



ALPHA & OMEGA
SEMICONDUCTOR

AO3420

N-Channel Enhancement Mode Field Effect Transistor



General Description

The AO3420 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V while retaining a 12V $V_{GS(MAX)}$ 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

$V_{DS} (V) = 20V$

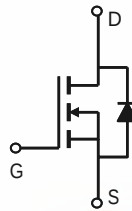
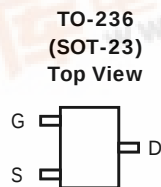
$I_D = 6 A (V_{GS} = 10V)$

$R_{DS(ON)} < 24m\Omega (V_{GS} = 10V)$

$R_{DS(ON)} < 27m\Omega (V_{GS} = 4.5V)$

$R_{DS(ON)} < 42m\Omega (V_{GS} = 2.5V)$

$R_{DS(ON)} < 55m\Omega (V_{GS} = 1.8V)$



Absolute Maximum Ratings $T_A=25^\circ C$ 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	I_D	6	A
		5	
Pulsed Drain Current ^B	I_{DM}	25	
Power Dissipation ^A	P_D	1.4	W
		0.9	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	70	90	$^\circ C/W$
Maximum Junction-to-Ambient ^A		100	125	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	63	80	$^\circ C/W$



Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=16\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.5	0.7	1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=6\text{A}$ $T_J=125^{\circ}\text{C}$		19 29	24 35	m Ω
		$V_{GS}=4.5\text{V}$, $I_D=5\text{A}$		22	27	
		$V_{GS}=2.5\text{V}$, $I_D=4\text{A}$		35	42	
		$V_{GS}=1.8\text{V}$, $I_D=2\text{A}$		45	55	
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=3.8\text{A}$		24		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.75	1	V
I_S	Maximum Body-Diode Continuous Current				2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=10\text{V}$, $f=1\text{MHz}$		630		pF
C_{oss}	Output Capacitance			164		pF
C_{rss}	Reverse Transfer Capacitance			137		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1.5		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=10\text{V}$, $I_D=6\text{A}$		8.8		nC
Q_{gs}	Gate Source Charge			1		nC
Q_{gd}	Gate Drain Charge			3.7		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=5\text{V}$, $V_{DS}=10\text{V}$, $R_L=1.7\Omega$, $R_{GEN}=6\Omega$		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	$I_F=6\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		15.2		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=6\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		6.3		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

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

C: The $R_{\theta JA}$ is the sum of the thermal impedance 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 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

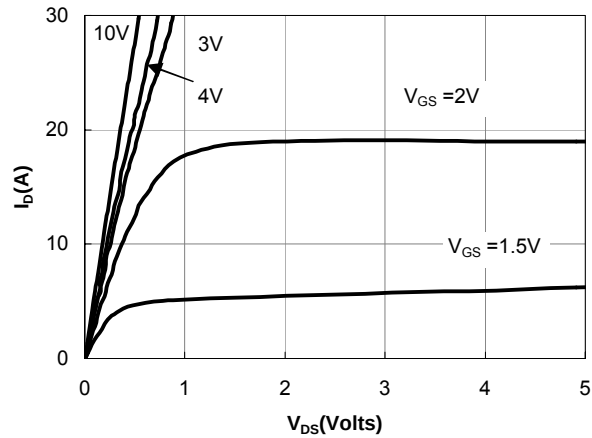


Figure 1: On-Regions Characteristic CS

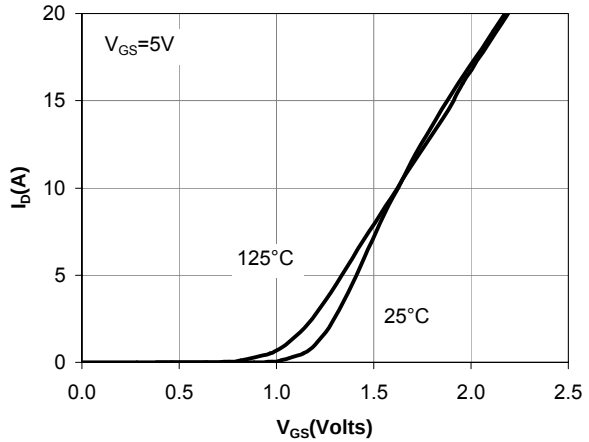


Figure 2: Transfer Characteristics

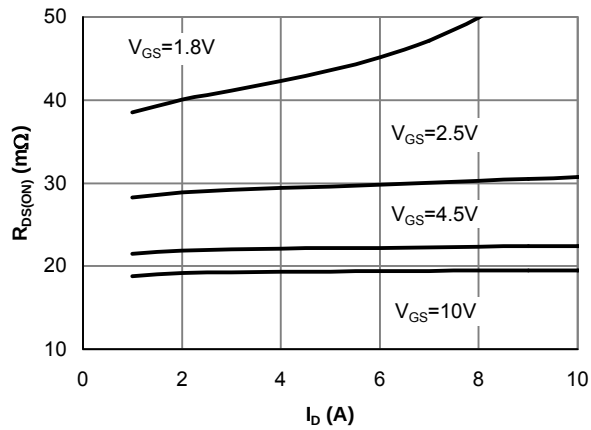


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

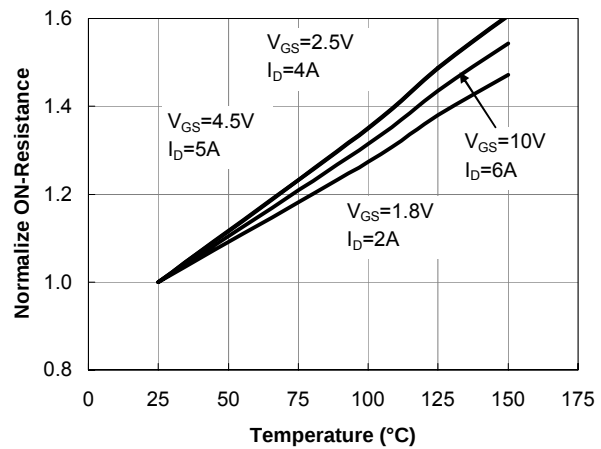


Figure 4: On-Resistance vs. Junction Temperature

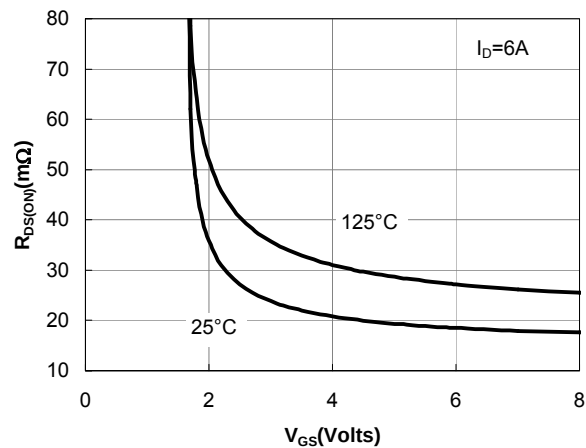


Figure 5: On-Resistance vs. Gate-Source Voltage

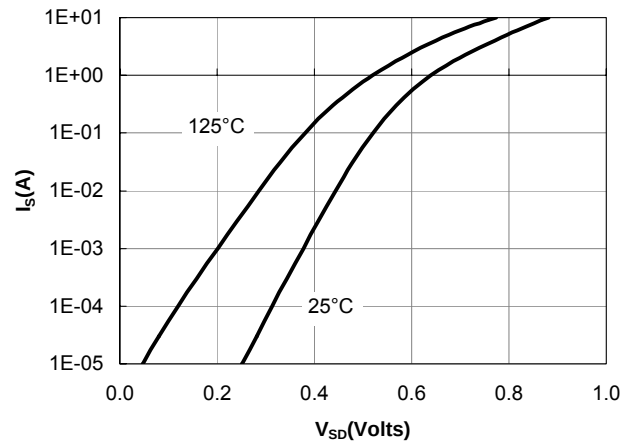


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

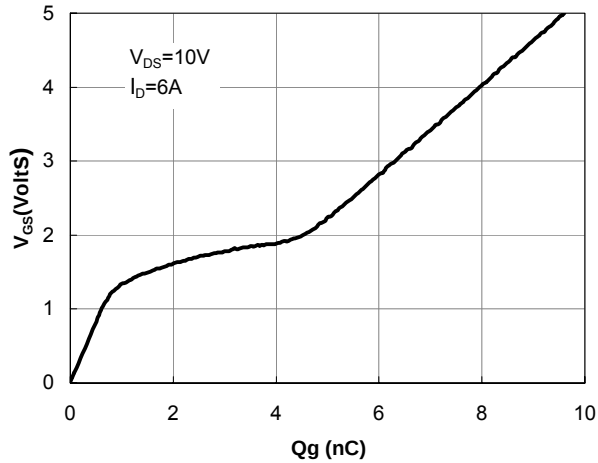


Figure 7: Gate-Charge Characteristics

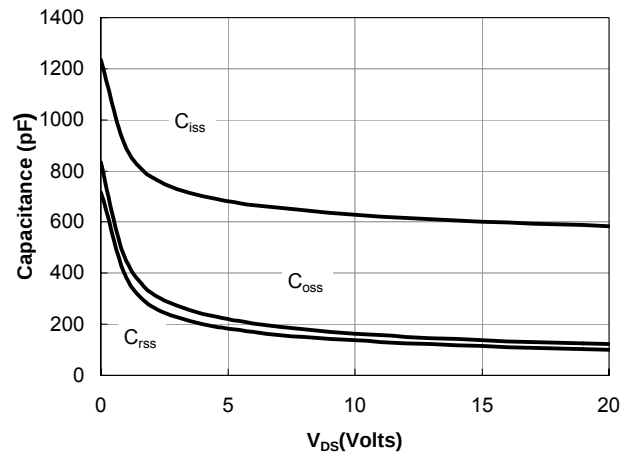


Figure 8: Capacitance Characteristics

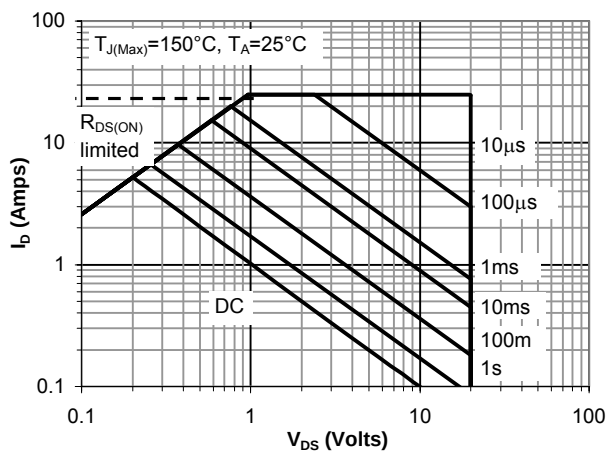


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

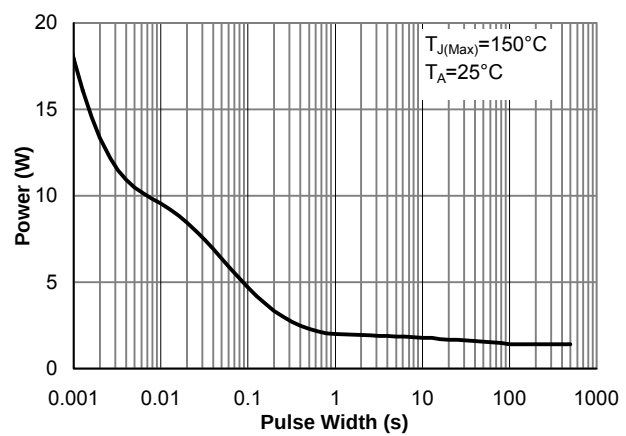


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

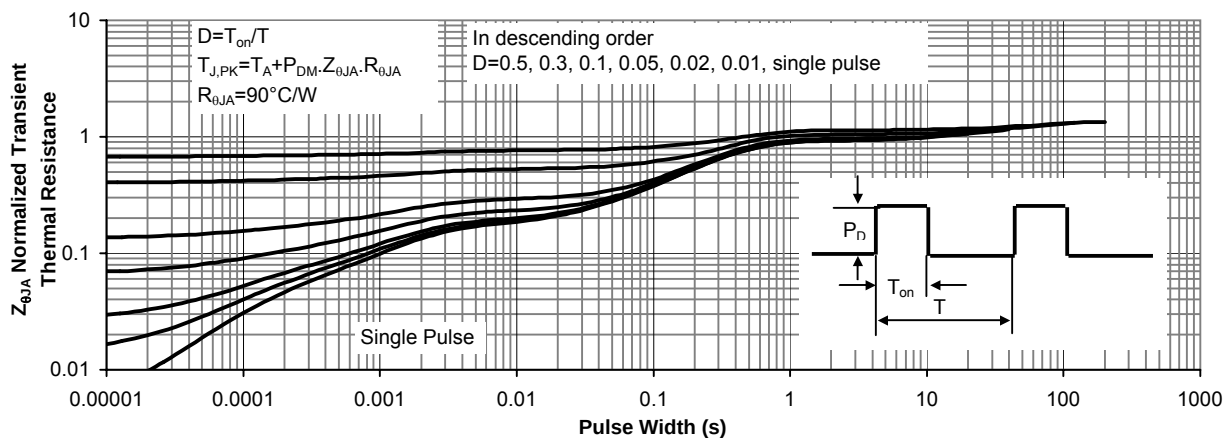


Figure 11: Normalized Maximum Transient Thermal Impedance

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