ALPHA & OMEGA SEMICONDUCTOR

AOD446
N-Channel Enhancement Mode Field Effect Transistor

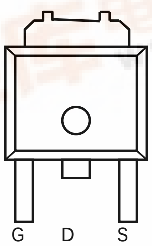
General Description

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.*

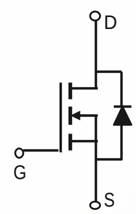
Features

V_{DS} (V) = 75V
I_D = 10 A (V_{GS} = 20V)
$R_{DS(ON)}$ < 130 mΩ (V_{GS} = 20V) @ 5A
$R_{DS(ON)}$ < 140 mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 165 mΩ (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}	75	V
Gate-Source Voltage		V_{GS}	±25	V
Continuous Drain Current [G]	T_C=25°C	I_D	10	A
	T_C=100°C		10	
Pulsed Drain Current [C]		I_{DM}	20	
Avalanche Current [C]		I_{AR}	10	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	15	mJ
Power Dissipation [B]	T_C=25°C	P_D	20	W
	T_C=100°C		10	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.1	W
	T_A=70°C		1.3	
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	$R_{\theta JA}$	17.4	30	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		50	60	°C/W
Maximum Junction-to-Case [B]	Steady-State	$R_{\theta JC}$	4	7.5	°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=10mA, V_{GS}=0V	75			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=60V, V_{GS}=0V			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	2.4	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 $R_{\theta JA}$ 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 <300 µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-case thermal impedence 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 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.

Rev2: August 2005

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

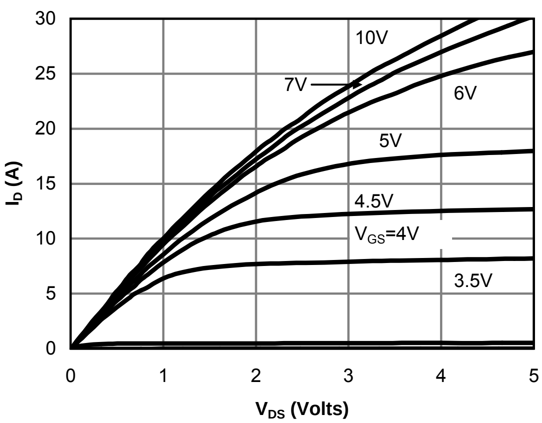


Fig 1: On-Region Characteristics

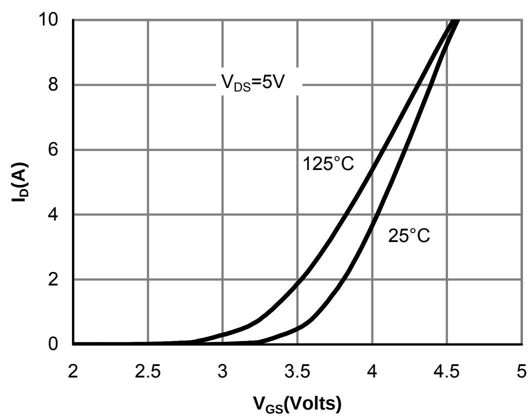


Figure 2: Transfer Characteristics

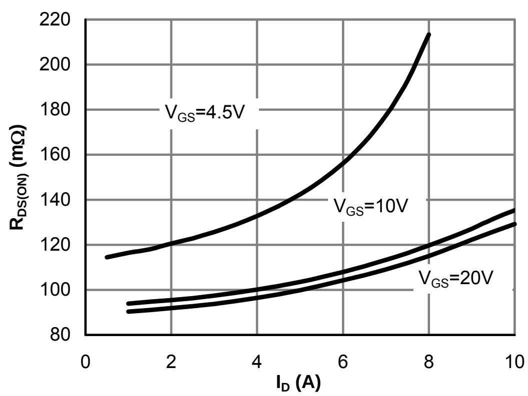


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

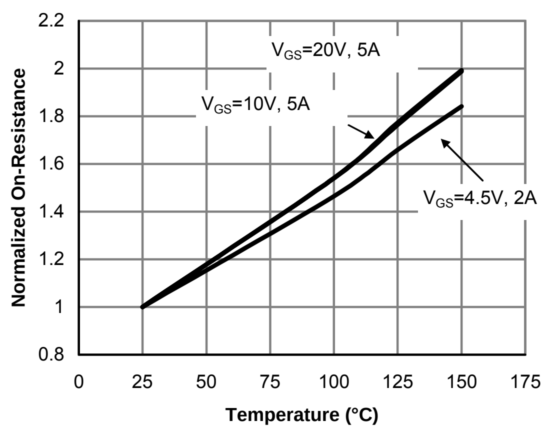


Figure 4: On-Resistance vs. Junction Temperature

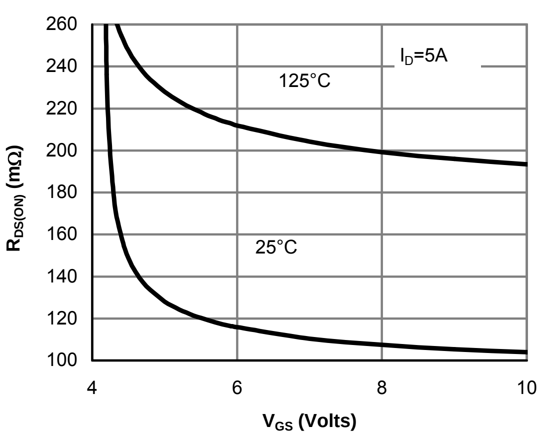


Figure 5: On-Resistance vs. Gate-Source Voltage

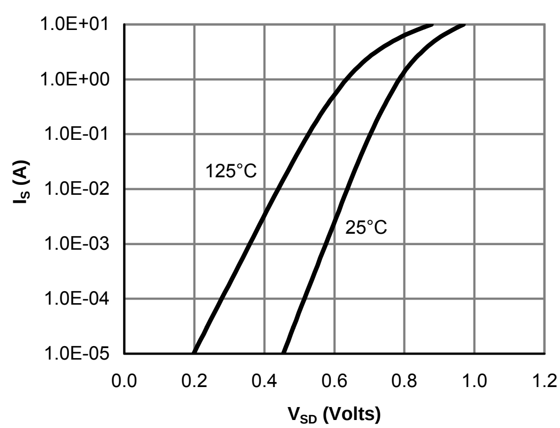


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

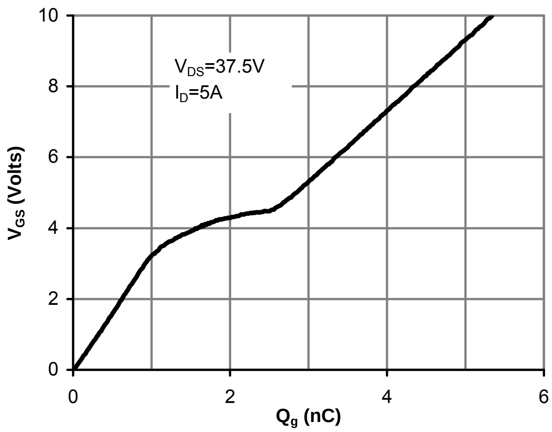


Figure 7: Gate-Charge Characteristics

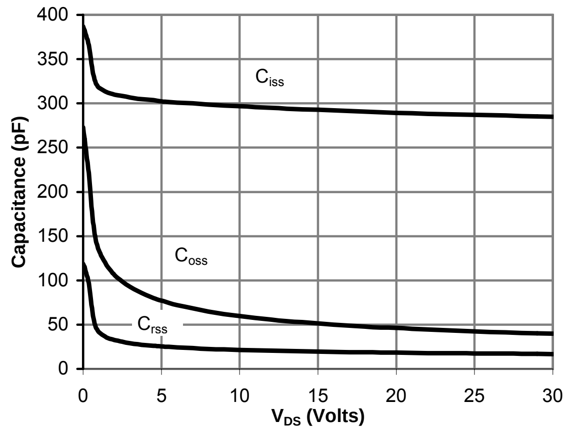


Figure 8: Capacitance Characteristics

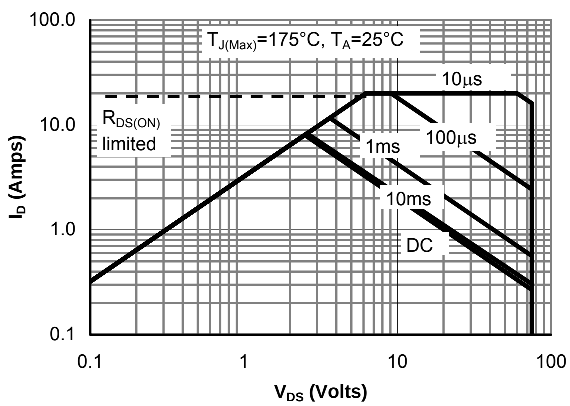


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

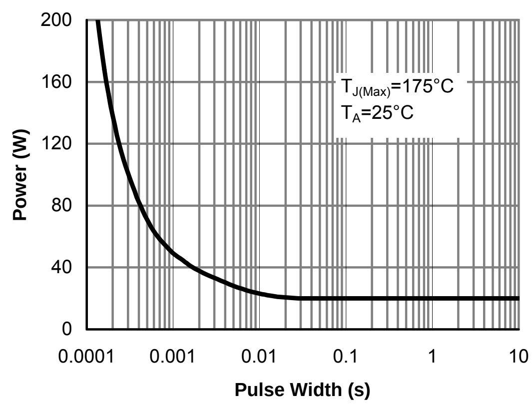


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

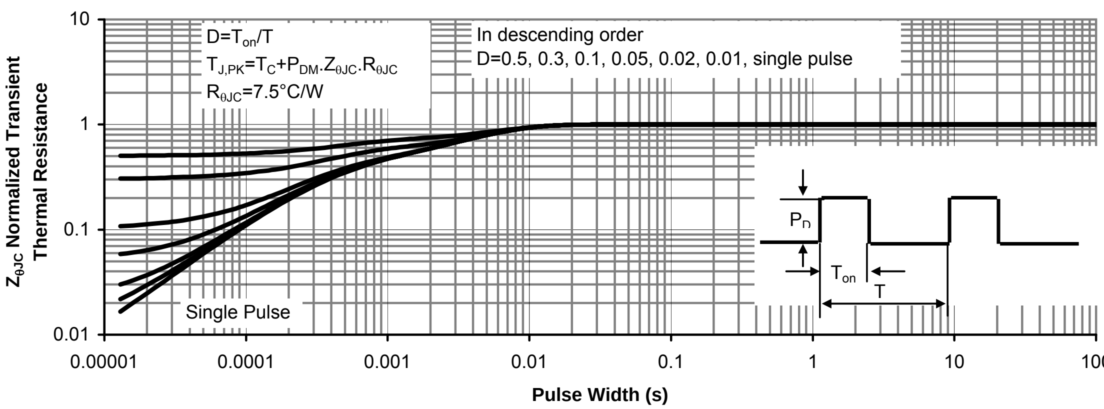


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

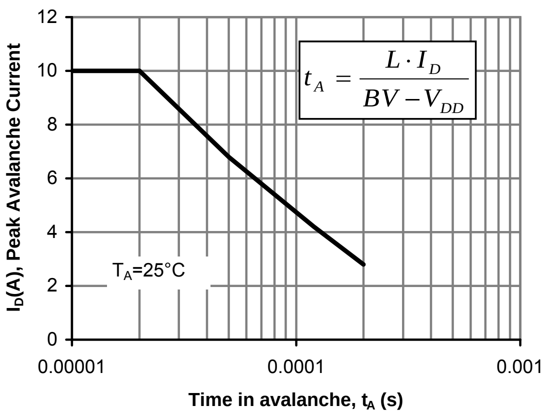


Figure 12: Single Pulse Avalanche capability

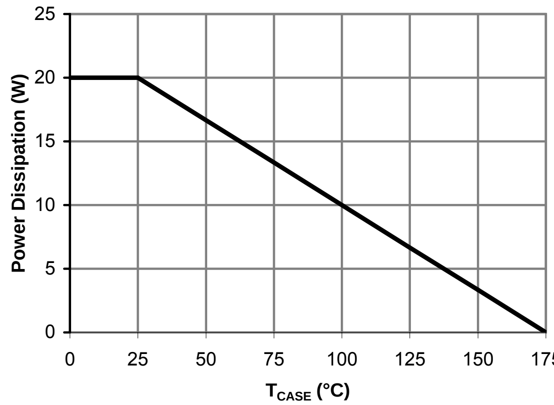


Figure 13: Power De-rating (Note B)

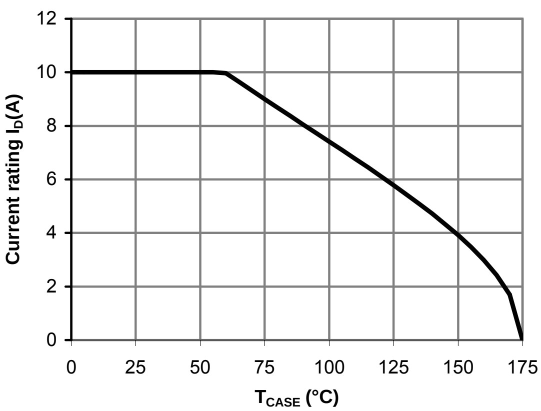


Figure 14: Current De-rating (Note B)

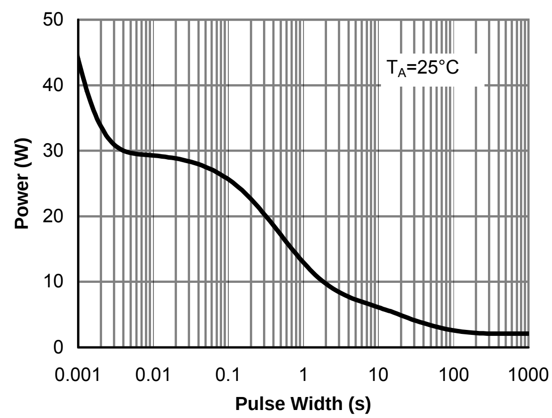


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

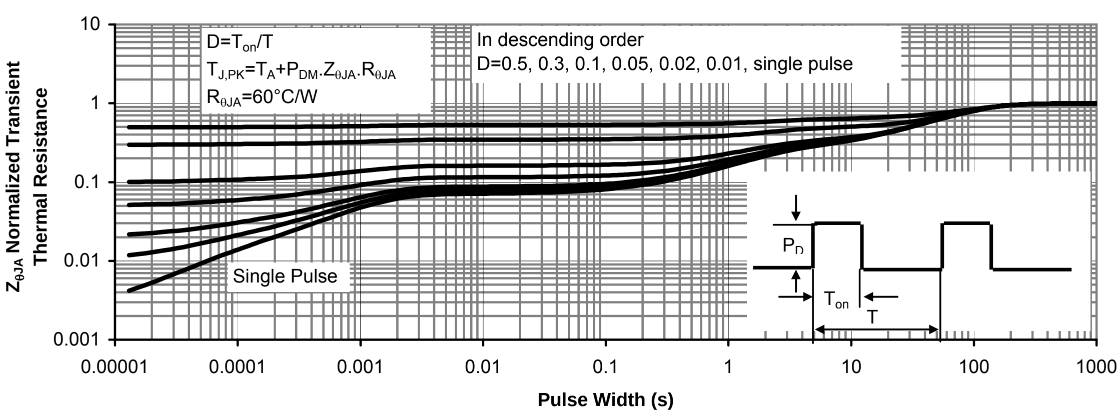


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)