

AO3700

N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

General Description

The AO3700 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 AO3700 is Pb-free (meets ROHS & Sony 259 specifications). AO3700L is a Green Product ordering option. AO3700 and AO3700L are electrically identical.*

Features

V_{DS} (V) = 30V

I_D = 3.3A (V_{GS} = 10V)

$R_{DS(ON)} < 65m\Omega$ (V_{GS} = 10V)

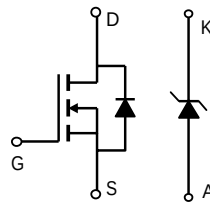
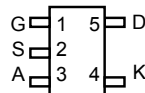
$R_{DS(ON)} < 75m\Omega$ (V_{GS} = 4.5V)

$R_{DS(ON)} < 160m\Omega$ (V_{GS} = 2.5V)

SCHOTTKY

V_{DS} (V) = 20V, I_F = 1A, $V_F < 0.5V @ 0.5A$

SOT-23-5
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	$T_A = 25^\circ\text{C}$	3.3		A
	$T_A = 70^\circ\text{C}$	2.6		
Pulsed Drain Current ^B	I_{DM}	10		
Schottky reverse voltage	V_{KA}		20	V
Continuous Forward Current ^A	$T_A = 25^\circ\text{C}$		2	A
	$T_A = 70^\circ\text{C}$		1	
Pulsed Forward Current ^B	I_{FM}		10	
Power Dissipation	$T_A = 25^\circ\text{C}$	1.15	0.92	W
	$T_A = 70^\circ\text{C}$	0.7	0.59	
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 ≤ 10s	R _{θJA}	80.3	110	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		117	150	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	43	80	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	109.4	135	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		136.5	175	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	58.5	80	

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=24\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1	1.4	2	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	$V_{GS}=10\text{V}$, $I_D=3.3\text{A}$ $T_J=125^{\circ}\text{C}$		51 64	65 90	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=3.0\text{A}$		60	75	$\text{m}\Omega$
		$V_{GS}=2.5\text{V}$, $I_D=1\text{A}$		100	160	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=3.3\text{A}$		11.7		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.81	1	V
I_S	Maximum Body-Diode Continuous Current				2.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		226	270	pF
C_{oss}	Output Capacitance			39		pF
C_{rss}	Reverse Transfer Capacitance			29		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1.4	2.5	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=15\text{V}$, $I_D=3.3\text{A}$		4.6	5.5	nC
Q_{gs}	Gate Source Charge			1.4		nC
Q_{gd}	Gate Drain Charge			0.55		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=4.7\Omega$, $R_{GEN}=6\Omega$		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	$I_F=3.3\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		10.2	13	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=3.3\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		3.8		nC
SCHOTTKY PARAMETERS						
V_F	Forward Voltage Drop	$I_F=0.5\text{A}$		0.39	0.5	V
I_{rm}	Maximum reverse leakage current	$V_R=16\text{V}$			0.1	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 1in² 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 μs 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 $T_A=25^{\circ}\text{C}$. The SOA curve provides a single pulse rating. Rev0: October 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

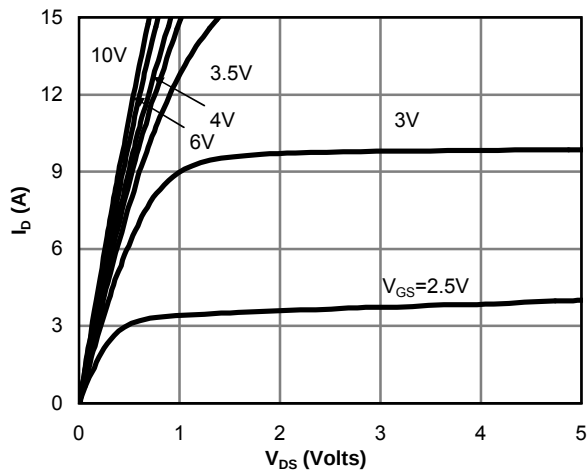


Fig 1: On-Region Characteristics

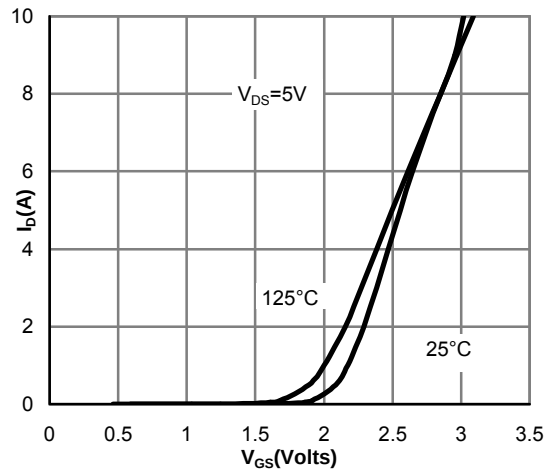


Figure 2: Transfer Characteristics

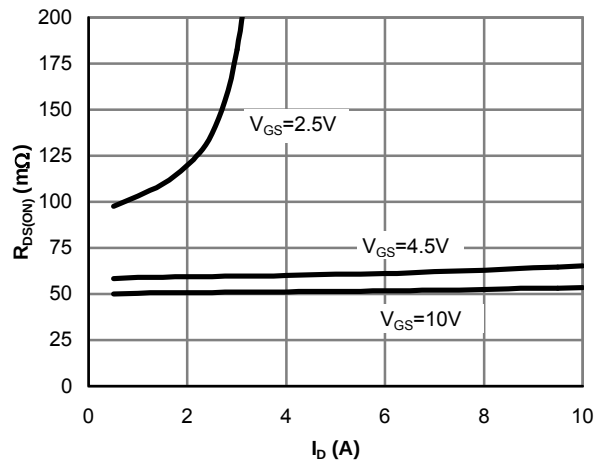


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

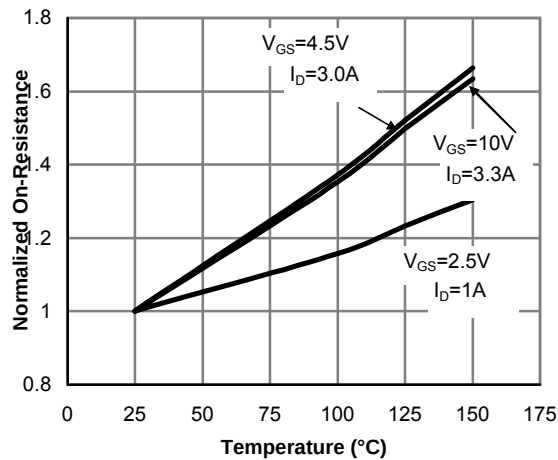


Figure 4: On-Resistance vs. Junction Temperature

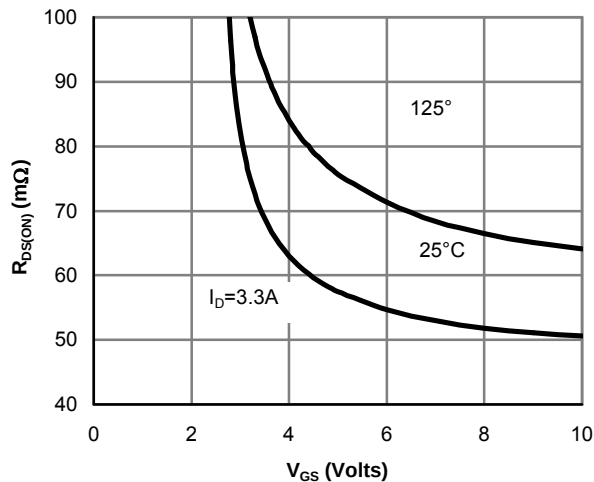


Figure 5: On-Resistance vs. Gate-Source Voltage

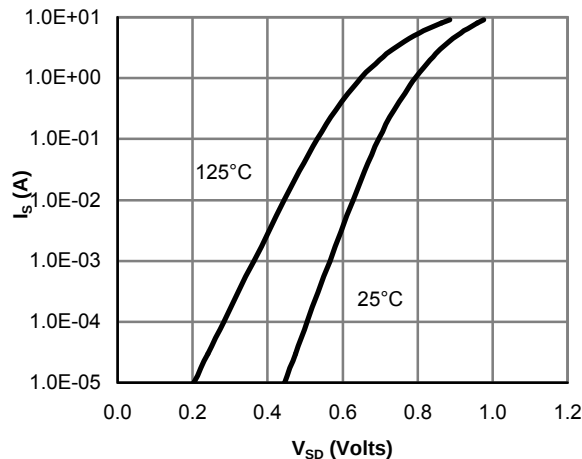


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

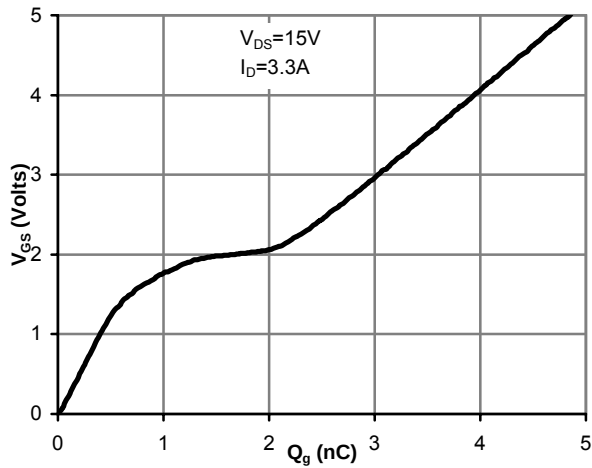


Figure 7: Gate-Charge Characteristics

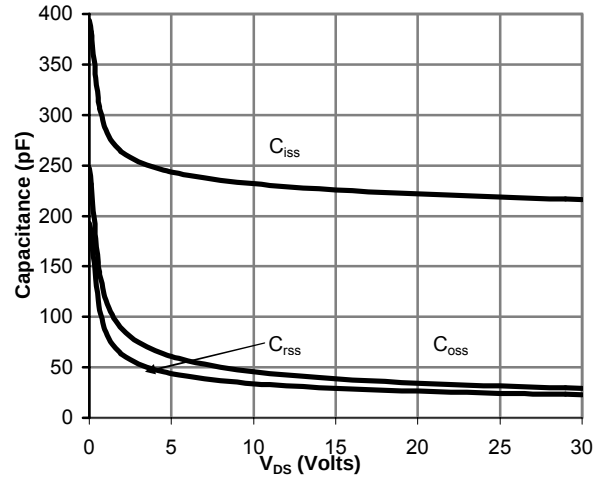


Figure 8: Capacitance Characteristics

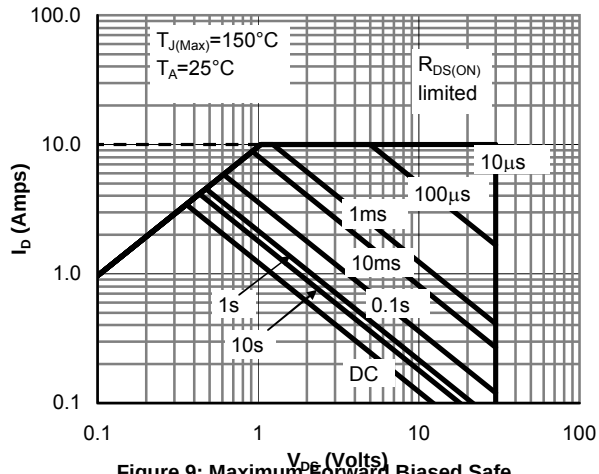


