

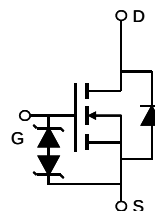
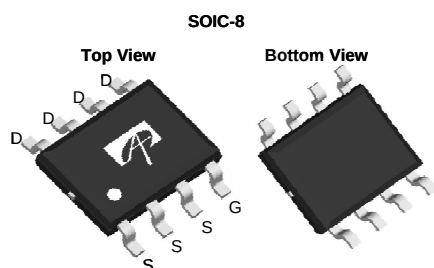
### General Description

The AO4302 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 $V_{GS}=10V$ )           | 23A           |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )    | < 4m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS} = 4.5V$ ) | < 5m $\Omega$ |

ESD Protected  
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                            | $V_{GS}$         | $\pm 20$   | V                |
| Continuous Drain Current                       | $I_D$            | 23         | A                |
|                                                |                  | 18         |                  |
| Pulsed Drain Current <sup>C</sup>              | $I_{DM}$         | 316        |                  |
| Avalanche Current <sup>C</sup>                 | $I_{AS}, I_{AR}$ | 49         | A                |
| Avalanche energy $L=0.1\text{mH}$ <sup>C</sup> | $E_{AS}, E_{AR}$ | 120        | mJ               |
| Power Dissipation <sup>B</sup>                 | $P_D$            | 3.6        | W                |
|                                                |                  | 2.3        |                  |
| 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>   | $R_{\theta JA}$ | 27  | 35  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A D</sup> |                 | 52  | 65  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead                   | $R_{\theta JL}$ | 11  | 15  | $^\circ\text{C/W}$ |

**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   | 36         |            | 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> = ±20V                                                |      |            | ±10        |       |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                   | 1.3  | 1.8        | 2.3        | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V                                                  | 316  |            |            | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =20A<br>T <sub>j</sub> =125°C                         |      | 3.2<br>4.8 | 4.0<br>6.0 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =18A                                                 |      | 3.9        | 5.0        | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =20A                                                   |      | 120        |            | 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 |                                                                                            |      |            | 5          | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                            |      |            |            |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz                                          | 2310 | 2891       | 3470       | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                            | 330  | 474        | 620        | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                            | 150  | 256        | 360        | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                           | 0.7  | 1.6        | 2.4        | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                            |      |            |            |       |
| Q <sub>g(10V)</sub>         | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A                            | 41   | 51.9       | 63         | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |                                                                                            | 19   | 24.8       | 30         | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                            |      | 7.5        |            | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                            |      | 10.9       |            | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω,<br>R <sub>GEN</sub> =3Ω |      | 7.0        |            | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                            |      | 4.8        |            | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                            |      | 41.5       |            | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                            |      | 8.8        |            | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =20A, dI/dt=500A/μs                                                         | 11   | 13.8       | 17         | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =20A, dI/dt=500A/μs                                                         | 24   | 30.8       | 37         | 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

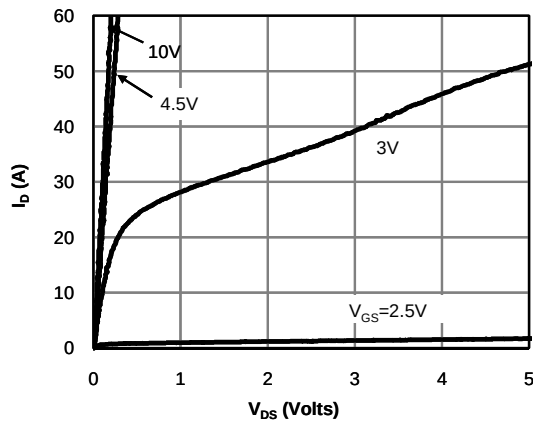


Figure 1: On-Region Characteristics (Note E)

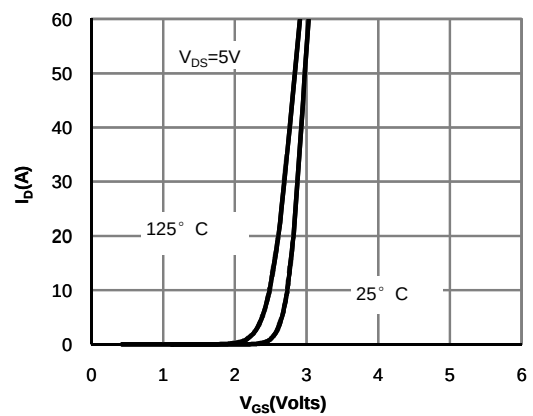


Figure 2: Transfer Characteristics (Note E)

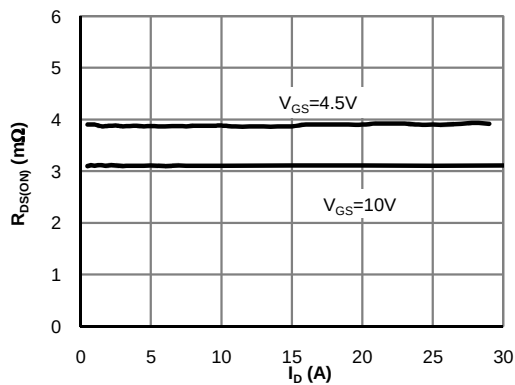


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

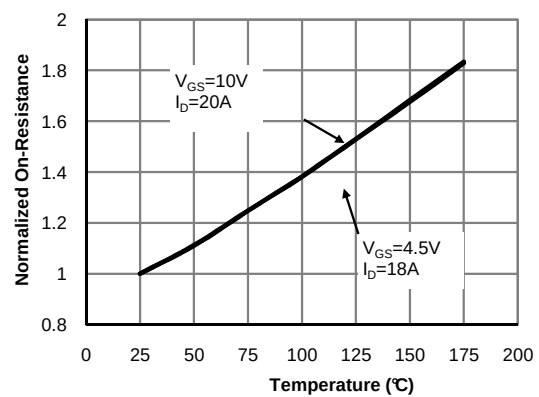


Figure 4: On-Resistance vs. Junction Temperature (Note E)

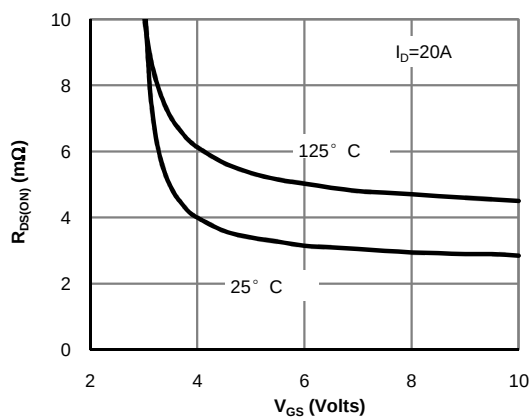


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

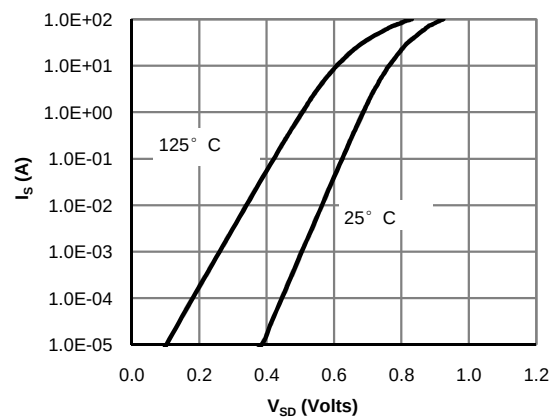
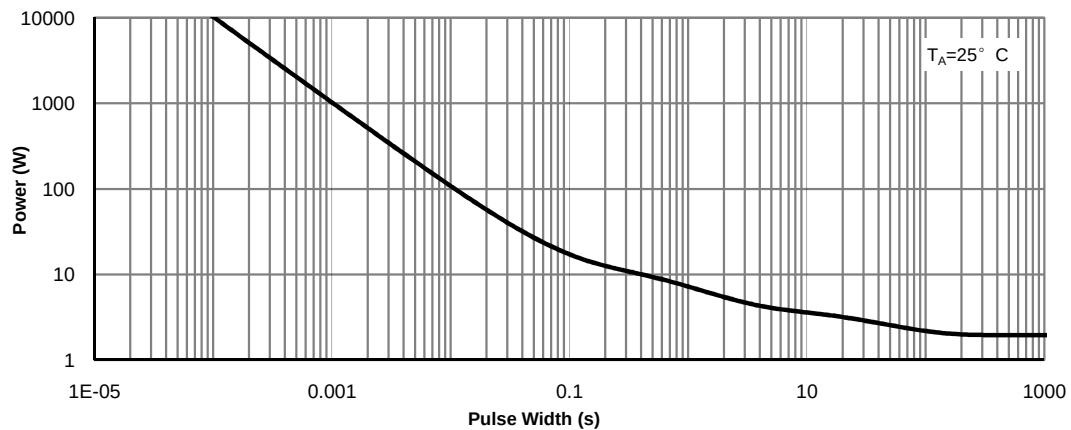
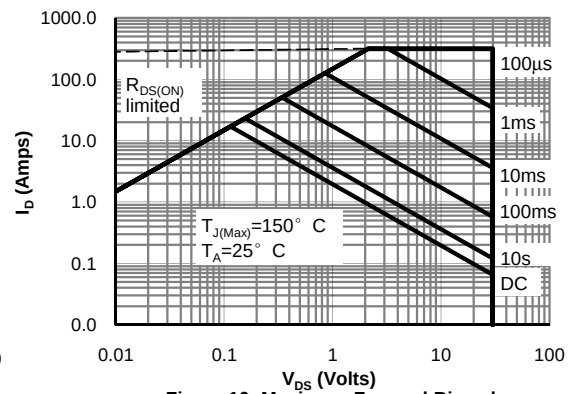
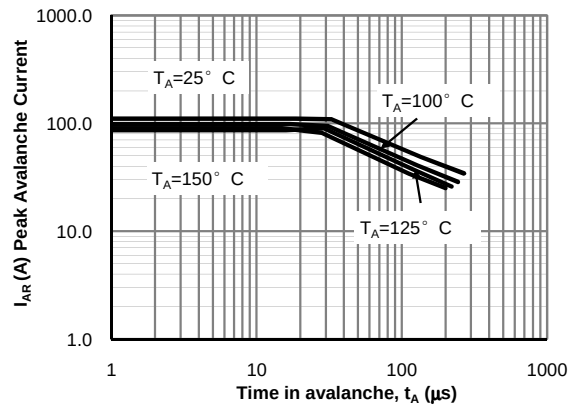
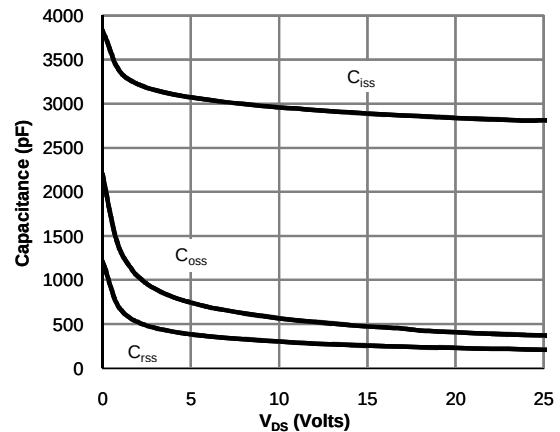
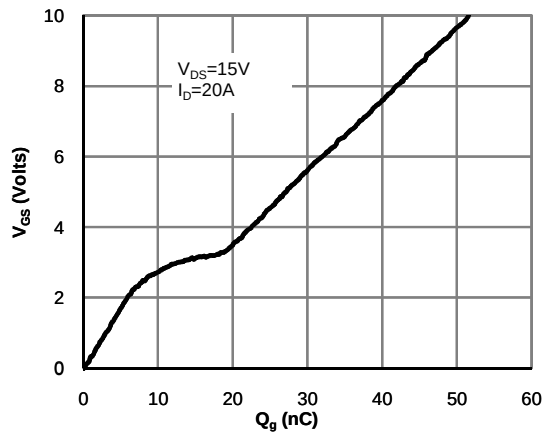


Figure 6: Body-Diode Characteristics (Note E)

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



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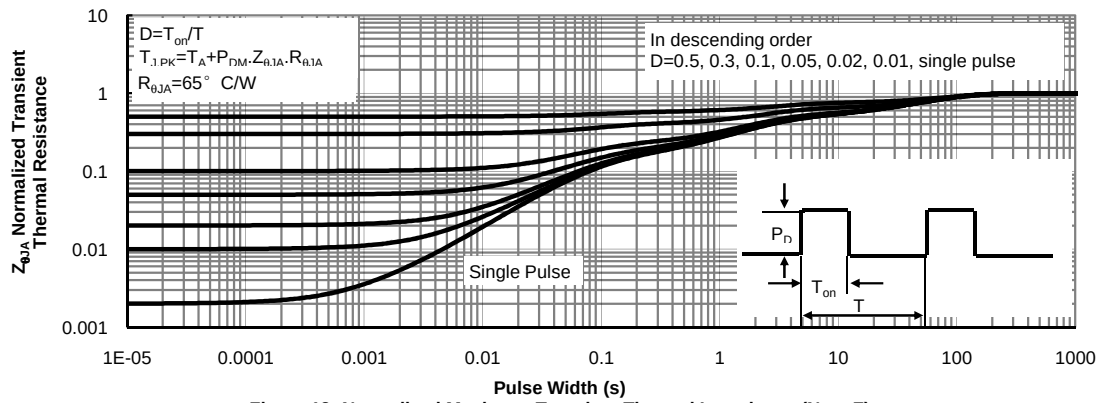
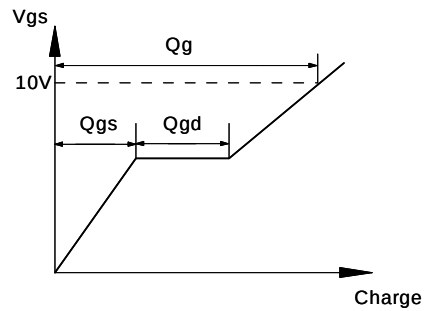
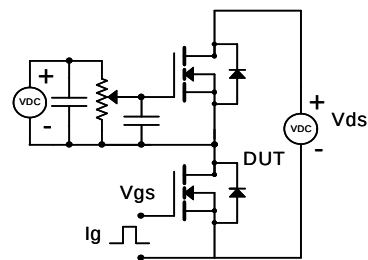
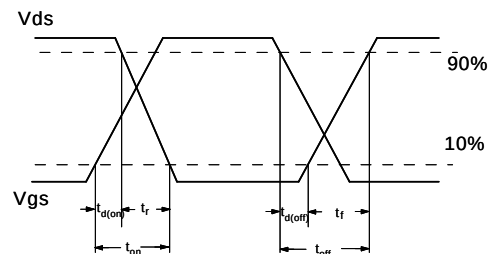
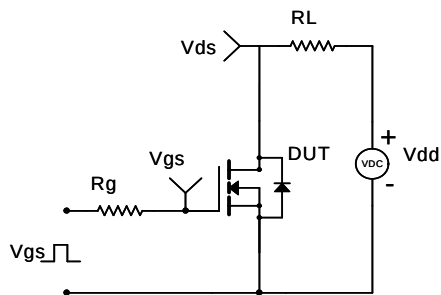


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

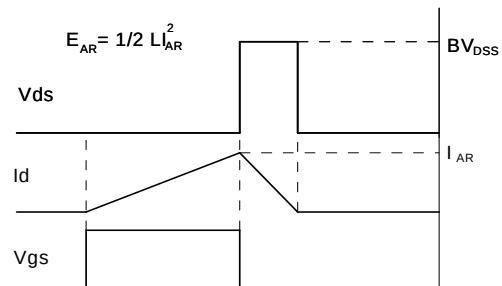
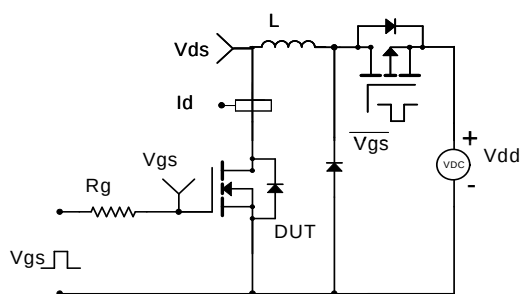
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



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



### Diode Recovery Test Circuit & Waveforms

