ALPHA & OMEGA
SEMICONDUCTOR

# AON1606

## *20V N-Channel MOSFET*

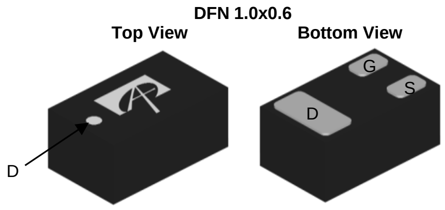
## General Description

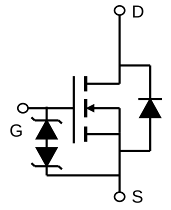
The AON1606 utilize advanced trench MOSFET technology in small DFN 1.0 x 0.6 package. This device is ideal for load switch applications.

## Product Summary

| | |
|---|---|
| $V_{DS}$ | 20V |
| $I_D$ (at $V_{GS}$=4.5V) | 0.7A |
| $R_{DS(ON)}$ (at $V_{GS}$ =4.5V) | < 275mΩ |
| $R_{DS(ON)}$ (at $V_{GS}$ =2.5V) | < 335mΩ |
| $R_{DS(ON)}$ (at $V_{GS}$ =1.8V) | < 390mΩ |
| **Typical ESD protection** | **HBM Class 1C** |

**DFN 1.0x0.6**





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

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±8 | V |
| Continuous Drain Current [E] | $T_A$=25°C | $I_D$ | 0.7 | A |
| | $T_A$=70°C | | 0.55 | |
| Pulsed Drain Current [C] | | $I_{DM}$ | 2.8 | A |
| Power Dissipation [A] | $T_A$=25°C | $P_D$ | 0.9 | W |
| | $T_A$=70°C | | 0.55 | |
| 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 | $R_{\theta JA}$ | 80 | 100 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 110 | 140 | °C/W |
| Maximum Junction-to-Ambient [B] | t ≤ 10s | $R_{\theta JA}$ | 200 | 245 | °C/W |
| Maximum Junction-to-Ambient [B] | Steady-State | | 280 | 340 | °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 | | 20 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=20V, $V_{GS}$=0V | | | | 1 | µA |
| | | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$=±8V | | | | ±10 | µA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=250µA | | 0.4 | 0.65 | 1.0 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=4.5V, $V_{DS}$=5V | | 2.8 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=4.5V, $I_D$=0.4A | | | 225 | 275 | mΩ |
| | | | $T_J$=125°C | | 313 | 380 | |
| | | $V_{GS}$=2.5V, $I_D$=0.3A | | | 265 | 335 | mΩ |
| | | $V_{GS}$=1.8V, $I_D$=0.2A | | | 300 | 390 | mΩ |
| | | $V_{GS}$=1.5V, $I_D$=0.1A | | | 355 | | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=0.4A | | | 2 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=0.4A,$V_{GS}$=0V | | | 0.75 | 1.2 | V |
| $I_S$ | Maximum Body-Diode Continuous Current [E] | | | | | 0.7 | A |
| **DYNAMIC PARAMETERS** | | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=10V, f=1MHz | | | 62.5 | | pF |
| $C_{oss}$ | Output Capacitance | | | | 12.5 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | | 9 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | | 5.5 | | Ω |
| **SWITCHING PARAMETERS** | | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{GS}$=4.5V, $V_{DS}$=10V, $I_D$=0.4A | | | 0.85 | | nC |
| $Q_{gs}$ | Gate Source Charge | | | | 0.1 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | | 0.25 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=4.5V, $V_{DS}$=10V, $R_L$=25Ω, $R_{GEN}$=3Ω | | | 2 | | ns |
| $t_r$ | Turn-On Rise Time | | | | 4 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | | 18 | | ns |
| $t_f$ | Turn-Off Fall Time | | | | 8 | | ns |

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 Power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150° C may be used if the PCB allows it to.

B. The value of $R_{\theta JA}$ is measured with the device mounted on FR-4 minimum pad board, in a still air environment with $T_A$ =25° C. The Power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150° C may be used if the PCB allows it to.

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

D. 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.

E. The maximum current limited by package.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

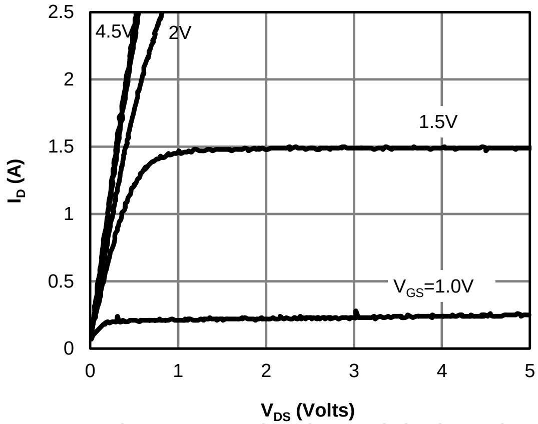


Figure 1: On-Region Characteristics (Note E)

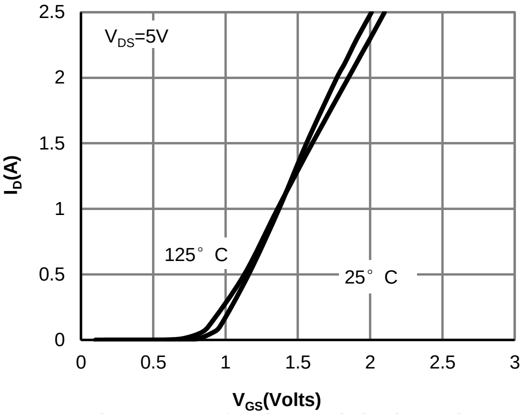


Figure 2: Transfer Characteristics (Note E)

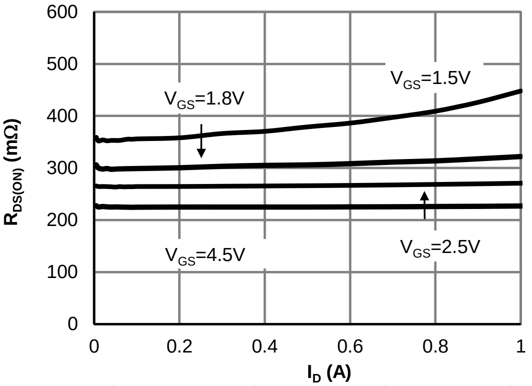


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

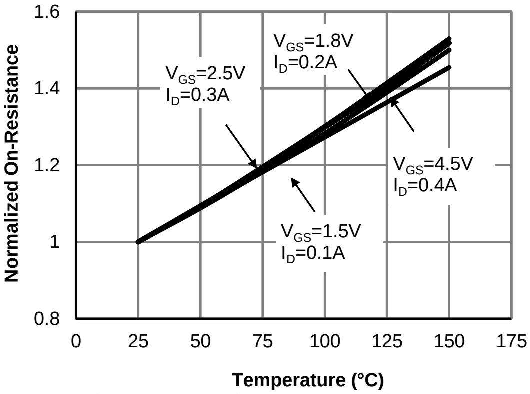


Figure 4: On-Resistance vs. Junction Temperature (Note E)

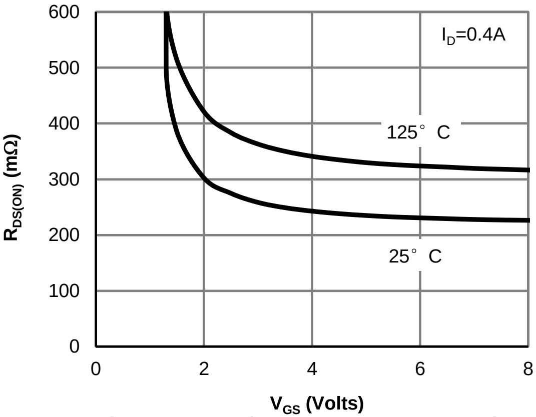


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

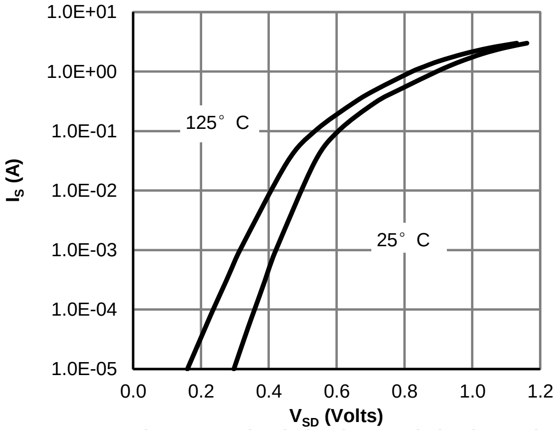


Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

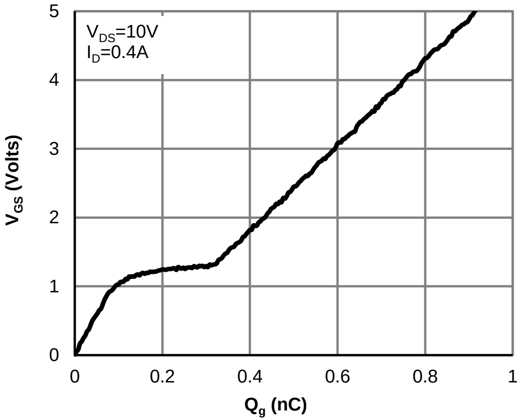


**Figure 7: Gate-Charge Characteristics**

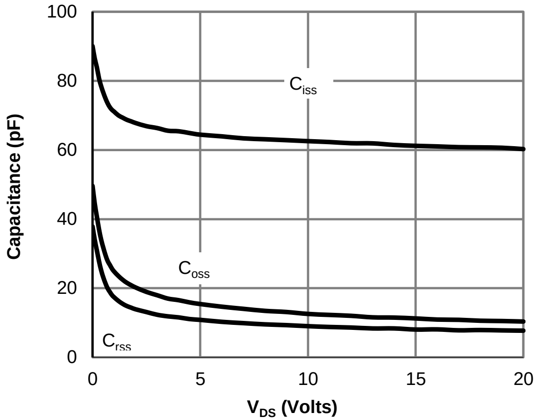


**Figure 8: Capacitance Characteristics**

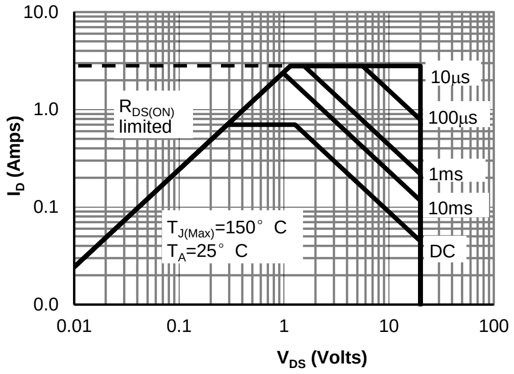


**Figure 9: Maximum Forward Biased Safe Operating Area (Note B)**

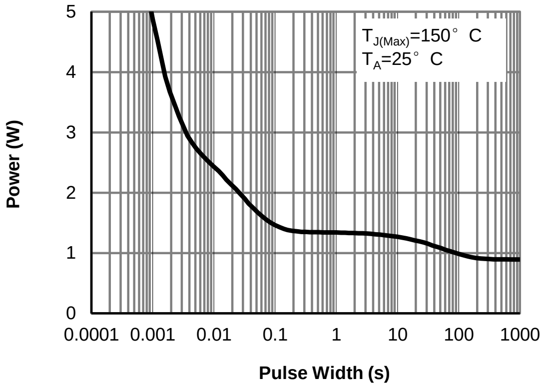


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note B)**

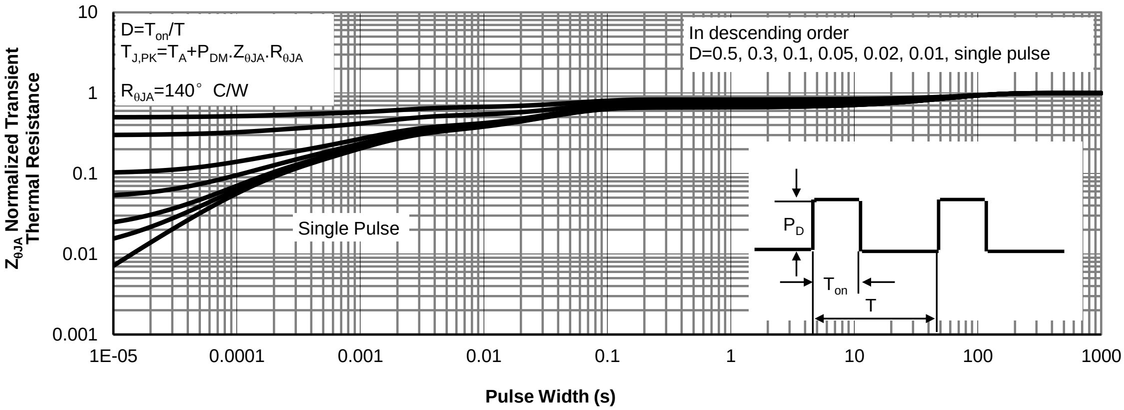
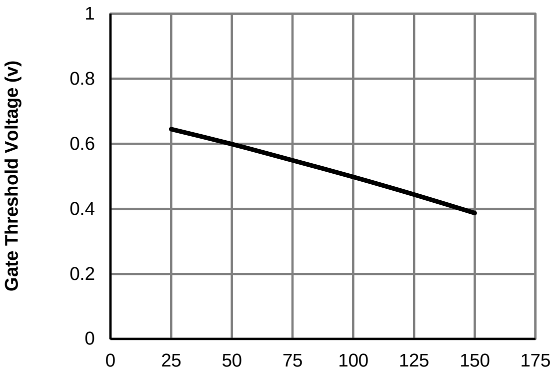


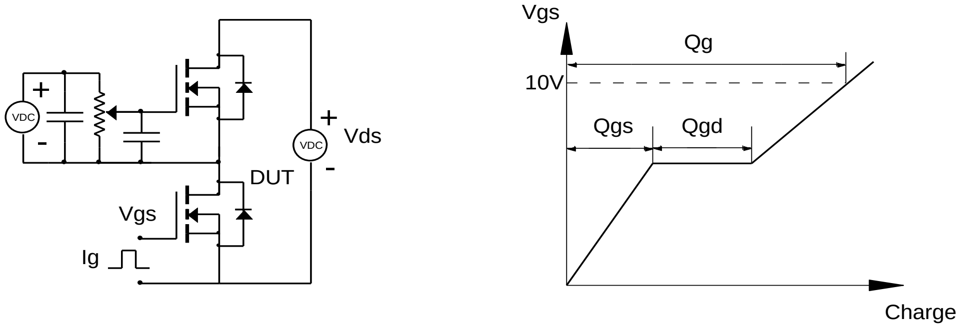
**Figure 11: Normalized Maximum Transient Thermal Impedance (Note B)**

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



Temperature (°C)
Figure12: Gate Threshold Voltage vs. Junction Temperature (Note E)

## Gate Charge Test Circuit & Waveform



## Resistive Switching Test Circuit & Waveforms