

**AOL1700**
**N-Channel Enhancement Mode Field Effect Transistor**
**SRFET™**
**General Description**

**SRFET™** AOL1700 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent  $R_{DS(ON)}$  and low gate charge. This device is suitable for use as a low side FET in SMPS, load switching and general purpose applications.

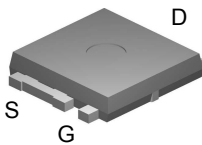
- RoHS Compliant
- Halogen and Antimony Free Green Device\*

**Features**

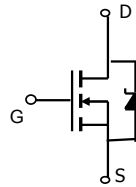
$V_{DS}$  (V) = 30V  
 $I_D$  =85A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 4.2m\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 6.0m\Omega$  ( $V_{GS}$  = 4.5V)

UIS Tested!  
 Rg,Ciss,Coss,Crss Tested

Ultra SO-8™ Top View



Bottom tab connected to drain



**SRFET™**  
 Soft Recovery MOSFET:  
 Integrated Schottky Diode

**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                                       | $V_{GS}$       | $\pm 20$                            | V                |
| Continuous Drain Current <sup>B</sup>                     | $I_D$          | $T_C=25^\circ\text{C}$ <sup>H</sup> | 85               |
|   |                | $T_C=100^\circ\text{C}$             | 81               |
| Pulsed Drain Current <sup>C</sup>                         | $I_{DM}$       | 200                                 | A                |
| Continuous Drain Current <sup>A</sup>                     | $I_{DSM}$      | $T_A=25^\circ\text{C}$              | 17               |
|   |                | $T_A=70^\circ\text{C}$              | 13               |
| Avalanche Current <sup>C</sup>                            | $I_{AR}$       | 30                                  | A                |
| Repetitive avalanche energy $L=0.3\text{mH}$ <sup>C</sup> | $E_{AR}$       | 135                                 | mJ               |
| Power Dissipation <sup>B</sup>                            | $P_D$          | $T_C=25^\circ\text{C}$              | 100              |
|   |                | $T_C=100^\circ\text{C}$             | 50               |
| Power Dissipation <sup>A</sup>                            | $P_{DSM}$      | $T_A=25^\circ\text{C}$              | 2.1              |
|   |                | $T_A=70^\circ\text{C}$              | 1.3              |
| 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 <sup>A</sup> | $R_{\theta JA}$ | $t \leq 10\text{s}$ | 19.6 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | Steady-State        | 50   | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case <sup>D</sup>    | $R_{\theta JC}$ | 1                   | 1.5  | $^\circ\text{C/W}$ |

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> =1mA, 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> =125°C                         |     |            | 0.1<br>20  | mA    |
| I <sub>GSS</sub>            | Gate-Body leakage current   | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V  |     |            | 0.1        | μA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage  | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA                                     | 1.2 | 1.5        | 2.2        | V     |
| I <sub>D(ON)</sub>          | On state drain current  | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V  | 200 |            |            | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance                                   | V <sub>GS</sub> =10V, I <sub>D</sub> =20A<br>T <sub>J</sub> =125°C                         |     | 3.4<br>5.2 | 4.2<br>6.5 | mΩ    |
|                             |   | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A   |     | 4.8        | 6.0        | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance  | V <sub>DS</sub> =5V, I <sub>D</sub> =20A   |     | 90         |            | S     |
| V <sub>SD</sub>             | Diode Forward Voltage   | I <sub>S</sub> =1A, V <sub>GS</sub> =0V  |     | 0.36       | 0.5        | V     |
| I <sub>S</sub>              | Maximum Body-Diode + Schottky Diode Continuous Current <sup>H</sup> |  |     |            | 85         | A     |
| <b>DYNAMIC PARAMETERS</b>   |   |  |     |            |            |       |
| C <sub>iss</sub>            | Input Capacitance   | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz  |     | 3760       | 4512       | pF    |
| C <sub>oss</sub>            | Output Capacitance  |  |     | 682        |            | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance  |  |     | 314        |            | pF    |
| R <sub>g</sub>              | Gate resistance   | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz   |     | 0.75       | 1.5        | Ω     |
| <b>SWITCHING PARAMETERS</b> |   |  |     |            |            |       |
| Q <sub>g</sub> (10V)        | Total Gate Charge   | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A                            |     | 62         | 74         | nC    |
| Q <sub>g</sub> (4.5V)       | Total Gate Charge   |  |     | 29         | 35         | nC    |
| Q <sub>gs</sub>             | Gate Source Charge  |  |     | 12         |            | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge   |  |     | 12         |            | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime   | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω,<br>R <sub>GEN</sub> =3Ω |     | 9.5        |            | ns    |
| t <sub>r</sub>              | Turn-On Rise Time   |  |     | 8.5        |            | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime  |  |     | 34         |            | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time  |  |     | 9          |            | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time                                    | I <sub>F</sub> =20A, di/dt=300A/μs   |     | 18         | 27         | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge                                  | I <sub>F</sub> =20A, di/dt=300A/μs   |     | 22         |            | nC    |

A: The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25°C. The power dissipation P<sub>DSM</sub> and current rating I<sub>DISM</sub> are based on T<sub>J(MAX)</sub>=150°C, using steady-state junction-to-ambient thermal resistance.

B: The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=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<sub>J(MAX)</sub>=175°C.

D: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.

E: The static characteristics in Figures 1 to 6 are obtained using <300 us 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<sub>J(MAX)</sub>=175°C. The SOA curve provides a single pulse rating.

G: 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<sub>A</sub>=25°C.

H: The maximum current rating is limited by bond-wires.

\* This device is guaranteed green after date code 8P11 (June 1<sup>ST</sup> 2008)

Rev3: Dec 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

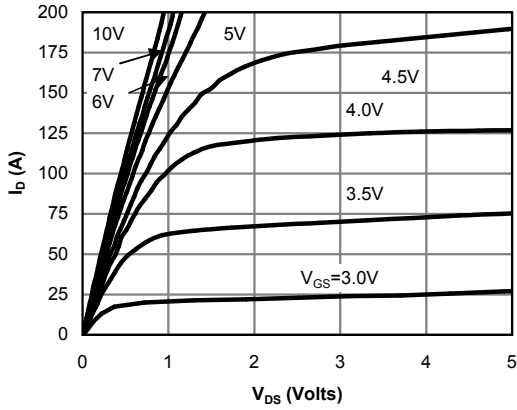


Figure 1: On-Region Characteristics

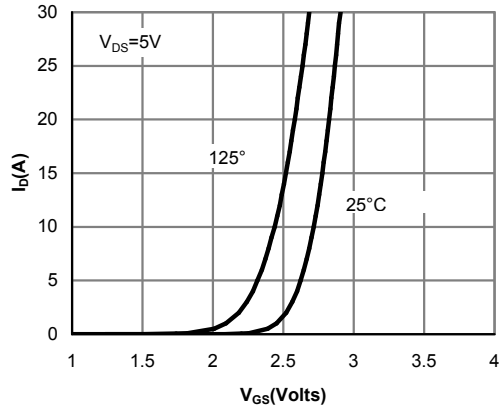


Figure 2: Transfer Characteristics

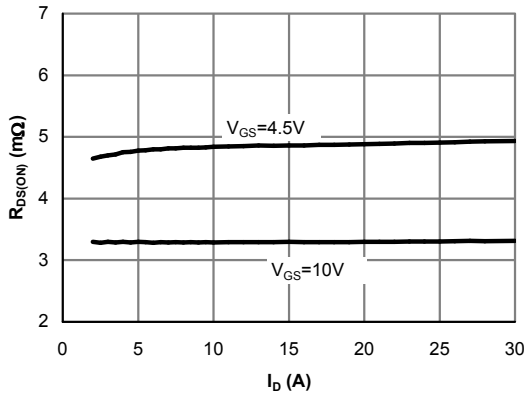


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

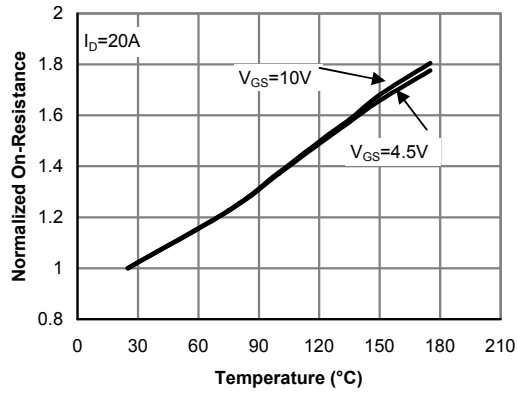


Figure 4: On-Resistance vs. Junction Temperature

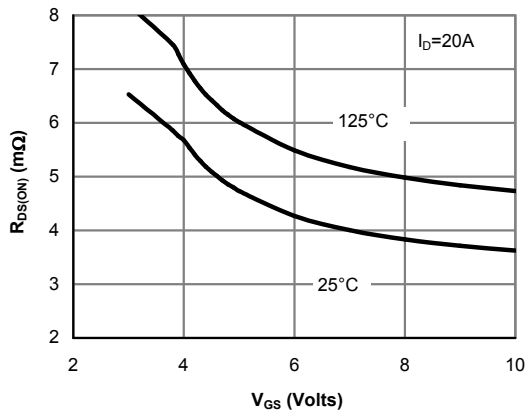


Figure 5: On-Resistance vs. Gate-Source Voltage

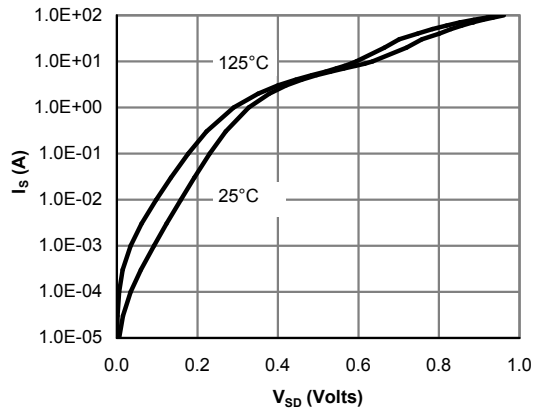


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

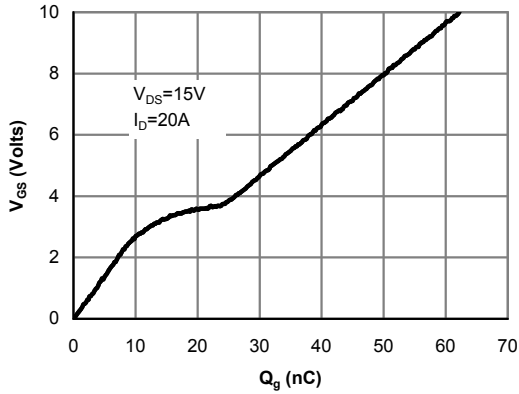


Figure 7: Gate-Charge Characteristics

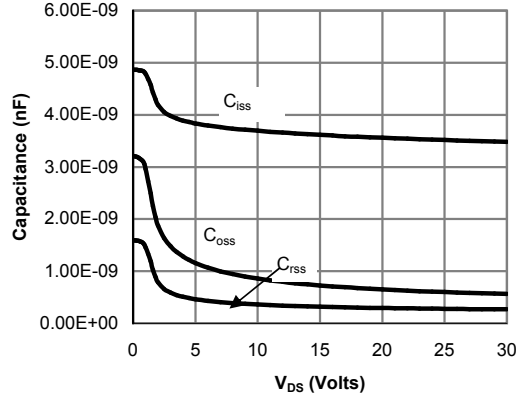


Figure 8: Capacitance Characteristics

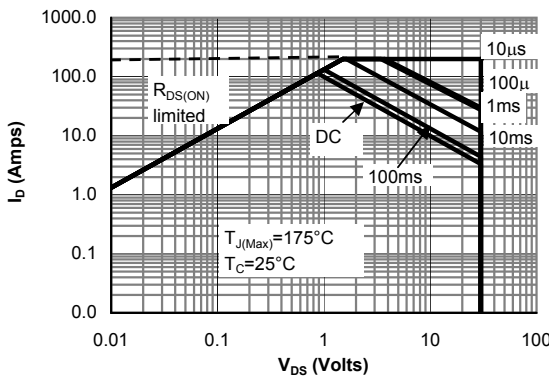


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

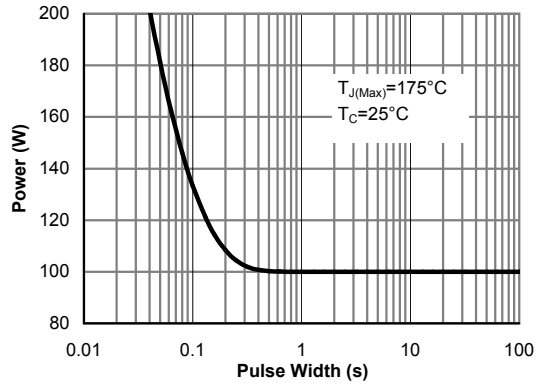


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

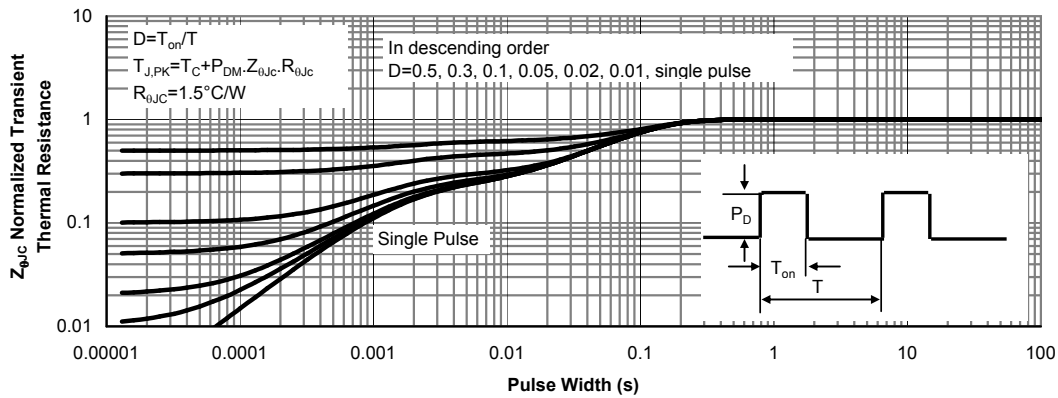


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

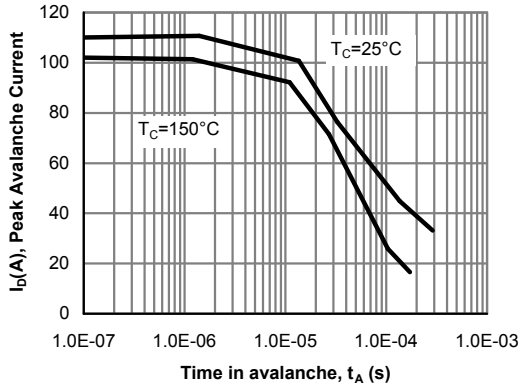


Figure 12: Single Pulse Avalanche capability

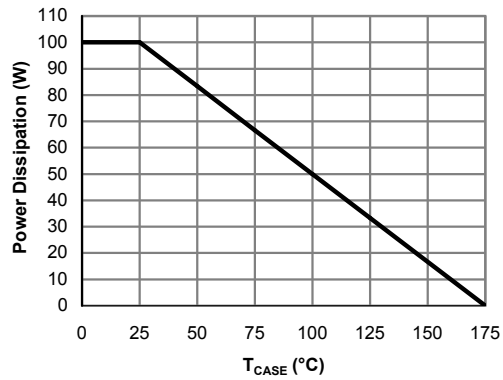


Figure 13: Power De-rating (Note B)

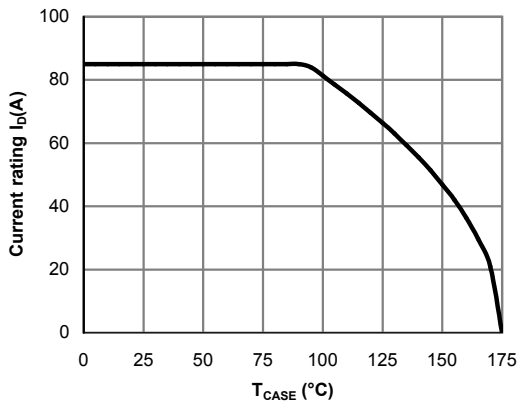


Figure 14: Current De-rating (Note B)

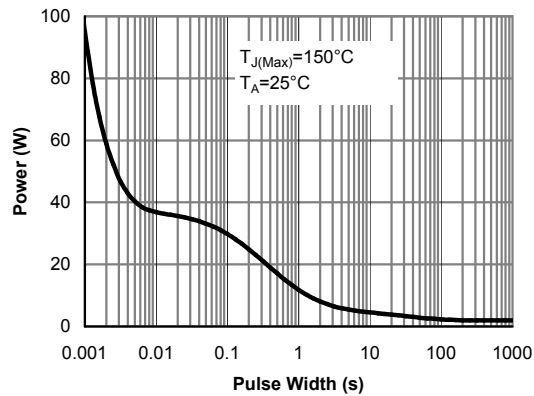


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

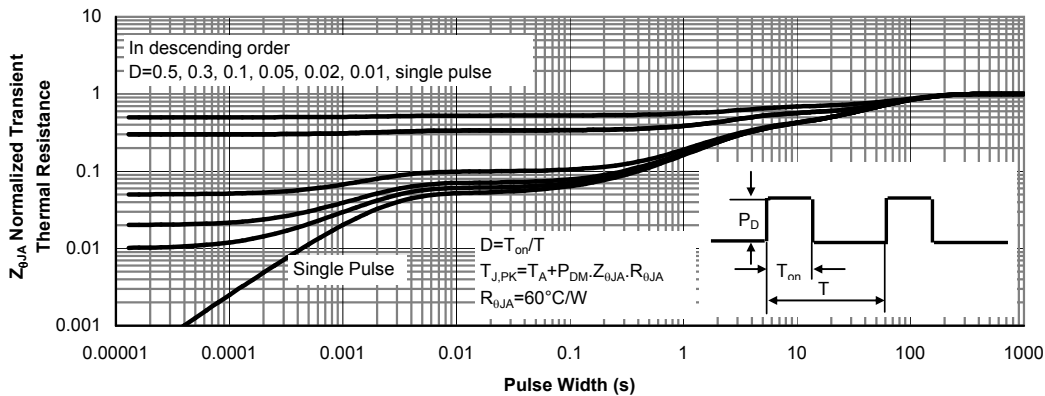
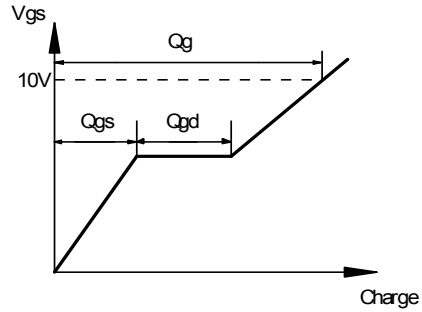
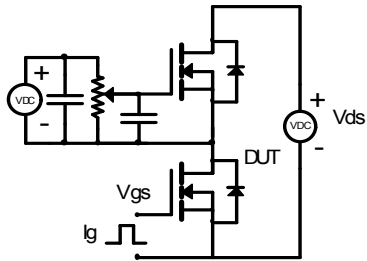
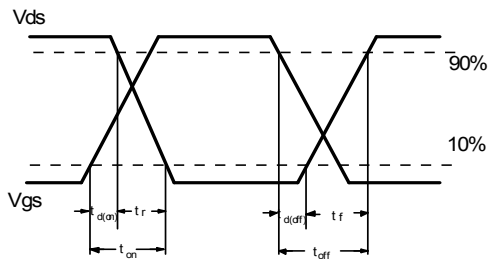
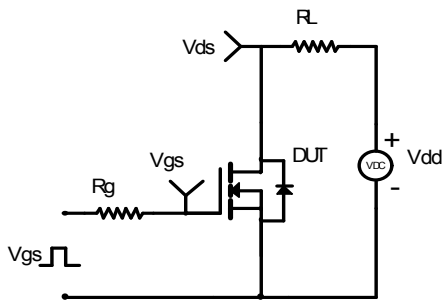


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

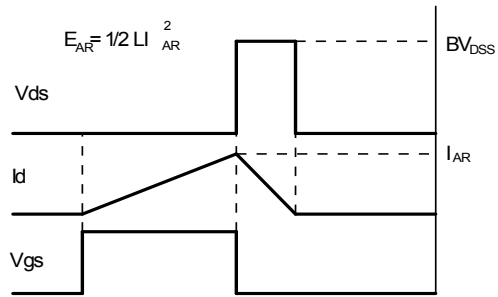
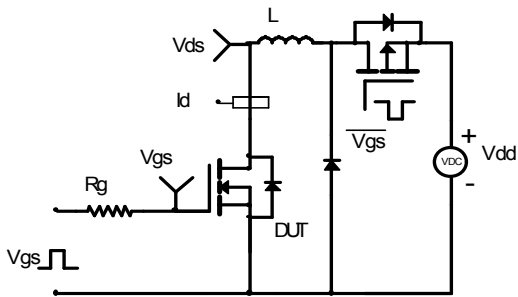
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

