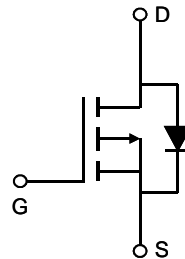
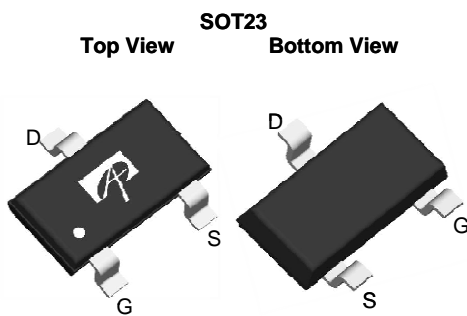


General Description

The AO3413 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.

Features

$V_{DS} = -20V$
 $I_D = -3A$ ($V_{GS} = -4.5V$)
 $R_{DS(ON)} < 80m\Omega$ ($V_{GS} = -4.5V$)
 $R_{DS(ON)} < 100m\Omega$ ($V_{GS} = -2.5V$)
 $R_{DS(ON)} < 130m\Omega$ ($V_{GS} = -1.8V$)



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} | ± 8 | V |
| Continuous Drain Current ^A | I_D | $T_A=25^\circ C$ | -3 |
| | | $T_A=70^\circ C$ | -2.4 |
| Pulsed Drain Current ^B | I_{DM} | -15 | A |
| Power Dissipation ^A | P_D | $T_A=25^\circ C$ | 1.4 |
| | | $T_A=70^\circ C$ | 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 ^A | $R_{\theta JA}$ | 70 | 90 | $^\circ C/W$ |
| Maximum Junction-to-Ambient ^A | | Steady-State | 100 | 125 |
| Maximum Junction-to-Lead ^C | $R_{\theta JL}$ | 63 | 80 | $^\circ C/W$ |

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|--|------|----------|-----------|-------|
| 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 | | | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =-250μA | -0.4 | -0.65 | -1 | V |
| I _{D(ON)} | On state drain current | V _{GS} =-4.5V, V _{DS} =-5V | -15 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =-4.5V, I _D =-3A T _J =125°C | | 56 80 | 80 115 | mΩ |
| | | V _{GS} =-2.5V, I _D =-2.6A | | 70 | 100 | mΩ |
| | | V _{GS} =-1.8V, I _D =-1A | | 85 | 130 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =-5V, I _D =-3A | | 12 | | S |
| V _{SD} | Diode Forward Voltage | I _S =-1A, V _{GS} =0V | | -0.7 | -1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | -1.4 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =-10V, f=1MHz | | 560 | 745 | pF |
| C _{oss} | Output Capacitance | | | 80 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 70 | | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | | 15 | 23 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =-4.5V, V _{DS} =-10V, I _D =-3A | | 8.5 | 11 | nC |
| Q _{gs} | Gate Source Charge | | | 1.2 | | nC |
| Q _{gd} | Gate Drain Charge | | | 2.1 | | nC |
| t _{D(on)} | Turn-On Delay Time | V _{GS} =-4.5V, V _{DS} =-10V, R _L =3.3Ω, R _{GEN} =6Ω | | 7.2 | | ns |
| t _r | Turn-On Rise Time | | | 36 | | ns |
| t _{D(off)} | Turn-Off Delay Time | | | 53 | | ns |
| t _f | Turn-Off Fall Time | | | 56 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =-3A, dI/dt=100A/μs | | 37 | 49 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =-3A, dI/dt=100A/μs | | 27 | | nC |

A: The value of R_{θJA} is measured with the device mounted on 1 in² 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. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

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

D: The static characteristics in Figures 1 to 6 are obtained using 300μs pulse width, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

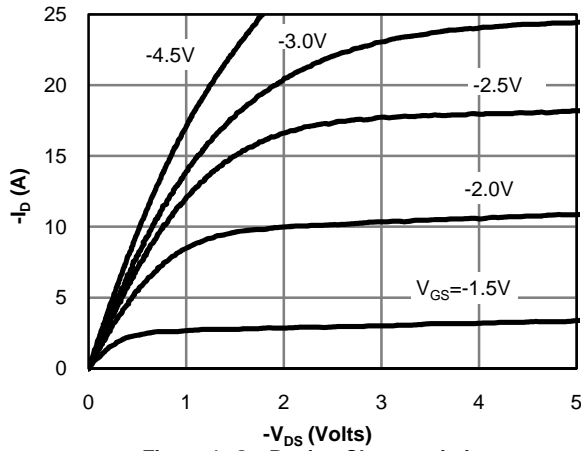


Figure 1: On-Region Characteristics

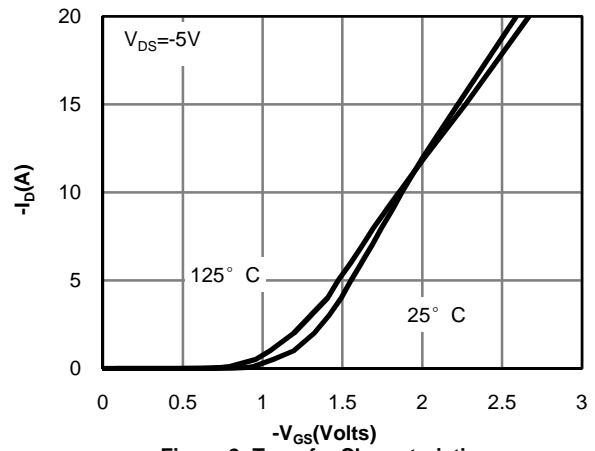


Figure 2: Transfer Characteristics

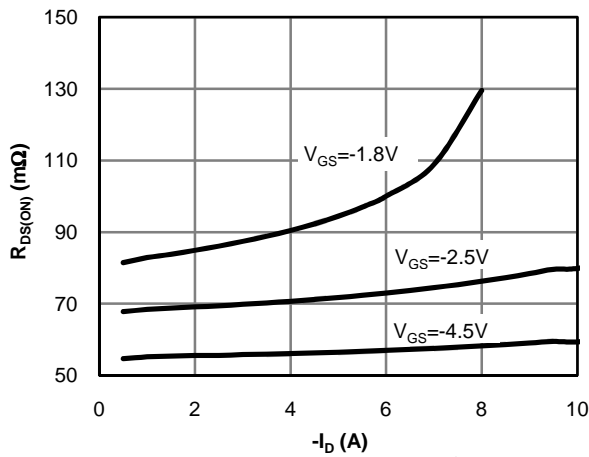


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

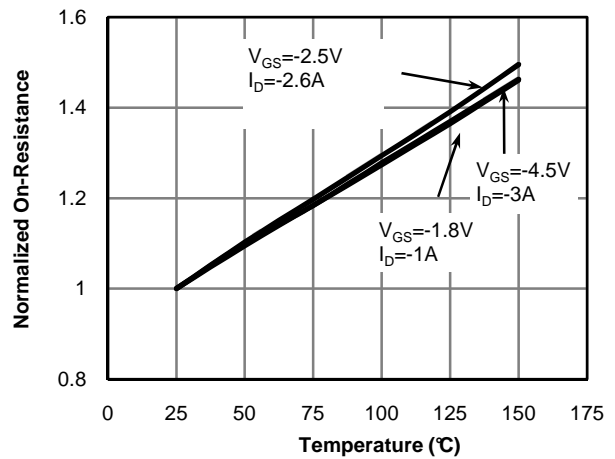


Figure 4: On-Resistance vs. Junction Temperature

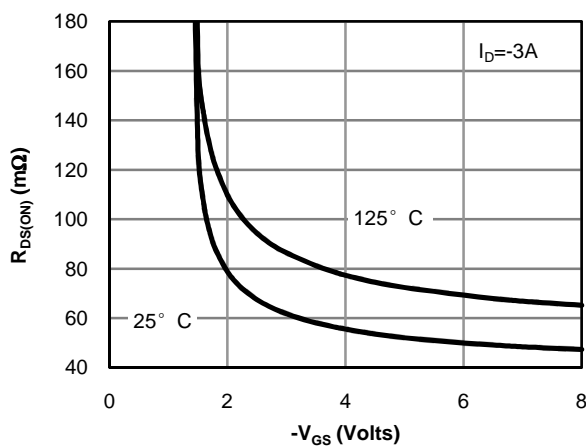


Figure 5: On-Resistance vs. Gate-Source Voltage

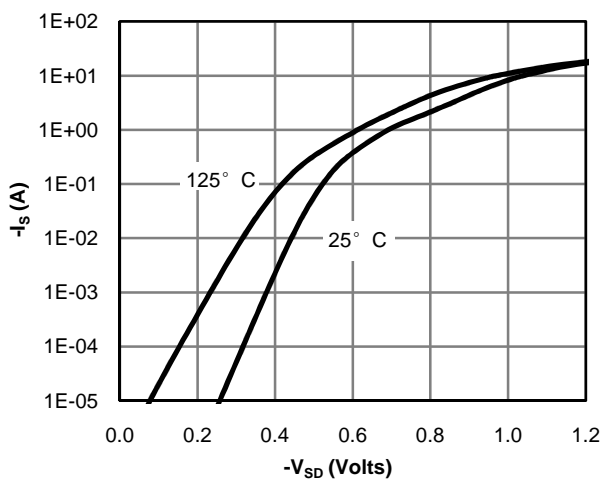


Figure 6: Body-Diode Characteristics



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

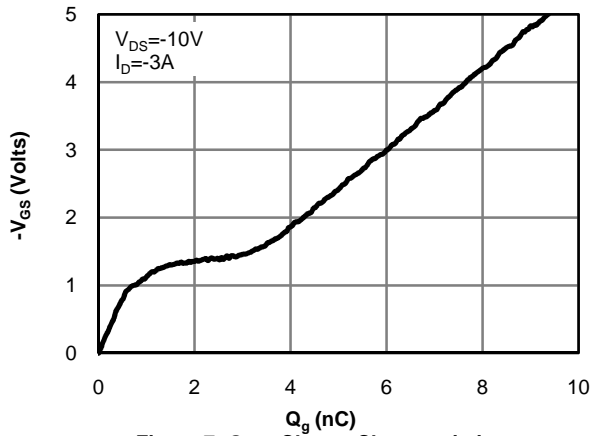


Figure 7: Gate-Charge Characteristics

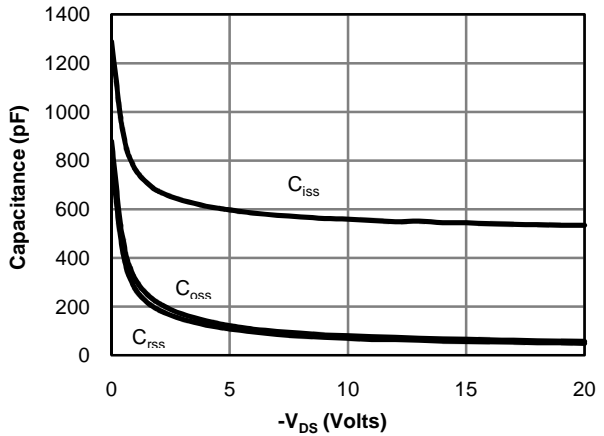


Figure 8: Capacitance Characteristics

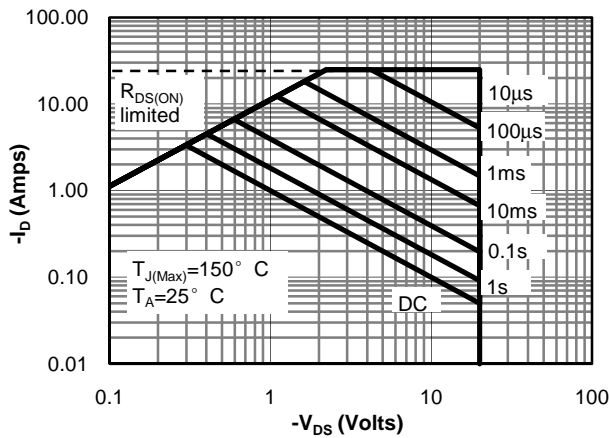


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

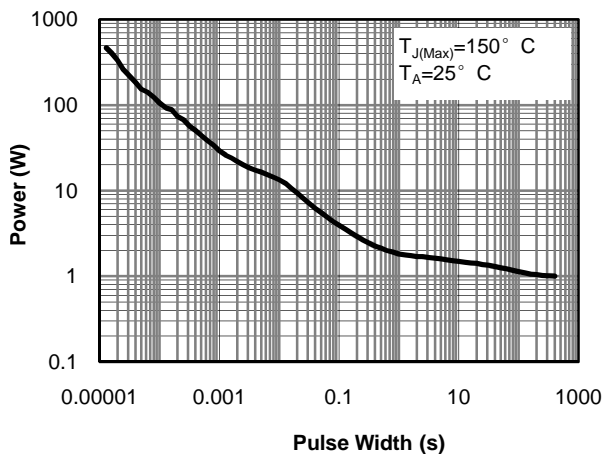


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

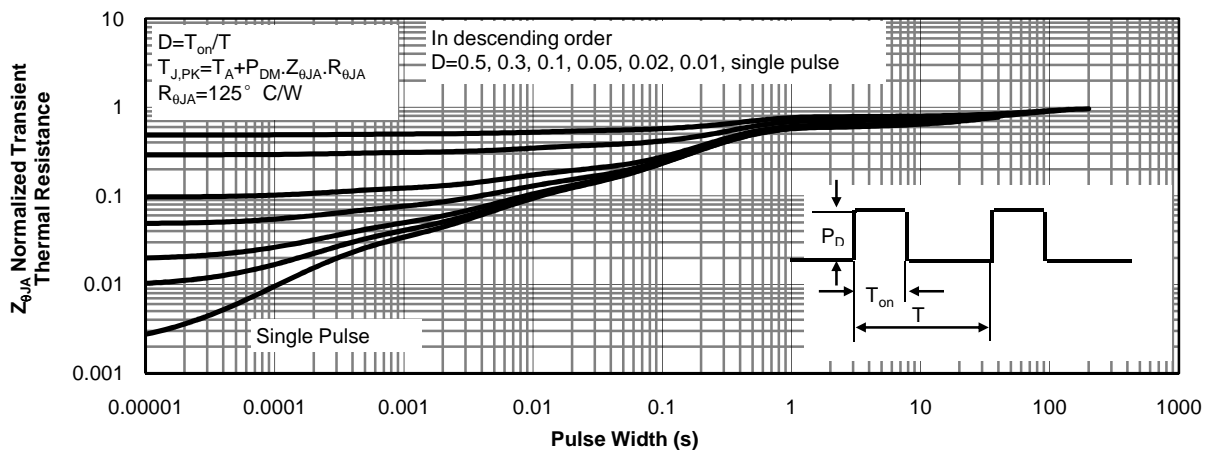
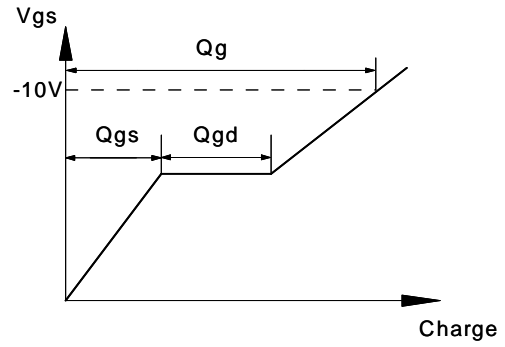
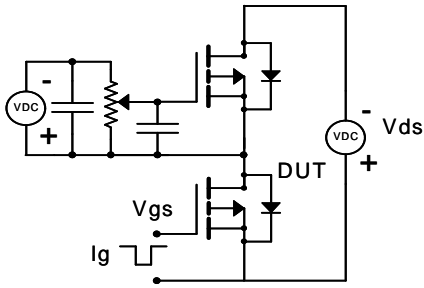
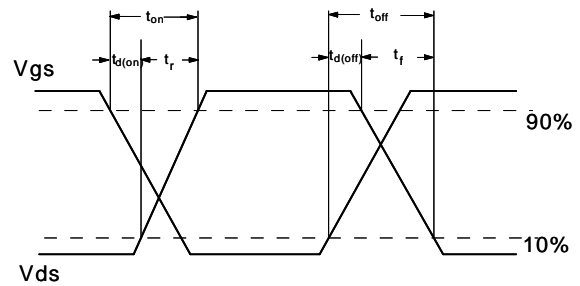
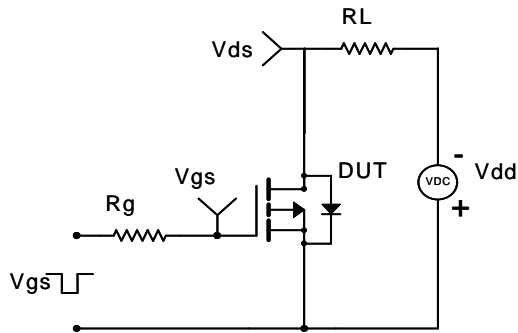


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

