



ALPHA & OMEGA
SEMICONDUCTOR



AOD446

N-Channel Enhancement Mode Field Effect Transistor

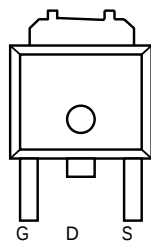
General Description

The AOD446 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications. *Standard Product AOD446 is Pb-free (meets ROHS & Sony 259 specifications). AOD446L is a Green Product ordering option. AOD446 and AOD446L are electrically identical.*

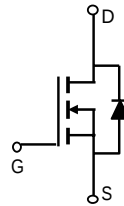
Features

V_{DS} (V) = 75V
 I_D = 10 A (V_{GS} = 20V)
 $R_{DS(ON)} < 130 \text{ m}\Omega$ (V_{GS} = 20V) @ 5A
 $R_{DS(ON)} < 140 \text{ m}\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 165 \text{ m}\Omega$ (V_{GS} = 4.5V)

TO-252
D-PAK



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}	75	V
Gate-Source Voltage	V_{GS}	± 25	V
Continuous Drain Current ^G	I_D	10	A
		10	
Pulsed Drain Current ^C	I_{DM}	20	
Avalanche Current ^C	I_{AR}	10	A
Repetitive avalanche energy $L=0.1\text{mH}$ ^C	E_{AR}	15	mJ
Power Dissipation ^B	P_D	20	W
		10	
Power Dissipation ^A	P_{DSM}	2.1	W
		1.3	
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	$R_{\theta JA}$	17.4	30	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		50	60	$^\circ\text{C/W}$
Maximum Junction-to-Case ^B	$R_{\theta JC}$	4	7.5	$^\circ\text{C/W}$

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 =10mA, V _{GS} =0V	75			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =60V, V _{GS} =0V T _J =55°C			1 5	μA
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	2.4	3	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	20			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =20V, I _D =5A		100	130	mΩ
		T _J =125°C		180	220	
		V _{GS} =10V, I _D =5A		105	140	mΩ
		V _{GS} =4.5V, I _D =2A		120	165	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =10A		9		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.79	1	V
I _S	Maximum Body-Diode Continuous Current				10	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, f=1MHz		293	350	pF
C _{oss}	Output Capacitance			51		pF
C _{rss}	Reverse Transfer Capacitance			20		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		2.2	3	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =37.5V, I _D =5A		5.2	6.5	nC
Q _g (4.5V)	Total Gate Charge			2.46	3.5	nC
Q _{gs}	Gate Source Charge			1		nC
Q _{gd}	Gate Drain Charge			1.34		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =37.5V, R _L =7.5Ω, R _{GEN} =3Ω		4.6		ns
t _r	Turn-On Rise Time			2.3		ns
t _{D(off)}	Turn-Off DelayTime			14.7		ns
t _f	Turn-Off Fall Time			1.7		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =5A, dI/dt=100A/μs		25	30	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =5A, dI/dt=100A/μs		27		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 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 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_{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 <300 μs pulses, duty cycle 0.5% max.

F: These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175°C.

G: The maximum current rating is limited by bond-wires.

H: 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.

Rev2: August 2005

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

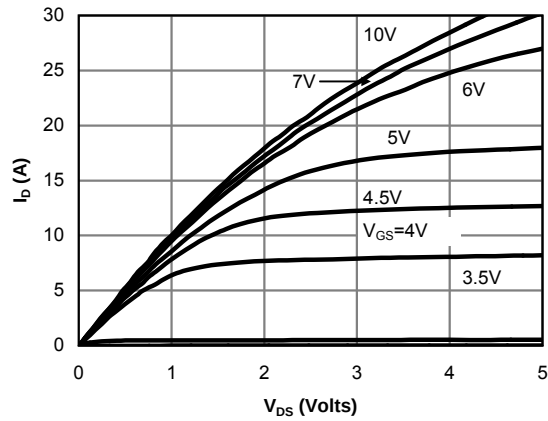


Fig 1: On-Region Characteristics

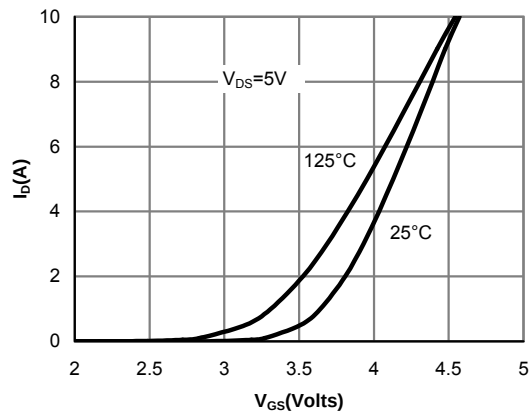


Figure 2: Transfer Characteristics

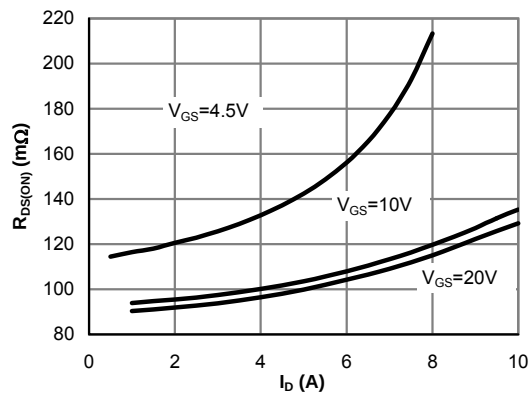


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

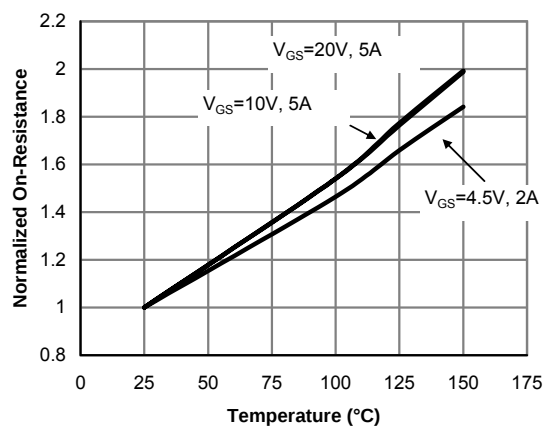


Figure 4: On-Resistance vs. Junction Temperature

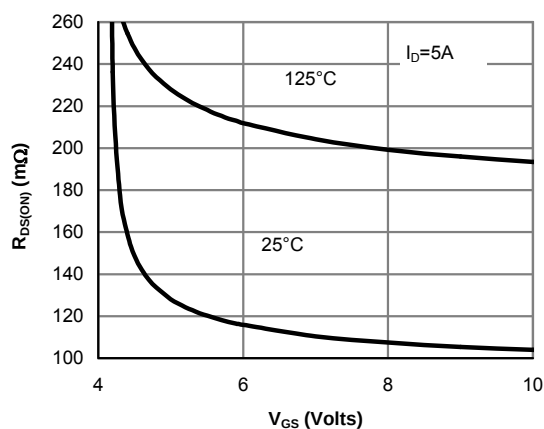


Figure 5: On-Resistance vs. Gate-Source Voltage

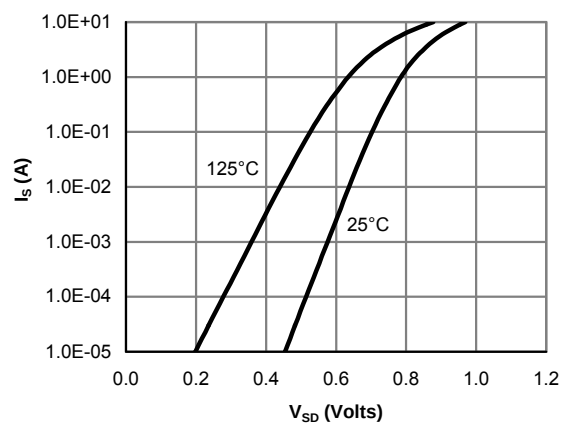


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

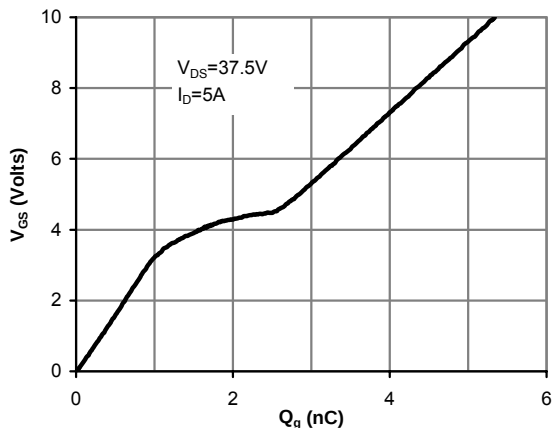


Figure 7: Gate-Charge Characteristics

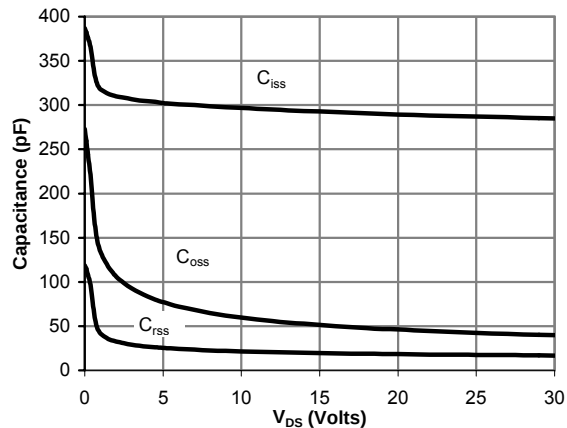


Figure 8: Capacitance Characteristics

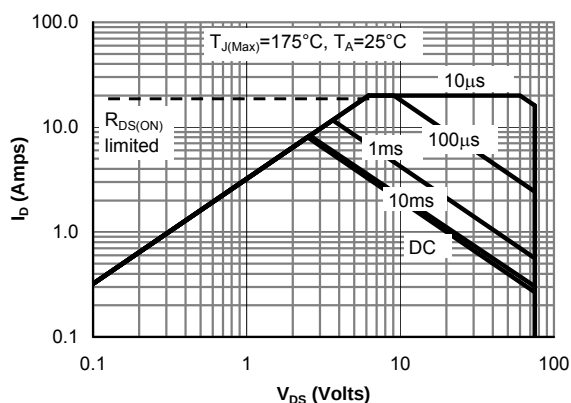


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

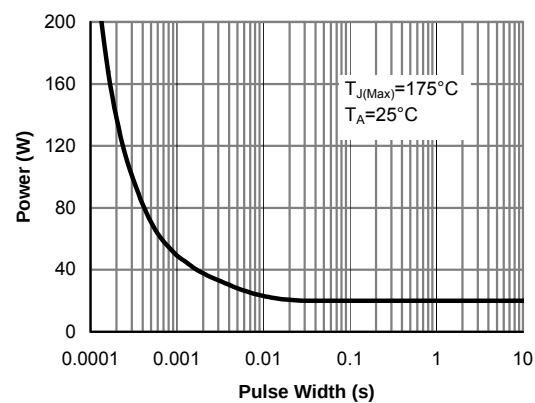


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

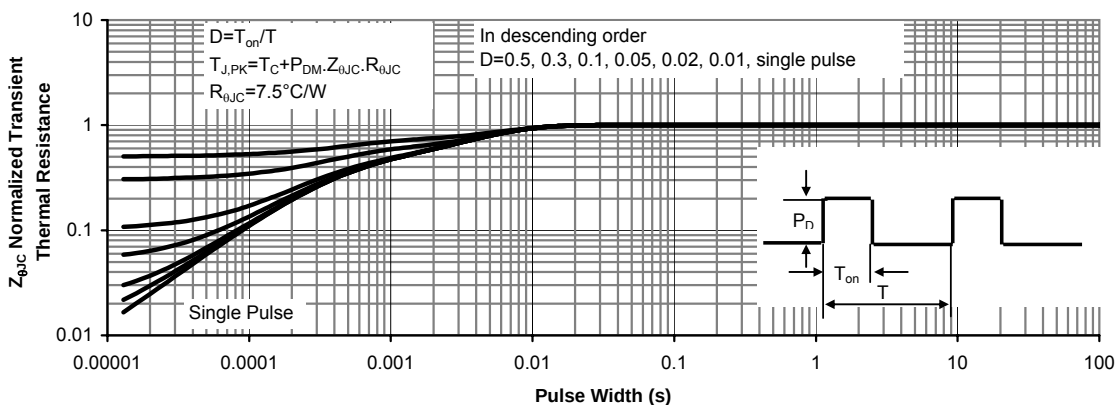


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

