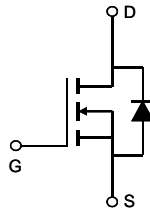# AO4314
36V N-Channel MOSFET

General Description

The AO4314 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.

Features

V_{DS}	36V
I_D (at V_{GS}=10V)	20A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 6mΩ
$R_{DS(ON)}$ (at V_{GS} = 4.5V)	< 8.5mΩ

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	20	A
	T_A=70℃		16	
Pulsed Drain Current [C]		I_{DM}	219	
Avalanche Current [C]		I_{AS}, I_{AR}	35	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	61	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	$R_{θJA}$	25	30	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		50	60	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{θJL}$	12	15	℃/W

Electrical Characteristics (T$_J$=25℃ 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℃			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		1.2	1.8	2.3	V
I$_{D(ON)}$	On state drain current	V$_{GS}$=10V, V$_{DS}$=5V		219			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=20A			4.2	6	mΩ
			T$_J$=125℃		6.5	9.5	
		V$_{GS}$=4.5V, I$_D$=20A			5.7	8.5	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=20A			90		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		980	1225	1470	pF
C$_{oss}$	Output Capacitance			325	465	605	pF
C$_{rss}$	Reverse Transfer Capacitance			10	35	60	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		14	18.6	23	nC
Q$_g$(4.5V)	Total Gate Charge			6	8.6	12	nC
Q$_{gs}$	Gate Source Charge				2.8		nC
Q$_{gd}$	Gate Drain Charge				3.2		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=18V, R$_L$=0.9Ω, R$_{GEN}$=3Ω			4.5		ns
t$_r$	Turn-On Rise Time				3.5		ns
t$_{D(off)}$	Turn-Off DelayTime				20.3		ns
t$_f$	Turn-Off Fall Time				3.5		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=20A, dI/dt=500A/µs		12	15	18	ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=20A, dI/dt=500A/µs		24	30	36	nC

A. The value of R$_{θJA}$ 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.

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$_{θJA}$ is the sum of the thermal impedence 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 1in^2 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.

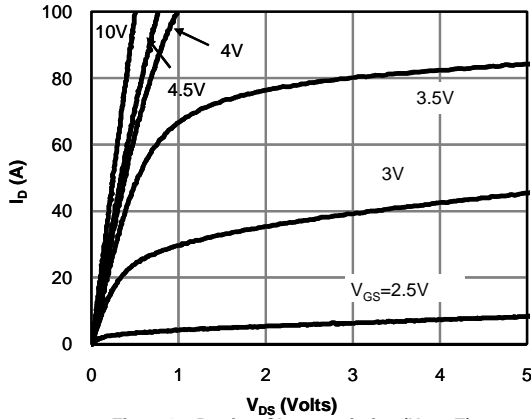**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**
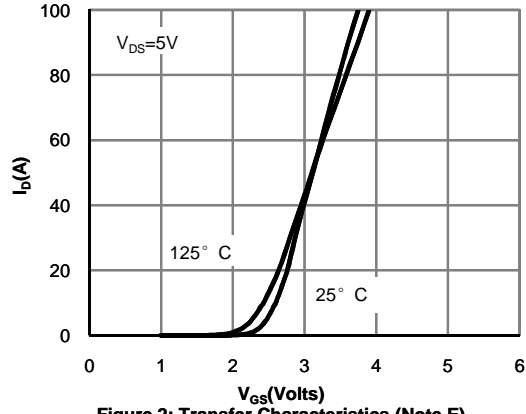
Fig 1: On-Region Characteristics (Note E)

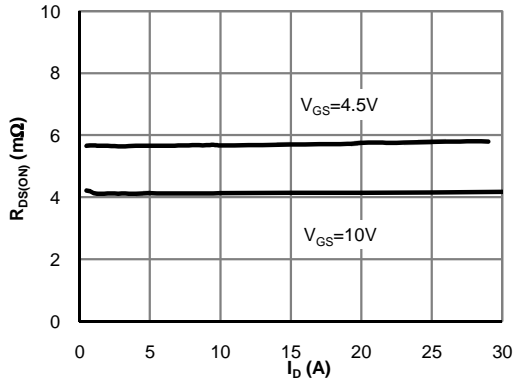Figure 2: Transfer Characteristics (Note E)

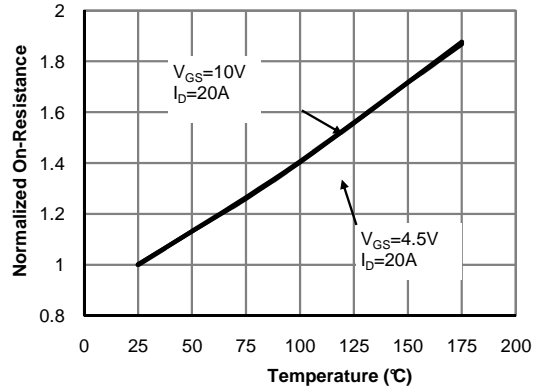Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

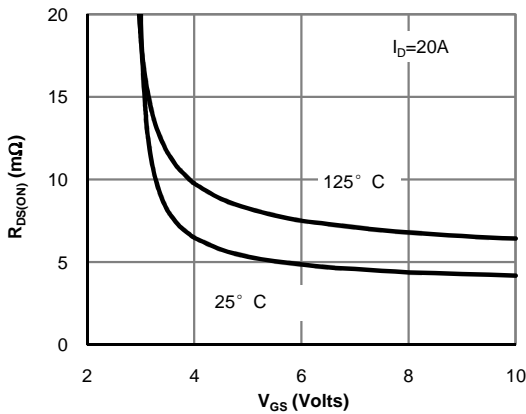Figure 4: On-Resistance vs. Junction Temperature (Note E)

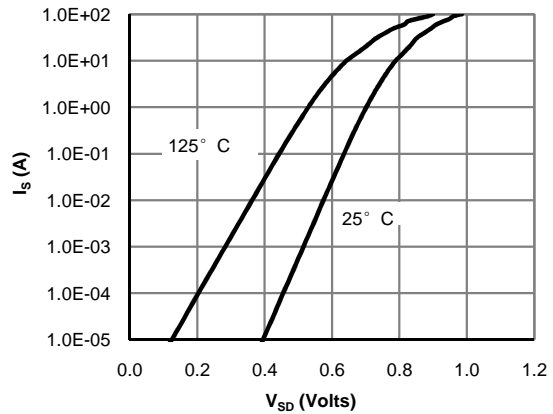Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

Figure 6: Body-Diode Characteristics (Note E)

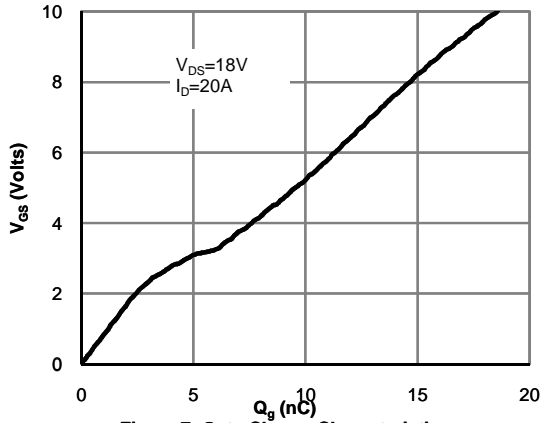**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**
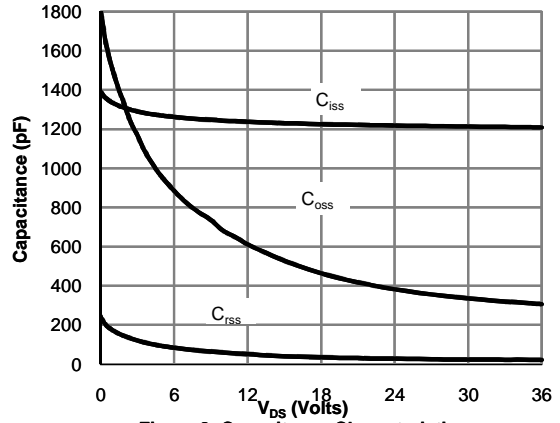

Figure 7: Gate-Charge Characteristics

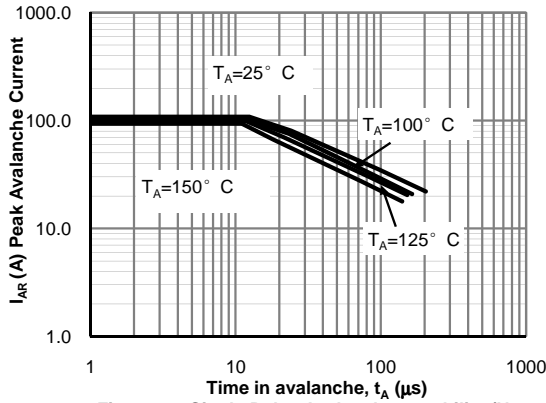Figure 8: Capacitance Characteristics
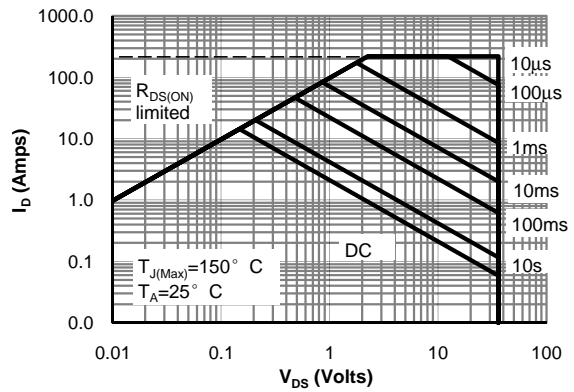

Figure 12: Single Pulse Avalanche capability (Note C)

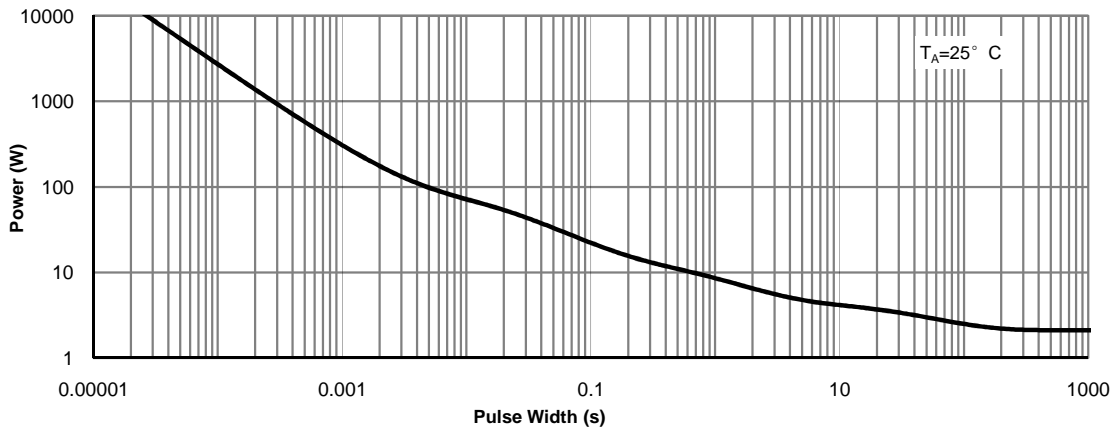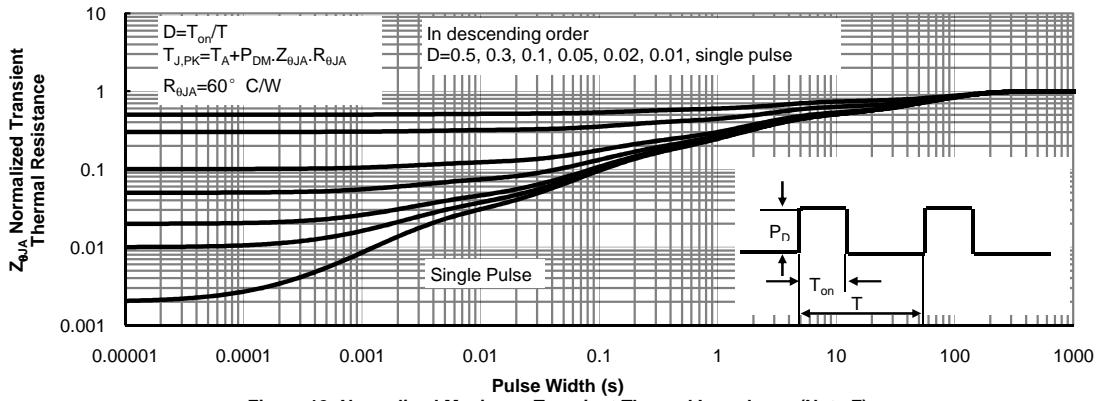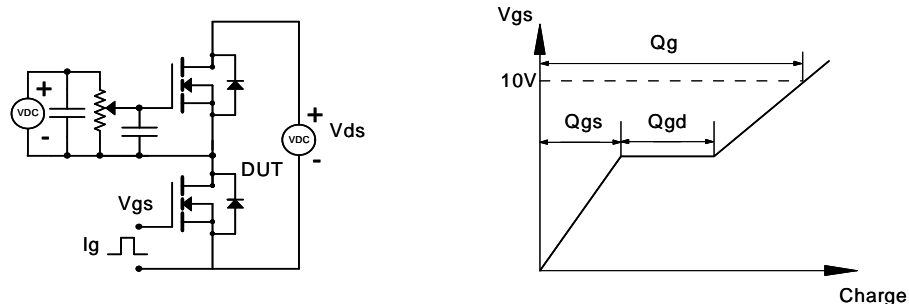Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

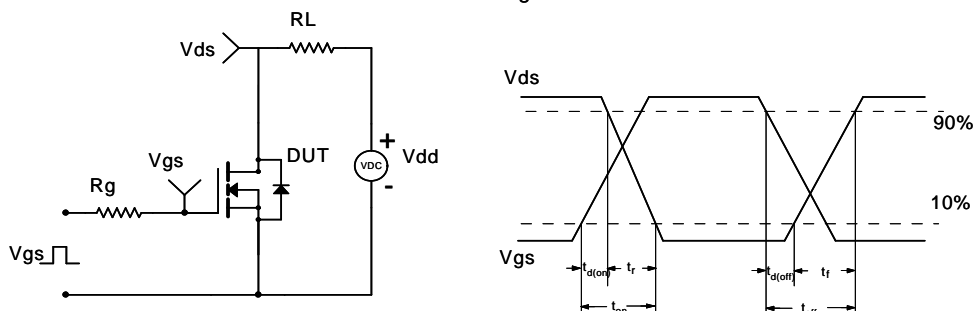Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

$D=T_{on}/T$

$T_{J,PK}=T_A+P_{DM} \cdot Z_{\theta JA} \cdot R_{\theta JA}$

$R_{\theta JA}=60^\circ C/W$

In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

Z$_{\theta JA}$ Normalized Transient Thermal Resistance

Pulse Width (s)

P_D T_{on} T

Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)
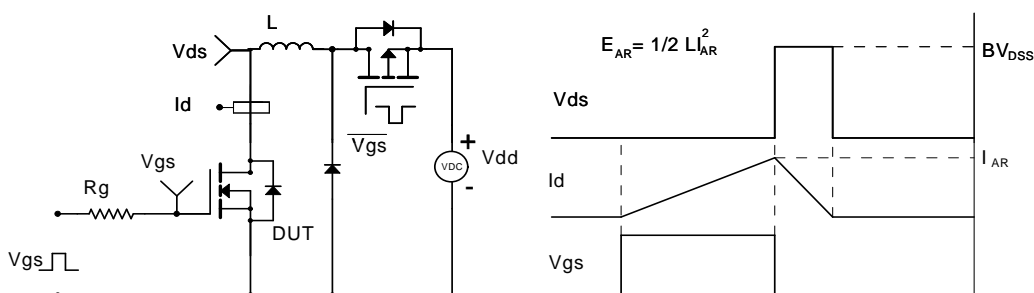
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR}= 1/2 \, LI_{AR}^{2}$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int I dt$$