



**AO8820**

**Common-Drain Dual N-Channel Enhancement Mode Field Effect Transistor**

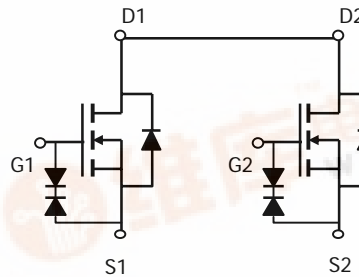
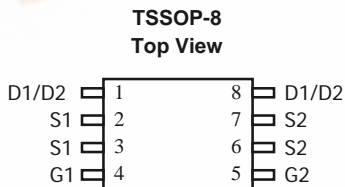


**General Description**

The AO8820 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. It is ESD protected. This device is suitable for use as a uni-directional or bi-directional load switch, facilitated by its common-drain configuration. *Standard Product AO8820 is Pb-free (meets ROHS & Sony 259 specifications). AO8820L is a Green Product ordering option. AO8820 and AO8820L are electrically identical.*

**Features**

- $V_{DS} (V) = 20V$
- $I_D = 7A (V_{GS} = 10V)$
- $R_{DS(ON)} < 21m\Omega (V_{GS} = 10V)$
- $R_{DS(ON)} < 24m\Omega (V_{GS} = 4.5V)$
- $R_{DS(ON)} < 32m\Omega (V_{GS} = 2.5V)$
- $R_{DS(ON)} < 50m\Omega (V_{GS} = 1.8V)$
- ESD Rating: 2000V HBM



**Absolute Maximum Ratings  $T_A=25^\circ C$  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 <sup>A</sup>  | $I_D$          | $T_A=25^\circ C$ | 7          |
|  |                | $T_A=70^\circ C$ | 5.5        |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$       | 25               | A          |
| Power Dissipation <sup>A</sup>         | $P_D$          | $T_A=25^\circ C$ | 1.5        |
|  |                | $T_A=70^\circ C$ | 0.96       |
| Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 to 150       | $^\circ C$ |

**Thermal Characteristics**

| Parameter                                | Symbol          | Typ          | Max | Units        |
|--|-----------------|--------------|-----|--------------|
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | 64           | 83  | $^\circ C/W$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | Steady-State | 89  | 120          |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 53           | 70  | $^\circ C/W$ |



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   | 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> =±10V   |     |              | 10     | μA    |
| BV <sub>GSO</sub>           | Gate-Source Breakdown Voltage         | V <sub>DS</sub> =0V, I <sub>G</sub> =±250μA  | ±12 |              |        | V     |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                 | 0.5 | 0.65         | 1      | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V   | 25  |              |        | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =7A<br>T <sub>J</sub> =125°C                        |     | 16.5<br>23.1 | 21     | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =6.6A  |     | 19           | 24     |       |
|                             |                                       | V <sub>GS</sub> =2.5V, I <sub>D</sub> =5.5A  |     | 25           | 32     |       |
|                             |                                       | V <sub>GS</sub> =1.8V, I <sub>D</sub> =2A  |     | 35           | 50     |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =7A  |     | 25           |        | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V  |     | 0.75         | 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> =10V, f=1MHz  |     | 615          |        | pF    |
| C <sub>OSS</sub>            | Output Capacitance                    |  |     | 150          |        | pF    |
| C <sub>RSS</sub>            | Reverse Transfer Capacitance          |  |     | 120          |        | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz   |     | 0.9          |        | 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> =7A                          |     | 8.5          | 12     | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |  |     | 1.2          |        | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |  |     | 3            |        | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =5V, V <sub>DS</sub> =10V, R <sub>L</sub> =1.4Ω,<br>R <sub>GEN</sub> =3Ω |     | 7            |        | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |  |     | 13           |        | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |  |     | 29           |        | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |  |     | 11           |        | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =7A, di/dt=100A/μs  |     | 15           |        | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =7A, di/dt=100A/μs  |     | 5            |        | 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 6,12,14 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

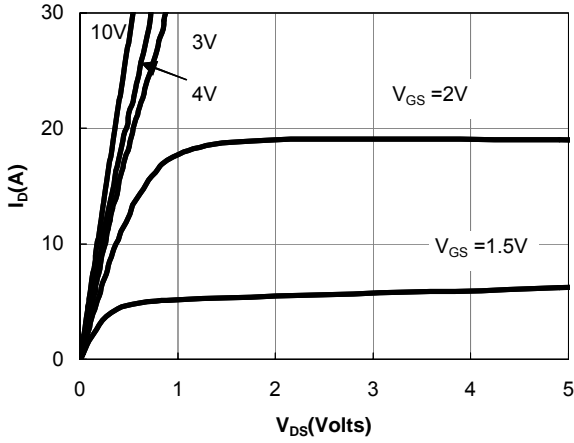


Figure 1: On-Regions Characteristics

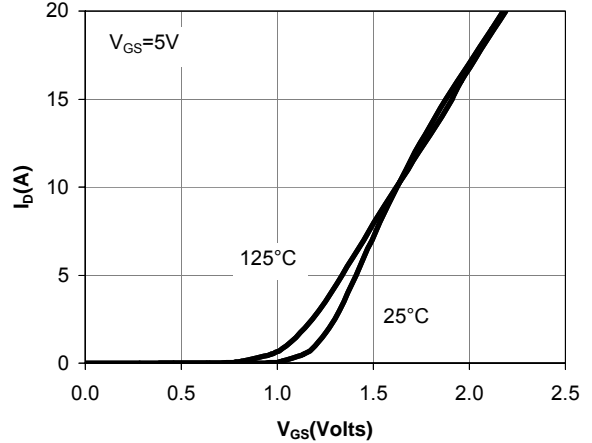


Figure 2: Transfer Characteristics

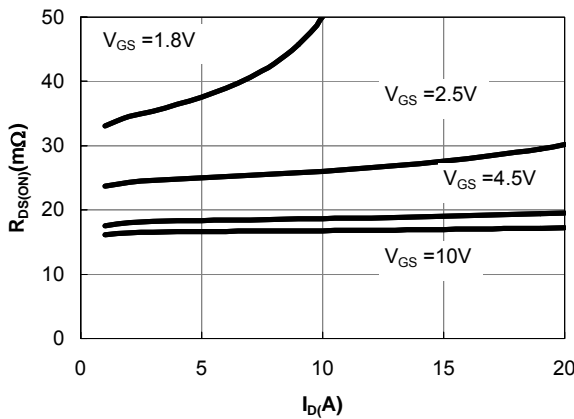


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

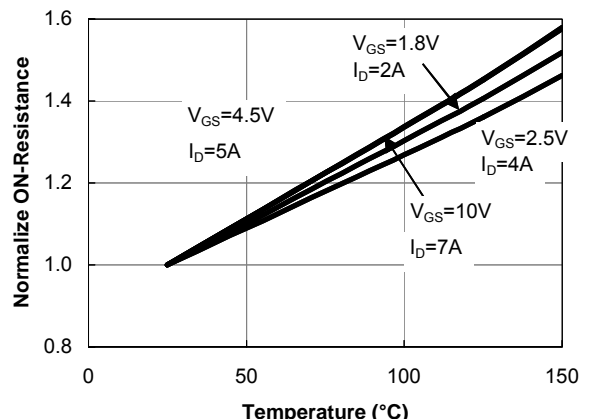


Figure 4: On-Resistance vs. Junction Temperature

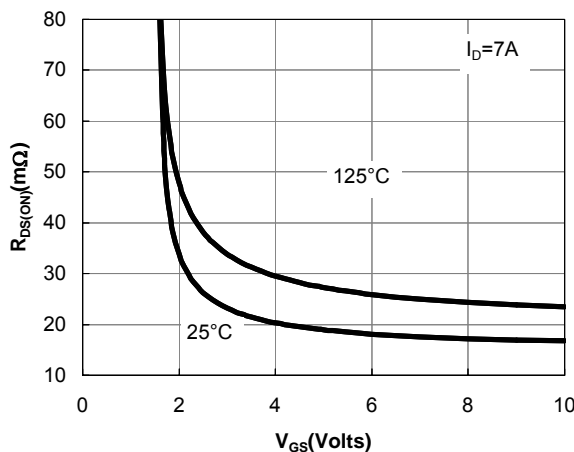


Figure 5: On-Resistance vs. Gate-Source Voltage

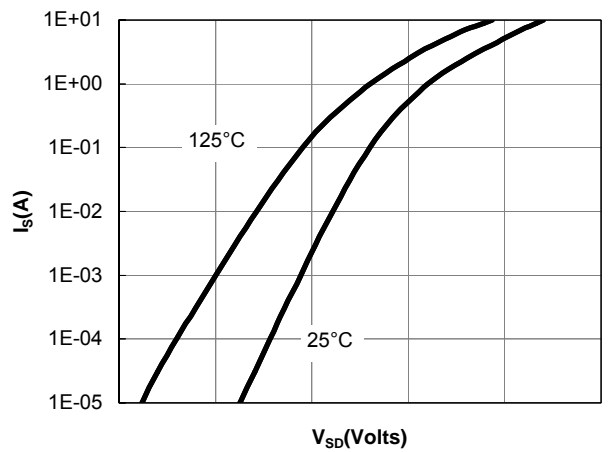


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

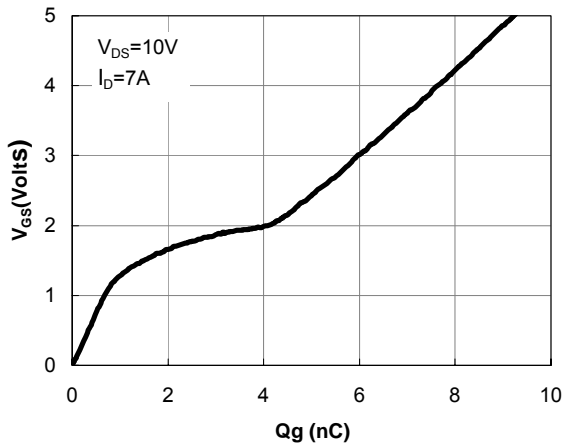


Figure 7: Gate-Charge Characteristics

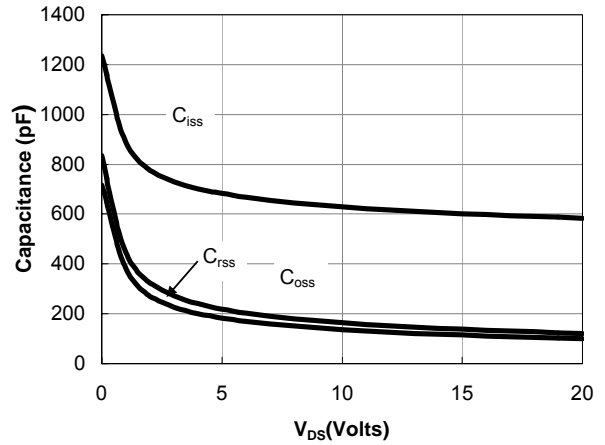


Figure 8: Capacitance Characteristics

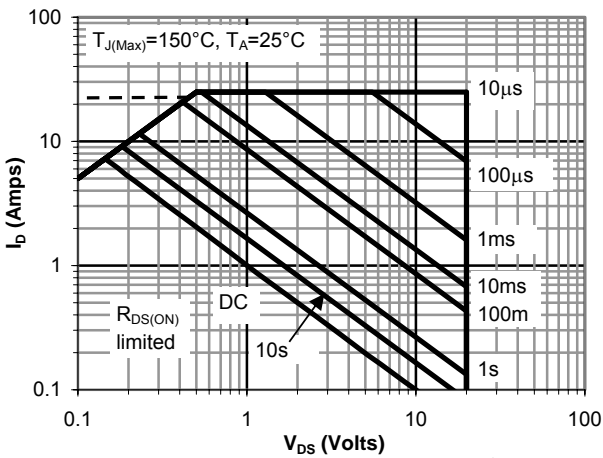


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

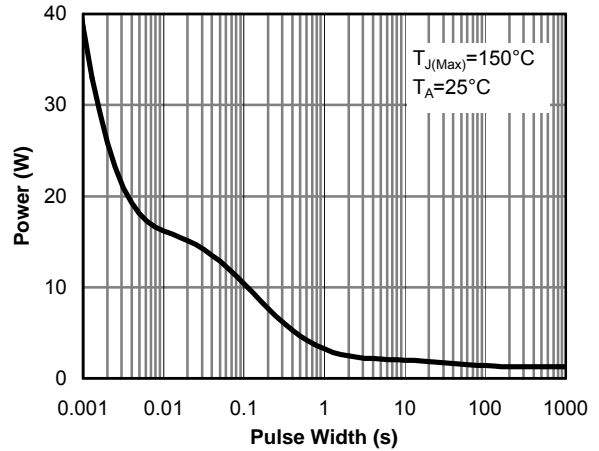


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

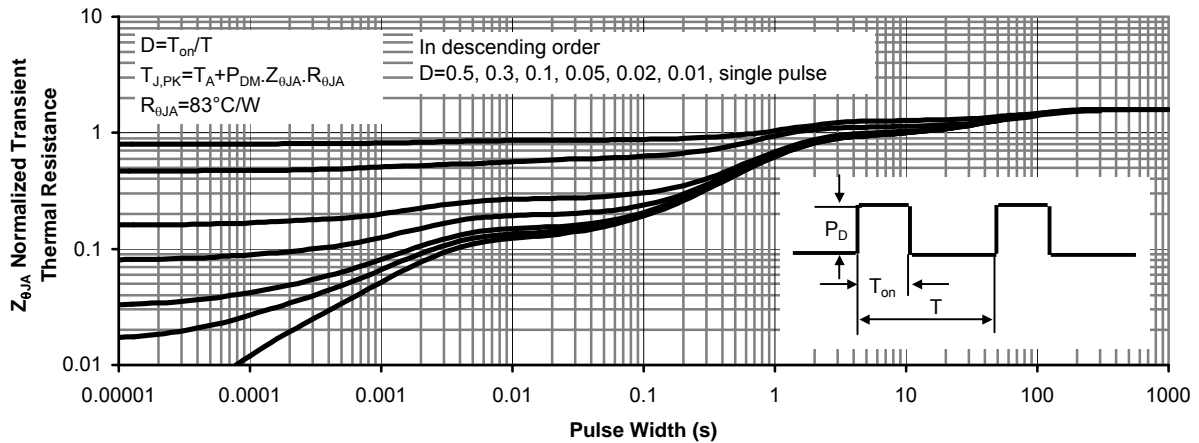


Figure 11: Normalized Maximum Transient Thermal Impedance