ALPHA & OMEGA
SEMICONDUCTOR

Green Product

RoHS Compliant

AOD403
P-Channel Enhancement Mode Field Effect Transistor

General Description

The AOD403 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.

-RoHS Compliant
-Halogen Free*

Features

V_{DS} (V) = -30V
I_D = -85A (V_{GS} = -20V)
$R_{DS(ON)}$ < 6mΩ (V_{GS} = -20V)
$R_{DS(ON)}$ < 7.6mΩ (V_{GS} = -10V)

UIS TESTED!
Rg,Ciss,Coss,Crss Tested

TO-252
D-PAK

Top View   Bottom View
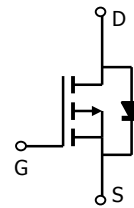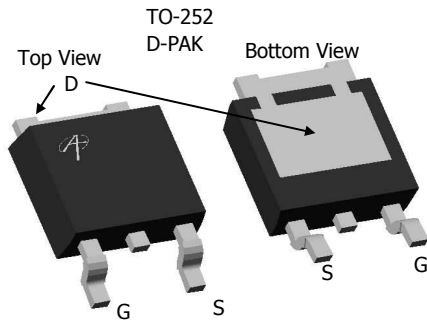
Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	±25	V
Continuous Drain Current [B,G]	T_A=25°C [G]	I_D	-85	A
	T_A=100°C [B]		-65	
Pulsed Drain Current		I_{DM}	-200	
Avalanche Current [C]		I_{AR}	-30	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	120	mJ
Power Dissipation [B]	T_C=25°C	P_D	100	W
	T_C=100°C		50	
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	$R_{\theta JA}$	13	20	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		39	50	°C/W
Maximum Junction-to-Case [C]	Steady-State	$R_{\theta JC}$	0.56	1.5	°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			-0.01	-1	µA
			T$_J$=55°C			-5	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$=0V, V$_{GS}$=±25V				±100	nA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$ I$_D$=-250µA		-1.5	-2.6	-3.5	V
I$_{D(ON)}$	On state drain current	V$_{GS}$=-10V, V$_{DS}$=-5V		-60			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=-20V, I$_D$=-20A			5.1	6	mΩ
			T$_J$=125°C		7.1	8.5	
		V$_{GS}$=-10V, I$_D$=-20A			6.3	7.6	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=-5V, I$_D$=-20A			44		S
V$_{SD}$	Diode Forward Voltage	I$_S$=-1A,V$_{GS}$=0V			-0.72	-1	V
I$_S$	Maximum Body-Diode Continuous Current[G]					-80	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=-15V, f=1MHz			4360	5300	pF
C$_{oss}$	Output Capacitance				1050		pF
C$_{rss}$	Reverse Transfer Capacitance				762		pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz			2.5	3	Ω
SWITCHING PARAMETERS							
Q$_g$	Total Gate Charge	V$_{GS}$=-10V, V$_{DS}$=-15V, I$_D$=-20A			93.2	120	nC
Q$_{gs}$	Gate Source Charge				18		nC
Q$_{gd}$	Gate Drain Charge				29.2		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=-10V, V$_{DS}$=-15V, R$_L$=0.75Ω, R$_{GEN}$=3Ω			18	25	ns
t$_r$	Turn-On Rise Time				30	45	ns
t$_{D(off)}$	Turn-Off DelayTime				51	75	ns
t$_f$	Turn-Off Fall Time				35	50	ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=-20A, dI/dt=100A/µs			39.5	48	ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=-20A, dI/dt=100A/µs			30.8	37	nC

A: The value of R$_{θJA}$ 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$_{θJA}$ 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 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°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$_{θJA}$ is the sum of the thermal impedence 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 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.
*This device is guaranteed green after data code 8X11 (Sep 1ST 2008).
Rev 6: Sep 2008
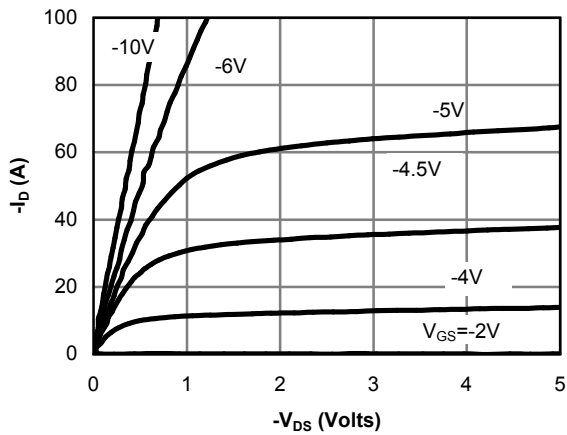
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

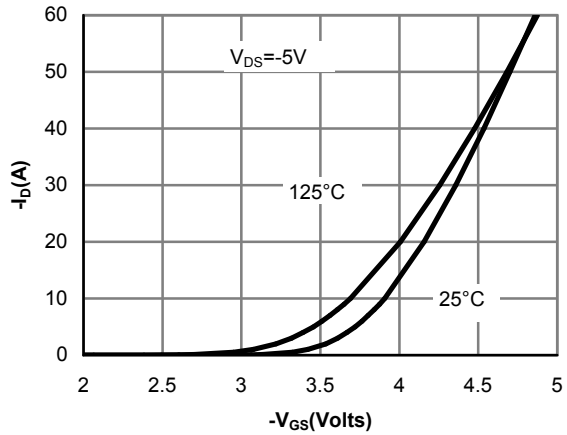**Fig 1: On-Region Characteristics**
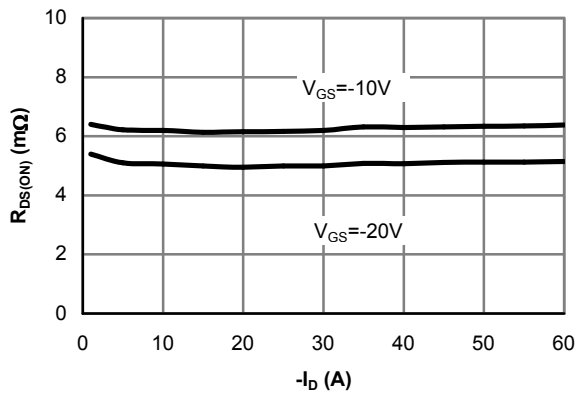
Figure 2: Transfer Characteristics

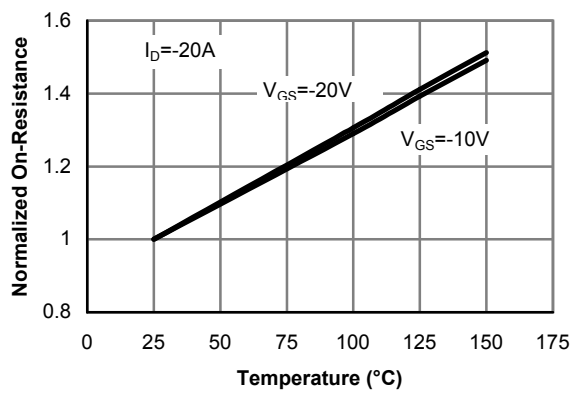**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

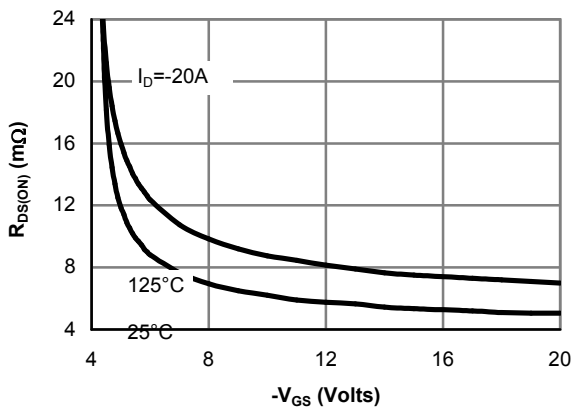**Figure 4: On-Resistance vs. Junction Temperature**
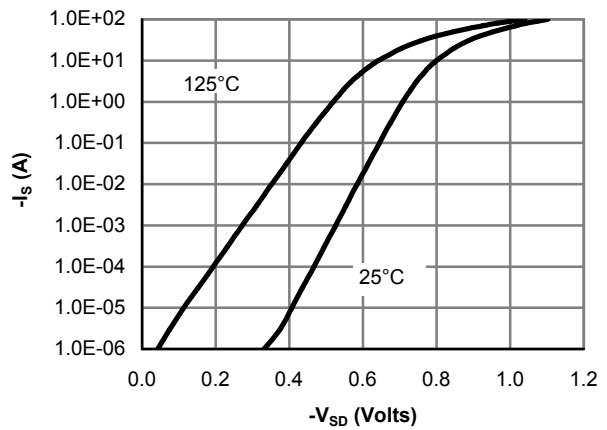
Figure 5: On-Resistance vs. Gate-Source Voltage

Figure 6: Body-Diode Characteristics
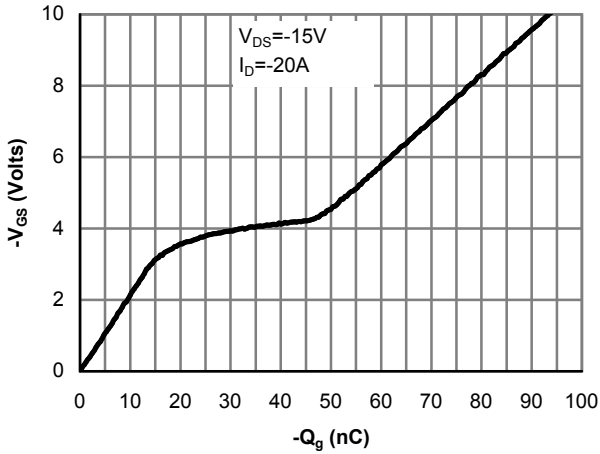
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
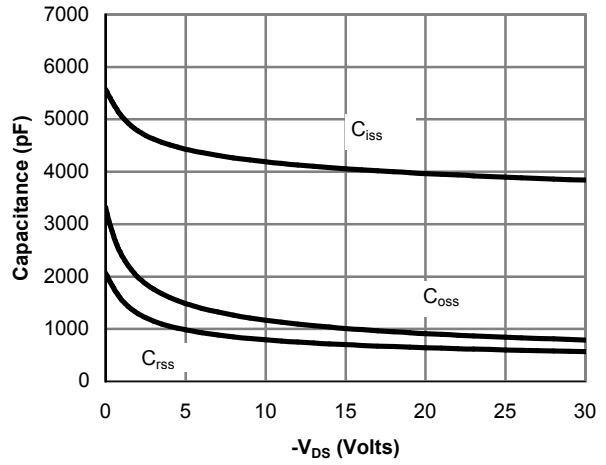

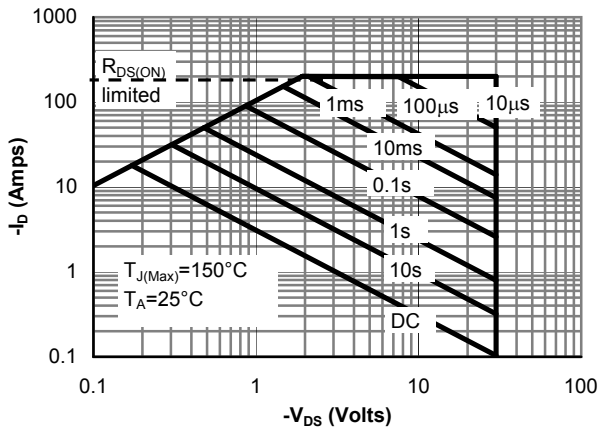**Figure 7: Gate-Charge Characteristics**

Figure 8: Capacitance Characteristics

Figure 9: Maximum Forward Biased Safe Operating Area (Note F)
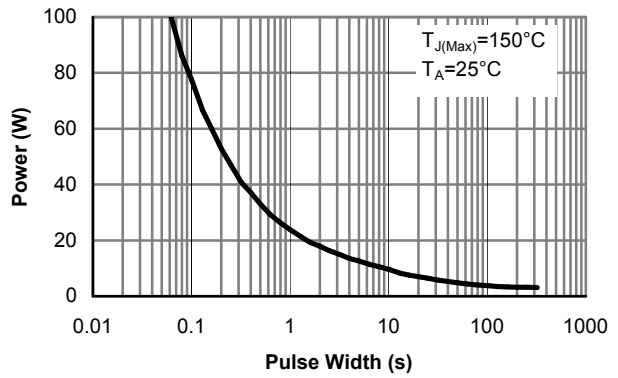
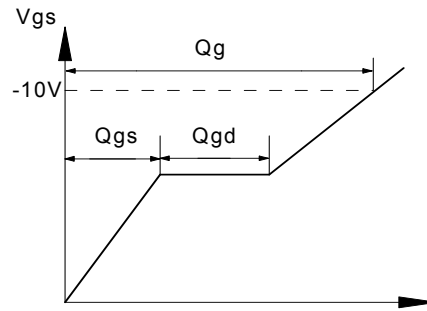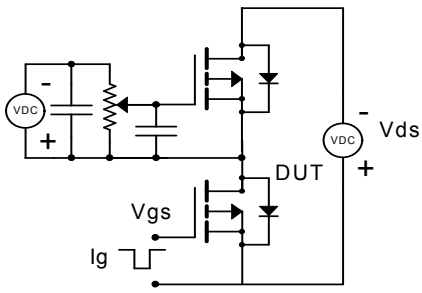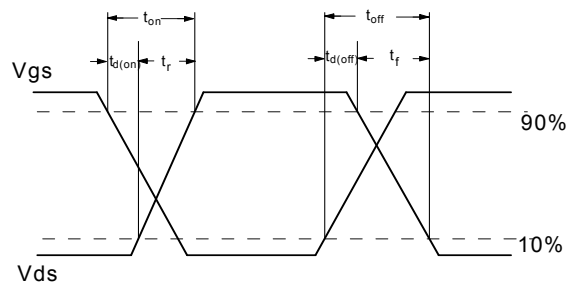**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)**
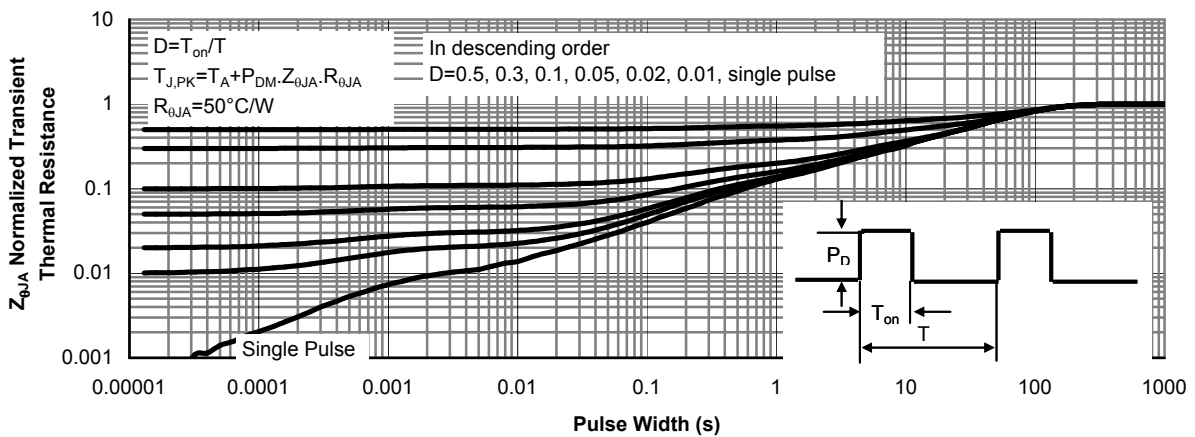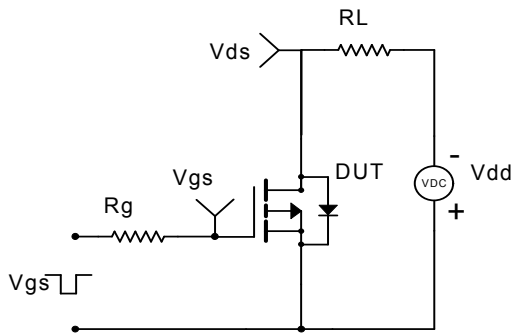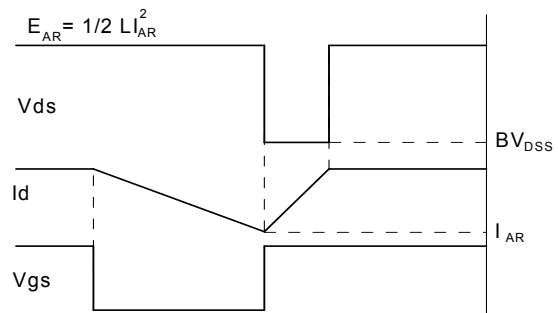

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)
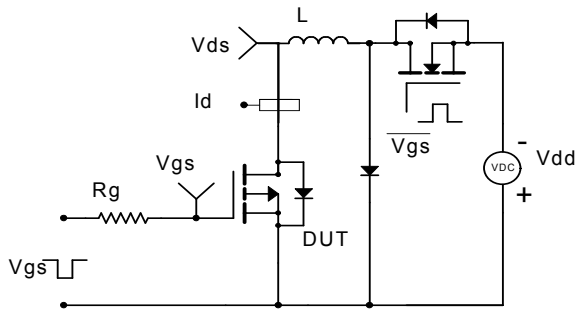
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2\, LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int Idt$$