



ALPHA & OMEGA
SEMICONDUCTOR



AO4433

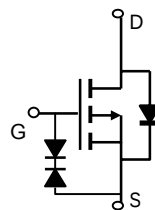
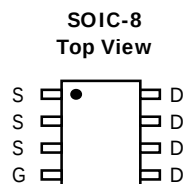
P-Channel Enhancement Mode Field Effect Transistor

General Description

The AO4433 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. The device is ESD protected. *Standard product AO4433 is Pb-free (meets ROHS & Sony 259 specifications). AO4433L is a Green Product ordering option. AO4433 and AO4433L are electrically identical.*

Features

$V_{DS} (V) = -30V$
 $I_D = -11 A \quad (V_{GS} = -20V)$
 $R_{DS(ON)} < 14m\Omega \quad (V_{GS} = -20V)$
 $R_{DS(ON)} < 18m\Omega \quad (V_{GS} = -10V)$
 ESD Rating: 1.5KV HBM



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}	± 25	V
Continuous Drain Current ^A	$T_A=25^\circ C$	-11	A
	$T_A=70^\circ C$	-9.7	
Pulsed Drain Current ^B	I_{DM}	-50	
Power Dissipation ^A	$T_A=25^\circ C$	3	W
	$T_A=70^\circ C$	2.1	
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 ^A	$R_{\theta JA}$	28	40	$^\circ C/W$
Maximum Junction-to-Ambient ^A		54	75	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	21	30	$^\circ C/W$

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	$V_{DS}=-24\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 25\text{V}$			± 1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-2	-2.8	-4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$	-50			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-20\text{V}$, $I_D=-11\text{A}$ $T_J=125^{\circ}\text{C}$		11 15	14 19	$\text{m}\Omega$
		$V_{GS}=-10\text{V}$, $I_D=-10\text{A}$		13.8	18	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}$, $I_D=-4\text{A}$		38.5		$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-11\text{A}$		20		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
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-15\text{V}$, $f=1\text{MHz}$		1760	2200	pF
C_{oss}	Output Capacitance			360		pF
C_{rss}	Reverse Transfer Capacitance			255		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		6.4	8	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $I_D=-11\text{A}$		30	38	nC
Q_{gs}	Gate Source Charge			7		nC
Q_{gd}	Gate Drain Charge			8		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $R_L=1.5\Omega$, $R_{GEN}=3\Omega$		11.5		ns
t_r	Turn-On Rise Time			8		ns
$t_{D(off)}$	Turn-Off DelayTime			35		ns
t_f	Turn-Off Fall Time			18.5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-11\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		24	30	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-11\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		16		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. 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.

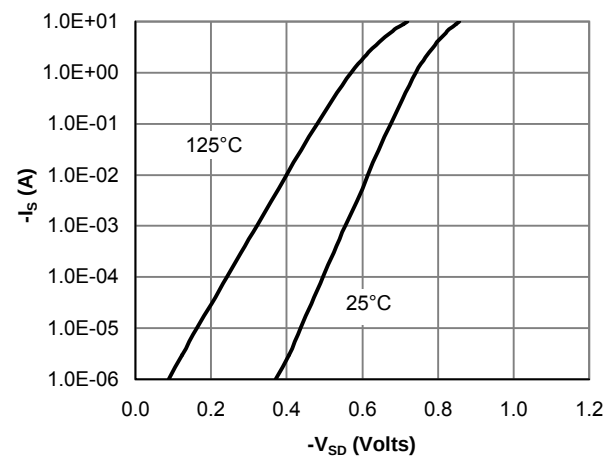
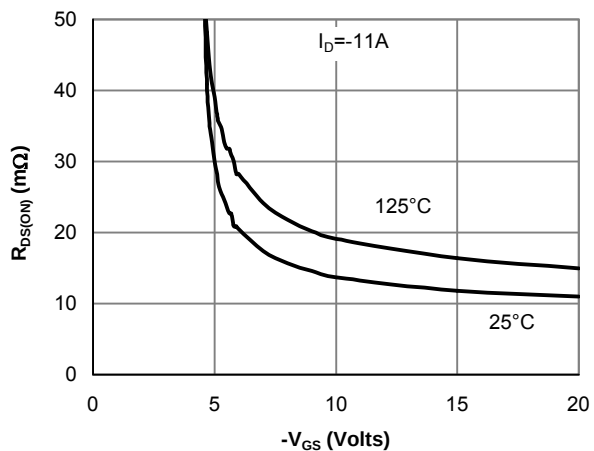
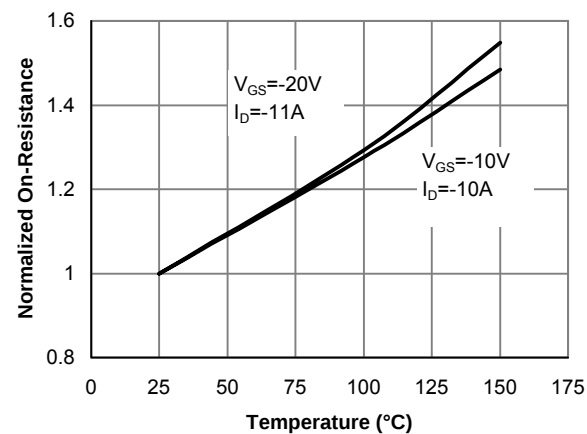
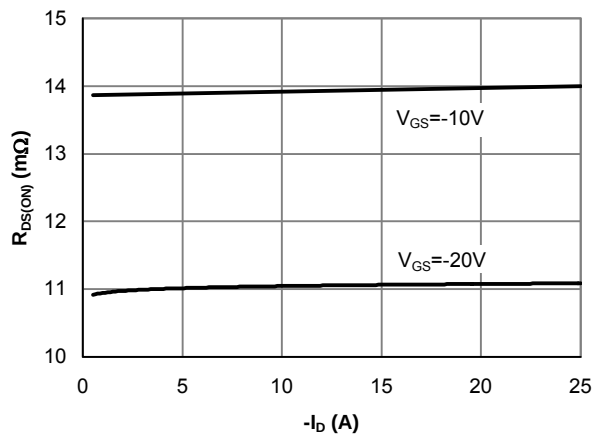
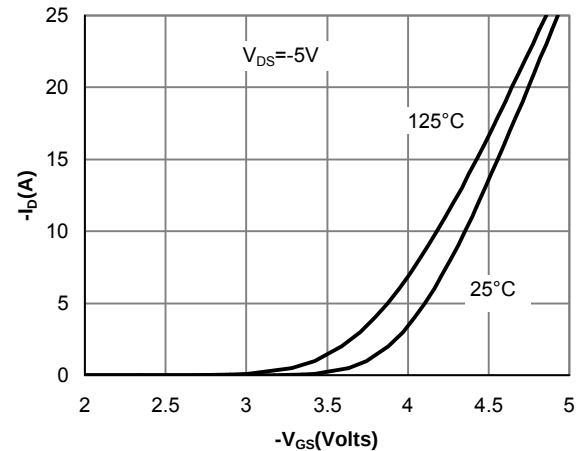
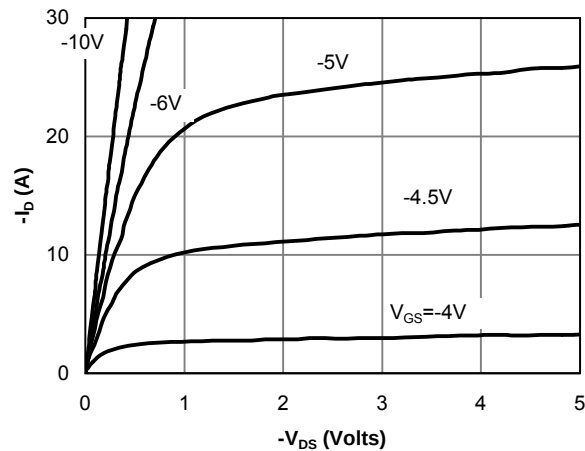
D: The static characteristics in Figures 1 to 6, 12, 14 are obtained using 80 μs pulses, duty cycle 0.5% max.

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



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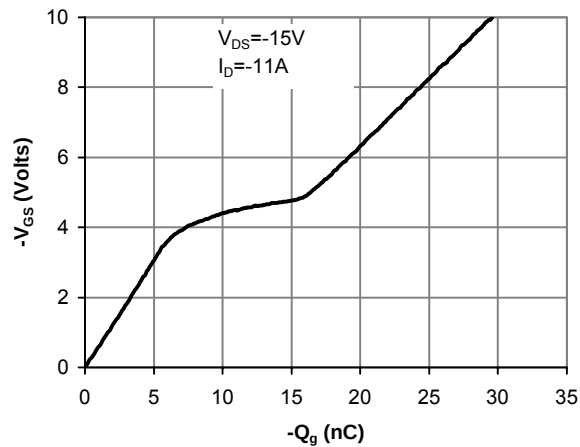


Figure 7: Gate-Charge Characteristics

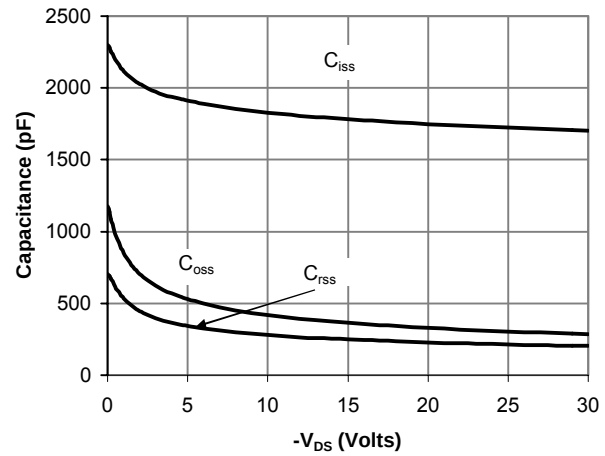


Figure 8: Capacitance Characteristics

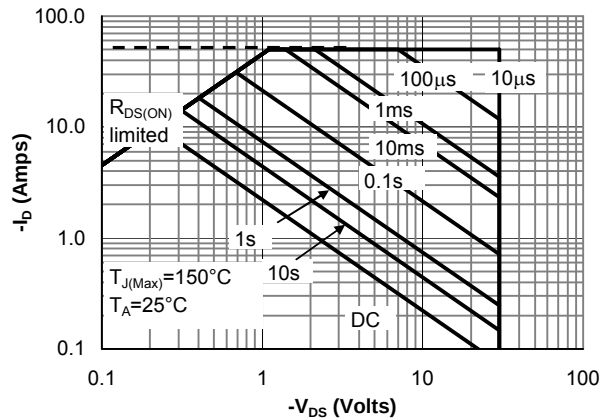


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

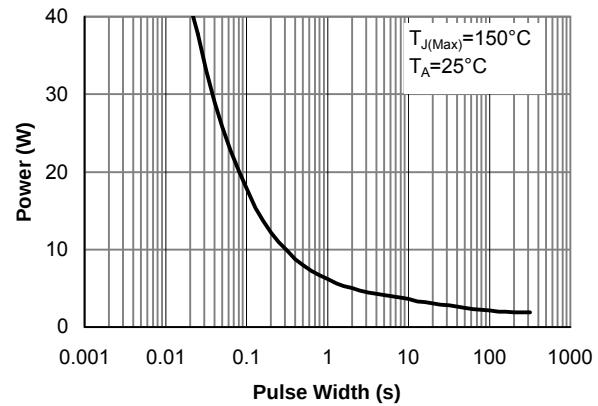


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

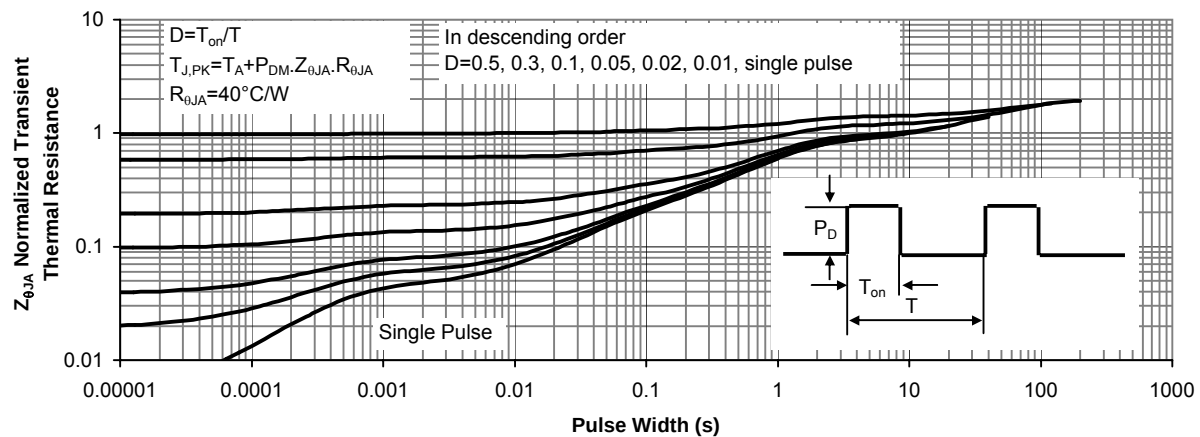


Figure 11: Normalized Maximum Transient Thermal Impedance