



ALPHA & OMEGA
SEMICONDUCTOR

AO4414

N-Channel Enhancement Mode Field Effect Transistor

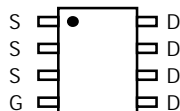


General Description

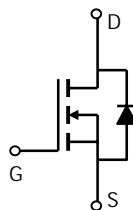
The AO4414 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a load switch or in PWM applications. The source leads are separated to allow a Kelvin connection to the source, which may be used to bypass the source inductance. *Standard Product AO4414 is Pb-free (meets ROHS & Sony 259 specifications). AO4414L is a Green Product ordering option. AO4414 and AO4414L are electrically identical.*

Features

V_{DS} (V) = 30V
 I_D = 8.5A (V_{GS} = 10V)
 $R_{DS(ON)} < 26m\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 40m\Omega$ (V_{GS} = 4.5V)



SOIC-8



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} | ± 20 | V |
| Continuous Drain Current ^A | I_D | 8.5 | A |
| $T_A=25^\circ\text{C}$ | | | |
| $T_A=70^\circ\text{C}$ | | 7.1 | |
| Pulsed Drain Current ^B | I_{DM} | 50 | |
| Power Dissipation | P_D | 3 | W |
| | | 2.1 | |
| $T_A=25^\circ\text{C}$ | | | |
| $T_A=70^\circ\text{C}$ | | | |
| 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 | $t \leq 10\text{s}$ | $R_{\theta JA}$ | 31 | 40 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient ^A | Steady-State | | 59 | 75 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead ^C | Steady-State | $R_{\theta JL}$ | 16 | 24 | $^\circ\text{C/W}$ |

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 | | 0.004 | 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 | 1.9 | 3 | V |
| I _{D(ON)} | On state drain current | V _{GS} =4.5V, V _{DS} =5V | 20 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =8.5A T _J =125°C | | 20 29.2 | 26 38 | mΩ |
| | | V _{GS} =4.5V, I _D =5A | | 31 | 40 | mΩ |
| | | | | | | |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =5A | 10 | 17 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.76 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 4.3 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =15V, f=1MHz | | 680 | 820 | pF |
| C _{oss} | Output Capacitance | | | 102 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 77 | | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | | 3 | 3.6 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g (10V) | Total Gate Charge | V _{GS} =10V, V _{DS} =15V, I _D =8.5A | | 13.84 | 17 | nC |
| Q _g (4.5V) | Total Gate Charge | | | 6.74 | 8.1 | nC |
| Q _{gs} | Gate Source Charge | | | 1.84 | | nC |
| Q _{gd} | Gate Drain Charge | | | 3.32 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =15V, R _L =1.8Ω, R _{GEN} =3Ω | | 4.5 | 6.5 | ns |
| t _r | Turn-On Rise Time | | | 4.2 | 6.3 | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 20.1 | 30 | ns |
| t _f | Turn-Off Fall Time | | | 4.9 | 7.5 | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =8.5A, dI/dt=100A/μs | | 17.2 | 21 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =8.5A, dI/dt=100A/μs | | 8.6 | 10 | 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 t ≤ 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 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

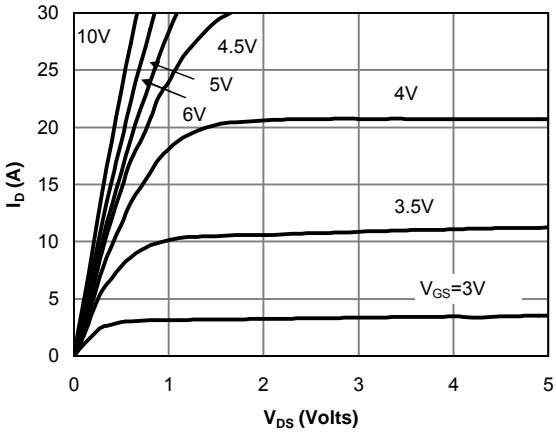


Fig 1: On-Region Characteristics

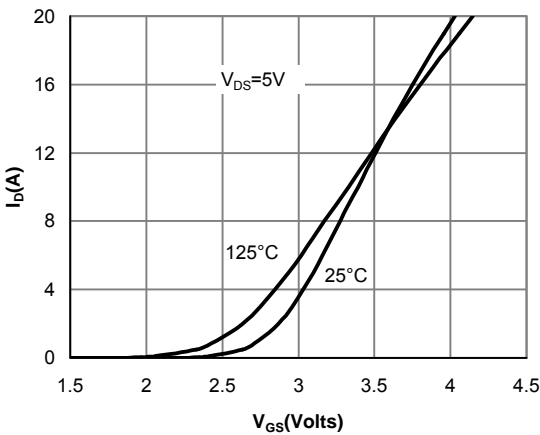


Figure 2: Transfer Characteristics

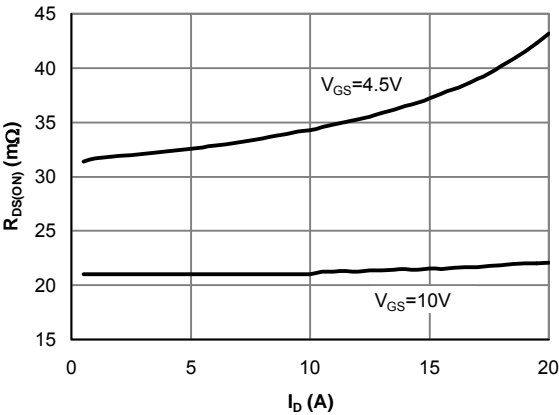


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

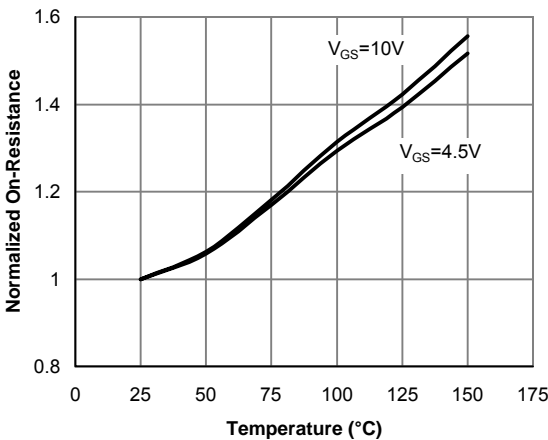


Figure 4: On-Resistance vs. Junction Temperature

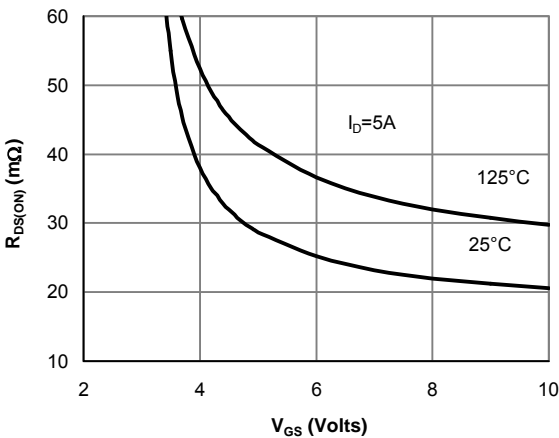


Figure 5: On-Resistance vs. Gate-Source Voltage

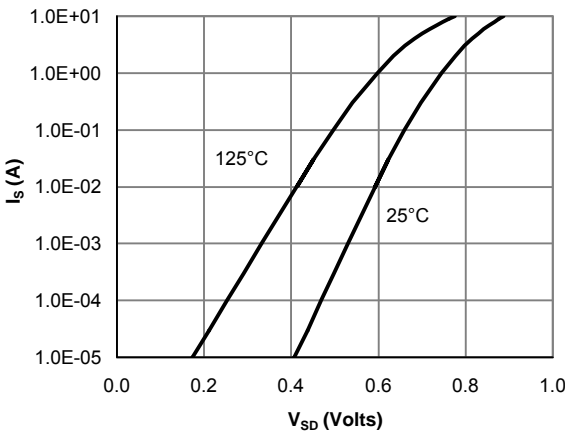


Figure 6: Body-Diode Characteristics

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