



AOD409, AOD409L (Lead-Free)
P-Channel Enhancement Mode Field Effect Transistor

General Description

The AOD409 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. AOD409L is offered in a lead-free package.

Features

- V_{DS} (V) = -60V
- I_D = -29A
- $R_{DS(ON)} < 40m\Omega$ ($V_{GS} = -10V$)
- $R_{DS(ON)} < 55m\Omega$ ($V_{GS} = -4.5V$)



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^{B,G}	$T_A=25^\circ C$ ^G	-29	A
	$T_A=100^\circ C$ ^G	-20	
Pulsed Drain Current	I_{DM}	-60	
Avalanche Current ^C	I_{AR}	-29	A
Repetitive avalanche energy $L=0.1mH$ ^C	E_{AR}	134	mJ
Power Dissipation ^B	$T_C=25^\circ C$	60	W
	$T_C=100^\circ C$	30	
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	$R_{\theta JA}$	16.7	25	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	40	50
Maximum Junction-to-Case ^C	$R_{\theta JL}$	1.9	2.5	$^\circ C/W$

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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-60			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-48\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		-0.003	-1	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1.2	-1.9	-2.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$	-60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-20\text{A}$ $T_J=125^\circ\text{C}$		32	40	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}$, $I_D=-20\text{A}$		43	55	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-20\text{A}$		33		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.73	-1	V
I_S	Maximum Body-Diode Continuous Current				-30	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-30\text{V}$, $f=1\text{MHz}$		2520	3024	pF
C_{oss}	Output Capacitance			183		pF
C_{rss}	Reverse Transfer Capacitance			120		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		2	2.4	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge (10V)	$V_{GS}=-10\text{V}$, $V_{DS}=-30\text{V}$, $I_D=-20\text{A}$		44	54	nC
$Q_g(4.5\text{V})$	Total Gate Charge (4.5V)			22.2	28	nC
Q_{gs}	Gate Source Charge			9		nC
Q_{gd}	Gate Drain Charge			10		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-10\text{V}$, $V_{DS}=-30\text{V}$, $R_L=1.5\Omega$, $R_{GEN}=3\Omega$		12		ns
t_r	Turn-On Rise Time			14.5		ns
$t_{D(off)}$	Turn-Off Delay Time			38		ns
t_f	Turn-Off Fall Time			15		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		40	50	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		59		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 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 $T_{J(MAX)}=175^\circ\text{C}$, 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.