ALPHA & OMEGA SEMICONDUCTOR

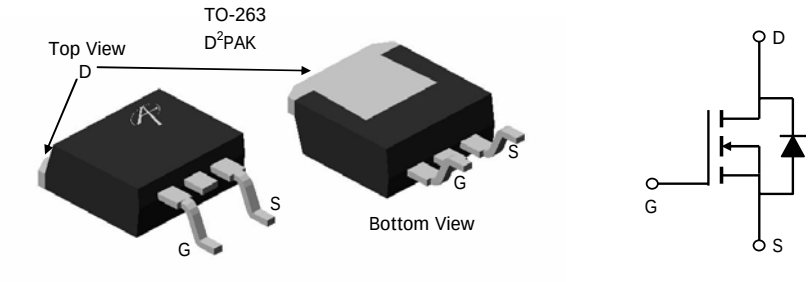
# AOB4184
## N-Channel Enhancement Mode Field Effect Transistor

### General Description
The AOB4184/L uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. With the excellent thermal resistance of the $D^2PAK$ package, this device is well suited for high current load applications. AOB4184 and AOB4184L are electrically identical.

-RoHS Compliant
-AOB4184L is Halogen Free

### Features
$V_{DS}$ (V) =40V
$I_D$ = 30 A ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 10.5 mΩ ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 13 mΩ ($V_{GS}$ = 4.5V)

***100% UIS Tested!***




**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current [G] | $T_C$=25°C | $I_D$ | 30 | A |
| | $T_C$=100°C | | 24 | |
| Pulsed Drain Current [C] | | $I_{DM}$ | 120 | |
| Continuous Drain Current [A] | $T_C$=25°C | $I_{DSM}$ | 12 | |
| | $T_C$=70°C | | 10 | |
| Avalanche Current [C] | | $I_{AR}$ | 35 | A |
| Repetitive avalanche energy L=100uH [C] | | $E_{AR}$ | 61 | mJ |
| Power Dissipation [B] | $T_C$=25°C | $P_D$ | 50 | W |
| | $T_C$=100°C | | 25 | |
| Power Dissipation [A] | $T_A$=25°C | $P_{DSM}$ | 2.5 | W |
| | $T_A$=70°C | | 1.6 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 175 | °C |

**Thermal Characteristics**

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 11 | 17 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 42 | 50 | °C/W |
| Maximum Junction-to-Case [B] | Steady-State | $R_{\theta JC}$ | 2.4 | 3 | °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 | 40 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=40V, $V_{GS}$=0V | | | 1 | µA |
| | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | 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 | 1.7 | 2.1 | 3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=10V, $V_{DS}$=5V | 120 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=20A | | 8.5 | 10.5 | mΩ |
| | | $T_J$=125°C | | 13.2 | 17 | |
| | | $V_{GS}$=4.5V, $I_D$=20A | | 10 | 13 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=20A | | 100 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A, $V_{GS}$=0V | | 0.72 | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current[G] | | | | 30 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=20V, f=1MHz | 1250 | 1500 | 1800 | pF |
| $C_{oss}$ | Output Capacitance | | 165 | 215 | 280 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | 95 | 135 | 190 | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | 2 | 3.5 | 5 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=20V, $I_D$=20A | 22 | 27.2 | 35 | nC |
| $Q_g$(4.5V) | Total Gate Charge | | 11 | 13.6 | 18 | nC |
| $Q_{gs}$ | Gate Source Charge | | 3.5 | 4.5 | 6 | nC |
| $Q_{gd}$ | Gate Drain Charge | | 4.5 | 6.4 | 9 | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=20V, $R_L$=1Ω, $R_{GEN}$=3Ω | | 6.4 | | ns |
| $t_r$ | Turn-On Rise Time | | | 17.2 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 29.6 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 16.8 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=20A, dI/dt=500A/µs | 15 | 19 | 25 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=20A, dI/dt=500A/µs | 48 | 59 | 78 | nC |

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in $^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The Power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ 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: Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=175°C.

D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ 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 impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C.

G. The maximum current rating is limited by bond-wires.

H. These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The SOA curve provides a single pulse rating.

Rev0 : July 2008

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

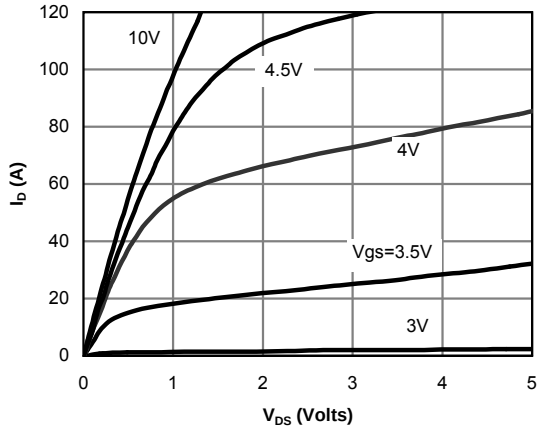



**Figure 1: On-Region Characteristics**

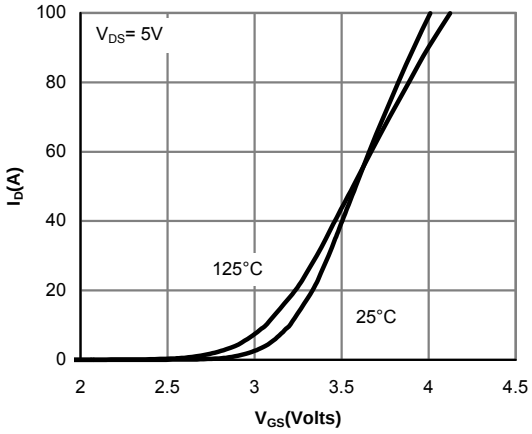



**Figure 2: Transfer Characteristics**

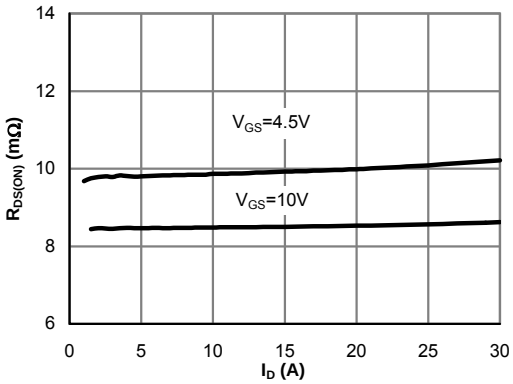



**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

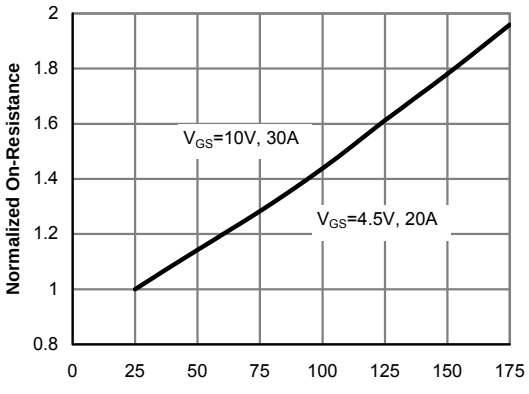



**Figure 4: On-Resistance vs. Junction Temperature**

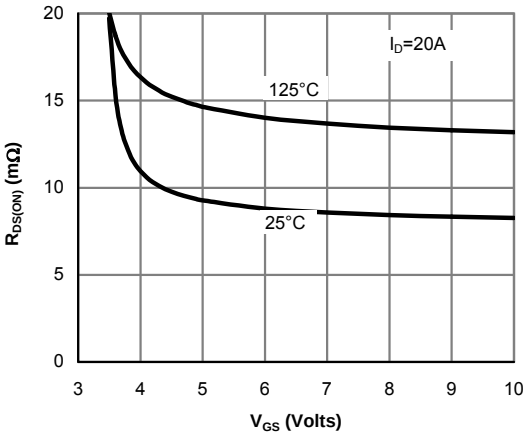



**Figure 5: On-Resistance vs. Gate-Source Voltage**

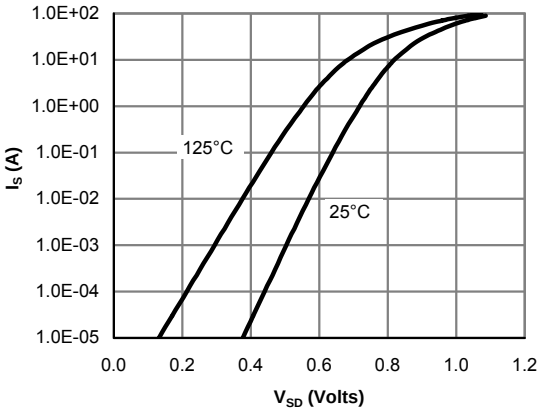



**Figure 6: Body-Diode Characteristics**

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

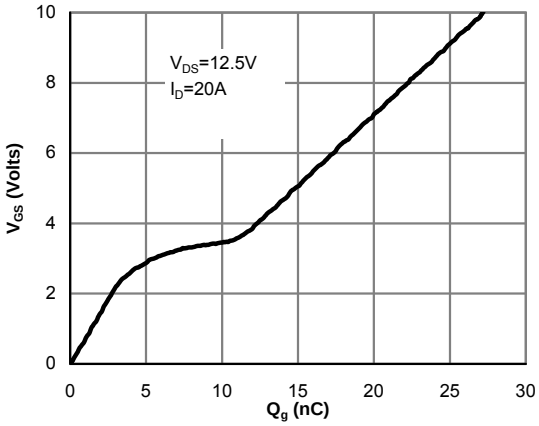



Figure 7: Gate-Charge Characteristics

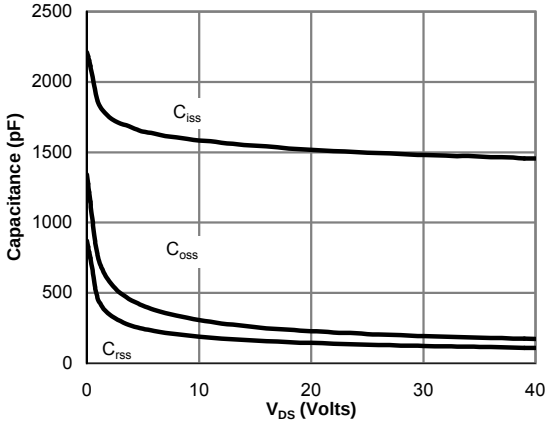



Figure 8: Capacitance Characteristics

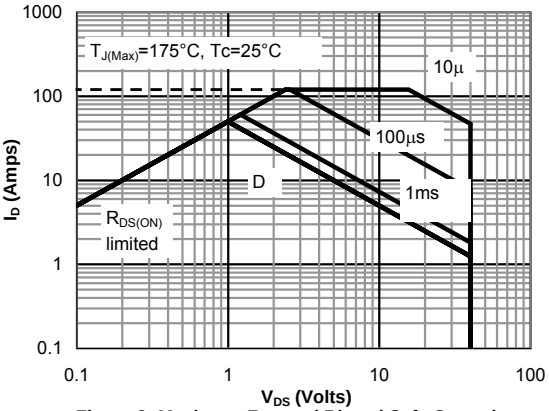



Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

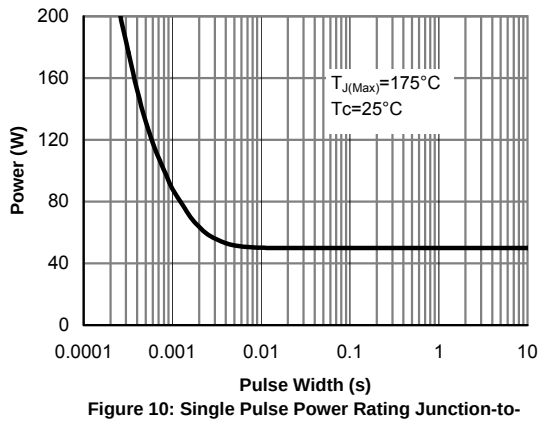



Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

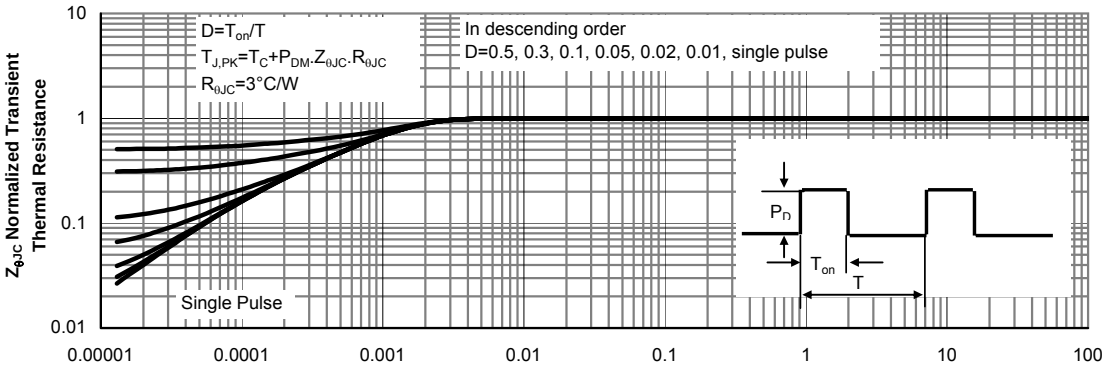



Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

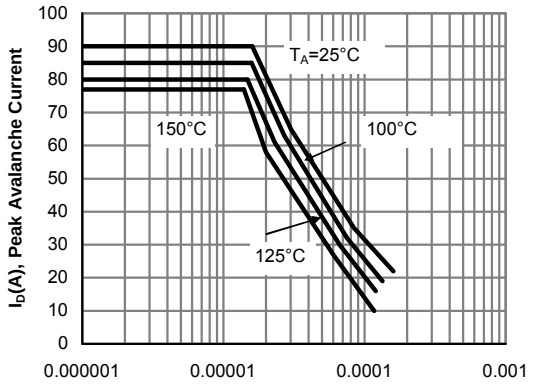



Figure 12: Single Pulse Avalanche capability

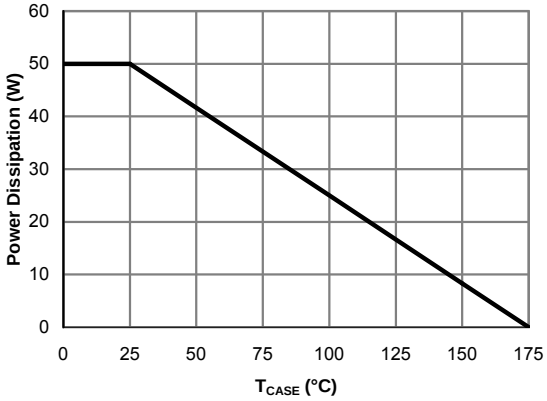



Figure 13: Power De-rating (Note F)

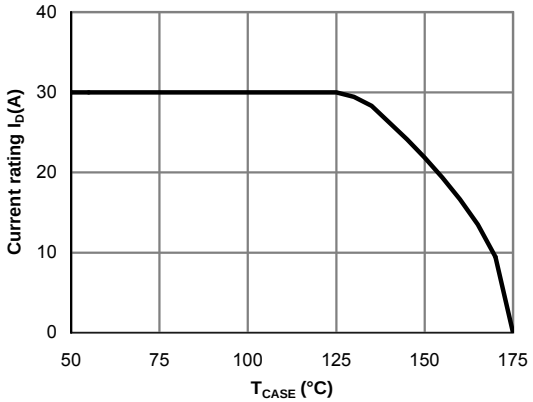



Figure 14: Current De-rating (Note F)

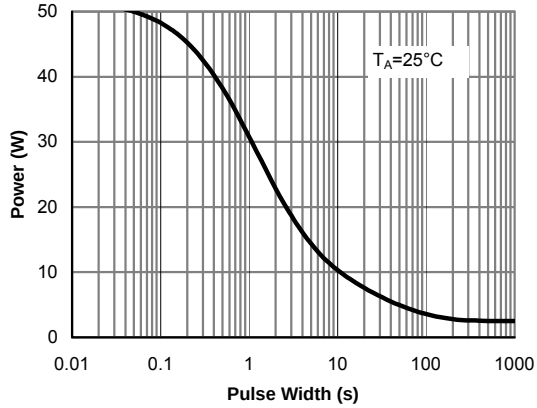



Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

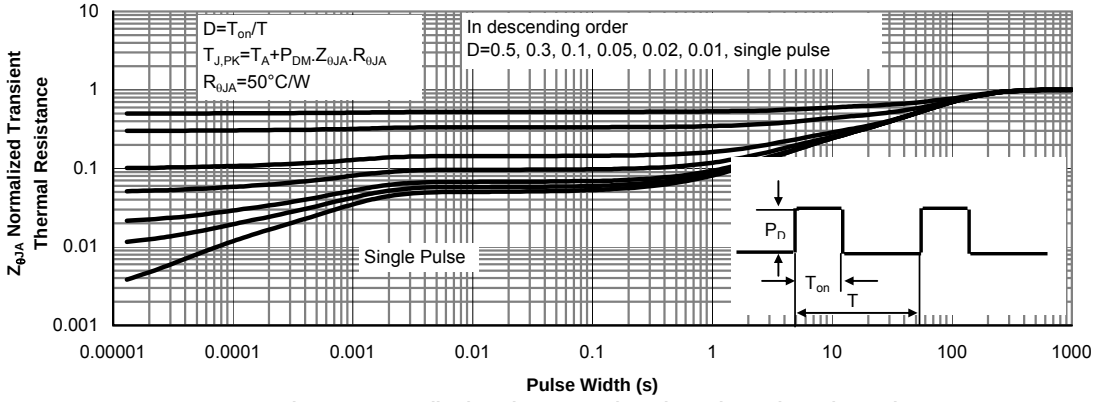
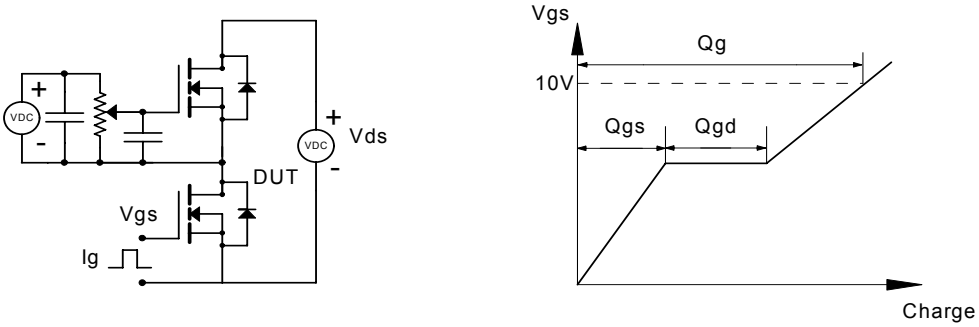
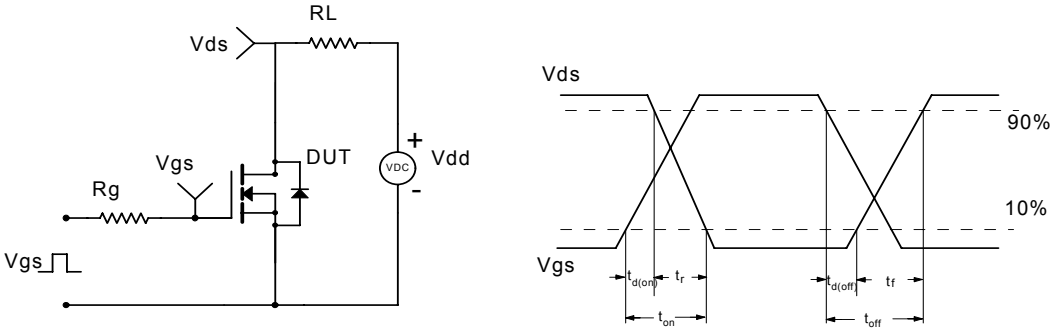



Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

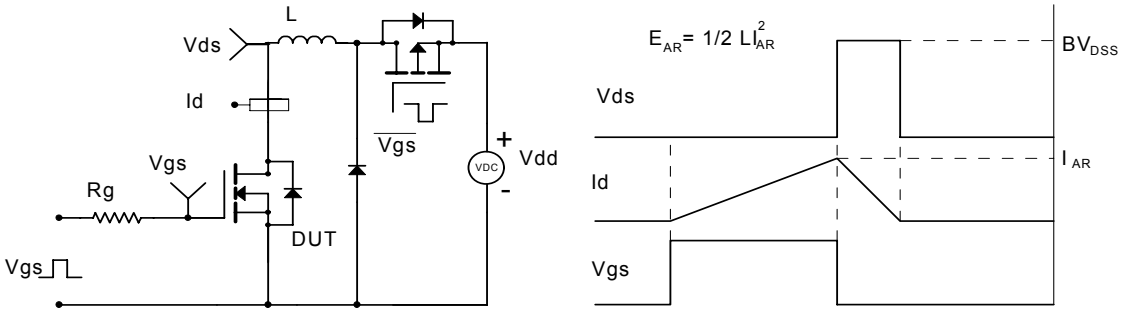
## Gate Charge Test Circuit & Waveform




## Resistive Switching Test Circuit & Waveforms




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




## Diode Recovery Test Circuit & Waveforms