ALPHA & OMEGA SEMICONDUCTOR

AO6704
N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

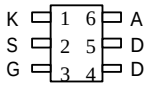
General Description

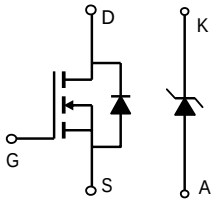
The AO6704 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for DC-DC conversion applications. *Standard Product AO6704 is Pb-free (meets ROHS & Sony 259 specifications). AO6704L is a Green Product ordering option. AO6704 and AO6704L are electrically identical.*

Features

V_{DS} (V) = 30V
I_D = 3.6A (V_{GS} = 10V)
$R_{DS(ON)}$ < 65mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 75mΩ (V_{GS} = 4.5V)
$R_{DS(ON)}$ < 160mΩ (V_{GS} = 2.5V)
SCHOTTKY
V_{DS} (V) = 20V, I_F = 1A, V_F<0.5V@0.5A

TSOP6
Top View





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	MOSFET	Schottky	Units
Drain-Source Voltage		V_{DS}	30		V
Gate-Source Voltage		V_{GS}	±12		V
Continuous Drain Current [A]	T_A=25°C	I_D	3.6		A
	T_A=70°C		2.9		
Pulsed Drain Current [B]		I_{DM}	10		
Schottky reverse voltage		V_{KA}		20	V
Continuous Forward Current [A]	T_A=25°C	I_F		1.5	A
	T_A=70°C			1	
Pulsed Forward Current [B]		I_{FM}		10	
Power Dissipation	T_A=25°C	P_D	1.39	0.78	W
	T_A=70°C		0.89	0.5	
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	$R_{\theta JA}$	70	90	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		102	130	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	51	80	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	129	160	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		158	200	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	52	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	30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=24V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±12V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	1	1.4	1.8	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=3.6A		44	65	mΩ
		T_J=125°C		64	90	
		V_{GS}=4.5V, I_D=3.4A		53	75	mΩ
		V_{GS}=2.5V, I_D=1A		106	160	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=3.6A		11.7		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.81	1	V
I_S	Maximum Body-Diode Continuous Current				2.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		226	270	pF
C_{oss}	Output Capacitance			39		pF
C_{rss}	Reverse Transfer Capacitance			29		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.4	1.7	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=15V, I_D=3.6A		3	3.6	nC
Q_{gs}	Gate Source Charge			1.4		nC
Q_{gd}	Gate Drain Charge			0.55		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=3.9Ω, R_{GEN}=6Ω		2.6		ns
t_r	Turn-On Rise Time			3.2		ns
$t_{D(off)}$	Turn-Off DelayTime			14.5		ns
t_f	Turn-Off Fall Time			2.1		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=3.6A, dI/dt=100A/µs		10.2	13	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=3.6A, dI/dt=100A/µs		3.8		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			0.1	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 80µs 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.

Rev 3 : June 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

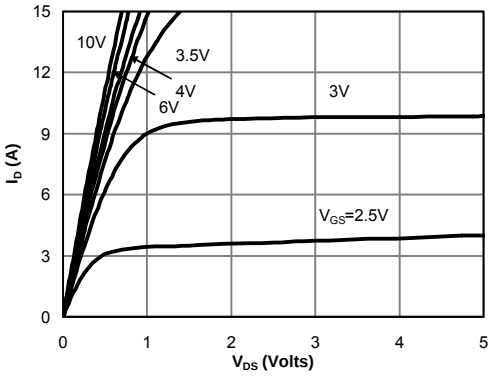


Fig 1: On-Region Characteristics

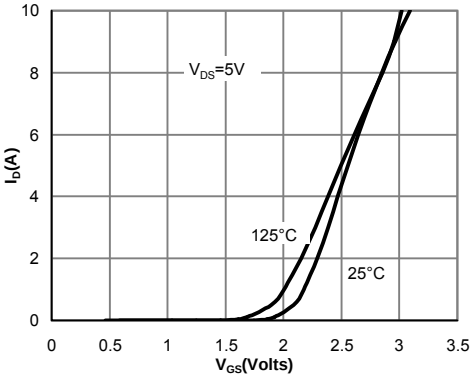


Figure 2: Transfer Characteristics

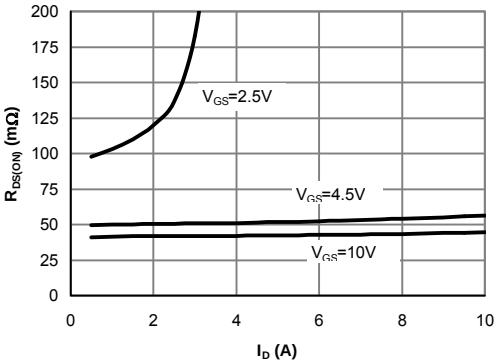


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

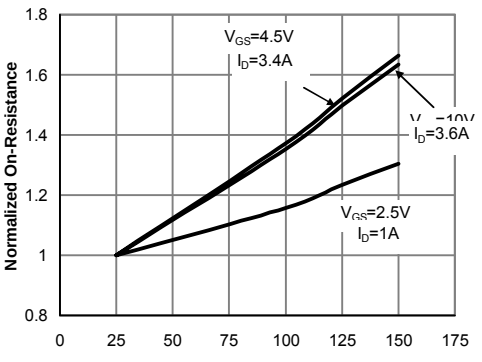


Figure 4: On-Resistance vs. Junction Temperature

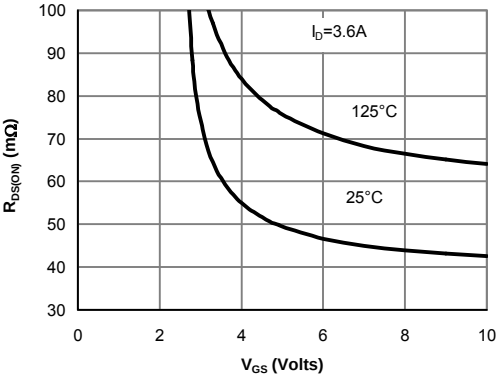


Figure 5: On-Resistance vs. Gate-Source Voltage

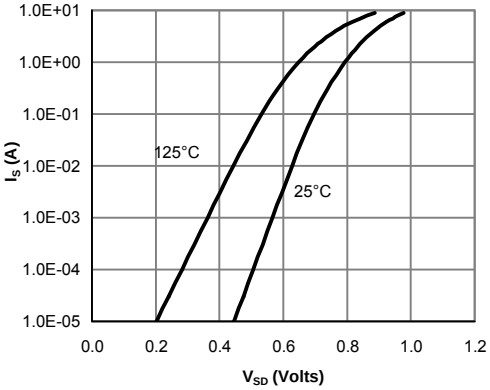


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

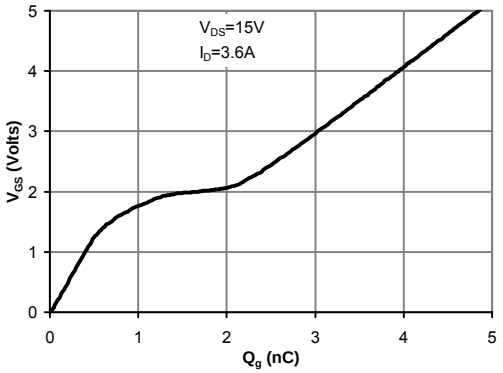


Figure 7: Gate-Charge Characteristics

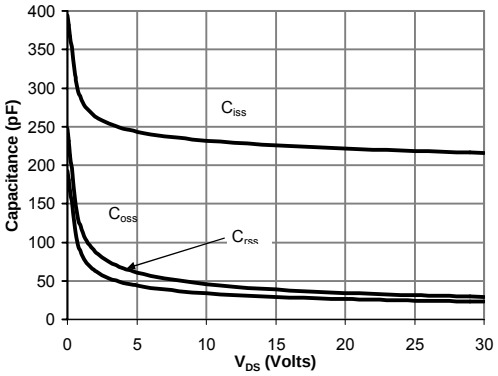


Figure 8: Capacitance Characteristics

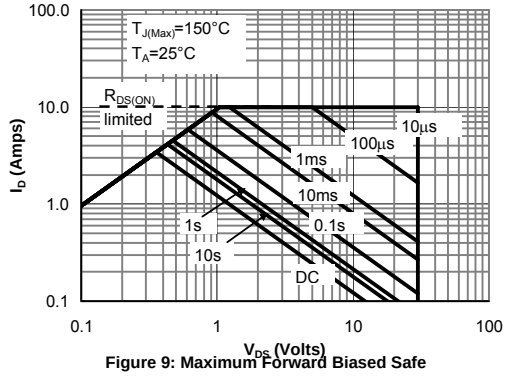


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

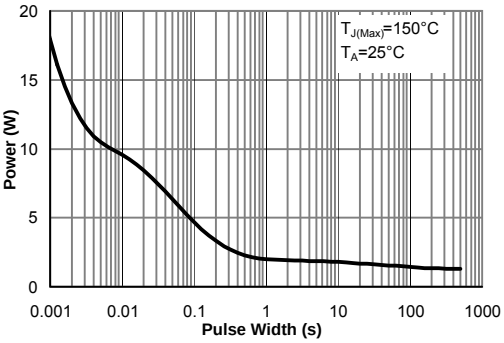


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

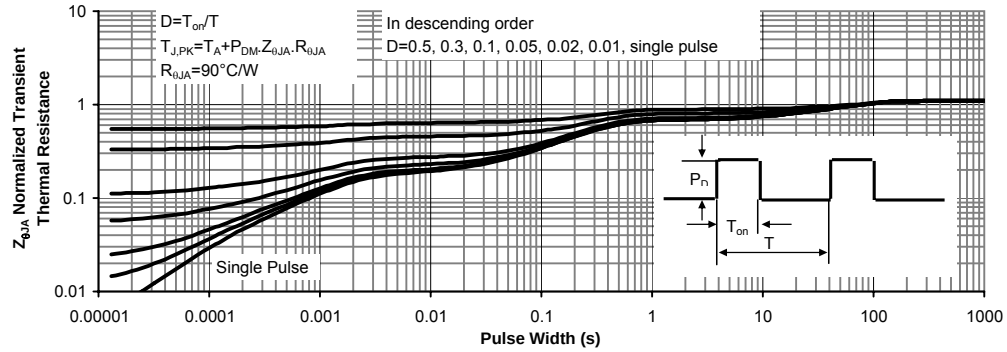


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

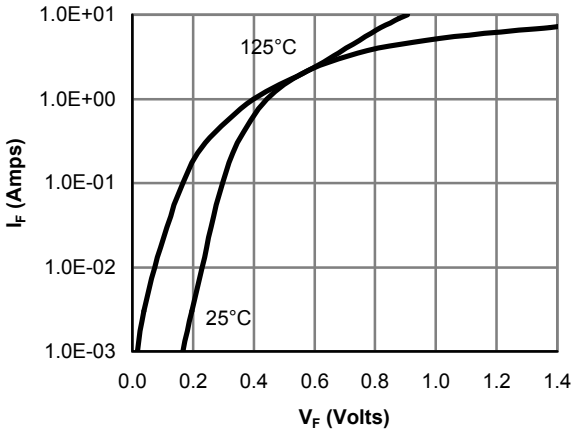


Figure 12: Schottky Forward Characteristics

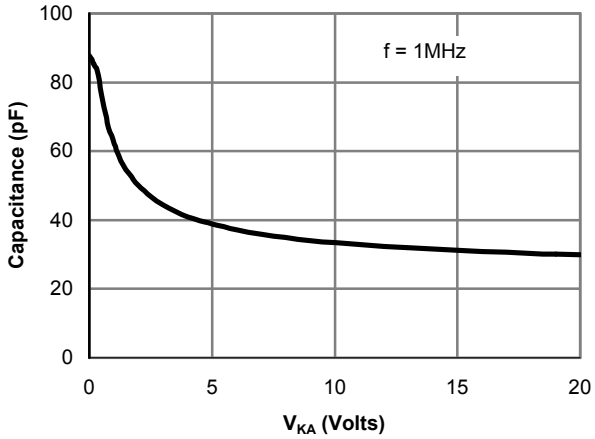


Figure 13: Schottky Capacitance Characteristics

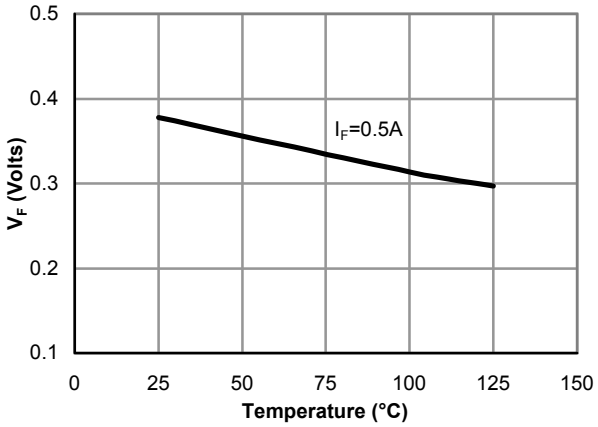


Figure 14: Schottky Forward Drop vs. Junction Temperature

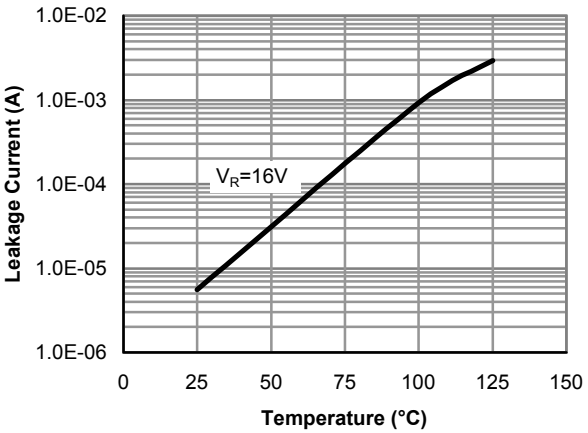


Figure 15: Schottky Leakage current vs. Junction Temperature

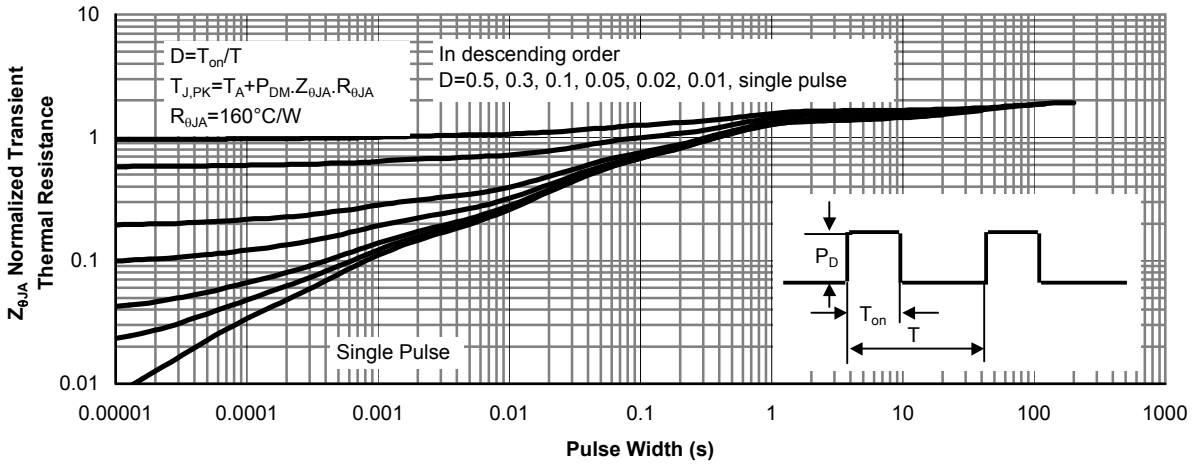


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance