

AO6702
N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode
General Description

The AO6702 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. *Standard Product AO6702 is Pb-free (meets ROHS & Sony 259 specifications). AO6702L is a Green Product ordering option. AO6702 and AO6702L are electrically identical.*

Features

$V_{DS} (V) = 20V$
 $I_D = 3.8A (V_{GS} = 4.5V)$
 $R_{DS(ON)} < 50m\Omega (V_{GS} = 4.5V)$
 $R_{DS(ON)} < 65m\Omega (V_{GS} = 2.5V)$
 $R_{DS(ON)} < 95m\Omega (V_{GS} = 1.8V)$
SCHOTTKY
 $V_{DS} (V) = 20V, I_F = 1A, V_F < 0.5V @ 0.5A$


Absolute Maximum Ratings $T_A=25^\circ C$ 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	I_D	$T_A=25^\circ C$	3.8	A
		$T_A=70^\circ C$	3	
Pulsed Drain Current ^B	I_{DM}	10		
Schottky reverse voltage	V_{KA}		20	V
Continuous Forward Current ^A	I_F	$T_A=25^\circ C$	2	A
		$T_A=70^\circ C$	1	
Pulsed Forward Current ^B	I_{FM}		10	
Power Dissipation	P_D	$T_A=25^\circ C$	1.15	W
		$T_A=70^\circ C$	0.7	
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 ^A	$t \leq 10s$	$R_{\theta JA}$	80.3	110	$^\circ C/W$
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	$t \leq 10s$	$R_{\theta JA}$	109.4	135	$^\circ C/W$
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 T _J =55°C			1 5	μA
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	0.4	0.6	1	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} =4.5V, I _D =3.8A T _J =125°C		41.6 63	50 80	mΩ
		V _{GS} =2.5V, I _D =3.3A		54	65	
		V _{GS} =1.8V, I _D =2.8A		74	95	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =3.8A		10.5		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.8	1	V
I _S	Maximum Body-Diode Continuous Current				1.8	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =10V, f=1MHz		449		pF
C _{oss}	Output Capacitance			74		pF
C _{rss}	Reverse Transfer Capacitance			51.6		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		4.9		Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =10V, I _D =3.8A		5.9		nC
Q _{gs}	Gate Source Charge			0.36		nC
Q _{gd}	Gate Drain Charge			1.3		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =5V, V _{DS} =10V, R _L =2.6Ω, R _{GEN} =0Ω		4.5		ns
t _r	Turn-On Rise Time			6		ns
t _{D(off)}	Turn-Off DelayTime			32.7		ns
t _f	Turn-Off Fall Time			7.1		ns
t _{rr}	Body Diode Reverse Recovery Time		I _F =3.8A, di/dt=100A/μs		13	
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =3.8A, di/dt=100A/μs		3.3		nC
SCHOTTKY PARAMETERS						
V _F	Forward Voltage Drop	I _F =0.5A		0.39	0.5	V
I _{rm}	Maximum reverse leakage current	V _R =16V			0.02	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_{θJA} is measured with the device mounted on 1in² 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_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

Rev3: August 2005

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

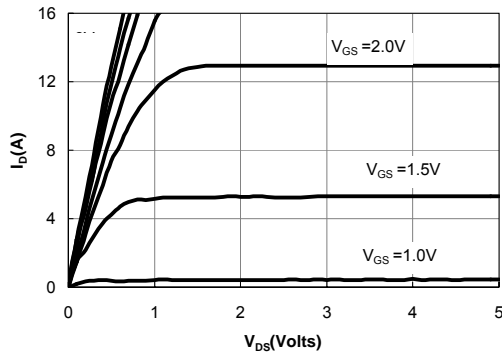


Figure 1: On-Regions Characteristics

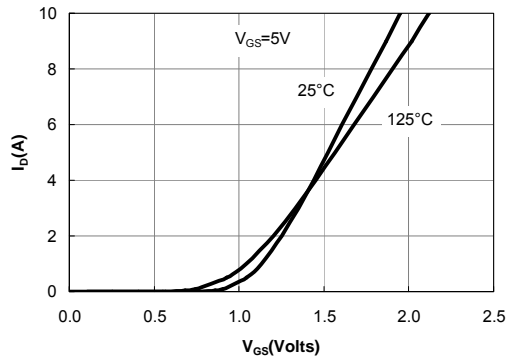


Figure 2: Transfer Characteristics

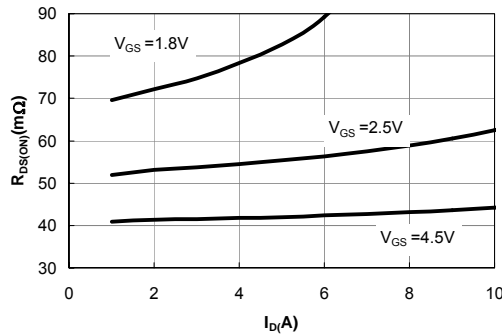


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

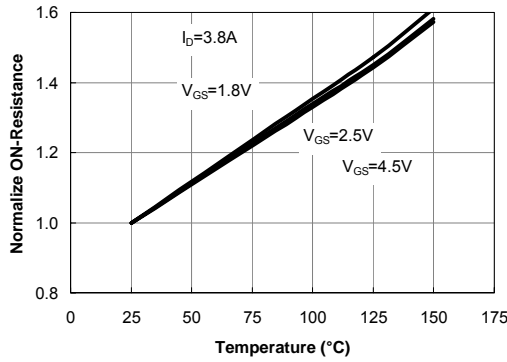


Figure 4: On-Resistance vs. Junction Temperature

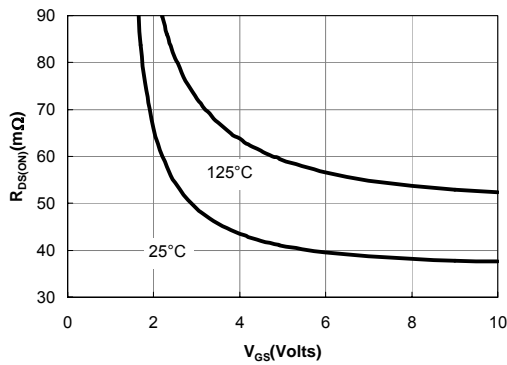


Figure 5: On-Resistance vs. Gate-Source Voltage

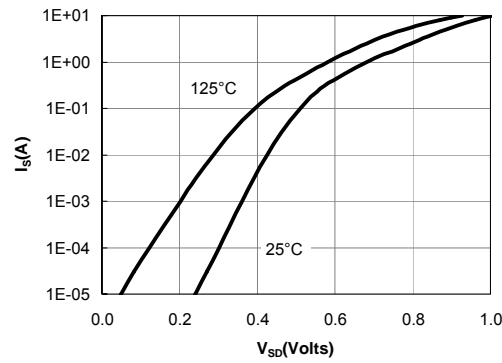


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

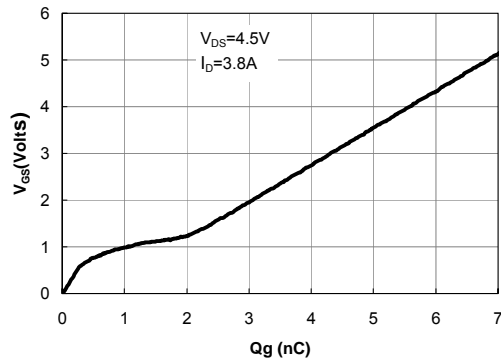


Figure 7: Gate-Charge Characteristics

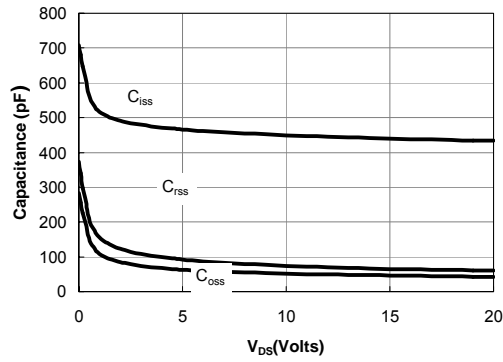


Figure 8: Capacitance Characteristics

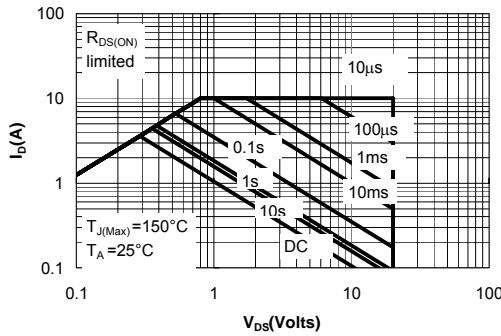


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

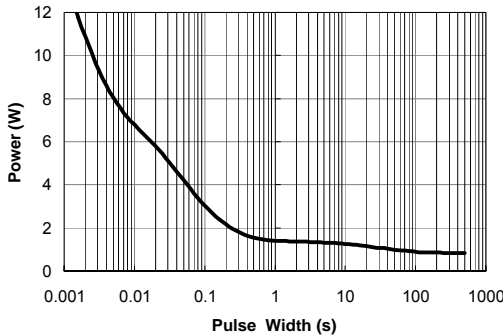


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

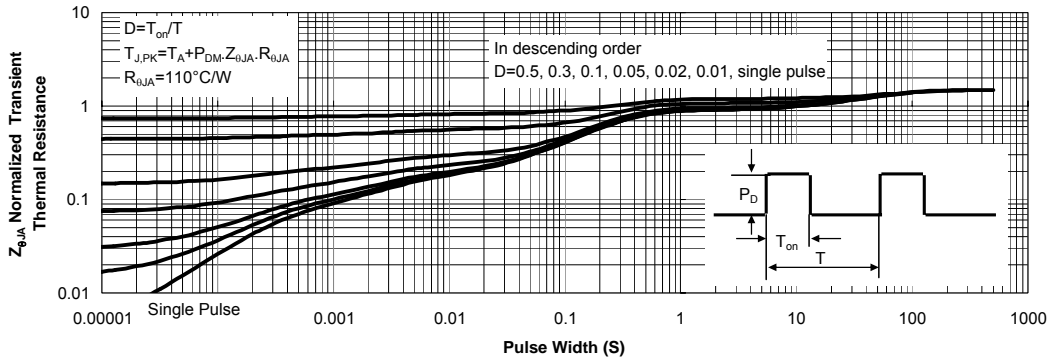


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

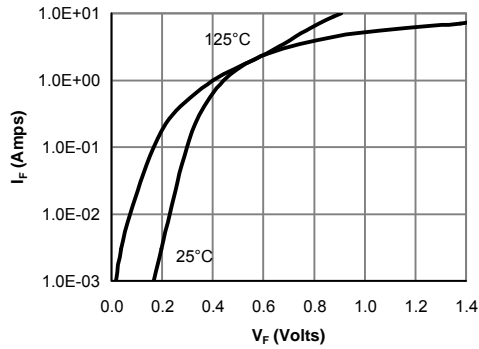


Figure 12: Schottky Forward Characteristics

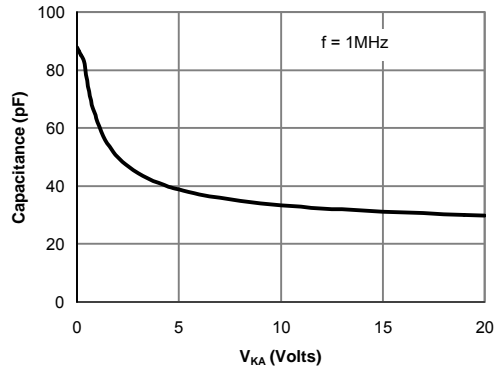


Figure 13: Schottky Capacitance Characteristics

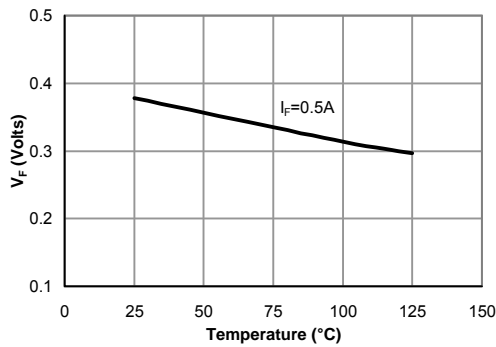


Figure 14: Schottky Forward Drop vs. Junction Temperature

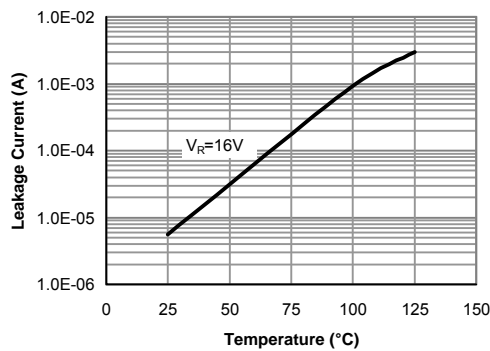


Figure 15: Schottky Leakage current vs. Junction Temperature

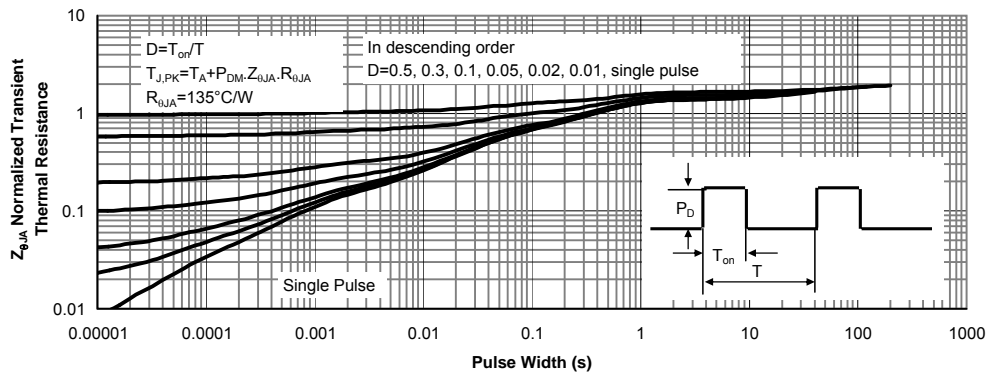


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance