



ALPHA & OMEGA
SEMICONDUCTOR

AON7516

30V N-Channel AlphaMOS

General Description

- Latest Trench Power AlphaMOS (α MOS LV) technology
- Very Low RDS(on) at 4.5V_{GS}
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

Product Summary

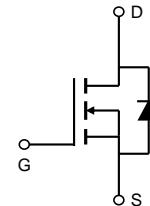
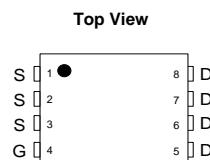
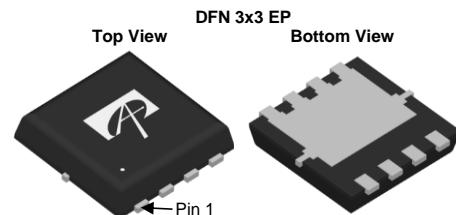
| | |
|---|---------|
| V _{DS} | 30V |
| I _D (at V _{GS} =10V) | 30A |
| R _{DS(ON)} (at V _{GS} =10V) | < 4.5mΩ |
| R _{DS(ON)} (at V _{GS} = 4.5V) | < 6.8mΩ |

Application

- DC/DC Converters in Computing, Servers, and POL
- Isolated DC/DC Converters in Telecom and Industrial

100% UIS Tested

100% R_g Tested



Absolute Maximum Ratings T_A=25°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 ^G | I _D | 30 | A |
| T _C =100°C | | | |
| Pulsed Drain Current ^C | I _{DM} | 80 | A |
| Continuous Drain Current | I _{DSM} | 20 | A |
| T _A =70°C | | | |
| Avalanche Current ^C | I _{AS} | 34 | A |
| Avalanche energy L=0.05mH ^C | E _{AS} | 29 | mJ |
| V _{DS} Spike | V _{SPIKE} | 36 | V |
| Power Dissipation ^B | P _D | 25 | W |
| T _C =100°C | | | |
| Power Dissipation ^A | P _{DSM} | 3.1 | W |
| T _A =70°C | | | |
| Junction and Storage Temperature Range | T _J , T _{STG} | -55 to 150 | °C |

Thermal Characteristics

| Parameter | Symbol | Typ | Max | Units |
|---|------------------|-----|-----|-------|
| Maximum Junction-to-Ambient ^A | R _{θJA} | 30 | 40 | °C/W |
| Maximum Junction-to-Ambient ^{A,D} Steady-State | | 60 | 75 | °C/W |
| Maximum Junction-to-Case | R _{θJC} | 4.2 | 5 | °C/W |

Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|--|-----|------|--------|------------------|
| STATIC PARAMETERS | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_D=250\mu\text{A}, V_{GS}=0\text{V}$ | 30 | | | V |
| $I_{\text{DS}}^{\text{SS}}$ | Zero Gate Voltage Drain Current | $V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$ | | | 1 5 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$ | | | 100 | nA |
| $V_{GS(\text{th})}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$ | 1.2 | 1.8 | 2.2 | V |
| $R_{DS(\text{ON})}$ | Static Drain-Source On-Resistance | $V_{GS}=10\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$ | | 3.7 | 4.5 | $\text{m}\Omega$ |
| | | $V_{GS}=4.5\text{V}, I_D=20\text{A}$ | | 5.3 | 6.5 | $\text{m}\Omega$ |
| g_{fs} | Forward Transconductance | $V_{DS}=5\text{V}, I_D=20\text{A}$ | | 83 | | S |
| V_{SD} | Diode Forward Voltage | $I_S=1\text{A}, V_{GS}=0\text{V}$ | | 0.7 | 1 | V |
| I_S | Maximum Body-Diode Continuous Current | | | | 30 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$ | | 1229 | | pF |
| C_{oss} | Output Capacitance | | | 526 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 83 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$ | 0.8 | 1.7 | 2.6 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge | $V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=20\text{A}$ | | 24 | 33 | nC |
| $Q_g(4.5\text{V})$ | Total Gate Charge | | | 12 | 17 | nC |
| Q_{gs} | Gate Source Charge | | | 4 | | nC |
| Q_{gd} | Gate Drain Charge | | | 5.5 | | nC |
| $t_{D(\text{on})}$ | Turn-On Delay Time | $V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.75\Omega, R_{\text{GEN}}=3\Omega$ | | 7.0 | | ns |
| t_r | Turn-On Rise Time | | | 4.8 | | ns |
| $t_{D(\text{off})}$ | Turn-Off Delay Time | | | 24.0 | | ns |
| t_f | Turn-Off Fall Time | | | 5.8 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$ | | 12.6 | | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$ | | 15.2 | | nC |

A. The value of R_{0JA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The Power dissipation P_{DSM} is based on R_{0JA} and the maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design.

B. The power dissipation P_D is based on $T_{J(\text{MAX})}=150^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Single pulse width limited by junction temperature $T_{J(\text{MAX})}=150^\circ\text{C}$.

D. The R_{0JA} is the sum of the thermal impedance from junction to case R_{0JC} and case to ambient.

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

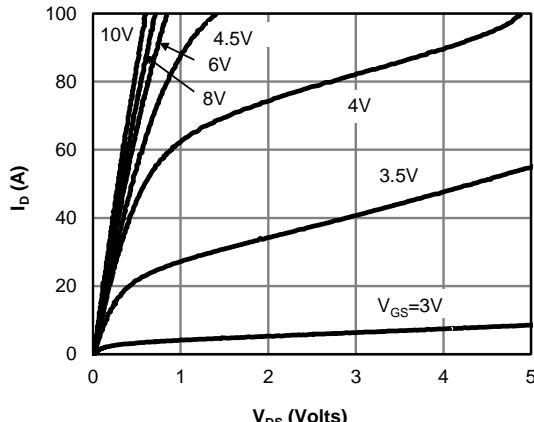
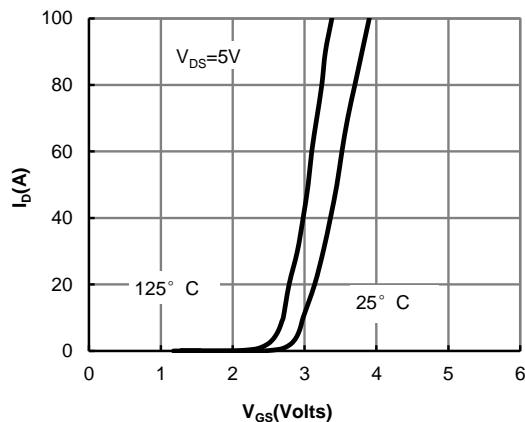
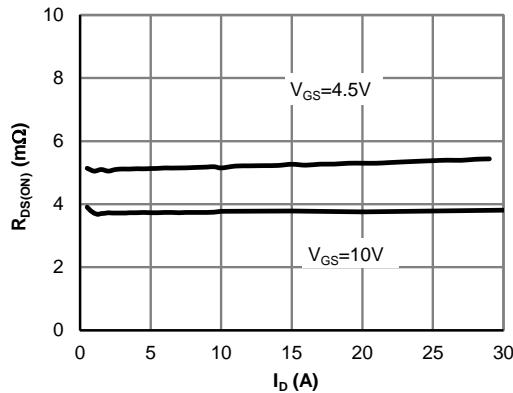
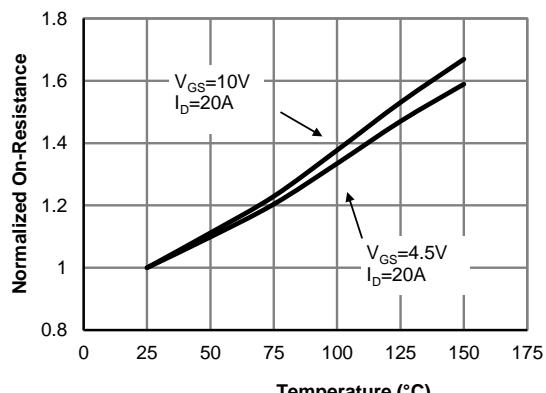
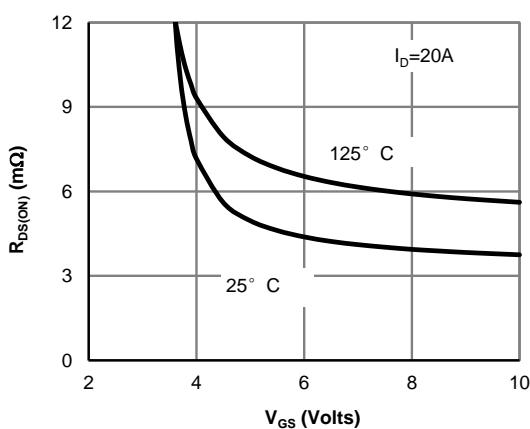
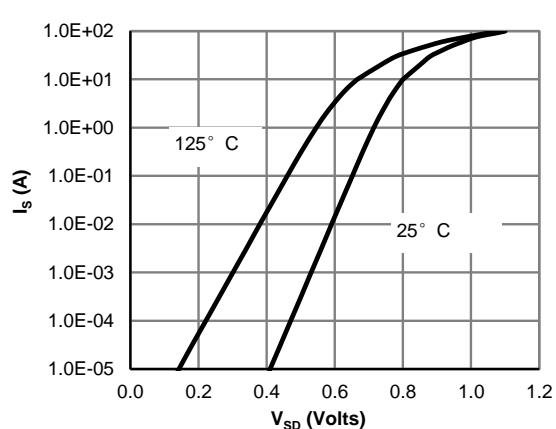
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(\text{MAX})}=150^\circ\text{C}$. The SOA curve provides a single pulse rating.

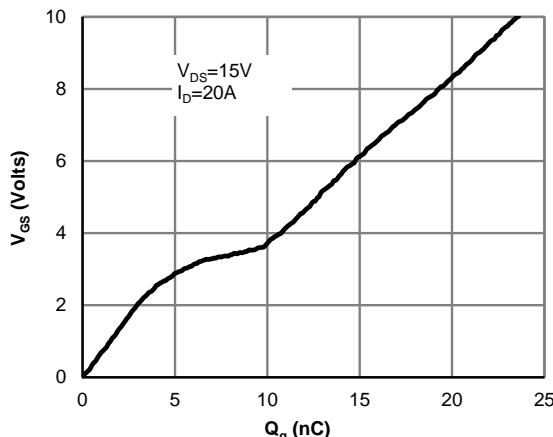
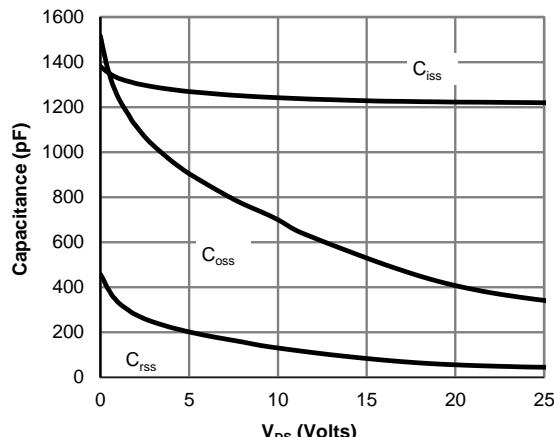
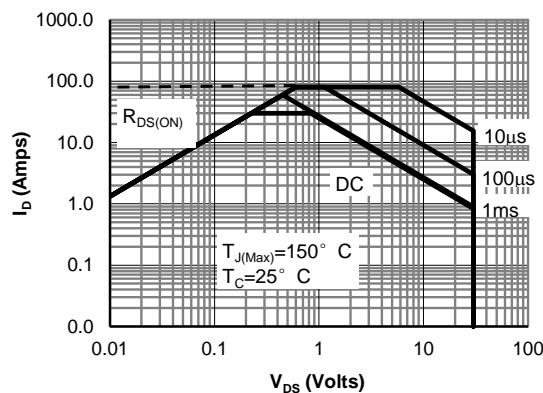
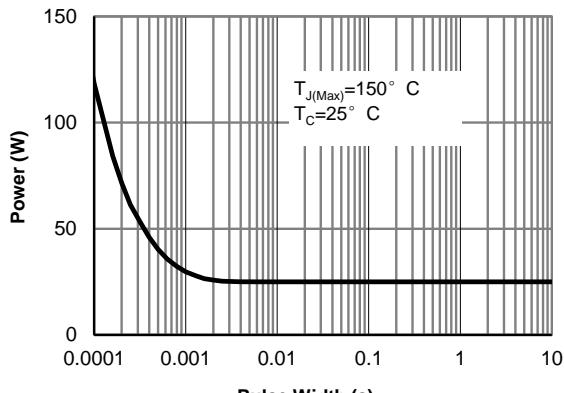
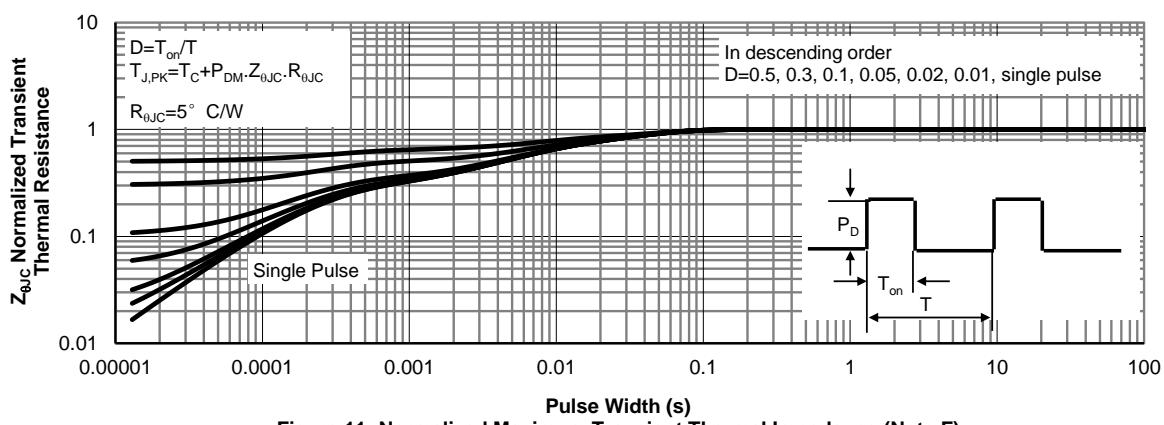
G. The maximum current rating is package limited.

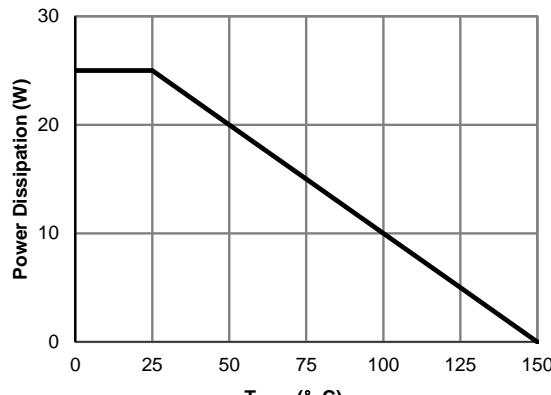
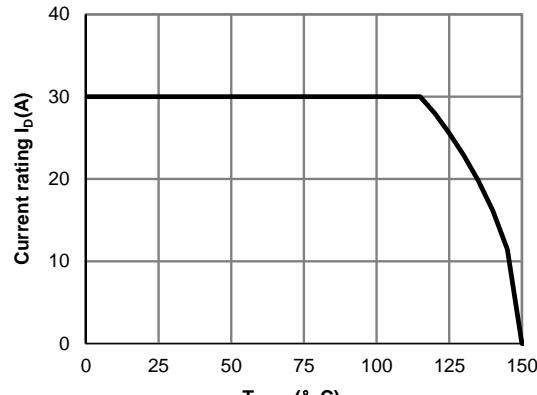
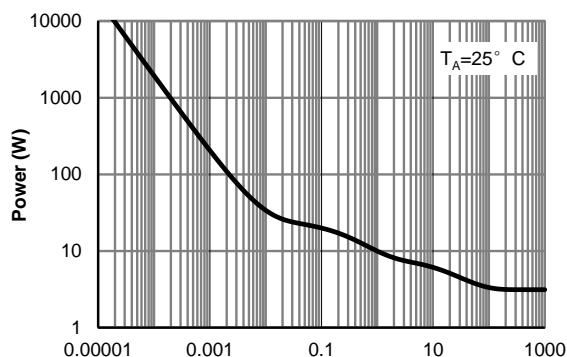
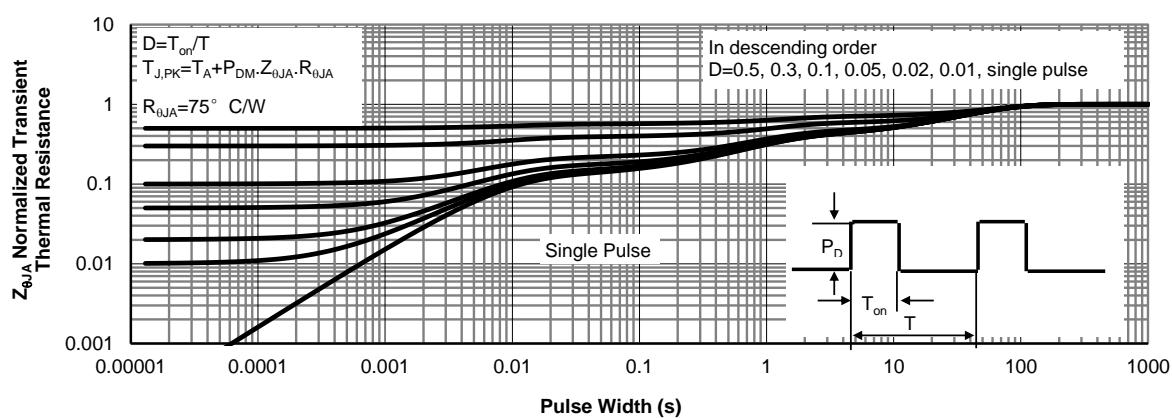
H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$.

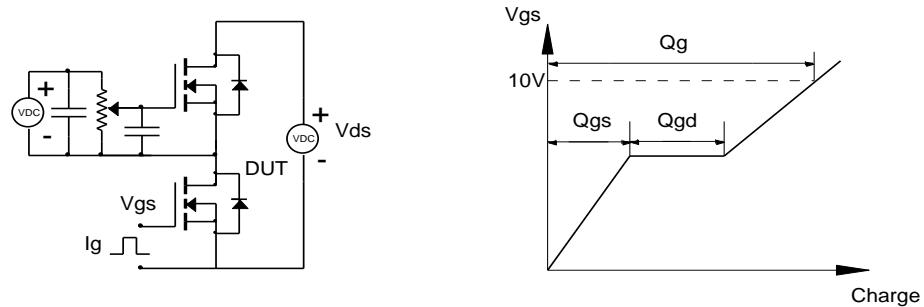
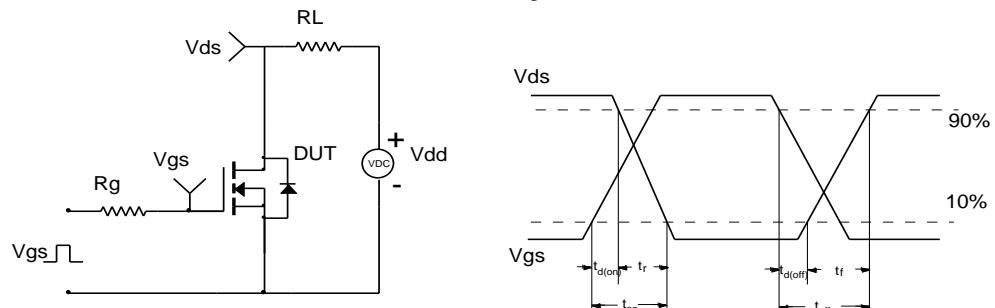
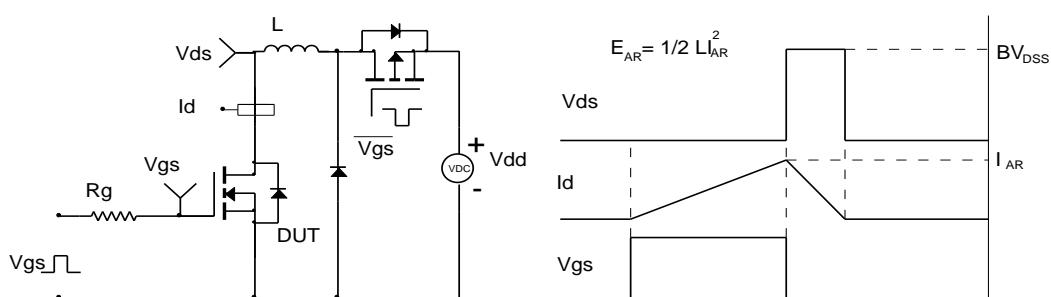
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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

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: Maximum Forward Biased Safe Operating Area (Note F)

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

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

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 12: Power De-rating (Note F)

Figure 13: Current De-rating (Note F)

Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

Diode Recovery Test Circuit & Waveforms
