



**AO4705**

**P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode**

**General Description**

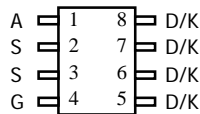
The AO4705 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. A Schottky diode is provided to facilitate the implementation of non-synchronous DC-DC converters. *Standard Product AO4705 is Pb-free (meets ROHS & Sony 259 specifications). AO4705L is a Green Product ordering option. AO4705 and AO4705L are electrically identical.*

**Features**

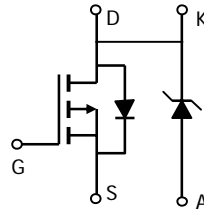
- $V_{DS} (V) = -30V$
- $I_D = -10A (V_{GS} = -10V)$
- $R_{DS(ON)} < 14m\Omega (V_{GS} = -20V)$
- $R_{DS(ON)} < 16m\Omega (V_{GS} = -10V)$

**SCHOTTKY**

$V_{DS} (V) = 30V, I_F = 5A, V_F < 0.52V@3A$



**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	$V_{GS}$	$\pm 25$		V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	-10	A
		$T_A=70^\circ C$	-8	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	-60		
Schottky reverse voltage	$V_{KA}$		30	V
Continuous Forward Current <sup>A</sup>	$I_F$	$T_A=25^\circ C$	5	A
		$T_A=70^\circ C$	3.5	
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>	$t \leq 10s$	$R_{\theta JA}$	28	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> =±25V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.7	-2.5	-3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V	60			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-10A T <sub>J</sub> =125°C		13 16	16 21	mΩ
		V <sub>GS</sub> =-20V, I <sub>D</sub> =-10A		10.7	14	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-10A		25		mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-10A		26		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V		-0.72	-1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				-4.2	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz		2076		pF
C <sub>oss</sub>	Output Capacitance			503		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			302		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		2		Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-10A		37.2		nC
Q <sub>gs</sub>	Gate Source Charge			7		nC
Q <sub>gd</sub>	Gate Drain Charge			10.4		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =1.0Ω, R <sub>GEN</sub> =3Ω		12.4		ns
t <sub>r</sub>	Turn-On Rise Time			8.2		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			25.6		ns
t <sub>f</sub>	Turn-Off Fall Time			12		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =-10A, di/dt=100A/μs		33	
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-10A, di/dt=100A/μs		23		nC
<b>SCHOTTKY PARAMETERS</b>						
V <sub>F</sub>	Forward Voltage Drop	I <sub>F</sub> =3.0A		0.48	0.52	V
I <sub>rm</sub>	Maximum reverse leakage current	V <sub>R</sub> =24V		0.07	0.15	mA
		V <sub>R</sub> =24V, T <sub>J</sub> =125°C		4.2	20	
		V <sub>R</sub> =24V, T <sub>J</sub> =150°C		15	60	
C <sub>T</sub>	Junction Capacitance	V <sub>R</sub> =15V		120		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<sub>θJA</sub> ≤ 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

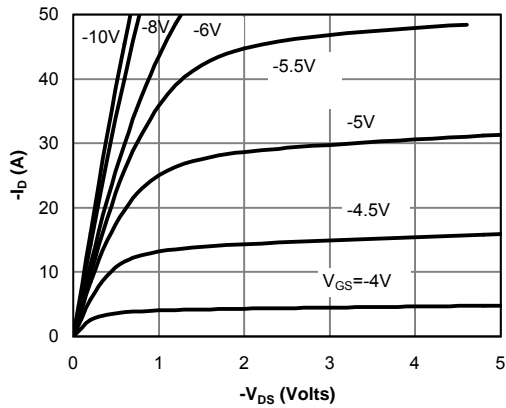


Fig 1: On-Region Characteristics

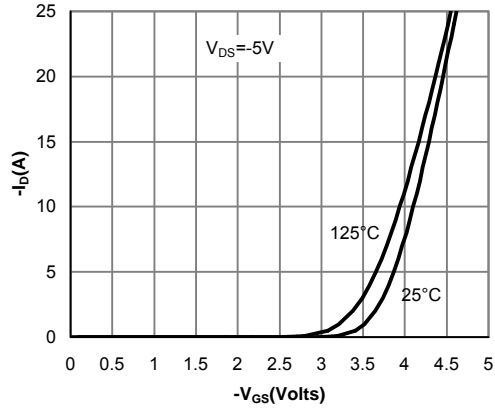


Figure 2: Transfer Characteristics

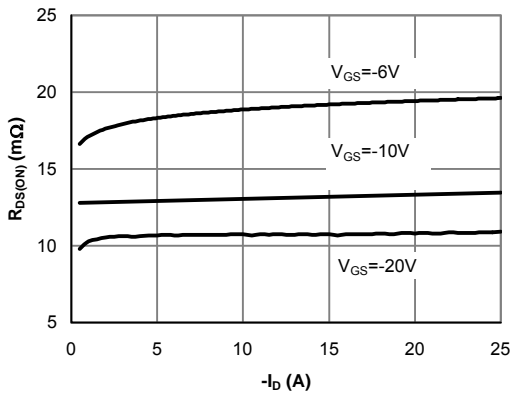


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

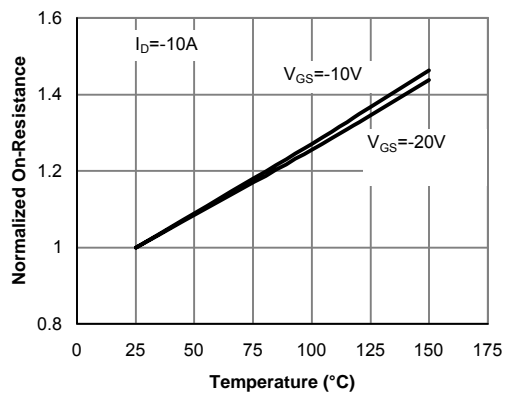


Figure 4: On-Resistance vs. Junction Temperature

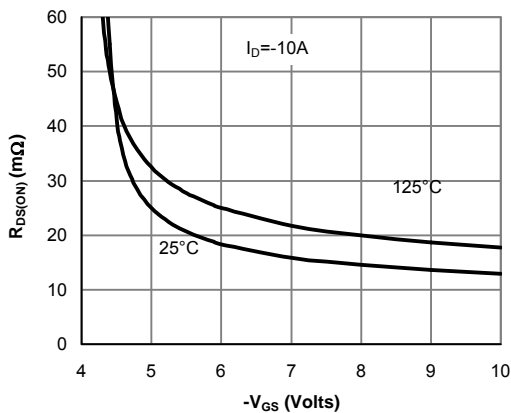


Figure 5: On-Resistance vs. Gate-Source Voltage

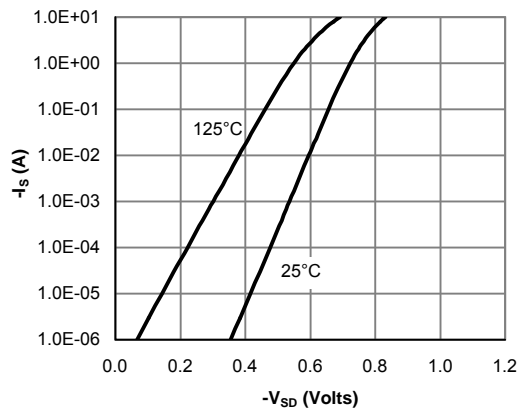


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

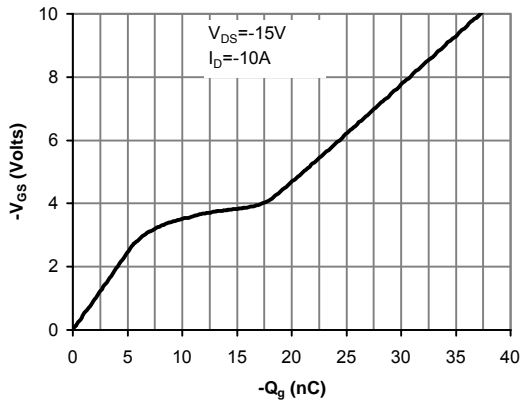


Figure 7: Gate-Charge Characteristics

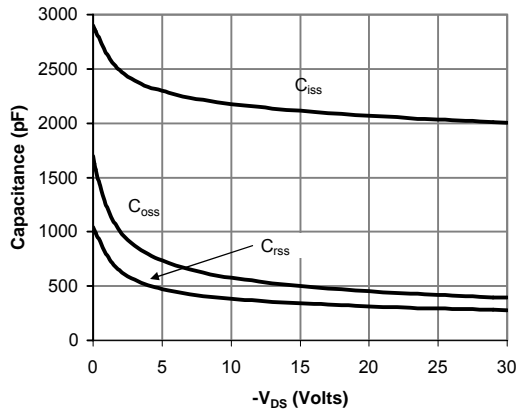


Figure 8: Capacitance Characteristics

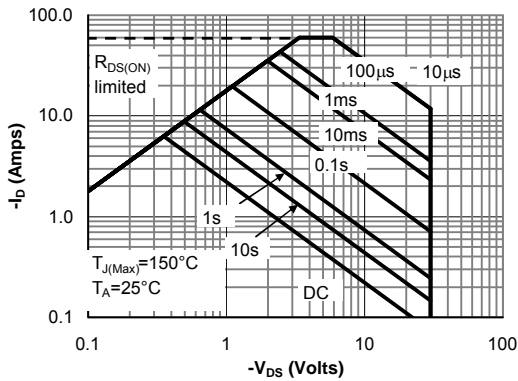


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

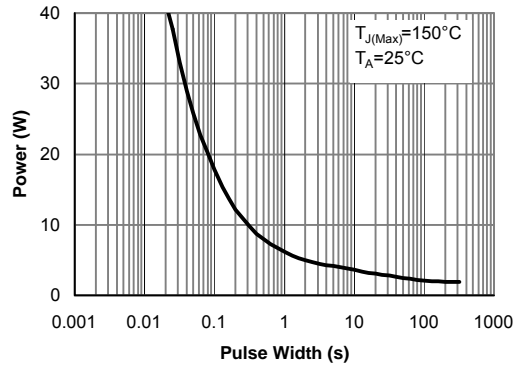


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

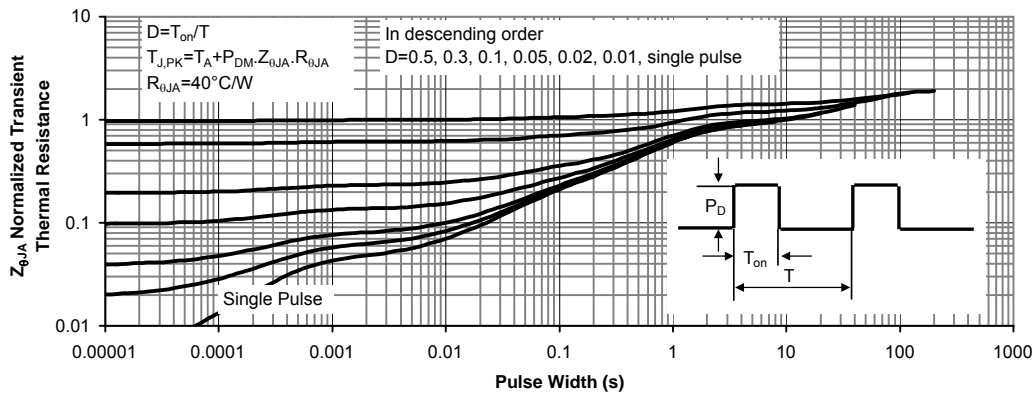


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

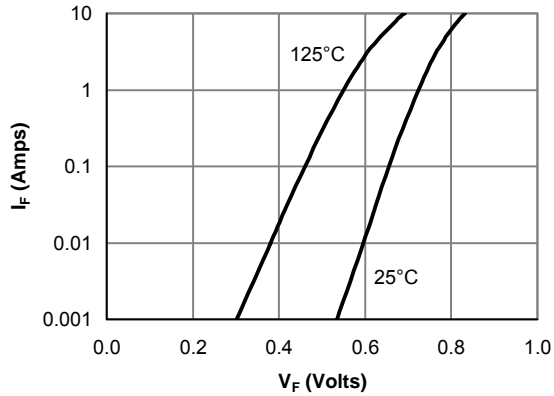


Figure 12: Schottky Forward Characteristics

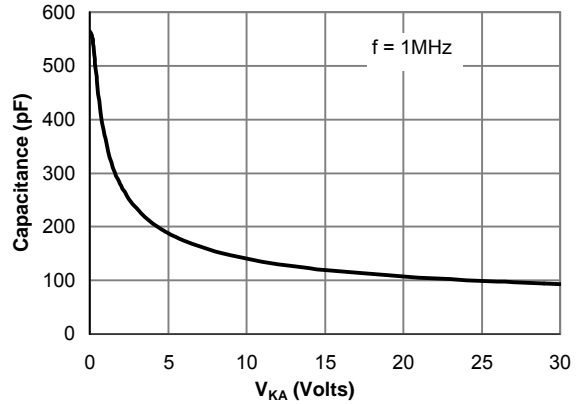


Figure 13: Schottky Capacitance Characteristics

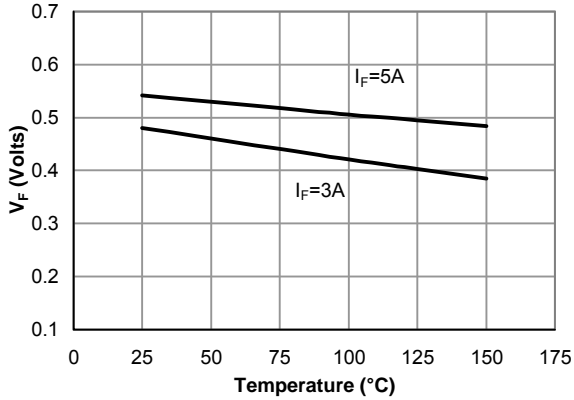


Figure 14: Schottky Forward Drop vs. Junction Temperature

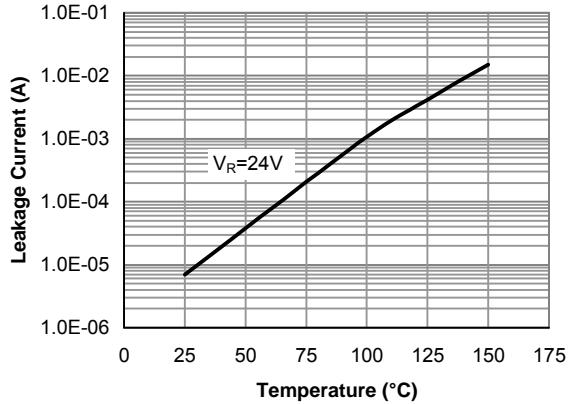


Figure 15: Schottky Leakage current vs. Junction Temperature

