ALPHA & OMEGA SEMICONDUCTOR

AO4406
N-Channel Enhancement Mode Field Effect Transistor

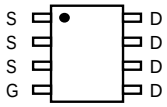
General Description

The AO4406/L uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device makes an excellent high side switch for notebook CPU core DC-DC conversion. *AO4406 and AO4406L are electrically identical.*
-RoHS Compliant
-AO4406L is Halogen Free

Features

V_{DS} (V) = 30V
I_D = 11.5A (V_{GS} = 10V)
$R_{DS(ON)}$ < 14mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 16.5mΩ (V_{GS} = 4.5V)
$R_{DS(ON)}$ < 26mΩ (V_{GS} = 2.5V)

UIS TESTED!
Rg,Ciss,Coss,Crss Tested



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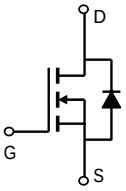


Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current [AF]	T_A=25°C	I_D	11.5	A
	T_A=70°C		9.6	
Pulsed Drain Current [B]		I_{DM}	80	
Avalanche Current [B]		I_{AV}	25	A
Repetitive Avalanche Energy [B] L=0.3mH		E_{AV}	94	mJ
Power Dissipation	T_A=25°C	P_D	3	W
	T_A=70°C		2.1	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [AF]	t ≤ 10s	$R_{\theta JA}$	23	40	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		48	65	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	12	16	°C/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	30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±12V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	0.8	1	1.5	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=12A		11.5	14	mΩ
		T_J=125°C		16	19.2	
		V_{GS}=4.5V, I_D=10A		13.5	16.5	mΩ
		V_{GS}=2.5V, I_D=8A		19.5	26	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=10A	25	38		S
V_{SD}	Diode Forward Voltage	I_S=10A,V_{GS}=0V		0.83	1	V
I_S	Maximum Body-Diode Continuous Current				4.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		1630	2300	pF
C_{oss}	Output Capacitance			201		pF
C_{rss}	Reverse Transfer Capacitance			142	200	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.4	0.8	1.8	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=15V, I_D=11.5A	13.5	18	24	nC
Q_{gs}	Gate Source Charge			2.5		nC
Q_{gd}	Gate Drain Charge			5.5		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.2Ω, R_{GEN}=3Ω		4	6	ns
t_r	Turn-On Rise Time			5	7.5	ns
$t_{D(off)}$	Turn-Off DelayTime			32	50	ns
t_f	Turn-Off Fall Time			5	10	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=10A, dI/dt=100A/µs		18.7	24	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=10A, dI/dt=100A/µs		12.5	15	nC

A: The value of $R_{\theta JA}$ 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: Repetitive rating, pulse width limited by junction temperature.

