ALPHA & OMEGA SEMICONDUCTOR

AO4312

36V N-Channel MOSFET

General Description

The AO4312 uses trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance.Power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Crss.In addition,switching behavior is well controlled with a "Schottky style" soft recovery body diode.

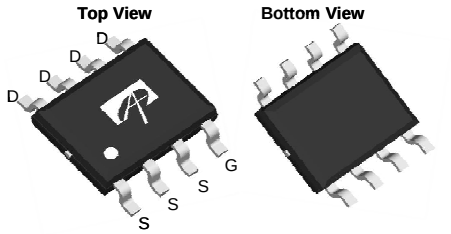
Product Summary

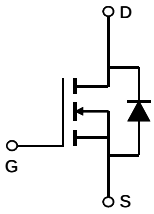
V_{DS}	36V
I_D (at V_{GS}=10V)	23A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 4.5mΩ
$R_{DS(ON)}$ (at V_{GS} = 4.5V)	< 6.2mΩ

100% UIS Tested
100% R_g Tested

Green Product

SOIC-8





Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	36	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_A=25℃	I_D	23	A
	T_A=70℃		18	
Pulsed Drain Current [C]		I_{DM}	264	
Avalanche Current [C]		I_{AS}, I_{AR}	45	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	101	mJ
Power Dissipation [B]	T_A=25℃	P_D	4.2	W
	T_A=70℃		2.7	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	25	30	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		50	60	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	12	15	℃/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	36			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=36V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±20V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	1.3	1.8	2.3	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	264			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		3.4	4.5	mΩ
		T_J=125°C		5.2	6.9	
		V_{GS}=4.5V, I_D=20A		4.5	6.2	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		110		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				5.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=18V, f=1MHz	1560	1952	2345	pF
C_{oss}	Output Capacitance		475	685	890	pF
C_{rss}	Reverse Transfer Capacitance		14	50	85	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.5	1.1	1.6	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=18V, I_D=20A	22	27.8	34	nC
Q_g(4.5V)	Total Gate Charge		10	12.7	17	nC
Q_{gs}	Gate Source Charge			4.3		nC
Q_{gd}	Gate Drain Charge			4.7		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=18V, R_L=0.9Ω, R_{GEN}=3Ω		7		ns
t_r	Turn-On Rise Time			3.1		ns
$t_{D(off)}$	Turn-Off DelayTime			26		ns
t_f	Turn-Off Fall Time			4.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs	13	17	21	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs	30	38.5	47	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° C. The value in any given application depends on the user's specific board design.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

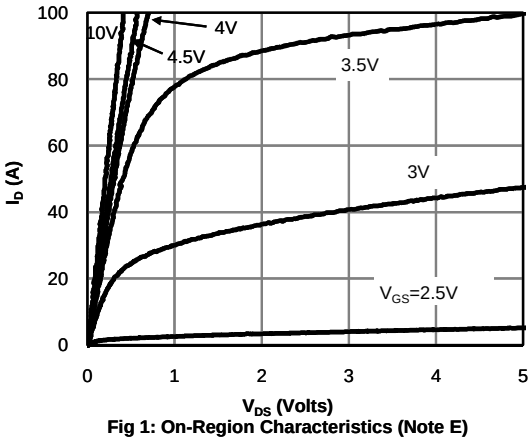


Fig 1: On-Region Characteristics (Note E)

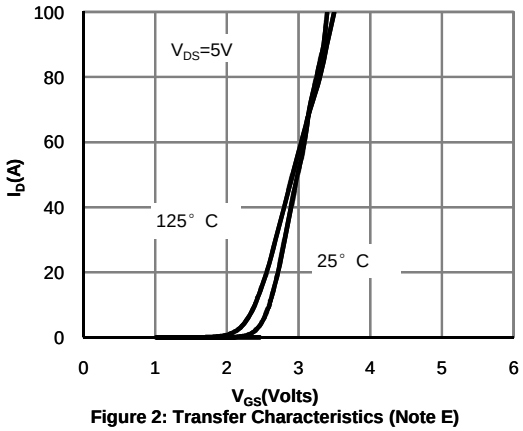


Figure 2: Transfer Characteristics (Note E)

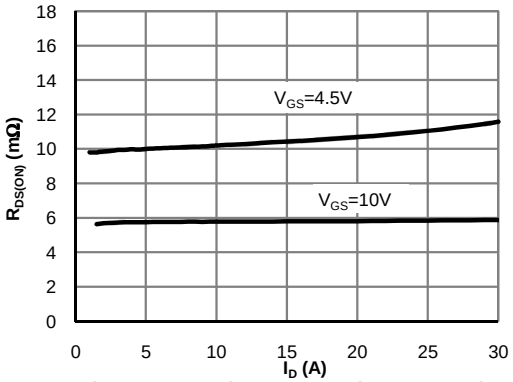


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

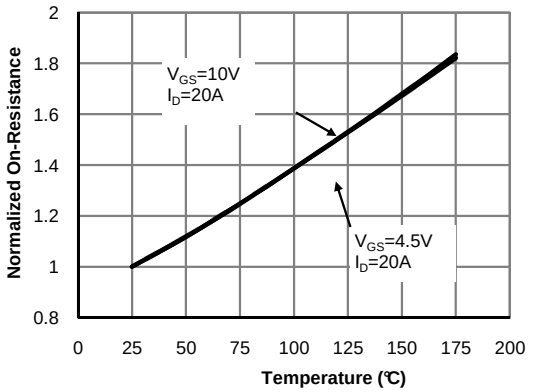


Figure 4: On-Resistance vs. Junction Temperature (Note E)

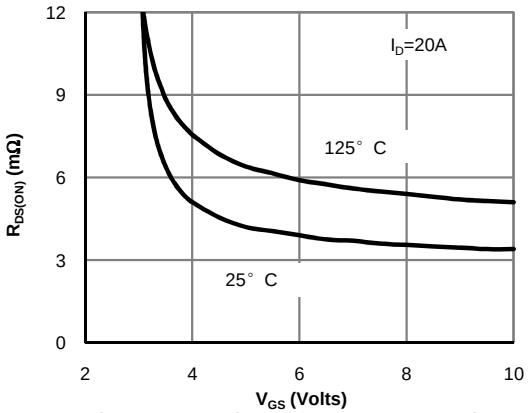


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

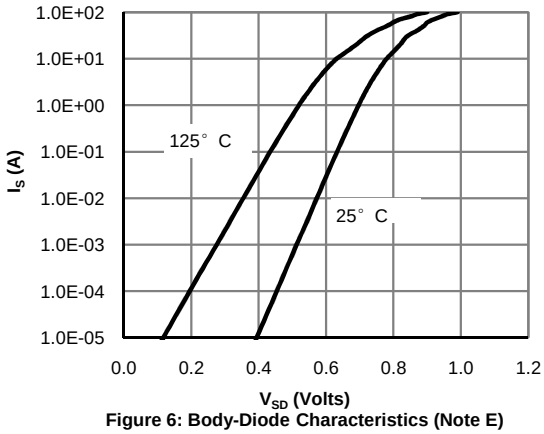


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

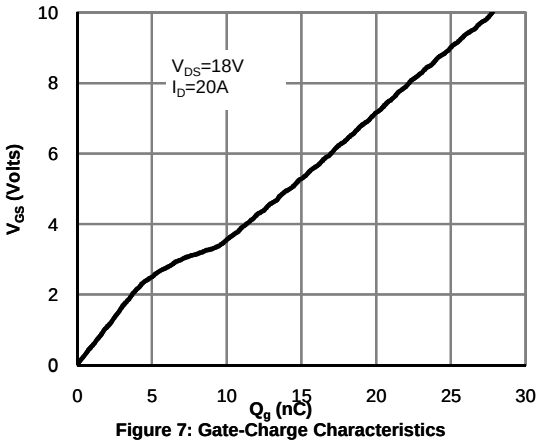


Figure 7: Gate-Charge Characteristics

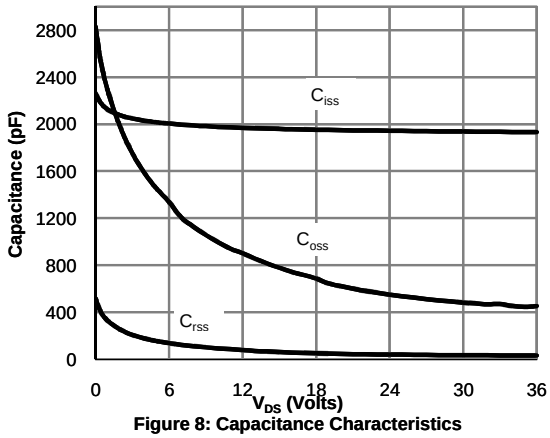


Figure 8: Capacitance Characteristics

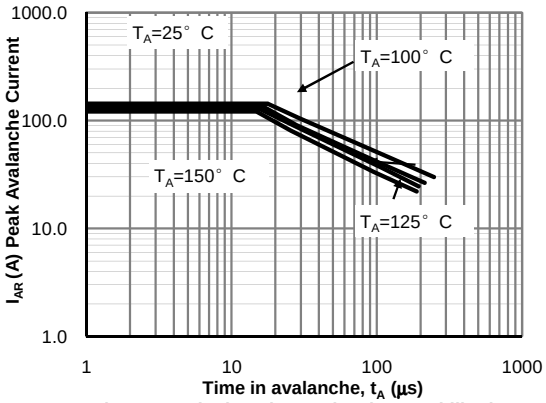


Figure 12: Single Pulse Avalanche capability (Note C)

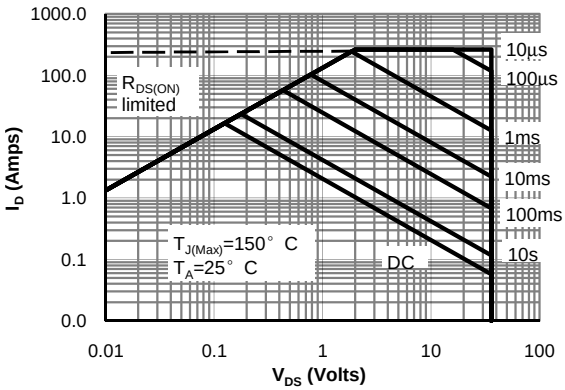


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

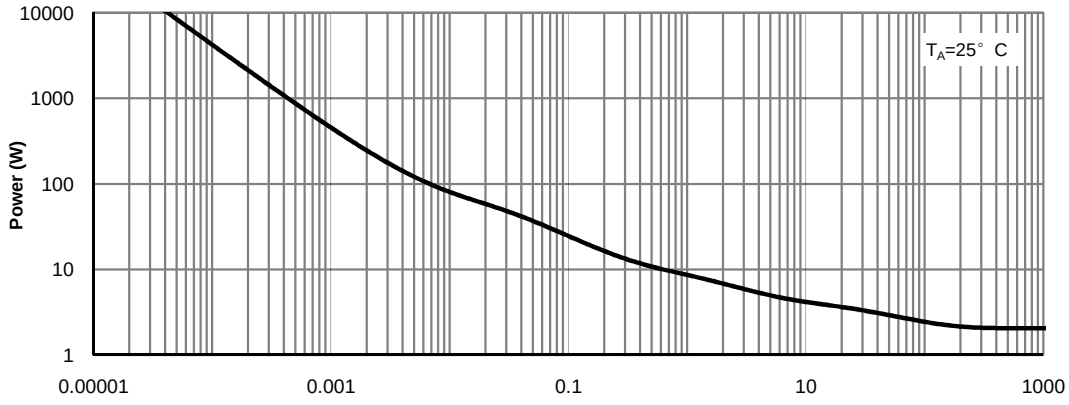


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

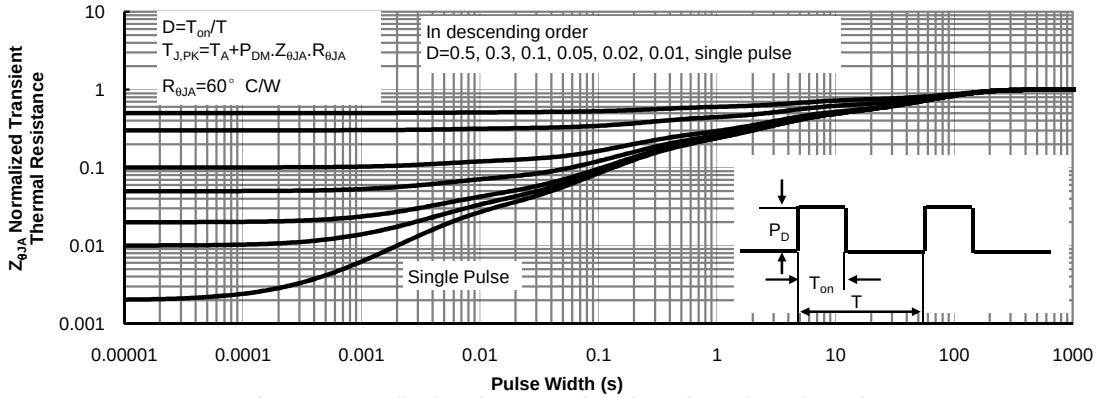
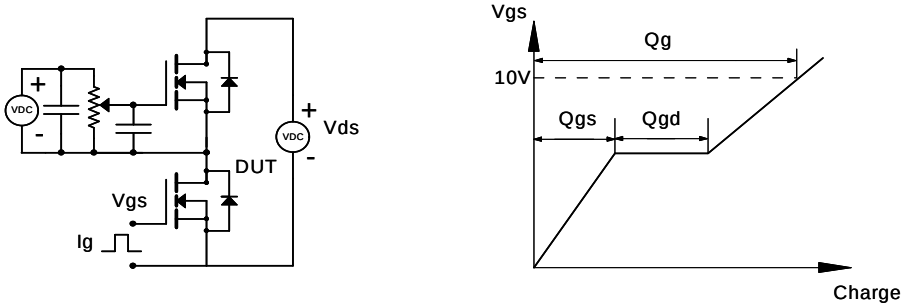
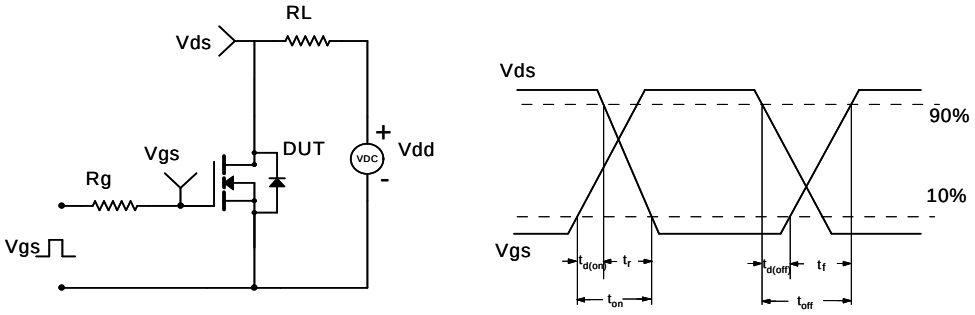


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

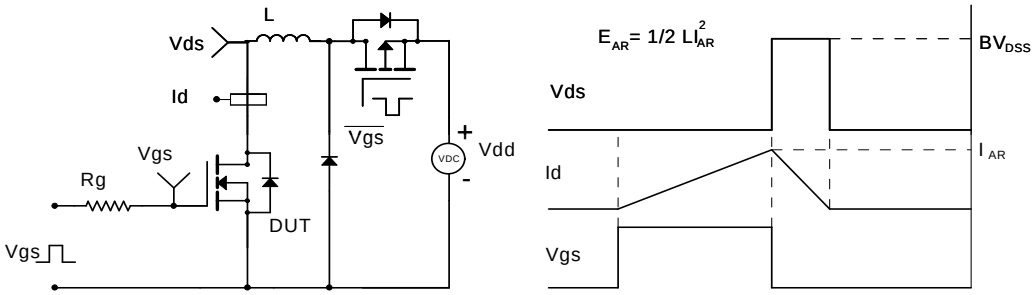
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms