

General Description

- Latest Trench Power MOSFET technology
- Very Low RDS(on) at 4.5VGS
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

Application

- DC/DC Converters in Computing
- Isolated DC/DC Converters in Telecom and Industrial

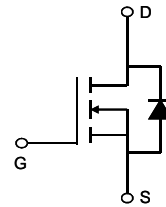
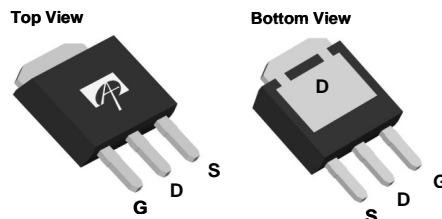
Product Summary

| | |
|------------------------------------|---------------|
| V_{DS} | 30V |
| I_D (at $V_{GS}=10V$) | 50A |
| $R_{DS(ON)}$ (at $V_{GS}=10V$) | < 5m Ω |
| $R_{DS(ON)}$ (at $V_{GS} = 4.5V$) | < 9m Ω |

100% UIS Tested
 100% R_g Tested



TO-251B IPAK



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 ^G | I_D | $T_C=25^\circ\text{C}$ | 50 |
| | | $T_C=100^\circ\text{C}$ | 39 |
| Pulsed Drain Current ^C | I_{DM} | 170 | A |
| Continuous Drain Current | I_{DSM} | $T_A=25^\circ\text{C}$ | 18 |
| | | $T_A=70^\circ\text{C}$ | 14 |
| Avalanche Current ^C | I_{AS} | 29 | A |
| Avalanche energy $L=0.1\text{mH}$ ^C | E_{AS} | 42 | mJ |
| V_{DS} Spike | V_{SPIKE} | 36 | V |
| Power Dissipation ^B | P_D | $T_C=25^\circ\text{C}$ | 50 |
| | | $T_C=100^\circ\text{C}$ | 25 |
| Power Dissipation ^A | P_{DSM} | $T_A=25^\circ\text{C}$ | 2.5 |
| | | $T_A=70^\circ\text{C}$ | 1.6 |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 175 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Typ | Max | Units |
|--|-----------------|-----|-----|--------------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 16 | 20 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient ^{A,D} | | 41 | 50 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case | $R_{\theta JC}$ | 2.5 | 3 | $^\circ\text{C/W}$ |

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 | 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 | | | 100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 1.6 | 2 | 2.4 | V |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =20A T _J =125°C | | 4 5.4 | 5 6.8 | mΩ |
| | | V _{GS} =4.5V, I _D =20A | | 7 | 9 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =20A | | 83 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.7 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current ^G | | | | 46 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =15V, f=1MHz | | 1300 | 1550 | pF |
| C _{oss} | Output Capacitance | | | 530 | 700 | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 75 | 130 | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | 0.7 | 1.5 | 2.3 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _{g(10V)} | Total Gate Charge | V _{GS} =10V, V _{DS} =15V, I _D =20A | | 18.3 | 33 | nC |
| Q _{g(4.5V)} | Total Gate Charge | | | 8.5 | 17 | nC |
| Q _{gs} | Gate Source Charge | | | 4.8 | | nC |
| Q _{gd} | Gate Drain Charge | | | 2.5 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω, R _{GEN} =3Ω | | 7.5 | | ns |
| t _r | Turn-On Rise Time | | | 4.8 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 23.3 | | ns |
| t _f | Turn-Off Fall Time | | | 4.5 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =20A, dI/dt=500A/μs | | 14 | | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =20A, dI/dt=500A/μs | | 25 | | 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 Power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.

B. The power dissipation P_D is based on T_{J(MAX)}=175° 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(MAX)}=175° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case 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-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175° 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° C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

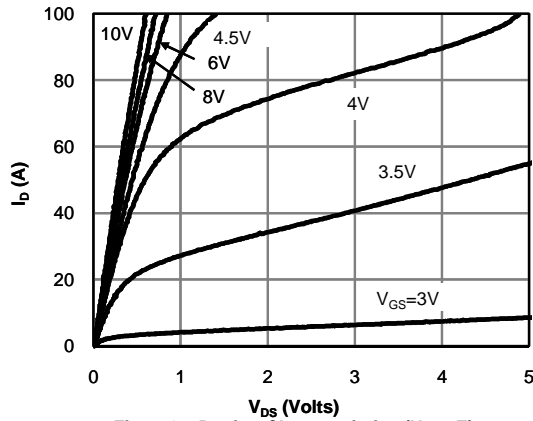


Figure 1: On-Region Characteristics (Note E)

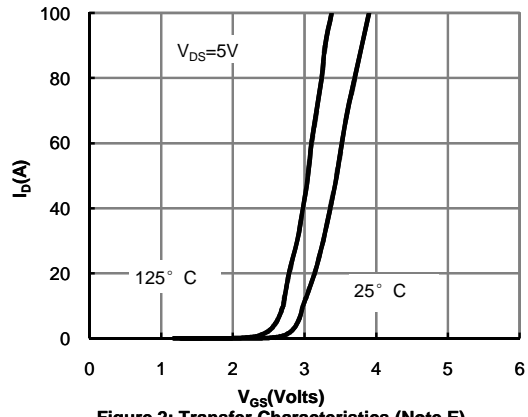


Figure 2: Transfer Characteristics (Note E)

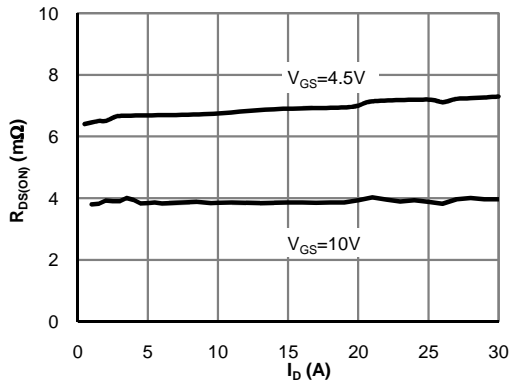


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

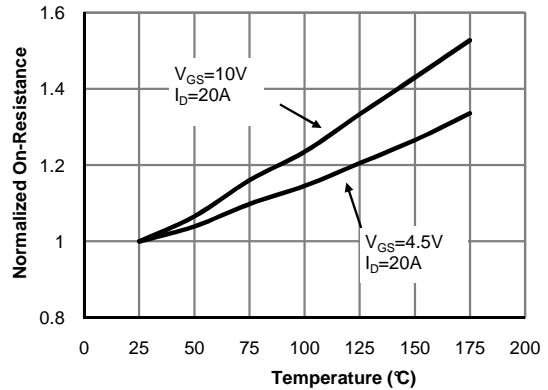


Figure 4: On-Resistance vs. Junction Temperature (Note E)

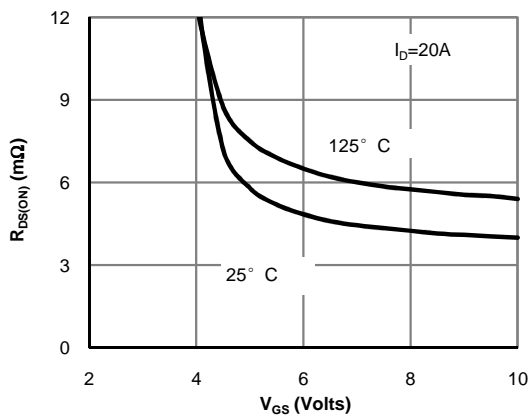


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

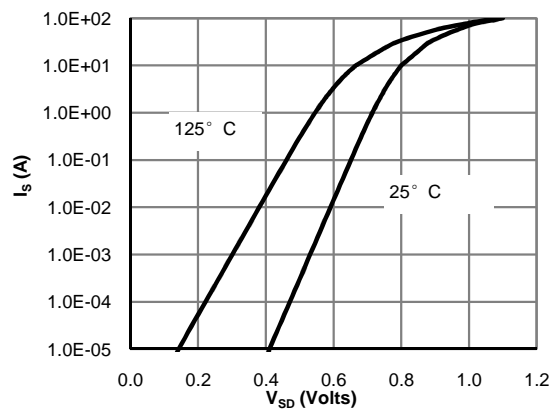


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

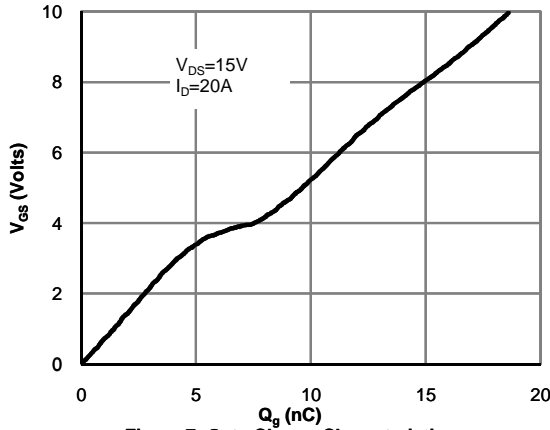


Figure 7: Gate-Charge Characteristics

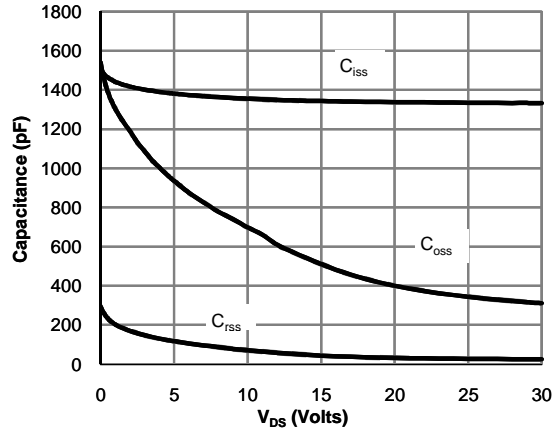


Figure 8: Capacitance Characteristics

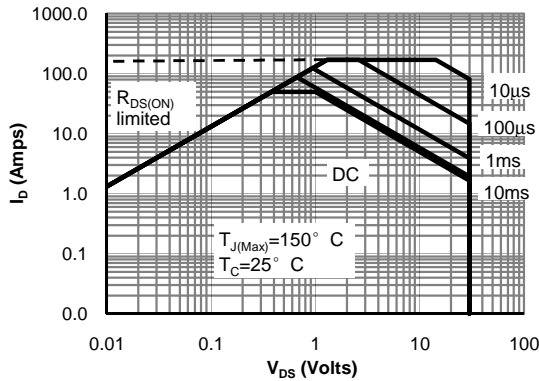


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

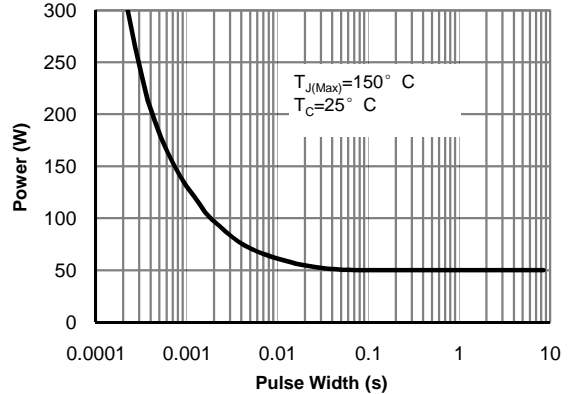


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

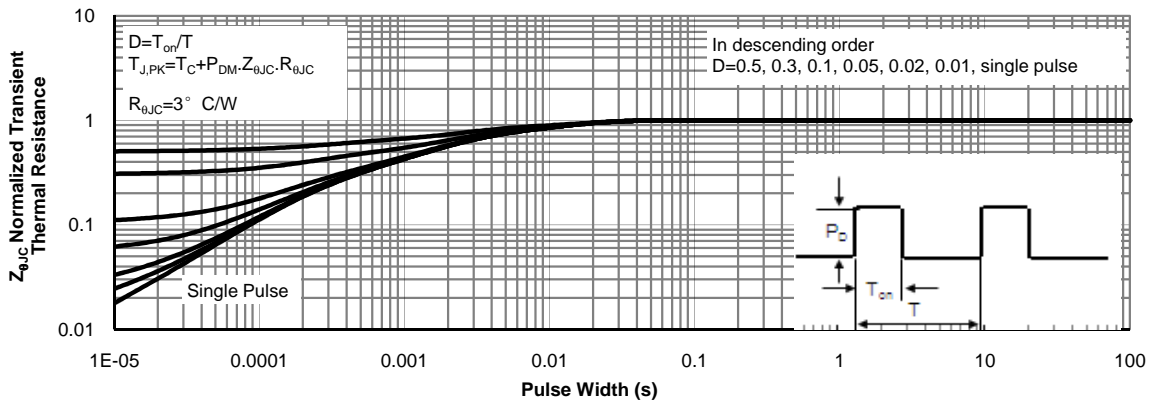


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

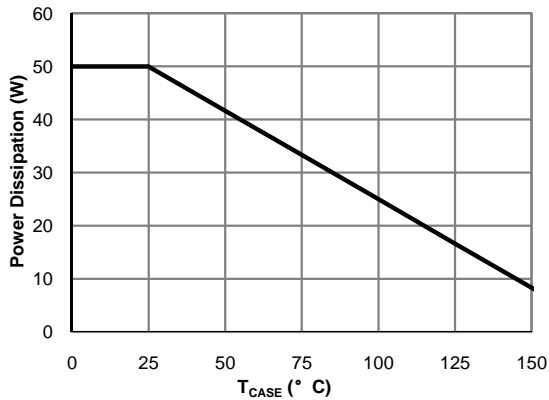


Figure 12: Power De-rating (Note F)

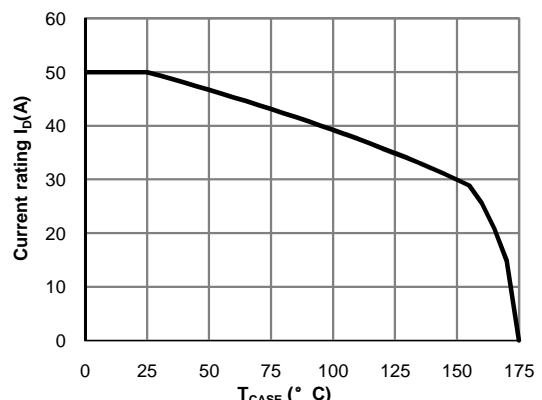


Figure 13: Current De-rating (Note F)

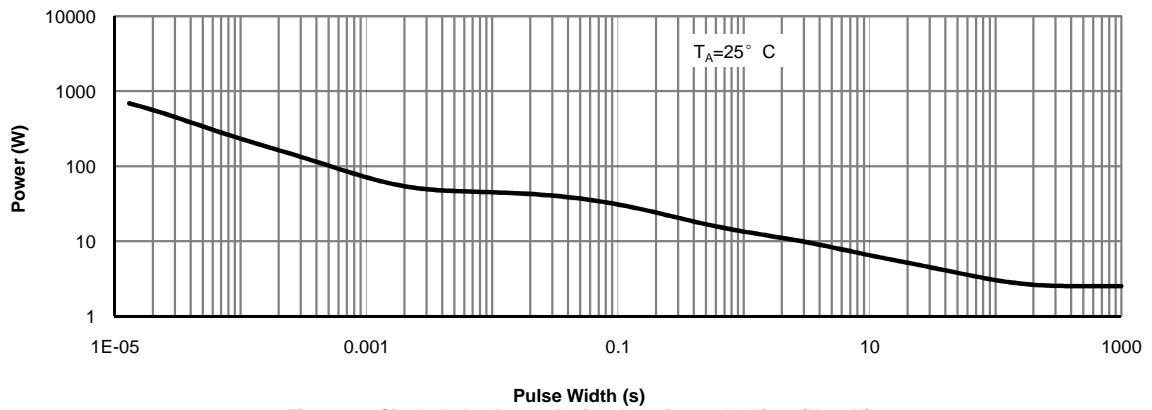


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

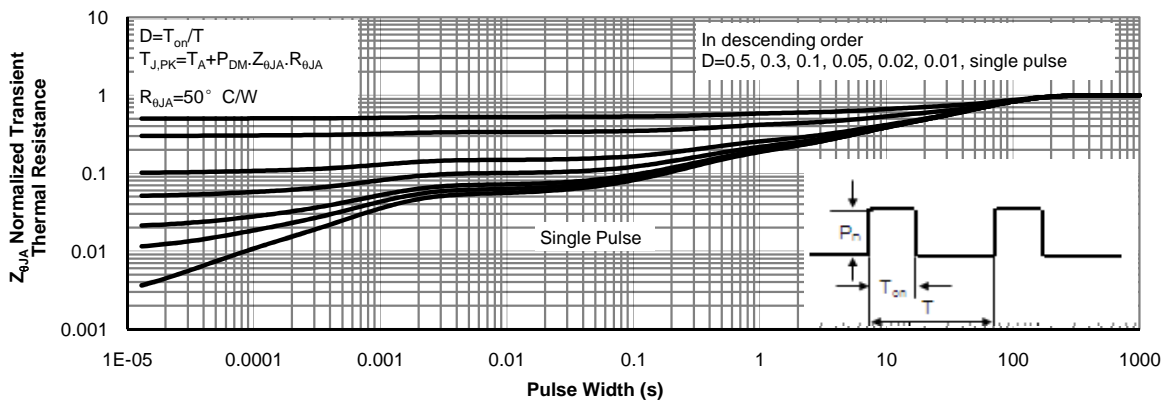
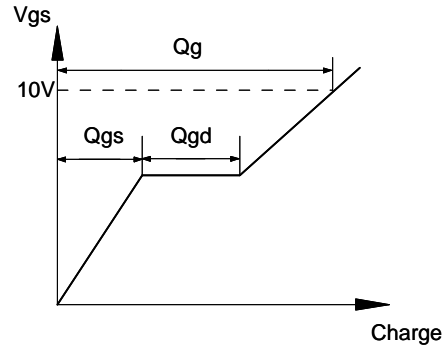
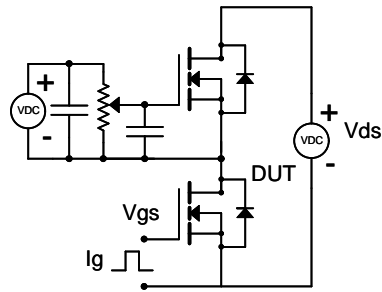
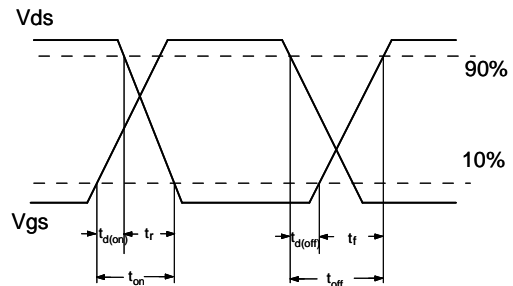
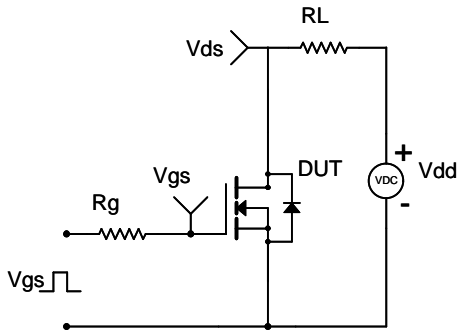


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

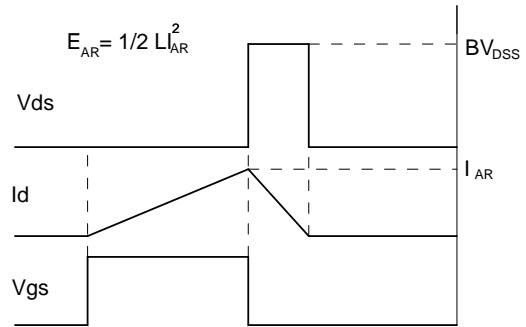
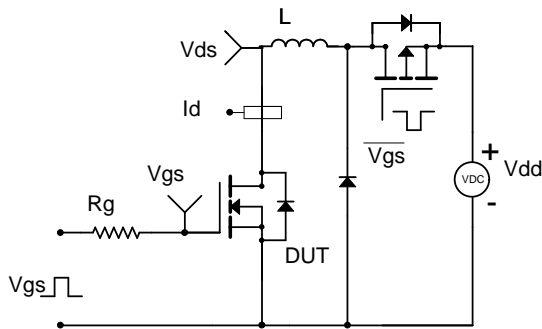
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

