ALPHA & OMEGA SEMICONDUCTOR, LTD

AOD434
N-Channel Enhancement Mode Field Effect Transistor

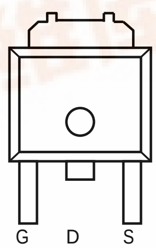
General Description

The AOD434 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V while retaining a 12V $V_{GS(MAX)}$ rating. It is ESD protected to a 2KV HBM rating. *Standard Product AOD434 is Pb-free (meets ROHS & Sony 259 specifications). AOD434L is a Green Product ordering option. AOD434 and AOD434L are electrically identical.*

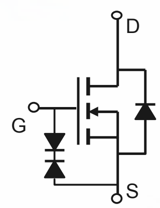
Features

V_{DS} (V) = 20V
I_D = 18A (V_{GS} = 10V)
$R_{DS(ON)}$ < 14mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 16mΩ (V_{GS} = 4.5V)
$R_{DS(ON)}$ < 21mΩ (V_{GS} = 2.5V)
$R_{DS(ON)}$ < 30mΩ (V_{GS} = 1.8V)
ESD Rating: 2KV HBM

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}	20	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain	T_C=25°C		18	
Current [G]	T_C=100°C	I_D	18	A
Pulsed Drain Current [C]		I_{DM}	30	
Avalanche Current [C]		I_{AR}	18	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	37	mJ
	T_C=25°C	P_D	60	W
Power Dissipation [B]	T_C=100°C		30	
	T_A=25°C	P_{DSM}	2.5	W
Power Dissipation [A]	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 [B]	Steady-State	$R_{\theta JC}$	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	20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=16V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±10V			10	µA
BV_{GSO}	Gate-Source Breakdown Voltage	V_{DS}=0V, I_G=±250uA	±12			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	0.5	0.75	1	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=18A		10.9	14	mΩ
		T_J=125°C		14.3	18	
		V_{GS}=4.5V, I_D=15A		12.6	16	mΩ
		V_{GS}=2.5V, I_D=10A		16.5	21	mΩ
		V_{GS}=1.8V, I_D=5A		23.2	30	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=18A		36		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.73	1	V
I_S	Maximum Body-Diode Continuous Current				18	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz		1810		pF
C_{oss}	Output Capacitance			232		pF
C_{rss}	Reverse Transfer Capacitance			200		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.6		Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=10V, I_D=18A		40.1		nC
Q_g(4.5V)	Total Gate Charge			8.9		
Q_{gs}	Gate Source Charge			1.7		nC
Q_{gd}	Gate Drain Charge			6.2		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=10V, R_L=0.56Ω, R_{GEN}=3Ω		4		ns
t_r	Turn-On Rise Time			15		ns
$t_{D(off)}$	Turn-Off DelayTime			42.2		ns
t_f	Turn-Off Fall Time			18.2		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=18A, dI/dt=100A/µs		23.2		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=18A, dI/dt=100A/µs		4.9		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 $R_{\theta JA}$ 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 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.

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 <300µs 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 bond-wires.

Rev 3 : July 2005

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

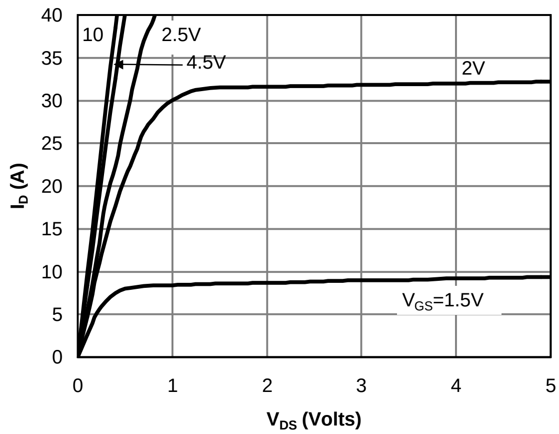


Fig 1: On-Region Characteristics

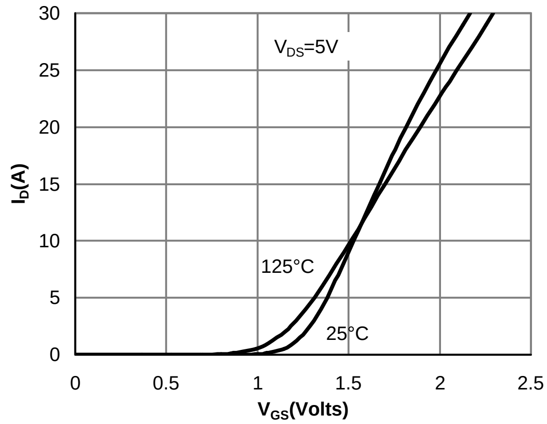


Figure 2: Transfer Characteristics

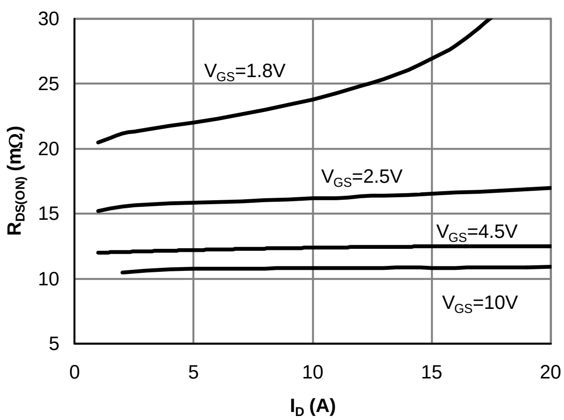


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

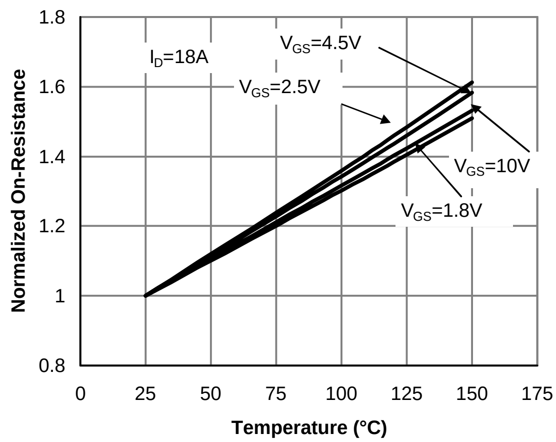


Figure 4: On-Resistance vs. Junction Temperature

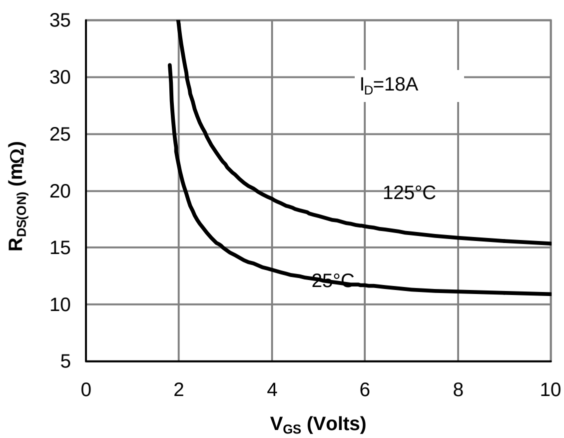


Figure 5: On-Resistance vs. Gate-Source Voltage

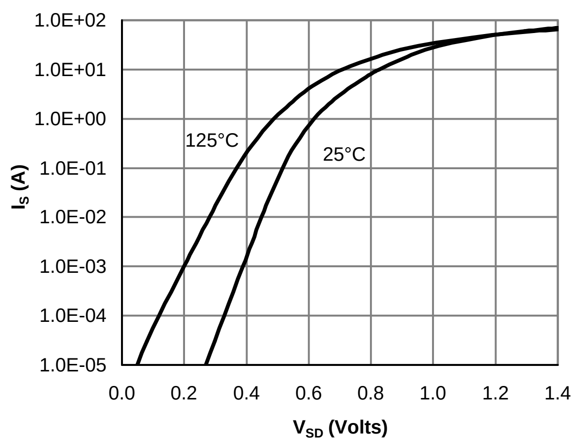


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

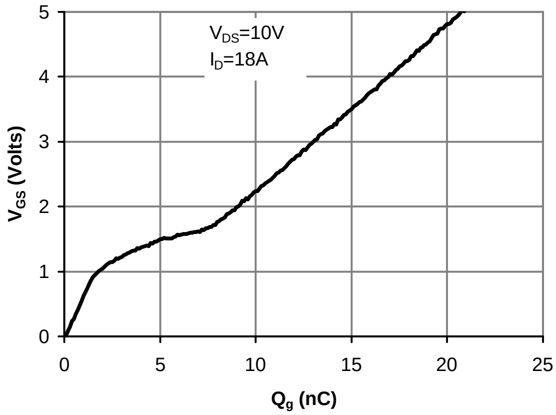


Figure 7: Gate-Charge Characteristics

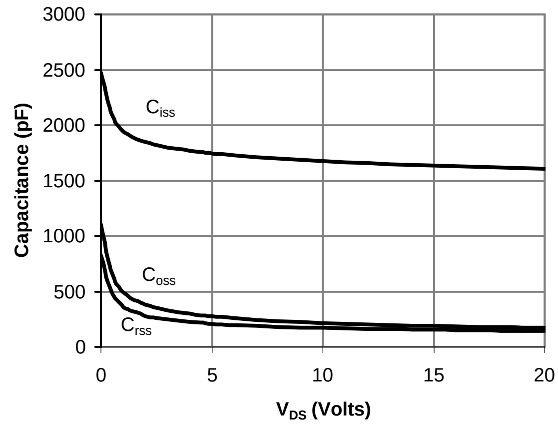


Figure 8: Capacitance Characteristics

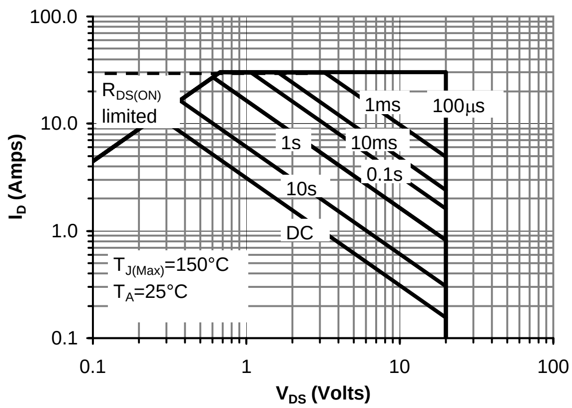


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

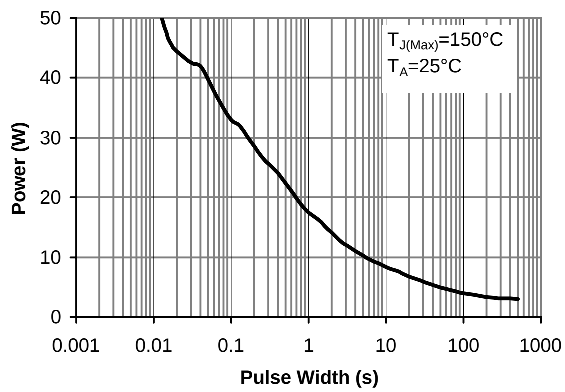


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

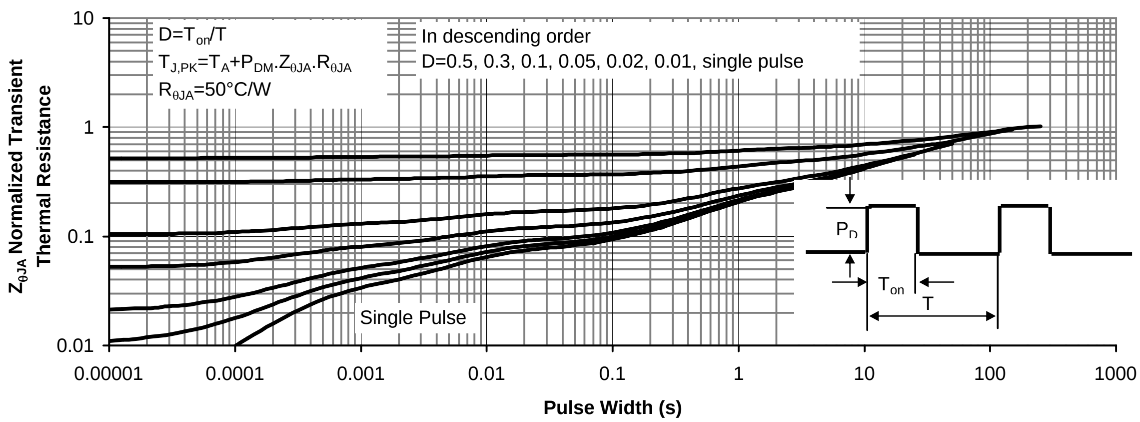


Figure 11: Normalized Maximum Transient Thermal Impedance