



AOD406

N-Channel Enhancement Mode Field Effect Transistor

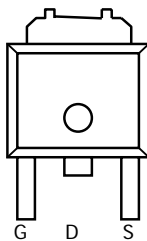
General Description

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. *Standard Product AOD406 is Pb-free (meets ROHS & Sony 259 specifications). AOD406L is a Green Product ordering option. AOD406 and AOD406L are electrically identical.*

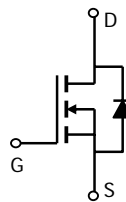
Features

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

TO-252
D-PAK



Top View
Drain Connected
to Tab



Absolute Maximum Ratings $T_A=25^\circ C$ 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}	$T_C=25^\circ C^G$	85	A
	$T_C=100^\circ C^B$	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	$T_C=25^\circ C$	100	W
	$T_C=100^\circ C$	50	
Power Dissipation ^A	$T_A=25^\circ C$	2.5	W
	$T_A=70^\circ C$	1.6	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	14.2	20	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	40	50
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	0.56	1.5	$^\circ C/W$

Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=24\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		0.005	1	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.8	1.1	1.5	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	100			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=20\text{A}$ $T_J=125^\circ\text{C}$		4	5	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=20\text{A}$		5.8	7	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=20\text{A}$		102		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.64	1	V
I_S	Maximum Body-Diode Continuous Current				85	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		9130	10500	pF
C_{oss}	Output Capacitance			625		pF
C_{rss}	Reverse Transfer Capacitance			387		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		0.4	0.5	Ω
SWITCHING PARAMETERS						
$Q_g(4.5\text{V})$	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=15\text{V}$, $I_D=20\text{A}$		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 Delay Time	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=0.75\Omega$, $R_{GEN}=3\Omega$		14.7	22	ns
t_r	Turn-On Rise Time			14.2	21	ns
$t_{D(off)}$	Turn-Off Delay Time			105.5	150	ns
t_f	Turn-Off Fall Time			23.5	35	ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		30.5	40	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		21	33	nC

- A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. 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 given application depends on the user's specific board design, and the maximum temperature for 175°C may be used if the PCB or heatsink allows it.
- B: The power dissipation P_D is based on $T_{J(MAX)}=175^\circ\text{C}$, 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 $T_{J(MAX)}=175^\circ\text{C}$.
- 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 $<300\mu\text{s}$ pulses, duty cycle 0.5% max.
- F: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.
- G: The maximum current rating is limited by the package current capability. Rev 1: Sept 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

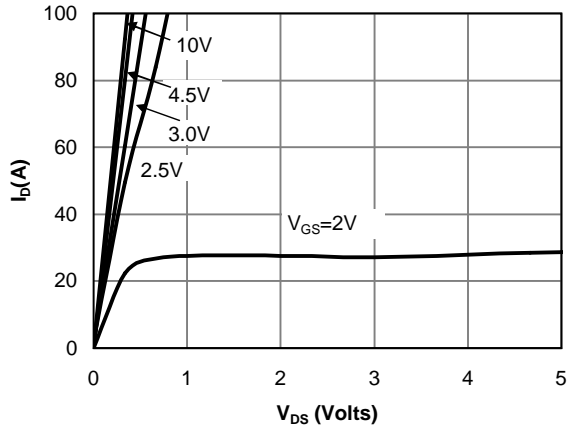


Figure 1: On-Region Characteristics

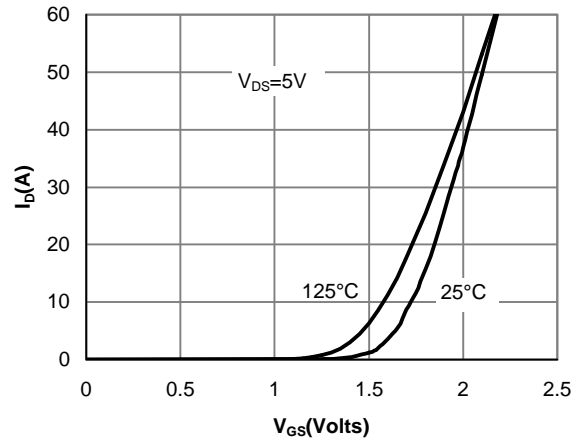


Figure 2: Transfer Characteristics

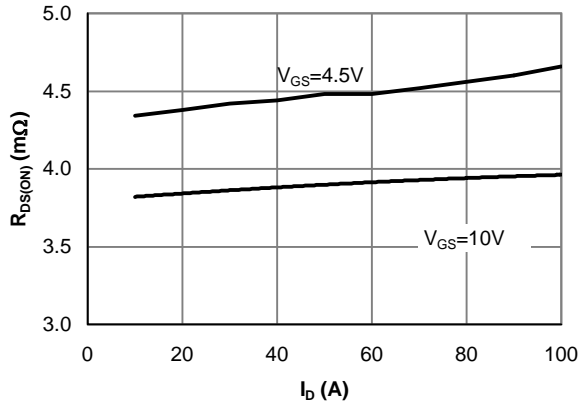


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

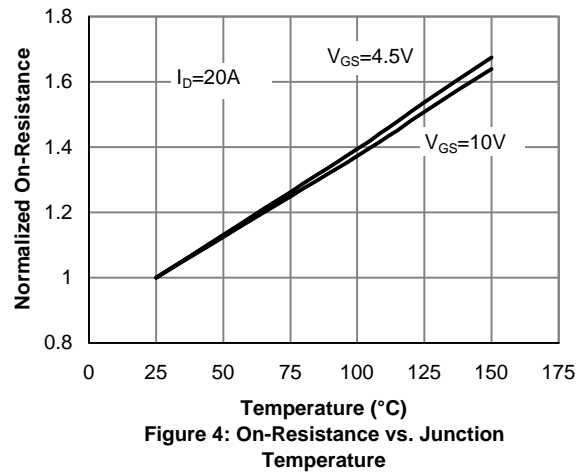


Figure 4: On-Resistance vs. Junction Temperature

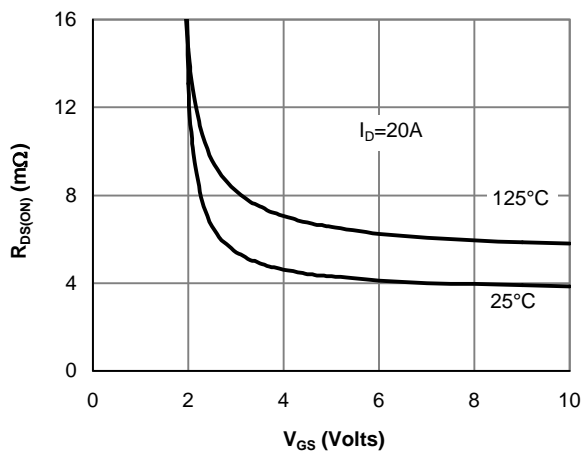


Figure 5: On-Resistance vs. Gate-Source Voltage

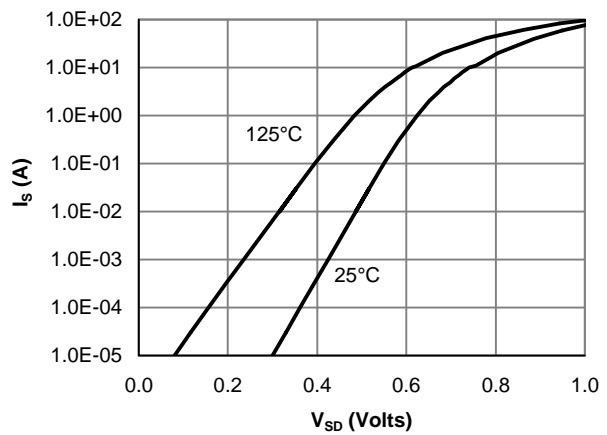


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

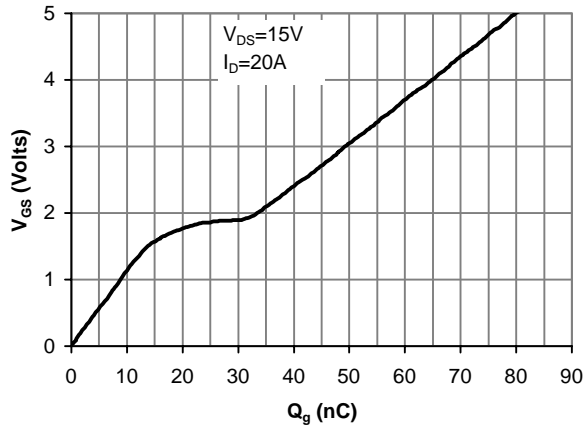


Figure 7: Gate-Charge Characteristics

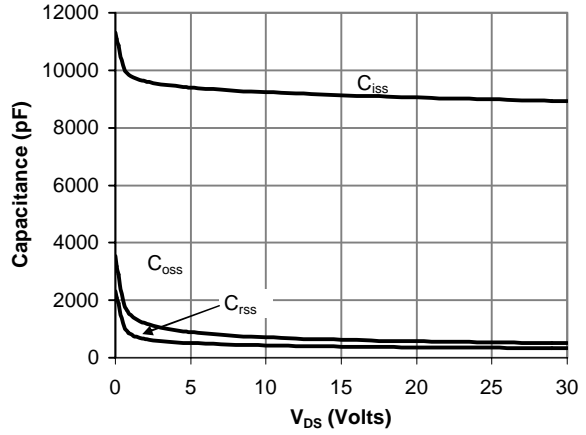


Figure 8: Capacitance Characteristics

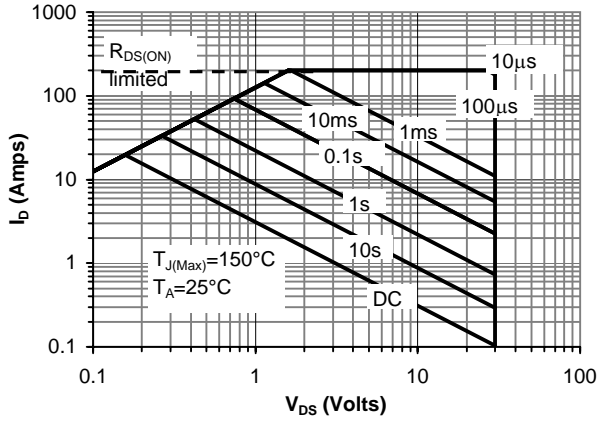


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

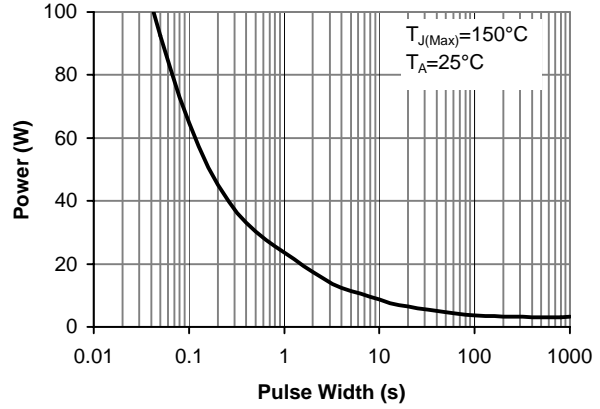


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

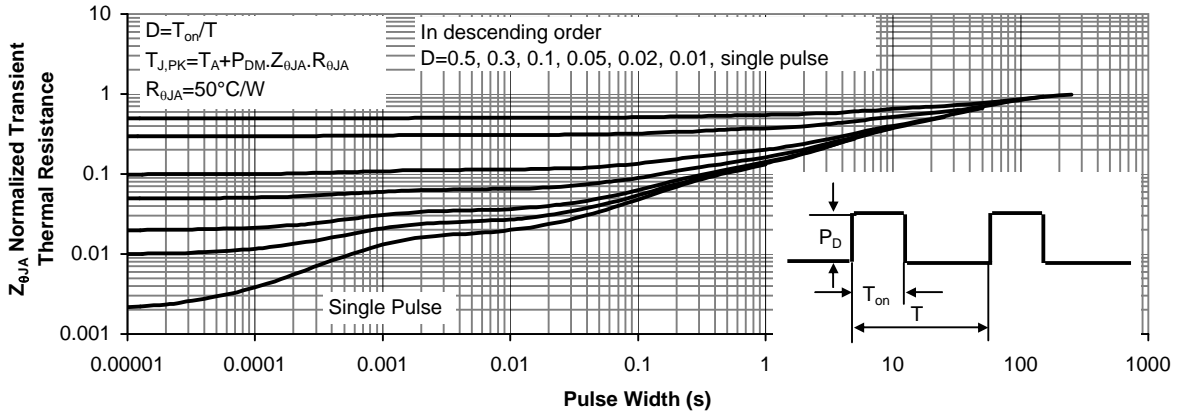


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

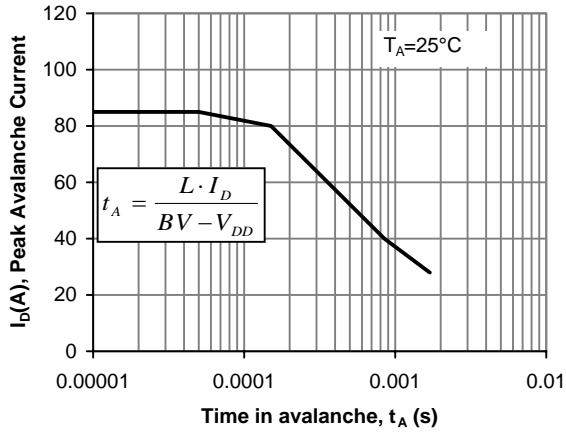


Figure 12: Single Pulse Avalanche capability

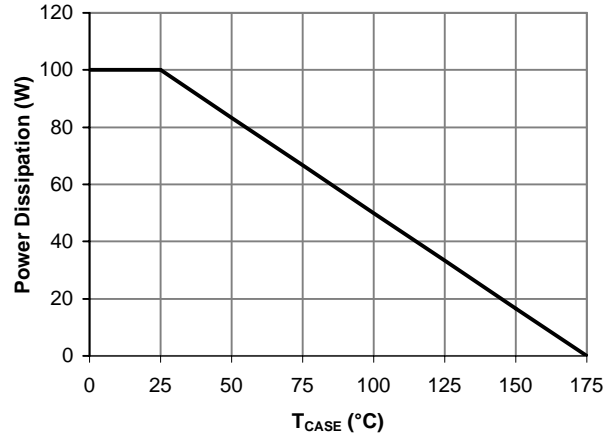


Figure 13: Power De-rating (Note B)

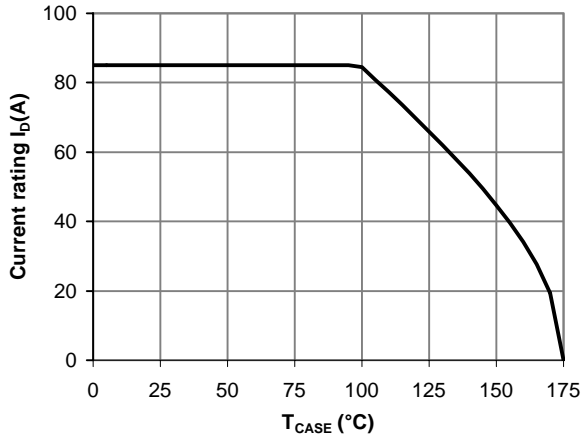


Figure 14: Current De-rating (Note B)