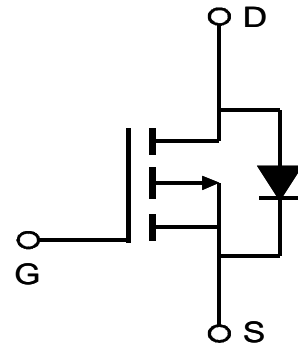


**General Description**

The AO4459 combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . This device is ideal for load switch and battery protection applications.



**Product Summary**

$V_{DS} = -30V$   $I_D = -6.5 A$

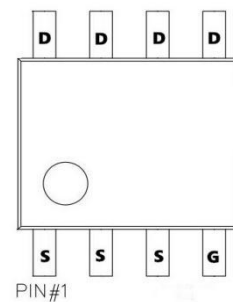
$R_{DS(ON)} < 42m\Omega @ V_{GS}=10V$

**Application**

Battery protection

Load switch

Uninterruptible power supply



**Absolute Maximum Ratings  $T_A=25^\circ C$  unless otherwise noted**

| Parameter                               | Symbol           | Maximum          | Units      |
|---|------------------|------------------|------------|
| Drain-Source Voltage                    | $V_{DS}$         | -30              | V          |
| Gate-Source Voltage                     | $V_{GS}$         | $\pm 20$         | V          |
| Continuous Drain Current                | $I_D$            | $T_A=25^\circ C$ | -6.5       |
|   |                  | $T_A=70^\circ C$ | -5.3       |
| Pulsed Drain Current <sup>C</sup>       | $I_{DM}$         | -30              | A          |
| Avalanche Current <sup>C</sup>          | $I_{AS}, I_{AR}$ | 17               | A          |
| Avalanche energy $L=0.1mH$ <sup>C</sup> | $E_{AS}, E_{AR}$ | 14               | mJ         |
| Power Dissipation <sup>B</sup>          | $P_D$            | $T_A=25^\circ C$ | 3.1        |
|   |                  | $T_A=70^\circ C$ | 2          |
| 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 <sup>A</sup> | $t \leq 10s$ | $R_{\theta JA}$ | 31  | 40  | $^\circ C/W$ |
|  | Steady-State |                 | 59  | 75  | $^\circ C/W$ |
| Maximum Junction-to-Lead                 | Steady-State | $R_{\theta JL}$ | 16  | 24  | $^\circ C/W$ |

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| Symbol               | Parameter                             | Conditions  | Min | Typ  | Max      | Units |
|----------------------|---------------------------------------|---|-----|------|----------|-------|
| BV <sub>DSS</sub>    | Drain-Source Breakdown Voltage        | I <sub>D</sub> =-250μA, V <sub>GS</sub> =0V   | -30 |      |          | V     |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =55°C                          |     |      | -1<br>-5 | μA    |
| I <sub>GSS</sub>     | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V   |     |      | ±100     | nA    |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =-250μA                                     | -1  | -1.5 | -2.5     | V     |
| I <sub>D(ON)</sub>   | On state drain current                | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V   | -30 |      |          | A     |
| R <sub>DS(ON)</sub>  | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-10V, I <sub>D</sub> =-6.5A  |     | 33   | 42       | mΩ    |
|                      |                                       | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A   |     | 56   | 60       | mΩ    |
| g <sub>FS</sub>      | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-6.5A   |     | 14   |          | S     |
| V <sub>SD</sub>      | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V  |     | -0.8 | -1       | V     |
| I <sub>S</sub>       | Maximum Body-Diode Continuous Current |   |     |      | -3.5     | A     |
| C <sub>iss</sub>     | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz  |     | 520  |          | pF    |
| C <sub>oss</sub>     | Output Capacitance                    |   |     | 100  |          | pF    |
| C <sub>riss</sub>    | Reverse Transfer Capacitance          |   |     | 65   |          | pF    |
| R <sub>g</sub>       | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  | 3.5 | 7.5  | 11.5     | Ω     |
| Q <sub>g(10V)</sub>  | Total Gate Charge                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-6.5A                         |     | 9.2  | 11       | nC    |
| Q <sub>g(4.5V)</sub> | Total Gate Charge                     |   |     | 4.6  | 6        | nC    |
| Q <sub>gs</sub>      | Gate Source Charge                    |   |     | 1.6  |          | nC    |
| Q <sub>gd</sub>      | Gate Drain Charge                     |   |     | 2.2  |          | nC    |
| t <sub>D(on)</sub>   | Turn-On DelayTime                     |   |     |      | 7.5      |       |
| t <sub>r</sub>       | Turn-On Rise Time                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =2.5Ω,<br>R <sub>GEN</sub> =3Ω |     | 5.5  |          | ns    |
| t <sub>D(off)</sub>  | Turn-Off DelayTime                    |   |     | 19   |          | ns    |
| t <sub>f</sub>       | Turn-Off Fall Time                    |   |     | 7    |          | ns    |
| t <sub>rr</sub>      | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-6.5A, dI/dt=100A/μs  |     | 11   |          | ns    |
| Q <sub>rr</sub>      | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-6.5A, dI/dt=100A/μs  |     | 5.3  |          | nC    |

A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The value in any given application depends on the user's specific board design.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150° C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25° C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> 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 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150° C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

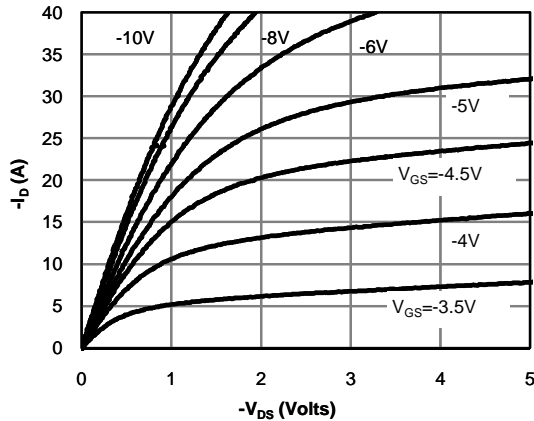


Fig 1: On-Region Characteristics (Note E)

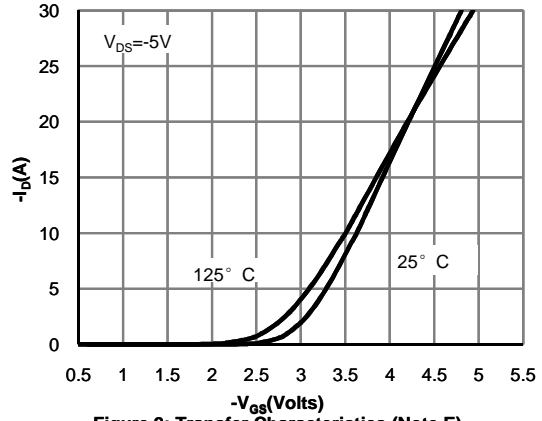


Figure 2: Transfer Characteristics (Note E)

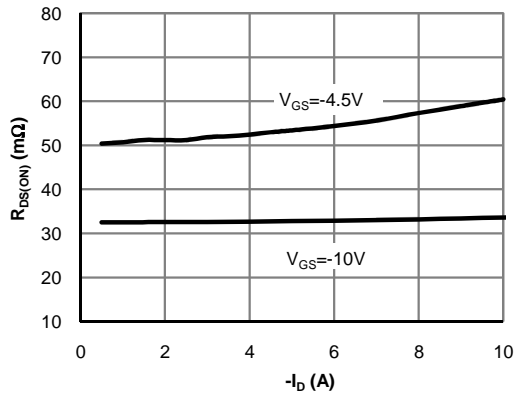


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

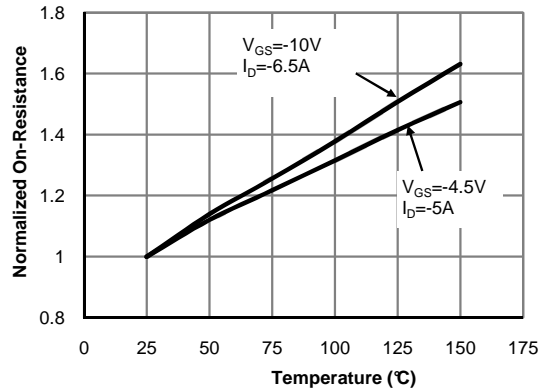


Figure 4: On-Resistance vs. Junction Temperature (Note E)

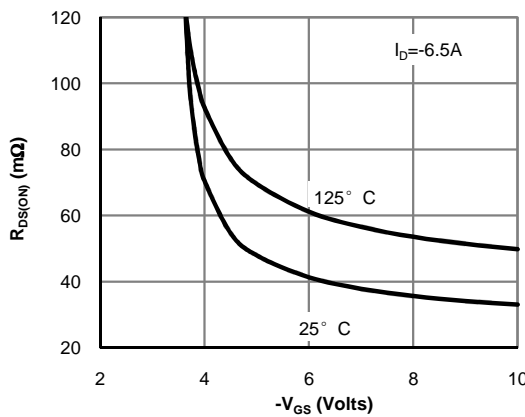


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

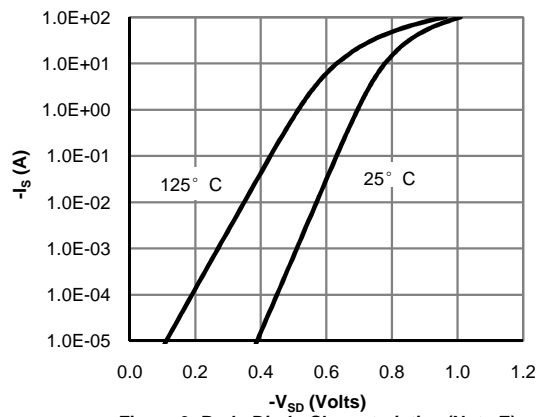


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

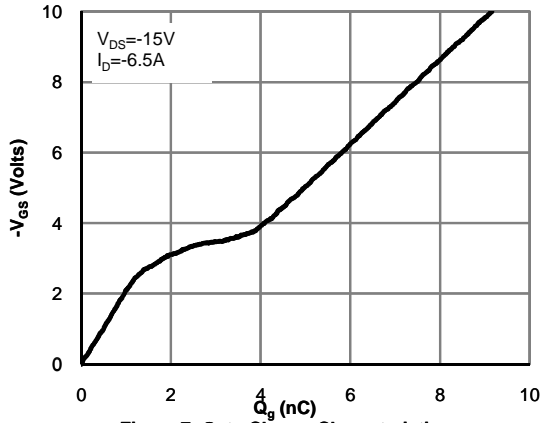


Figure 7: Gate-Charge Characteristics

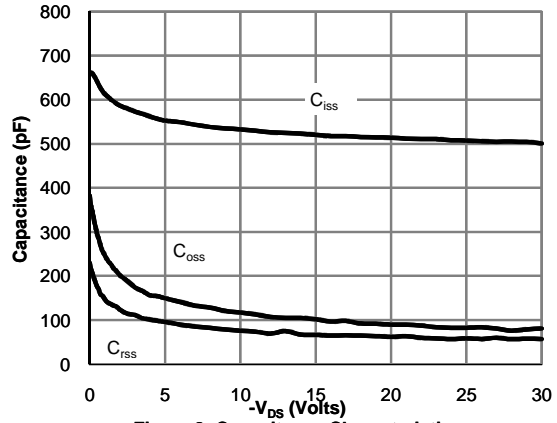


Figure 8: Capacitance Characteristics

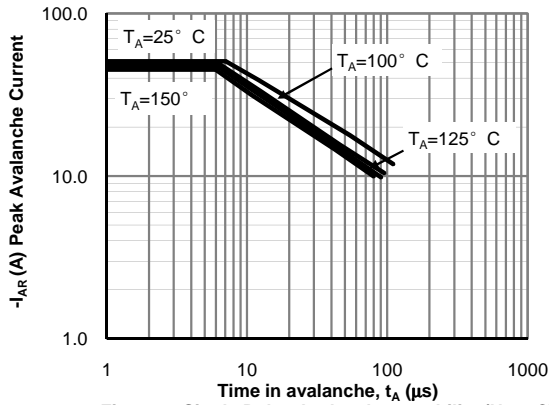


Figure 9: Single Pulse Avalanche capability (Note C)

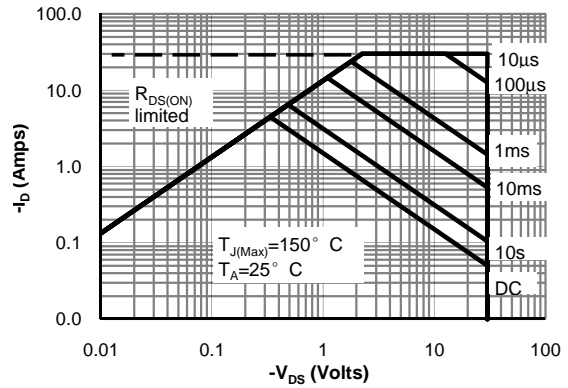


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

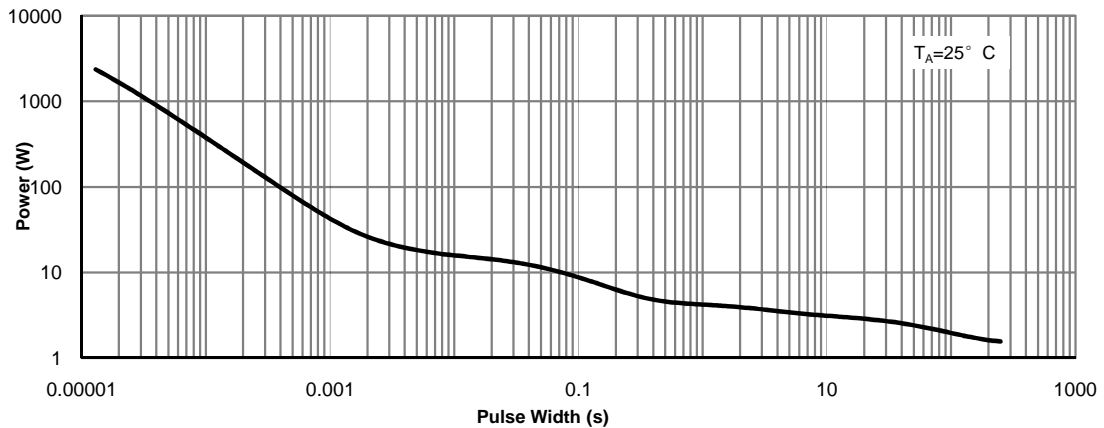


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

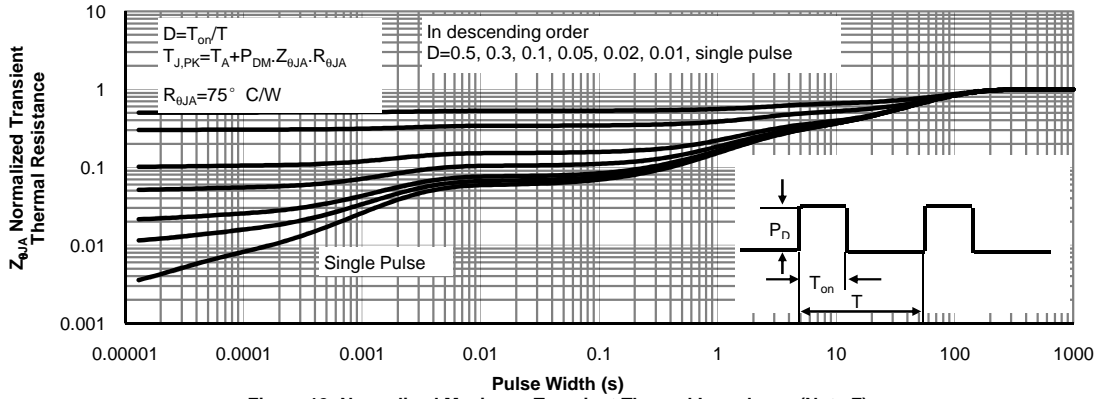
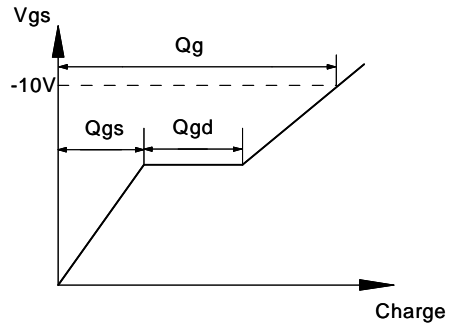
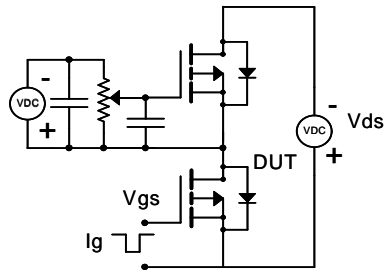
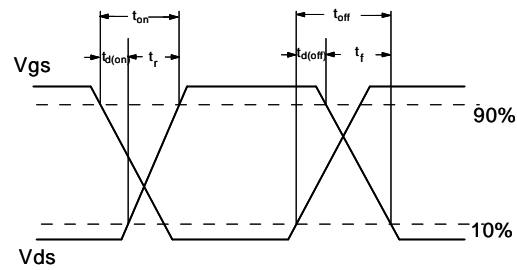
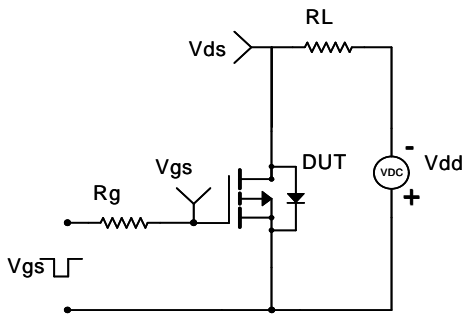


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

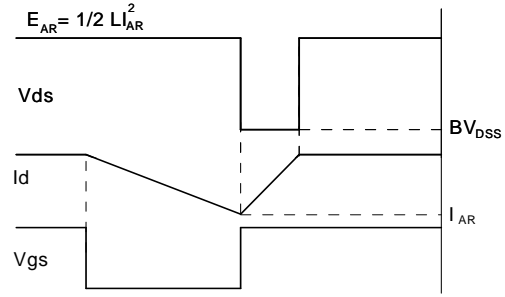
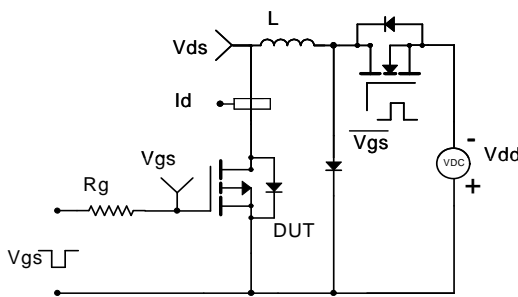
Gate Charge Test Circuit & Waveform



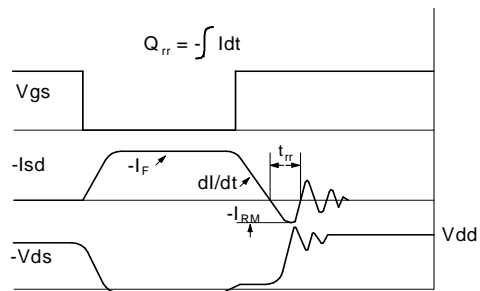
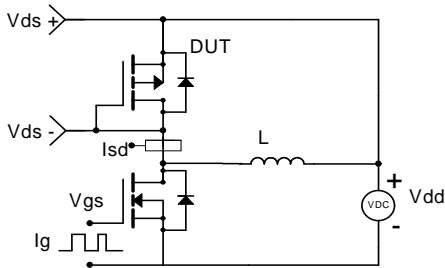
Resistive Switching Test Circuit & Waveforms



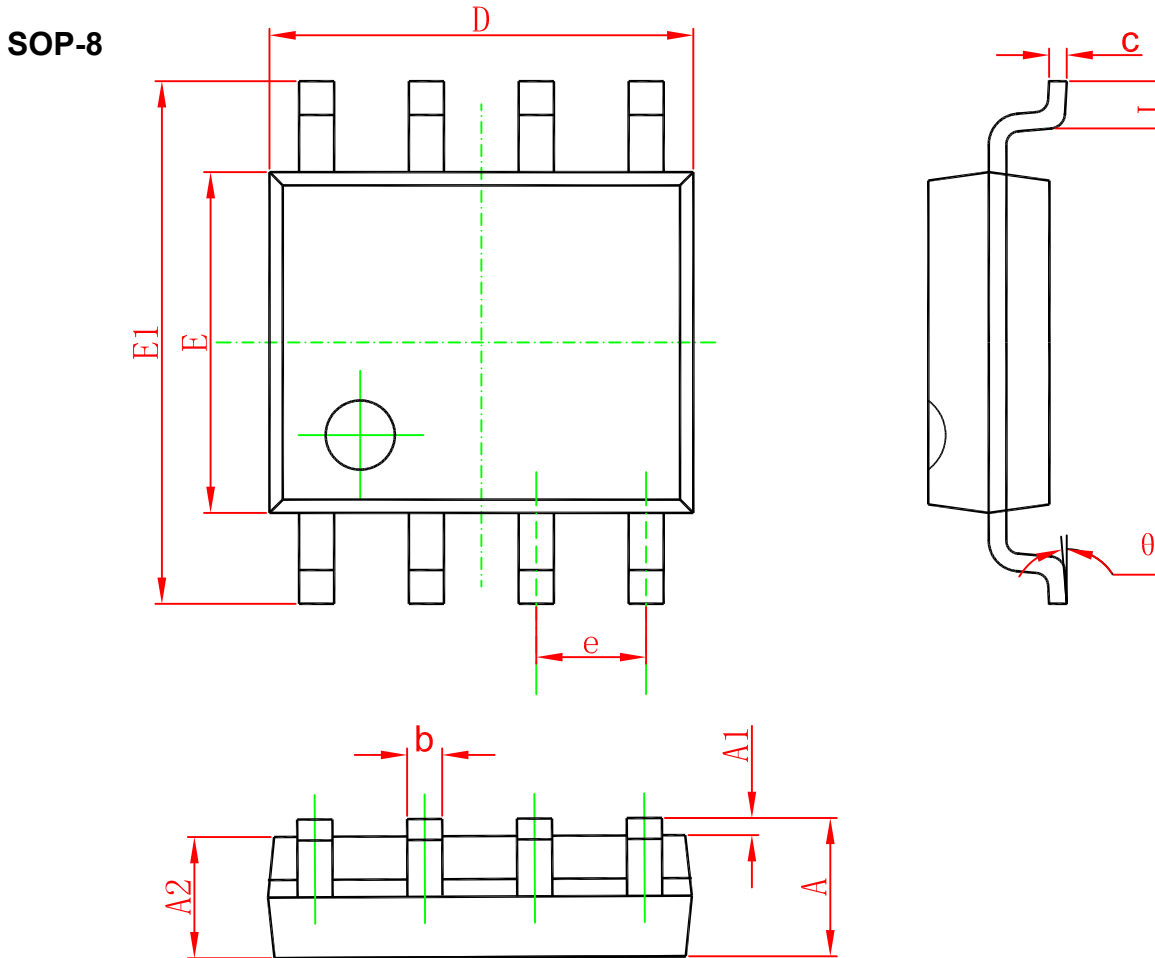
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

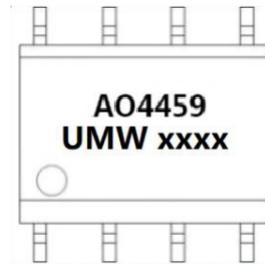


PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1     | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2     | 1.350                     | 1.550 | 0.053                | 0.061 |
| b      | 0.330                     | 0.510 | 0.013                | 0.020 |
| c      | 0.170                     | 0.250 | 0.006                | 0.010 |
| D      | 4.700                     | 5.100 | 0.185                | 0.200 |
| E      | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1     | 5.800                     | 6.200 | 0.228                | 0.244 |
| e      | 1.270(BSC)                |       | 0.050(BSC)           |       |
| L      | 0.400                     | 1.270 | 0.016                | 0.050 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

**Marking**



("xxxx"代表年份周期)

**Ordering information**

| Order code | Package | Baseqty | Deliverymode  |
|------------|---------|---------|---------------|
| UMW AO4459 | SOP-8   | 3000    | Tape and reel |



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