



AOU404

N-Channel Enhancement Mode Field Effect Transistor

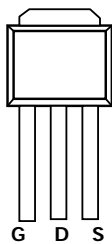
General Description

The AOU404 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications. *Standard Product AOU404 is Pb-free (meets ROHS & Sony 259 specifications). AOU404L is a Green Product ordering option. AOU404 and AOU404L are electrically identical.*

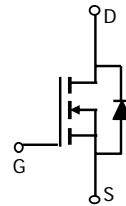
Features

- V_{DS} (V) = 75V
- I_D = 10 A (V_{GS} = 20V)
- $R_{DS(ON)} < 130\text{ m}\Omega$ (V_{GS} = 20V) @ 5A
- $R_{DS(ON)} < 140\text{ m}\Omega$ (V_{GS} = 10V)
- $R_{DS(ON)} < 165\text{ m}\Omega$ (V_{GS} = 4.5V)

TO-251



Top View
Drain Connected
to Tab



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

| Parameter | Symbol | Maximum | Units |
|---|----------------|-------------------------|------------------|
| Drain-Source Voltage | V_{DS} | 75 | V |
| Gate-Source Voltage | V_{GS} | ± 25 | V |
| Continuous Drain Current ^G | I_D | $T_C=25^\circ\text{C}$ | A |
| | | $T_C=100^\circ\text{C}$ | |
| Pulsed Drain Current ^C | I_{DM} | 20 | |
| Avalanche Current ^C | I_{AR} | 10 | A |
| Repetitive avalanche energy $L=0.1\text{mH}$ ^C | E_{AR} | 15 | mJ |
| Power Dissipation ^B | P_D | $T_C=25^\circ\text{C}$ | W |
| | | $T_C=100^\circ\text{C}$ | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 175 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Typ | Max | Units |
|--|-----------------|-----|-----|--------------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 115 | 140 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case ^B | $R_{\theta JC}$ | 4.5 | 7.5 | $^\circ\text{C/W}$ |

Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|--|-----|------------|------------|------------------|
| STATIC PARAMETERS | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_D=10\text{mA}$, $V_{GS}=0\text{V}$ | 75 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=60\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$ | | | 1 5 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$ | | | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$ | 1 | 2.4 | 3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}=10\text{V}$, $V_{DS}=5\text{V}$ | 20 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=20\text{V}$, $I_D=5\text{A}$ $T_J=125^\circ\text{C}$ | | 100 180 | 130 220 | $\text{m}\Omega$ |
| | | $V_{GS}=10\text{V}$, $I_D=5\text{A}$ | | 105 | 140 | $\text{m}\Omega$ |
| | | $V_{GS}=4.5\text{V}$, $I_D=2\text{A}$ | | 120 | 165 | $\text{m}\Omega$ |
| | | | | | | |
| g_{FS} | Forward Transconductance | $V_{DS}=5\text{V}$, $I_D=10\text{A}$ | | 9 | | S |
| V_{SD} | Diode Forward Voltage | $I_S=1\text{A}$, $V_{GS}=0\text{V}$ | | 0.79 | 1 | V |
| I_S | Maximum Body-Diode Continuous Current | | | | 10 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}$, $V_{DS}=30\text{V}$, $f=1\text{MHz}$ | | 293 | 350 | pF |
| C_{oss} | Output Capacitance | | | 51 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 20 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$ | | 2.2 | 3 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge | $V_{GS}=10\text{V}$, $V_{DS}=37.5\text{V}$, $I_D=5\text{A}$ | | 5.2 | 6.5 | nC |
| $Q_g(4.5\text{V})$ | Total Gate Charge | | | 2.46 | 3.5 | nC |
| Q_{gs} | Gate Source Charge | | | 1 | | nC |
| Q_{gd} | Gate Drain Charge | | | 1.34 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}=10\text{V}$, $V_{DS}=37.5\text{V}$, $R_L=7.5\Omega$, $R_{GEN}=3\Omega$ | | 4.6 | | ns |
| t_r | Turn-On Rise Time | | | 2.3 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 14.7 | | ns |
| t_f | Turn-Off Fall Time | | | 1.7 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=5\text{A}$, $di/dt=100\text{A}/\mu\text{s}$ | | 25 | 30 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=5\text{A}$, $di/dt=100\text{A}/\mu\text{s}$ | | 27 | | nC |

A: The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A=25^\circ\text{C}$.

B: The power dissipation P_D is based on $T_{J(MAX)}=175^\circ\text{C}$, 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 $T_{J(MAX)}=175^\circ\text{C}$.

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 $<300\mu\text{s}$ 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 $T_{J(MAX)}=175^\circ\text{C}$.

G: The maximum current rating is limited by bond-wires.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

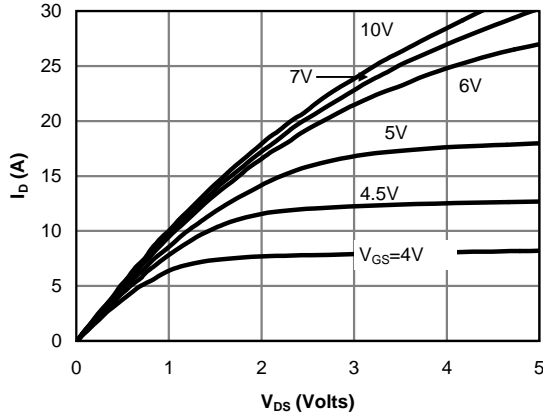


Fig 1: On-Region Characteristics

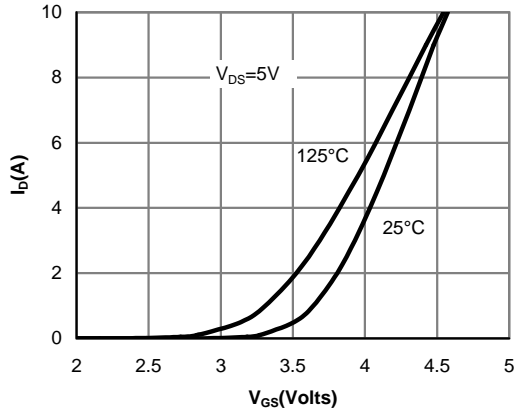


Figure 2: Transfer Characteristics

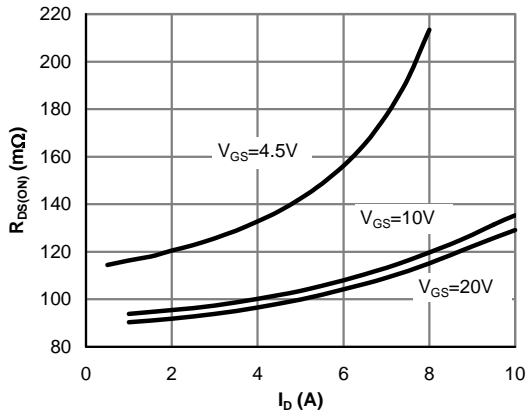


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

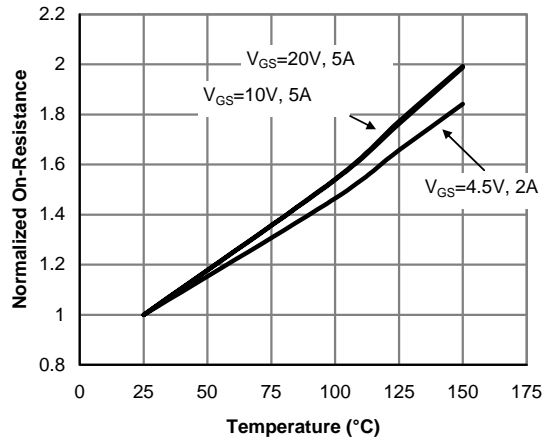


Figure 4: On-Resistance vs. Junction Temperature

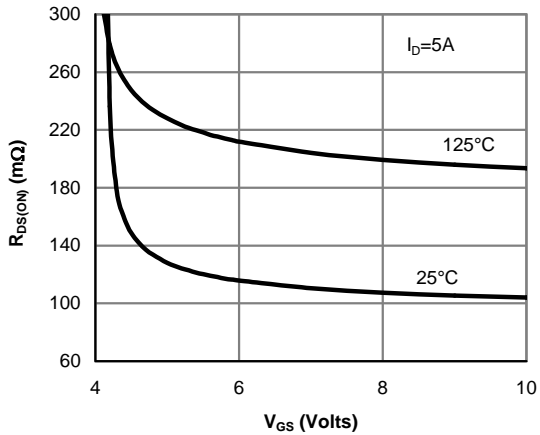


Figure 5: On-Resistance vs. Gate-Source Voltage

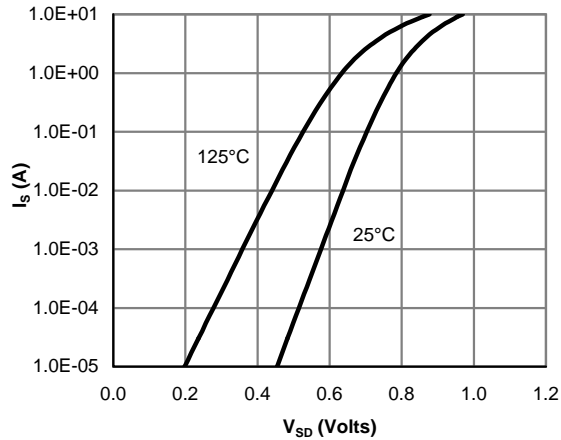


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

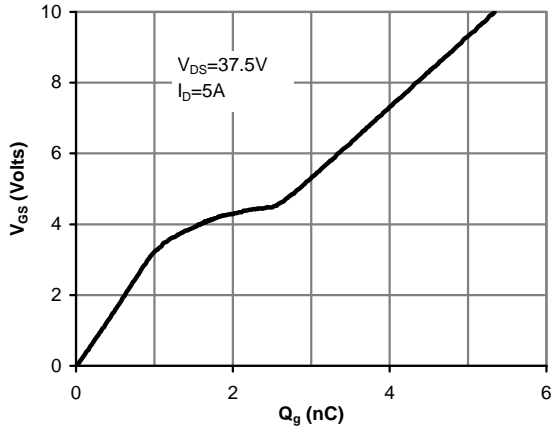


Figure 7: Gate-Charge Characteristics

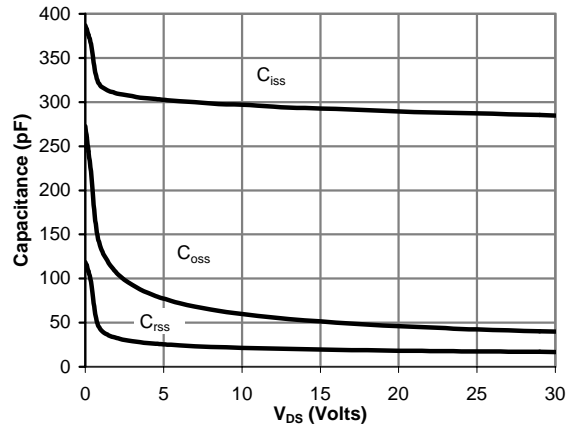


Figure 8: Capacitance Characteristics

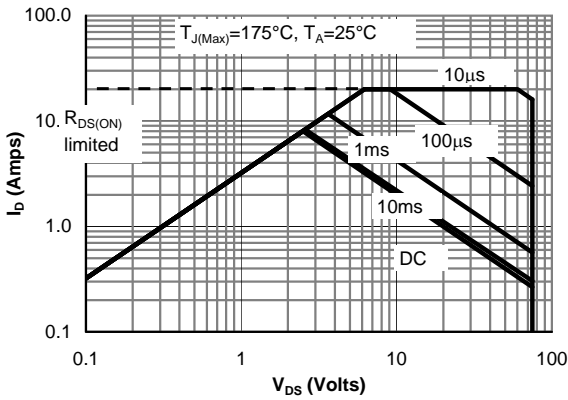


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

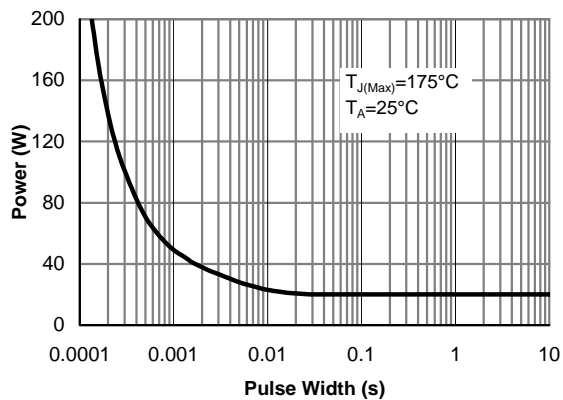


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

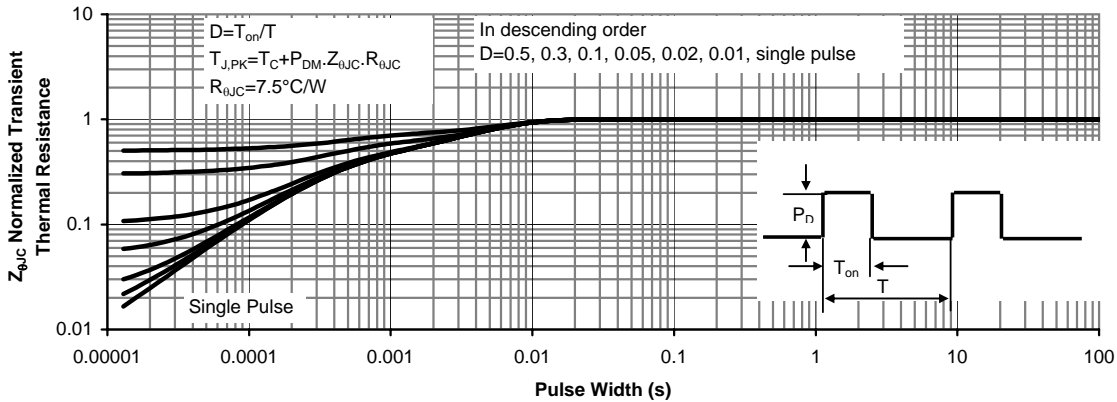


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

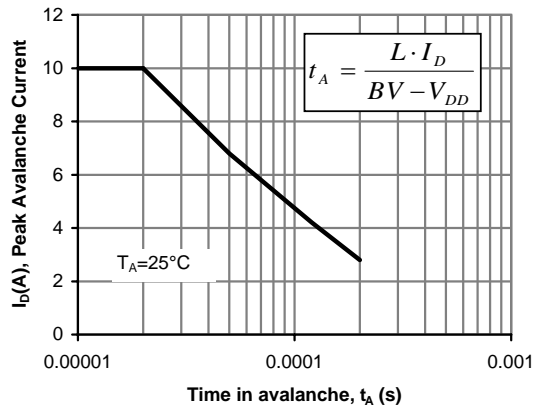


Figure 12: Single Pulse Avalanche capability

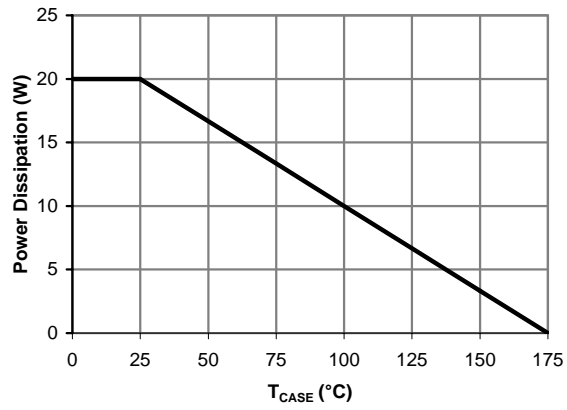


Figure 13: Power De-rating (Note B)

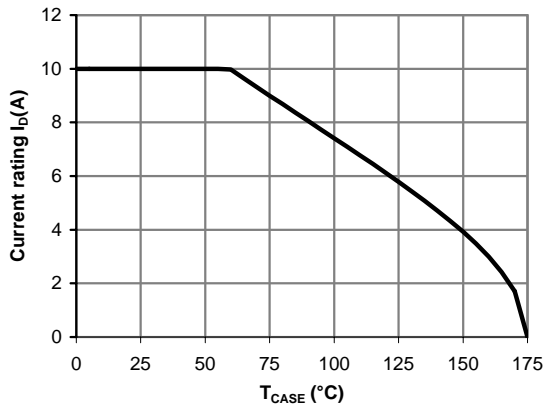


Figure 14: Current De-rating (Note B)