



THE DATASHEET OF AO4312



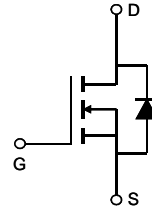
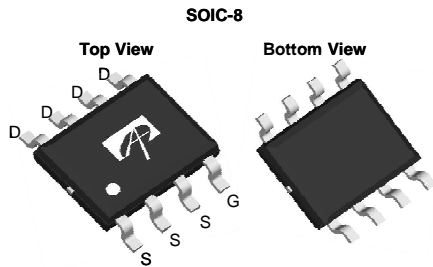
General Description

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 C_{rss} . 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 $V_{GS}=10V$)	< 4.5m Ω
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$)	< 6.2m Ω

100% UIS Tested
 100% R_g Tested



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	36	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_A=25^\circ\text{C}$	23
		$T_A=70^\circ\text{C}$	18
Pulsed Drain Current ^C	I_{DM}	264	A
Avalanche Current ^C	I_{AS}, I_{AR}	45	A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}, E_{AR}	101	mJ
Power Dissipation ^B	P_D	$T_A=25^\circ\text{C}$	4.2
		$T_A=70^\circ\text{C}$	2.7
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 ^A	$R_{\theta JA}$	25	30	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient ^{A, D}		Steady-State	50	60
Maximum Junction-to-Lead	$R_{\theta JL}$	12	15	$^\circ\text{C}/\text{W}$

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 T _J =55°C			1 5	μA
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 T _J =125°C		3.4	4.5	mΩ
		V _{GS} =4.5V, I _D =20A		4.5	6.2	
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 _{riss}	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_{θJA} 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 initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} 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 impedance 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

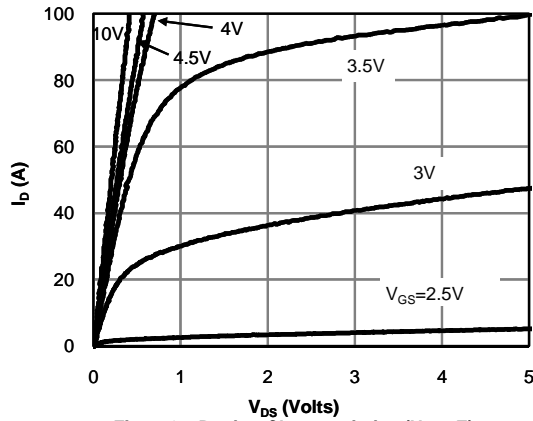


Fig 1: On-Region Characteristics (Note E)

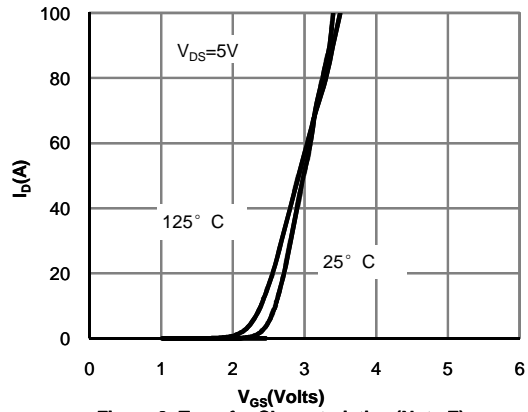


Figure 2: Transfer Characteristics (Note E)

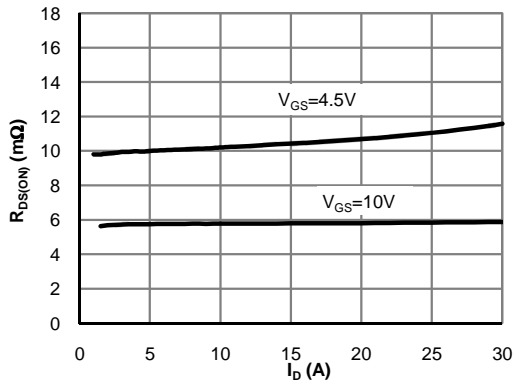


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

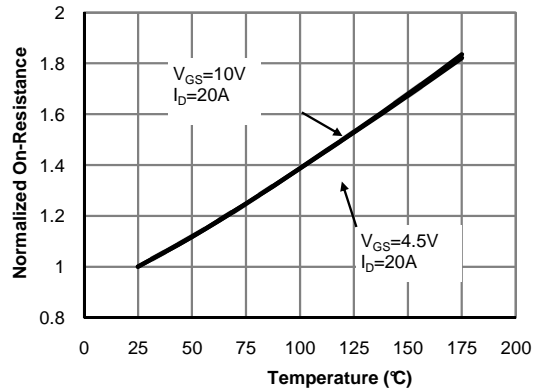


Figure 4: On-Resistance vs. Junction Temperature (Note E)

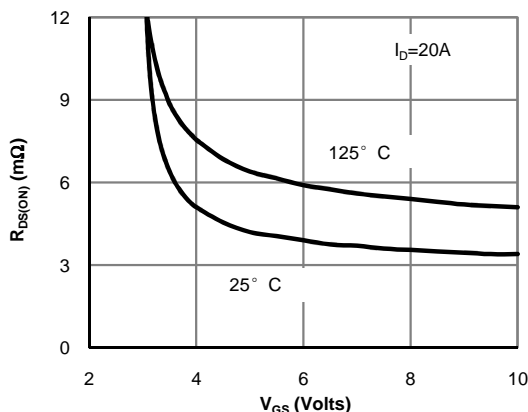


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

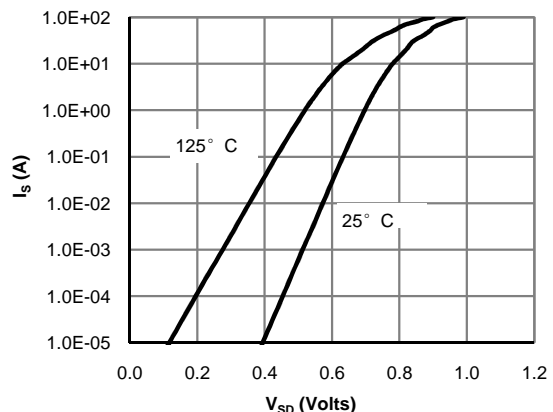


Figure 6: Body-Diode Characteristics (Note E)

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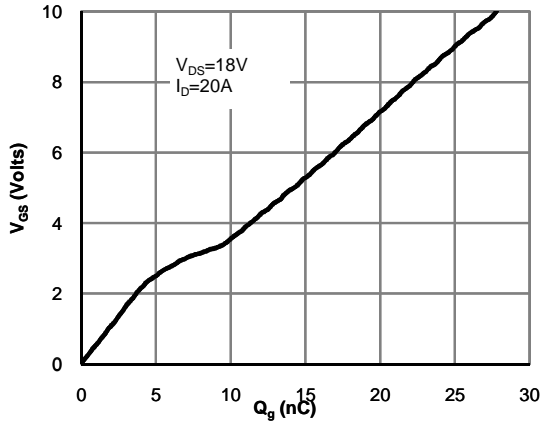


Figure 7: Gate-Charge Characteristics

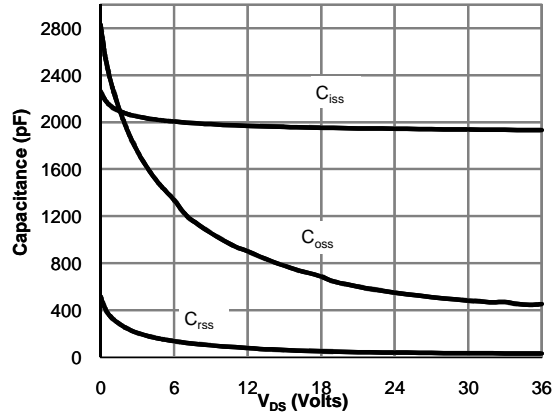


Figure 8: Capacitance Characteristics

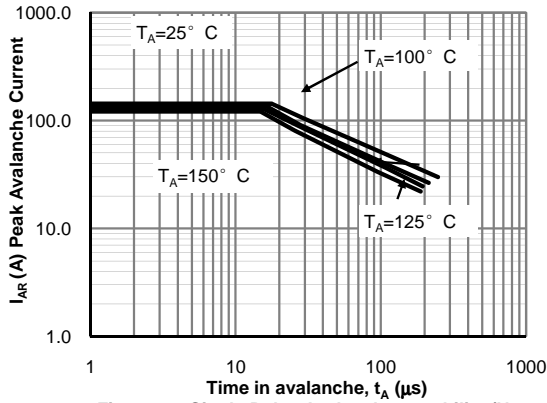


Figure 12: Single Pulse Avalanche capability (Note C)

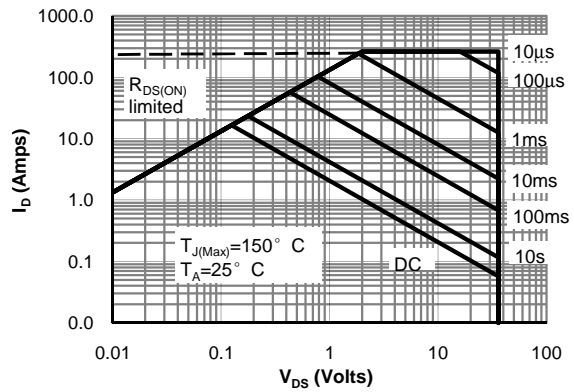


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

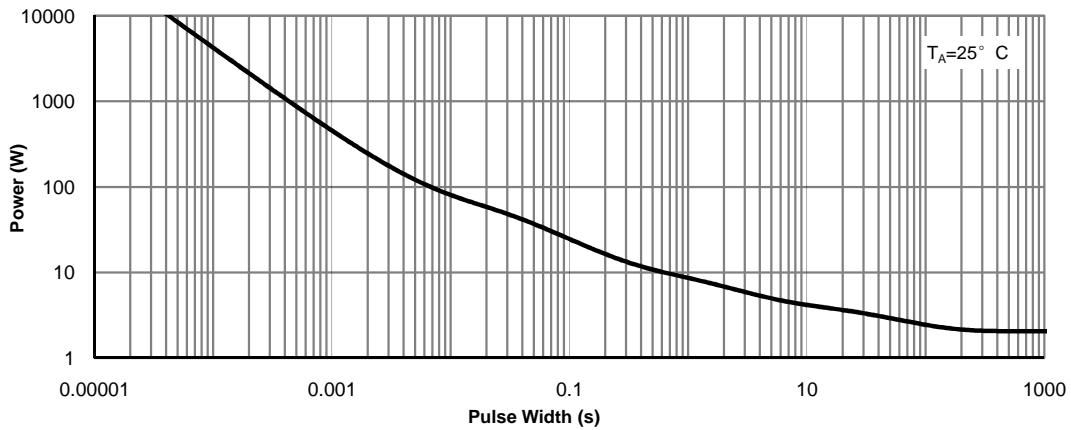
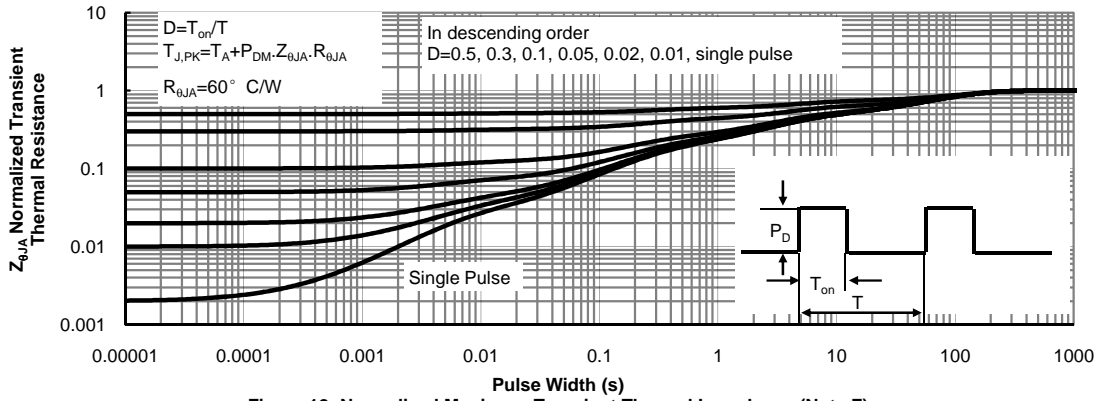
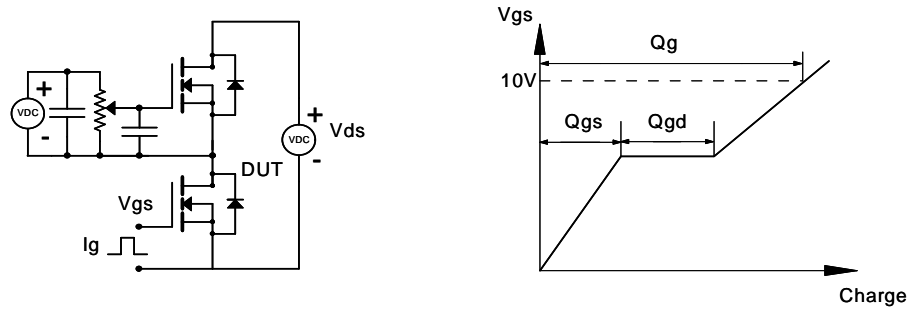


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

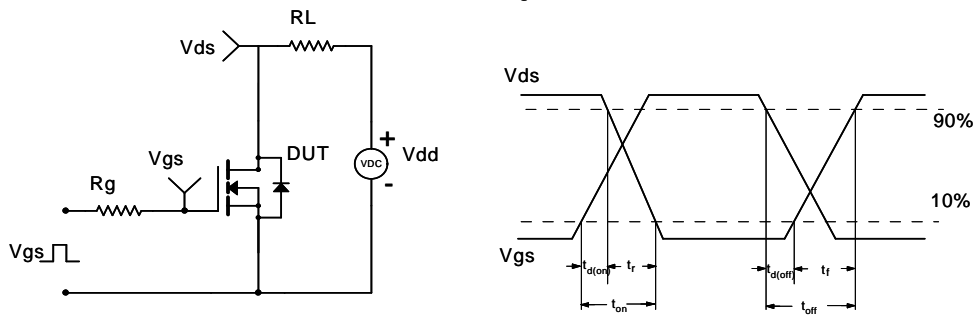
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



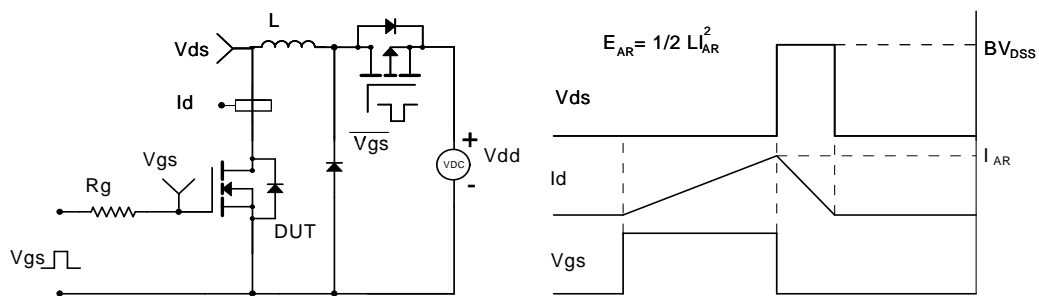
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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