ALPHA & OMEGA SEMICONDUCTOR

AOD406
N-Channel Enhancement Mode Field Effect Transistor

General Description

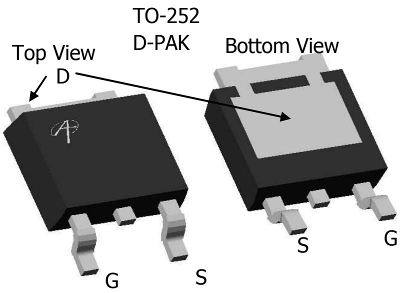
The AOD406 uses advanced trench technology to provide excellent $R_{DS(ON)}$, shoot-through immunity and body diode characteristics. This device is ideally suited for use as a low side switch in CPU core power conversion.

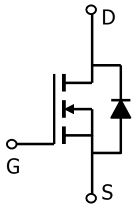
-RoHS Compliant
-Halogen Free*

Features

V_{DS} (V) = 30V
I_D = 85A (V_{GS} = 10V)
$R_{DS(ON)} < 5.0m\Omega$ (V_{GS} = 10V)
$R_{DS(ON)} < 5.7m\Omega$ (V_{GS} = 4.5V)

UIS TESTED!
Rg,Ciss,Coss,Crss Tested





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current [B,G]	T_C=25°C [G]	I_D	85	A
	T_C=100°C [B]		75	
Pulsed Drain Current		I_{DM}	200	
Avalanche Current [C]		I_{AR}	30	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	140	mJ
Power Dissipation [B]	T_C=25°C	P_D	100	W
	T_C=100°C		50	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.5	W
	T_A=70°C		1.6	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	14.2	20	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		40	50	°C/W
Maximum Junction-to-Case [B]	Steady-State	$R_{\theta JC}$	0.56	1.5	°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	30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=24V, V_{GS}=0V		0.005	1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±12V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	0.8	1.1	1.5	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	100			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		4	5	mΩ
		T_J=125°C		5.8	7	
		V_{GS}=4.5V, I_D=20A		4.6	5.7	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		102		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.64	1	V
I_S	Maximum Body-Diode Continuous Current				85	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		9130	10500	pF
C_{oss}	Output Capacitance			625		pF
C_{rss}	Reverse Transfer Capacitance			387		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.4	0.5	Ω
SWITCHING PARAMETERS						
Q_g(4.5V)	Total Gate Charge	V_{GS}=4.5V, V_{DS}=15V, I_D=20A		72.4	85	nC
Q_{gs}	Gate Source Charge			13.4		nC
Q_{gd}	Gate Drain Charge			16.8		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.75Ω, R_{GEN}=3Ω		14.7	22	ns
t_r	Turn-On Rise Time			14.2	21	ns
$t_{D(off)}$	Turn-Off DelayTime			105.5	150	ns
t_f	Turn-Off Fall Time			23.5	35	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=100A/µs		30.5	40	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=100A/µs		21	33	nC

A: The value of R $_{\theta JA}$ is measured with the device mounted on 1in ^{2} FR-4 board with 2oz. Copper, in a still air environment with T $_A$ =25°C. The Power dissipation P_{DSM} is based on steady-state R $_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any a given application depends on the user's specific board design, and the maximum temperature fo 175°C may be used if the PCB or heatsink allows it.
B. The power dissipation P_D is based on $T_{J(MAX)}$=175°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.
C: Repetitive rating, pulse width limited by junction temperature T $_{J(MAX)}$=175°C.
D. The R $_{\theta JA}$ is the sum of the thermal impedence 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 tests are performed with the device mounted on 1 in ^{2} FR-4 board with 2oz. Copper, in a still air environment with T $_A$=25°C. The SOA curve provides a single pulse rating.
G. The maximum current rating is limited by the package current capability.
*This device is guaranteed green after data code 8X11 (Sep 1ST 2008).
Rev 5: Sep 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

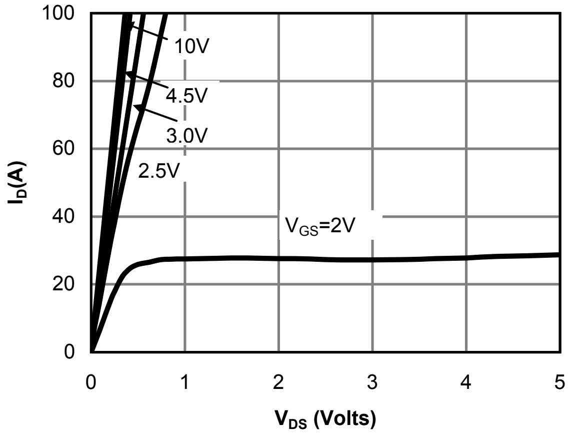


Figure 1: On-Region Characteristics

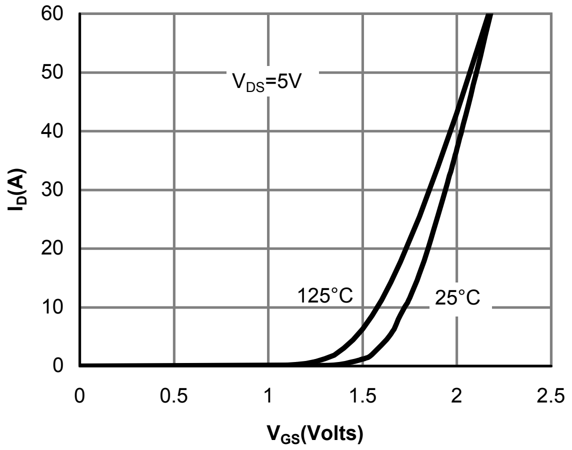


Figure 2: Transfer Characteristics

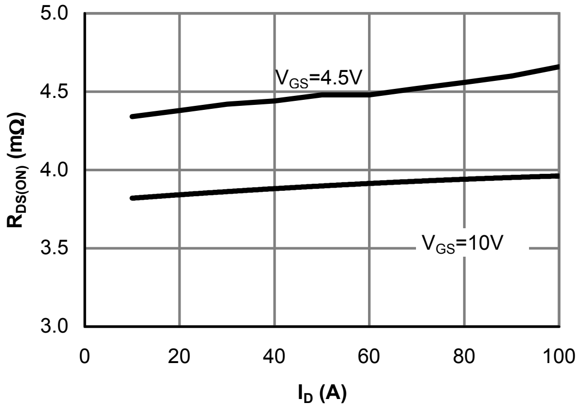


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

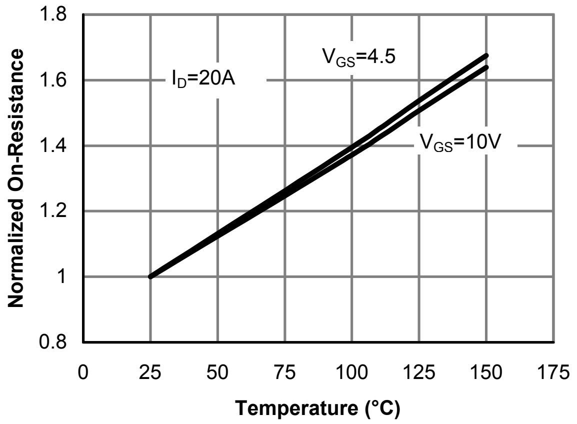


Figure 4: On-Resistance vs. Junction Temperature

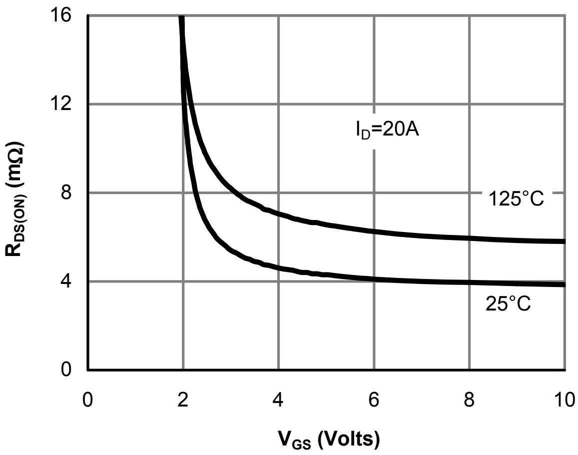


Figure 5: On-Resistance vs. Gate-Source Voltage

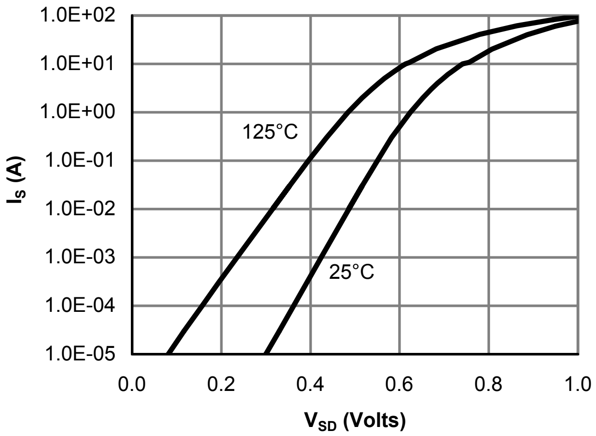


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

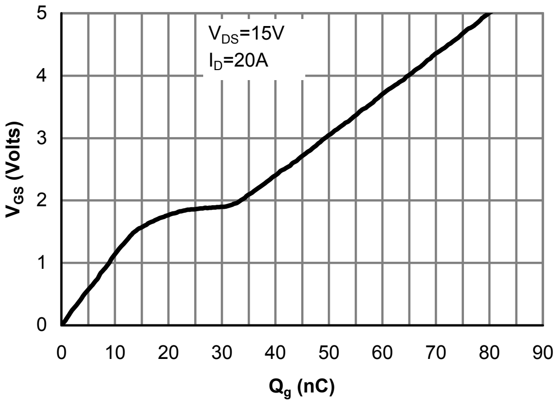


Figure 7: Gate-Charge Characteristics

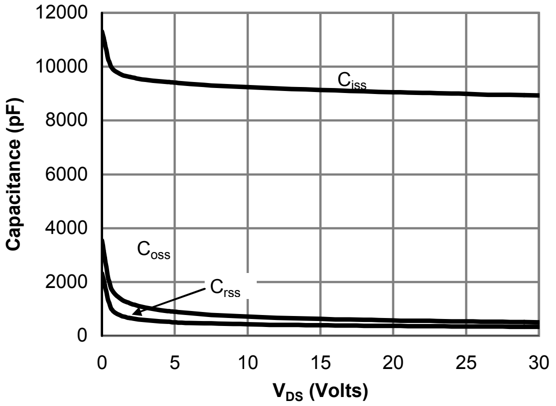


Figure 8: Capacitance Characteristics

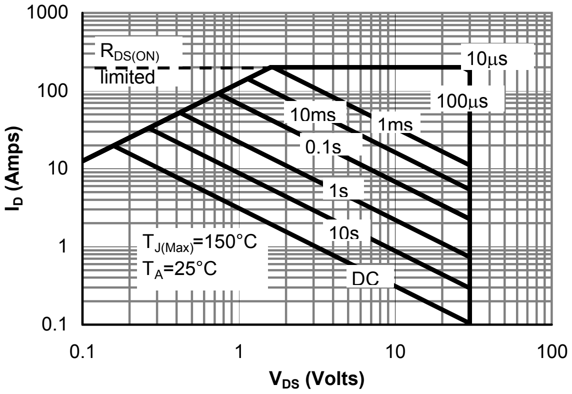


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

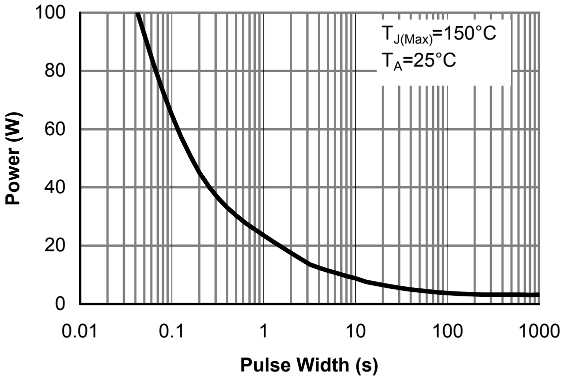


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

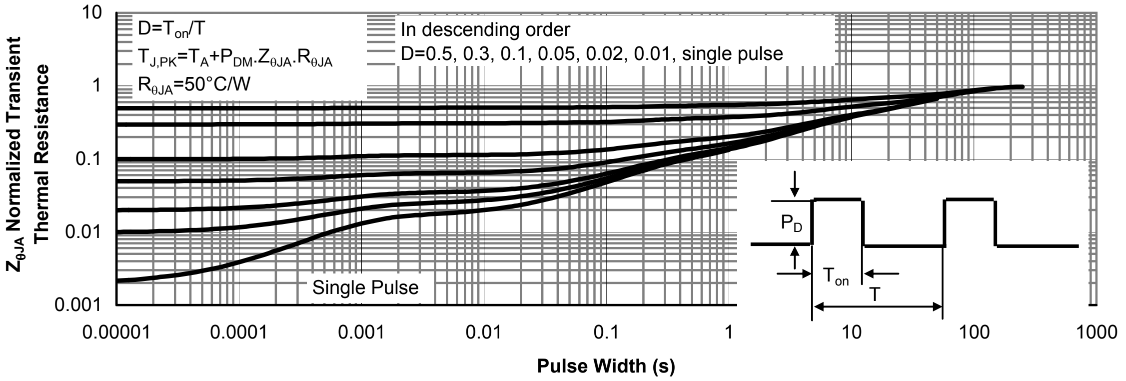


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

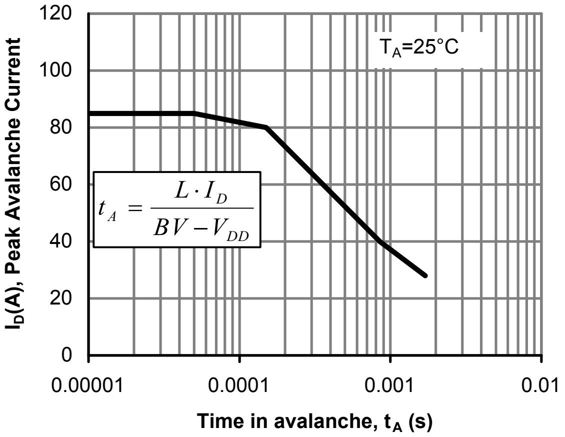


Figure 12: Single Pulse Avalanche capability

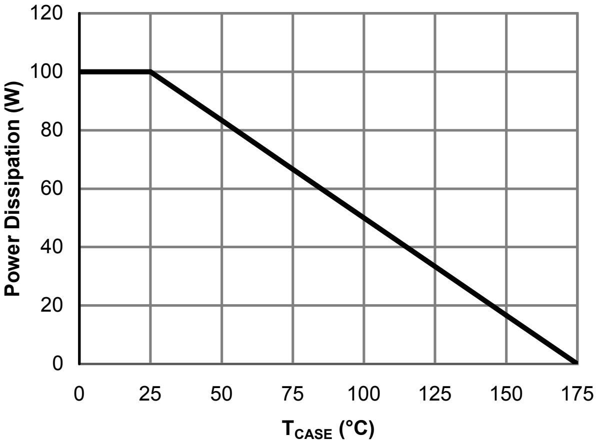


Figure 13: Power De-rating (Note B)

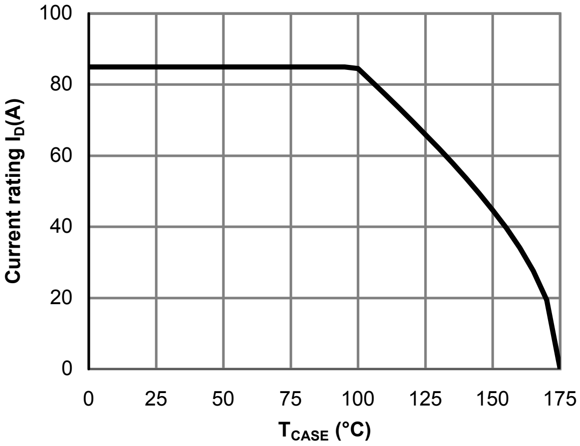
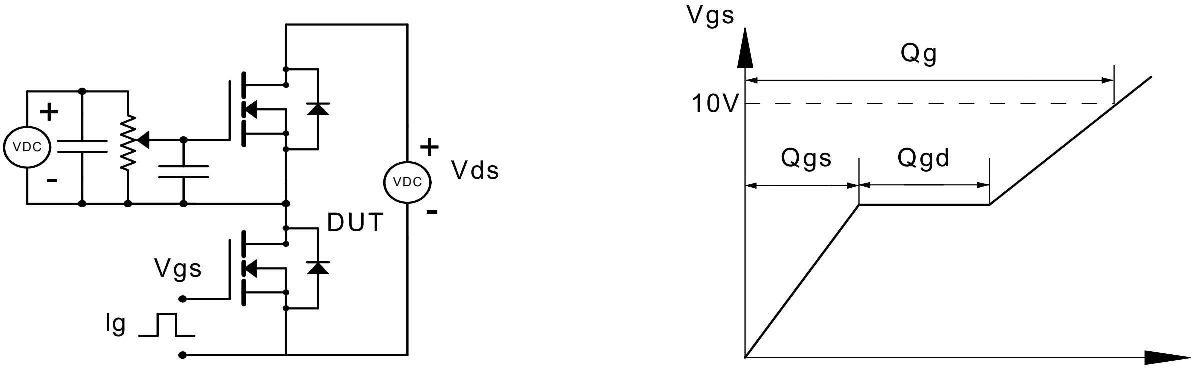
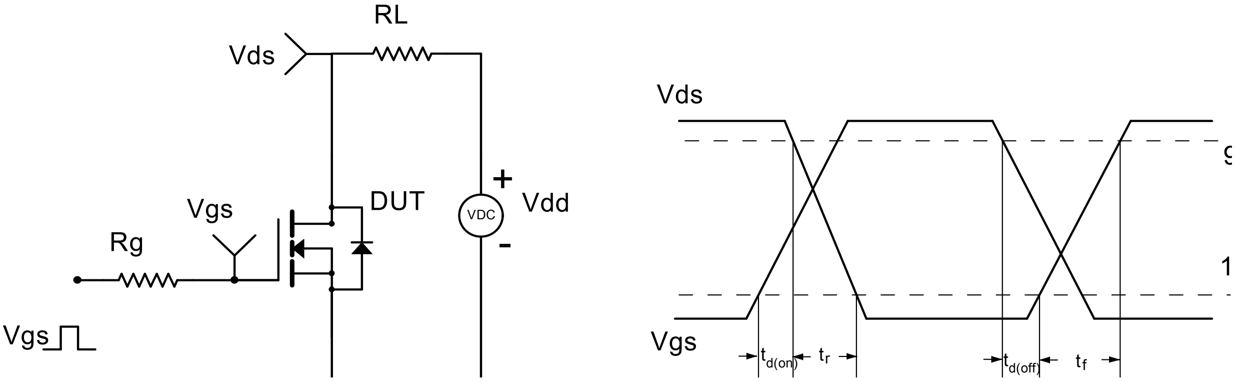


Figure 14: Current De-rating (Note B)

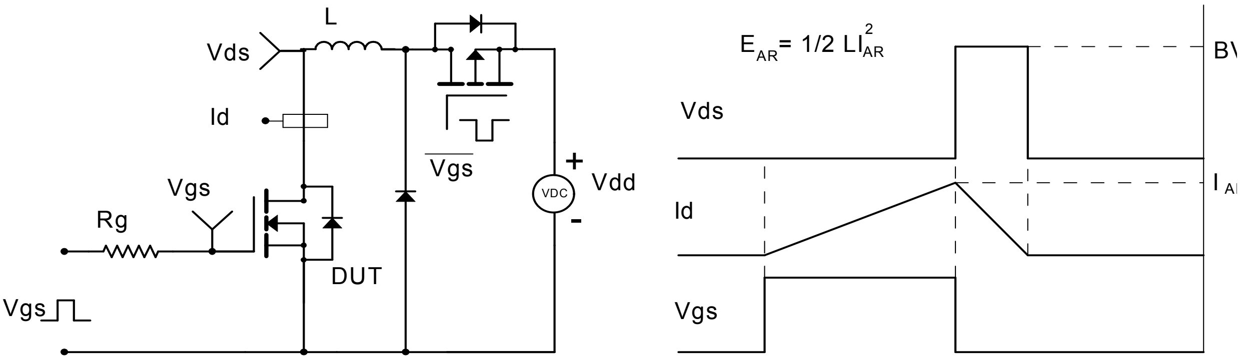
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms