# AO3402

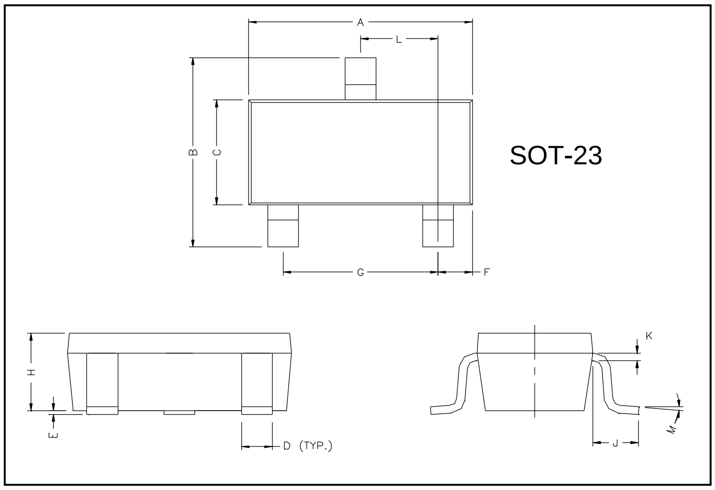
## 30V N-Channel Enhancement Mode MOSFET

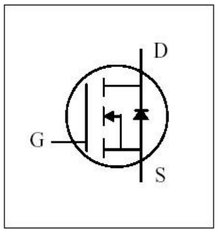
$V_{DS}$ (V) = 30V
$I_D$ = 4 A
$R_{DS(ON)}$ < 55mΩ ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 70mΩ ($V_{GS}$ = 4.5V)
$R_{DS(ON)}$ < 110mΩ ($V_{GS}$ = 2.5V)

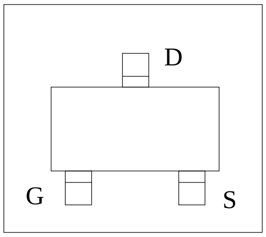
### Features

The AO3402 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

### Package Dimensions







| REF. | Millimeter |  | REF. | Millimete |  |
|---|---|---|---|---|---|
|  | Min. | Max. |  | Min. | Max. |
| A | 2.80 | 3.00 | G | 1.80 | 2.00 |
| B | 2.30 | 2.50 | H | 0.90 | 1.1 |
| C | 1.20 | 1.40 | K | 0.10 | 0.20 |
| D | 0.30 | 0.50 | J | 0.35 | 0.70 |
| E | 0 | 0.10 | L | 0.92 | 0.98 |
| F | 0.45 | 0.55 | M | 0° | 10° |

**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 [A] | $T_A$=25°C | $I_D$ | 4 | A |
|  | $T_A$=70°C |  | 3.4 |  |
| Pulsed Drain Current [B] |  | $I_{DM}$ | 15 |  |
| Power Dissipation [A] | $T_A$=25°C | $P_D$ | 1.4 | W |
|  | $T_A$=70°C |  | 1 |  |
| 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 | $R_{\theta JA}$ | 70 | 90 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State |  | 100 | 125 | °C/W |
| Maximum Junction-to-Lead [C] | Steady-State | $R_{\theta JL}$ | 63 | 80 | °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 | $I_D$=250µA, $V_{GS}$=0V | 30 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=24V, $V_{GS}$=0V | | | 1 | µA |
| | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body 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 | 1.4 | 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 | $V_{GS}$=10V, $I_D$=4A | | 45 | 55 | mΩ |
| | | $T_J$=125°C | | 66 | 80 | |
| | | $V_{GS}$=4.5V, $I_D$=3A | | 55 | 70 | mΩ |
| | | $V_{GS}$=2.5V, $I_D$=2A | | 83 | 110 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=4A | | 8 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A,$V_{GS}$=0V | | 0.8 | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | 2.5 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 390 | | pF |
| $C_{oss}$ | Output Capacitance | | | 54.5 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 41 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 3 | | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{GS}$=4.5V, $V_{DS}$=15V, $I_D$=4A | | 4.34 | | nC |
| $Q_{gs}$ | Gate Source Charge | | | 0.6 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 1.38 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=3.75Ω, $R_{GEN}$=6Ω | | 3.3 | | ns |
| $t_r$ | Turn-On Rise Time | | | 1 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 21.7 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 2.1 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=4A, dI/dt=100A/µs | | 12 | | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=4A, dI/dt=100A/µs | | 6.3 | | 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 a 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 6,12,14 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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

