



STTA3006CW/CP

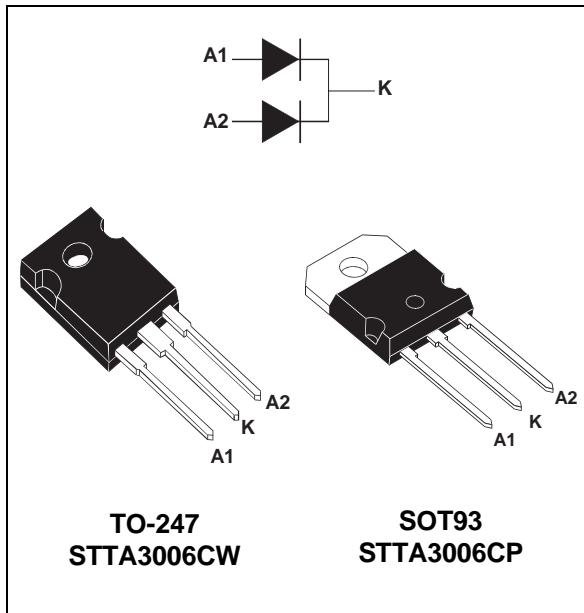
TURBOSWITCH™ ULTRA-FAST HIGH VOLTAGE DIODES

MAIN PRODUCT CHARACTERISTICS

I _{F(AV)}	2 x 15A
V _{RRM}	600V
t _{rr} (typ)	35ns
V _F (max)	1.6V

FEATURES AND BENEFITS

- SPECIFIC TO "FREEWHEEL MODE" OPERATIONS: 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 either in TO-247 or SOT93, these 600V devices are particularly intended for use on 240V domestic mains.

ABSOLUTE RATINGS (limiting values, 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	30	A
I _{FRM}	Repetitive peak forward current	200	A
I _{FSM}	Surge non repetitive forward current	230	A
T _j	Maximum operating junction temperature	150	°C
T _{stg}	Storage temperature range	-65 to 150	°C

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THERMAL AND POWER DATA

Symbol	Parameter	Test conditions	Value	Unit
R _{th(j-c)}	Junction to case	Per diode Total Coupling	1.9 1.0 0.1	°C/W
P ₁	Conduction power dissipation	Per diode I _{F(AV)} = 30A δ = 0.5 T _c = 110°C	20.5	W
P _{max}	Total power dissipation P _{max} = P ₁ + P ₃ (P ₃ = 10% P ₁)	Per diode T _c = 105°C	22.5	W

STATIC ELECTRICAL CHARACTERISTICS (per diode)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V _F *	Forward voltage drop	I _F = 15A	T _j = 25°C T _j = 125°C	1.3	1.8 1.6	V V
I _R **	Reverse leakage current	V _R = 0.8 x V _{RRM}	T _j = 25°C T _j = 125°C	2	100 5	μA mA
V _{to}	Threshold voltage	I _p < 3.I _{AV}	T _j = 125°C		1.06	V
r _d	Dynamic resistance				177	mΩ

Test pulse : * tp = 380 μs, δ < 2%

** tp = 5 ms, δ < 2%

To evaluate the maximum conduction losses use the following equation :

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

DYNAMIC ELECTRICAL CHARACTERISTICS (per diode)

TURN-OFF SWITCHING

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t _{rr}	Reverse recovery time	T _j = 25°C I _F = 0.5 A I _R = 1A I _{rr} = 0.25A I _F = 1A dI _F /dt = -50A/μs V _R = 30V		35	65	ns
I _{RM}	Maximum reverse recovery current	T _j = 125°C V _R = 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	T _j = 125°C V _R = 400V I _F = 15A dI _F /dt = -500 A/μs		0.5		/

TURN-ON SWITCHING

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t _{fr}	Forward recovery time	T _j = 25°C I _F = 15A, dI _F /dt = 120 A/μs measured at, 1.1 × V _{Fmax}			500	ns
V _{Fp}	Peak forward voltage	T _j = 25°C I _F = 15A, dI _F /dt = 120 A/μs			9	V

Fig. 1: Conduction losses versus average current.

