

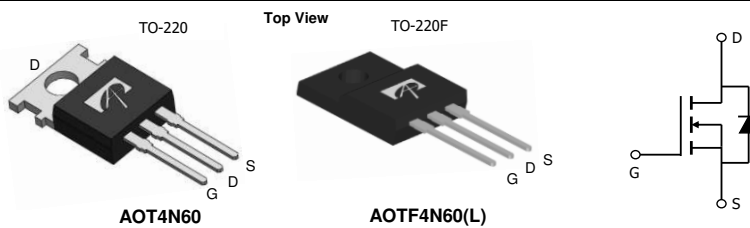
General Description

The AOT4N60 & AOTF4N60 & AOTF4N60L have been fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications. By providing low $R_{DS(on)}$, C_{iss} and C_{rss} along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.

Product Summary

| | |
|---------------------------------|------------|
| V_{DS} | 700V@150°C |
| I_D (at $V_{GS}=10V$) | 4A |
| $R_{DS(ON)}$ (at $V_{GS}=10V$) | < 2.2Ω |

100% UIS Tested
 100% R_g Tested



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

| Parameter | Symbol | AOT4N60 | AOTF4N60 | AOTF4N60L | Units |
|--|-------------------------|------------|----------|-----------|-------|
| Drain-Source Voltage | V_{DS} | 600 | | | V |
| Gate-Source Voltage | V_{GS} | ±30 | | | V |
| Continuous Drain Current | $T_C=25^\circ\text{C}$ | 4 | 4* | 4* | A |
| | $T_C=100^\circ\text{C}$ | 2.7 | 2.7* | 2.7* | |
| Pulsed Drain Current ^C | I_{DM} | 16 | | | |
| Avalanche Current ^C | I_{AR} | 2.5 | | | A |
| Repetitive avalanche energy ^C | E_{AR} | 94 | | | mJ |
| Single pulsed avalanche energy ^G | E_{AS} | 188 | | | mJ |
| MOSFET dv/dt ruggedness | dv/dt | 50 | | | V/ns |
| Peak diode recovery dv/dt | | 5 | | | |
| Power Dissipation ^B | $T_C=25^\circ\text{C}$ | 104 | 35 | 25 | W |
| | Derate above 25°C | 0.83 | 0.28 | 0.20 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | | | °C |
| Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds | T_L | 300 | | | °C |

Thermal Characteristics

| Parameter | Symbol | AOT4N60 | AOTF4N60 | AOTF4N60L | Units |
|--|-----------------|---------|----------|-----------|-------|
| Maximum Junction-to-Ambient ^{A,D} | $R_{\theta JA}$ | 65 | 65 | 65 | °C/W |
| Maximum Case-to-sink ^A | $R_{\theta CS}$ | 0.5 | -- | -- | °C/W |
| Maximum Junction-to-Case | $R_{\theta JC}$ | 1.2 | 3.6 | 5 | °C/W |

* Drain current limited by maximum junction temperature.

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, T _J =25°C | 600 | | | V |
| | | I _D =250μA, V _{GS} =0V, T _J =150°C | | 700 | | |
| BV _{DSS} /ΔT _J | Breakdown Voltage Temperature Coefficient | I _D =250μA, V _{GS} =0V | | 0.69 | | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =600V, V _{GS} =0V | | | 1 | μA |
| | | V _{DS} =480V, T _J =125°C | | | 10 | |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±30V | | | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =5V, I _D =250μA | 3 | 4 | 4.5 | V |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =2A | | 1.9 | 2.2 | Ω |
| g _{FS} | Forward Transconductance | V _{DS} =40V, I _D =2A | | 7.4 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.77 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 4 | A |
| I _{SM} | Maximum Body-Diode Pulsed Current | | | | 16 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =25V, f=1MHz | 400 | 511 | 615 | pF |
| C _{oss} | Output Capacitance | | 40 | 51 | 65 | pF |
| C _{riss} | Reverse Transfer Capacitance | | 3.5 | 4.4 | 5.3 | pF |
| R _g | Gate resistance | | 3.3 | 4.2 | 6.3 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =10V, V _{DS} =480V, I _D =4A | | 15 | 18 | nC |
| Q _{gs} | Gate Source Charge | | 3 | 3.6 | nC | |
| Q _{gd} | Gate Drain Charge | | 7.6 | 9.1 | nC | |
| t _{D(on)} | Turn-On Delay Time | V _{GS} =10V, V _{DS} =300V, I _D =4A, R _G =25Ω | | 20.2 | 30 | ns |
| t _r | Turn-On Rise Time | | 28.7 | 42 | ns | |
| t _{D(off)} | Turn-Off Delay Time | | 36 | 51 | ns | |
| t _f | Turn-Off Fall Time | | 27 | 40 | ns | |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =4A, di/dt=100A/μs, V _{DS} =100V | | 212 | 254 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =4A, di/dt=100A/μs, V _{DS} =100V | | 1.6 | 1.9 | μC |

A. The value of R_{θJA} is measured with the device in a still air environment with T_A=25° C.

B. The power dissipation P_D is based on T_{J(MAX)}=150° 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. 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 case R_{θJC} 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(MAX)}=150° C. The SOA curve provides a single pulse rating.

G. L=60mH, I_{AS}=2.5A, V_{DD}=150V, R_G=25Ω, Starting T_J=25° C

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

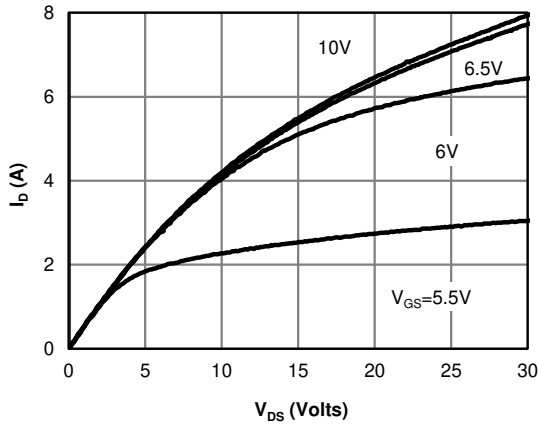


Figure 1: On-Region Characteristics

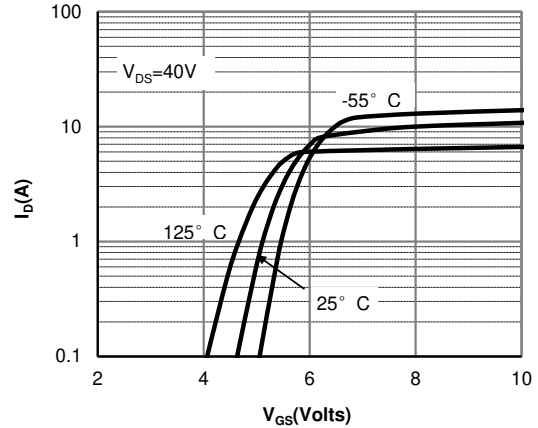


Figure 2: Transfer Characteristics

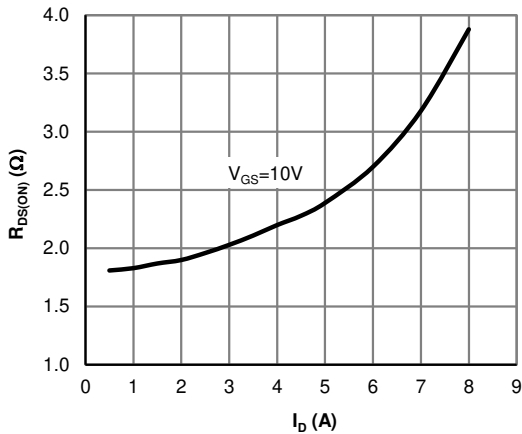


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

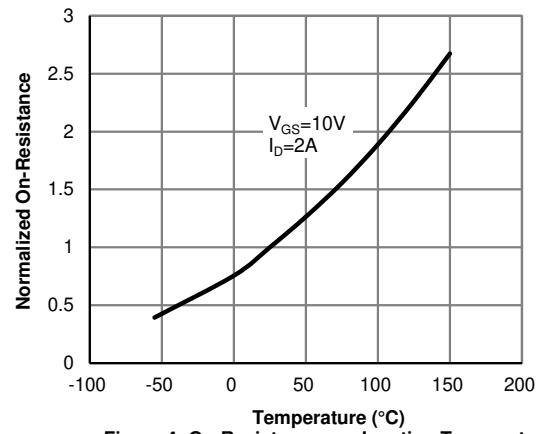


Figure 4: On-Resistance vs. Junction Temperature

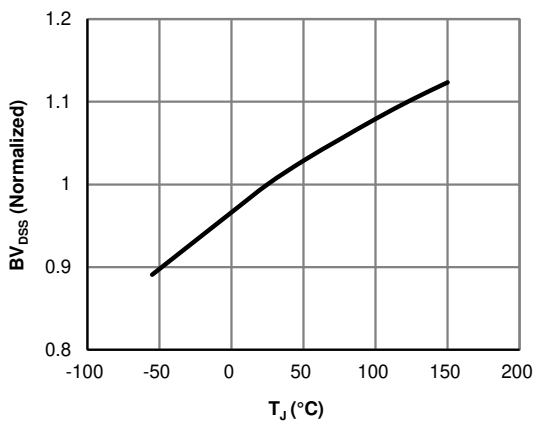


Figure 5: Break Down vs. Junction Temperature

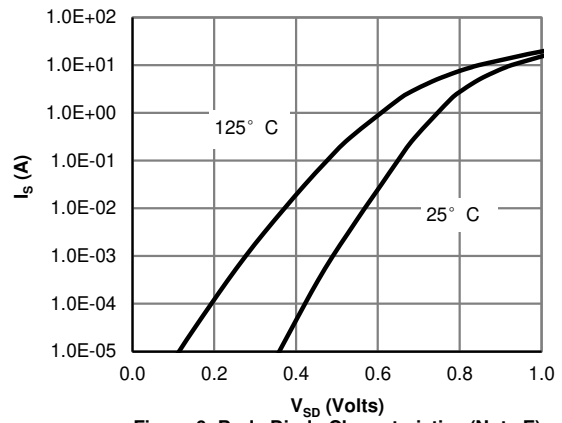


Figure 6: Body-Diode Characteristics (Note E)

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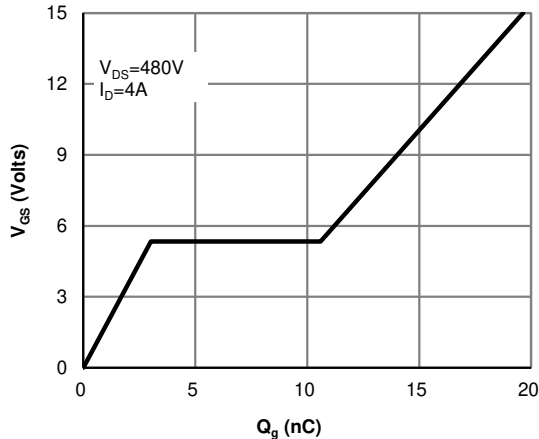


Figure 7: Gate-Charge Characteristics

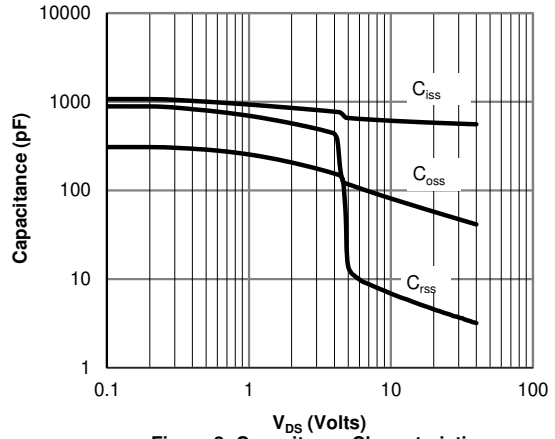


Figure 8: Capacitance Characteristics

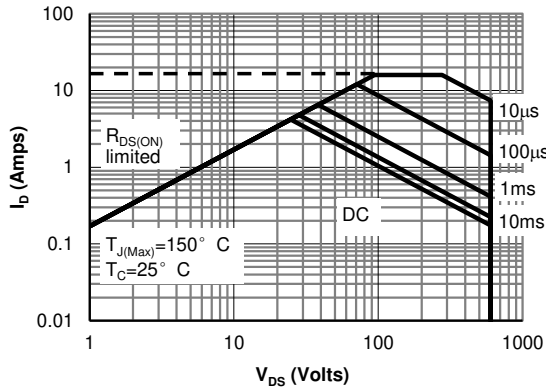


Figure 9: Maximum Forward Biased Safe Operating Area for AOT4N60 (Note F)

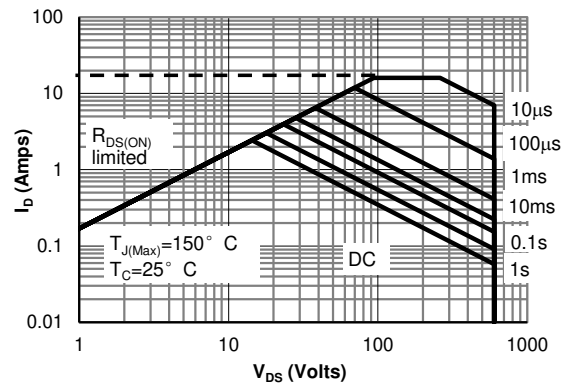


Figure 10: Maximum Forward Biased Safe Operating Area for AOTF4N60 (Note F)

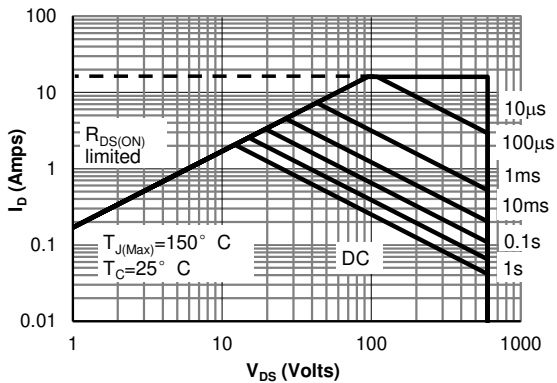


Figure 11: Maximum Forward Biased Safe Operating Area for AOTF4N60L (Note F)

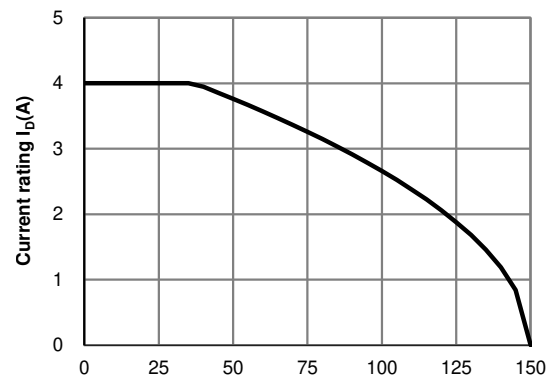


Figure 12: Current De-rating (Note B)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

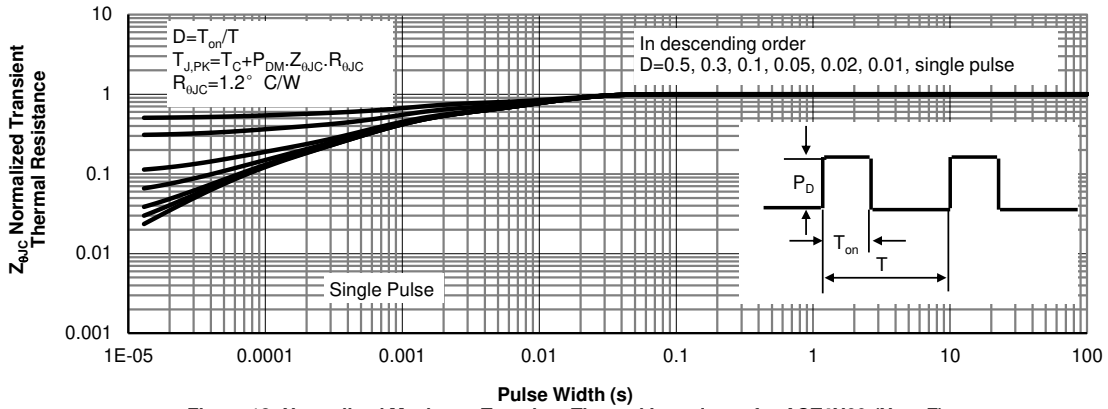


Figure 13: Normalized Maximum Transient Thermal Impedance for AOT4N60 (Note F)

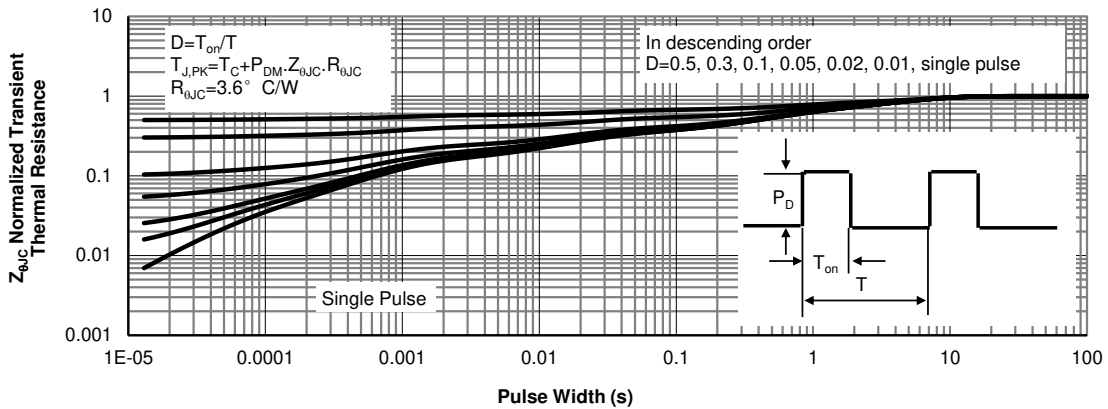


Figure 14: Normalized Maximum Transient Thermal Impedance for AOTF4N60 (Note F)

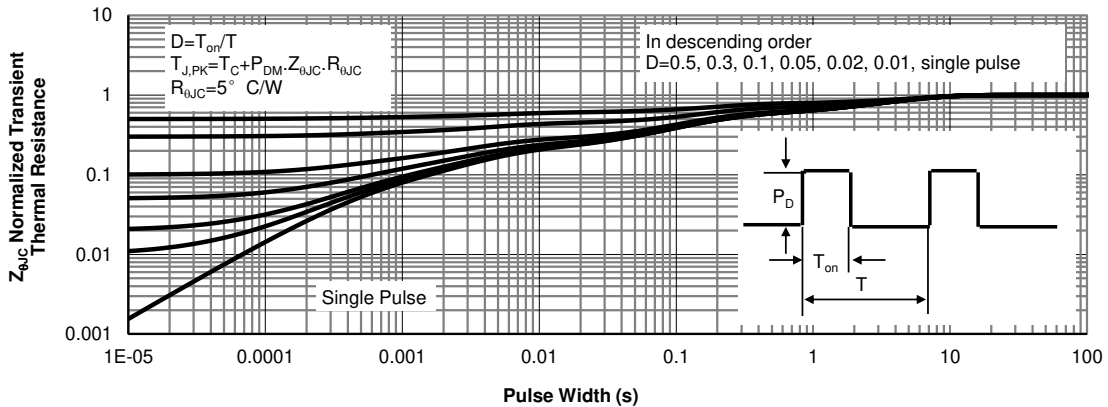
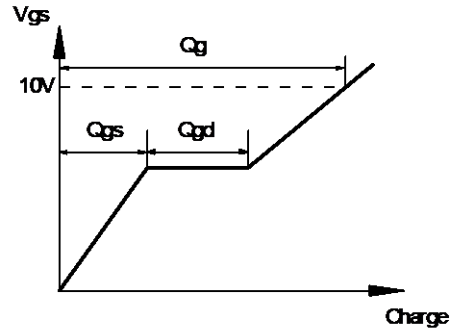
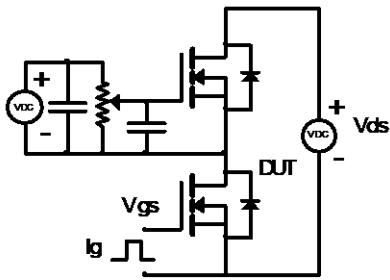
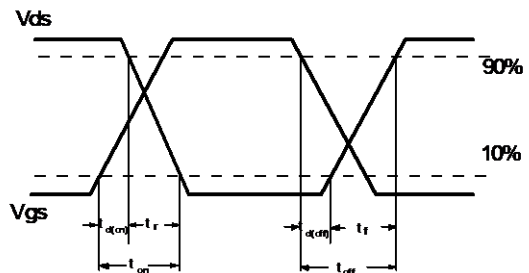
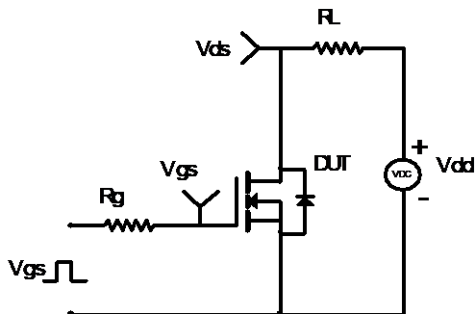


Figure 15: Normalized Maximum Transient Thermal Impedance for AOTF4N60L (Note F)

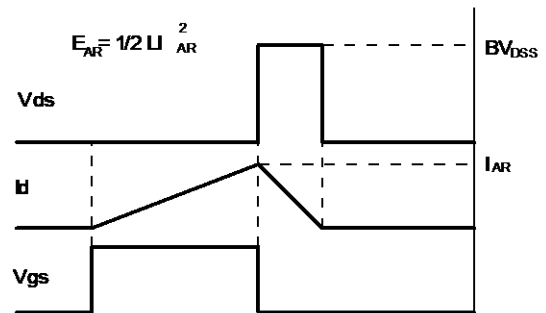
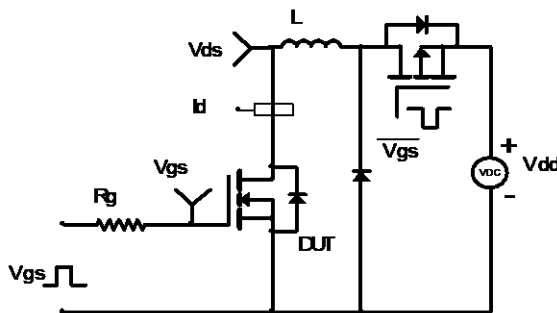
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

