# UMW AO4407A

P-Channel MOSFET

## 1.Description

The AO4407A uses advanced trench technology to provide excellent $R_{DS(ON)}$, and ultra-low low gate charge with a 25V gate rating. This device is suitable for use as a load switch or in PWM applications. Standard Product AO4407A is Pb-free (meets ROHS & Sony 259 specifications).

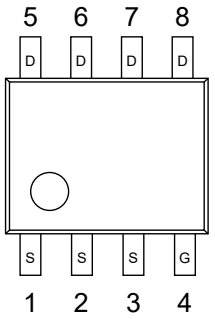
## 2.Features

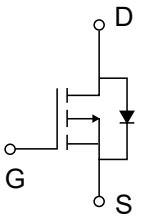
- $V_{DS}$=-30V
- $I_D$=-14A
- $R_{DS(ON)}$<9.5mΩ ($V_{GS}$=-10V)
- $R_{DS(ON)}$ <14.7mΩ($V_{GS}$=-4.5V)

## 3.Pinning information

| Pin | Symbol | Description |
|---|---|---|
| 4 | G | GATE |
| 1,2,3 | S | SOURCE |
| 5,6,7,8 | D | DRAIN |

**SOP-8**




## 4.Absolute Maximum Ratings $T_A$=25°C unless otherwise noted

| Parameter | | Symbol | Rating | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | -30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±25 | V |
| Continuous Drain Current | $T_A$=25°C | $I_D$ | -14 | A |
| | $T_A$=70°C | | -11 | |
| Pulsed Drain Current [C] | | $I_{DM}$ | -56 | |
| Avalanche Current [C] | | $I_{AS}$ | -33 | A |
| Avalanche energy | L=0.1mH [C] | $E_{AS}$ | 54 | mJ |
| Power Dissipation [B] | $T_A$=25°C | $P_D$ | 3.1 | W |
| | $T_A$=70°C | | 2.0 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | °C |

## 5.Thermal Characteristics

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 31 | 40 | °C/W |
| Maximum Junction-to-Ambient [A D] | Steady-State | | 59 | 75 | °C/W |
| Maximum Junction-to-Lead | Steady-State | $R_{\theta JL}$ | 16 | 24 | °C/W |

## 6.Electrical Characteristics ($T_J$=25°C unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$=-250μA, $V_{GS}$=0V | -30 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-30V, $V_{GS}$=0V | | | -1 | μA |
| | | $T_J$=55°C | | | -5 | |
| Gate-Body leakage current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=±25V | | | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=-250μA | -1.3 | -1.8 | -2.3 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=-10V, $I_D$=-14A | | 9.5 | 11.5 | mΩ |
| | | $V_{GS}$=-4.5V, $I_D$=-10A | | 14.7 | 18.5 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-5V, $I_D$=-14A | | 42 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=-1A, $V_{GS}$=0V | | -0.7 | -1 | V |
| Maximum Body-Diode Continuous Current | $I_S$ | | | | -4 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=-15V, f=1MHz | | 2050 | | pF |
| Output Capacitance | $C_{oss}$ | | | 330 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 300 | | pF |
| Gate resistance | $R_g$ | f=1MHz | | 3.2 | 6.4 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| Total Gate Charge | $Q_g$(-10V) | $V_{GS}$=-10V, $V_{DS}$=-15V, $I_D$=-14A | | 40 | 60 | nC |
| Total Gate Charge | $Q_g$(-4.5V) | | | 20 | 30 | nC |
| Gate Source Charge | $Q_{gs}$ | | | 6 | | nC |
| Gate Drain Charge | $Q_{gd}$ | | | 10 | | nC |
| Turn-On DelayTime | $t_{D(on)}$ | $V_{GS}$=-10V, $V_{DS}$=-15V, $R_L$=1.05Ω,$R_{GEN}$=3Ω | | 11 | | ns |
| Turn-On Rise Time | $t_r$ | | | 10 | | ns |
| Turn-Off DelayTime | $t_{D(off)}$ | | | 40 | | ns |
| Turn-Off Fall Time | $t_f$ | | | 18 | | ns |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$=-14A, dI/dt=500A/μs | | 14 | | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | $I_F$=-14A, dI/dt=500A/μs | | 25 | | 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. The power dissipation $P_D$ is based on $T_{J(MAX)}$=150°C, using ≤ 10s junction-to-ambient thermal resistance.

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 lead $R_{\theta JL}$ and lead to ambient.

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

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on $1in^2$ FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.

## 7.1TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

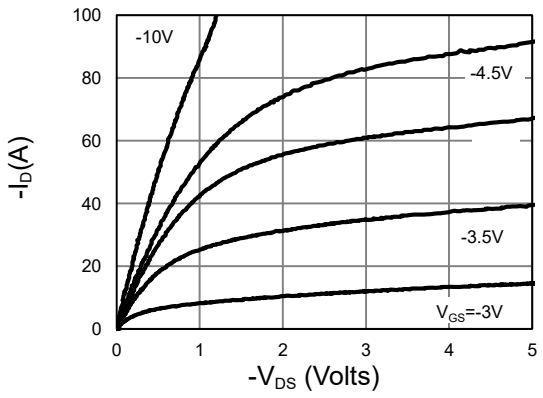



Fig 1: On-Region Characteristics (Note E)

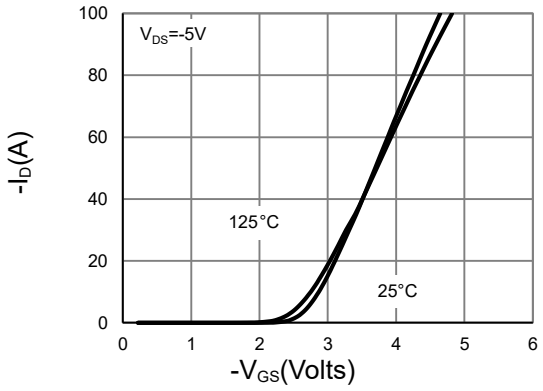



Figure 2: Transfer Characteristics (Note E)

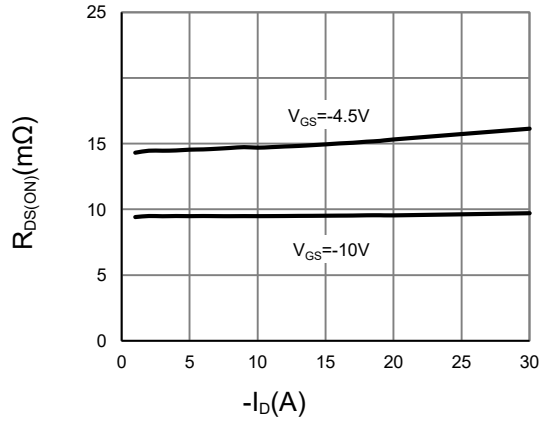



Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

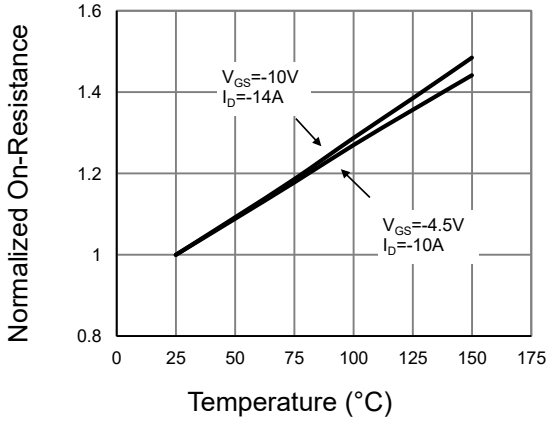



Figure 4: On-Resistance vs. Junction Temperature (Note E)

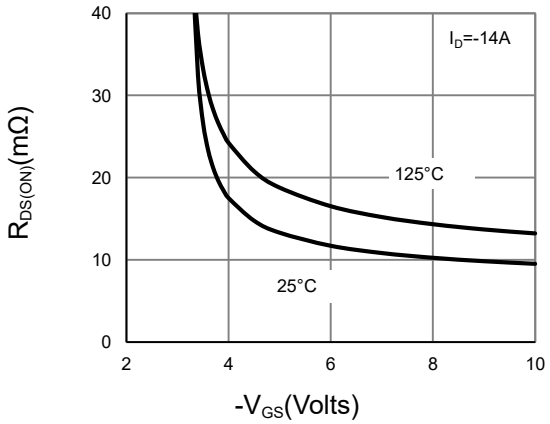



Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

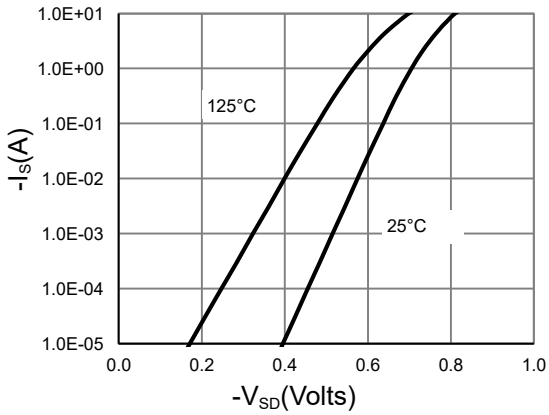



Figure 6: Body-Diode Characteristics(Note E)

## 7.2TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

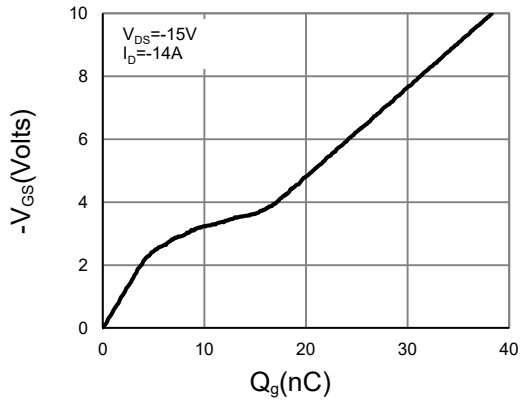



Figure 7: Gate-Charge Characteristics

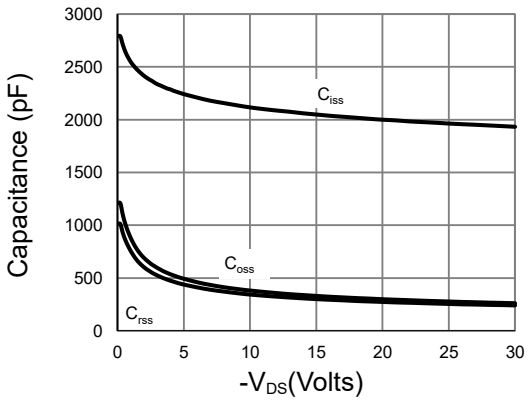



Figure 8: Capacitance Characteristics

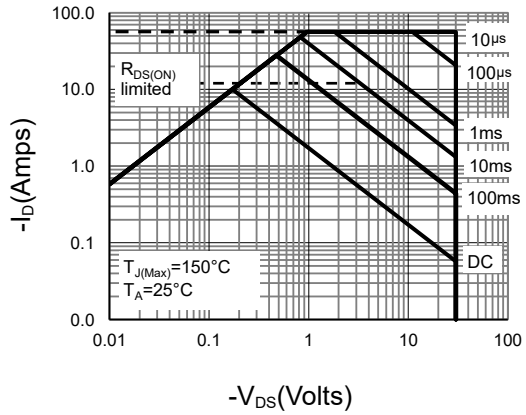



Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

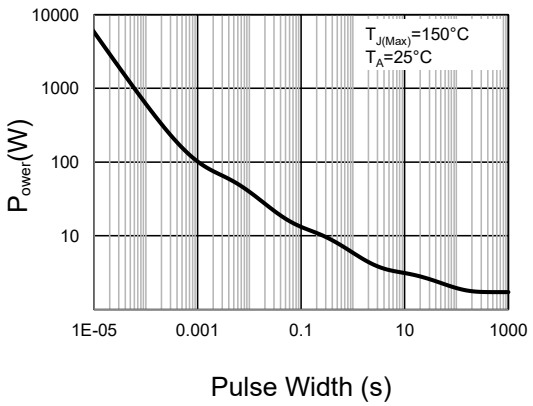



Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

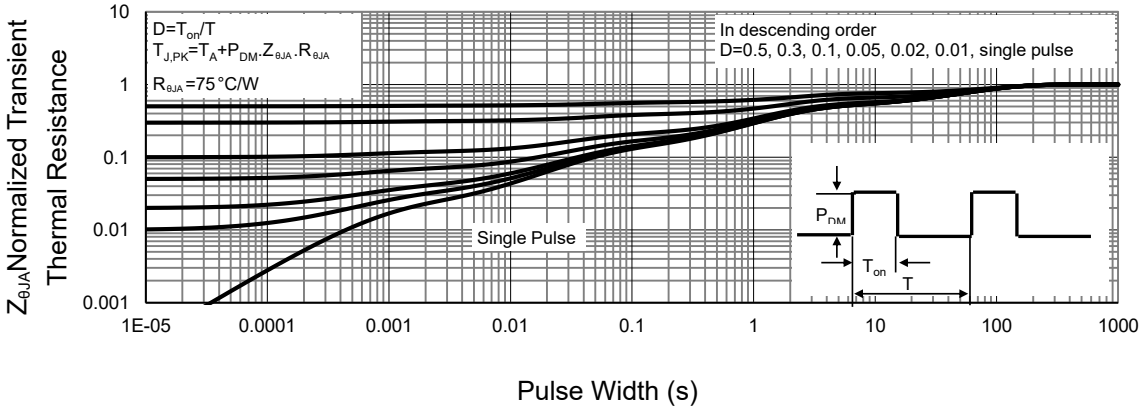
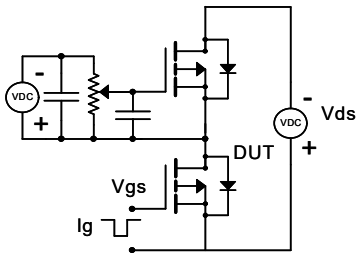
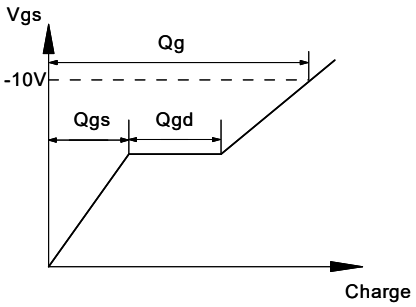


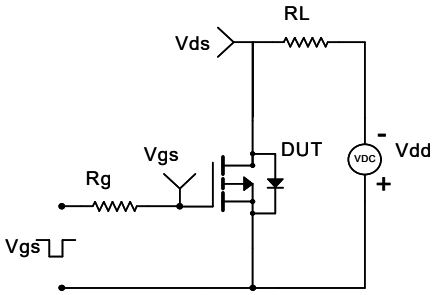

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

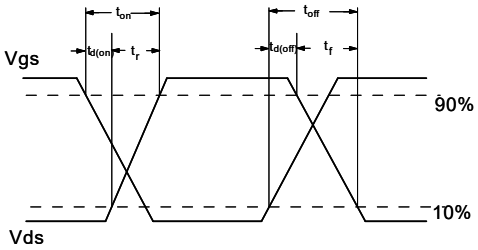
## Gate Charge Test Circuit & Waveform



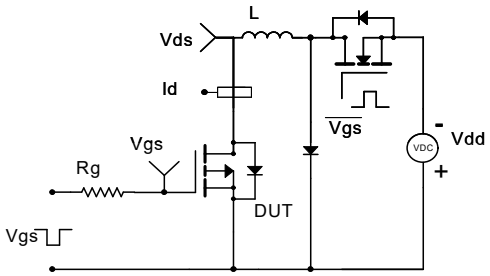



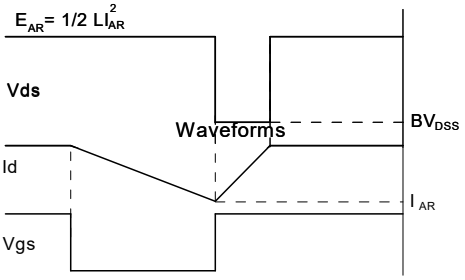

## Resistive Switching Test Circuit & Waveforms



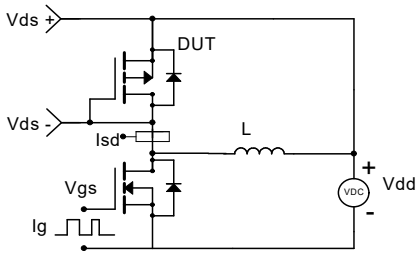



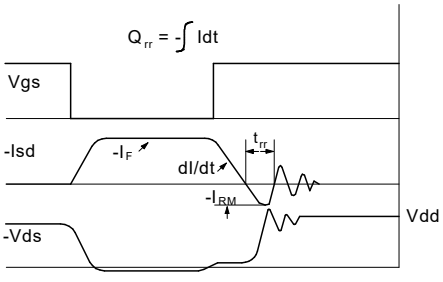

## Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



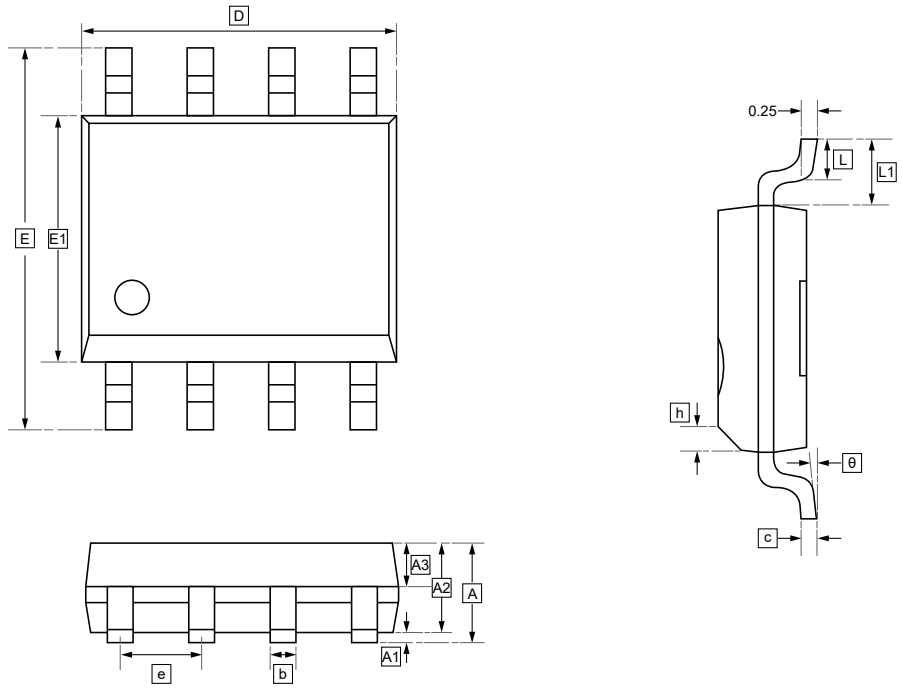




## Diode Recovery Test Circuit & Waveforms



## 8.SOP-8 Package Outline Dimensions

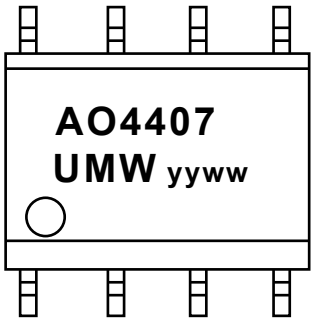



**DIMENSIONS (mm are the original dimensions)**

| Symbol | A | A1 | A2 | A3 | b | c | D | E | E1 | e | h | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Min | - | 0.05 | 1.30 | 0.60 | 0.39 | 0.20 | 4.70 | 5.80 | 3.80 | 1.24 | 0.30 | 0.50 |
| Max | 1.75 | 0.20 | 1.50 | 0.70 | 0.47 | 0.24 | 5.10 | 6.20 | 4.00 | 1.30 | 0.50 | 0.80 |

| Symbol | L1 | θ |
|---|---|---|
| Min | 1.00 | 0° |
| Max | 1.10 | 8° |

## 9.Ordering information




yy: Year Code
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|---|---|---|---|
| UMW AO4407A | SOP-8 | 3000 | Tape and reel |

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