

General Description

- Trench Power AlphaMOS-II technology
- Low $R_{DS(ON)}$
- Low C_{iss} and C_{rss}
- High Current Capability
- RoHS and Halogen Free Compliant

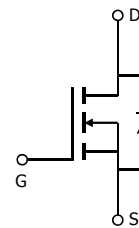
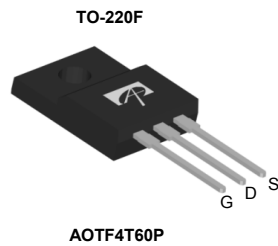
Applications

- General Lighting for LED and CCFL
- AC/DC Power supplies for Industrial, Consumer, and Telecom

Product Summary

$V_{DS} @ T_{j,max}$	700V
I_{DM}	16A
$R_{DS(ON),max}$	< 2.1 Ω
$Q_{g,typ}$	8.3nC
$E_{oss} @ 400V$	1.6 μ J

100% UIS Tested
 100% R_g Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOTF4T60P	TO-220F Pb Free	Tube	1000

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

Parameter	Symbol	Maximum	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*
		$T_C=100^\circ\text{C}$	2.5*
Pulsed Drain Current ^C	I_{DM}	16	A
Avalanche Current ^C $L=1\text{mH}$	I_{AR}	4	A
Repetitive avalanche energy ^C	E_{AR}	8	mJ
Single pulsed avalanche energy ^G	E_{AS}	203	mJ
MOSFET dv/dt ruggedness	dv/dt	50	V/ns
Peak diode recovery dv/dt		5	
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	35
		Derate above 25°C	0.3
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	T_L	300	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case	$R_{\theta JC}$	3.6	$^\circ\text{C}/\text{W}$

* 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		0.55		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	4.2	5	V	
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =2A		1.75	2.1	Ω	
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =2A		3.2		S	
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.78	1	V	
I _S	Maximum Body-Diode Continuous Current				4	A	
I _{SM}	Maximum Body-Diode Pulsed Current ^C				16	A	
DYNAMIC PARAMETERS							
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =100V, f=1MHz		522		pF	
C _{oss}	Output Capacitance				22		pF
C _{o(er)}	Effective output capacitance, energy related ^H	V _{GS} =0V, V _{DS} =0 to 480V, f=1MHz		20		pF	
C _{o(tr)}	Effective output capacitance, time related ^I				32		pF
C _{rss}	Reverse Transfer Capacitance	V _{GS} =0V, V _{DS} =100V, f=1MHz		2		pF	
R _g	Gate resistance	f=1MHz		2.9		Ω	
SWITCHING PARAMETERS							
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =480V, I _D =4A		8.3	15	nC	
Q _{gs}	Gate Source Charge				3.4		nC
Q _{gd}	Gate Drain Charge				1.9		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =300V, I _D =4A, R _G =25Ω		21		ns	
t _r	Turn-On Rise Time				19		ns
t _{D(off)}	Turn-Off DelayTime				25		ns
t _f	Turn-Off Fall Time				11		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =4A, dI/dt=100A/μs, V _{DS} =100V		309		ns	
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =4A, dI/dt=100A/μs, V _{DS} =100V		2.7		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 <300μs 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}=2.6A, V_{DD}=150V, R_G=25Ω, Starting T_J=25°C.

H. C_{o(er)} is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{(BR)DSS}.

I. C_{o(tr)} is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{(BR)DSS}.

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

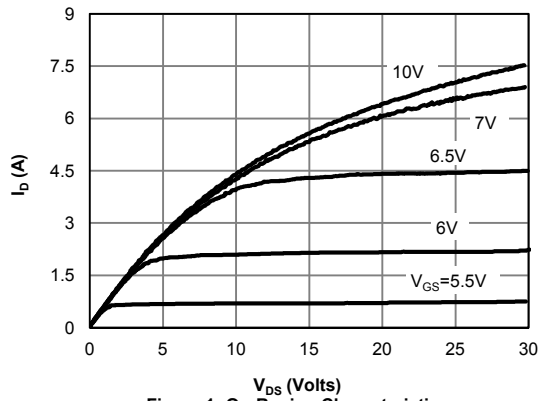


Figure 1: On-Region Characteristics

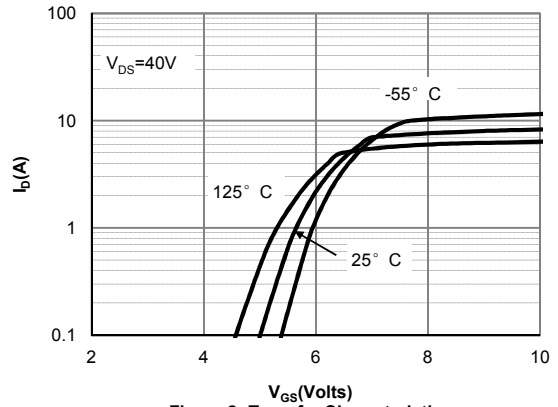


Figure 2: Transfer Characteristics

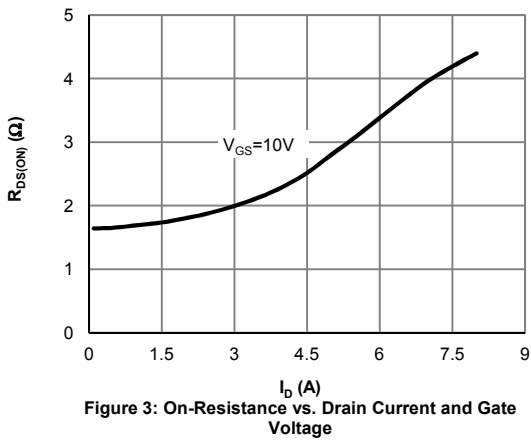


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

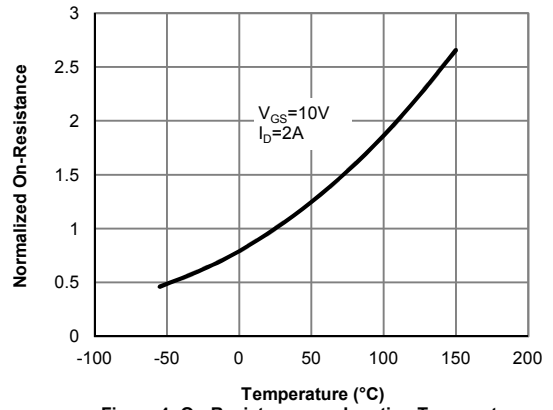


Figure 4: On-Resistance vs. Junction Temperature

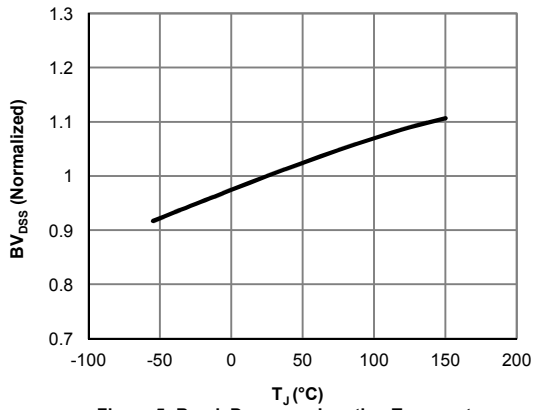


Figure 5: Break Down vs. Junction Temperature

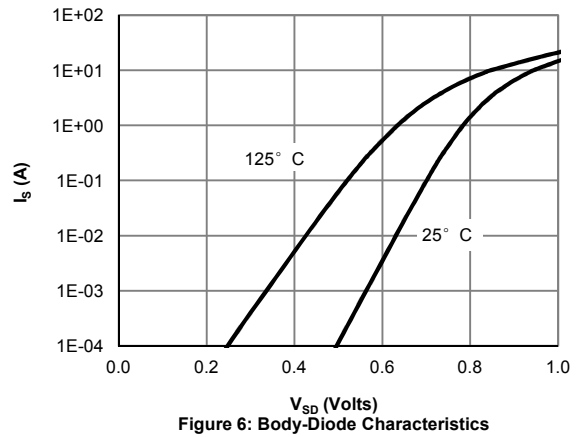


Figure 6: Body-Diode Characteristics

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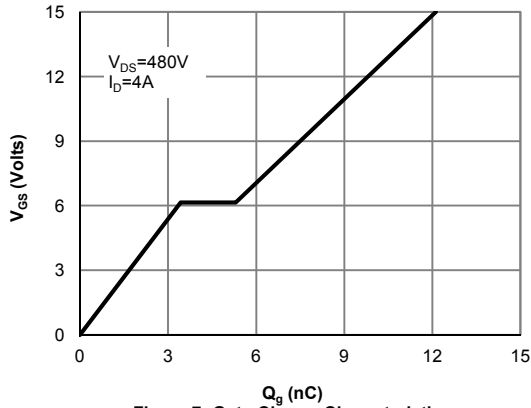


Figure 7: Gate-Charge Characteristics

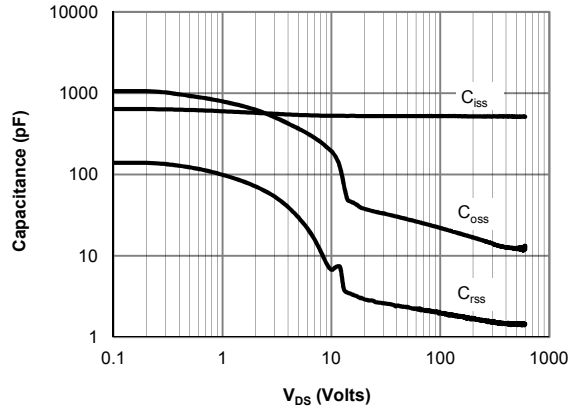


Figure 8: Capacitance Characteristics

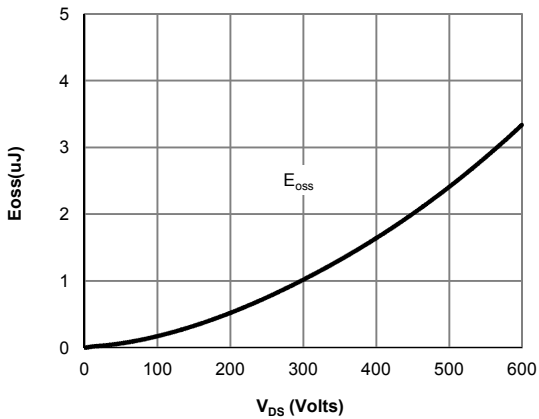


Figure 9: Coss stored Energy

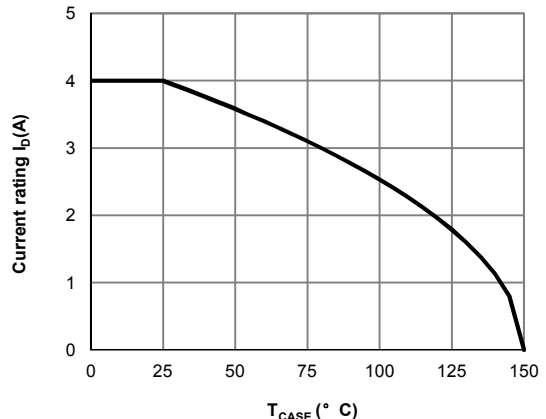


Figure 10: Current De-rating (Note F)

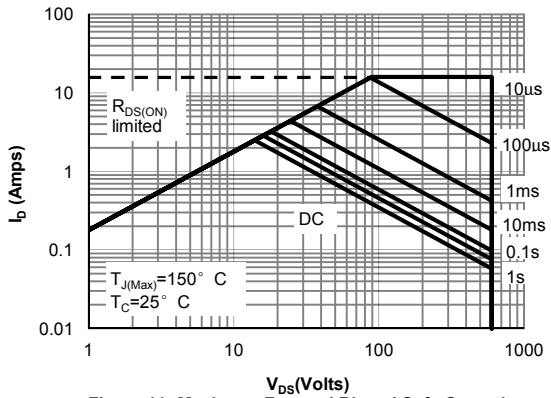


Figure 11: Maximum Forward Biased Safe Operating Area for TO-220F Pb Free (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

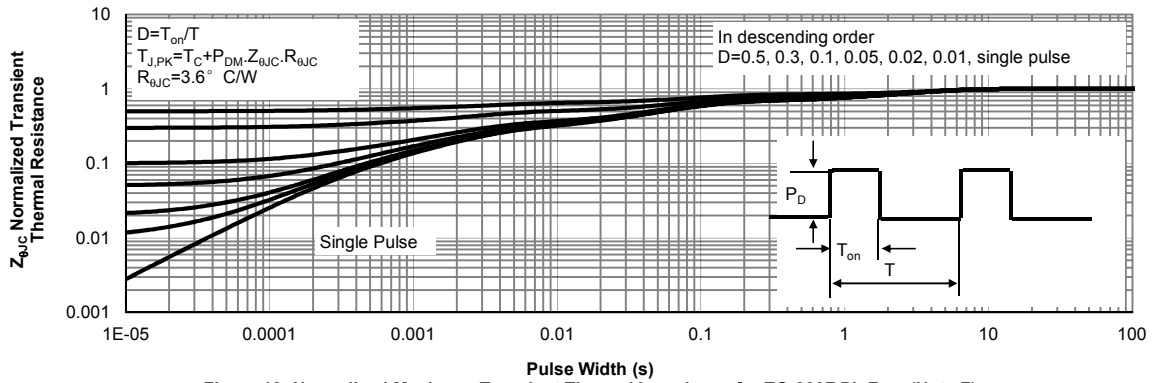
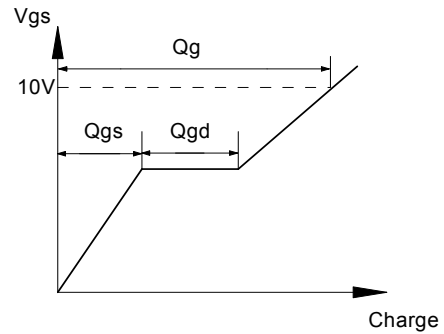
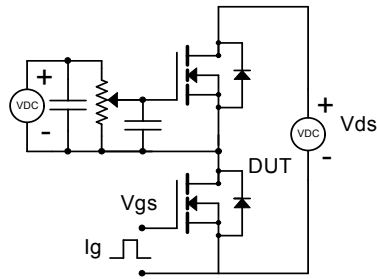
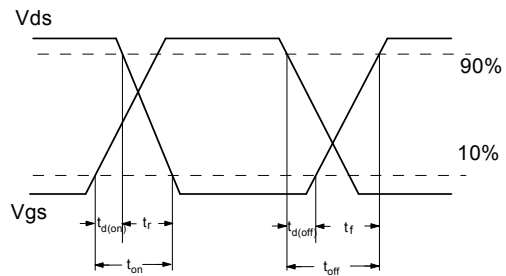
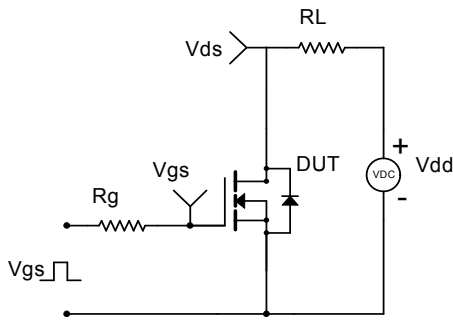


Figure 12: Normalized Maximum Transient Thermal Impedance for TO-220F Pb Free (Note F)

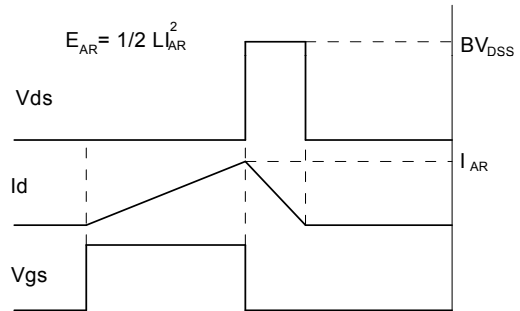
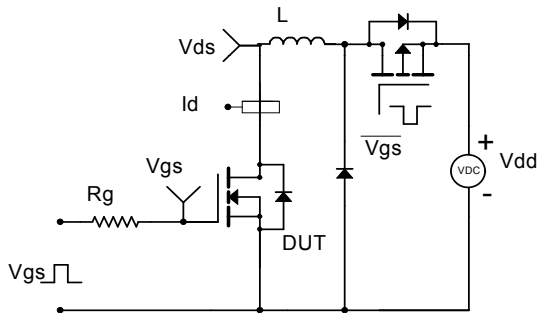
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

