



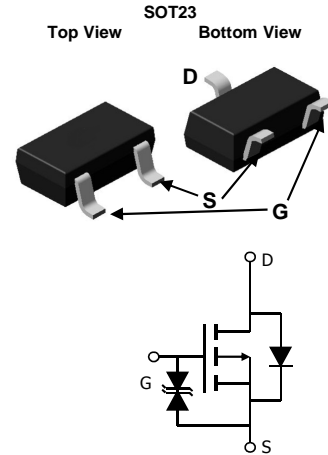
General Description

The AO3415 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 applications. ESD protected.

| | |
|------------------------------------|----------------|
| V_{DS} | -20V |
| I_D (at $V_{GS}=-4.5V$) | -4A |
| $R_{DS(ON)}$ (at $V_{GS}= -4.5V$) | < 41m Ω |
| $R_{DS(ON)}$ (at $V_{GS}= -2.5V$) | < 53m Ω |
| $R_{DS(ON)}$ (at $V_{GS}= -1.8V$) | < 65m Ω |

Applications

- Load Switch
- DC/DC Converter
- Switching Circuits
- LED Driver



Order Information

| Product | Package | Marking | Packing | Min Unit Quantity |
|---------|---------|---------|--------------|-------------------|
| AO3415 | SOT23 | 3415 | 3000PCS/Reel | 3000PCS |

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} | ± 8 | V |
| Continuous Drain Current | I_D | $T_A=25^{\circ}C$ | -4 |
| | | $T_A=70^{\circ}C$ | -3.5 |
| Pulsed Drain Current ^C | I_{DM} | -30 | A |
| Power Dissipation ^B | P_D | $T_A=25^{\circ}C$ | 1.5 |
| | | $T_A=70^{\circ}C$ | 1 |
| 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 ^A | $R_{\theta JA}$ | 65 | 80 | $^{\circ}C/W$ |
| Maximum Junction-to-Ambient ^{A D} | | 85 | 100 | $^{\circ}C/W$ |
| Maximum Junction-to-Lead | $R_{\theta JL}$ | 43 | 52 | $^{\circ}C/W$ |



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 | -0.3 | -0.57 | -0.9 | 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 =-4A T _J =125°C | | 34 49 | 41 59 | mΩ |
| | | V _{GS} =-2.5V, I _D =-4A | | 42 | 53 | |
| | | V _{GS} =-1.8V, I _D =-2A | | 52 | 65 | |
| | | V _{GS} =-1.5V, I _D =-1A | | 61 | | |
| g _{FS} | Forward Transconductance | V _{DS} =-5V, I _D =-4A | | 20 | | S |
| V _{SD} | Diode Forward Voltage | I _S =-1A, V _{GS} =0V | | -0.64 | -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 | 600 | 751 | 905 | pF |
| C _{oss} | Output Capacitance | | 80 | 115 | 150 | pF |
| C _{rss} | Reverse Transfer Capacitance | | 48 | 80 | 115 | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | 6 | 13 | 20 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =-4.5V, V _{DS} =-10V, I _D =-4A | 7.4 | 9.3 | 11 | nC |
| Q _{gs} | Gate Source Charge | | 0.8 | 1 | 1.2 | nC |
| Q _{gd} | Gate Drain Charge | | 1.3 | 2.2 | 3.1 | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =-4.5V, V _{DS} =-10V, R _L =2.5Ω, R _{GEN} =3Ω | | 13 | | ns |
| t _r | Turn-On Rise Time | | 9 | | ns | |
| t _{D(off)} | Turn-Off DelayTime | | 19 | | ns | |
| t _f | Turn-Off Fall Time | | 29 | | ns | |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =-4A, dI/dt=500A/μs | 20 | 26 | 32 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =-4A, dI/dt=500A/μs | 40 | 51 | 62 | 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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

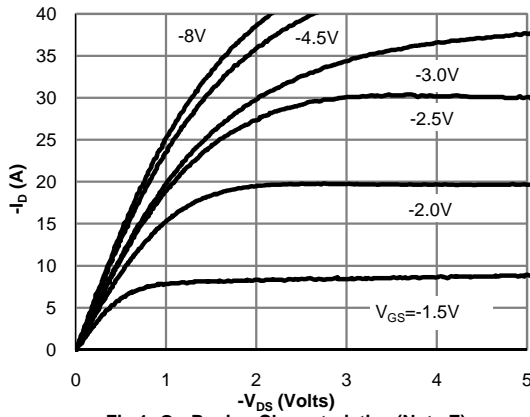


Figure 1: On-Region Characteristics (Note E)

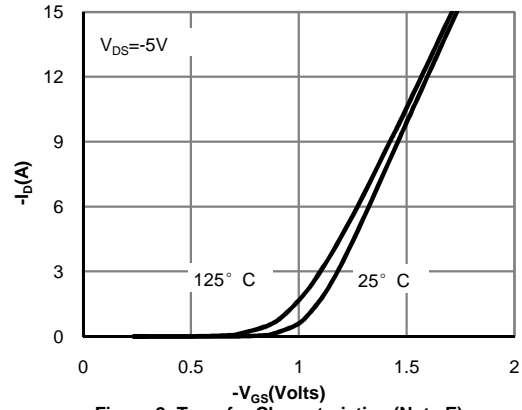


Figure 2: Transfer Characteristics (Note E)

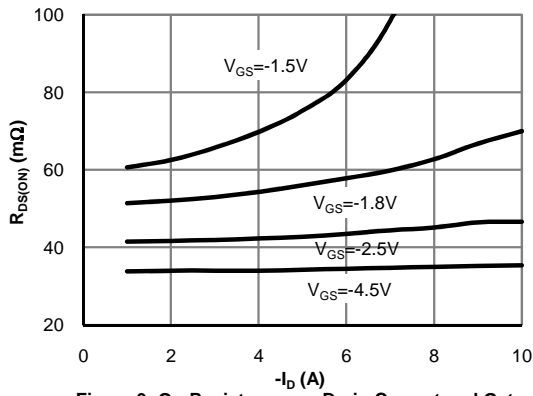


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

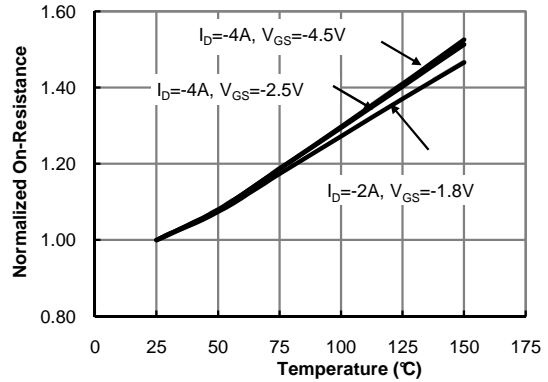


Figure 4: On-Resistance vs. Junction Temperature (Note E)

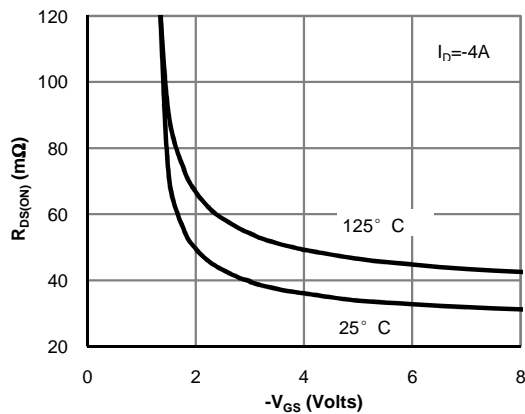


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

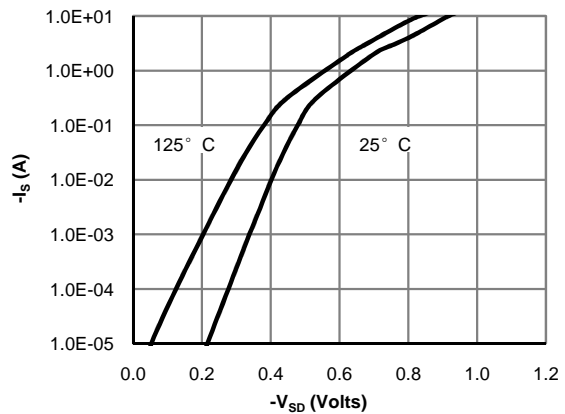


Figure 6: Body-Diode Characteristics (Note E)



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

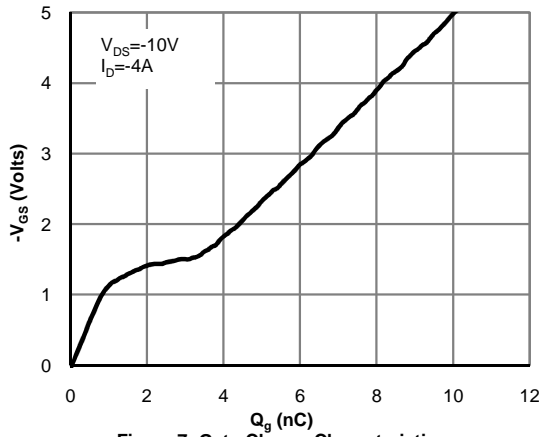


Figure 7: Gate-Charge Characteristics

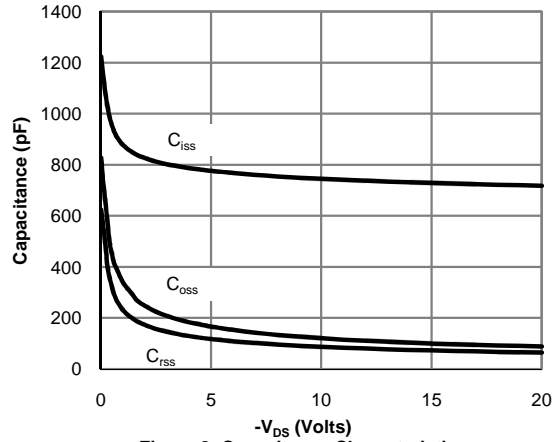


Figure 8: Capacitance Characteristics

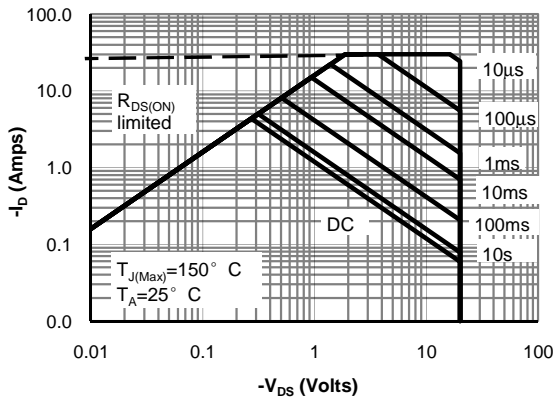


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

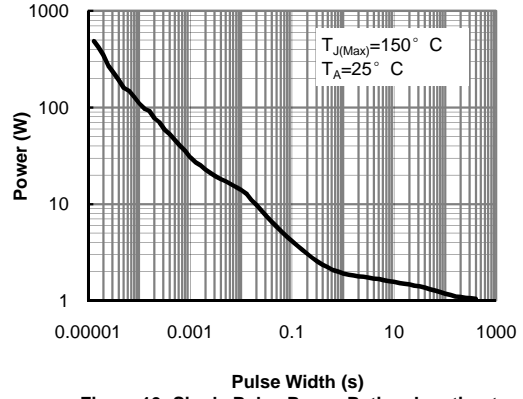


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

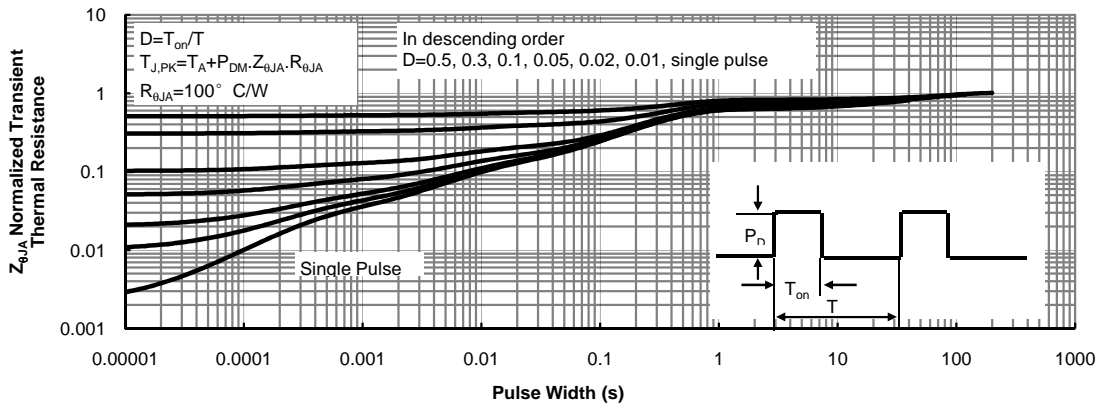
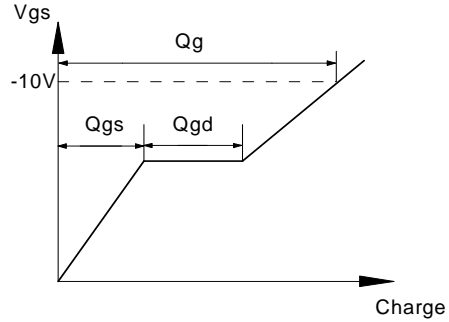
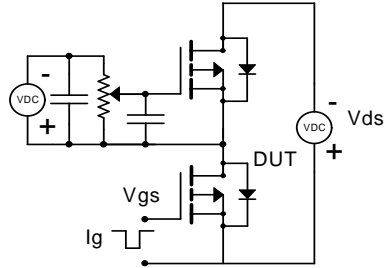


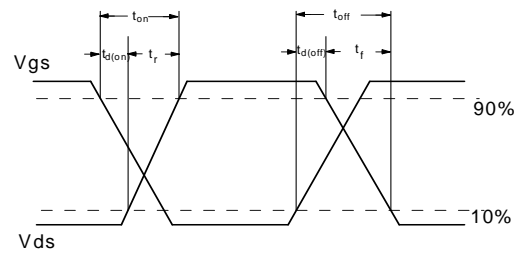
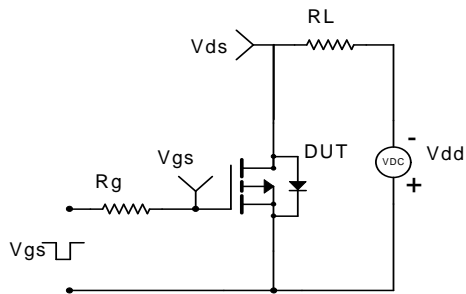
Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)



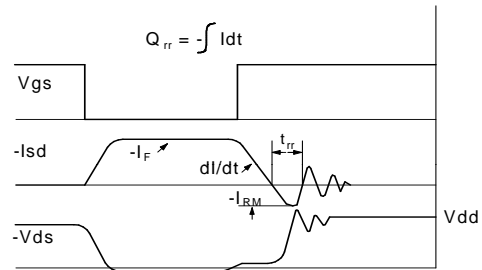
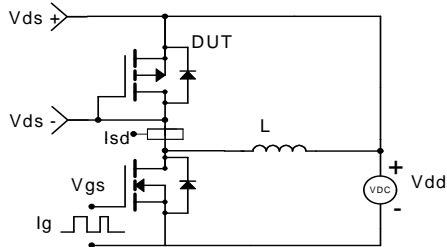
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



| Package | Reel | Reel Size | Box | Box Size(mm) | Carton | Carton Size(mm) |
|---------|---------|-----------|-----------|--------------|------------|-----------------|
| SOT-23 | 3000pcs | 7inch | 45,000pcs | 203×203×195 | 180,000pcs | 438×438×220 |