



AON7401

P-Channel Enhancement Mode Field Effect Transistor

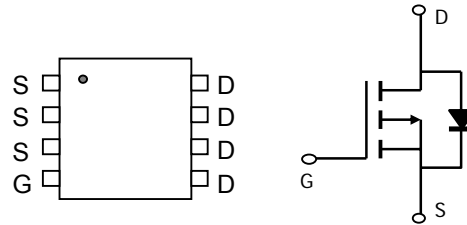
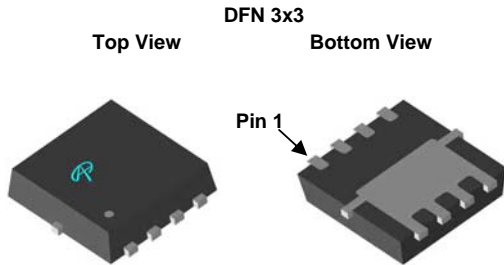


General Description

The AON7401/L 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.
AON7401 and AON7401L are electrically identical.
-RoHS Compliant
-AON7401L is Halogen Free

Features

V_{DS} (V) = -30V
 I_D = -9A (V_{GS} = -10V)
 $R_{DS(ON)} < 14m\Omega$ (V_{GS} = -10V)
 $R_{DS(ON)} < 36m\Omega$ (V_{GS} = -4.5V)



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

| Parameter | Symbol | Maximum | Units |
|---|-------------------------|-------------------------|------------------|
| Drain-Source Voltage | V_{DS} | -30 | V |
| Gate-Source Voltage | V_{GS} | ± 25 | V |
| Continuous Drain Current ^{B,G} | $T_C=25^\circ\text{C}$ | -20 | A |
| | | $T_C=100^\circ\text{C}$ | |
| Pulsed Drain Current ^C | I_{DM} | -80 | |
| Continuous Drain Current | $T_A=25^\circ\text{C}$ | -9 | |
| | $T_A=70^\circ\text{C}$ | -7 | |
| Power Dissipation ^B | $T_C=25^\circ\text{C}$ | 27 | |
| | $T_C=100^\circ\text{C}$ | 11 | |
| Power Dissipation ^A | $T_A=25^\circ\text{C}$ | 1.6 | |
| | $T_A=70^\circ\text{C}$ | 1 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Typ | Max | Units |
|--|-----------------|--------------|-----|--------------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 30 | 40 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient ^A | | Steady-State | 60 | 75 |
| Maximum Junction-to-Case ^D | $R_{\theta JC}$ | 4 | 4.5 | $^\circ\text{C/W}$ |

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 | $I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$ | -30 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=-30\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$ | | | -1 -5 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{DS}=0\text{V}$, $V_{GS}=\pm 25\text{V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$ | -1.7 | -2.2 | -3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$ | -80 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=-10\text{V}$, $I_D=-9\text{A}$ $T_J=125^\circ\text{C}$ $V_{GS}=-4.5\text{V}$, $I_D=-5\text{A}$ | | 11 14 28 | 14 17 36 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{DS}=-5\text{V}$, $I_D=-10\text{A}$ | | 27 | | S |
| V_{SD} | Diode Forward Voltage | $I_S=-1\text{A}$, $V_{GS}=0\text{V}$ | | -0.7 | -1 | V |
| I_S | Maximum Body-Diode Continuous Current | | | | -3 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{ISS} | Input Capacitance | $V_{GS}=0\text{V}$, $V_{DS}=-15\text{V}$, $f=1\text{MHz}$ | | 2060 | 2600 | pF |
| C_{OSS} | Output Capacitance | | | 370 | | pF |
| C_{RSS} | Reverse Transfer Capacitance | | | 295 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$ | | 2.4 | 3.6 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q_g | Total Gate Charge | $V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $I_D=-9\text{A}$ | | 30 | 39 | nC |
| Q_{gs} | Gate Source Charge | | | 4.6 | | nC |
| Q_{gd} | Gate Drain Charge | | | 10 | | nC |
| $t_{D(on)}$ | Turn-On Delay Time | $V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $R_L=1.6\Omega$, $R_{GEN}=3\Omega$ | | 11 | | ns |
| t_r | Turn-On Rise Time | | | 9.4 | | ns |
| $t_{D(off)}$ | Turn-Off Delay Time | | | 24 | | ns |
| t_f | Turn-Off Fall Time | | | 12 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=-9\text{A}$, $dI/dt=500\text{A}/\mu\text{s}$ | | 14 | 18 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=-9\text{A}$, $dI/dt=500\text{A}/\mu\text{s}$ | | 35 | | nC |

A: The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A=25^\circ\text{C}$. The power dissipation P_{DSM} and current rating I_{DSM} are based on $T_{J(MAX)}=150^\circ\text{C}$, using steady state junction-to-ambient thermal resistance.

B: The power dissipation P_D is based on $T_{J(MAX)}=150^\circ\text{C}$, 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 $T_{J(MAX)}=150^\circ\text{C}$.

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 tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$.

The SOA curve provides a single pulse rating.

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

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

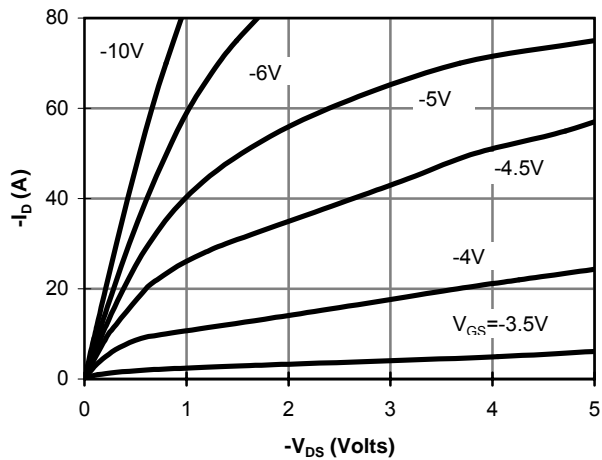


Figure 1: On-Region Characteristics

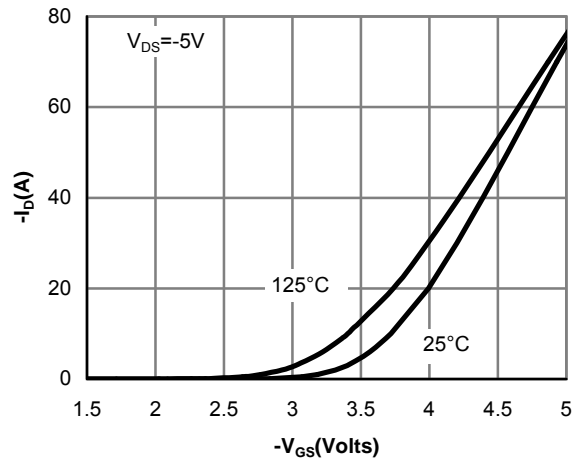


Figure 2: Transfer Characteristics

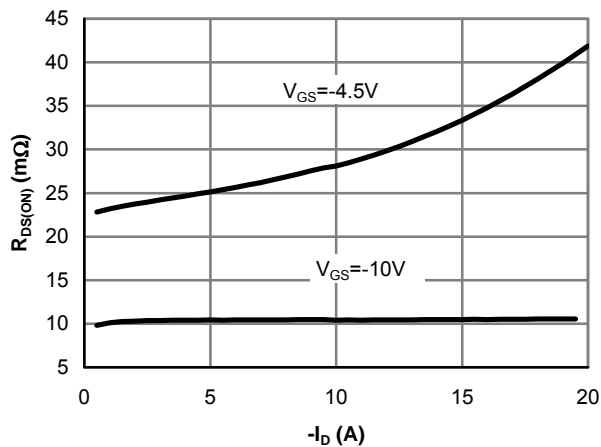


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

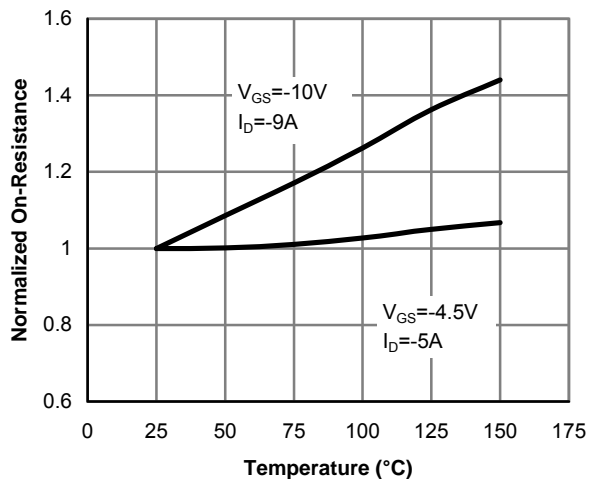


Figure 4: On-Resistance vs. Junction Temperature

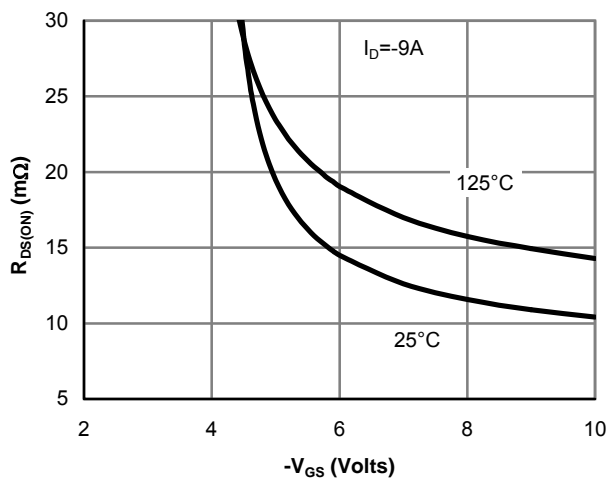


Figure 5: On-Resistance vs. Gate-Source Voltage

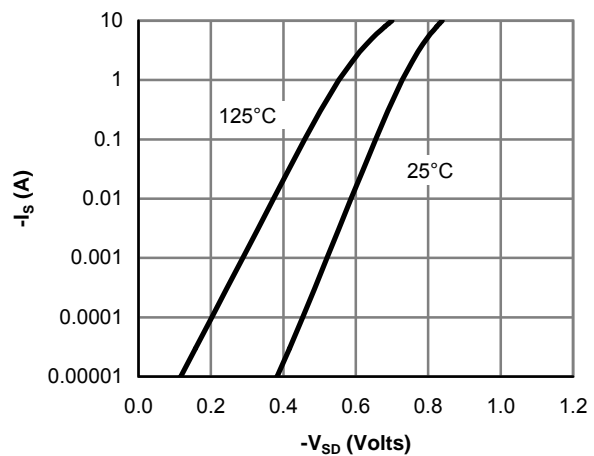


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

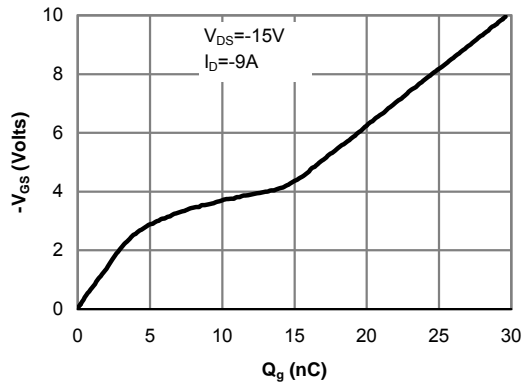


Figure 7: Gate-Charge Characteristics

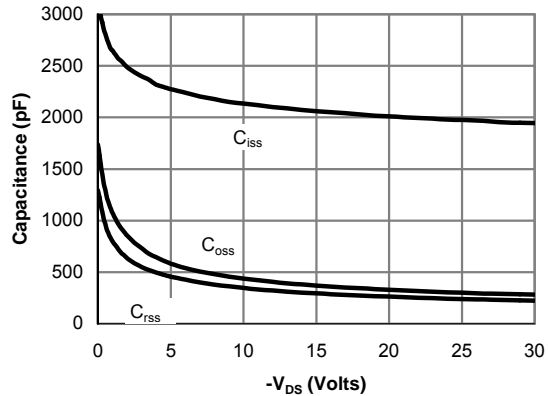


Figure 8: Capacitance Characteristics

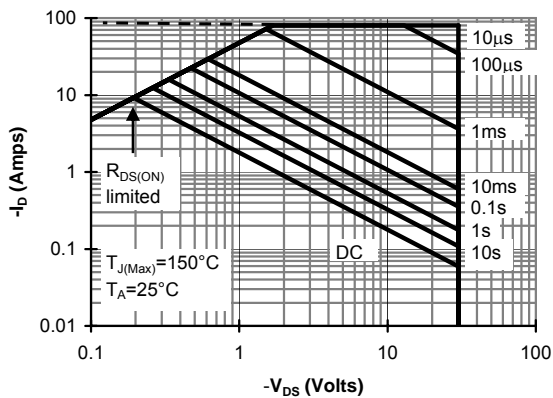


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

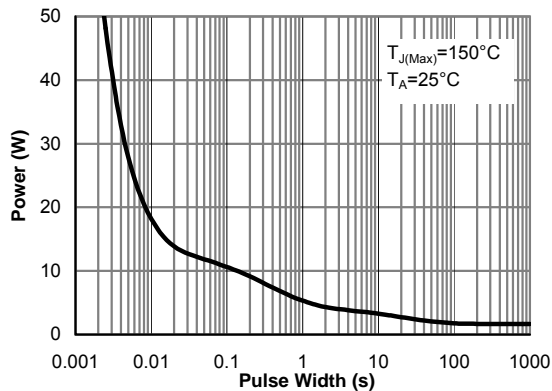


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

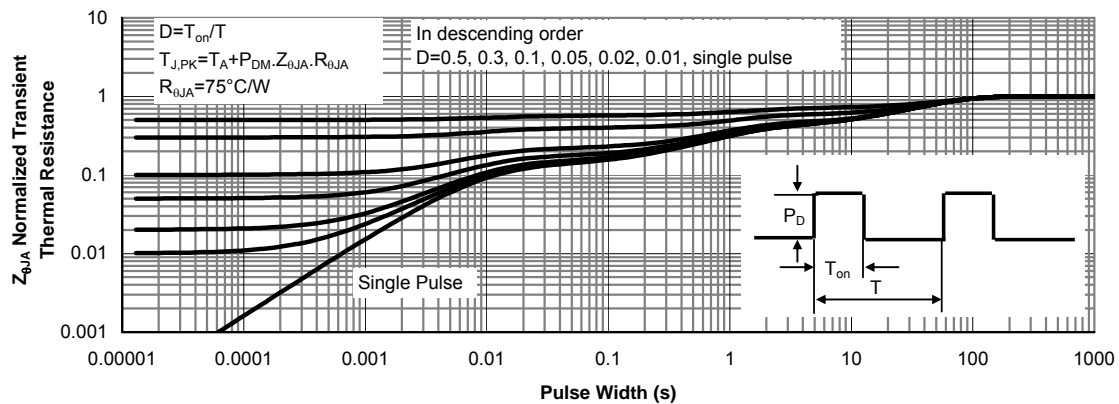


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)