



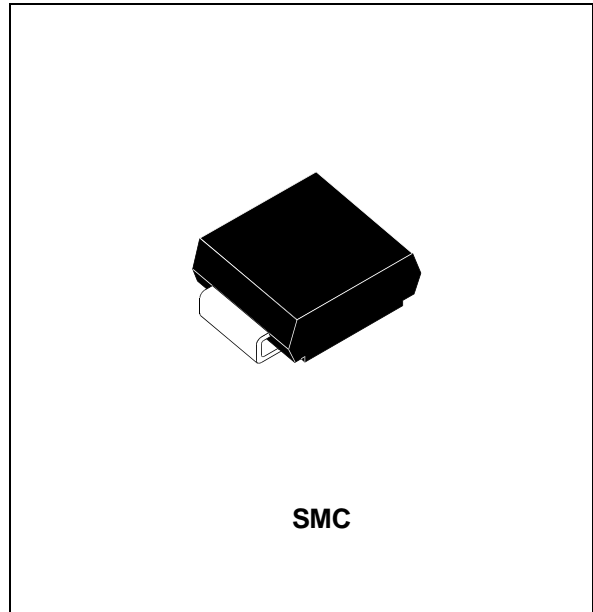
TURBOSWITCH™ ULTRA-FAST HIGH VOLTAGE DIODE

MAIN PRODUCTS CHARACTERISTICS

I_{F(AV)}	2A
V_{RRM}	600V
t_{rr} (typ)	20ns
V_F (max)	1.5V

FEATURES AND BENEFITS

- SPECIFIC TO "FREEWHEEL MODE" OPERATION: 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



DESCRIPTION

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

TURBOSWITCH 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 SMC, these 600V devices are particularly intended for use on 240V domestic mains.

ABSOLUTE RATINGS (limiting values)

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		10	A
I _{FRM}	Repetitive peak forward current	tp = 5 μs F = 5kHz square	20	A
I _{FSM}	Surge non repetitive forward current	tp=10ms sinusoidal	35	A
T _j	Maximum operating junction temperature		125	°C
T _{stg}	Storage temperature range		- 65 to + 150	°C

THERMAL AND POWER DATA

Symbol	Parameter	Test conditions	Value	Unit
$R_{th(j-l)}$	Junction to lead		21	°C/W
P_1	Conduction power dissipation	$I_{F(AV)} = 1.5A$ $\delta = 0.5$ $T_{lead} = 72^\circ C$	2.5	W
P_{max}	Total power dissipation $P_{max} = P_1 + P_3$ ($P_3 = 10\% P_1$)	$T_{lead} = 67^\circ C$	2.8	W

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_F^*	Forward voltage drop	$I_F = 2A$ $T_j = 25^\circ C$ $T_j = 125^\circ C$		1.1	1.75 1.5	V
I_R^{**}	Reverse leakage current	$V_R = 0.8$ $\times V_{RRM}$ $T_j = 25^\circ C$ $T_j = 125^\circ C$		400	20 1200	μA
V_{to}	Threshold voltage	$I_p < 3 \cdot I_{AV}$ $T_j = 125^\circ C$			1.15	V
r_d	Dynamic resistance				175	m Ω

Test pulse : * $t_p = 380 \mu s$, $\delta < 2\%$

** $t_p = 5 ms$, $\delta < 2\%$

To evaluate the maximum conduction losses use the following equation :

$$P = V_{to} \times I_{F(AV)} + r_d \times I_F^2(RMS)$$

DYNAMIC ELECTRICAL CHARACTERISTICS

TURN-OFF SWITCHING

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	$T_j = 25^\circ C$ $I_F = 0.5 A$ $I_R = 1A$ $I_{rr} = 0.25A$ $I_F = 1 A$ $di_F/dt = -50A/\mu s$ $V_R = 30V$		20	50	ns
I_{RM}	Maximum recovery current	$T_j = 125^\circ C$ $V_R = 400V$ $I_F = 2A$ $di_F/dt = -16 A/\mu s$ $di_F/dt = -50 A/\mu s$		2.0	1.2	A
S factor	Softness factor	$T_j = 125^\circ C$ $V_R = 400V$ $I_F = 2A$ $di_F/dt = -50 A/\mu s$		11		-

TURN-ON SWITCHING

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{fr}	Forward recovery time	$T_j = 25^\circ C$ $I_F = 1 A$ $di_F/dt = 8 A/\mu s$ measured at, $1.1 \times V_F \max$			500	ns
V_{Fp}	Peak forward voltage				10	V

Fig. 1: Conduction losses versus average current.

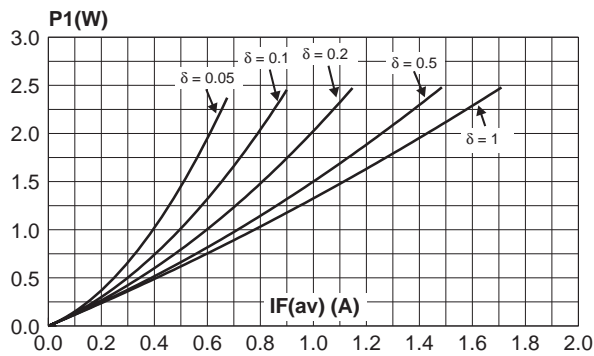


Fig. 2: Forward voltage drop versus forward current (maximum values).

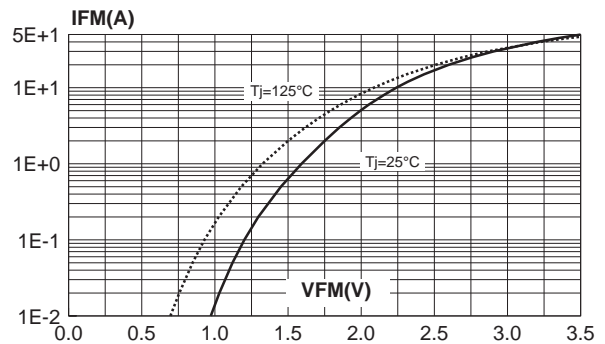


Fig. 3: Relative variation of thermal impedance junction to ambient versus pulse duration (recommended pad layout).

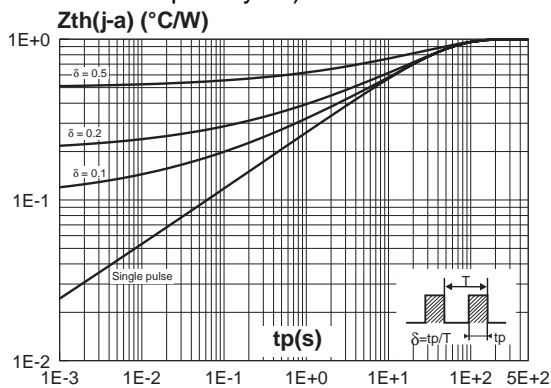


Fig. 4: Peak reverse recovery current versus dIF/dt (90% confidence).

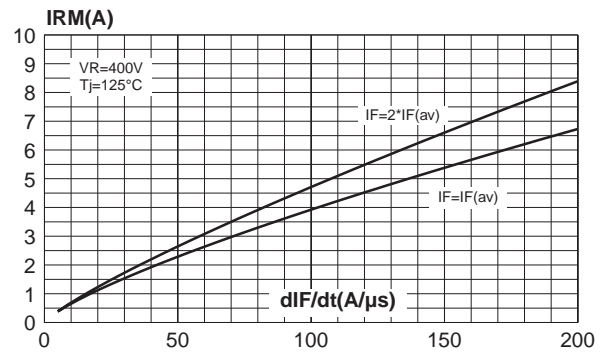


Fig. 5: Reverse recovery time versus dIF/dt (90% confidence).

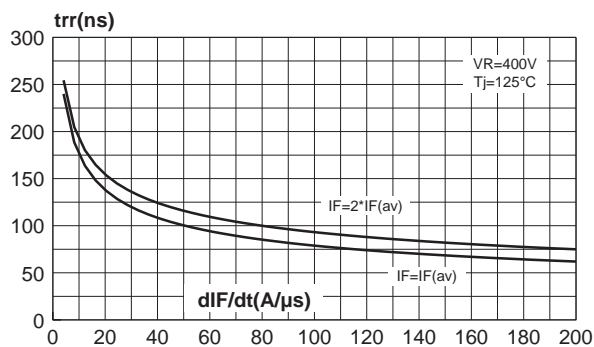


Fig. 6: Softness factor (tb/ta) versus dIF/dt (typical values).

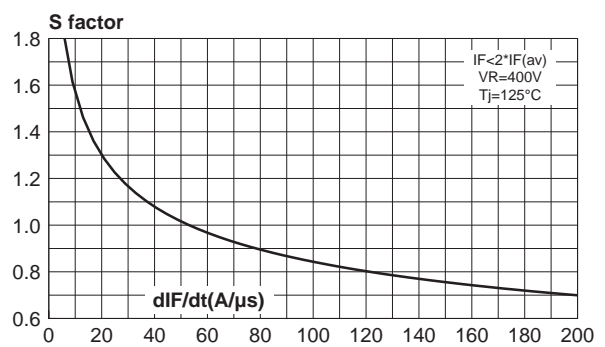


Fig. 7: Relative variation of dynamic parameters versus junction temperature (reference $T_j=125^\circ\text{C}$).

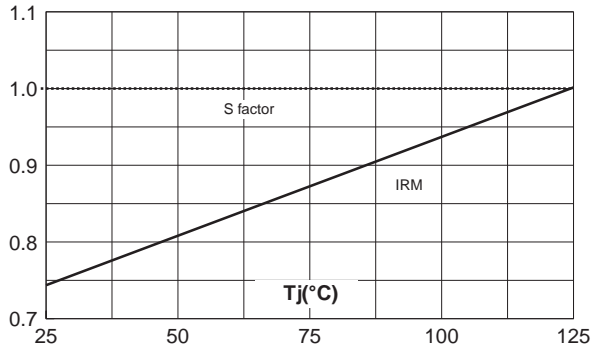


Fig. 8: Transient peak forward voltage versus dI_F/dt (90% confidence).

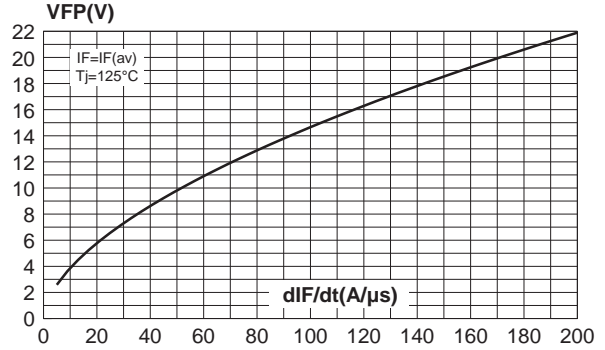


Fig. 9: Forward recovery time versus dI_F/dt (90% confidence).

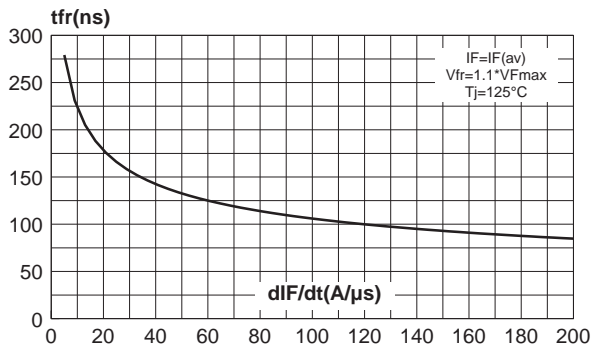
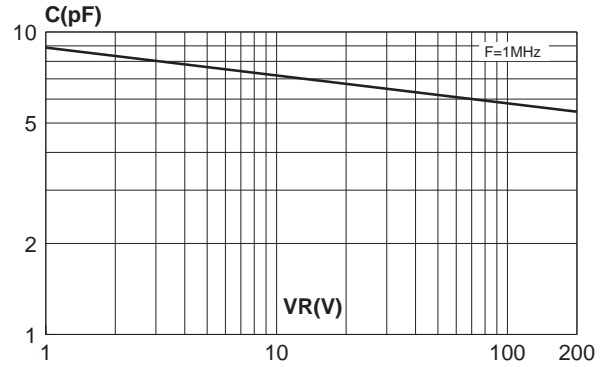


Fig. 10: Junction capacitance versus reverse voltage applied (typical values).



APPLICATION DATA

The TURBOSWITCH™ is especially designed to provide the lowest overall power losses in any "Freewheel Mode" application (see fig. A) 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 :

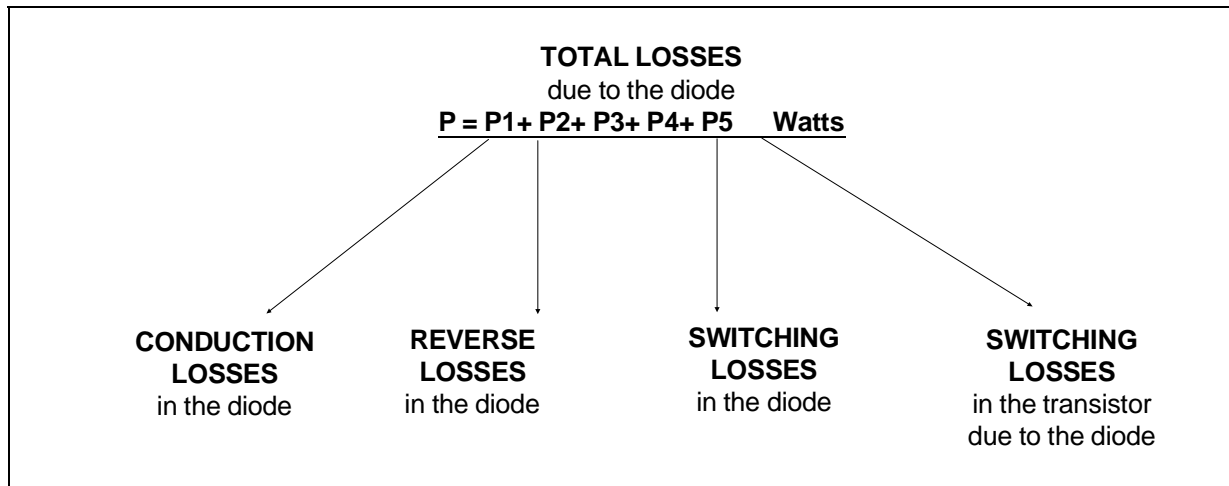
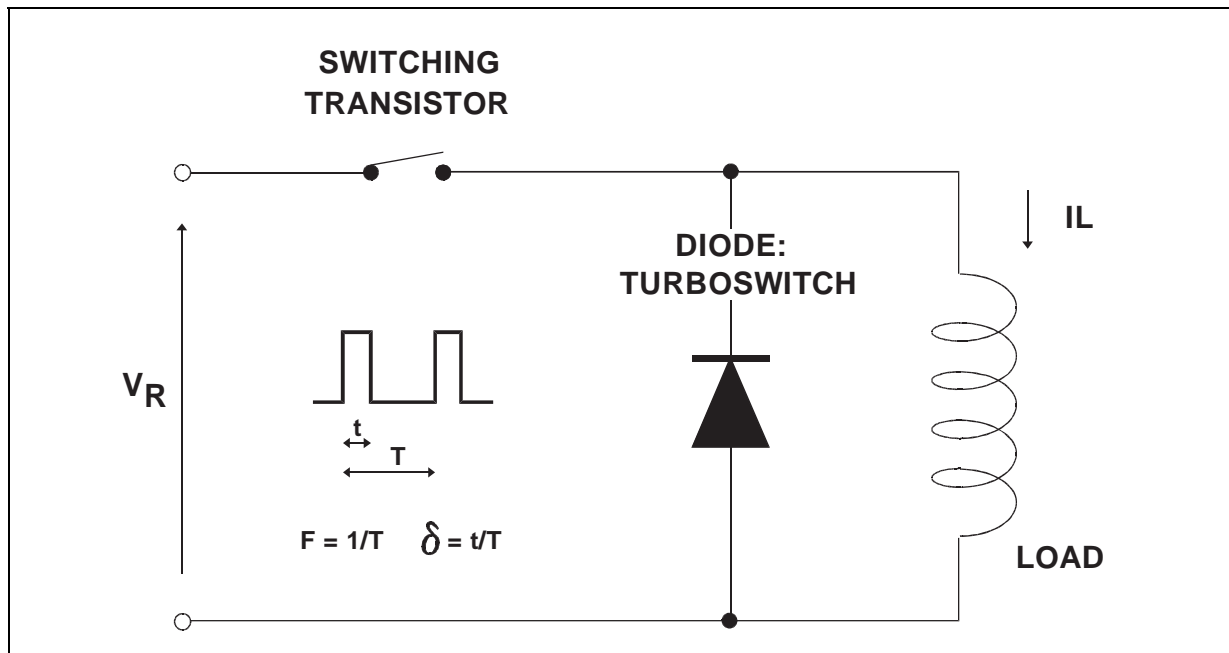
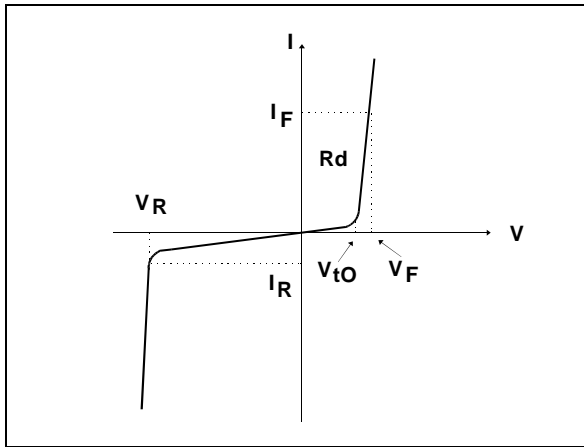


Fig. A : "FREEWHEEL" MODE



APPLICATION DATA (Cont'd)

Fig. B : STATIC CHARACTERISTICS



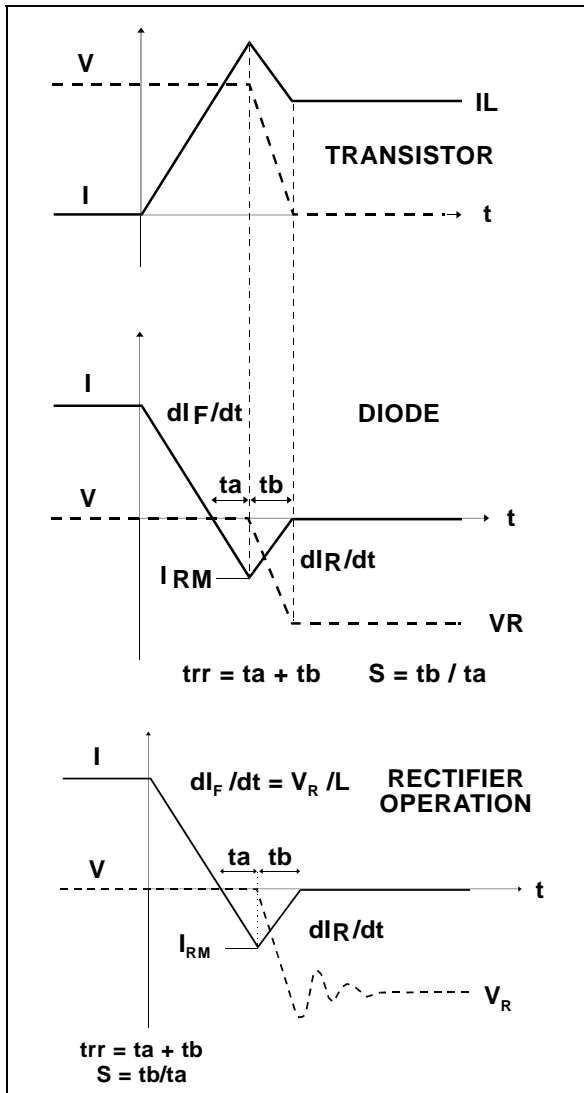
Conduction losses :

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

Reverse losses :

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

Fig. C : TURN-OFF CHARACTERISTICS



Turn-on losses :

(in the transistor, due to the diode)

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

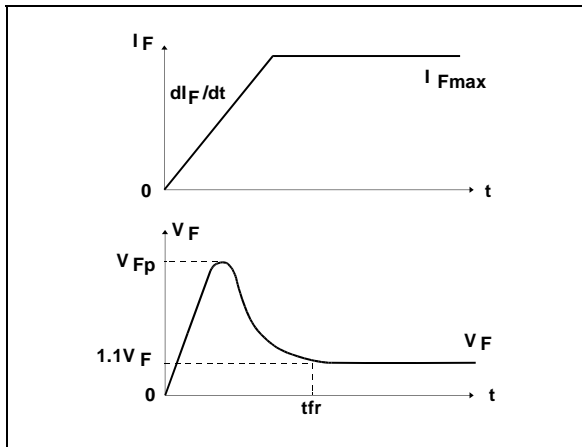
Turn-off losses (in the diode) :

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

P3 and P5 are suitable for power MOSFET and IGBT

APPLICATION DATA (Cont'd)

Fig. D : TURN-ON CHARACTERISTICS

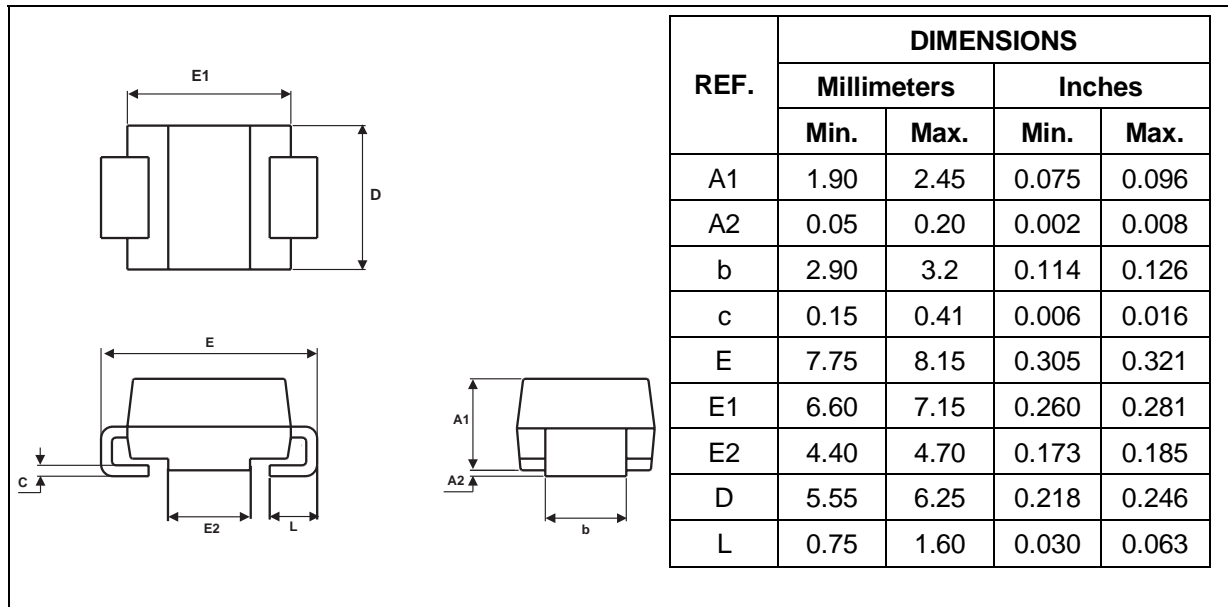


Turn-on losses :

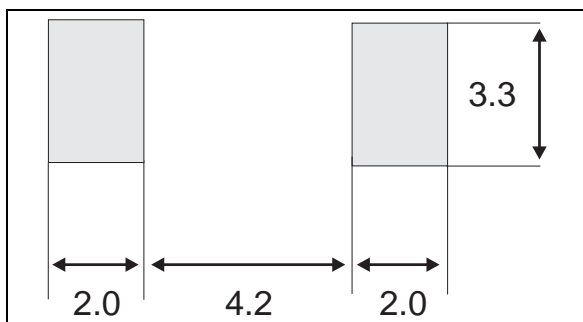
$$P_4 = 0.4 (V_{FP} - V_F) \times I_{Fmax} \times t_{fr} \times F$$

STTA206S

PACKAGE MECHANICAL DATA SMC



FOOTPRINT DIMENSIONS (in millimeters)



Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTA206S	T51	SMC	0.243g	2500	Tape & reel

- Band indicates cathode
- Epoxy meets UL94,V0

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