



ALPHA & OMEGA
SEMICONDUCTOR, LTD

AO4407A

P-Channel Enhancement Mode Field Effect Transistor



General Description

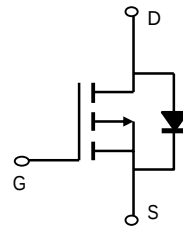
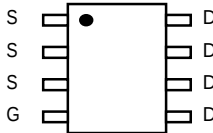
The AO4407A uses advanced trench technology to provide excellent $R_{DS(ON)}$, and ultra-low low gate charge with a 25V gate rating. This device is suitable for use as a load switch or in PWM applications. *Standard Product AO4407A is Pb-free (meets ROHS & Sony 259 specifications).*

Features

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

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

SOIC-8
Top View



Absolute Maximum Ratings $T_A=25^\circ C$ 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	I_D	-12	-9.2	A
$T_A=25^\circ C$				
Current ^A		-10	-7.4	
$T_A=70^\circ C$				
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	P_D	3.1	1.7	W
		2.0	1.1	
$T_A=25^\circ C$				
$T_A=70^\circ C$				
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150		$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	32	40	$^\circ C/W$
$t \leq 10s$				
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	60	75	$^\circ C/W$
Steady State				
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	17	24	$^\circ C/W$
Steady State				

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 T _J = 55°C			-10 -50	μA
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 T _J =125°C		8.5	11	mΩ
		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_{θJA} is measured with the device mounted on 1 in² 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_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} 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 in² 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=25°C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

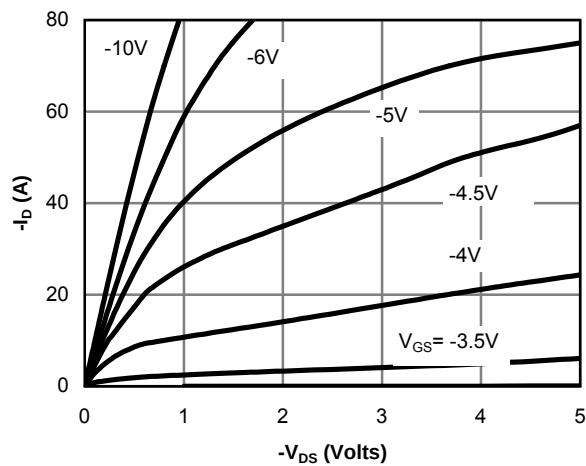


Figure 1: On-Region Characteristics

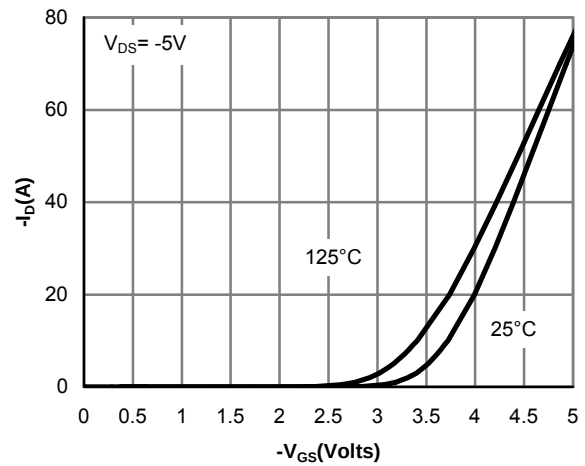


Figure 2: Transfer Characteristics

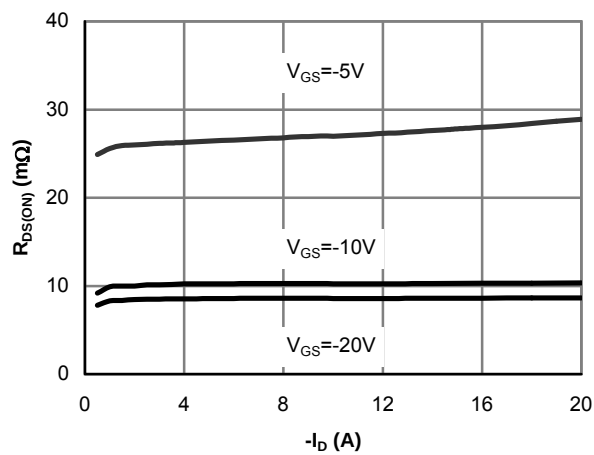


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

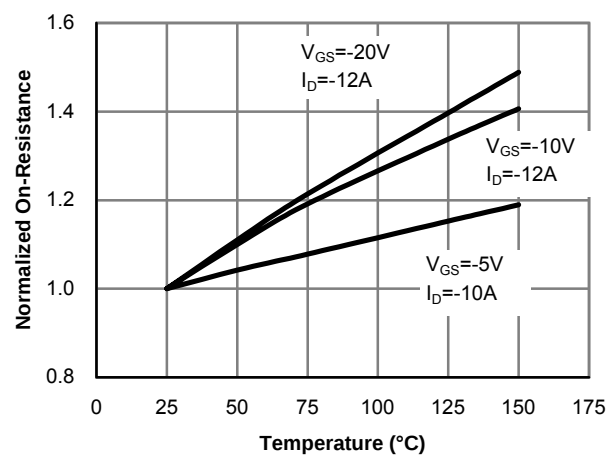


Figure 4: On-Resistance vs. Junction Temperature

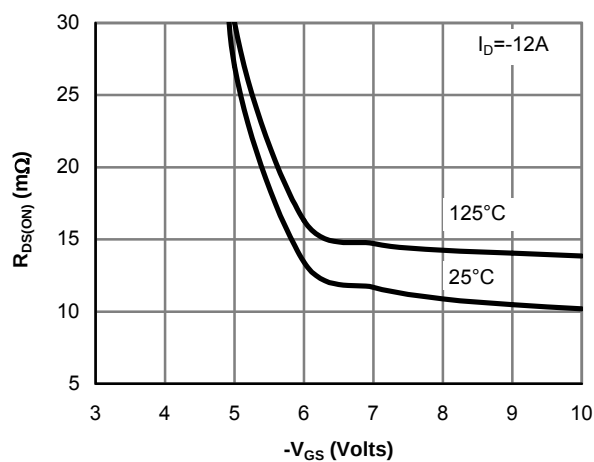


Figure 5: On-Resistance vs. Gate-Source Voltage

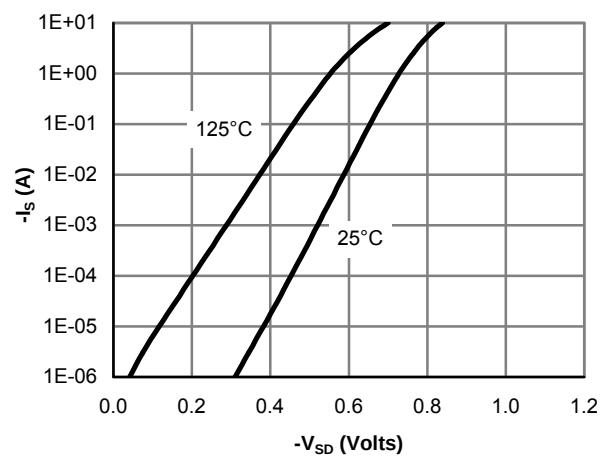


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

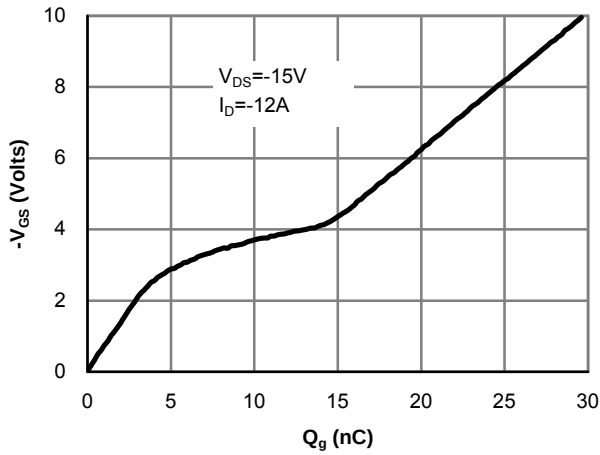


Figure 7: Gate-Charge Characteristics

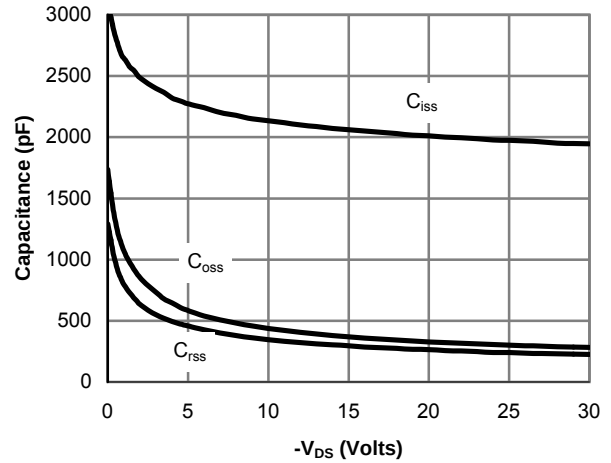


Figure 8: Capacitance Characteristics

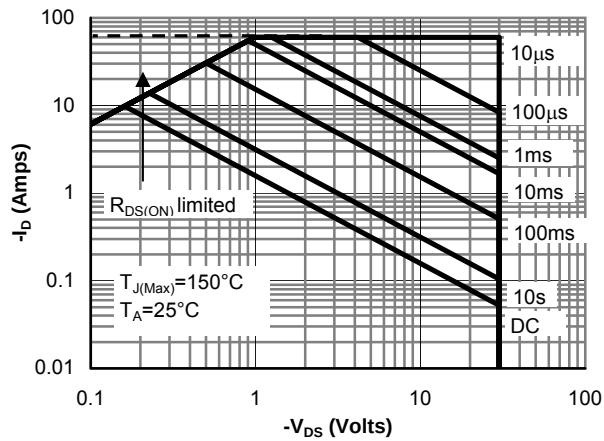


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

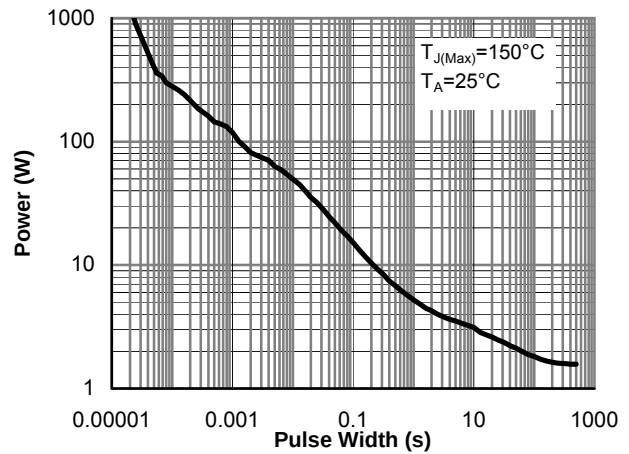


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

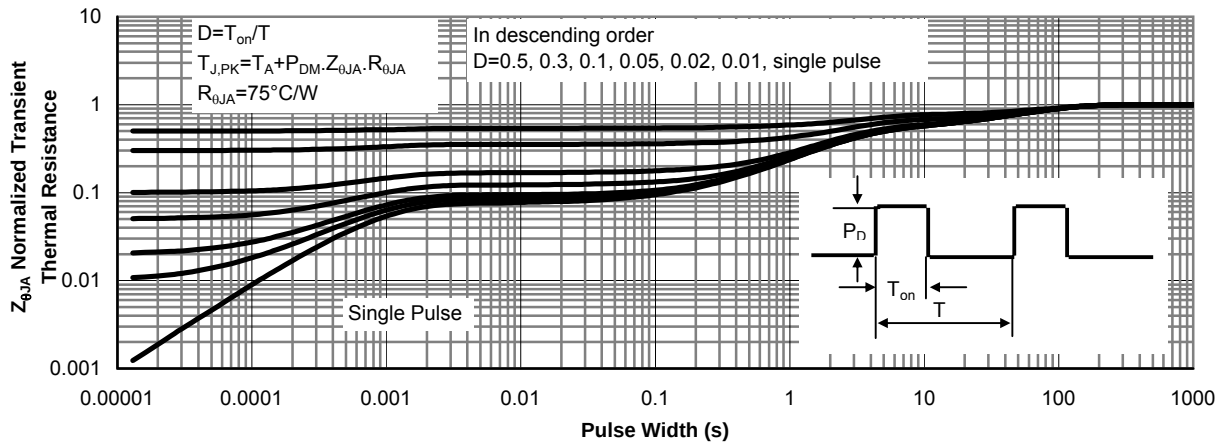


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)