



## AO6700

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

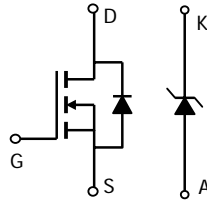
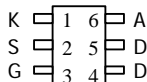
#### General Description

The AO6700 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 AO6700 is Pb-free (meets ROHS & Sony 259 specifications). AO6700L is a Green Product ordering option. AO6700 and AO6700L are electrically identical.

#### Features

$V_{DS}$  (V) = 20V  
 $I_D$  = 4.1A ( $V_{GS}$  = 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,  $V_F < 0.5V@0.5A$

TSOP6  
Top View



#### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	MOSFET	Schottky	Units
Drain-Source Voltage	$V_{DS}$	20		V
Gate-Source Voltage	$V_{GS}$	$\pm 8$		V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ\text{C}$	4.1	A
		$T_A=70^\circ\text{C}$	3.3	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	10		
Schottky reverse voltage	$V_{KA}$		20	V
Continuous Forward Current <sup>A</sup>	$I_F$	$T_A=25^\circ\text{C}$	1.5	A
		$T_A=70^\circ\text{C}$	1	
Pulsed Forward Current <sup>B</sup>	$I_{FM}$		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 <sup>A</sup>	$t \leq 10s$	$R_{\theta JA}$	70	90	$^\circ\text{C/W}$
	Steady-State		102	130	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	$R_{\theta JL}$	51	80	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient <sup>A</sup>	$t \leq 10s$	$R_{\theta JA}$	129	160	$^\circ\text{C/W}$
	Steady-State		158	200	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	$R_{\theta JL}$	52	80	

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±8V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.4	0.6	1	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	10			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =4.1A T <sub>J</sub> =125°C		41.6	50	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =3.6A		54	65	
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =3A		74	95	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =4.1A		10.5		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.8	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				1.8	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz		449	550	pF
C <sub>oss</sub>	Output Capacitance			74		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			51.6		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		4.9	6	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =4.1A		5.9	7.2	nC
Q <sub>gs</sub>	Gate Source Charge			0.36		nC
Q <sub>gd</sub>	Gate Drain Charge			1.3		nC
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =5V, V <sub>DS</sub> =10V, R <sub>L</sub> =2.35Ω, R <sub>GEN</sub> =0Ω		4.5		ns
t <sub>r</sub>	Turn-On Rise Time			6		ns
t <sub>D(off)</sub>	Turn-Off Delay Time			32.7		ns
t <sub>f</sub>	Turn-Off Fall Time			7.1		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =4.1A, dI/dt=100A/μs		13	16
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =4.1A, dI/dt=100A/μs		3.3		nC
<b>SCHOTTKY PARAMETERS</b>						
V <sub>F</sub>	Forward Voltage Drop	I <sub>F</sub> =0.5A		0.39	0.5	V
I <sub>rm</sub>	Maximum reverse leakage current	V <sub>R</sub> =16V			0.02	mA
		V <sub>R</sub> =16V, T <sub>J</sub> =125°C			20	
C <sub>T</sub>	Junction Capacitance	V <sub>R</sub> =10V		34		pF
t <sub>rr</sub>	Schottky Reverse Recovery Time	I <sub>F</sub> =1A, dI/dt=100A/μs		5.2	10	ns
Q <sub>rr</sub>	Schottky Reverse Recovery Charge	I <sub>F</sub> =1A, dI/dt=100A/μs		0.8		nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t<sub>θJA</sub> ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

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

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

Rev 2 : Sept 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.

MOSFET TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

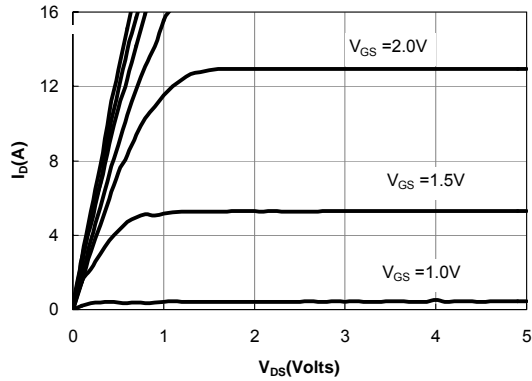


Figure 1: On-Regions Characteristic CS

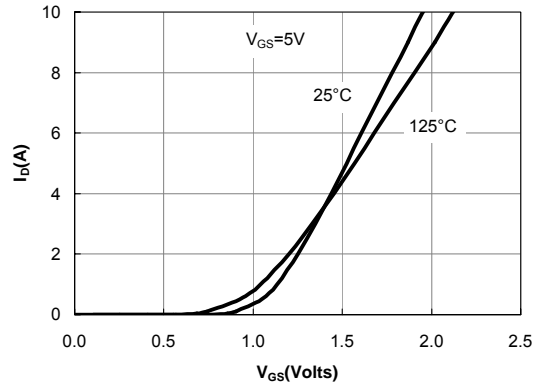


Figure 2: Transfer Characteristics

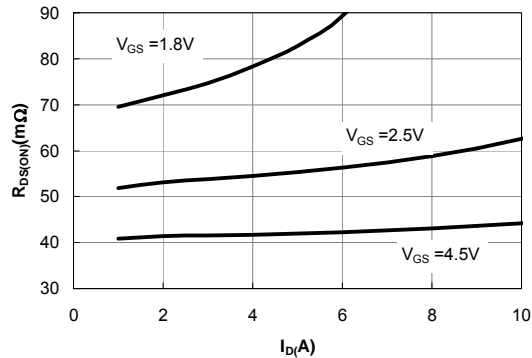


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

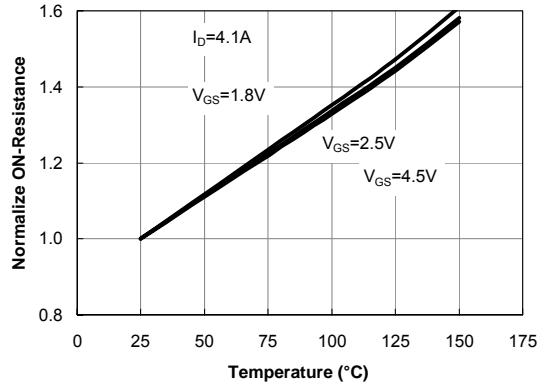


Figure 4: On-Resistance vs. Junction Temperature

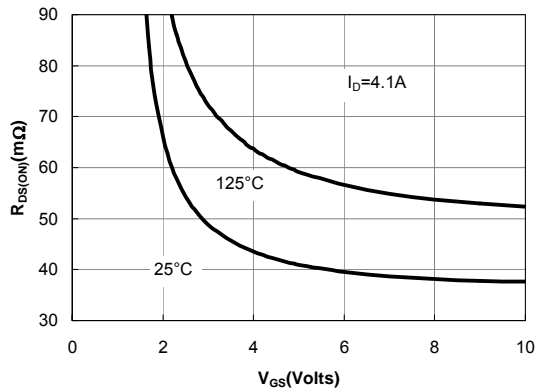


Figure 5: On-Resistance vs. Gate-Source Voltage

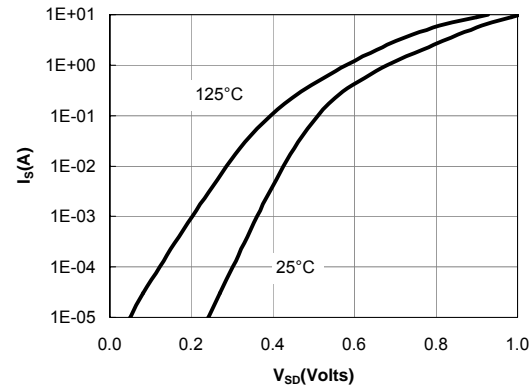


Figure 6: Body-Diode Characteristics

MOSFET TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

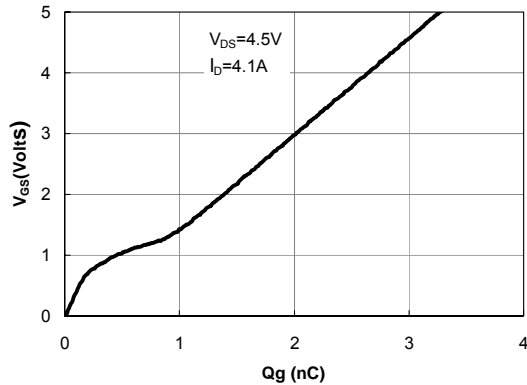


Figure 7: Gate-Charge Characteristics

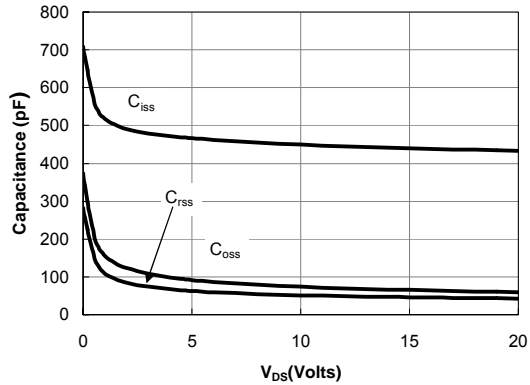


Figure 8: Capacitance Characteristics

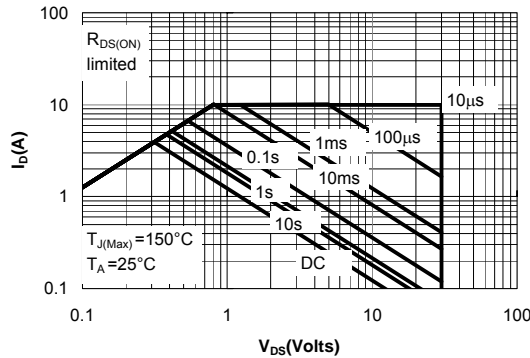


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

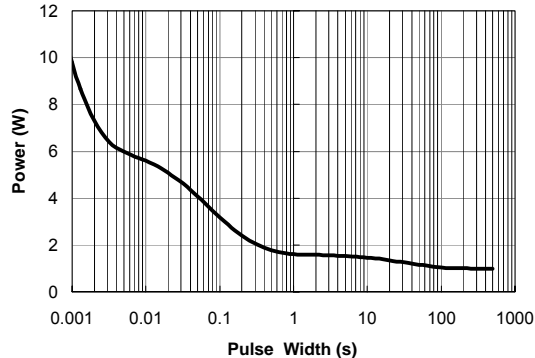


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

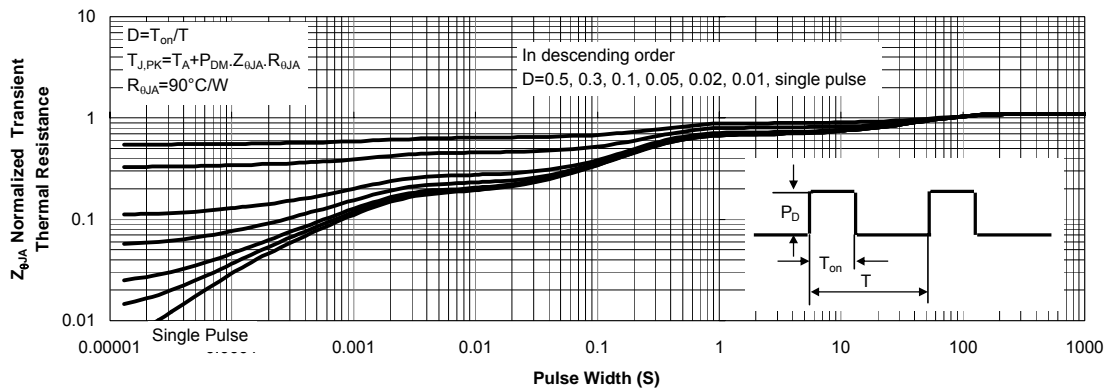


Figure 11: Normalized Maximum Transient Thermal Impedance