

### General Description

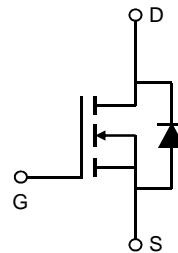
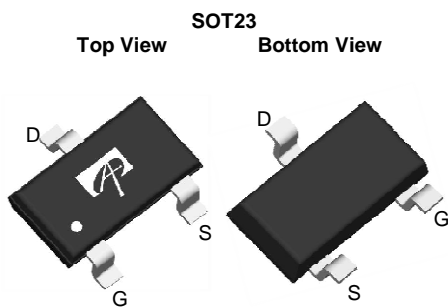
- Low  $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

### Applications

- Load switch
- PWM

### Features

$V_{DS} = 20V$   
 $I_D = 3A$  ( $V_{GS} = 4.5V$ )  
 $R_{DS(ON)} < 62m\Omega$  ( $V_{GS} = 4.5V$ )  
 $R_{DS(ON)} < 70m\Omega$  ( $V_{GS} = 2.5V$ )  
 $R_{DS(ON)} < 85m\Omega$  ( $V_{GS} = 1.8V$ )



### 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                    | $V_{GS}$         | $\pm 8$    | V          |
| Continuous Drain Current <sup>A</sup>  | $T_A=25^\circ C$ | 3          | A          |
|  | $T_A=70^\circ C$ | 2.5        |            |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$         | 16         |            |
| Power Dissipation <sup>A</sup>         | $T_A=25^\circ C$ | 1.4        | W          |
|  | $T_A=70^\circ C$ | 0.9        |            |
| 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> | $R_{\theta JA}$ | 70           | 90  | $^\circ C/W$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | Steady-State | 100 | 125          |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 63           | 80  | $^\circ C/W$ |

**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> =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> =±8V  |     |          | 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 | 0.7      | 1        | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V   | 16  |          |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A<br>T <sub>J</sub> =125°C                       |     | 51<br>68 | 62<br>85 | mΩ    |
|                             |                                       | V <sub>GS</sub> =2.5V, I <sub>D</sub> =2.8A  |     | 58       | 70       |       |
|                             |                                       | V <sub>GS</sub> =1.8V, I <sub>D</sub> =2.5A  |     | 68       | 85       | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =3A  |     | 11       |          | 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  |     | 260      |          | pF    |
| C <sub>OSS</sub>            | Output Capacitance                    |  |     | 48       |          | pF    |
| C <sub>RSS</sub>            | Reverse Transfer Capacitance          |  |     | 27       |          | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz   |     | 3        | 4.5      | 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> =3A                          |     | 3        | 10       | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |  |     | 0.4      |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |  |     | 0.6      |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =5V, V <sub>DS</sub> =10V, R <sub>L</sub> =3.3Ω,<br>R <sub>GEN</sub> =6Ω |     | 2.5      |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |  |     | 3.2      |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |  |     | 21       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |  |     | 3        |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =3A, di/dt=100A/μs  |     | 14       |          | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =3A, di/dt=100A/μs  |     | 3.8      |          | nC    |

A: The value of R<sub>θJA</sub> is measured 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 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

