ALPHA & OMEGA SEMICONDUCTOR

AO3701
P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

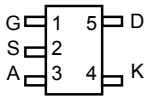
General Description

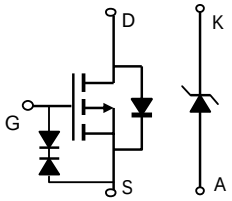
The AO3701 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for DC-DC conversion applications. It is ESD protected. *Standard Product AO3701 is Pb-free (meets ROHS & Sony 259 specifications). AO3701L is a Green Product ordering option. AO3701 and AO3701L are electrically identical.*

Features

V_{DS} (V) = -20V
I_D = -3A (V_{GS} = -10V)
$R_{DS(ON)}$ < 80mΩ (V_{GS} = -10V)
$R_{DS(ON)}$ < 100mΩ (V_{GS} = -4.5V)
$R_{DS(ON)}$ < 145mΩ (V_{GS} = -2.5V)
ESD Rating: 2000V HBM
SCHOTTKY
V_{DS} (V) = 20V, I_F = 1A, V_F<0.5V@0.5A

SOT-23-5
Top View





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	MOSFET	Schottky	Units
Drain-Source Voltage		V_{DS}	-20		V
Gate-Source Voltage		V_{GS}	±12		V
Continuous Drain Current [A]	T_A=25°C	I_D	-3		A
	T_A=70°C		-2.3		
Pulsed Drain Current [B]		I_{DM}	-10		
Schottky reverse voltage		V_{KA}		20	V
Continuous Forward Current [A]	T_A=25°C	I_F		2	A
	T_A=70°C			1	
Pulsed Forward Current [B]		I_{FM}		10	
Power Dissipation	T_A=25°C	P_D	1.14	0.92	W
	T_A=70°C		0.72	0.59	
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	$R_{\theta JA}$	80.3	110	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		117	150	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	43	80	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	109.4	135	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		136.5	175	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	58.5	80	

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	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-16V, V_{GS}=0V			-0.5	µA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±10V			±1	µA
		V_{DS}=0V, V_{GS}=±12V			±10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.6	-0.9	-1.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-10			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-3A		65	80	mΩ
		T_J=125°C		91	110	
		V_{GS}=-4.5V, I_D=-2A		82	100	mΩ
		V_{GS}=-2.5V, I_D=-1A		117	145	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3A		6.8		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V	-0.65	-0.8	-0.95	V
I_S	Maximum Body-Diode Continuous Current				-2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		512	620	pF
C_{oss}	Output Capacitance			77		pF
C_{rss}	Reverse Transfer Capacitance			62		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		9.2	13	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3A		5.5	6.6	nC
Q_{gs}	Gate Source Charge			0.8		nC
Q_{gd}	Gate Drain Charge			1.9		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-10V, R_L=2.8Ω, R_{GEN}=3Ω		5		ns
t_r	Turn-On Rise Time			6.7		ns
$t_{D(off)}$	Turn-Off DelayTime			28		ns
t_f	Turn-Off Fall Time			13.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-3A, dI/dt=100A/µs		9.8	12	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-3A, dI/dt=100A/µs		2.7		nC
SCHOTTKY PARAMETERS						
V_F	Forward Voltage Drop	I_F=0.5A		0.39	0.45	V
I_{rm}	Maximum reverse leakage current	V_R=16V			0.1	mA
		V_R=16V, T_J=125°C			20	
C_T	Junction Capacitance	V_R=10V		34		pF
t_{rr}	Schottky Reverse Recovery Time	I_F=1A, dI/dt=100A/µs		5.2	10	ns
Q_{rr}	Schottky Reverse Recovery Charge	I_F=1A, dI/dt=100A/µs		0.8		nC

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 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.

Rev1: May 2006

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

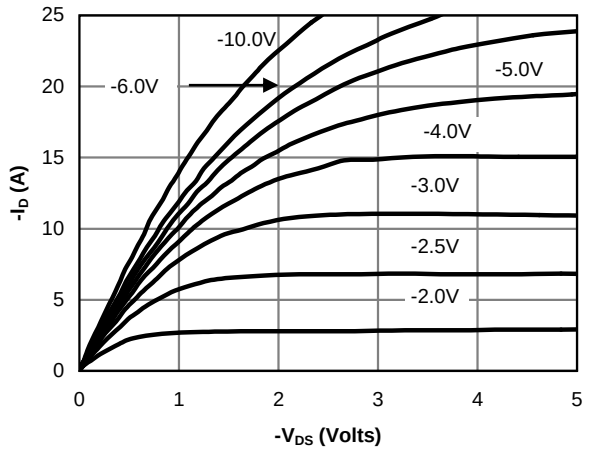


Fig 1: On-Region Characteristics

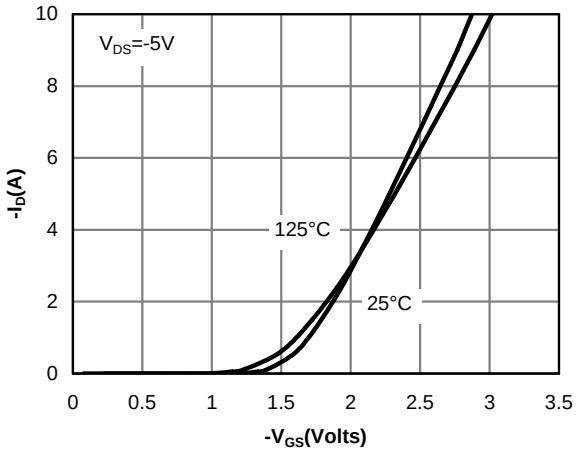


Figure 2: Transfer Characteristics

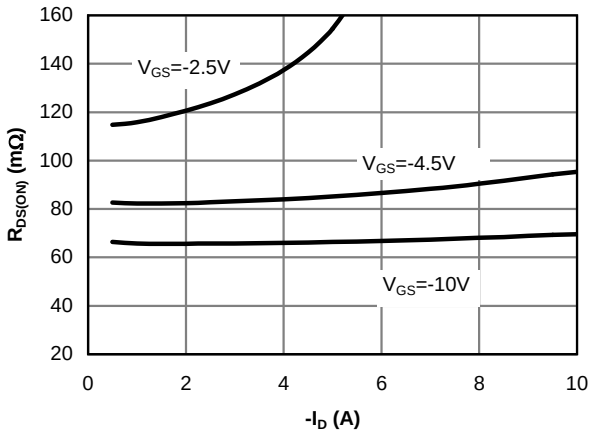


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

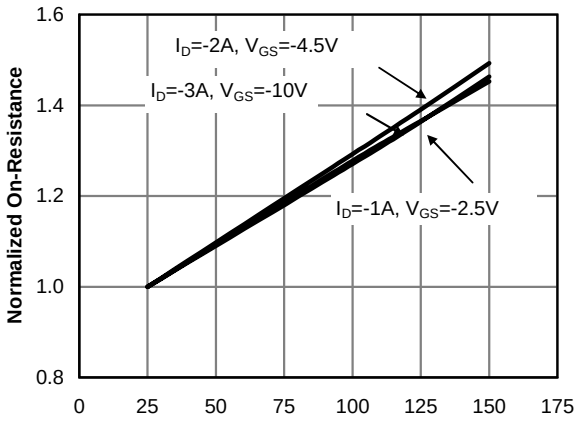


Figure 4: On-Resistance vs. Junction Temperature

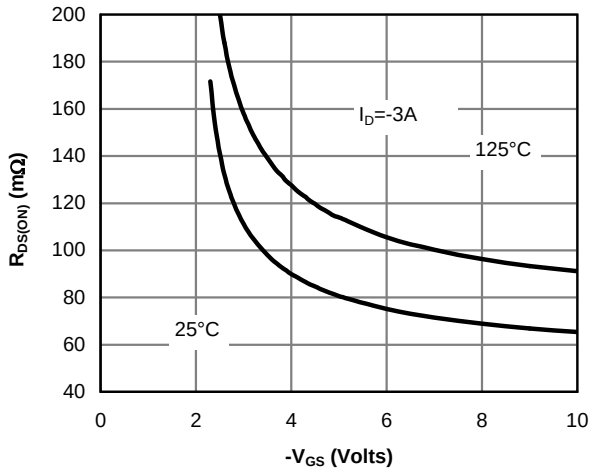


Figure 5: On-Resistance vs. Gate-Source Voltage

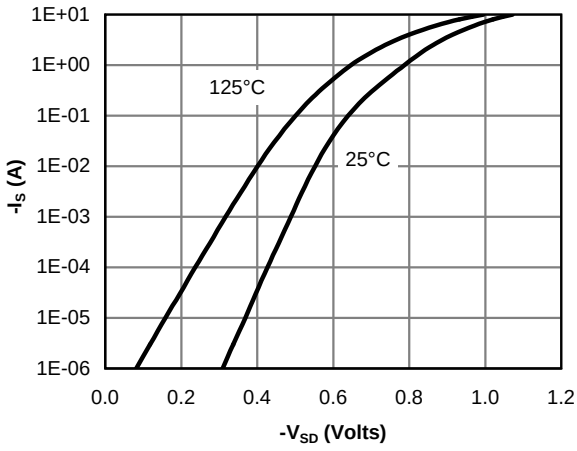


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

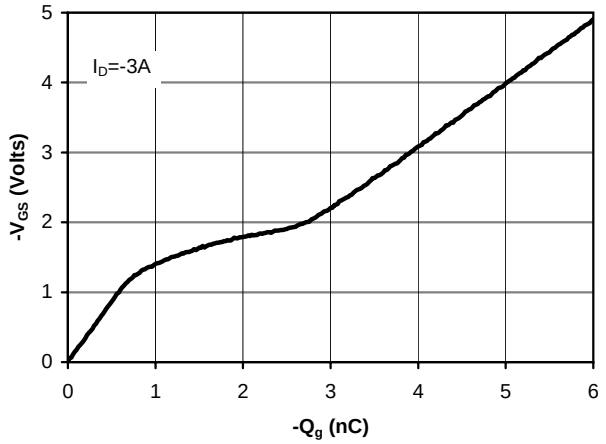


Figure 7: Gate-Charge Characteristics

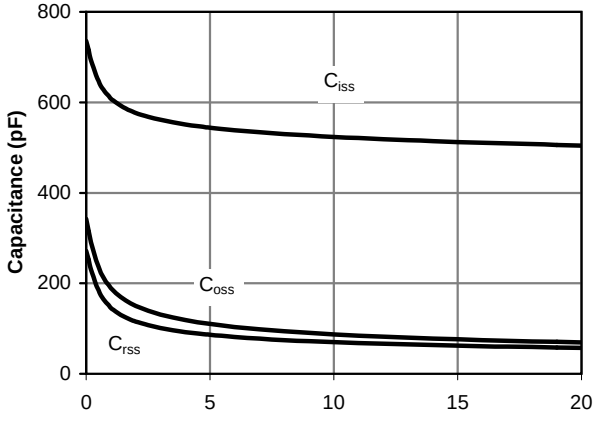


Figure 8: Capacitance Characteristics

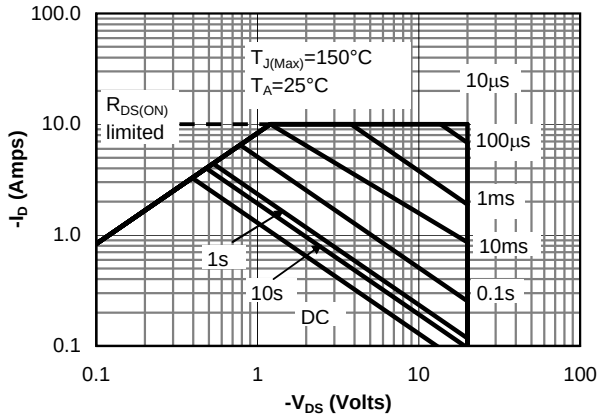


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

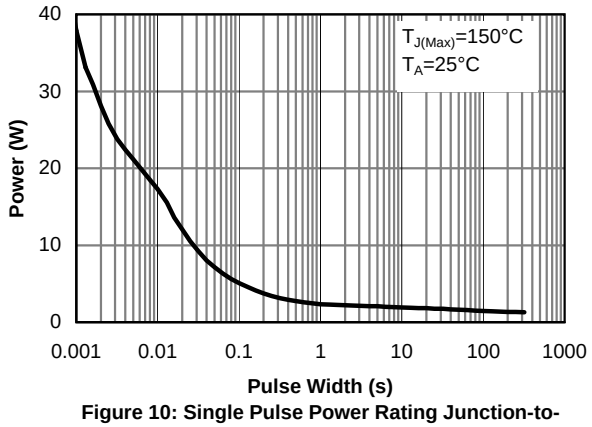


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

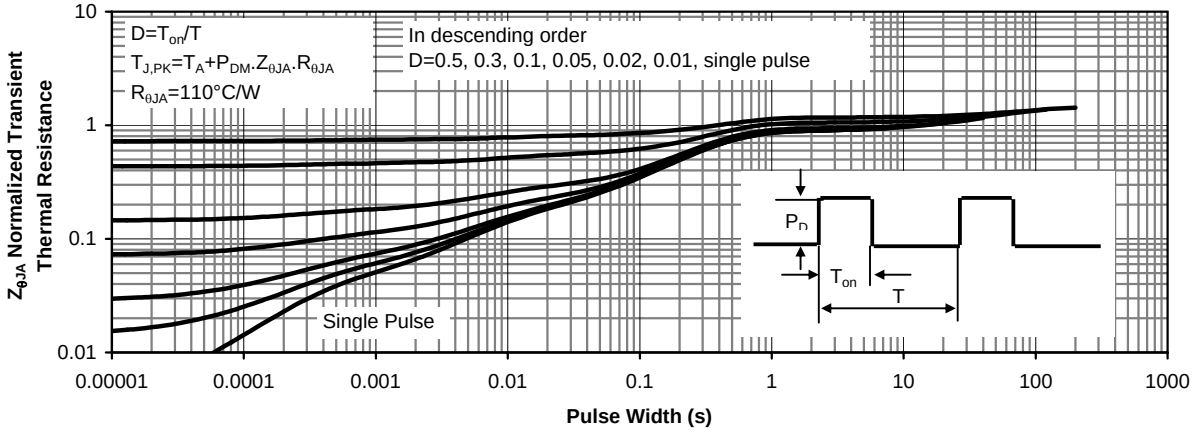


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

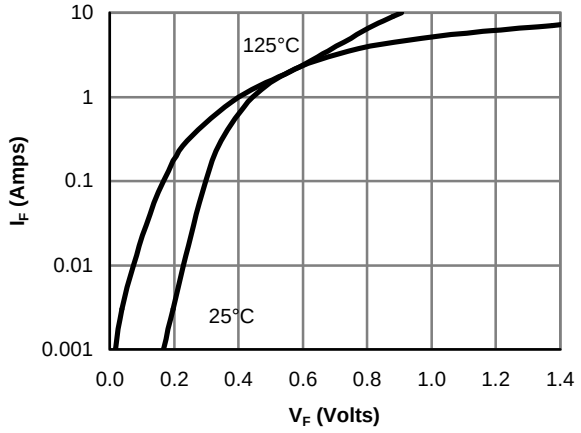


Figure 12: Schottky Forward Characteristics

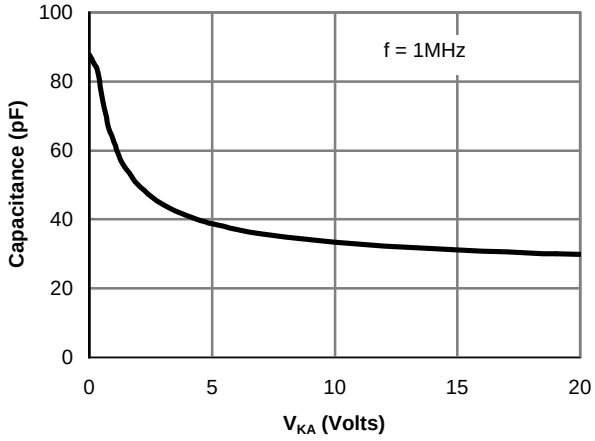


Figure 13: Schottky Capacitance Characteristics

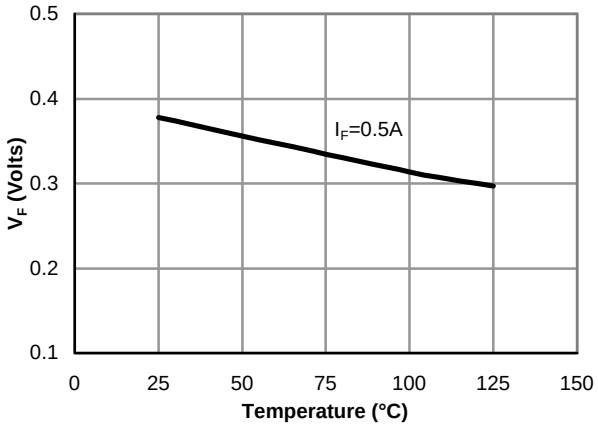


Figure 14: Schottky Forward Drop vs. Junction Temperature

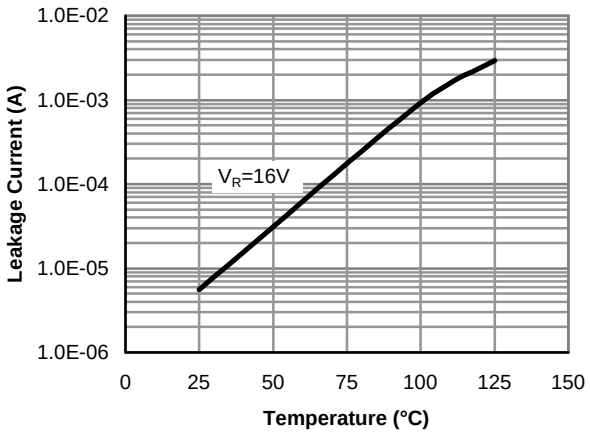


Figure 15: Schottky Leakage current vs. Junction Temperature

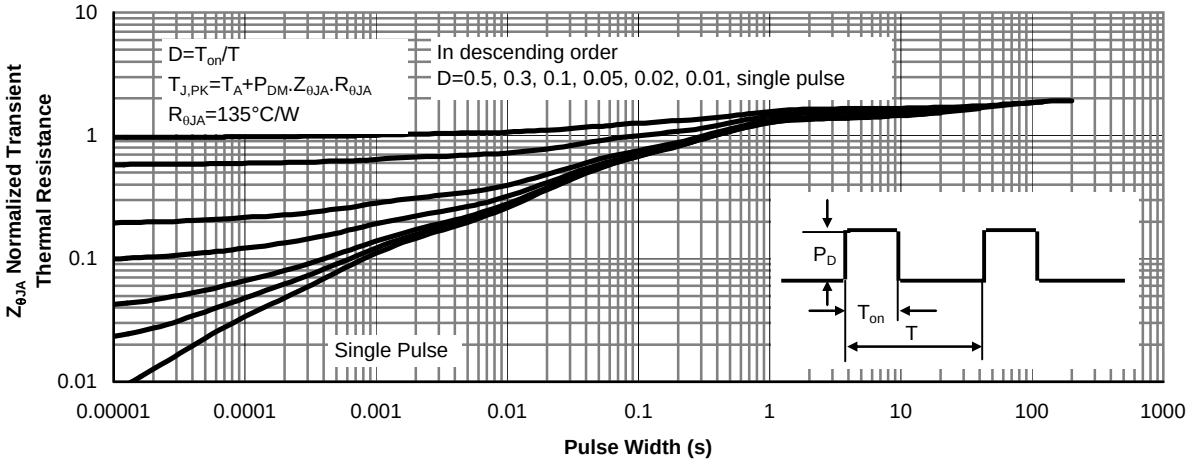


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance