

General Description

The AO7404 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V, in the small SOT323 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters. It is ESD protected to 1KV HBM. *Standard Product AO7404 is Pb-free (meets ROHS & Sony 259 specifications). AO7404L is a Green Product ordering option. AO7404 and AO7404L are electrically identical.*

Features

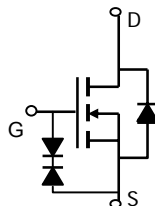
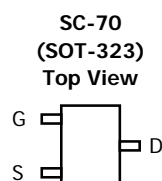
$$V_{DS} (V) = 20V$$

$$I_D = 1 A (V_{GS} = 4.5V)$$

$$R_{DS(ON)} < 225m\Omega (V_{GS} = 4.5V)$$

$$R_{DS(ON)} < 290m\Omega (V_{GS} = 2.5V)$$

$$R_{DS(ON)} < 425m\Omega (V_{GS} = 1.8V)$$



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

| Parameter | Symbol | Maximum | Units |
|--|------------------------|------------|------------------|
| Drain-Source Voltage | V_{DS} | 20 | V |
| Gate-Source Voltage | V_{GS} | ± 8 | V |
| Continuous Drain Current ^A | $T_A=25^\circ\text{C}$ | 1 | A |
| | $T_A=70^\circ\text{C}$ | 0.75 | |
| Pulsed Drain Current ^B | I_{DM} | 5 | |
| Power Dissipation ^A | $T_A=25^\circ\text{C}$ | 0.35 | W |
| | $T_A=70^\circ\text{C}$ | 0.22 | |
| 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 | $R_{\theta JA}$ | $t \leq 10s$ | 300 | 360 | $^\circ\text{C}/\text{W}$ |
| | | Steady-State | 340 | 425 | $^\circ\text{C}/\text{W}$ |
| Maximum Junction-to-Lead ^C | $R_{\theta JL}$ | 280 | 320 | $^\circ\text{C}/\text{W}$ | |

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 | 20 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =16V, V _{GS} =0V T _J =55°C | | | 1 5 | μA |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±8V | | | 25 | μA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 0.4 | 0.55 | 0.8 | V |
| I _{D(ON)} | On state drain current | V _{GS} =4.5V, V _{DS} =5V | 5 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =4.5V, I _D =1A T _J =125°C | | 186 262 | 225 315 | mΩ |
| | | V _{GS} =2.5V, I _D =0.85A | | 241 | 290 | mΩ |
| | | V _{GS} =1.8V, I _D =0.7A | | 326 | 425 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =1A | | 2.6 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.69 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 0.4 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | | | 101 | | pF |
| C _{oss} | Output Capacitance | V _{GS} =0V, V _{DS} =10V, f=1MHz | | 17 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 14 | | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | | 3 | | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | | | 1.57 | | nC |
| Q _{gs} | Gate Source Charge | V _{GS} =4.5V, V _{DS} =10V, I _D =1A | | 0.13 | | nC |
| Q _{gd} | Gate Drain Charge | | | 0.36 | | nC |
| t _{D(on)} | Turn-On Delay Time | | | 3.2 | | ns |
| t _r | Turn-On Rise Time | V _{GS} =5V, V _{DS} =10V, R _L =10Ω, | | 4 | | ns |
| t _{D(off)} | Turn-Off Delay Time | R _{GEN} =6Ω | | 15.5 | | ns |
| t _f | Turn-Off Fall Time | | | 2.4 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =1A, dI/dt=100A/μs | | 6.7 | | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =1A, dI/dt=100A/μs | | 1.6 | | 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 ≤ 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.

Rev 3 : Aug 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

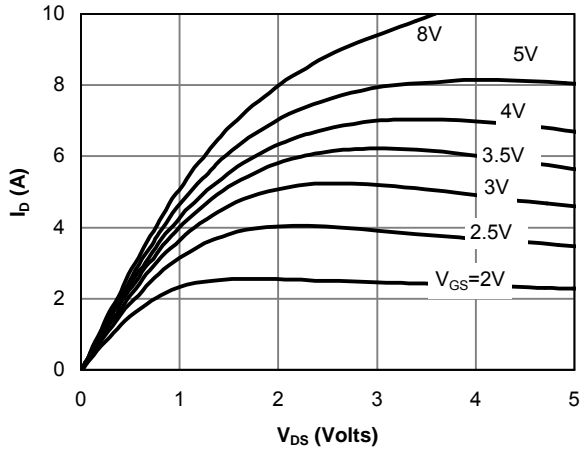


Fig 1: On-Region Characteristics

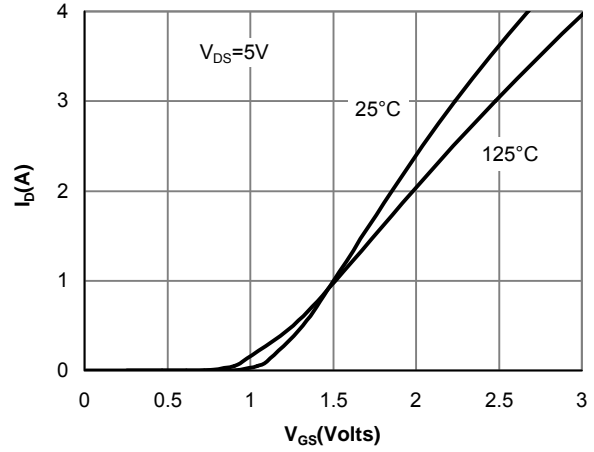


Figure 2: Transfer Characteristics

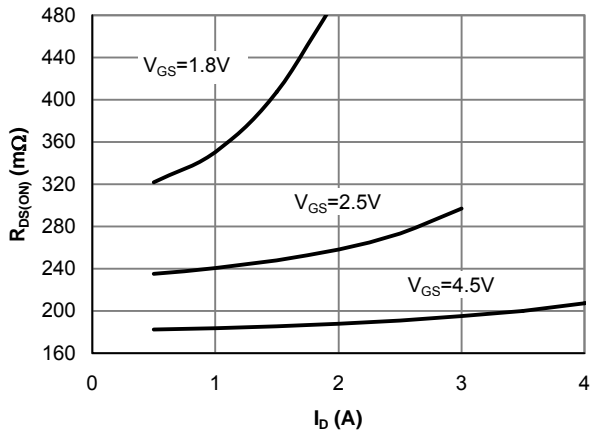


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

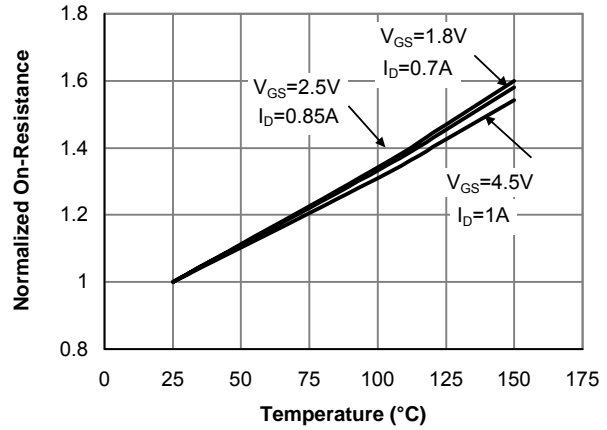


Figure 4: On-Resistance vs. Junction Temperature

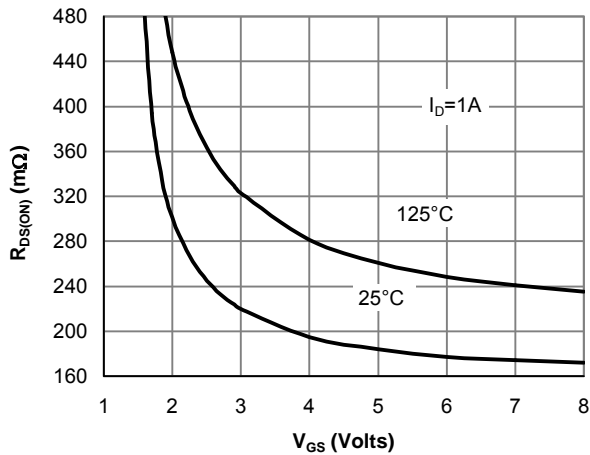


Figure 5: On-Resistance vs. Gate-Source Voltage

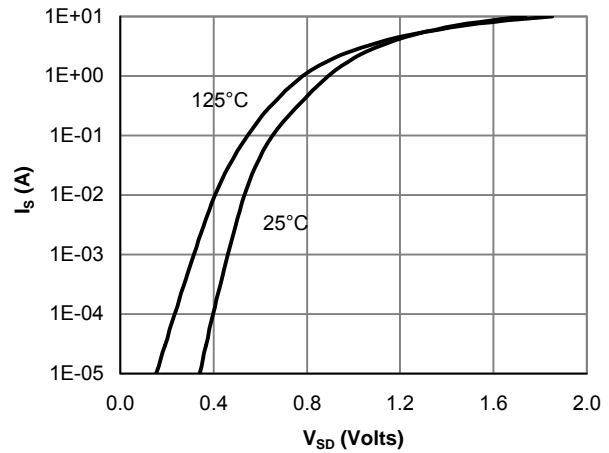


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

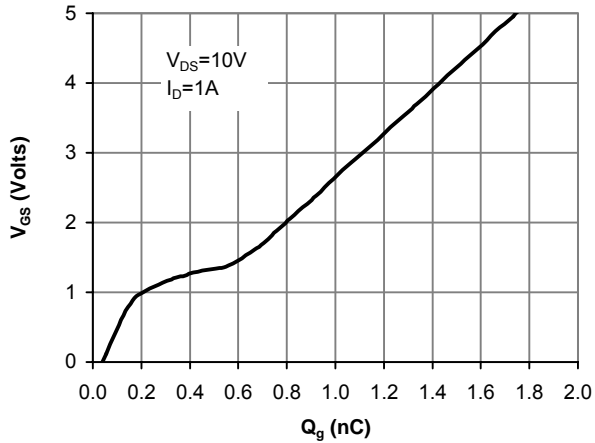


Figure 7: Gate-Charge Characteristics

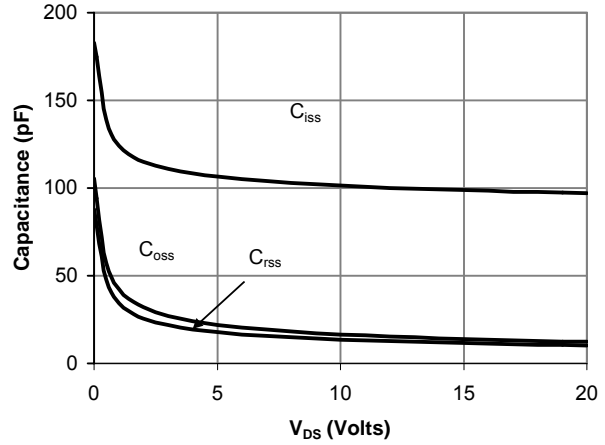


Figure 8: Capacitance Characteristics

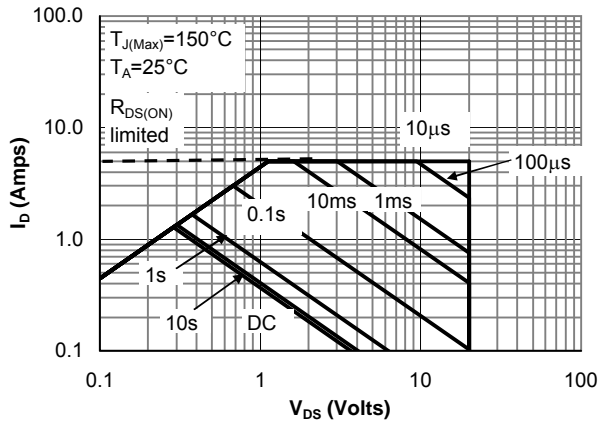


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

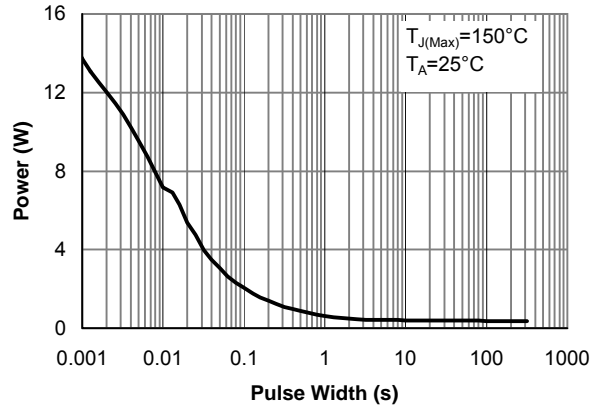


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

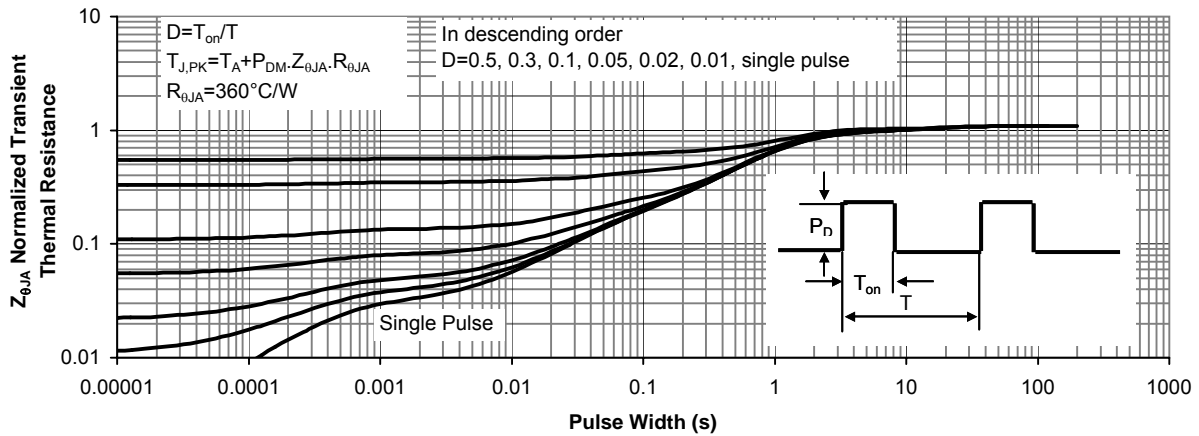


Figure 11: Normalized Maximum Transient Thermal Impedance