ALPHA & OMEGA SEMICONDUCTOR

AOT16N50/AOTF16N50
## 500V, 16A N-Channel MOSFET

General Description

The AOT16N50 & AOTF16N50 have 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 these parts can be adopted quickly into new and existing offline power supply designs.

For Halogen Free add "L" suffix to part number:
AOT16N50L & AOTF16N50L
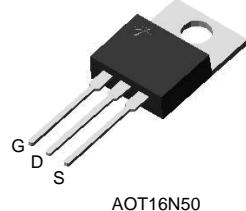
Product Summary

V_{DS}	600V@150℃
I_D (at V_{GS}=10V)	16A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 0.37Ω

100% UIS Tested
100% R_g Tested

RoHS Compliant

TO-220   Top View   TO-220F

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AOT16N50

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AOTF16N50

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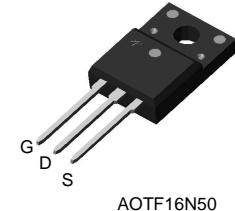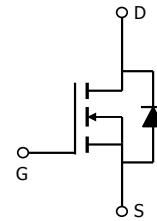
Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	AOT16N50	AOTF16N50	Units
Drain-Source Voltage		V_{DS}	500		V
Gate-Source Voltage		V_{GS}	±30		V
Continuous Drain Current	T_C=25℃	I_D	16	16*	A
	T_C=100℃		11	11*	
Pulsed Drain Current [C]		I_{DM}	64		A
Avalanche Current [C]		I_{AR}	6		A
Repetitive avalanche energy [C]		E_{AR}	540		mJ
Single plused avalanche energy [G]		E_{AS}	1080		mJ
Peak diode recovery dv/dt		dv/dt	5		V/ns
Power Dissipation [B]	T_C=25℃	P_D	278	50.0	W
	Derate above 25°C		2.2	0.4	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	AOT16N50	AOTF16N50	Units
Maximum Junction-to-Ambient [A,D]	$R_{\theta JA}$	65	65	℃/W
Maximum Case-to-sink [A]	$R_{\theta CS}$	0.5	--	℃/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.45	2.5	℃/W

* Drain current limited by maximum junction temperature.

