ALPHA & OMEGA SEMICONDUCTOR

AOTF360A70NL

700V, αMOS5™ N-Channel Power Transistor

General Description

- Proprietary αMOS5™ technology
- Low $R_{DS(ON)}$
- Optimized switching parameters for better EMI performance
- Enhanced body diode for robustness and fast reverse recovery

Product Summary

V_{DS} @ $T_{j,max}$	800V
I_{DM}	48A
$R_{DS(ON),max}$	< 0.36Ω
$Q_{g,typ}$	22.5nC
E_{oss} @ 400V	2.8μJ

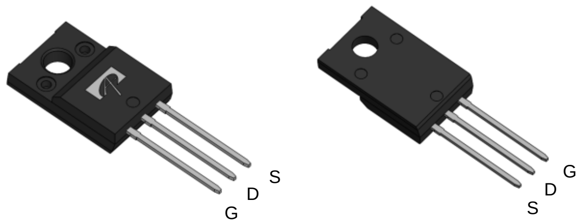
100% UIS Tested
100% R_g Tested

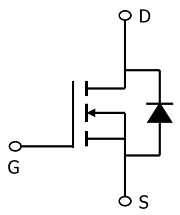
Green Product

Applications

- PFC and PWM stages (Flyback, LLC) of Adapter, PC Silverbox, Server, Gaming Power Supply, Industrial, TV, Lighting

TO-220FNL





Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOTF360A70NL	TO220FNL	Tube	1000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	700	V
Gate-Source Voltage		V_{GS}	±20	V
Gate-Source Voltage (dynamic) AC(f>1Hz)		V_{GS}	±30	V
Continuous Drain Current	T_C=25°C	I_D	12*	A
	T_C=100°C		7.6*	
Pulsed Drain Current [C]		I_{DM}	48	
Avalanche Current [C] L=1mH		I_{AR}	3.4	A
Repetitive avalanche energy [C]		E_{AR}	5.8	mJ
Single pulsed avalanche energy [G]		E_{AS}	50	mJ
MOSFET dv/dt ruggedness		dv/dt	100	V/ns
Peak diode recovery dv/dt			20	
Power Dissipation [B]	T_C=25°C	P_D	29.5	W
	Derate above 25°C		0.23	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	Maximum	Units
Maximum Junction-to-Ambient [A,D]	$R_{\theta JA}$	65	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	4.2	°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	700			V
		I_D=250µA, V_{GS}=0V, T_J=150°C		800		
BV_{DSS} /∆TJ	Breakdown Voltage Temperature Coefficient	I_D=250µA, V_{GS}=0V		0.6		V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=700V, V_{GS}=0V			1	µA
		V_{DS}=560V, T_J=125°C			10	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=5V, I_D=250µA	3.4	4	4.6	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=6A		0.316	0.36	Ω
g_{FS}	Forward Transconductance	V_{DS}=10V, I_D=6A		10		S
V_{SD}	Diode Forward Voltage	I_S=6A,V_{GS}=0V		0.86	1.2	V
I_S	Maximum Body-Diode Continuous Current				12	A
I_{SM}	Maximum Body-Diode Pulsed Current [C]				48	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz		1360		pF
C_{oss}	Output Capacitance			34		pF
$C_{o(er)}$	Effective output capacitance, energy related [H]	V_{GS}=0V, V_{DS}=0 to 480V, f=1MHz		32		pF
$C_{o(tr)}$	Effective output capacitance, time related [I]			147		pF
C_{rss}	Reverse Transfer Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz		1.7		pF
R_g	Gate resistance	f=1MHz		2		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=480V, I_D=6A		22.5		nC
Q_{gs}	Gate Source Charge			9		nC
Q_{gd}	Gate Drain Charge			6.3		nC
$T_{d(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=400V, I_D=6A, R_G=5Ω		24.5		ns
T_r	Turn-On Rise Time			17		ns
$T_{d(off)}$	Turn-Off DelayTime			34.5		ns
T_f	Turn-Off Fall Time			13		ns
T_{rr}	Body Diode Reverse Recovery Time	I_F=6A, dI/dt=100A/µs, V_{DS}=400V		310		ns
I_{rm}	Peak Reverse Recovery Current			24.5		A
Q_{rr}	Body Diode Reverse Recovery Charge			4.8		µC

A. The value of R_{qJA} 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 in a TO252 package, 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.
D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case R_{qJC} 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}=1.3A, 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% $V_{(BR)DSS}$.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

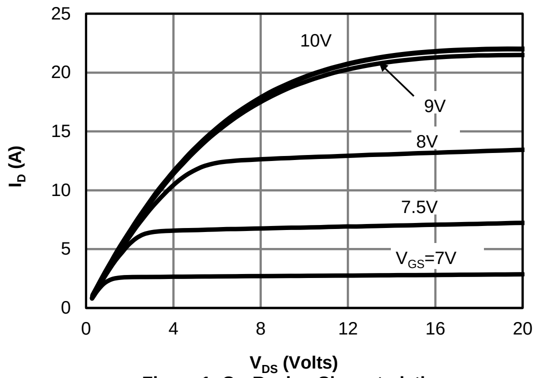


Figure 1: On-Region Characteristics

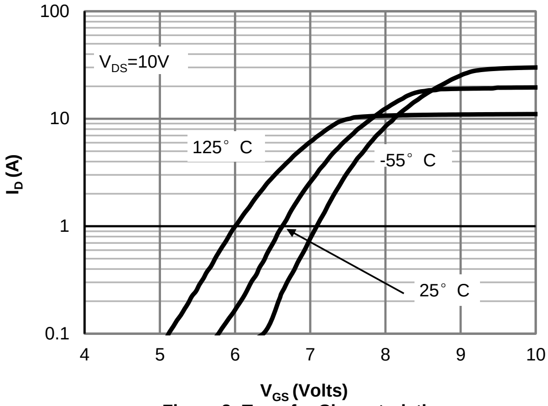


Figure 2: Transfer Characteristics

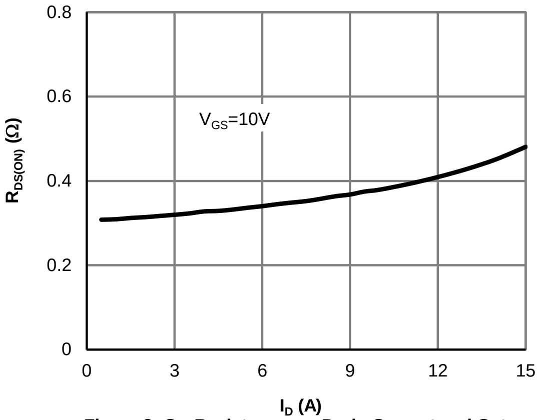


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

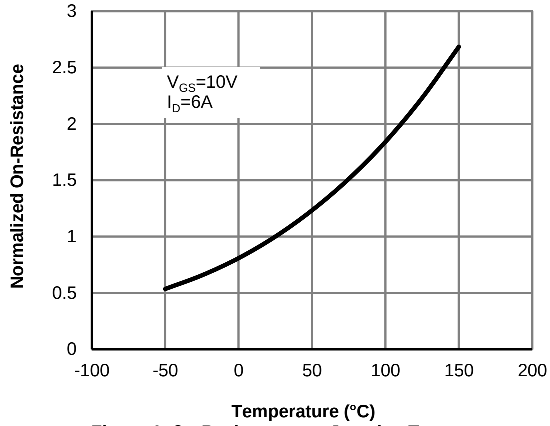


Figure 4: On-Resistance vs. Junction Temperature

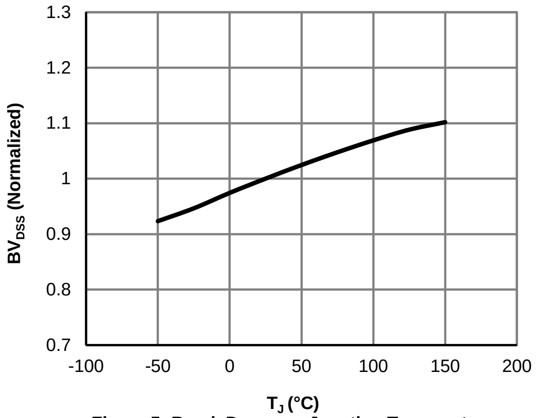


Figure 5: Break Down vs. Junction Temparature

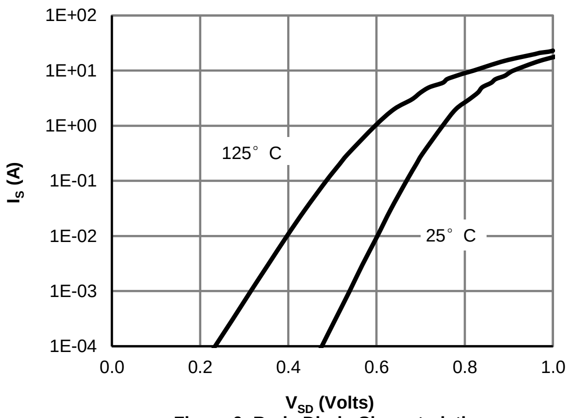


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

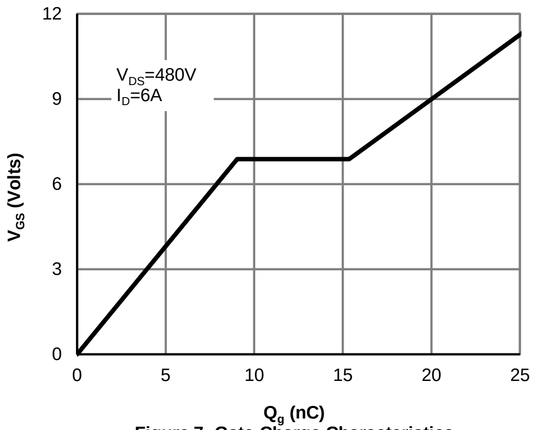


Figure 7: Gate-Charge Characteristics

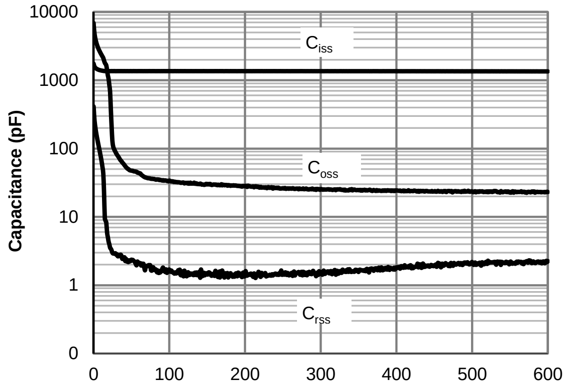


Figure 8: Capacitance Characteristics

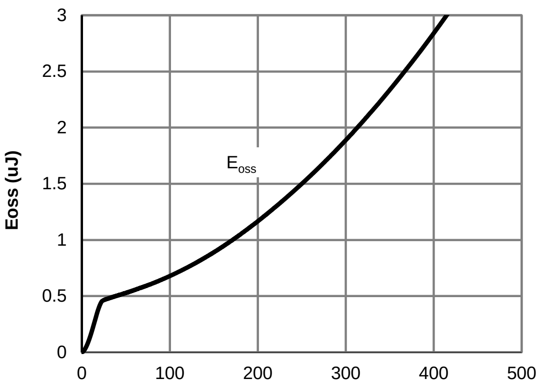


Figure 9: Coss stored Energy

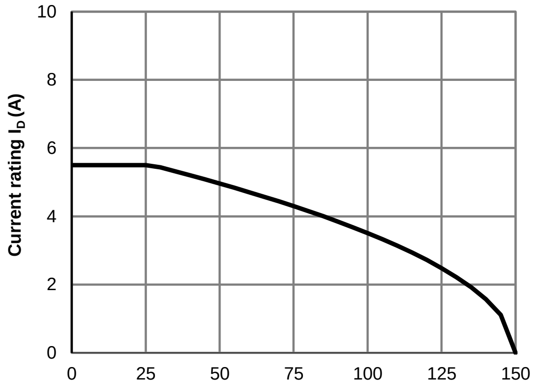


Figure 10: Current De-rating (Note F)

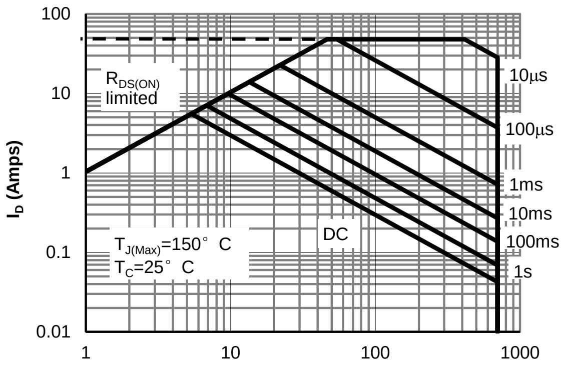


Figure 11: Maximum Forward Biased Safe Operating Area (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

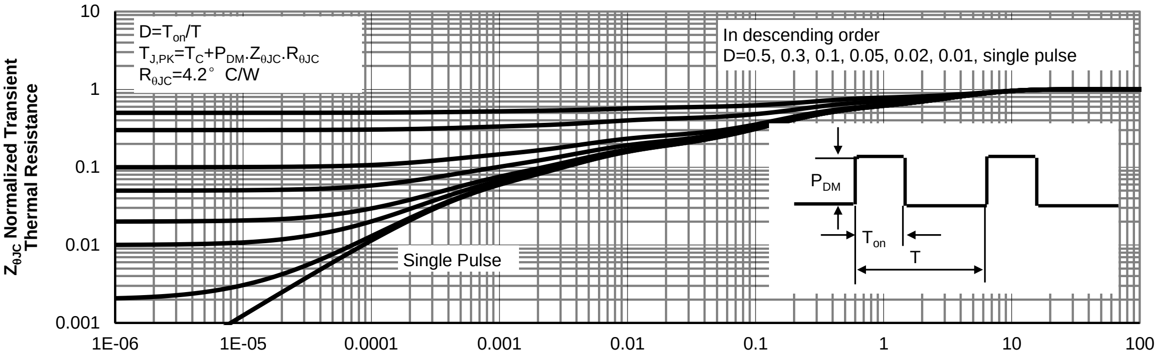
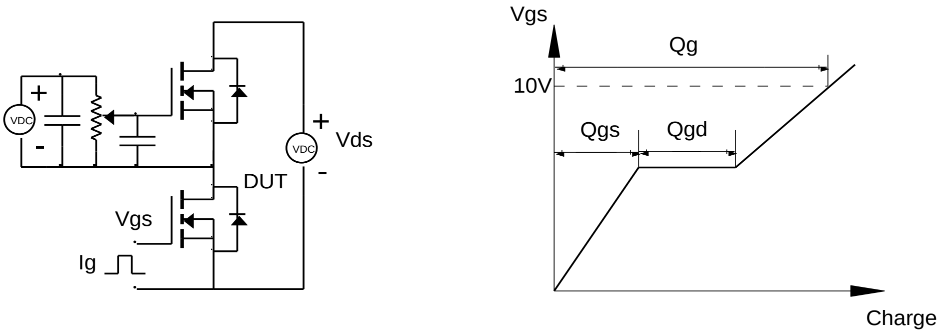
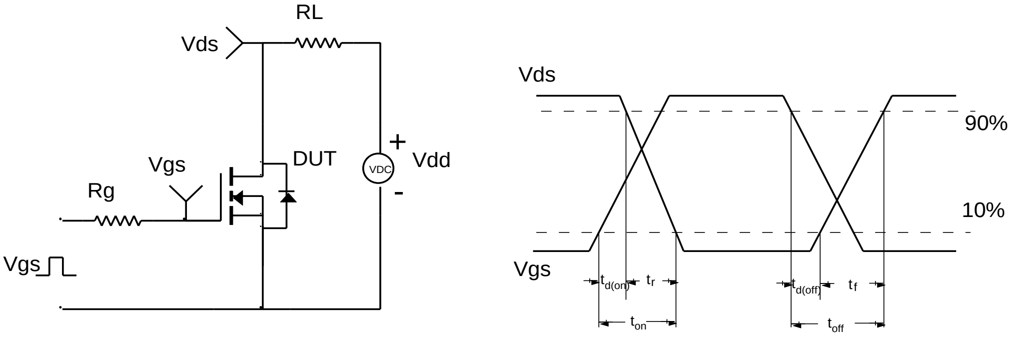


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

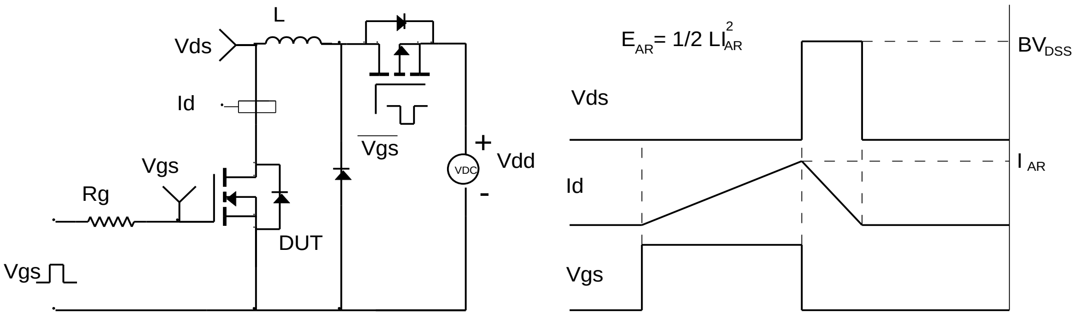
Gate Charge Test Circuit & Waveform



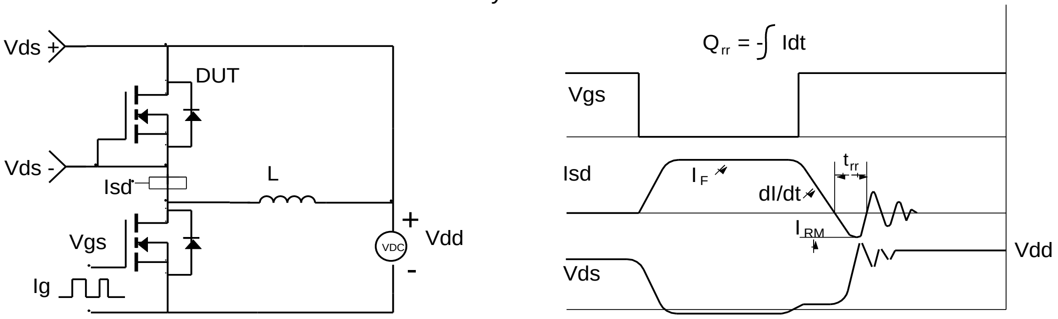
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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