



## AO3703

### P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

#### General Description

The AO3703 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 AO3703 is Pb-free (meets ROHS & Sony 259 specifications). AO3703L is a Green Product ordering option. AO3703 and AO3703L are electrically identical.*

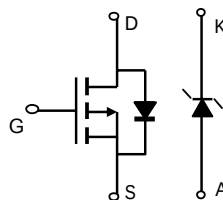
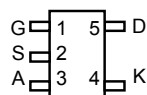
#### Features

$V_{DS}$  (V) = -20V  
 $I_D$  = -2.7 A ( $V_{GS}$  = -10V)  
 $R_{DS(ON)}$  < 97m $\Omega$  ( $V_{GS}$  = -4.5V)  
 $R_{DS(ON)}$  < 130m $\Omega$  ( $V_{GS}$  = -2.5V)  
 $R_{DS(ON)}$  < 190m $\Omega$  ( $V_{GS}$  = -1.8V)

#### SCHOTTKY

$V_{DS}$  (V) = 20V,  $I_F$  = 1A,  $V_F$  < 0.5V@0.5A

SOT-23-5  
Top View



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

| Parameter                               | Symbol                 | MOSFET     | Schottky   | Units            |
|-----------------------------------------|------------------------|------------|------------|------------------|
| Drain-Source Voltage                    | $V_{DS}$               | -20        |            | V                |
| Gate-Source Voltage                     | $V_{GS}$               | $\pm 8$    |            | V                |
| Continuous Drain Current <sup>A</sup>   | $T_A=25^\circ\text{C}$ | -2.7       |            | A                |
|                                         | $T_A=70^\circ\text{C}$ | -2.1       |            |                  |
| Pulsed Drain Current <sup>B</sup>       | $I_{DM}$               | -10        |            |                  |
| Schottky reverse voltage                | $V_{KA}$               |            | 20         | V                |
| Continuous Forward Current <sup>A</sup> | $T_A=25^\circ\text{C}$ |            | 2          | A                |
|                                         | $T_A=70^\circ\text{C}$ |            | 1          |                  |
| Pulsed Forward Current <sup>B</sup>     | $I_{FM}$               |            | 10         |                  |
| Power Dissipation                       | $T_A=25^\circ\text{C}$ | 1.14       | 0.92       | W                |
|                                         | $T_A=70^\circ\text{C}$ | 0.72       | 0.59       |                  |
| 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 <sup>A</sup>  | $t \leq 10\text{s}$ | $R_{\theta JA}$ | 80.3 | 110 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup>  | Steady-State        |                 | 117  | 150 |                    |
| Maximum Junction-to-Lead <sup>C</sup>     | Steady-State        | $R_{\theta JL}$ | 58.5 | 80  |                    |

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

| Symbol                      | Parameter                             | Conditions                                                                                   | Min  | Typ       | Max       | Units |
|-----------------------------|---------------------------------------|----------------------------------------------------------------------------------------------|------|-----------|-----------|-------|
| <b>STATIC PARAMETERS</b>    |                                       |                                                                                              |      |           |           |       |
| BV <sub>DSS</sub>           | Drain-Source Breakdown Voltage        | I <sub>D</sub> =-250μA, V <sub>GS</sub> =0V                                                  | -20  |           |           | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =55°C                           |      |           | -1<br>-5  | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> =±8V                                                    |      |           | ±100      | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                    | -0.3 | -0.6      | -1        | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-5V                                                 | -10  |           |           | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2.7A<br>T <sub>J</sub> =125°C                       |      | 76<br>111 | 97<br>135 | mΩ    |
|                             |                                       | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2A                                                  |      | 101       | 130       | mΩ    |
|                             |                                       | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-1A                                                  |      | 134       | 190       | mΩ    |
|                             |                                       |                                                                                              |      |           |           |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-2.7A                                                  | 4    | 7         |           | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                     |      | -0.78     | -1        | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                              |      |           | -2        | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                              |      |           |           |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-10V, f=1MHz                                           |      | 540       |           | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                              |      | 72        |           | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                              |      | 49        |           | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                             |      | 12        |           | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                              |      |           |           |       |
| Q <sub>g</sub>              | Total Gate Charge                     | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, I <sub>D</sub> =-2.7A                         |      | 6.1       |           | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                              |      | 0.6       |           | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                              |      | 1.6       |           | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, R <sub>L</sub> =2.8Ω,<br>R <sub>GEN</sub> =3Ω |      | 10        |           | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                              |      | 12        |           | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                              |      | 44        |           | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                              |      | 22        |           | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-2.7A, dI/dt=100A/μs                                                         |      | 21        |           | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-2.7A, dI/dt=100A/μs                                                         |      | 7.5       |           | nC    |
| <b>SCHOTTKY PARAMETERS</b>  |                                       |                                                                                              |      |           |           |       |
| V <sub>F</sub>              | Forward Voltage Drop                  | I <sub>F</sub> =0.5A                                                                         |      | 0.39      | 0.5       | V     |
| I <sub>rm</sub>             | Maximum reverse leakage current       | V <sub>R</sub> =16V<br>V <sub>R</sub> =16V, T <sub>J</sub> =125°C                            |      |           | 0.1<br>20 | mA    |
| C <sub>T</sub>              | Junction Capacitance                  | V <sub>R</sub> =10V                                                                          |      | 34        |           | pF    |
| t <sub>rr</sub>             | Schottky Reverse Recovery Time        | I <sub>F</sub> =1A, dI/dt=100A/μs                                                            |      | 5.2       | 10        | ns    |
| Q <sub>rr</sub>             | Schottky Reverse Recovery Charge      | I <sub>F</sub> =1A, dI/dt=100A/μs                                                            |      | 0.8       |           | nC    |

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=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<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> 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 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating. Rev0: July 2006

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

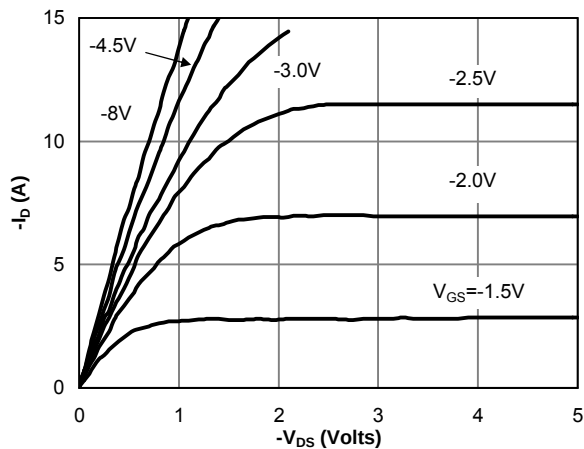


Fig 1: On-Region Characteristics

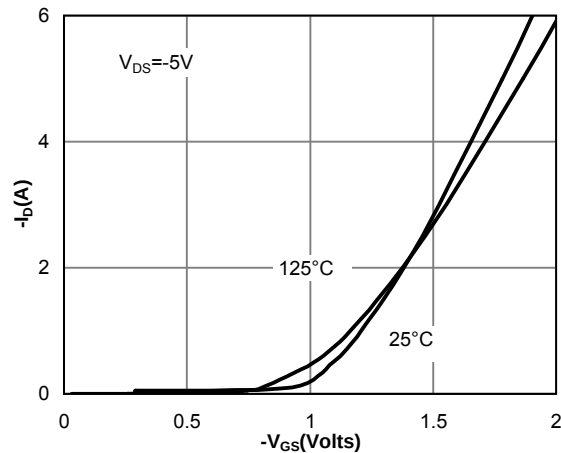


Figure 2: Transfer Characteristics

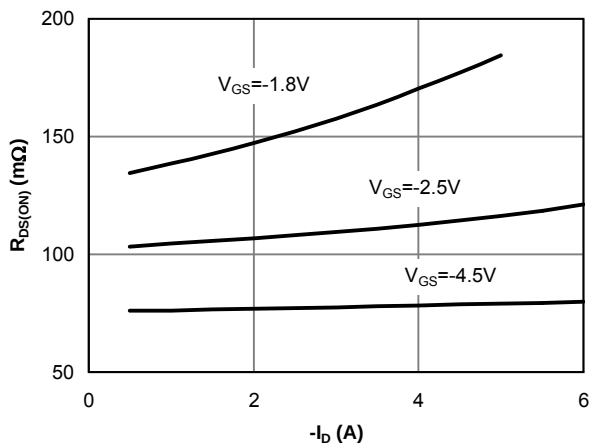


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

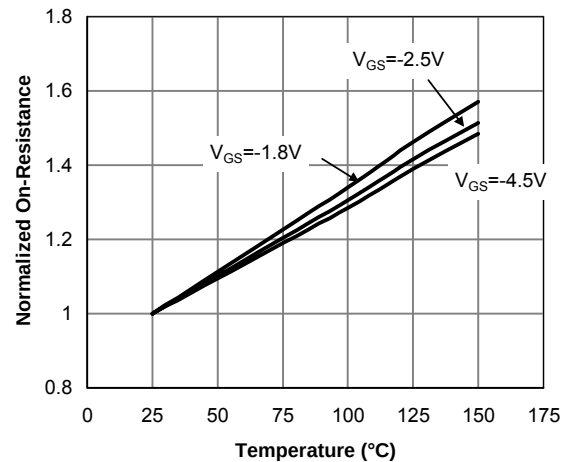


Figure 4: On-Resistance vs. Junction Temperature

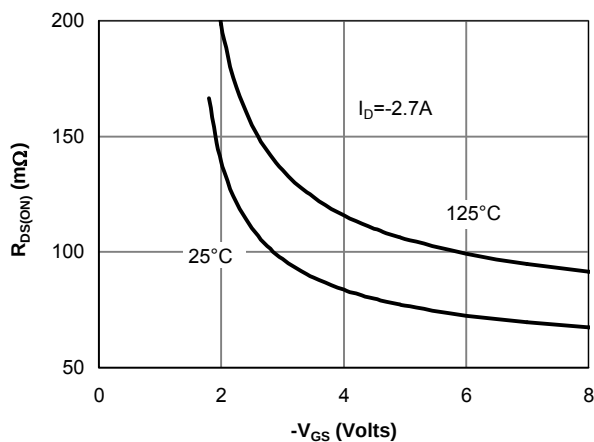


Figure 5: On-Resistance vs. Gate-Source Voltage

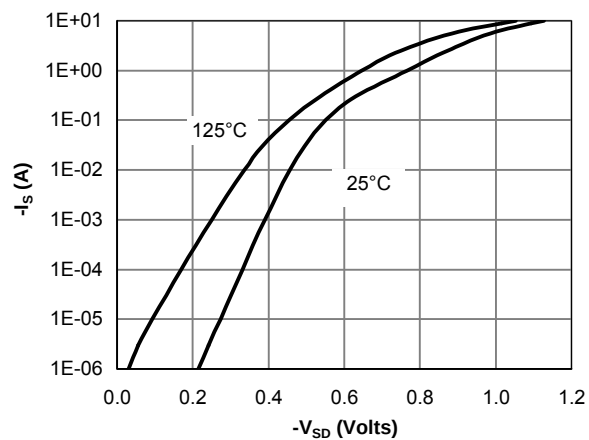


Figure 6: Body-Diode Characteristics

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