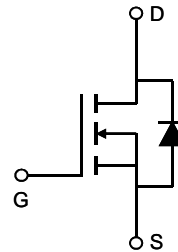
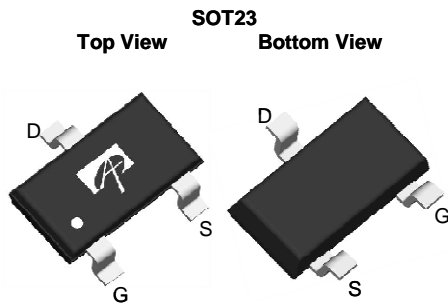


General Description

The AO3414 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

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



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} | ± 8 | V |
| Continuous Drain Current ^A | $T_A=25^\circ C$ | 3 | A |
| | $T_A=70^\circ C$ | 2.5 | |
| Pulsed Drain Current ^B | I_{DM} | 16 | |
| Power Dissipation ^A | $T_A=25^\circ C$ | 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 ^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 |
|-----------------------------|---------------------------------------|--|-----|----------|----------|-------|
| 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 | | | 100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} I _D =250μA | 0.4 | 0.7 | 1 | V |
| I _{D(ON)} | On state drain current | V _{GS} =4.5V, V _{DS} =5V | 16 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =4.5V, I _D =3A T _J =125°C | | 51 68 | 62 85 | mΩ |
| | | V _{GS} =2.5V, I _D =2.8A | | 58 | 70 | |
| | | V _{GS} =1.8V, I _D =2.5A | | 68 | 85 | |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =3A | | 11 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.7 | 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 | | 260 | 320 | pF |
| C _{oss} | Output Capacitance | | 48 | | pF | |
| C _{rss} | Reverse Transfer Capacitance | | 27 | | pF | |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | | 3 | 4.5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =4.5V, V _{DS} =10V, I _D =3A | | 2.9 | 3.8 | nC |
| Q _{gs} | Gate Source Charge | | 0.4 | | nC | |
| Q _{gd} | Gate Drain Charge | | 0.6 | | nC | |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =5V, V _{DS} =10V, R _L =3.3Ω, R _{GEN} =6Ω | | 2.5 | | ns |
| t _r | Turn-On Rise Time | | 3.2 | | ns | |
| t _{D(off)} | Turn-Off DelayTime | | 21 | | ns | |
| t _f | Turn-Off Fall Time | | 3 | | ns | |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =3A, di/dt=100A/μs | | 14 | 19 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =3A, di/dt=100A/μs | | 3.8 | | 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 <300 μs pulses, 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

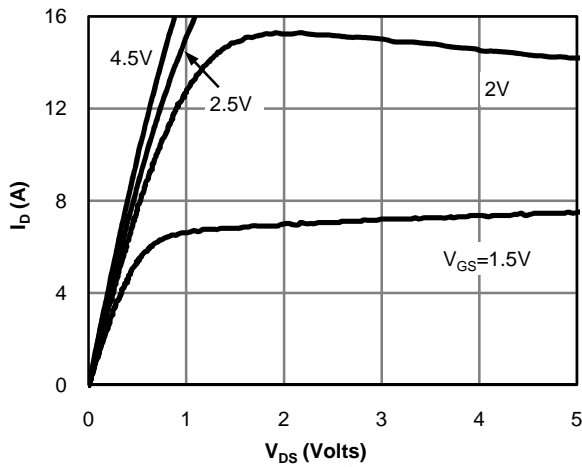


Figure 1: On-Region Characteristics

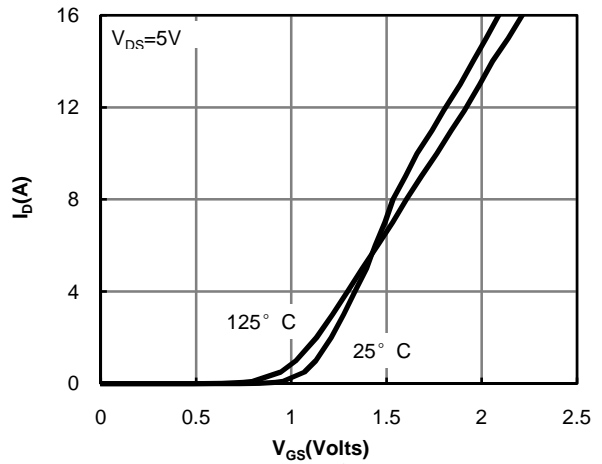


Figure 2: Transfer Characteristics

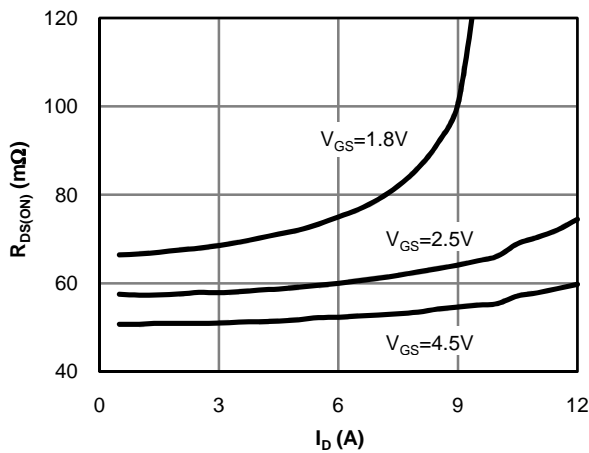


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

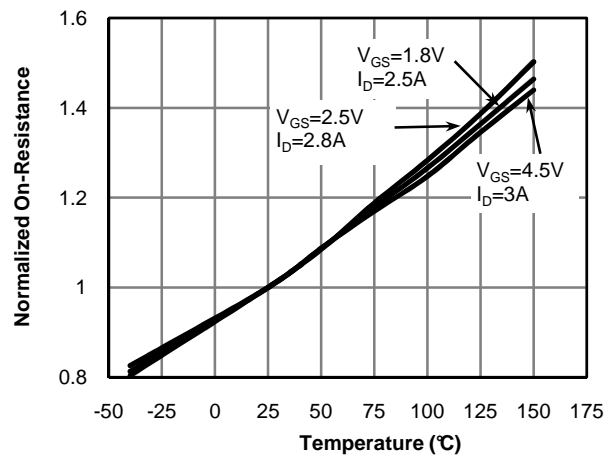


Figure 4: On-Resistance vs. Junction Temperature

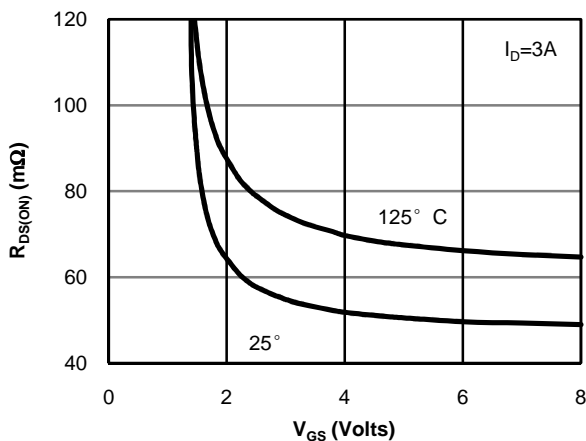


Figure 5: On-Resistance vs. Gate-Source Voltage

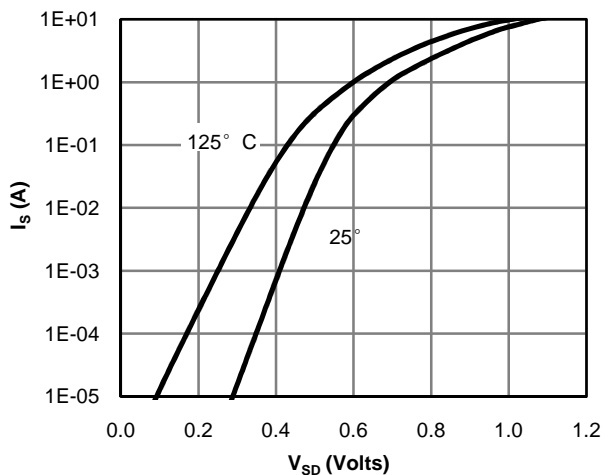


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

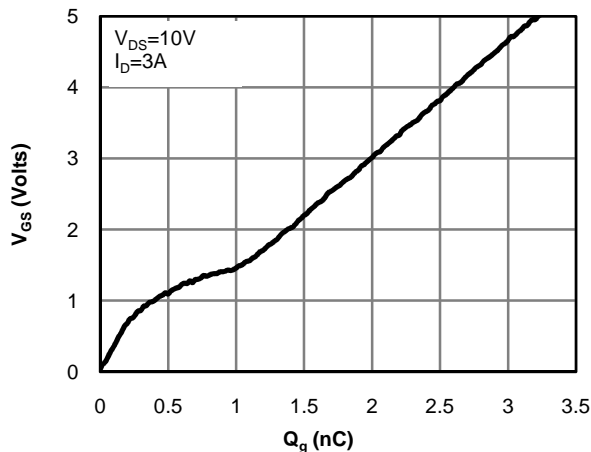


Figure 7: Gate-Charge Characteristics

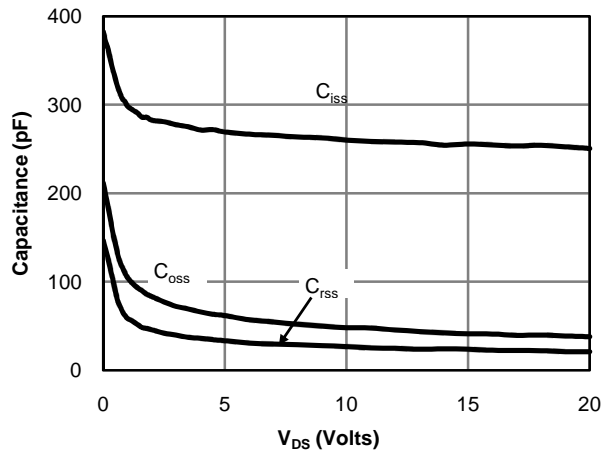


Figure 8: Capacitance Characteristics

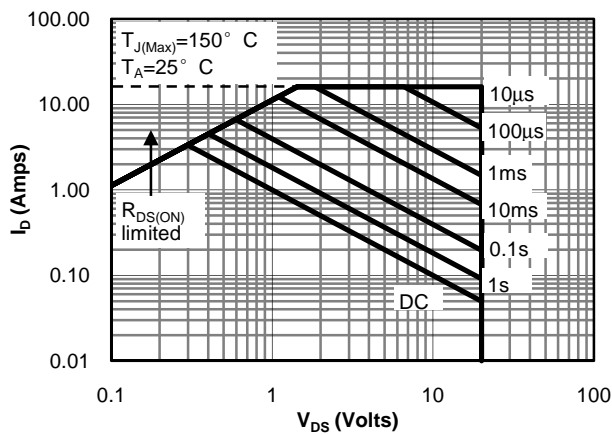


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

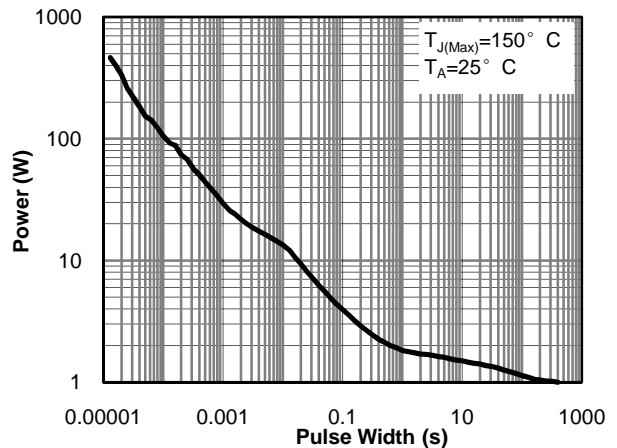


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

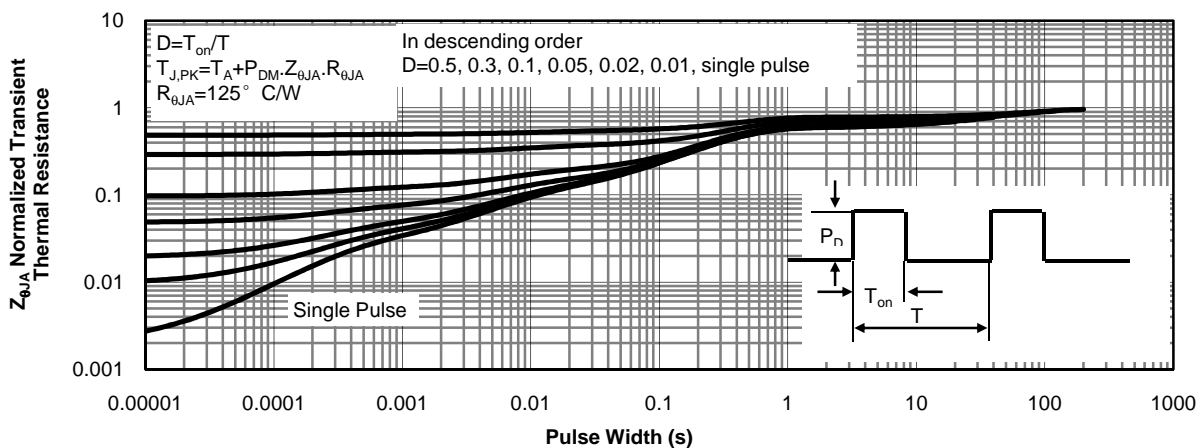
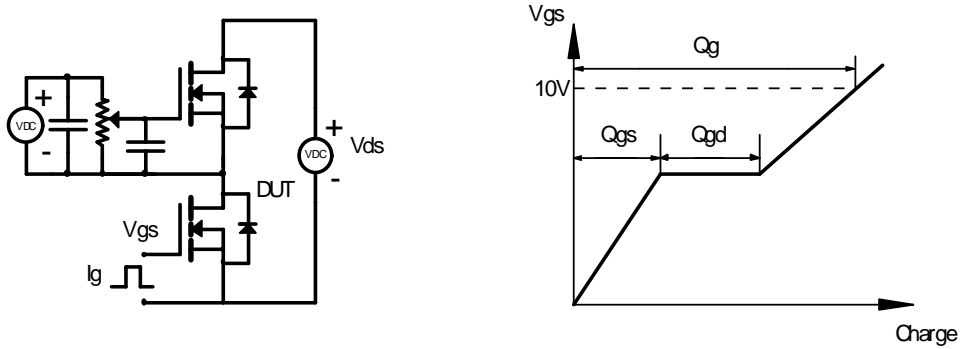
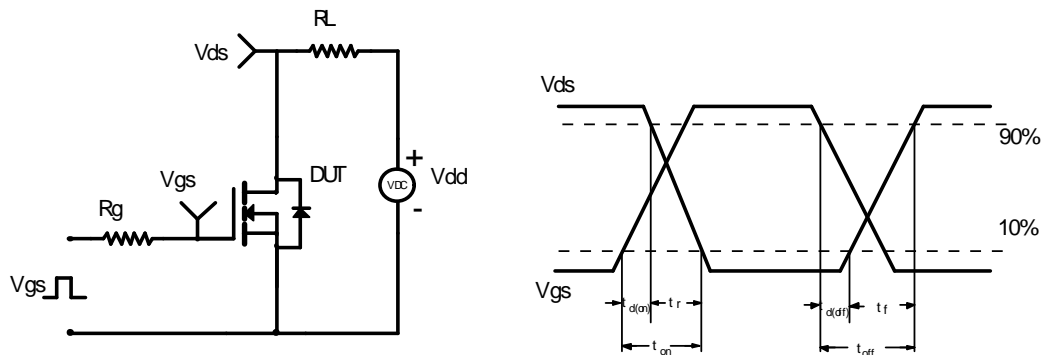


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

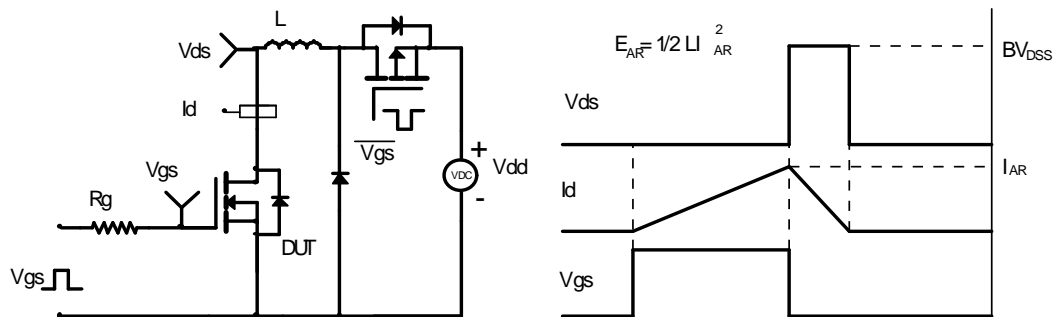
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

