



**AO4716**

**N-Channel Enhancement Mode Field Effect Transistor**

**SRFET™**



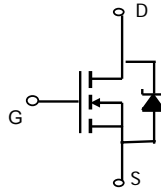
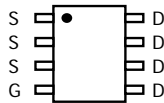
**General Description**

**SRFET™** AO4716 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. *Standard Product AO4716 is Pb-free (meets ROHS & Sony 259 specifications).*

**Features**

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

**UIS TESTED!**  
**Rg, Ciss, Coss, Crss Tested**



**SRFET™**  
**Soft Recovery MOSFET:**  
**Integrated Schottky Diode**

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

Parameter	Symbol	Maximum		Units	
		10 Sec	Steady State		
Drain-Source Voltage	$V_{DS}$	30		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		V	
Continuous Drain Current <sup>AF</sup>	$I_{DSM}$	$T_A=25^\circ\text{C}$	16.5	12.0	A
		$T_A=70^\circ\text{C}$	13.0	9.6	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	180		A	
Avalanche Current <sup>B</sup>	$I_{AR}$	25		A	
Repetitive avalanche energy $L=0.3\text{mH}$ <sup>B</sup>	$E_{AR}$	94		mJ	
Power Dissipation	$P_{DSM}$	$T_A=25^\circ\text{C}$	3.1	1.7	W
		$T_A=70^\circ\text{C}$	2.0	1.1	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150		$^\circ\text{C}$	

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>AF</sup>	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	59	75
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=1\text{mA}, V_{GS}=0\text{V}$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$			0.1 20	mA
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$			0.1	$\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.3	1.6	2	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	180			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=16.5\text{A}$ $T_J=125^\circ\text{C}$		5.8 9.9	7.0 12.3	m $\Omega$
		$V_{GS}=4.5\text{V}, I_D=13\text{A}$		8.2	10.0	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=16.5\text{A}$		55		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.33	0.5	V
$I_S$	Maximum Body-Diode + Schottky Continuous Current				5.5	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		2154	2650	pF
$C_{oss}$	Output Capacitance			474		pF
$C_{riss}$	Reverse Transfer Capacitance			185		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		0.75	1.1	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=16.5\text{A}$		37	45	nC
$Q_g(4.5\text{V})$	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 Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.8\Omega,$ $R_{GEN}=3\Omega$		6.8		ns
$t_r$	Turn-On Rise Time			7.2		ns
$t_{D(off)}$	Turn-Off Delay Time			25.2		ns
$t_f$	Turn-Off Fall Time			5.8		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=16.5\text{A}, dI/dt=300\text{A}/\mu\text{s}$		12	18	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=16.5\text{A}, dI/dt=300\text{A}/\mu\text{s}$		10.5		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in 2 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.

B: Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$ .

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  $<300\mu\text{s}$  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  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

F: The current rating is based on the  $\leq 10\text{s}$  thermal resistance rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

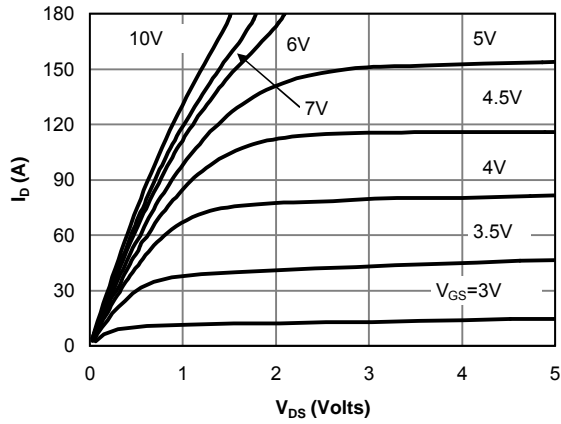


Figure 1: On-Region Characteristics

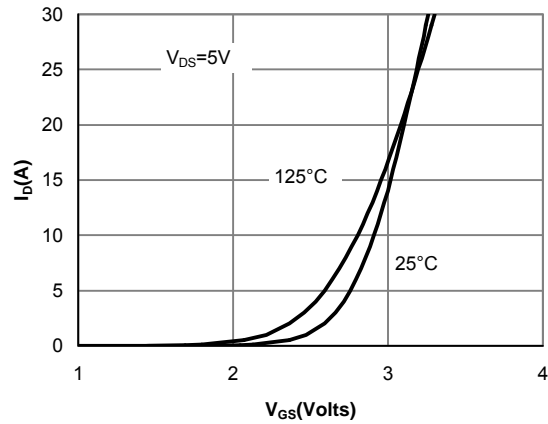


Figure 2: Transfer Characteristics

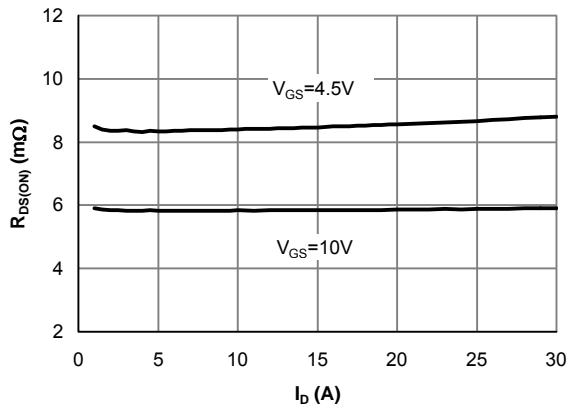


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

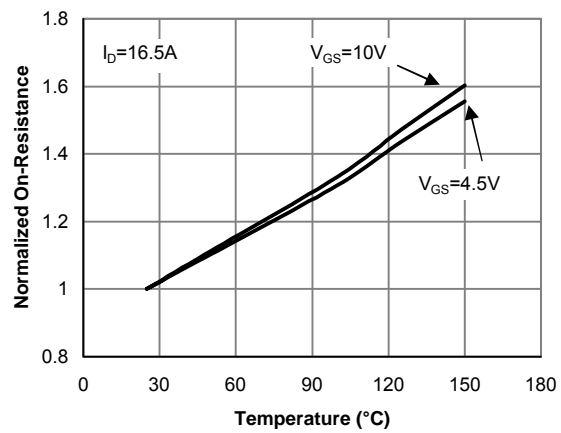


Figure 4: On-Resistance vs. Junction Temperature

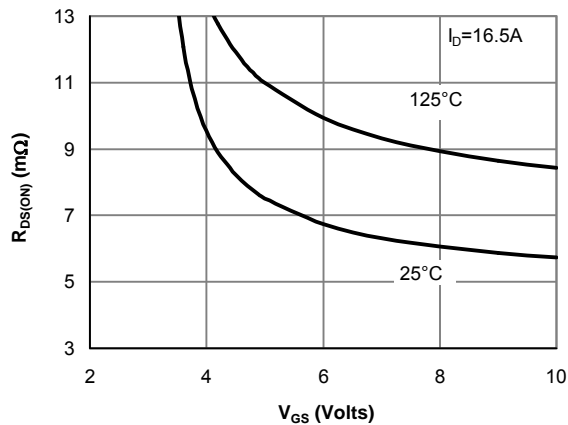


Figure 5: On-Resistance vs. Gate-Source Voltage

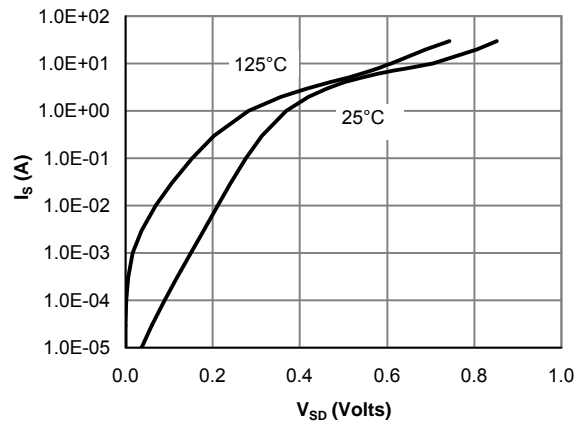


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

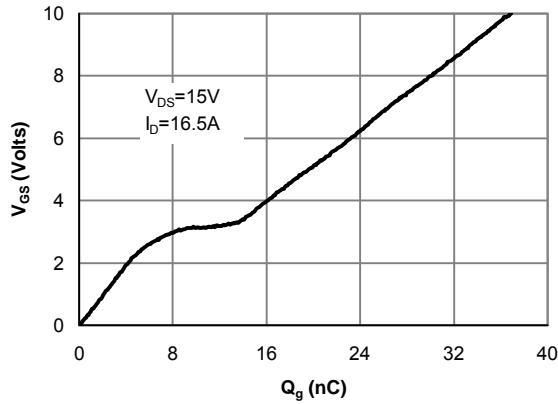


Figure 7: Gate-Charge Characteristics

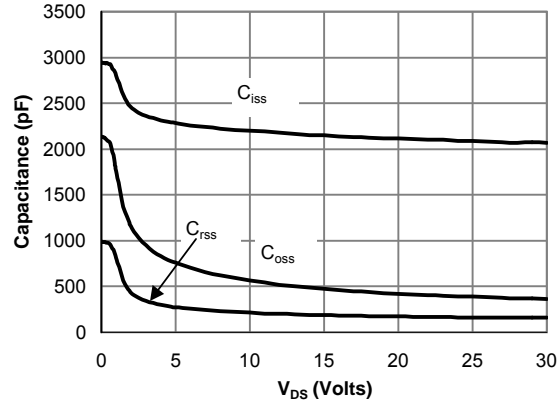


Figure 8: Capacitance Characteristics

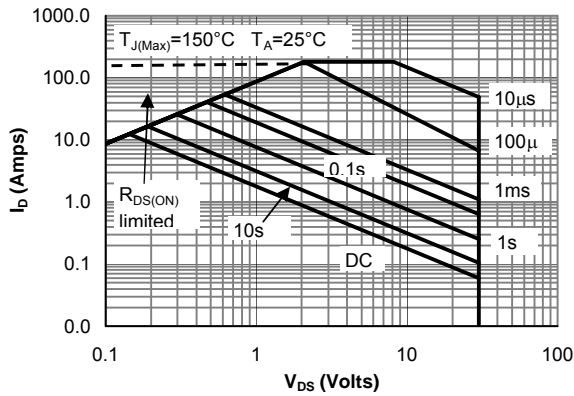


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

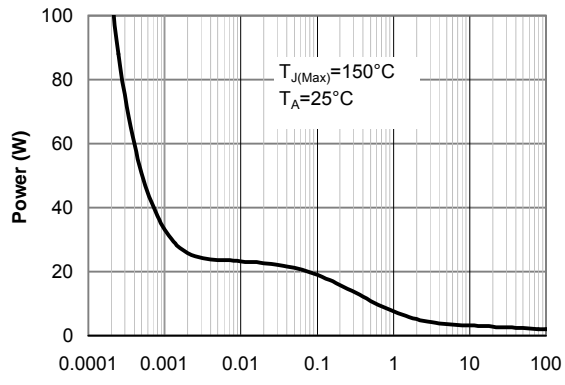


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

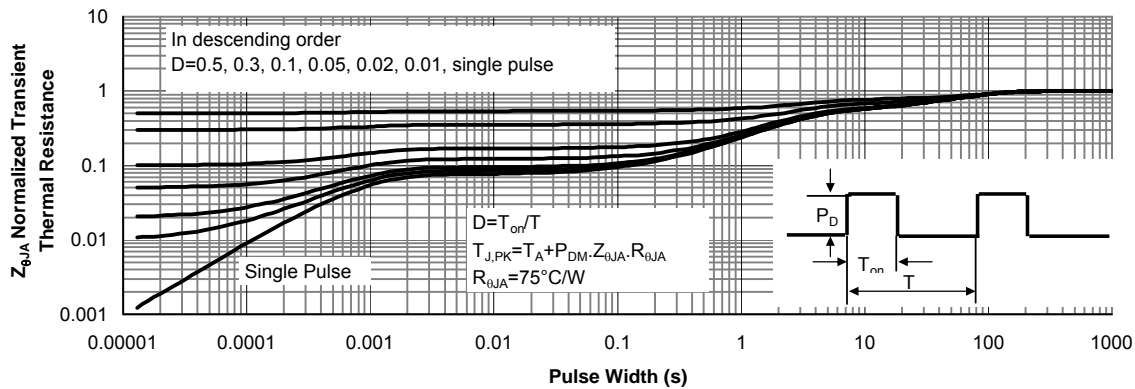


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

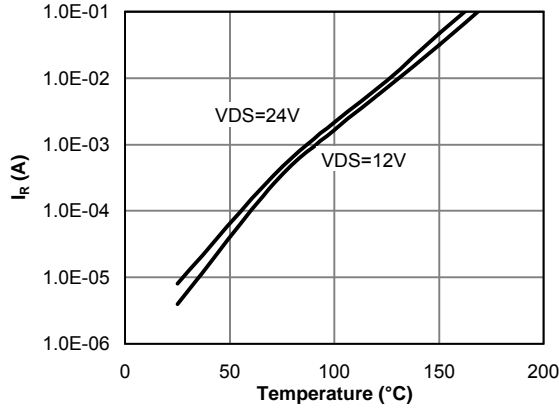


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

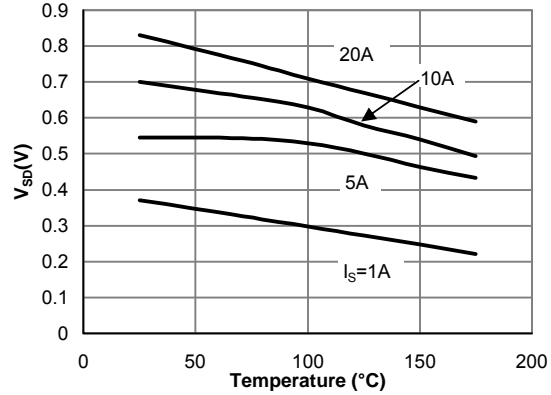


Figure 13: Diode Forward voltage vs. Junction Temperature

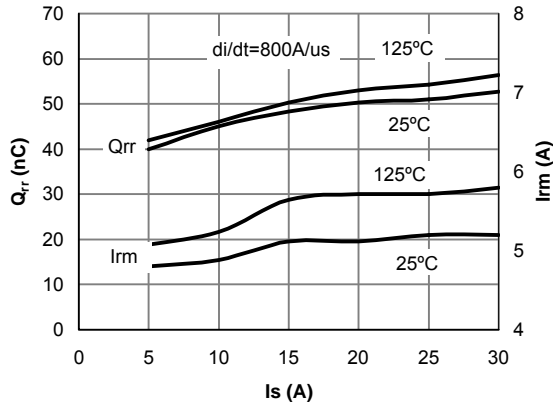


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

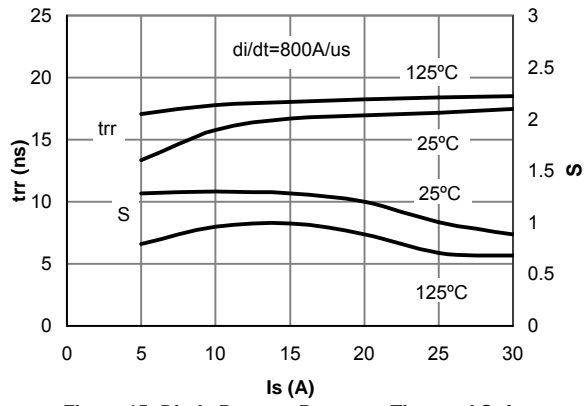


Figure 15: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

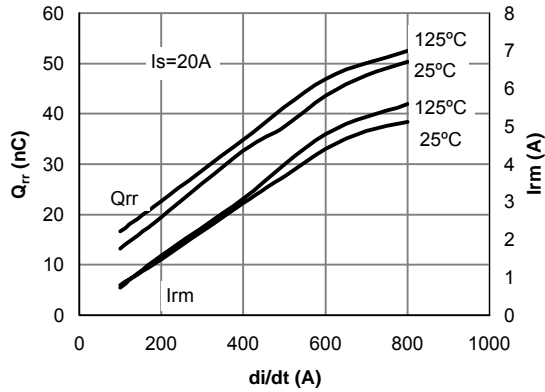


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

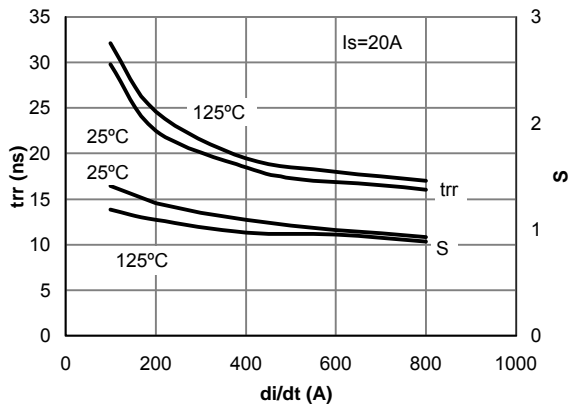


Figure 17: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt