

## General Description

The AO4414 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 AO4414 is Pb-free (meets ROHS & Sony 259 specifications). AO4414L is a Green Product ordering option. AO4414 and AO4414L are electrically identical.*

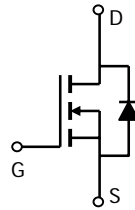
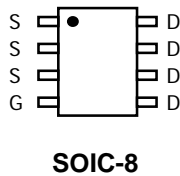
## Features

$$V_{DS} (V) = 30V$$

$$I_D = 8.5A (V_{GS} = 10V)$$

$$R_{DS(ON)} < 26m\Omega (V_{GS} = 10V)$$

$$R_{DS(ON)} < 40m\Omega (V_{GS} = 4.5V)$$



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ\text{C}$	8.5	A
	$T_A=70^\circ\text{C}$	7.1	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	50	
Power Dissipation	$T_A=25^\circ\text{C}$	3	W
	$T_A=70^\circ\text{C}$	2.1	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	59	
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C		0.004	1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.9	3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	20			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =8.5A T <sub>J</sub> =125°C		20 29.2	26 38	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A		31	40	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =5A	10	17		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.76	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				4.3	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance			680	820	pF
C <sub>oss</sub>	Output Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		102		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			77		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		3	3.6	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub> (10V)	Total Gate Charge			13.84	17	nC
Q <sub>g</sub> (4.5V)	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =8.5A		6.74	8.1	nC
Q <sub>gs</sub>	Gate Source Charge			1.84		nC
Q <sub>gd</sub>	Gate Drain Charge			3.32		nC
t <sub>D(on)</sub>	Turn-On Delay Time			4.5	6.5	ns
t <sub>r</sub>	Turn-On Rise Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.8Ω,		4.2	6.3	ns
t <sub>D(off)</sub>	Turn-Off Delay Time	R <sub>GEN</sub> =3Ω		20.1	30	ns
t <sub>f</sub>	Turn-Off Fall Time			4.9	7.5	ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =8.5A, dI/dt=100A/μs		17.2	21	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =8.5A, dI/dt=100A/μs		8.6	10	nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=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<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> 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 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

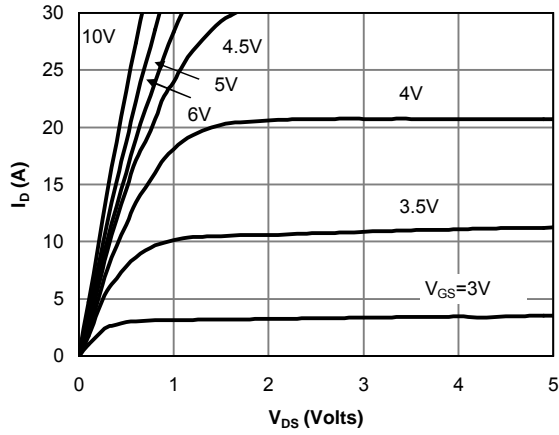


Fig 1: On-Region Characteristics

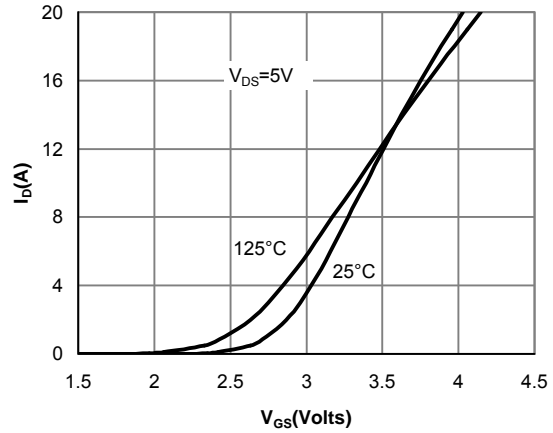


Figure 2: Transfer Characteristics

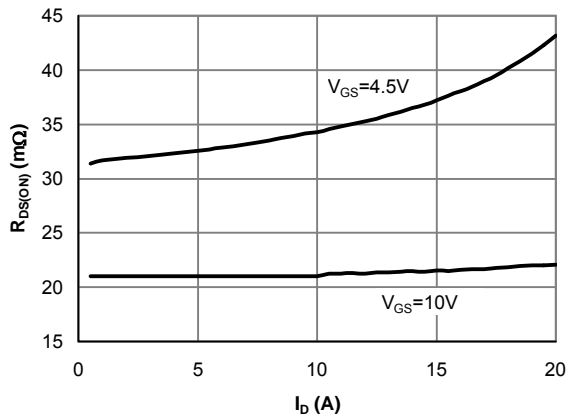


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

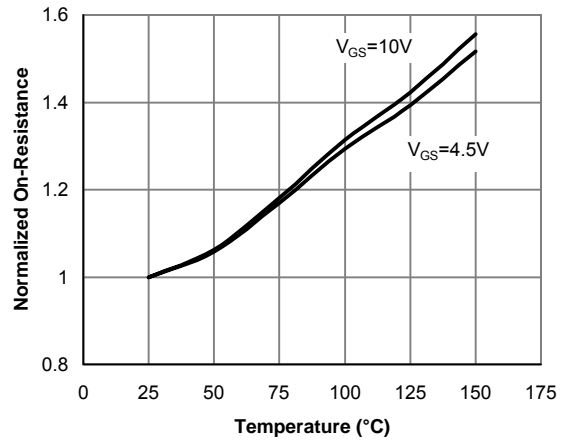


Figure 4: On-Resistance vs. Junction Temperature

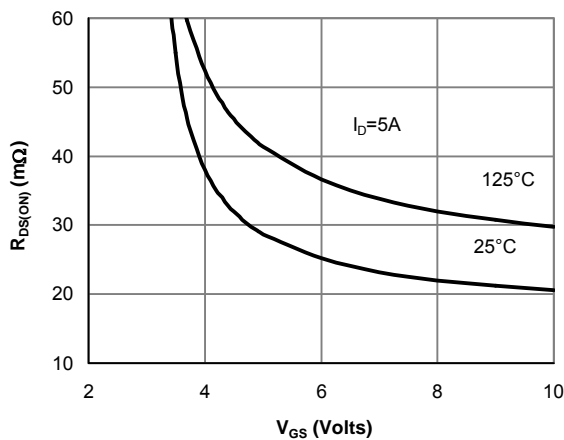


Figure 5: On-Resistance vs. Gate-Source Voltage

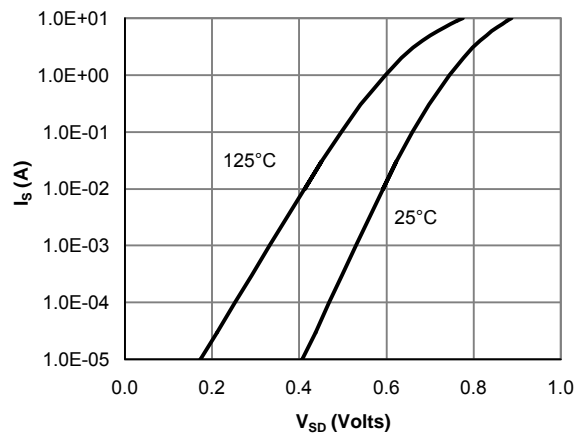


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

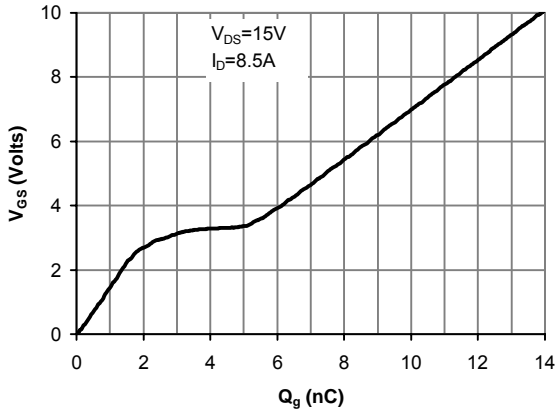


Figure 7: Gate-Charge Characteristics

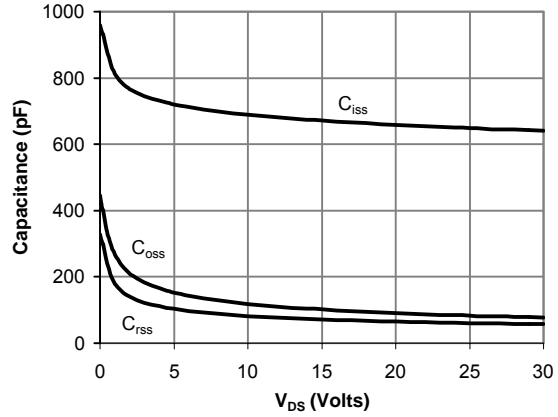


Figure 8: Capacitance Characteristics

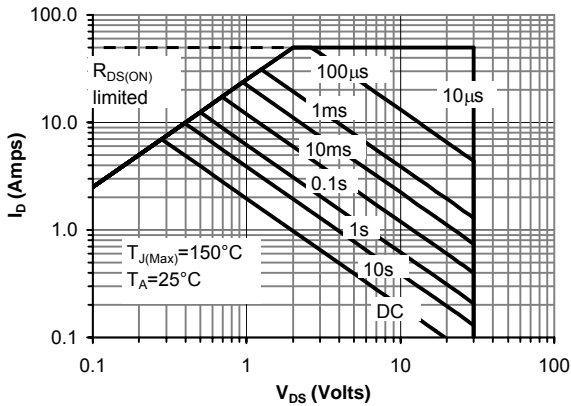


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

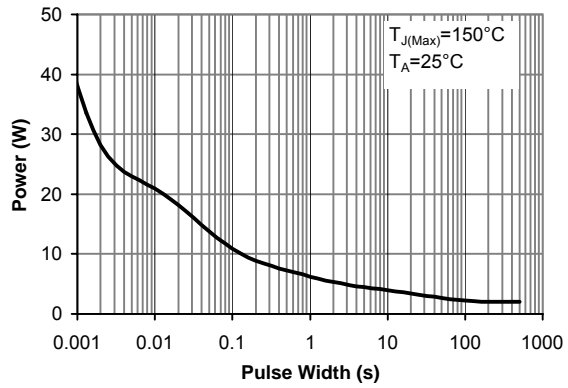


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

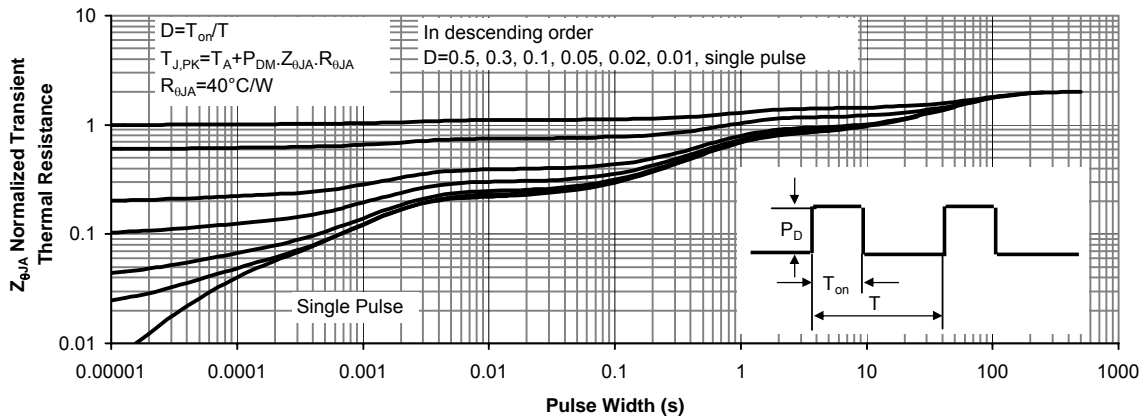


Figure 11: Normalized Maximum Transient Thermal Impedance