ALPHA & OMEGA SEMICONDUCTOR

# AO4714

## N-Channel Enhancement Mode Field Effect Transistor

***SRFET*** **TM**

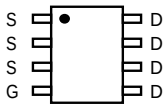
### General Description

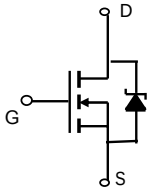
***SRFET*** *TM* AO4714 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$,and low gate charge. This device is suitable for use as a low side FET in SMPS, load switching and general purpose applications. *Standard Product AO4714 is Pb-free (meets ROHS & Sony 259 specifications).*

### Features

$V_{DS}$ (V) = 30V
$I_D$ =20A ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 4.7mΩ ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 6.7mΩ ($V_{GS}$ = 4.5V)

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




***SRFET*** *TM*
**S**oft **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 [F] | $T_A$=25°C | $I_{DSM}$ | 20 | A |
| | $T_A$=70°C | | 16 | |
| Pulsed Drain Current [B] | | $I_{DM}$ | 100 | A |
| Power Dissipation [F] | $T_A$=25°C | $P_{DSM}$ | 3.0 | W |
| | $T_A$=70°C | | 2.0 | |
| Avalanche Current [B] | | $I_{AR}$ | 30 | A |
| Repetitive avalanche energy L=0.3mH [B] | | $E_{AR}$ | 135 | mJ |
| 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 | $R_{\theta JA}$ | 31 | 41 | °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 | 1.2 | 1.5 | 2.2 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=10V, $V_{DS}$=5V | 100 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=20A | | 3.9 | 4.7 | mΩ |
| | | $T_J$=125°C | | 5.9 | 7.3 | |
| | | $V_{GS}$=4.5V, $I_D$=16A | | 5.4 | 6.7 | 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 Continuous Current | | | | 6 | 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 | |
| $Q_g$(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 $R_{\theta JA}$ 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 <300µs 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 power dissipation and current rating is based on the ≤ 10s junction to ambient thermal resistance rating.
Rev1: Feb. 2007

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

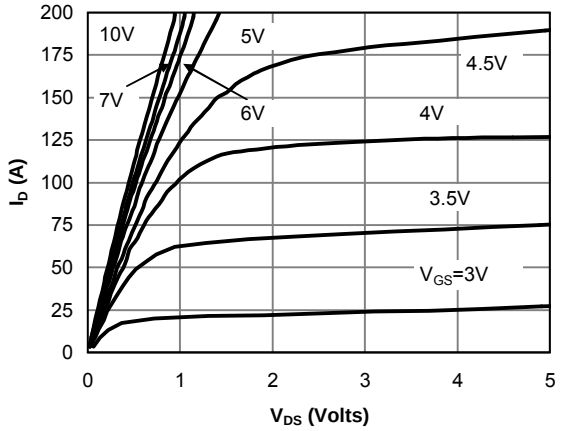


**Figure 1: On-Region Characteristics**

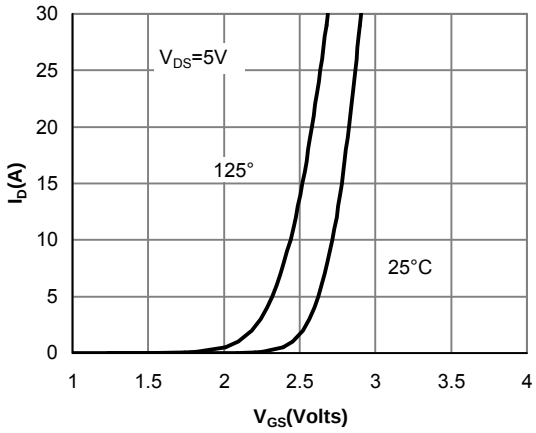


**Figure 2: Transfer Characteristics**

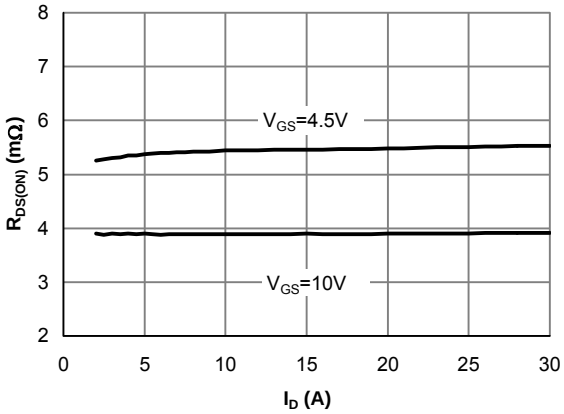


**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

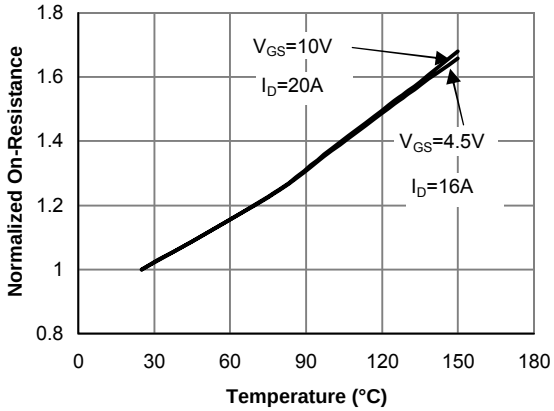


**Figure 4: On-Resistance vs. Junction Temperature**

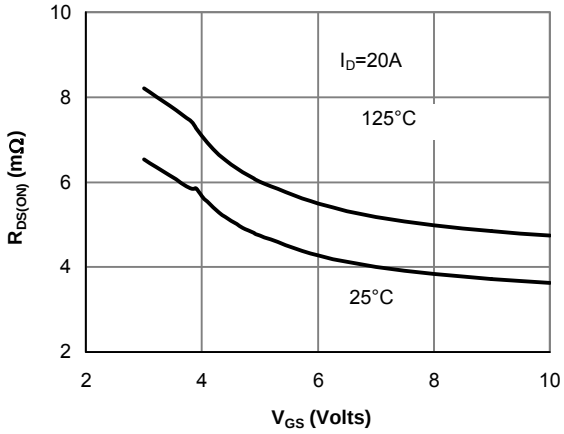


**Figure 5: On-Resistance vs. Gate-Source Voltage**

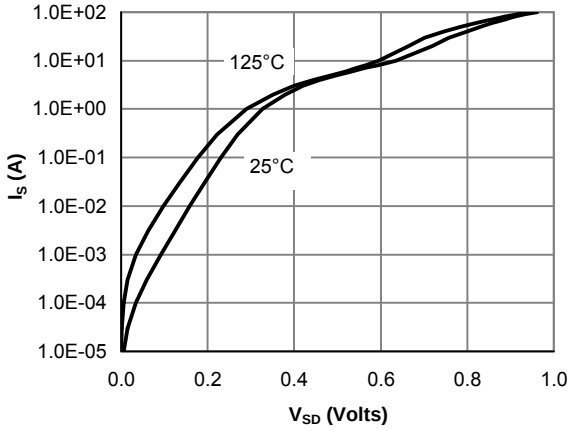


**Figure 6: Body-Diode Characteristics**

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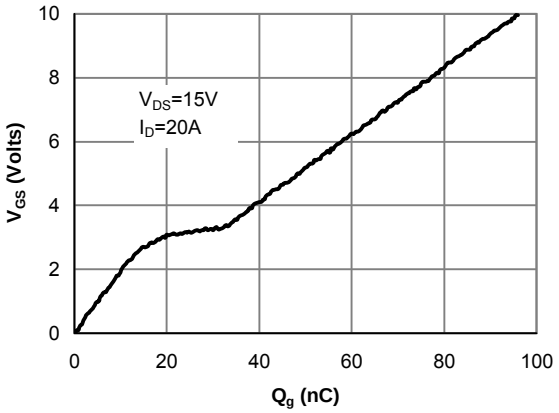


**Figure 7: Gate-Charge Characteristics**

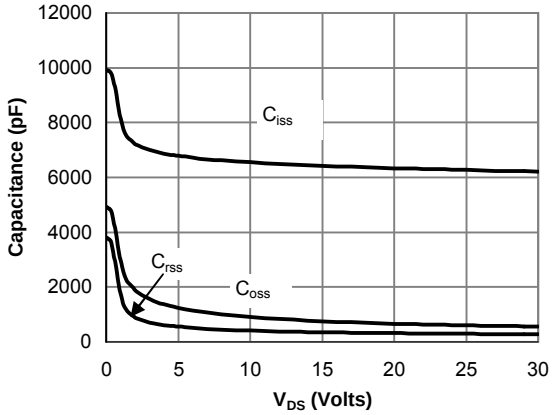


**Figure 8: Capacitance Characteristics**

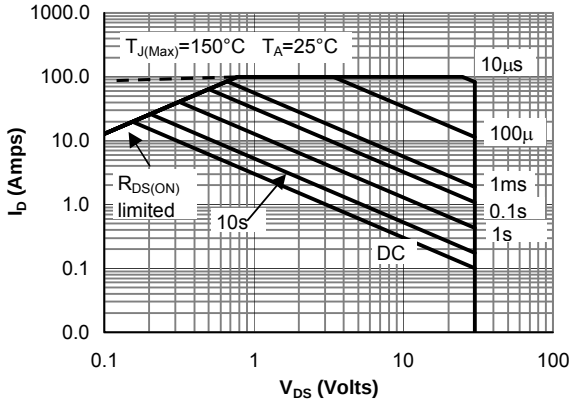


**Figure 9: Maximum Forward Biased Safe Operating Area (Note E)**

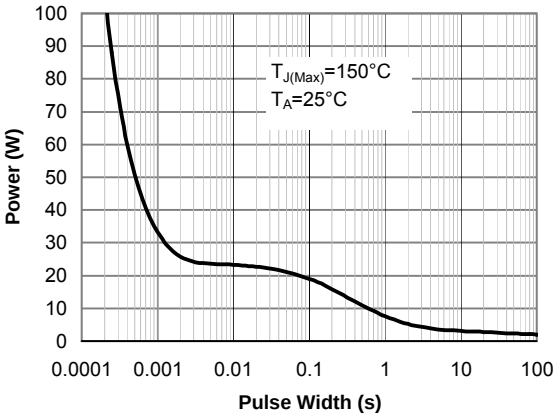


**Figure10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

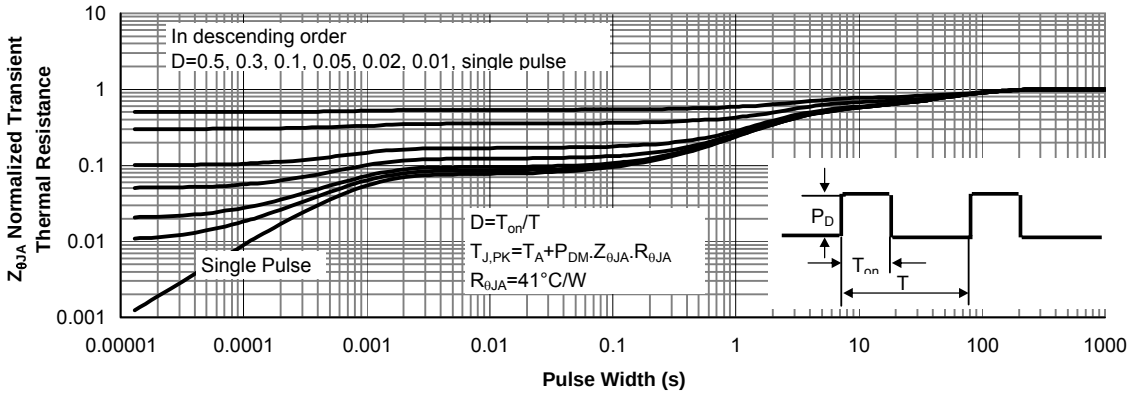


**Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)**