ALPHA & OMEGA SEMICONDUCTOR, LTD.

Rev 1:Nov 2004

AO3419, AO3419L (Green Product)
P-Channel Enhancement Mode Field Effect Transistor

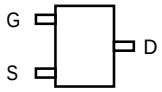
General Description

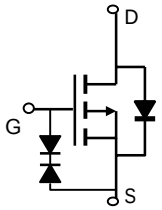
The AO3419 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications. It is ESD protected. AO3419L (Green Product) is offered in a lead-free package.

Features

V_{DS} (V) = -20V
I_D = -3.5 A
$R_{DS(ON)}$ < 75mΩ (V_{GS} = -10V)
$R_{DS(ON)}$ < 95mΩ (V_{GS} = -4.5V)
$R_{DS(ON)}$ < 145mΩ (V_{GS} = -2.5V)
ESD Rating: 2000V HBM

TO-236 (SOT-23) Top View





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 Current [A]	T_A=25°C	I_D	-3.5	A
	T_A=70°C		-2.8	
Pulsed Drain Current [B]		I_{DM}	-15	
Power Dissipation [A]	T_A=25°C	P_D	1.4	W
	T_A=70°C		0.9	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	65	90	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		85	125	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	43	60	°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			-0.5	µA
		T_J=55°C			-2.5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±10V			±1	µA
		V_{DS}=0V, V_{GS}=±12V			±10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.7	-0.9	-1.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-3.5A		59	75	mΩ
		T_J=125°C		83	105	
		V_{GS}=-4.5V, I_D=-3A		76	95	mΩ
		V_{GS}=-2.5V, I_D=-1A		111	145	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3.5A		6.8		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V	-0.65	-0.81	-0.95	V
I_S	Maximum Body-Diode Continuous Current				-2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		512	620	pF
C_{oss}	Output Capacitance			77		pF
C_{rss}	Reverse Transfer Capacitance			62		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		9.2	13	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3.5A		5.5	6.6	nC
Q_{gs}	Gate Source Charge			0.8		nC
Q_{gd}	Gate Drain Charge			1.9		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-10V, R_L=2.8Ω, R_{GEN}=3Ω		5		ns
t_r	Turn-On Rise Time			6.7		ns
$t_{D(off)}$	Turn-Off DelayTime			28		ns
t_f	Turn-Off Fall Time			13.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-3.5A, dI/dt=100A/µs		9.8	12	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-3.5A, dI/dt=100A/µs		2.7		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 value in any a given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

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

C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80 µs 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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

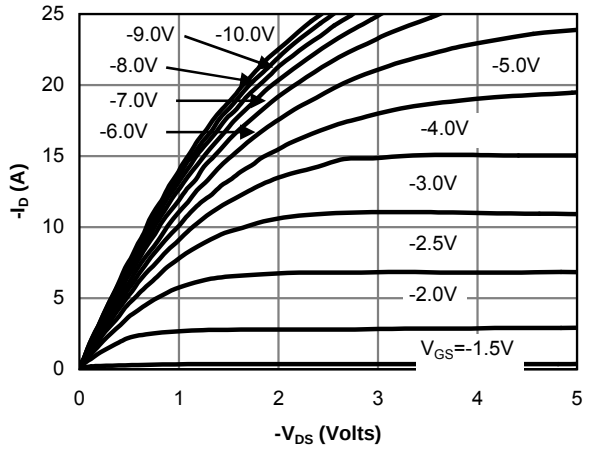


Fig 1: On-Region Characteristics

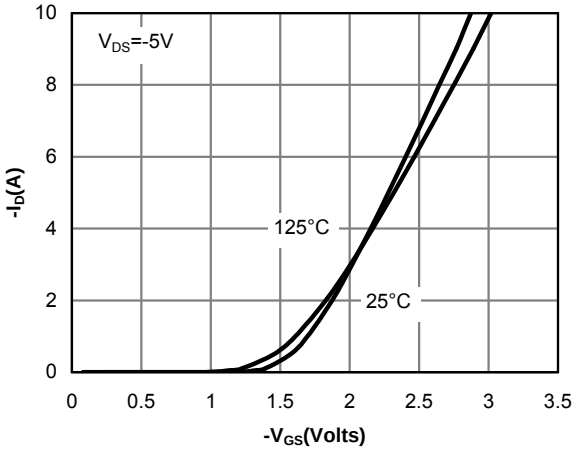


Figure 2: Transfer Characteristics

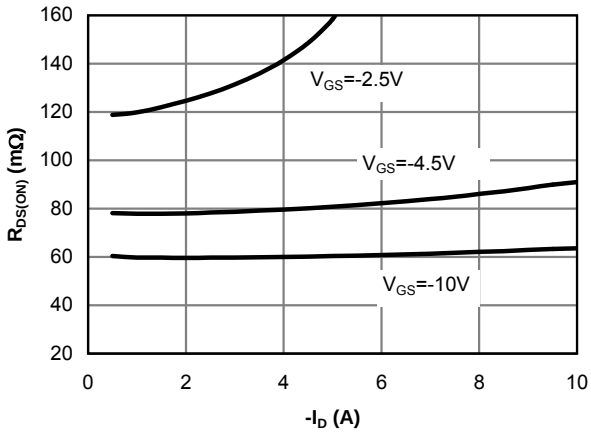


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

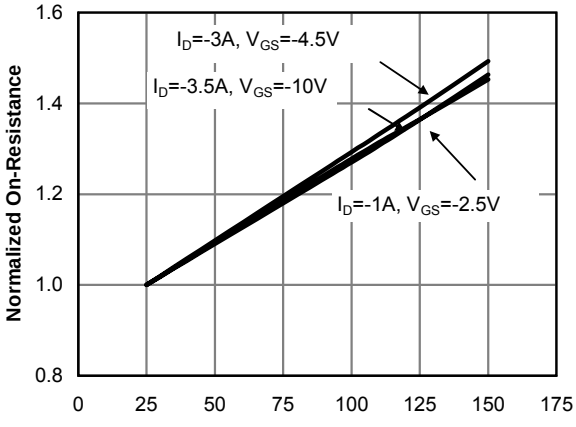


Figure 4: On-Resistance vs. Junction Temperature

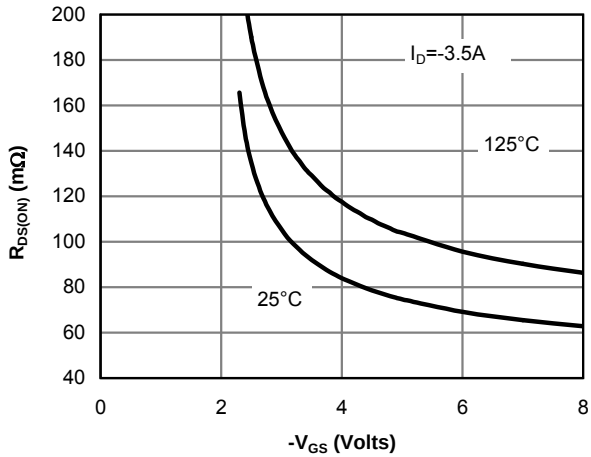


Figure 5: On-Resistance vs. Gate-Source Voltage

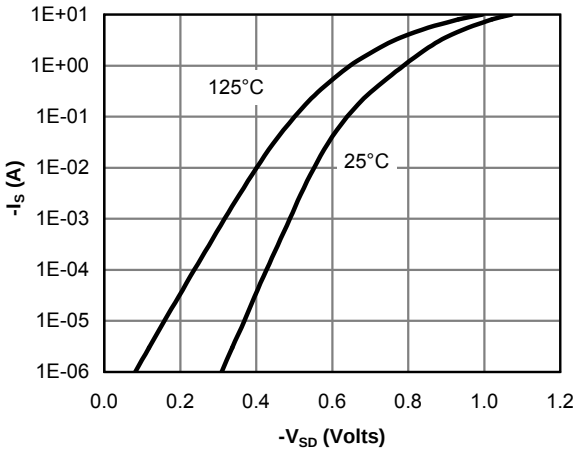


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

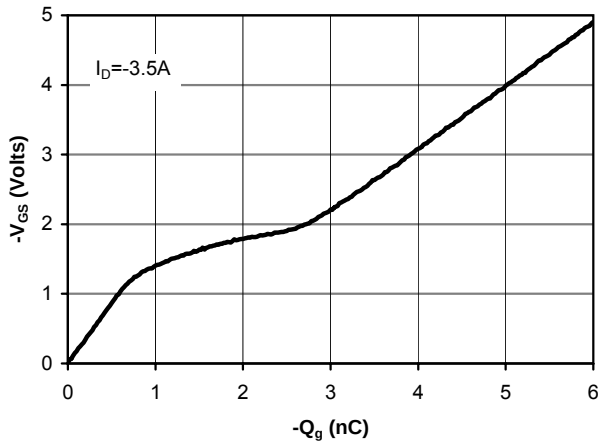


Figure 7: Gate-Charge Characteristics

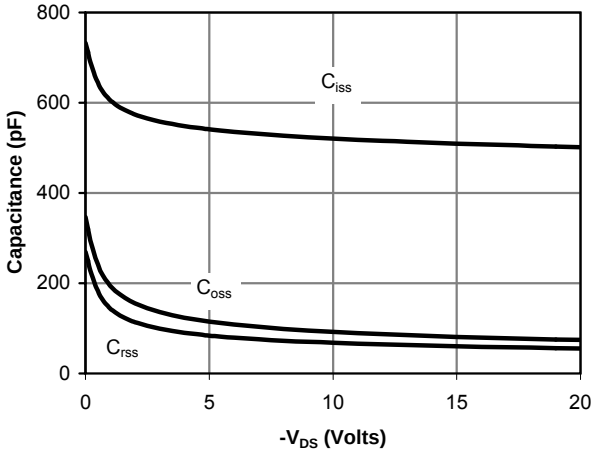


Figure 8: Capacitance Characteristics

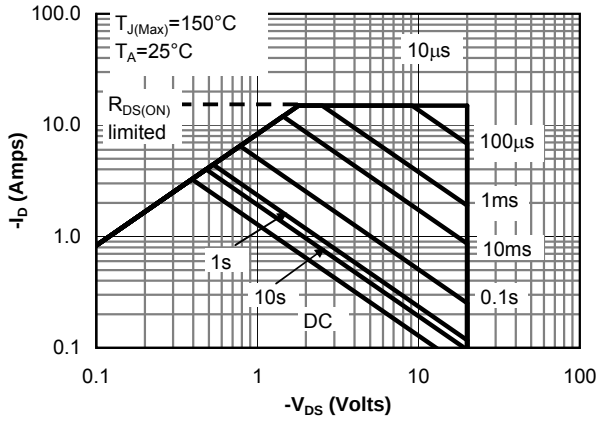


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

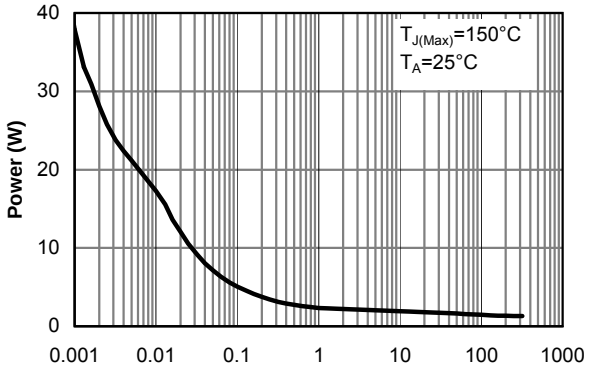


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

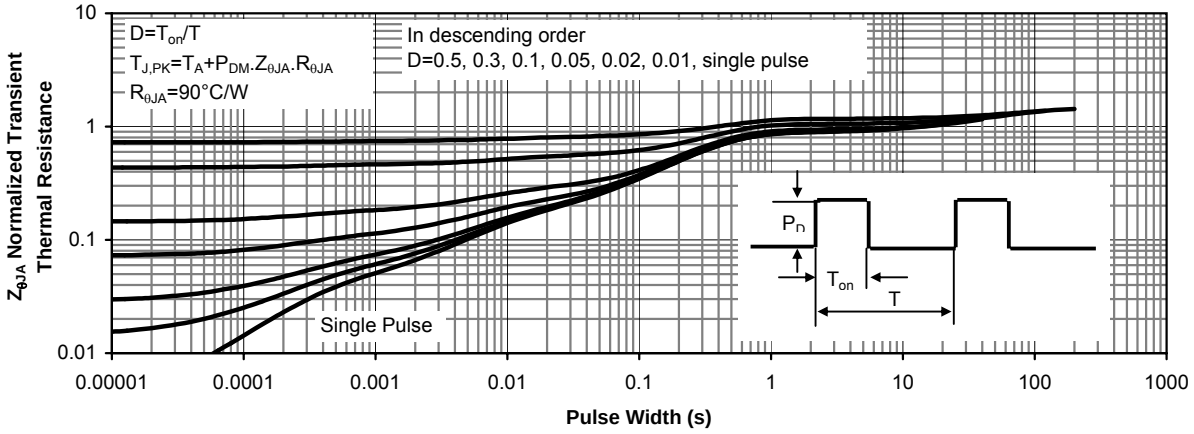


Figure 11: Normalized Maximum Transient Thermal Impedance