ALPHA & OMEGA SEMICONDUCTOR

AO4709

P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

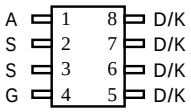
General Description

The AO4709 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of non-synchronous DC-DC converters. *Standard Product AO4709 is Pb-free (meets ROHS & Sony 259 specifications). AO4709L is a Green Product ordering option. AO4709 and AO4709L are electrically identical.*

Features

V_{DS} (V) = -30V
I_D = -8A (V_{GS} = -10V)
$R_{DS(ON)}$ < 33mΩ (V_{GS} = -10V)
$R_{DS(ON)}$ < 56mΩ (V_{GS} = -4.5V)

SCHOTTKY
V_{DS} (V) = 30V,IF = 3A, VF<0.5V@1A



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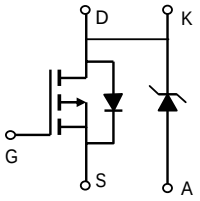

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	MOSFET	Schottky	Units
Drain-Source Voltage		V_{DS}	-30		V
Gate-Source Voltage		V_{GS}	±20		V
Continuous Drain Current [A]	T_A=25°C	I_D	-8		A
	T_A=70°C		-6.6		
Pulsed Drain Current [B]		I_{DM}	-40		
Schottky reverse voltage		V_{KA}		30	V
Continuous Forward Current [A]	T_A=25°C	I_F		4.4	A
	T_A=70°C			3.2	
Pulsed Forward Current [B]		I_{FM}		30	
Power Dissipation	T_A=25°C	P_D	3	3	W
	T_A=70°C		2	2	
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	$R_{\theta JA}$	24	40	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		54	75	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	21	30	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	36	40	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		67	75	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	25	30	

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			-1	µA
		T_J=55°C			-5	
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	-2.4	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=-8A		24.5	33	mΩ
		T_J=125°C		33		
		V_{GS}=-4.5V, I_D=-5A		41	56	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-8A		14.5		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.76	-1	V
I_S	Maximum Body-Diode Continuous Current				-4.2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz		920		pF
C_{oss}	Output Capacitance			190		pF
C_{rss}	Reverse Transfer Capacitance			122		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		3.6		Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge (10V)	V_{GS}=-10V, V_{DS}=-15V, I_D=-8A		18.4		nC
Q_g(4.5V)	Total Gate Charge (4.5V)			9.3		nC
Q_{gs}	Gate Source Charge			2.7		nC
Q_{gd}	Gate Drain Charge			4.9		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=1.8Ω, R_{GEN}=3Ω		7.1		ns
t_r	Turn-On Rise Time			3.4		ns
$t_{D(off)}$	Turn-Off DelayTime			18.9		ns
t_f	Turn-Off Fall Time			8.4		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-8A, dI/dt=100A/µs		21.5		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-8A, dI/dt=100A/µs		12.5		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 $R_{\theta JA}$ 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 $R_{\theta JA}$ is the sum of the thermal impedence 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 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. Rev 4: Sept 2005

P-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

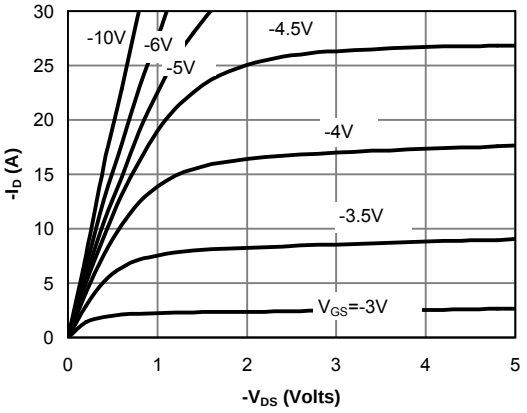

Fig 1: On-Region Characteristics

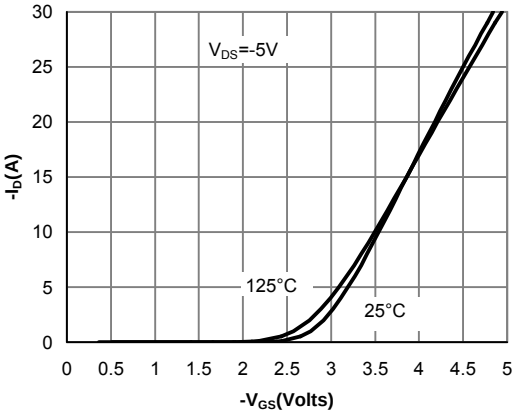

Figure 2: Transfer Characteristics

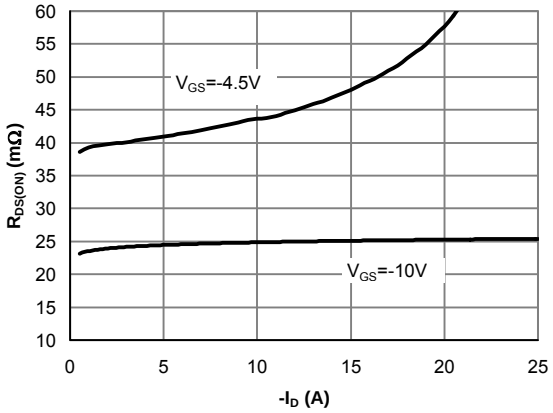

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

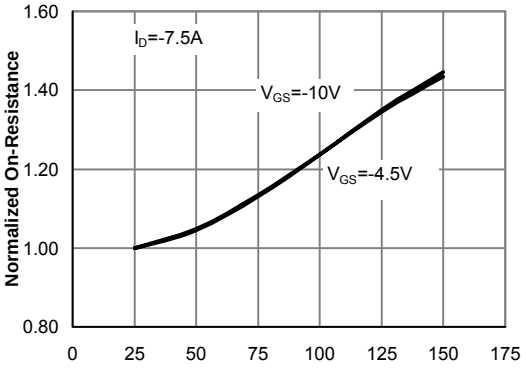

Figure 4: On-Resistance vs. Junction Temperature

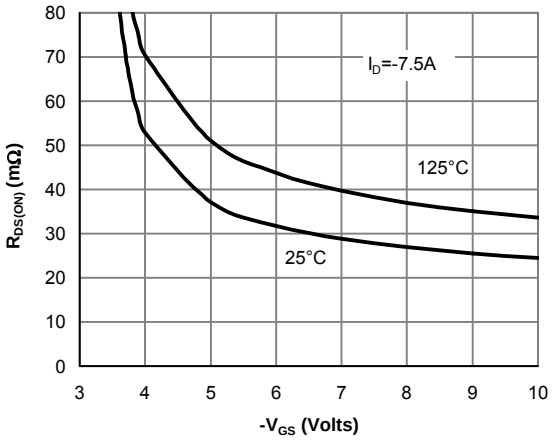

Figure 5: On-Resistance vs. Gate-Source Voltage

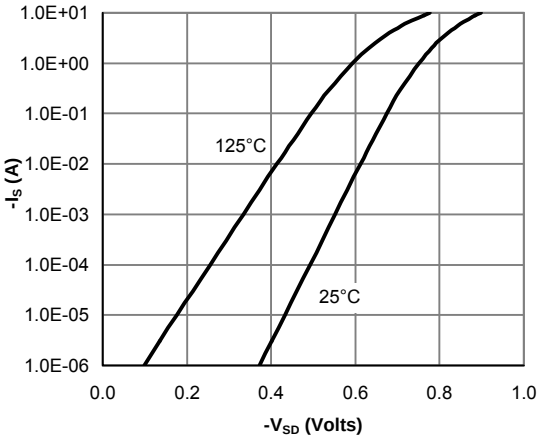

Figure 6: Body-Diode Characteristics

P-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

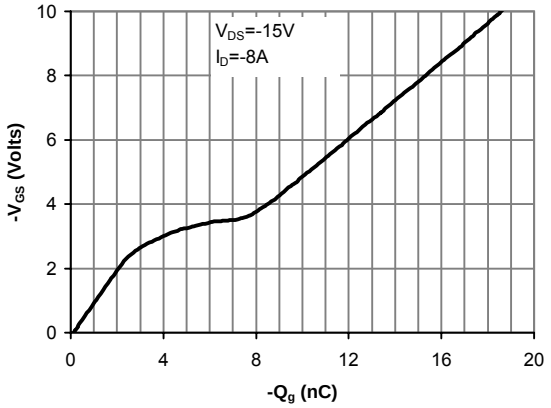

Figure 7: Gate-Charge Characteristics

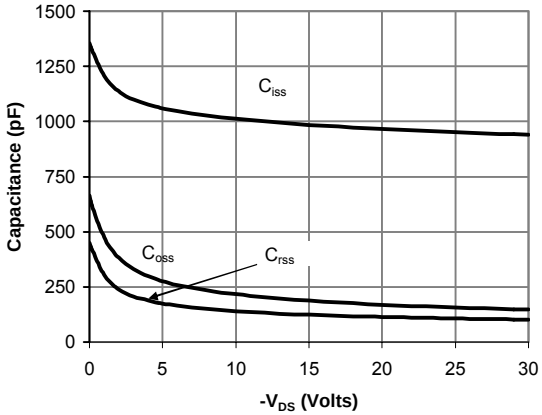

Figure 8: Capacitance Characteristics

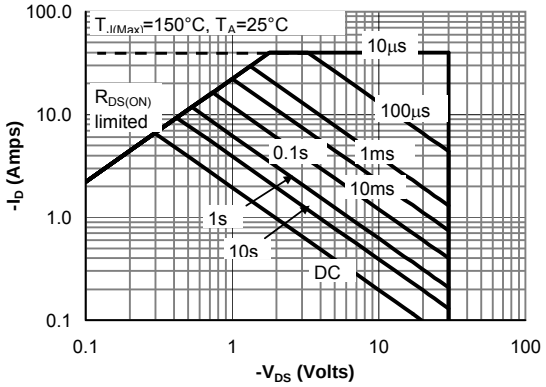

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

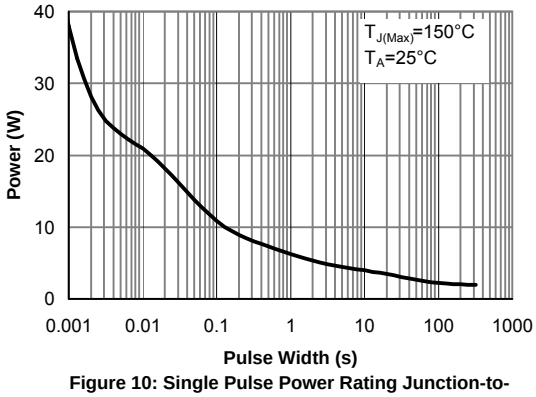

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

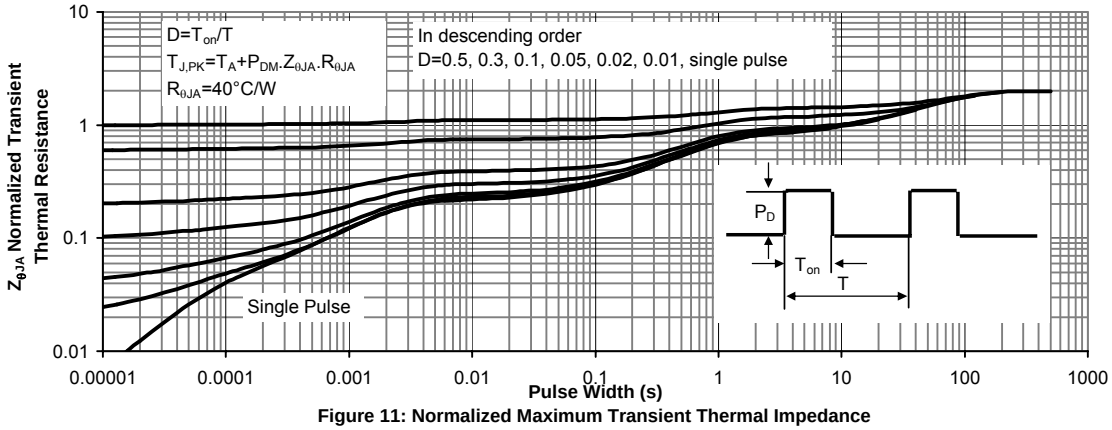

Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

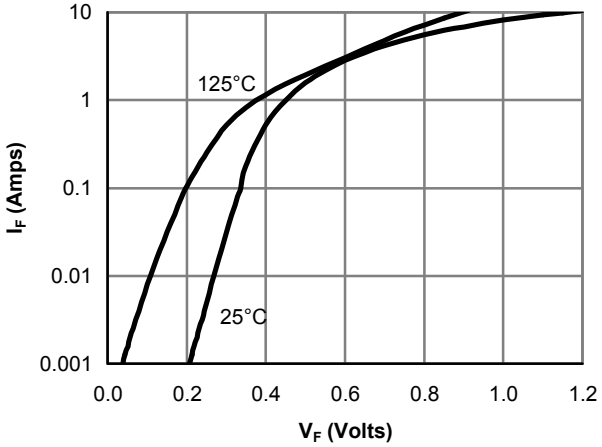

Figure 12: Schottky Forward Characteristics

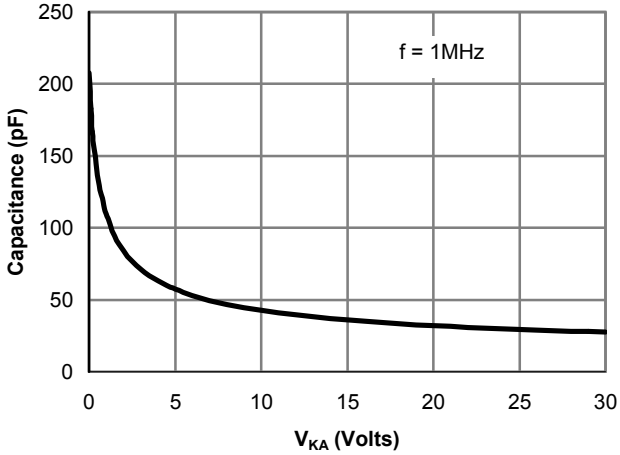

Figure 13: Schottky Capacitance Characteristics

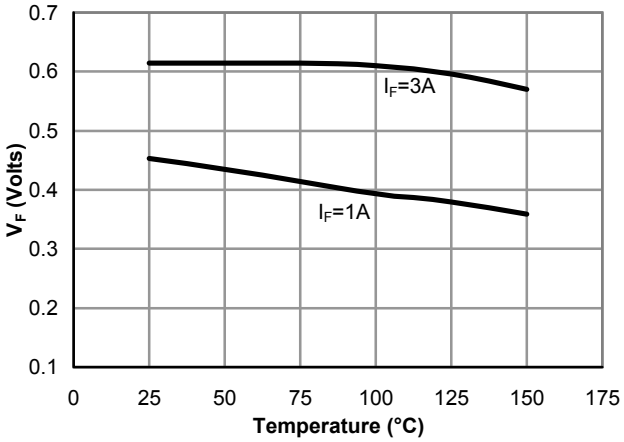

Figure 14: Schottky Forward Drop vs. Junction Temperature

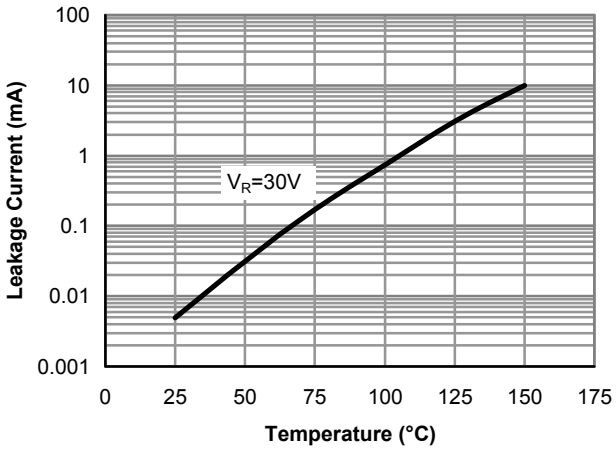

Figure 15: Schottky Leakage current vs. Junction Temperature

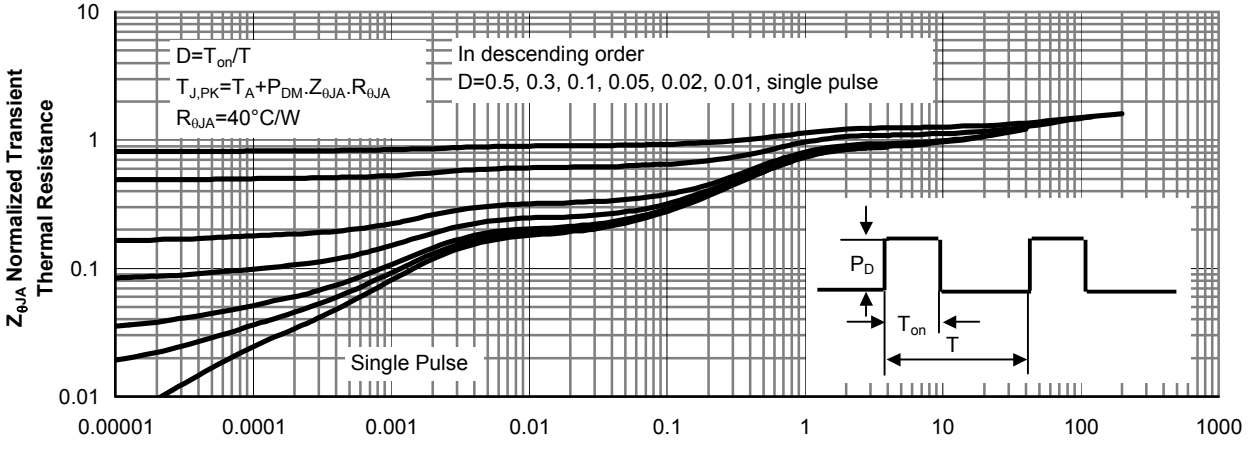

Figure 15: Schottky Normalized Maximum Transient Thermal Impedance