

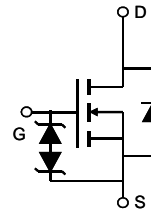
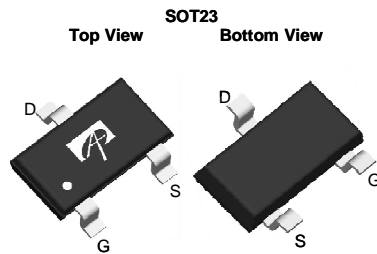
General Description

The AO3416 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. It is ESD protected.

Product Summary

| | |
|------------------------------------|----------------|
| V_{DS} | 20V |
| I_D (at $V_{GS}=4.5V$) | 6.5A |
| $R_{DS(ON)}$ (at $V_{GS}=4.5V$) | < 22m Ω |
| $R_{DS(ON)}$ (at $V_{GS} = 2.5V$) | < 26m Ω |
| $R_{DS(ON)}$ (at $V_{GS} = 1.8V$) | < 34m Ω |

ESD protected



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} | ± 8 | V |
| Continuous Drain Current | I_D | $T_A=25^\circ\text{C}$ | 6.5 |
| | | $T_A=70^\circ\text{C}$ | 5.2 |
| Pulsed Drain Current ^C | I_{DM} | 30 | A |
| Power Dissipation ^B | 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 ^A | $R_{\theta JA}$ | 70 | 90 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient ^{A,D} | | Steady-State | 100 | 125 |
| Maximum Junction-to-Lead | $R_{\theta JL}$ | 63 | 80 | $^\circ\text{C/W}$ |

Electrical Characteristics (T_J=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|---|-----|----------|----------|-------|
| STATIC PARAMETERS | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | I _D =250μA, V _{GS} =0V | 20 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =20V, V _{GS} =0V T _J =55°C | | | 1 5 | μA |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} = ±8V | | | ±10 | μA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 0.4 | 0.7 | 1.1 | V |
| I _{D(ON)} | On state drain current | V _{GS} =4.5V, V _{DS} =5V | 30 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =4.5V, I _D =6.5A T _J =125°C | | 16 22 | 22 30 | mΩ |
| | | V _{GS} =2.5V, I _D =5.5A | | 18 | 26 | |
| | | V _{GS} =1.8V, I _D =5A | | 21 | 34 | |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =6.5A | | 50 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.62 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 2 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =10V, f=1MHz | | 1295 | 1650 | pF |
| C _{oss} | Output Capacitance | | | 160 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 87 | | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | | 1.8 | | KΩ |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =4.5V, V _{DS} =10V, I _D =6.5A | | 10 | | nC |
| Q _{gs} | Gate Source Charge | | | 4.2 | | nC |
| Q _{gd} | Gate Drain Charge | | | 2.6 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =4.5V, V _{DS} =10V, R _L =1.54Ω, R _{GEN} =3Ω | | 280 | | ns |
| t _r | Turn-On Rise Time | | | 328 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 3.76 | | us |
| t _f | Turn-Off Fall Time | | | 2.24 | | us |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =6.5A, di/dt=100A/μs | | 31 | 41 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =6.5A, di/dt=100A/μs | | 6.8 | | nC |

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The value in any given application depends on the user's specific board design.

B. The power dissipation P_D is based on T_{J(MAX)}=150° C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150° C. Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

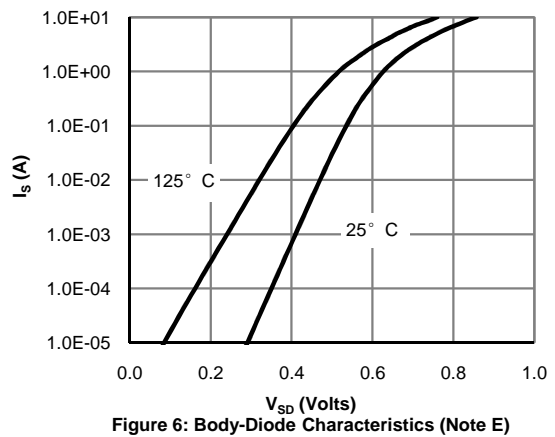
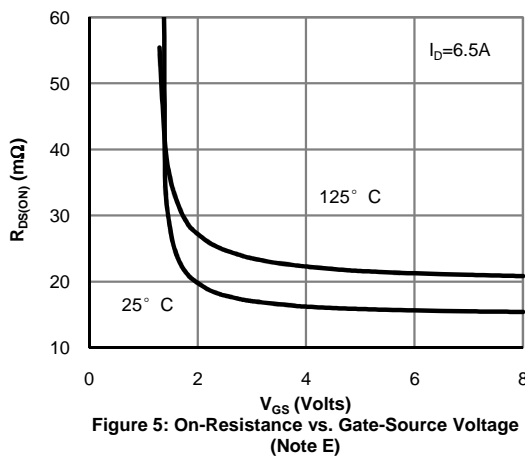
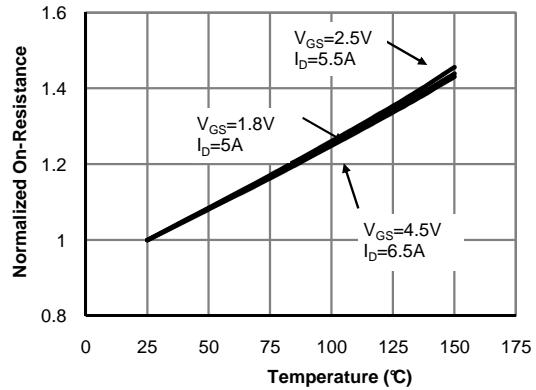
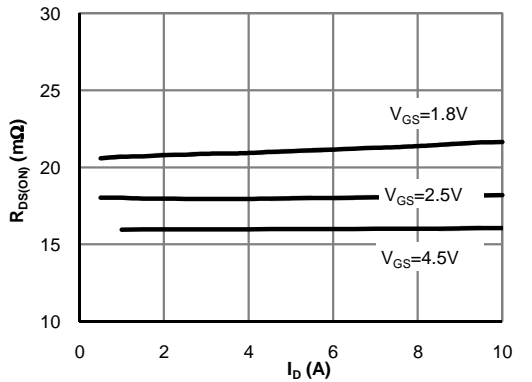
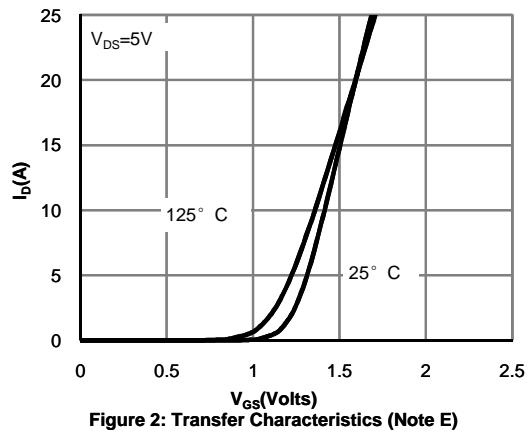
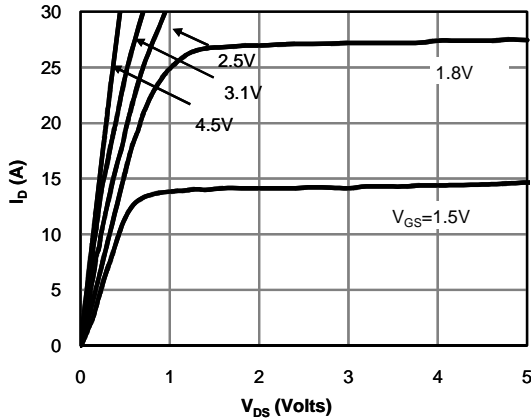
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T_{J(MAX)}=150° C. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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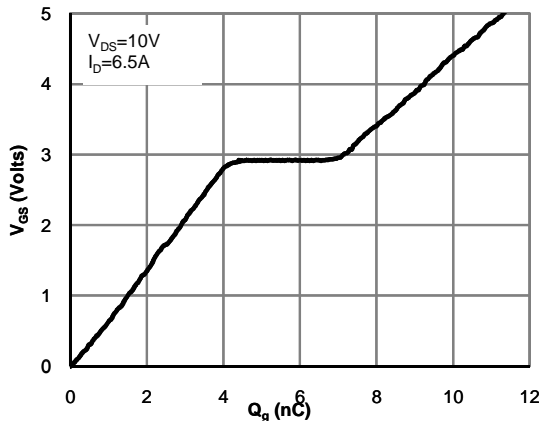


Figure 7: Gate-Charge Characteristics

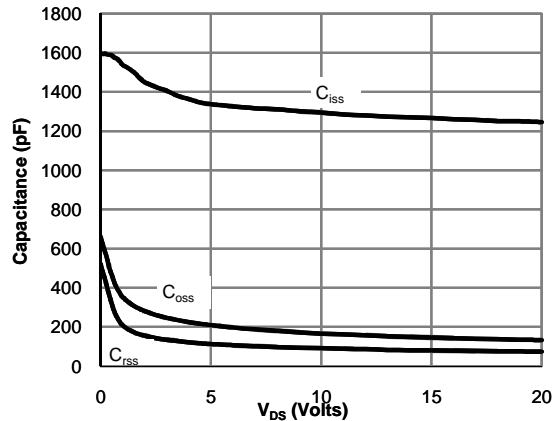


Figure 8: Capacitance Characteristics

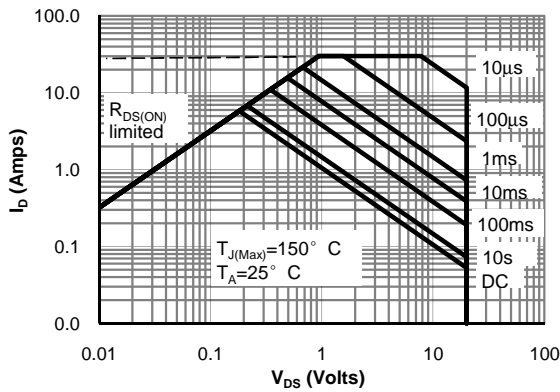


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

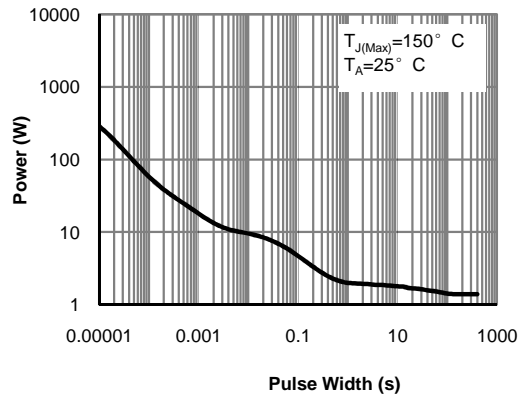


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

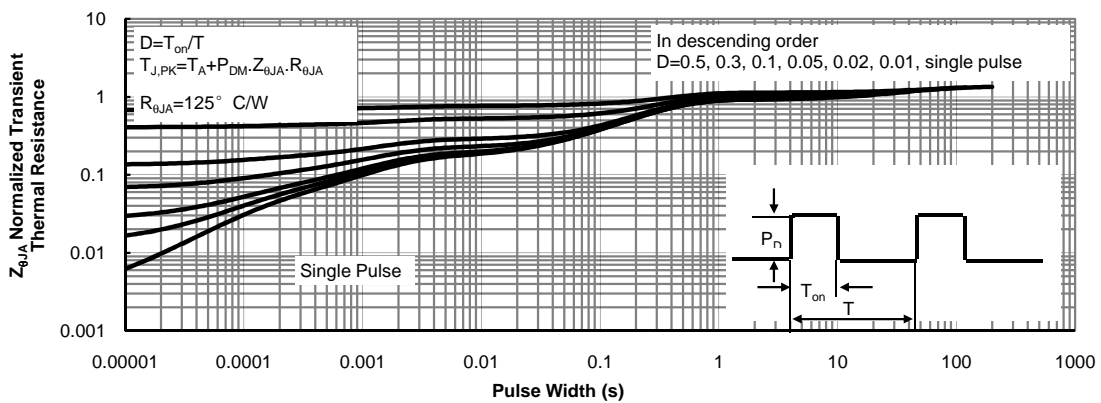
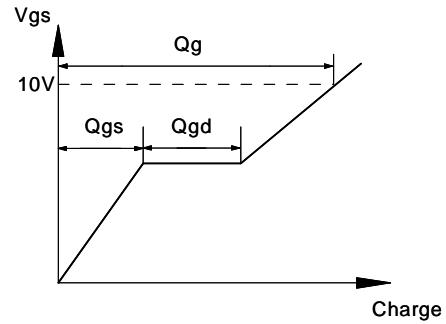
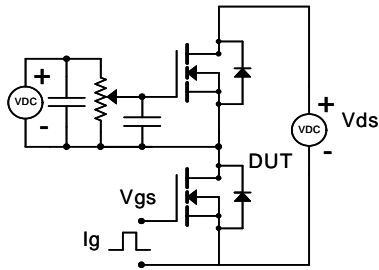
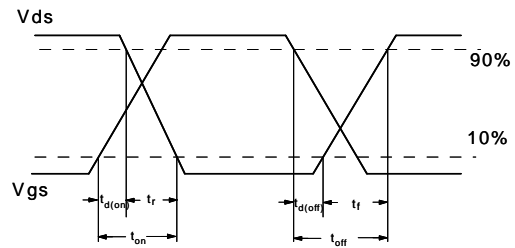
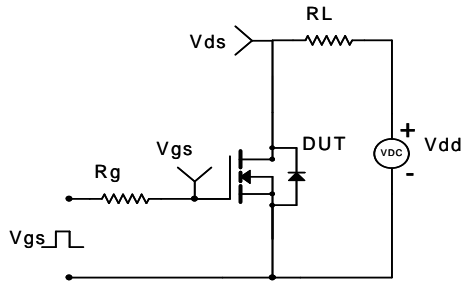


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

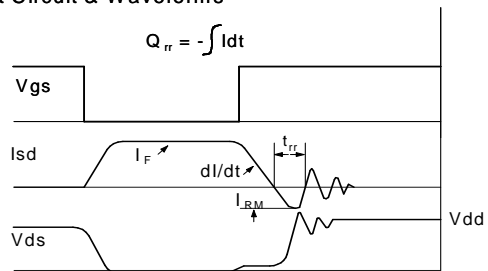
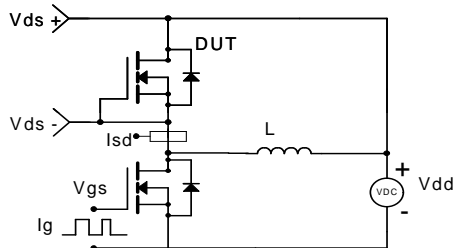
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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