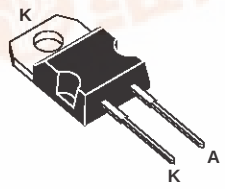
STTA812D/DI/G

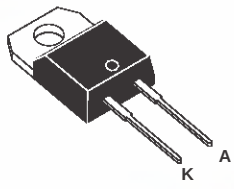
TURBOSWITCH ™ ULTRA-FAST HIGH VOLTAGE DIODE

MAIN PRODUCT CHARACTERISTICS

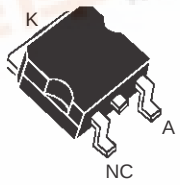
$I_{F(AV)}$	8A
V_{RRM}	1200V
t_{rr} (typ)	50ns
V_F (max)	2.0V



TO-220AC
STTA812D



TO-220AC Ins.
STTA812DI



D^2PAK
STTA812G

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
- INSULATED PACKAGE: TO-220AC Ins.
  Electrical insulation : 2500V_{RMS}
  Capacitance: 7pF.

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)

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	TO-220AC/ D^2PAK	30	A
		TO-220AC Ins.	20	A
I_{FRM}	Repetitive peak forward current	tp = 5 µs F = 5kHz square	110	A
I_{FSM}	Surge non repetitive forward current	tp = 10ms sinusoidal	70	A
T_{stg}	Storage temperature range		- 65 to + 150	°C
T_j	Maximum operating junction temperature		150	°C

TURBOSWITCH is a trademark of STMicroelectronics.

THERMAL AND POWER DATA

Symbol	Parameter		Conditions	Value	Unit
$R_{th(j-c)}$	Junction to case thermal resistance	TO-220AC/D^2PAK TO-220AC Ins.		2.3 3.3	°C/W
P_1	Conduction power dissipation $I_{F(AV)}$ = 8A δ =0.5	TO-220AC/D^2PAK TO-220AC Ins.	Tc= 105°C Tc= 85°C	19.5	W
P_{max}	Total power dissipation Pmax = P1 + P3 (P3 = 10% P1)	TO-220AC/D^2PAK TO-220AC Ins.	Tc= 100°C Tc= 79°C	21.5	W

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
V_F *	Forward voltage drop	I_F =8A	Tj = 25°C Tj = 125°C		 1.35	2.2 2.0	V V
I_R **	Reverse leakage current	V_R =0.8 x V_{RRM}	Tj = 25°C Tj = 125°C		 0.6	100 4	µA mA
Vto	Threshold voltage	Ip < 3.I_{AV}	Tj = 125°C			1.57	V
rd	Dynamic parameter					54	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

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		50	 100	ns
I_{RM}	Maximum reverse recovery current	Tj = 125°C VR = 600V I_F =8A dI_F/dt = -64 A/µs dI_F/dt = -500 A/µs		 25	12	A
S factor	Softness factor	Tj = 125°C V_R = 600V I_F =8A 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 =8 A, dI_F/dt = 64 A/µs measured at 1.1 × $V_F$max			900	ns
V_{Fp}	Peak forward voltage	Tj = 25°C I_F =8A, dI_F/dt = 64 A/µs I_F =40A, dI_F/dt = 500 A/µs		 45	35	V

Fig. 1: Conduction losses versus average current.

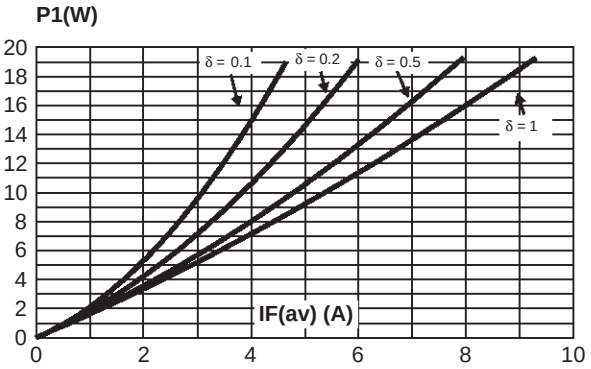


Fig. 2: Forward voltage drop versus forward current (maximum values).

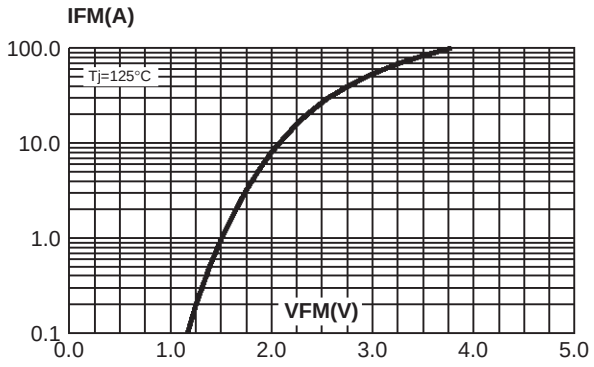


Fig. 3: Relative variation of thermal impedance junction to case versus pulse duration.

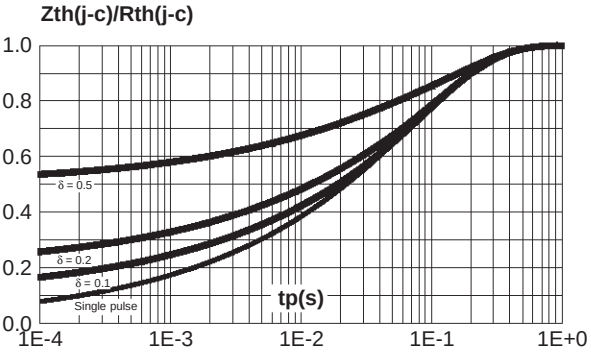


Fig. 4: Peak reverse recovery current versus dI_F/dt (90% confidence).

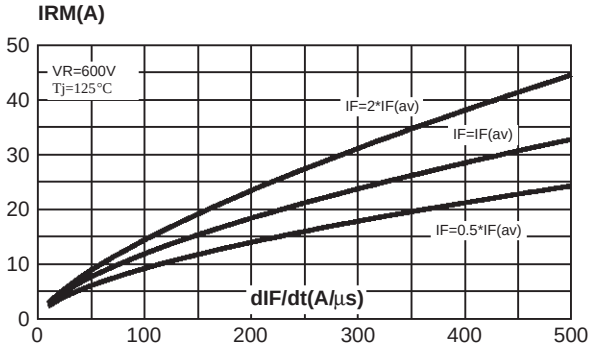


Fig. 5: Reverse recovery time versus dI_F/dt (90% confidence).

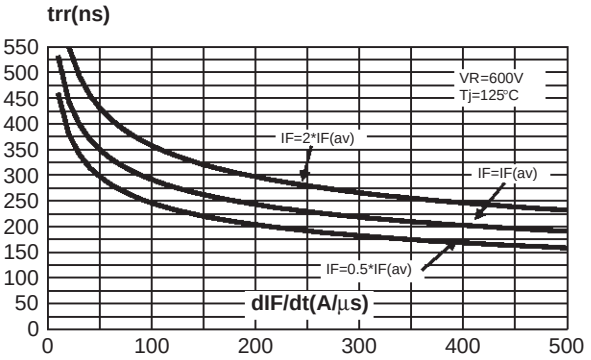


Fig. 6: Softness factor (tb/ta) versus dI_F/dt (typical values).

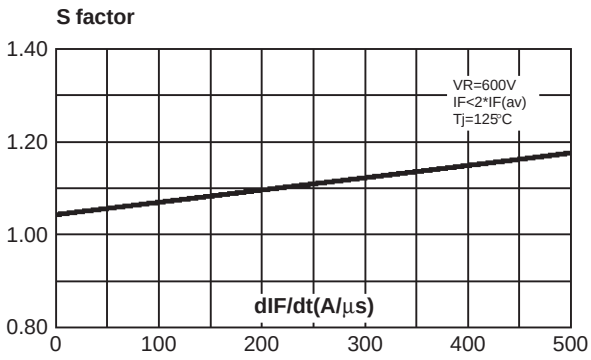


Fig. 7: Relative variation of dynamic parameters versus junction temperature (reference Tj=125°C).

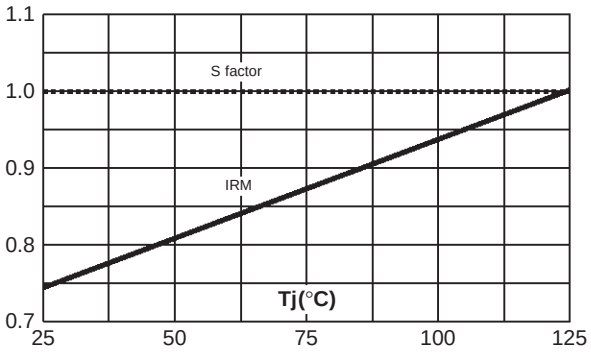


Fig.8: Transient peak forward voltage versus dI_F/dt (90% confidence).

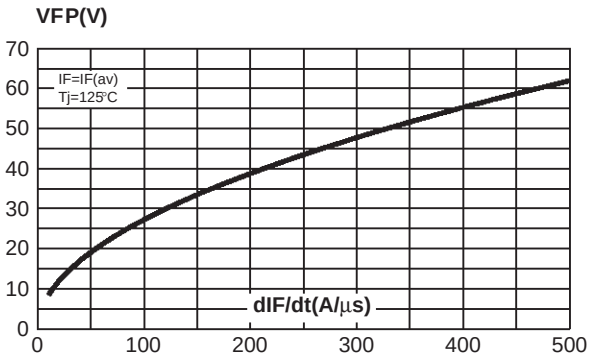
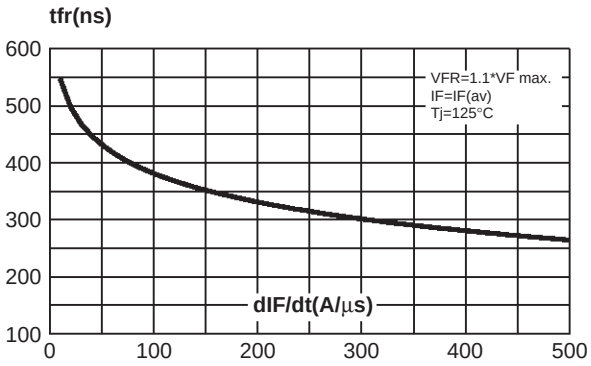


Fig. 9: Forward recovery time versus dI_F/dt (90% confidence).



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:

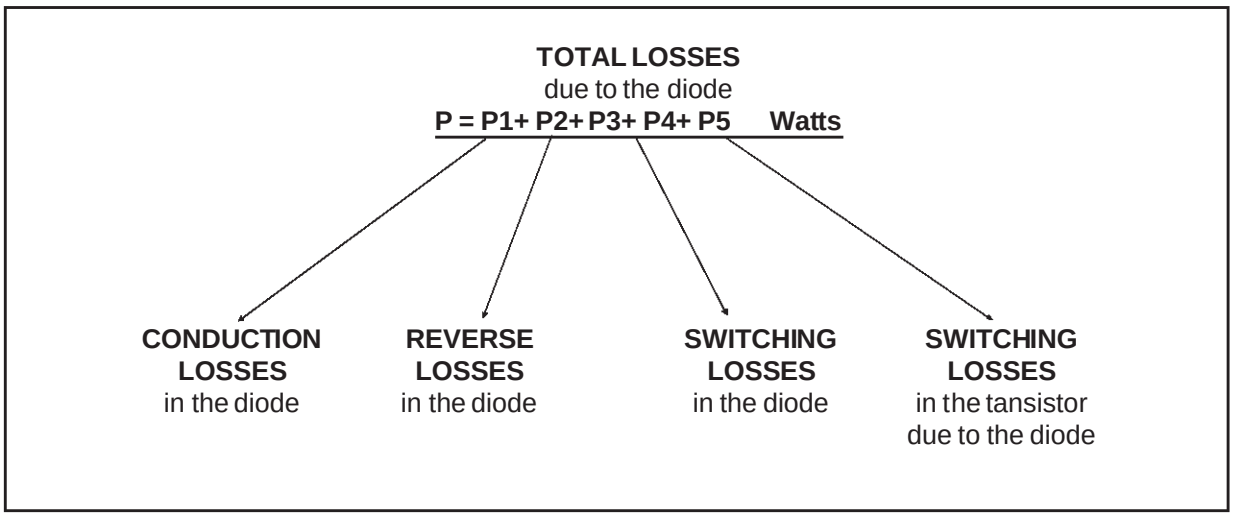


Fig. A: "FREEWHEEL" MODE.

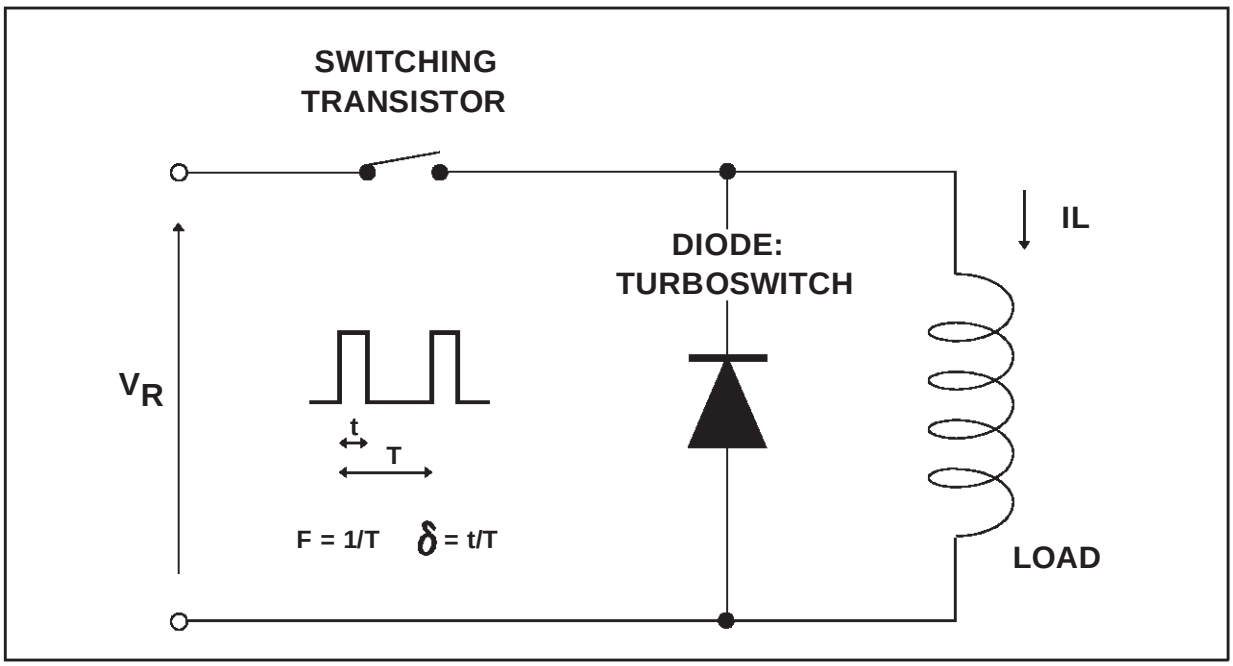


Fig. B: SNUBBER DIODE.

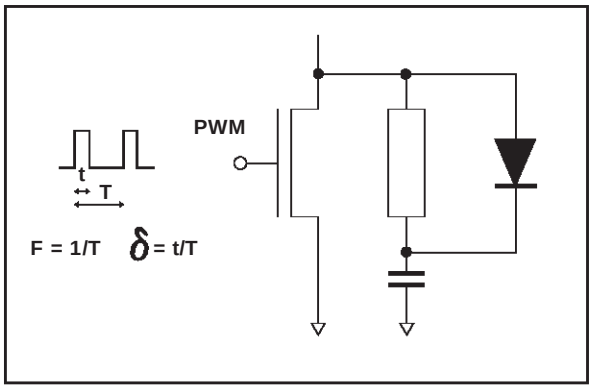


Fig. C: DEMAGNETIZING DIODE.

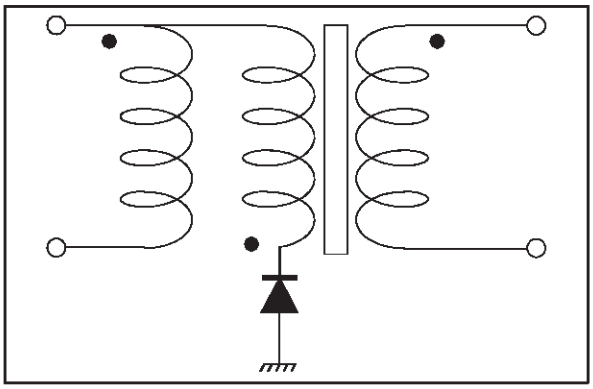
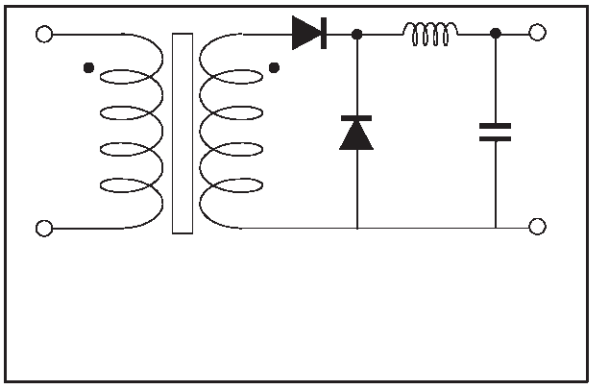
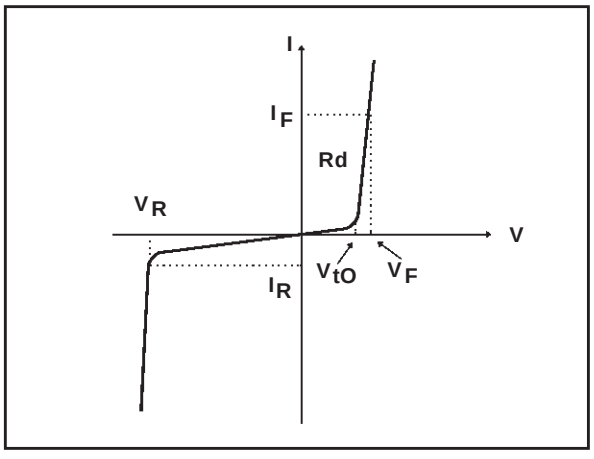


Fig. D: RECTIFIER DIODE.



STATIC & DYNAMIC CHARACTERISTICS . POWER LOSSES .

Fig. E: STATIC CHARACTERISTICS



Conduction losses :

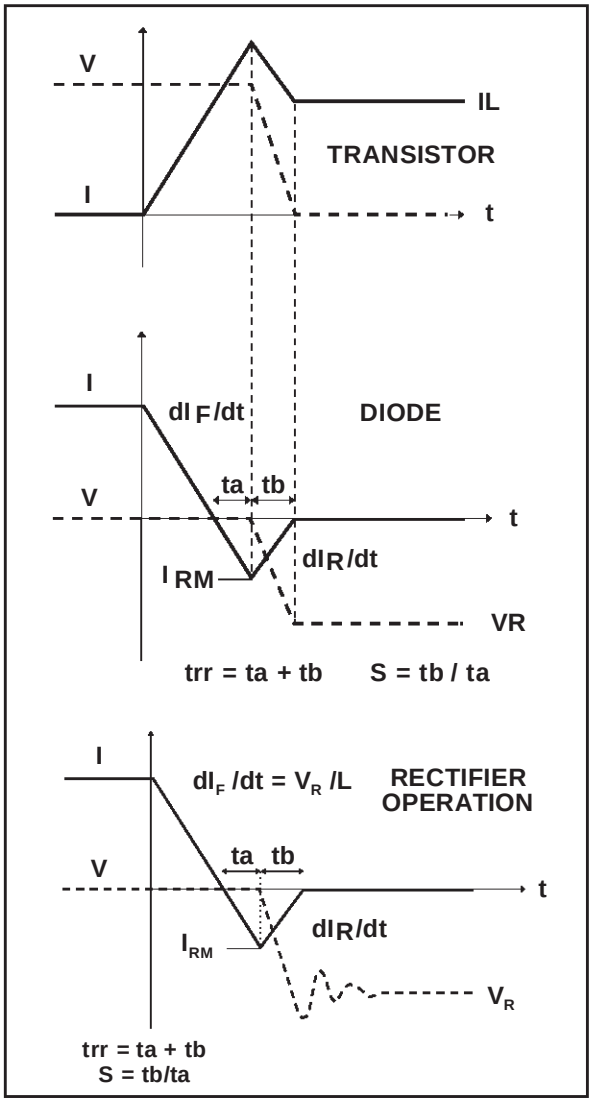
$P1 = V_{t0} \cdot I_{F(AV)} + R_d \cdot I_F{}^2{}_{(RMS)}$

Reverse losses :

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

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) :

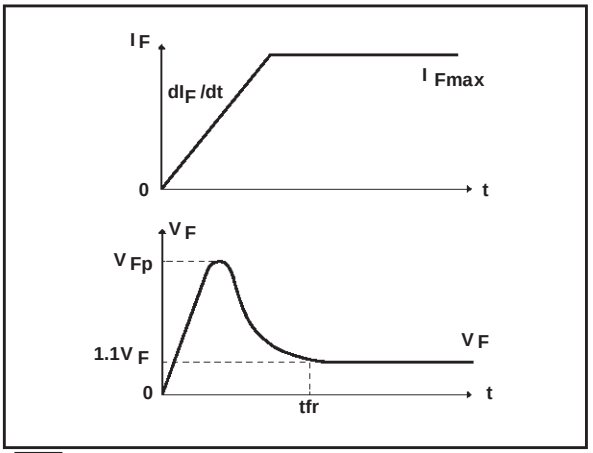
$$P3 = \frac{V_R \times I_{RM}^2 \times S \times F}{6 \times dI_F/dt}$$

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

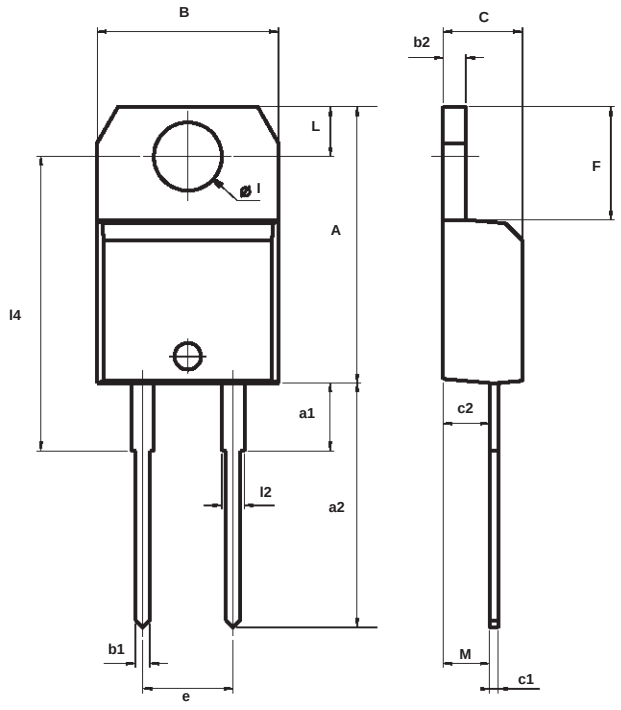


Turn-on losses :

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

PACKAGE DATA

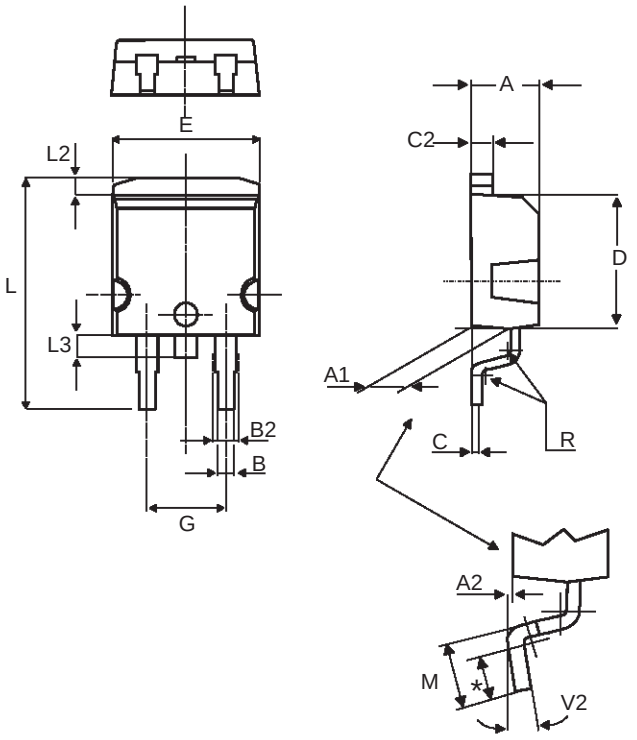
TO-220AC Ins.



REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	4.80		5.40	0.189		0.212
F	6.20		6.60	0.244		0.259
I	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
M		2.60			0.102	

- Cooling method: by conduction (C)
- Recommended torque value: 0.8 m.N
- Maximum torque value: 1.0 m.N

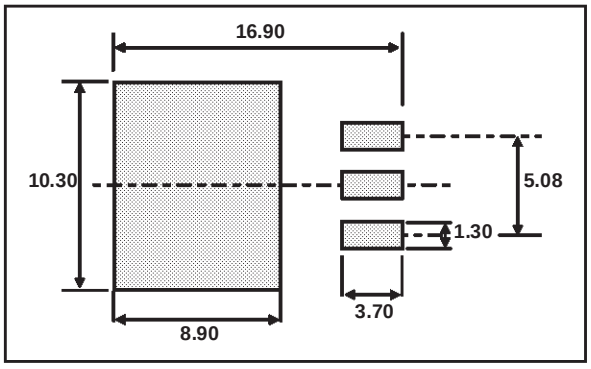
PACKAGE DATA
D^2PAK



* FLAT ZONE NO LESSTHAN 2mm

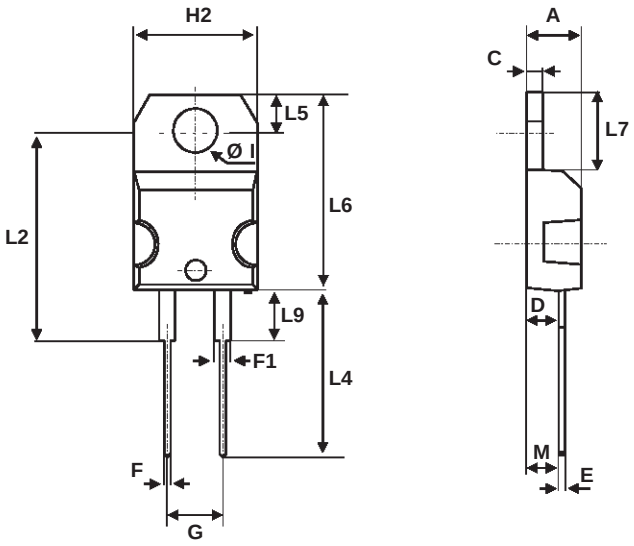
REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.49	2.69	0.098	0.106
A2	0.03	0.23	0.001	0.009
B	0.70	0.93	0.027	0.037
B2	1.14	1.70	0.045	0.067
C	0.45	0.60	0.017	0.024
C2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
E	10.00	10.40	0.393	0.409
G	4.88	5.28	0.192	0.208
L	15.00	15.85	0.590	0.624
L2	1.27	1.40	0.050	0.055
L3	1.40	1.75	0.055	0.069
M	2.40	3.20	0.094	0.126
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

FOOTPRINT DIMENSIONS (in millimeters)



PACKAGE DATA

TO-220AC (JEDEC outline)



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
Diam. I	3.75	3.85	0.147	0.151

- Cooling method: by conduction (C)
- Recommended torque value: 0.55 m.N
- Maximum torque value: 0.7 m.N

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTA812D	STTA812D	TO-220AC	1.86g	50	Tube
STTA812DI	STTA812DI	TO-220AC Ins.	1.86g	250	Box
STTA812G	STTA812G	D^2PAK	1.48g	50	Tube
STTA812G-TR	STTA812G	D^2PAK	1.48g	500	Tape & reel

- Epoxy meets UL94,V0