



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AOWF600A60**

600V,  $\alpha$ MOS5™ N-Channel Power Transistor

### General Description

- Proprietary  $\alpha$ MOS5™ technology
- Low  $R_{DS(ON)}$
- Optimized switching parameters for better EMI performance
- Enhanced body diode for robustness and fast reverse recovery

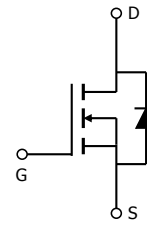
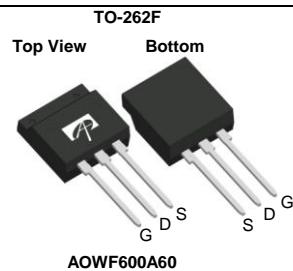
### Applications

- SMPS with PFC, Flyback and LLC topologies
- Silver ATX, adapter, TV, lighting, Server power

### Product Summary

$V_{DS} @ T_{j,max}$	700V
$I_{DM}$	32A
$R_{DS(ON),max}$	< 0.6 $\Omega$
$Q_{g,typ}$	11.5nC
$E_{oss} @ 400V$	1.8 $\mu$ J

100% UIS Tested  
100%  $R_g$  Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOWF600A60	TO262F	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	$V_{GS}$	$\pm 20$	V
Gate-Source Voltage (dynamic) AC (f>1Hz)	$V_{GS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	8*	A
		5*	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	32	
Avalanche Current <sup>C</sup> L=1mH	$I_{AR}$	1.6	A
Repetitive avalanche energy <sup>C</sup>	$E_{AR}$	1.3	mJ
Single pulsed avalanche energy <sup>G</sup>	$E_{AS}$	19	mJ
MOSFET dv/dt ruggedness	dv/dt	100	V/ns
Peak diode recovery dv/dt		20	
Power Dissipation <sup>B</sup>	$P_D$	23	W
		0.18	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 <sup>A,D</sup>	$R_{\theta JA}$	65	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	5.4	°C/W

\* Drain current limited by maximum junction temperature.

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	600			V
		I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C		700		
BV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V		0.59		V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V			1	μA
		V <sub>DS</sub> =480V, T <sub>J</sub> =125°C			10	
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =5V, I <sub>D</sub> =250μA		3.5		V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =2.1A		0.53	0.6	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =2.1A		4.2		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =2.1A, V <sub>GS</sub> =0V		0.8	1.2	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				8	A
I <sub>SM</sub>	Maximum Body-Diode Pulsed Current <sup>C</sup>				32	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =100V, f=1MHz		608		pF
C <sub>oss</sub>	Output Capacitance			19		pF
C <sub>o(er)</sub>	Effective output capacitance, energy related <sup>H</sup>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0 to 480V, f=1MHz		21		pF
C <sub>o(tr)</sub>	Effective output capacitance, time related <sup>I</sup>			76		pF
C <sub>rss</sub>	Reverse Transfer Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =100V, f=1MHz		1.3		pF
R <sub>g</sub>	Gate resistance	f=1MHz		4.6		Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =480V, I <sub>D</sub> =2.1A		11.5		nC
Q <sub>gs</sub>	Gate Source Charge			4.2		nC
Q <sub>gd</sub>	Gate Drain Charge			2.8		nC
T <sub>d(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =400V, I <sub>D</sub> =2.1A, R <sub>G</sub> =5Ω		18		ns
T <sub>r</sub>	Turn-On Rise Time			5.5		ns
T <sub>d(off)</sub>	Turn-Off DelayTime			36		ns
T <sub>f</sub>	Turn-Off Fall Time			16		ns
T <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =2.1A, di/dt=100A/μs, V <sub>DS</sub> =400V		159		ns
I <sub>rm</sub>	Peak Reverse Recovery Current			13		A
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge			1.2		μC

A. The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25°C.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=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<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25°C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> 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<sub>J(MAX)</sub>=150°C. The SOA curve provides a single pulse rating.

G. L=60mH, I<sub>AS</sub>=0.8A, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.

H. C<sub>o(er)</sub> is a fixed capacitance that gives the same stored energy as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 to 80% V<sub>(BR)DSS</sub>.