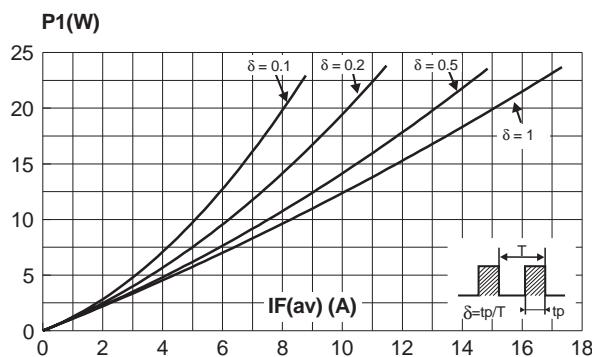


Fig. 3: Relative variation of thermal transient junction to case versus pulse duration.

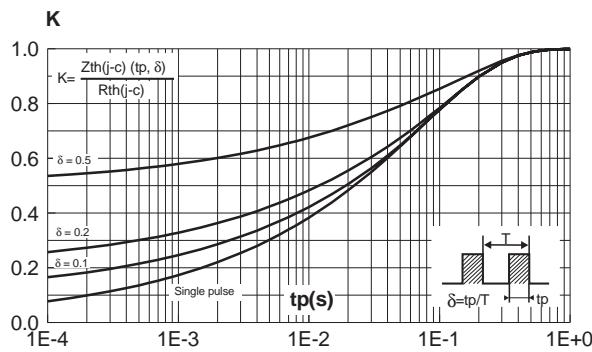


Fig. 5: Reverse recovery time versus dI/dt (90% confidence).

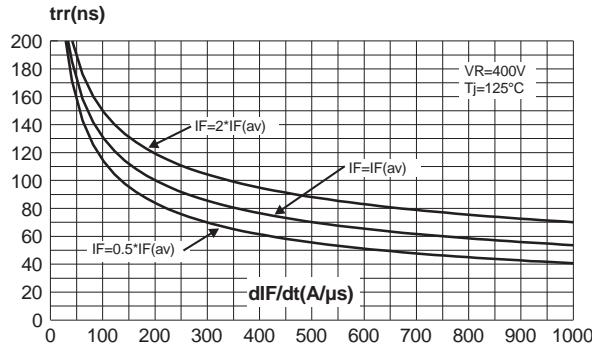


Fig. 2: Forward voltage drop versus forward current (maximum values).

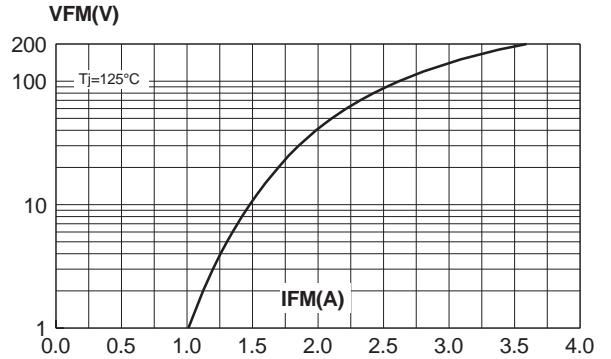


Fig. 4: Peak reverse recovery current versus dI/dt (90% confidence).

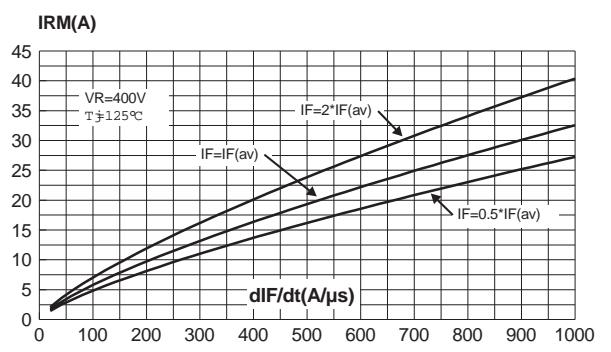
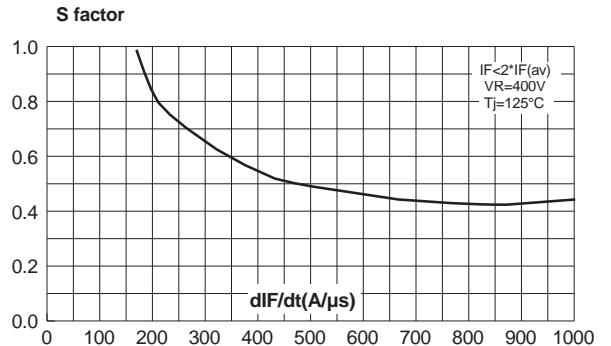


Fig. 6: Softness factor (tb/ta) versus dI/dt (typical values).



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

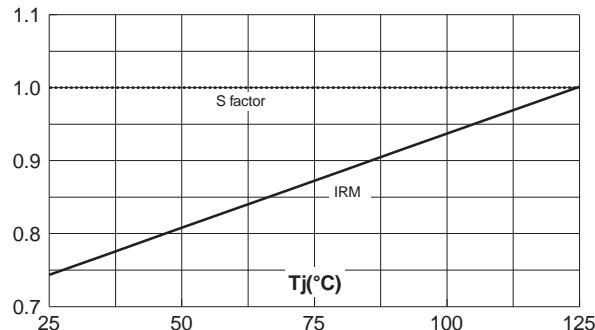


Fig. 8: Transient peak forward voltage versus dI/dt (90% confidence).

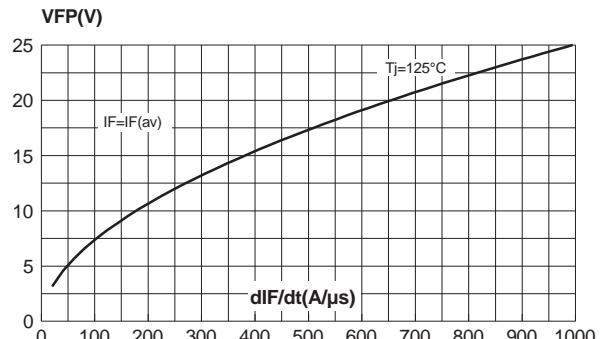
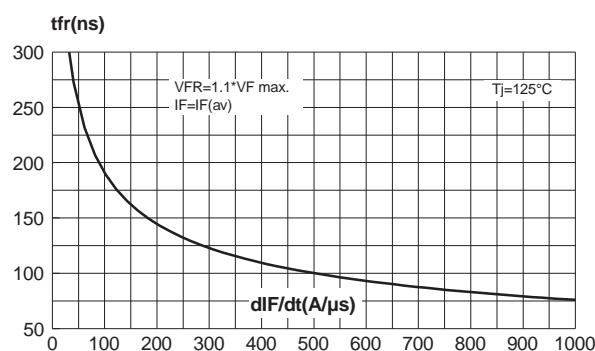


Fig. 9: Forward recovery time versus dI/dt (90% confidence).



APPLICATION DATA

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

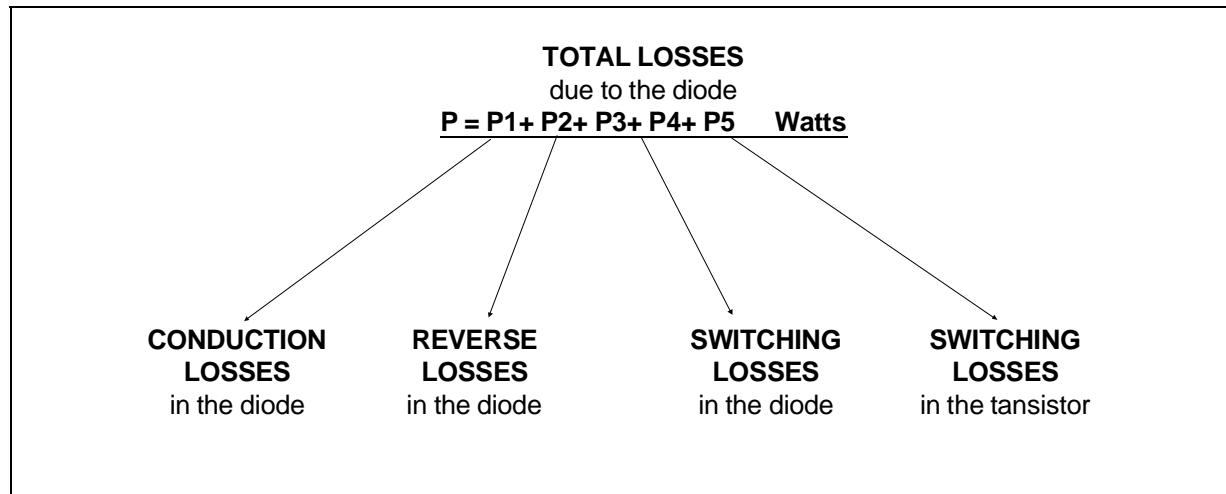
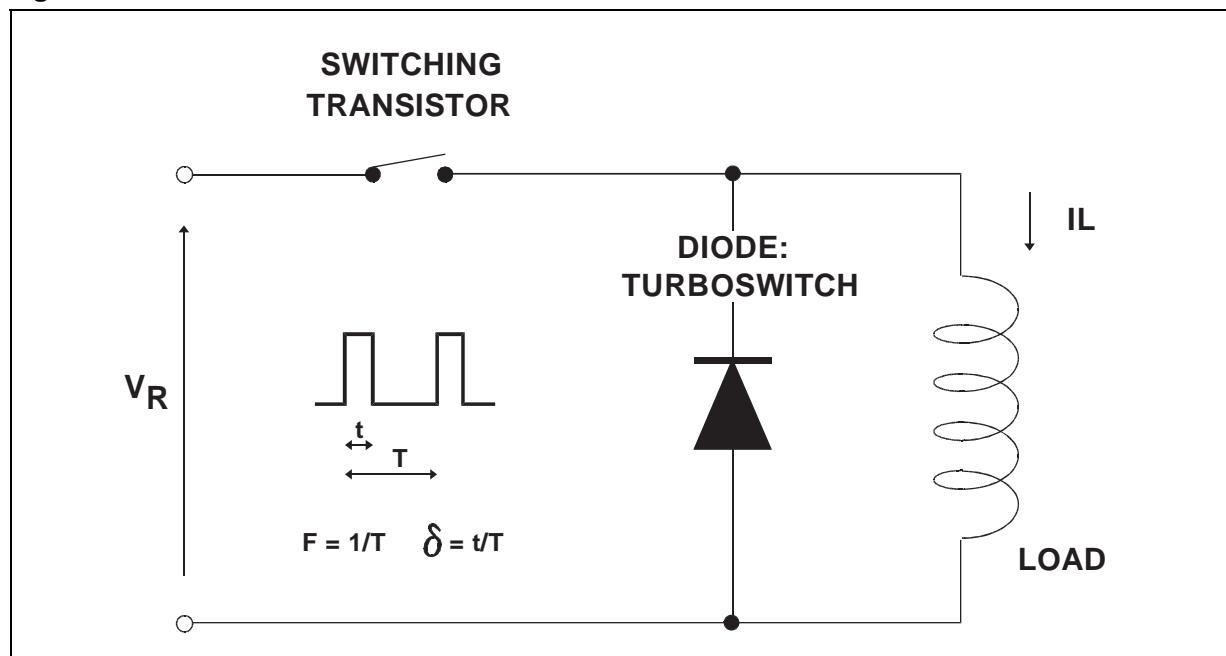
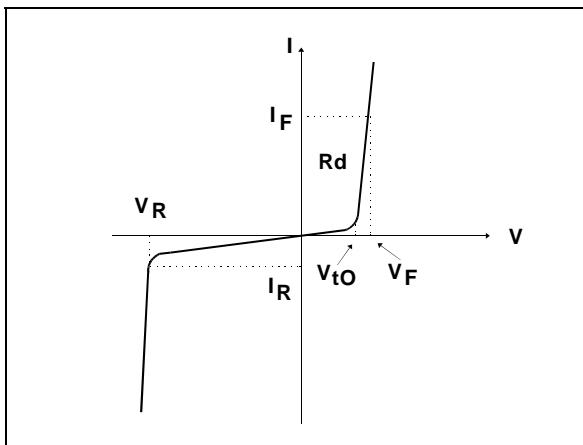


Fig. A : "FREEWHEEL" MODE.



APPLICATION DATA (Cont'd)

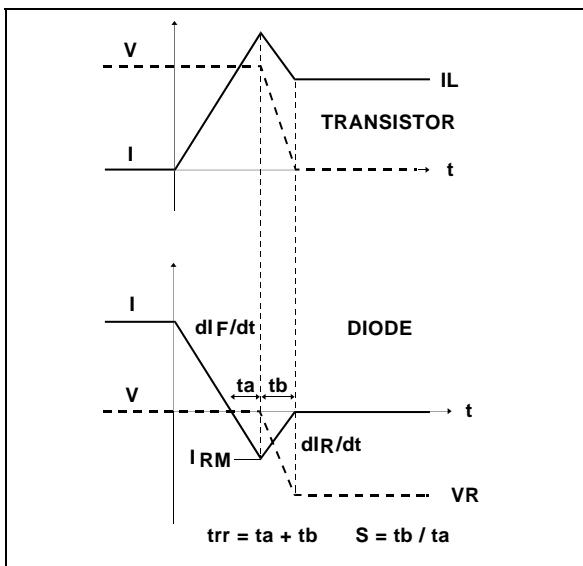
Fig. B: STATIC CHARACTERISTICS



Conduction losses :

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

Fig. C: TURN-OFF CHARACTERISTICS



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

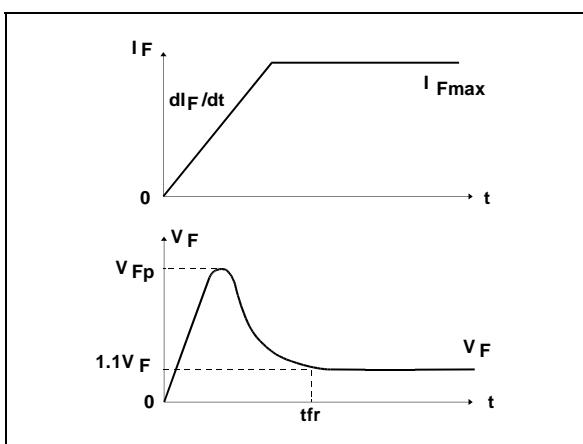
$$P5 = \frac{V_R \times I_{RM}^2 \times (3 + 2 \times S) \times F}{6 \times dI_F/dt} + \frac{V_R \times I_{RM} \times I_L \times (S + 2) \times F}{2 \times dI_F/dt}$$

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

Fig. C: TURN-ON CHARACTERISTICS



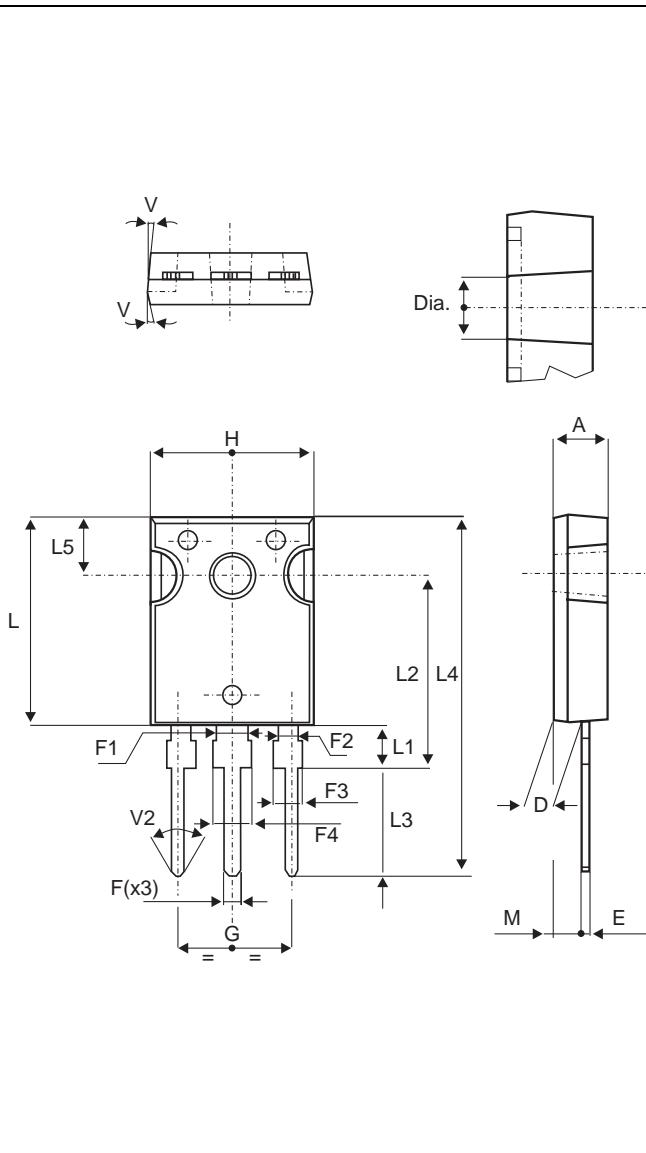
Turn-on losses :

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

PACKAGE DATA

TO-247 Plastic

REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.191		0.203
D	2.20		2.60	0.086		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	15.45		15.75	0.608		0.620
L	19.85		20.15	0.781		0.793
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
L3	14.20		14.80	0.559		0.582
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



The technical drawing illustrates the physical dimensions of the TO-247 plastic package. Key dimensions include:
- Top view: Total width L, height L, lead spacing H, lead thickness F1, lead pitch F2, lead height F3, lead width F4, lead angle V2, lead spacing F(x3), lead thickness G.
- Side view: Lead height L1, lead thickness M, lead angle E, lead width D, lead thickness Dia., lead spacing V, lead thickness V2.

- Cooling method : by conduction (C).
- Recommended torque value : 0.8 m.N
- Maximum torque value : 1 m.N

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PACKAGE DATA

SOT93 Plastic

REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.70		4.90	1.185		0.193
C	1.90		2.10	0.075		0.083
D		2.50			0.098	
D1		2.00			0.078	
E	0.50		0.78	0.020		0.031
F	1.10		1.30	0.043		0.051
F3		1.75			0.069	
F4		2.10			0.083	
G	10.80		11.10	0.425		0.437
H	14.70		15.20	0.279		0.598
L			12.20			0.480
L2			16.20			0.638
L3		18.0			0.709	
L5	3.95		4.15	0.156		0.163
L6		31.00			1.220	
O	4.00		4.10	0.157		0.161

- Cooling method : by conduction (C).
- Recommended torque value : 0.8 m.N
- Maximum torque value : 1 m.N

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTA3006CW	STTA3006CW	TO247	4.36g	30	Tube
STTA3006CP	STTA3006CP	SOT93	3.97g	30	Tube

- Epoxy meets UL94,V0

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