



ALPHA & OMEGA
SEMICONDUCTOR

AO4403

P-Channel Enhancement Mode Field Effect Transistor



General Description

The AO4403/L uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications. The source leads are separated to allow a Kelvin connection to the source, which may be used to bypass the source inductance.

AO4403 and AO4403L are electrically identical.

-RoHS Compliant

-AO4403L is Halogen Free

Features

V_{DS} (V) = -30V

I_D = -6.1 A (V_{GS} = -10V)

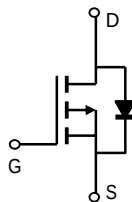
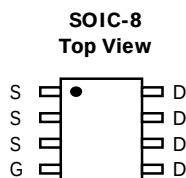
$R_{DS(ON)} < 46m\Omega$ (V_{GS} = -10V)

$R_{DS(ON)} < 61m\Omega$ (V_{GS} = -4.5V)

$R_{DS(ON)} < 117m\Omega$ (V_{GS} = -2.5V)

UIS TESTED!

Rg, Ciss, Coss, Crss Tested



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ^{AF}	I_D	-6.1	A
$T_A=25^\circ\text{C}$			
$T_A=70^\circ\text{C}$		-5.1	
Pulsed Drain Current ^B	I_{DM}	-30	
Power Dissipation ^A	P_D	3	W
$T_A=25^\circ\text{C}$			
$T_A=70^\circ\text{C}$		2.1	
Avalanche Current ^B	I_{AR}	8	A
Repetitive avalanche energy 0.3mH ^B	E_{AR}	10	mJ
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^{AF}	$t \leq 10s$	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		59	75	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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 =-250μA, V _{GS} =0V	-30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-30V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±12V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =-250μA	-0.7	-1	-1.3	V
I _{D(ON)}	On state drain current	V _{GS} =-4.5V, V _{DS} =-5V	20			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-6.1A T _J =125°C		38 60	46 70	mΩ
		V _{GS} =-4.5V, I _D =-5A		49	61	mΩ
		V _{GS} =-2.5V, I _D =-1A		76	117	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-5A	7	11		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.75	-1	V
I _S	Maximum Body-Diode Continuous Current				-4.2	A
I _{SM}	Pulsed Body-Diode Current ^B				-30	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		940	1128	pF
C _{oss}	Output Capacitance			104		pF
C _{rss}	Reverse Transfer Capacitance			73		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	3	6	9	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-4.5V, V _{DS} =-15V, I _D =-5A		9.4	11.3	nC
Q _{gs}	Gate Source Charge			2		nC
Q _{gd}	Gate Drain Charge			3		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =2.4Ω, R _{GEN} =6Ω		7.6		ns
t _r	Turn-On Rise Time			8.6		ns
t _{D(off)}	Turn-Off DelayTime			44.7		ns
t _f	Turn-Off Fall Time			16.5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-5A, dI/dt=100A/μs		22.7	30	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-5A, dI/dt=100A/μs		15.9		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 value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

E: 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.

F: The current rating is based on the ≤ 10s junction to ambient thermal resistance rating.

Rev6: Feb 2008

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

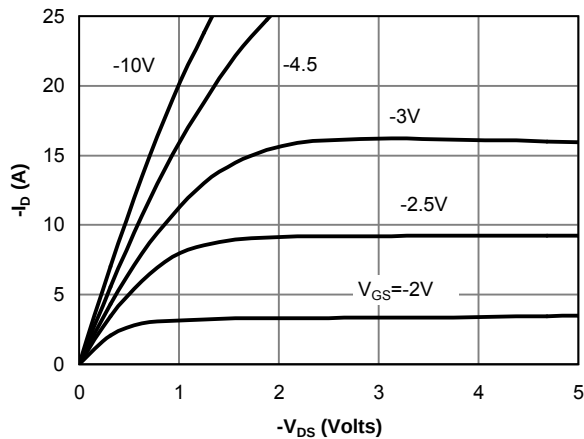


Fig 1: On-Region Characteristics

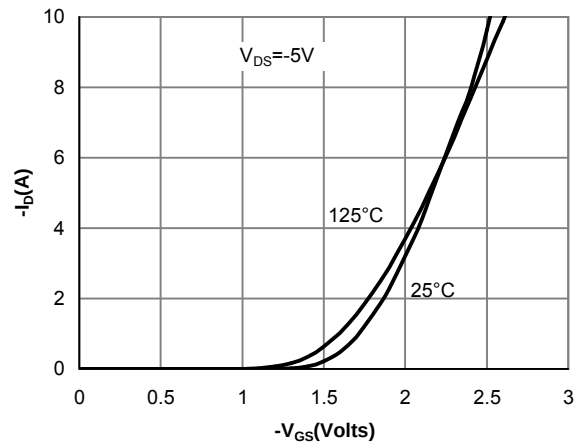


Figure 2: Transfer Characteristics

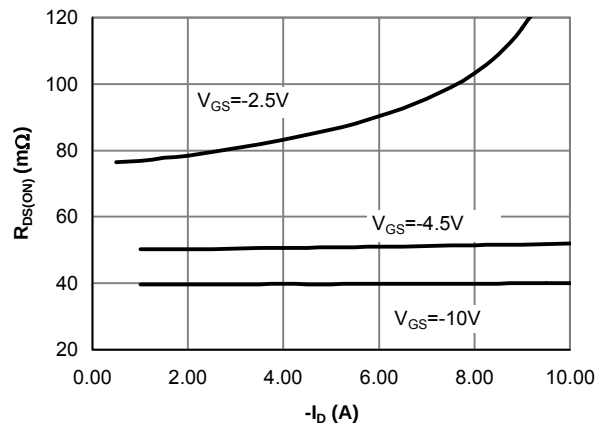


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

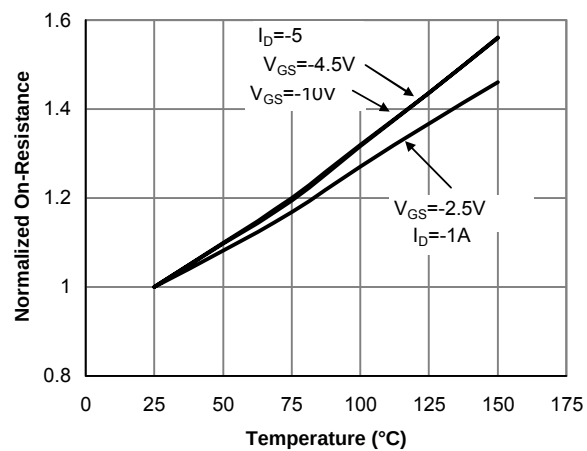


Figure 4: On-Resistance vs. Junction Temperature

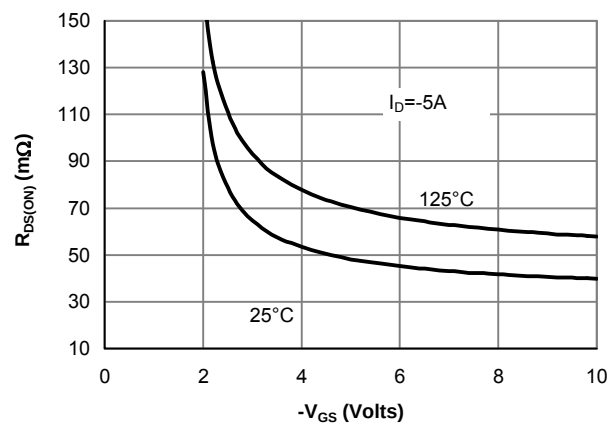


Figure 5: On-Resistance vs. Gate-Source Voltage

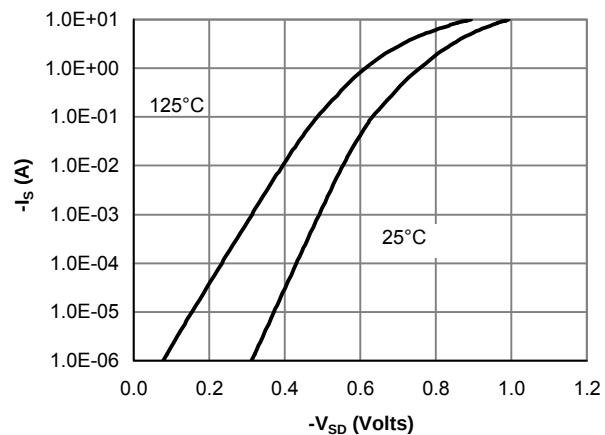


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

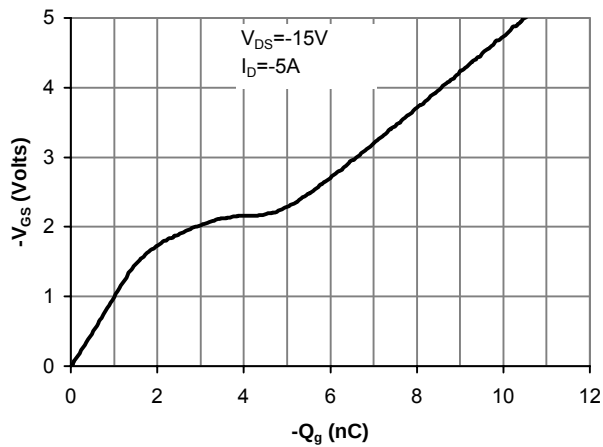


Figure 7: Gate-Charge Characteristics

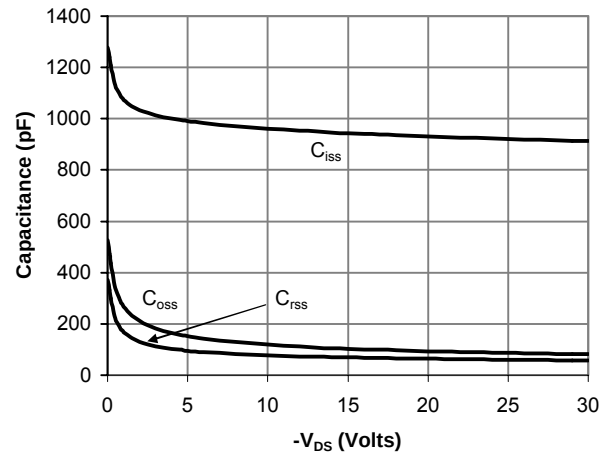


Figure 8: Capacitance Characteristics

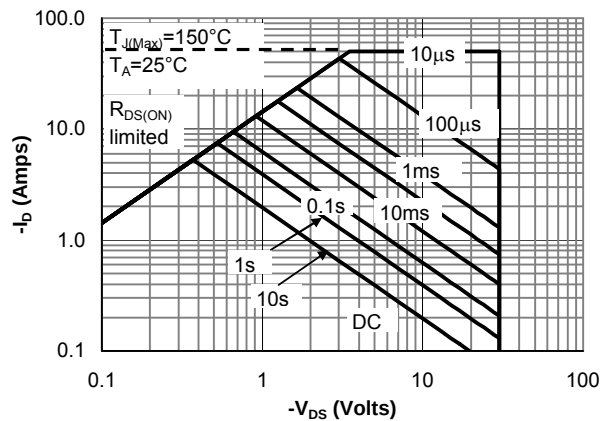


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

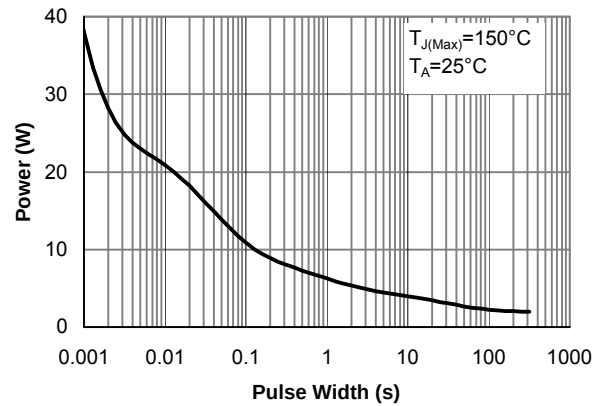


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

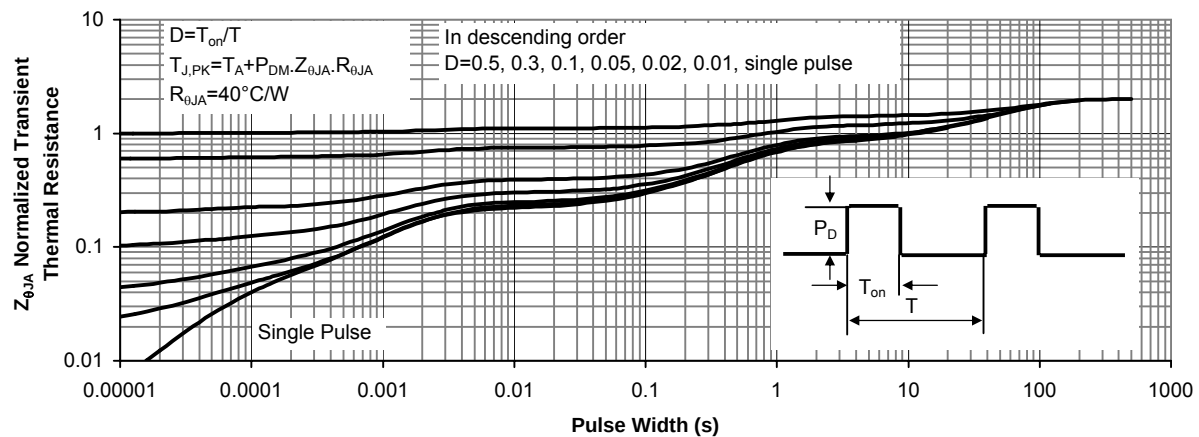


Figure 11: Normalized Maximum Transient Thermal Impedance