



ALPHA & OMEGA
SEMICONDUCTOR



AOD3N50

3A, 500V N-Channel MOSFET

General Description

The AOD3N50 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 these parts can be adopted quickly into new and existing offline power supply designs.

Features

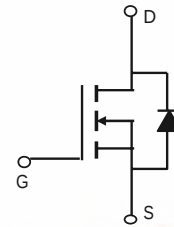
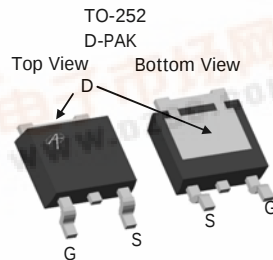
V_{DS} (V) = 600V @ 150°C

I_D = 2.8A

$R_{DS(on)}$ < 3Ω (V_{GS} = 10V)

100% UIS Tested!

100% R_g Tested!



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current ^B	I_D	2.8	A
		1.8	
Pulsed Drain Current ^C	I_{DM}	9.0	
Avalanche Current ^C	I_{AR}	2.0	A
Repetitive avalanche energy ^C	E_{AR}	60	mJ
Single pulsed avalanche energy ^H	E_{AS}	120	mJ
Peak diode recovery dv/dt	dv/dt	5	V/ns
Power Dissipation ^B	P_D	57	W
		0.45	W/°C
Junction and Storage Temperature Range	T_J, T_{STG}	-50 to 150	°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	T_L	300	°C

Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Units
Maximum Junction-to-Ambient ^{A,G}	$R_{\theta JA}$	45	55	°C/W
Maximum Case-to-Sink ^A	$R_{\theta CS}$	-	0.5	°C/W
Maximum Junction-to-Case ^{D,F}	$R_{\theta JC}$	1.8	2.2	°C/W

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 =125°C		600		V
BV _{DSS} /ΔT _J	Breakdown Voltage Temperature Coefficient	I _D =250μA, V _{GS} =0V		0.54		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	μA
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	3.5	4.1	4.7	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =1.5A		2.3	3	Ω
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =1.5A		2.8		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.78	1	V
I _S	Maximum Body-Diode Continuous Current				3	A
I _{SM}	Maximum Body-Diode Pulsed Current				9	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	221	276	331	pF
C _{oss}	Output Capacitance		25	31.4	38	pF
C _{rss}	Reverse Transfer Capacitance		2.1	2.6	3.0	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.9	3.9	5.9	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =400V, I _D =3A		6.7	8.0	nC
Q _{gs}	Gate Source Charge			1.7	2.0	nC
Q _{gd}	Gate Drain Charge			2.7	3.2	nC
t _{D(on)}	Turn-On Delay Time	V _{GS} =10V, V _{DS} =250V, I _D =3A, R _G =25Ω		11	13.2	ns
t _r	Turn-On Rise Time			19	23.0	ns
t _{D(off)}	Turn-Off Delay Time			20.5	24.6	ns
t _f	Turn-Off Fall Time			15	18.0	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =3A, dI/dt=100A/μs, V _{DS} =100V		134	161	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =3A, dI/dt=100A/μs, V _{DS} =100V		0.89	1.1	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 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_{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.

G: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.

H: L=60mH, I_{AS}=2A, V_{DD}=50V, R_G=10Ω, Starting T_J=25°C

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THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKI-50 to 175

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

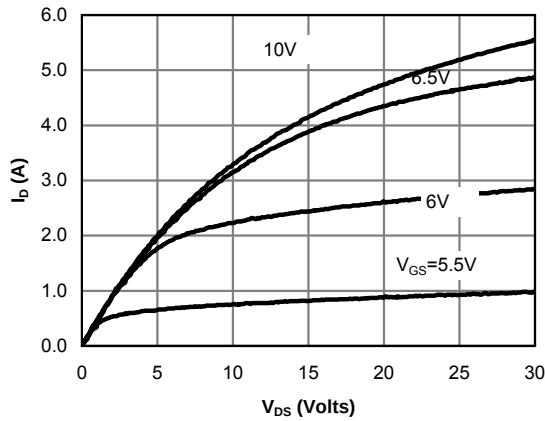


Fig 1: On-Region Characteristics

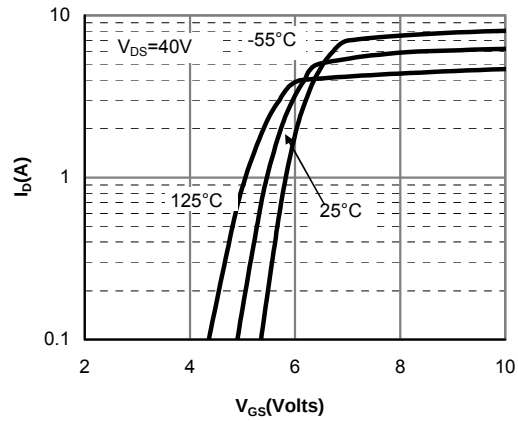


Figure 2: Transfer Characteristics

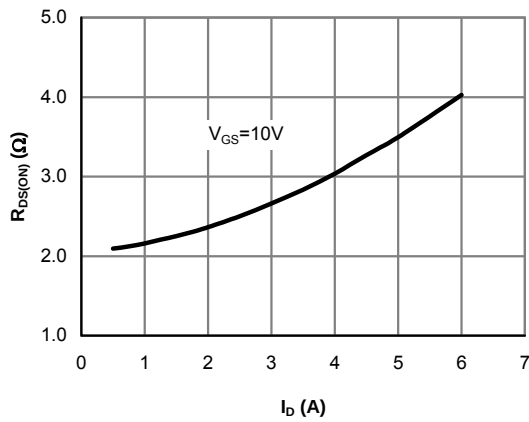


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

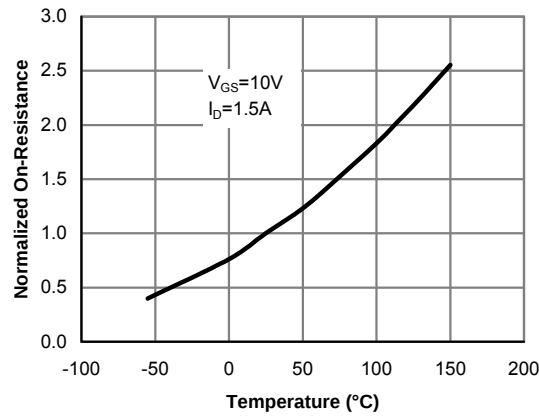


Figure 4: On-Resistance vs. Junction Temperature

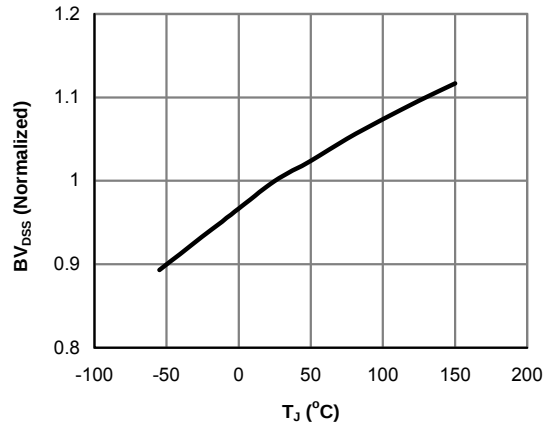


Figure 5: Break Down vs. Junction Temperature

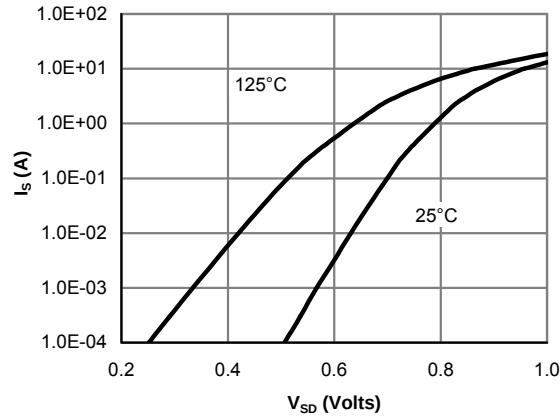


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

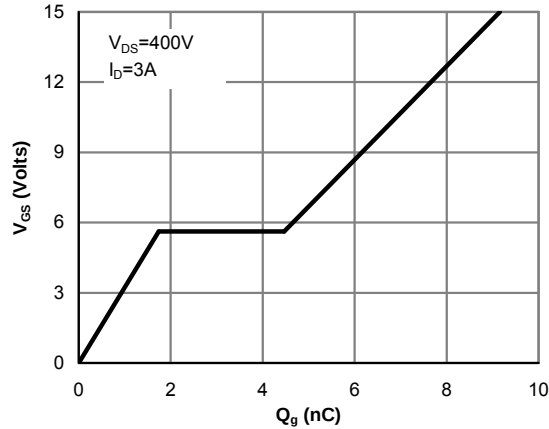


Figure 7: Gate-Charge Characteristics

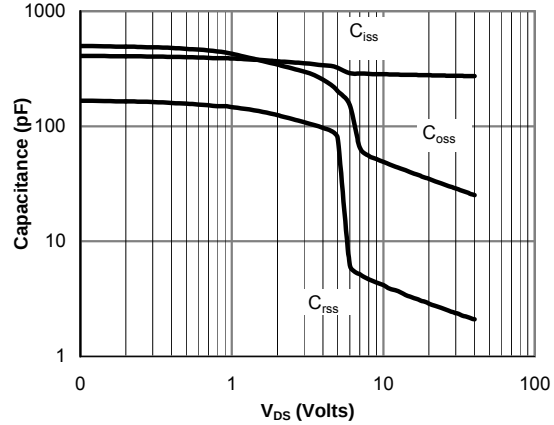


Figure 8: Capacitance Characteristics

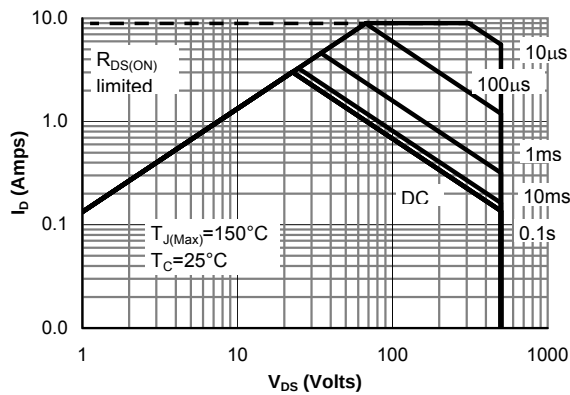


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

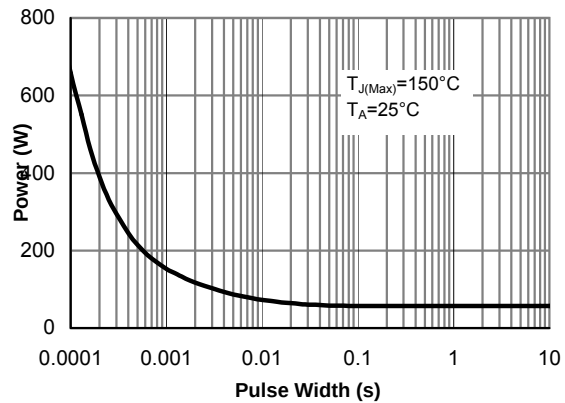


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

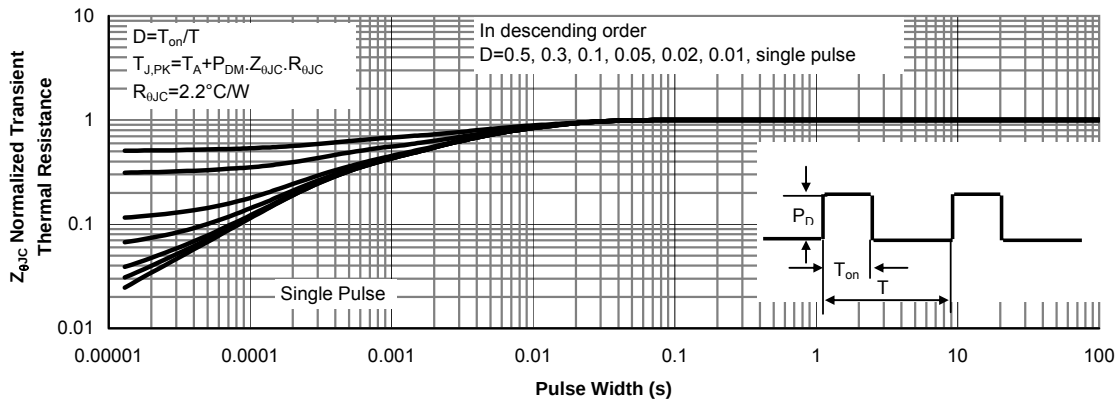


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

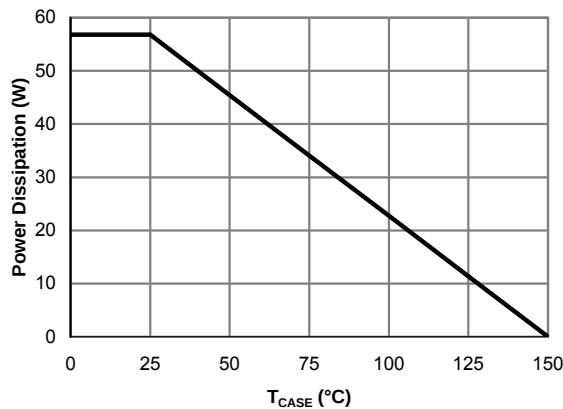


Figure 12: Power De-rating (Note B)

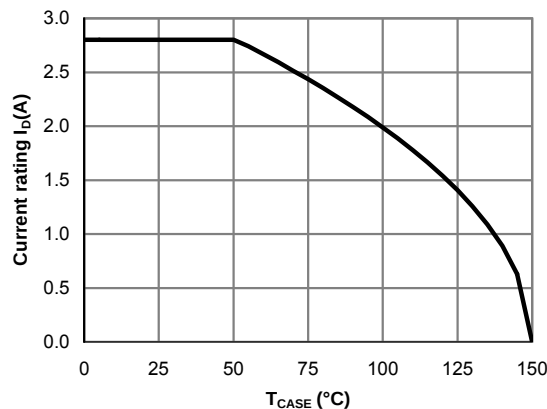


Figure 13: Current De-rating (Note B)

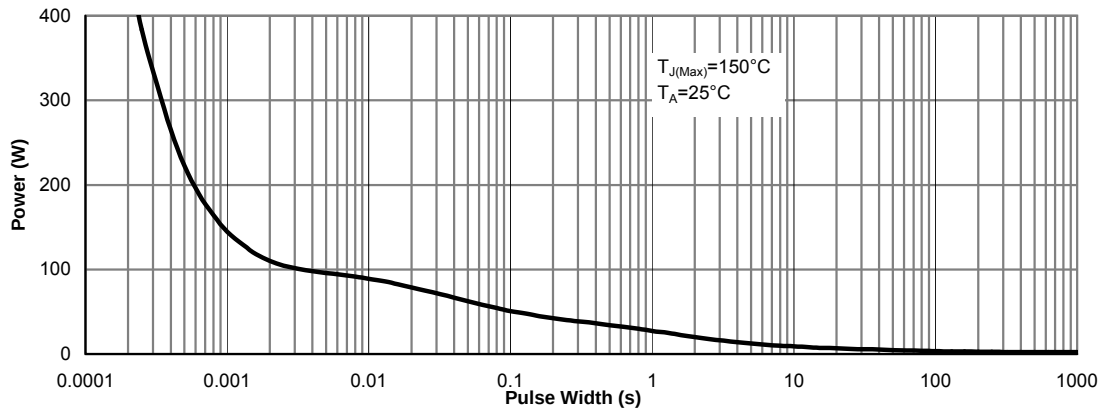


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

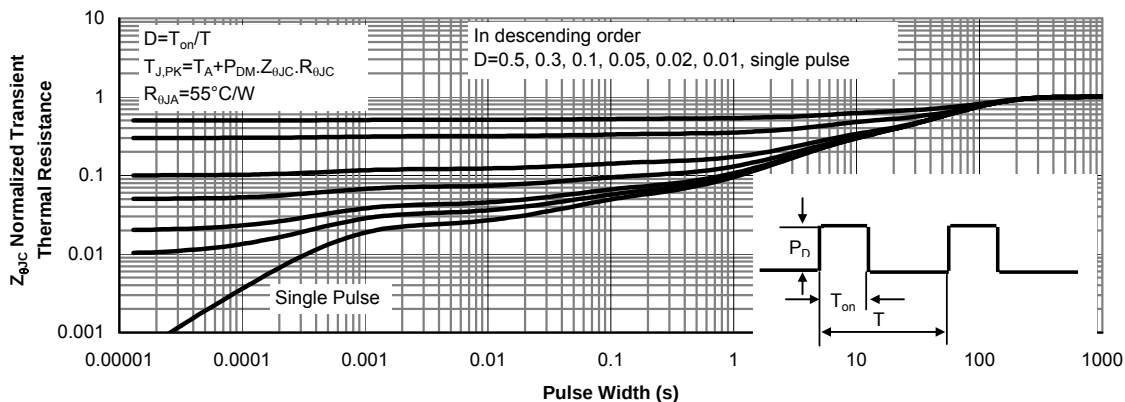
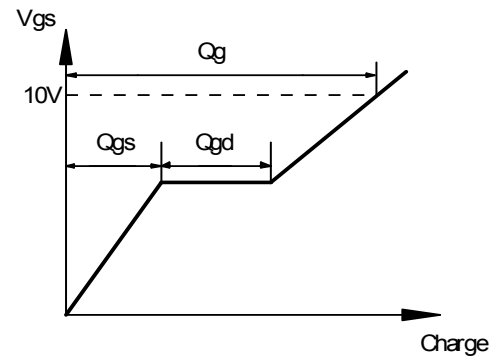
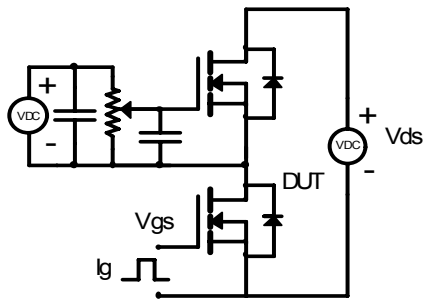
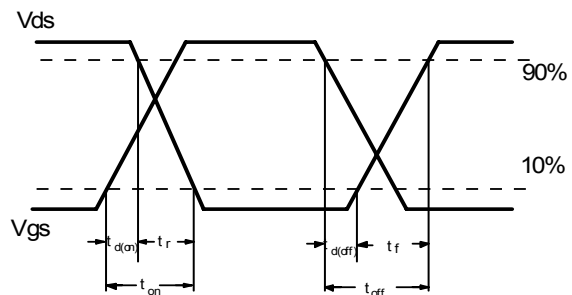
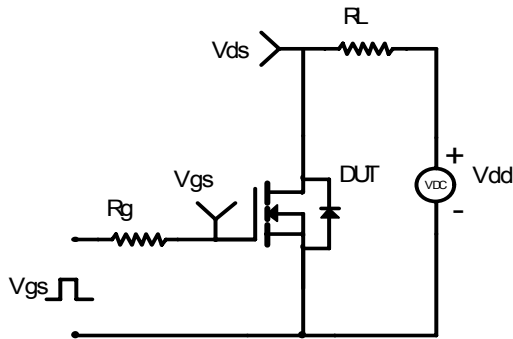


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

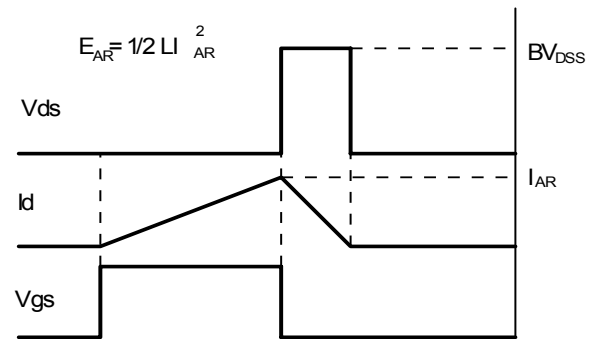
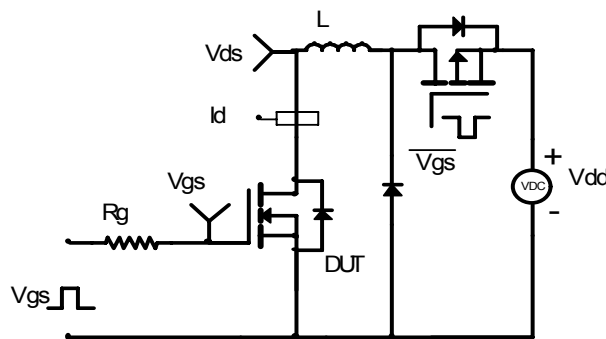
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

