AO4906

Dual N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

General Description

The AO4906 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in DC-DC converters. A Schottky diode is co-packaged in parallel with the synchronous MOSFET to boost efficiency further. *Standard Product AO4906 is Pb-free (meets ROHS & Sony 259 specifications). AO4906L is a Green Product ordering option. AO4906 and AO4906L are electrically identical.*

Features

V_{DS} (V) = 30V
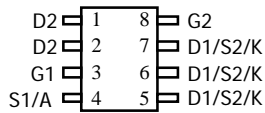I_D = 7A (V_{GS} = 10V)
$R_{DS(ON)}$ < 27mΩ (V_{GS} = 10V)
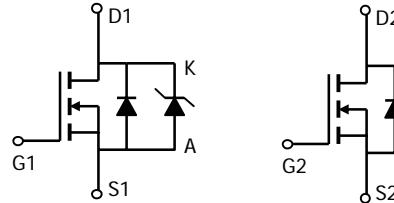$R_{DS(ON)}$ < 32mΩ (V_{GS} = 4.5V)
$R_{DS(ON)}$ < 50mΩ (V_{GS} = 2.5V)

SCHOTTKY

V_{DS} (V) = 30V, I_F = 3A, V_F=0.5V@1A

SOIC-8

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	MOSFET	Schottky	Units
Drain-Source Voltage		V_{DS}	30		V
Gate-Source Voltage		V_{GS}	±12		V
Continuous Drain Current[A]	T_A=25°C	I_D	7		A
	T_A=70°C		6		
Pulsed Drain Current[B]		I_{DM}	40		
Schottky reverse voltage		V_{KA}		30	V
Continuous Forward Current[A]	T_A=25°C	I_F		3	A
	T_A=70°C			2	
Pulsed Forward Current[B]		I_{FM}		40	
Power Dissipation	T_A=25°C	P_D	2	2	W
	T_A=70°C		1.44	1.44	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Parameter: Thermal Characteristics MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{θJA}$	48	62.5	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		74	110	
Maximum Junction-to-Lead[C]	Steady-State	$R_{θJL}$	35	40	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{θJA}$	47.5	62.5	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		71	110	
Maximum Junction-to-Lead[C]	Steady-State	$R_{θJL}$	32	40	

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			0.002	1	μA
			T$_J$=55°C			5	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$=0V, V$_{GS}$= ±12V				100	nA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$ I$_D$=250μA		0.7	1	1.4	V
I$_{D(ON)}$	On state drain current	V$_{GS}$=4.5V, V$_{DS}$=5V		25			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=7.0A			22	27	mΩ
			T$_J$=125°C		31	40	
		V$_{GS}$=4.5V, I$_D$=6.0A			26	32	mΩ
		V$_{GS}$=2.5V, I$_D$=5A			38	50	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=5A		12	16		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A			0.71	1	V
I$_S$	Maximum Body-Diode Continuous Current					3	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=15V, f=1MHz			846	1050	pF
C$_{oss}$	Output Capacitance				96		pF
C$_{rss}$	Reverse Transfer Capacitance				67		pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz			1.24	3.6	Ω
SWITCHING PARAMETERS							
Q$_g$	Total Gate Charge	V$_{GS}$=4.5V, V$_{DS}$=15V, I$_D$=7.0A			9.6	12	nC
Q$_{gs}$	Gate Source Charge				1.6		nC
Q$_{gd}$	Gate Drain Charge				3		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=15V, R$_L$=2.2Ω, R$_{GEN}$=3Ω			3.2	4.8	ns
t$_r$	Turn-On Rise Time				4.1	6.2	ns
t$_{D(off)}$	Turn-Off DelayTime				26.3	40	ns
t$_f$	Turn-Off Fall Time				3.7	5.5	ns
t$_{rr}$	Body Diode Reverse Recovery time	I$_F$=5A, dI/dt=100A/μs			15.5	20	ns
Q$_{rr}$	Body Diode Reverse Recovery charge	I$_F$=5A, dI/dt=100A/μs			7.9	12	nC
SCHOTTKY PARAMETERS							
V$_F$	Forward Voltage Drop	I$_F$=1.0A			0.45	0.5	V
I$_{rm}$	Maximum reverse leakage current	V$_R$=30V			0.007	0.05	mA
		V$_R$=30V, T$_J$=125°C			3.2	10	
		V$_R$=30V, T$_J$=150°C			12	20	
C$_T$	Junction Capacitance	V$_R$=15V			37		pF

A: The value of R$_{θJA}$ is measured with the device mounted on 1in^2 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 impedence from junction to lead R$_{θJL}$ 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 in^2 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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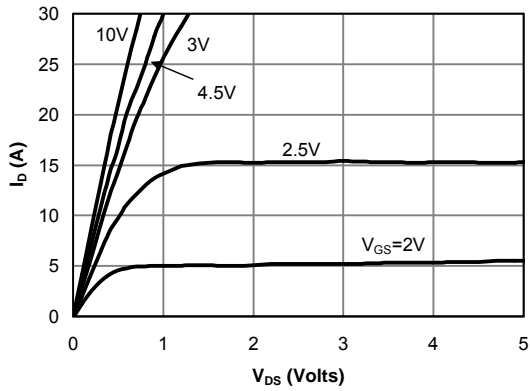**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**
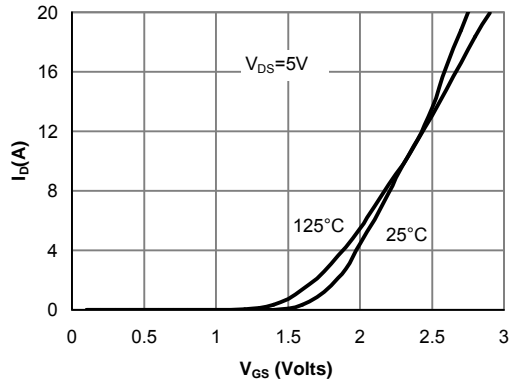
Fig 1: On-Region Characteristics
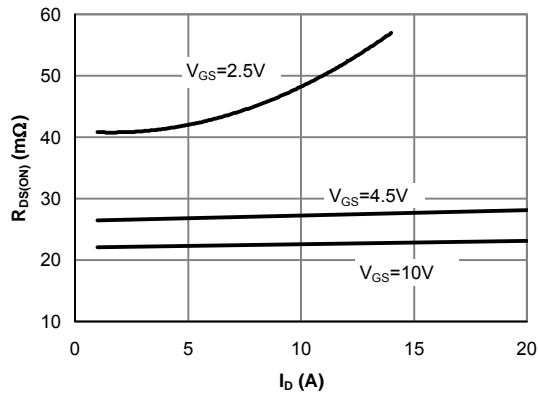
Figure 2: Transfer Characteristics

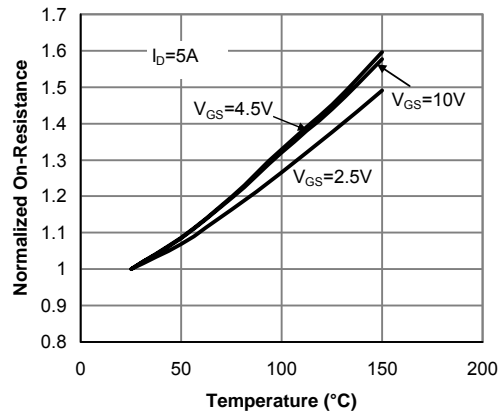Figure 3: On-Resistance vs. Drain Current and Gate Voltage
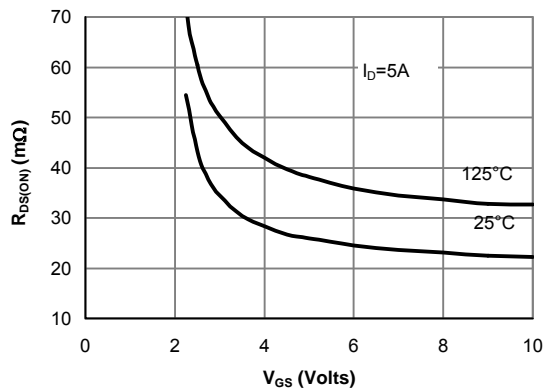
Figure 4: On resistance vs. Junction Temperature
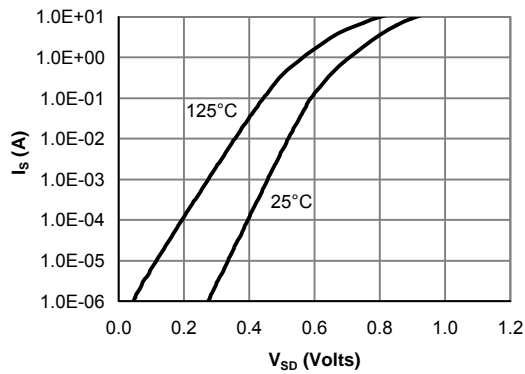
Figure 5: On resistance vs. Gate-Source Voltage

Figure 6: Body-Diode Characteristics
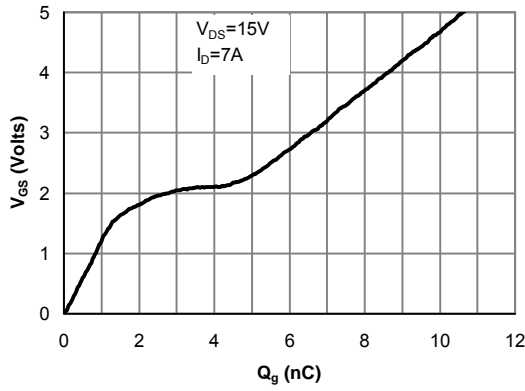
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
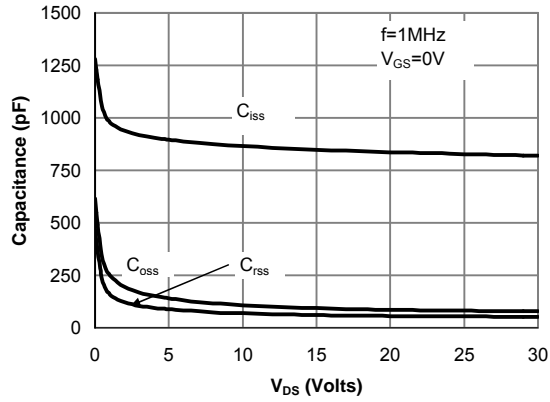
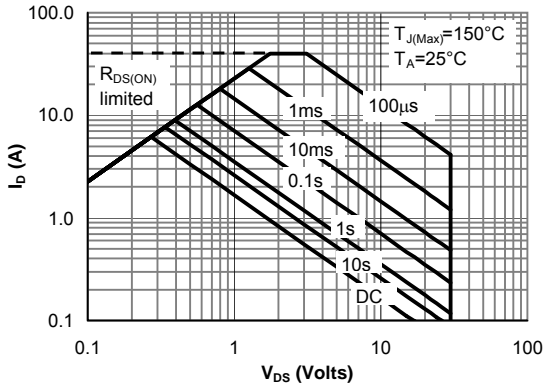**Figure 7: Gate-Charge Characteristics**

Figure 8: Capacitance Characteristics

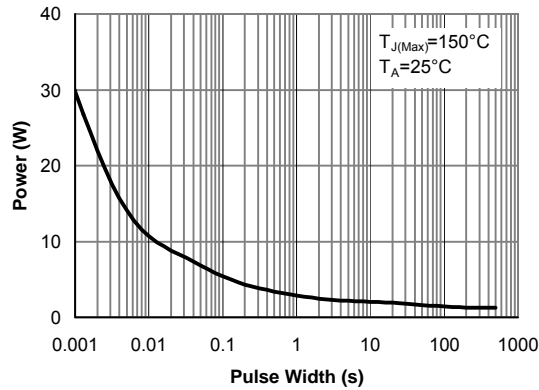**Figure 9: Maximum Forward Biased Safe Operating Area (Note E)**

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)
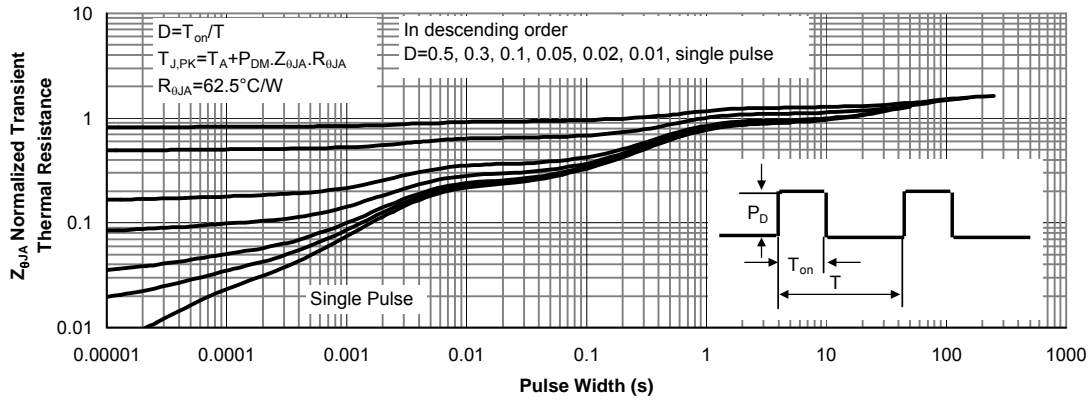
Figure 11: Normalized Maximum Transient Thermal Impedance

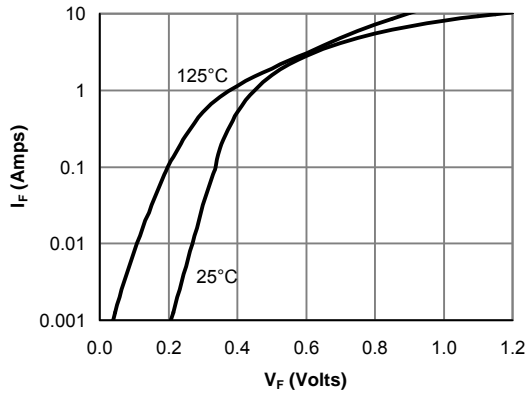## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY
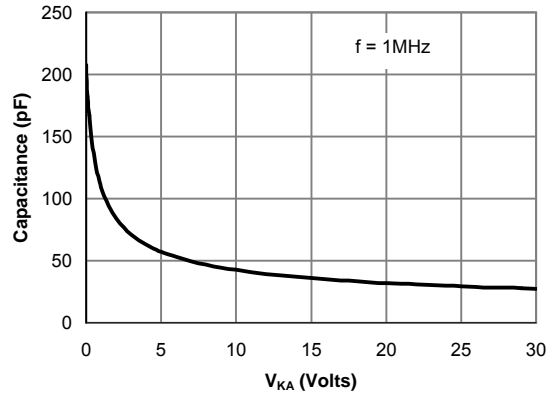
Figure 12: Schottky Forward Characteristics

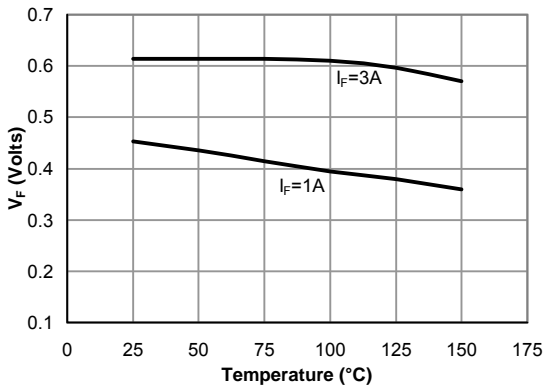**Figure 13: Schottky Capacitance Characteristics**

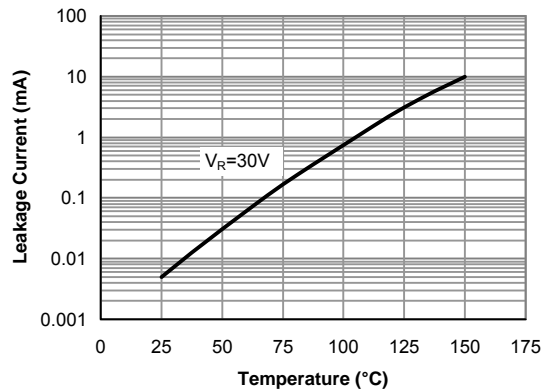**Figure 14: Schottky Forward Drop vs. Junction Temperature**

Figure 15: Schottky Leakage current vs. Junction Temperature

$D = T_{on}/T$
$T_{J,PK} = T_A + P_{DM} \cdot Z_{\theta JA} \cdot R_{\theta JA}$
$R_{\theta JA} = 62.5°C/W$

In descending order
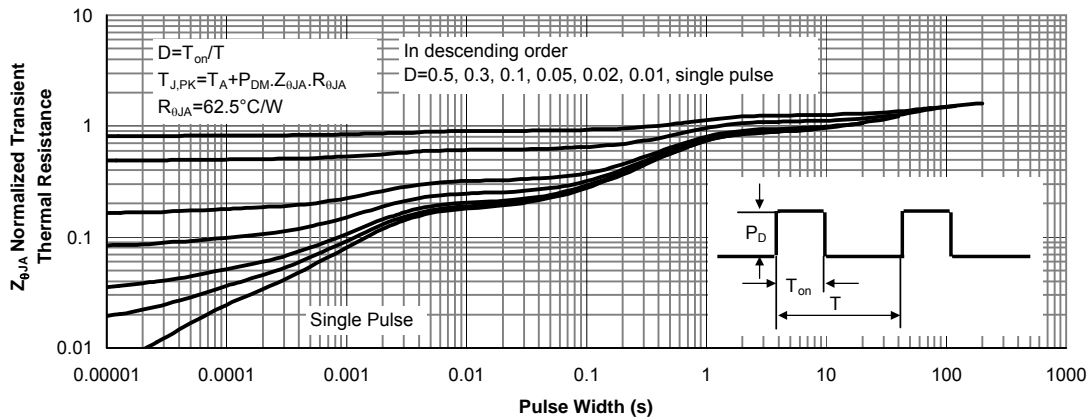D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

Figure 15: Schottky Normalized Maximum Transient Thermal Impedance