



ALPHA & OMEGA
SEMICONDUCTOR, LTD



AON4407

12V P-Channel MOSFET

General Description

The AON4407 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch.

Features

V_{DS} (V) = -12V

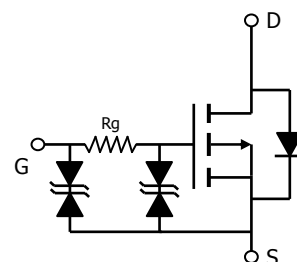
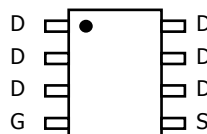
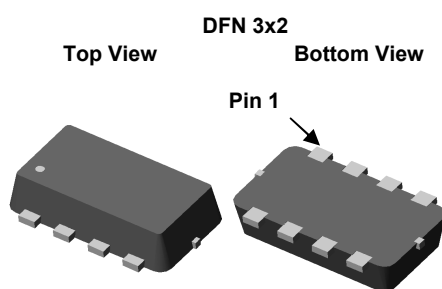
I_D = -9 A (V_{GS} = -4.5V)

$R_{DS(ON)} < 20m\Omega$ (V_{GS} = -4.5V)

$R_{DS(ON)} < 25m\Omega$ (V_{GS} = -2.5V)

$R_{DS(ON)} < 31m\Omega$ (V_{GS} = -1.8V)

ESD Protected



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-12	V
Gate-Source Voltage	V_{GS}	± 8	V
Continuous Drain Current	I_D	-9	A
Current		-7	
Pulsed Drain Current ^C	I_{DM}	-60	
Power Dissipation ^B	P_D	2.5	W
		1.6	
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 ^A	$R_{\theta JA}$	42	50	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A,D}		74	90	$^\circ\text{C/W}$
Maximum Junction-to-Lead	$R_{\theta JL}$	25	30	$^\circ\text{C/W}$

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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-12			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-12\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.35	-0.5	-0.85	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-9\text{A}$ $T_J=125^\circ\text{C}$		16.5 22	20 26	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$, $I_D=-8.5\text{A}$		20	25	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}$, $I_D=-7.5\text{A}$		24	31	$\text{m}\Omega$
		$V_{GS}=-1.5\text{V}$, $I_D=-7\text{A}$		29	38	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-9\text{A}$		45		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.53	-1	V
I_S	Maximum Body-Diode Continuous Current				-2.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-6\text{V}$, $f=1\text{MHz}$		1740	2100	pF
C_{oss}	Output Capacitance			334		pF
C_{rss}	Reverse Transfer Capacitance			200		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1.3	1.7	k Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-6\text{V}$, $I_D=-9\text{A}$		19	23	nC
Q_{gs}	Gate Source Charge			4.5		nC
Q_{gd}	Gate Drain Charge			5.3		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-4.5\text{V}$, $V_{DS}=-6\text{V}$, $R_L=0.67\Omega$, $R_{GEN}=3\Omega$		240		ns
t_r	Turn-On Rise Time			580		ns
$t_{D(off)}$	Turn-Off DelayTime			7		μs
t_f	Turn-Off Fall Time			4.2		μs
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-9\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		22	27	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-9\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		17		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² 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 1in² 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

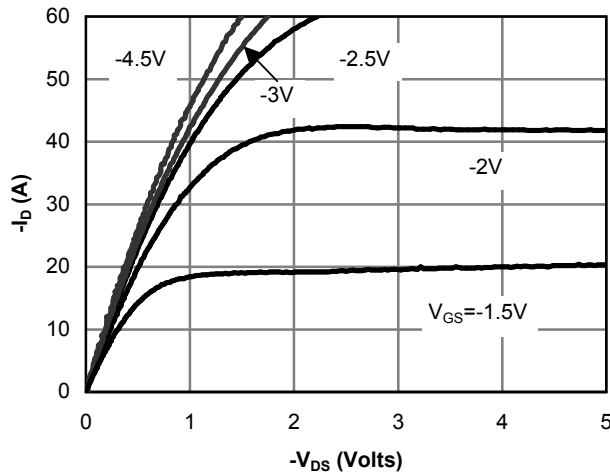


Figure 1: On-Region Characteristics(Note E)

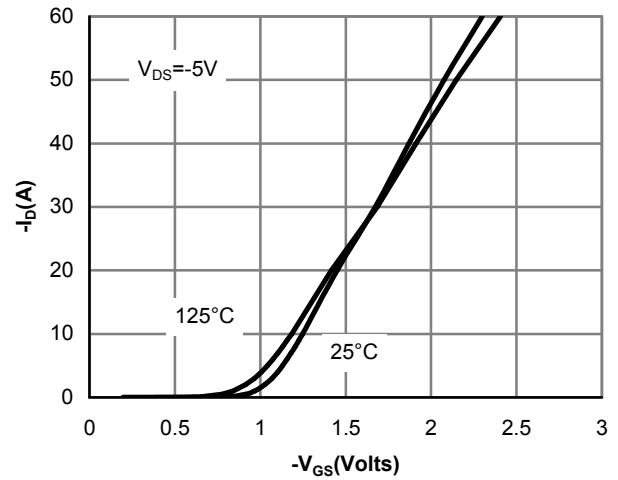


Figure 2: Transfer Characteristics(Note E)

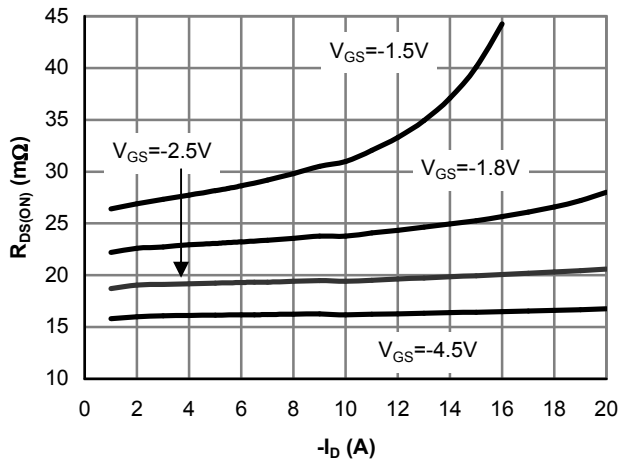


Figure 3: On-Resistance vs. Drain Current and Gate Voltage(Note E)

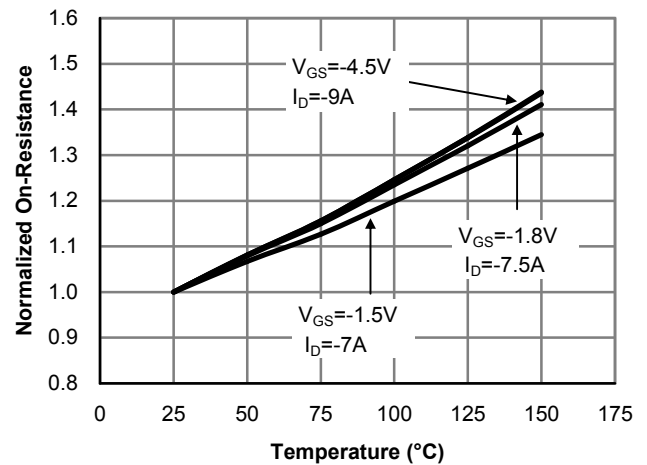


Figure 4: On-Resistance vs. Junction Temperature(Note E)

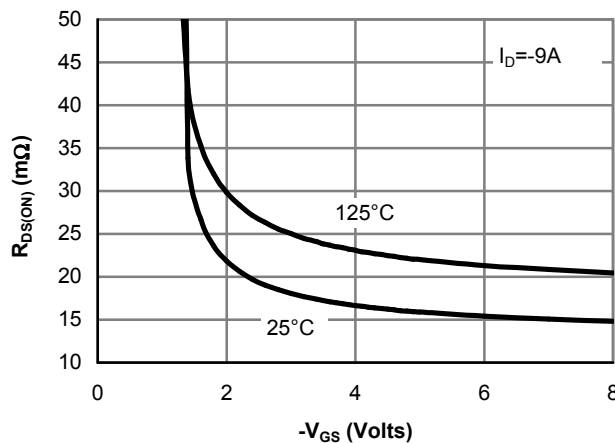


Figure 5: On-Resistance vs. Gate-Source Voltage(Note E)

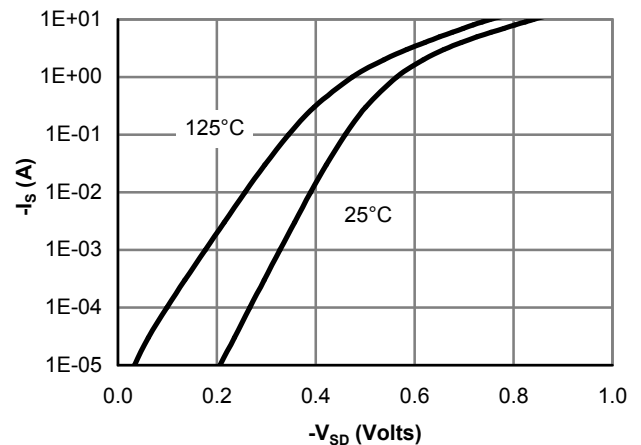


Figure 6: Body-Diode Characteristics(Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

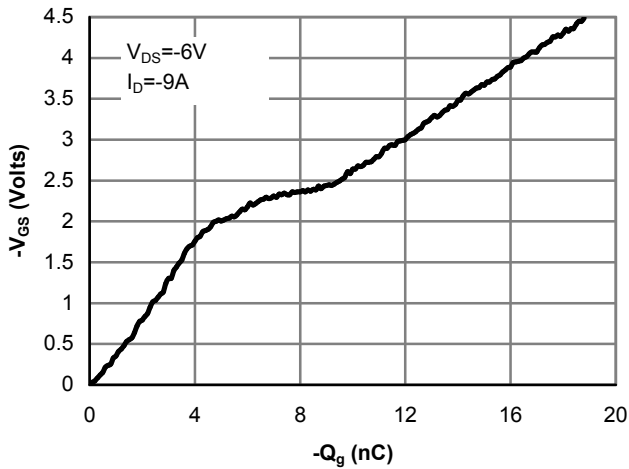


Figure 7: Gate-Charge Characteristics

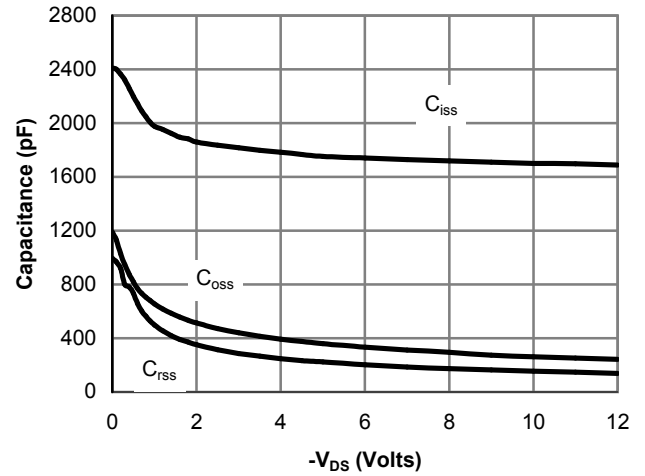


Figure 8: Capacitance Characteristics

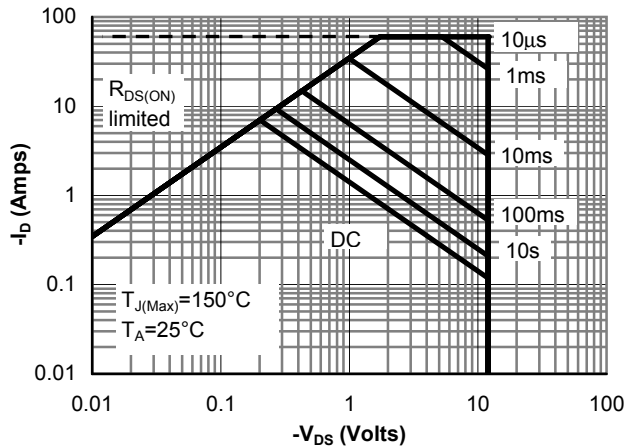


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

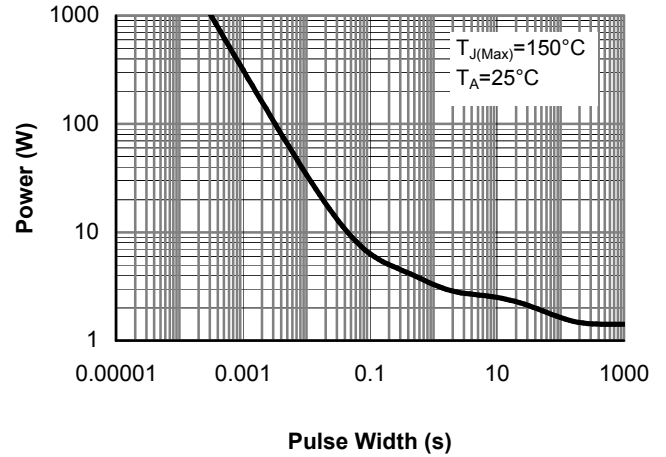


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

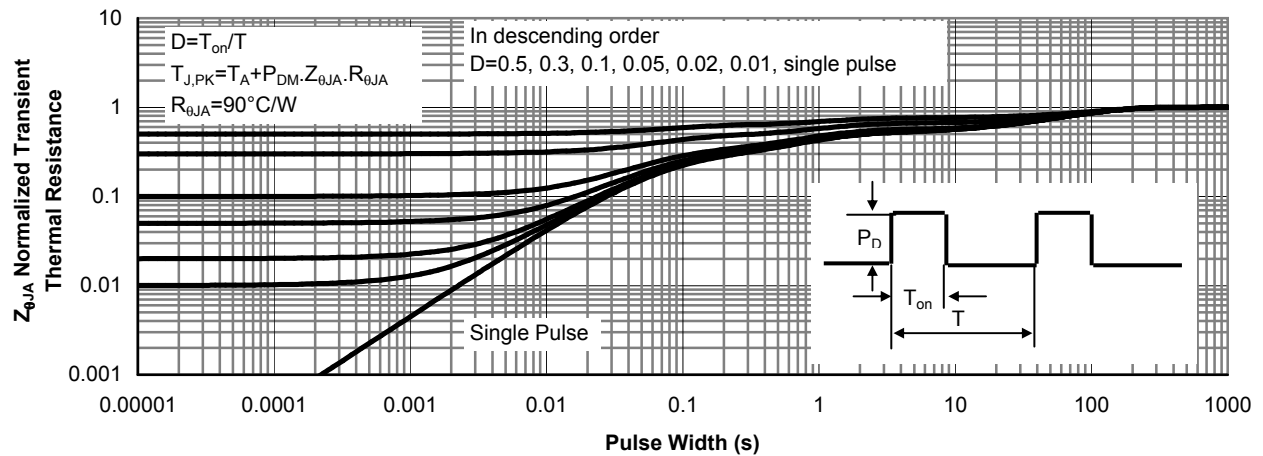
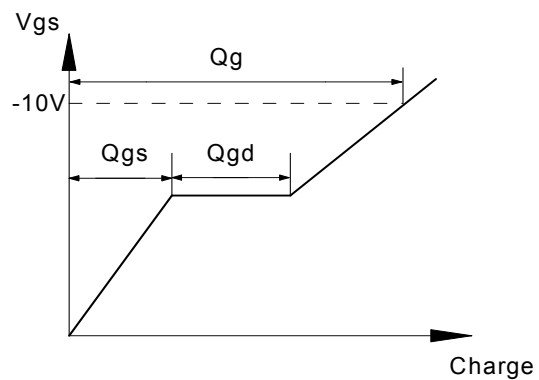
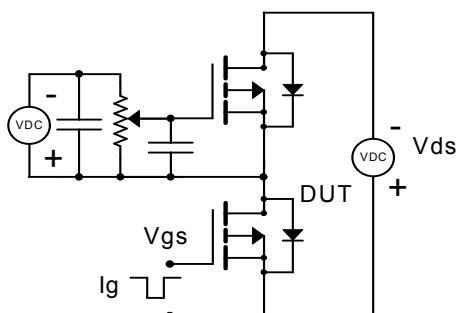
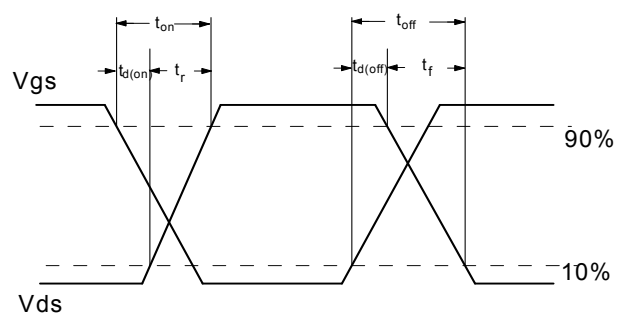
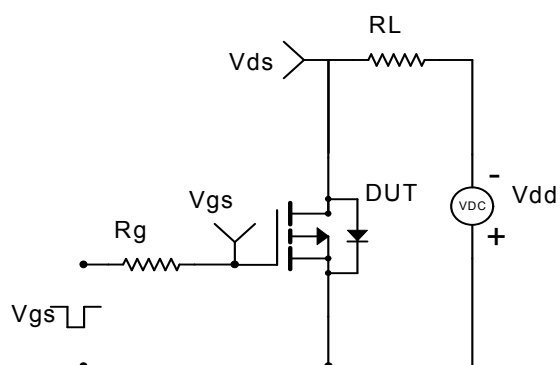


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

