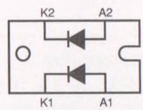
TURBOSWITCH ™ "B". ULTRA-FAST HIGH VOLTAGE DIODE

MAIN PRODUCTS CHARACTERISTICS

$I_{F(AV)}$	**2*60A**
V_{RRM}	**600V**
t_{rr} (typ)	**65ns**
V_F (max)	**1.3V**



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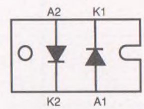

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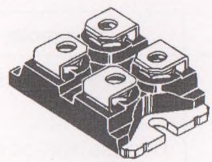

ISOTOP ®
(Plastic)
Screw version (*)

FEATURES AND BENEFITS

- SPECIFIC TO THE FOLLOWING OPERATIONS: Snubbing or clamping, demagnetization and rectification.
- ULTRA-FAST, SOFT AND NOISE-FREE RECOVERY.
- VERY LOW OVERALL POWER LOSSES AND PARTICULARY LOW FORWARD VOLTAGE.
- DESIGNED FOR HIGH PULSED CURRENT OPERATIONS.

DESCRIPTION

The TURBOSWITCH is a very high performance series of ultra-fast high voltage power diodes from 600V to 1200V.
TURBOSWITCH, B family, drastically cuts losses in all high voltage operations which require extremely fast, soft and noise-free power diodes.
They are particularly suitable in the primary circuit of an SMPS as snubber, clamping or demagnetizing diodes, and also in most power converters as high performance rectifier diodes.
Packaged in ISOTOP, these 600V devices are particularly intended for use on 240V domestic mains.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{RRM}	Repetitive peak reverse voltage	600	V
V_{RSM}	Non repetitive peak reverse voltage	600	V
$I_{F(RMS)}$	RMS forward current	150	A
I_{FRM}	Repetitive peak forward current (tp = 5 µs, f = 1kHz)	2100	A
T_j	Max operating junction temperature	-65 to 150	°C
T_{stg}	Storage temperature	-65 to 150	°C

(*) : Tin plated Fast-on version is also available (without V suffix).

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THERMAL AND POWER DATA

Symbol	Parameter	Conditions	Value	Unit
$R_{th(j-c)}$	Junction to case thermal resistance	Per diode	085	°C/W
		Total	0.47	
		Coupling	0.1	
P_1	Conduction power dissipation (see fig. 5)	Per diode $I_{F(AV)}$ = 60A δ =0.5 Tc= 58°C	108	W
P_{max}	Total power dissipation Pmax = P1 + P3 (P3 = 10% P1)	Per diode Tc= 48°C	120	W

STATIC ELECTRICAL CHARACTERISTICS (see Fig.5)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_F *	Forward voltage drop	I_F =60A	Tj = 25°C Tj = 125°C			1.4 1.3	V V
I_R **	Reverse leakage current	V_R =0.8 x V_{RRM}	Tj = 25°C Tj = 125°C			200 9	µA mA

Test pulses widths : * tp = 380 µs, duty cycle < 2%
** tp = 5 ms , duty cycle < 2%

DYNAMIC ELECTRICAL CHARACTERISTICS

TURN-OFF SWITCHING (see Fig.6)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	Tj = 25°C I_F = 0.5 A I_R = 1A Irr = 0.25A I_F = 1 A dI_F/dt =-50A/µs V_R =30V		65	115	ns
I_{RM}	Maximum reverse recovery current	Tj = 125°C VR = 400V I_F =60A dI_F/dt = -480 A/µs			TBD	A
S factor	Softness factor	Tj = 125°C V_R = 400V I_F =60A dI_F/dt = -500 A/µs		TBD		/

TURN-ON SWITCHING (see Fig.7)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
t_{fr}	Forward recovery time	Tj = 25°C I_F =60 A, dI_F/dt = 480 A/µs measured at, 1.1 × $V_F$max			TBD	ns
V_{Fp}	Peak forward voltage	Tj = 25°C I_F =60A, dI_F/dt = 480 A/µs			TBD	V

TBD : To Be Defined

APPLICATION DATA

The TURBOSWITCH "B" is especially designed to provide the lowest overall power losses in any application such as snubbing,clamping, demagnetization and rectification. In such applications (fig.1 to fig.4), the way of calculating the power losses is given below :

TOTAL LOSSES
due to the diode
P = P1+ P2+ P3+ P4 Watts

CONDUCTION LOSSES
P1 Watts
(Fig. 5)

REVERSE LOSSES
P2 Watts
(Fig. 5)

SWITCHING LOSSES
OFF : P3 Watts
ON : P4 Watts
(Fig. 6 & 7)

Fig. 1 : SNUBBER DIODE.

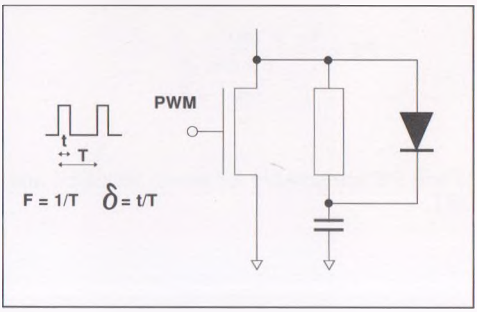


Fig. 2 : CLAMPING DIODE.

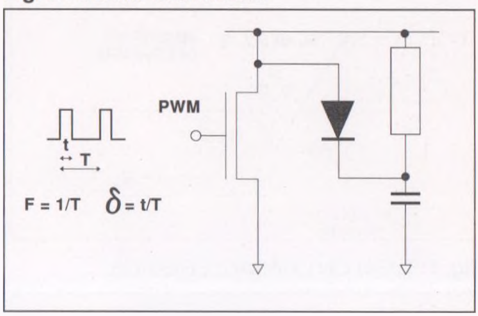


Fig. 3 : DEMAGNETIZING DIODE.

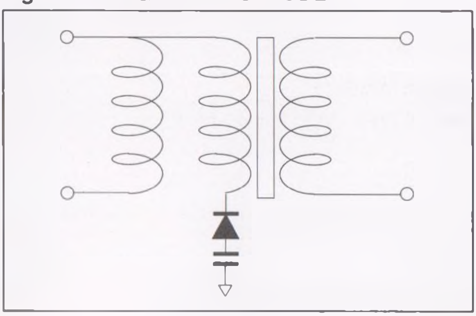
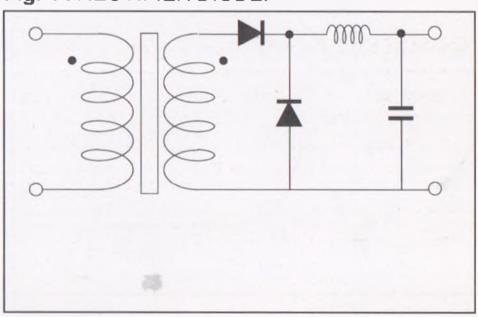
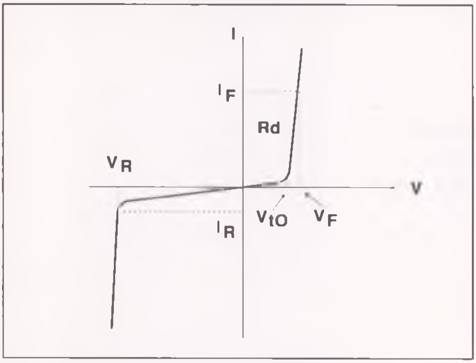


Fig. 4 : RECTIFIER DIODE.



APPLICATION DATA (Cont'd)

Fig. 5: STATIC CHARACTERISTICS



Conduction losses :

$$P1 = V_{t0} \,.\, I_{F(AV)} + R_d \,.\, I_F^2{}_{(RMS)}$$

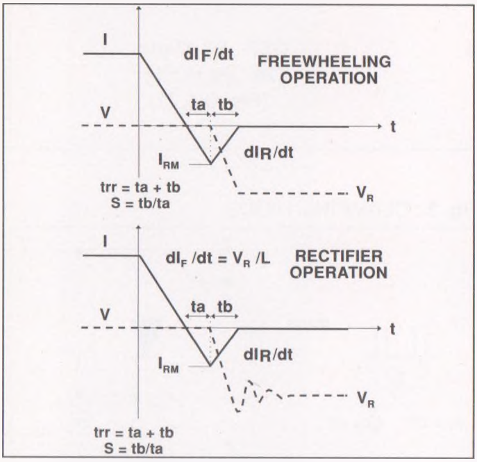
with

$$V_{t0} = 1.00\ V$$
$$R_d = 0.005\ Ohm$$
(Max values at 125°C)

Reverse losses :

$$P2 = V_R \,.\, I_R \,.\, (1 - \delta)$$

Fig. 6: TURN-OFF CHARACTERISTICS



Turn-off losses :

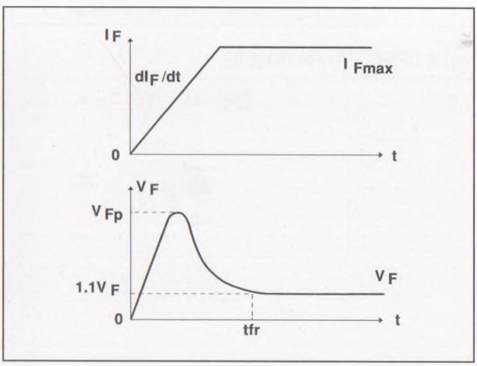
$$P3 = \frac{V_R \times I_{RM}^2 \times S \times F}{6 \times dI_F/dt}$$

Turn-off losses :
(with non negligible serial inductance)

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

P3 and P3' are suitable for power MOSFET and IGBT

Fig. 7: TURN-ON CHARACTERISTICS



Turn-on losses :

$$P4 = 0.4\,(V_{FP} - V_F) \,.\, I_{Fmax} \,.\, t_{fr} \,.\, F$$