ALPHA & OMEGA SEMICONDUCTOR

RoHS Compliant

AO4716

N-Channel Enhancement Mode Field Effect Transistor

SRFET™

General Description

SRFET™ AO4716/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.

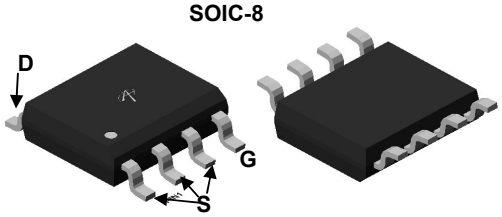
AO4716 and AO4716L are electrically identical.
- RoHS Compliant
- AO4716L is Halogen Free

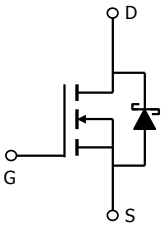
Features

V_{DS} (V) = 30V
I_D =16.5A (V_{GS} = 10V)
$R_{DS(ON)}$ < 7mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 10mΩ (V_{GS} = 4.5V)

100% UIS Tested!
100% Rg Tested!

SOIC-8





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}	±20	V
Continuous Drain Current [AF]	T_A=25°C	I_{DSM}	16.5	A
	T_A=70°C		13.0	
Pulsed Drain Current [B]		I_{DM}	180	A
Avalanche Current [B]		I_{AR}	25	A
Repetitive avalanche energy L=0.3mH [B]		E_{AR}	94	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 [AF]	t ≤ 10s	$R_{\theta JA}$	31	40	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		59	75	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	16	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			0.1	mA
		T_J=125°C			20	
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	1.3	1.6	2	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	180			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	VGS=10V, ID=16.5A		5.8	7.0	mΩ
		T_J=125°C		9.9	12.3	
		V_{GS}=4.5V, I_D=13A		8.2	10.0	mΩ
g_{FS}	Forward Transconductance	VDS=5V, ID=16.5A		55		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.33	0.5	V
I_S	Maximum Body-Diode + Schottky Continuous Current				5.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		2154	2650	pF
C_{oss}	Output Capacitance			474		pF
C_{rss}	Reverse Transfer Capacitance			185		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.75	1.1	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	VGS=10V, VDS=15V, ID=16.5A		37	45	nC
Q_g(4.5V)	Total Gate Charge			17.8	23	nC
Q_{gs}	Gate Source Charge			6.6		nC
Q_{gd}	Gate Drain Charge			7.6		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.8Ω, R_{GEN}=3Ω		6.8		ns
t_r	Turn-On Rise Time			7.2		ns
$t_{D(off)}$	Turn-Off DelayTime			25.2		ns
t_f	Turn-Off Fall Time			5.8		ns
t_{rr}	Body Diode Reverse Recovery Time	IF=16.5A, dI/dt=300A/us		12	18	ns
Q_{rr}	Body Diode Reverse Recovery Charge	IF=16.5A, dI/dt=300A/us		10.5		nC

A: The value of $R_{\theta JA}$ is measured with the 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.

Rev2: Nov 2008

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

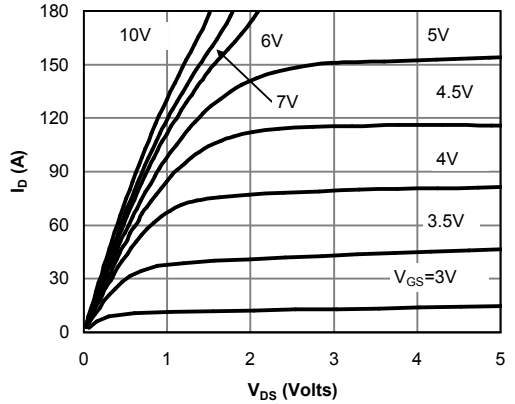


Figure 1: On-Region Characteristics

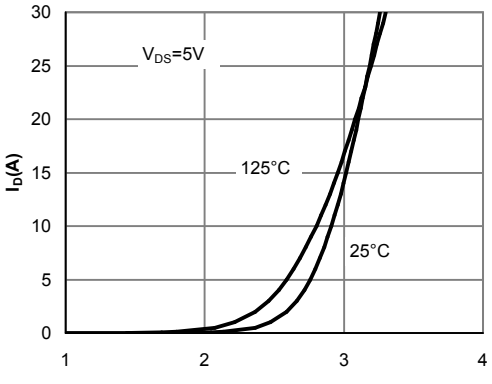


Figure 2: Transfer Characteristics

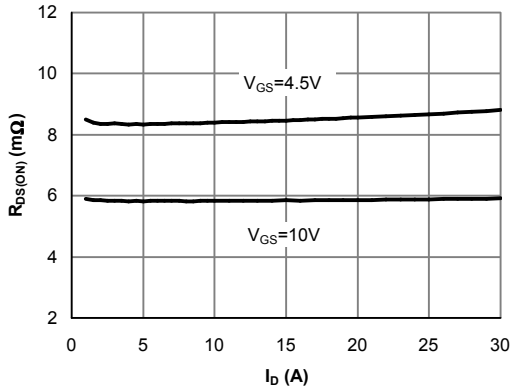


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

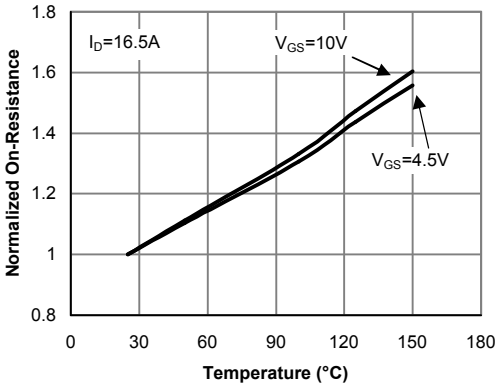


Figure 4: On-Resistance vs. Junction Temperature

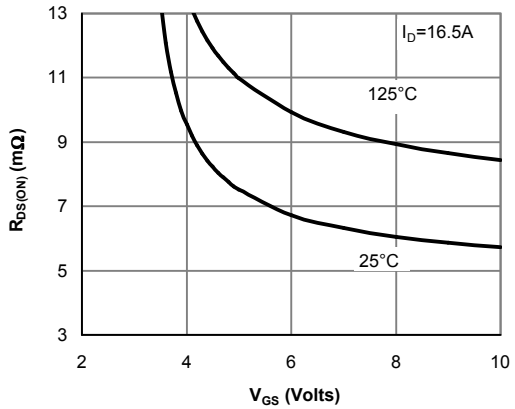


Figure 5: On-Resistance vs. Gate-Source Voltage

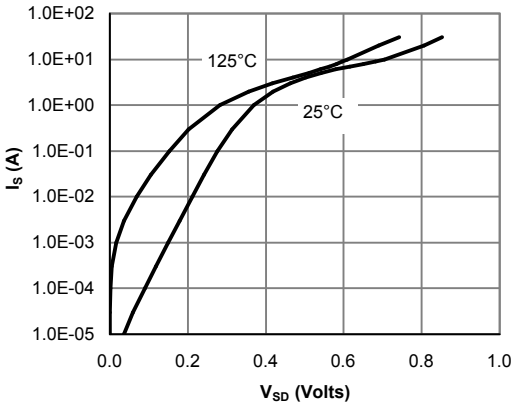


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

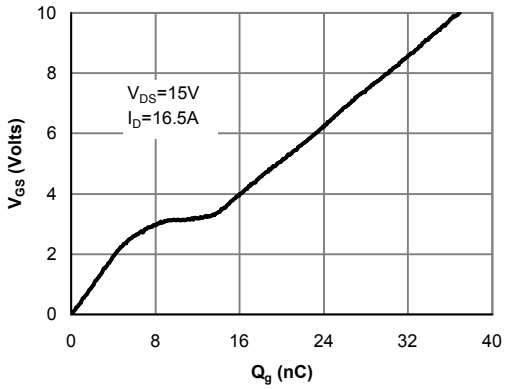


Figure 7: Gate-Charge Characteristics

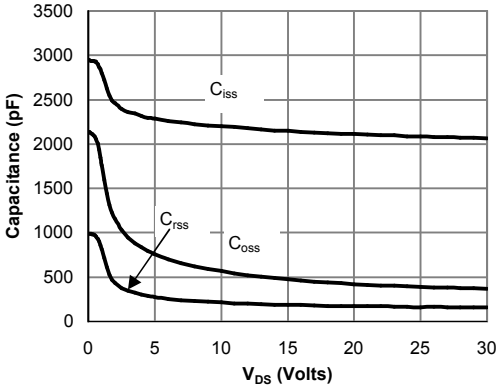


Figure 8: Capacitance Characteristics

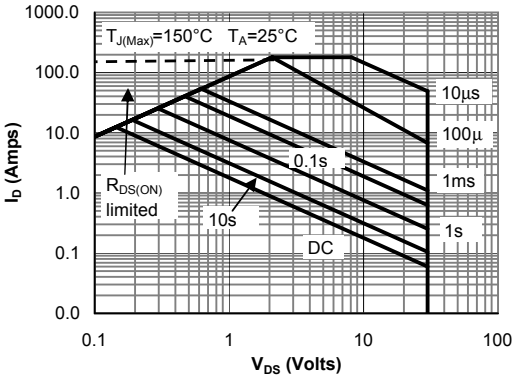


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

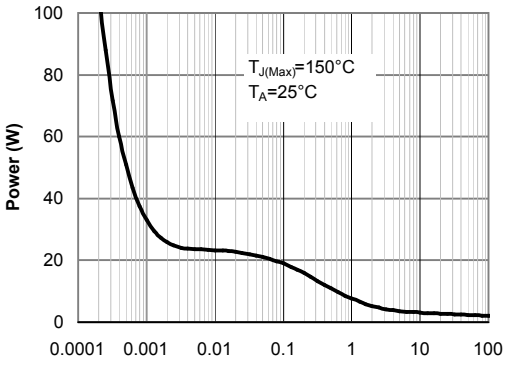


Figure10: Single Pulse Power Rating Junction-to-Ambient (Note E)

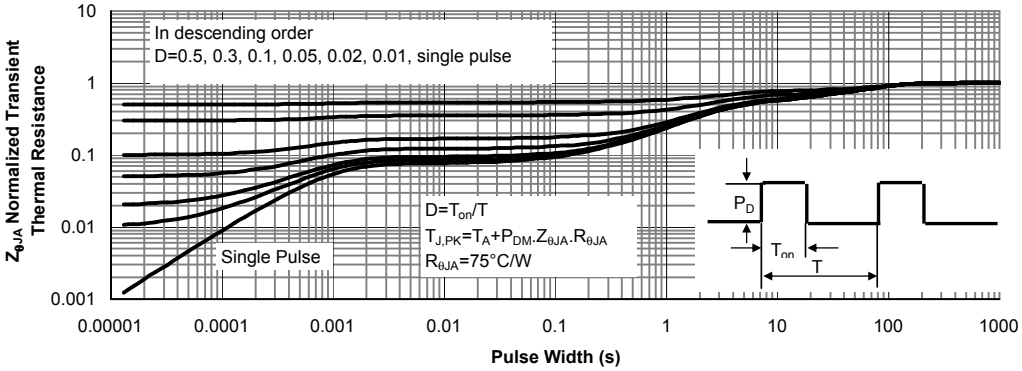


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

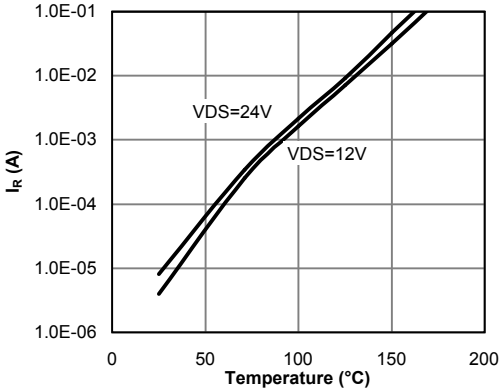


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

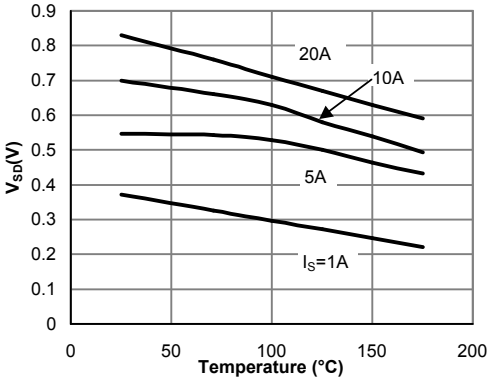


Figure 13: Diode Forward voltage vs. Junction Temperature

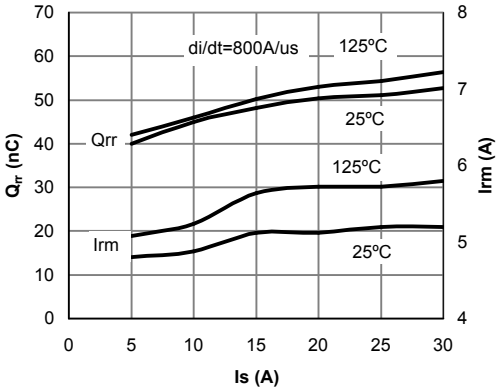


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

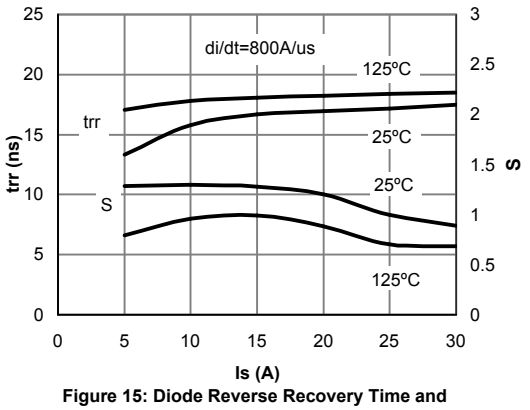


Figure 15: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

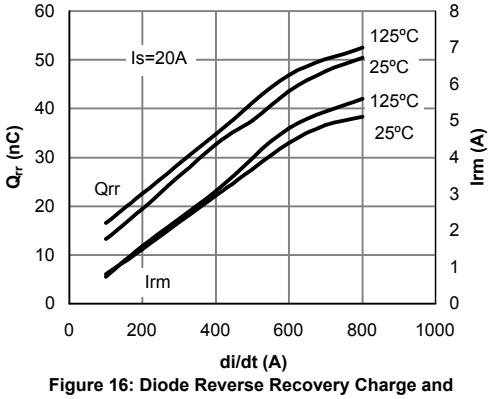


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

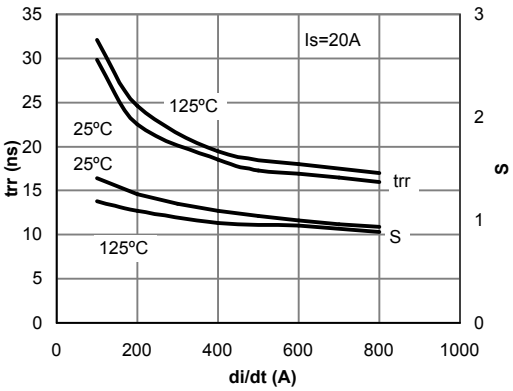
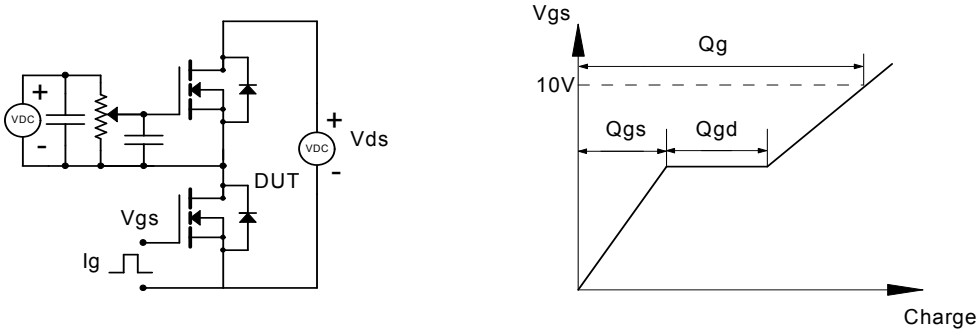
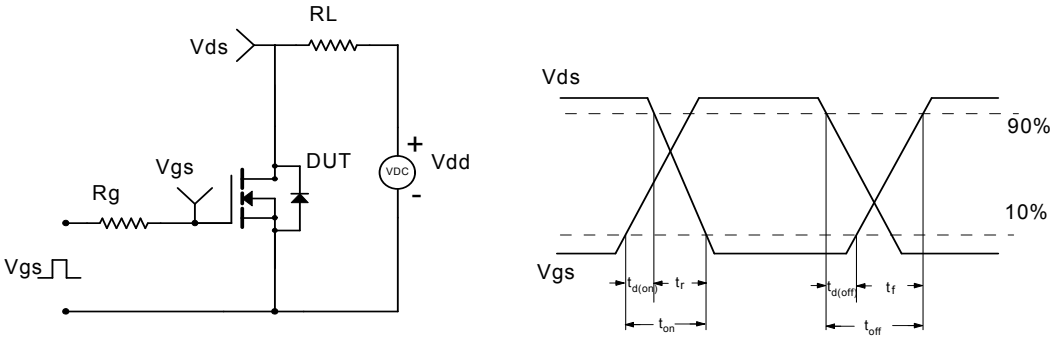


Figure 17: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

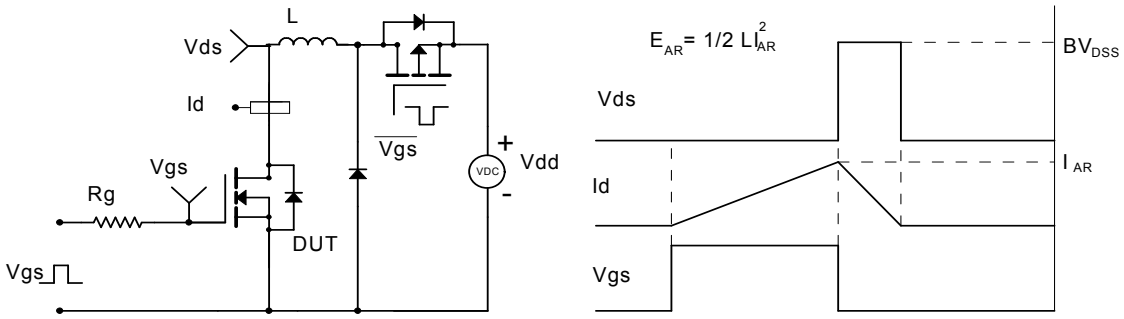
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms