

General Description

- Trench Power LV (P-ch) MOSFET technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- ESD protected
- RoHS and Halogen-Free Compliant

Applications

- This device is suitable for use as a load switch or in PWM applications.

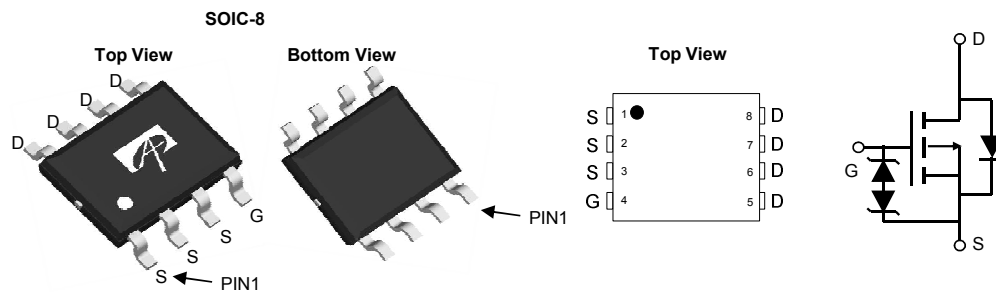
Product Summary

| | |
|-----------------------------------|----------------|
| V_{DS} | -30V |
| I_D (at $V_{GS}=-10V$) | -6A |
| $R_{DS(ON)}$ (at $V_{GS}=-10V$) | < 45m Ω |
| $R_{DS(ON)}$ (at $V_{GS}=-4.5V$) | < 80m Ω |

Typical ESD protection

100% UIS Tested
100% Rg Tested

HBM Class 1C



| Orderable Part Number | Package Type | Form | Minimum Order Quantity |
|-----------------------|--------------|-------------|------------------------|
| AO4405E | SO-8 | Tape & Reel | 3000 |

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

| Parameter | Symbol | Maximum | Units |
|--|------------------|------------------------|------------------|
| Drain-Source Voltage | V_{DS} | -30 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current | I_D | $T_A=25^\circ\text{C}$ | -6 |
| | | $T_A=70^\circ\text{C}$ | -4.7 |
| Pulsed Drain Current ^C | I_{DM} | -24 | A |
| Avalanche Current ^C | I_{AS}, I_{AR} | 15 | A |
| Avalanche energy $L=0.1\text{mH}$ ^C | E_{AS}, E_{AR} | 11 | mJ |
| V_{DS} Spike | V_{SPIKE} | -36 | V |
| Power Dissipation ^B | P_D | $T_A=25^\circ\text{C}$ | 2.5 |
| | | $T_A=70^\circ\text{C}$ | 1.6 |
| 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 | $R_{\theta JA}$ | 42 | 50 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient ^{A,D} | | Steady-State | 70 | 85 |
| Maximum Junction-to-Lead | $R_{\theta JL}$ | 20 | 30 | $^\circ\text{C/W}$ |

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|---|------|----------|----------|-------|
| STATIC PARAMETERS | | | | | | |
| B _V DSS | Drain-Source Breakdown Voltage | I _D =-250μA, V _{GS} =0V | -30 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =-30V, V _{GS} =0V T _J =55°C | | | -1 -5 | μA |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±20V | | | ±10 | μA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =-250μA | -2.5 | -2 | -1.5 | V |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =-10V, I _D =-6A T _J =125°C | | 29 40 | 45 65 | mΩ |
| | | V _{GS} =-4.5V, I _D =-4A | | 50 | 80 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =-5V, I _D =-6A | | 14 | | S |
| V _{SD} | Diode Forward Voltage | I _S =-1A, V _{GS} =0V | | -0.76 | -1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | -3 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =-15V, f=1MHz | | 495 | | pF |
| C _{oss} | Output Capacitance | | | 100 | | pF |
| C _{riss} | Reverse Transfer Capacitance | | | 56 | | pF |
| R _g | Gate resistance | f=1MHz | 3.5 | 7.5 | 11.5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _{g(10V)} | Total Gate Charge | V _{GS} =-10V, V _{DS} =-15V, I _D =-6A | | 8.8 | 16 | nC |
| Q _{g(4.5V)} | Total Gate Charge | | | 4.2 | 8 | nC |
| Q _{gs} | Gate Source Charge | | | 1.8 | | nC |
| Q _{gd} | Gate Drain Charge | | | 2.0 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =-10V, V _{DS} =-15V, R _L =2.5Ω, R _{GEN} =3Ω | | 9 | | ns |
| t _r | Turn-On Rise Time | | | 4.5 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 15.5 | | ns |
| t _f | Turn-Off Fall Time | | | 4.5 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =-6A, dI/dt=500A/μs | | 9 | | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =-6A, dI/dt=500A/μs | | 13.5 | | 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

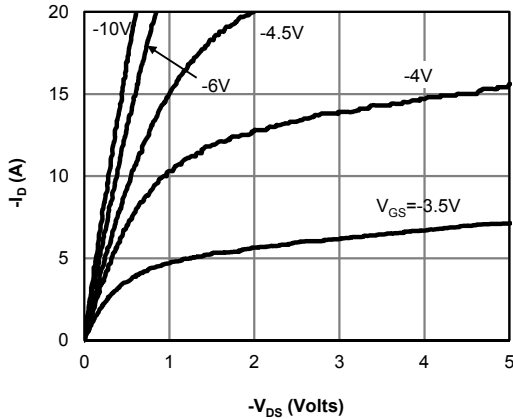


Figure 1: On-Region Characteristics (Note E)

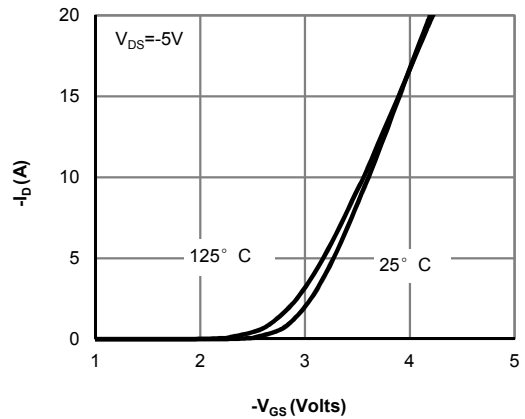


Figure 2: Transfer Characteristics (Note E)

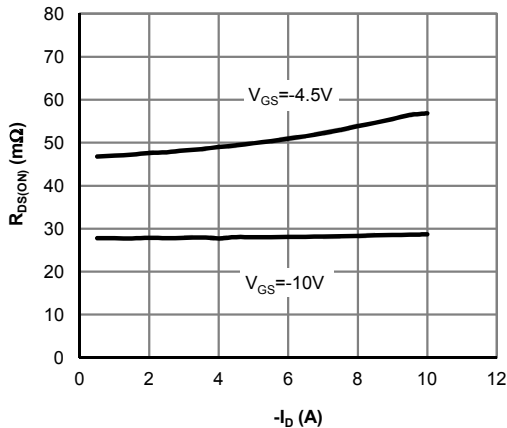


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

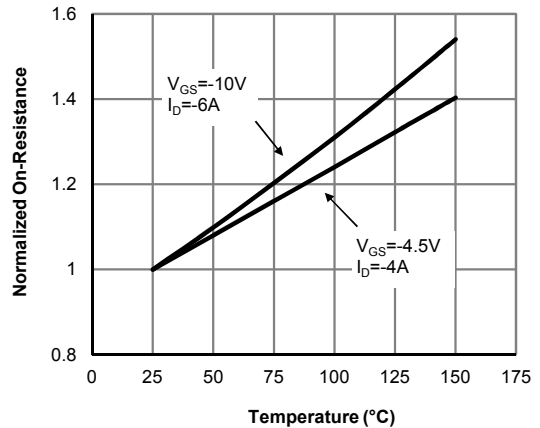


Figure 4: On-Resistance vs. Junction Temperature (Note E)

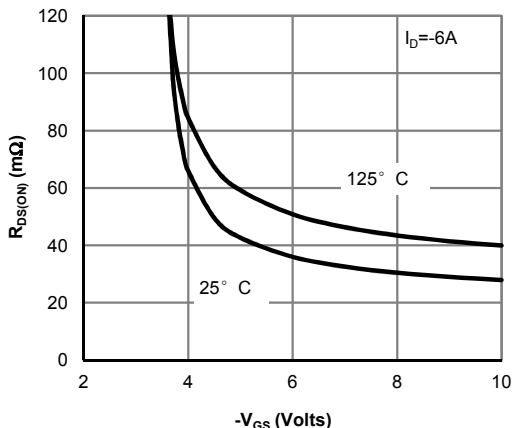


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

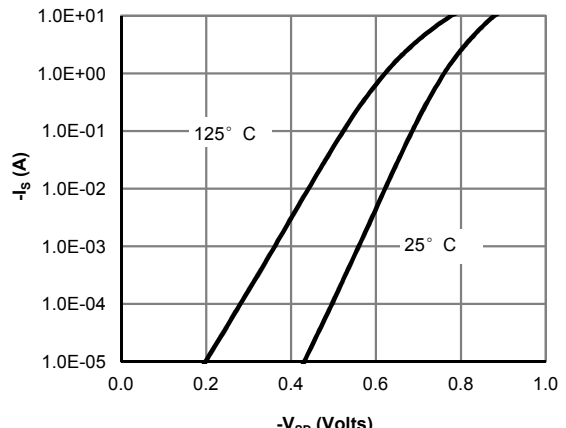


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

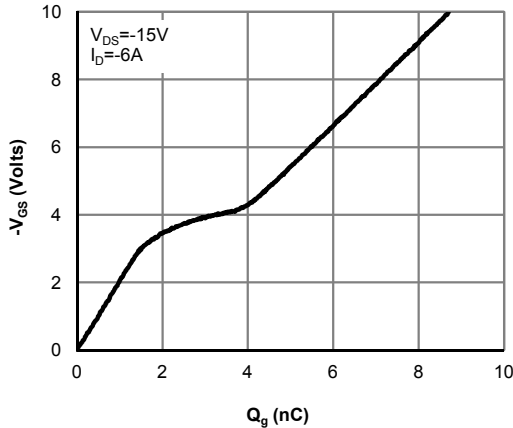


Figure 7: Gate-Charge Characteristics

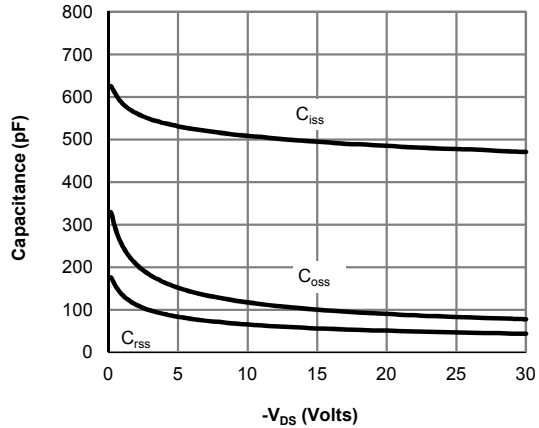


Figure 8: Capacitance Characteristics

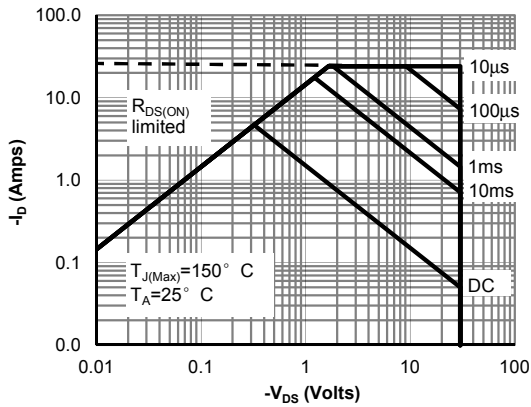


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

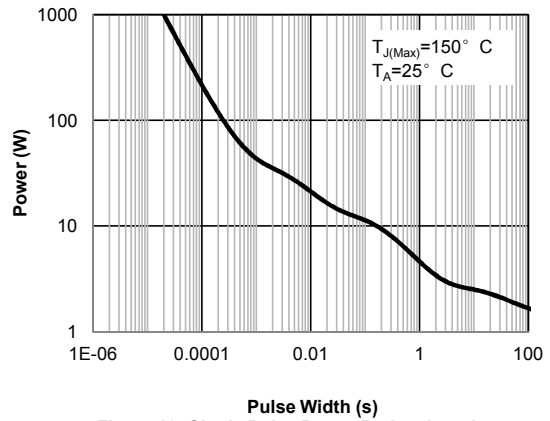


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

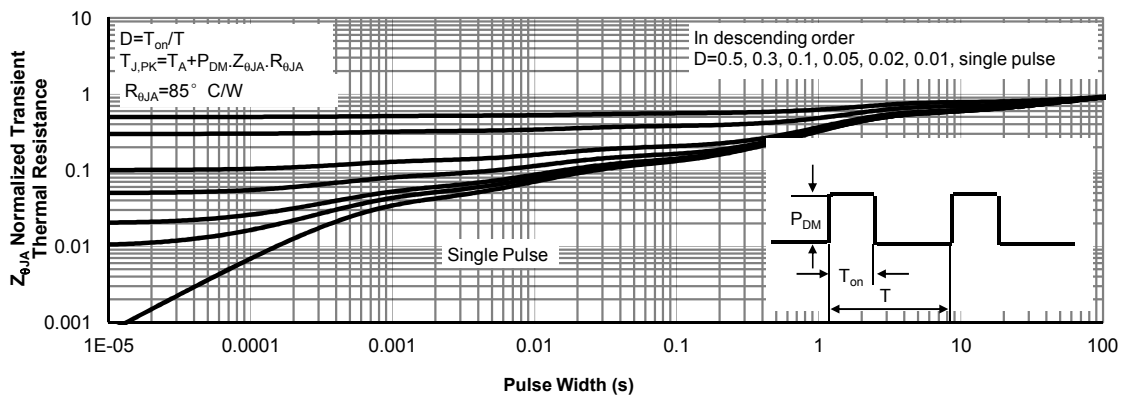
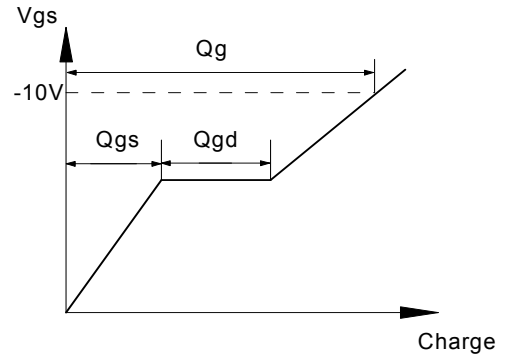
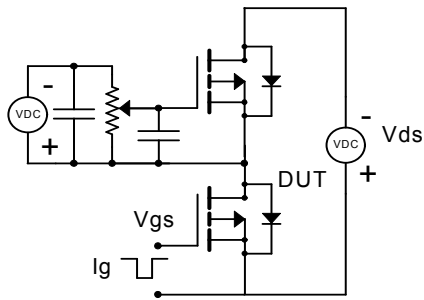
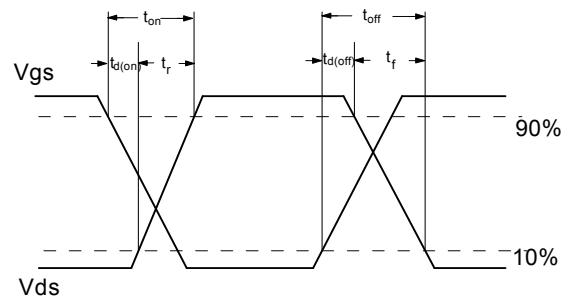
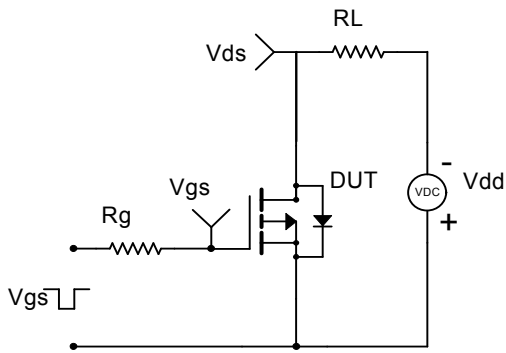


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

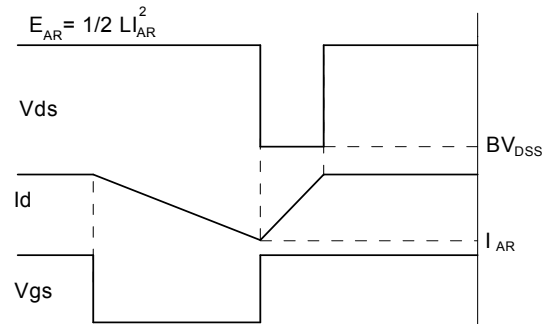
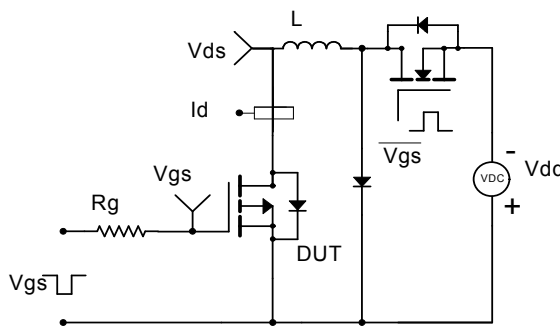
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

