

**AO4407A**

ALPHA & OMEGA SEMICONDUCTORS

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## Company Address

Arrow Electronics, Inc  
9201 East Dry Creek Road  
Centennial, CO 80112

### 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.

\* RoHS and Halogen-Free Compliant

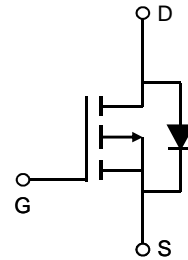
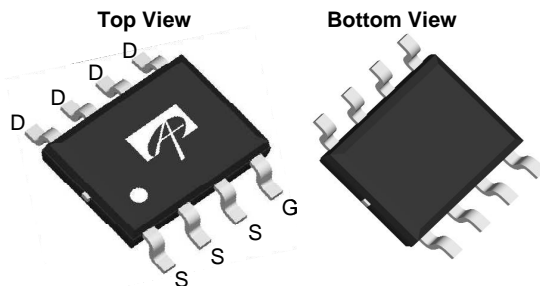
### Product Summary

$V_{DS} = -30V$   
 $I_D = -12A$  ( $V_{GS} = -20V$ )  
 $R_{DS(ON)} < 11m\Omega$  ( $V_{GS} = -20V$ )  
 $R_{DS(ON)} < 13m\Omega$  ( $V_{GS} = -10V$ )  
 $R_{DS(ON)} < 17m\Omega$  ( $V_{GS} = -6V$ )

100% UIS Tested  
 100% Rg Tested



SOIC-8



### 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	$V_{GS}$	$\pm 25$	V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	-12
		$T_A=70^\circ C$	-10
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	-60	A
Avalanche Current <sup>G</sup>	$I_{AR}$	-26	
Repetitive avalanche energy $L=0.3mH$ <sup>G</sup>	$E_{AR}$	101	mJ
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ C$	3.1
		$T_A=70^\circ C$	2.0
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>	$R_{\theta JA}$	32	40	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady State	60	75
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	17	24	$^\circ C/W$

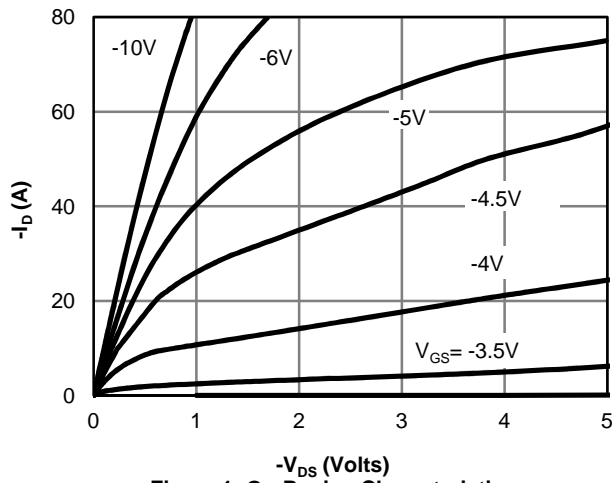
**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

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> = -30V, V <sub>GS</sub> = 0V T <sub>J</sub> = 55°C			-1 -5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±25V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1.7	-2.3	-3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> = -10V, V <sub>DS</sub> = -5V	-60			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = -20V, I <sub>D</sub> = -12A T <sub>J</sub> = 125°C		8.5 11.5	11 15	mΩ
		V <sub>GS</sub> = -10V, I <sub>D</sub> = -12A		10	13	
		V <sub>GS</sub> = -6V, I <sub>D</sub> = -10A		12.7	17	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = -5V, I <sub>D</sub> = -10A		21		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = -1A, V <sub>GS</sub> = 0V		-0.7	-1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				-3	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz		2060	2600	pF
C <sub>oss</sub>	Output Capacitance			370		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			295		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		2.4	3.6	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-12A		30	39	nC
Q <sub>gs</sub>	Gate Source Charge			4.6		nC
Q <sub>gd</sub>	Gate Drain Charge			10		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =1.25Ω, R <sub>GEN</sub> =3Ω		11		ns
t <sub>r</sub>	Turn-On Rise Time			9.4		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			24		ns
t <sub>f</sub>	Turn-Off Fall Time			12		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =-12A, dI/dt=100A/μs		30	40	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-12A, dI/dt=100A/μs		22		nC

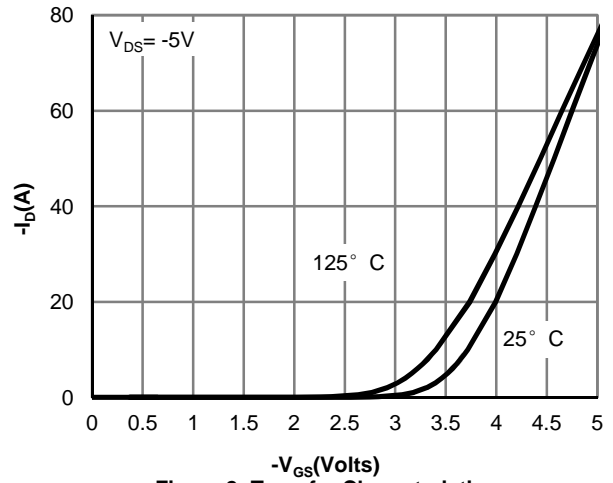
- A: The value of R<sub>θJA</sub> is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub> = 25° C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal 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 < 300μs 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.
- F: The current rating is based on the t ≤ 10s thermal resistance rating.
- G: E<sub>AR</sub> and I<sub>AR</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub>=25C.

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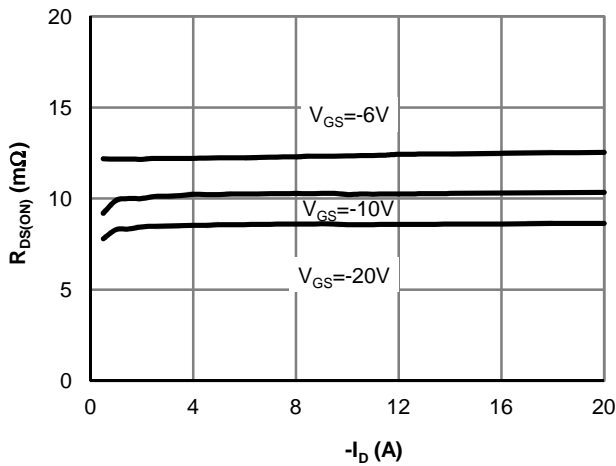
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



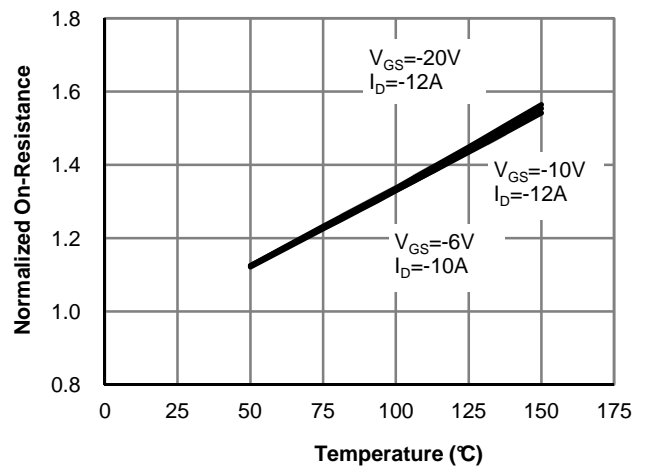
**Figure 1: On-Region Characteristics**



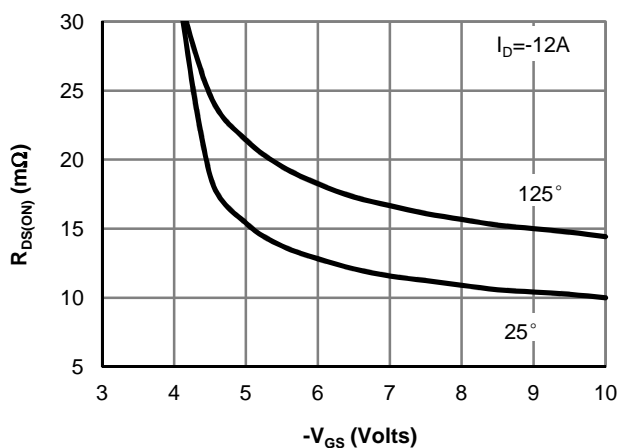
**Figure 2: Transfer Characteristics**



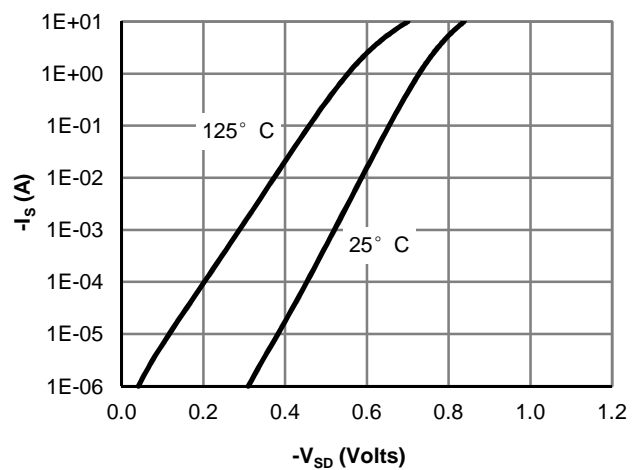
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**

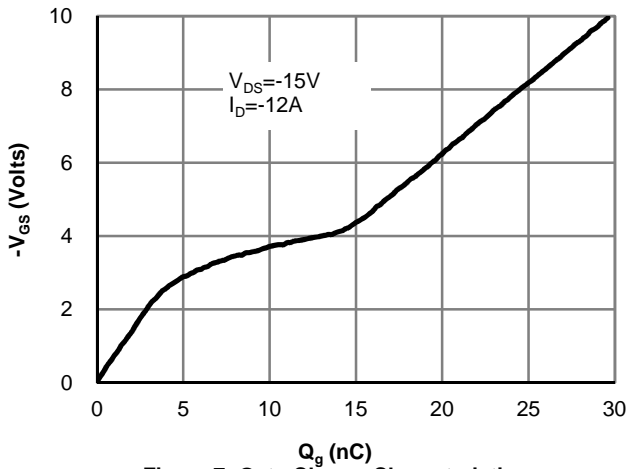


**Figure 5: On-Resistance vs. Gate-Source Voltage**

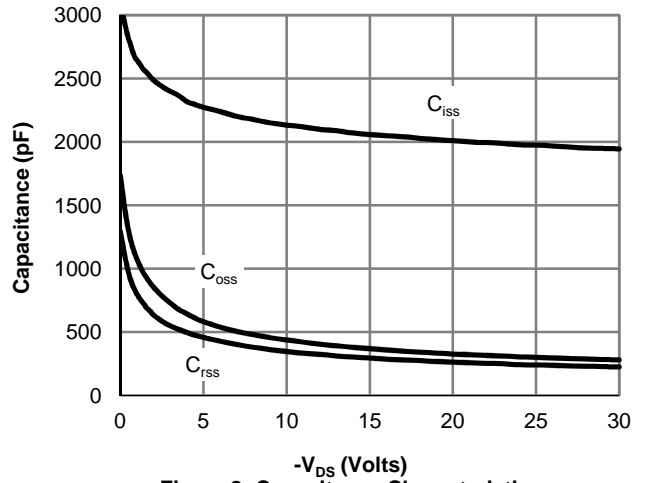


**Figure 6: Body-Diode Characteristics**

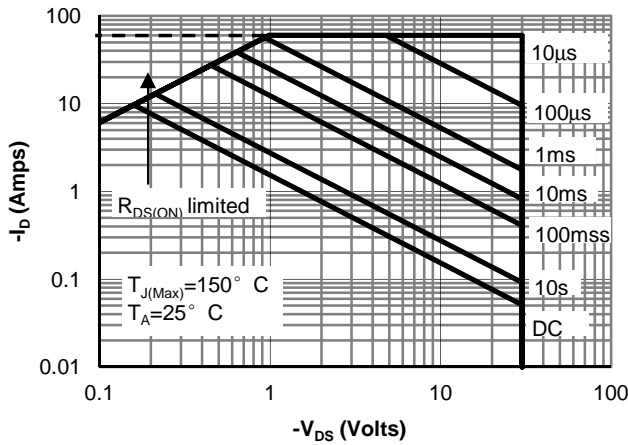
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



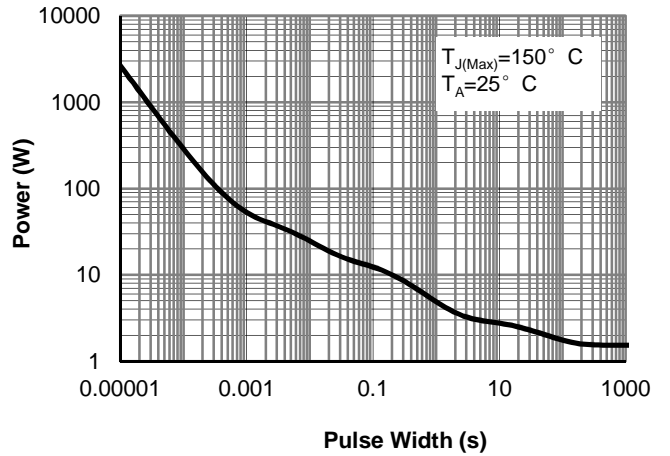
**Figure 7: Gate-Charge Characteristics**



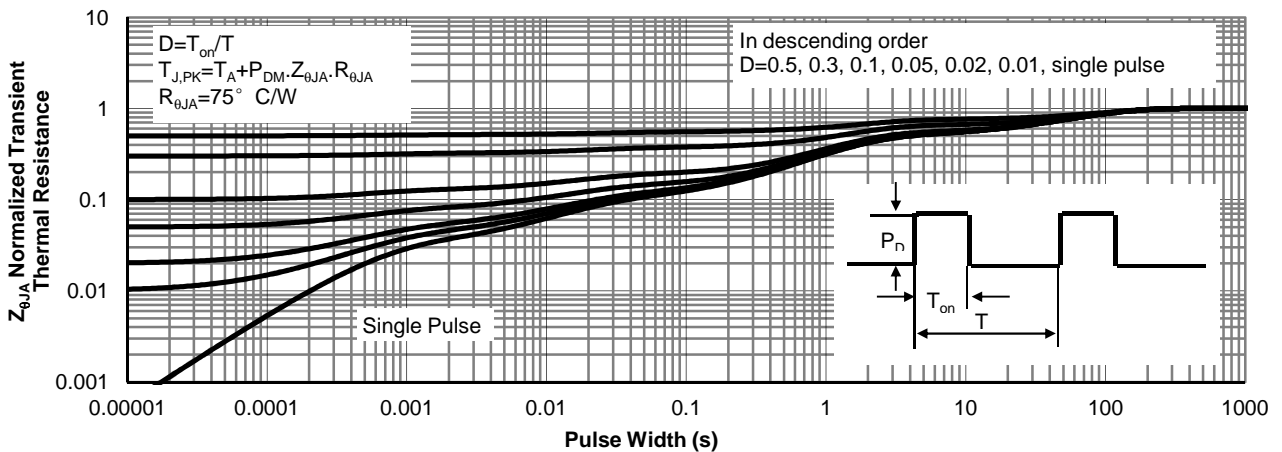
**Figure 8: Capacitance Characteristics**



