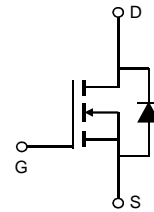
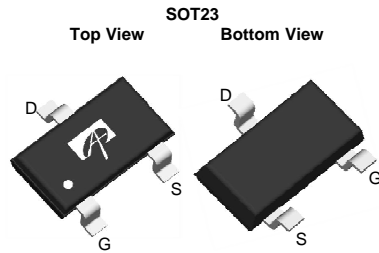


### General Description

The AO3420 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V while retaining a 12V  $V_{GS(MAX)}$  rating. This device is suitable for use as a uni-directional or bi-directional load switch.

### Product Summary

|                                  |                |
|----------------------------------|----------------|
| $V_{DS}$                         | 20V            |
| $I_D$ (at $V_{GS}=10V$ )         | 6A             |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )  | < 24m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=4.5V$ ) | < 27m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=2.5V$ ) | < 42m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=1.8V$ ) | < 55m $\Omega$ |



### 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                    | $V_{GS}$       | $\pm 12$               | V                |
| Continuous Drain Current               | $I_D$          | $T_A=25^\circ\text{C}$ | 6                |
|  |                | $T_A=70^\circ\text{C}$ | 5                |
| Pulsed Drain Current <sup>C</sup>      | $I_{DM}$       | 30                     | A                |
| Power Dissipation <sup>B</sup>         | $P_D$          | $T_A=25^\circ\text{C}$ | 1.4              |
|  |                | $T_A=70^\circ\text{C}$ | 0.9              |
| 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>   | $R_{\theta JA}$ | 70  | 90  | $^\circ\text{C}/\text{W}$ |
| Maximum Junction-to-Ambient <sup>A D</sup> |                 | 100 | 125 | $^\circ\text{C}/\text{W}$ |
| Maximum Junction-to-Lead                   | $R_{\theta JL}$ | 63  | 80  | $^\circ\text{C}/\text{W}$ |

**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  | 20  |          |          | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =20V, 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> = ±12V   |     |          | ±100     | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                  | 0.4 | 0.75     | 1.1      | V     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =6A<br>T <sub>J</sub> =125°C                         |     | 16<br>23 | 24<br>35 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A   |     | 18       | 27       | mΩ    |
|                             |                                       | V <sub>GS</sub> =2.5V, I <sub>D</sub> =4A   |     | 23       | 42       | mΩ    |
|                             |                                       | V <sub>GS</sub> =1.8V, I <sub>D</sub> =2A   |     | 31       | 55       | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =6A   |     | 25       |          | 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        | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |   |     |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz   | 420 | 525      | 630      | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |   | 65  | 95       | 125      | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |   | 45  | 75       | 105      | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  | 0.8 | 1.7      | 2.6      | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |   |     |          |          |       |
| Q <sub>g(10V)</sub>         | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =10V, I <sub>D</sub> =6A                            |     | 12.5     |          | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |   |     | 6        |          | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |   |     | 1        |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |   |     | 2        |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =10V, R <sub>L</sub> =1.7Ω,<br>R <sub>GEN</sub> =3Ω |     | 3        |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |   |     | 7.5      |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |   |     | 20       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |   |     | 6        |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =6A, dI/dt=100A/μs   |     | 14       |          | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =6A, dI/dt=100A/μs   |     | 6        |          | 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**

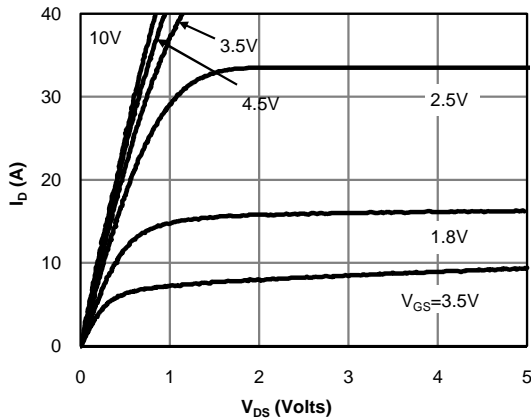


Figure 1: On-Region Characteristics (Note E)

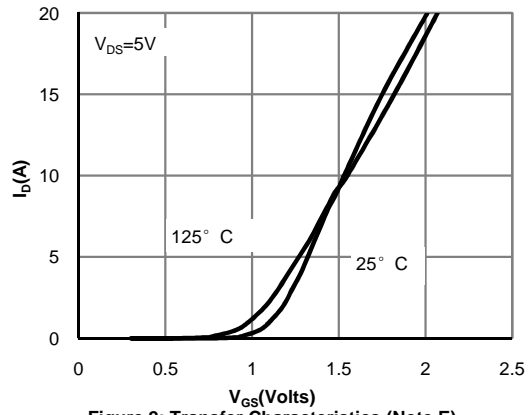


Figure 2: Transfer Characteristics (Note E)

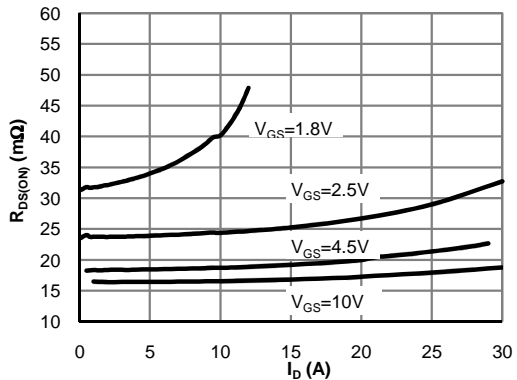


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

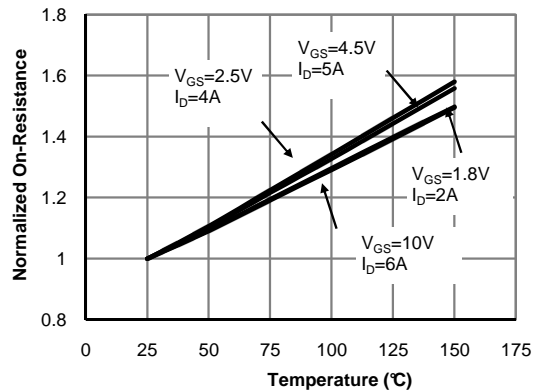


Figure 4: On-Resistance vs. Junction Temperature (Note E)

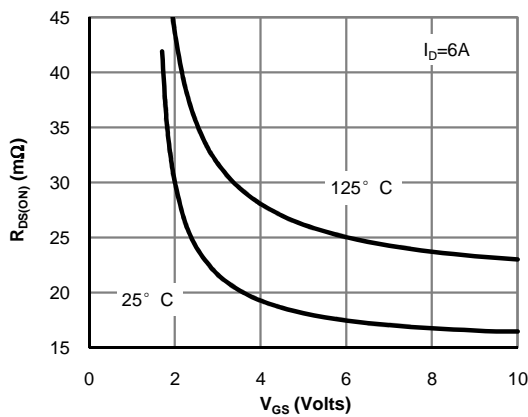


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

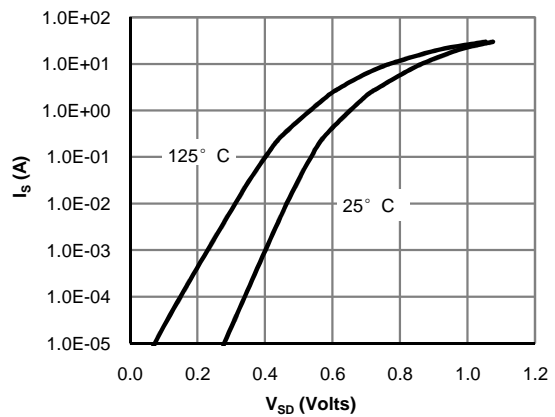
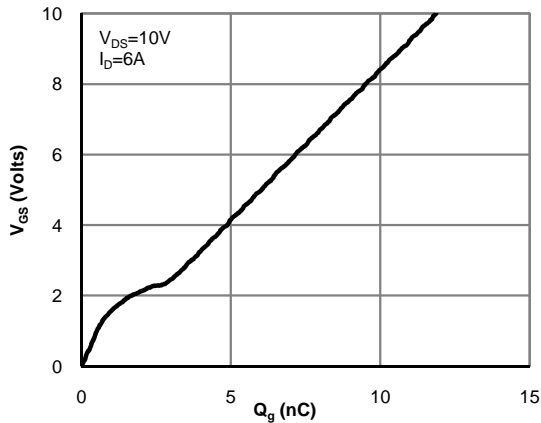
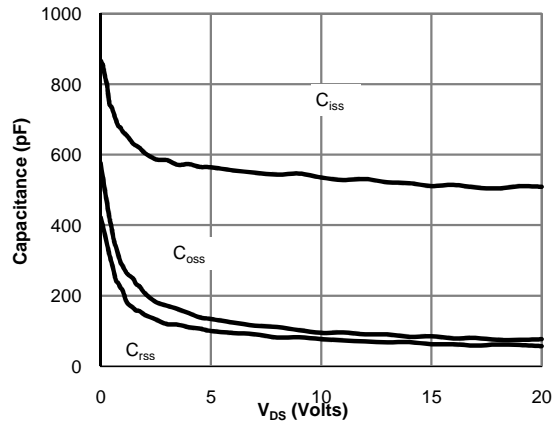


Figure 6: Body-Diode Characteristics (Note E)

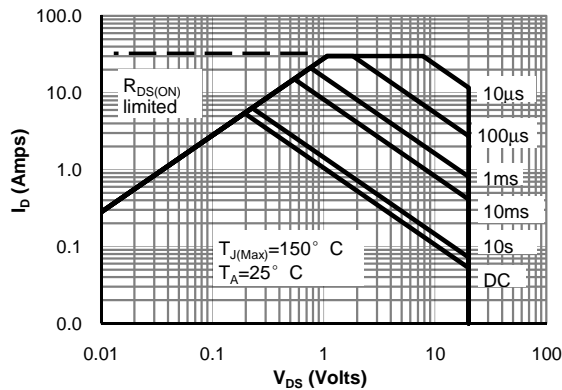
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



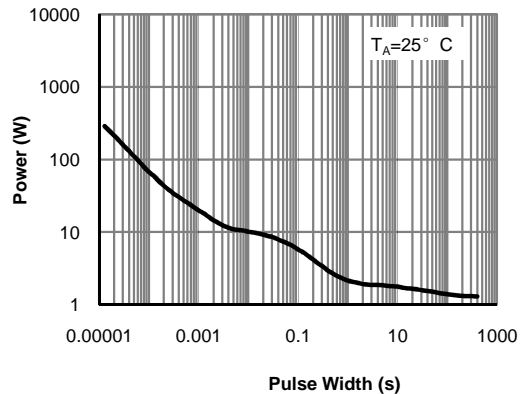
**Figure 7: Gate-Charge Characteristics**



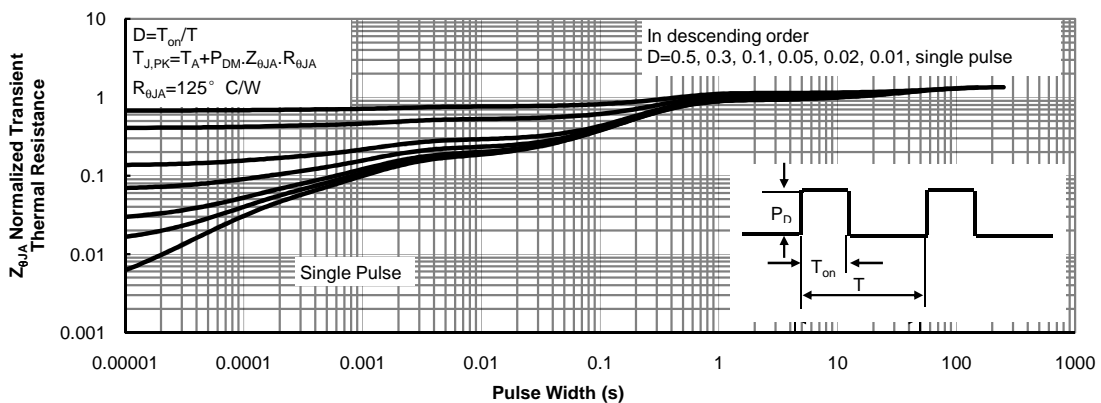
**Figure 8: Capacitance Characteristics**



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



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



**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

