



ALPHA & OMEGA
SEMICONDUCTOR



AO4438

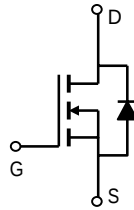
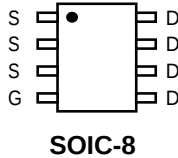
N-Channel Enhancement Mode Field Effect Transistor

General Description

The AO4438 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a load switch or in PWM applications. *Standard Product AO4438 is Pb-free (meets ROHS & Sony 259 specifications). AO4438L is a Green Product ordering option. AO4438 and AO4438L are electrically identical.*

Features

V_{DS} (V) = 60V
 I_D = 8.2A (V_{GS} = 10V)
 $R_{DS(ON)} < 22m\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 27m\Omega$ (V_{GS} = 4.5V)



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^A	I_D	8.2	A
$T_A=25^\circ\text{C}$			
$T_A=70^\circ\text{C}$		6.6	
Pulsed Drain Current ^B	I_{DM}	40	
Power Dissipation	P_D	3.1	W
$T_A=25^\circ\text{C}$			
$T_A=70^\circ\text{C}$		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 ^A	$R_{\theta JA}$	24	40	$^\circ\text{C/W}$
$t \leq 10\text{s}$				
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	54	75	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	21	30	$^\circ\text{C/W}$
Steady-State				

N Channel Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	60			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =48V, V _{GS} =0V T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±20V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1	2.2	3	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	40			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =8.2A T _J =125°C		16.3 30	22 40	mΩ
		V _{GS} =4.5V, I _D =7.6A		20	27	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =8.2A		24		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.74	1	V
I _S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, f=1MHz		1920	2300	pF
C _{oss}	Output Capacitance			155		pF
C _{rss}	Reverse Transfer Capacitance			116		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.65	0.8	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =30V, I _D =8.2A		47.6	58	nC
Q _g (4.5V)	Total Gate Charge			24.2	30	nC
Q _{gs}	Gate Source Charge			6		nC
Q _{gd}	Gate Drain Charge			14.4		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =30V, R _L =3.6Ω, R _{GEN} =3Ω		8.2		ns
t _r	Turn-On Rise Time			5.5		ns
t _{D(off)}	Turn-Off DelayTime			29.7		ns
t _f	Turn-Off Fall Time			5.2		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =8.2A, dI/dt=100A/μs		34	41	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =8.2A, dI/dt=100A/μs		53		nC

A: The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80μs 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°C. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

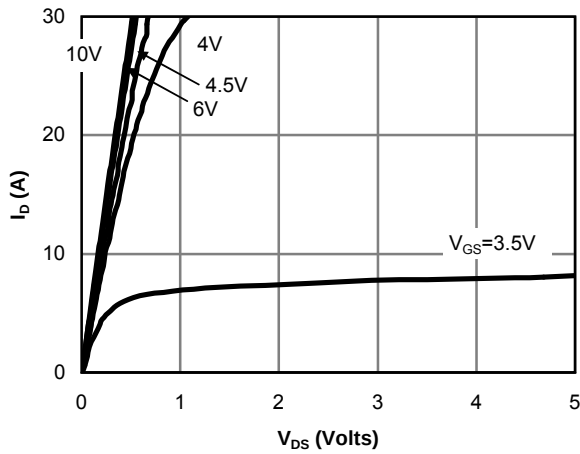


Fig 1: On-Region Characteristics

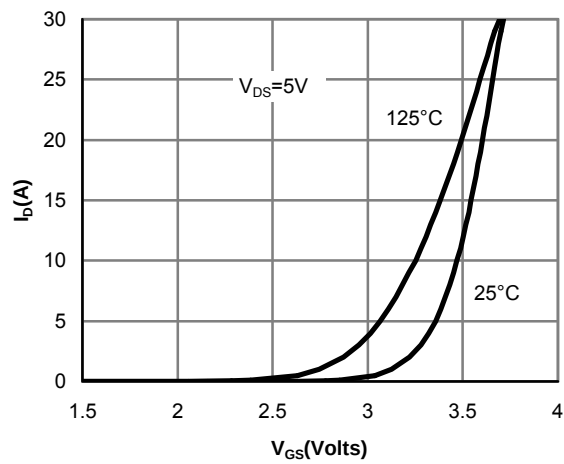


Figure 2: Transfer Characteristics

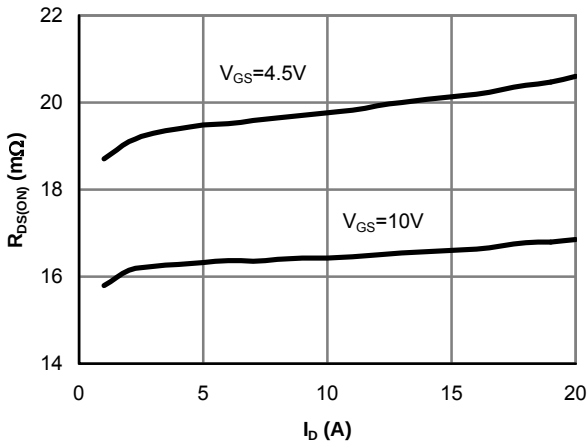


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

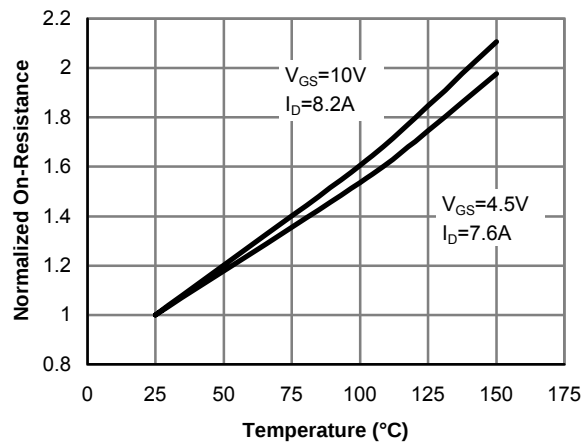


Figure 4: On-Resistance vs. Junction Temperature

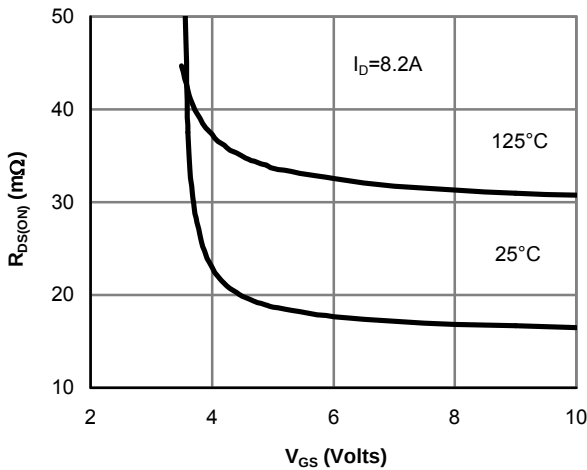


Figure 5: On-Resistance vs. Gate-Source Voltage

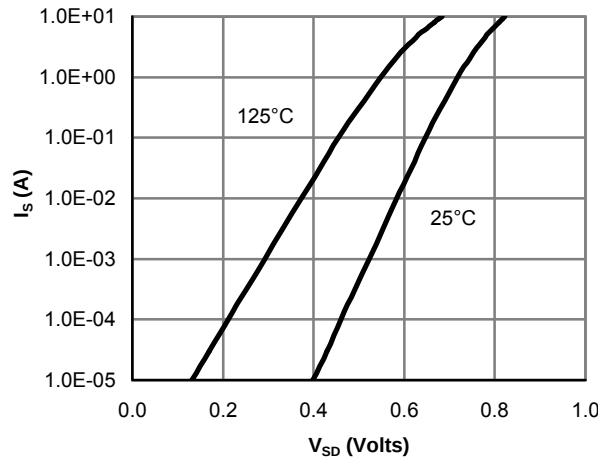


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

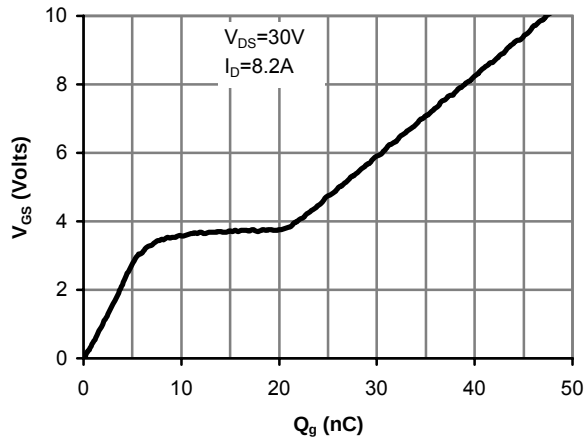


Figure 7: Gate-Charge Characteristics

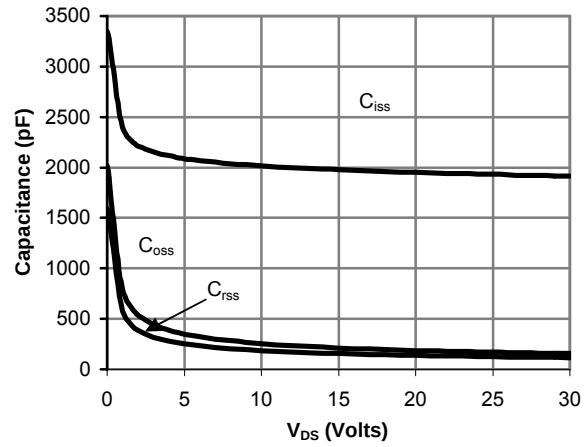


Figure 8: Capacitance Characteristics

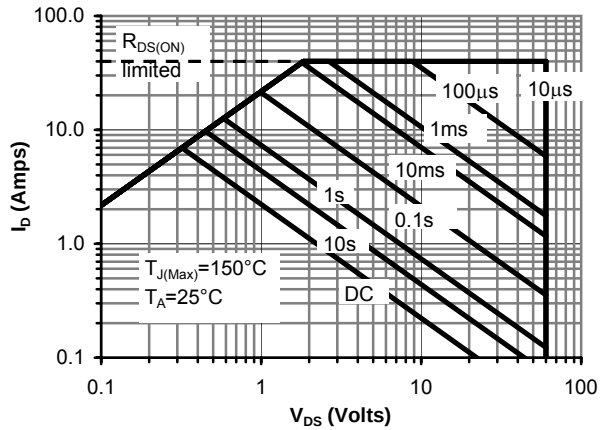


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

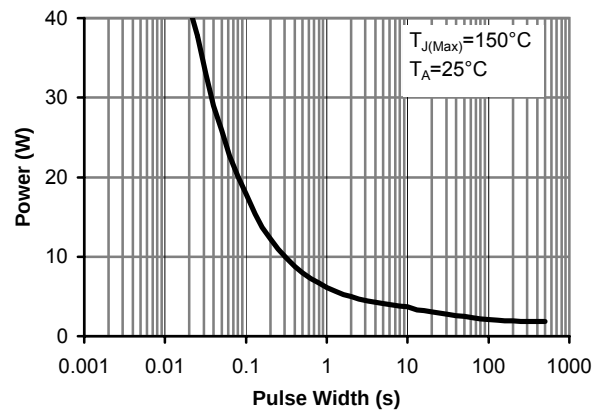


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

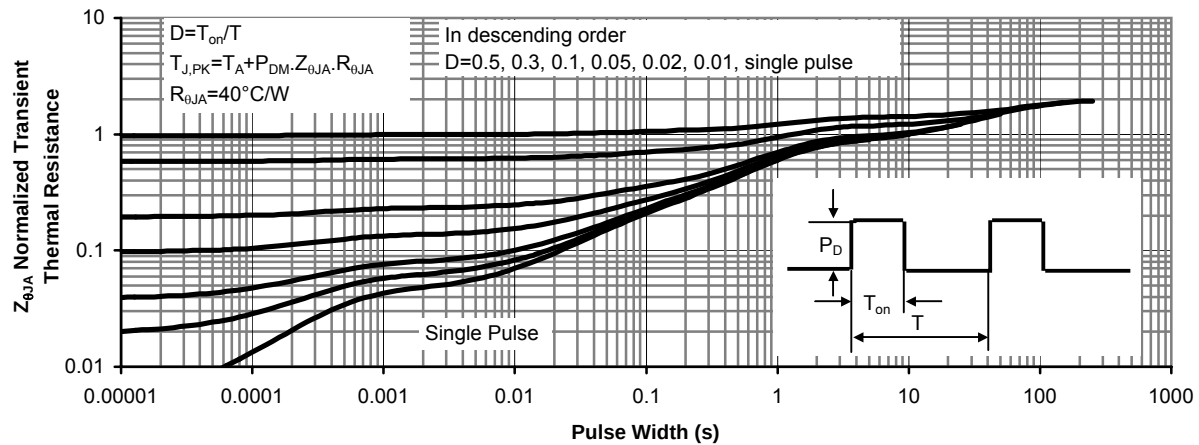


Figure 11: Normalized Maximum Transient Thermal Impedance