



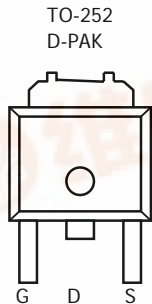
AOD406 N-Channel Enhancement Mode Field Effect Transistor

General Description

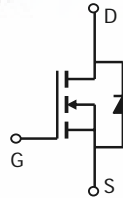
The AOD406 uses advanced trench technology to provide excellent $R_{DS(ON)}$, shoot-through immunity and body diode characteristics. This device is ideally suited for use as a low side switch in CPU core power conversion. *Standard Product AOD406 is Pb-free (meets ROHS & Sony 259 specifications). AOD406L 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)



Top View
Drain Connected to Tab



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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}	I_D	$T_C=25^\circ\text{C}$ ^G	85
		$T_C=100^\circ\text{C}$ ^B	75
Pulsed Drain Current	I_{DM}	200	A
Avalanche Current ^C	I_{AR}	30	A
Repetitive avalanche energy $L=0.1\text{mH}$ ^C	E_{AR}	140	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	100
		$T_C=100^\circ\text{C}$	50
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$	2.5
		$T_A=70^\circ\text{C}$	1.6
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10\text{s}$	14.2	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		Steady-State	40	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	0.56	1.5	$^\circ\text{C/W}$

AOD406

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 T _J =55°C		0.005	1 5	μA
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 T _J =125°C		4 5.8	5 7	mΩ
		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_{θJA} is measured with the device mounted on 1in² 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_{θJA} 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 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_{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 <300μs 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°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

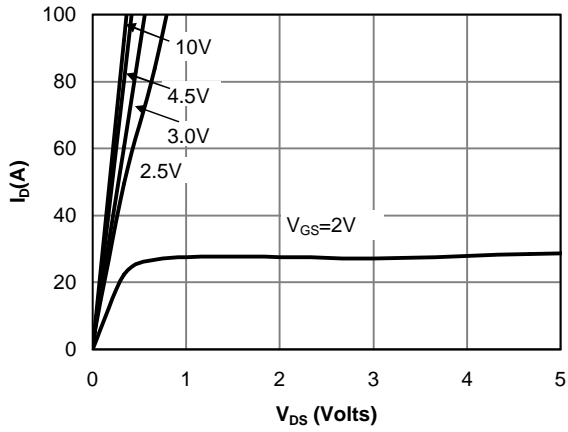


Figure 1: On-Region Characteristics

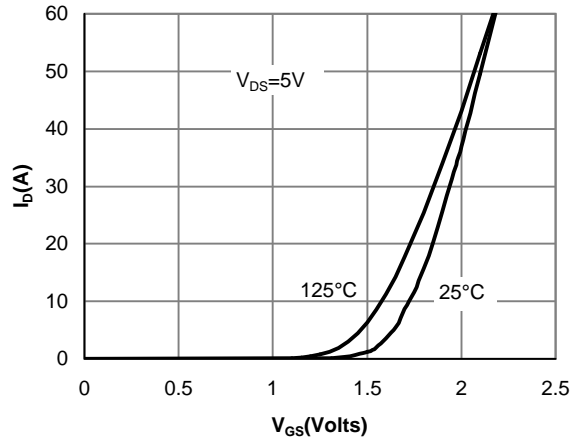


Figure 2: Transfer Characteristics

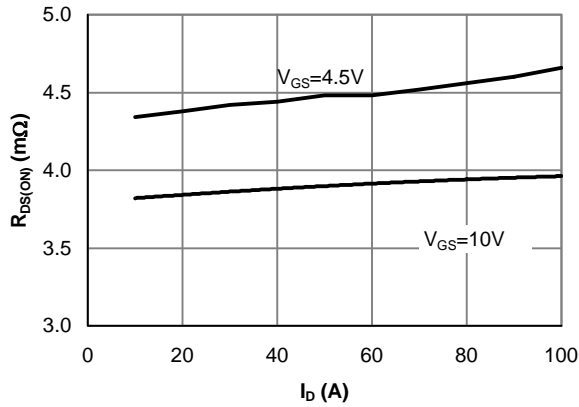


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

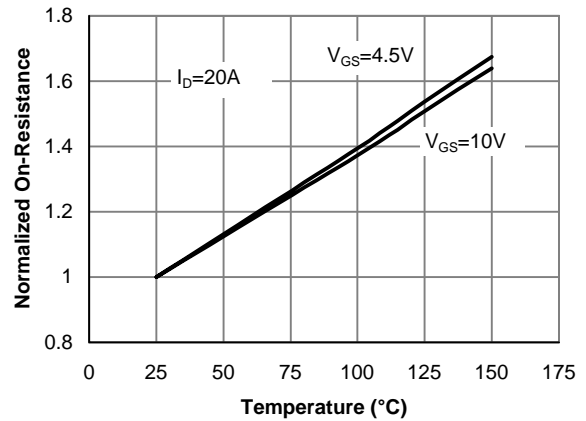


Figure 4: On-Resistance vs. Junction Temperature

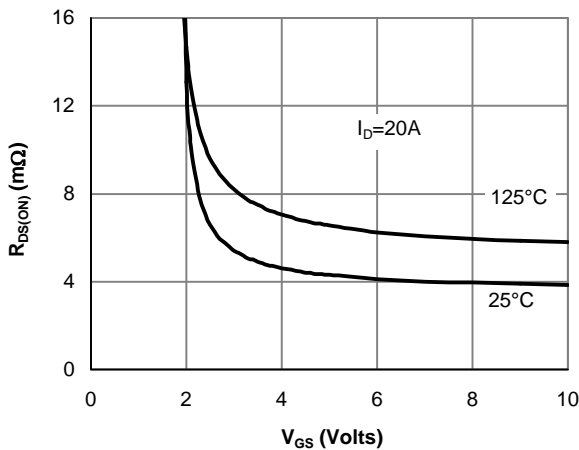


Figure 5: On-Resistance vs. Gate-Source Voltage

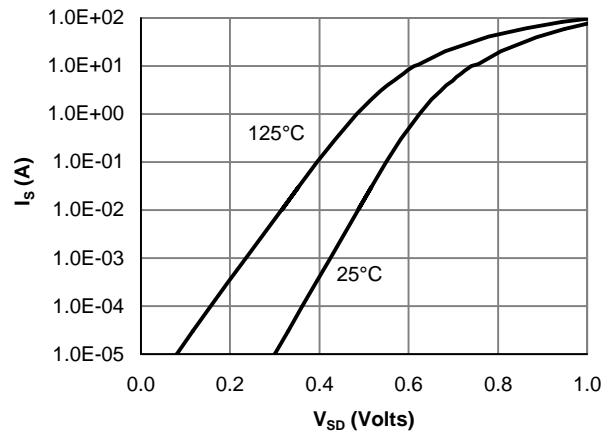


Figure 6: Body-Diode Characteristics

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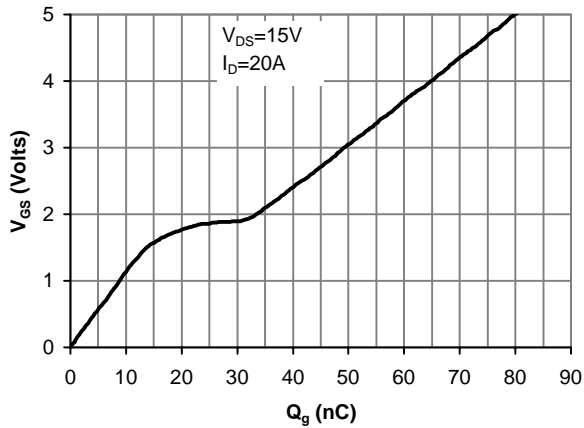


Figure 7: Gate-Charge Characteristics

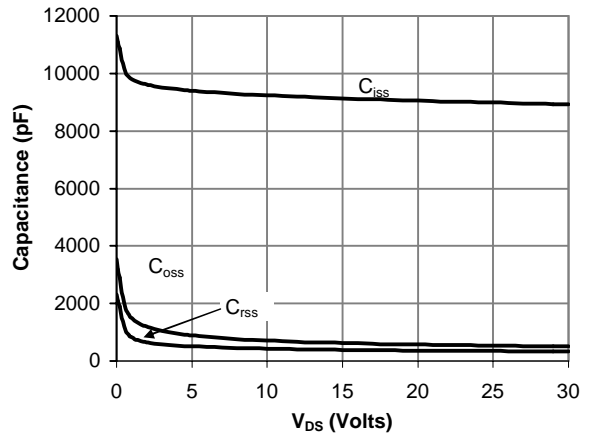


Figure 8: Capacitance Characteristics

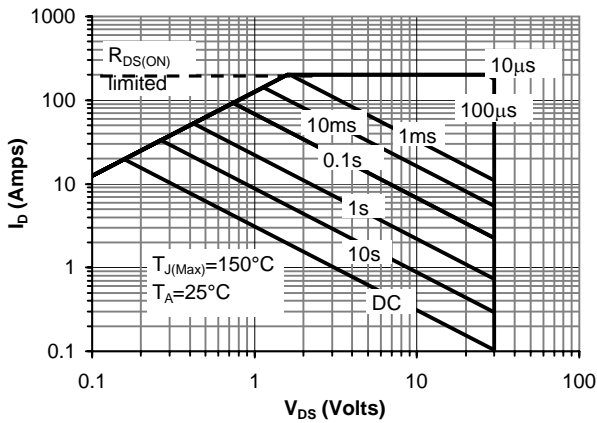


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

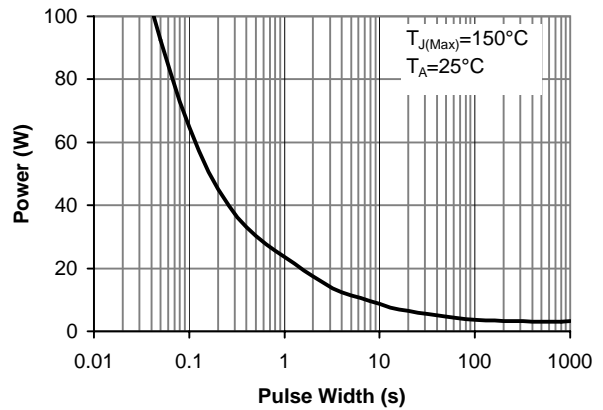


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

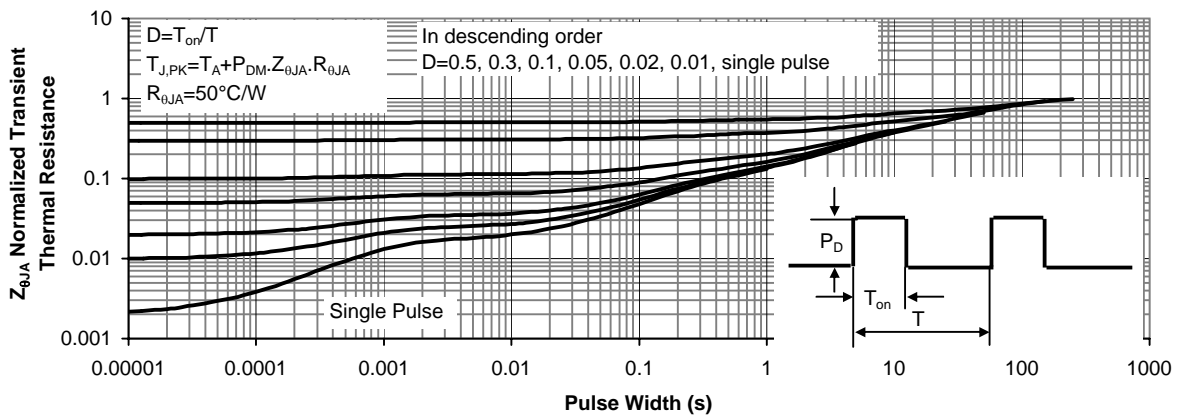


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

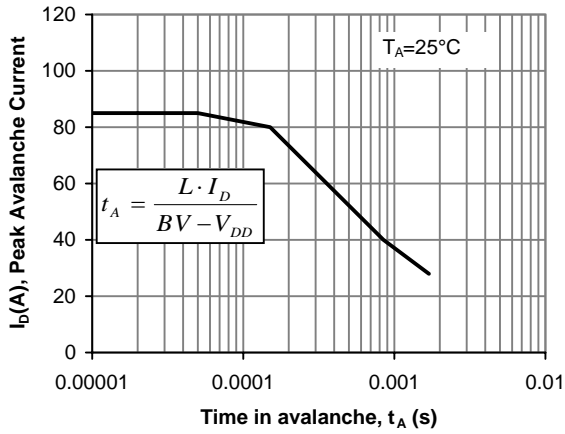


Figure 12: Single Pulse Avalanche capability

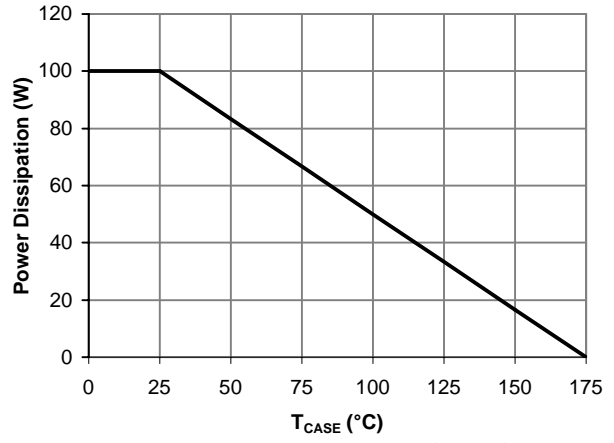


Figure 13: Power De-rating (Note B)

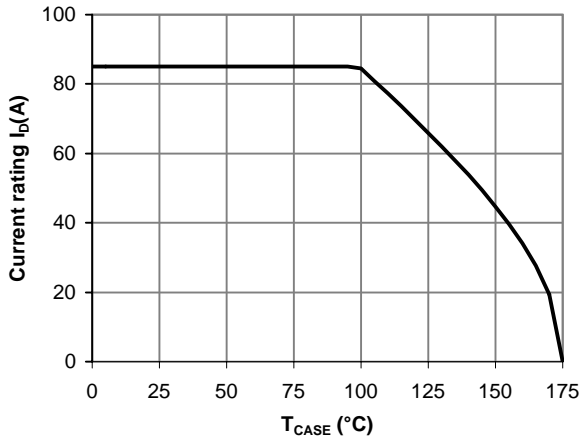


Figure 14: Current De-rating (Note B)