

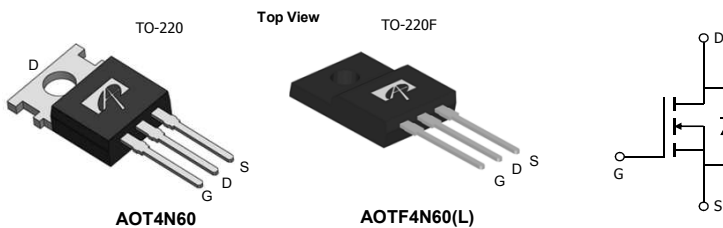
General Description

The AOT4N60 & AOTF4N60 & AOTF4N60L have been 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 these parts can be adopted quickly into new and existing offline power supply designs.

Product Summary

V_{DS}	700V@150°C
I_D (at $V_{GS}=10V$)	4A
$R_{DS(on)}$ (at $V_{GS}=10V$)	< 2.2Ω

100% UIS Tested
 100% R_g Tested



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

Parameter	Symbol	AOT4N60	AOTF4N60	AOTF4N60L	Units	
Drain-Source Voltage	V_{DS}	600			V	
Gate-Source Voltage	V_{GS}	±30			V	
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	4	4*	A	
		$T_C=100^\circ\text{C}$	2.7	2.7*		
Pulsed Drain Current ^c	I_{DM}	16				
Avalanche Current ^c	I_{AR}	2.5			A	
Repetitive avalanche energy ^c	E_{AR}	94			mJ	
Single pulsed avalanche energy ^g	E_{AS}	188			mJ	
MOSFET dv/dt ruggedness	dv/dt	50			V/ns	
Peak diode recovery dv/dt		5				
Power Dissipation ^b	P_D	$T_C=25^\circ\text{C}$	104	35	25	W
		Derate above 25°C	0.83	0.28	0.20	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	AOT4N60	AOTF4N60	AOTF4N60L	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	65	65	°C/W
Maximum Case-to-sink ^A	$R_{\theta CS}$	0.5	--	--	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	1.2	3.6	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	600			V
		I _D =250μA, V _{GS} =0V, T _J =150°C		700		
BV _{DSS} /ΔT _J	Breakdown Voltage Temperature Coefficient	I _D =250μA, V _{GS} =0V		0.69		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =600V, V _{GS} =0V			1	μA
		V _{DS} =480V, 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	4.5	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =2A		1.9	2.2	Ω
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =2A		7.4		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.77	1	V
I _S	Maximum Body-Diode Continuous Current				4	A
I _{SM}	Maximum Body-Diode Pulsed Current				16	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	400	511	615	pF
C _{oss}	Output Capacitance		40	51	65	pF
C _{rss}	Reverse Transfer Capacitance		3.5	4.4	5.3	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	3.3	4.2	6.3	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =480V, I _D =4A		15	18	nC
Q _{gs}	Gate Source Charge		3	3.6	nC	
Q _{gd}	Gate Drain Charge		7.6	9.1	nC	
t _{D(on)}	Turn-On Delay Time	V _{GS} =10V, V _{DS} =300V, I _D =4A, R _G =25Ω		20.2	30	ns
t _r	Turn-On Rise Time		28.7	42	ns	
t _{D(off)}	Turn-Off Delay Time		36	51	ns	
t _f	Turn-Off Fall Time		27	40	ns	
t _{rr}	Body Diode Reverse Recovery Time	I _F =4A, dI/dt=100A/μs, V _{DS} =100V		212	254	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =4A, dI/dt=100A/μs, V _{DS} =100V		1.6	1.9	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=60mH, I_{AS}=2.5A, V_{DD}=150V, R_G=25Ω, 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

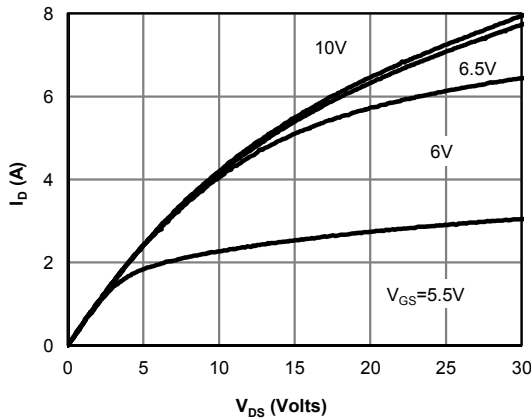


Fig 1: On-Region Characteristics

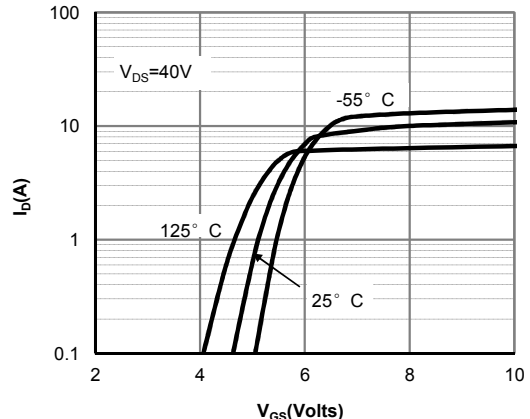


Figure 2: Transfer Characteristics

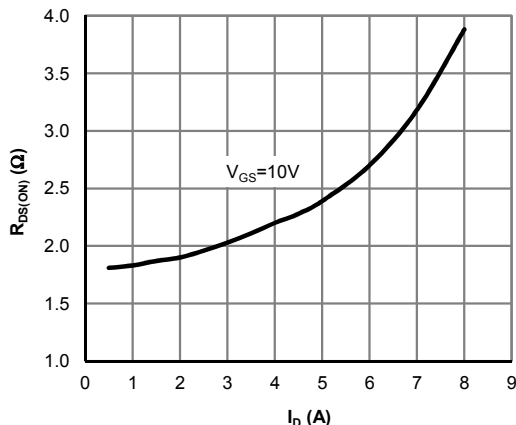


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

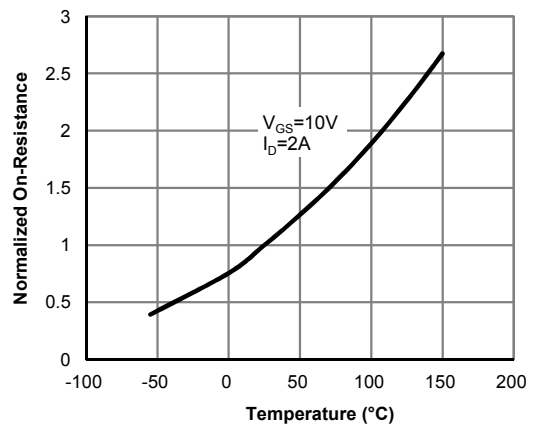


Figure 4: On-Resistance vs. Junction Temperature

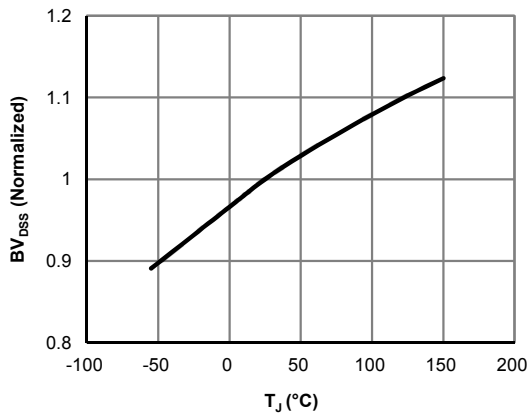


Figure 5: Break Down vs. Junction Temperature

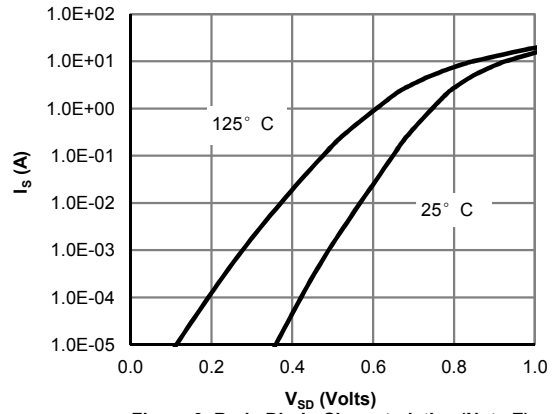


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

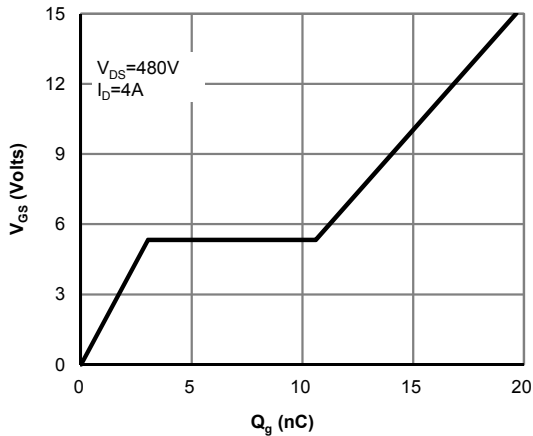


Figure 7: Gate-Charge Characteristics

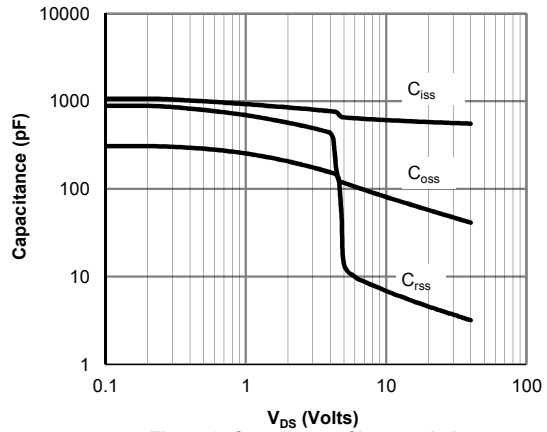


Figure 8: Capacitance Characteristics

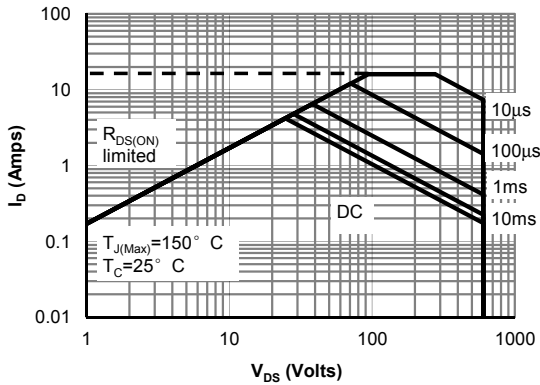


Figure 9: Maximum Forward Biased Safe Operating Area for AOT4N60 (Note F)

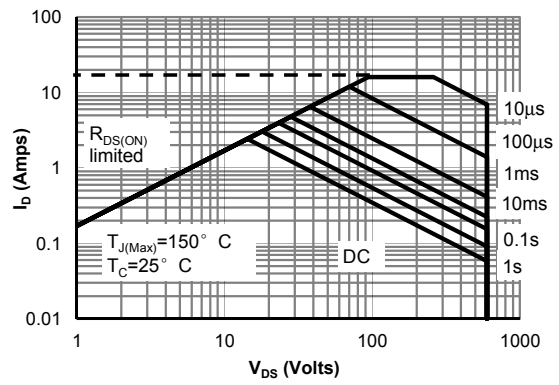


Figure 10: Maximum Forward Biased Safe Operating Area for AOTF4N60 (Note F)

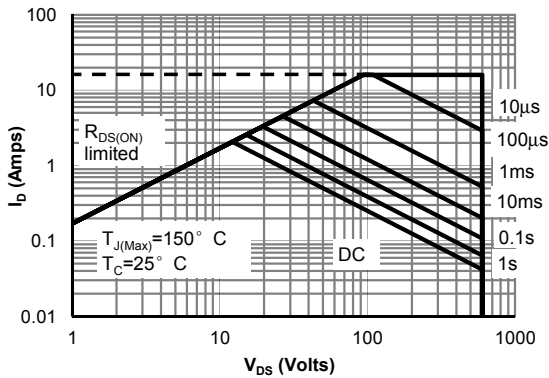


Figure 11: Maximum Forward Biased Safe Operating Area for AOTF4N60L (Note F)

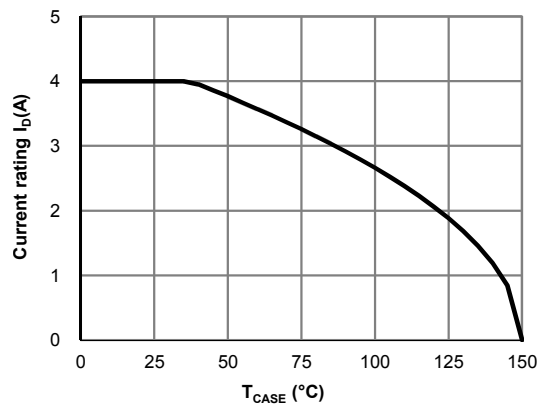


Figure 12: Current De-rating (Note B)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

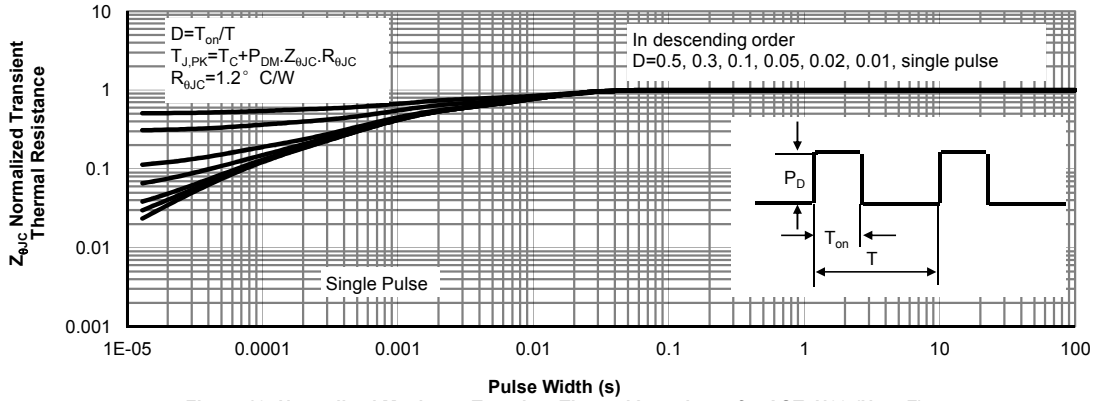


Figure 13: Normalized Maximum Transient Thermal Impedance for AOT4N60 (Note F)

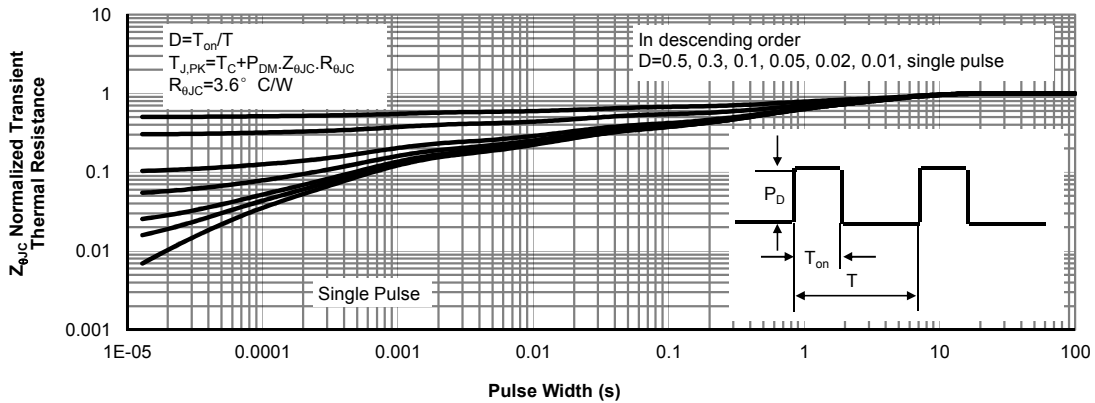


Figure 14: Normalized Maximum Transient Thermal Impedance for AOTF4N60 (Note F)

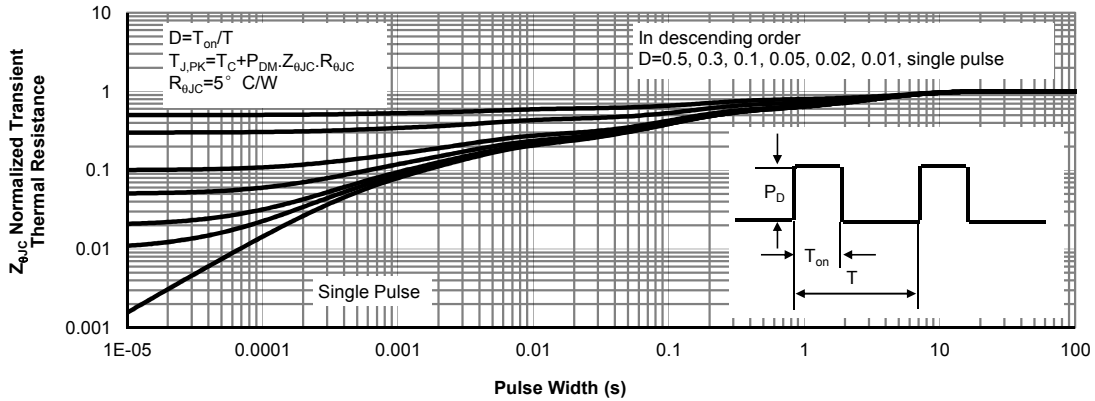
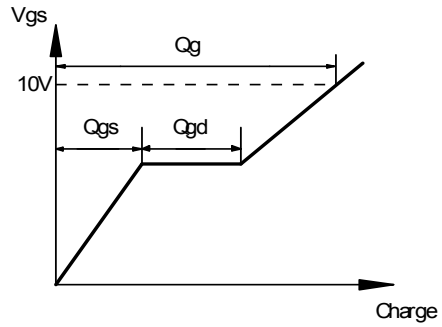
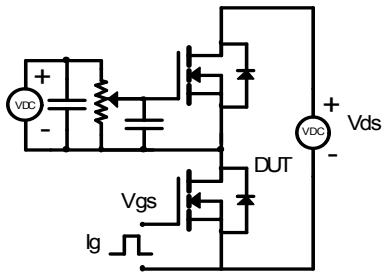
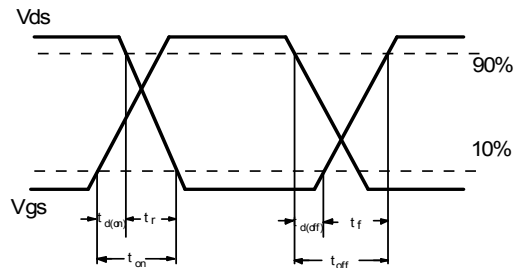
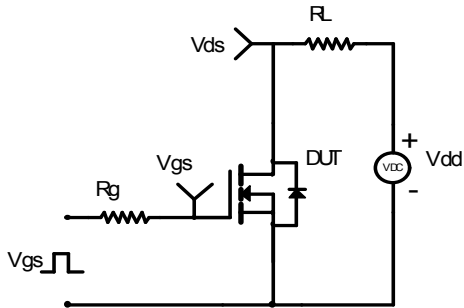


Figure 15: Normalized Maximum Transient Thermal Impedance for AOTF4N60L (Note F)

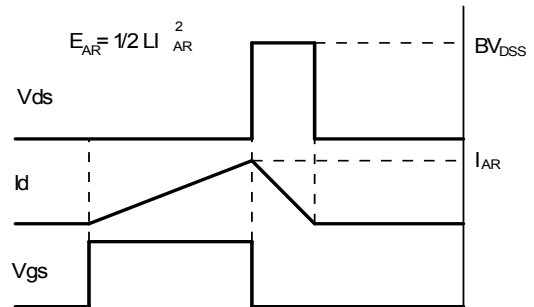
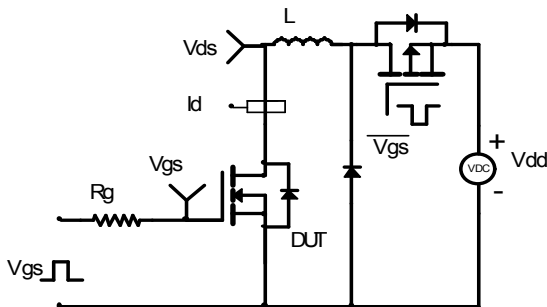
Gate Charge Test Circuit & Waveform



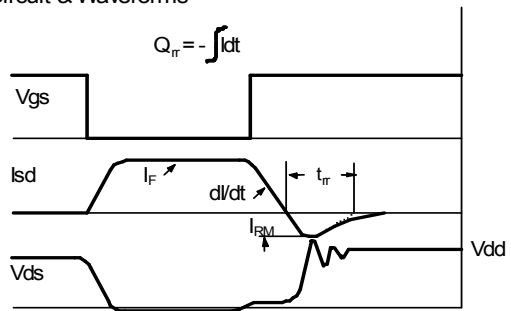
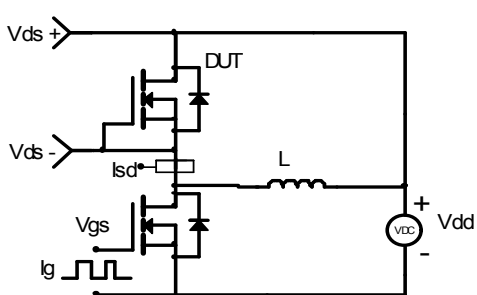
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



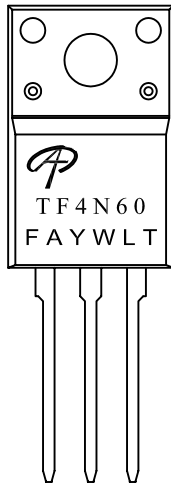
Diode Recovery Test Circuit & Waveforms



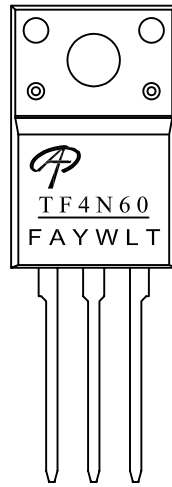


Document No.	PD-00915
Version	A
Title	AOTF4N60 Marking Description

TO220F PACKAGE MARKING DESCRIPTION



Standard product



Green product

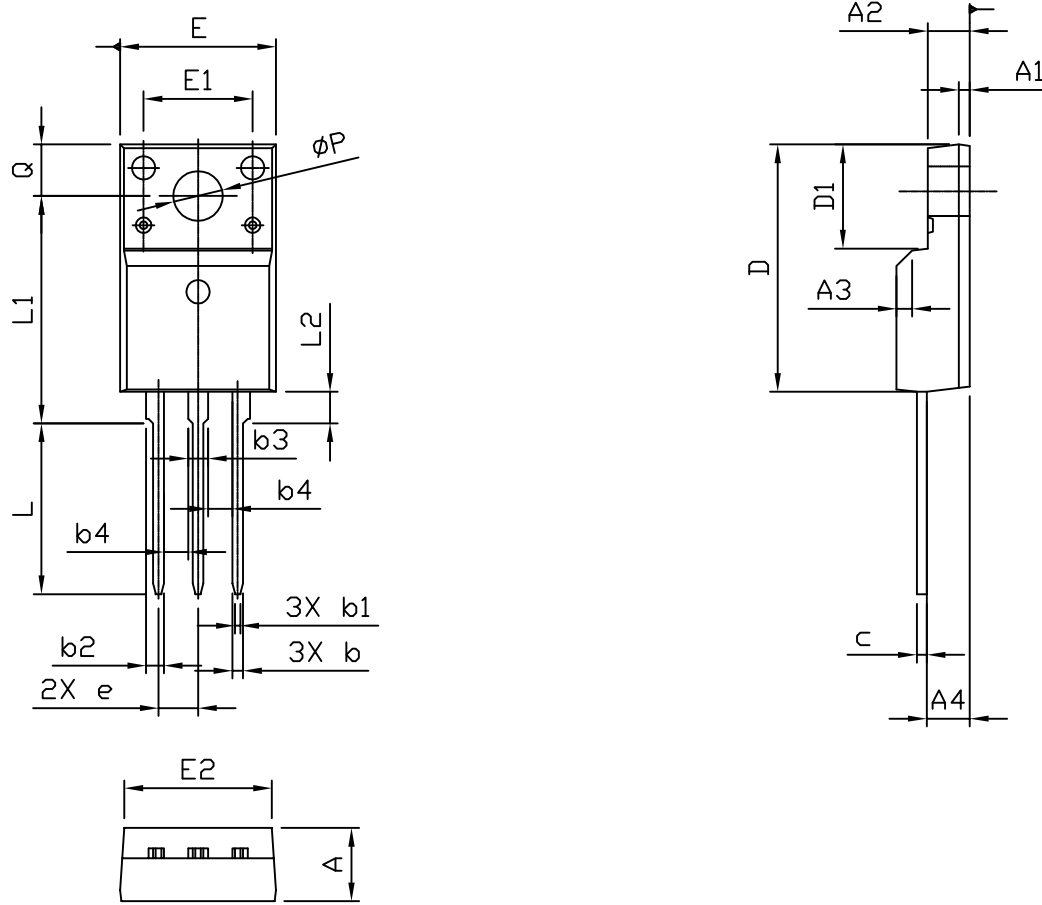
NOTE:

- LOGO - AOS Logo
- TF4N60 - Part number code
- F - Fab code
- A - Assembly location code
- Y - Year code
- W - Week code
- L&T - Assembly lot code

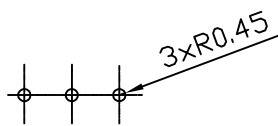
PART NO.	DESCRIPTION	CODE
AOTF4N60	Standard product	TF4N60
AOTF4N60L	Green product	<u>TF4N60</u>



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

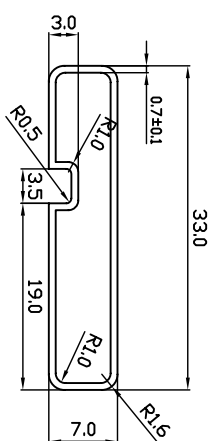
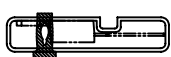
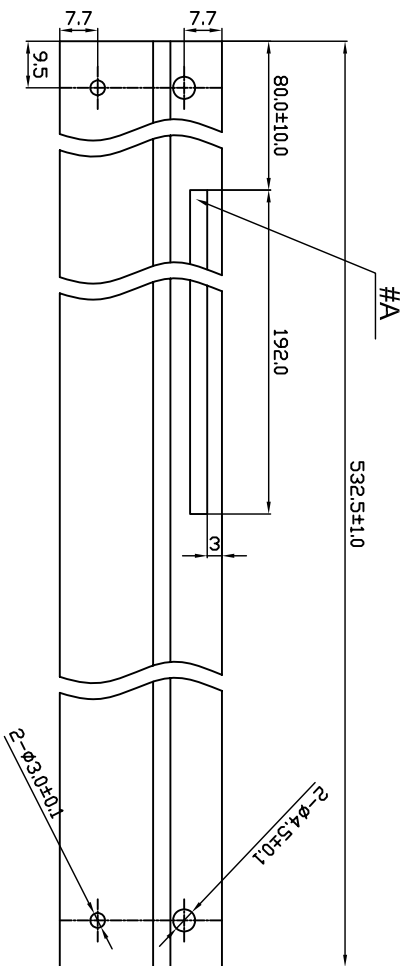
NOTE

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.

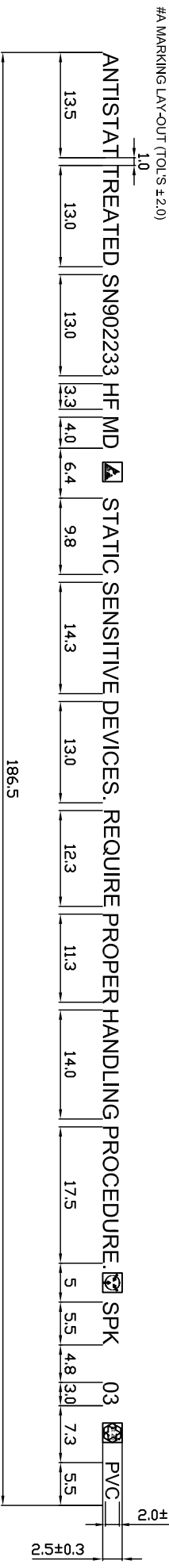


TO220F / TO220FL PLASTIC TUBE DRAWING

REV.	DATE	DESCRIPTION	DRG.
A		NEW ISSUE	



2:1



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

DRAWN BY		SIGNATURE		UNIT		PAGE	
				MM		1 OF 1	
APPROVED BY		SIGNATURE		DRAWING NUMBER		VENDOR CODE	
N.T.S.				TR-00061		N	
TITLE				REV.			
TO220F / TO220FL TUBE DRAWING				A			