



## AO6700 N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

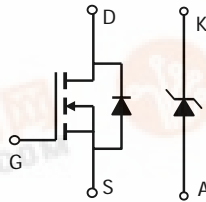
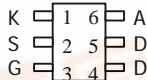
### General Description

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 $T_A=25^\circ C$ 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>	$I_D$	$T_A=25^\circ C$	4.1	A
		$T_A=70^\circ C$	3.3	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	10		
Schottky reverse voltage	$V_{KA}$		20	V
Continuous Forward Current <sup>A</sup>	$I_F$	$T_A=25^\circ C$	1.5	A
		$T_A=70^\circ C$	1	
Pulsed Forward Current <sup>B</sup>	$I_{FM}$		10	
Power Dissipation	$P_D$	$T_A=25^\circ C$	1.39	W
		$T_A=70^\circ C$	0.89	
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 <sup>A</sup>	$t \leq 10s$	$R_{\theta JA}$	70	90	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>	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	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		158	200	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	$R_{\theta JL}$	52	80	

Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	20			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=16\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 8\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	0.4	0.6	1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$ , $V_{DS}=5\text{V}$	10			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=4.5\text{V}$ , $I_D=4.1\text{A}$ $T_J=125^\circ\text{C}$		41.6 63	50 80	$\text{m}\Omega$
		$V_{GS}=2.5\text{V}$ , $I_D=3.6\text{A}$		54	65	$\text{m}\Omega$
		$V_{GS}=1.8\text{V}$ , $I_D=3\text{A}$		74	95	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=4.1\text{A}$		10.5		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		0.8	1	V
$I_S$	Maximum Body-Diode Continuous Current				1.8	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=10\text{V}$ , $f=1\text{MHz}$		449	550	pF
$C_{oss}$	Output Capacitance			74		pF
$C_{rss}$	Reverse Transfer Capacitance			51.6		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		4.9	6	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=4.5\text{V}$ , $V_{DS}=10\text{V}$ , $I_D=4.1\text{A}$		5.9	7.2	nC
$Q_{gs}$	Gate Source Charge			0.36		nC
$Q_{gd}$	Gate Drain Charge			1.3		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=5\text{V}$ , $V_{DS}=10\text{V}$ , $R_L=2.35\Omega$ , $R_{GEN}=0\Omega$		4.5		ns
$t_r$	Turn-On Rise Time			6		ns
$t_{D(off)}$	Turn-Off Delay Time			32.7		ns
$t_f$	Turn-Off Fall Time			7.1		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=4.1\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		13	16	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=4.1\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		3.3		nC
<b>SCHOTTKY PARAMETERS</b>						
$V_F$	Forward Voltage Drop	$I_F=0.5\text{A}$		0.39	0.5	V
$I_{rm}$	Maximum reverse leakage current	$V_R=16\text{V}$			0.02	mA
		$V_R=16\text{V}$ , $T_J=125^\circ\text{C}$			20	
$C_T$	Junction Capacitance	$V_R=10\text{V}$		34		pF
$t_{rr}$	Schottky Reverse Recovery Time	$I_F=1\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		5.2	10	ns
$Q_{rr}$	Schottky Reverse Recovery Charge	$I_F=1\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		0.8		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design. The current rating is based on the  $t \leq 10\text{s}$  thermal resistance rating.

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

C: The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80  $\mu\text{s}$  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  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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MOSFET TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

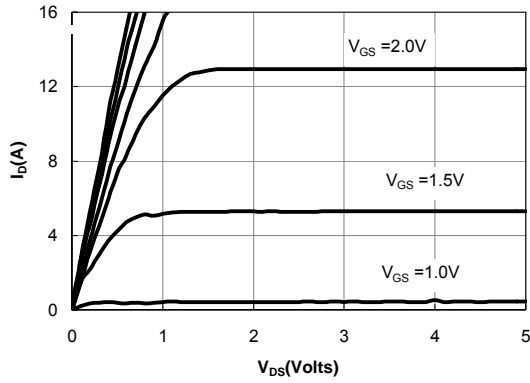


Figure 1: On-Regions Characteristi CS

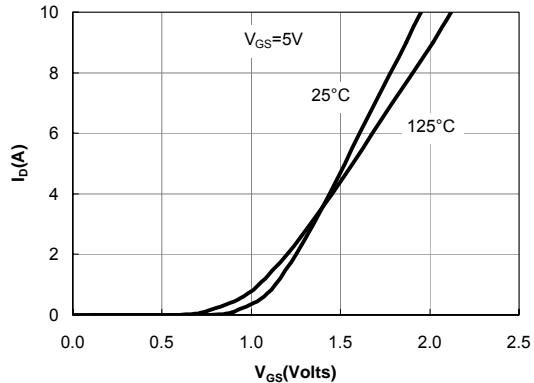


Figure 2: Transfer Characteristics

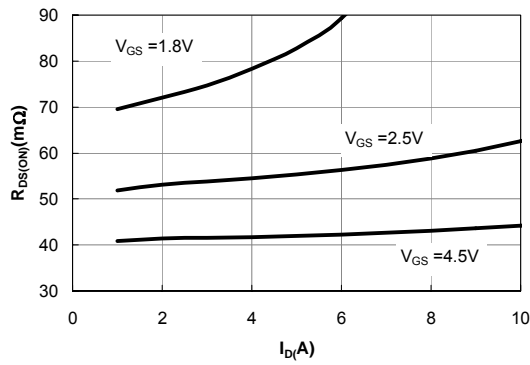


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

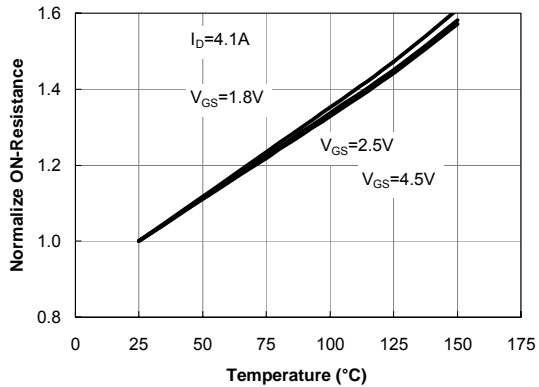


Figure 4: On-Resistance vs. Junction Temperature

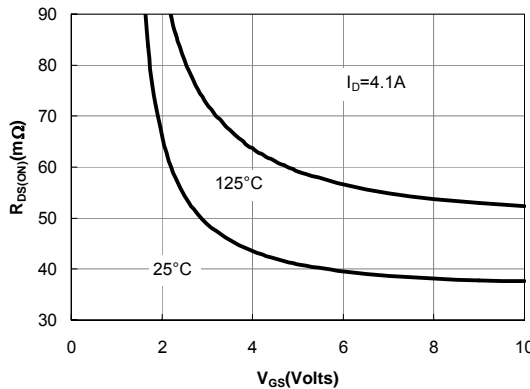


Figure 5: On-Resistance vs. Gate-Source Voltage

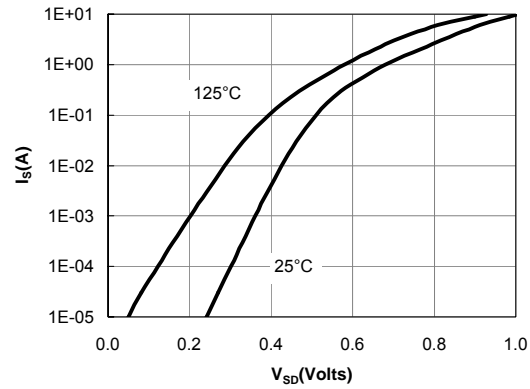


Figure 6: Body-Diode Characteristics

MOSFET TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

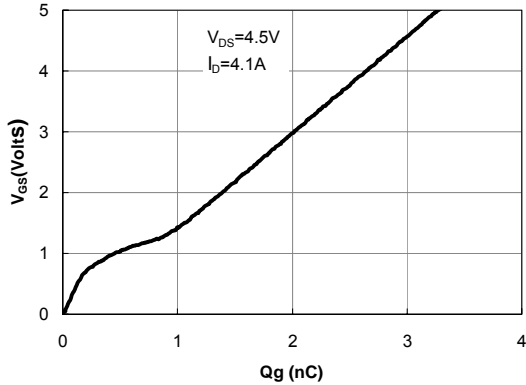


Figure 7: Gate-Charge Characteristics

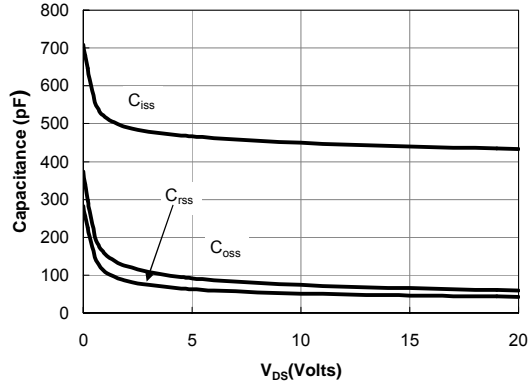


Figure 8: Capacitance Characteristics

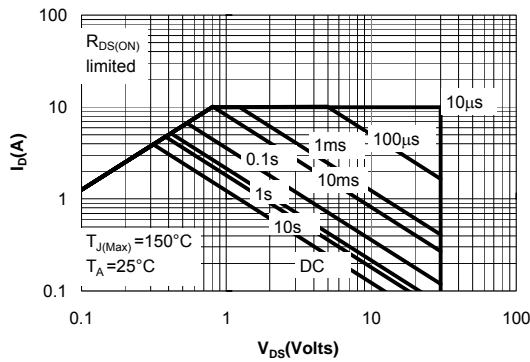


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

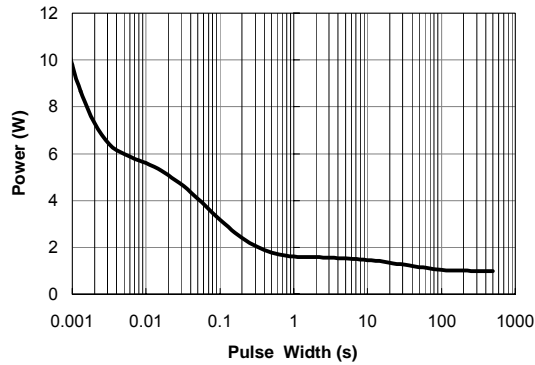


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

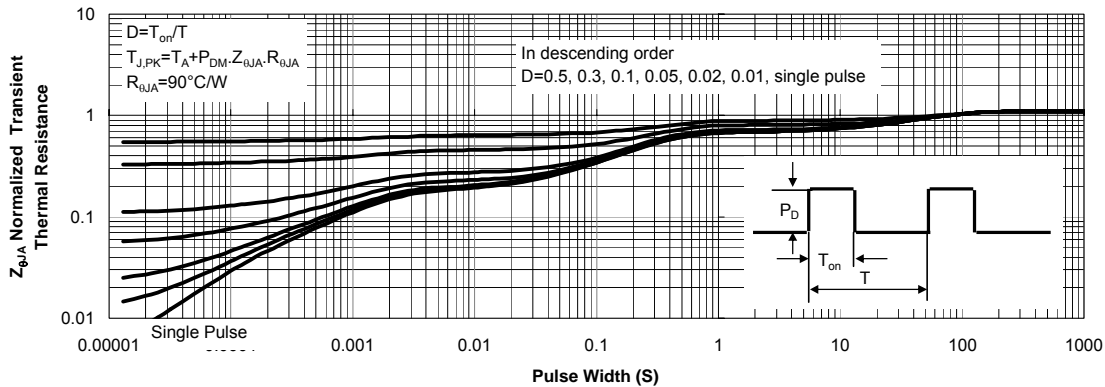


Figure 11: Normalized Maximum Transient Thermal Impedance