



ALPHA & OMEGA
SEMICONDUCTOR, LTD



AO4447AL

P-Channel Enhancement Mode Field Effect Transistor

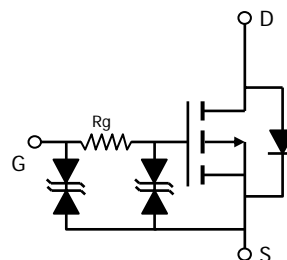
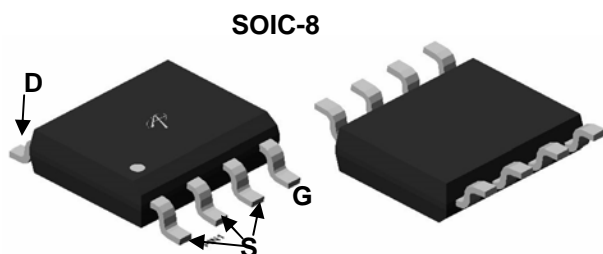
General Description

The AO4447AL uses advanced trench technology to provide excellent $R_{DS(ON)}$ with low gate charge. This device is ideal for load switch and battery protection applications.

- RoHS Compliant
- Halogen Free

Features

V_{DS} (V) = -30V
 I_D = -17A (V_{GS} = -10V)
 $R_{DS(ON)}$ < 7m Ω (V_{GS} = -10V)
 $R_{DS(ON)}$ < 8m Ω (V_{GS} = -4.5V)
 $R_{DS(ON)}$ < 9m Ω (V_{GS} = -4V)
ESD Protected!



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	-17	A
$T_A=25^\circ\text{C}$		-13	
Pulsed Drain Current ^C	I_{DM}	-160	
Power Dissipation ^B	P_D	3.1	W
$T_A=25^\circ\text{C}$		2.0	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{AD}		59	75	$^\circ\text{C/W}$
Maximum Junction-to-Lead	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
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	μA
I_{GSS}	Gate-Body leakage current	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 16\text{V}$			± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = -250\mu\text{A}$	-0.8	-1.3	-1.6	V
$I_{D(ON)}$	On state drain current	$V_{GS} = -10\text{V}$, $V_{DS} = -5\text{V}$	-160			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{V}$, $I_D = -17\text{A}$ $T_J = 125^{\circ}\text{C}$		5.5 7	7 8.5	$\text{m}\Omega$
		$V_{GS} = -4.5\text{V}$, $I_D = -15\text{A}$		6.5	8	
		$V_{GS} = -4\text{V}$, $I_D = -13\text{A}$		6.9	9	
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{V}$, $I_D = -17\text{A}$		70		S
V_{SD}	Diode Forward Voltage	$I_S = -1\text{A}$, $V_{GS} = 0\text{V}$		-0.62	-1	V
I_S	Maximum Body-Diode Continuous Current				-3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = -15\text{V}$, $f = 1\text{MHz}$		4580	5500	pF
C_{oss}	Output Capacitance			755		pF
C_{rss}	Reverse Transfer Capacitance			564		pF
R_g	Gate resistance	$V_{GS} = 0\text{V}$, $V_{DS} = 0\text{V}$, $f = 1\text{MHz}$		160	210	Ω
SWITCHING PARAMETERS						
$Q_g (-10\text{V})$	Total Gate Charge	$V_{GS} = -10\text{V}$, $V_{DS} = -15\text{V}$, $I_D = -17\text{A}$		87	105	nC
$Q_g (-4.5\text{V})$	Total Gate Charge			41		nC
Q_{gs}	Gate Source Charge			12.8		nC
Q_{gd}	Gate Drain Charge			17		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS} = -10\text{V}$, $V_{DS} = 15\text{V}$ $R_L = -0.9\Omega$, $R_{GEN} = 3\Omega$		180		ns
t_r	Turn-On Rise Time			260		ns
$t_{D(off)}$	Turn-Off DelayTime			1.2		μs
t_f	Turn-Off Fall Time			9.7		μs
t_{rr}	Body Diode Reverse Recovery Time	$I_F = -17\text{A}$, $dI/dt = 300\text{A}/\mu\text{s}$		32	40	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F = -17\text{A}$, $dI/dt = 300\text{A}/\mu\text{s}$		77		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: The power dissipation P_D is based on $T_{J(MAX)} = 150^{\circ}\text{C}$, using $\leq 10\text{s}$ junction-to-ambient thermal resistance.

C: Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 150^{\circ}\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J = 25^{\circ}\text{C}$.

