ALPHA & OMEGA SEMICONDUCTOR

# AO3422
# N-Channel Enhancement Mode Field Effect Transistor

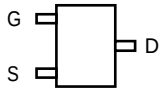
## General Description

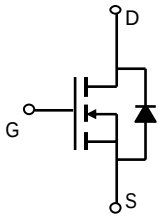
The AO3422 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. It offers operation over a wide gate drive range from 2.5V to 12V. This device is suitable for use as a load switch. Standard product *AO3422 is Pb-free (meets ROHS & Sony 259 specifications). AO3422L is a Green Product ordering option. AO3422 and AO3422L are electrically identical.*

## Features

$V_{DS}$ (V) = 55V
$I_D$ = 2.1A ($V_{GS}$ = 4.5V)
$R_{DS(ON)}$ < 160mΩ ($V_{GS}$ = 4.5V)
$R_{DS(ON)}$ < 200mΩ ($V_{GS}$ = 2.5V)

**TO-236 (SOT-23) Top View**




**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 55 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±12 | V |
| Continuous Drain Current [A] | $T_A$=25°C | $I_D$ | 2.1 | A |
| | $T_A$=70°C | | 1.7 | |
| Pulsed Drain Current [B] | | $I_{DM}$ | 10 | |
| Power Dissipation | $T_A$=25°C | $P_D$ | 1.25 | W |
| | $T_A$=70°C | | 0.8 | |
| 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 | $R_{\theta JA}$ | 75 | 100 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 115 | 150 | °C/W |
| Maximum Junction-to-Lead [C] | Steady-State | $R_{\theta JL}$ | 48 | 60 | °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 | $I_D$=10mA, $V_{GS}$=0V | | 55 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=44V, $V_{GS}$=0V | | | | 1 | µA |
| | | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Source leakage current | $V_{DS}$=0V, $V_{GS}$=±12V | | | | ±100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ $I_D$=250µA | | 0.6 | 1.3 | 2 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=4.5V, $V_{DS}$=5V | | 10 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=4.5V, $I_D$=2.1A | | | 125 | 160 | mΩ |
| | | | $T_J$=125°C | | 175 | 210 | |
| | | $V_{GS}$=2.5V, $I_D$=1.5A | | | 157 | 200 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=2.1A | | | 11 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A | | | 0.78 | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | | 1 | A |
| **DYNAMIC PARAMETERS** | | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=25V, f=1MHz | | | 214 | 300 | pF |
| $C_{oss}$ | Output Capacitance | | | | 31 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | | 12.6 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | | 1.3 | 3 | Ω |
| **SWITCHING PARAMETERS** | | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{GS}$=4.5V, $V_{DS}$=27.5V, $I_D$=2.1A | | | 2.6 | 3.3 | nC |
| $Q_{gs}$ | Gate Source Charge | | | | 0.6 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | | 0.8 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=27.5V, $R_L$=12Ω, $R_{GEN}$=3Ω | | | 2.3 | | ns |
| $t_r$ | Turn-On Rise Time | | | | 2.4 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | | 16.5 | | ns |
| $t_f$ | Turn-Off Fall Time | | | | 2 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=2.1A, dI/dt=100A/µs | | | 20 | 30 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=2.1A, dI/dt=100A/µs | | | 17 | | 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. The current rating is based on the t≤ 10s thermal resistance rating.
B: Repetitive rating, pulse width limited by junction temperature.
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 80µs 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.
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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

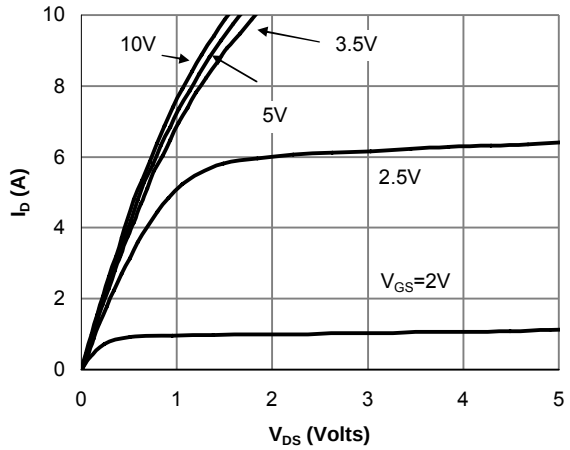


**Fig 1: On-Region characteristics**

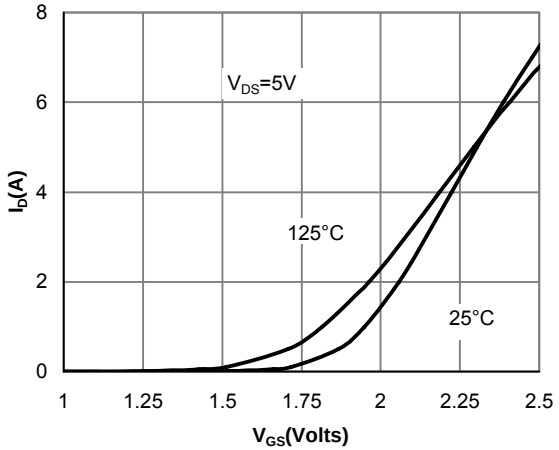


**Figure 2: Transfer Characteristics**

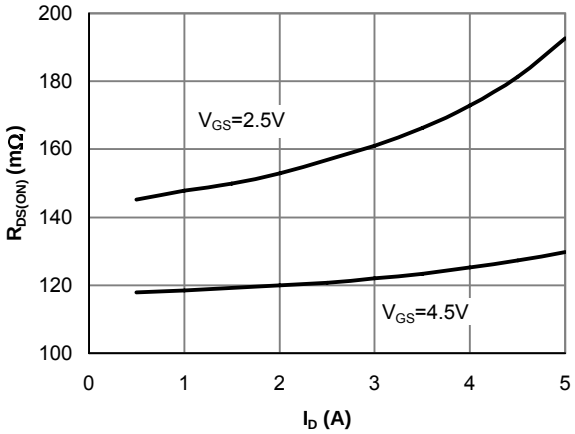


**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

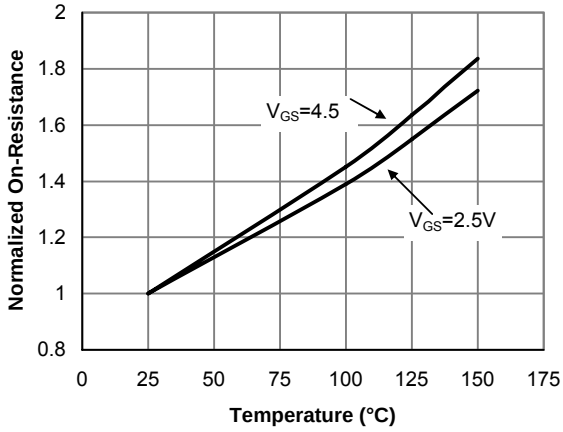


**Figure 4: On-Resistance vs. Junction Temperature**

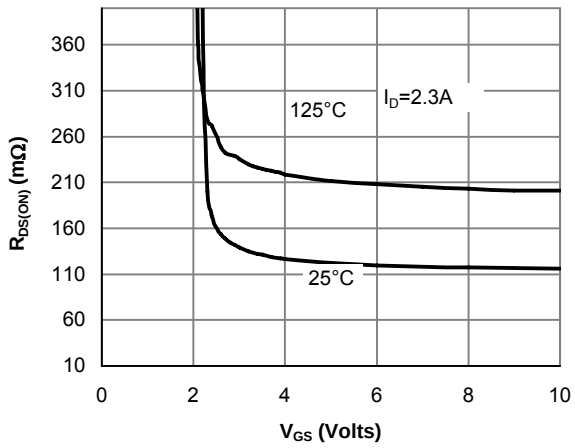


**Figure 5: On-Resistance vs. Gate-Source Voltage**

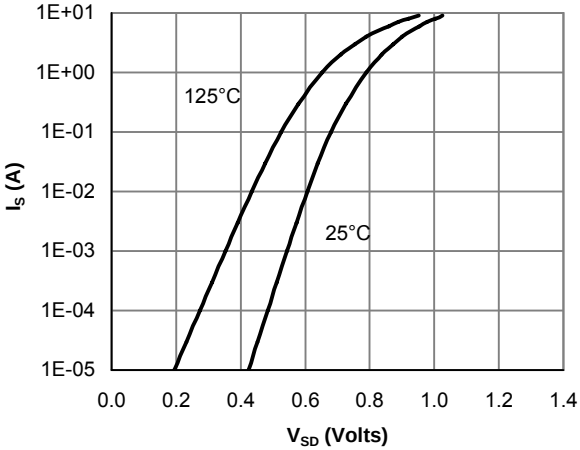


**Figure 6: Body-Diode Characteristics**

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

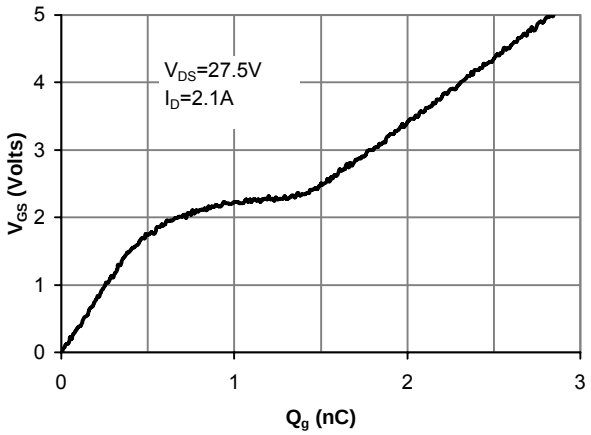


**Figure 7: Gate-Charge Characteristics**

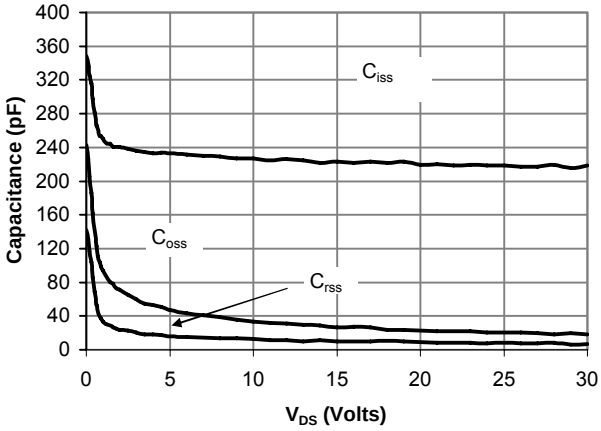


**Figure 8: Capacitance Characteristics**

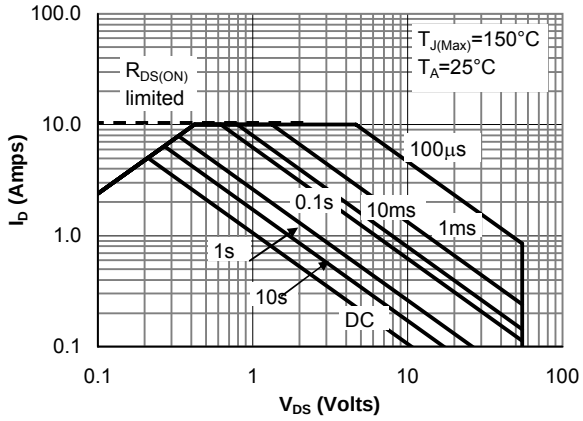


**Figure 9: Maximum Forward Biased Safe Operating Area (Note E)**

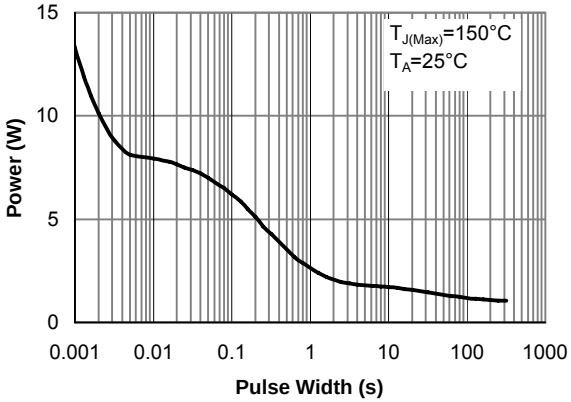


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

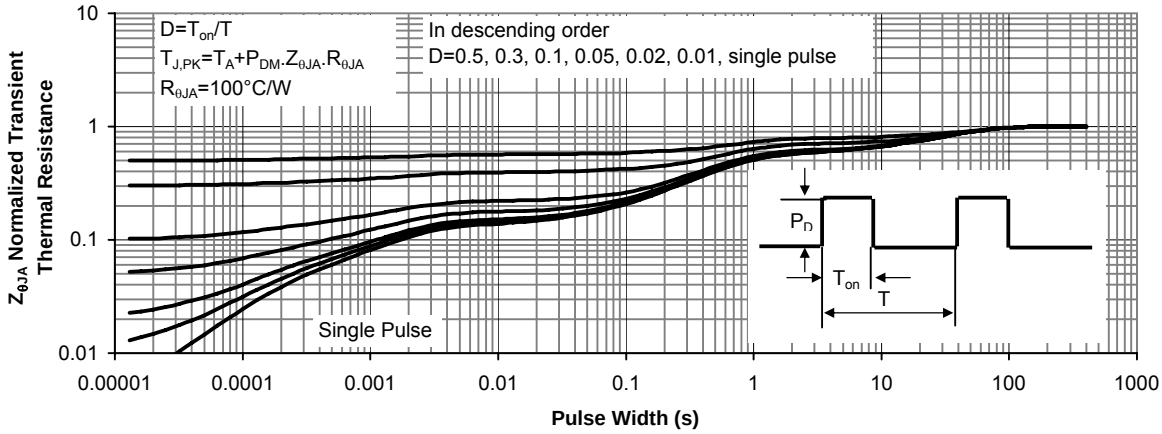


**Figure 11: Normalized Maximum Transient Thermal Impedance**