



ALPHA & OMEGA
SEMICONDUCTOR, LTD.

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AO4408, AO4408L (Green Product)

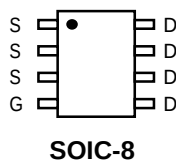
N-Channel Enhancement Mode Field Effect Transistor

General Description

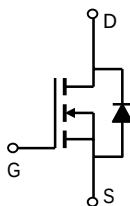
The AO4408 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and fast switching. This device makes an excellent high side switch for notebook CPU core DC-DC conversion. AO4408L (Green Product) is offered in a lead-free package.

Features

V_{DS} (V) = 30V
 I_D = 12A
 $R_{DS(ON)} < 13m\Omega$ ($V_{GS} = 10V$)
 $R_{DS(ON)} < 16m\Omega$ ($V_{GS} = 4.5V$)



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}	± 12	V
Continuous Drain Current ^A	I_D	12	A
		10	A
Pulsed Drain Current ^B	I_{DM}	80	A
Avalanche Current ^{B,E}	I_{AV}	30	A
Repetitive Avalanche Energy ^{B,E} L=0.1mH	E_{AV}	100	mJ
Power Dissipation	P_D	3	W
		2.1	W
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	$t \leq 10s$	$R_{\theta JA}$	23	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		48	65	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	12	16	$^\circ\text{C/W}$

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	$V_{DS}=24\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$		0.003	1 5	μA
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	1.5	2.5	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=12\text{A}$ $T_J=125^{\circ}\text{C}$		10.5 16	14 21	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=10\text{A}$		13	16.5	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=10\text{A}$	30	48		S
V_{SD}	Diode Forward Voltage	$I_S=10\text{A}$, $V_{GS}=0\text{V}$		0.76	1	V
I_S	Maximum Body-Diode Continuous Current				4.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		1020	1200	pF
C_{oss}	Output Capacitance			320		pF
C_{rss}	Reverse Transfer Capacitance			80		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		0.25	0.5	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=15\text{V}$, $I_D=12\text{A}$		10.3	12.5	nC
Q_{gs}	Gate Source Charge			2.1		nC
Q_{gd}	Gate Drain Charge			3.9		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=1.2\Omega$, $R_{GEN}=3\Omega$		3.9	5.5	ns
t_r	Turn-On Rise Time			3	6	ns
$t_{D(off)}$	Turn-Off DelayTime			19.2	30	ns
t_f	Turn-Off Fall Time			2.6	5	ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=12\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		26	32	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=12\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		18	32	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 a 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 μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in² 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

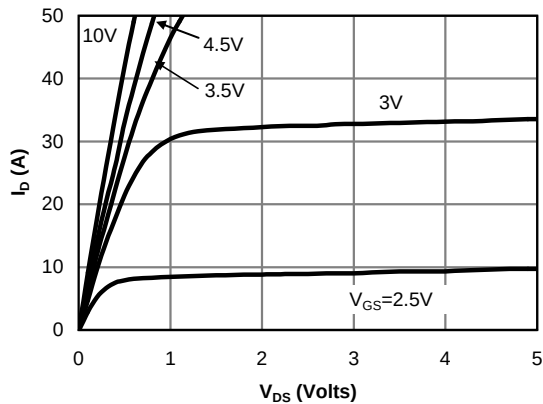


Fig 1: On-Region Characteristics

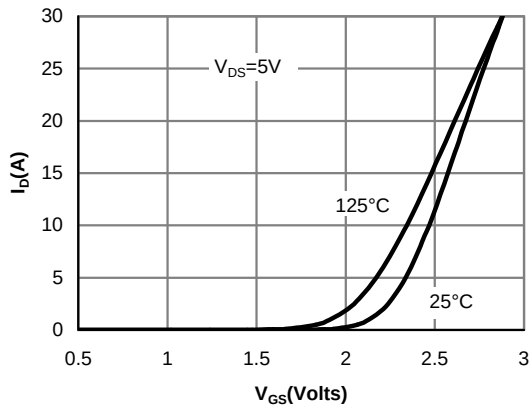


Figure 2: Transfer Characteristics

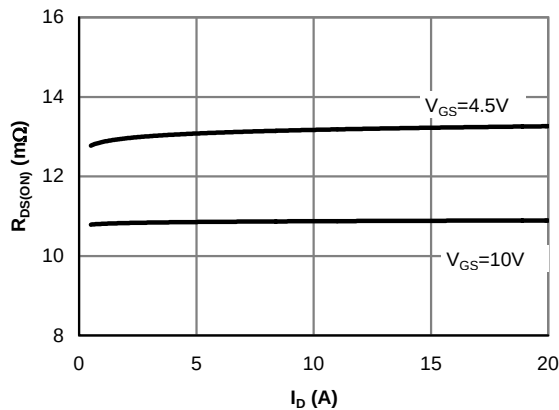


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

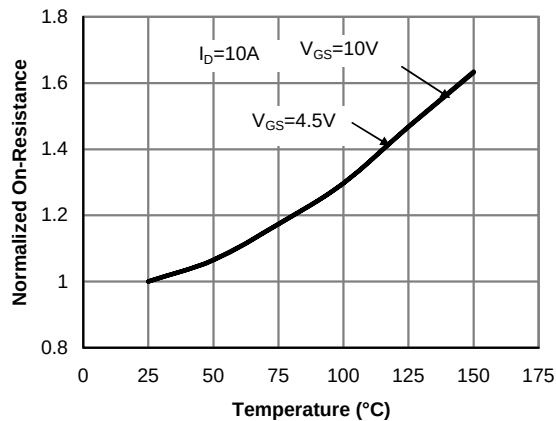


Figure 4: On-Resistance vs. Junction Temperature

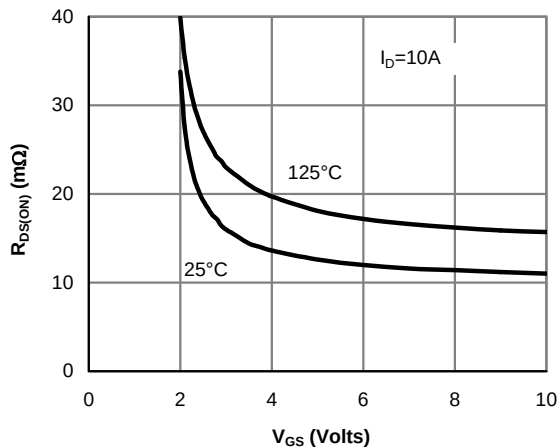


Figure 5: On-Resistance vs. Gate-Source Voltage

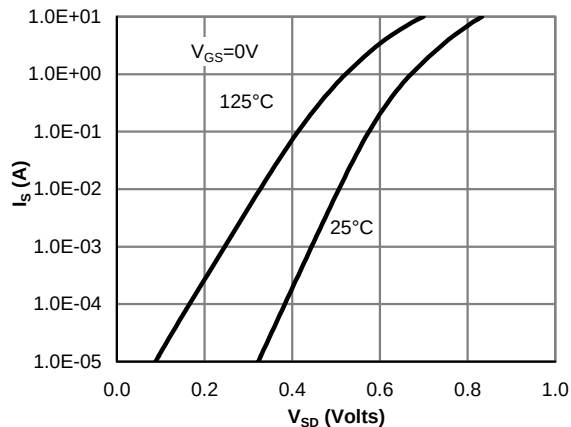
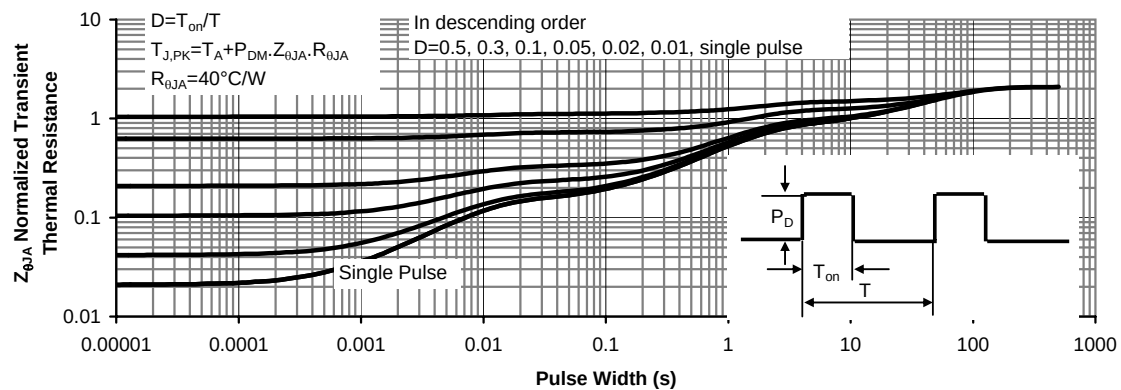
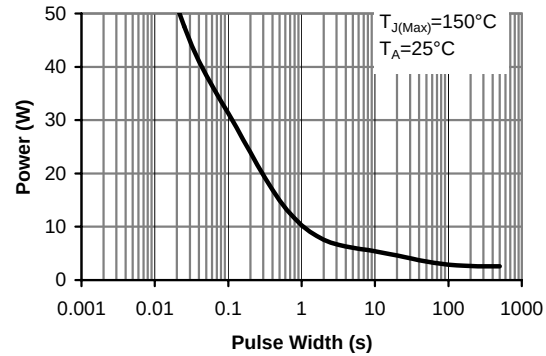
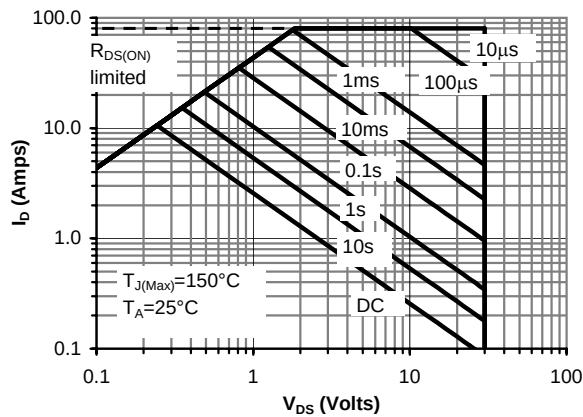
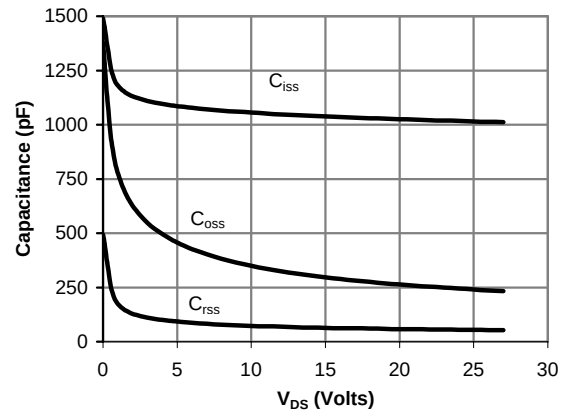
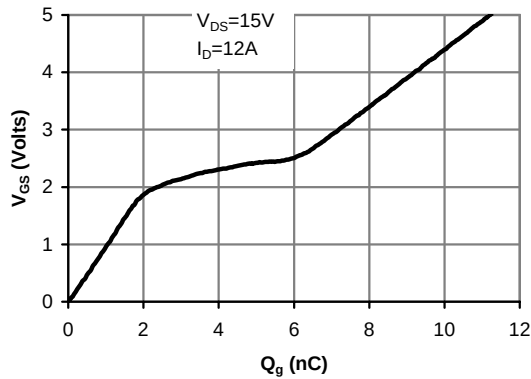


Figure 6: Body-Diode Characteristics

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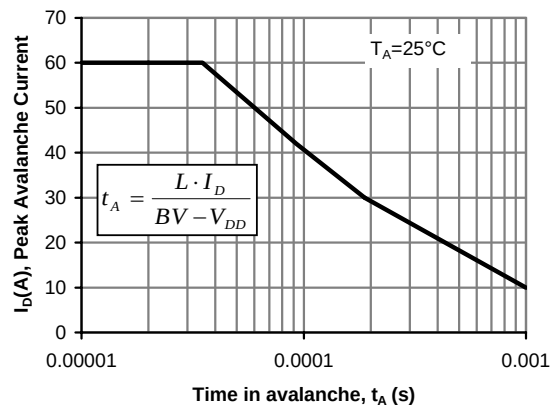


Figure 12: Avalanche capability

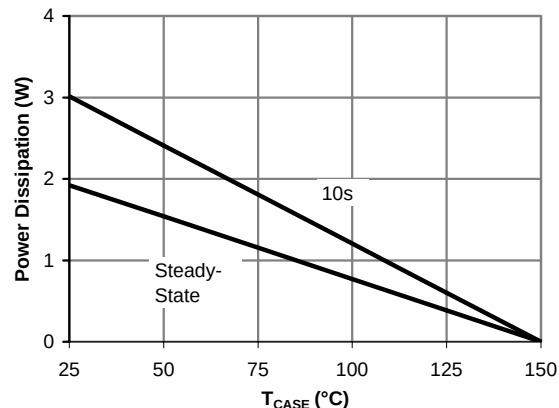


Figure 13: Power De-rating (Note A)