ALPHA & OMEGA SEMICONDUCTOR

AOWF12T60

600V,12A N-Channel MOSFET

General Description

The AOWF12T60 is 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.

Product Summary

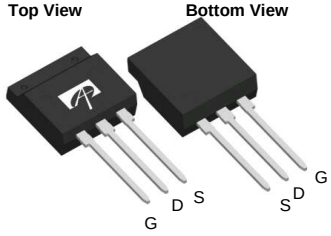
V_{DS} @ $T_{j,max}$	700
I_{DM}	48A
$R_{DS(ON),max}$	< 0.52Ω
$Q_{g,typ}$	33nC
E_{oss} @ 400V	4.5µJ

100% UIS Tested
100% R_g Tested

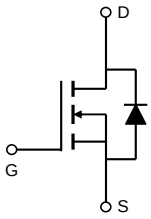
Green Product

TO-262F

Top View Bottom View



AOWF12T60



Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	600	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current	T_C=25℃	I_D	12*	A
	T_C=100℃		9*	
Pulsed Drain Current [C]		I_{DM}	48	
Avalanche Current [C,J]		I_{AR}	12	A
Repetitive avalanche energy [C,J]		E_{AR}	72	mJ
Single pulsed avalanche energy [G]		E_{AS}	607	mJ
MOSFET dv/dt ruggedness		dv/dt	50	V/ns
Peak diode recovery dv/dt			5	
Power Dissipation [B]	T_C=25℃	P_D	28	W
	Derate above 25°C		0.2	W/ °C
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds		T_L	300	℃

Thermal Characteristics

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Ambient [A,D]	$R_{\theta JA}$	65	℃/W
Maximum Junction-to-Case	$R_{\theta JC}$	4.5	℃/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} /ΔTJ	Zero Gate Voltage Drain Current	ID=250µA, VGS=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	5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=6A		0.42	0.52	Ω
g_{FS}	Forward Transconductance	V_{DS}=40V, I_D=6A		13		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.73	1	V
I_S	Maximum Body-Diode Continuous Current				12	A
I_{SM}	Maximum Body-Diode Pulsed Current				48	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz		1954		pF
C_{oss}	Output Capacitance			76		pF
$C_{o(er)}$	Effective output capacitance, energy related [H]	V_{GS}=0V, V_{DS}=0 to 480V, f=1MHz		52		pF
$C_{o(tr)}$	Effective output capacitance, time related [I]			97		pF
C_{rss}	Reverse Transfer Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz		13		pF
R_g	Gate resistance	f=1MHz		3.6		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=480V, I_D=12A		33	50	nC
Q_{gs}	Gate Source Charge			10		nC
Q_{gd}	Gate Drain Charge			9.5		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=300V, I_D=12A, R_G=25Ω		45		ns
t_r	Turn-On Rise Time			68		ns
$t_{D(off)}$	Turn-Off DelayTime			76		ns
t_f	Turn-Off Fall Time			46		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=12A,dI/dt=100A/µs,V_{DS}=100V		566		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=12A,dI/dt=100A/µs,V_{DS}=100V		7.4		µC

A. The value of $R_{\theta JA}$ 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 $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 µs 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 ratin g.

G. L=60mH, I_{AS}=4.5A, 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% $V_{(BR)DSS}$.

J. L=1.0mH, V_{DD}=150V, R_G=25Ω, Starting T_J=25°C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

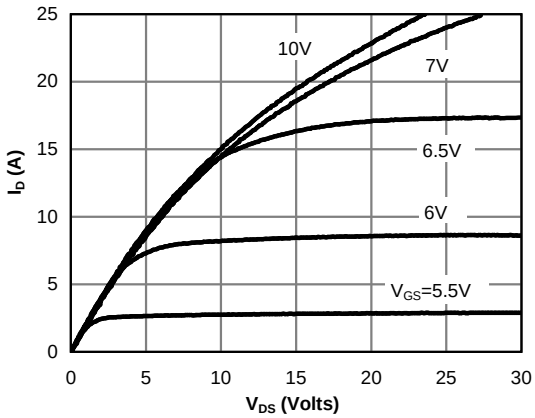


Fig 1: On-Region Characteristics

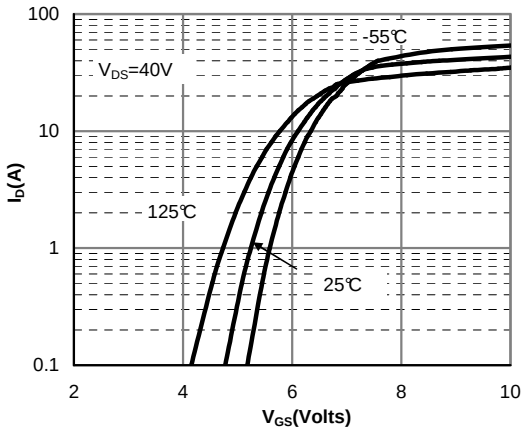


Figure 2: Transfer Characteristics

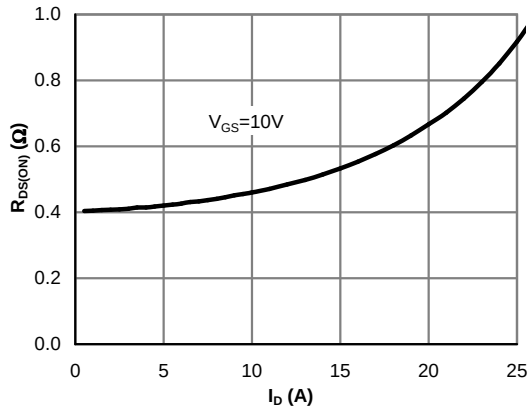


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

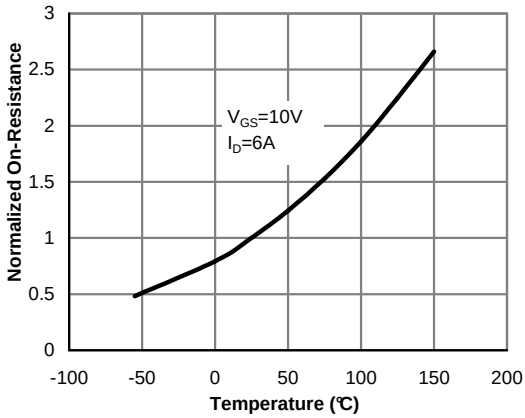


Figure 4: On-Resistance vs. Junction Temperature

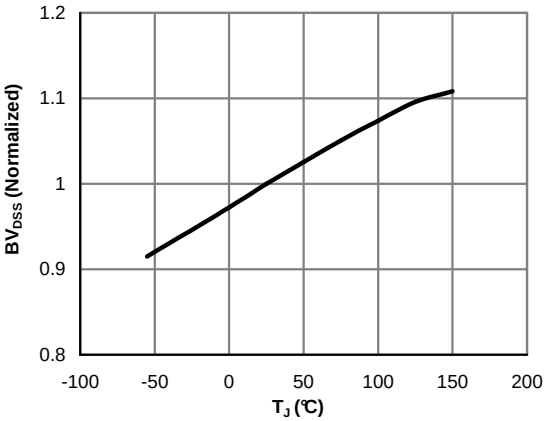


Figure 5:Break Down vs. Junction Temparature

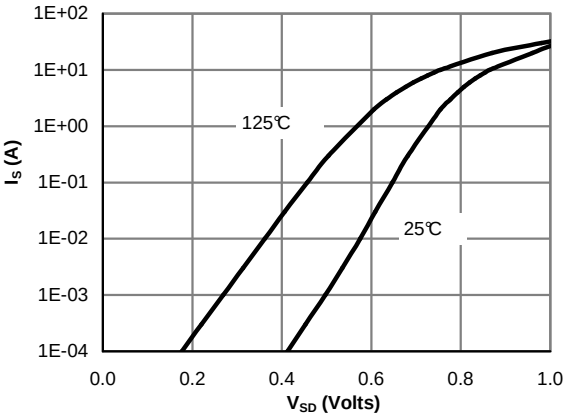


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

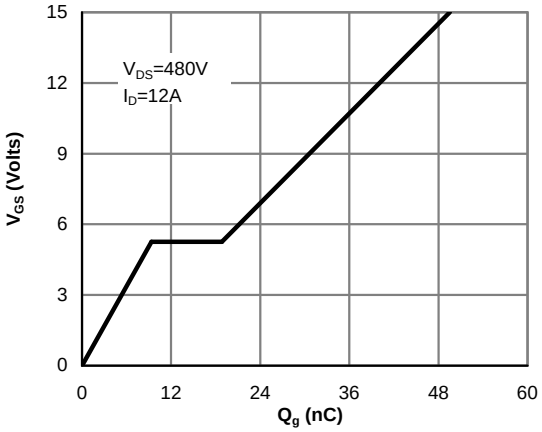


Figure 7: Gate-Charge Characteristics

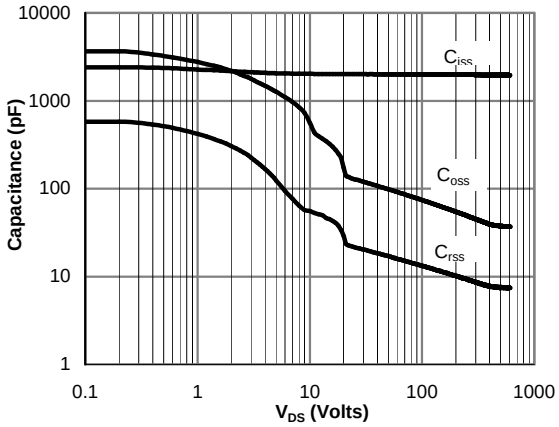


Figure 8: Capacitance Characteristics

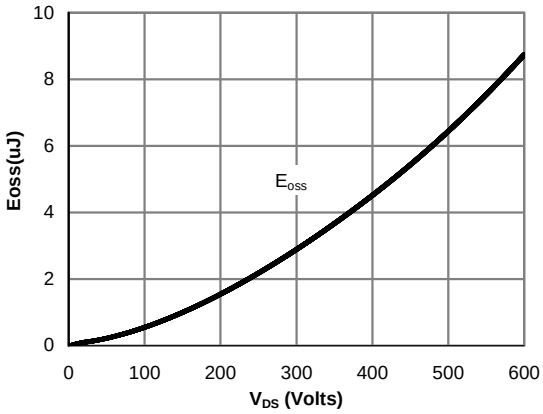


Figure 9: Coss stored Energy

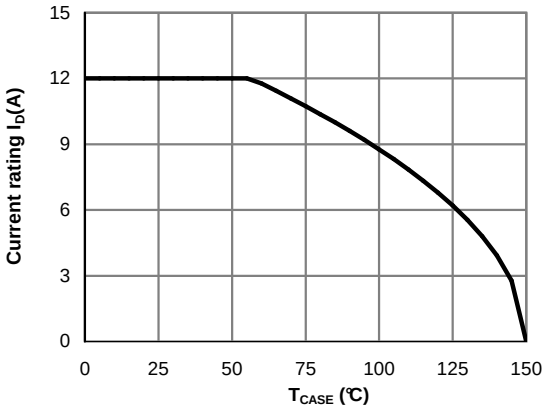


Figure 10: Current De-rating (Note B)

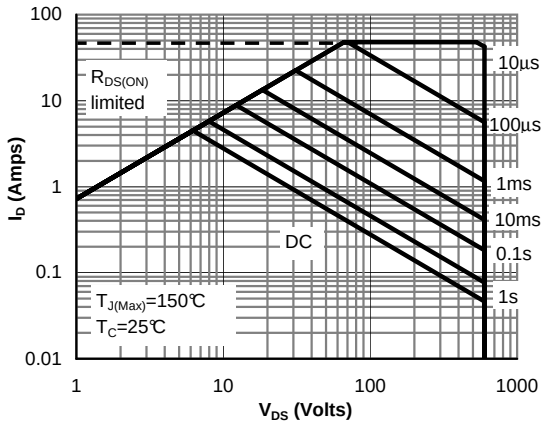


Figure 11: Maximum Forward Biased Safe Operating Area for AOWF12T60 (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

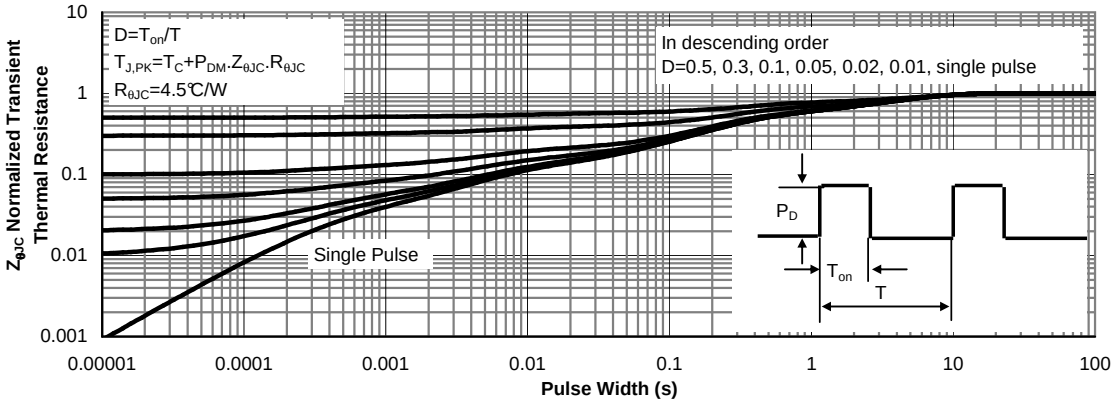
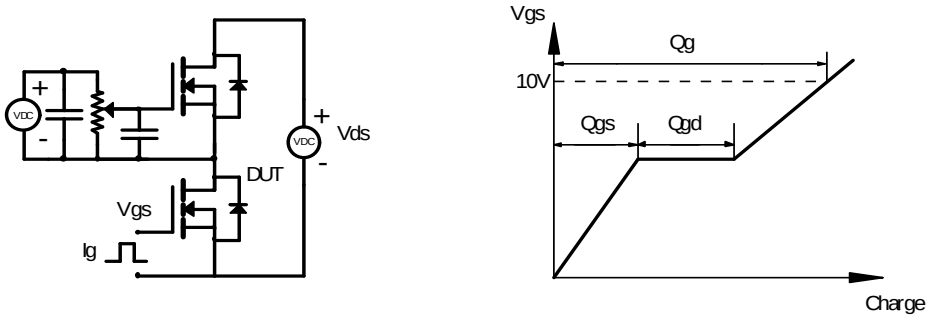
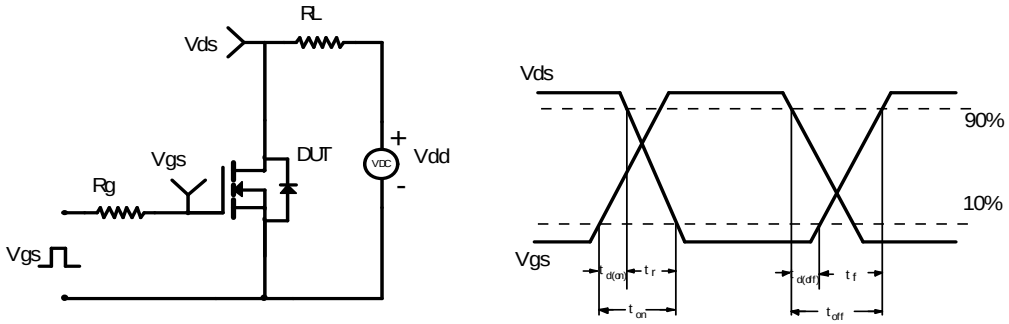


Figure 12: Normalized Maximum Transient Thermal Impedance for AOWF12T60 (Note F)

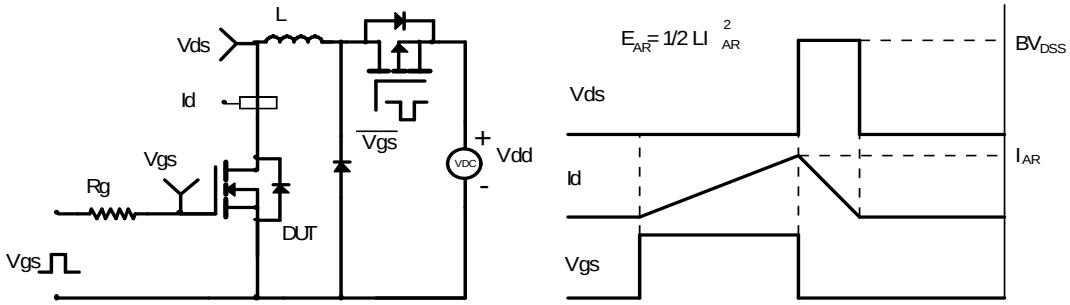
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms