

General Description

The AOTF6N90 is fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications. By providing low $R_{DS(on)}$, C_{iss} and C_{rss} along with guaranteed avalanche capability this parts can be adopted quickly into new and existing offline power supply designs.

For Halogen Free add "L" suffix to part number:
AOTF6N90L

Product Summary

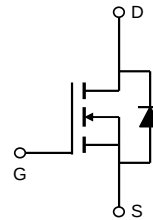
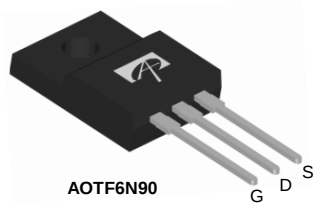
V_{DS}	1000V@150°C
I_D (at $V_{GS}=10V$)	6A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 2.2Ω

100% UIS Tested
100% R_g Tested



Top View

TO-220F



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	AOTF6N90	Units
Drain-Source Voltage	V_{DS}	900	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D	6*	A
$T_C=100^\circ\text{C}$		3.9*	
Pulsed Drain Current ^C	I_{DM}	24	A
Avalanche Current ^C	I_{AR}	3.3	A
Repetitive avalanche energy ^C	E_{AR}	80	mJ
Single plused avalanche energy ^G	E_{AS}	160	mJ
Peak diode recovery dv/dt	dv/dt	5	V/ns
Power Dissipation ^B	P_D	50	W
		0.4	W/°C
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	T_L	300	°C

Thermal Characteristics

Parameter	Symbol	AOTF6N90	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	2.5	°C/W

* Drain current limited by maximum junction temperature.

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V, T _J =25°C	900			V
		I _D =250μA, V _{GS} =0V, T _J =150°C		1000		
BV _{DSS} /ΔT _J	Zero Gate Voltage Drain Current	I _D =250μA, V _{GS} =0V		1		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =900V, V _{GS} =0V			1	μA
		V _{DS} =720V, T _J =125°C			10	
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±30V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =5V I _D =250μA	3.4	4.1	4.5	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =3A		1.74	2.2	Ω
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =3A		8		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.73	1	V
I _S	Maximum Body-Diode Continuous Current				6	A
I _{SM}	Maximum Body-Diode Pulsed Current				24	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	955	1196	1450	pF
C _{oss}	Output Capacitance		65	82	110	pF
C _{rss}	Reverse Transfer Capacitance		6	7.8	12	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.7	3.4	5.1	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =720V, I _D =6A	23	29	35	nC
Q _{gs}	Gate Source Charge		5.5	7	8.5	nC
Q _{gd}	Gate Drain Charge		10	13	20	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =450V, I _D =6A, R _G =25Ω		30		ns
t _r	Turn-On Rise Time			58		ns
t _{D(off)}	Turn-Off DelayTime			70		ns
t _f	Turn-Off Fall Time			49		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =6A, dI/dt=100A/μs, V _{DS} =100V	230	286	343	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =6A, dI/dt=100A/μs, V _{DS} =100V	4.5	5.6	6.7	μC

A. The value of R_{θJA} is measured with the device in a still air environment with T_A=25°C.

B. The power dissipation P_D is based on T_{J(MAX)}=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150°C, Ratings are based on low frequency and duty cycles to keep initial T_J=25°C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150°C. The SOA curve provides a single pulse rating.

G. L=30mH, I_{AS}=3.3A, V_{DD}=150V, R_G=25 Ω, Starting T_J=25°C

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

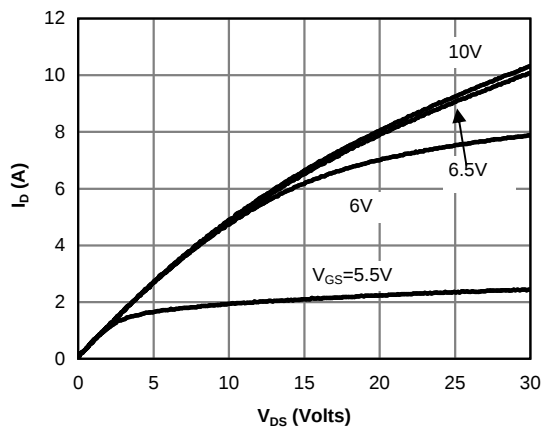


Fig 1: On-Region Characteristics

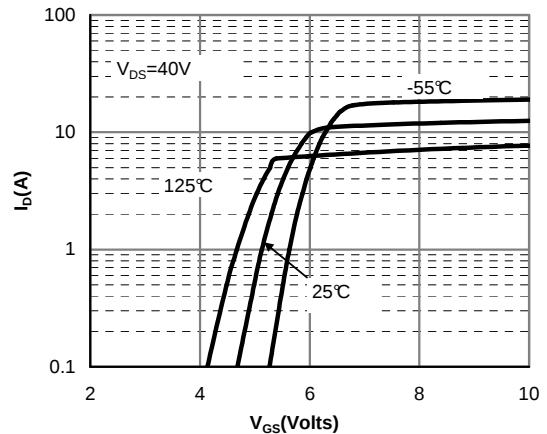


Figure 2: Transfer Characteristics

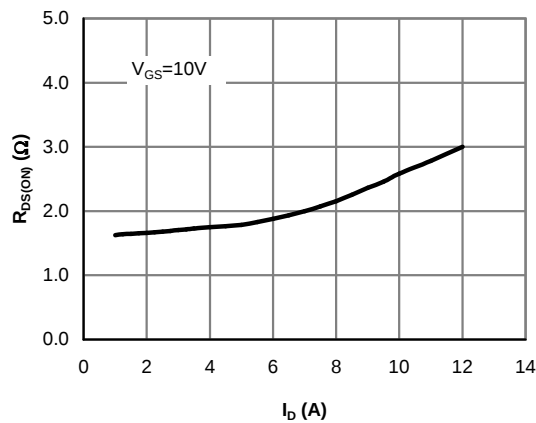


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

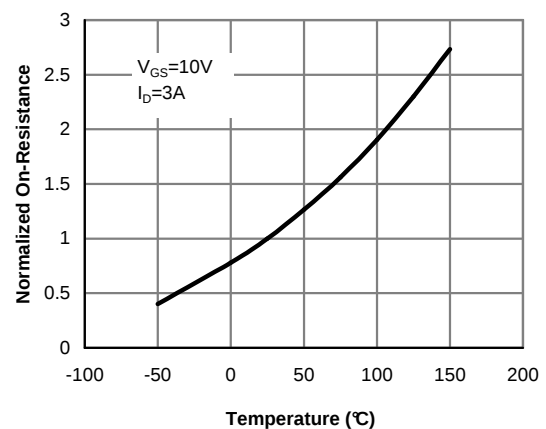


Figure 4: On-Resistance vs. Junction Temperature

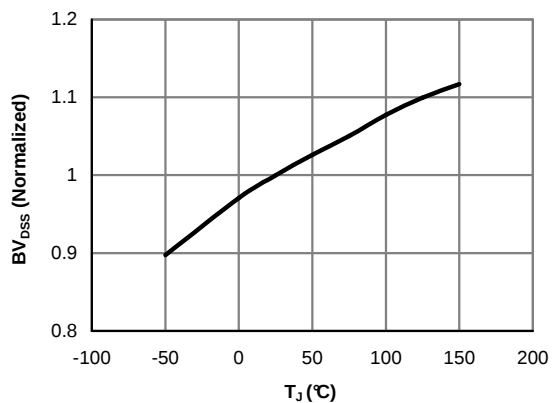


Figure 5: Break Down vs. Junction Temperature

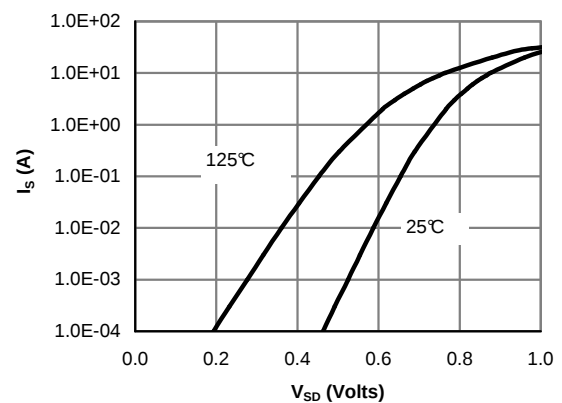


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

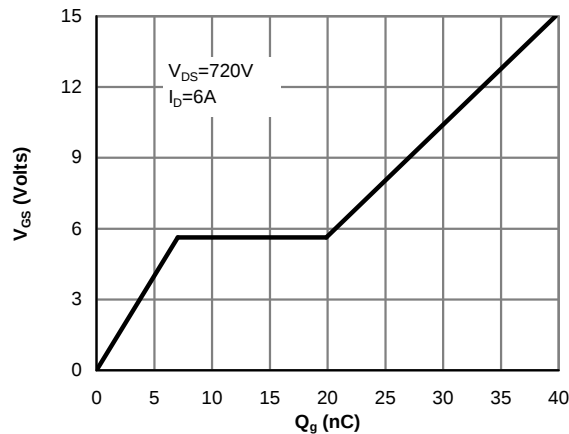


Figure 7: Gate-Charge Characteristics

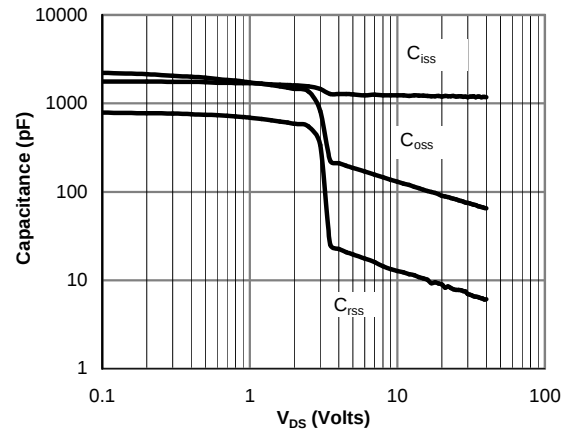


Figure 8: Capacitance Characteristics

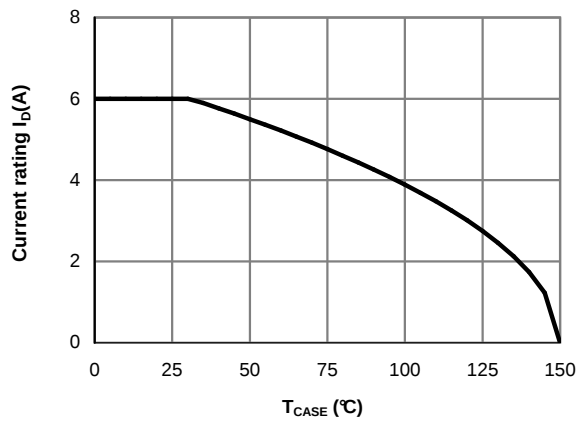


Figure 9: Current De-rating (Note B)

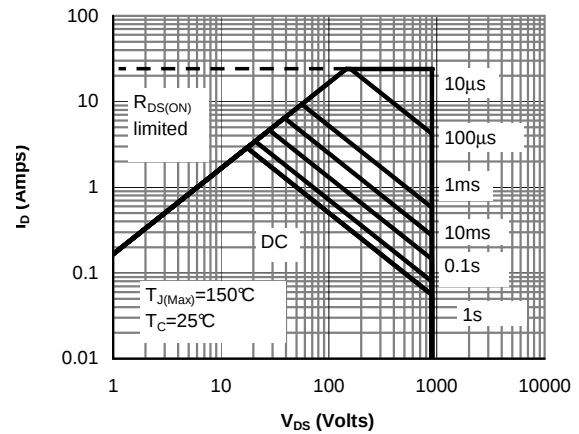


Figure 10: Maximum Forward Biased Safe Operating Area for AOTF6N90 (Note F)

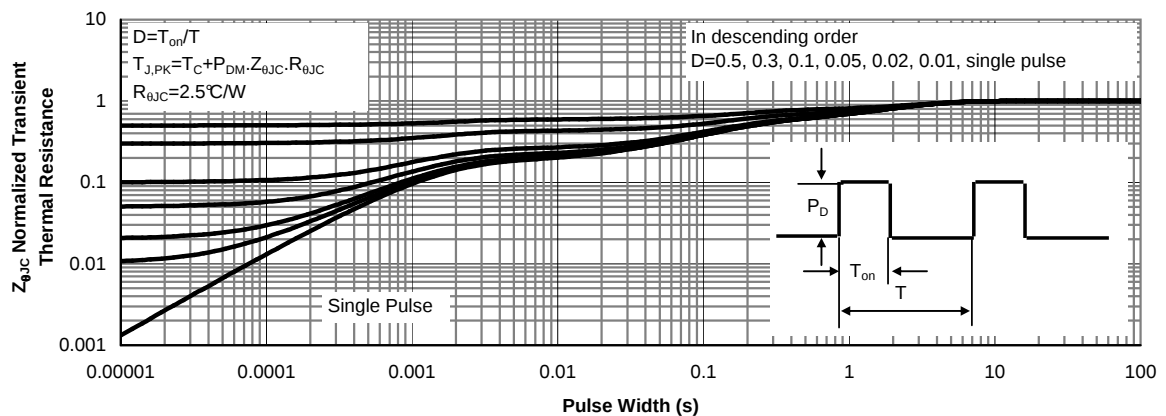
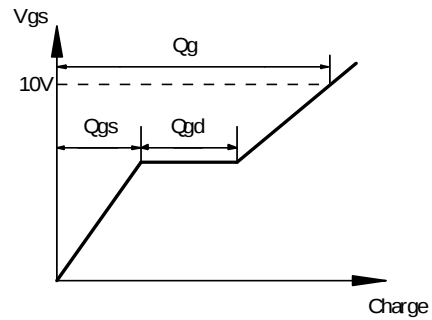
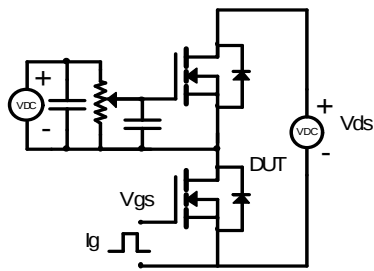
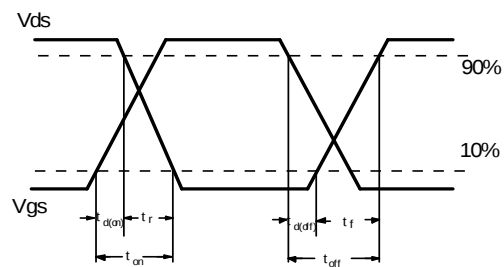
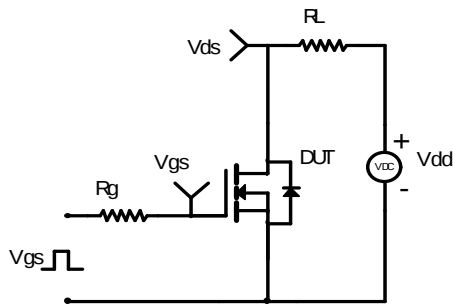


Figure 11: Normalized Maximum Transient Thermal Impedance for AOTF6N90 (Note F)

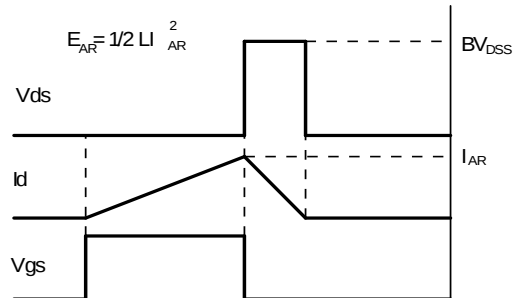
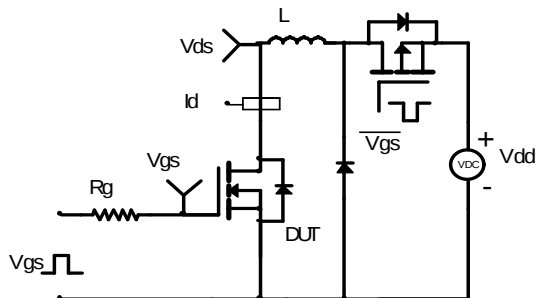
Gate Charge Test Circuit & Waveform



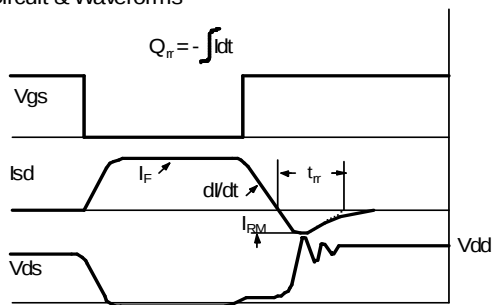
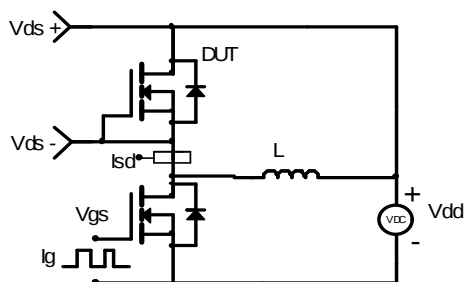
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



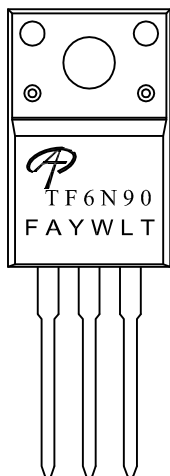
Diode Recovery Test Circuit & Waveforms



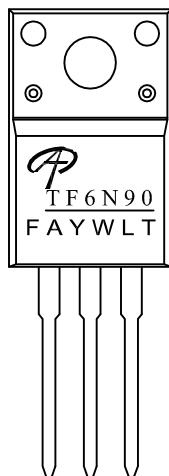


Document No.	PD-01286
Version	A
Title	AOTF6N90 Marking Description

TO220FL PACKAGE MARKING DESCRIPTION



Standard product



Green product

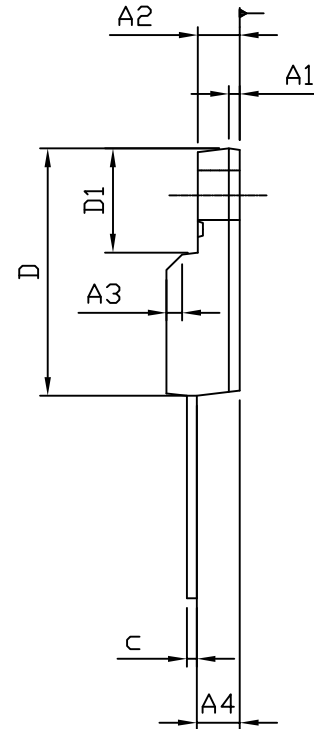
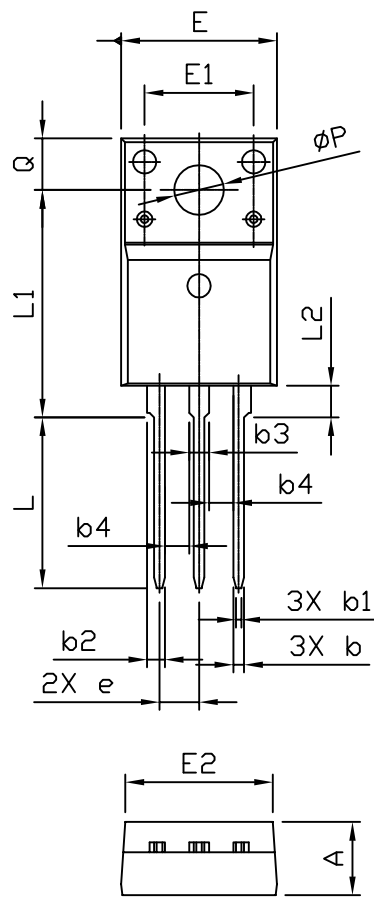
NOTE:

LOGO - AOS Logo
TF6N90 - Part number code
F - Fab code
A - Assembly location code
Y - Year code
W - Week code
L&T - Assembly lot code

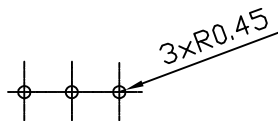
PART NO.	DESCRIPTION	CODE
AOTF6N90	Standard product	TF6N90
AOTF6N90L	Green product	<u>TF6N90</u>



TO220F PACKAGE OUTLINE



RECOMMENDATION OF HOLE PATTERN



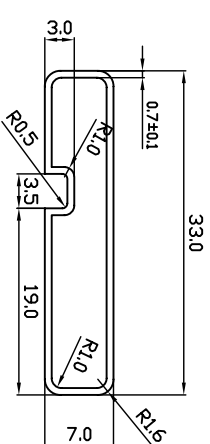
UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	---	0.70	---	---	0.028	---
A2	2.34	2.54	2.74	0.092	0.100	0.108
A3	1X45°			1X45°		
A4	2.66	2.76	2.86	0.105	0.106	0.113
b	0.59	0.69	0.79	0.023	0.027	0.031
b1	0.25	0.35	0.45	0.010	0.014	0.018
b2	1.14	1.24	1.29	0.045	0.049	0.051
b3	1.28	1.38	1.43	0.050	0.054	0.056
b4	1.40 MIN.			0.055 MIN.		
c	0.59	0.64	0.74	0.023	0.025	0.029
D	15.67	15.87	16.07	0.617	0.625	0.633
D1	6.48	6.68	6.88	0.255	0.263	0.271
e	2.54 BSC			0.100 BSC		
E	9.96	10.16	10.36	0.392	0.400	0.408
E1	---	7.00	---	---	0.276	---
E2	9.26	9.46	9.66	0.365	0.372	0.380
L	10.76	10.96	11.16	0.424	0.431	0.439
L1	14.39	14.59	14.79	0.567	0.574	0.582
L2	1.70	2.03	2.20	0.067	0.080	0.087
Q	3.20	3.30	3.40	0.126	0.130	0.134
ØP	3.08	3.18	3.28	0.121	0.125	0.129

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH SHOULD BE LESS THAN 6 MIL.
2. TOLERANCE 0.100 MILLIMETERS UNLESS OTHERWISE SPECIFIED.
3. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

TO220F/TO220FL PLASTIC TUBE DRAWING



#A MARKING LAY-OUT (TOL'S ± 2.0)

1.0

ANTISTAT TREATED SN902233 HF MD  STATIC SENSITIVE DEVICES. REQUIRE PROPER HANDLING PROCEDURE.  SPK

SPK

03

 PVC

11

[illegible]

186.5

2:1

NOTE

1. TUBE
- MATERIAL : P.V.C
 - COLOR : TRANSPARENCY, RED, YELLOW
 - MARKING #A : 6 MONTHS, BLACK COLOR
- LETTER STYLE : Arial
- CAMBAR : 1.5 MAX
2. PIN
- MATERIAL: NYLON
 - COLOR : GREEN (ONE PIN MUST BE INSERTED IN LEFT-SIDE OF " ANTISTATIC~" AND ANOTHER PIN IS FREE.)
3. ALL UNSPECIFICATED SPECIFICATIONS FOLLOW TUBE GENERAL SPEC.
UNSPECIFICATED TOLERANCE ± 0.2
4. PACKING Q'TY :
- | PKG | Q'TY(PCS) |
|--------------------|-----------|
| TO220F/
TO220FL | 50 |

PKG	QTY(PCS)
TO220F/ TO220FL	50

 ALPHA & OMEGA SEMICONDUCTOR		77116 TD220F / TD220FL TUBE DRAWING	
DRAWN BY	SIGNATURE		
APPROVED BY	SIGNATURE	UNIT	PAGE
		MM	1 OF 1
SCALE	PROJECTION	DRAWING NUMBER	VENDOR CODE
N.T.S.		TR-00061	N
			REV.
			A