C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

F. The current rating is based on the t≤ 10s junction to ambient thermal resistance rating.

Rev8: July 2008

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

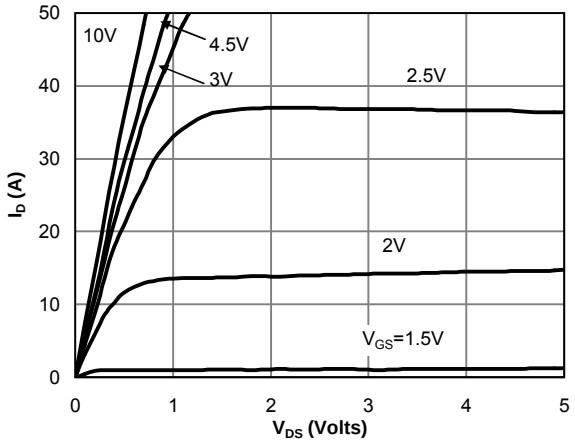


Fig 1: On-Region Characteristics

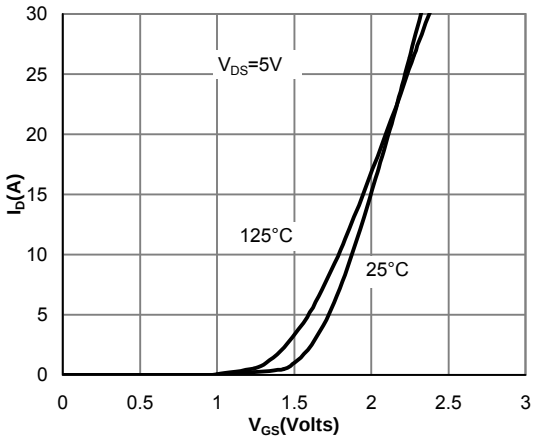


Figure 2: Transfer Characteristics

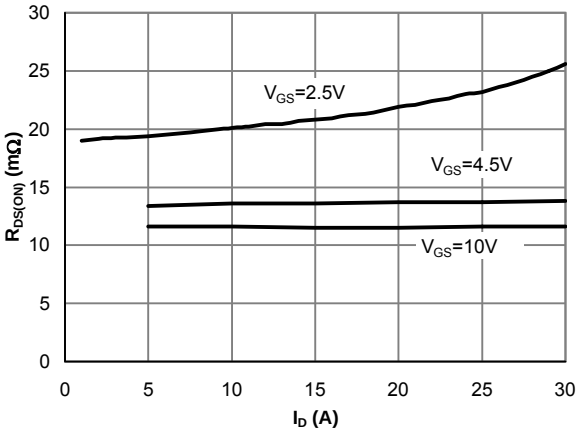


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

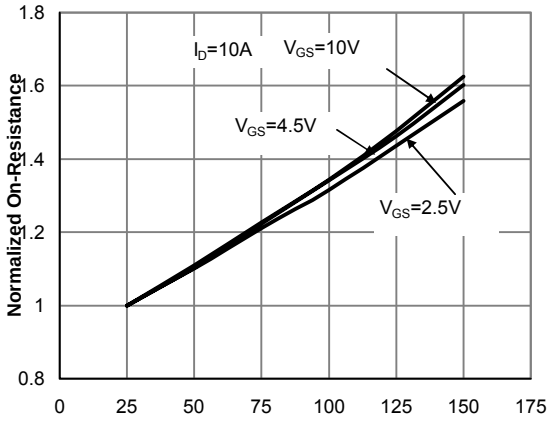


Figure 4: On-Resistance vs. Junction Temperature

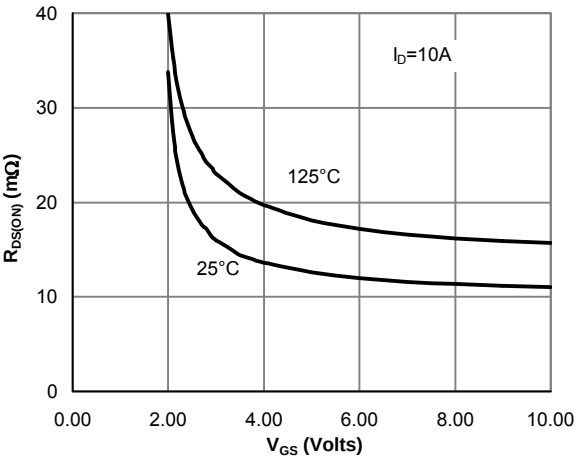


Figure 5: On-Resistance vs. Gate-Source Voltage

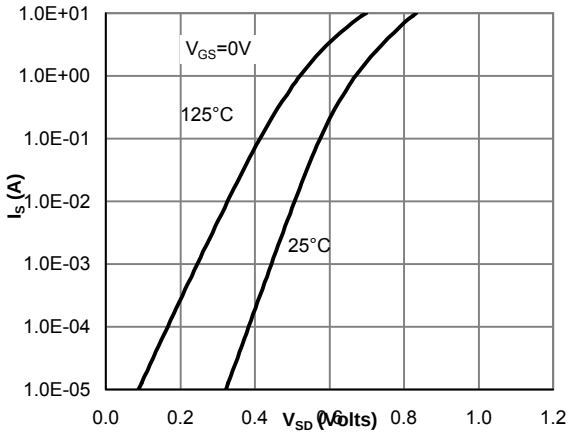


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

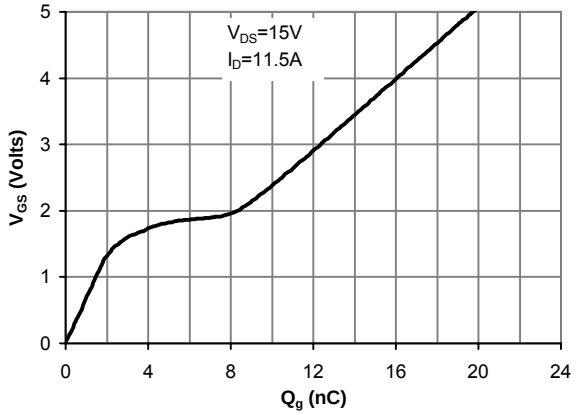


Figure 7: Gate-Charge Characteristics

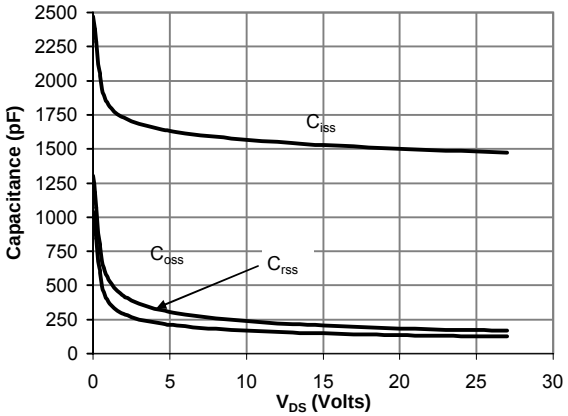


Figure 8: Capacitance Characteristics

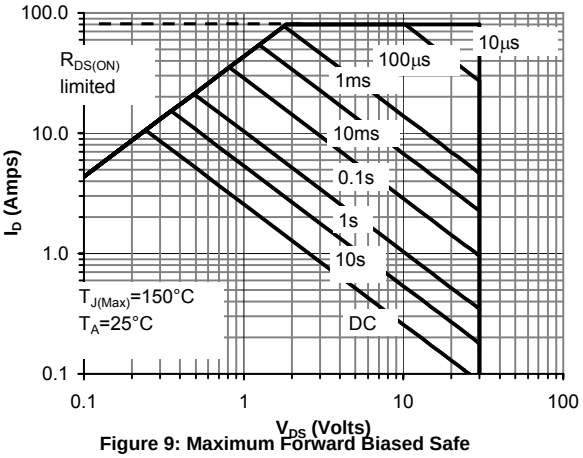


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

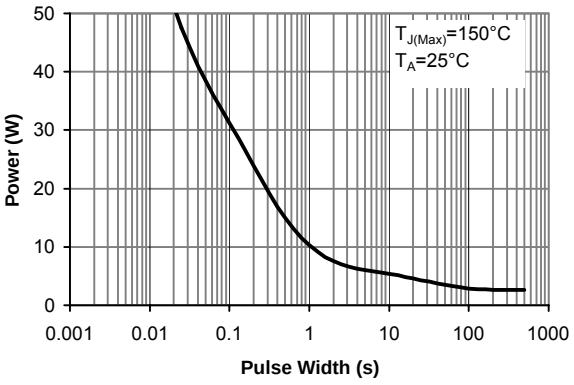


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

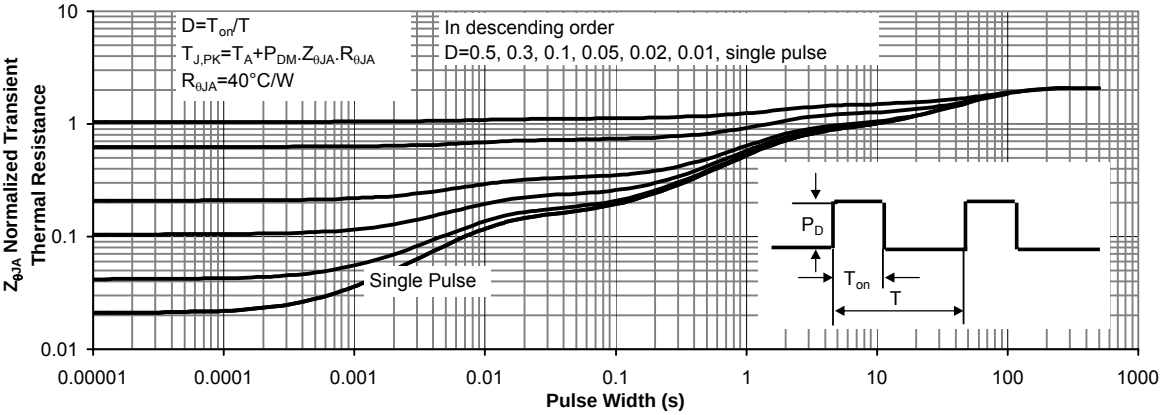


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

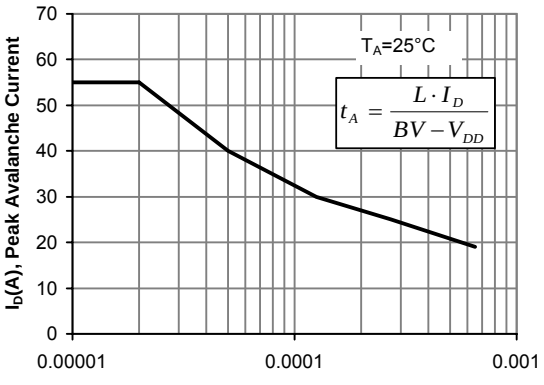


Figure 12: Avalanche capability

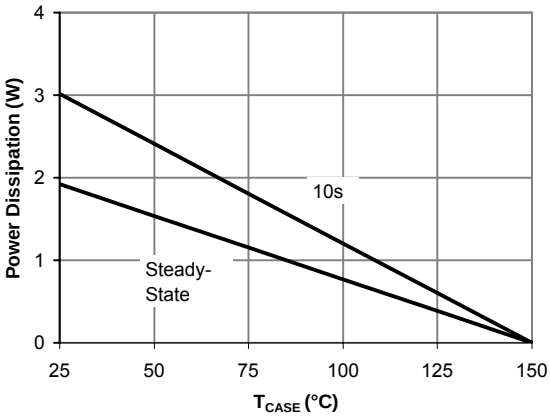
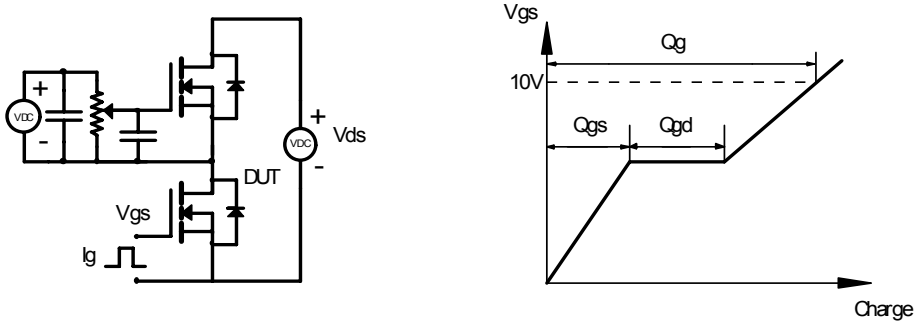
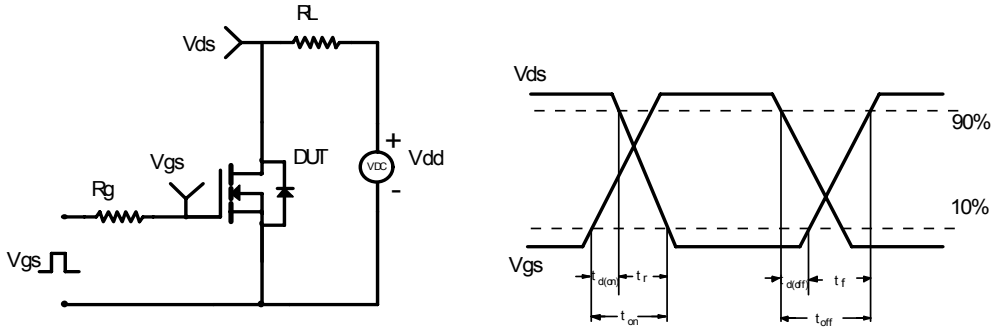


Figure 13: Power De-rating (Note A)

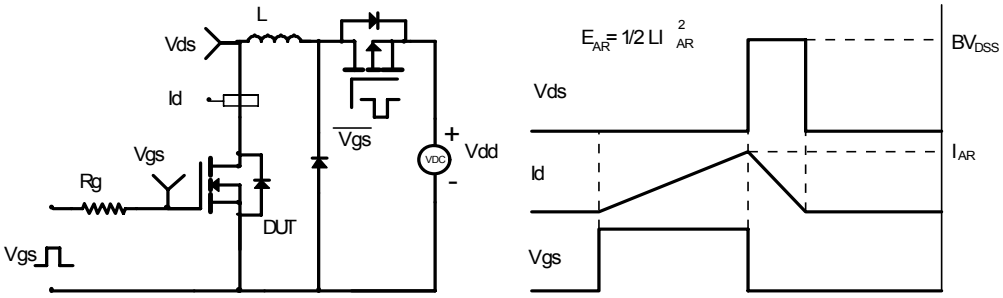
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms