_a$  versus  $di_F/dt$  (typical values).



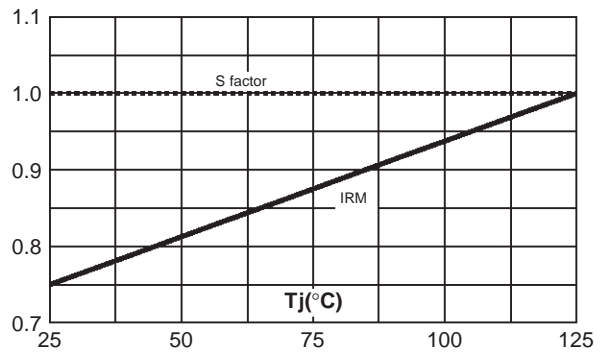
**Fig. 19:** Transient peak forward voltage versus  $di_F/dt$  (90% confidence).



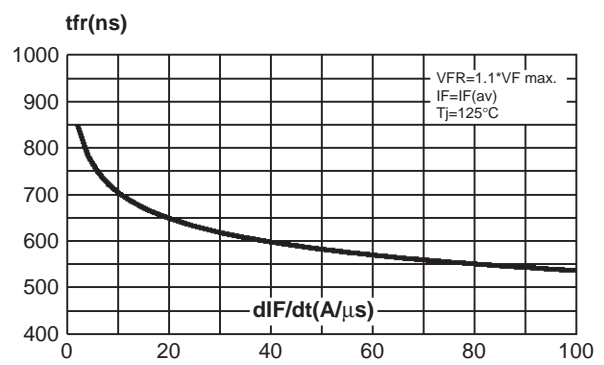
**Fig. 16:** Reverse recovery time versus  $di_F/dt$  (90% confidence).



**Fig. 18:** Relative variation of dynamic parameters versus junction temperature (reference:  $T_j=125^\circ C$ ).



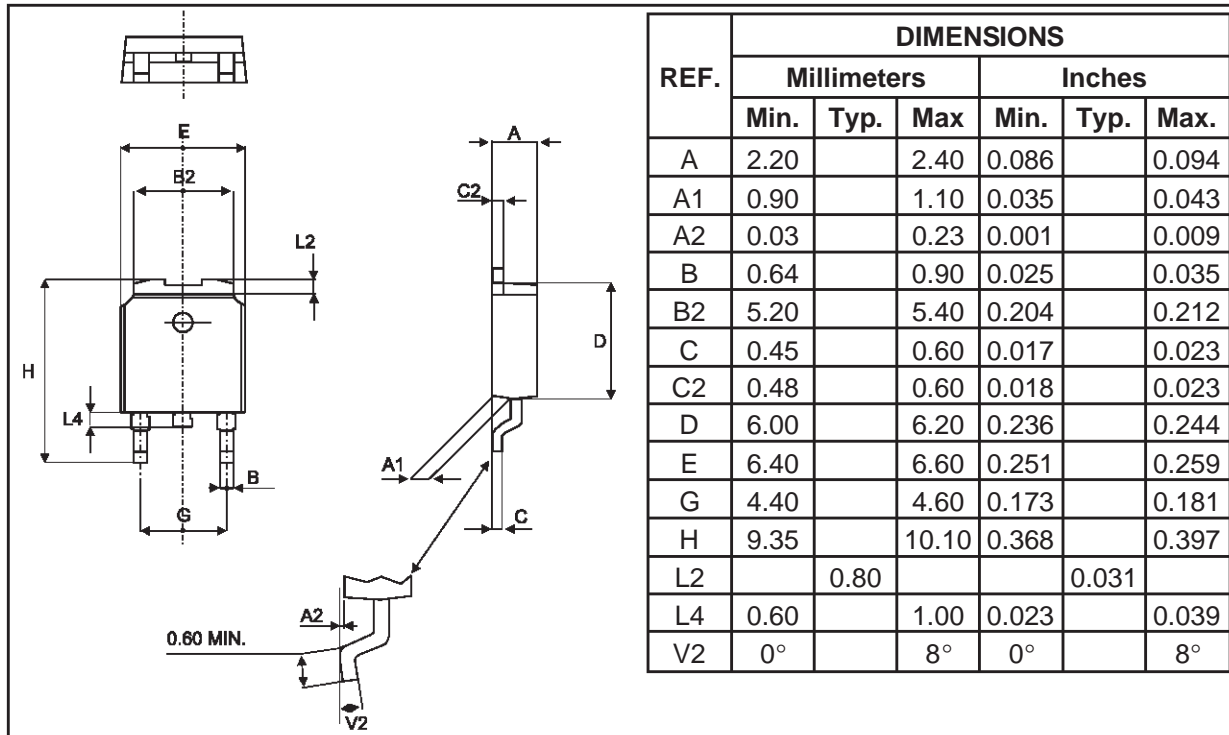
**Fig. 20:** Forward recovery time versus  $di_F/dt$  (90% confidence).



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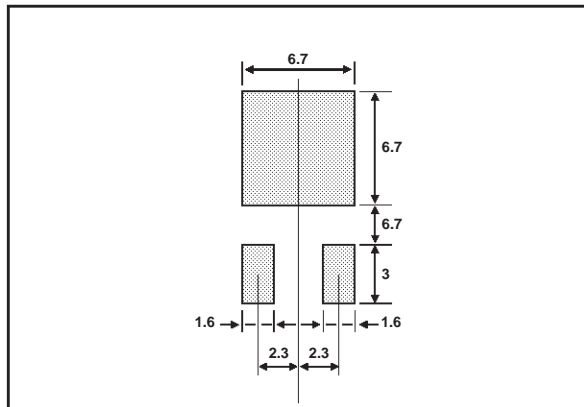
## PACKAGE MECHANICAL DATA

DPAK



## FOOTPRINT DIMENSIONS (in millimeters)

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