

**General Description**

The AO4701 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch.

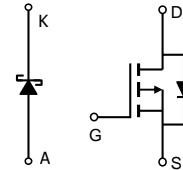
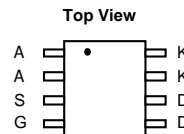
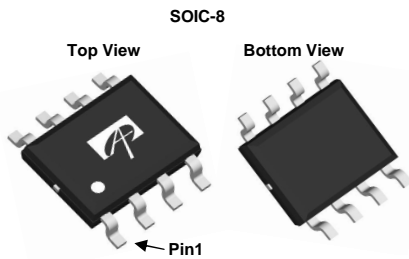
**Product Summary**

$V_{DS}$	-30V
$I_D$ (at $V_{GS}=-10V$ )	-5A
$R_{DS(ON)}$ (at $V_{GS}=-10V$ )	< 48m $\Omega$
$R_{DS(ON)}$ (at $V_{GS}=-4.5V$ )	< 57m $\Omega$
$R_{DS(ON)}$ (at $V_{GS}=-2.5V$ )	< 80m $\Omega$

100% UIS Tested  
 100%  $R_g$  Tested

**Schottky**

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


**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	$V_{GS}$	$\pm 12$		V
Continuous Drain Current	$I_D$	$T_A=25^\circ C$	-5	A
		$T_A=70^\circ C$	-4	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	-25		
Avalanche Current <sup>C</sup>	$I_{AS}, I_{AR}$	18		A
Avalanche energy $L=0.1mH$ <sup>C</sup>	$E_{AS}, E_{AR}$	16		mJ
Schottky reverse voltage	$V_{KA}$		30	V
Continuous Forward Current	$I_F$	$T_A=25^\circ C$	4.4	A
		$T_A=70^\circ C$	3.2	
Power Dissipation <sup>B</sup>	$P_D$	$T_A=25^\circ C$	2	W
		$T_A=70^\circ C$	1.3	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ C$

**Thermal Characteristics**

Parameter: MOSFET	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	48	62.5	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A,D</sup>		Steady-State	74	90
Maximum Junction-to-Lead	$R_{\theta JL}$	32	40	$^\circ C/W$
Parameter: Schottky				
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	49	62.5	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A,D</sup>		Steady-State	72	90
Maximum Junction-to-Lead	$R_{\theta JL}$	31	40	$^\circ C/W$

**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> =-30V, 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> =±12V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-0.5	-0.9	-1.3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V	-25			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-5A T <sub>J</sub> =125°C		40 60	48 72	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A		45	57	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-1A		60	80	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-5A		18		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		-0.7	-1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				-2.5	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz		645	780	pF
C <sub>oss</sub>	Output Capacitance			80		pF
C <sub>riss</sub>	Reverse Transfer Capacitance			55		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	4	7.8	12	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(4.5V)</sub>	Total Gate Charge	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-5A		7		nC
Q <sub>gs</sub>	Gate Source Charge			1.5		nC
Q <sub>gd</sub>	Gate Drain Charge			2.5		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =3Ω, R <sub>GEN</sub> =3Ω		6.5		ns
t <sub>r</sub>	Turn-On Rise Time			3.5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			41		ns
t <sub>f</sub>	Turn-Off Fall Time			9		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =-5A, di/dt=100A/μs		11		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-5A, di/dt=100A/μs		3.5		nC
<b>SCHOTTKY PARAMETERS</b>						
V <sub>F</sub>	Forward Voltage Drop	I <sub>F</sub> =1A		0.45	0.5	V
I <sub>rm</sub>	Maximum reverse leakage current	V <sub>R</sub> =30V		0.007	0.05	mA
		V <sub>R</sub> =30V, T <sub>J</sub> =125°C		3.2	10	
		V <sub>R</sub> =30V, T <sub>J</sub> =150°C		12	20	
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.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150°C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25°C.

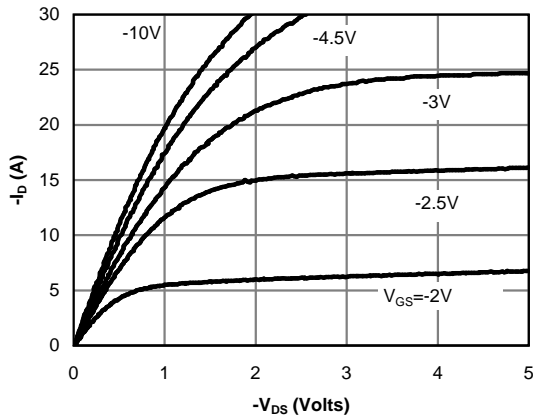
D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

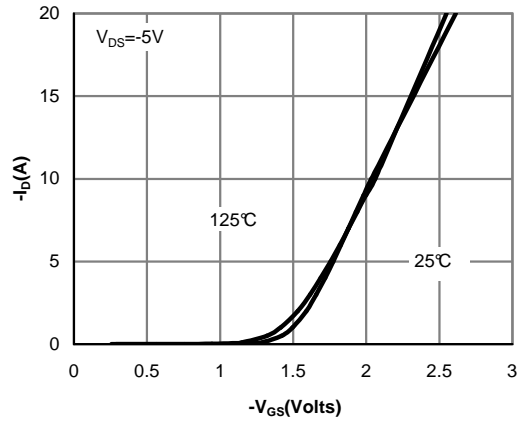
F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150°C. The SOA curve provides a single pulse rating.

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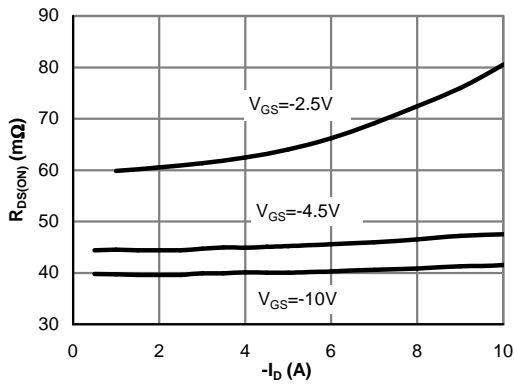
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



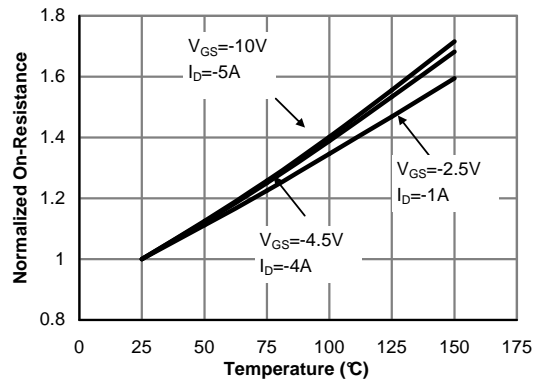
**Fig 1: On-Region Characteristics (Note E)**



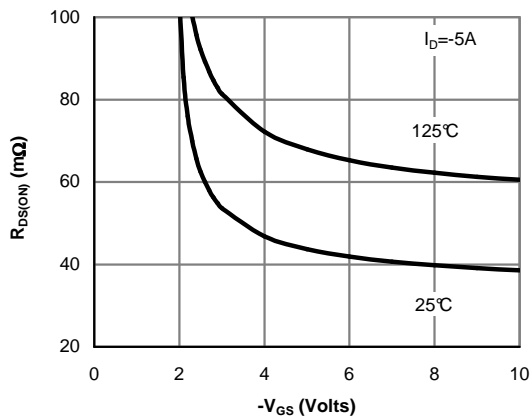
**Figure 2: Transfer Characteristics (Note E)**



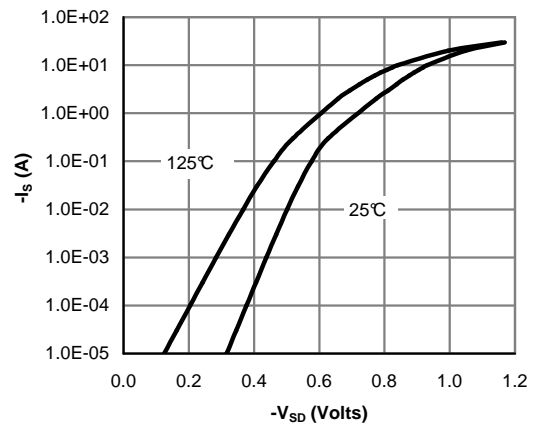
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



**Figure 4: On-Resistance vs. Junction Temperature (Note E)**

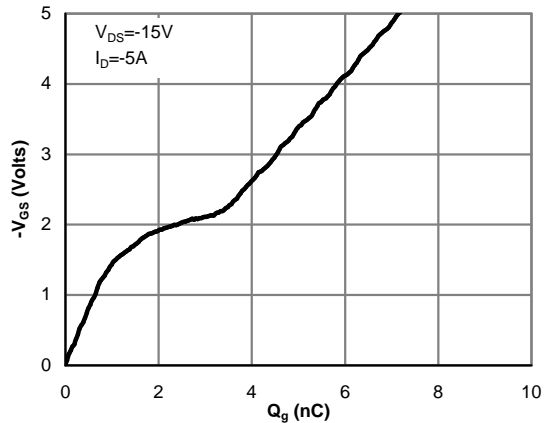


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

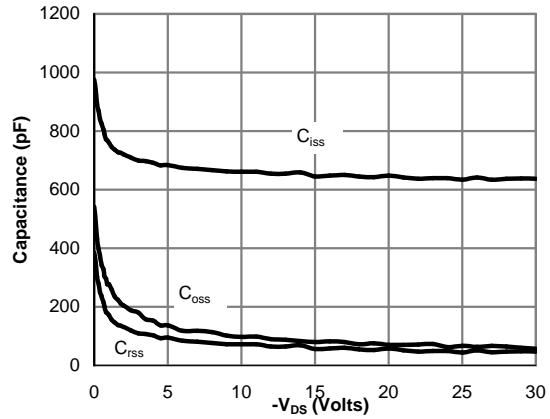


**Figure 6: Body-Diode Characteristics (Note E)**

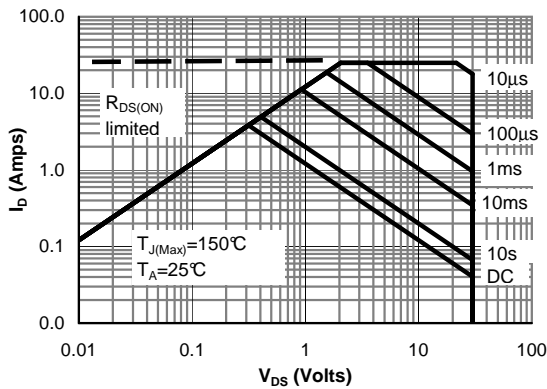
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



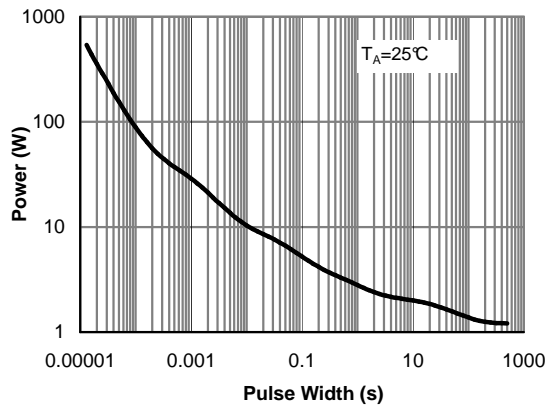
**Figure 7: Gate-Charge Characteristics**



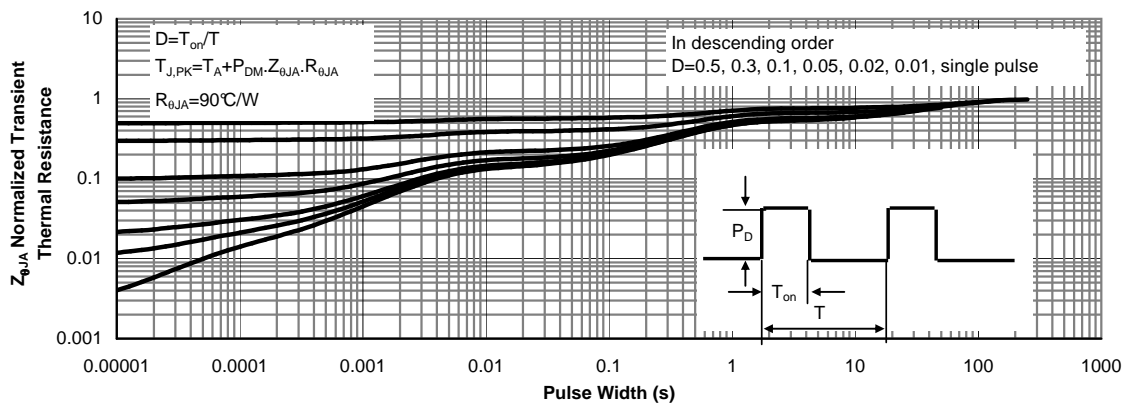
**Figure 8: Capacitance Characteristics**



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

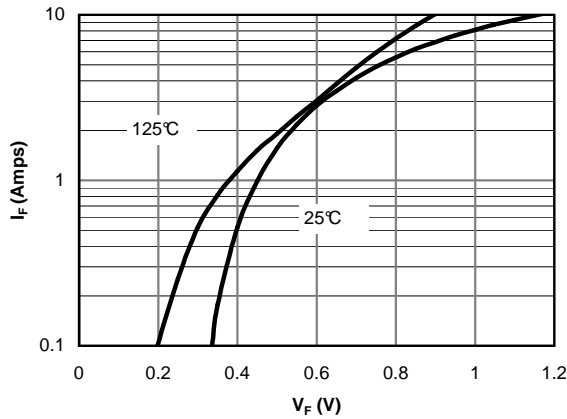


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)**

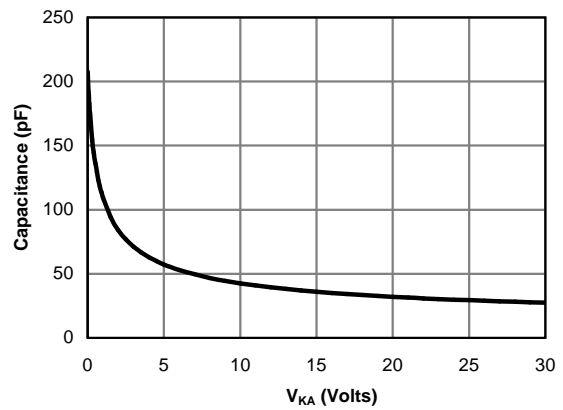


**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

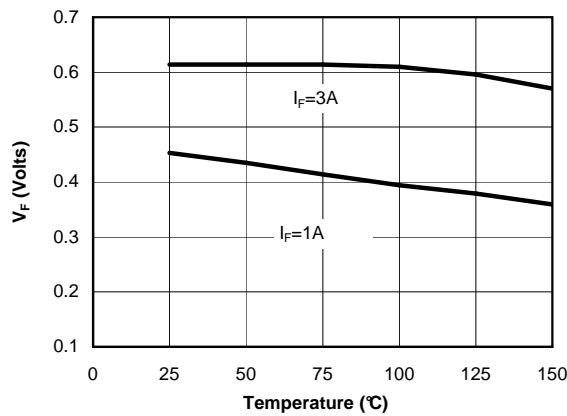
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



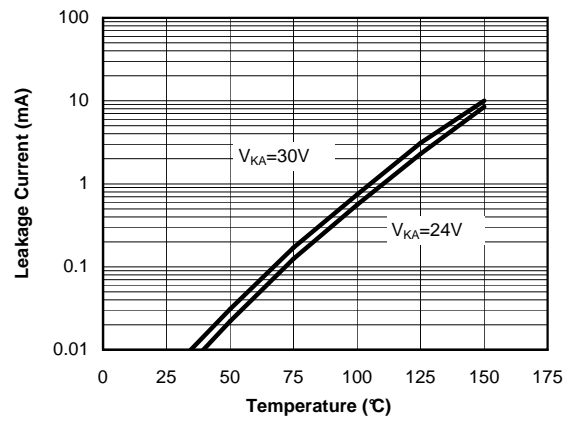
**Figure 12: Schottky Forward Characteristics**



**Figure 13: Schottky Capacitance Characteristics**

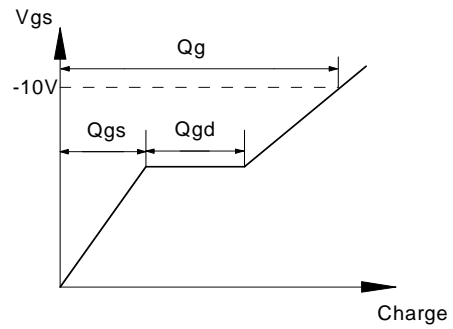
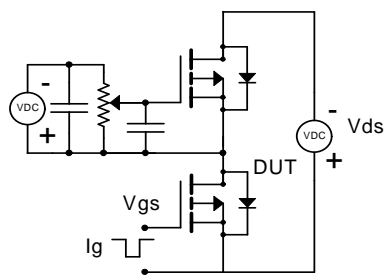


**Figure 14: Schottky Forward Drop vs. Junction Temperature**

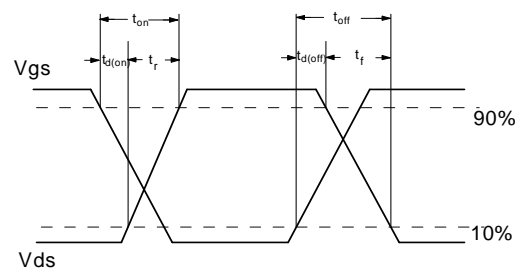
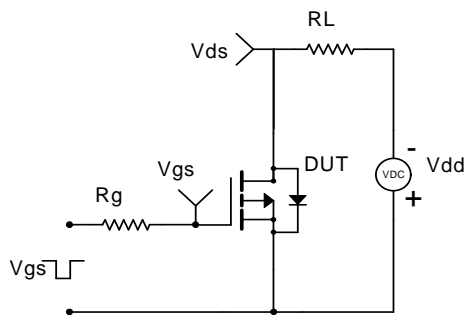


**Figure 15: Schottky Leakage Current vs. Junction Temperature**

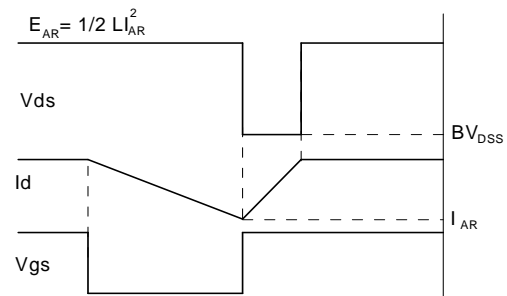
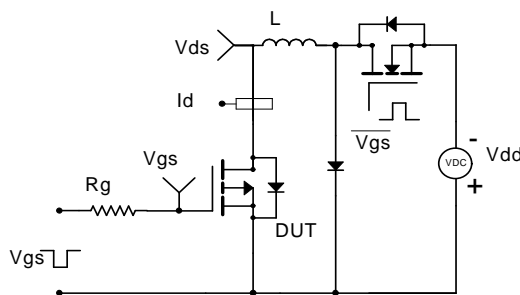
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching (UIS) Test Circuit & Waveforms**



**Diode Recovery Test Circuit & Waveforms**

