



AO4411

P-Channel Enhancement Mode Field Effect Transistor

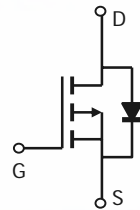
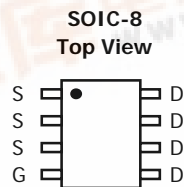


General Description

The AO4411 uses advanced trench technology to provide excellent $R_{DS(ON)}$, and ultra-low low gate charge. This device is suitable for use as a load switch or in PWM applications. *Standard Product AO4411 is Pb-free (meets ROHS & Sony 259 specifications). AO4411L is a Green Product ordering option. AO4411 and AO4411L are electrically identical.*

Features

- $V_{DS} (V) = -30V$
- $I_D = -8 A (V_{GS} = -10V)$
- $R_{DS(ON)} < 32m\Omega (V_{GS} = -10V)$
- $R_{DS(ON)} < 55m\Omega (V_{GS} = -4.5V)$



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

| Parameter | Symbol | Maximum | Units |
|--|----------------|------------------|------------|
| Drain-Source Voltage | V_{DS} | -30 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current ^A | I_D | $T_A=25^\circ C$ | -8 |
| | | $T_A=70^\circ C$ | -6.6 |
| Pulsed Drain Current ^B | I_{DM} | -40 | A |
| Power Dissipation ^A | P_D | $T_A=25^\circ C$ | 3 |
| | | $T_A=70^\circ C$ | 2.1 |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | $^\circ C$ |

Thermal Characteristics

| Parameter | Symbol | Typ | Max | Units |
|--|-----------------|--------------|-----|--------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 24 | 40 | $^\circ C/W$ |
| Maximum Junction-to-Ambient ^A | | Steady-State | 54 | 75 |
| Maximum Junction-to-Lead ^C | $R_{\theta JL}$ | 21 | 30 | $^\circ C/W$ |



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} =-24V, V _{GS} =0V T _J =55°C | | | -1 -5 | μA |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±20V | | | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} I _D =-250μA | -1.2 | -2 | -2.4 | V |
| I _{D(ON)} | On state drain current | V _{GS} =-10V, V _{DS} =-5V | -40 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =-10V, I _D =-8A T _J =125°C | | 24.5 33 | 32 | mΩ |
| | | V _{GS} =-4.5V, I _D =-5A | | 41 | 55 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =-5V, I _D =-8A | | 14.5 | | S |
| V _{SD} | Diode Forward Voltage | I _S =-1A, V _{GS} =0V | | -0.76 | -1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | -4.2 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =-15V, f=1MHz | | 920 | 1120 | pF |
| C _{oss} | Output Capacitance | | | 190 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 122 | | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | | 3.6 | 5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g (10V) | Total Gate Charge (10V) | V _{GS} =-10V, V _{DS} =-15V, I _D =-8A | | 18.4 | 23 | nC |
| Q _g (4.5V) | Total Gate Charge (4.5V) | | | 9.3 | 11.5 | nC |
| Q _{gs} | Gate Source Charge | | | 2.7 | | nC |
| Q _{gd} | Gate Drain Charge | | | 4.9 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =-10V, V _{DS} =-15V, R _L =1.8Ω, R _{GEN} =3Ω | | 7.1 | | ns |
| t _r | Turn-On Rise Time | | | 3.4 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 18.9 | | ns |
| t _f | Turn-Off Fall Time | | | 8.4 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =-8A, di/dt=100A/μs | | 21.5 | 27 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =-8A, di/dt=100A/μs | | 12.5 | | nC |

A: The value of R_{θJA} 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 value in any given application depends on the user's specific board design. The current rating is based on the \leq 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6,12,14 are obtained using 80μs pulses, duty cycle 0.5% max.

E: 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. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

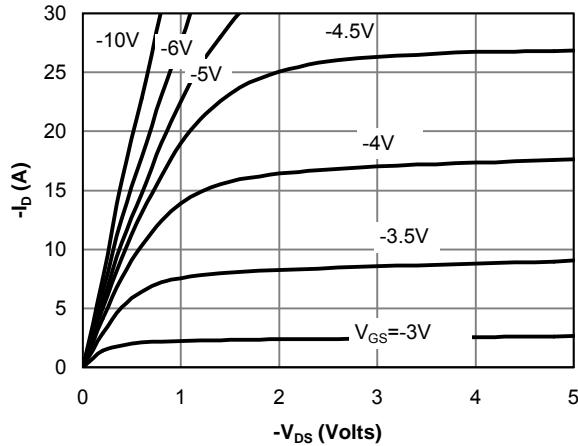


Fig 1: On-Region Characteristics

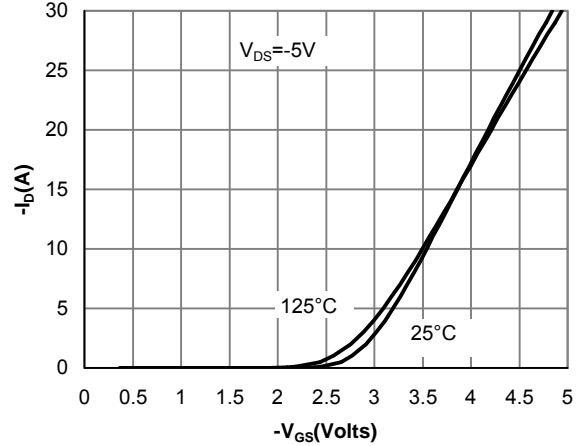


Figure 2: Transfer Characteristics

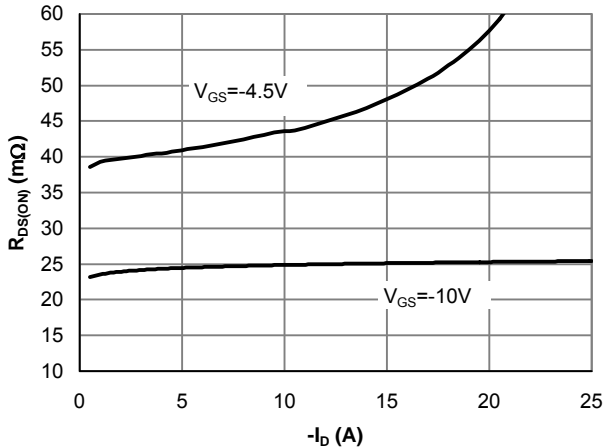


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

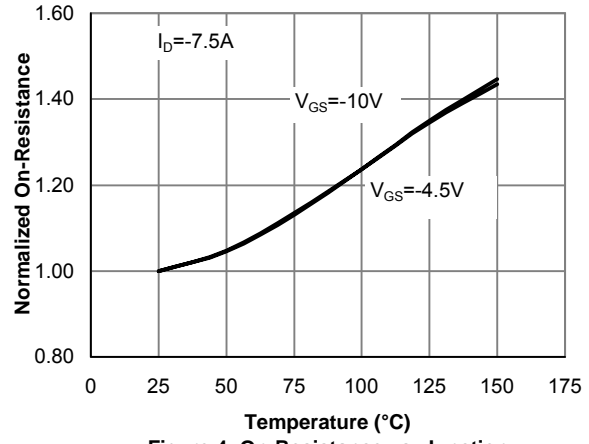


Figure 4: On-Resistance vs. Junction Temperature

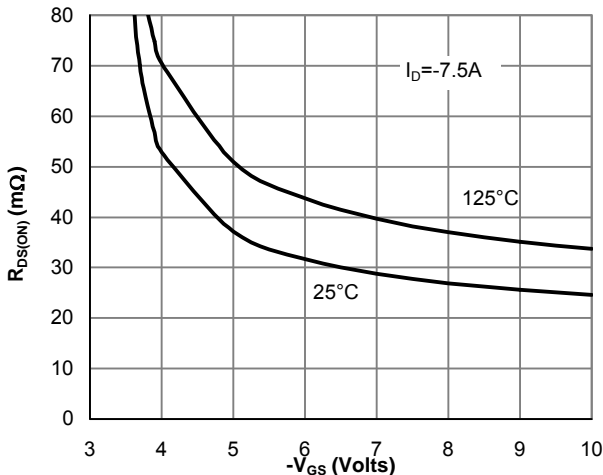


Figure 5: On-Resistance vs. Gate-Source Voltage

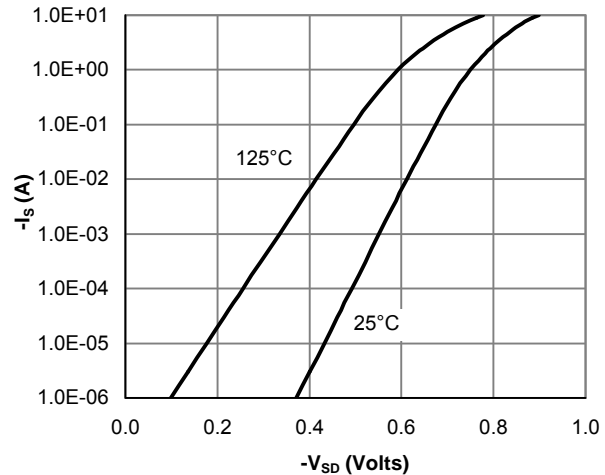


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

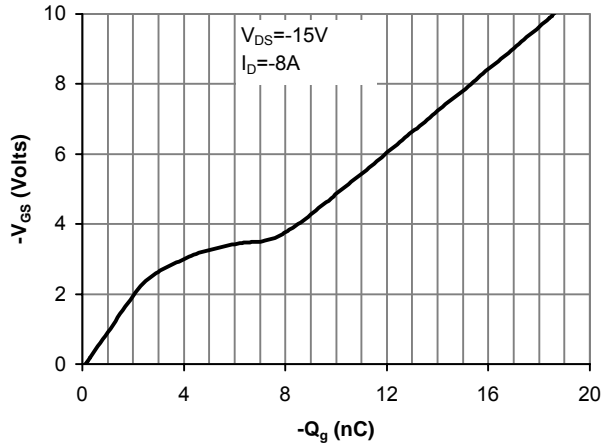


Figure 7: Gate-Charge Characteristics

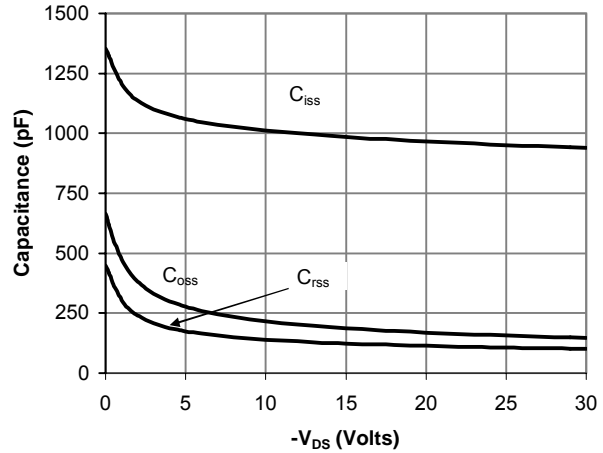


Figure 8: Capacitance Characteristics

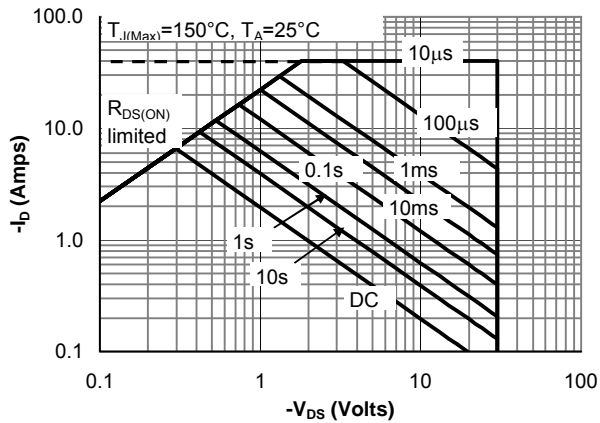


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

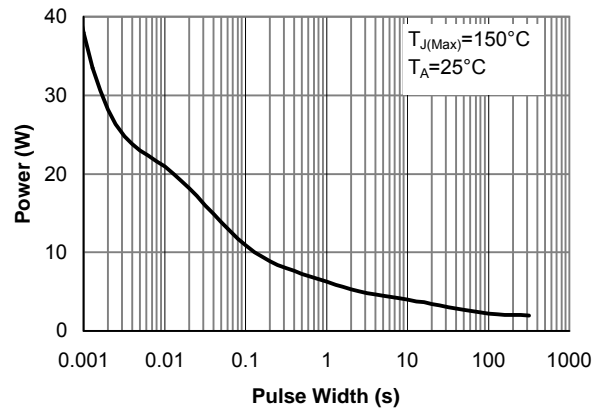


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

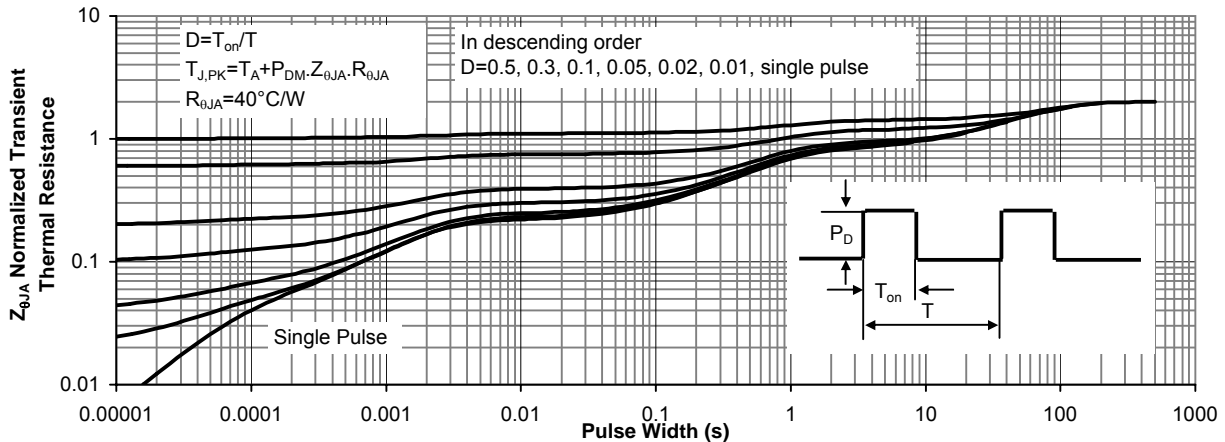


Figure 11: Normalized Maximum Transient Thermal Impedance



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