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ALPHA & OMEGA SEMICONDUCTOR

# AO3460

## 60V N-Channel MOSFET

## General Description

The AO3460 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge, and operation with gate voltages as low as 4.5V, in the small SOT-23 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters. It is ESD protected.

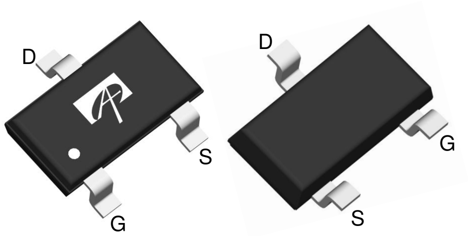
## Product Summary

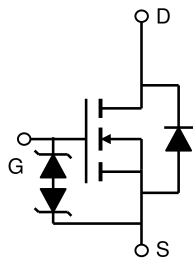
$V_{DS}$ (V) = 60V
$I_D$ = 0.65A ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 1.7Ω ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 2Ω ($V_{GS}$ = 4.5V)

ESD protected

**SOT23**

**Top View** **Bottom View**




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

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current [A, F] | $T_A$=25°C | $I_D$ | 0.65 | A |
| | $T_A$=70°C | | 0.5 | |
| Pulsed Drain Current [B] | | $I_{DM}$ | 1.6 | |
| Power Dissipation [A] | $T_A$=25°C | $P_D$ | 1.4 | W |
| | $T_A$=70°C | | 0.9 | |
| 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 | | 60 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=60V, $V_{GS}$=0V | | | | 1 | µA |
| | | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$=±20V | | | | ±10 | µA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ $I_D$=250uA | | 1 | 2.2 | 2.5 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=10V, $V_{DS}$=5V | | 1.6 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=0.65A | | | 1.4 | 1.7 | Ω |
| | | | $T_J$=125°C | | 2.5 | 3 | |
| | | $V_{GS}$=4.5V, $I_D$=0.5A | | | 1.6 | 2 | Ω |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=0.65A | | | 0.8 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=0.1A,$V_{GS}$=0V | | | 0.8 | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | | 1.2 | A |
| **DYNAMIC PARAMETERS** | | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=30V, f=1MHz | | | 22 | 27 | pF |
| $C_{oss}$ | Output Capacitance | | | | 6 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | | 2 | | pF |
| **SWITCHING PARAMETERS** | | | | | | | |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=30V, $R_L$=75Ω, $R_{GEN}$=3Ω | | | 5.3 | | ns |
| $t_r$ | Turn-On Rise Time | | | | 2.8 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | | 19.7 | | ns |
| $t_f$ | Turn-Off Fall Time | | | | 5.5 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=0.65A, dI/dt=100A/µs, $V_{GS}$=-9V | | | 11.3 | 14 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=0.65A, dI/dt=100A/µs, $V_{GS}$=-9V | | | 7.5 | | 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.
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.
Rev 2: Nov. 2010

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

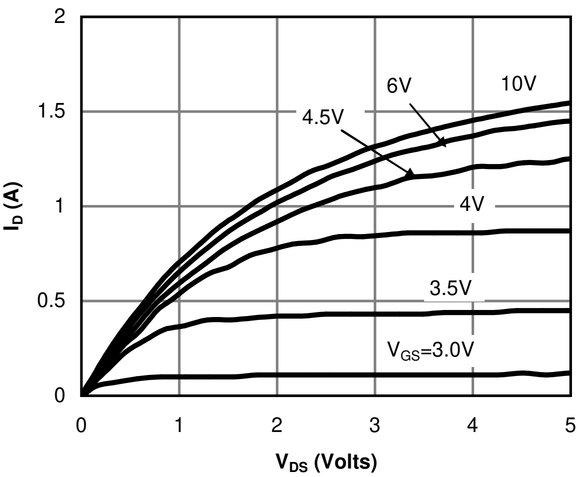



**Figure 1: On-Region Characteristics**

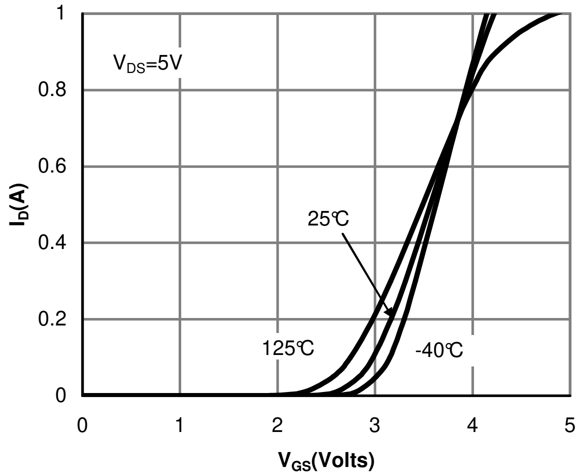



**Figure 2: Transfer Characteristics**

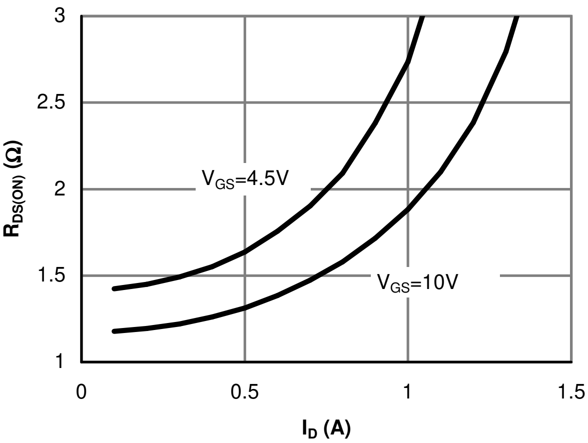



**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

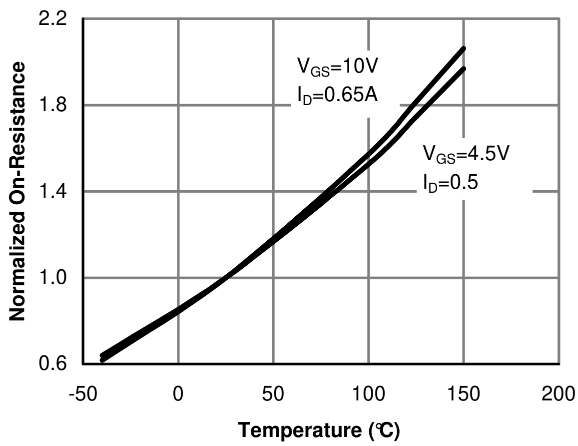



**Figure 4: On-Resistance vs. Junction Temperature**

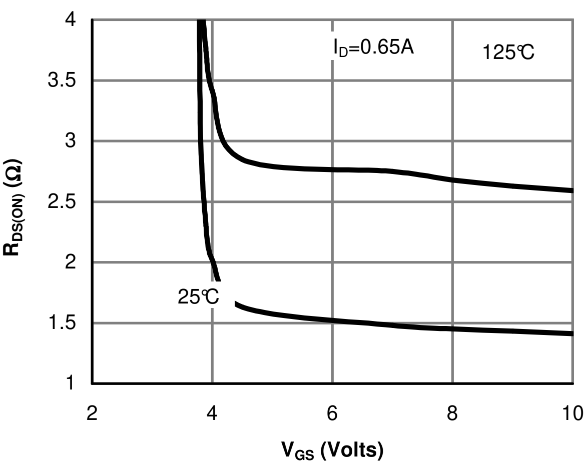



**Figure 5: On-Resistance vs. Gate-Source Voltage**

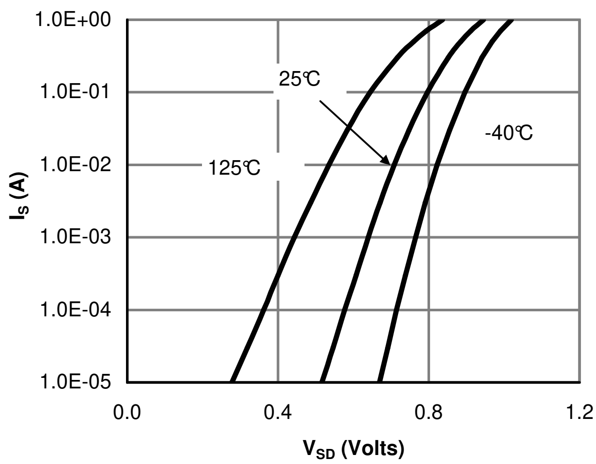



**Figure 6: Body-Diode Characteristics**

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

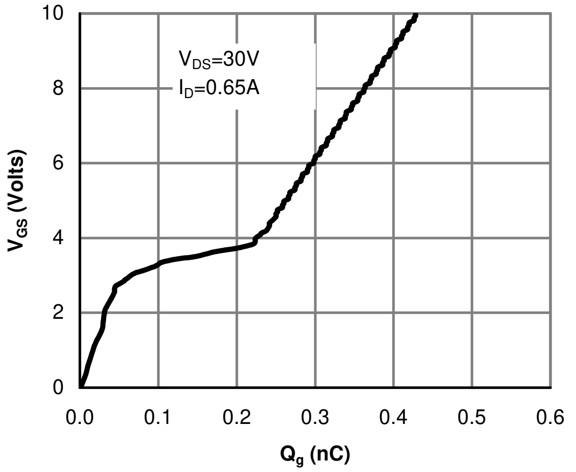



Figure 7: Gate-Charge Characteristics

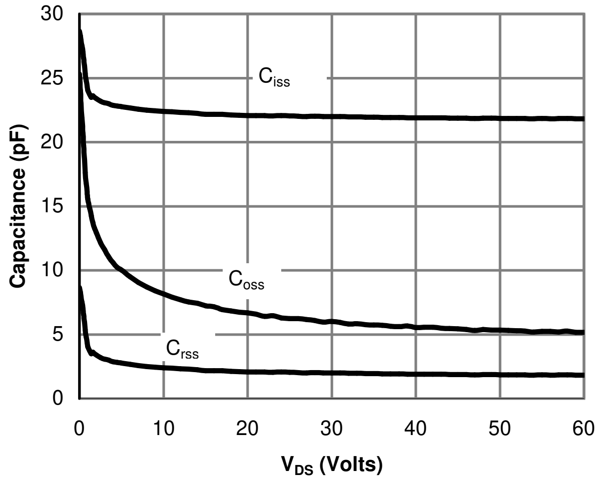



Figure 8: Capacitance Characteristics

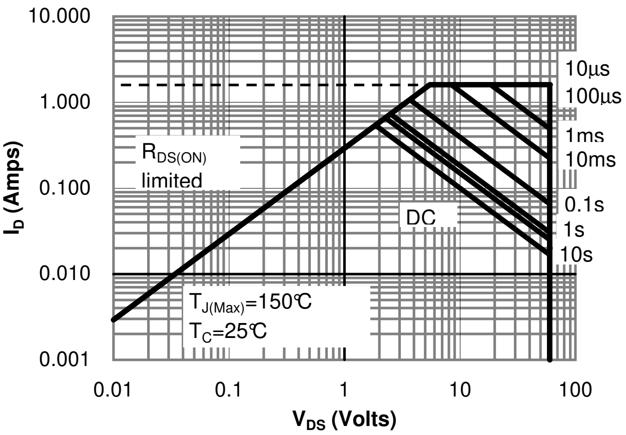



Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

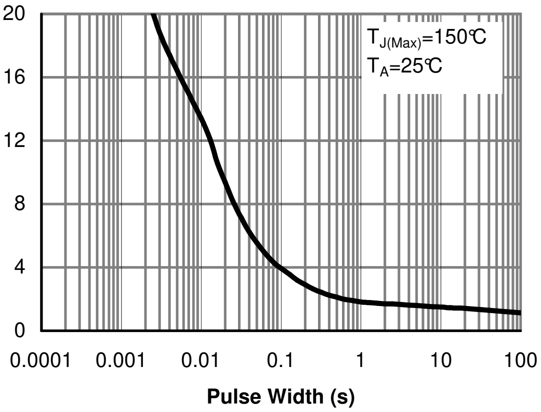



Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

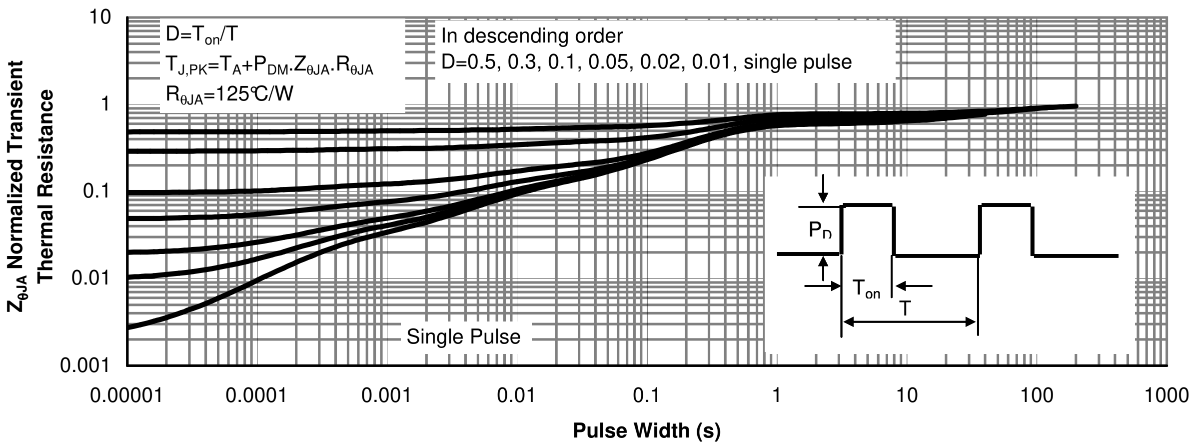



Figure 11: Normalized Maximum Transient Thermal Impedance