



ALPHA & OMEGA
SEMICONDUCTOR

AOTF4T60P

600V,4A N-Channel MOSFET

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

Product Summary

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

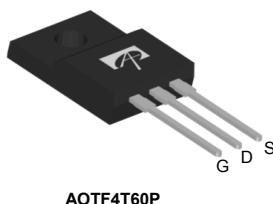
Applications

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

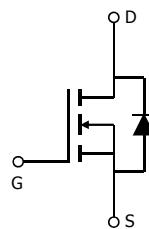
100% UIS Tested
100% R_g Tested



TO-220F



AOTF4T60P



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

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current ^A	I_D	4*	A
$T_C=100^\circ C$		2.5*	
Pulsed Drain Current ^C	I_{DM}	16	
Avalanche Current ^C $L=1mH$	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 $T_C=25^\circ C$	P_D	35	W
Derate above $25^\circ C$		0.3	W/ $^\circ C$
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	T_L	300	$^\circ C$

Thermal Characteristics

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

* Drain current limited by maximum junction temperature.

Electrical Characteristics ($T_J=25^\circ\text{C}$ 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 Delay Time	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 Delay Time			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.

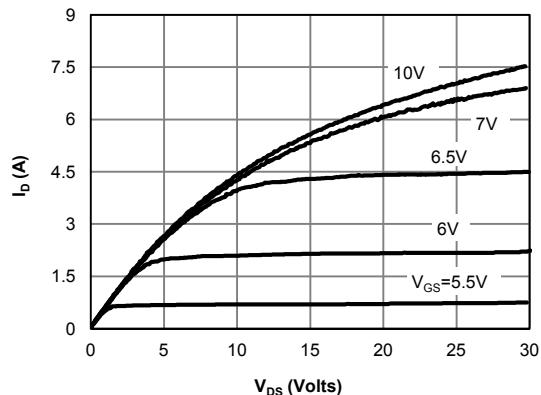
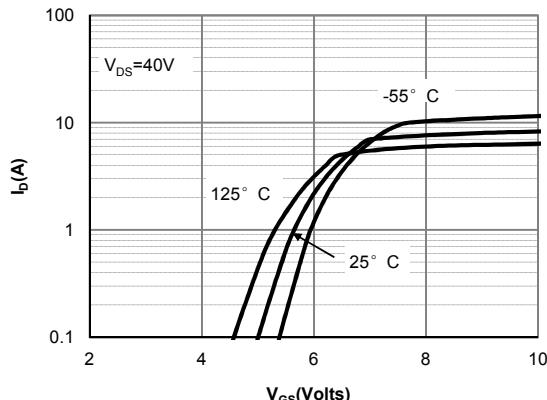
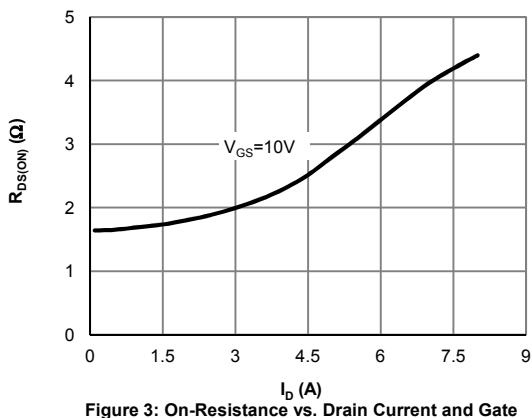
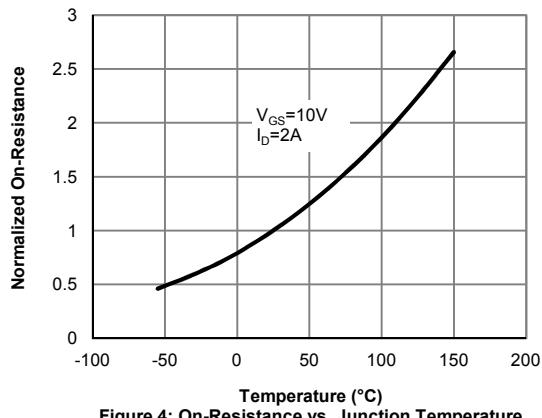
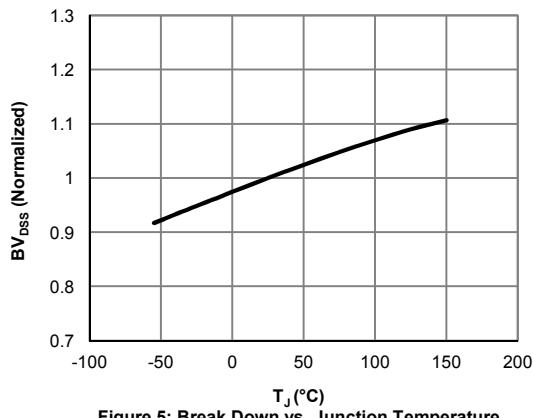
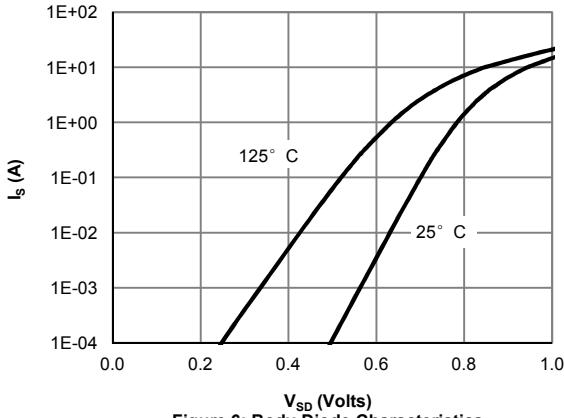
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150°C. The SOA curve provides a single pulse rating.

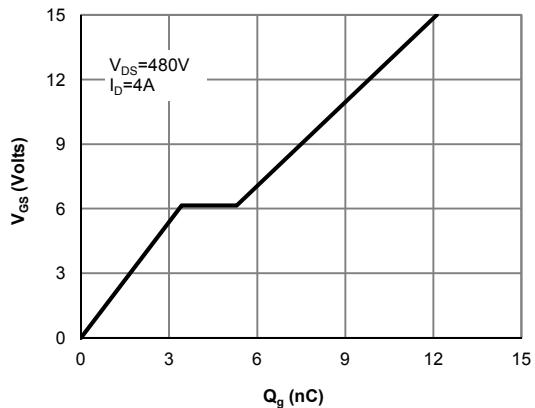
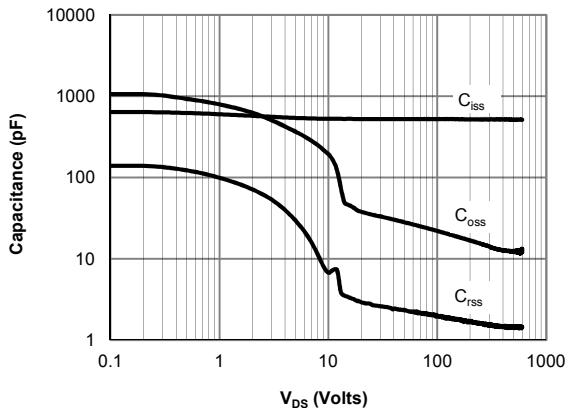
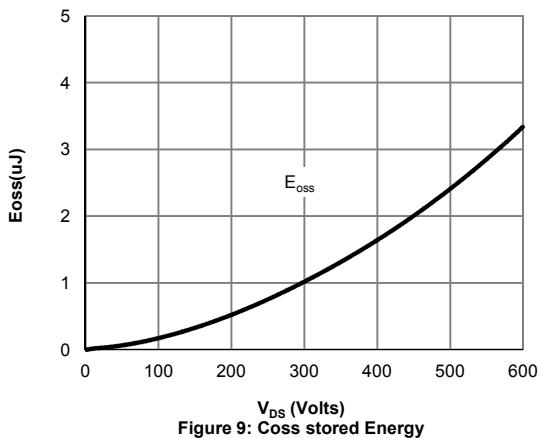
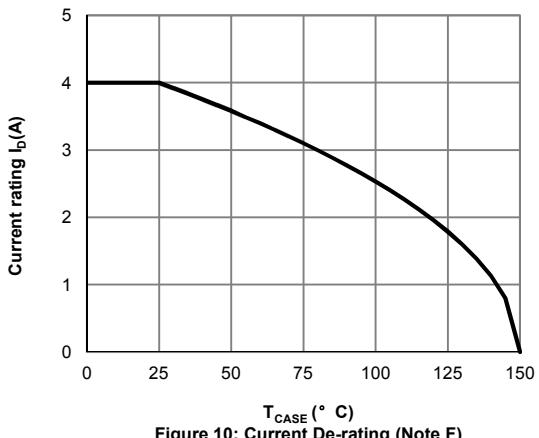
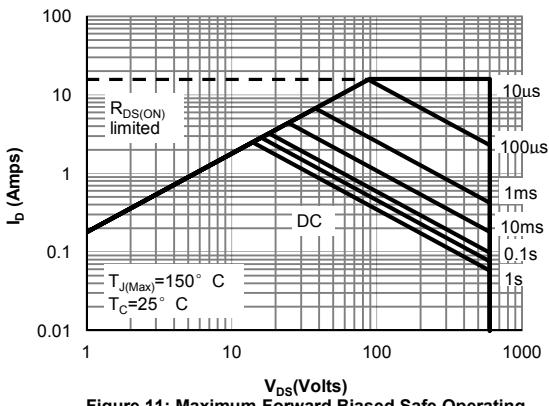
G. L=60mH, I_{AS}=2.6A, V_{DD}=150V, R_G=25Ω, Starting T_J=25°C.

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}.

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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

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

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)

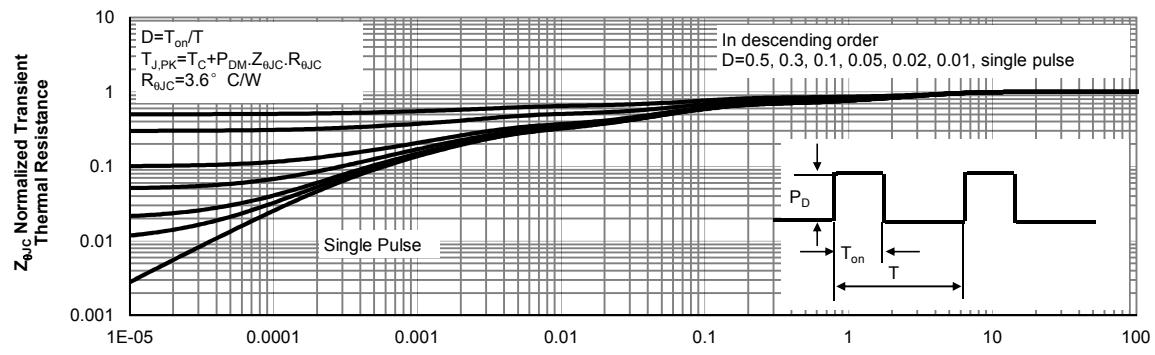
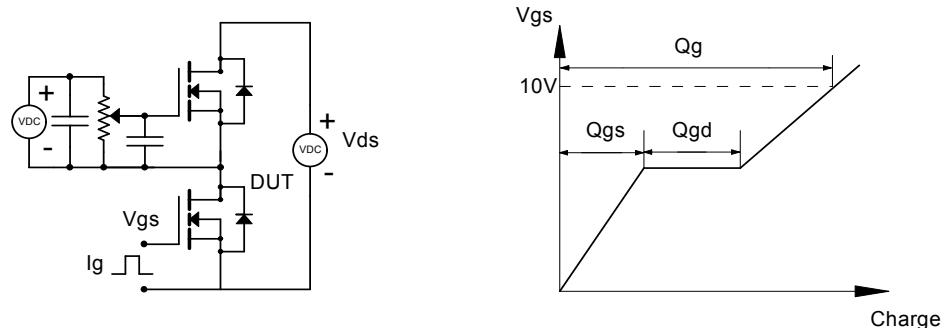
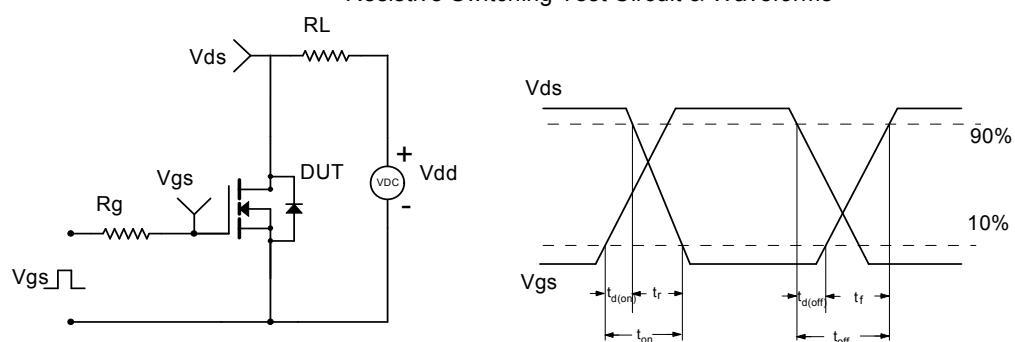
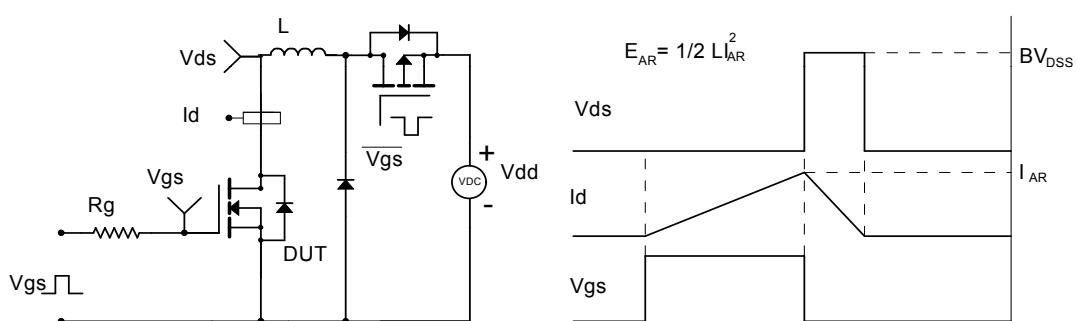
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS


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