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

E: The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

F: These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)} = 150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

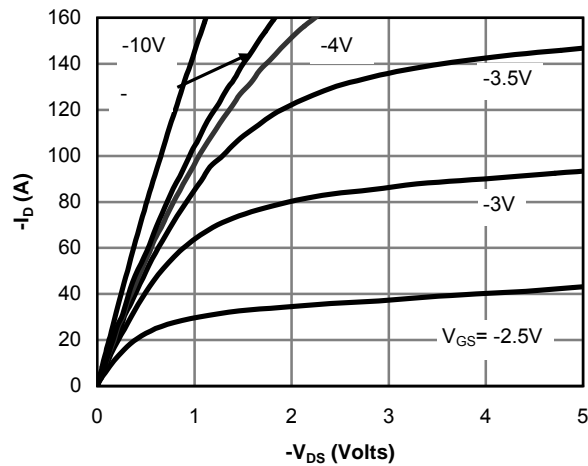


Figure 1: On-Region Characteristics(Note E)

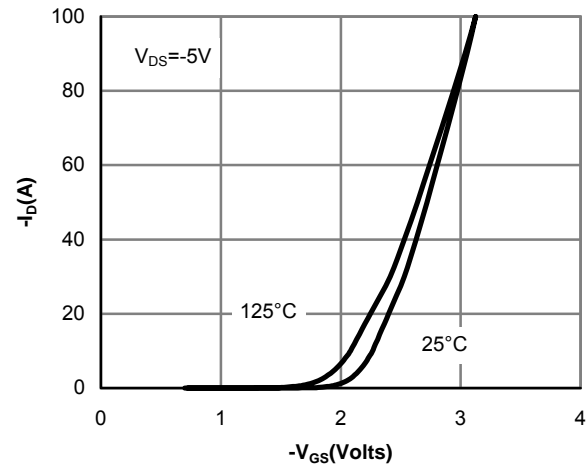


Figure 2: Transfer Characteristics(Note E)

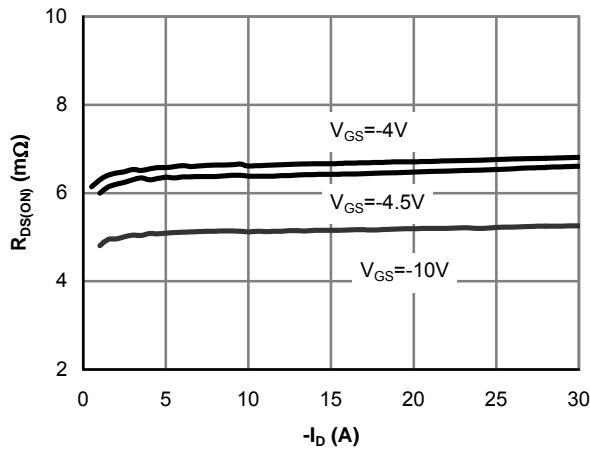


Figure 3: On-Resistance vs. Drain Current and Gate Voltage(Note E)

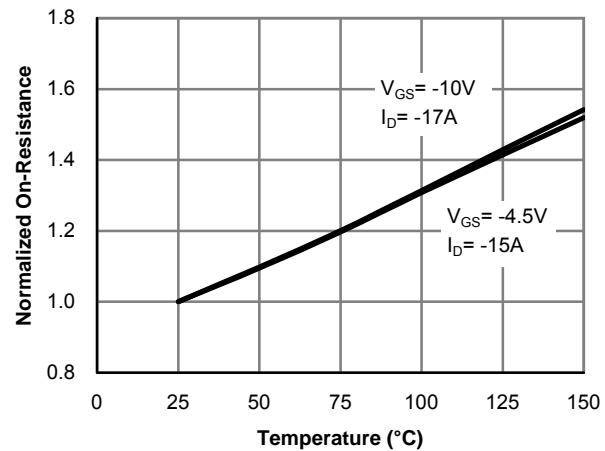


Figure 4: On-Resistance vs. Junction Temperature(Note E)

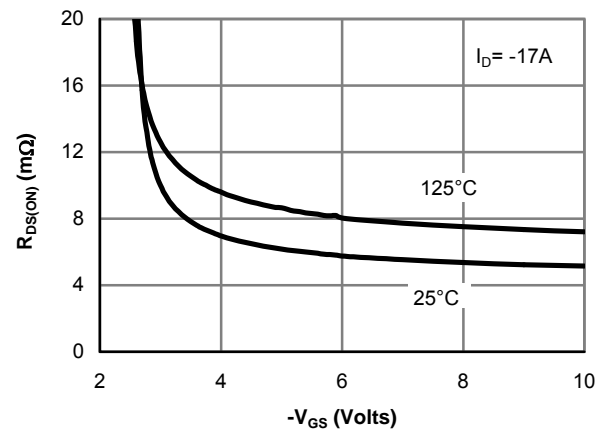


Figure 5: On-Resistance vs. Gate-Source Voltage(Note E)

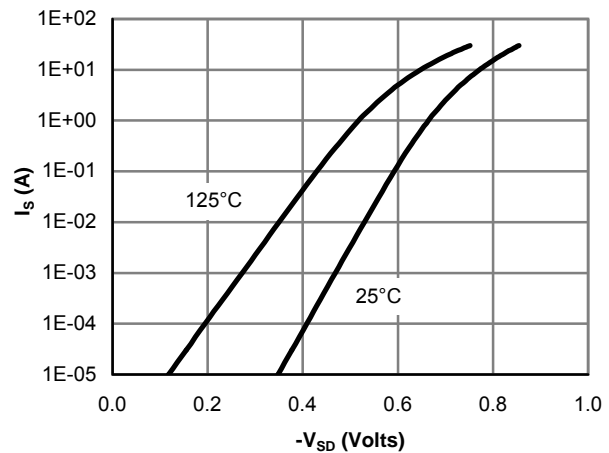
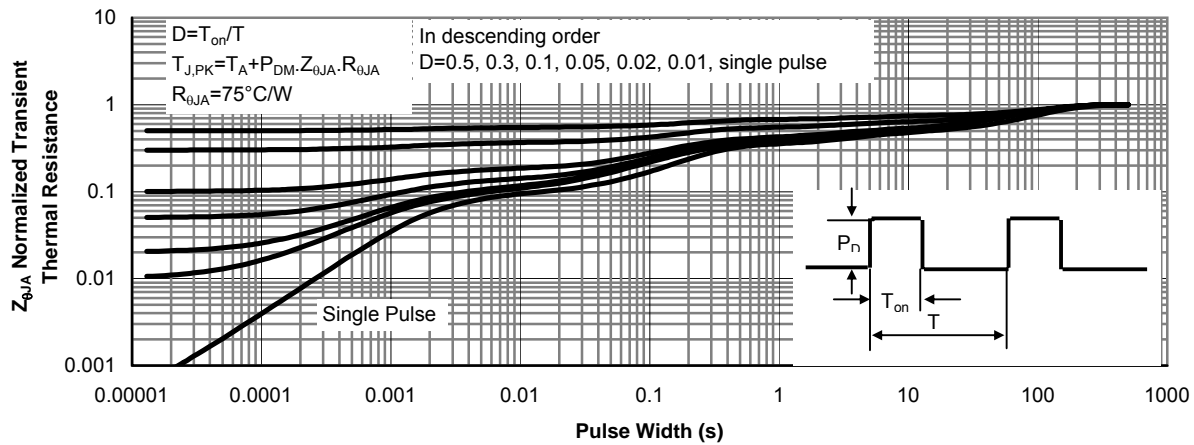
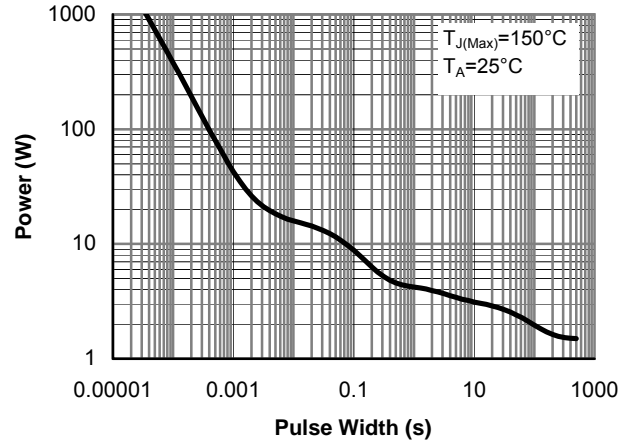
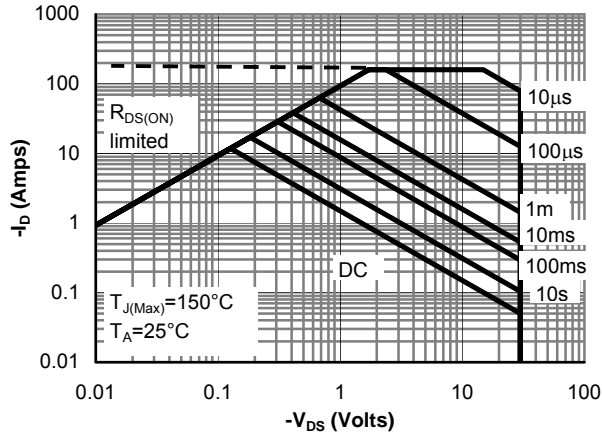
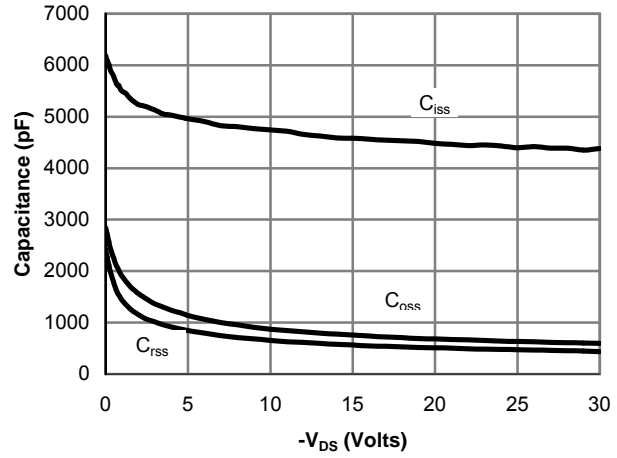
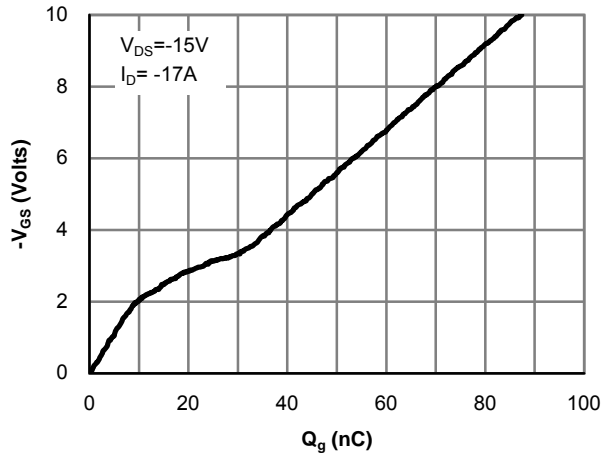
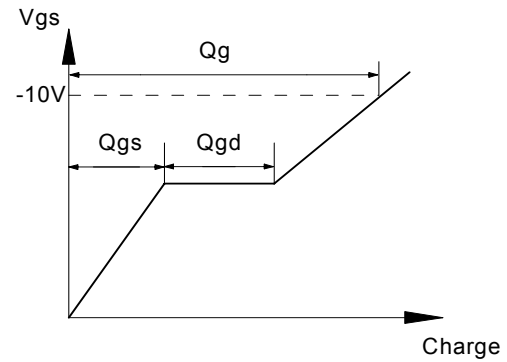
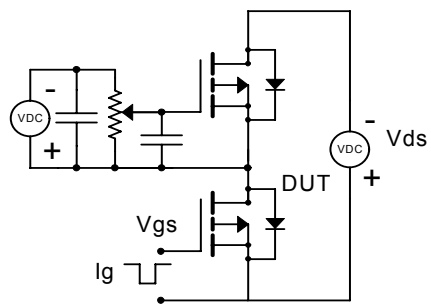


Figure 6: Body-Diode Characteristics(Note E)

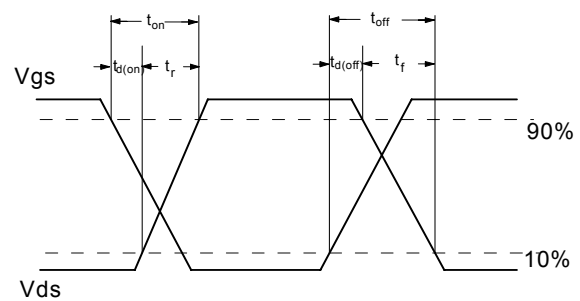
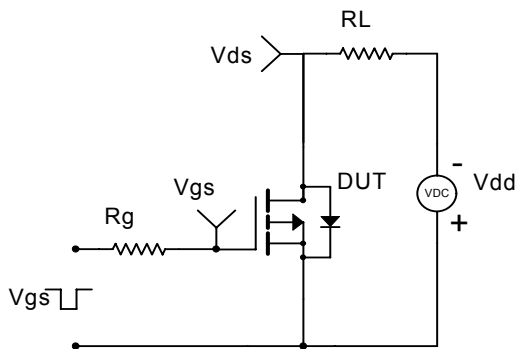
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