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

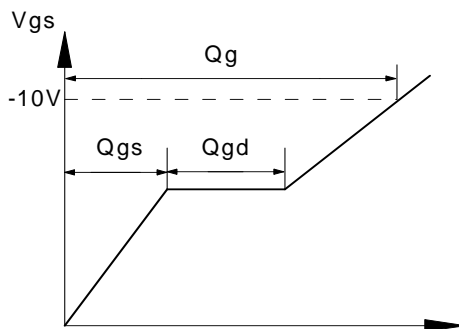
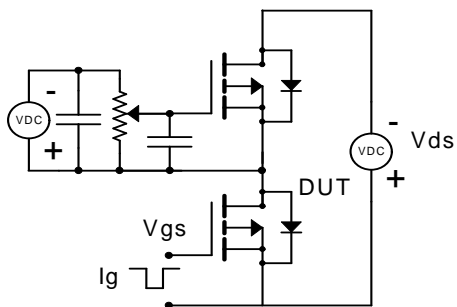


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

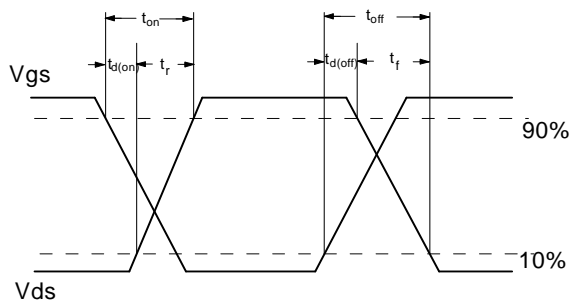
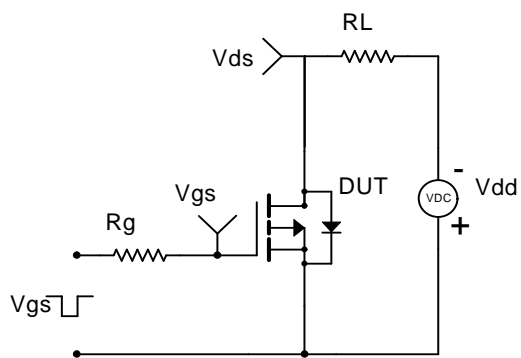


**Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)**

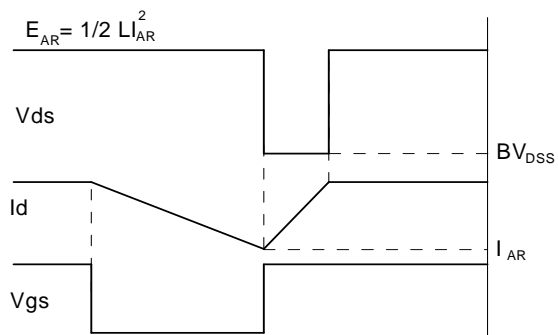
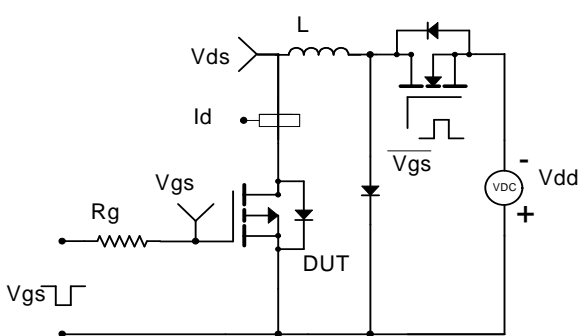
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

