



ALPHA & OMEGA
SEMICONDUCTOR



AOL1700

N-Channel Enhancement Mode Field Effect Transistor

SRFET™

General Description

SRFET™ AOL1700 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a low side FET in SMPS, load switching and general purpose applications.

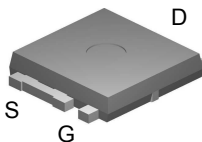
-RoHS Compliant
-Halogen and Antimony Free Green Device*

Features

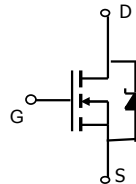
V_{DS} (V) = 30V
 I_D = 85A (V_{GS} = 10V)
 $R_{DS(ON)} < 4.2m\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 6.0m\Omega$ (V_{GS} = 4.5V)

UIS Tested!
Rg, Ciss, Coss, Crss Tested

Ultra SO-8™ Top View



Bottom tab
connected to
drain



SRFET™
Soft Recovery MOSFET:
Integrated Schottky Diode

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^B	I_D	85	A
$T_C=25^\circ\text{C}^H$			
$T_C=100^\circ\text{C}$		81	
Pulsed Drain Current ^C	I_{DM}	200	
Continuous Drain Current ^A	I_{DSM}	17	A
$T_A=25^\circ\text{C}$			
$T_A=70^\circ\text{C}$		13	
Avalanche Current ^C	I_{AR}	30	A
Repetitive avalanche energy $L=0.3mH^C$	E_{AR}	135	mJ
Power Dissipation ^B	P_D	100	W
$T_C=25^\circ\text{C}$			
$T_C=100^\circ\text{C}$		50	
Power Dissipation ^A	P_{DSM}	2.1	W
$T_A=25^\circ\text{C}$			
$T_A=70^\circ\text{C}$		1.3	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	19.6	25	$^\circ\text{C/W}$
$t \leq 10s$				
Maximum Junction-to-Ambient ^A	$R_{\theta JC}$	50	60	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Case ^D		1	1.5	$^\circ\text{C/W}$
Steady-State				

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 =1mA, V _{GS} =0V	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =30V, V _{GS} =0V T _J =125°C			0.1 20	mA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±20V			0.1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1.2	1.5	2.2	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	200			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		3.4 5.2	4.2 6.5	mΩ
		V _{GS} =4.5V, I _D =20A		4.8	6.0	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		90		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.36	0.5	V
I _S	Maximum Body-Diode + Schottky Diode Continuous Current ^H				85	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		3760	4512	pF
C _{oss}	Output Capacitance			682		pF
C _{rss}	Reverse Transfer Capacitance			314		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.75	1.5	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =20A		62	74	nC
Q _g (4.5V)	Total Gate Charge			29	35	nC
Q _{gs}	Gate Source Charge			12		nC
Q _{gd}	Gate Drain Charge			12		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω, R _{GEN} =3Ω		9.5		ns
t _r	Turn-On Rise Time			8.5		ns
t _{D(off)}	Turn-Off DelayTime			34		ns
t _f	Turn-Off Fall Time			9		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=300A/μs		18	27	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=300A/μs		22		nC

A: The value of R_{θJA} is measured with the device in a still air environment with T_A=25°C. The power dissipation P_{DSM} and current rating I_{DSM} are based on T_{J(MAX)}=150°C, using steady-state junction-to-ambient thermal resistance.

B. The power dissipation P_D is based on T_{J(MAX)}=175°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=175°C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 us pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175°C. The SOA curve provides a single pulse rating.

G. These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.

H. The maximum current rating is limited by bond-wires.

* This device is guaranteed green after date code 8P11 (June 1ST 2008)

Rev3: Dec 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

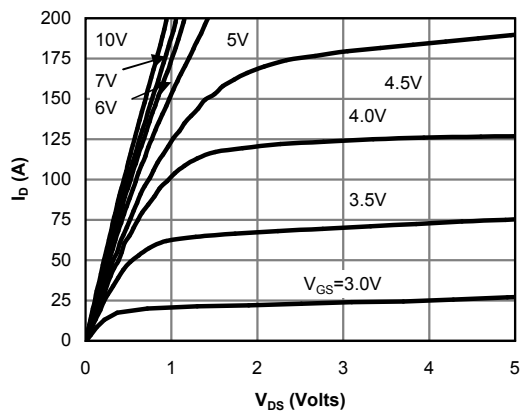


Figure 1: On-Region Characteristics

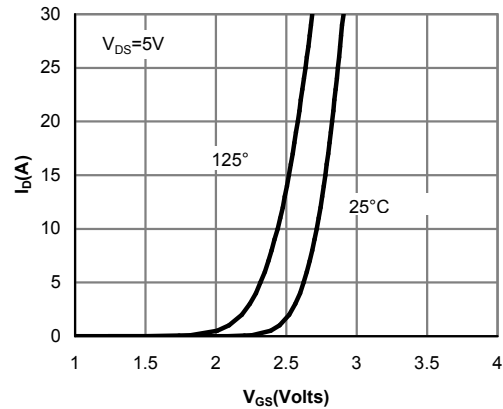


Figure 2: Transfer Characteristics

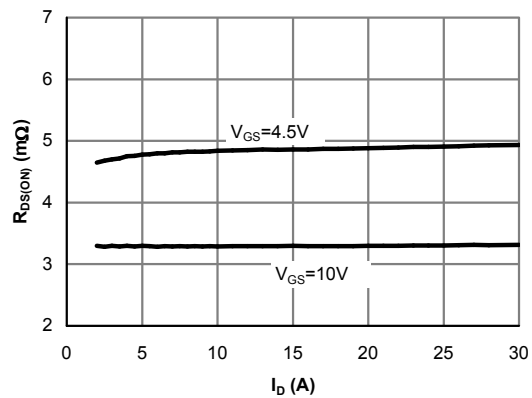


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

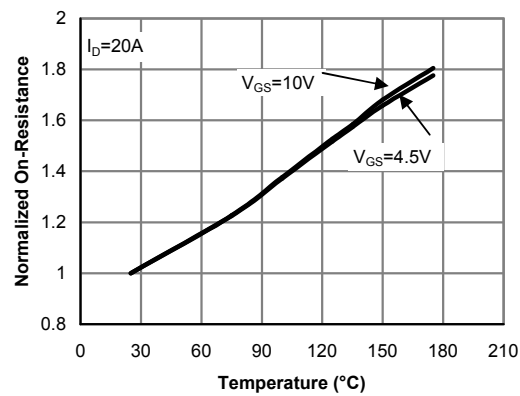


Figure 4: On-Resistance vs. Junction Temperature

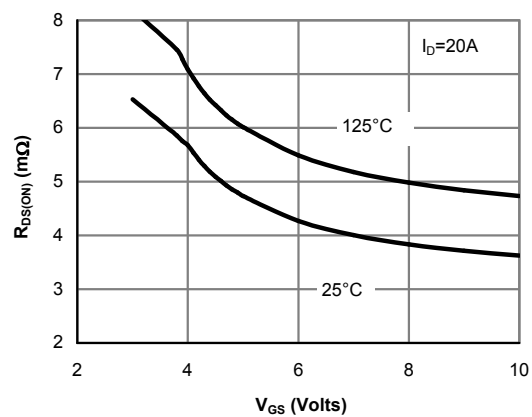


Figure 5: On-Resistance vs. Gate-Source Voltage

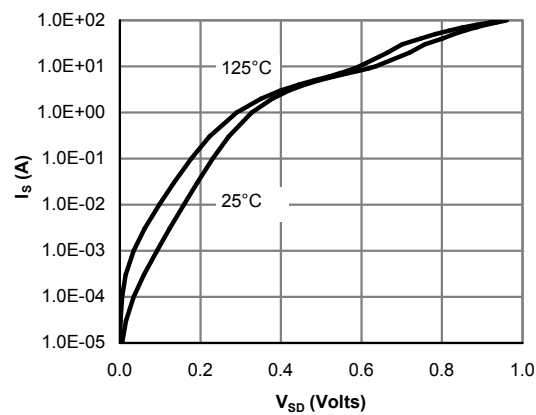


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

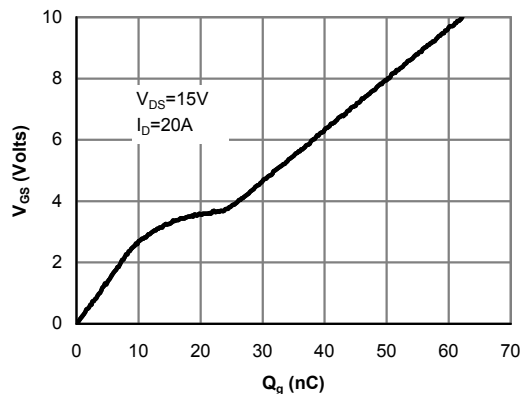


Figure 7: Gate-Charge Characteristics

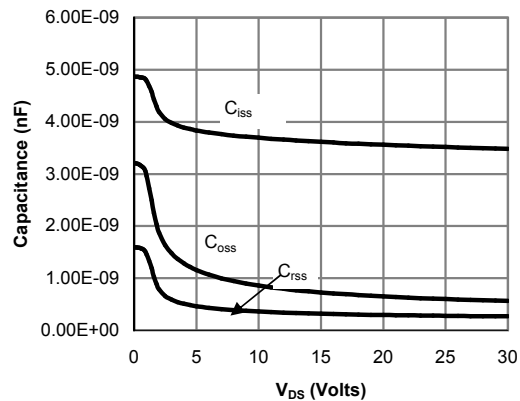


Figure 8: Capacitance Characteristics

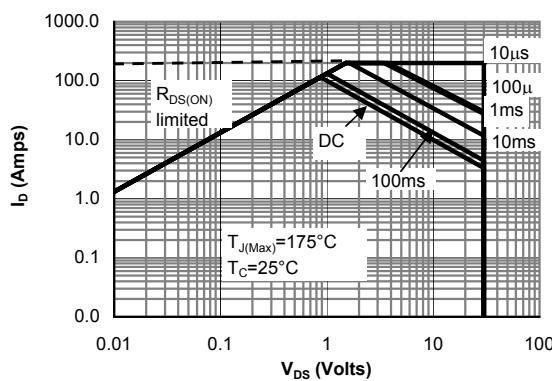


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

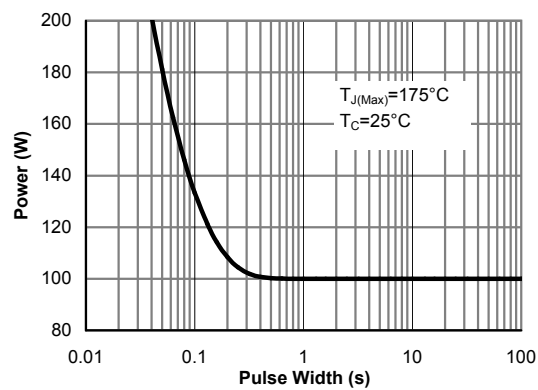


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

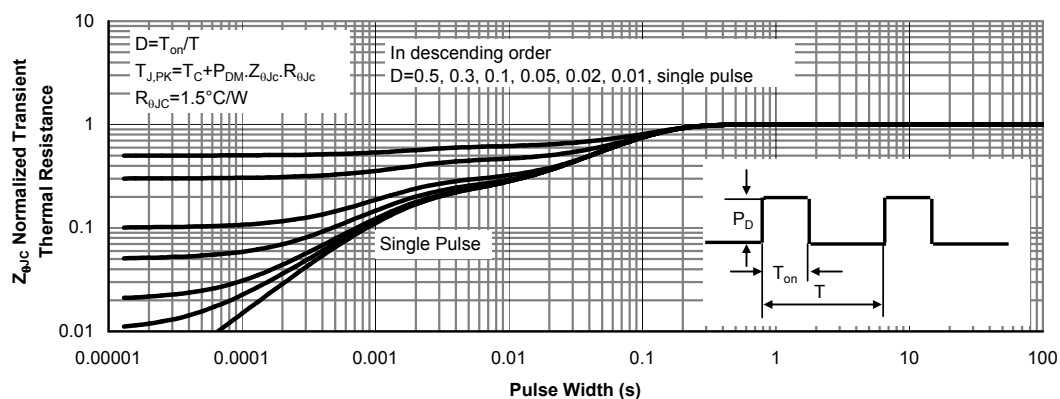


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

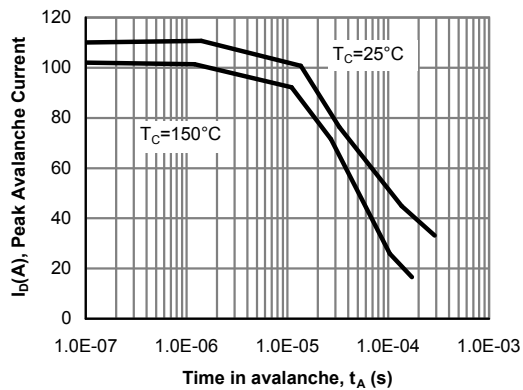


Figure 12: Single Pulse Avalanche capability

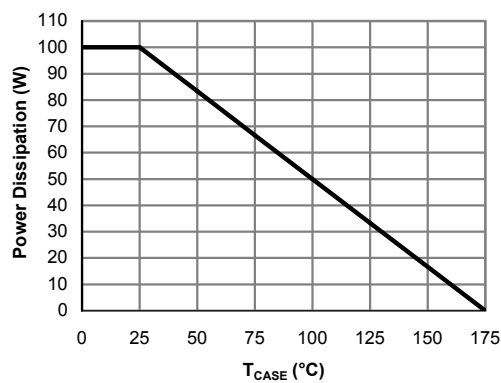


Figure 13: Power De-rating (Note B)

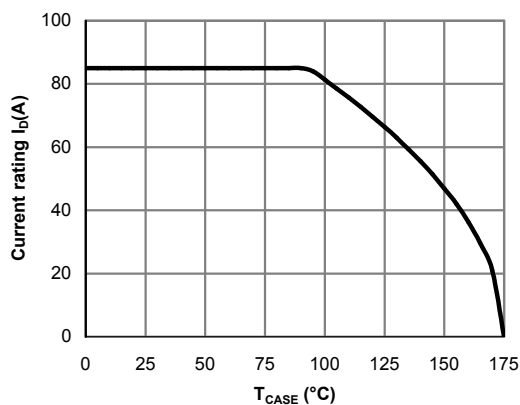


Figure 14: Current De-rating (Note B)

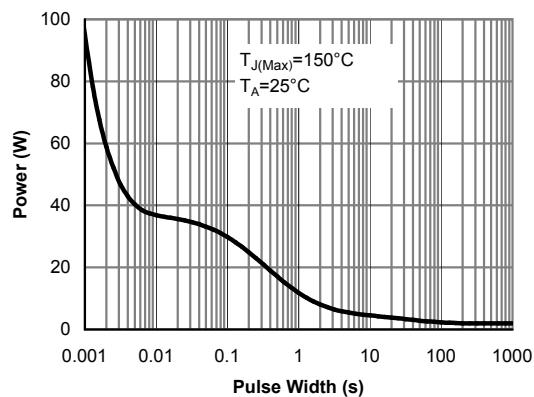


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

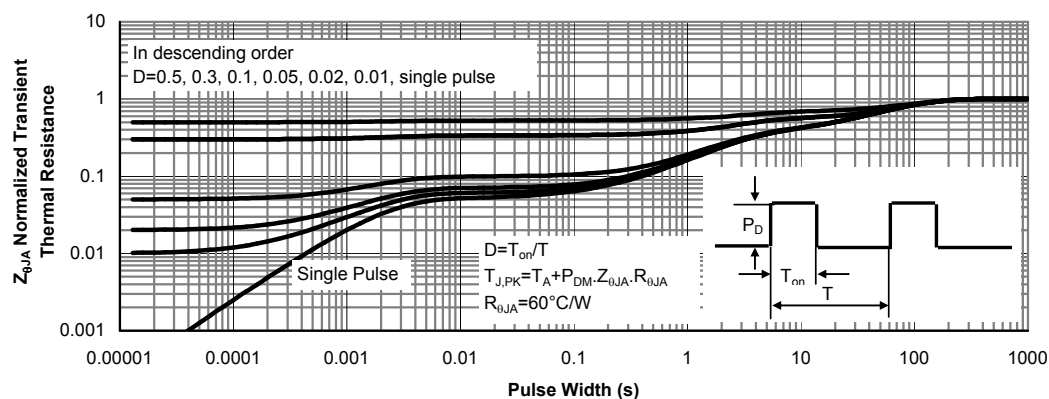
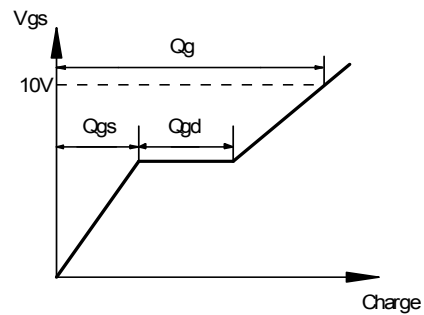
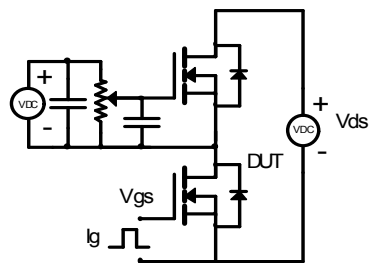
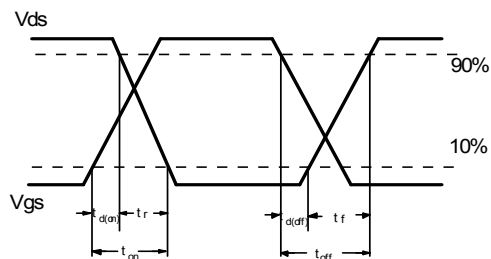
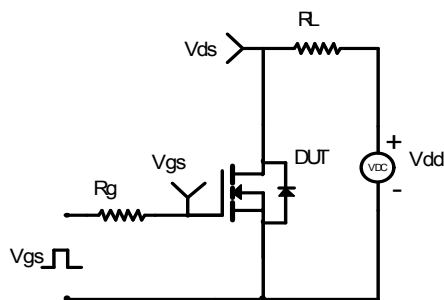


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

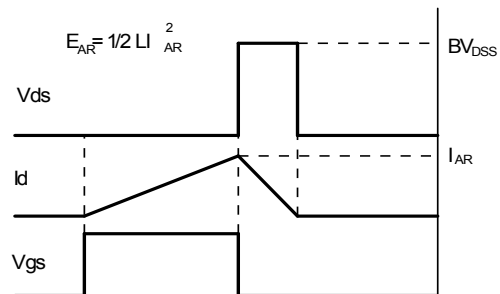
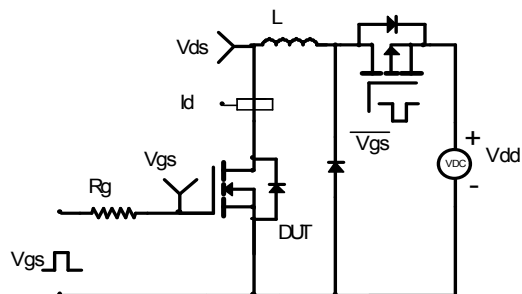
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

