

### General Description

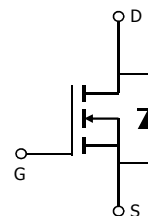
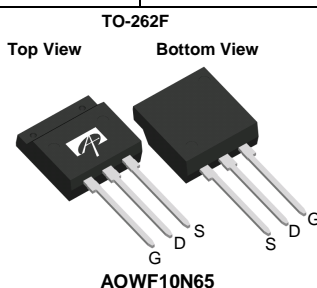
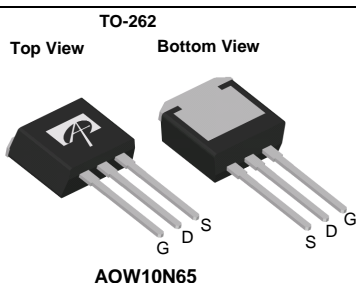
The AOW10N65/AOWF10N65 is fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications. By providing low  $R_{DS(on)}$ ,  $C_{iss}$  and  $C_{rss}$  along with guaranteed avalanche capability this device can be adopted quickly into new and existing offline power supply designs.

### Product Summary

|                                 |            |
|---------------------------------|------------|
| $V_{DS}$                        | 750V@150°C |
| $I_D$ (at $V_{GS}=10V$ )        | 10A        |
| $R_{DS(on)}$ (at $V_{GS}=10V$ ) | < 1Ω       |

100% UIS Tested

100%  $R_g$  Tested



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

| Parameter  | Symbol                  | AOW10N65   | AOWF10N65 | Units |
|--|-------------------------|------------|-----------|-------|
| Drain-Source Voltage   | $V_{DS}$                | 650        |           | V     |
| Gate-Source Voltage  | $V_{GS}$                | ±30        |           | V     |
| Continuous Drain Current   | $T_C=25^\circ\text{C}$  | 10         | 10*       | A     |
|  | $T_C=100^\circ\text{C}$ | 6.2        | 6.2*      |       |
| Pulsed Drain Current <sup>C</sup>  | $I_{DM}$                | 36         |           |       |
| Avalanche Current <sup>C</sup>   | $I_{AR}$                | 3.4        |           | A     |
| Repetitive avalanche energy <sup>C</sup>                                     | $E_{AR}$                | 173        |           | mJ    |
| Single pulsed avalanche energy <sup>G</sup>                                  | $E_{AS}$                | 347        |           | mJ    |
| Peak diode recovery dv/dt  | dv/dt                   | 5          |           | V/ns  |
| Power Dissipation <sup>B</sup>   | $T_C=25^\circ\text{C}$  | 250        | 28        | W     |
|  | Derate above 25°C       | 2          | 0.22      | W/°C  |
| Junction and Storage Temperature Range                                       | $T_J, T_{STG}$          | -55 to 150 |           | °C    |
| Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds | $T_L$                   | 300        |           | °C    |

### Thermal Characteristics

| Parameter                                  | Symbol          | AOW10N65 | AOWF10N65 | Units |
|--|-----------------|----------|-----------|-------|
| Maximum Junction-to-Ambient <sup>A,D</sup> | $R_{\theta JA}$ | 65       | 65        | °C/W  |
| Maximum Case-to-sink <sup>A</sup>          | $R_{\theta CS}$ | 0.5      | --        | °C/W  |
| Maximum Junction-to-Case                   | $R_{\theta JC}$ | 0.5      | 4.5       | °C/W  |

\* Drain current limited by maximum junction temperature.

**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, T <sub>J</sub> =25°C                         | 650  |      |      | V     |
|                                       |                                       | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C                        |      | 750  |      |       |
| BV <sub>DSS</sub><br>/ΔT <sub>J</sub> | Zero Gate Voltage Drain Current       | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V   |      | 0.75 |      | V/°C  |
| I <sub>DSS</sub>                      | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =650V, V <sub>GS</sub> =0V   |      |      | 1    | μA    |
|                                       |                                       | V <sub>DS</sub> =520V, T <sub>J</sub> =125°C   |      |      | 10   |       |
| I <sub>GSS</sub>                      | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V   |      |      | ±100 | nA    |
| V <sub>GS(th)</sub>                   | Gate Threshold Voltage                | V <sub>DS</sub> =5V I <sub>D</sub> =250μA  | 3    | 4    | 4.5  | V     |
| R <sub>DS(on)</sub>                   | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =5A   |      | 0.77 | 1    | Ω     |
| g <sub>FS</sub>                       | Forward Transconductance              | V <sub>DS</sub> =40V, I <sub>D</sub> =5A   |      | 13   |      | S     |
| V <sub>SD</sub>                       | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V  |      | 0.73 |      | V     |
| I <sub>S</sub>                        | Maximum Body-Diode Continuous Current |  |      |      | 10   | A     |
| I <sub>SM</sub>                       | Maximum Body-Diode Pulsed Current     |  |      |      | 36   | A     |
| <b>DYNAMIC PARAMETERS</b>             |                                       |  |      |      |      |       |
| C <sub>iss</sub>                      | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz  | 1095 | 1369 | 1645 | pF    |
| C <sub>oss</sub>                      | Output Capacitance                    |  | 80   | 118  | 154  | pF    |
| C <sub>rss</sub>                      | Reverse Transfer Capacitance          |  | 6    | 10   | 14   | pF    |
| R <sub>g</sub>                        | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz   | 1.7  | 3.5  | 5.5  | Ω     |
| <b>SWITCHING PARAMETERS</b>           |                                       |  |      |      |      |       |
| Q <sub>g</sub>                        | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =520V, I <sub>D</sub> =10A                         | 22   | 27.7 | 33   | nC    |
| Q <sub>gs</sub>                       | Gate Source Charge                    |  | 6    | 7.4  | 9    | nC    |
| Q <sub>gd</sub>                       | Gate Drain Charge                     |  | 5.5  | 11.3 | 17   | nC    |
| t <sub>D(on)</sub>                    | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =325V, I <sub>D</sub> =10A,<br>R <sub>G</sub> =25Ω |      | 30   |      | ns    |
| t <sub>r</sub>                        | Turn-On Rise Time                     |  |      | 61   |      | ns    |
| t <sub>D(off)</sub>                   | Turn-Off DelayTime                    |  |      | 74   |      | ns    |
| t <sub>f</sub>                        | Turn-Off Fall Time                    |  |      | 53   |      | ns    |
| t <sub>rr</sub>                       | Body Diode Reverse Recovery Time      | I <sub>F</sub> =10A, di/dt=100A/μs, V <sub>DS</sub> =100V                                | 255  | 320  | 385  | ns    |
| Q <sub>rr</sub>                       | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =10A, di/dt=100A/μs, V <sub>DS</sub> =100V                                | 4.8  | 6    | 7.2  | μC    |

A. The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25° C.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

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 case R<sub>θJC</sub> and case to ambient.

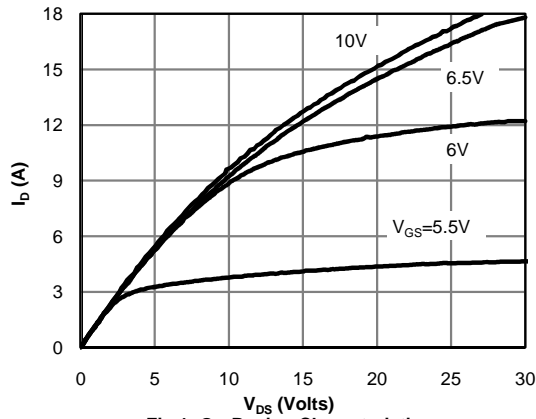
E. The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150° C. The SOA curve provides a single pulse rating.

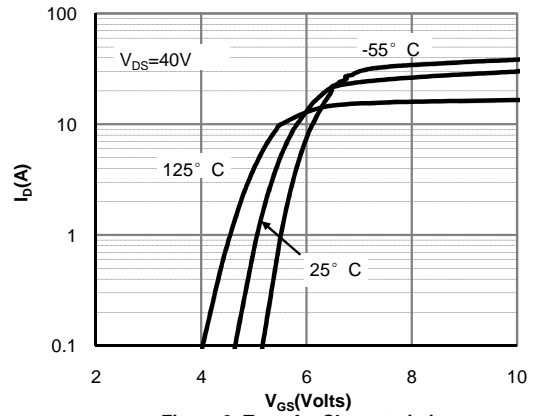
G. L=60mH, I<sub>AS</sub>=3.4A, V<sub>DD</sub>=150V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25° C

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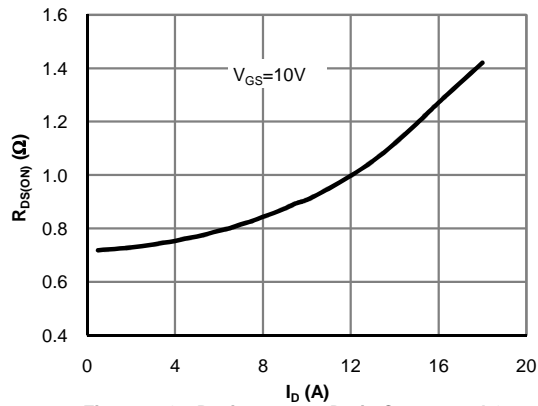
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



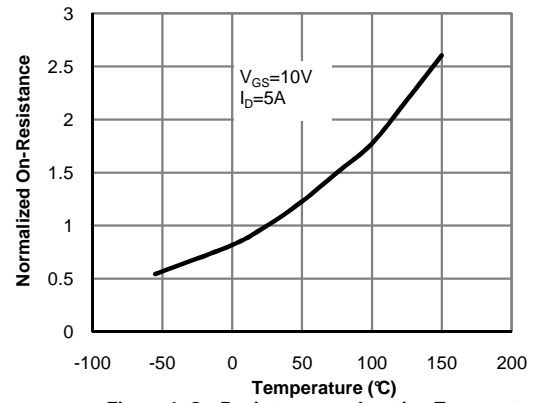
**Fig 1: On-Region Characteristics**



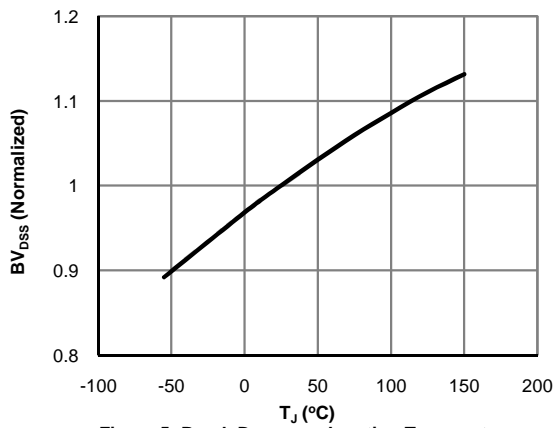
**Figure 2: Transfer Characteristics**



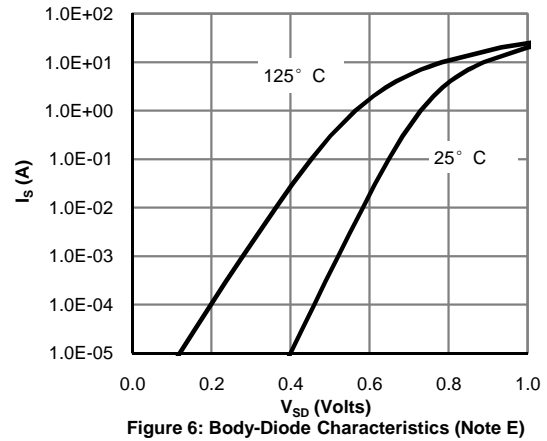
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**

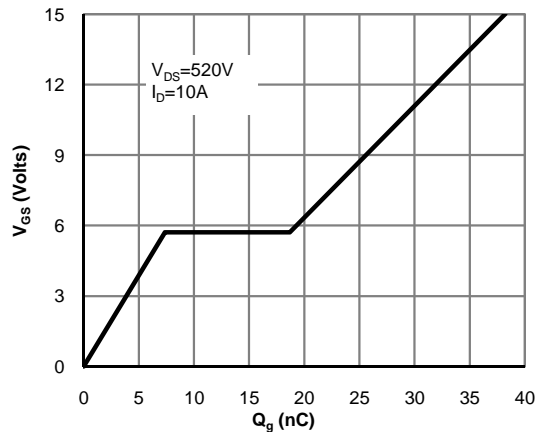


**Figure 5: Break Down vs. Junction Temperature**

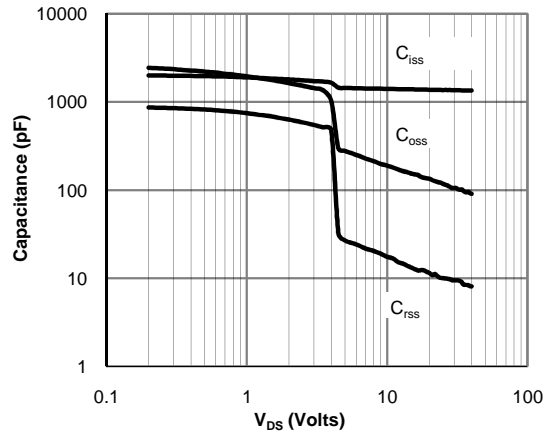


**Figure 6: Body-Diode Characteristics (Note E)**

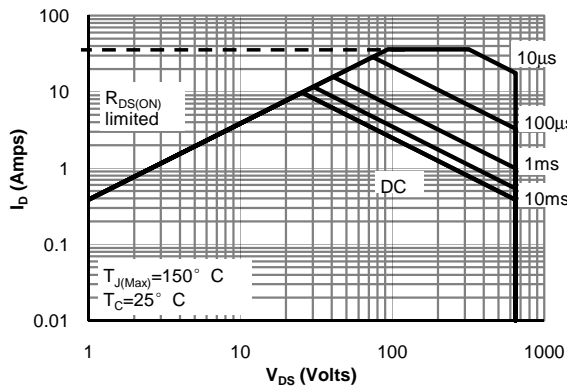
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



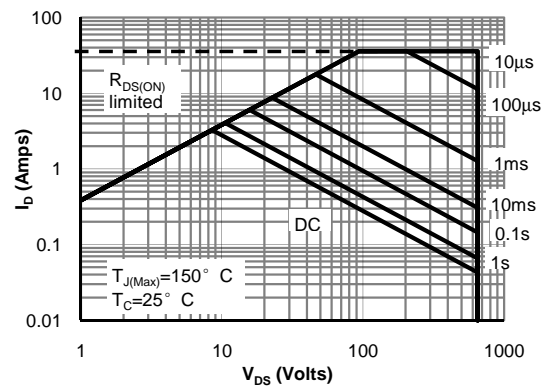
**Figure 7: Gate-Charge Characteristics**



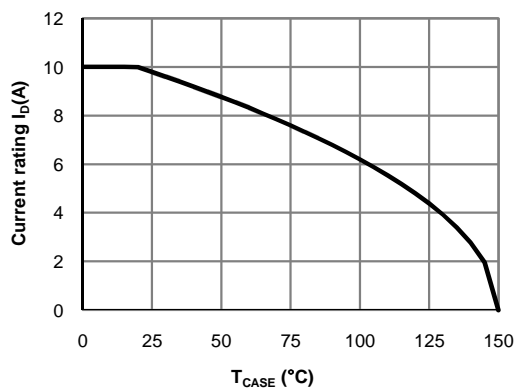
**Figure 8: Capacitance Characteristics**



**Figure 9: Maximum Forward Biased Safe Operating Area for AOW10N65 (Note F)**



**Figure 10: Maximum Forward Biased Safe Operating Area for AOWF10N65 (Note F)**



**Figure 11: Current De-rating (Note B)**

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

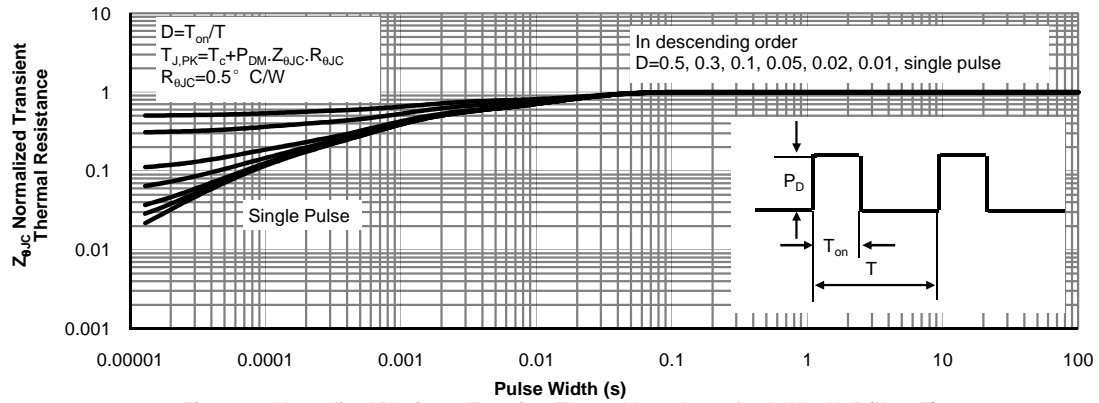


Figure 12: Normalized Maximum Transient Thermal Impedance for AOW10N65 (Note F)

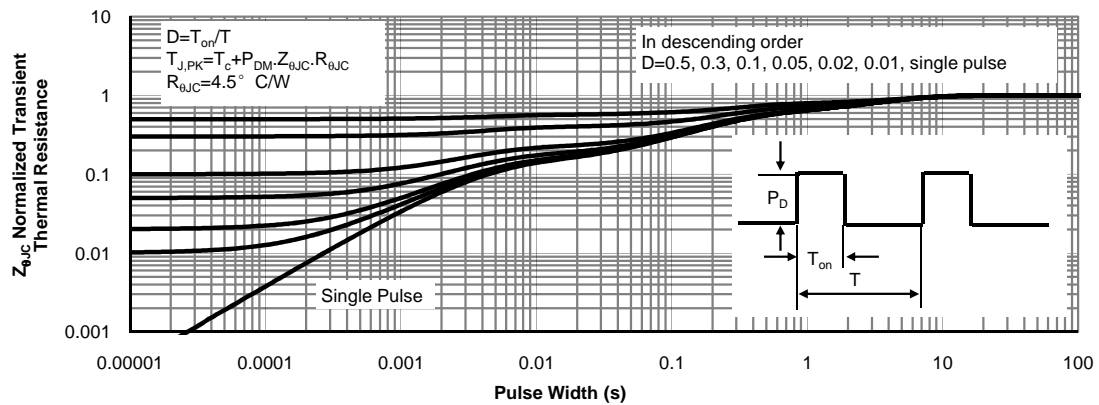
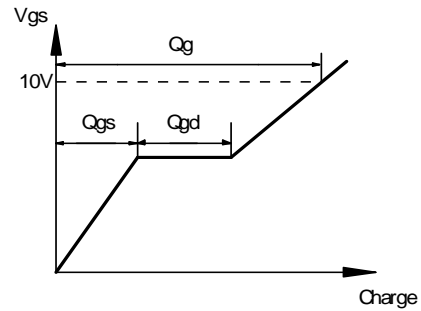
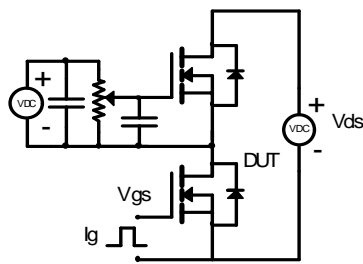
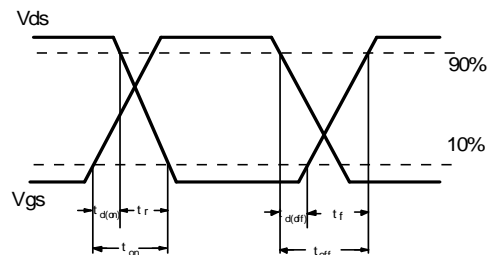
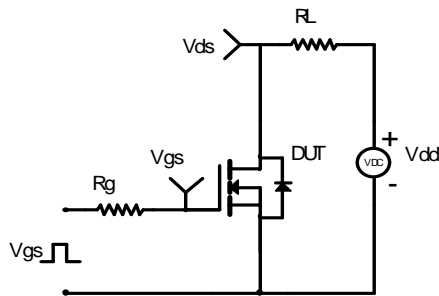


Figure 13: Normalized Maximum Transient Thermal Impedance for AOWF10N65 (Note F)

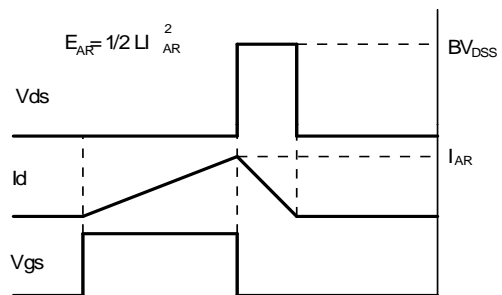
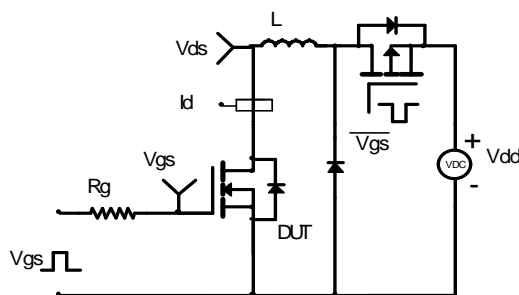
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

