

## General Description

The AO6420 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. This device is suitable for use as a load switch or in PWM applications.

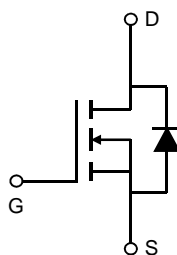
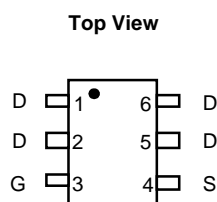
## Features

$$V_{DS} (V) = 60V$$

$$I_D = 4.2A (V_{GS} = 10V)$$

$$R_{DS(ON)} < 60m\Omega (V_{GS} = 10V)$$

$$R_{DS(ON)} < 75m\Omega (V_{GS} = 4.5V)$$



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

| Parameter                               | Symbol                 | Maximum    | Units            |
|---|------------------------|------------|------------------|
| Drain-Source Voltage                    | $V_{DS}$               | 60         | V                |
| Gate-Source Voltage                     | $V_{GS}$               | $\pm 20$   | V                |
| Continuous Drain Current <sup>A,F</sup> | $T_A=25^\circ\text{C}$ | 4.2        | A                |
|   | $T_A=70^\circ\text{C}$ | 3.4        |                  |
| Pulsed Drain Current <sup>B</sup>       | $I_{DM}$               | 20         |                  |
| Power Dissipation                       | $T_A=25^\circ\text{C}$ | 2.00       | W                |
|   | $T_A=70^\circ\text{C}$ | 1.28       |                  |
| 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</sup> |                 | Steady-State | 74   | 110                |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 35           | 40   | $^\circ\text{C/W}$ |

**N Channel 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  | 60  |          |        | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =60V, 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   |     |          | 100    | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA                                  | 1   | 2.3      | 3      | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V   | 20  |          |        | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =4.2A<br>T <sub>J</sub> =125°C                     |     | 50<br>85 | 60     | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A   |     | 60       | 75     | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =4.2A   |     | 13       |        | 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 |   |     |          | 3      | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |   |     |          |        |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1MHz                                       |     | 450      | 540    | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |   |     | 60       |        | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |   |     | 25       |        | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  |     | 1.65     | 2      | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |   |     |          |        |       |
| Q <sub>g(10V)</sub>         | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =4.2A                        |     | 9.5      | 11.5   | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |   |     | 4.3      | 5.5    | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |   |     | 1.6      |        | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |   |     | 2.2      |        | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, R <sub>L</sub> =7Ω,<br>R <sub>GEN</sub> =3Ω |     | 5.1      | 7      | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |   |     | 2.6      | 4      | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |   |     | 15.9     | 20     | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |   |     | 2        | 3      | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =4.2A, dI/dt=100A/μs   |     | 25.1     | 35     | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =4.2A, dI/dt=100A/μs   |     | 28.7     |        | 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.

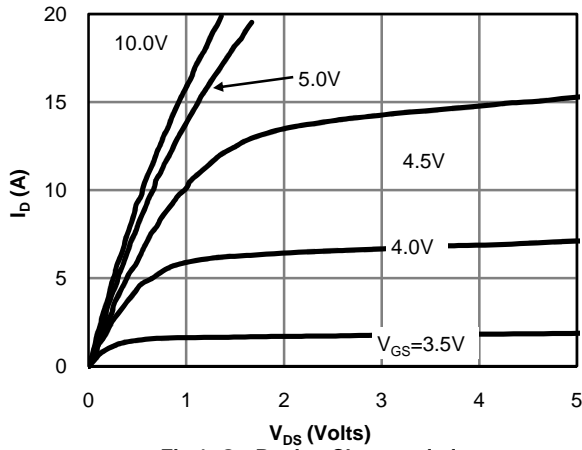
D: The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

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.

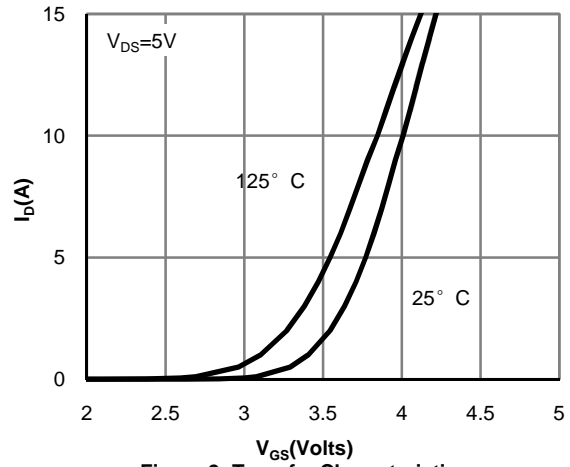
F: The current rating is based on the t ≤ 10s thermal resistance rating.

