



AO6704

N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode



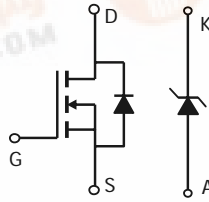
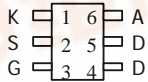
General Description

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)
- $R_{DS(ON)}$ < 65m Ω (V_{GS} = 10V)
- $R_{DS(ON)}$ < 75m Ω (V_{GS} = 4.5V)
- $R_{DS(ON)}$ < 160m Ω (V_{GS} = 2.5V)
- SCHOTTKY**
- V_{DS} (V) = 20V, I_F = 1A, V_F < 0.5V@0.5A

TSOP6
Top View



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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	I_D	$T_A=25^\circ\text{C}$	3.6	A
		$T_A=70^\circ\text{C}$	2.9	
Pulsed Drain Current ^B	I_{DM}	10		
Schottky reverse voltage	V_{KA}		20	V
Continuous Forward Current ^A	I_F	$T_A=25^\circ\text{C}$	1.5	A
		$T_A=70^\circ\text{C}$	1	
Pulsed Forward Current ^B	I_{FM}		10	
Power Dissipation	P_D	$T_A=25^\circ\text{C}$	1.39	W
		$T_A=70^\circ\text{C}$	0.89	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Parameter: Thermal Characteristics MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10\text{s}$	$R_{\theta JA}$	70	90	$^\circ\text{C/W}$
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	$t \leq 10\text{s}$	$R_{\theta JA}$	129	160	$^\circ\text{C/W}$
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 T _J =55°C			1 5	μA
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 T _J =125°C		44 64	65 90	mΩ
		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_{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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

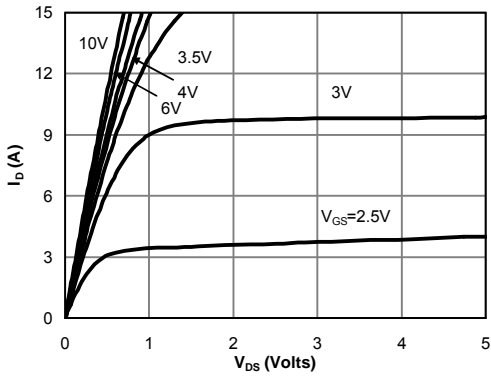


Fig 1: On-Region Characteristics

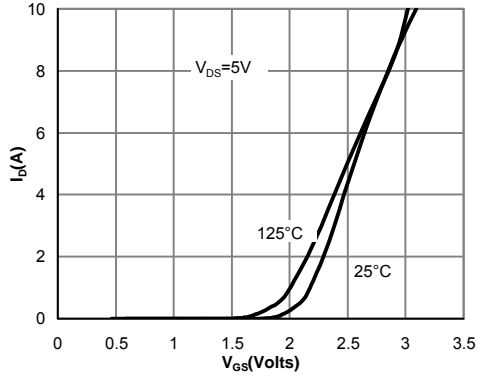


Figure 2: Transfer Characteristics

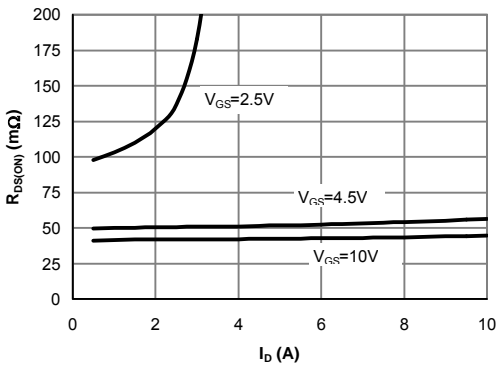


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

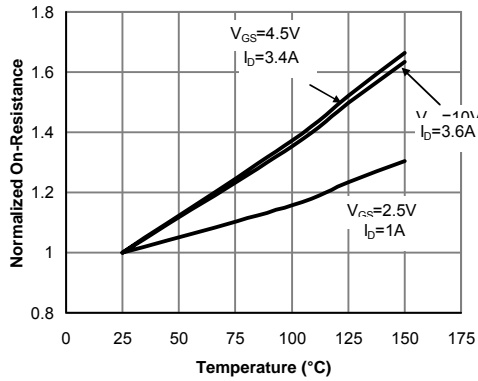


Figure 4: On-Resistance vs. Junction Temperature

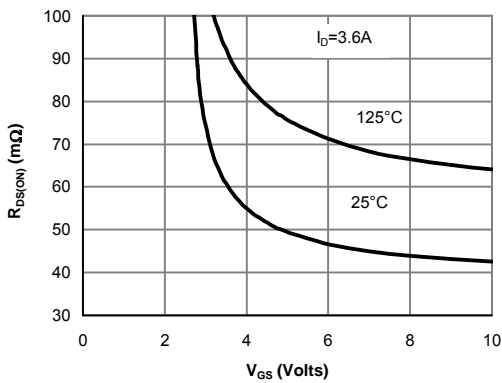


Figure 5: On-Resistance vs. Gate-Source Voltage

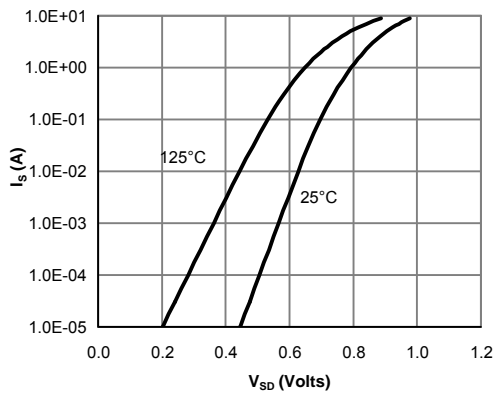


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

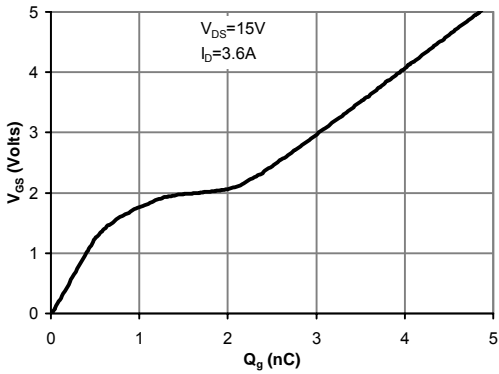


Figure 7: Gate-Charge Characteristics

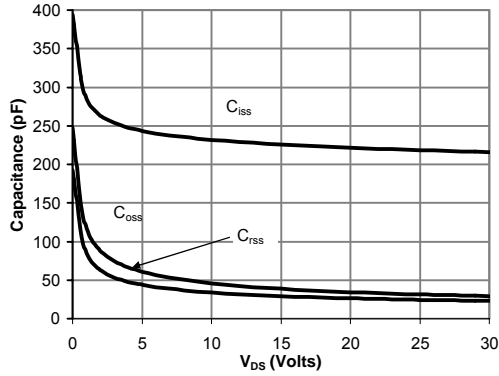


Figure 8: Capacitance Characteristics

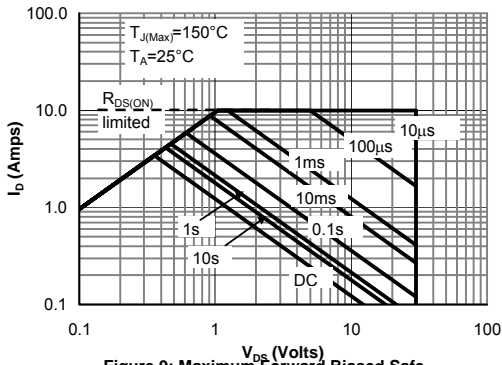


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

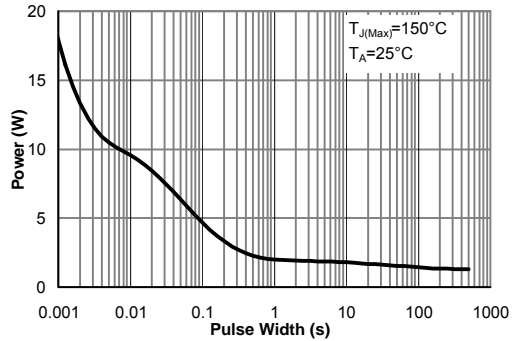


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

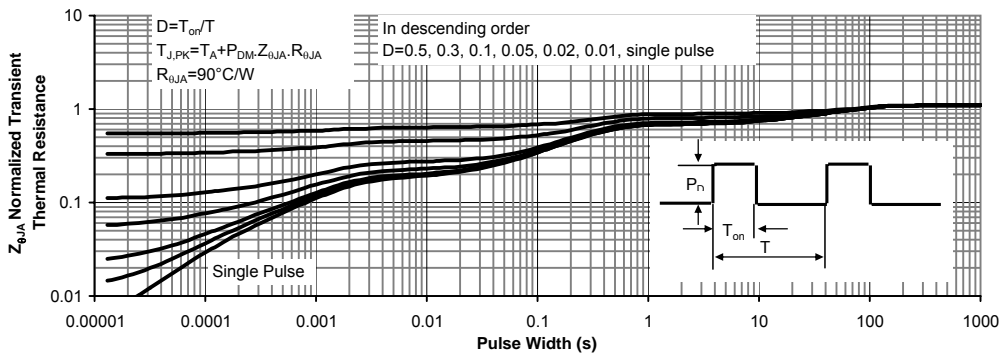


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

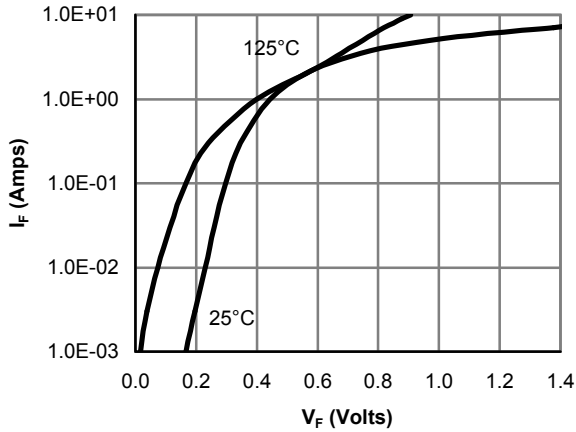


Figure 12: Schottky Forward Characteristics

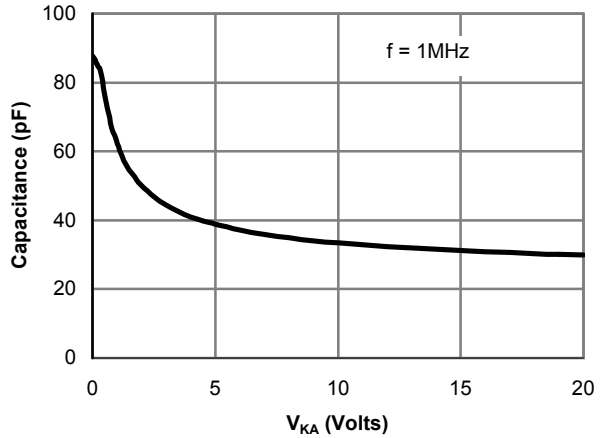


Figure 13: Schottky Capacitance Characteristics

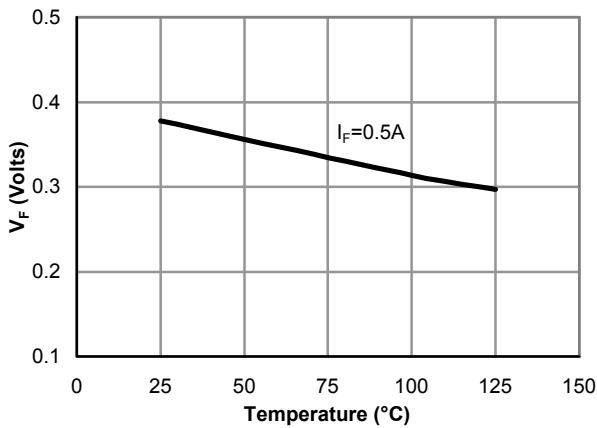


Figure 14: Schottky Forward Drop vs. Junction Temperature

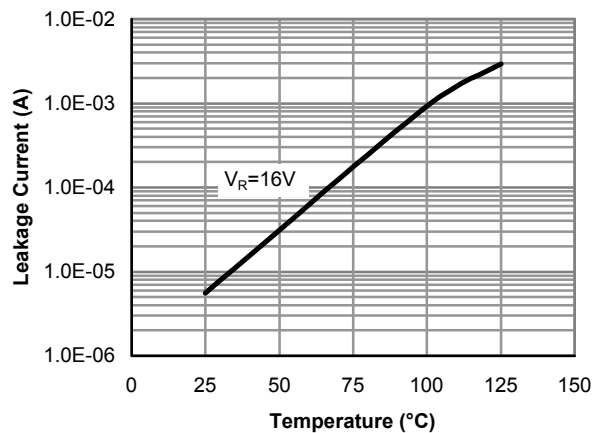


Figure 15: Schottky Leakage current vs. Junction Temperature

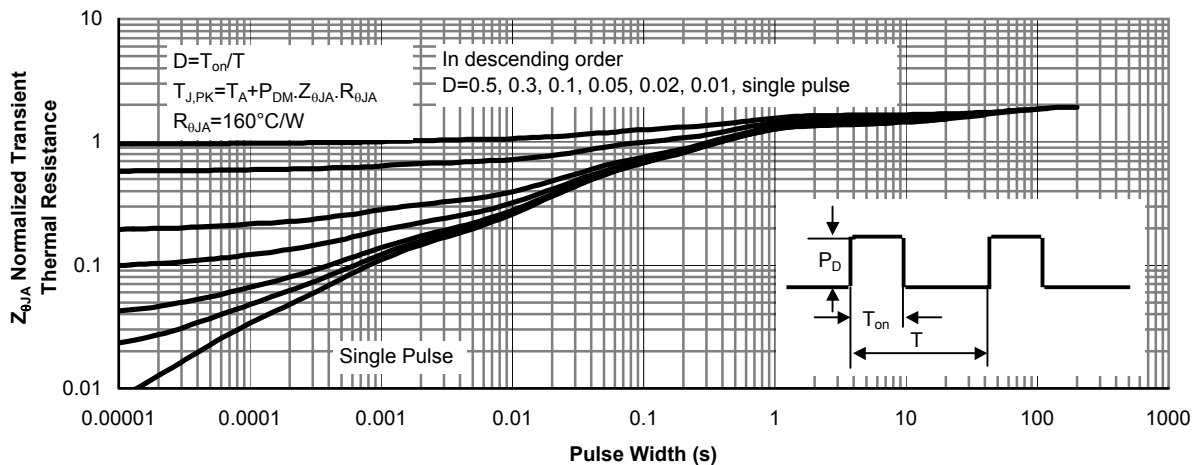


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance