

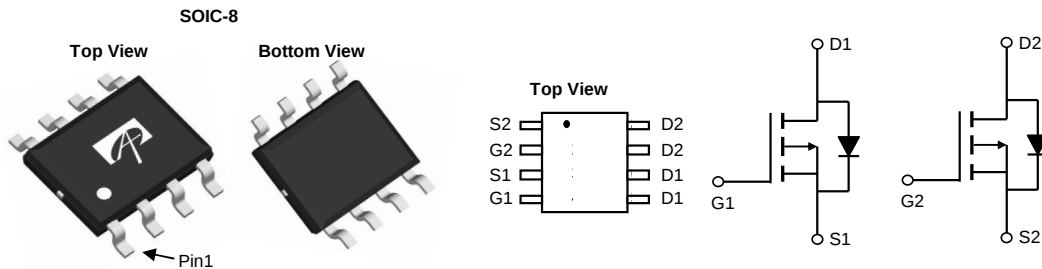
### General Description

The AO4805 combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . This device is ideal for load switch and battery protection applications.

### Product Summary

|                                  |                |
|----------------------------------|----------------|
| $V_{DS}$                         | -30V           |
| $I_D$ (at $V_{GS}=-20V$ )        | -9A            |
| $R_{DS(ON)}$ (at $V_{GS}=-20V$ ) | < 15m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=-10V$ ) | < 18m $\Omega$ |

100% UIS Tested  
100%  $R_g$  Tested



### 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                            | $V_{GS}$         | $\pm 25$   | V                |
| Continuous Drain Current                       | $I_D$            | -9         | A                |
|                                                |                  | -7         |                  |
| Pulsed Drain Current <sup>C</sup>              | $I_{DM}$         | -50        |                  |
| Avalanche Current <sup>C</sup>                 | $I_{AS}, I_{AR}$ | 33         | A                |
| Avalanche energy $L=0.1\text{mH}$ <sup>C</sup> | $E_{AS}, E_{AR}$ | 54         | mJ               |
| Power Dissipation <sup>B</sup>                 | $P_D$            | 2          | W                |
|                                                |                  | 1.3        |                  |
| 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 <sup>A</sup>   | $R_{\theta JA}$ | 48  | 62.5 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A,D</sup> |                 | 74  | 90   | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead                   | $R_{\theta JL}$ | 32  | 40   | $^\circ\text{C/W}$ |

**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                                                  | -30  |          |          | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =-30V, 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> =±25V                                                   |      |          | ±100     | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                    | -1.7 | -2.3     | -2.8     | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V                                                  | -50  |          |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-20V, I <sub>D</sub> =-9A                                                   |      | 10       | 15       | mΩ    |
|                             |                                       | V <sub>GS</sub> =-10V, I <sub>D</sub> =-8A<br>T <sub>J</sub> =125°C                          |      | 12<br>13 | 18<br>20 | mΩ    |
|                             |                                       | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A                                                  |      | 29       |          | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-9A                                                    |      | 27       |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                     |      | -0.7     | -1       | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                              |      |          | -2.5     | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                              |      |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz                                           |      | 2060     | 2600     | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                              |      | 370      |          | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                              |      | 295      |          | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                             | 1.2  | 2.4      | 3.6      | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                              |      |          |          |       |
| Q <sub>g</sub>              | Total Gate Charge                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-9A                            |      | 30       | 39       | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                              |      | 4.6      |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                              |      | 10       |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =1.67Ω,<br>R <sub>GEN</sub> =3Ω |      | 11       |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                              |      | 9.4      |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                              |      | 24       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                              |      | 12       |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-9A, dI/dt=100A/μs                                                           |      | 30       | 40       | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-9A, dI/dt=100A/μs                                                           |      | 22       |          | 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.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150°C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25°C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150°C. The SOA curve provides a single pulse rating.

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# TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

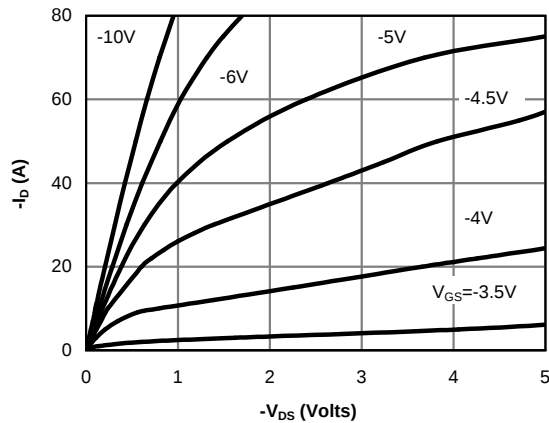


Fig 1: On-Region Characteristics (Note E)

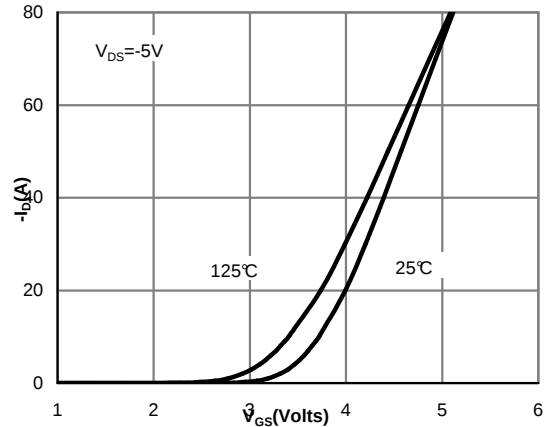


Figure 2: Transfer Characteristics (Note E)

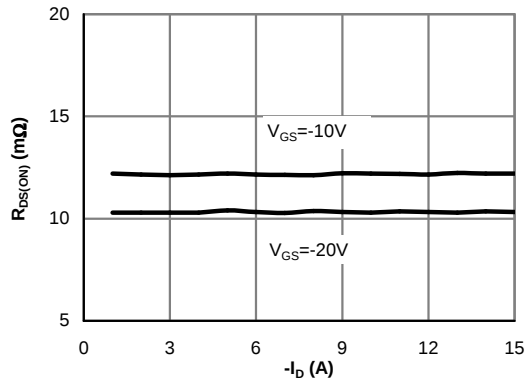


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

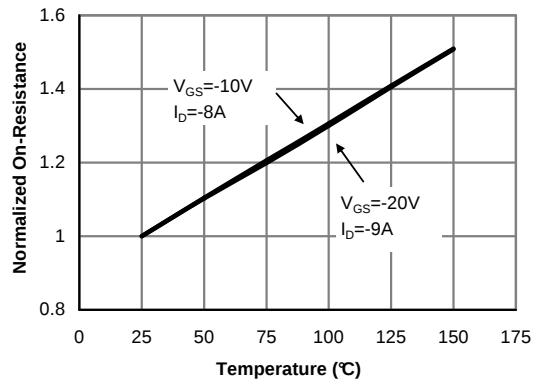


Figure 4: On-Resistance vs. Junction Temperature (Note E)

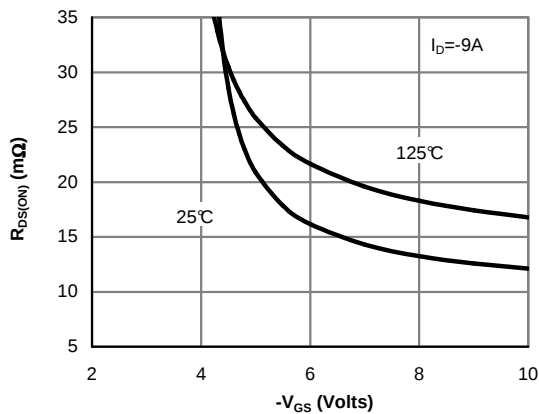


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

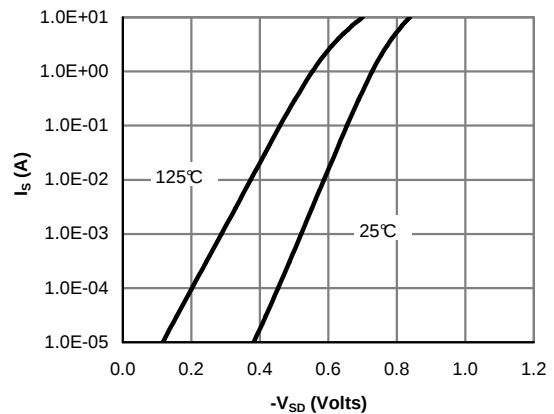


Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

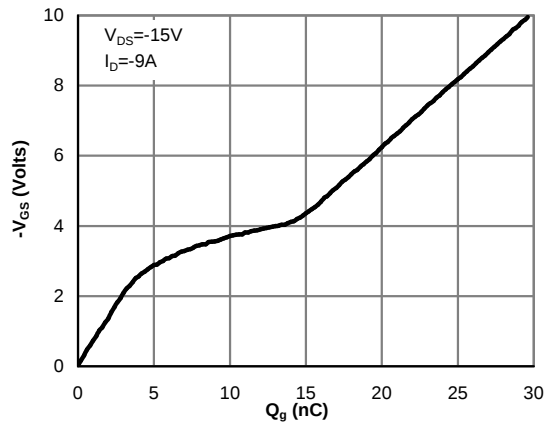


Figure 7: Gate-Charge Characteristics

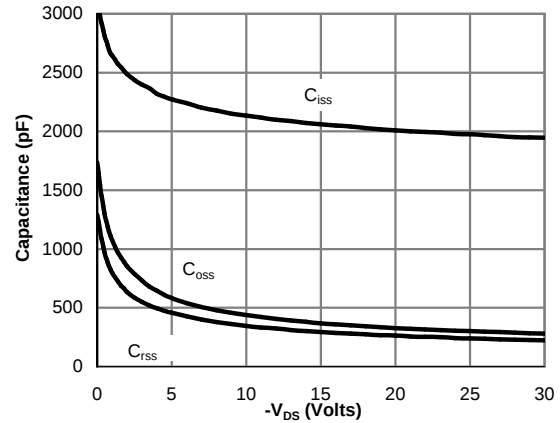


Figure 8: Capacitance Characteristics

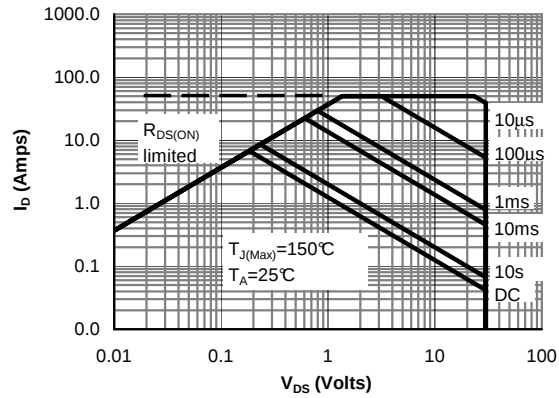


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

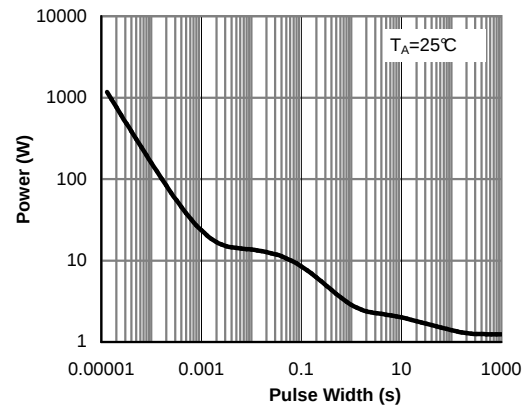


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

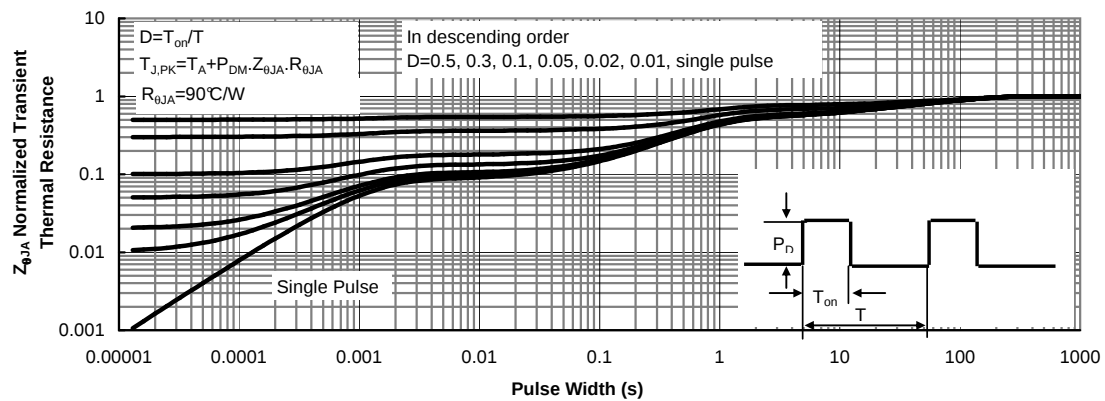
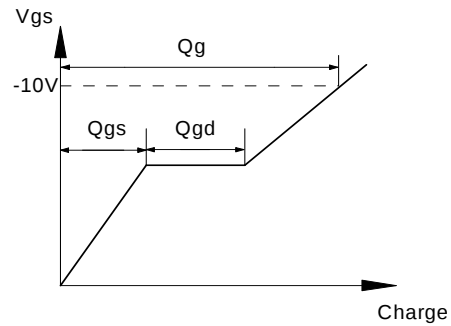
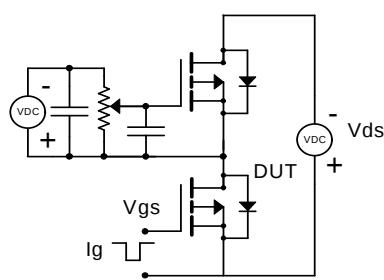
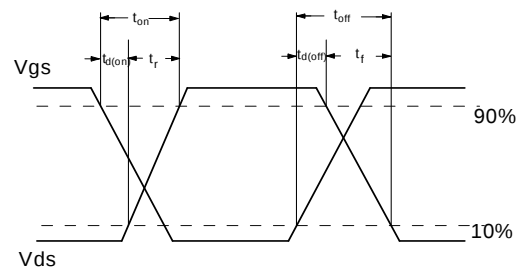
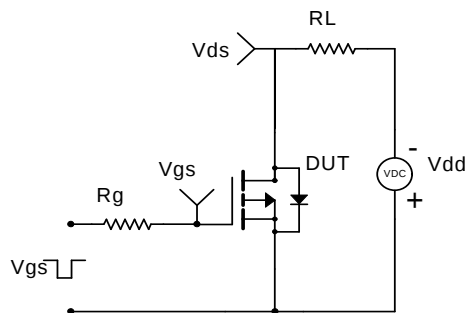


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

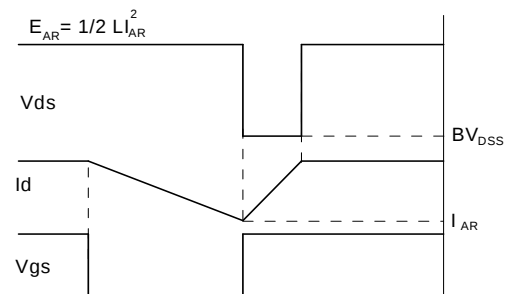
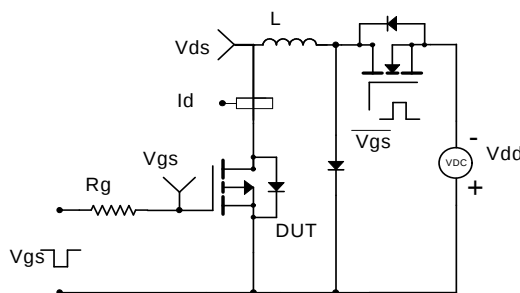
### Gate Charge Test Circuit & Waveform



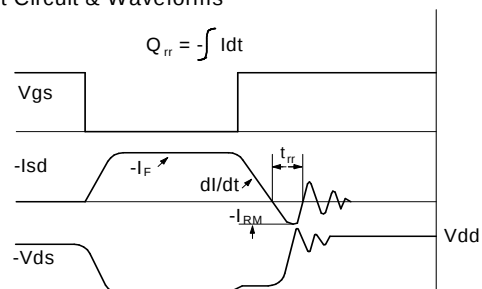
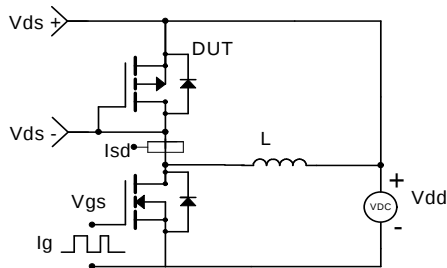
### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms



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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

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