ALPHA & OMEGA SEMICONDUCTOR, LTD

AOD405
P-Channel Enhancement Mode Field Effect Transistor

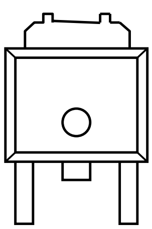
General Description

The AOD405 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and low gate resistance. With the excellent thermal resistance of the DPAK package, this device is well suited for high current load applications. *Standard Product AOD405 is Pb-free (meets ROHS & Sony 259 specifications). AOD405L is a Green Product ordering option. AOD405 and AOD405L are electrically identical.*

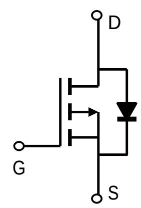
Features

V_{DS} (V) = -30V
I_D = -18A (V_{GS} = -10V)
$R_{DS(ON)}$ < 32mΩ (V_{GS} = -10V)
$R_{DS(ON)}$ < 60mΩ (V_{GS} = -4.5V)

TO-252
D-PAK



Top View
Drain Connected to Tab



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}	±20	V
Continuous Drain Current [B,G]	T_A=25°C [G]	I_D	-18	A
	T_A=100°C [G]		-18	
Pulsed Drain Current		I_{DM}	-40	
Avalanche Current [C]		I_{AR}	-18	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	40	mJ
Power Dissipation [B]	T_C=25°C	P_D	60	W
	T_C=100°C		30	
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	$R_{\theta JA}$	16.7	25	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		40	50	°C/W
Maximum Junction-to-Case [C]	Steady-State	$R_{\theta JL}$	1.9	2.5	°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		-0.003	-1	µA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-1.2	-2	-2.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V	-40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-18A		24.5	32	mΩ
		T_J=125°C		36	43	
		V_{GS}=-4.5V, I_D=-10A		41	60	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-18A		17		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.76	-1	V
I_S	Maximum Body-Diode Continuous Current				-18	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz		920	1100	pF
C_{oss}	Output Capacitance			190		pF
C_{rss}	Reverse Transfer Capacitance			122		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		3.6	4.5	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge (10V)	V_{GS}=-10V, V_{DS}=-15V, I_D=-18A		18.7	23	nC
Q_g(4.5V)	Total Gate Charge (4.5V)			9.7	11.7	nC
Q_{gs}	Gate Source Charge			2.54		nC
Q_{gd}	Gate Drain Charge			5.4		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=0.82Ω, R_{GEN}=3Ω		9	13	ns
t_r	Turn-On Rise Time			25	35	ns
$t_{D(off)}$	Turn-Off DelayTime			20	30	ns
t_f	Turn-Off Fall Time			12	18	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-18A, dI/dt=100A/µs		21.4	26	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-18A, dI/dt=100A/µs		13	16	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 given application depends on the user's specific board design, and the maximum temperature of 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.
Rev4 : June 2005

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

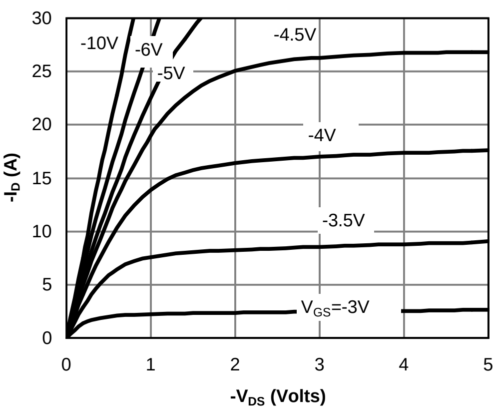


Fig 1: On-Region Characteristics

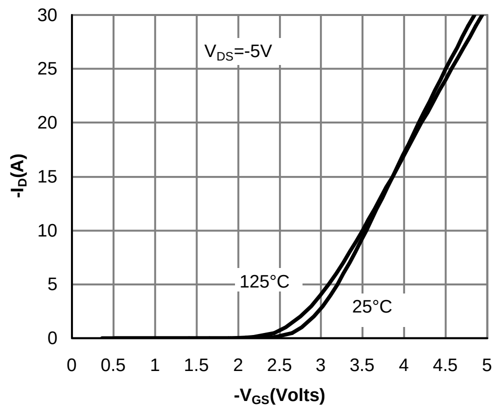


Figure 2: Transfer Characteristics

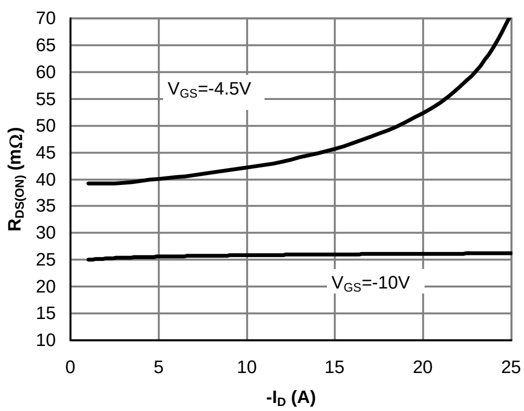


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

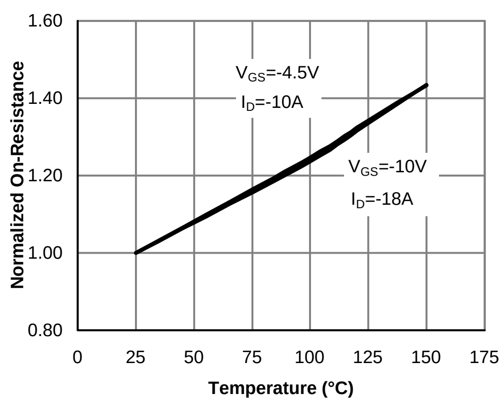


Figure 4: On-Resistance vs. Junction Temperature

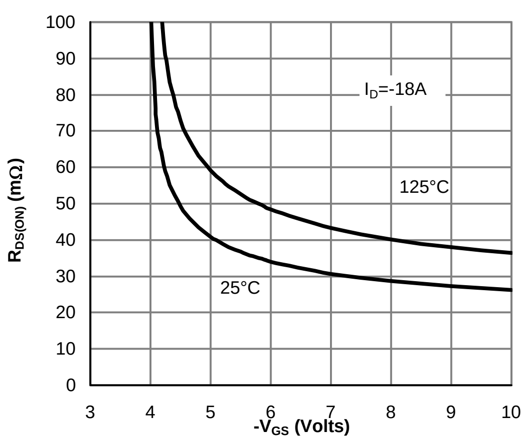


Figure 5: On-Resistance vs. Gate-Source Voltage

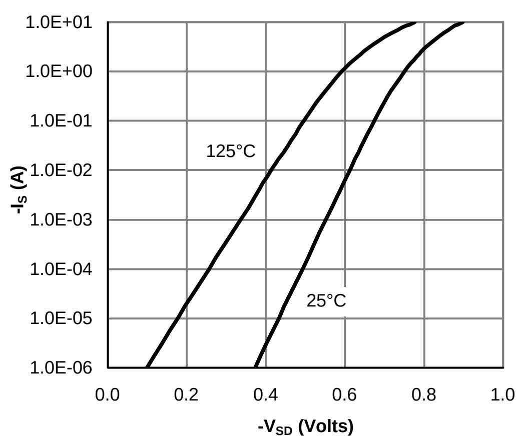


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

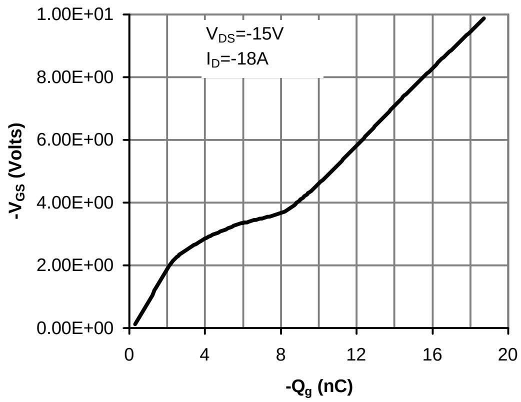


Figure 7: Gate-Charge Characteristics

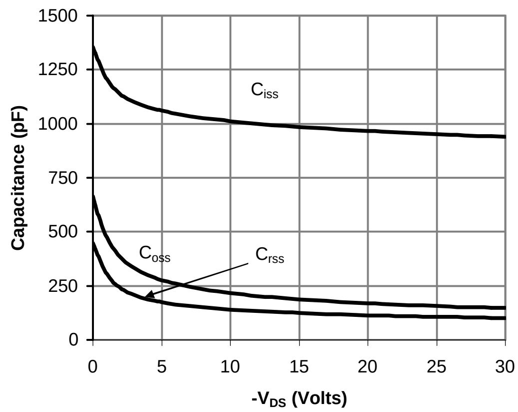


Figure 8: Capacitance Characteristics

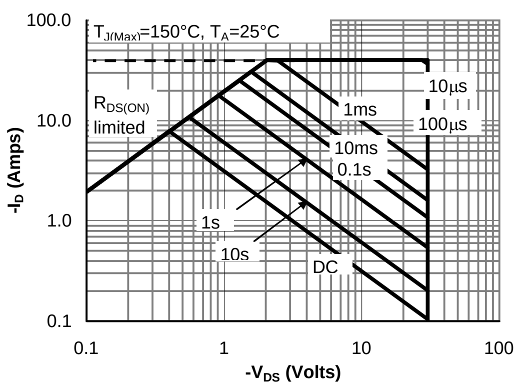


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

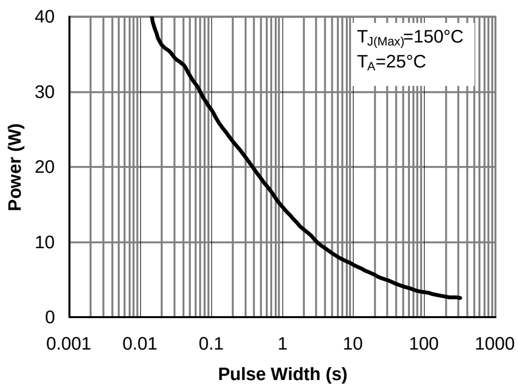


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

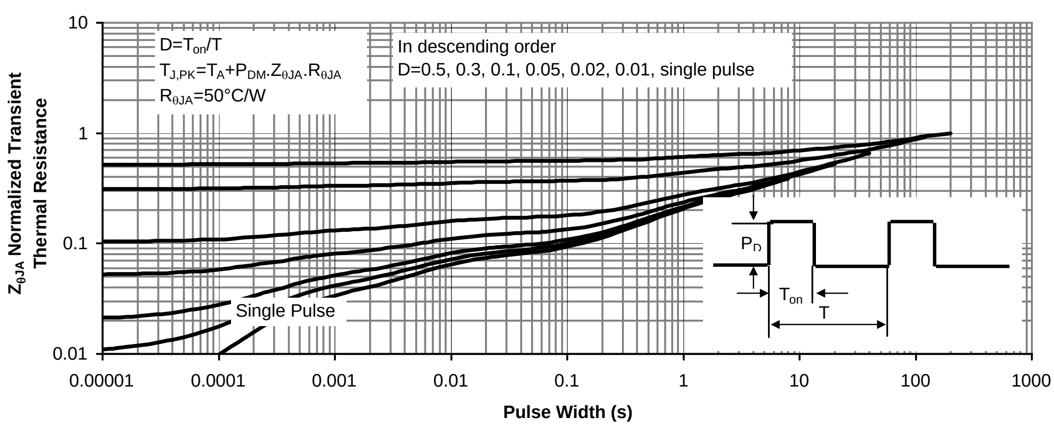


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)