I. C<sub>o(tr)</sub> is a fixed capacitance that gives the same charging time as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 to 80% V<sub>(BR)DSS</sub>.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

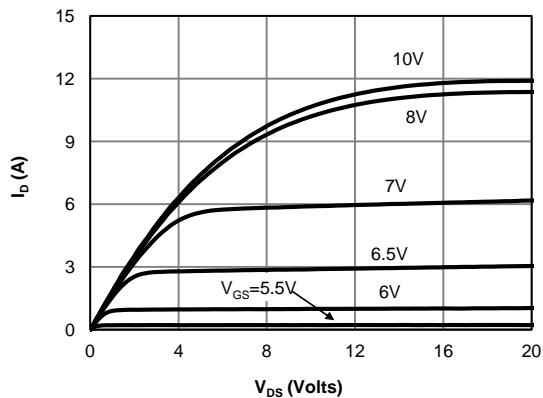


Figure 1: On-Region Characteristics

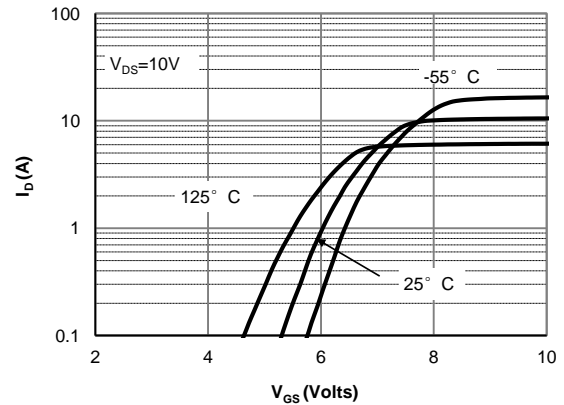


Figure 2: Transfer Characteristics

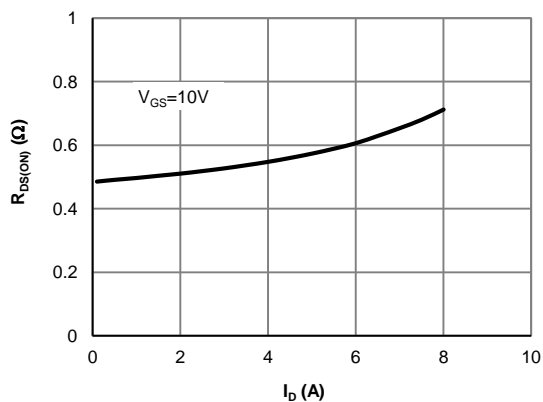


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

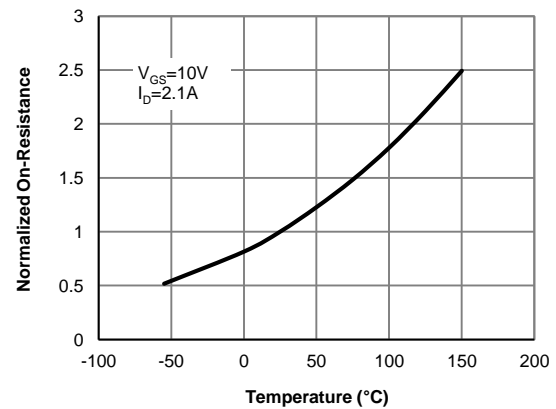


Figure 4: On-Resistance vs. Junction Temperature

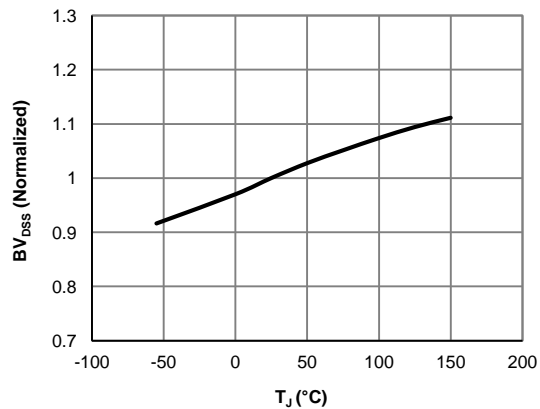


Figure 5: Break Down vs. Junction Temperature

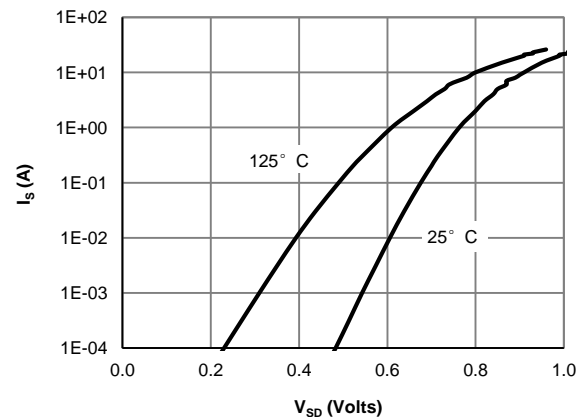
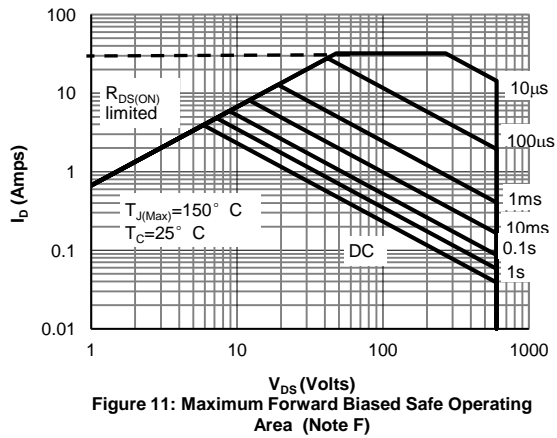
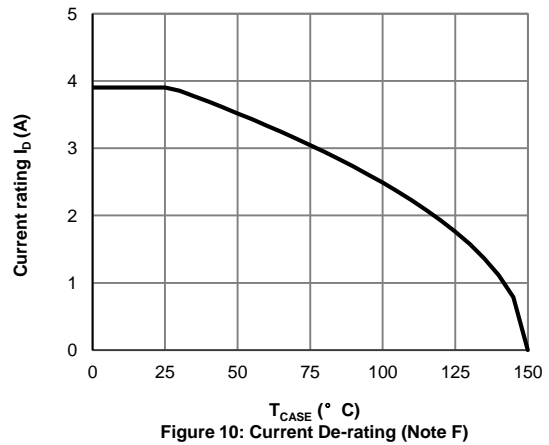
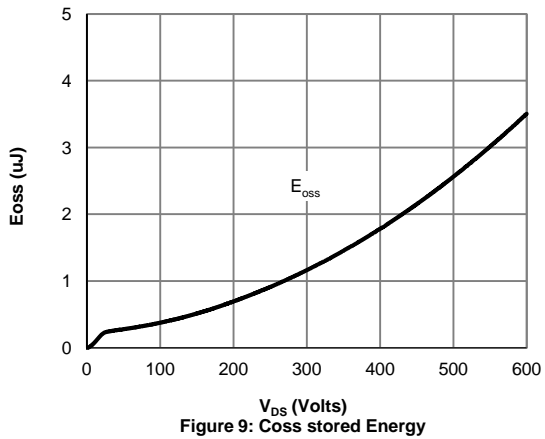
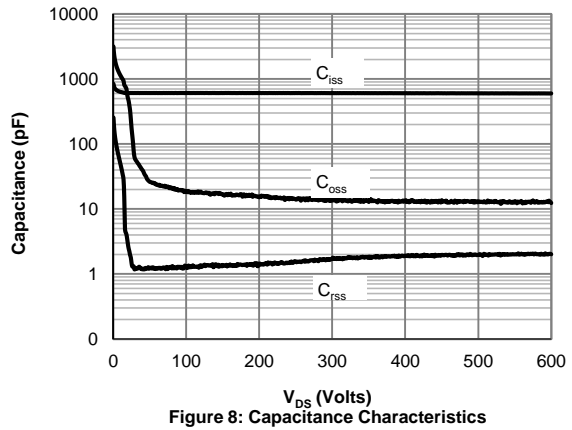
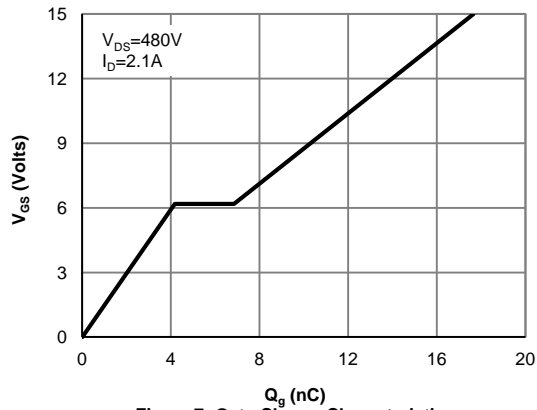
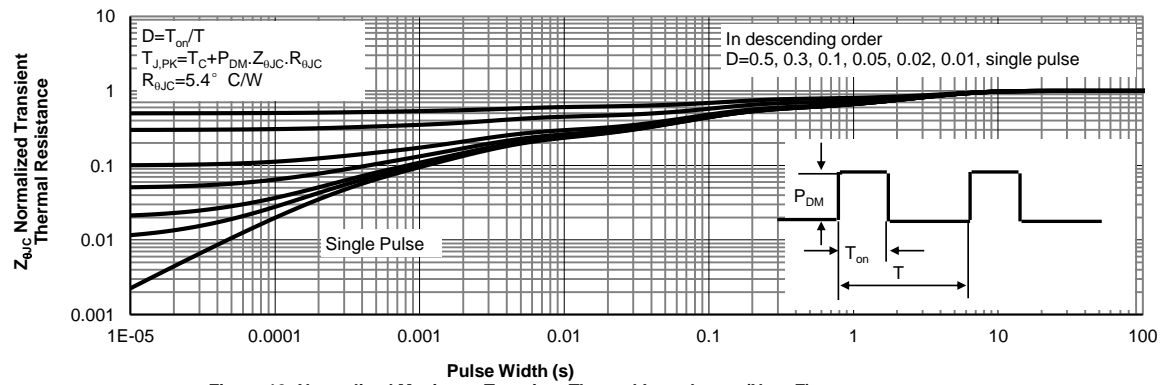


Figure 6: Body-Diode Characteristics

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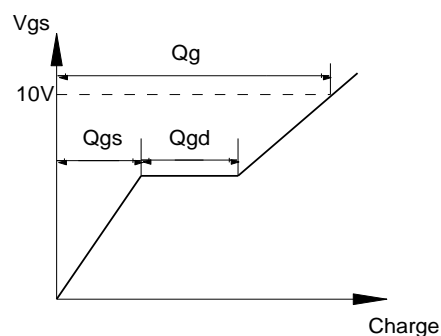
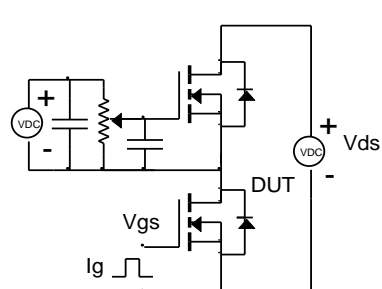


**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

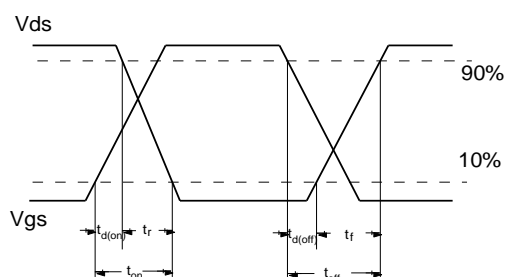
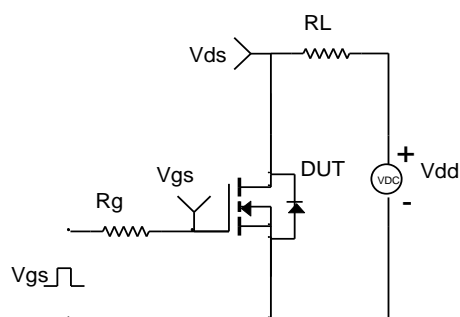


**Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)**

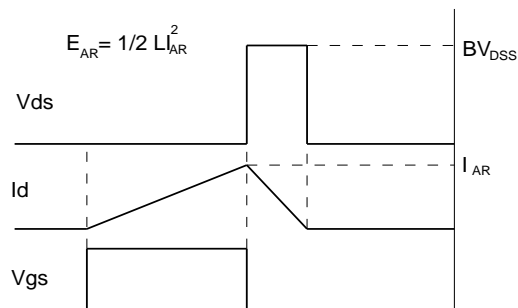
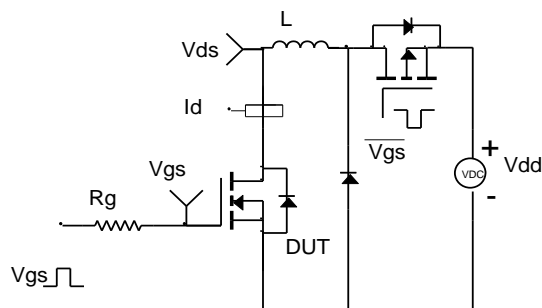
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

