


AO4709
P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode
General Description

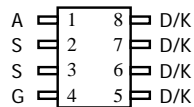
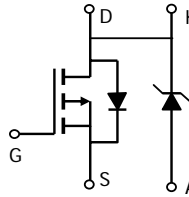
The AO4709 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of non-synchronous DC-DC converters. *Standard Product AO4709 is Pb-free (meets ROHS & Sony 259 specifications). AO4709L is a Green Product ordering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

Features

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

SCHOTTKY

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


SOIC-8

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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	I_D	$T_A=25^\circ\text{C}$	-8	A
		$T_A=70^\circ\text{C}$	-6.6	
Pulsed Drain Current ^B	I_{DM}	-40		
Schottky reverse voltage	V_{KA}		30	V
Continuous Forward Current ^A	I_F	$T_A=25^\circ\text{C}$	4.4	A
		$T_A=70^\circ\text{C}$	3.2	
Pulsed Forward Current ^B	I_{FM}		30	
Power Dissipation	P_D	$T_A=25^\circ\text{C}$	3	W
		$T_A=70^\circ\text{C}$	2	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Parameter: Thermal Characteristics MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	24	40	$^\circ\text{C/W}$
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	$t \leq 10s$	$R_{\theta JA}$	36	40	$^\circ\text{C/W}$
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 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	-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 T _J =125°C		24.5 33	33	mΩ
		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			920		pF
C _{oss}	Output Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		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)			18.4		nC
Q _g (4.5V)	Total Gate Charge (4.5V)	V _{GS} =-10V, V _{DS} =-15V, I _D =-8A		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			7.1		ns
t _r	Turn-On Rise Time	V _{GS} =-10V, V _{DS} =-15V, R _L =1.8Ω,		3.4		ns
t _{D(off)}	Turn-Off DelayTime	R _{GEN} =3Ω		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 V _R =30V, T _J =125°C V _R =30V, T _J =150°C		0.007 3.2 12	0.05 10 20	mA
C _T	Junction Capacitance	V _R =15V		37		pF

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 6,12,14 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°C. The SOA curve provides a single pulse rating. Rev 4: Sept 2005

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P-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

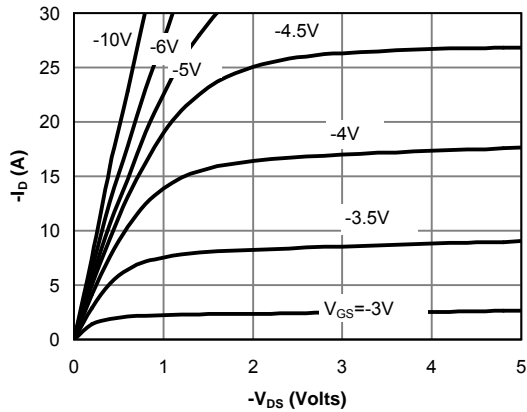


Fig 1: On-Region Characteristics

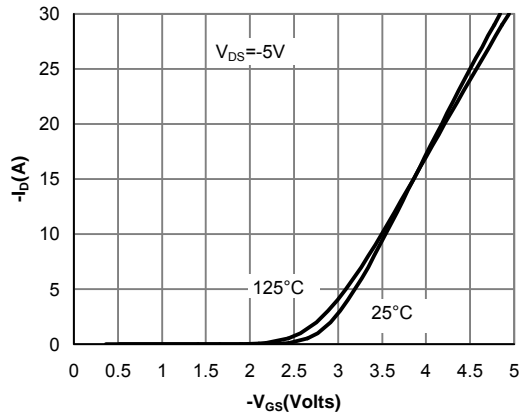


Figure 2: Transfer Characteristics

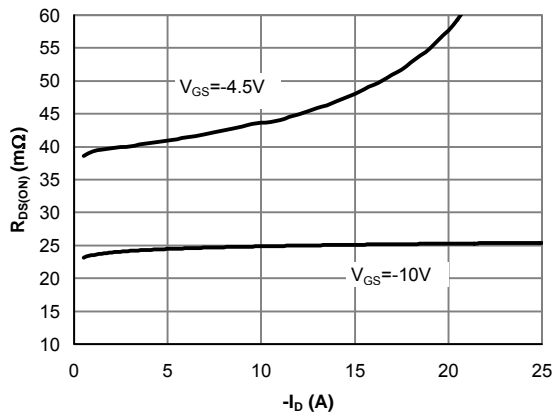


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

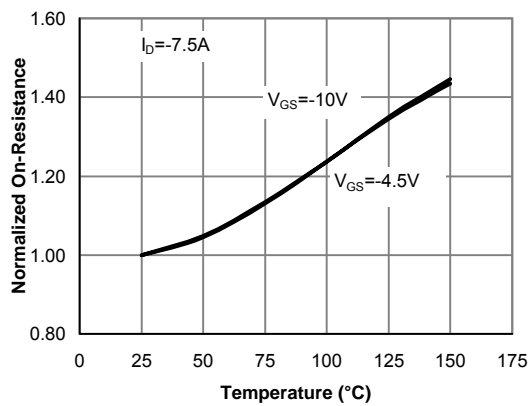


Figure 4: On-Resistance vs. Junction Temperature

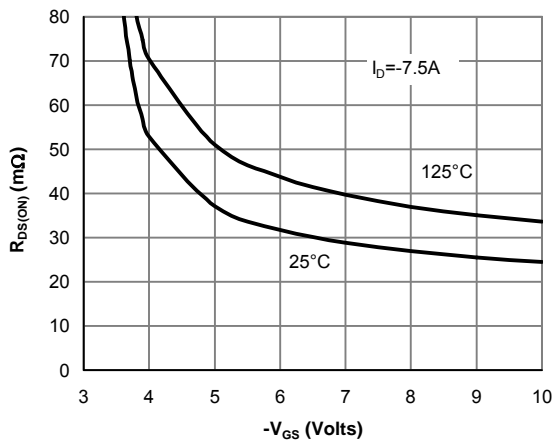


Figure 5: On-Resistance vs. Gate-Source Voltage

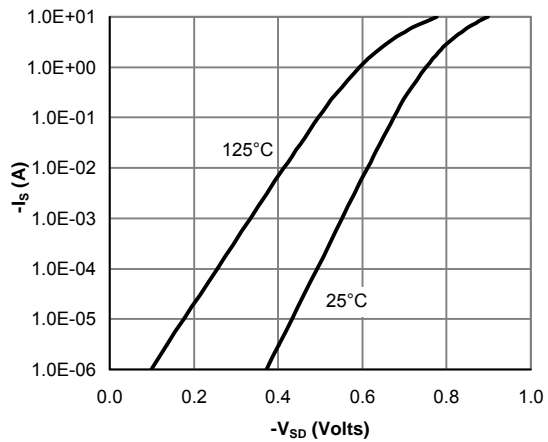


Figure 6: Body-Diode Characteristics

P-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

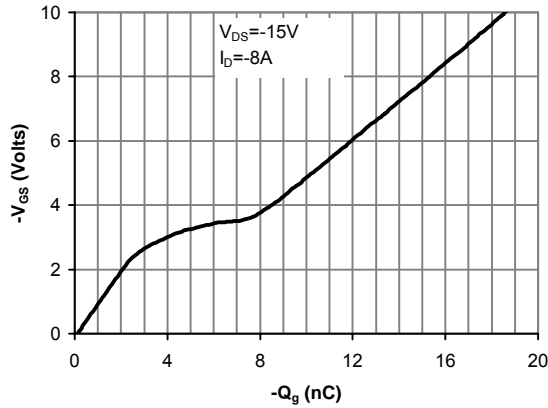


Figure 7: Gate-Charge Characteristics

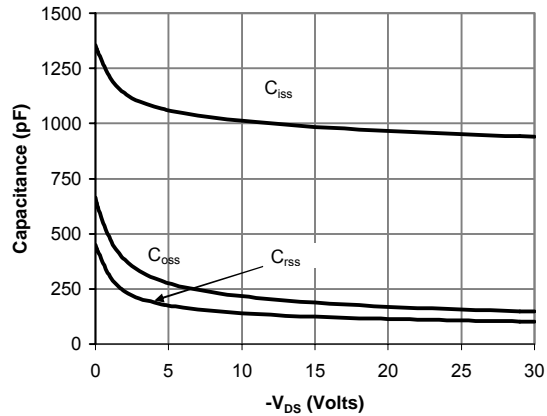


Figure 8: Capacitance Characteristics

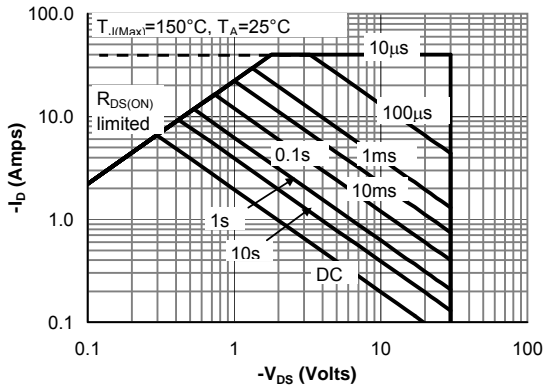


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

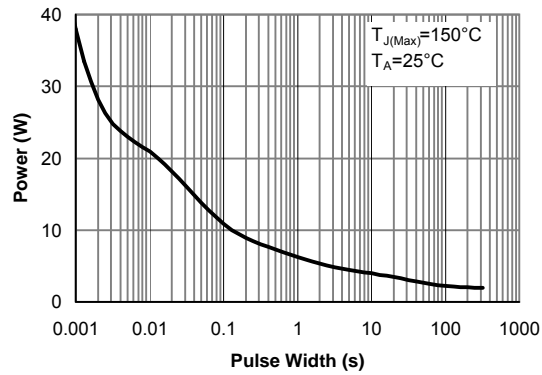


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

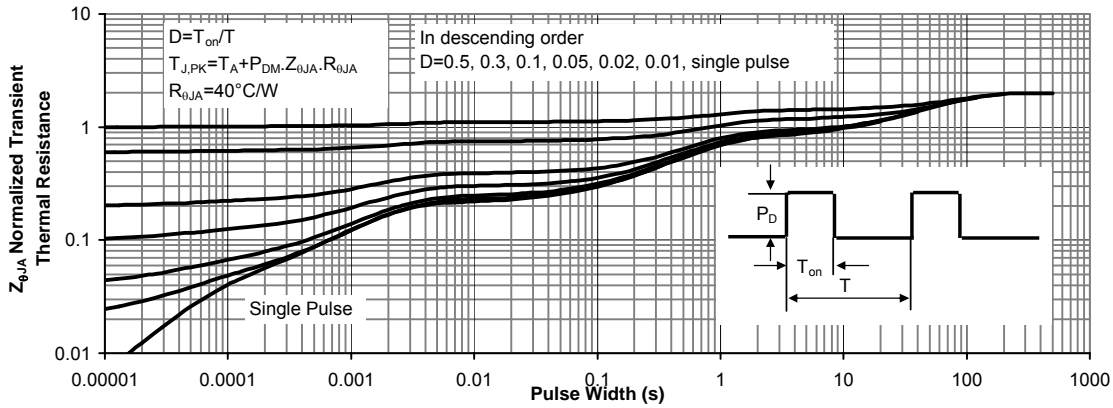


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

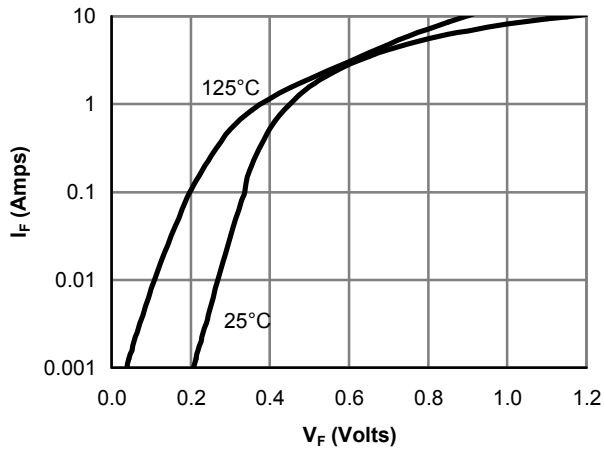


Figure 12: Schottky Forward Characteristics

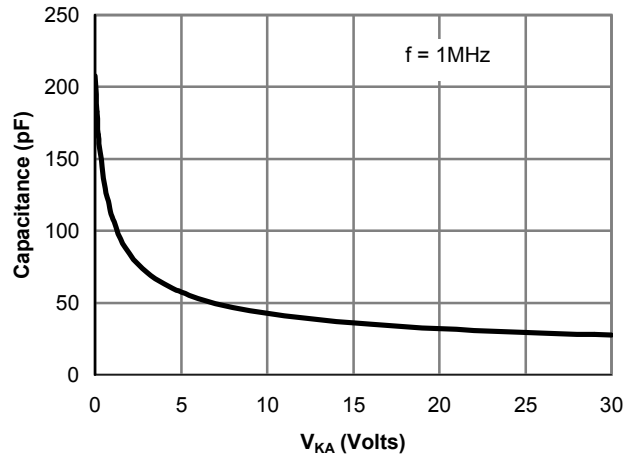


Figure 13: Schottky Capacitance Characteristics

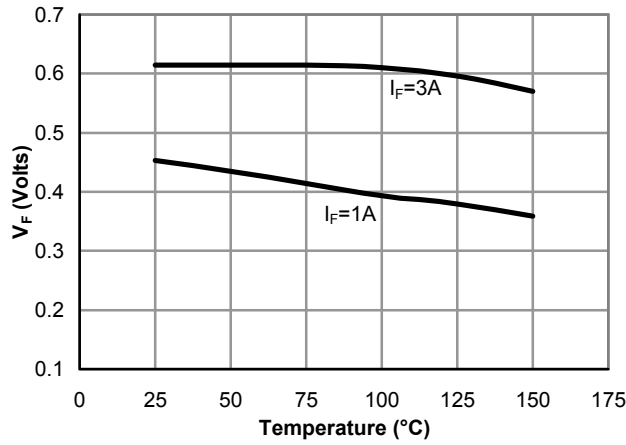


Figure 14: Schottky Forward Drop vs. Junction Temperature

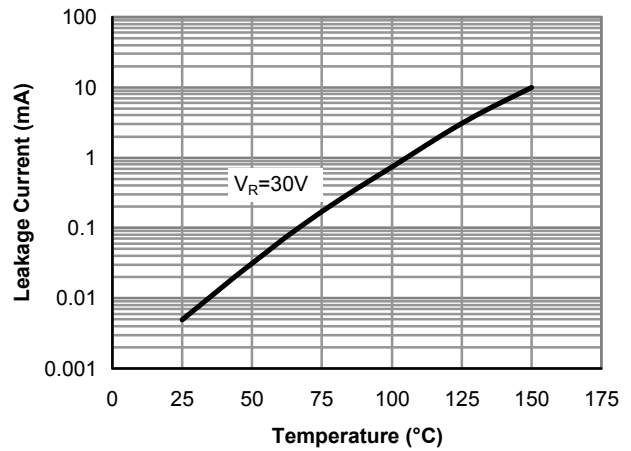


Figure 15: Schottky Leakage current vs. Junction Temperature

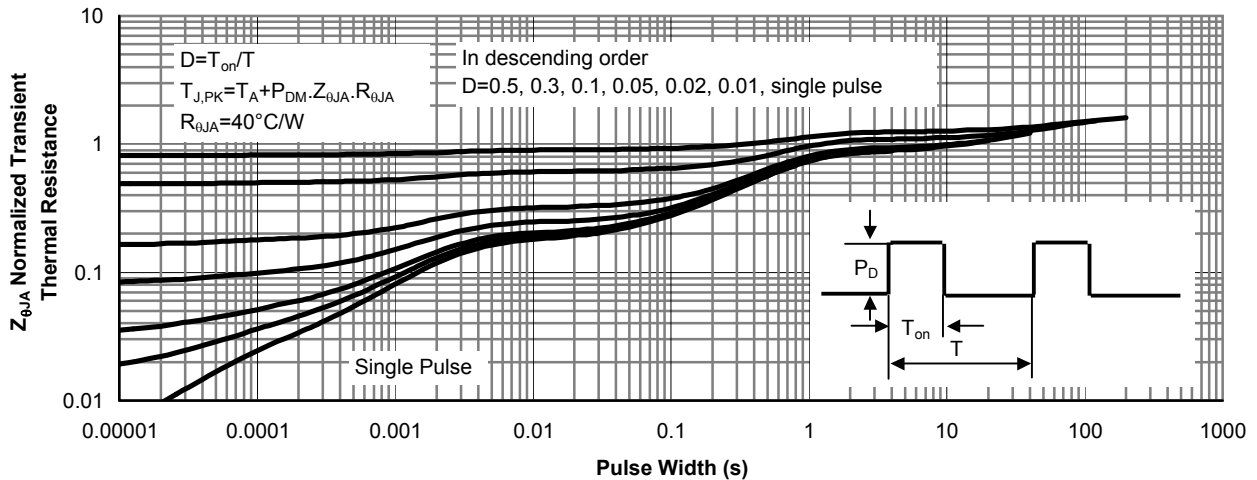


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance