

## 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

$V_{DS} (V) = -30V$

$I_D = -8A (V_{GS} = -10V)$

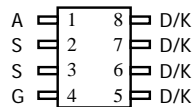
$R_{DS(ON)} < 33m\Omega (V_{GS} = -10V)$

$R_{DS(ON)} < 56m\Omega (V_{GS} = -4.5V)$

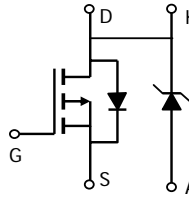


## SCHOTTKY

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



SOIC-8



### Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	MOSFET	Schottky	Units
Drain-Source Voltage	$V_{DS}$	-30		V
Gate-Source Voltage	$V_{GS}$	$\pm 20$		V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	-8	A
		$T_A=70^\circ C$	-6.6	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	-40		
Schottky reverse voltage	$V_{KA}$		30	V
Continuous Forward Current <sup>A</sup>	$I_F$	$T_A=25^\circ C$	4.4	A
		$T_A=70^\circ C$	3.2	
Pulsed Forward Current <sup>B</sup>	$I_{FM}$		30	
Power Dissipation	$P_D$	$T_A=25^\circ C$	3	W
		$T_A=70^\circ C$	2	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ C$

Parameter: Thermal Characteristics MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$t \leq 10s$	$R_{\theta JA}$	24	40	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		54	75	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	$R_{\theta JL}$	21	30	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient <sup>A</sup>	$t \leq 10s$	$R_{\theta JA}$	36	40	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		67	75	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	$R_{\theta JL}$	25	30	

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =-250μA, V <sub>GS</sub> =0V	-30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			-1 -5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.2	-2	-2.4	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V	40			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-8A T <sub>J</sub> =125°C		24.5 33	33	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A		41	56	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-8A		14.5		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V		-0.76	-1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				-4.2	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance			920		pF
C <sub>oss</sub>	Output Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz		190		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			122		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		3.6		Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub> (10V)	Total Gate Charge (10V)			18.4		nC
Q <sub>g</sub> (4.5V)	Total Gate Charge (4.5V)	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-8A		9.3		nC
Q <sub>gs</sub>	Gate Source Charge			2.7		nC
Q <sub>gd</sub>	Gate Drain Charge			4.9		nC
t <sub>D(on)</sub>	Turn-On DelayTime			7.1		ns
t <sub>r</sub>	Turn-On Rise Time	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =1.8Ω,		3.4		ns
t <sub>D(off)</sub>	Turn-Off DelayTime	R <sub>GEN</sub> =3Ω		18.9		ns
t <sub>f</sub>	Turn-Off Fall Time			8.4		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =-8A, di/dt=100A/μs		21.5		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-8A, di/dt=100A/μs		12.5		nC
<b>SCHOTTKY PARAMETERS</b>						
V <sub>F</sub>	Forward Voltage Drop	I <sub>F</sub> =1.0A		0.45	0.5	V
I <sub>rm</sub>	Maximum reverse leakage current	V <sub>R</sub> =30V V <sub>R</sub> =30V, T <sub>J</sub> =125°C V <sub>R</sub> =30V, T <sub>J</sub> =150°C		0.007 3.2 12	0.05 10 20	mA
C <sub>T</sub>	Junction Capacitance	V <sub>R</sub> =15V		37		pF

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=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<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> 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<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=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

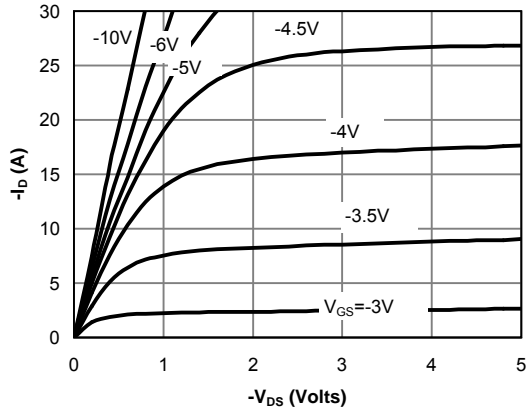


Fig 1: On-Region Characteristics

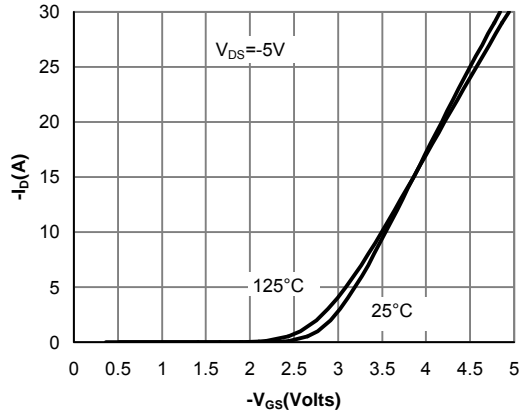


Figure 2: Transfer Characteristics

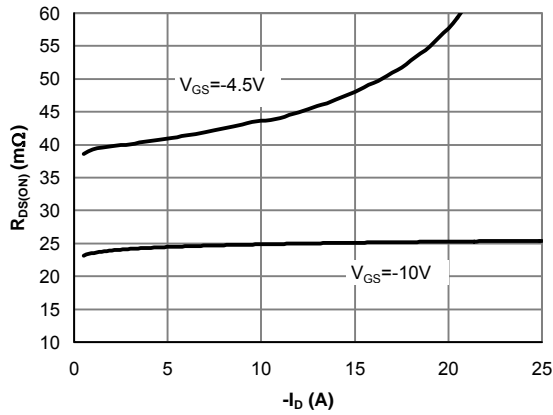


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

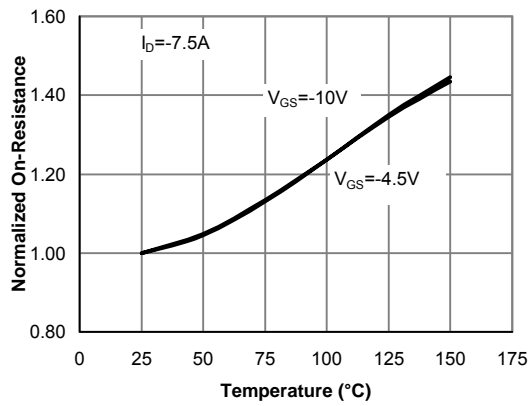


Figure 4: On-Resistance vs. Junction Temperature

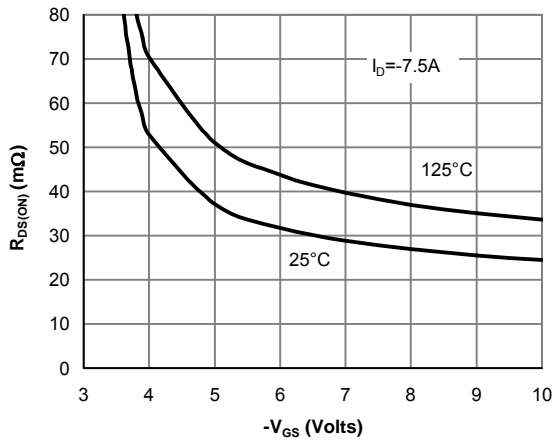


Figure 5: On-Resistance vs. Gate-Source Voltage

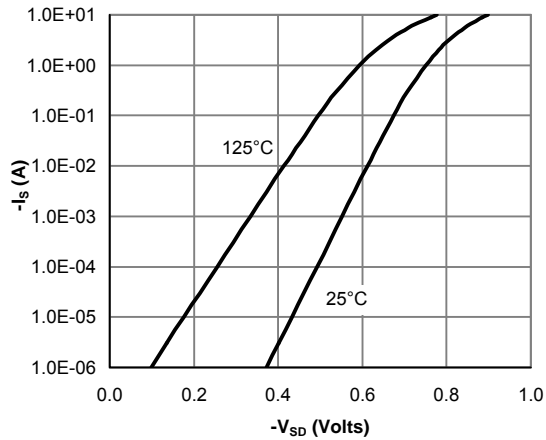


Figure 6: Body-Diode Characteristics

P-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

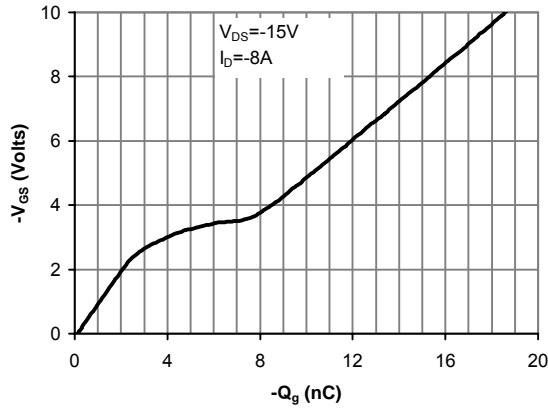


Figure 7: Gate-Charge Characteristics

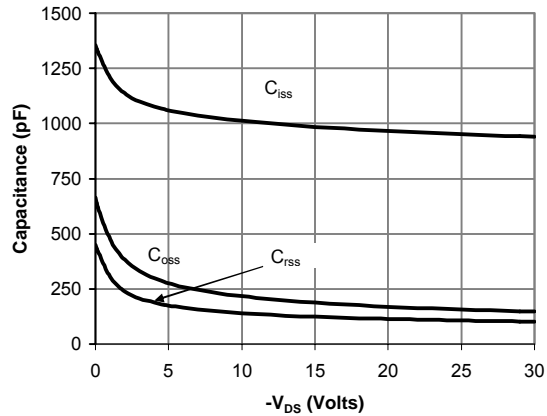


Figure 8: Capacitance Characteristics

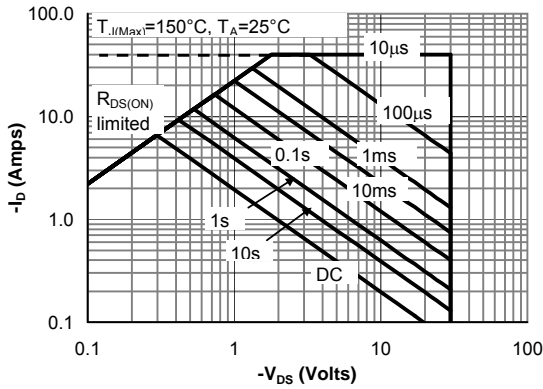


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

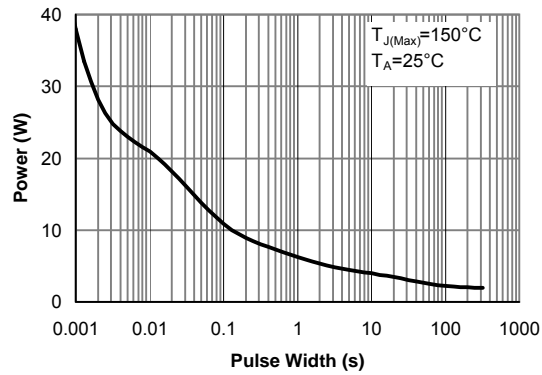


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

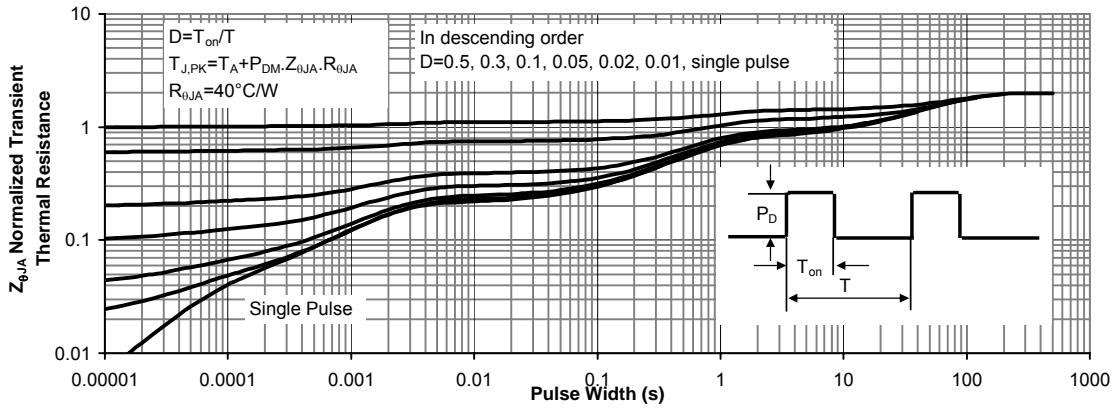


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

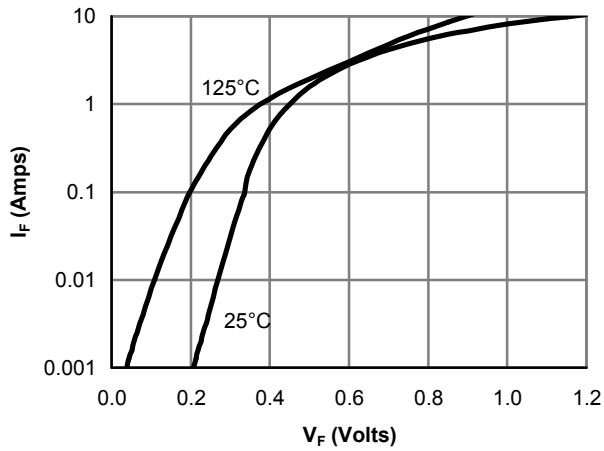


Figure 12: Schottky Forward Characteristics

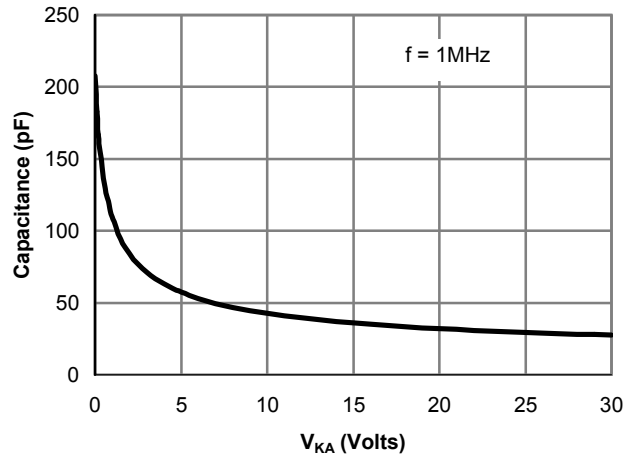


Figure 13: Schottky Capacitance Characteristics

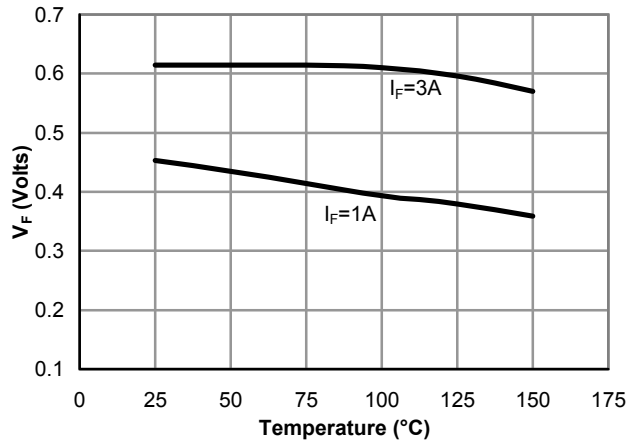


Figure 14: Schottky Forward Drop vs. Junction Temperature

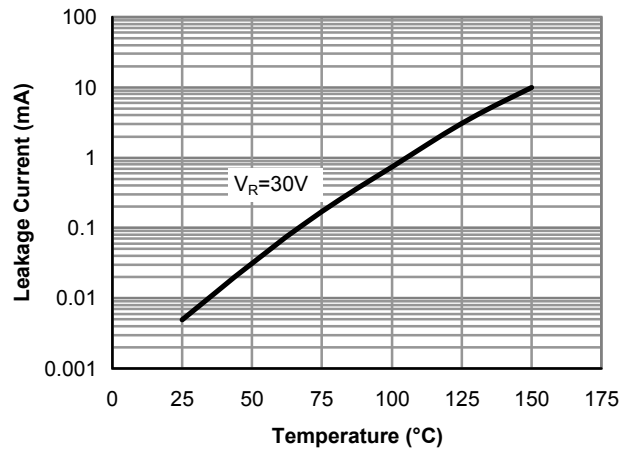


Figure 15: Schottky Leakage current vs. Junction Temperature

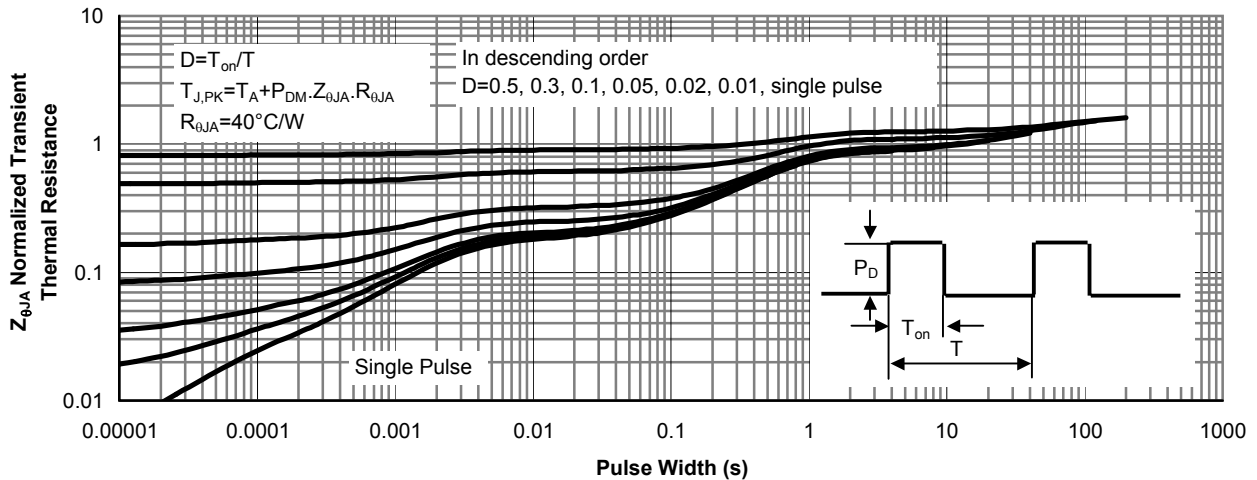


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance