

### General Description

The AO4407A uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , and ultra-low low gate charge with a 25V gate rating. This device is suitable for use as a load switch or in PWM applications.

\* RoHS and Halogen-Free Complaint

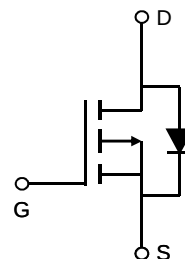
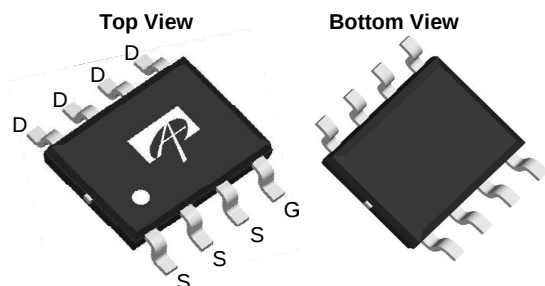
### Product Summary

$V_{DS} = -30V$   
 $I_D = -12A$  ( $V_{GS} = -20V$ )  
 $R_{DS(ON)} < 11m\Omega$  ( $V_{GS} = -20V$ )  
 $R_{DS(ON)} < 13m\Omega$  ( $V_{GS} = -10V$ )  
 $R_{DS(ON)} < 17m\Omega$  ( $V_{GS} = -6V$ )

100% UIS Tested  
100% Rg Tested



SOIC-8



### 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                                | $V_{GS}$       | $\pm 25$   | V          |
| Continuous Drain Current <sup>A</sup>              | $I_D$          | -12        | A          |
| $T_A=25^\circ C$                                   |                | -10        |            |
| $T_A=70^\circ C$                                   |                | -60        |            |
| Pulsed Drain Current <sup>B</sup>                  | $I_{DM}$       | -26        |            |
| Avalanche Current <sup>G</sup>                     | $I_{AR}$       | 101        | mJ         |
| Repetitive avalanche energy $L=0.3mH$ <sup>G</sup> | $E_{AR}$       | 3.1        | W          |
| Power Dissipation <sup>A</sup>                     | $P_D$          | 2.0        |            |
| $T_A=25^\circ C$                                   |                |            |            |
| $T_A=70^\circ C$                                   |                |            |            |
| 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> | $R_{\theta JA}$ | 32  | 40  | $^\circ C/W$ |
| $t \leq 10s$                             |                 | 60  | 75  | $^\circ C/W$ |
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JL}$ | 17  | 24  | $^\circ C/W$ |
| Steady State                             |                 |     |     |              |
| Maximum Junction-to-Lead <sup>C</sup>    |                 |     |     |              |

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

| Symbol                      | Parameter                             | Conditions                                                                                   | Min  | Typ         | Max      | Units |
|-----------------------------|---------------------------------------|----------------------------------------------------------------------------------------------|------|-------------|----------|-------|
| <b>STATIC PARAMETERS</b>    |                                       |                                                                                              |      |             |          |       |
| 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> = ±25V                                                 |      |             | ±100     | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                  | -1.7 | -2.3        | -3       | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> = -10V, V <sub>DS</sub> = -5V                                                | -60  |             |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> = -20V, I <sub>D</sub> = -12A<br>T <sub>J</sub> = 125°C                      |      | 8.5<br>11.5 | 11<br>15 | mΩ    |
|                             |                                       | V <sub>GS</sub> = -10V, I <sub>D</sub> = -12A                                                |      | 10          | 13       |       |
|                             |                                       | V <sub>GS</sub> = -6V, I <sub>D</sub> = -10A                                                 |      | 12.7        | 17       |       |
|                             |                                       |                                                                                              |      |             |          |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> = -5V, I <sub>D</sub> = -10A                                                 |      | 21          |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> = -1A, V <sub>GS</sub> = 0V                                                   |      | -0.7        | -1       | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                              |      |             | -3       | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                              |      |             |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz                                           |      | 2060        | 2600     | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                              |      | 370         |          | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                              |      | 295         |          | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                             |      | 2.4         | 3.6      | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                              |      |             |          |       |
| Q <sub>g</sub>              | Total Gate Charge                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-12A                           |      | 30          | 39       | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                              |      | 4.6         |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                              |      | 10          |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =1.25Ω,<br>R <sub>GEN</sub> =3Ω |      | 11          |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                              |      | 9.4         |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                              |      | 24          |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                              |      | 12          |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-12A, dI/dt=100A/μs                                                          |      | 30          | 40       | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-12A, dI/dt=100A/μs                                                          |      | 22          |          | nC    |

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1 in<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. The current rating is based on the t ≤ 10s thermal resistance rating.

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

C: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

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

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

F: The current rating is based on the t ≤ 10s thermal resistance rating.

G: E<sub>AR</sub> and I<sub>AR</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub>=25°C.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

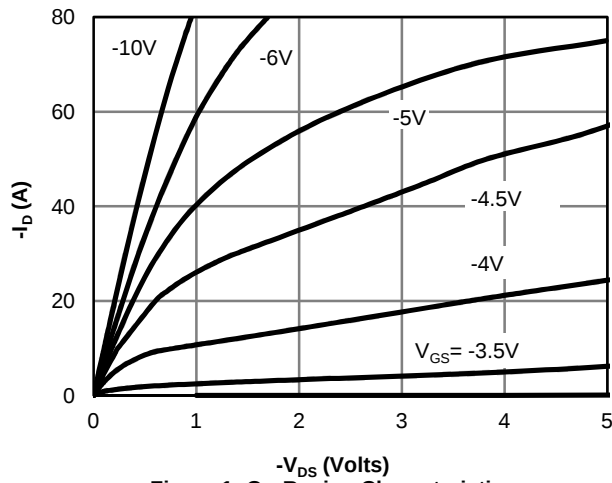


Figure 1: On-Region Characteristics

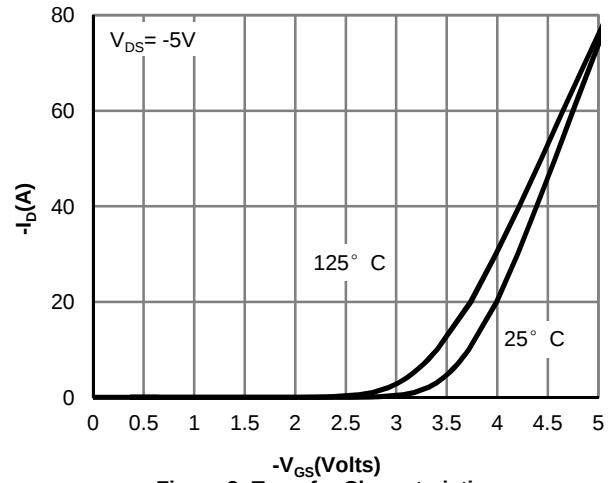


Figure 2: Transfer Characteristics

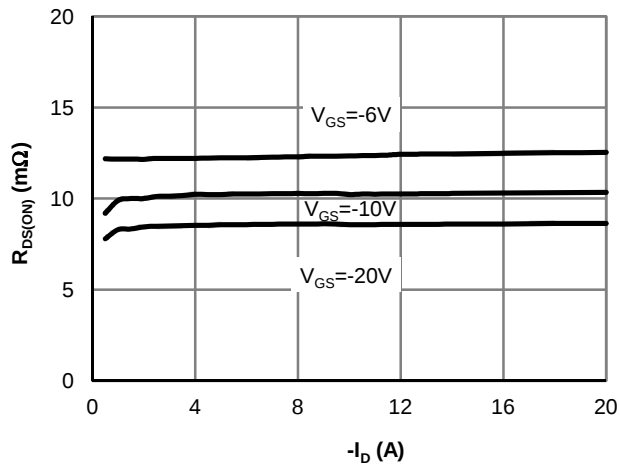


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

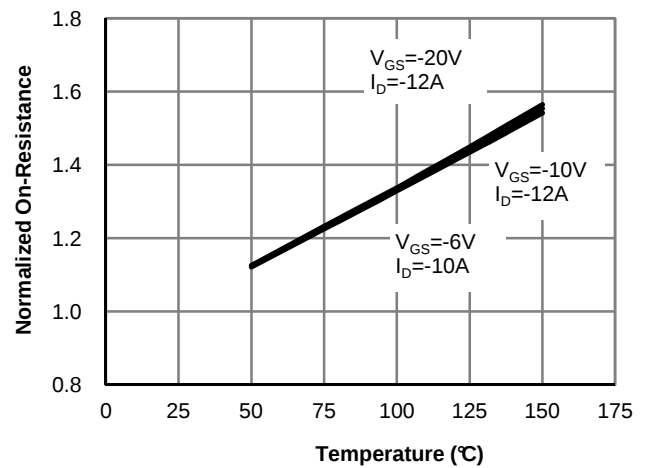


Figure 4: On-Resistance vs. Junction Temperature

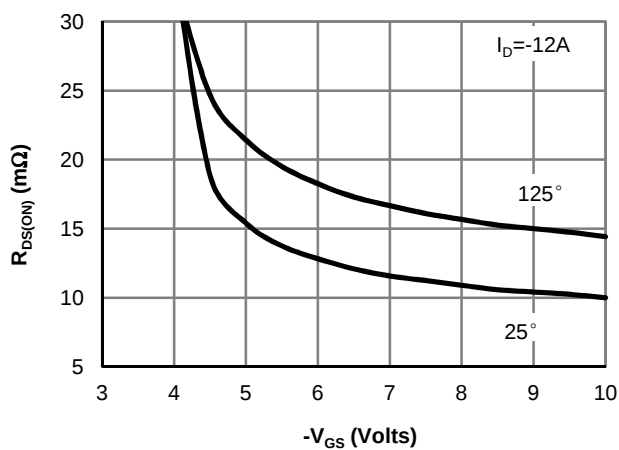


Figure 5: On-Resistance vs. Gate-Source Voltage

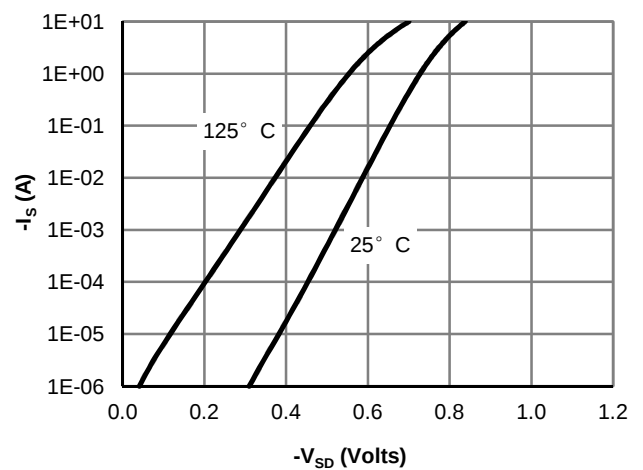
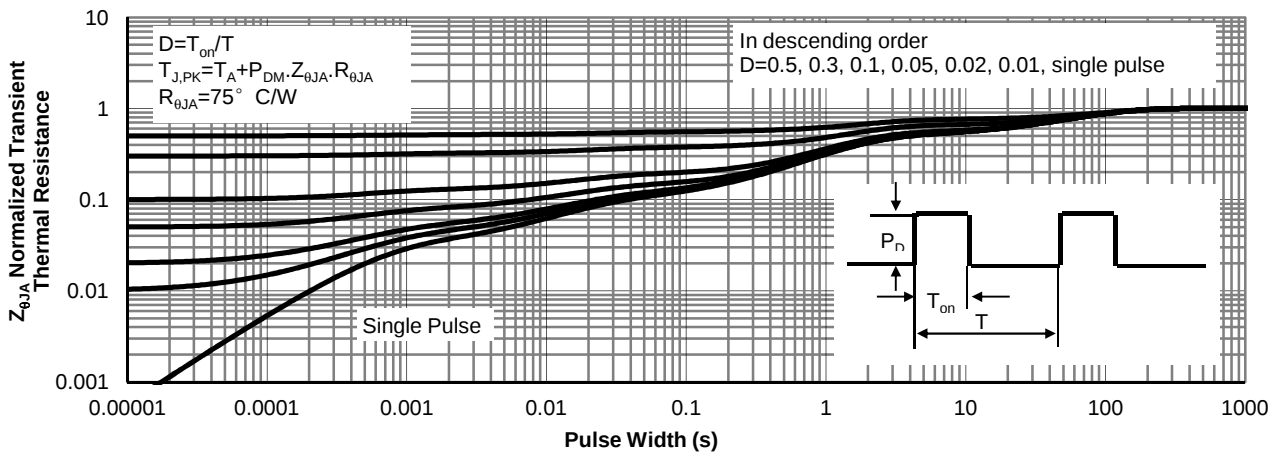
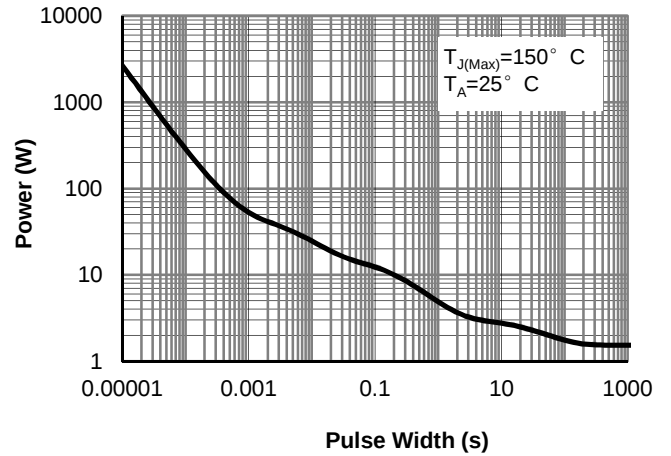
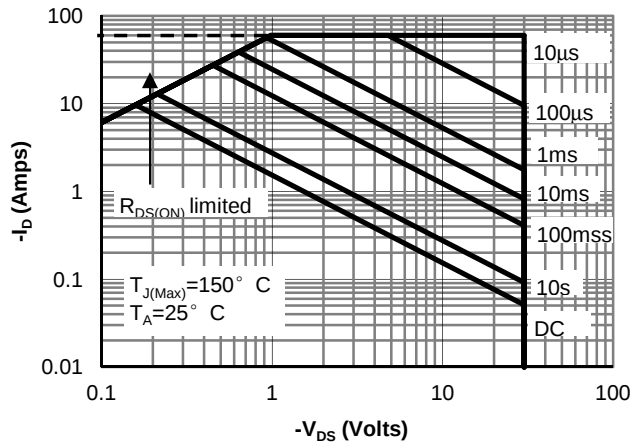
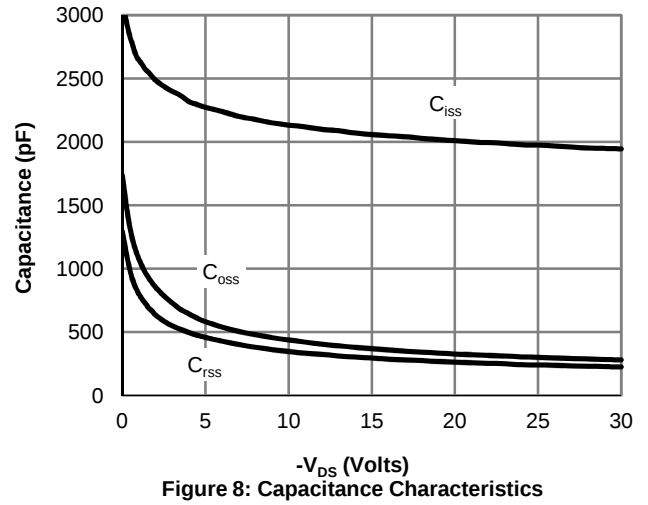
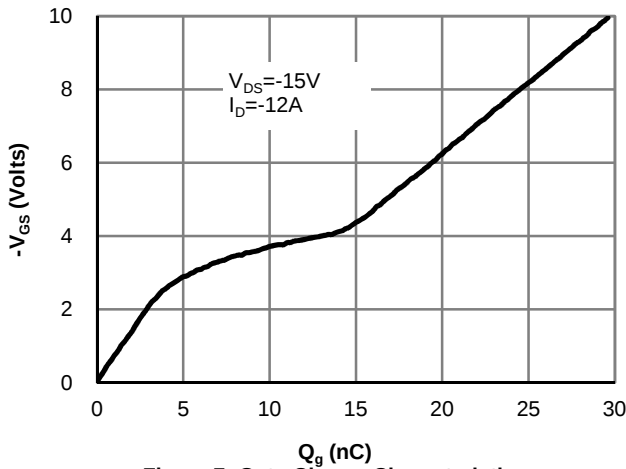
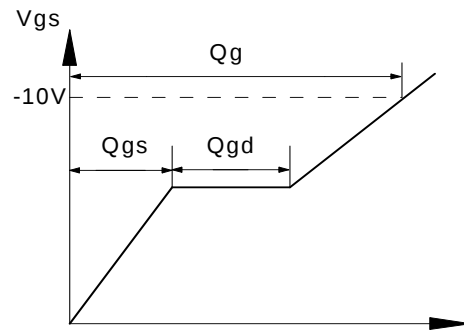
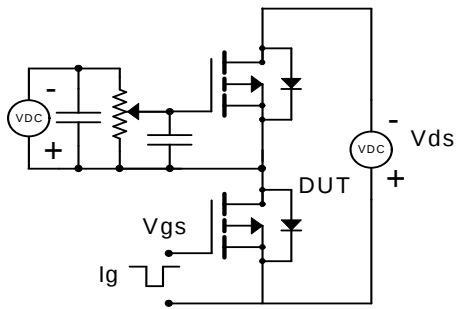


Figure 6: Body-Diode Characteristics

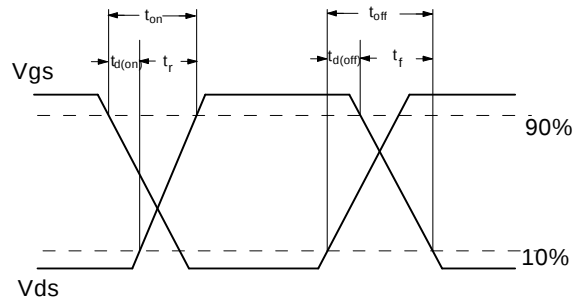
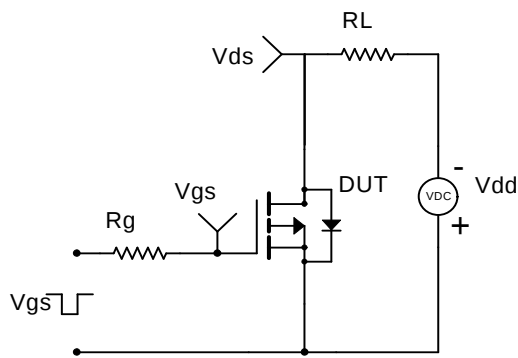
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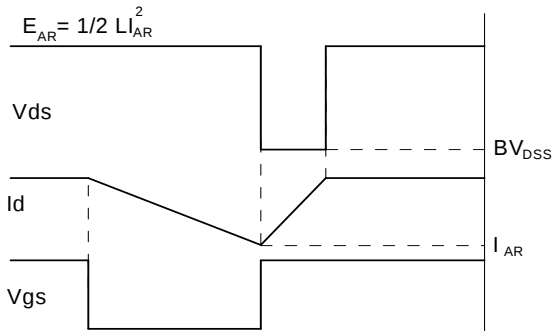
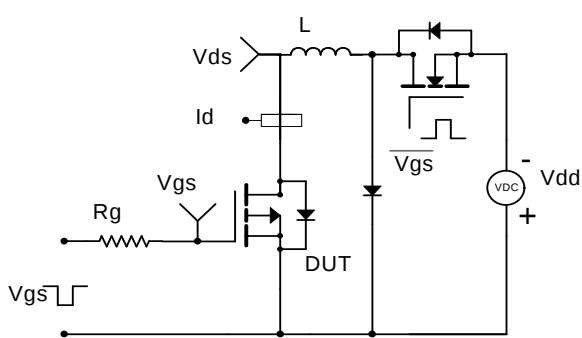
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

