



AO4414A

N-Channel Enhancement Mode Field Effect Transistor

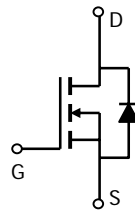
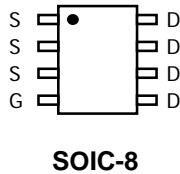


General Description

The AO4414A uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a load switch or in PWM applications. The source leads are separated to allow a Kelvin connection to the source, which may be used to bypass the source inductance. *Standard Product AO4414A is Pb-free (meets ROHS & Sony 259 specifications). AO4414AL is a Green Product ordering option. AO4414A and AO4414AL are electrically identical.*

Features

- $V_{DS} (V) = 30V$
- $I_D = 8.5A (V_{GS} = 10V)$
- $R_{DS(ON)} < 26m\Omega (V_{GS} = 10V)$
- $R_{DS(ON)} < 40m\Omega (V_{GS} = 4.5V)$



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}	± 20	V
Continuous Drain Current ^A	$T_A=25^\circ C$	8.5	A
	$T_A=70^\circ C$	7.1	
Pulsed Drain Current ^B	I_{DM}	50	
Power Dissipation	$T_A=25^\circ C$	3	W
	$T_A=70^\circ C$	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	$R_{\theta JA}$	$t \leq 10s$	34	40	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	62	75	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	18	24	$^\circ C/W$	

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} =24V, V _{GS} =0V T _J =55°C		0.004	1	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±20V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1	1.8	3	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	20			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =8.5A T _J =125°C		17	26	mΩ
		V _{GS} =4.5V, I _D =5A		24	30	mΩ
				27	40	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =8.5A	10	24		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.77	1	V
I _S	Maximum Body-Diode Continuous Current				4.3	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance			621	820	pF
C _{oss}	Output Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		118		pF
C _{rss}	Reverse Transfer Capacitance			85		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.8	1.5	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge			11.3	17	nC
Q _g (4.5V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =8.5A		5.7	8	nC
Q _{gs}	Gate Source Charge			2.1		nC
Q _{gd}	Gate Drain Charge			3		nC
t _{D(on)}	Turn-On Delay Time			4.5	6.5	ns
t _r	Turn-On Rise Time	V _{GS} =10V, V _{DS} =15V, R _L =1.8Ω,		3.1	5	ns
t _{D(off)}	Turn-Off Delay Time	R _{GEN} =3Ω		15.1	23	ns
t _f	Turn-Off Fall Time			2.7	5	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =8.5A, dI/dt=100A/μs		15.5	21	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =8.5A, dI/dt=100A/μs		7.1	10	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. 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 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.

Rev 0: December 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

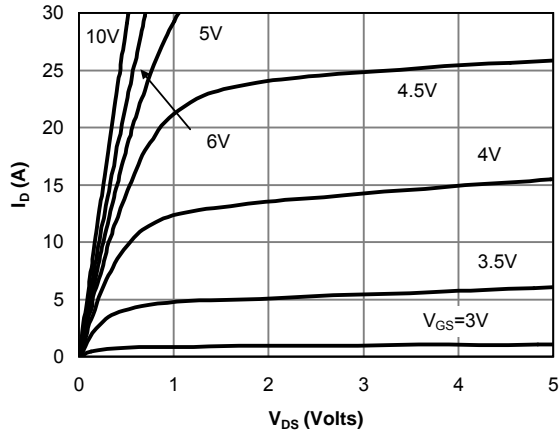


Figure 1: On-Region Characteristics

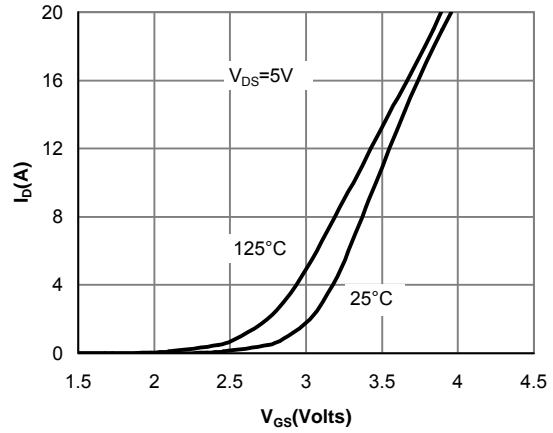


Figure 2: Transfer Characteristics

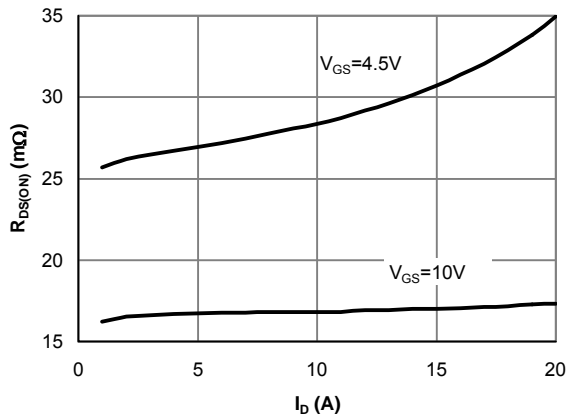


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

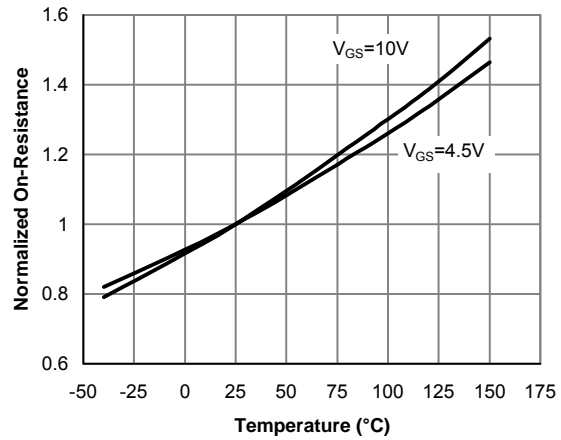


Figure 4: On-Resistance vs. Junction Temperature

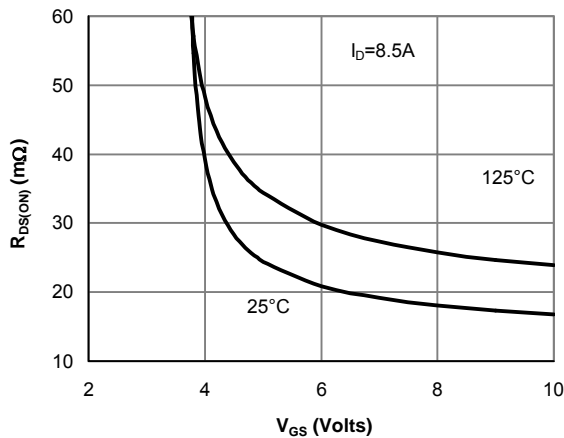


Figure 5: On-Resistance vs. Gate-Source Voltage

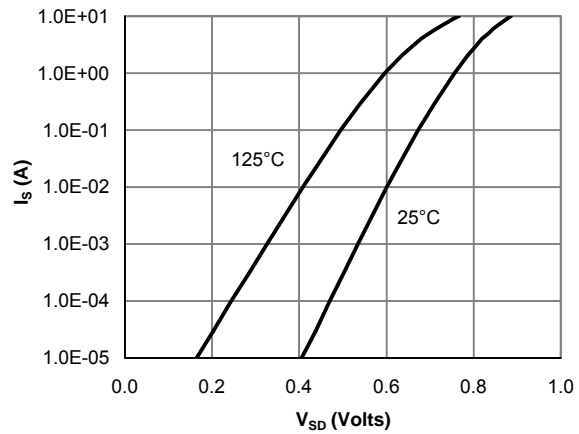


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

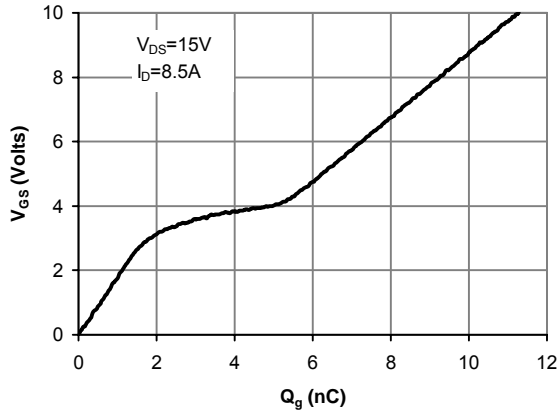


Figure 7: Gate-Charge Characteristics

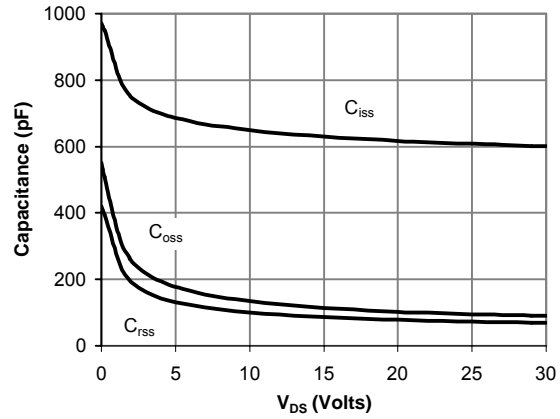


Figure 8: Capacitance Characteristics

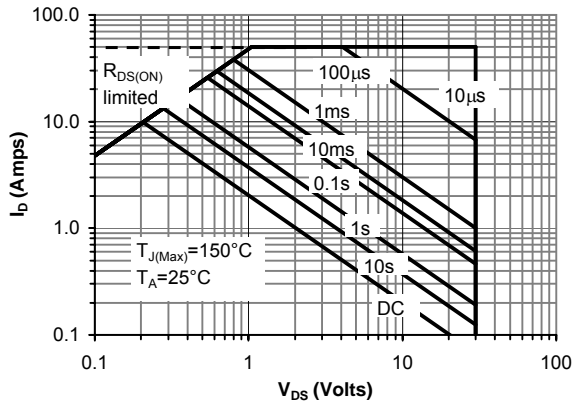


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

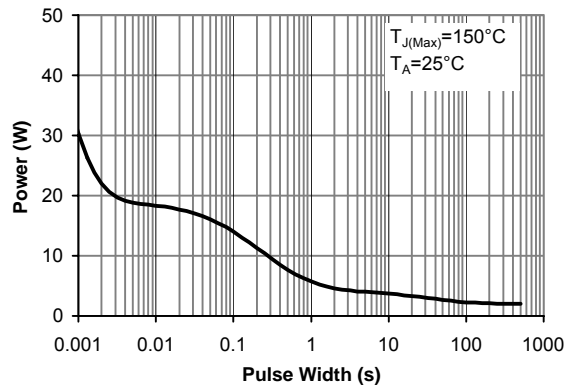


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

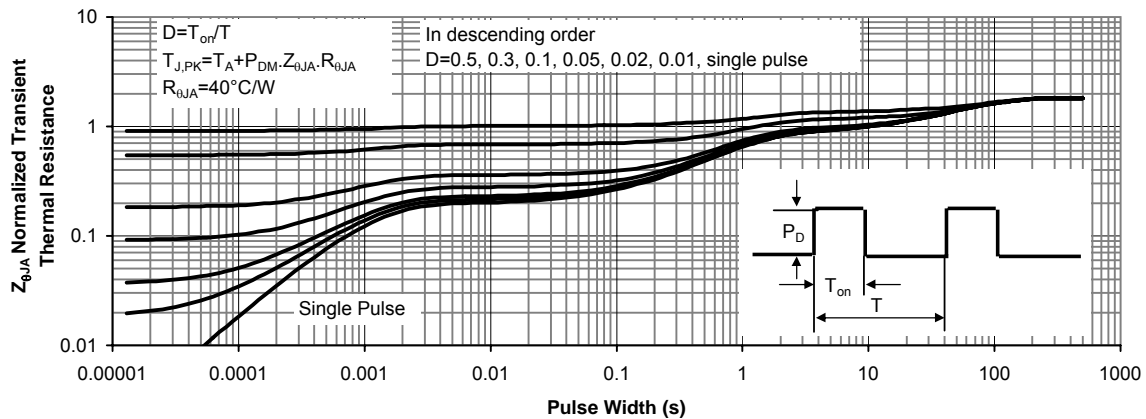


Figure 11: Normalized Maximum Transient Thermal Impedance