# SGS-THOMSON MICROELECTRONICS

# STTA106U

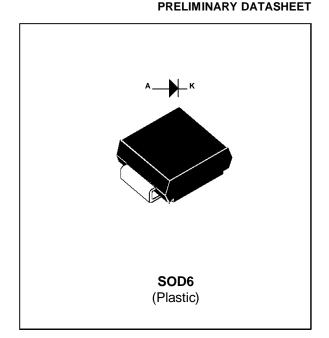
# TURBOSWITCH ™ "A". ULTRA-FAST HIGH VOLTAGE DIODE

#### MAIN PRODUCTS CHARACTERISTICS

lf(av)	1A	
V <sub>RRM</sub>	600V	
<b>t<sub>rr</sub> (typ)</b>	20ns	
V <sub>F</sub> (max)	1.5V	

#### FEATURES AND BENEFITS

- SPECIFIC TO "FREEWHEEL MODE" OPERA -TIONS: FREEWHEEL OR BOOSTER DIODE
- ULTRA-FAST AND SOFT RECOVERY
- VERY LOW OVERALL POWER LOSSES IN BOTH THE DIODE AND THE COMPANION TRANSISTOR
- HIGH FREQUENCY OPERATIONS
- SURFACE MOUNT DEVICE



# DESCRIPTION

The TURBOSWITCH is a very high performance series of ultra-fast high voltage power diodes from 600V to 1200V.

TURBOSWITCH "A" family drastically cuts losses in both the diode and the associated switching IGBT and MOSFET in all "Freewheel Mode" operations and is particulary suitable and efficient in Motor Control Freewheel applications and in Booster diode applications in Power Factor Control circuitries.

Packaged in SOD6 surface mount envelope, these 600V devices are particularly intended for use on 240V domestic mains.

Symbol	Parameter	Value	Unit
V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	600	V
V <sub>RSM</sub>	Non Repetitive Peak Reverse Voltage	600	V
I <sub>F(RMS)</sub>	RMS Forward Current	3.5	А
IFRM	Repetitive Peak Forward Current (tp = 5 $\mu$ s, f = 5kHz)	22	А
Tj	Max. Operating Junction Temperature	125	°C
T <sub>stg</sub>	Storage Temperature range	- 65 to + 150	°C

#### ABSOLUTE MAXIMUM RATINGS

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# THERMAL AND POWER DATA

Symbol	bol Parameter Conditions		Value	Unit
R <sub>th(j-I)</sub>	Junction to Lead Thermal Resistance		23	°C/W
P <sub>1</sub>	Conduction Power Dissipation (see fig. 2)	$I_{F(AV)} = 0.8A  \delta = 0.5$ Tlead= 93°C	1.4	W
P <sub>max</sub>	Total Power Dissipation Pmax = P1 + P3 (P3 = 10% P1)	Tlead= 90°C	1.5	W

## STATIC ELECTRICAL CHARACTERISTICS (see Fig. 2)

Sym	bol	Parameter	Test Conditions		Min	Тур	Max	Unit
VF	*	Forward Voltage Drop	I <sub>F</sub> = 1A	Tj = 25℃ Tj = 125℃		1.1	1.75 1.5	V
I <sub>R</sub>	**	Reverse Leakage Current	V <sub>R</sub> = 0.8 x V <sub>RRM</sub>	Tj = 25℃ Tj = 125℃		250	10 750	μA

Test pulses widths :  $\ ^{*}$  tp = 380  $\mu s,$  duty cycle < 2%

\*\* tp = 5 ms , duty cycle < 2%

#### DYNAMIC ELECTRICAL CHARACTERISTICS

# TURN-OFF SWITCHING (see Fig. 3)

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
trr	Reverse Recovery Time			20	50	ns
I <sub>RM</sub>	Maximum Recovery Current	Tj = 125°C VR = 400V I <sub>F</sub> = 1A dI <sub>F</sub> /dt = -8 A/μs dI <sub>F</sub> /dt = -50 A/μs		1.6	0.6	A
S factor	Softness factor	Tj = 125°C V <sub>R</sub> = 400V I <sub>F</sub> =1A dI <sub>F</sub> /dt = -50 A/μs		TBD		/

# TURN-ON SWITCHING (see Fig. 4)

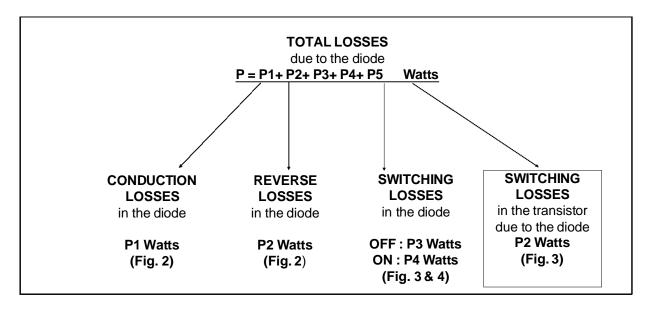
Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
t <sub>fr</sub>	Forward Recovery Time	Tj = 25°C I <sub>F</sub> = 1 A, dI <sub>F</sub> /dt = 8 A/μs			500	ns
V <sub>Fp</sub>	Peak Forward Voltage	measured at, $1.1 \times V_F$ max			10	V



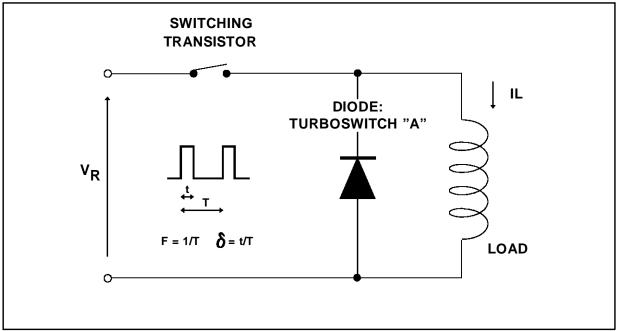
#### **APPLICATION DATA**

The TURBOSWITCH<sup>TM</sup> "A" is especially designed to provide the lowest overall power losses in any "Freewhell Mode" application (see fig. 1) considering both the diode and the companion transistor, thus optimizing the overall performance in the end application.

The way of calculating the power losses is given below :



#### Fig. 1 : "FREEWHEEL" MODE





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## APPLICATION DATA (Cont'd)

#### Fig. 2 : STATIC CHARACTERISTICS

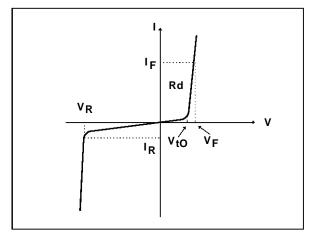
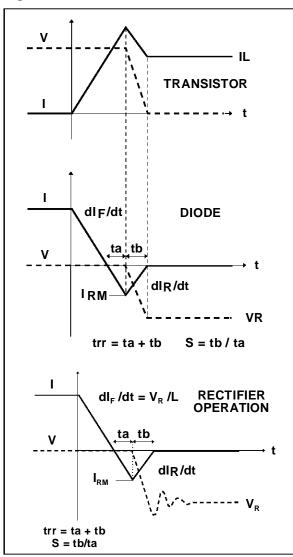


Fig. 3 : TURN-OFF CHARACTERISTICS



Conduction losses:

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

with

 $V_{t0} = 1.15 V$  $R_d = 0.350 Ohm$ (Max values at 125°C)

#### Reverse losses :

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

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

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

Turn-off losses (in the diode) :

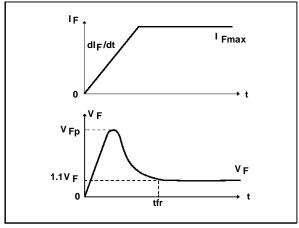
$$P3 = \frac{V_R \times I_{RM}^2 \times S \times F}{6 x \, dI_F / \, dt}$$

 $\ensuremath{\mathsf{P3}}$  and  $\ensuremath{\mathsf{P5}}$  are suitable for power MOSFET and IGBT



# APPLICATION DATA (Cont'd)

# Fig. 4 : TURN-ON CHARACTERISTICS



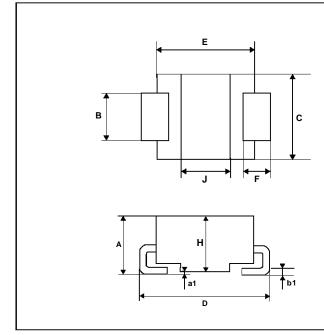
Ratings and characteristics curves are ON GOING.

Turn-on losses : P4 = 0.4 (VFP - VF) x IFmax x tfr x F



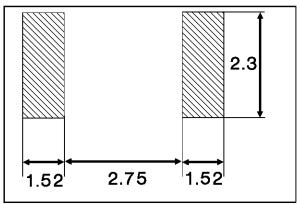
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#### PACKAGE MECHANICAL DATA SOD6 Plastic (JEDEC outline)



	DIMENSIONS			
REF.	Millimeters		Inches	
	Min.	Min. Max.		Max.
Α	2.44	2.62	0.096	0.103
a1	0.10	0.20	0.004	0.008
В	1.96	2.11	0.077	0.083
b1	0.25	0.35	0.010	0.014
С	3.65	3.93	0.143	0.155
D	5.39	5.59	0.212	0.220
E	4.15	4.30	0.163	0.170
F	1.00	1.27	0.039	0.050
Н	2.33	2.41	0.092	0.095
J	2.05	2.13	0.080	0.084

#### FOOTPRINT DIMENSIONS SOD6 Plastic



# Marking : T01 Laser marking Logo indicates cathode

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