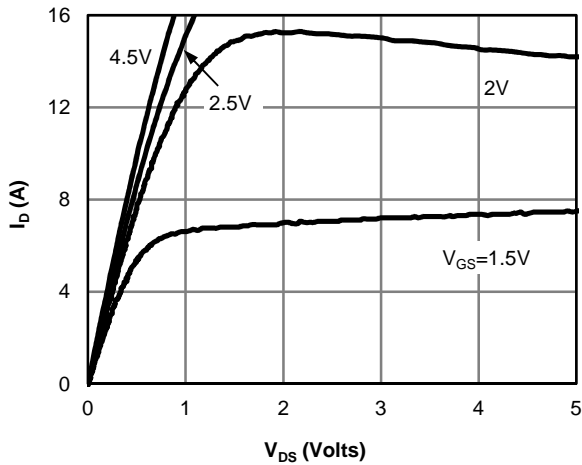


Figure 1: On-Region Characteristics

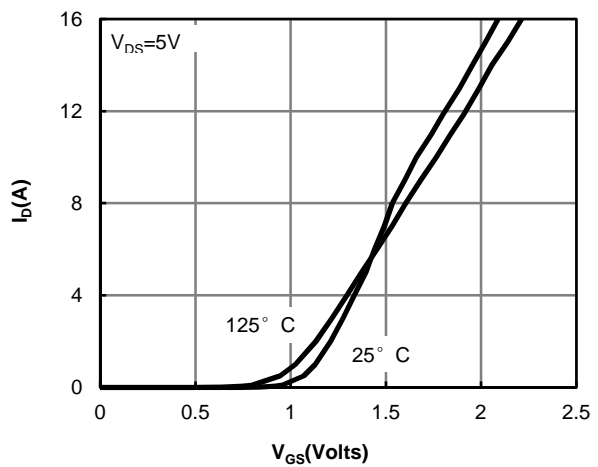


Figure 2: Transfer Characteristics

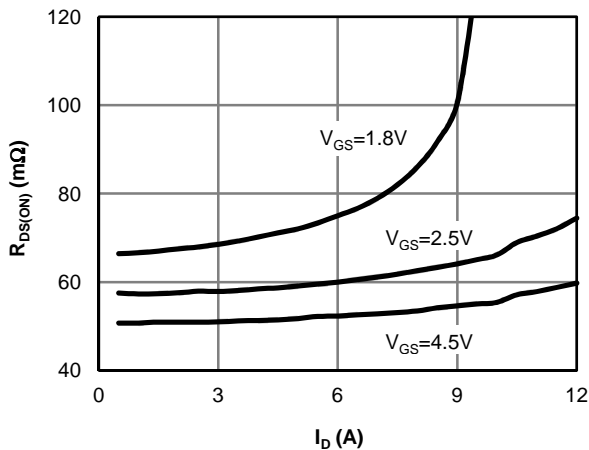


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

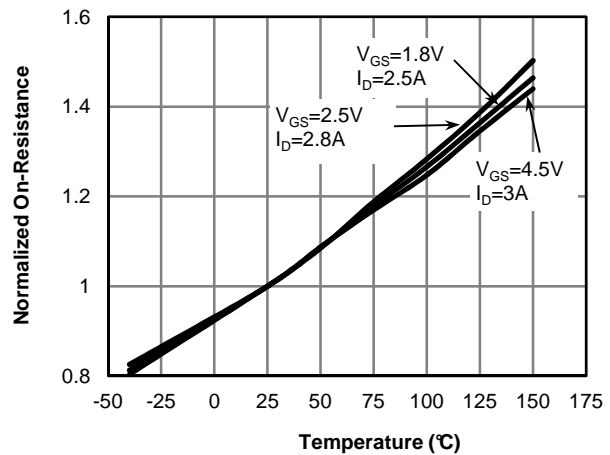


Figure 4: On-Resistance vs. Junction Temperature

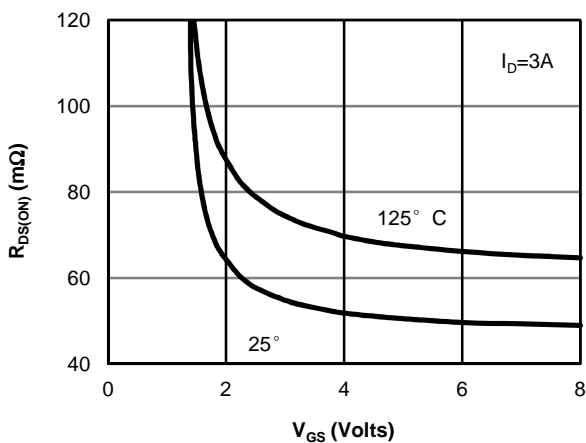


Figure 5: On-Resistance vs. Gate-Source Voltage

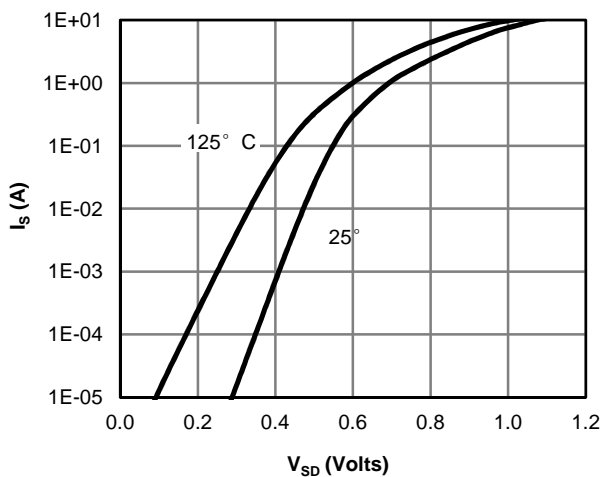
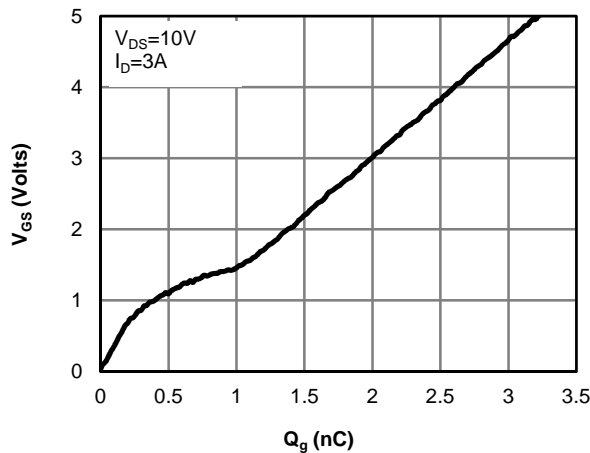
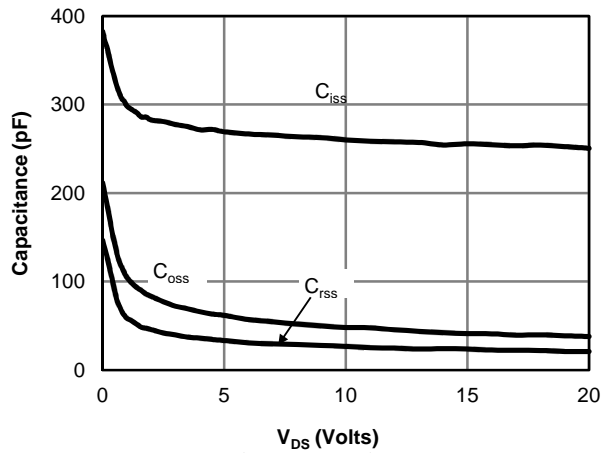


Figure 6: Body-Diode Characteristics

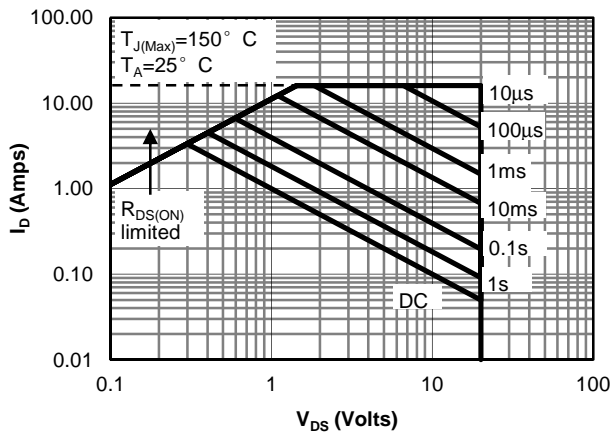
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



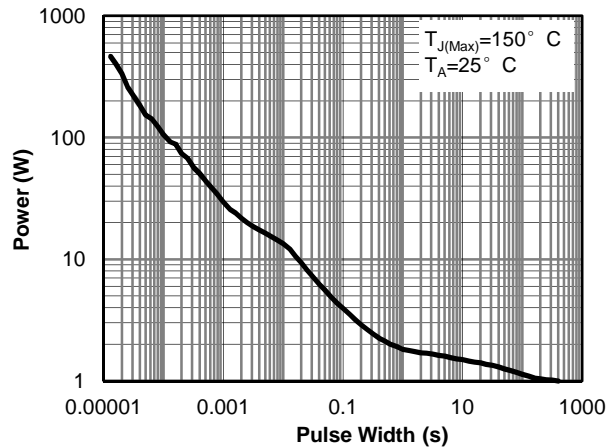
**Figure 7: Gate-Charge Characteristics**



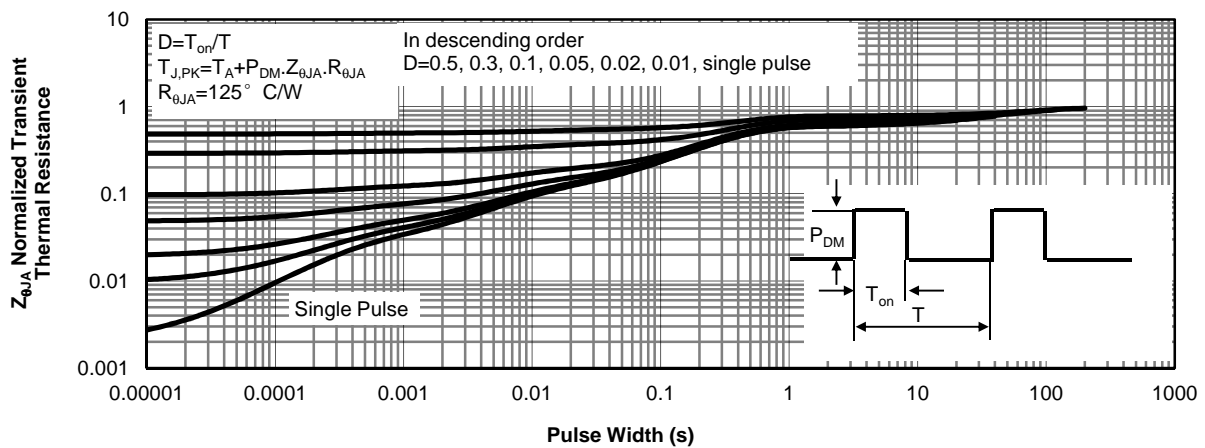
**Figure 8: Capacitance Characteristics**



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

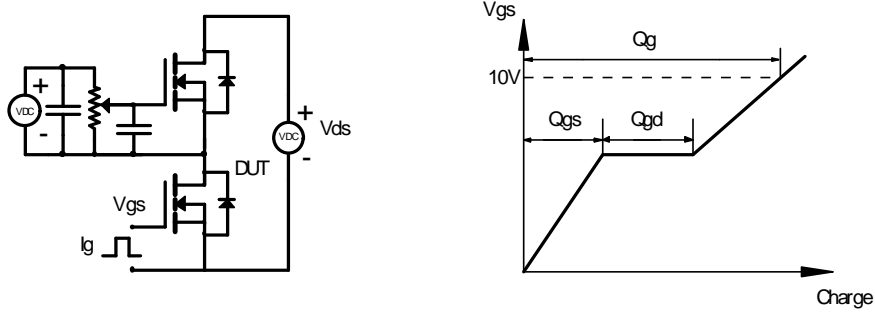


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

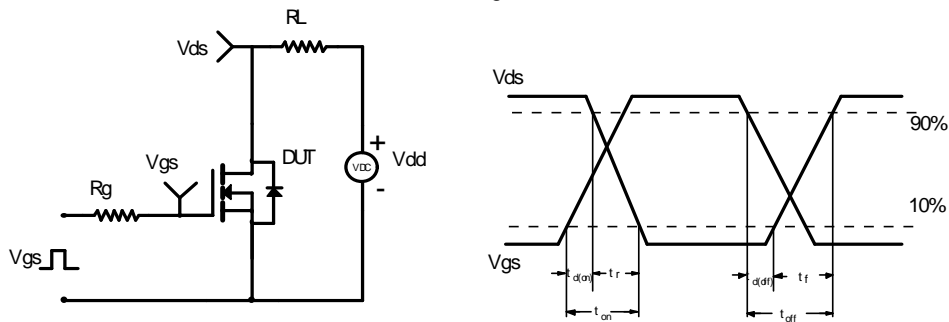


**Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)**

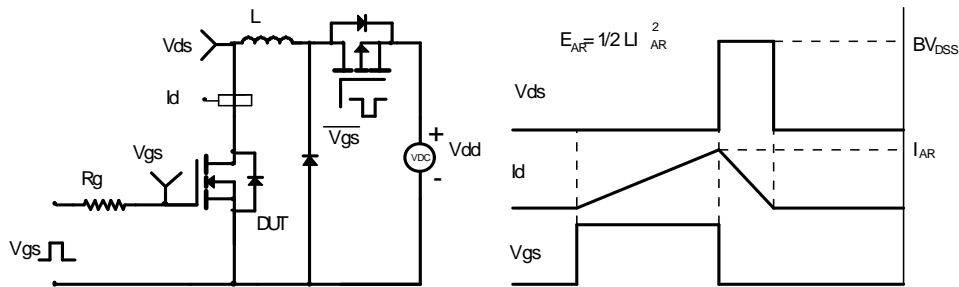
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

