ALPHA & OMEGA SEMICONDUCTOR

AO3705
P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

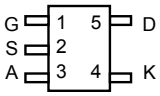
General Description

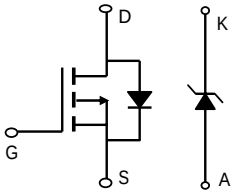
The AO3705/L uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for buck convertor applications.
AO3705 and AO3705L are electrically identical.
-RoHs Complaint
-AO3705L is Halogen Free

Features

V_{DS} (V) = -20V
I_D = -3.2A (V_{GS} = -4.5V)
$R_{DS(ON)}$ < 70mΩ (V_{GS} = -4.5V)
$R_{DS(ON)}$ < 90mΩ (V_{GS} = -2.5V)
$R_{DS(ON)}$ < 110mΩ (V_{GS} = -1.8V)
$R_{DS(ON)}$ < 130mΩ (V_{GS} = -1.5V)
SCHOTTKY
V_{DS} (V) = 20V, I_F = 1A, V_F<0.45V@1A

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}	±8		V
Continuous Drain Current [A]	T_A=25°C	I_D	-3.2		A
	T_A=70°C		-2.5		
Pulsed Drain Current [B]		I_{DM}	-25		
Schottky reverse voltage		V_{KA}		20	V
Continuous Forward Current [A]	T_A=25°C	I_F		1	A
	T_A=70°C			0.5	
Pulsed Forward Current [B]		I_{FM}		10	
Power Dissipation	T_A=25°C	P_D	1.15	0.66	W
	T_A=70°C		0.7	0.42	
Junction and Storage Temperature Range		T_J, T_{STG}	-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	$R_{\theta JA}$	153	190	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		173	220	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	103	140	

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}=-20V, V_{GS}=0V			-1	µA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.5	-0.65	-1	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-3.2A		56	70	mΩ
		T_J=125°C		80	100	
		V_{GS}=-2.5V, I_D=-2.8A		70	90	mΩ
		V_{GS}=-1.8V, I_D=-2A		85	110	mΩ
		V_{GS}=-1.5V, I_D=-0.5A		100	130	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3.2A		15		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current				-1.2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		560	745	pF
C_{oss}	Output Capacitance			80		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		15	23	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3.2A		8.5	11	nC
Q_{gs}	Gate Source Charge			1.2		nC
Q_{gd}	Gate Drain Charge			2.1		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=3Ω, R_{GEN}=6Ω		7.2		ns
t_r	Turn-On Rise Time			36		ns
$t_{D(off)}$	Turn-Off DelayTime			53		ns
t_f	Turn-Off Fall Time			56		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-3.2A, dI/dt=100A/µs		37	49	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-3.2A, dI/dt=100A/µs		27		nC
SCHOTTKY PARAMETERS						
V_F	Forward Voltage Drop	I_F=1A		0.4	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		44		pF
t_{rr}	Schottky Reverse Recovery Time	I_F=1A, dI/dt=100A/µs		11	14	ns
Q_{rr}	Schottky Reverse Recovery Charge	I_F=1A, dI/dt=100A/µs		2.5		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 <300 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 2008

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

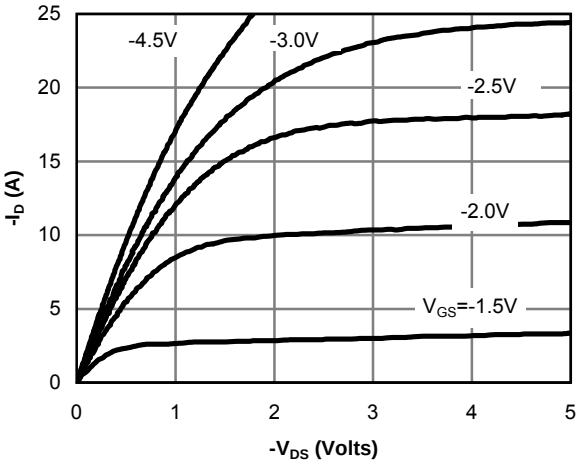


Figure 1: On-Region Characteristics

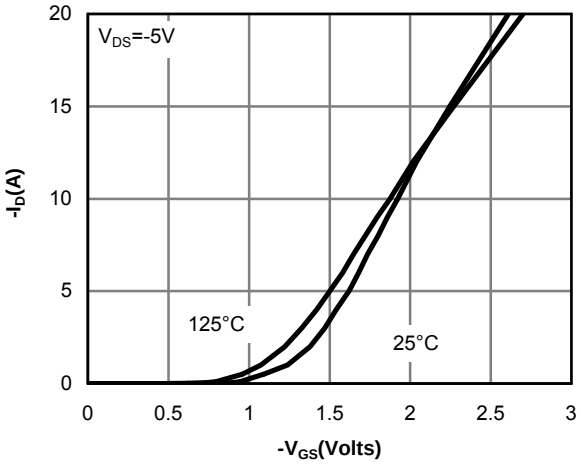


Figure 2: Transfer Characteristics

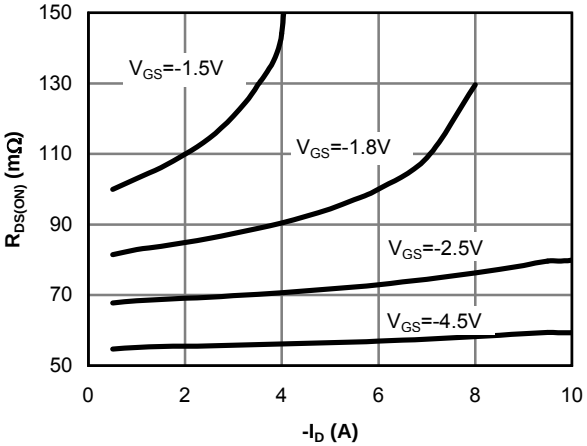


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

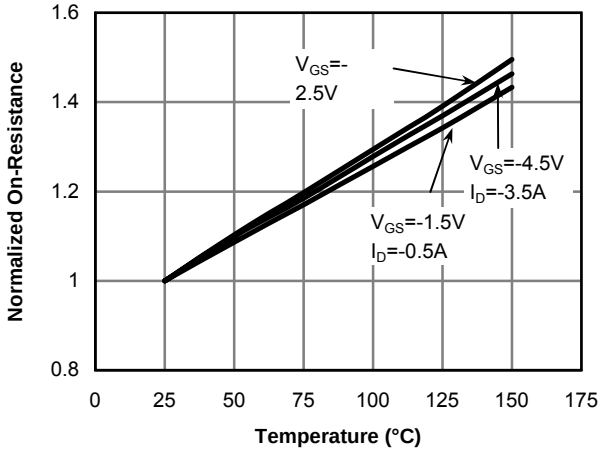


Figure 4: On-Resistance vs. Junction Temperature

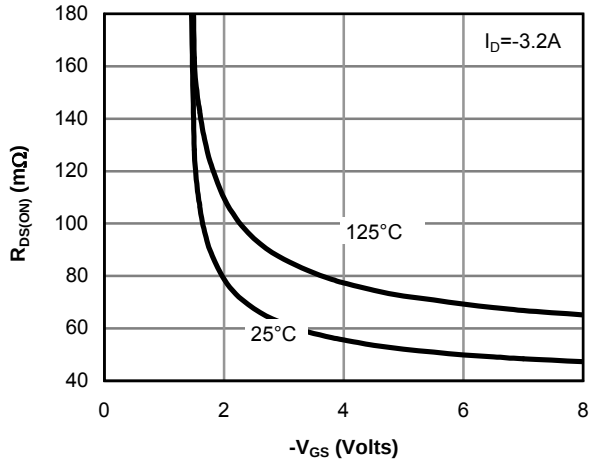


Figure 5: On-Resistance vs. Gate-Source Voltage

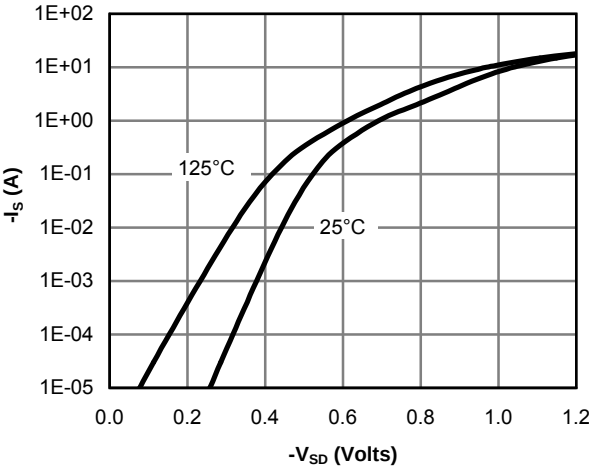


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

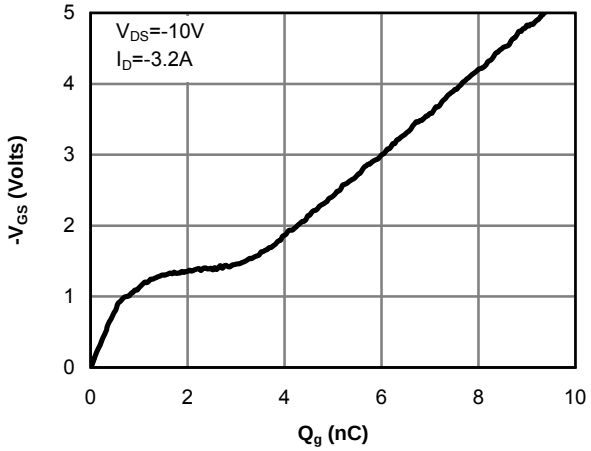


Figure 7: Gate-Charge Characteristics

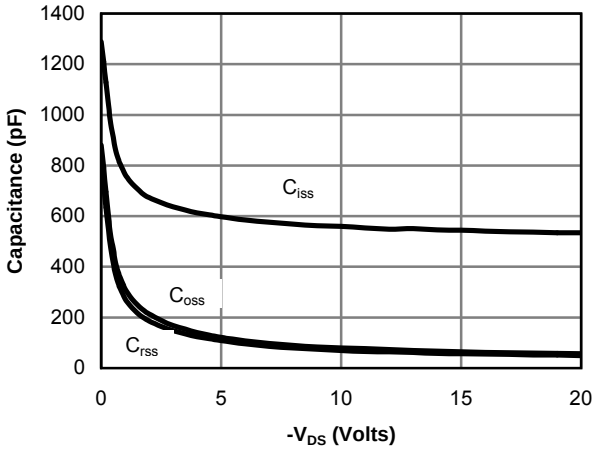


Figure 8: Capacitance Characteristics

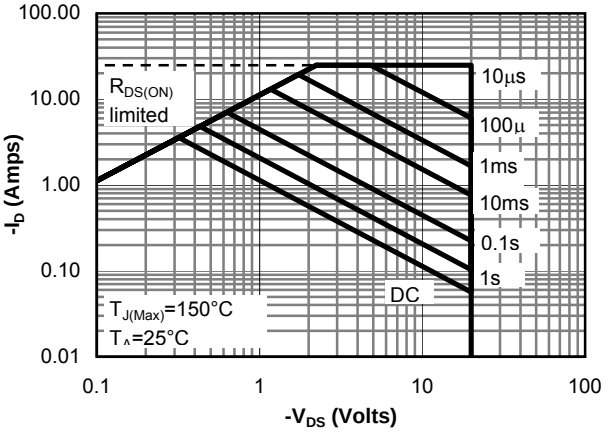


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

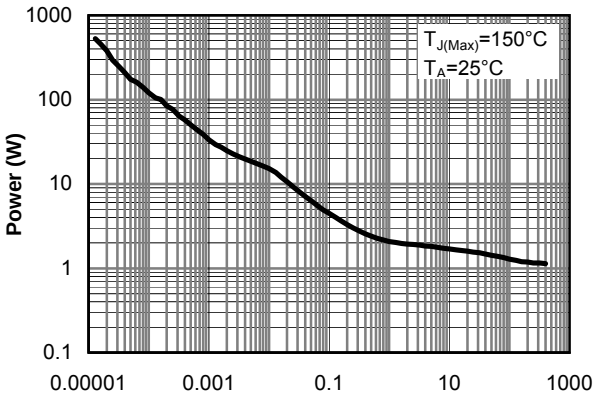


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

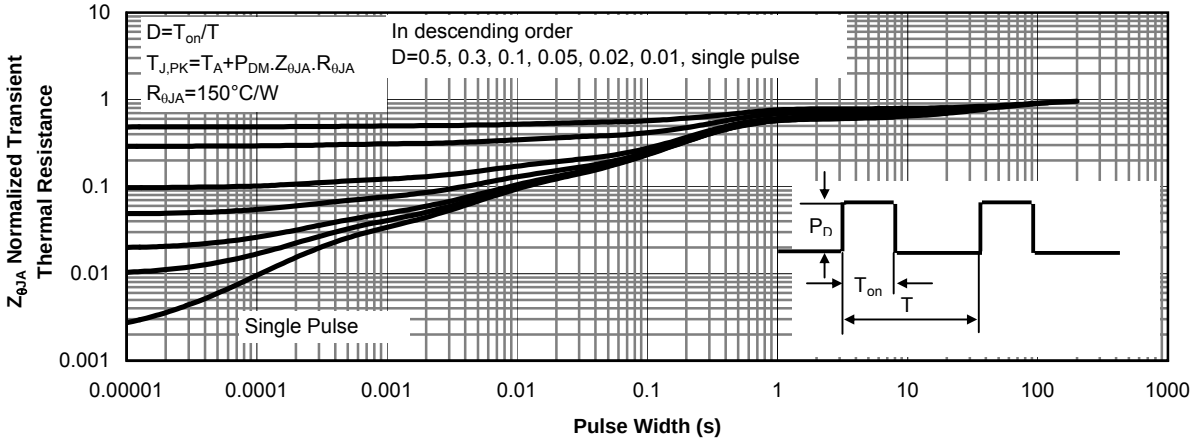


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

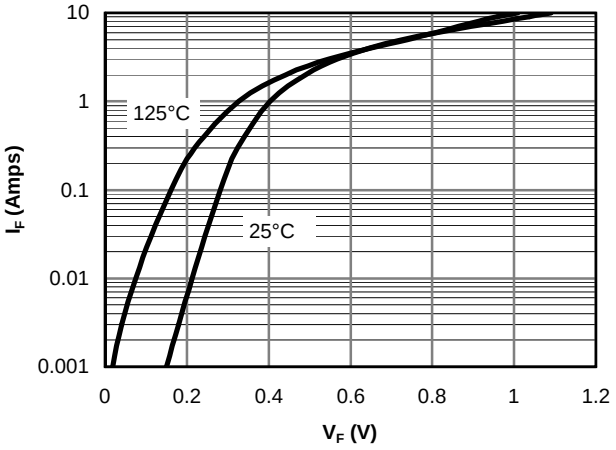


Figure 12: Schottky Forward Characteristics

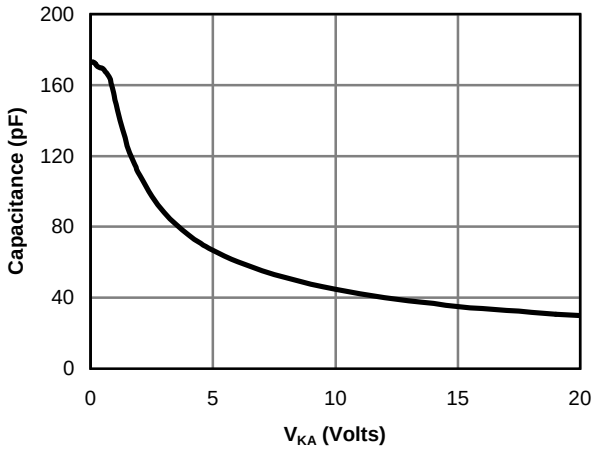


Figure 13: Schottky Capacitance Characteristics

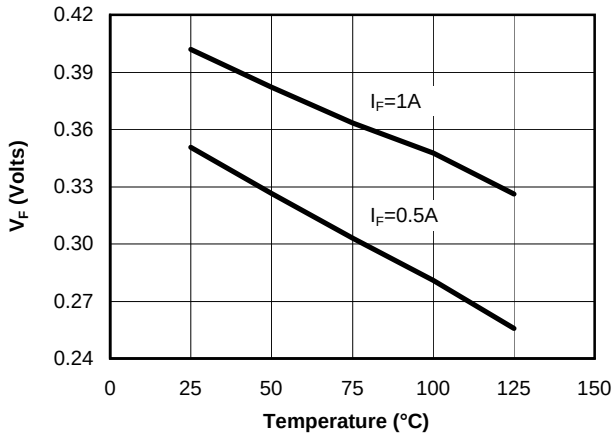


Figure 14: Schottky Forward Drop vs. Junction Temperature

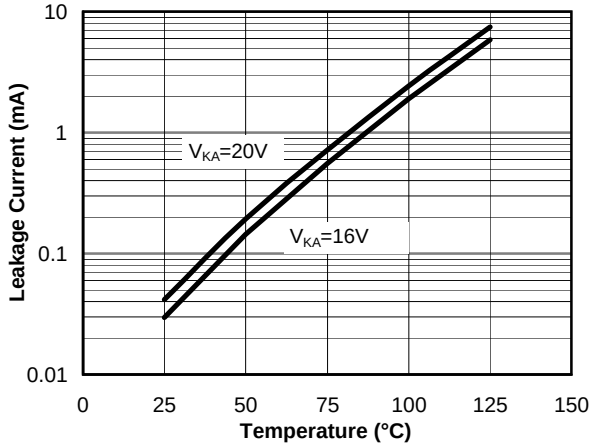


Figure 15: Schottky Leakage Current vs. Junction Temperature

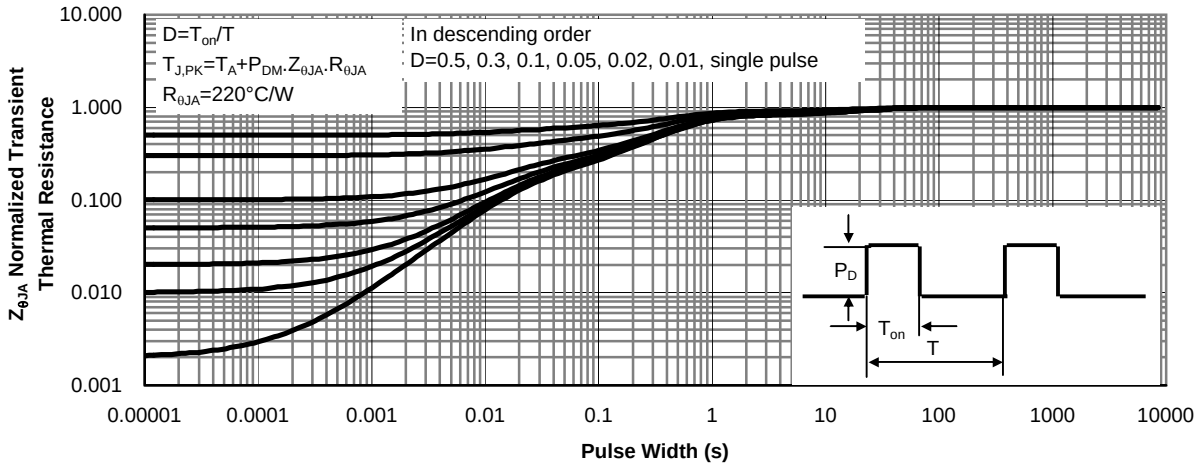


Figure 16: Schottky Normalized Maximum Transient Thermal Impedance