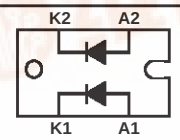
STTA9012TV1/2

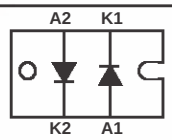
TURBOSWITCH™ ULTRA-FAST HIGH VOLTAGE DIODE

MAIN PRODUCT CHARACTERISTICS

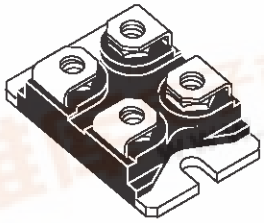
$I_{F(AV)}$	2 x 45A
V_{RRM}	1200V
t_{rr} (typ)	65ns
V_F (max)	1.85V



STTA9012TV1



STTA9012TV2



ISOTOP™

FEATURES AND BENEFITS

- ULTRA-FAST, SOFT RECOVERY.
- VERY LOW OVERALL POWER LOSSES IN BOTH THE DIODE AND THE COMPANION TRANSISTOR.
- HIGH FREQUENCY AND/OR HIGH PULSED CURRENT OPERATION.
- HIGH REVERSE VOLTAGE CAPABILITY.
- LOW INDUCTANCE PACKAGE < 5 nH.
- INSULATED PACKAGE:
  Electrical insulation : 2500V_{RMS}
  Capacitance : < 45pF.

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 the primary of SMPS as snubber, clamping or demagnetizing diodes. They are also suitable for secondary of SMPS as high voltage rectifier diodes.

ABSOLUTE RATINGS (limiting values, per diode)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		1200	V
V_{RSM}	Non repetitive peak reverse voltage		1200	V
$I_{F(RMS)}$	RMS forward current		150	A
I_{FRM}	Repetitive peak forward current	tp = 5 µs F = 5kHz square	700	A
I_{FSM}	Surge non repetitive forward current	tp = 10ms sinusoidal	420	A
T_{stg}	Storage temperature range		- 65 to + 150	°C
T_j	Maximum operating junction temperature		150	°C

THERMAL AND POWER DATA (per diode)

Symbol	Parameter	Test conditions	Value	Unit
$R_{th(j-c)}$	Junction to case thermal resistance	Per diode	0.85	°C/W
		Total	0.48	
		Coupling	0.1	
P_1	Conduction power dissipation	$I_{F(AV)}$ = 45A δ =0.5 Tc= 70°C	94	W
P_{max}	Total power dissipation Pmax = P1 + P3 (P3 = 10% P1)	Tc= 62°C	104	W

STATIC ELECTRICAL CHARACTERISTICS (per diode)

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
V_F *	Forward voltage drop	I_F =45A	Tj = 25°C Tj = 125°C		1.3	2.05 1.85	V
I_R **	Reverse leakage current	V_R =0.8 x V_{RRM}	Tj = 25°C Tj = 125°C		3	200 12	µA mA
Vto	Threshold voltage	Ip < 3.I_{AV}	Tj = 125°C			1.57	V
Rd	Dynamic resistance					6	mΩ

Test pulses : * tp = 380 µs, δ < 2%
** tp = 5 ms , δ < 2%

To evaluate the maximum conduction losses use the following equation :
$P = V_{to} \times I_{F(AV)} + rd \times I_F{}^2{}_{(RMS)}$

DYNAMIC ELECTRICAL CHARACTERISTICS (per diode)

TURN-OFF SWITCHING

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 = 600V I_F =45A dI_F/dt = -360 A/µs dI_F/dt = -500 A/µs		50	60	A
S factor	Softness factor	Tj = 125°C V_R = 600V I_F =45A dI_F/dt = -500 A/µs		1.2		-

TURN-ON SWITCHING

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{fr}	Forward recovery time	Tj = 25°C I_F =45 A, dI_F/dt = 360 A/µs measured at 1.1 × $V_F$max			900	ns
V_{Fp}	Peak forward voltage	Tj = 25°C I_F =45A, dI_F/dt = 360 A/µs I_F =45A, dI_F/dt = 500 A/µs		30	30	V

Fig. 1: Conduction losses versus average current (per diode).

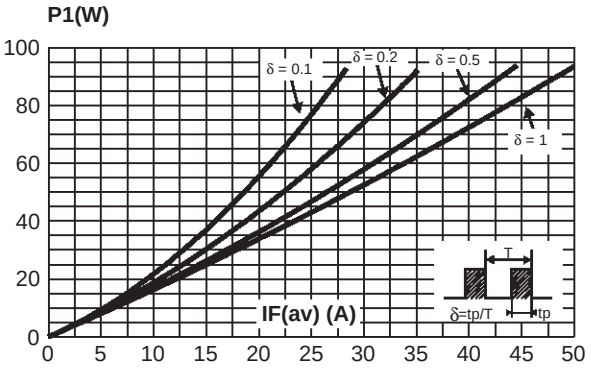


Fig. 2: Forward voltage drop versus forward current (maximum values, per diode).

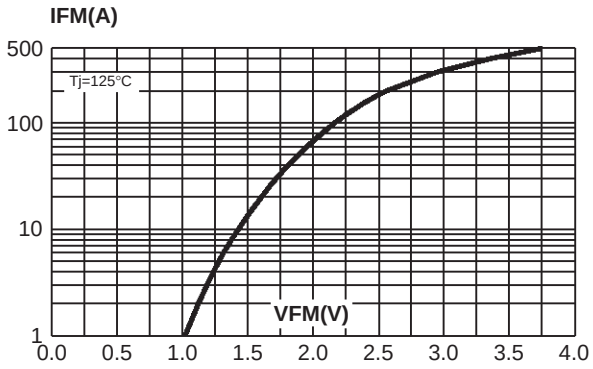


Fig. 3: Relative variation of thermal impedance junction to case versus pulse duration (per diode).

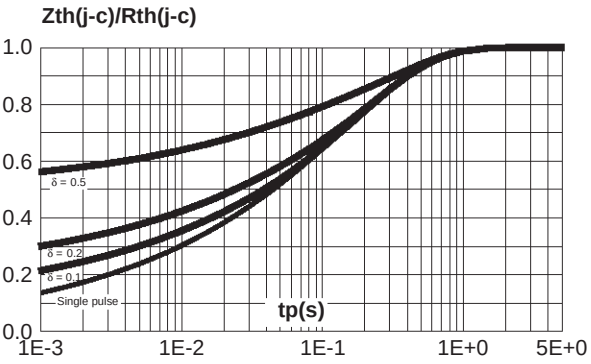


Fig. 4: Peak reverse recovery current versus dI_F/dt (90% confidence, per diode).

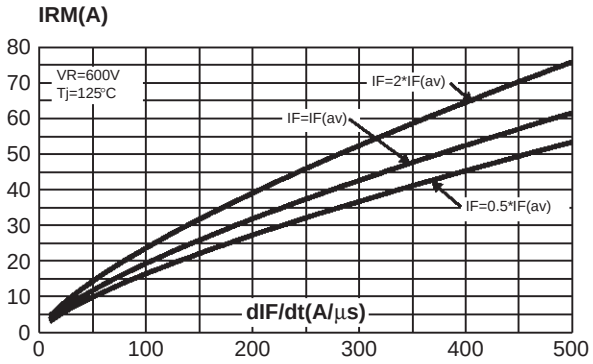


Fig. 5: Reverse recovery time versus dI_F/dt (90% confidence, per diode).

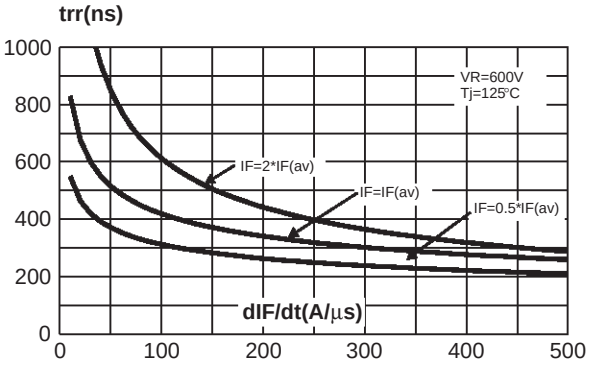


Fig. 6: Softness factor (tb/ta) versus dI_F/dt (typical values).

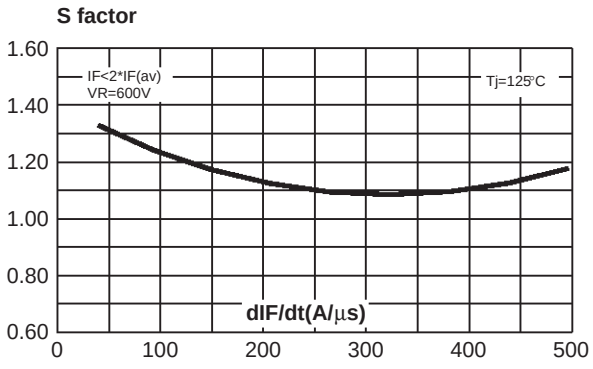


Fig. 7: Relative variation of dynamic parameters versus junction temperature (reference: Tj=125°C).

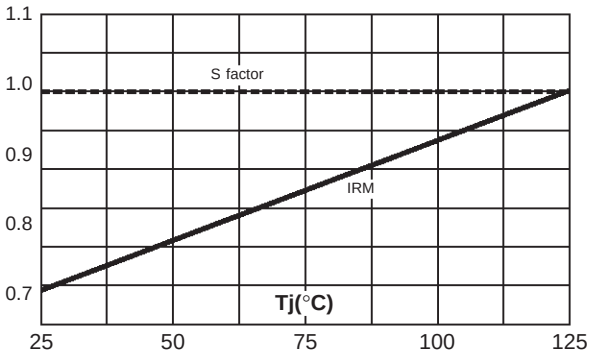


Fig. 8: Transient peak forward voltage versus dI_F/dt (90% confidence, per diode).

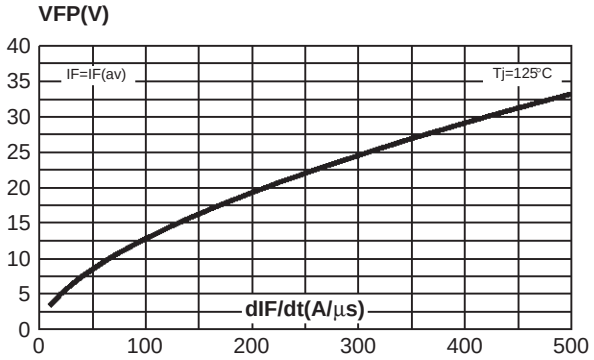
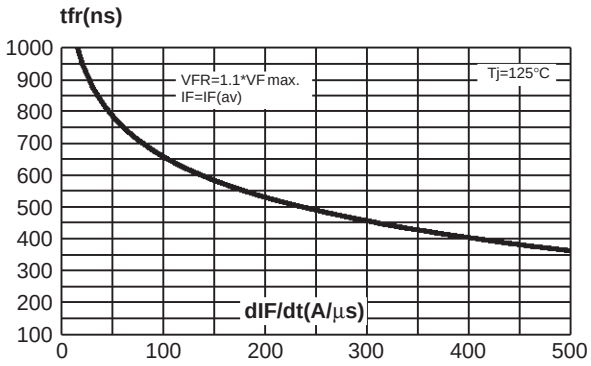


Fig. 9: Forward recovery time versus dI_F/dt (90% confidence, per diode).



APPLICATION DATA

The 1200V TURBOSWITCH series has been designed to provide the lowest overall power losses in all high frequency or high pulsed current operations. In such applications (Fig A to D),the way of calculating the power losses is given below :

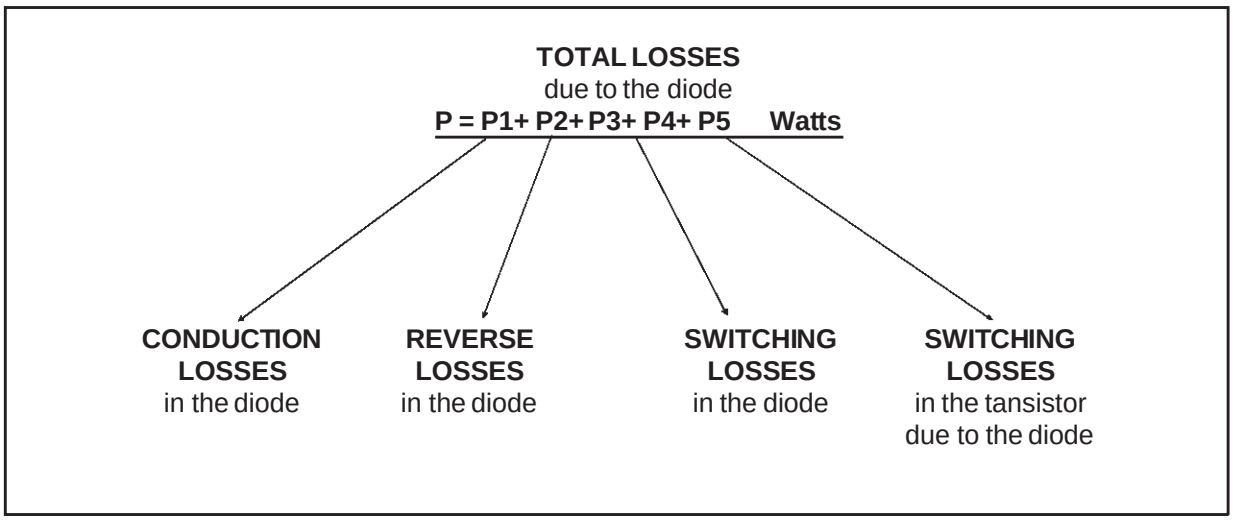


Fig. A : "FREEWHEEL" MODE.

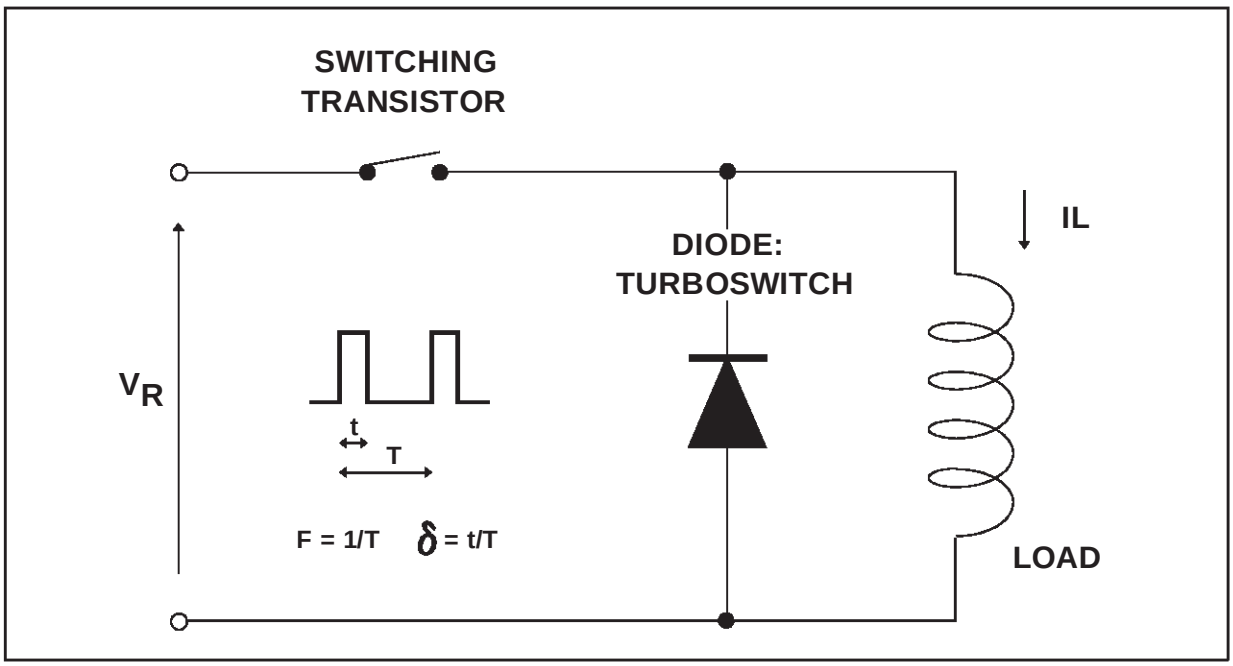


Fig. B : SNUBBER DIODE.

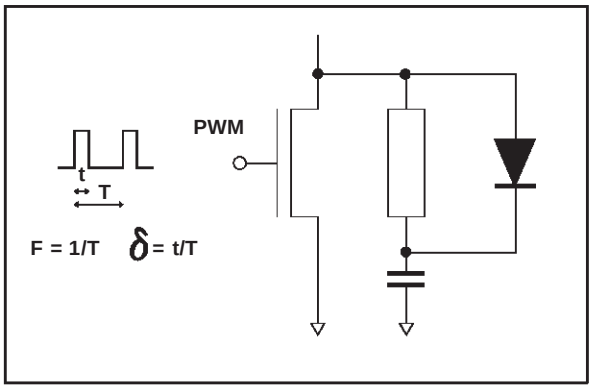


Fig. C : DEMAGNETIZING DIODE.

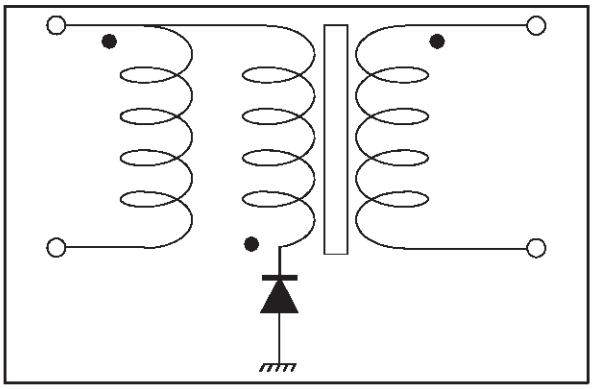
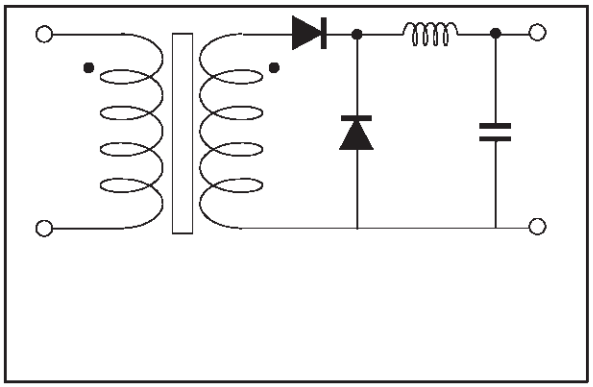
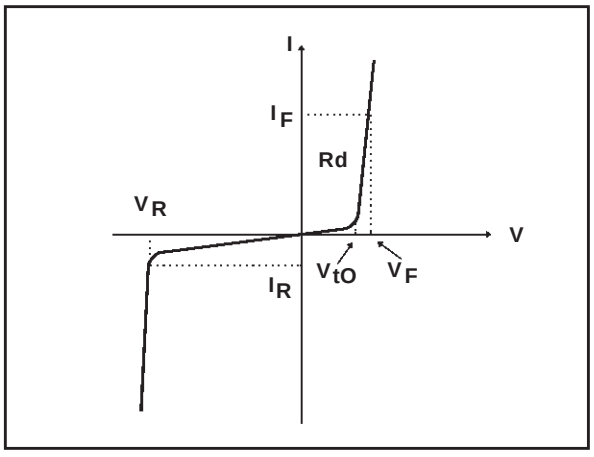


Fig. D : RECTIFIER DIODE.



STATIC & DYNAMIC CHARACTERISTICS . POWER LOSSES .

Fig. E: STATIC CHARACTERISTICS



Conduction losses :

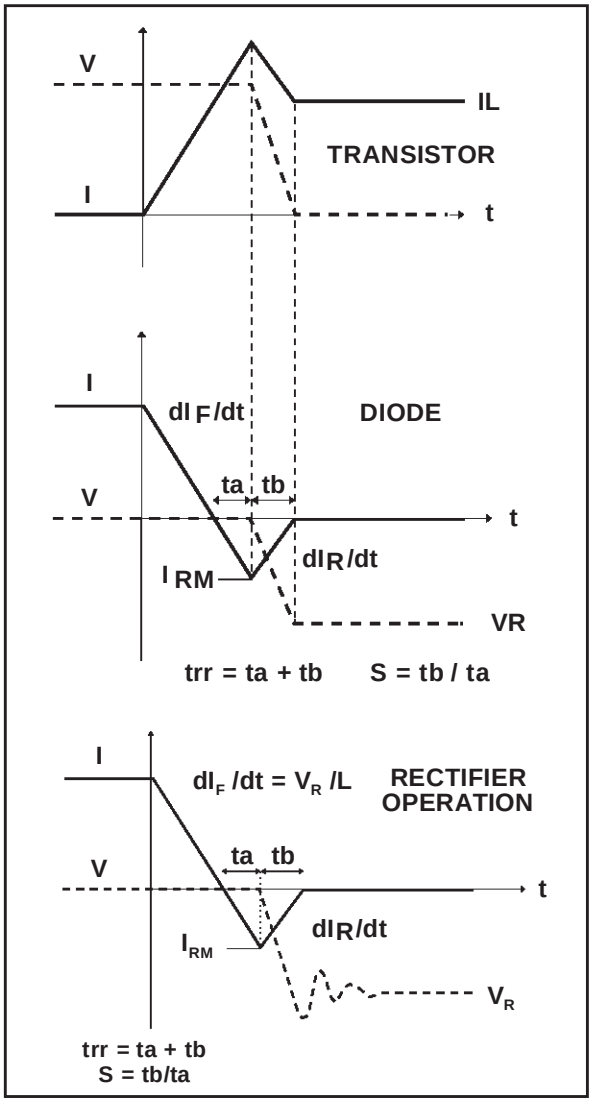
$P1 = V_{t0} . I_{F(AV)} + R_d . I_F{}^2{}_{(RMS)}$

Reverse losses :

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

APPLICATION DATA (Cont'd)

Fig. F: TURN-OFF CHARACTERISTICS



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

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

Turn-off losses (in the diode) :

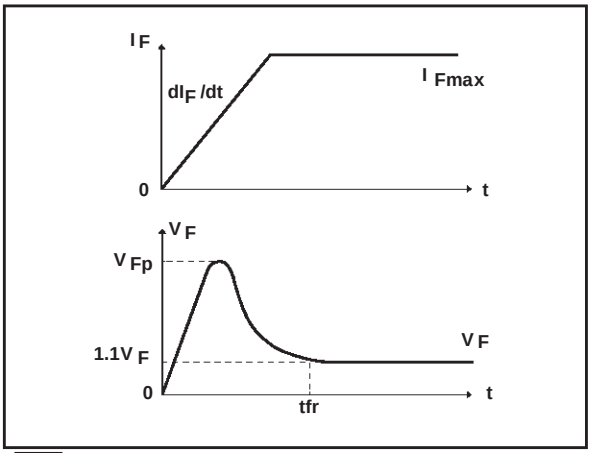
$$P3 = \frac{V_R \times I_{RM}^2 \times S \times F}{6 \times dI_F/dt}$$

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

Fig. G: TURN-ON CHARACTERISTICS

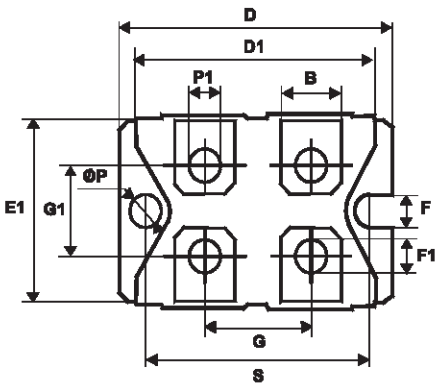


Turn-on losses :

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

PACKAGE MECHANICAL DATA

ISOTOP



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	11.80	12.20	0.465	0.480
A1	8.90	9.10	0.350	0.358
B	7.8	8.20	0.307	0.323
C	0.75	0.85	0.030	0.033
C2	1.95	2.05	0.077	0.081
D	37.80	38.20	1.488	1.504
D1	31.50	31.70	1.240	1.248
E	25.15	25.50	0.990	1.004
E1	23.85	24.15	0.939	0.951
E2	24.80 typ.		0.976 typ.	
G	14.90	15.10	0.587	0.594
G1	12.60	12.80	0.496	0.504
G2	3.50	4.30	0.138	0.169
F	4.10	4.30	0.161	0.169
F1	4.60	5.00	0.181	0.197
P	4.00	4.30	0.157	0.69
P1	4.00	4.40	0.157	0.173
S	30.10	30.30	1.185	1.193

- Cooling method: by condiction (C)
- Recommended torque value: 1.3 N.m (MAX 1.5 N.m) for the 6 x M4 screws. (2 x M4 screws recommended for mounting the package on the heatsink and the 4 screws for terminals).
- The screws supplied with the package are suitable for mounting on a board (or other types of terminals) with a thickness of 0.6 mm min and 2.2 mm max.

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTA9012TV1	STTA9012TV1	ISOTOP	27g. without screws	10	Tube
STTA9012TV2	STTA9012TV2	ISOTOP		10	Tube

- Epoxy meets UL94,V0