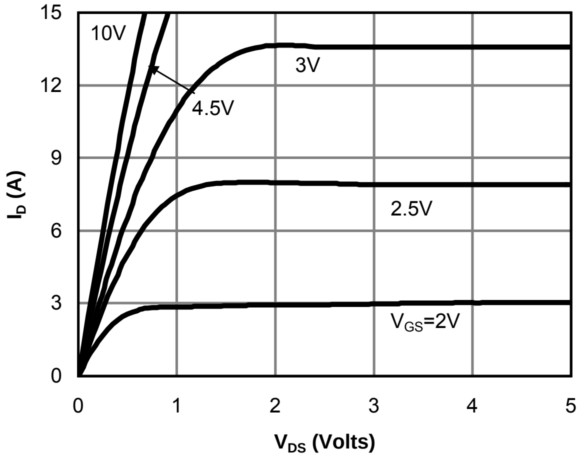


Fig 1: On-Region Characteristics

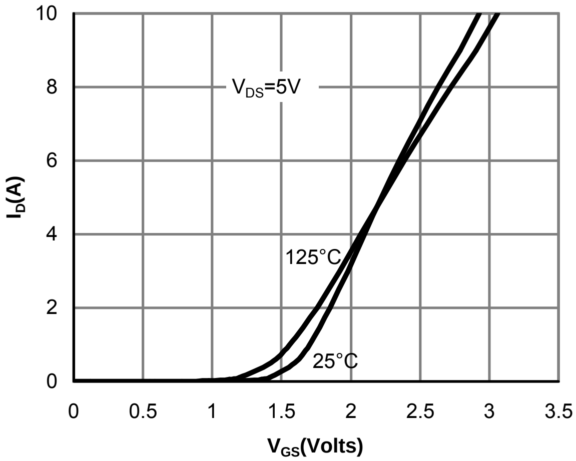


Figure 2: Transfer Characteristics

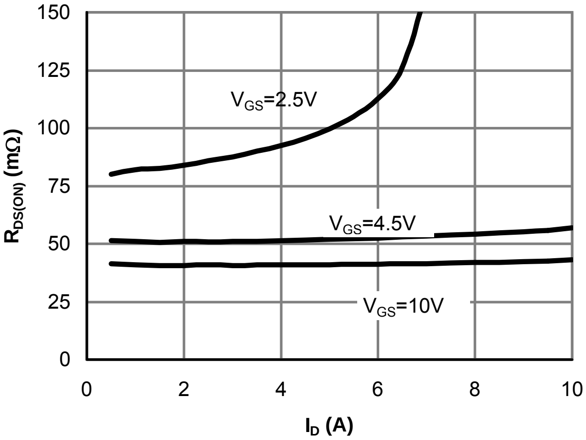


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

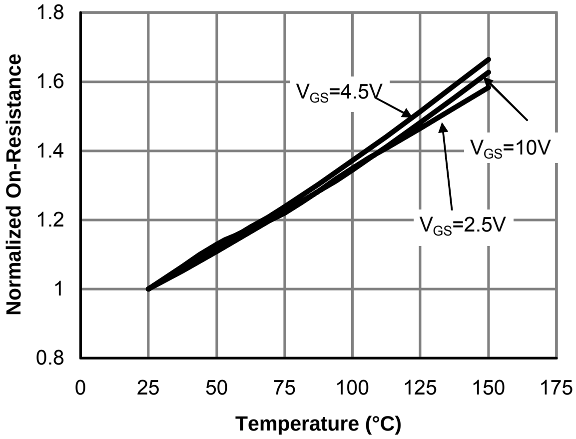


Figure 4: On-Resistance vs. Junction Temperature

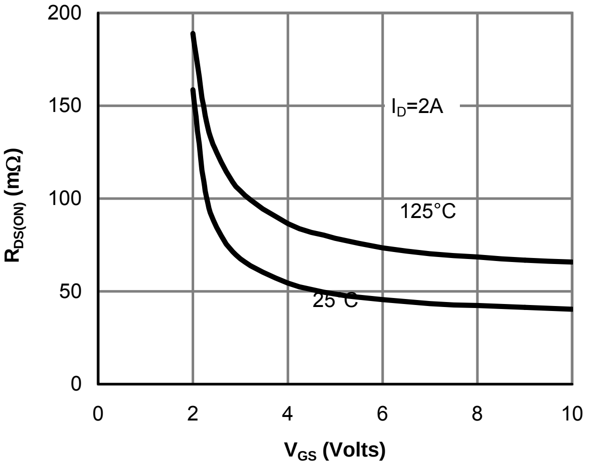


Figure 5: On-Resistance vs. Gate-Source Voltage

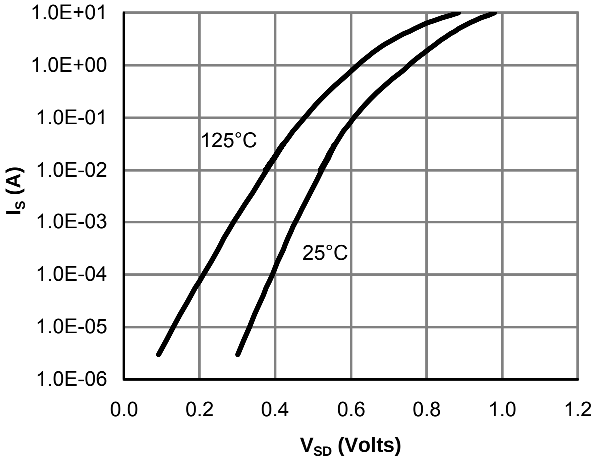


Figure 6: Body-Diode Characteristics

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTIC

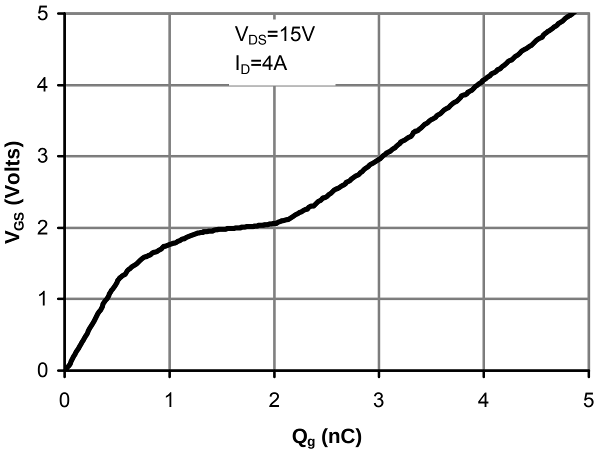


**Figure 7: Gate-Charge Characteristics**

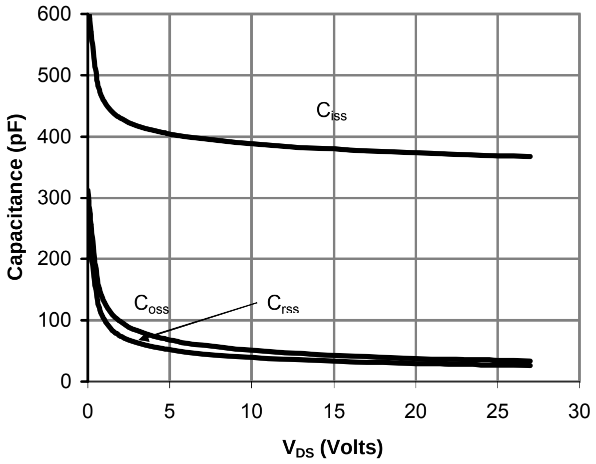


**Figure 8: Capacitance Characteristics**

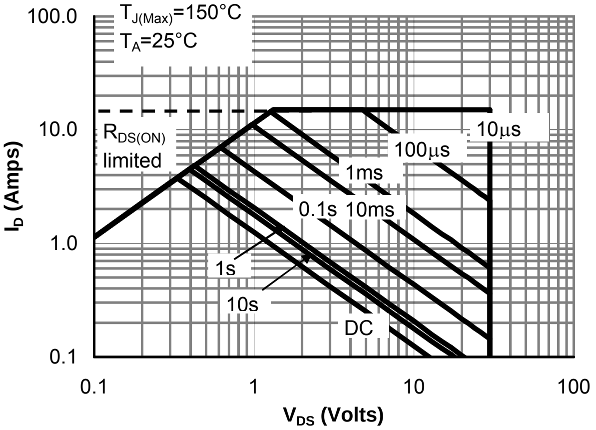


**Figure 9: Maximum Forward Biased Safe Operating Area (Note E)**

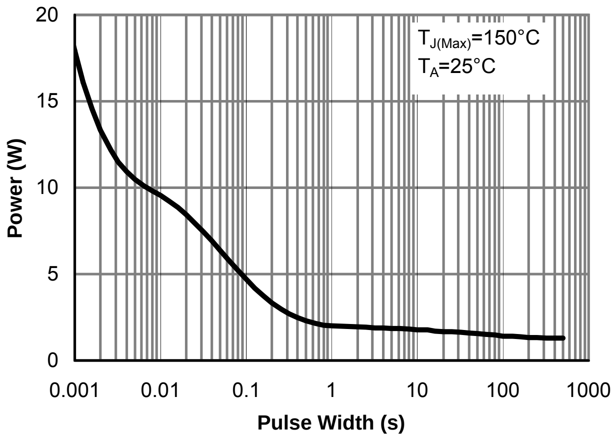


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

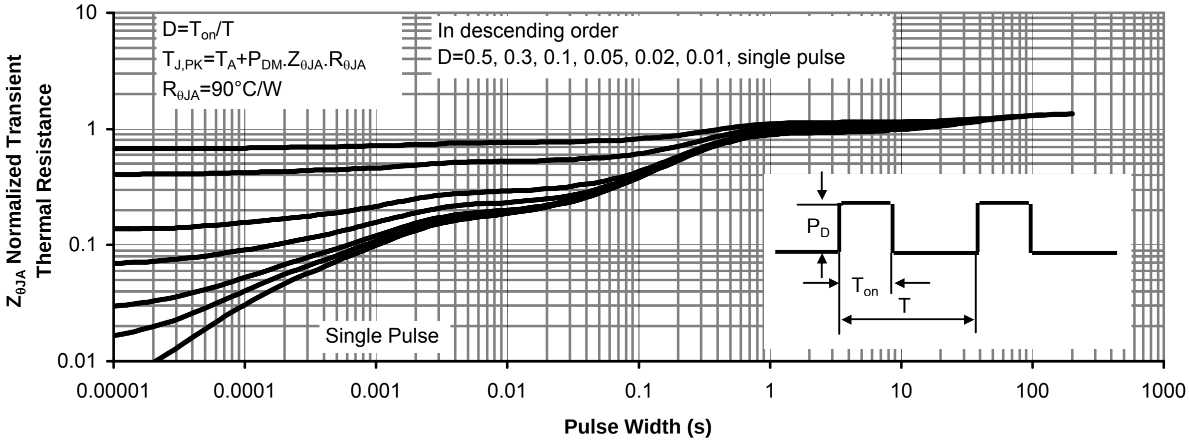


**Figure 11: Normalized Maximum Transient Thermal Impedance**