



ALPHA & OMEGA
SEMICONDUCTOR

AO4446

N-Channel Enhancement Mode Field Effect Transistor

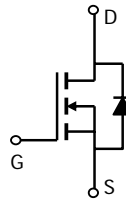
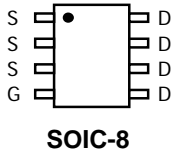


General Description

The AO4446 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and low gate resistance. This device is ideally suited for use in PWM applications. *Standard Product AO4446 is Pb-free (meets ROHS & Sony 259 specifications). AO4446L is a Green Product ordering option. AO4446 and AO4446L are electrically identical.*

Features

V_{DS} (V) = 30V
 I_D = 15A (V_{GS} = 10V)
 $R_{DS(ON)} < 8.5m\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 14.5m\Omega$ (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}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^A	I_D	$T_A=25^\circ\text{C}$	A
		$T_A=70^\circ\text{C}$	
Pulsed Drain Current ^B	I_{DM}	40	
Avalanche Current ^B	I_{AR}	20	A
Repetitive avalanche energy $L=0.1\text{mH}$ ^B	E_{AR}	50	mJ
Power Dissipation	P_D	$T_A=25^\circ\text{C}$	W
		$T_A=70^\circ\text{C}$	
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	$R_{\theta JA}$	$t \leq 10\text{s}$	33	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		Steady-State	59	
Maximum Junction-to-Case ^C	$R_{\theta JC}$	16	24	$^\circ\text{C/W}$

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	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V, 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 =15A T _J =125°C		6.9	8.5	mΩ
				11	13.5	
		V _{GS} =4.5V, I _D =11A		11.8	14.5	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =15A		27		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.71	1	V
I _S	Maximum Body-Diode Continuous Current				4	A
DYNAMIC PARAMETERS						
C _{ISS}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=100kHz		1520	1825	pF
C _{OSS}	Output Capacitance			306		pF
C _{rSS}	Reverse Transfer Capacitance			214		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.47	0.7	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =15A		33.7	40	nC
Q _{g(4.5V)}	Total Gate Charge			17	20	nC
Q _{gs}	Gate Source Charge			6.2		nC
Q _{gd}	Gate Drain Charge			10		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.0Ω, R _{GEN} =3Ω		7.2		ns
t _r	Turn-On Rise Time			8.2		ns
t _{D(off)}	Turn-Off DelayTime			22		ns
t _f	Turn-Off Fall Time			6.7		ns
t _{rr}	Body Diode Reverse Recovery Time		I _F =15A, dI/dt=100A/μs		24	30
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =15A, dI/dt=100A/μs		19		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_s ≤ 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.

Rev 1: May 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

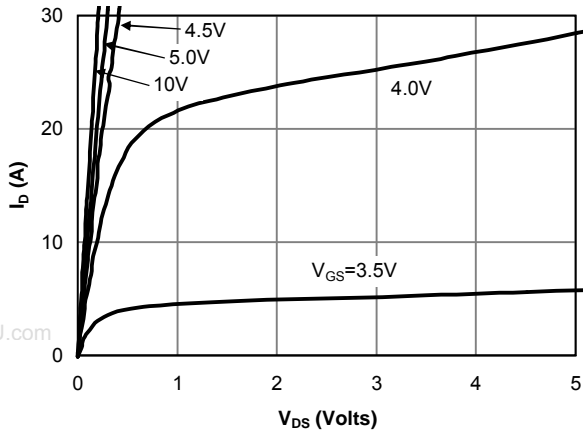


Fig 1: On-Region Characteristics

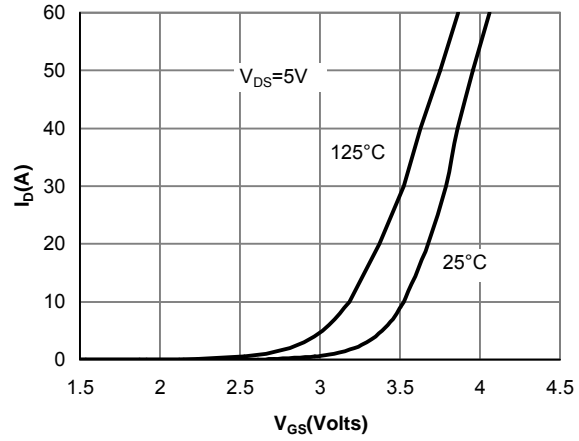


Figure 2: Transfer Characteristics

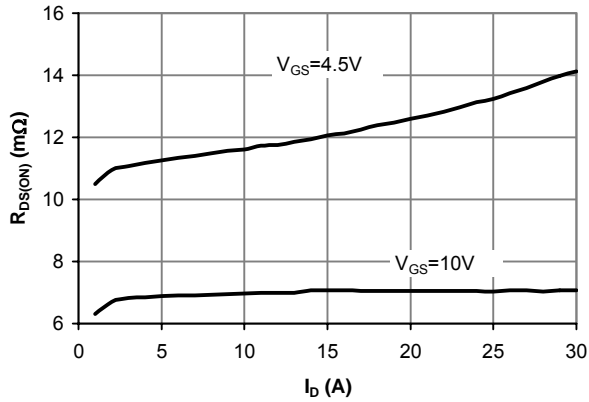


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

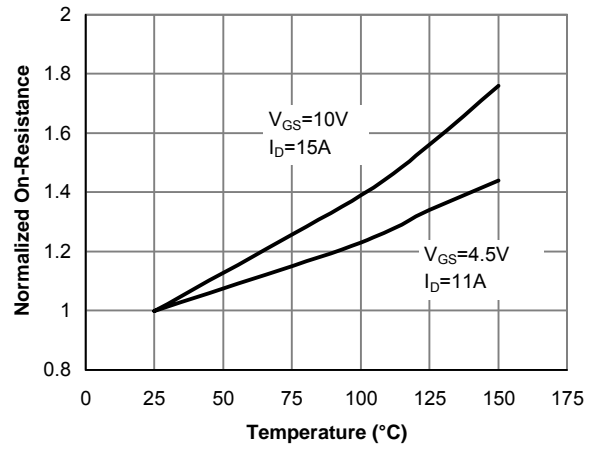


Figure 4: On-Resistance vs. Junction Temperature

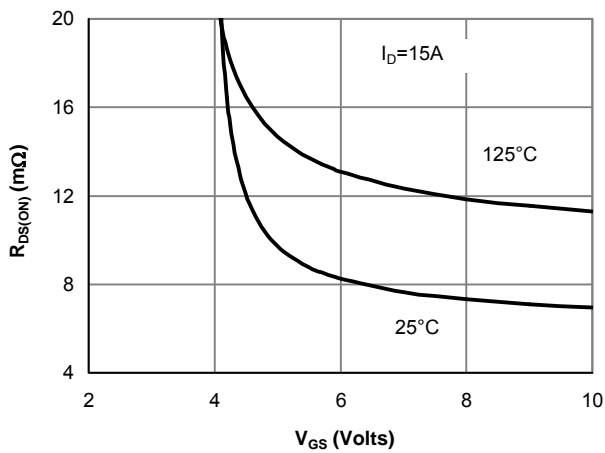


Figure 5: On-Resistance vs. Gate-Source Voltage

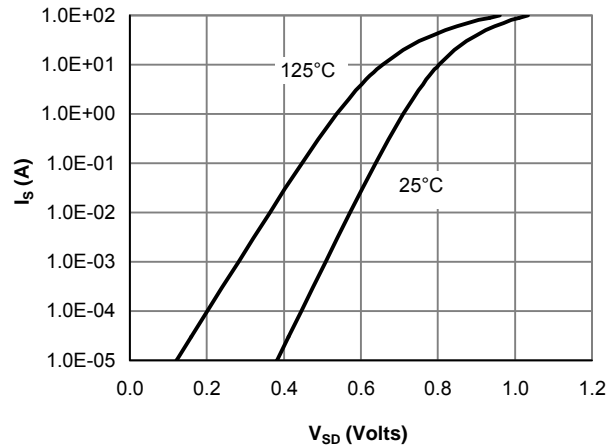


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

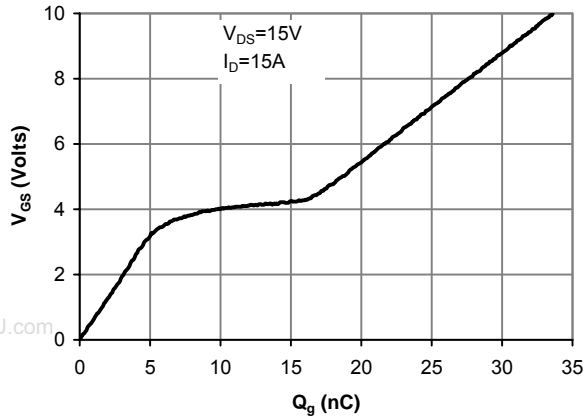


Figure 7: Gate-Charge Characteristics

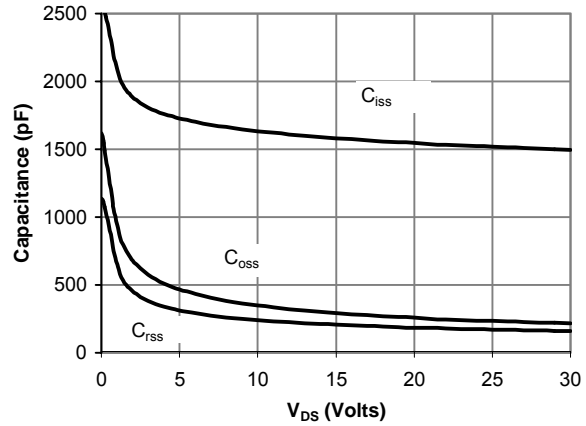


Figure 8: Capacitance Characteristics

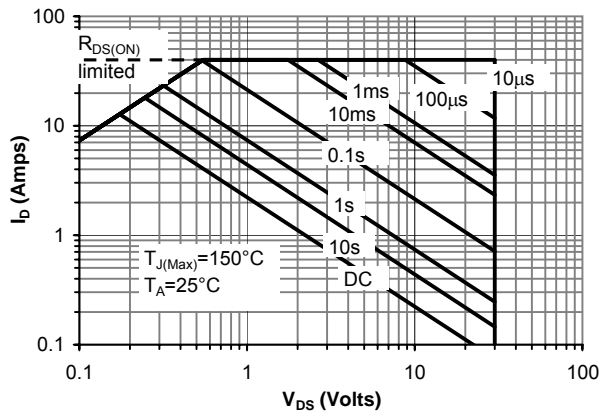


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

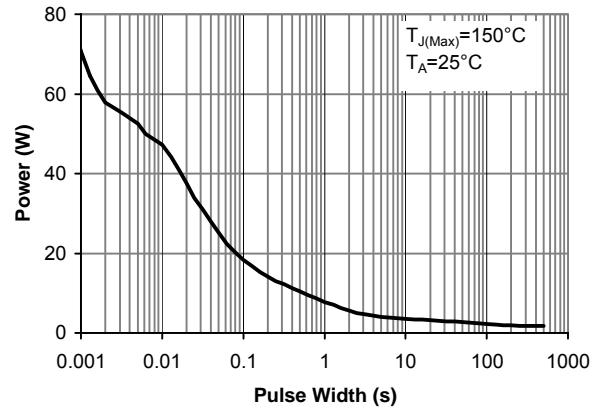


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

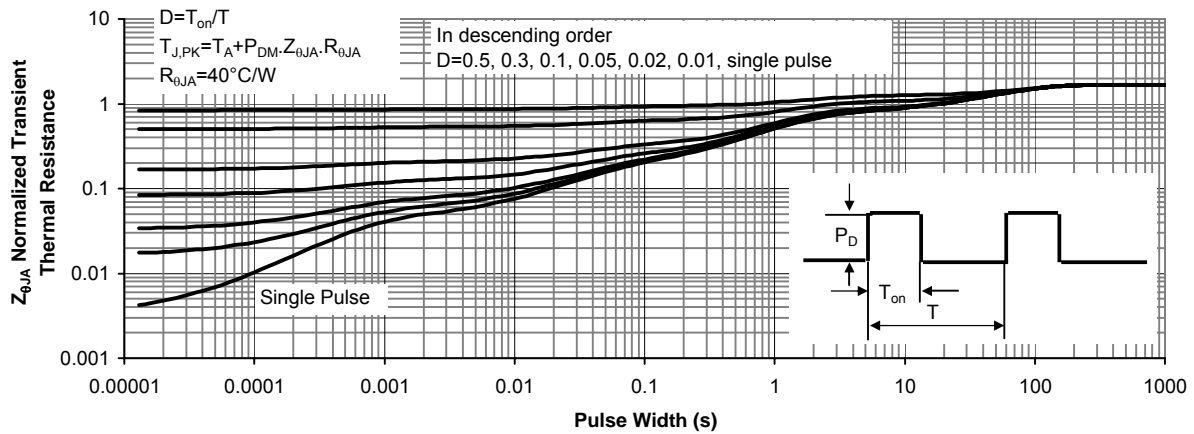


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)