ALPHA & OMEGA SEMICONDUCTOR 500V, 10A N-Channel MOSFET with Fast Recovery Diode									
General Description			Product Summary						
The AOTF10N50FD has 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 this part can be adopted quickly into new and existing offline power supply designs.			V_{DS} I _D (at V _{GS} =10V) R _{DS(ON)} (at V _{GS} =10V)	600V@150℃ 10A < 0.75Ω					
			100% UIS Tested 100% R _g Tested	Green					
	TO-220F			O D					
	DTF10N50FD G D	s	0 G						
Absolute Maximum	C	s otherwise n	G						
Absolute Maximum Parameter	DTF10N50FD ^G Ratings T _A =25°C unles	ss otherwise n Symbol	G Dited AOTF10N50FD	Units					
Absolute Maximum Parameter Drain-Source Voltage	DTF10N50FD ^G Ratings T _A =25°C unles	ss otherwise no Symbol V _{DS}	G oted <u>AOTF10N50FD</u> 500	Units V					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage	DTF10N50FD ^G Ratings T _A =25°C unles	ss otherwise n Symbol	G Deted AOTF10N50FD 500 ±30	Units					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current	DTF10N50FD G Ratings $T_A=25^{\circ}C$ unles $T_C=25^{\circ}C$ $T_C=100^{\circ}C$	ss otherwise no Symbol V _{DS}	G oted <u>AOTF10N50FD</u> 500	Units V					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current	DTF10N50FD G Ratings $T_A=25^{\circ}C$ unles $T_C=25^{\circ}C$ $T_C=100^{\circ}C$	ss otherwise n Symbol V _{DS} V _{GS}	G bted AOTF10N50FD 500 ±30 10* 6* 33	Units V V					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C	Tr $_{c}$ Tr $_$	ss otherwise n Symbol V _{DS} V _{GS} I _D	G bted AOTF10N50FD 500 ±30 10* 6*	Units V V					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche	energy ^C G Ratings $T_A=25^{\circ}C$ unles $T_C=25^{\circ}C$ $T_C=100^{\circ}C$ C G G G G G G G G	S otherwise n Symbol V _{DS} V _{GS} I _D I _{DM}	G bted AOTF10N50FD 500 ±30 10* 6* 33	Units V V A					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche	energy ^C G Ratings $T_A=25^{\circ}C$ unles $T_C=25^{\circ}C$ $T_C=100^{\circ}C$ C G G G G G G G G	SS otherwise n Symbol V _{DS} V _{GS} I _D I _{DM} I _{AR}	G bted AOTF10N50FD 500 ±30 10* 6* 33 3.8	Units V V A A					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C	DTF10N50FD G Ratings $T_A=25^{\circ}C$ unles T _C =25^{\circ}C T _C =100^{\circ}C c energy ^C che energy ^G dv/dt	S otherwise n Symbol V _{DS} V _{GS} I _D I _{DM} I _{AR} E _{AR}	G bted AOTF10N50FD 500 ±30 10* 6* 33 3.8 216	Units V V A A M M J					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche Single pulsed avalance Peak diode recovery	Tr 10N50FD G Ratings $T_A=25^{\circ}C$ unles T_C=25^{\circ}C T_C=100^{\circ}C C energy C che energy G dv/dt T_C=25^{\circ}C	ss otherwise n V_{DS} V_{GS} I_D I_{DM} I_{AR} E_{AR} E_{AS} dv/dt	G bted AOTF10N50FD 500 ±30 10* 6* 33 3.8 216 433	Units V V A A A M A M J MJ V/ns W					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche Single pulsed avalance Peak diode recovery Power Dissipation ^B	T _C =25°C unles T _C =25°C T_{C} =100°C T_{C} =100°C T_{C} =100°C T_{C} =100°C T_{C} =	SS otherwise n Symbol V _{DS} V _{GS} I _D I _{DM} I _{AR} E _{AR} E _{AS} dv/dt P _D	G AOTF10N50FD 500 ±30 10* 6* 33 3.8 216 433 5	Units V V A A MJ V/ns W W/°C					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche Single pulsed avalance Peak diode recovery Power Dissipation ^B Junction and Storage	T _C =25°C unles T _C =25°C Unles T _C =25°C T _C =100°C c energy ^C che energy ^G dv/dt T _C =25°C Derate above 25°C Temperature Range	ss otherwise n V_{DS} V_{GS} I_D I_{DM} I_{AR} E_{AR} E_{AS} dv/dt	G AOTF10N50FD 500 ±30 10* 6* 33 3.8 216 433 5 50	Units V V V A A A MJ V V/ns W					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche Single pulsed avalance Peak diode recovery Power Dissipation ^B Junction and Storage Maximum lead tempe	G G Ratings $T_A=25^{\circ}C$ unles T_C=25^{\circ}C T_C=100^{\circ}C C energy C che energy G dv/dt T_C=25^{\circ}C Derate above 25^{\circ}C Temperature Range orature for soldering	SS otherwise n Symbol V _{DS} V _{GS} I _D I _{DM} I _{AR} E _{AR} E _{AR} dv/dt P _D T _J , T _{STG}	G AOTF10N50FD 500 ±30 10* 6* 33 3.8 216 433 5 50 0.4 -55 to 150	Units V V A MJ W/ns W/°C °C					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche Single pulsed avalance Peak diode recovery Power Dissipation ^B Junction and Storage Maximum lead tempe purpose, 1/8" from ca	G G Ratings $T_A=25^{\circ}C$ unles T_C=25^{\circ}C T_C=100^{\circ}C C energy C che energy G dv/dt T_C=25^{\circ}C Derate above 25^{\circ}C Temperature Range rature for soldering se for 5 seconds	SS otherwise n Symbol V _{DS} V _{GS} I _D I _{DM} I _{AR} E _{AR} E _{AS} dv/dt P _D	G AOTF10N50FD 500 ±30 10* 6* 33 3.8 216 433 5 50 0.4	Units V V A A MJ W W W/°C					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche Single pulsed avalance Peak diode recovery of Power Dissipation ^B Junction and Storage Maximum lead tempe purpose, 1/8" from ca Thermal Characteris	G Ratings $T_A=25^{\circ}C$ unles T_c=25^{\circ}C T_c=100^{\circ}C C energy C che energy G dv/dt T_c=25^{\circ}C Derate above 25^{\circ}C Temperature Range rature for soldering se for 5 seconds stics	SS otherwise n Symbol V _{DS} V _{GS} I _D I _D I _{AR} E _{AR} E _{AR} E _{AS} dv/dt P _D T _J , T _{STG} T _L	G AOTF10N50FD 500 ±30 10* 6* 33 3.8 216 433 5 50 0.4 -55 to 150 300	Units V V A MJ MJ V/ns W V/°C °C °C					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche Single pulsed avalance Power Dissipation ^B Junction and Storage Maximum lead tempe purpose, 1/8" from ca Thermal Characteris	G G Ratings T_A =25°C unles T_C=25°C T_C=100°C C C energy C che energy G dv/dt T_C=25°C Derate above 25°C Temperature Range rature for soldering se for 5 seconds stics rameter	ss otherwise m Symbol V_{DS} V_{GS} I_D I_{DM} I_{AR} E_{AR} E_{AS} dv/dt P_D T_J, T_{STG} T_L Symbol	G AOTF10N50FD 500 ±30 10* 6* 33 3.8 216 433 5 50 0.4 -55 to 150 300 AOT10N50FD	Units V V A MJ MJ W V/ns W OC OC Units					
Absolute Maximum Parameter Drain-Source Voltage Gate-Source Voltage Continuous Drain Current Pulsed Drain Current Avalanche Current ^C Repetitive avalanche Single pulsed avalance Peak diode recovery of Power Dissipation ^B Junction and Storage Maximum lead tempe purpose, 1/8" from ca Thermal Characteris	G G Ratings $T_A=25^{\circ}C$ unles T_c=25^{\circ}C T_c=100^{\circ}C C energy C che energy G dv/dt T_c=25^{\circ}C Derate above 25^{\circ}C Temperature Range rature for soldering se for 5 seconds stics rameter -Ambient A,D	SS otherwise n Symbol V _{DS} V _{GS} I _D I _D I _{AR} E _{AR} E _{AR} E _{AS} dv/dt P _D T _J , T _{STG} T _L	G AOTF10N50FD 500 ±30 10* 6* 33 3.8 216 433 5 50 0.4 -55 to 150 300	Units V V A MJ MJ V/ns W V/°C °C °C					

* Drain current limited by maximum junction temperature.



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

Symbol	Parameter	Conditions	Min	Тур	Max	Units	
STATIC	PARAMETERS	·				-	
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =10mA, V _{GS} =0V, T _J =25°C	500				
		I_D =10mA, V_{GS} =0V, T_J =150°C		600		V	
BV _{DSS} /∆TJ	Breakdown Voltage Temperature Coefficient	I _D =10mA, V _{GS} =0V		0.56		V/°C	
I _{DSS}	Zero Gate Voltage Drain Current	V_{DS} =500V, V_{GS} =0V			10		
		V _{DS} =400V, T _J =125°C			100	μA	
I _{GSS}	Gate-Body leakage current	$V_{DS}=0V, V_{GS}=\pm 30V$			±100	nA	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =5V, I _D =250μA	2.5	3.1	4.2	V	
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =5A		0.6	0.75	Ω	
g fs	Forward Transconductance	V_{DS} =40V, I_{D} =5A		10		S	
V _{SD}	Diode Forward Voltage	I _S =10A,V _{GS} =0V		0.93	1.6	V	
I _S	Maximum Body-Diode Continuous Current				10	А	
I _{SM}	Maximum Body-Diode Pulsed Current				33	А	
DYNAMI	C PARAMETERS						
C _{iss}	Input Capacitance		820	1030	1240	pF	
C _{oss}	Output Capacitance	V_{GS} =0V, V_{DS} =25V, f=1MHz	75	112	150	pF	
C _{rss}	Reverse Transfer Capacitance		5	10	15	pF	
R _g	Gate resistance	V_{GS} =0V, V_{DS} =0V, f=1MHz	1.7	3.4	5.2	Ω	
SWITCH	ING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =400V, I _D =10A	20	26	35	nC	
Q_{gs}	Gate Source Charge			4.8		nC	
Q_{gd}	Gate Drain Charge			9.5		nC	
t _{D(on)}	Turn-On DelayTime			24		ns	
t _r	Turn-On Rise Time	V_{GS} =10V, V_{DS} =250V, I_{D} =10A,		65		ns	
t _{D(off)}	Turn-Off DelayTime	$R_{G}=25\Omega$		69		ns	
t _f	Turn-Off Fall Time			50		ns	
t _{rr}	Body Diode Reverse Recovery Time	I_{F} =10A,dI/dt=100A/µs,V _{DS} =100V		116	190	ns	
Q _{rr}	Body Diode Reverse Recovery Charge	e I _F =10A,dI/dt=100A/μs,V _{DS} =100V		0.3	0.6	μC	

A. The value of R $_{\rm 0JA}$ is measured with the device in a still air environment with T $_{\rm A}$ =25 $^\circ\,$ 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 $T_{J(MAX)}=150^{\circ}$ C, Ratings are based on low frequency and duty cycles to keep initial $T_{J}=25^{\circ}$ C.

D. The R $_{\text{0JA}}$ is the sum of the thermal impedance from junction to case R $_{\text{0JC}}$ and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 μ s 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.

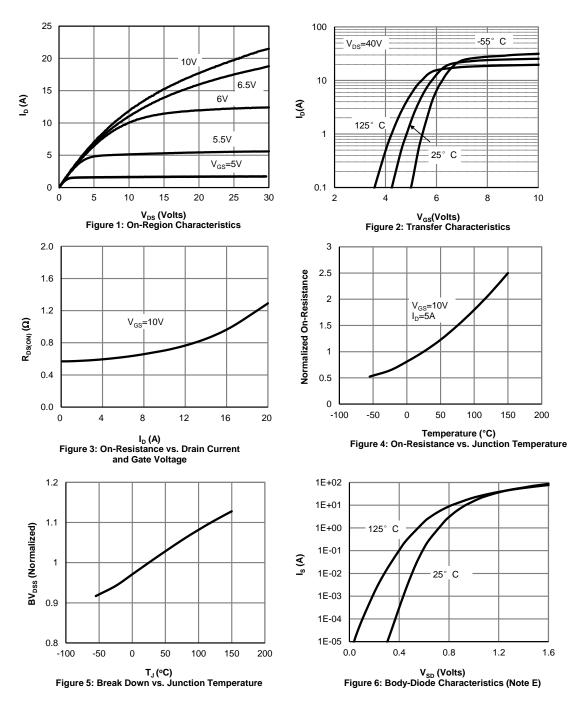
G. L=60mH, I_{AS} =3.8A, V_{DD} =150V, R_{G} =25 Ω , Starting T_{J} =25 $^{\circ}$ C

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS





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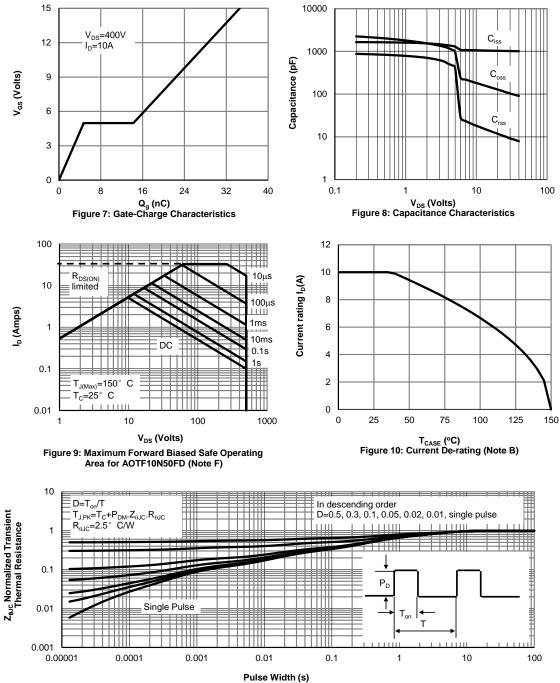
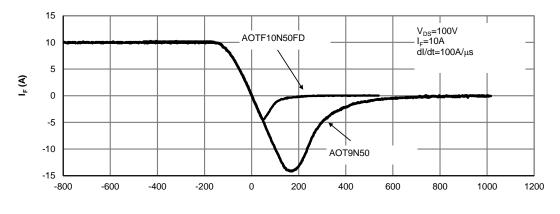


Figure 11: Normalized Maximum Transient Thermal Impedance for AOTF10N50FD (Note F)



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

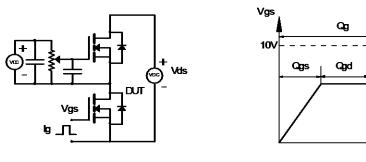


Trr (nS) Figure 12: Diode Recovery Characteristics

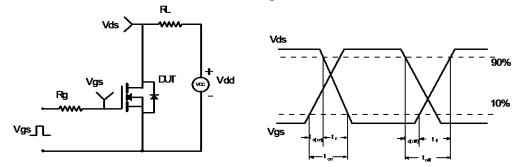


Charge

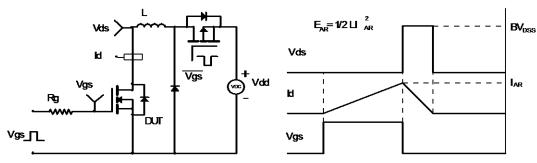
Gate Charge Test Circuit & Wave form



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

