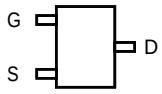
ALPHA & OMEGA SEMICONDUCTOR

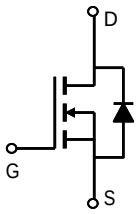
AO3420
N-Channel Enhancement Mode Field Effect Transistor

General Description
The AO3420 uses advanced trench technology to provide excellent RDS(ON), low gate charge and operation with gate voltages as low as 1.8V while retaining a 12V VGS(MAX) rating. This device is suitable for use as a uni-directional or bi-directional load switch. Standard Product AO3420 is Pb-free (meets ROHS & Sony 259 specifications). AO3420L is a Green Product ordering option. AO3420 and AO3420L are electrically identical.

Features
V_{DS} (V) = 20V
I_D = 6 A (V_{GS} = 10V)
$R_{DS(ON)}$ < 24mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 27mΩ (V_{GS} = 4.5V)
$R_{DS(ON)}$ < 42mΩ (V_{GS} = 2.5V)
$R_{DS(ON)}$ < 55mΩ (V_{GS} = 1.8V)

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	6	A
	T_A=70°C		5	
Pulsed Drain Current [B]		I_{DM}	25	
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	$R_{\theta JA}$	70	90	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		100	125	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	63	80	°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			1	μA
		T_J=55°C			5	
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=250uA	0.5	0.7	1	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=6A		19	24	mΩ
		T_J=125°C		29	35	
		V_{GS}=4.5V, I_D=5A		22	27	
		V_{GS}=2.5V, I_D=4A		35	42	
		V_{GS}=1.8V, I_D=2A		45	55	
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=3.8A		24		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.75	1	V
I_S	Maximum Body-Diode Continuous Current				2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz		630		pF
C_{oss}	Output Capacitance			164		pF
C_{rss}	Reverse Transfer Capacitance			137		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.5		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=10V, I_D=6A		8.8		nC
Q_{gs}	Gate Source Charge			1		nC
Q_{gd}	Gate Drain Charge			3.7		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=5V, V_{DS}=10V, R_L=1.7Ω, R_{GEN}=6Ω		5.5		ns
t_r	Turn-On Rise Time			14		ns
$t_{D(off)}$	Turn-Off DelayTime			29		ns
t_f	Turn-Off Fall Time			10.2		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=6A, dI/dt=100A/μs		15.2		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=6A, dI/dt=100A/μs		6.3		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 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 80μs 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

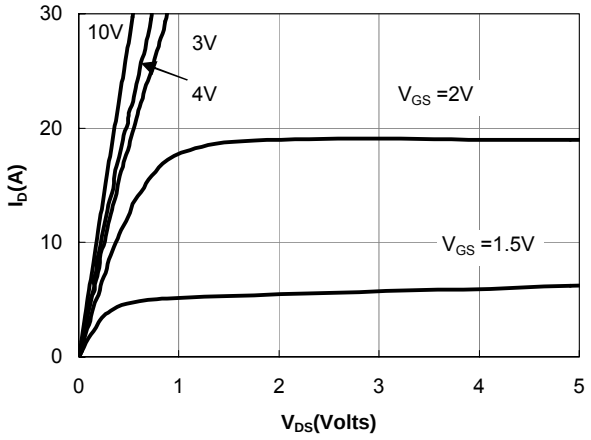

Figure 1: On-Regions Characteristics

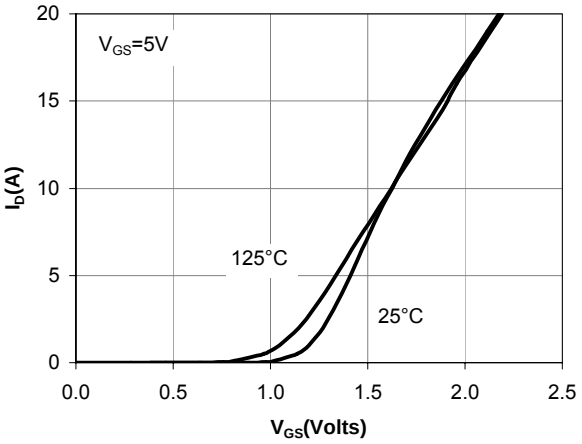

Figure 2: Transfer Characteristics

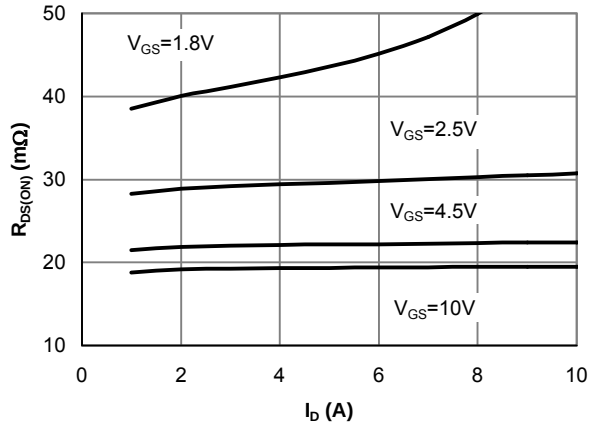

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

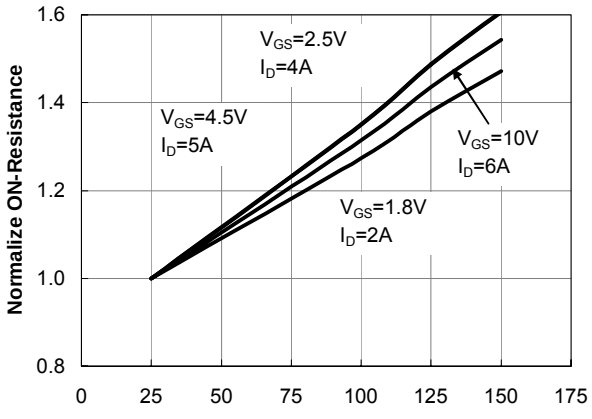

Figure 4: On-Resistance vs. Junction Temperature

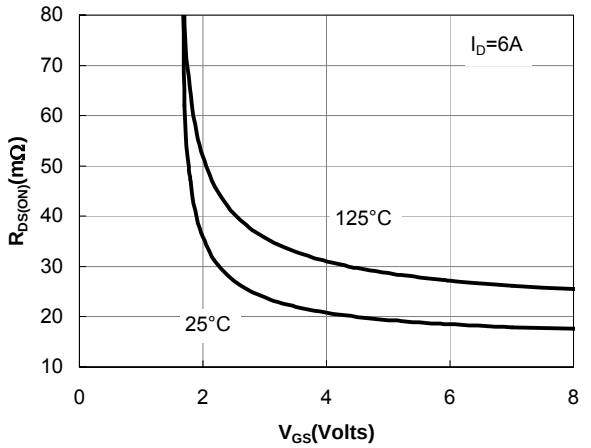

Figure 5: On-Resistance vs. Gate-Source Voltage

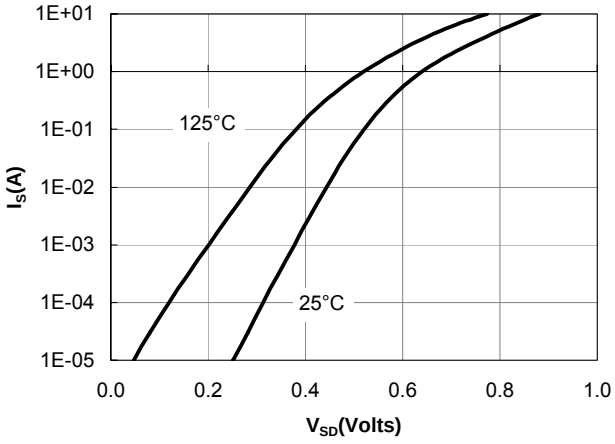

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

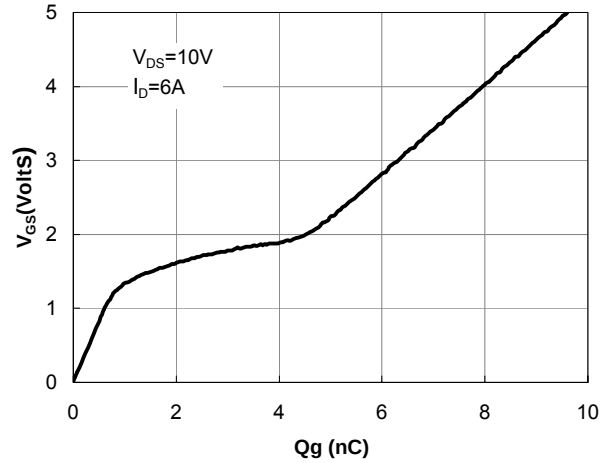

Figure 7: Gate-Charge Characteristics

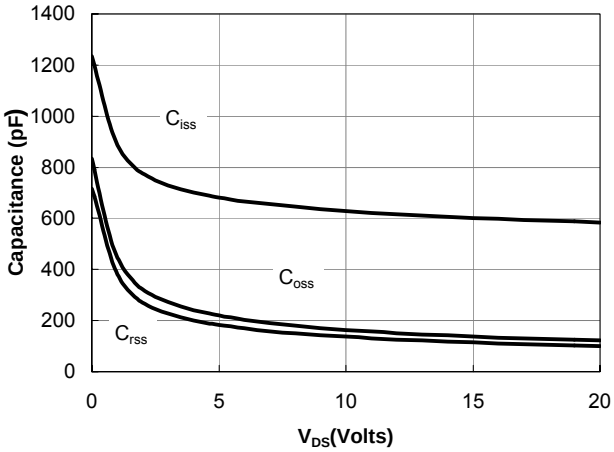

Figure 8: Capacitance Characteristics

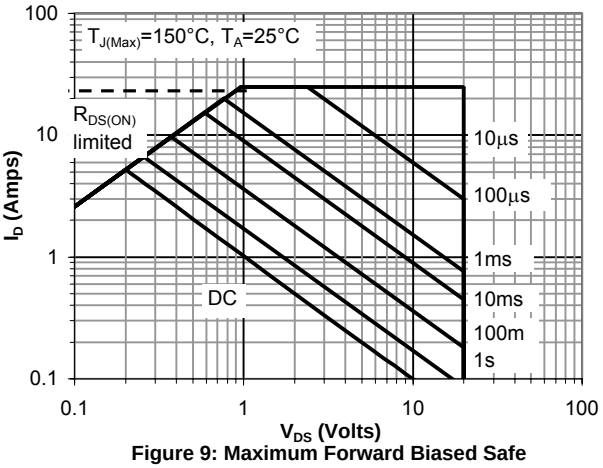

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

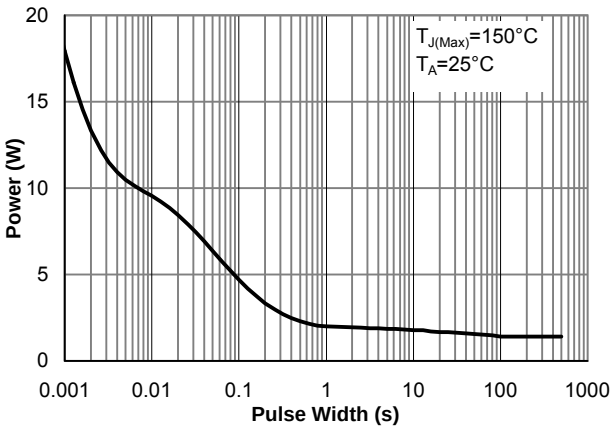

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

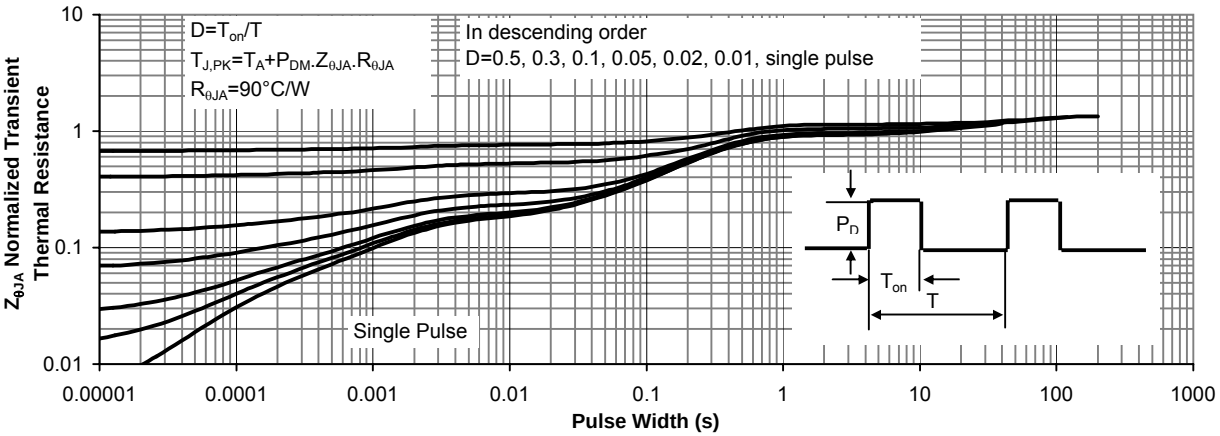

Figure 11: Normalized Maximum Transient Thermal Impedance