ALPHA & OMEGA SEMICONDUCTOR

AO4710

N-Channel Enhancement Mode Field Effect Transistor

SRFET ™

General Description

SRFET™ The AO4710/L 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.*AO4710 and AO4710L are electrically identical.*

-RoHS Compliant

-AO4710L is Halogen Free

Features

V_{DS} (V) = 30V

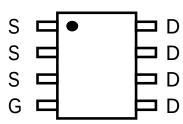
I_D =12.7A (V_{GS} = 10V)

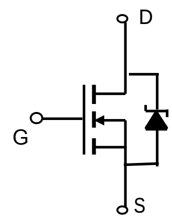
$R_{DS(ON)}$ < 11.8mΩ (V_{GS} = 10V)

$R_{DS(ON)}$ < 14.2mΩ (V_{GS} = 4.5V)

UIS TESTED!

Rg,Ciss,Coss,Crss Tested





SRFET™

Soft **R**ecovery MOS**FET**:

Integrated Schottky Diode

Absolute Maximum Ratings T_A=25°C unless otherwise noted				
Parameter		**Symbol**	**Maximum**	**Units**
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current [AF]	T_A=25°C	I_{DSM}	12.7	A
	T_A=70°C		10	
Pulsed Drain Current [B]		I_{DM}	60	A
Avalanche Current [C]		I_{AR}	22	A
Repetitive avalanche energy L=0.3mH [C]		E_{AR}	73	mJ
Power Dissipation	T_A=25°C	P_{DSM}	3.1	W
	T_A=70°C		2.0	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	32	40	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		60	75	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	17	24	°C/W

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			0.02	0.1	mA
			T_J=125°C		6	20	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±12V				0.1	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA		1.5	1.9	2.3	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=12.7A			9.8	11.8	mΩ
			T_J=125°C		15.2	19.0	
		V_{GS}=4.5V, I_D=11A			11.7	14.2	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=12.7A			78		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.38	0.5	V
I_S	Maximum Body-Diode + Schottky Continuous Current					5	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz			1980	2376	pF
C_{oss}	Output Capacitance				317		pF
C_{rss}	Reverse Transfer Capacitance				111		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz			1.3	2.0	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=12.7A			33	43	nC
Q_g(4.5V)	Total Gate Charge				15.0	20	nC
Q_{gs}	Gate Source Charge				5.3		nC
Q_{gd}	Gate Drain Charge				6.0		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.2Ω, R_{GEN}=3Ω			5.5		ns
t_r	Turn-On Rise Time				5.5		ns
$t_{D(off)}$	Turn-Off DelayTime				27.0		ns
t_f	Turn-Off Fall Time				4.3		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=12.7A, dI/dt=300A/µs			11.2	13	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=12.7A, dI/dt=300A/µs			7		nC

A: The value of $R_{\theta JA}$ is measured withthe device mounted on 1in ^{2} 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.
B: Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C.
C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
D. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.
E. 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. The SOA curve provides a single pulse rating.
F. The current rating is based on the t ≤ 10s thermal resistance rating.

Rev3: July 2008

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

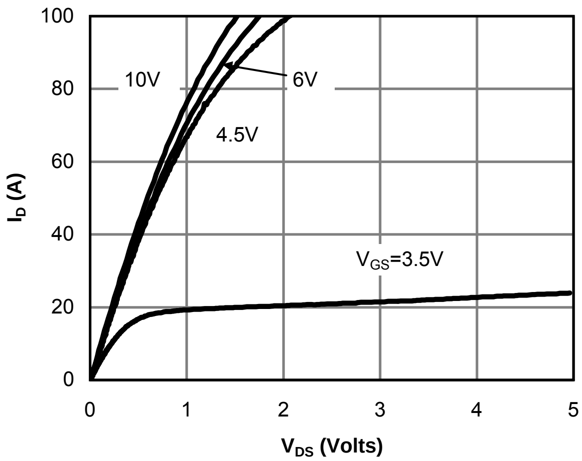


Figure 1: On-Region Characteristics

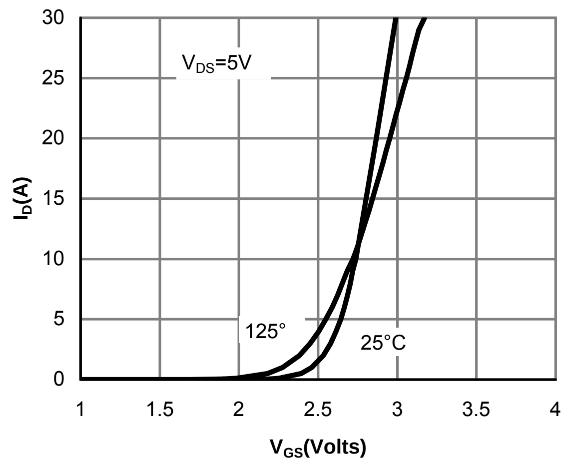


Figure 2: Transfer Characteristics

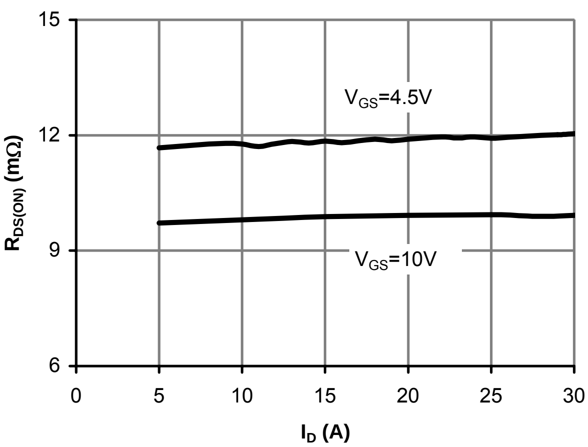


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

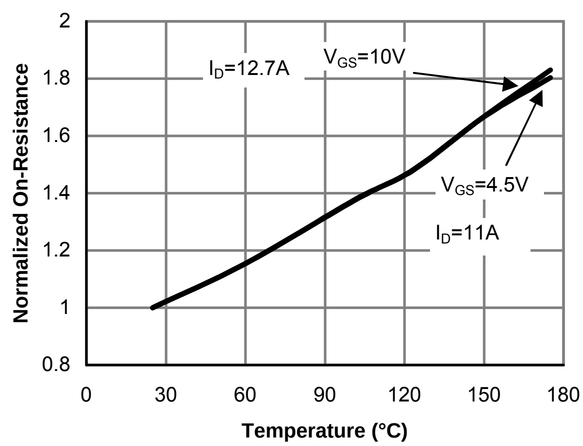


Figure 4: On-Resistance vs. Junction Temperature

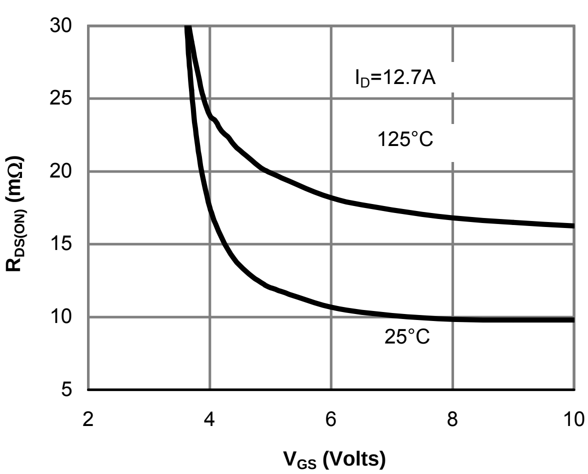


Figure 5: On-Resistance vs. Gate-Source Voltage

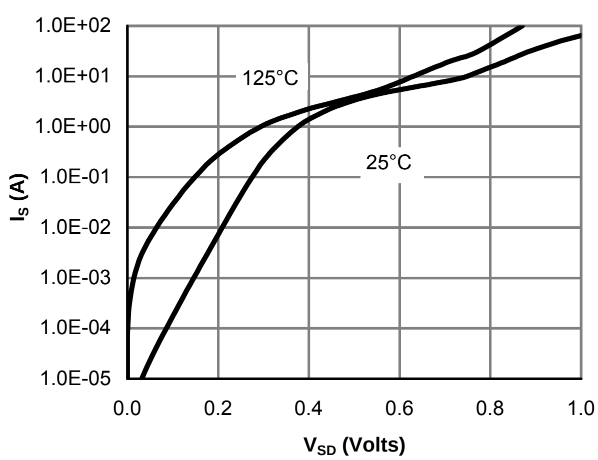


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

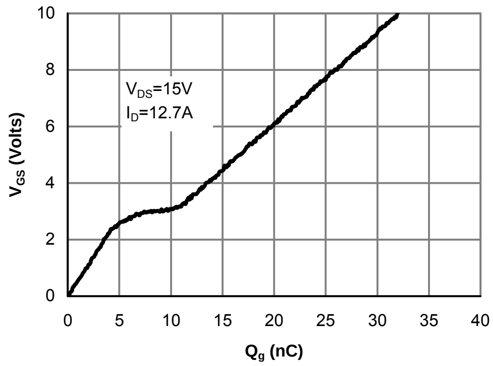


Figure 7: Gate-Charge Characteristics

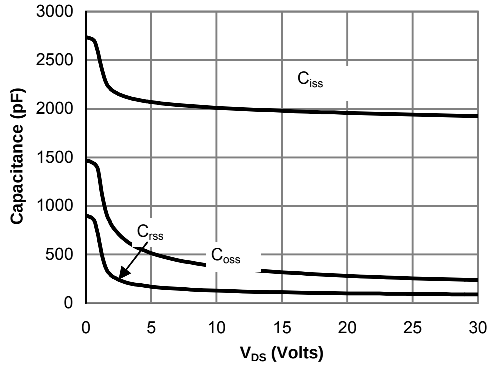


Figure 8: Capacitance Characteristics

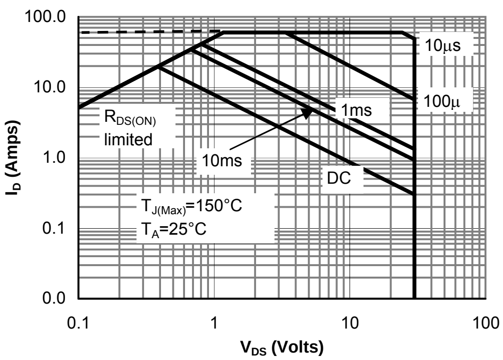


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

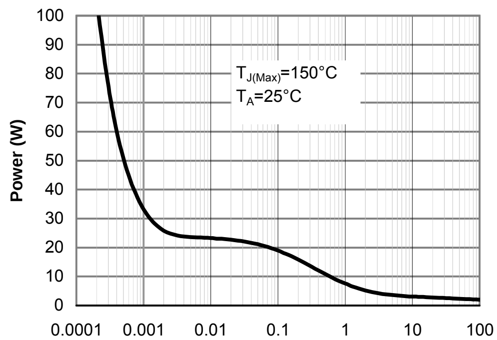


Figure10: Single Pulse Power Rating Junction-to-Ambient (Note E)

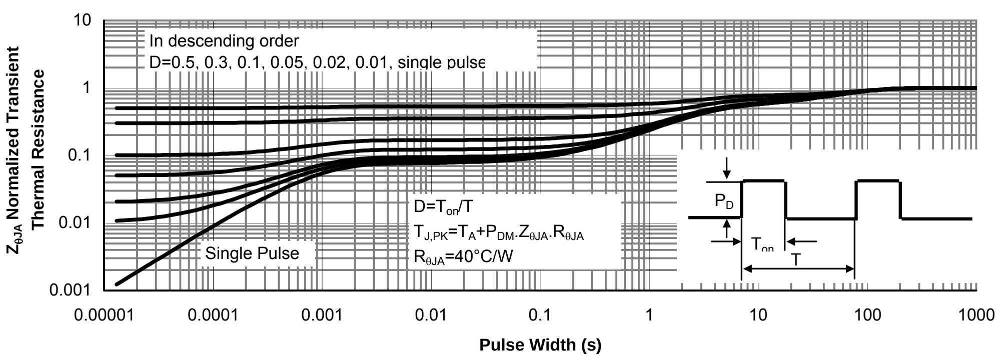


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

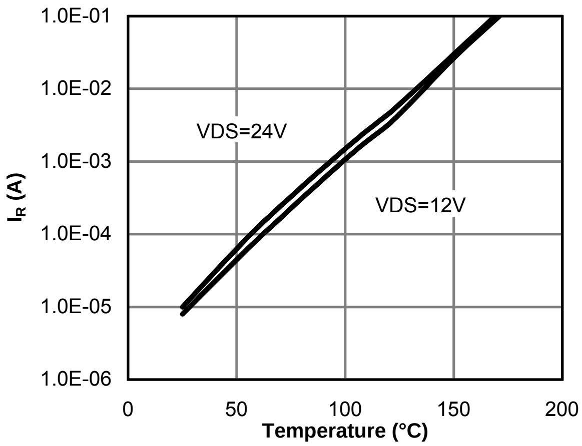


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

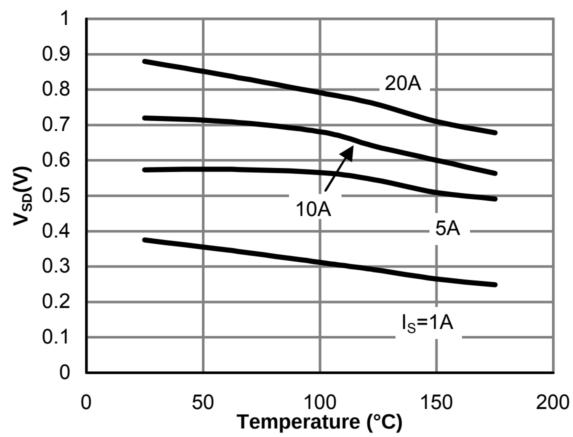


Figure 13: Diode Forward voltage vs. Junction Temperature

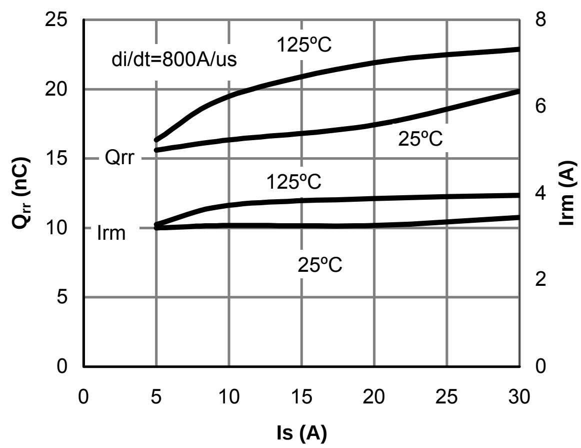


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

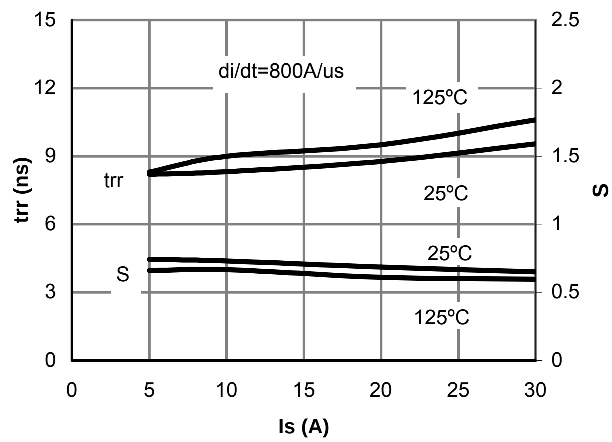


Figure 15: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

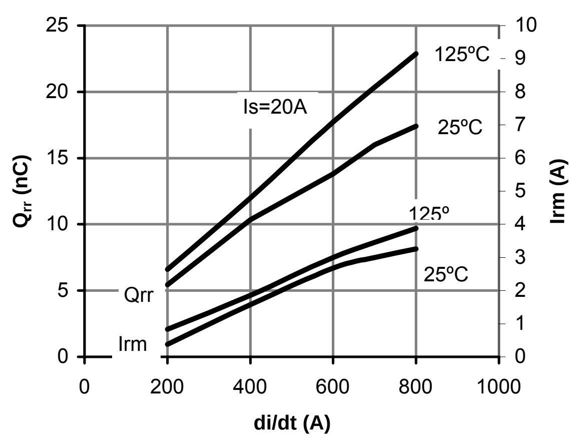


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

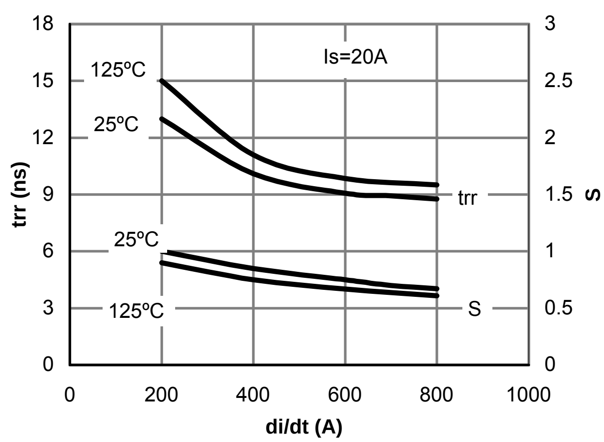
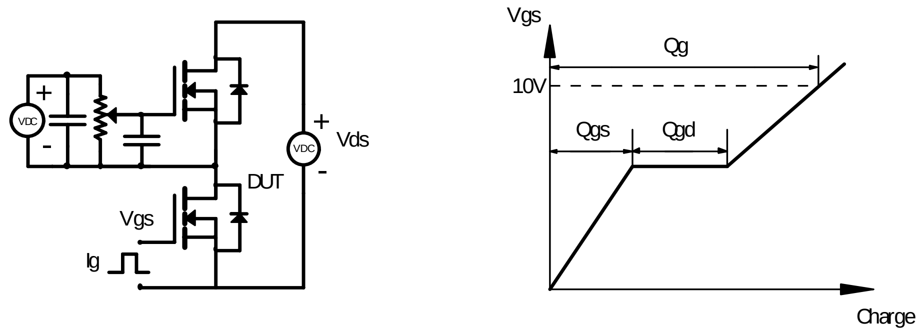
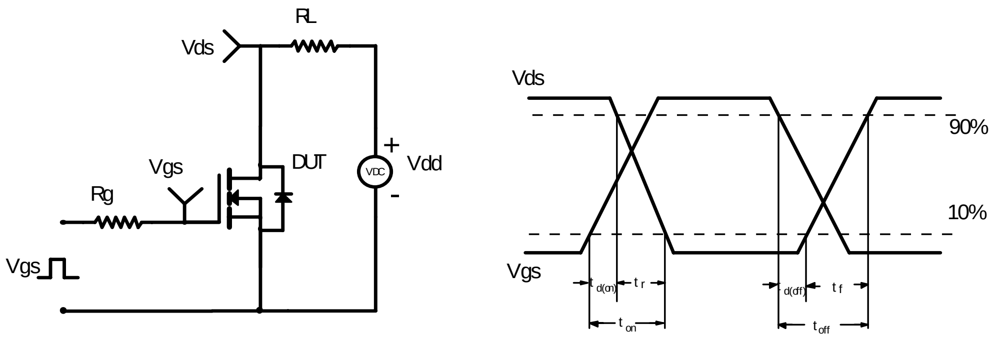


Figure 17: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

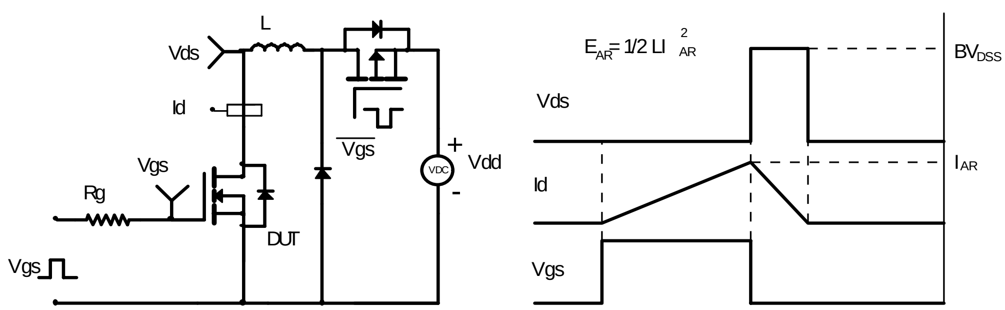
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms