



ALPHA & OMEGA
SEMICONDUCTOR

AO4413A

P-Channel Enhancement Mode Field Effect Transistor



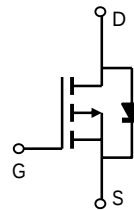
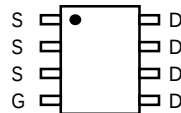
General Description

The AO4413A 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 AO4413A is Pb-free (meets ROHS & Sony 259 specifications). AO4413AL is a Green Product ordering option. AO4413A and AO4413AL are electrically identical.*

Features

$V_{DS} (V) = -30V$
 $I_D = -15A$ ($V_{GS} = -10V$)
 $R_{DS(ON)} < 7m\Omega$ ($V_{GS} = -20V$)
 $R_{DS(ON)} < 8.5m\Omega$ ($V_{GS} = -10V$)

SOIC-8
Top View



Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 25	V
Continuous Drain Current ^A	I_D	-15	A
$T_A=25^\circ C$			
$T_A=70^\circ C$		-12.8	
Pulsed Drain Current ^B	I_{DM}	-80	
Power Dissipation ^A	P_D	3	W
$T_A=25^\circ C$			
$T_A=70^\circ C$		2.1	
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	$R_{\theta JA}$	62	75	$^\circ C/W$
Steady-State				
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	18	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} =-24V, V _{GS} =0V T _J =55°C			-1 -5	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	-1.5	-2.2	-3.5	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 =-15A T _J =125°C		5.5	7 8.7	mΩ
		V _{GS} =-10V, I _D =-15A		6.6	8.5	mΩ
		V _{GS} =-6V, I _D =-10A		8.2		mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-15A		48		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.72	-1	V
I _S	Maximum Body-Diode Continuous Current				5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		4245	5500	pF
C _{oss}	Output Capacitance			983		pF
C _{rss}	Reverse Transfer Capacitance			689		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		12	18	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-10V, V _{DS} =-15V, I _D =-15A		69	90	nC
Q _{gs}	Gate Source Charge			15.2		nC
Q _{gd}	Gate Drain Charge			18.8		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =1.0Ω, R _{GEN} =3Ω		16.5		ns
t _r	Turn-On Rise Time			23.5		ns
t _{D(off)}	Turn-Off DelayTime			116		ns
t _f	Turn-Off Fall Time			82		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-15A, dI/dt=100A/μs		59	77	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-15A, dI/dt=100A/μs		55		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 a given application depends on the user's specific board design. The current rating is based on the ≤ 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 6,12,14 are obtained using 80μs 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. Rev 0: July 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

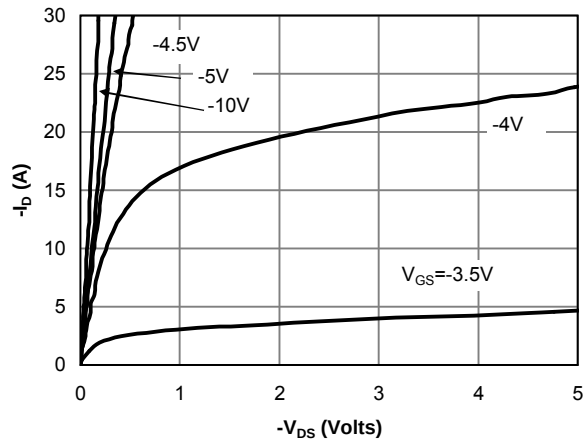


Fig 1: On-Region Characteristics

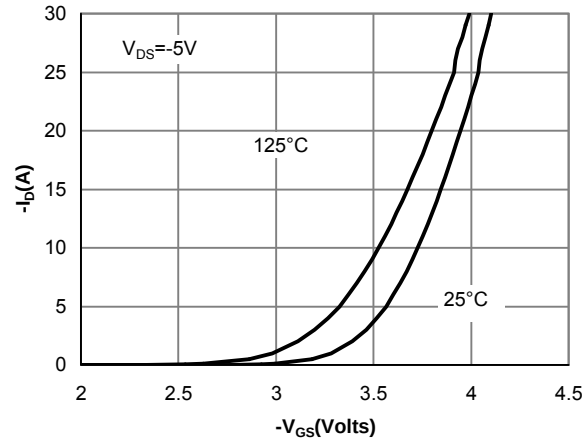


Figure 2: Transfer Characteristics

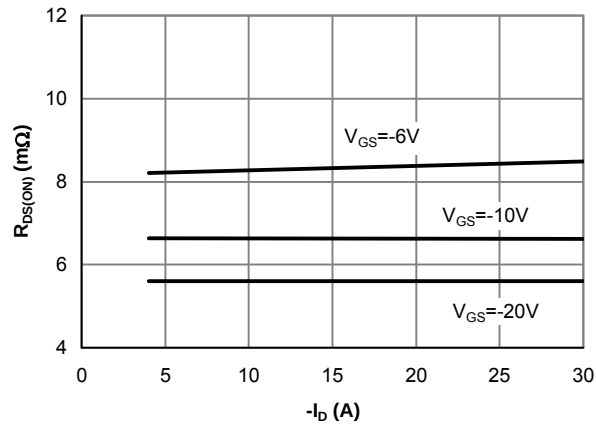


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

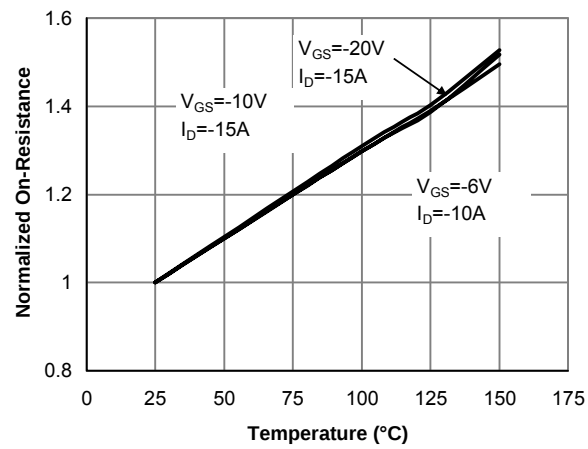


Figure 4: On-Resistance vs. Junction Temperature

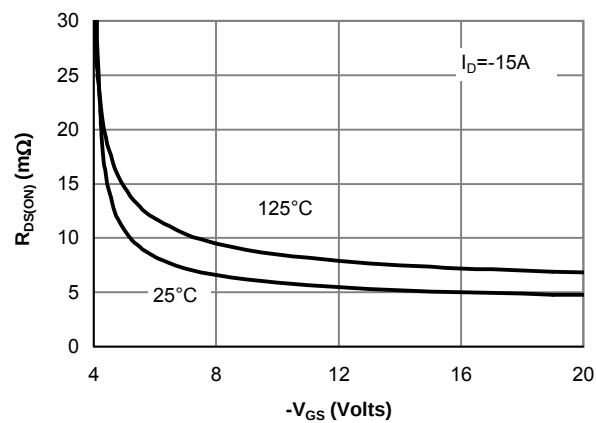


Figure 5: On-Resistance vs. Gate-Source Voltage

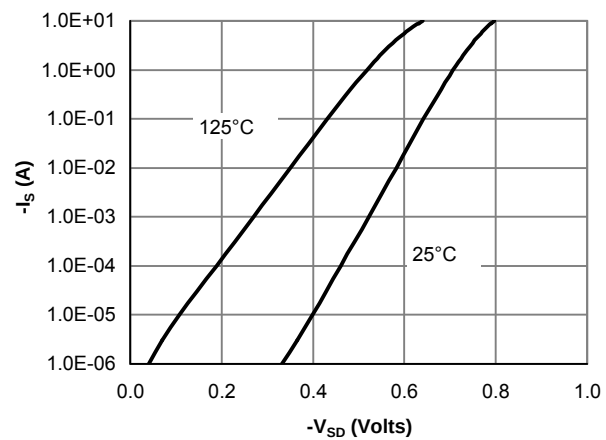


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

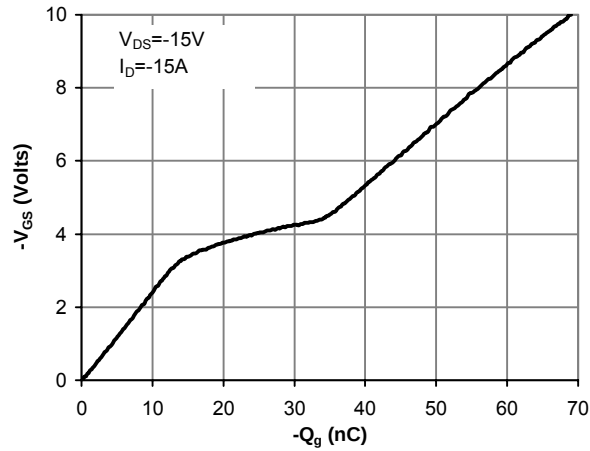


Figure 7: Gate-Charge Characteristics

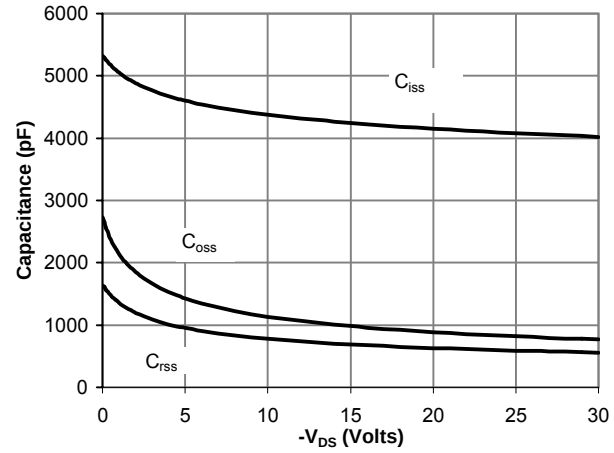


Figure 8: Capacitance Characteristics

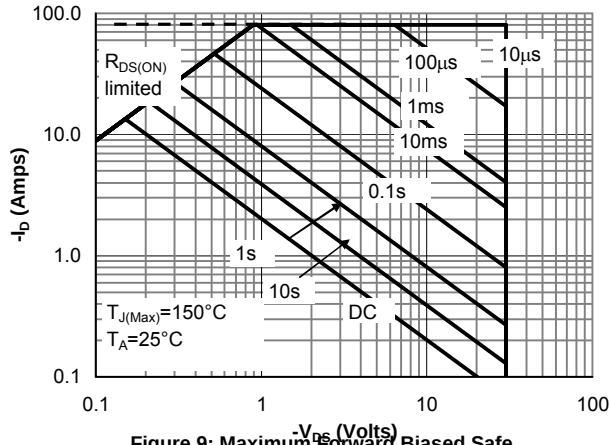


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

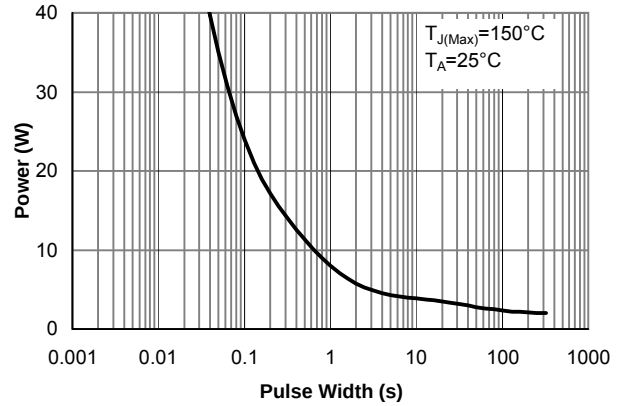


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

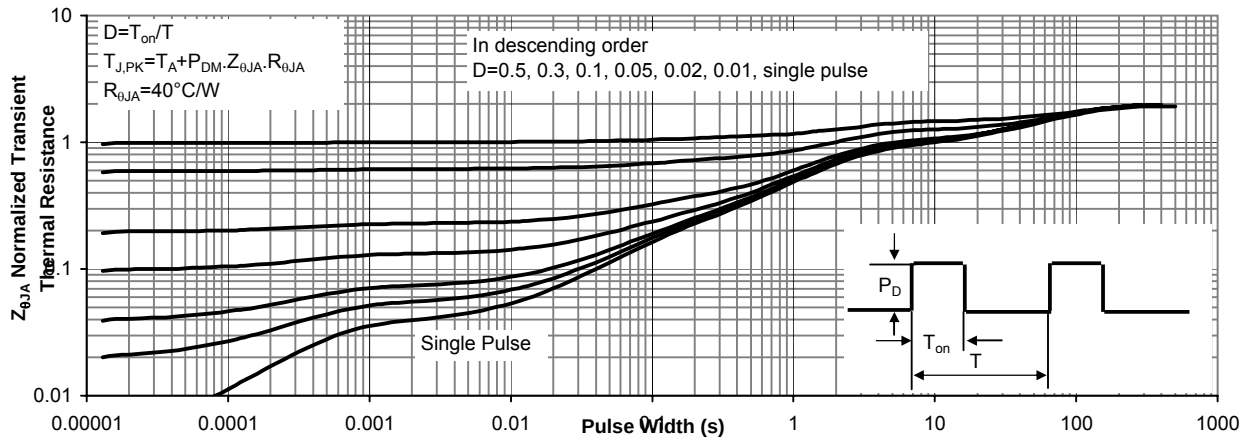


Figure 11: Normalized Maximum Transient Thermal Impedance