



AO6704

**N-Channel Enhancement Mode Field Effect Transistor
with Schottky Diode**



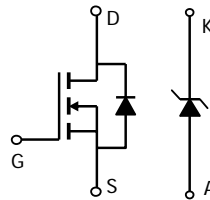
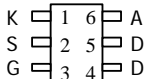
General Description

The AO6704 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for DC-DC conversion applications. *Standard Product AO6704 is Pb-free (meets ROHS & Sony 259 specifications). AO6704L is a Green Product ordering option. AO6704 and AO6704L are electrically identical.*

Features

- V_{DS} (V) = 30V
- I_D = 3.6A (V_{GS} = 10V)
- $R_{DS(ON)} < 65m\Omega$ (V_{GS} = 10V)
- $R_{DS(ON)} < 75m\Omega$ (V_{GS} = 4.5V)
- $R_{DS(ON)} < 160m\Omega$ (V_{GS} = 2.5V)
- SCHOTTKY**
- V_{DS} (V) = 20V, I_F = 1A, $V_F < 0.5V@0.5A$

**TSOP6
Top View**



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

| Parameter | Symbol | MOSFET | Schottky | Units |
|---|----------------|------------------------|------------|------------------|
| Drain-Source Voltage | V_{DS} | 30 | | V |
| Gate-Source Voltage | V_{GS} | ± 12 | | V |
| Continuous Drain Current ^A | I_D | $T_A=25^\circ\text{C}$ | 3.6 | A |
| | | $T_A=70^\circ\text{C}$ | 2.9 | |
| Pulsed Drain Current ^B | I_{DM} | 10 | | |
| Schottky reverse voltage | V_{KA} | | 20 | V |
| Continuous Forward Current ^A | I_F | $T_A=25^\circ\text{C}$ | 1.5 | A |
| | | $T_A=70^\circ\text{C}$ | 1 | |
| Pulsed Forward Current ^B | I_{FM} | | 10 | |
| Power Dissipation | P_D | $T_A=25^\circ\text{C}$ | 1.39 | W |
| | | $T_A=70^\circ\text{C}$ | 0.89 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | -55 to 150 | $^\circ\text{C}$ |

| Parameter: Thermal Characteristics MOSFET | | Symbol | Typ | Max | Units |
|---|--------------|-----------------|-----|-----|--------------------|
| Maximum Junction-to-Ambient ^A | $t \leq 10s$ | $R_{\theta JA}$ | 70 | 90 | $^\circ\text{C/W}$ |
| | Steady-State | | 102 | 130 | |
| Maximum Junction-to-Lead ^C | Steady-State | $R_{\theta JL}$ | 51 | 80 | |
| Thermal Characteristics Schottky | | | | | |
| Maximum Junction-to-Ambient ^A | $t \leq 10s$ | $R_{\theta JA}$ | 129 | 160 | $^\circ\text{C/W}$ |
| | Steady-State | | 158 | 200 | |
| Maximum Junction-to-Lead ^C | Steady-State | $R_{\theta JL}$ | 52 | 80 | |

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} =±12V | | | 100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 1 | 1.4 | 1.8 | V |
| I _{D(ON)} | On state drain current | V _{GS} =4.5V, V _{DS} =5V | 10 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =3.6A T _j =125°C | | 44 | 65 | mΩ |
| | | V _{GS} =4.5V, I _D =3.4A | | 53 | 75 | |
| | | V _{GS} =2.5V, I _D =1A | | 106 | 160 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =3.6A | | 11.7 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.81 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 2.5 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =15V, f=1MHz | | 226 | 270 | pF |
| C _{oss} | Output Capacitance | | | 39 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 29 | | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | | 1.4 | 4 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =4.5V, V _{DS} =15V, I _D =3.6A | | 3 | 3.6 | nC |
| Q _{gs} | Gate Source Charge | | | 1.4 | | nC |
| Q _{gd} | Gate Drain Charge | | | 0.55 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =15V, R _L =3.9Ω, R _{GEN} =6Ω | | 2.6 | | ns |
| t _r | Turn-On Rise Time | | | 3.2 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 14.5 | | ns |
| t _f | Turn-Off Fall Time | | | 2.1 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | | I _F =3.6A, di/dt=100A/μs | | 10.2 | 13 |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =3.6A, di/dt=100A/μs | | 3.8 | | nC |
| SCHOTTKY PARAMETERS | | | | | | |
| V _F | Forward Voltage Drop | I _F =0.5A | | 0.39 | 0.5 | V |
| I _{rm} | Maximum reverse leakage current | V _R =16V | | | 0.1 | mA |
| | | V _R =16V, T _j =125°C | | | 20 | |
| C _T | Junction Capacitance | V _R =10V | | 34 | | pF |
| t _{tr} | Schottky Reverse Recovery Time | I _F =1A, di/dt=100A/μs | | 5.2 | 10 | ns |
| Q _{rr} | Schottky Reverse Recovery Charge | I _F =1A, di/dt=100A/μs | | 0.8 | | 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 a 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

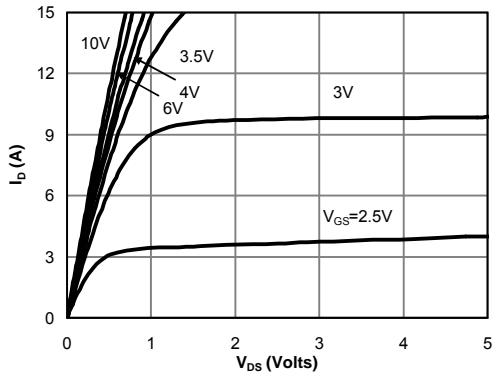


Fig 1: On-Region Characteristics

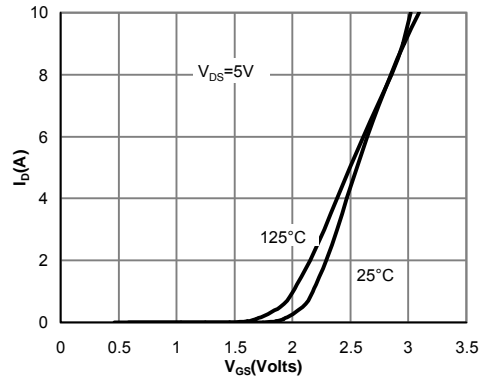


Figure 2: Transfer Characteristics

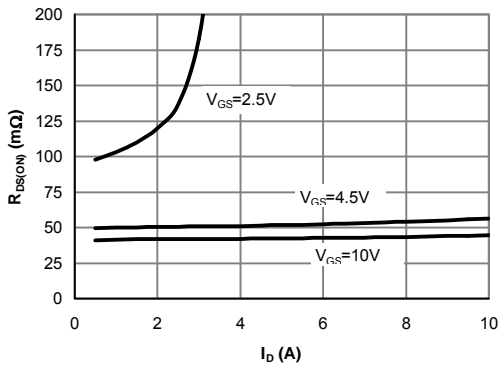


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

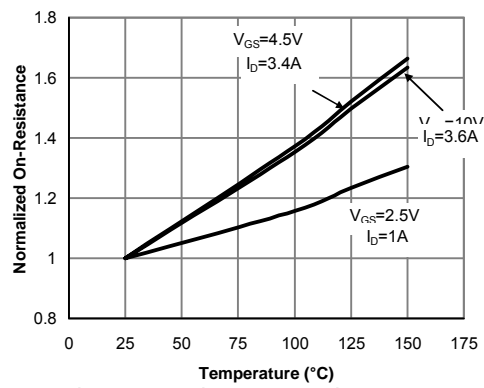


Figure 4: On-Resistance vs. Junction Temperature

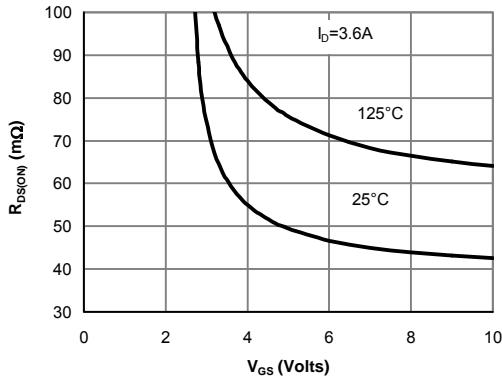


Figure 5: On-Resistance vs. Gate-Source Voltage

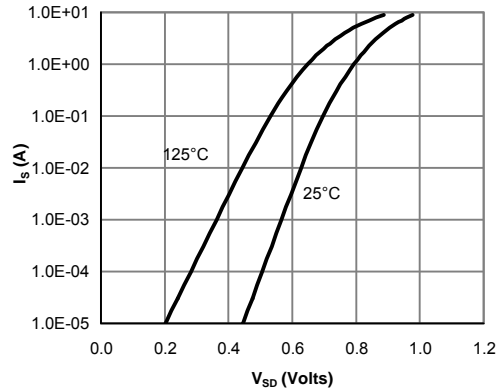


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

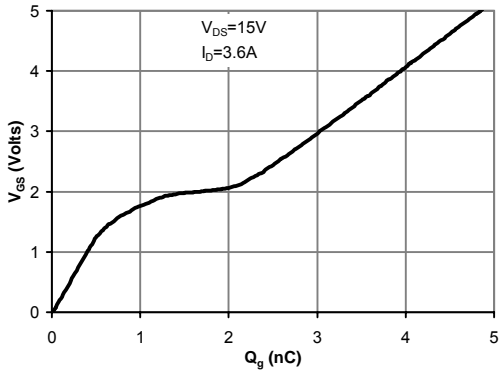


Figure 7: Gate-Charge Characteristics

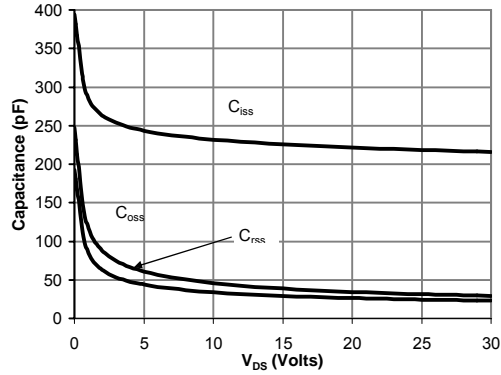


Figure 8: Capacitance Characteristics

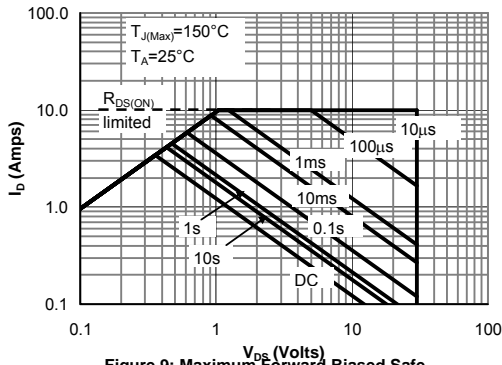


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

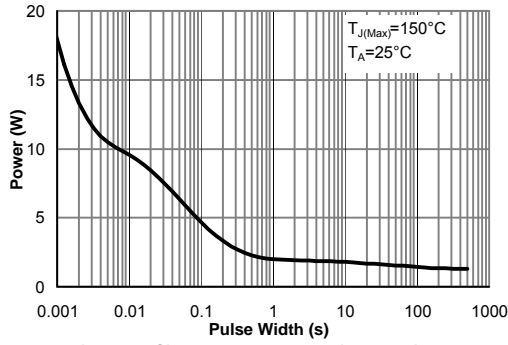


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

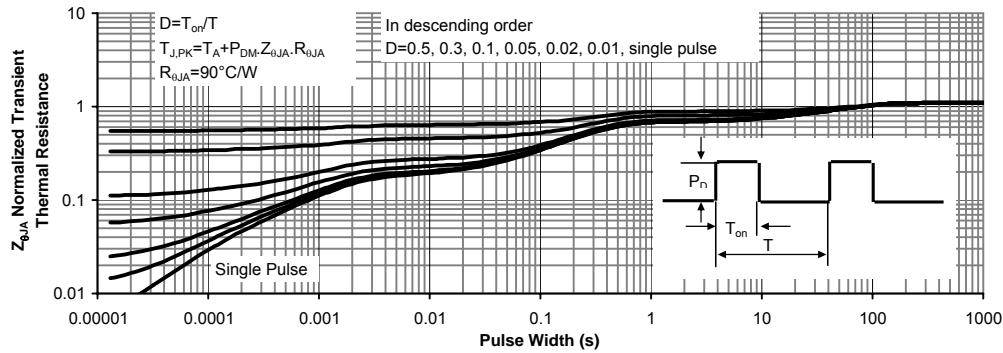


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

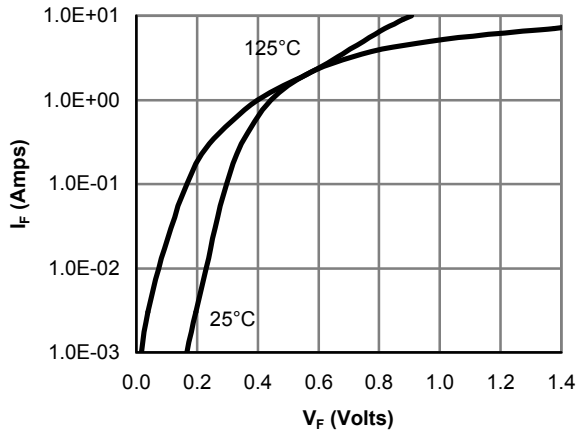


Figure 12: Schottky Forward Characteristics

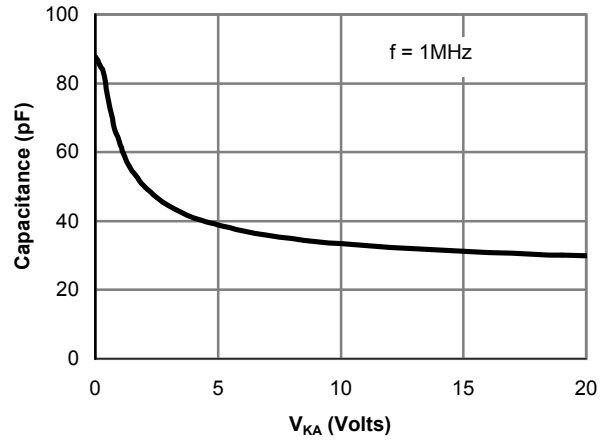


Figure 13: Schottky Capacitance Characteristics

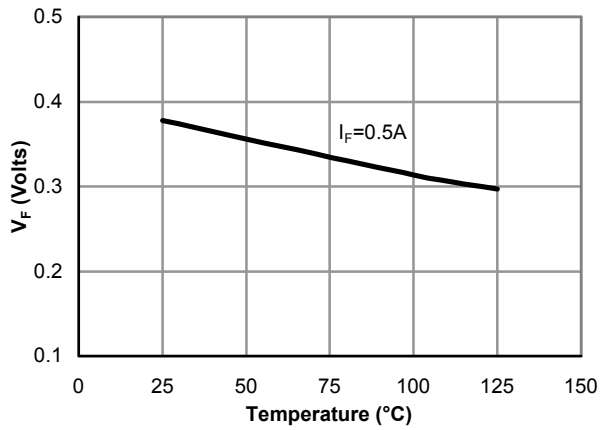


Figure 14: Schottky Forward Drop vs. Junction Temperature

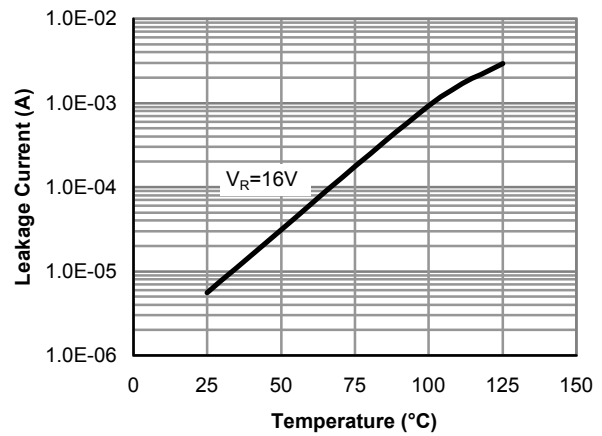


Figure 15: Schottky Leakage current vs. Junction Temperature

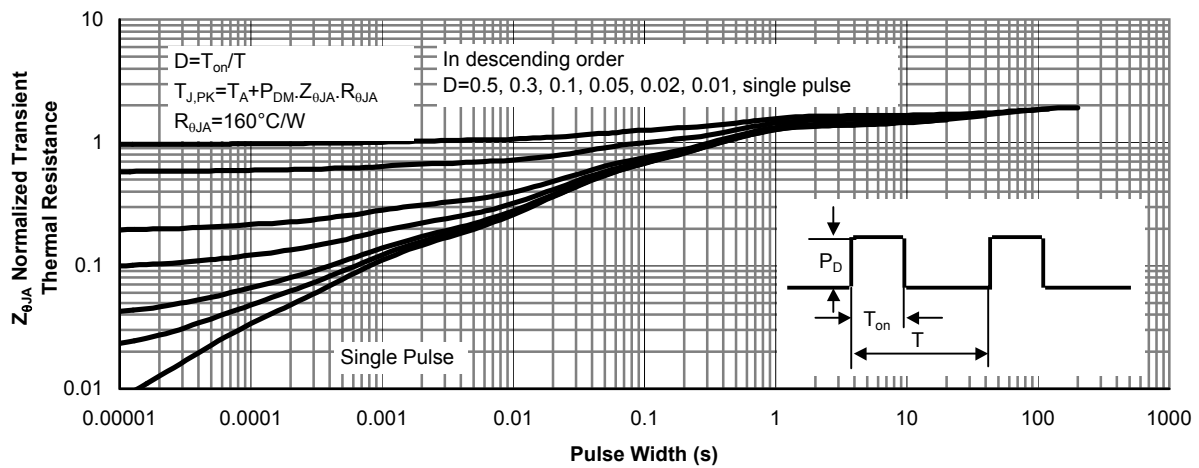


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance