ALPHA & OMEGA SEMICONDUCTOR, LTD

AO4407A
P-Channel Enhancement Mode Field Effect Transistor

General Description

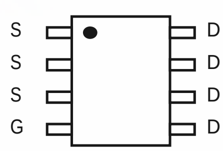
The AO4407A uses advanced trench technology to provide excellent $R_{DS(ON)}$, and ultra-low low gate charge with a 25V gate rating. This device is suitable for use as a load switch or in PWM applications. *Standard Product AO4407A is Pb-free (meets ROHS & Sony 259 specifications).*

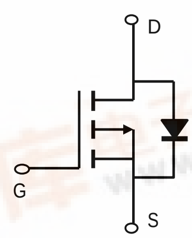
Features

V_{DS} = -30V
I_D = -12A (V$_{GS}$ = -10V)
$R_{DS(ON)}$ < 11mΩ (V_{GS} = -20V)
$R_{DS(ON)}$ < 13mΩ (V_{GS} = -10V)
$R_{DS(ON)}$ < 38mΩ (V_{GS} = -10V)

UIS TESTED!
RG, CISS, COSS, CRSS TESTED!

SOIC-8
Top View





Absolute Maximum Ratings T_A=25°C unless otherwise noted					
Parameter		**Symbol**	**10 Sec**	**Steady State**	**Units**
Drain-Source Voltage		V_{DS}	-30		V
Gate-Source Voltage		V_{GS}	±25		V
Continuous Drain Current [A]	T_A=25°C	I_D	-12	-9.2	A
	T_A=70°C		-10	-7.4	
Pulsed Drain Current [B]		I_{DM}	-60		
Avalanche Current [G]		I_{AR}	26		
Repetitive avalanche energy L=0.3mH [G]		E_{AR}	101		mJ
Power Dissipation [A]	T_A=25°C	P_D	3.1	1.7	W
	T_A=70°C		2.0	1.1	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		°C

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	32	40	°C/W
Maximum Junction-to-Ambient [A]	Steady State		60	75	°C/W
Maximum Junction-to-Lead [C]	Steady State	$R_{\theta JL}$	17	24	°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			-10	µA
		T_J = 55°C			-50	
I_{GSS}	Gate-Body leakage current	V_{DS} = 0V, V_{GS} = ±25V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = -250µA	-1.7	-2.3	-3	V
$I_{D(ON)}$	On state drain current	V_{GS} = -10V, V_{DS} = -5V	-60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = -20V, I_D = -12A		8.5	11	mΩ
		T_J=125°C		11.5	15	
		V_{GS} = -10V, I_D = -12A		10	13	
		V_{GS} = -5V, I_D = -10A		27	38	
g_{FS}	Forward Transconductance	V_{DS} = -5V, I_D = -10A		21		S
V_{SD}	Diode Forward Voltage	I_S = -1A,V_{GS} = 0V		-0.7	-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		2060	2600	pF
C_{oss}	Output Capacitance			370		pF
C_{rss}	Reverse Transfer Capacitance			295		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		2.4	3.6	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-10V, V_{DS}=-15V, I_D=-12A		30	39	nC
Q_{gs}	Gate Source Charge			4.6		nC
Q_{gd}	Gate Drain Charge			10		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=1.25Ω, R_{GEN}=3Ω		11		ns
t_r	Turn-On Rise Time			9.4		ns
$t_{D(off)}$	Turn-Off DelayTime			24		ns
t_f	Turn-Off Fall Time			12		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-12A, dI/dt=100A/µs		30	40	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-12A, dI/dt=100A/µs		22		nC

A: The value of $R_{\theta JA}$ is measured 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 value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.
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 < 300 µs 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 thermal resistance rating.
G. E_{AR} and I_{AR} ratings are based on low frequency and duty cycles to keep T_j=25C.
Rev3: Jan 2008

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

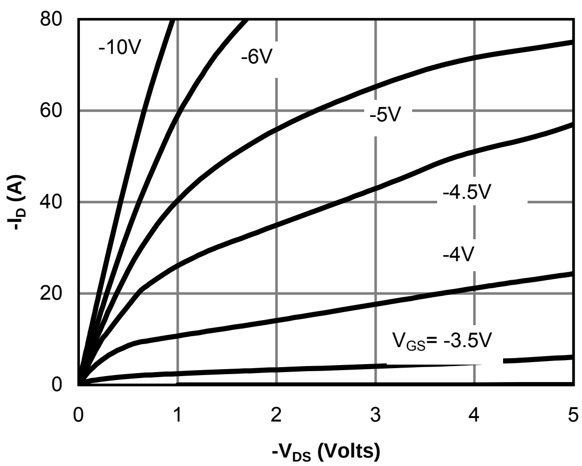


Figure 1: On-Region Characteristics

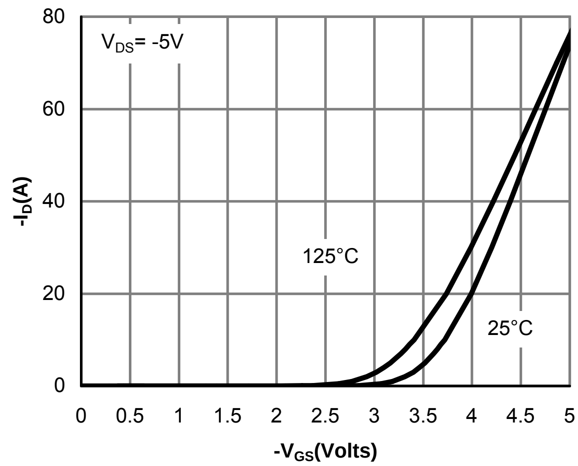


Figure 2: Transfer Characteristics

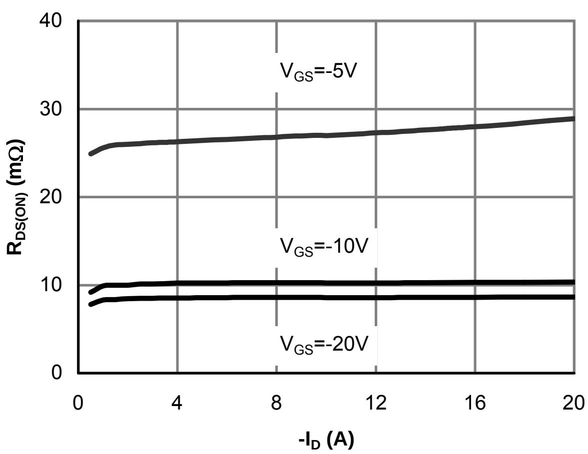


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

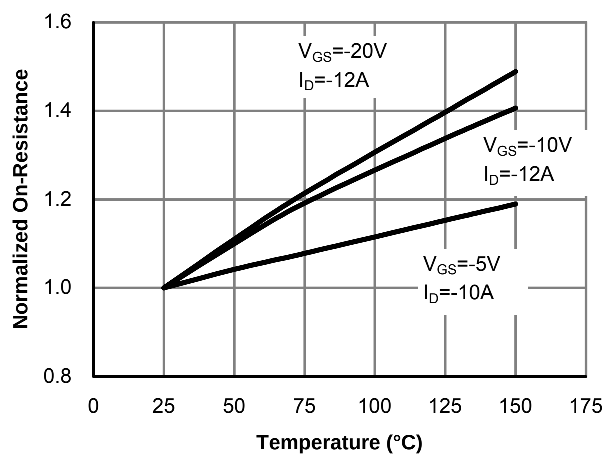


Figure 4: On-Resistance vs. Junction Temperature

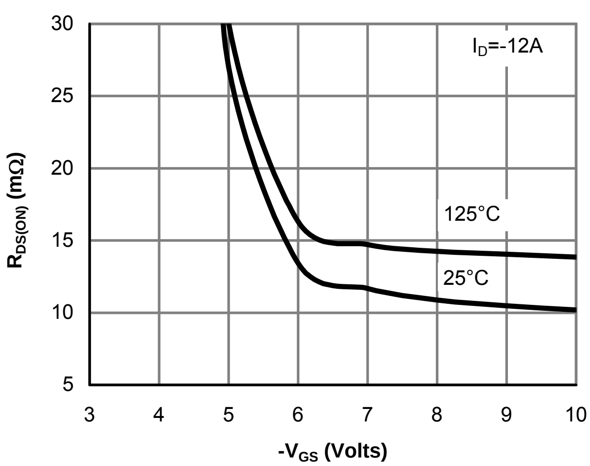


Figure 5: On-Resistance vs. Gate-Source Voltage

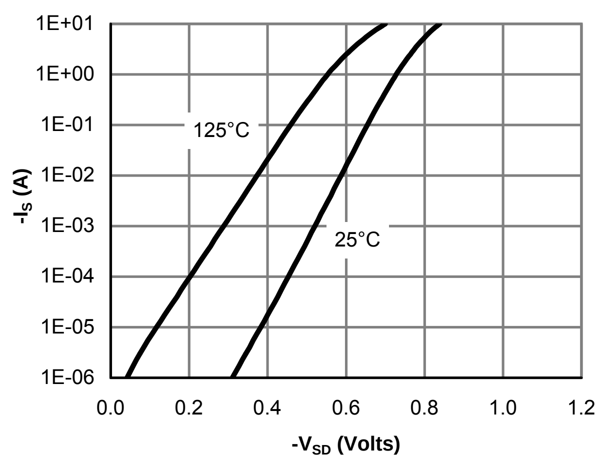


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

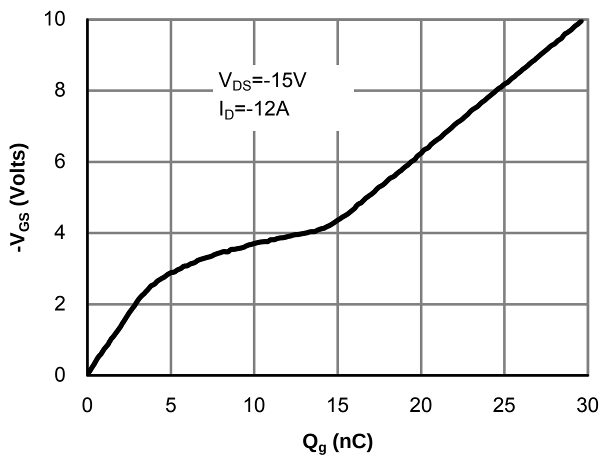


Figure 7: Gate-Charge Characteristics

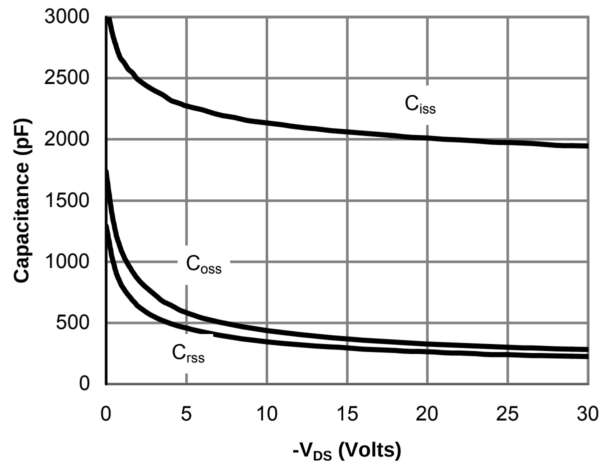


Figure 8: Capacitance Characteristics

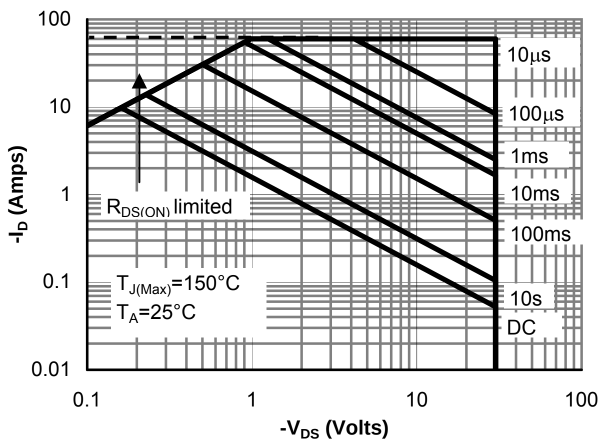


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

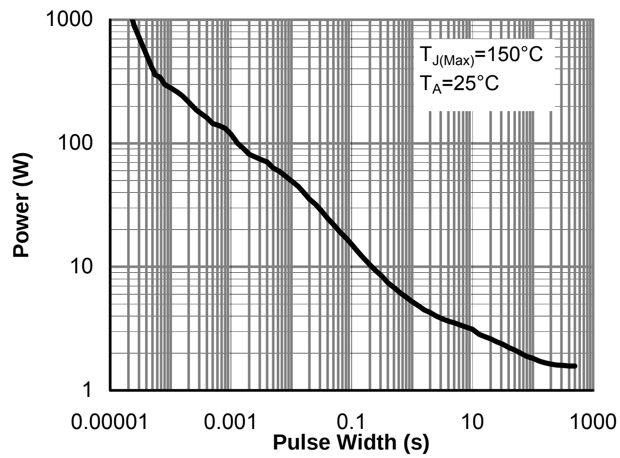


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

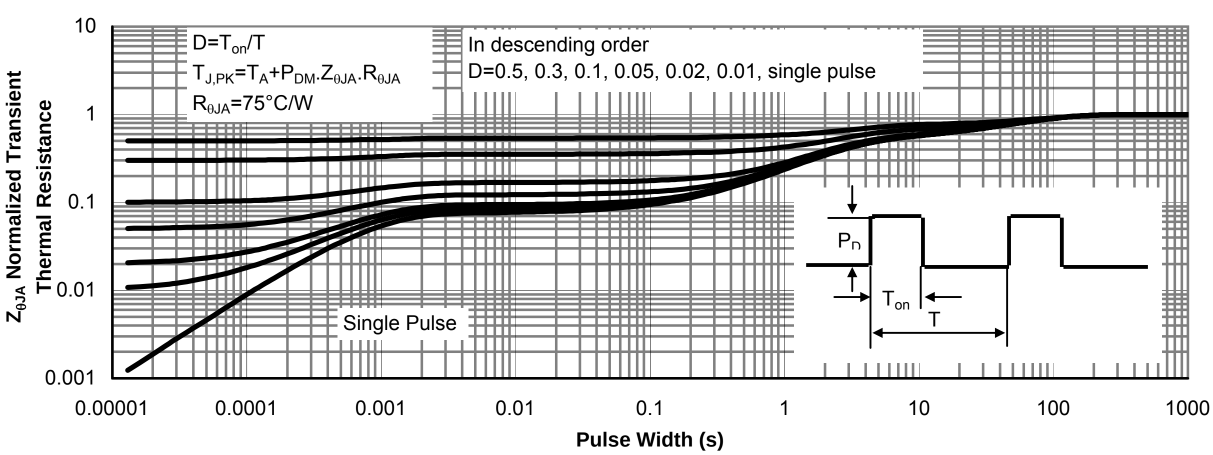


Figure 11: Normalized Maximum Transient Thermal Impedance(Note E)