ALPHA & OMEGA SEMICONDUCTOR

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

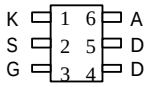
General Description

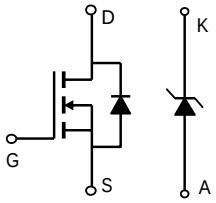
The AO6704 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for DC-DC conversion applications. *Standard Product AO6704 is Pb-free (meets ROHS & Sony 259 specifications).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

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

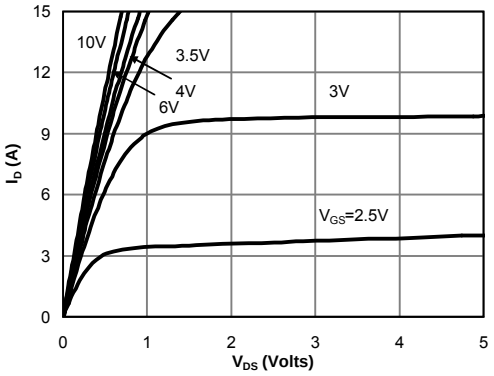

Fig 1: On-Region Characteristics

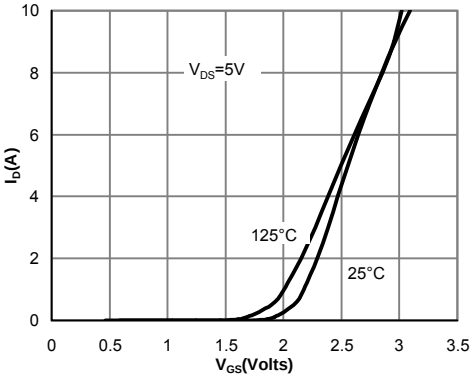

Figure 2: Transfer Characteristics

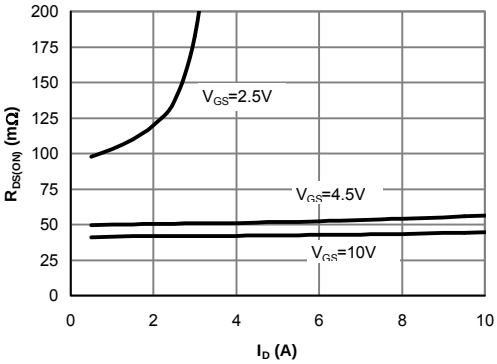

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

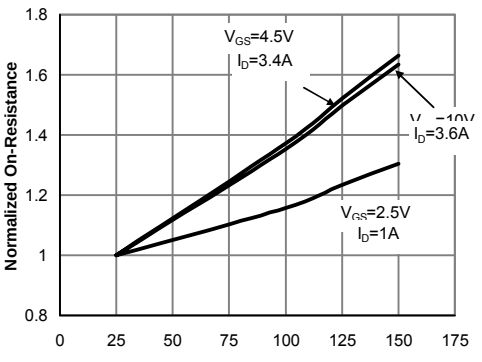

Figure 4: On-Resistance vs. Junction Temperature

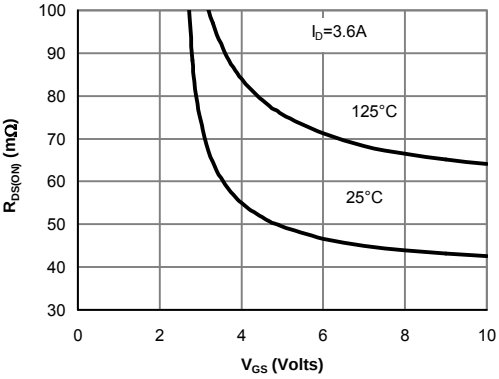

Figure 5: On-Resistance vs. Gate-Source Voltage

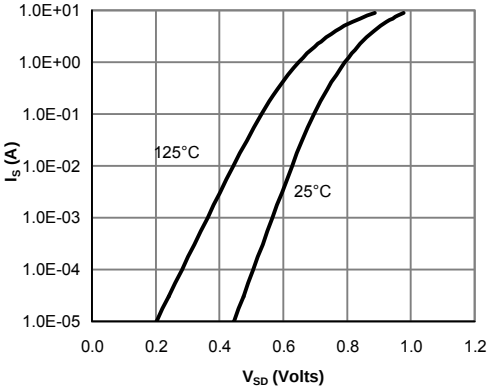

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

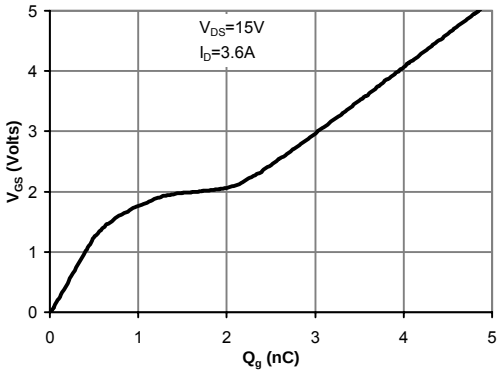

Figure 7: Gate-Charge Characteristics

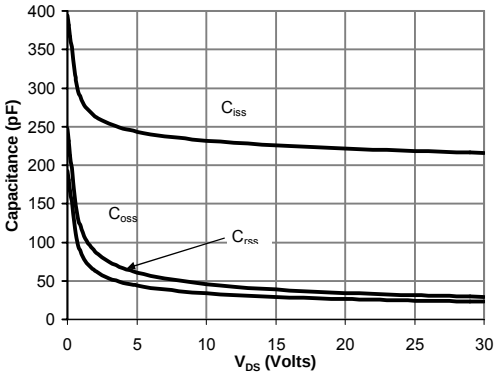

Figure 8: Capacitance Characteristics

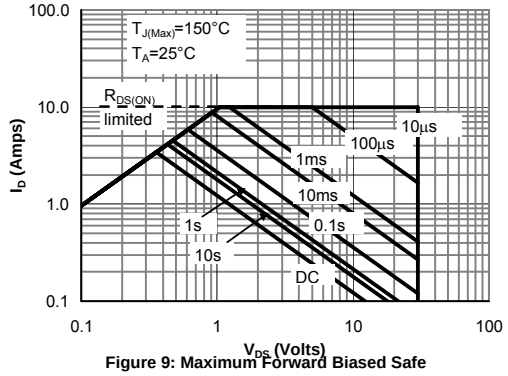

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

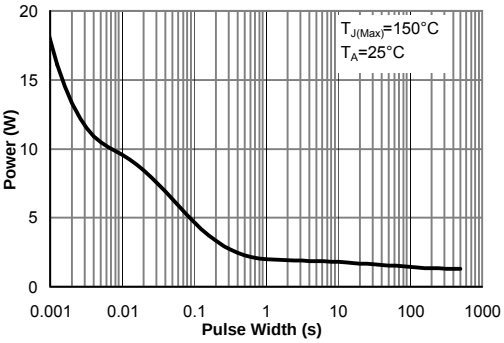

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

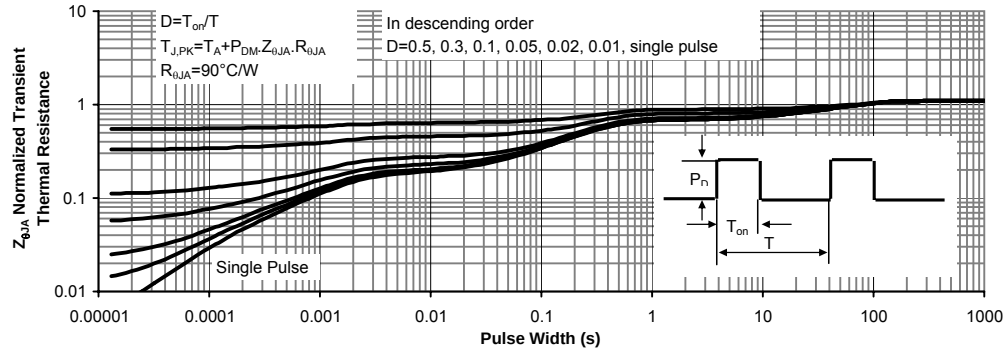

Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

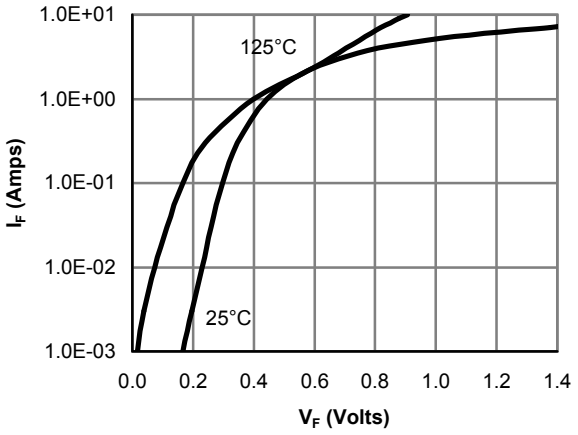

Figure 12: Schottky Forward Characteristics

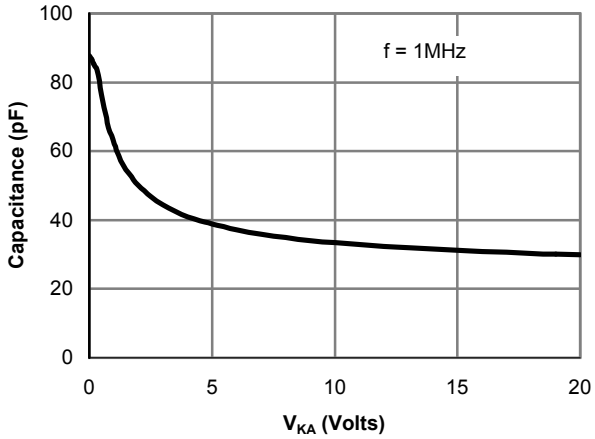

Figure 13: Schottky Capacitance Characteristics

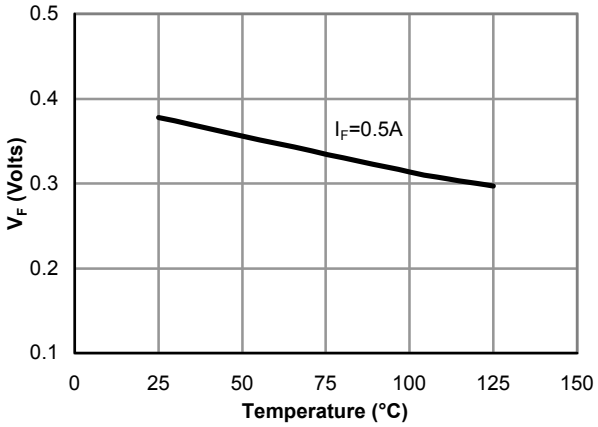

Figure 14: Schottky Forward Drop vs. Junction Temperature

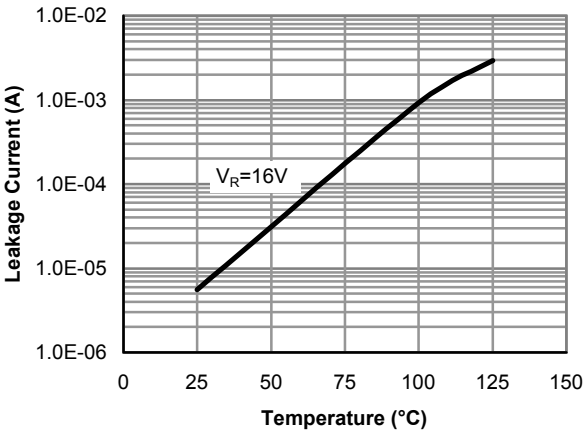

Figure 15: Schottky Leakage current vs. Junction Temperature

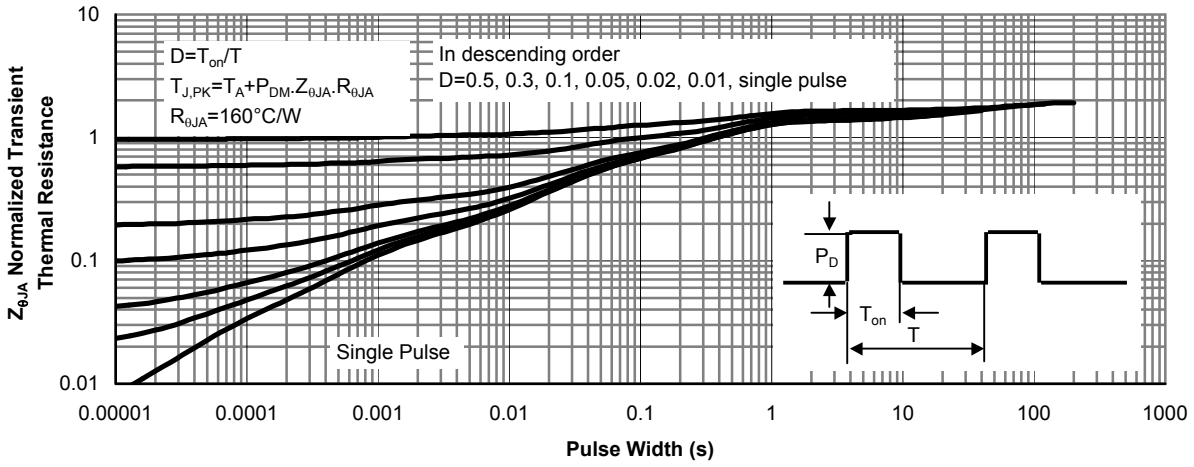

Figure 15: Schottky Normalized Maximum Transient Thermal Impedance