SGS-THOMSON MICROELECTRONICS

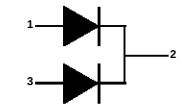
STTA3006CW

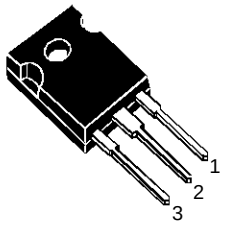
TURBOSWITCH ™ "A". ULTRA-FAST HIGH VOLTAGE DIODES

PRELIMINARY DATASHEET

MAIN PRODUCTS CHARACTERISTICS

$I_{F(AV)}$	**2 x 15A**
V_{RRM}	**600V**
t_{rr} (typ)	**35ns**
V_F (max)	**1.6V**





TO247
(Plastic)

FEATURES AND BENEFITS

- SPECIFIC TO "FREEWHEEL MODE" OPERATIONS: Freewheel or Booster Diode.
- ULTRA-FAST RECOVERY.
- VERY LOW OVERALL POWER LOSSES IN BOTH THE DIODE AND THE COMPANION TRANSISTOR.
- HIGH FREQUENCY OPERATIONS.
- CECC APPROVED.

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 or MOSFET in all "Freewheel Mode" operations and is particularly suitable and efficient in Motor Control Freewheel applications and in Booster diode applications in Power Factor Control circuitries.
Packaged in TO247, these 600V devices are particularly intended for use on 240V domestic mains.

ABSOLUTE MAXIMUM RATINGS (per diode)

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	35	A
I_{FRM}	Repetitive peak forward current (tp = 5 µs, f = 5kHz)	100	A
T_j	Max operating junction temperature	-65 to 150	°C
T_{stg}	Storage temperature	-65 to 150	°C

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THERMAL AND POWER DATA

Symbol	Parameter	Conditions	Value	Unit
$R_{th(j-c)}$	Junction to case thermal resistance	Per diode Total Coupling	1.9 1.0 0.1	°C/W
P_1	Conduction power dissipation (see fig. 2)	Per diode $I_{F(AV)}$ = 30A δ =0.5 Tc= 110°C	20.5	W
P_{max}	Total power dissipation Pmax = P1 + P3 (P3 = 10% P1)	Per diode Tc=105°C	22.5	W

STATIC ELECTRICAL CHARACTERISTICS (per diode) (see Fig.2)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_F *	Forward voltage drop	I_F =15A	Tj = 25°C Tj = 125°C		 1.3	1.8 1.6	V V
I_R **	Reverse leakage current	V_R =0.8 x V_{RRM}	Tj = 25°C Tj = 125°C			100 5	µA mA

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

DYNAMIC ELECTRICAL CHARACTERISTICS (per diode)

TURN-OFF SWITCHING (see Fig.3)

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 = 1A dI_F/dt =-50A/µs V_R = 30V		35	 65	ns
I_{RM}	Maximum reverse recovery current	Tj = 125°C VR = 400V I_F = 15A dI_F/dt = -120 A/µs dI_F/dt = -500 A/µs		 17.5	12.5	A
S factor	Softness factor	Tj = 125°C V_R = 400V I_F = 15A dI_F/dt = -500 A/µs		0.5		/

TURN-ON SWITCHING (see Fig.4)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
t_{fr}	Forward recovery time	Tj = 25°C I_F = 15A, dI_F/dt = 120 A/µs measured at, 1.1 × $V_F$max			500	ns
V_{Fp}	Peak forward voltage	Tj = 25°C I_F = 15A, dI_F/dt = 120 A/µs			9	V

APPLICATION DATA

The TURBOSWITCH "A" is especially designed to provide the lowest overall power losses in any "FREEWHEEL Mode" application (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:

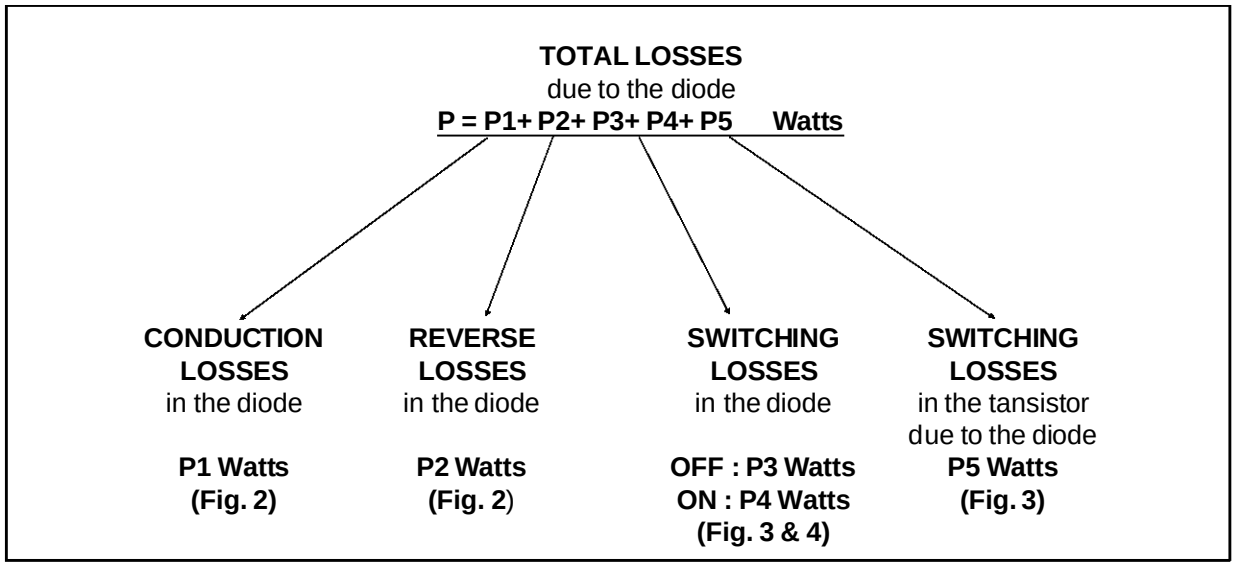
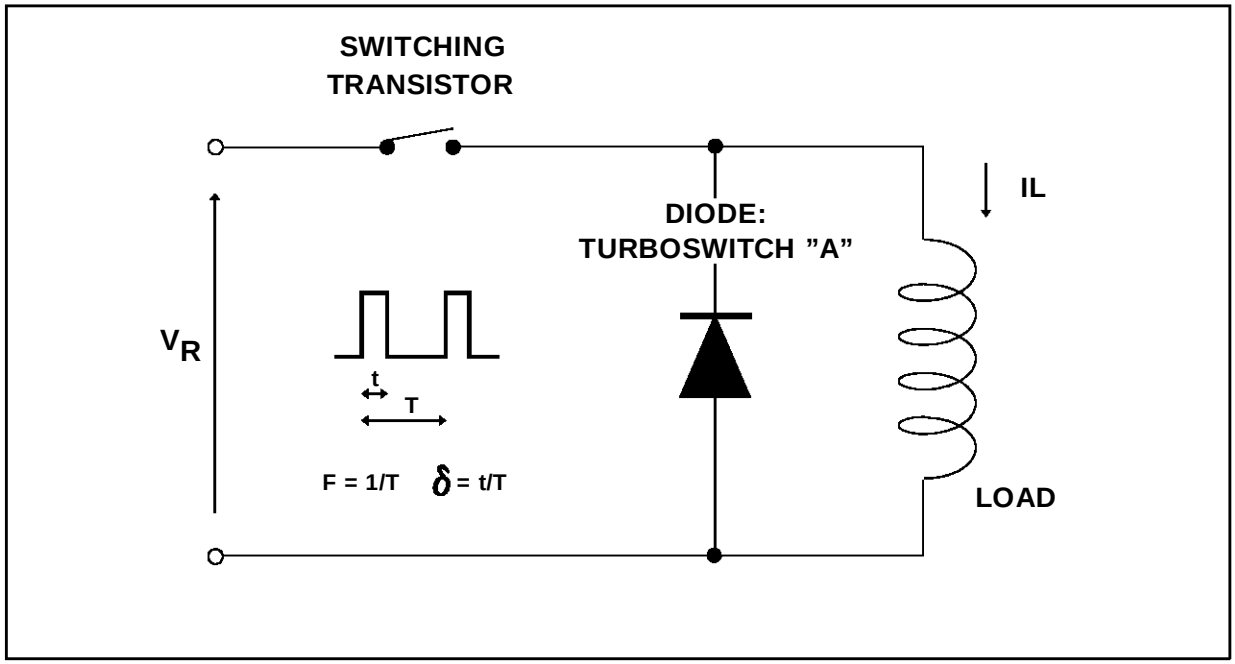
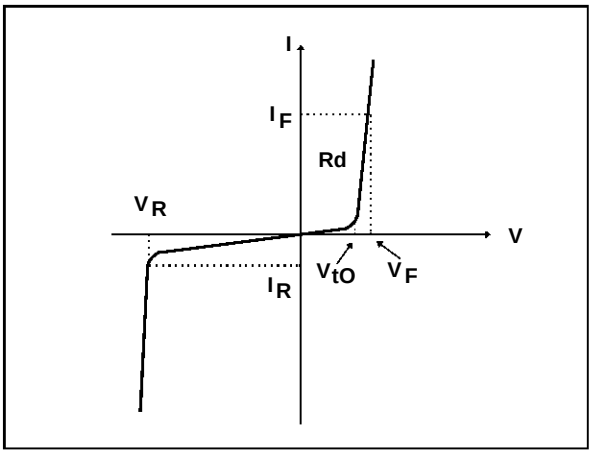


Fig. 1 : "FREEWHEEL" MODE.



APPLICATION DATA (Cont'd)

Fig. 2: STATIC CHARACTERISTICS



Conduction losses :

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

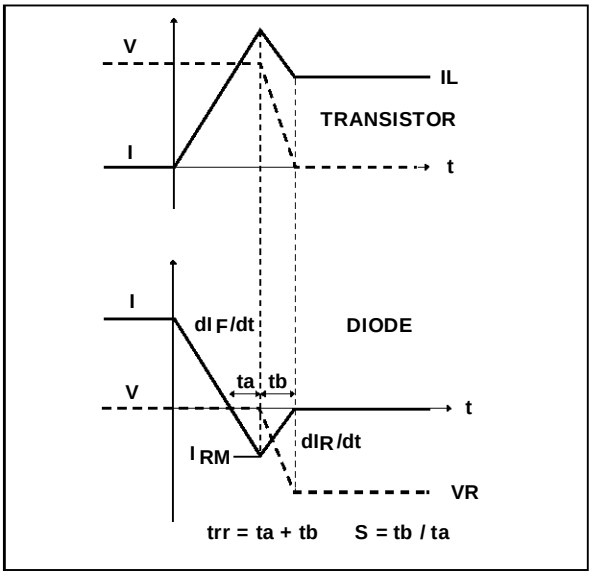
with

$V_{t0} = 1.06$
$R_d = 0.0177$
(Max values at 125°C)

Reverse losses :

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

Fig. 3: TURN-OFF CHARACTERISTICS



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

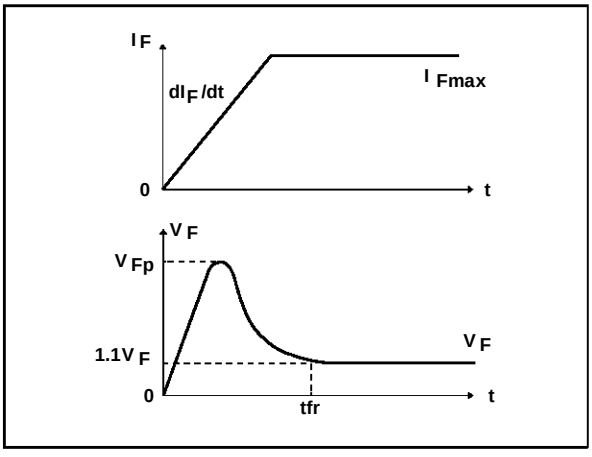
$$P5 = \frac{V_R \times I_{RM}{}^2 \times (3 + 2 \times S) \times F}{6 \; x \; dI_F/dt} + \frac{V_R \times I_{RM} \times I_L \times (S + 2) \times F}{2 \; x \; dI_F/dt}$$

Turn-off losses (in the diode) :

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

P3 and P5 are suitable for power MOSFET and IGBT

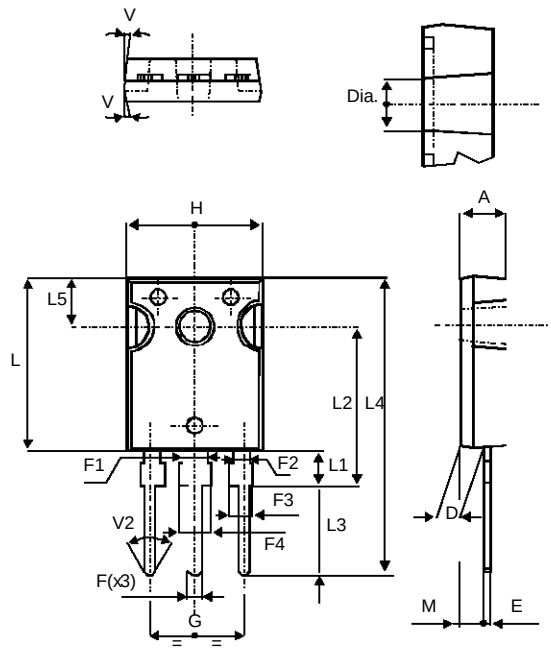
Fig. 4: TURN-ON CHARACTERISTICS



Turn-on losses :

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

PACKAGE DATA
TO247 Plastic



REF.	DIMENSIONS					
	Millimeters			Inches		
	Typ.	Min.	Max.	Typ.	Min.	Max.
A		4.70	5.30		0.190	0.210
D		2.20	2.60		0.0866	0.102
E		0.40	0.80		0.015	0.031
F		1.00	1.40		0.039	0.055
F1	3.00			0.118		
F2	2.00			0.078		
F3		2.00	2.40		0.078	0.094
F4		3.00	3.40		0.118	0.133
G	10.90			0.429		
H		15.30	15.90		0.602	0.625
L		19.70	20.30		0.775	0.799
L1		3.70	4.30		0.145	0.169
L2	18.50			0.728		
L3	10.50			0.413		
L4	34.60			1.362		
L5	5.50			0.216		
M		2.00	3.00		0.078	0.118
V	5°			5°		
V2	60°			60°		
Dia.		3.55	3.65		0.139	0.143