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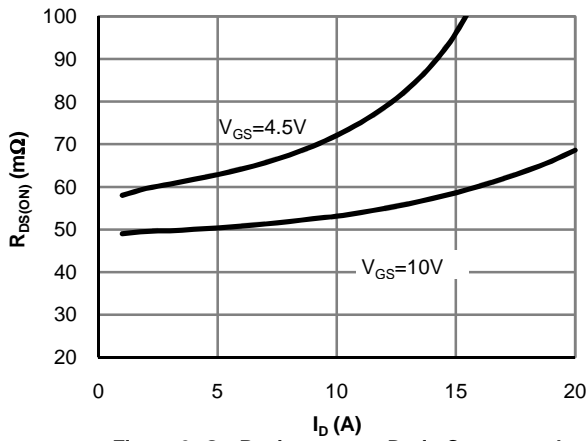
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL**



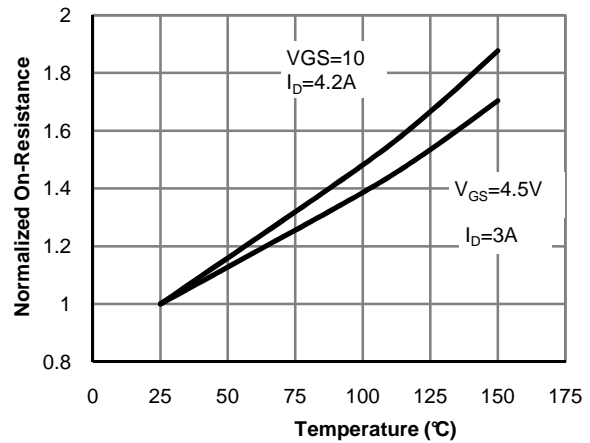
**Fig 1: On-Region Characteristics**



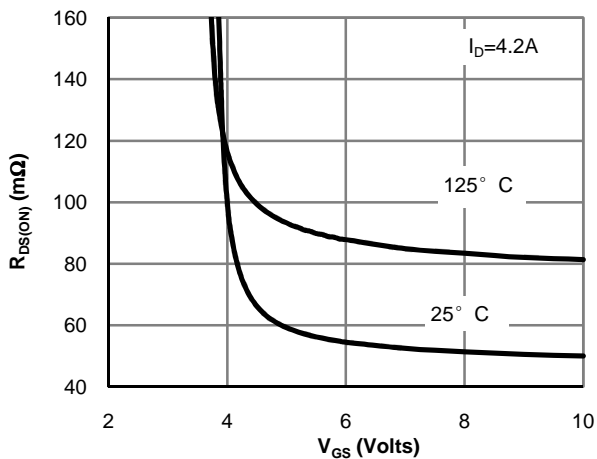
**Figure 2: Transfer Characteristics**



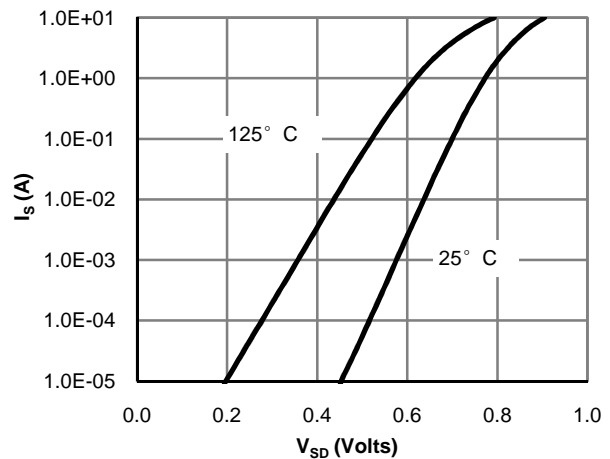
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**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: N-CHANNEL**

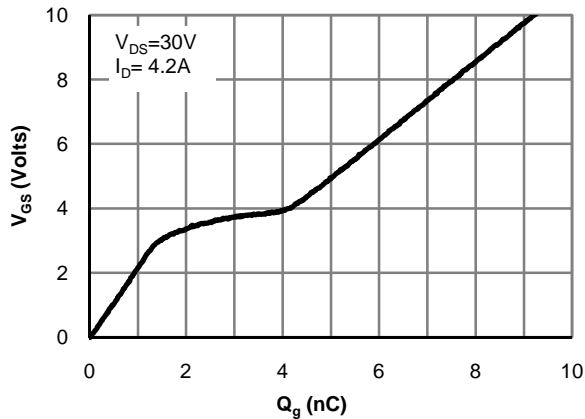


Figure 7: Gate-Charge Characteristics

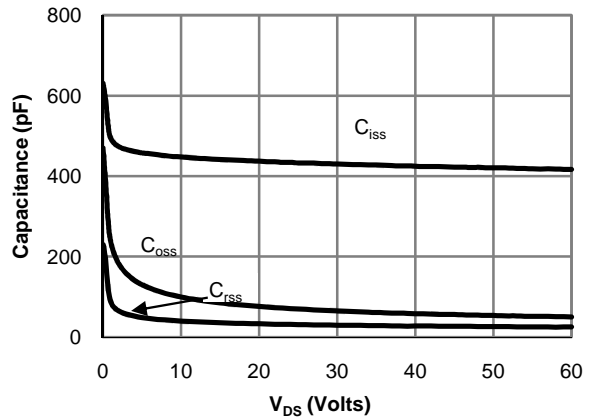


Figure 8: Capacitance Characteristics

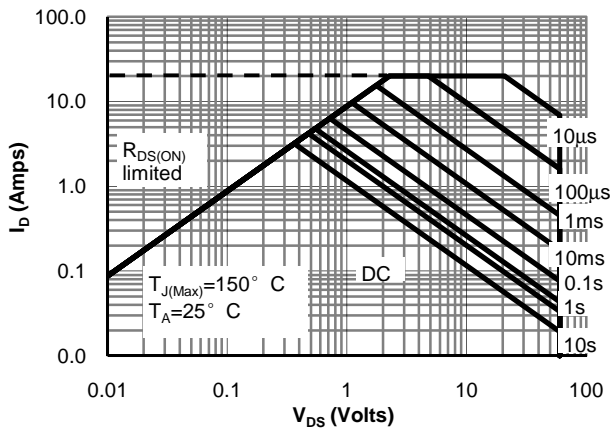


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

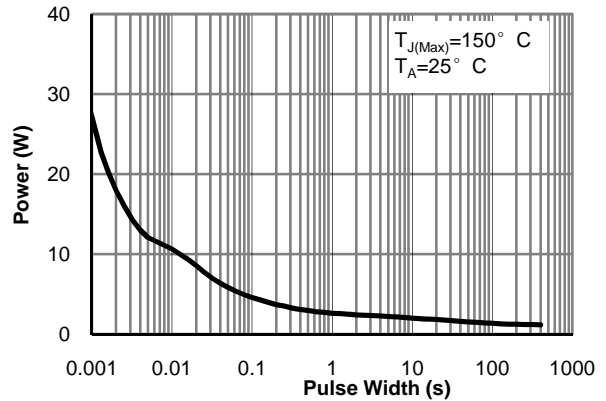


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

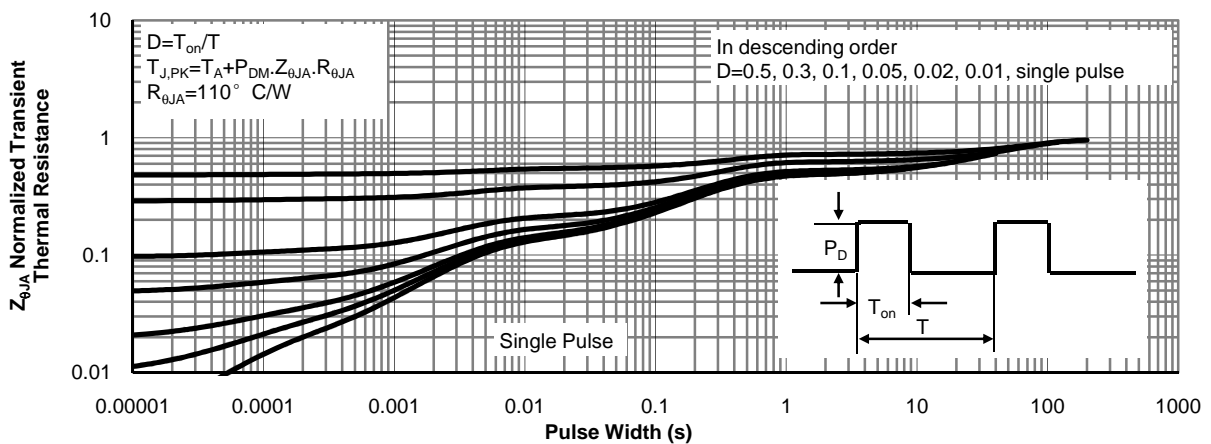


Figure 11: Normalized Maximum Transient Thermal Impedance