

## General Description

The AO4412 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and ultra low gate charge for use has a fast high side switch. The source leads are separated to allow a Kelvin connection to the source, which may be used to bypass the source inductance. Standard product AO4412 is Pb-free (meets ROHS & Sony 259 specifications). AO4412L is a Green Product ordering option. AO4412 and AO4412L are electrically identical.

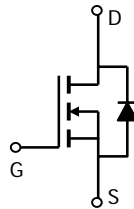
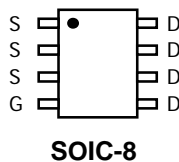
## Features

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

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

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

$$R_{DS(ON)} < 34m\Omega \quad (V_{GS} = 4.5V)$$



### 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	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ C$	8.5	A
	$T_A=70^\circ C$	7.1	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	60	
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 <sup>A</sup>	$R_{\theta JA}$	31	40	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	59	75
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	16	24	$^\circ C/W$

Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=24\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1	$\mu\text{A}$
					5	
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 12\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	1	1.8	3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$ , $V_{DS}=5\text{V}$	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$ , $I_D=8.5\text{A}$ $T_J=125^\circ\text{C}$		22	26	m $\Omega$
			$V_{GS}=4.5\text{V}$ , $I_D=5\text{A}$		28	
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=5\text{A}$				S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		0.76	1	V
$I_S$	Maximum Body-Diode Continuous Current				4	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=15\text{V}$ , $f=1\text{MHz}$		590		pF
$C_{oss}$	Output Capacitance			162		pF
$C_{rss}$	Reverse Transfer Capacitance			40		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		0.45		$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=4.5\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=8.5\text{A}$		6.04		nC
$Q_{gs}$	Gate Source Charge			1.46		nC
$Q_{gd}$	Gate Drain Charge			2.56		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $R_L=1.8\Omega$ , $R_{GEN}=3\Omega$		3.7		ns
$t_r$	Turn-On Rise Time			3.5		ns
$t_{D(off)}$	Turn-Off DelayTime			14.9		ns
$t_f$	Turn-Off Fall Time			2.5		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=5\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		26		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=5\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		20		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design. The current rating is based on the  $t \leq 10\text{s}$  thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80 $\mu\text{s}$  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  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

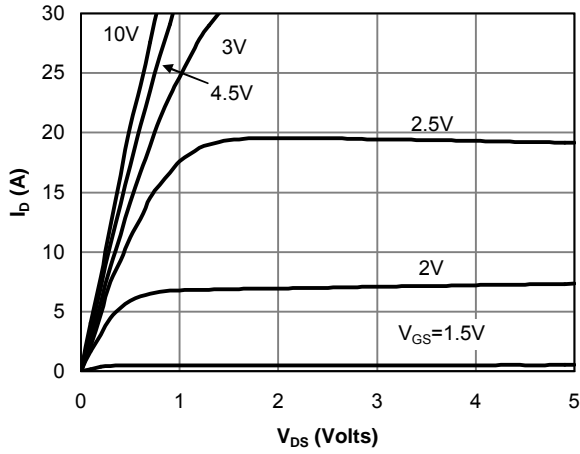


Fig 1: On-Region Characteristics

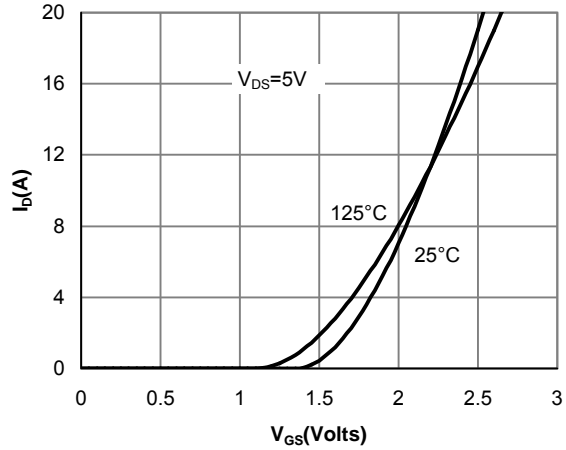


Figure 2: Transfer Characteristics

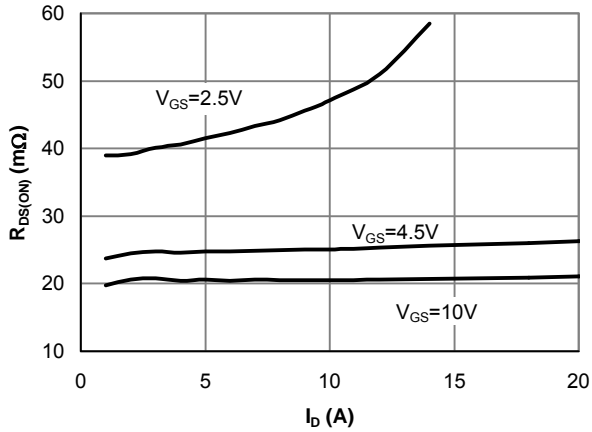


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

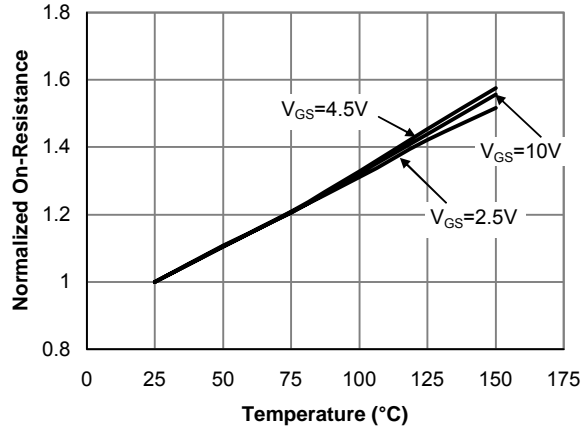


Figure 4: On-Resistance vs. Junction Temperature

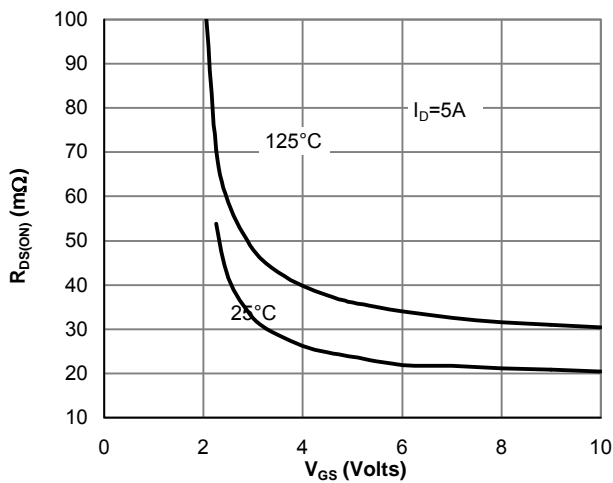


Figure 5: On-Resistance vs. Gate-Source Voltage

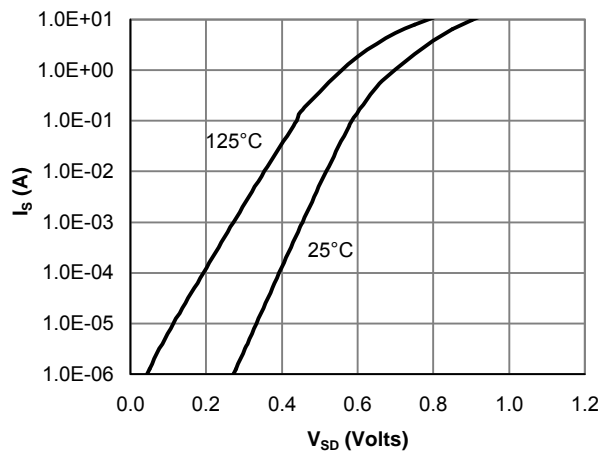


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

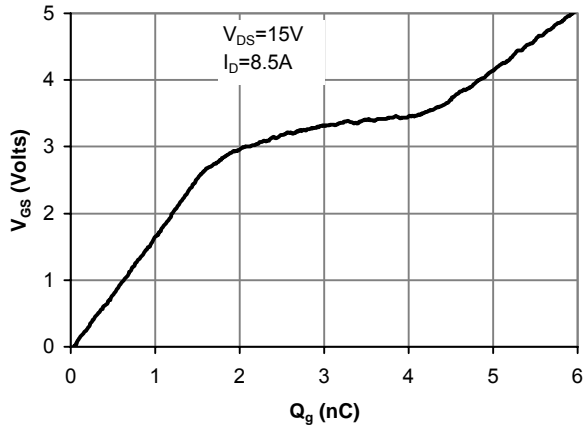


Figure 7: Gate-Charge Characteristics

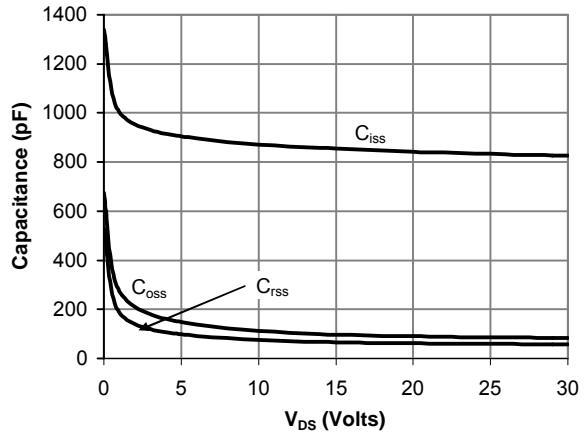


Figure 8: Capacitance Characteristics

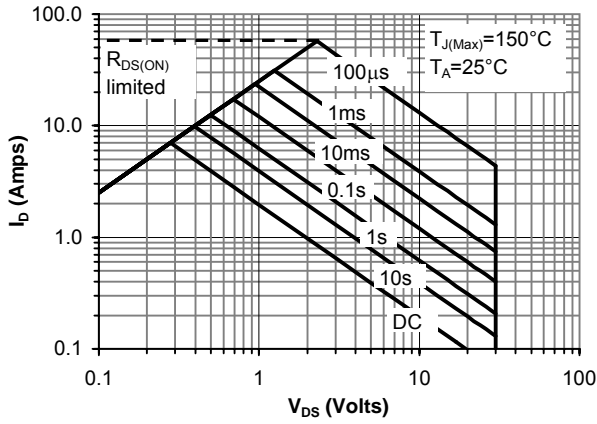


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

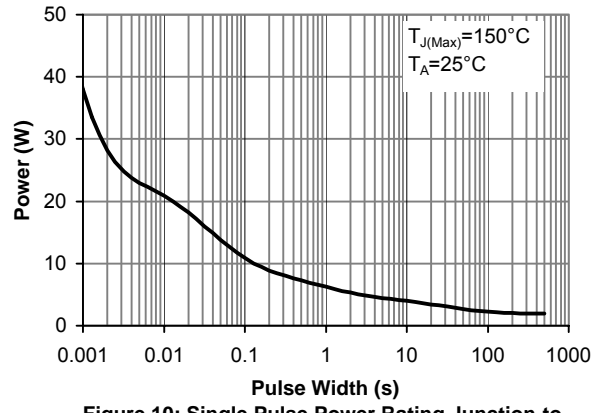


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

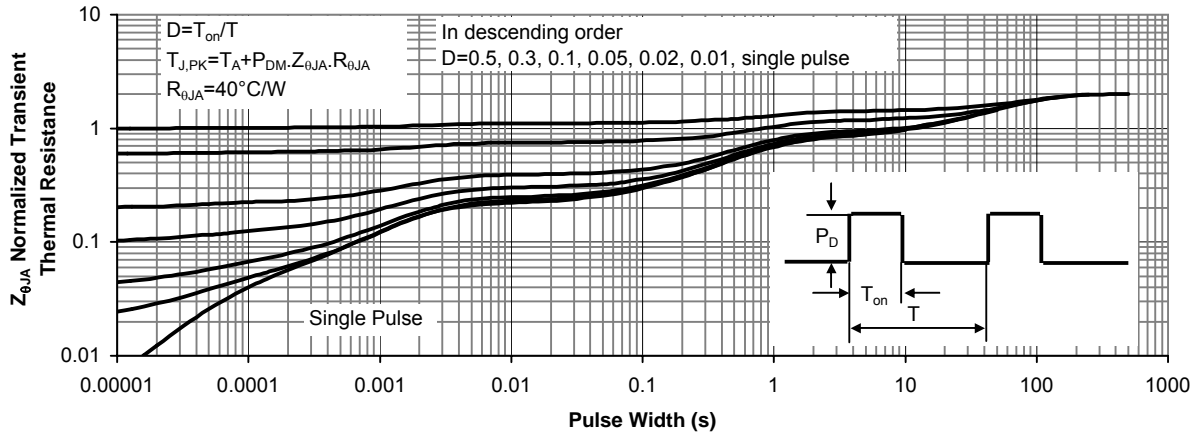


Figure 11: Normalized Maximum Transient Thermal Impedance