



ALPHA & OMEGA
SEMICONDUCTOR



AO4700

N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

General Description

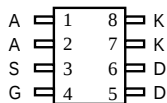
The AO4700 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for non-synchronous DC-DC conversion applications. *Standard Product AO4700 is Pb-free (meets ROHS & Sony 259 specifications). AO4700L is a Green Product ordering option. AO4700 and AO4700L are electrically identical.*

Features

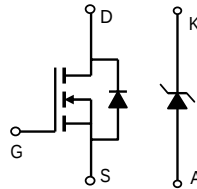
V_{DS} (V) = 30V
 I_D = 6.9A (V_{GS} = 10V)
 $R_{DS(ON)} < 28m\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 42m\Omega$ (V_{GS} = 4.5V)

SCHOTTKY

V_{DS} (V) = 30V, I_F = 4A, $V_F < 0.5V@3A$



SOIC-8



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}	± 20		V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	I_D	6.9	A
	$T_A=70^\circ\text{C}$		5.8	
Pulsed Drain Current ^B	I_{DM}	30		
Schottky reverse voltage	V_{KA}		30	V
Continuous Forward Current ^A	$T_A=25^\circ\text{C}$	I_F	4	A
	$T_A=70^\circ\text{C}$		2.6	
Pulsed Forward Current ^B	I_{FM}		40	
Power Dissipation	$T_A=25^\circ\text{C}$	P_D	2	W
	$T_A=70^\circ\text{C}$		1.28	
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}	48	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		74	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	35	40	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	44	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		73	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	31	40	

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} =±20V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1	1.9	3	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	20			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =6.9A T _J =125°C		22.5 31.3	28 38	mΩ
		V _{GS} =4.5V, I _D =5.0A		34.5	42	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =6.9A	10	15.4		S
V _{SD}	Diode Forward Voltage	I _S =1A		0.76	1	V
I _S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		680		pF
C _{oss}	Output Capacitance			102		pF
C _{rss}	Reverse Transfer Capacitance			77		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		3		Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =6.9A		13.84		nC
Q _g (4.5V)	Total Gate Charge			6.74		nC
Q _{gs}	Gate Source Charge			1.82		nC
Q _{gd}	Gate Drain Charge			3.2		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =2.2Ω, R _{GEN} =3Ω		4.6		ns
t _r	Turn-On Rise Time			4.1		ns
t _{D(off)}	Turn-Off DelayTime			20.6		ns
t _f	Turn-Off Fall Time			5.2		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =6.9A, dI/dt=100A/μs		16.5		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =6.9A, dI/dt=100A/μs		7.8		nC
SCHOTTKY PARAMETERS						
V _F	Forward Voltage Drop	I _F =3.0A		0.45	0.5	V
I _{rm}	Maximum reverse leakage current	V _R =24V		0.07	0.15	mA
		V _R =24V, T _J =125°C		4.2	20	
		V _R =24V, T _J =150°C		15	60	
C _T	Junction Capacitance	V _R =15V		120		pF

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 ≤ 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.

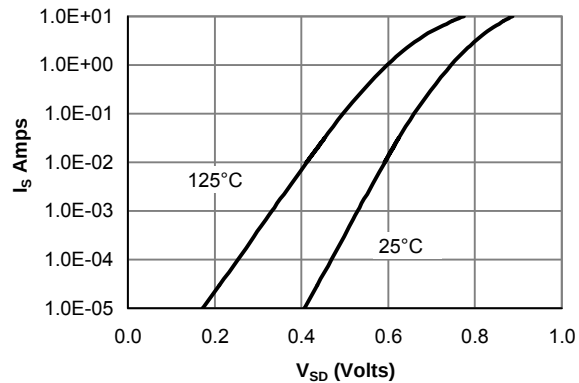
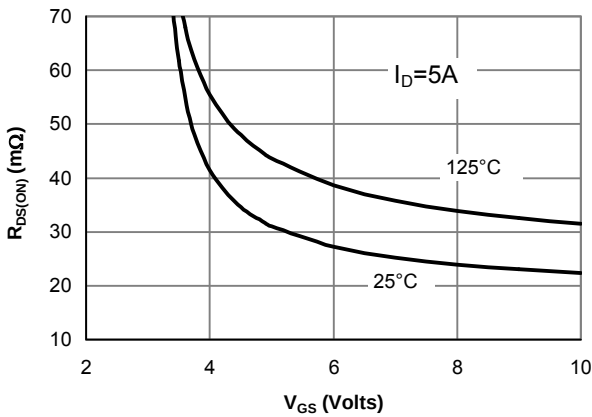
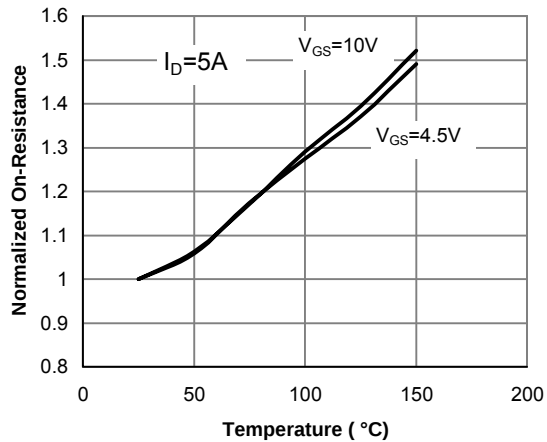
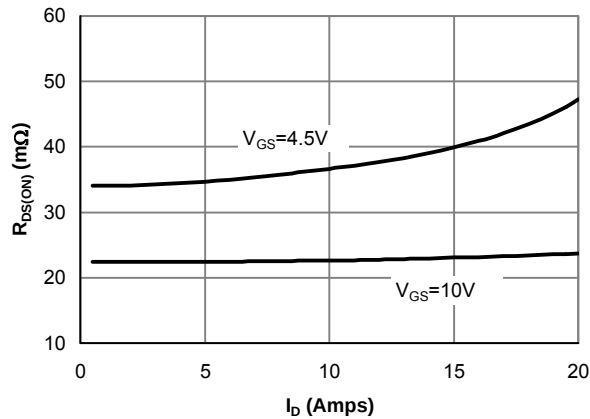
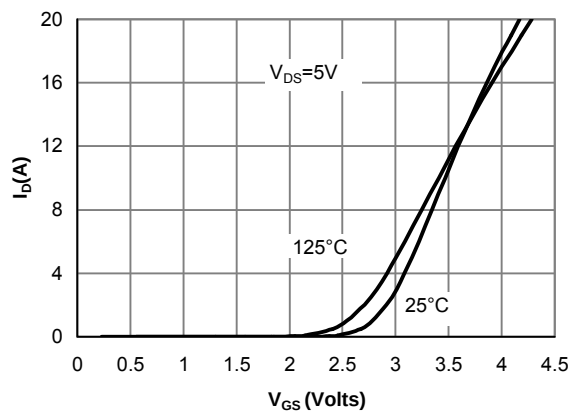
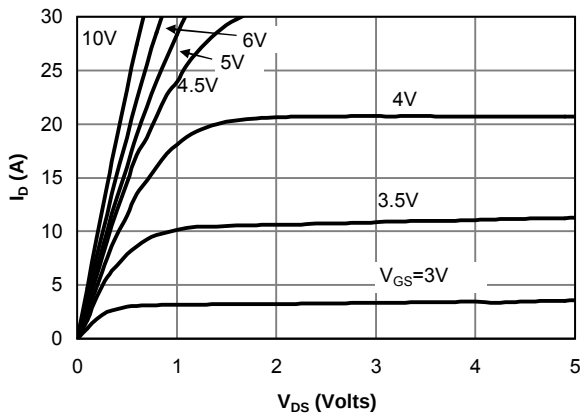
D: The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5% max.

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



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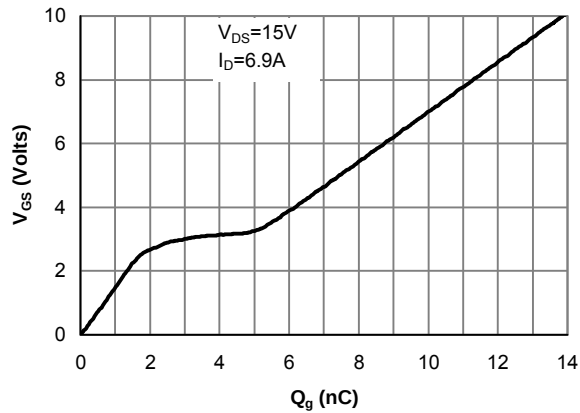


Figure 7: Gate-Charge characteristics

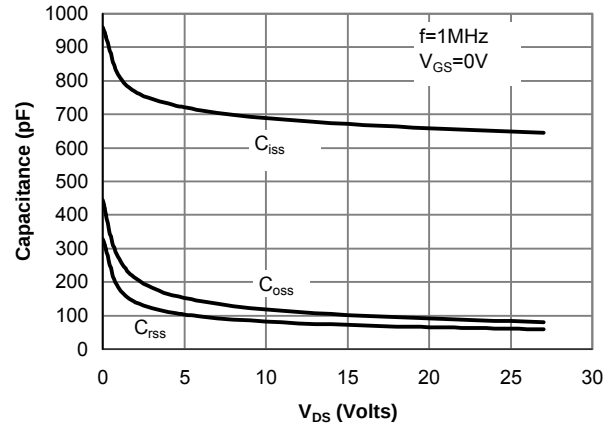


Figure 8: Capacitance Characteristics

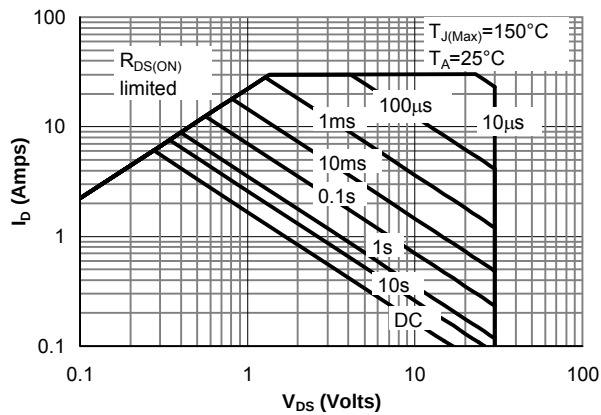


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

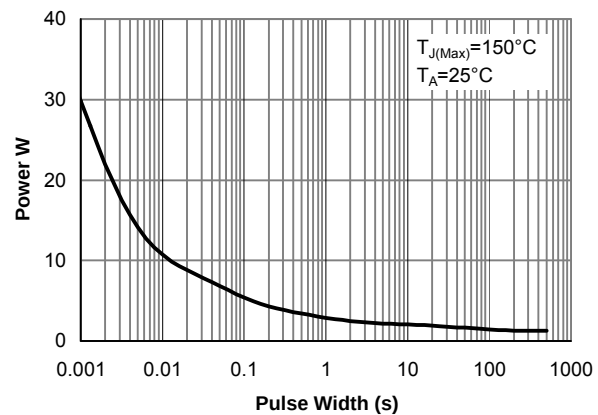


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

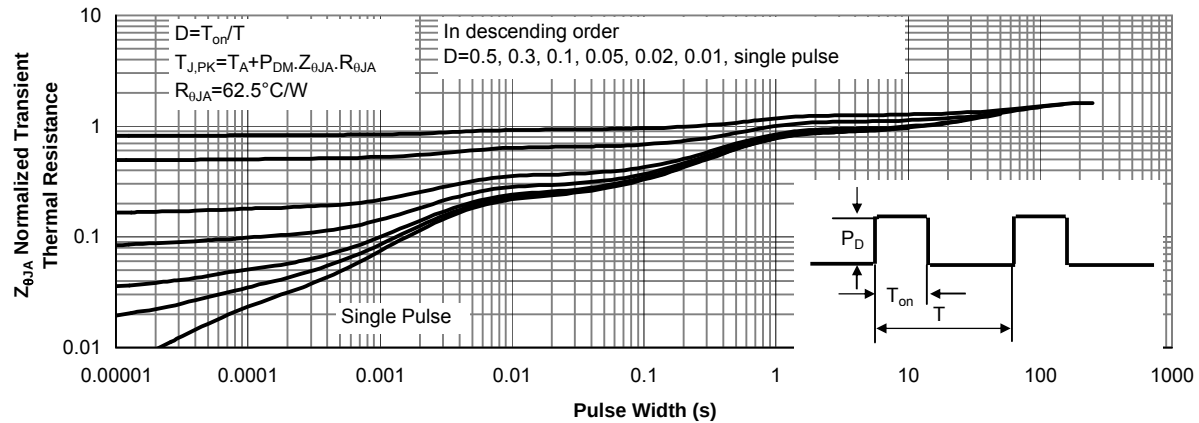


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

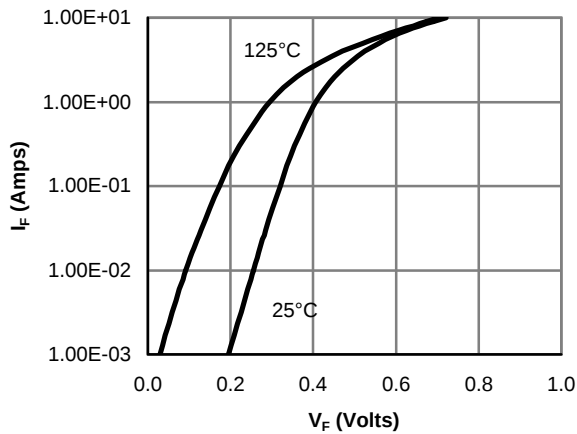


Figure 12: Schottky Forward Characteristics

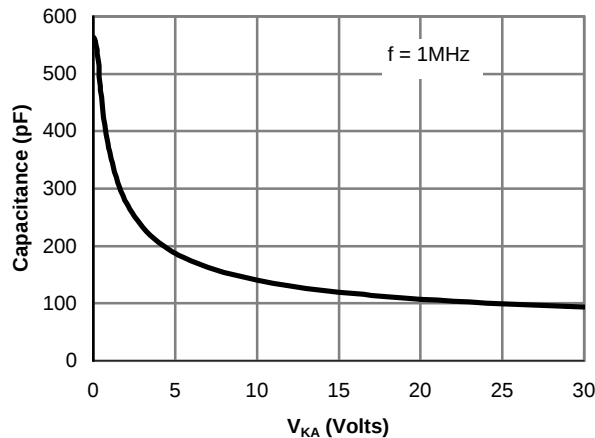


Figure 13: Schottky Capacitance Characteristics

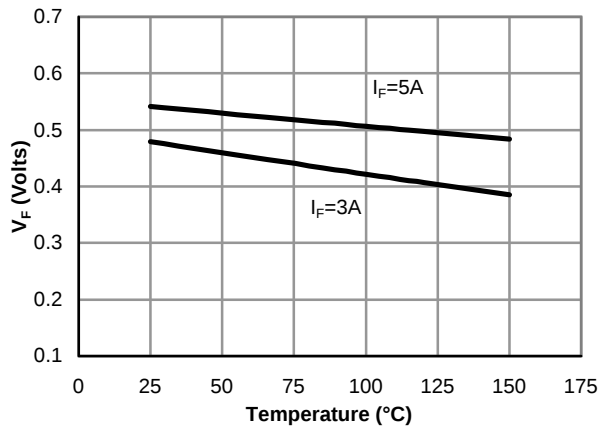


Figure 14: Schottky Forward Drop vs. Junction Temperature

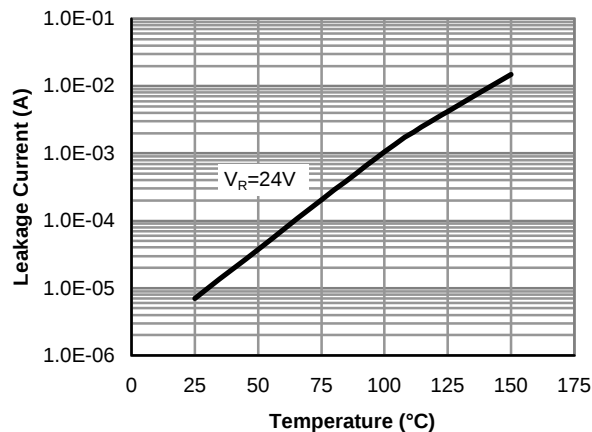


Figure 15: Schottky Leakage current vs. Junction Temperature

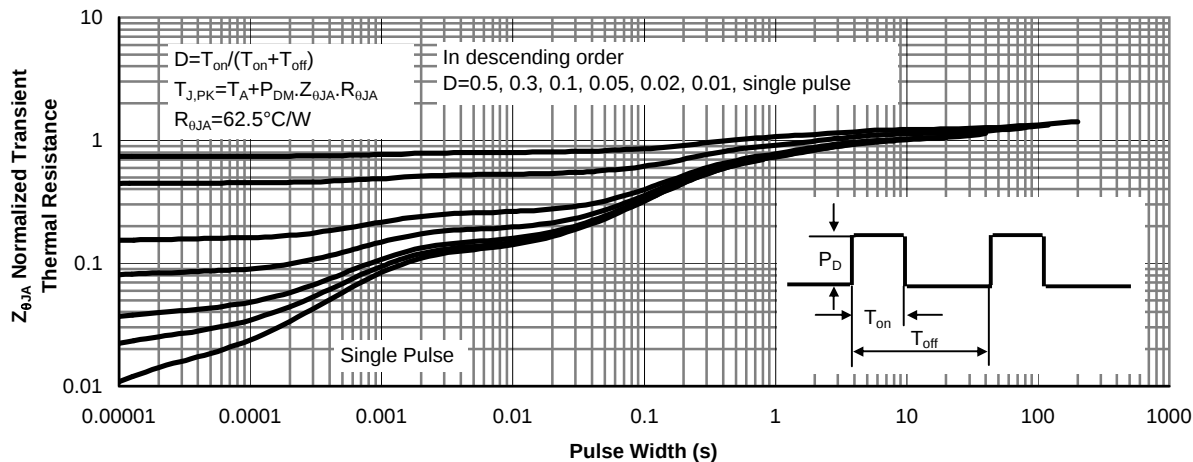


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance