ALPHA & OMEGA SEMICONDUCTOR

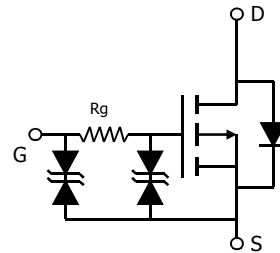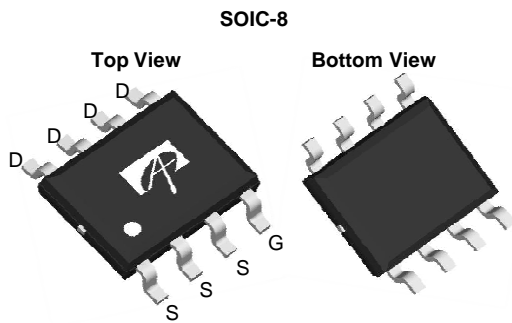# AO4447A
30V P-Channel MOSFET

General Description

• The AO4447A uses advanced trench technology to provide excellent $R_{DS(ON)}$ with low gate charge.This device is ideal for load switch and battery protection applications.

• RoHS and Halogen-Free Compliant

Product Summary

V_{DS}	-30V
I_D (at V_{GS} = -10V)	-17A
$R_{DS(ON)}$ (at V_{GS} = -10V)	< 7mΩ
$R_{DS(ON)}$ (at V_{GS} = -4.5V)	< 8mΩ
$R_{DS(ON)}$ (at V_{GS} = -4V)	< 9mΩ

ESD Protected
100% UIS Tested
100% Rg Tested

Green Product

SOIC-8

Top View   Bottom View

Absolute Maximum Ratings T_J=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_A=25℃	I_D	-17	A
	T_A=70℃		-13	
Pulsed Drain Current [C]		I_{DM}	-160	
Avalanche Current [C]		I_{AS}	54	A
Avalanche energy L=0.1mH [C]		E_{AS}	146	mJ
Power Dissipation [B]	T_A=25℃	P_D	3.1	W
	T_A=70℃		2.0	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{θJA}$	31	40	℃/W
Maximum Junction-to-Ambient [AD]	Steady State		59	75	℃/W
Maximum Junction-to-Lead	Steady State	$R_{θJL}$	16	24	℃/W

ALPHA & OMEGA
SEMICONDUCTOR

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	-30			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$ =-30V, V$_{GS}$ = 0V			-1	μA
		T$_J$ = 55℃			-5	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$ = 0V, V$_{GS}$ =±16V			±10	μA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$ =V$_{GS}$ I$_D$ =-250μA	-0.8	-1.3	-1.6	V
I$_{D(ON)}$	On state drain current	V$_{GS}$ =-10V, V$_{DS}$ =-5V	-160			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$ =-10V, I$_D$ =-17A		5.5	7	mΩ
		T$_J$=125℃		7	8.5	
		V$_{GS}$ =-4.5V, I$_D$ =-15A		6.5	8	
		V$_{GS}$ =-4V, I$_D$ =-13A		6.9	9	
g$_{FS}$	Forward Transconductance	V$_{DS}$ =-5V, I$_D$ =-17A		70		S
V$_{SD}$	Diode Forward Voltage	I$_S$ =-1A,V$_{GS}$ = 0V		-0.62	-1	V
I$_S$	Maximum Body-Diode Continuous Current				-3	A
DYNAMIC PARAMETERS						
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=-15V, f=1MHz		4580	5500	pF
C$_{oss}$	Output Capacitance			755		pF
C$_{rss}$	Reverse Transfer Capacitance			564		pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz	110	160	210	Ω
SWITCHING PARAMETERS						
Q$_g$ (-10V)	Total Gate Charge	V$_{GS}$=-10V, V$_{DS}$=-15V, I$_D$=-17A		87	105	nC
Q$_g$ (-4.5V)	Total Gate Charge			41		nC
Q$_{gs}$	Gate Source Charge			12.8		nC
Q$_{gd}$	Gate Drain Charge			17		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=-10V, V$_{DS}$=-15V R$_L$=-0.9Ω, R$_{GEN}$=3Ω		180		ns
t$_r$	Turn-On Rise Time			260		ns
t$_{D(off)}$	Turn-Off DelayTime			1.2		μs
t$_f$	Turn-Off Fall Time			9.7		μs
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=-17A, dI/dt=300A/μs		32	40	ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=-17A, dI/dt=300A/μs		77		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.

ALPHA & OMEGA SEMICONDUCTOR

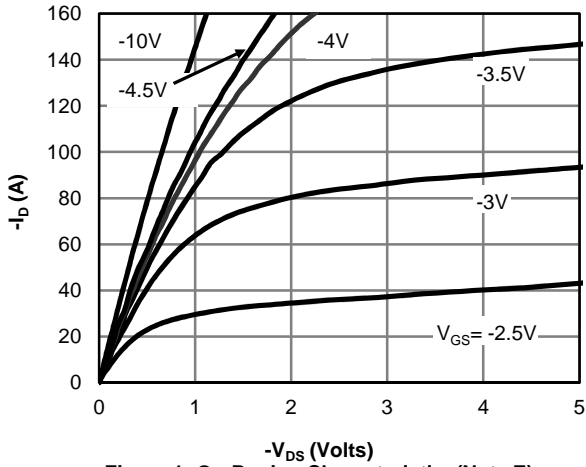## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
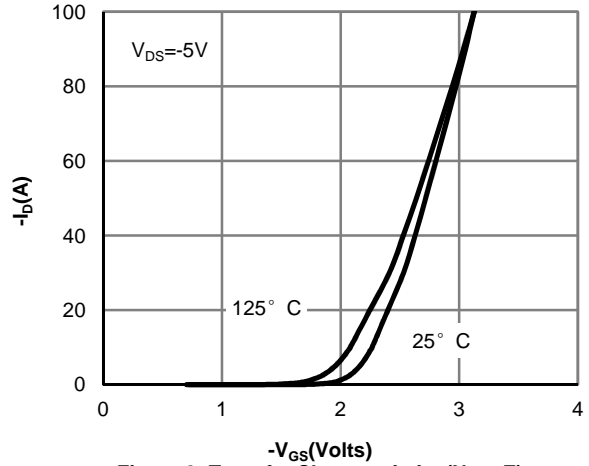
Figure 1: On-Region Characteristics(Note E)

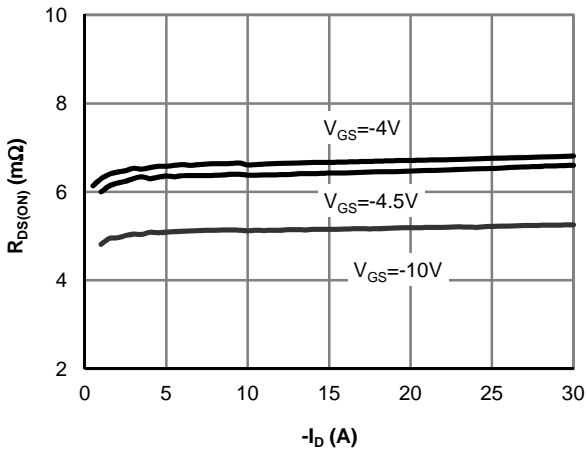**Figure 2: Transfer Characteristics(Note E)**

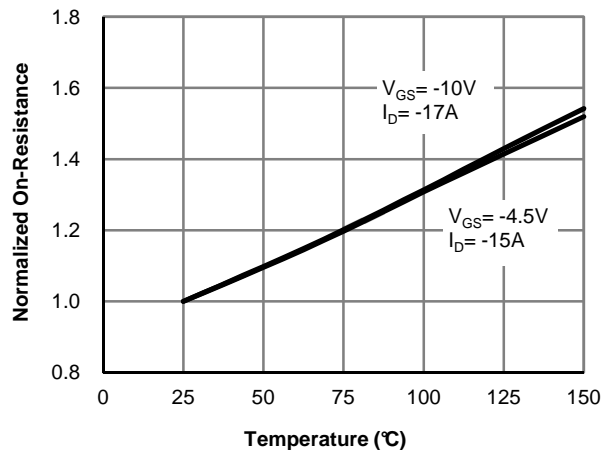**Figure 3: On-Resistance vs. Drain Current and Gate Voltage(Note E)**

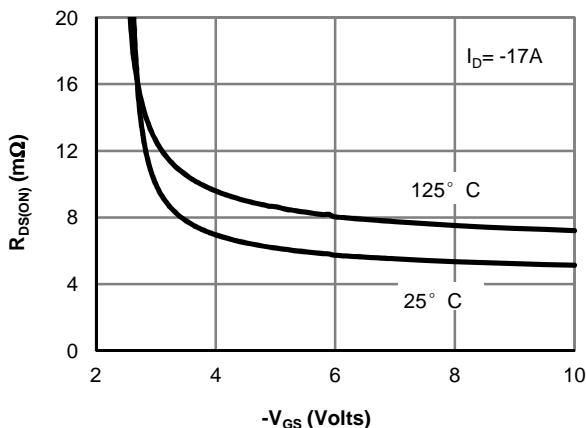**Figure 4: On-Resistance vs. Junction Temperature(Note E)**

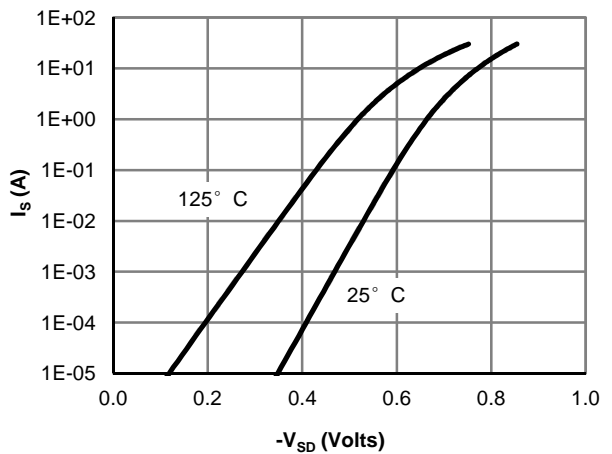**Figure 5: On-Resistance vs. Gate-Source Voltage(Note E)**

Figure 6: Body-Diode Characteristics(Note E)

ALPHA & OMEGA
SEMICONDUCTOR

TYPICAL ELECTRICAL AND THERMAL CHARACTER

$V_{DS}=-15V$
$I_D= -17A$

Figure 7: Gate-Charge Characteristics

C_{iss}

C_{oss}

C_{rss}

Figure 8: Capacitance Characteristics

$R_{DS(ON)}$ limited

10μs
1ms
10ms
100ms
10s
DC

$T_{J(Max)}=150°C$
$T_A=25°C$

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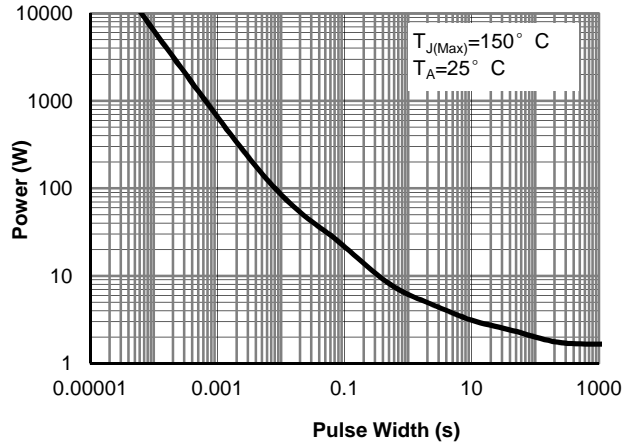

$T_{J(Max)}=150°C$
$T_A=25°C$

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

$D=T_{on}/T$
$T_{J,PK}=T_A+P_{DM} \cdot Z_{\theta JA} \cdot R_{\theta JA}$
$R_{\theta JA}=75°C/W$

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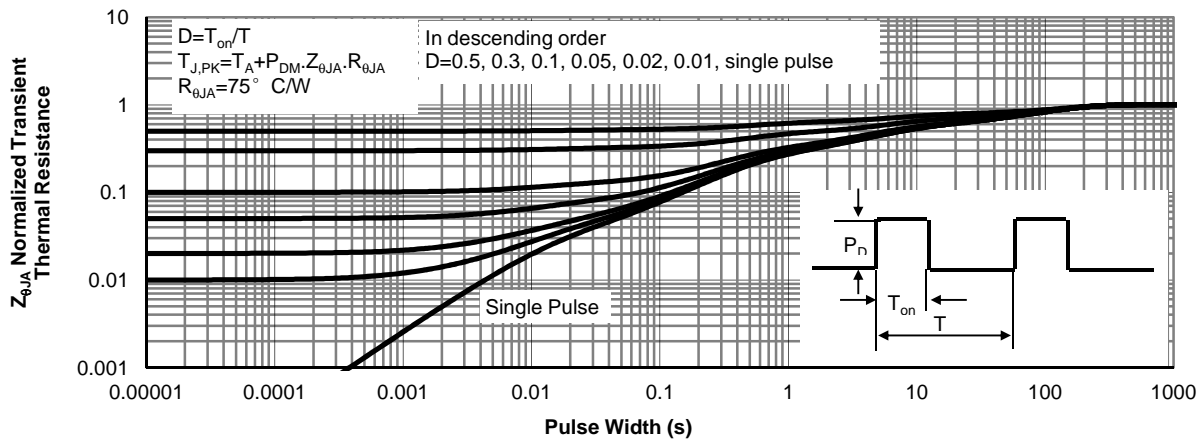D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse
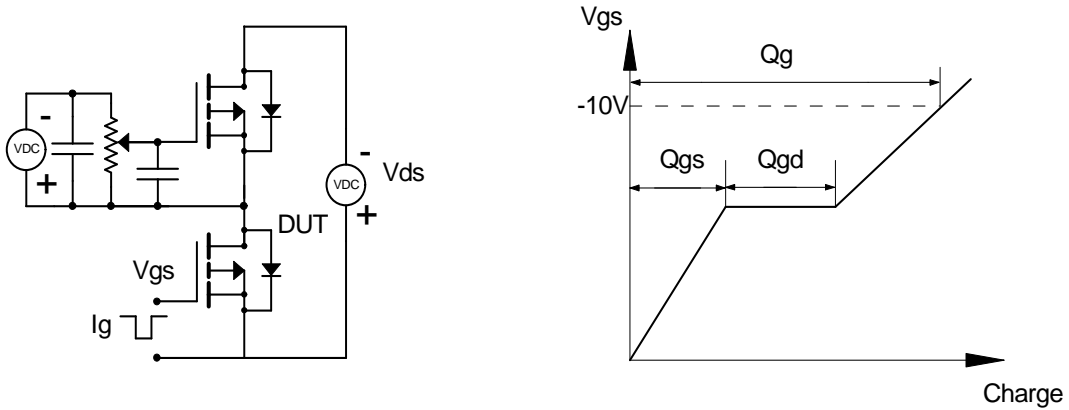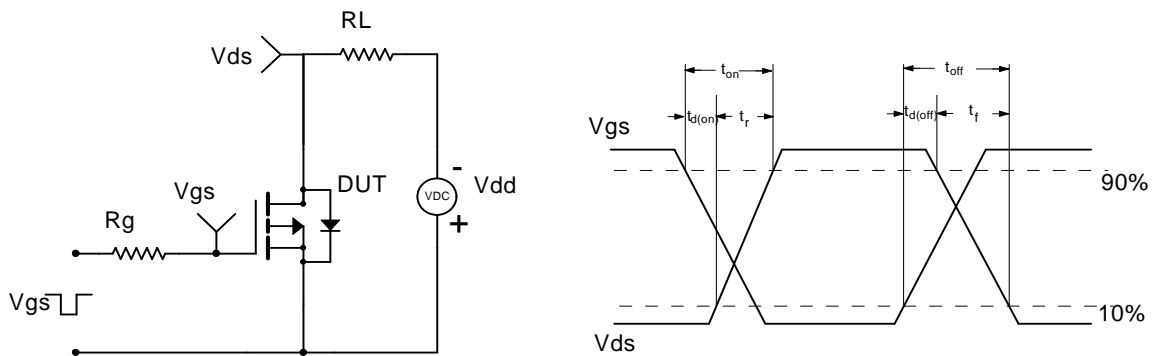
Single Pulse

P_D
T_{on}
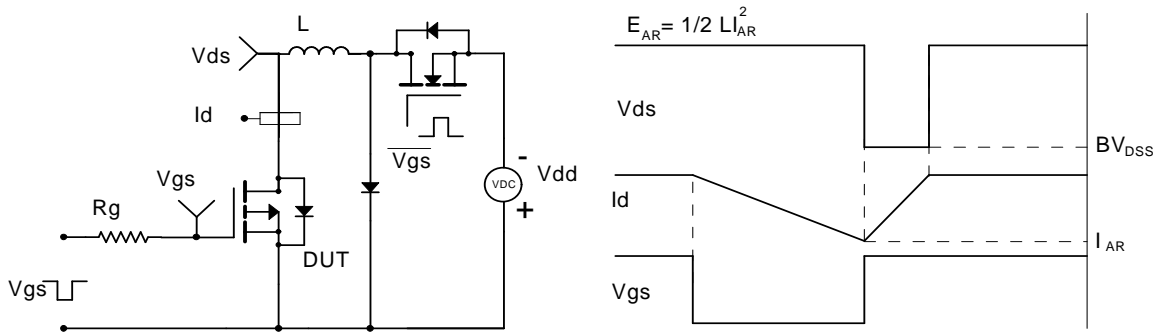T

Figure 11: 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

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