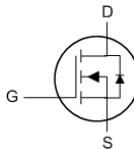
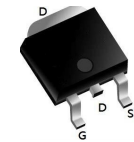


### Features

- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- 100% UIS Tested
- 100%  $\Delta V_{DS}$  Tested
- Halogen-free; RoHS-compliant

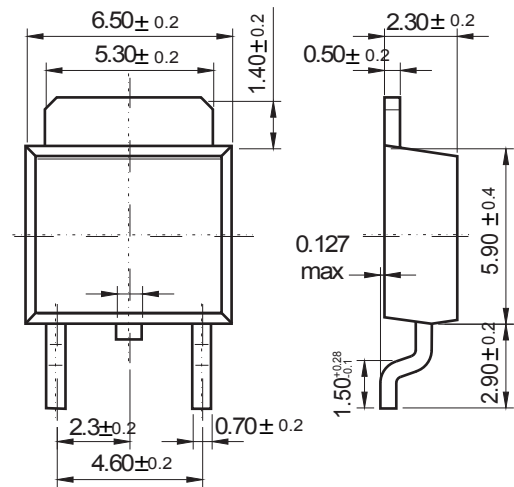
### Applications

- Load Switch
- PWM Application
- Power Management



TO-252

Unit: mm



Dimensions in inches and (millimeters)

### Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

| Symbol         | Parameter                                     | Value                     | Unit             |
|----------------|-----------------------------------------------|---------------------------|------------------|
| $V_{DS}$       | Drain-to-Source Voltage                       | 60                        | V                |
| $V_{GS}$       | Gate-to-Source Voltage                        | $\pm 20$                  | V                |
| $I_D$          | Continuous Drain Current                      | $T_C = 25^\circ\text{C}$  | A                |
|                |                                               | $T_C = 100^\circ\text{C}$ |                  |
| $I_{DM}$       | Pulsed Drain Current <sup>(1)</sup>           | Refer to Fig.4            | A                |
| $E_{AS}$       | Single Pulsed Avalanche Energy <sup>(2)</sup> | 24                        | mJ               |
| $P_D$          | Power Dissipation                             | $T_C = 25^\circ\text{C}$  | W                |
|                |                                               | $T_C = 100^\circ\text{C}$ |                  |
| $T_J, T_{STG}$ | Junction & Storage Temperature Range          | -55 to 150                | $^\circ\text{C}$ |

### Thermal Characteristics

| Symbol          | Parameter                                              | Max | Unit               |
|-----------------|--------------------------------------------------------|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient <sup>(3)</sup> | 42  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case                   | 3.4 |                    |

# 20N06

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

| Symbol                     | Parameter                                        | Conditions                                                                                  | Min. | Typ. | Max. | Unit |
|----------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------|------|------|------|------|
| Off Characteristics        |                                                  |                                                                                             |      |      |      |      |
| V <sub>(BR)DSS</sub>       | Drain-Source Breakdown Voltage                   | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                                | 60   | -    | -    | V    |
| I <sub>DSS</sub>           | Zero Gate Voltage Drain Current                  | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                 | -    | -    | 1.0  | μA   |
| I <sub>GSS</sub>           | Gate-Body Leakage Current                        | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V                                                | -    | -    | ±100 | nA   |
| On Characteristics         |                                                  |                                                                                             |      |      |      |      |
| V <sub>GS(th)</sub>        | Gate Threshold Voltage                           | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                  | 1.1  | 1.6  | 2.5  | V    |
| R <sub>DS(ON)</sub>        | Static Drain-Source ON-Resistance <sup>(4)</sup> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A                                                 | -    | 26   | 33   | mΩ   |
|                            |                                                  | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 5A                                                 | -    | 32   | 45   | mΩ   |
| Dynamic Characteristics    |                                                  |                                                                                             |      |      |      |      |
| R <sub>g</sub>             | Gate Resistance                                  | f = 1MHz                                                                                    | -    | 1.4  | -    | Ω    |
| C <sub>iss</sub>           | Input Capacitance                                | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 30V, f = 1MHz                                       | 848  | 1187 | 1602 | pF   |
| C <sub>oss</sub>           | Output Capacitance                               |                                                                                             | 40   | 56   | 76   | pF   |
| C <sub>rss</sub>           | Reverse Transfer Capacitance                     |                                                                                             | 34   | 47   | 63   | pF   |
| Q <sub>g</sub>             | Total Gate Charge                                | V <sub>GS</sub> = 0 to 10V<br>V <sub>DS</sub> = 30V, I <sub>D</sub> = 10A                   | 17   | 24   | 33   | nC   |
| Q <sub>gs</sub>            | Gate Source Charge                               |                                                                                             | -    | 4.5  | -    | nC   |
| Q <sub>gd</sub>            | Gate Drain("Miller") Charge                      |                                                                                             | -    | 4.5  | -    | nC   |
|                            |                                                  |                                                                                             |      |      |      |      |
| Switching Characteristics  |                                                  |                                                                                             |      |      |      |      |
| t <sub>d(on)</sub>         | Turn-On DelayTime                                | V <sub>GS</sub> = 10V, V <sub>DD</sub> = 30V<br>I <sub>D</sub> = 10A, R <sub>GEN</sub> = 3Ω | -    | 6.7  | -    | ns   |
| t <sub>r</sub>             | Turn-On Rise Time                                |                                                                                             | -    | 15   | -    | ns   |
| t <sub>d(off)</sub>        | Turn-Off DelayTime                               |                                                                                             | -    | 24   | -    | ns   |
| t <sub>f</sub>             | Turn-Off Fall Time                               |                                                                                             | -    | 2.7  | -    | ns   |
| Body Diode Characteristics |                                                  |                                                                                             |      |      |      |      |
| I <sub>S</sub>             | Maximum Continuous Body Diode Forward Current    |                                                                                             | -    | -    | 20   | A    |
| I <sub>SM</sub>            | Maximum Pulsed Body Diode Forward Current        |                                                                                             | -    | -    | 79   | A    |
| V <sub>SD</sub>            | Body Diode Forward Voltage                       | V <sub>GS</sub> = 0V, I <sub>S</sub> = 10A                                                  | -    |      | 1.2  | V    |
| trr                        | Body Diode Reverse Recovery Time                 | I <sub>F</sub> = 10A, di/dt = 100A/us                                                       | 13   | 19   | 25   | ns   |
| Qrr                        | Body Diode Reverse Recovery Charge               |                                                                                             | -    | 19   | -    | nC   |

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2.  $E_{AS}$  condition: Starting  $T_J = 25^\circ\text{C}$ ,  $V_{DS} = 30\text{V}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\text{ohm}$ ,  $L = 0.5\text{mH}$ ,  $I_{AS} = 9.8\text{A}$ ,  $V_{DD} = 0\text{V}$  during time in avalanche.
3.  $R_{\theta JA}$  is measured with the device mounted on a  $1\text{inch}^2$  pad of 2oz copper FR4 PCB.
4. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$ .

## RATING AND CHARACTERISTIC CURVES (20N06)

Figure 1: Power De-rating

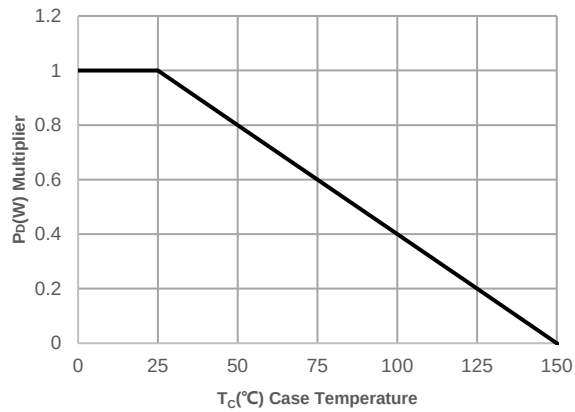


Figure 2: Current De-rating

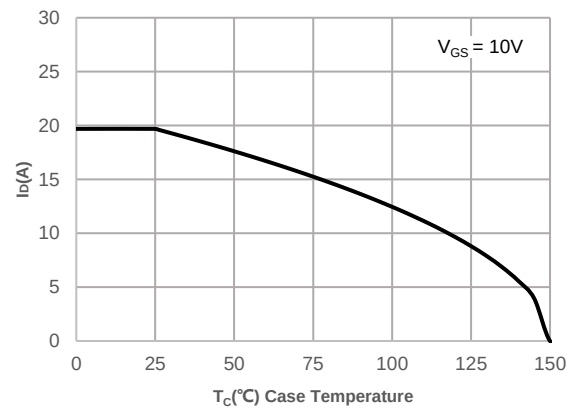


Figure 3: Normalized Maximum Transient Thermal Impedance

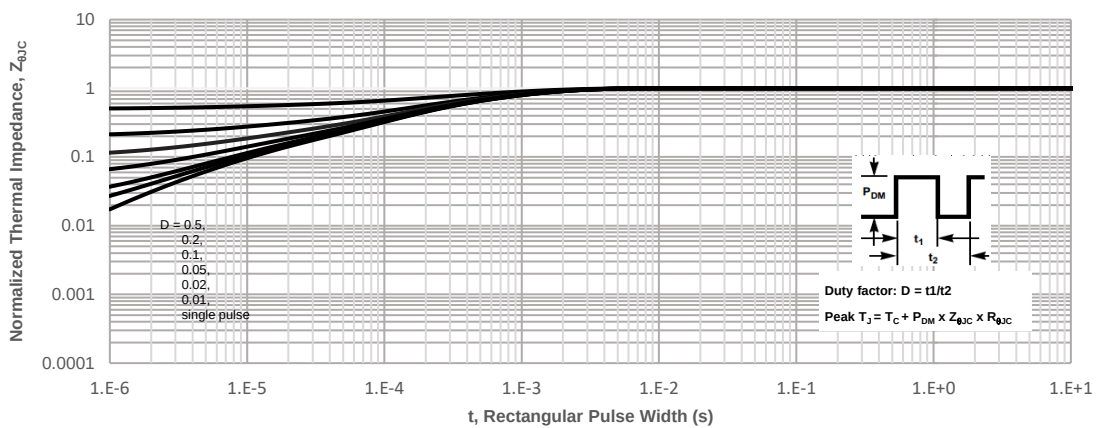
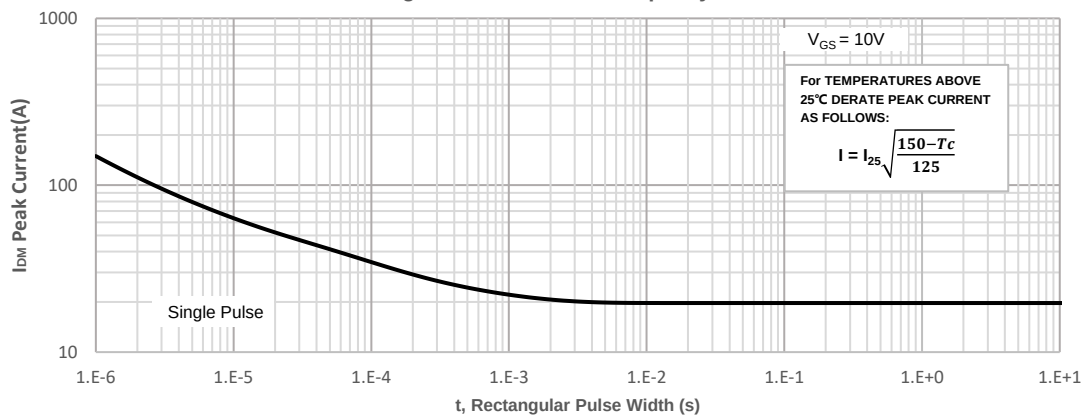


Figure 4: Peak Current Capacity



## RATING AND CHARACTERISTIC CURVES (20N06)

Figure 5: Output Characteristics

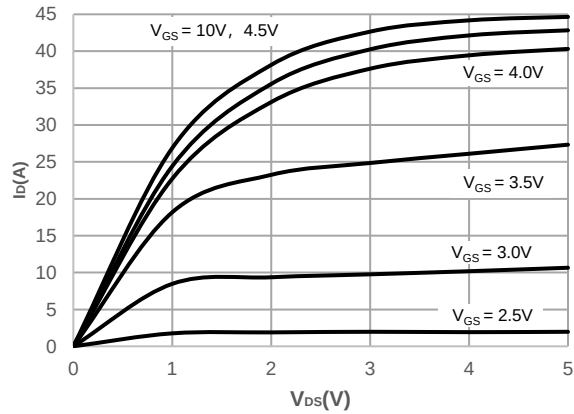


Figure 6: Typical Transfer Characteristics

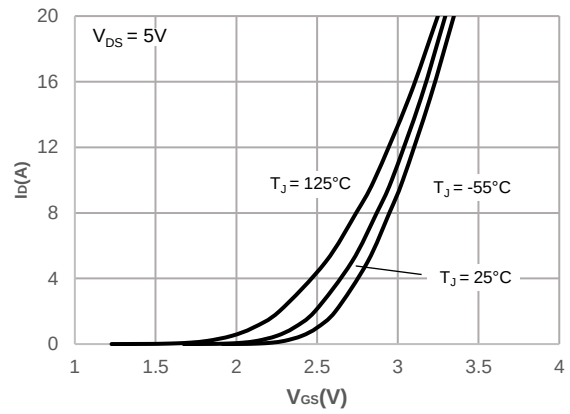


Figure 7: On-resistance vs. Drain Current

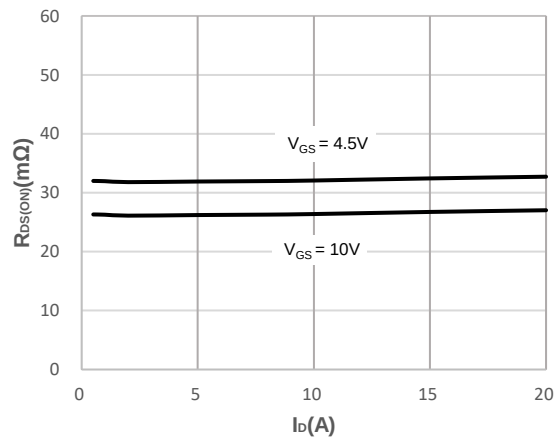


Figure 8: Body Diode Characteristics

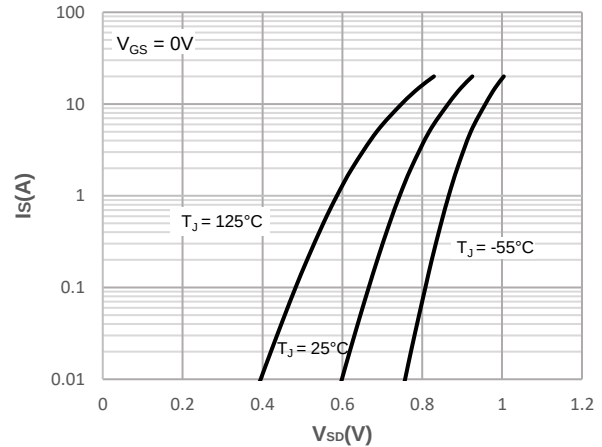


Figure 9: Gate Charge Characteristics

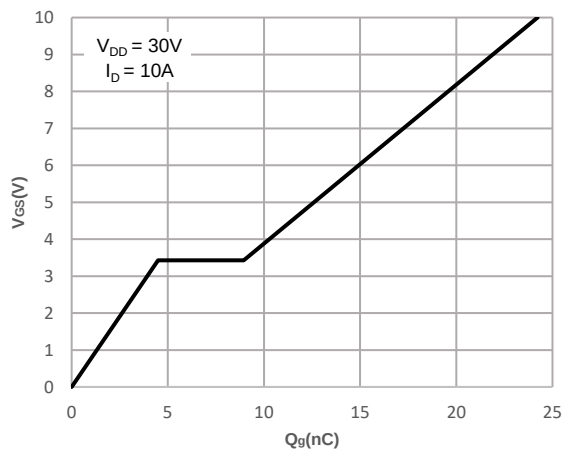
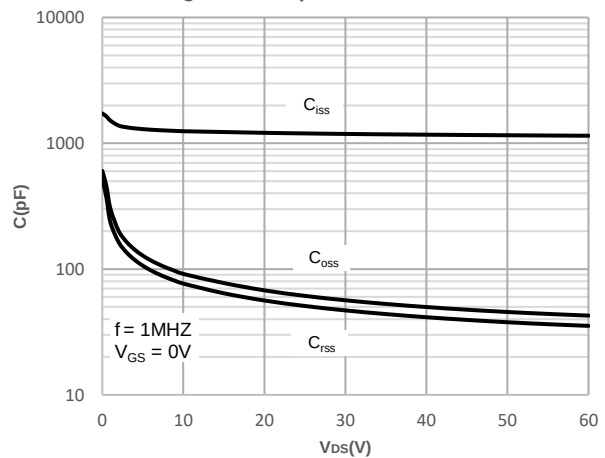


Figure 10: Capacitance Characteristics





## RATING AND CHARACTERISTIC CURVES (20N06)

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

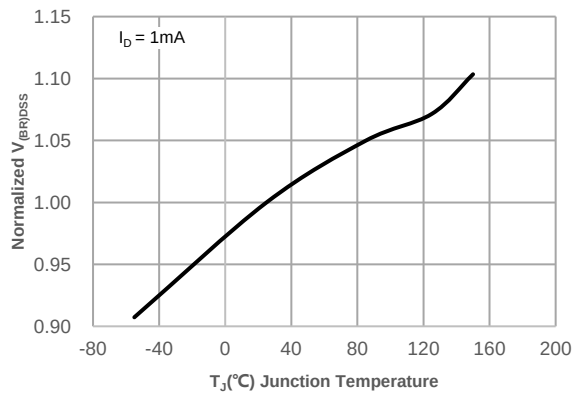


Figure 12: Normalized on Resistance vs. Junction Temperature

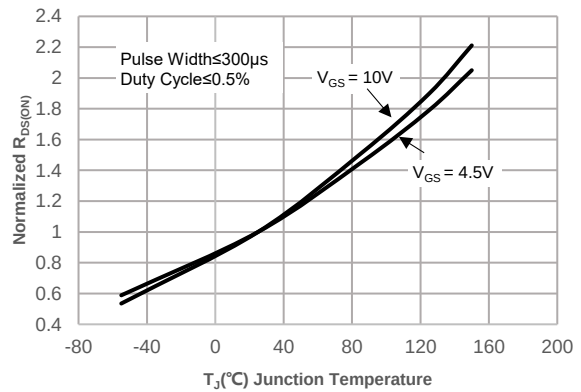


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

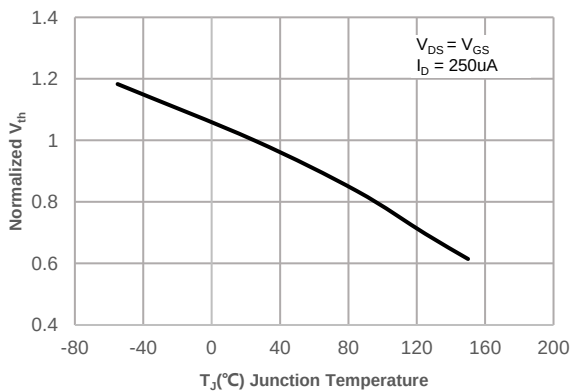


Figure 14:  $R_{DS(ON)}$  VS.  $V_{GS}$

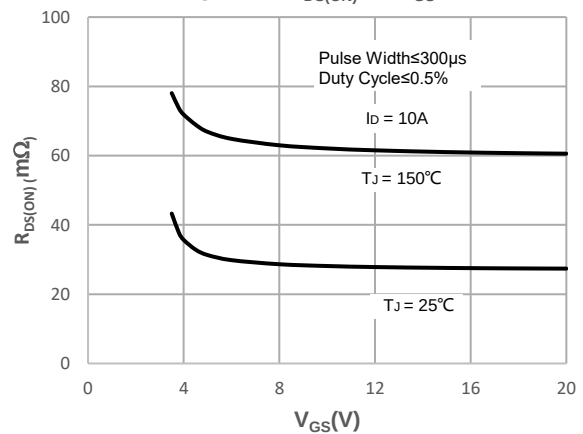
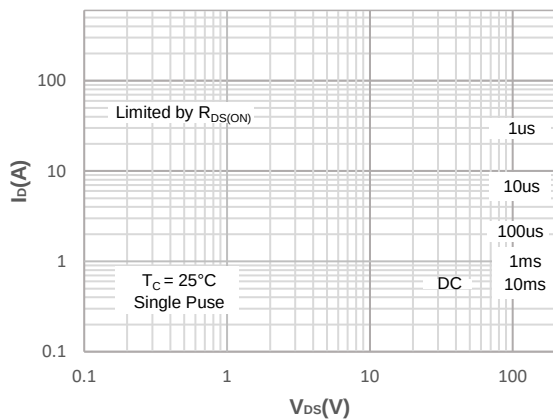


Figure 15: Maximum Safe Operating Area



## Test Circuit

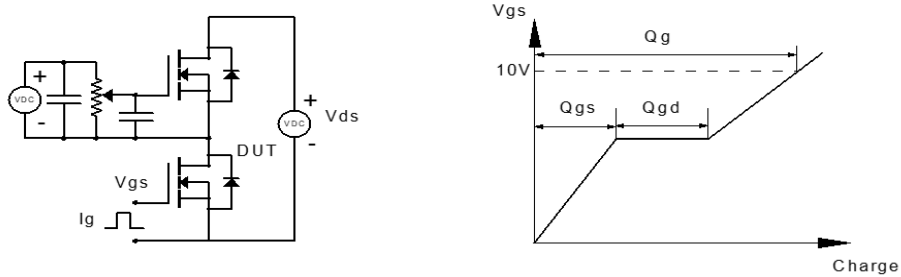


Figure 1: Gate Charge Test Circuit & Waveform

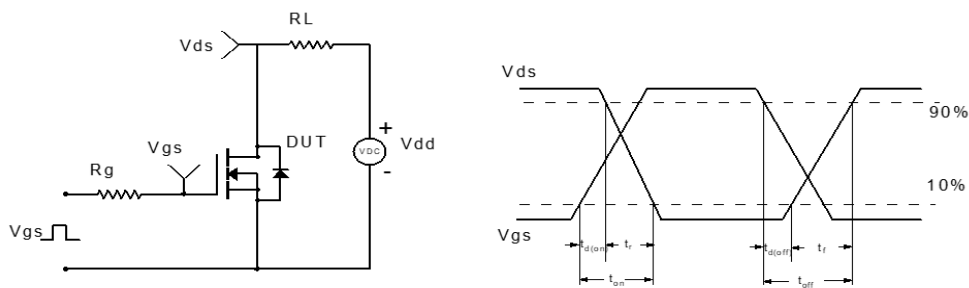


Figure 2: Resistive Switching Test Circuit & Waveform

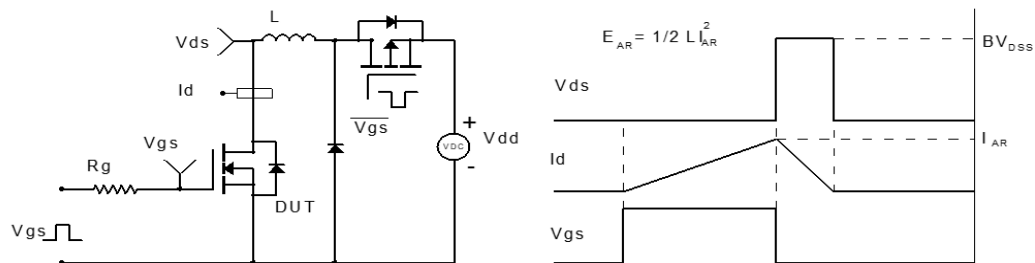


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

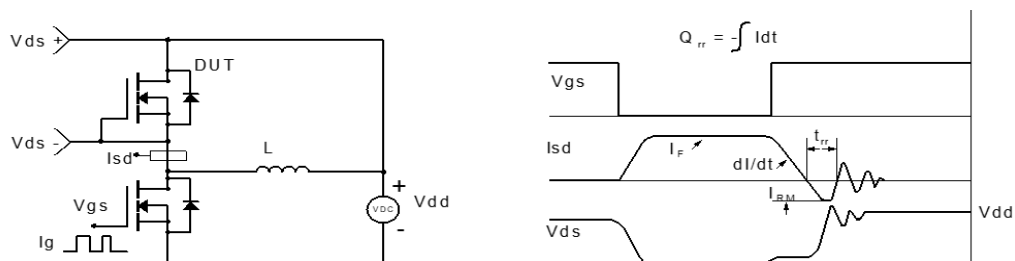


Figure 4: Diode Recovery Test Circuit & Waveform