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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	500			V
		I$_D$=250µA, V$_{GS}$=0V, T$_J$=150°C		600		
BV$_{DSS}$/ΔTJ	Zero Gate Voltage Drain Current	ID=250µA, VGS=0V		0.5		V/°C
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=500V, V$_{GS}$=0V			1	µA
		V$_{DS}$=400V, 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	3.3	4	4.5	V
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=8A		0.29	0.37	Ω
g$_{FS}$	Forward Transconductance	V$_{DS}$=40V, I$_D$=8A		20		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A,V$_{GS}$=0V		0.71	1	V
I$_S$	Maximum Body-Diode Continuous Current				16	A
I$_{SM}$	Maximum Body-Diode Pulsed Current				64	A
DYNAMIC PARAMETERS						
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=25V, f=1MHz	1531	1914	2297	pF
C$_{oss}$	Output Capacitance		153	191	229	pF
C$_{rss}$	Reverse Transfer Capacitance		11	16	20	pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz	1.75	3.5	5.3	Ω
SWITCHING PARAMETERS						
Q$_g$	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=400V, I$_D$=16A	34	42.8	51	nC
Q$_{gs}$	Gate Source Charge		7.5	9.3	11	nC
Q$_{gd}$	Gate Drain Charge		16	20.3	24	nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=250V, I$_D$=16A, R$_G$=25Ω		44		ns
t$_r$	Turn-On Rise Time			84		ns
t$_{D(off)}$	Turn-Off DelayTime			92		ns
t$_f$	Turn-Off Fall Time			50		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=16A,dI/dt=100A/µs,V$_{DS}$=100V	265	334	400	ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=16A,dI/dt=100A/µs,V$_{DS}$=100V	4.5	6	7.5	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.
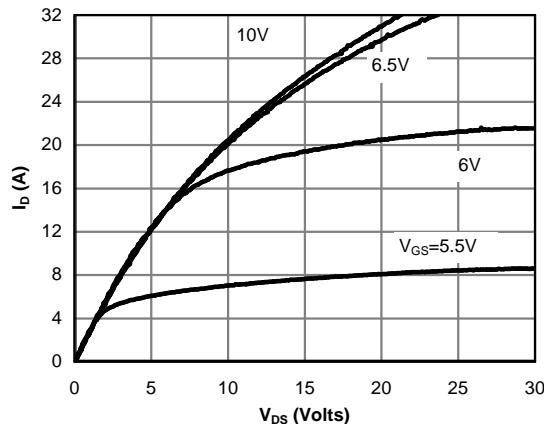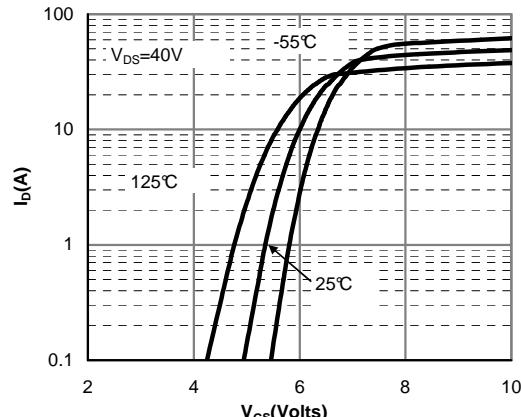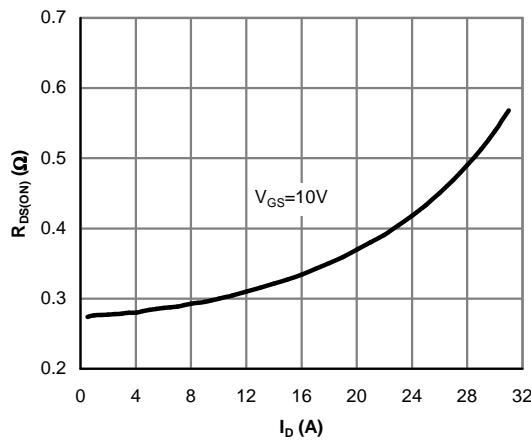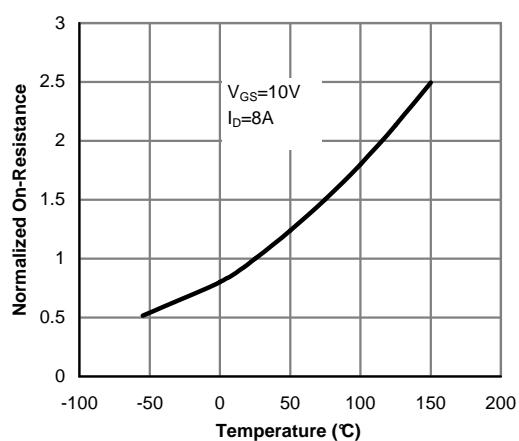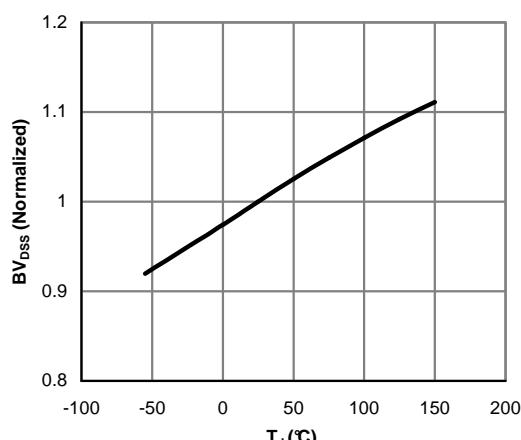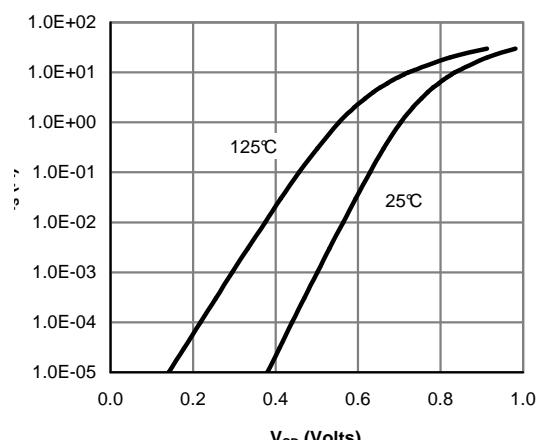
D. The R$_{θJA}$ is the sum of the thermal impedance from junction to case R$_{θJC}$ and case to ambient.
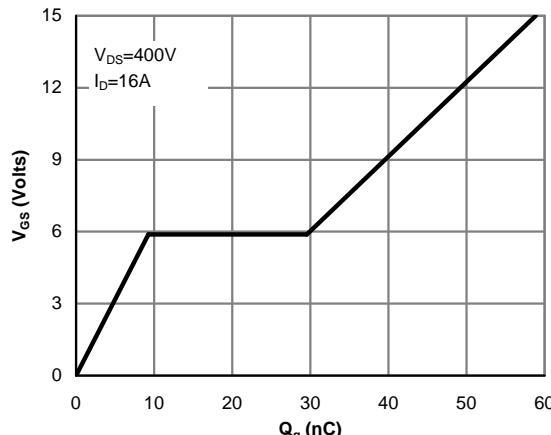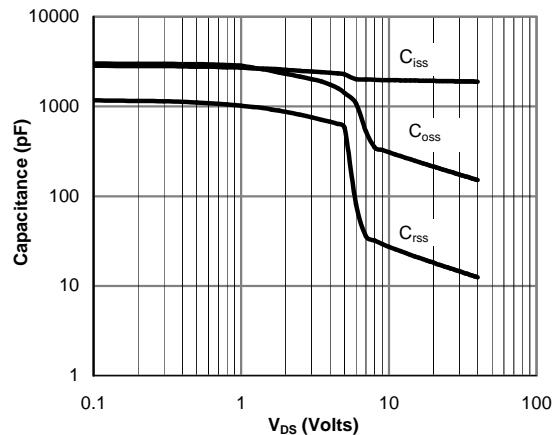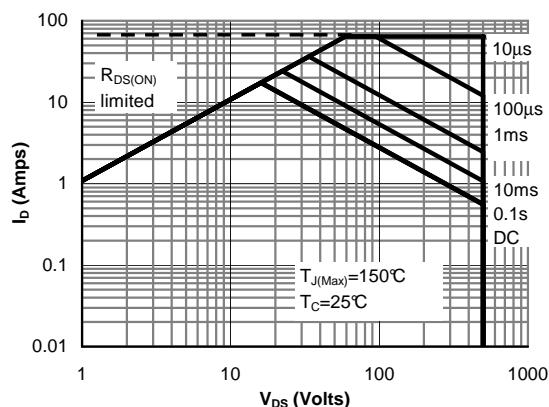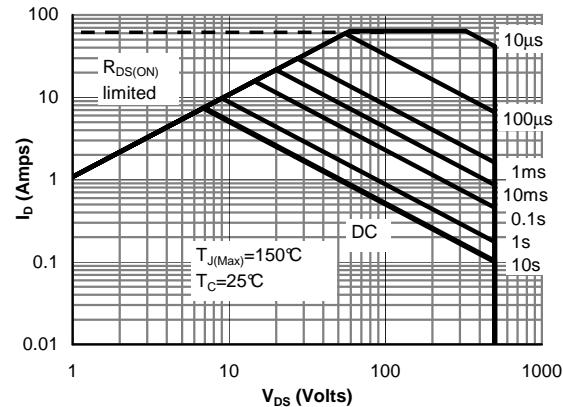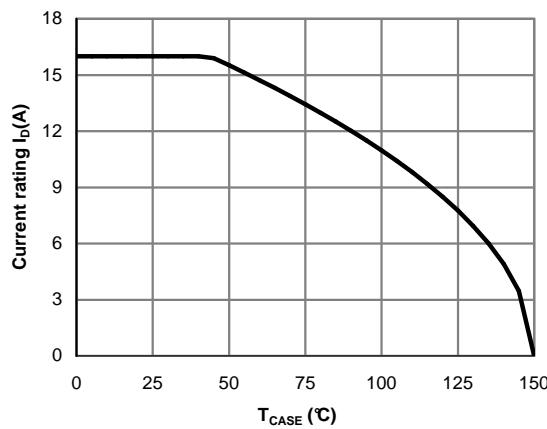
E. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.

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$_{AS}$=6A, V$_{DD}$=150V, R$_G$=25Ω, Starting T$_J$=25°C

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**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)

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics

**Figure 9: Maximum Forward Biased Safe Operating Area for AOT16N50 (Note F)**

**Figure 10: Maximum Forward Biased Safe Operating Area for AOTF16N50 (Note F)**

Figure 11: Current De-rating (Note B)
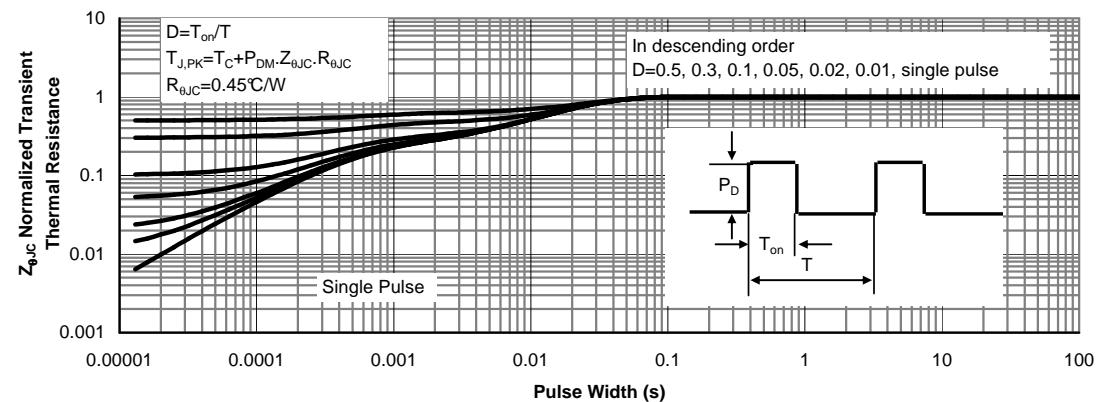
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

**Figure 12: Normalized Maximum Transient Thermal Impedance for AOT16N50 (Note F)**
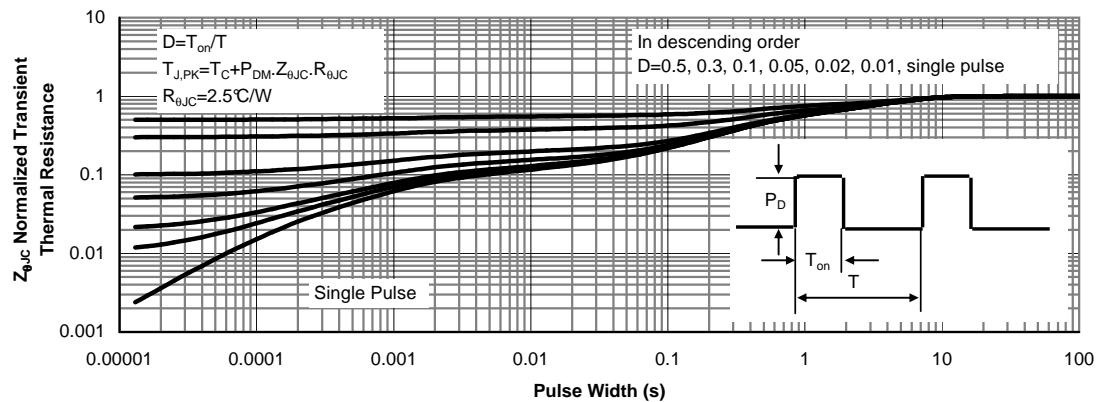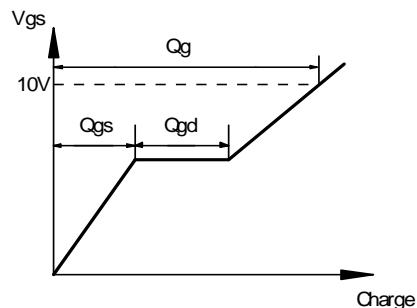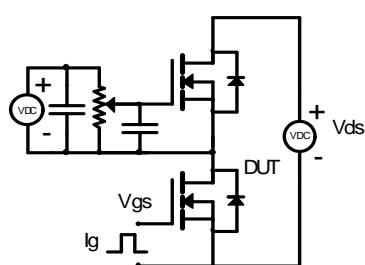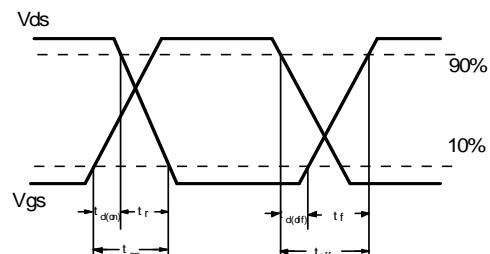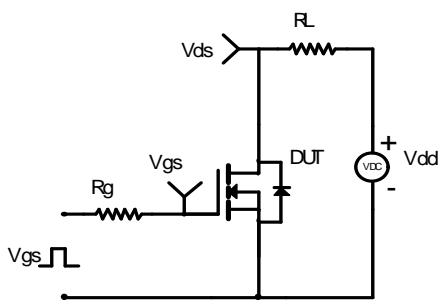
Figure 13: Normalized Maximum Transient Thermal Impedance for AOTF16N50 (Note F)

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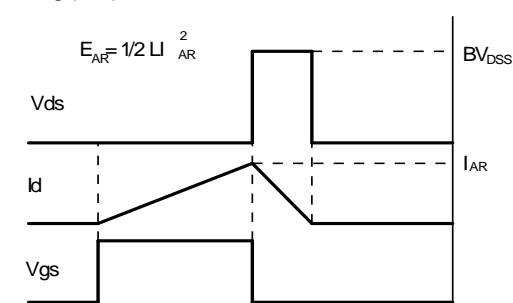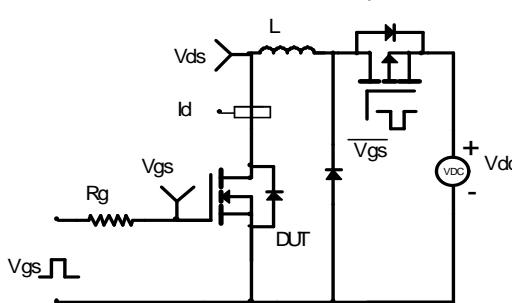
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2 \, L I_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int I \, dt$$