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

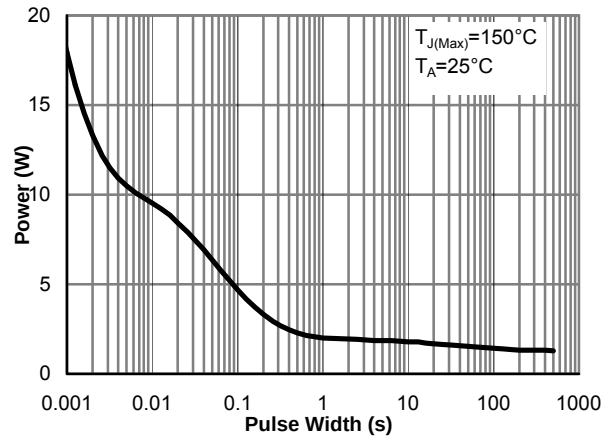


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

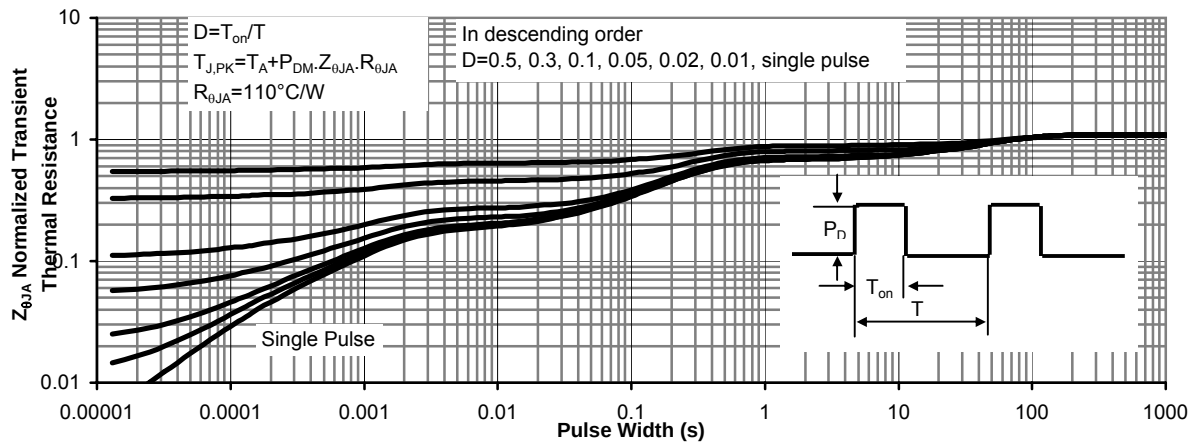


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

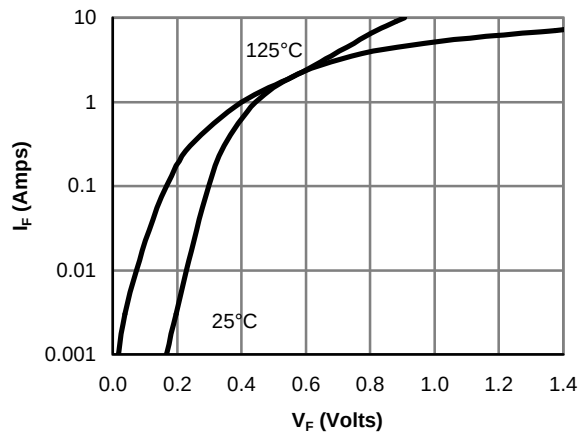


Figure 12: Schottky Forward Characteristics

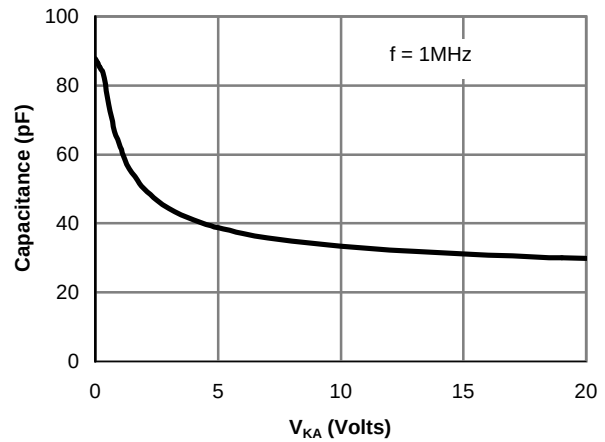


Figure 13: Schottky Capacitance Characteristics

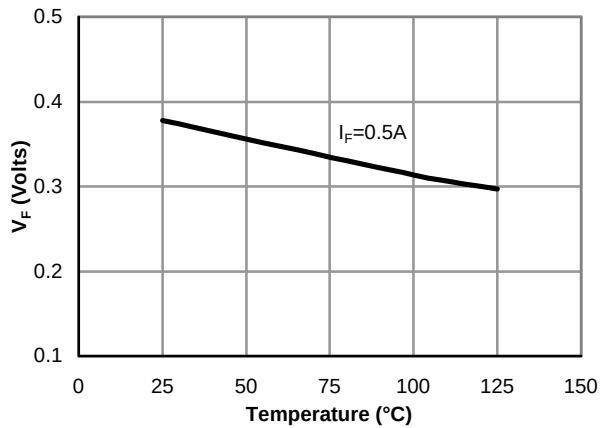


Figure 14: Schottky Forward Drop vs. Junction Temperature

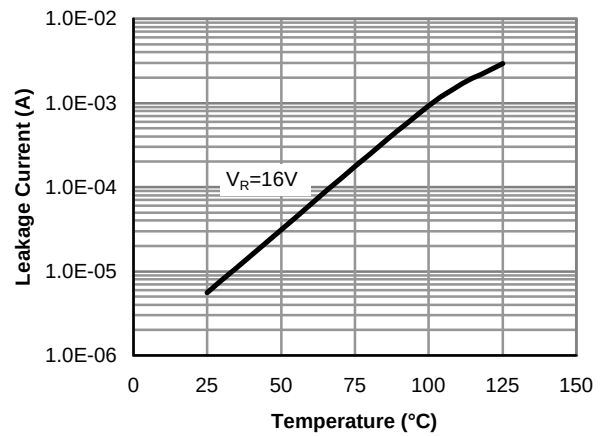


Figure 15: Schottky Leakage current vs. Junction Temperature

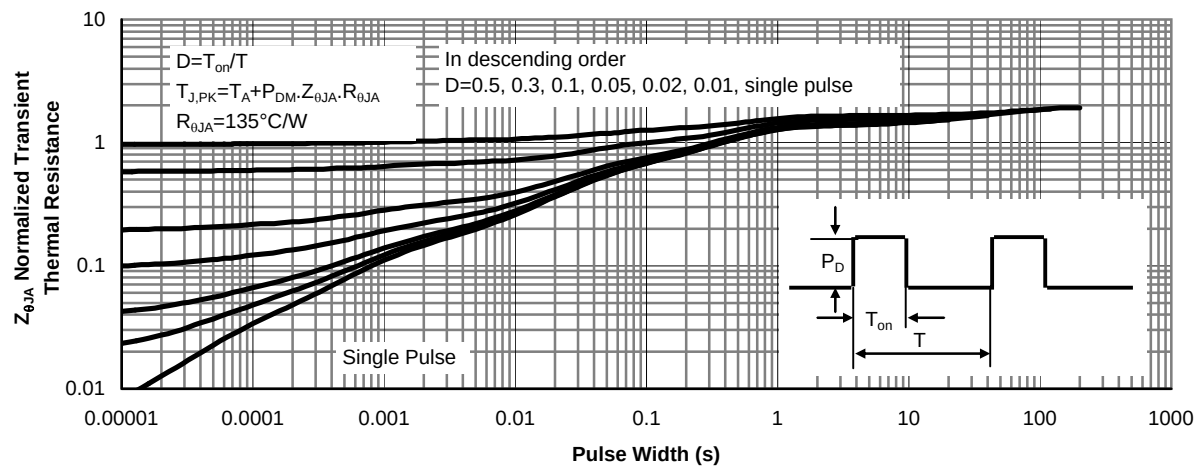


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance