ALPHA & OMEGA SEMICONDUCTOR

# AON1634

## 30V N-Channel MOSFET

## General Description

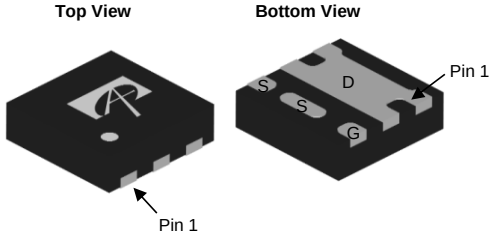
The AON1634 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

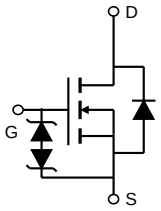
## Product Summary

| | |
|---|---|
| $V_{DS}$ | 30V |
| $I_D$ (at $V_{GS}$=10V) | 4A |
| $R_{DS(ON)}$ (at $V_{GS}$ =10V) | < 54mΩ |
| $R_{DS(ON)}$ (at $V_{GS}$ =4.5V) | < 62mΩ |
| $R_{DS(ON)}$ (at $V_{GS}$ =2.5V) | < 82mΩ |
| **Typical ESD protection** | **HBM Class 3A** |

Green Product

**DFN 1.6x1.6A**




**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 [G] | $T_A$=25°C | $I_D$ | 4 | A |
| | $T_A$=70°C | | 3 | |
| Pulsed Drain Current [C] | | $I_{DM}$ | 16 | |
| Power Dissipation [A] | $T_A$=25°C | $P_D$ | 1.8 | W |
| | $T_A$=70°C | | 1.15 | |
| 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 | $R_{\theta JA}$ | 56 | 70 | °C/W |
| Maximum Junction-to-Ambient [A D] | Steady-State | | 88 | 110 | °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 | $V_{DS}$=30V, $V_{GS}$=0V | | | 1 | µA |
| | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$=±10V | | | ±10 | µA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=250µA | 0.7 | 1.05 | 1.5 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=10V, $V_{DS}$=5V | 16 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=4A | | 43.5 | 54 | mΩ |
| | | $T_J$=125°C | | 68 | 84 | |
| | | $V_{GS}$=4.5V, $I_D$=3A | | 48 | 62 | mΩ |
| | | $V_{GS}$=2.5V, $I_D$=2A | | 62 | 82 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=4A | | 15 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A,$V_{GS}$=0V | | 0.75 | 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 | | 245 | | pF |
| $C_{oss}$ | Output Capacitance | | | 35 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 20 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 5.3 | | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_{g(10V)}$ | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=15V, $I_D$=4A | | 5.7 | 10 | nC |
| $Q_{g(4.5V)}$ | Total Gate Charge | | | 2.6 | 5 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 0.5 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 1 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=3.75Ω, $R_{GEN}$=3Ω | | 2 | | ns |
| $t_r$ | Turn-On Rise Time | | | 3.5 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 22 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 3.5 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=4A, dI/dt=500A/µs | | 6.5 | | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=4A, dI/dt=500A/µs | | 7.5 | | nC |

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25° C. The Power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ t ≤ 10s value and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.

B. The power dissipation $P_D$ is based on $T_{J(MAX)}$=150° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initial $T_J$ =25° C.

D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25° C.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

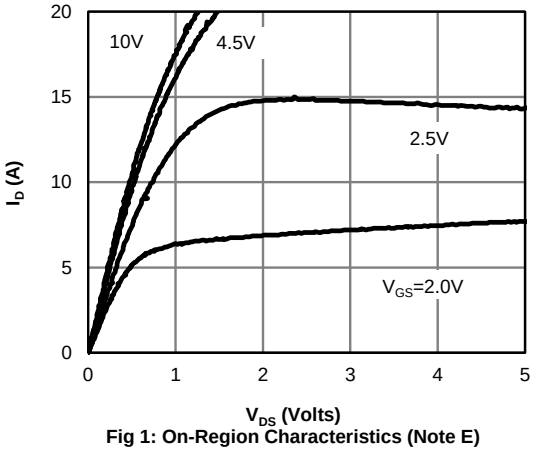



Fig 1: On-Region Characteristics (Note E)

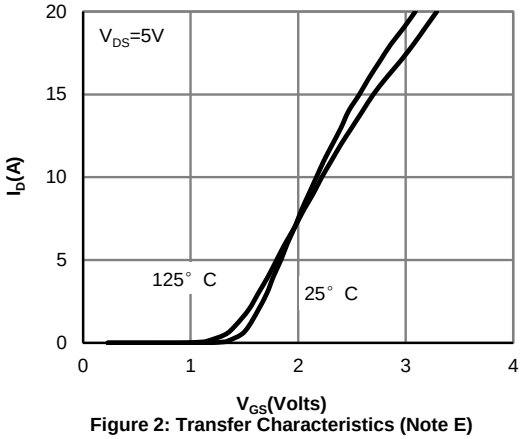



Figure 2: Transfer Characteristics (Note E)

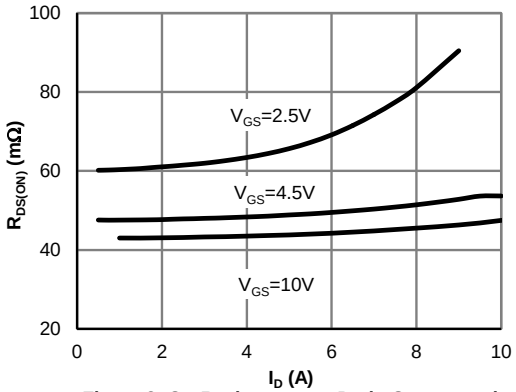



Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

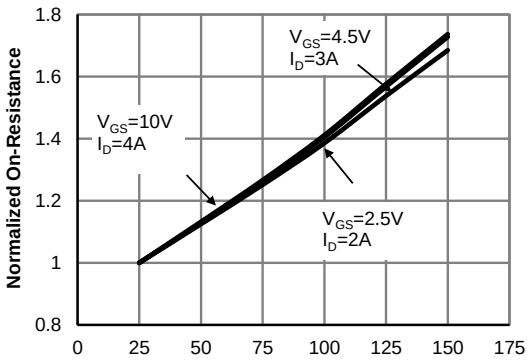



Figure 4: On-Resistance vs. Junction Temperature (Note E)

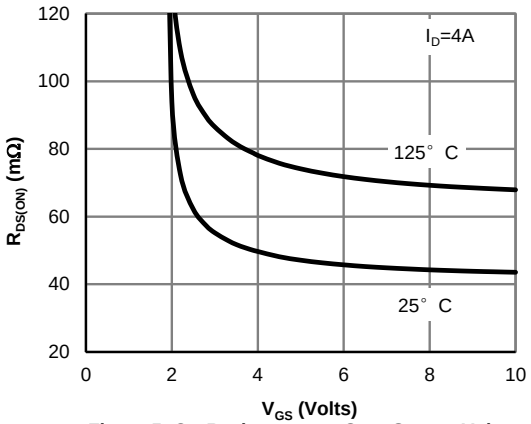



Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

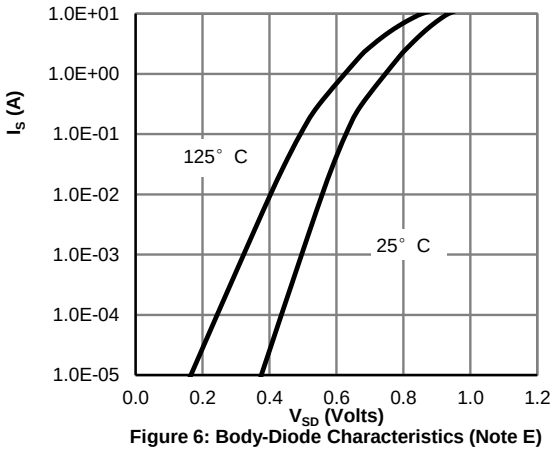



Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

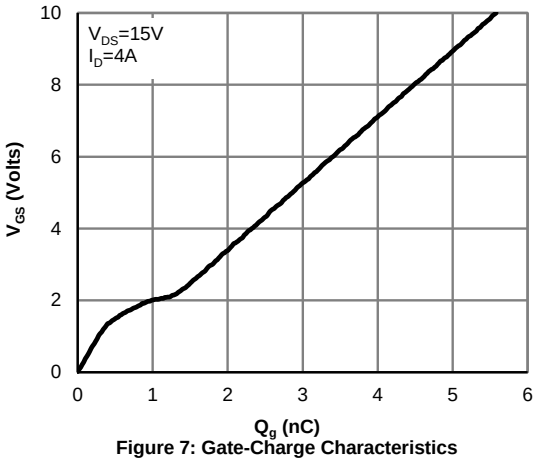



**Figure 7: Gate-Charge Characteristics**

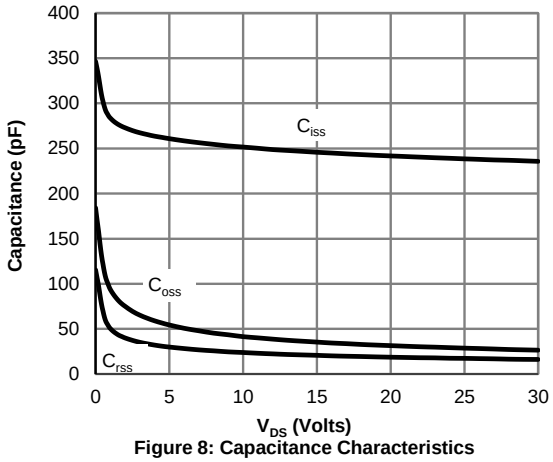



**Figure 8: Capacitance Characteristics**

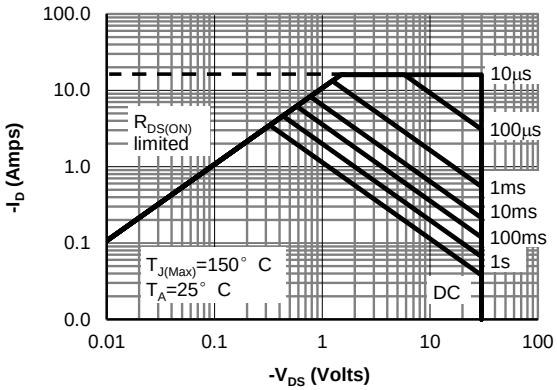



**Figure 9: Maximum Forward Biased Safe Operating Area (Note F)**

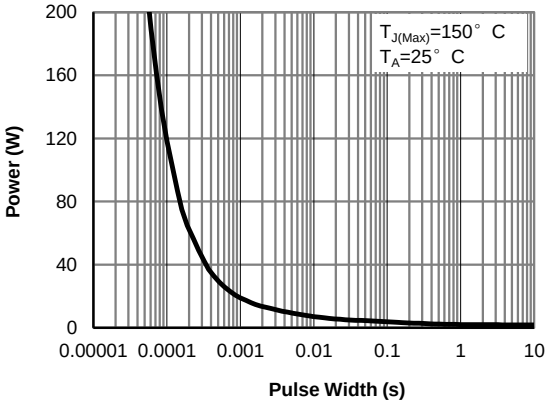



**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note H)**

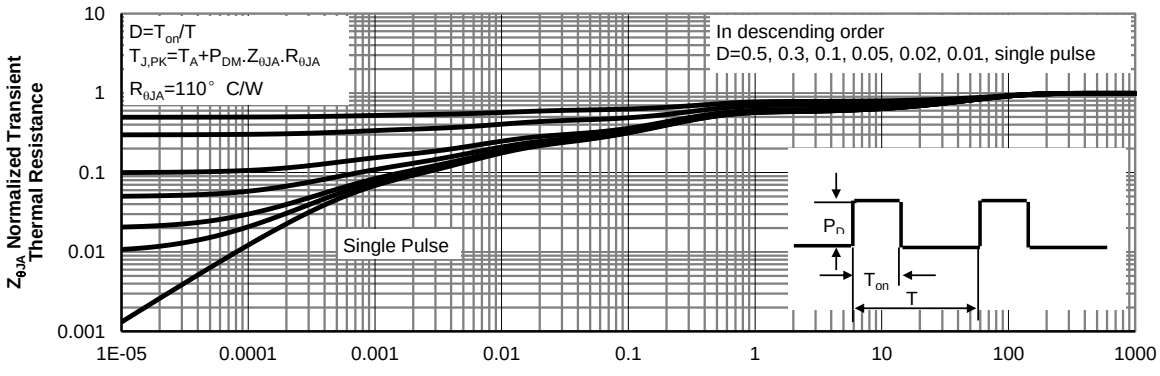
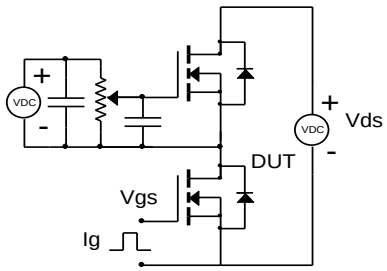
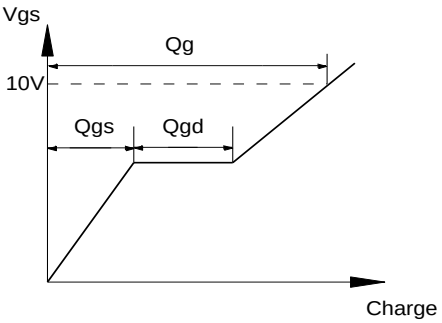


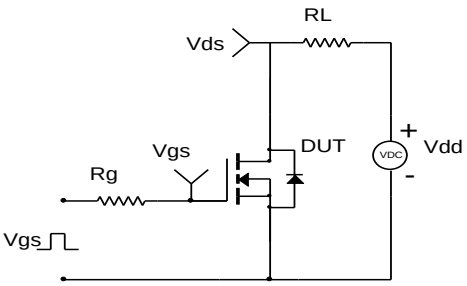

**Figure 11: Normalized Maximum Transient Thermal Impedance (Note H)**

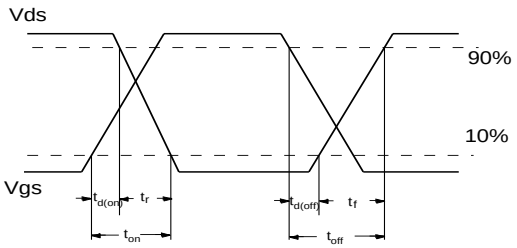
## Gate Charge Test Circuit & Waveform



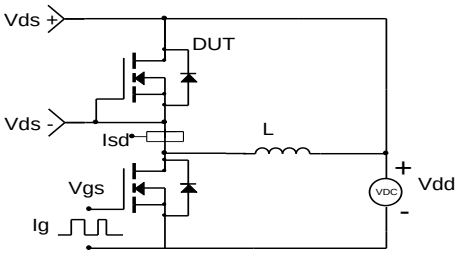



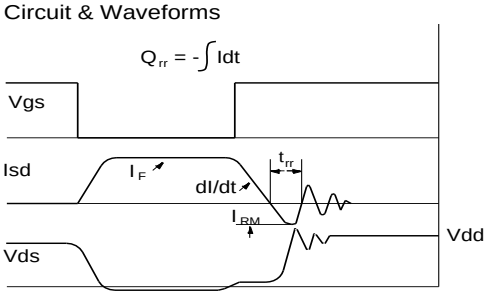

## Resistive Switching Test Circuit & Waveforms




## Diode Recovery Test Circuit & Waveforms



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