

**AO4407**  
**30V P-Channel MOSFET**
**General Description**

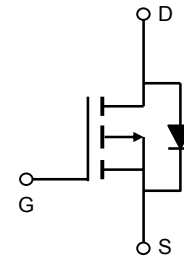
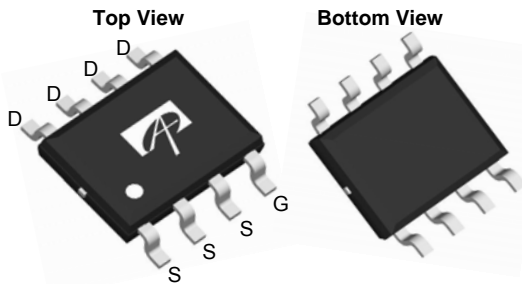
The AO4407/L uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , and ultra-low low gate charge with a 25V gate rating. This device is suitable for use as a load switch or in PWM applications. AO4407 and AO4407L are electrically identical.

- RoHS Compliant
- AO4407L is Halogen Free

**Features**

- $V_{DS}$  (V) = -30V
- $I_D$  = -12 A ( $V_{GS}$  = -20V)
- $R_{DS(ON)} < 13m\Omega$  ( $V_{GS}$  = -20V)
- $R_{DS(ON)} < 14m\Omega$  ( $V_{GS}$  = -10V)
- $R_{DS(ON)} < 38m\Omega$  ( $V_{GS}$  = -5V)

- 100% UIS Tested
- 100%  $R_g$  Tested

**SOIC-8**

**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	$V_{GS}$	$\pm 25$	V
Continuous Drain Current <sup>AF</sup>	$I_D$	$T_A=25^\circ\text{C}$	-12
		$T_A=70^\circ\text{C}$	-10
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	-60	A
Avalanche Current <sup>G</sup>	$I_{AR}$	-30	A
Repetitive avalanche energy $L=0.3\text{mH}$ <sup>G</sup>	$E_{AR}$	135	mJ
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ\text{C}$	3.1
		$T_A=70^\circ\text{C}$	2
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>	$R_{\theta JA}$	32	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	60	75
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	17	24	$^\circ\text{C/W}$

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	$V_{DS}=-30\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 25\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$	-1.7	-2.5	-3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$ , $V_{DS}=-5\text{V}$	60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$ , $I_D=-10\text{A}$ $T_J=125^\circ\text{C}$		11 15	14 19	$\text{m}\Omega$
		$V_{GS}=-20\text{V}$ , $I_D=-10\text{A}$		10	13	$\text{m}\Omega$
		$V_{GS}=-5\text{V}$ , $I_D=-10\text{A}$		27	38	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=-5\text{V}$ , $I_D=-10\text{A}$		26		S
$V_{SD}$	Diode Forward Voltage	$I_S=-1\text{A}$ , $V_{GS}=0\text{V}$		-0.72	-1	V
$I_S$	Maximum Body-Diode Continuous Current				-4.2	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=-15\text{V}$ , $f=1\text{MHz}$		2076	2500	pF
$C_{oss}$	Output Capacitance			503		pF
$C_{rss}$	Reverse Transfer Capacitance			302	423	pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$	1	2	3	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=-10\text{V}$ , $V_{DS}=-15\text{V}$ , $I_D=-12\text{A}$	30	37.2	45	nC
$Q_{gs}$	Gate Source Charge			7		nC
$Q_{gd}$	Gate Drain Charge			10.4		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$ , $V_{DS}=-15\text{V}$ , $R_L=1.25\Omega$ , $R_{GEN}=3\Omega$		12.4		ns
$t_r$	Turn-On Rise Time			8.2		ns
$t_{D(off)}$	Turn-Off DelayTime			25.6		ns
$t_f$	Turn-Off Fall Time			12		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=-12\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		33	40	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=-12\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		23		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in 2 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.

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  $<300 \mu\text{s}$  pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in 2 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.

F: The current rating is based on the  $t \leq 10\text{s}$  junction to ambient thermal resistance rating.

G: EAR and IAR ratings are based on low frequency and duty cycles such that  $T_J(\text{start})=25\text{C}$  for each pulse.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

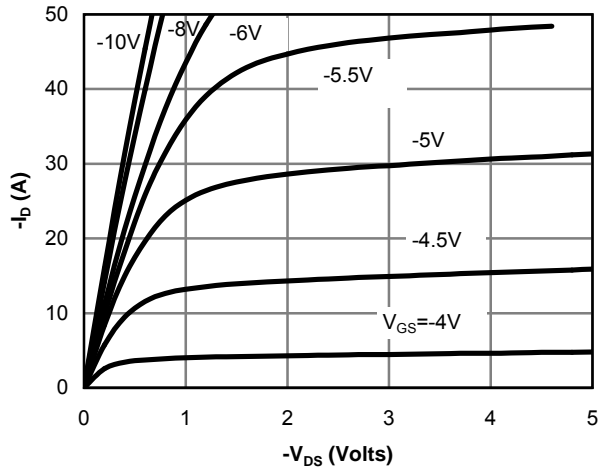


Fig 1: On-Region Characteristics

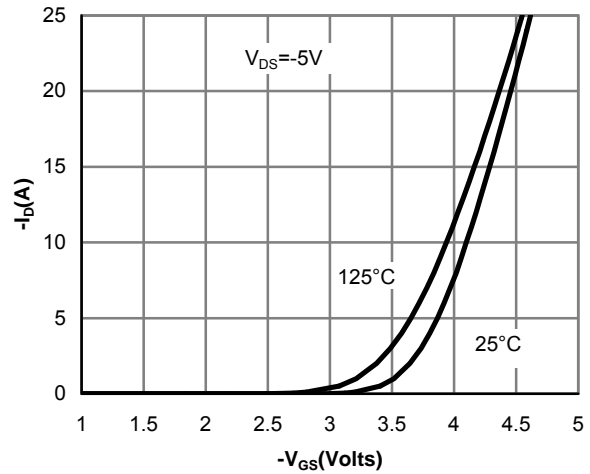


Figure 2: Transfer Characteristics

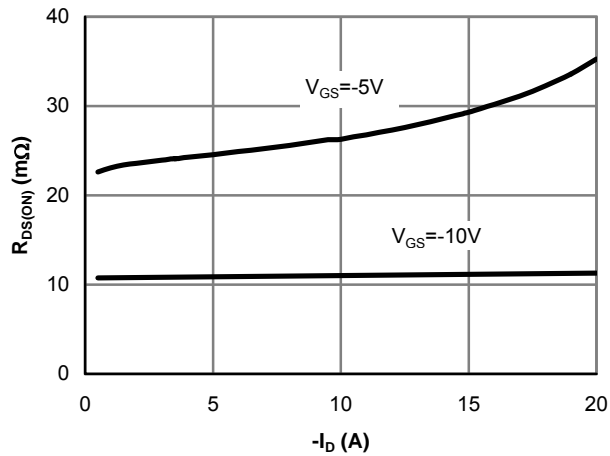


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

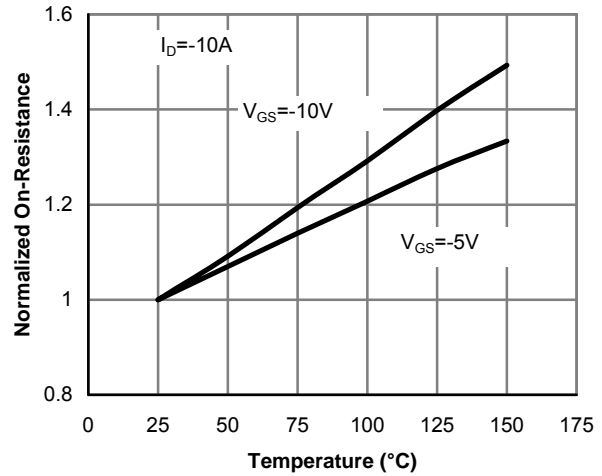


Figure 4: On-Resistance vs. Junction Temperature

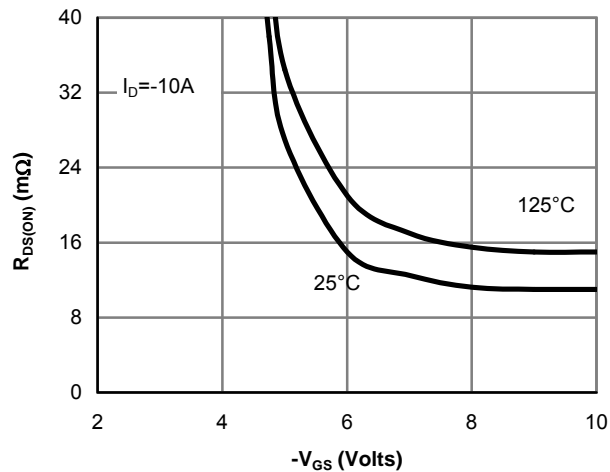


Figure 5: On-Resistance vs. Gate-Source Voltage

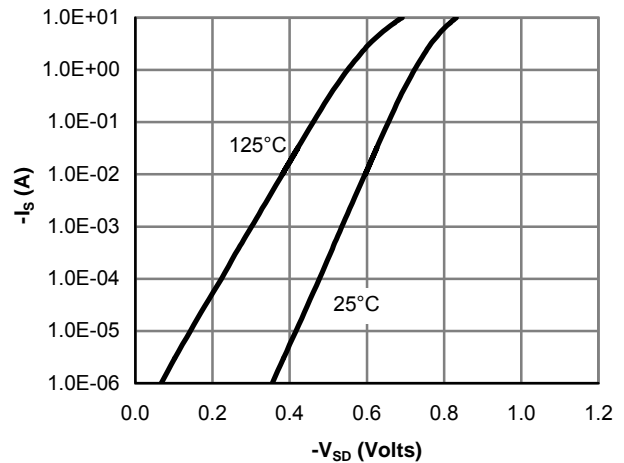


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

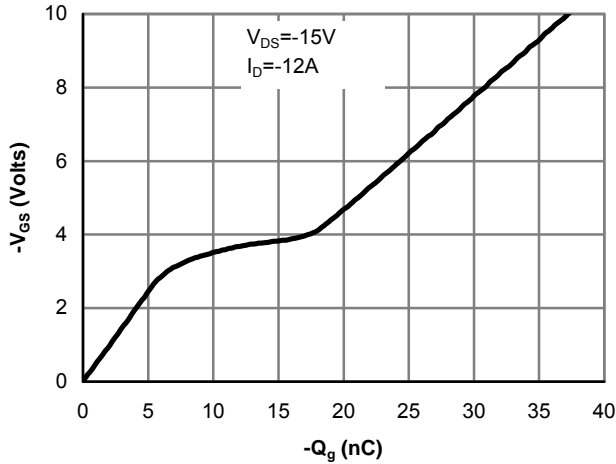


Figure 7: Gate-Charge Characteristics

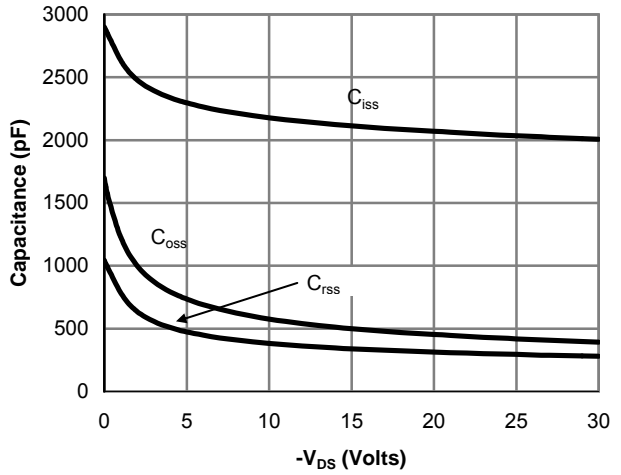


Figure 8: Capacitance Characteristics

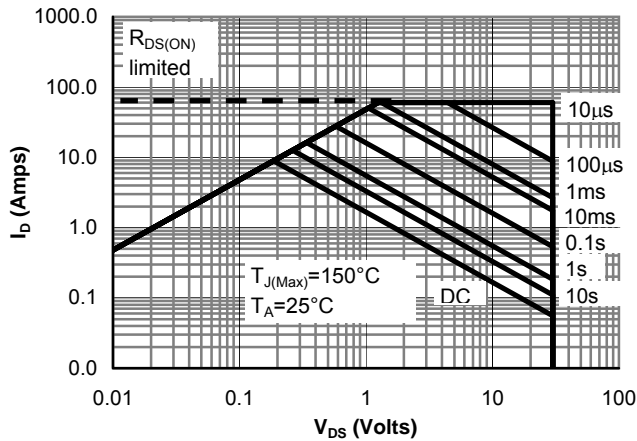


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

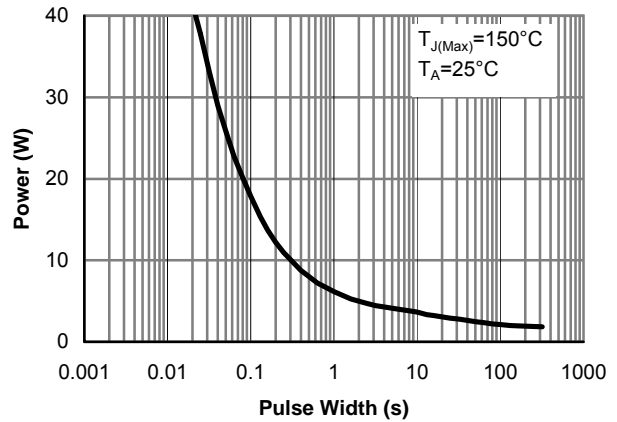


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

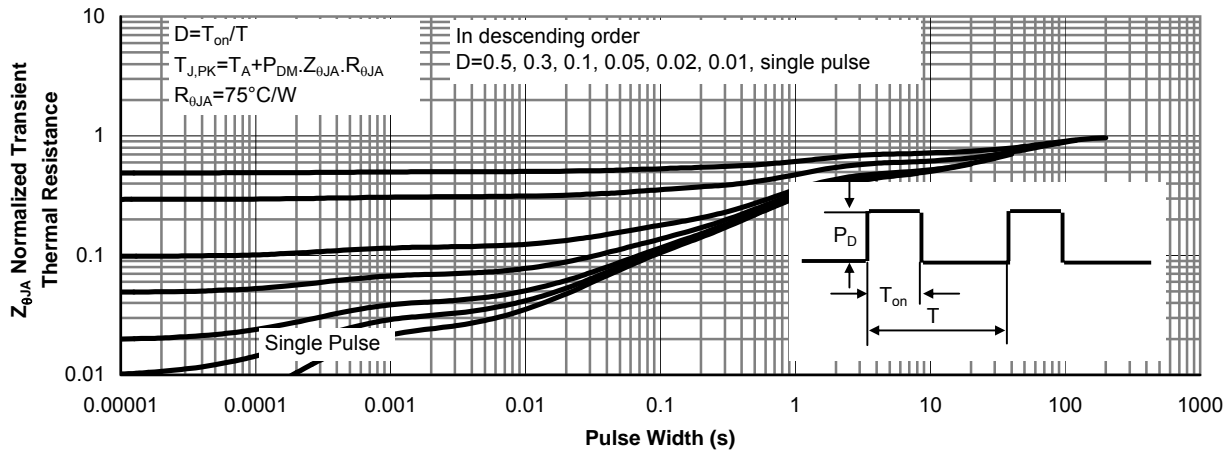
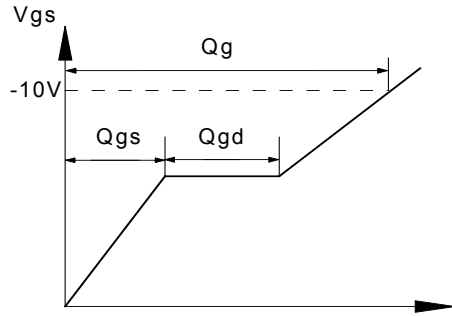
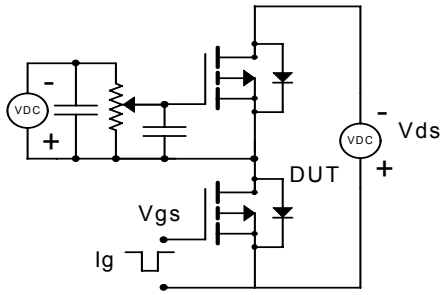
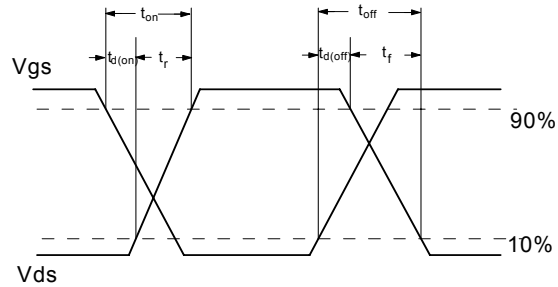
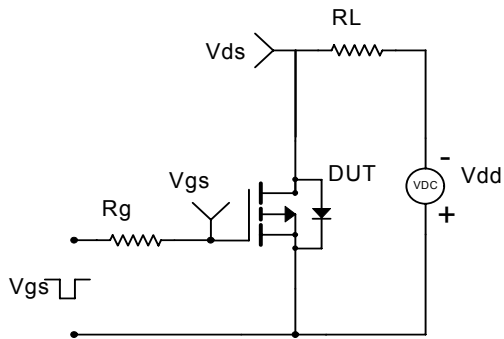


Figure 11: Normalized Maximum Transient Thermal Impedance

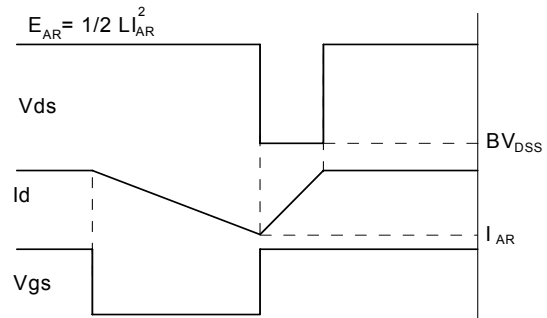
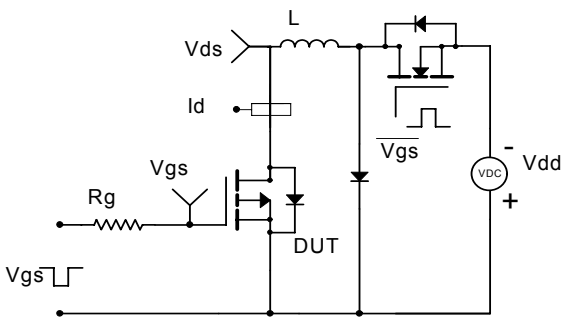
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

