

**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> =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<br>T <sub>J</sub> =55°C                         |      |            | 100<br>500  | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V                                               |      |            | 100         | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                  | 1.5  | 2          | 2.5         | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V                                                 | 170  |            |             | 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                        |      | 5.4<br>9.6 | 6.5<br>11.5 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                                |      | 6.4        | 8           | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =20A                                                  |      | 75         |             | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V                                                   |      | 0.7        | 1           | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                           |      |            | 81          | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                           |      |            |             |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1MHz                                         | 3800 | 4800       | 5800        | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                           | 330  | 470        | 610         | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                           | 110  | 190        | 270         | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                          | 0.5  | 1          | 1.5         | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                           |      |            |             |       |
| Q <sub>g(10V)</sub>         | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =20A                           | 64   | 80         | 96          | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |                                                                                           | 32   | 40         | 48          | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                           | 12   | 15         | 18          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                           | 8    | 14         | 20          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, R <sub>L</sub> =1.5Ω,<br>R <sub>GEN</sub> =3Ω |      | 13.5       |             | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                           |      | 4.2        |             | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                           |      | 51         |             | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                           |      | 7          |             | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =20A, dI/dt=500A/μs                                                        | 14   | 18         | 22          | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =20A, dI/dt=500A/μs                                                        | 43   | 54         | 65          | nC    |

A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> 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 150°C may be used if the PCB allows it.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=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<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25°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 <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<sub>J(MAX)</sub>=150°C. The SOA curve provides a single pulse rating.

G. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C.

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# TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

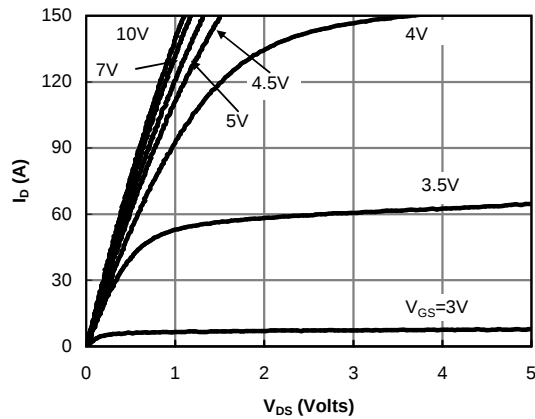


Fig 1: On-Region Characteristics (Note E)

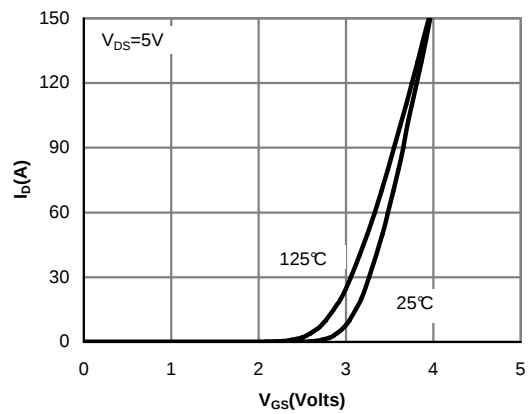


Figure 2: Transfer Characteristics (Note E)

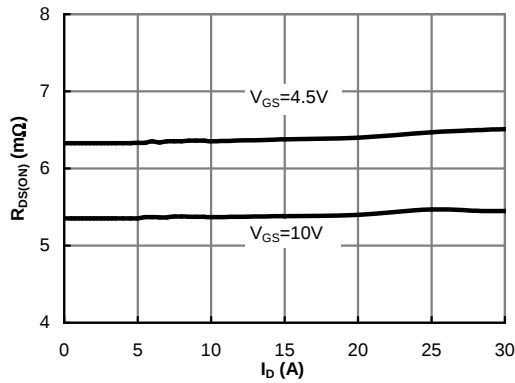


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

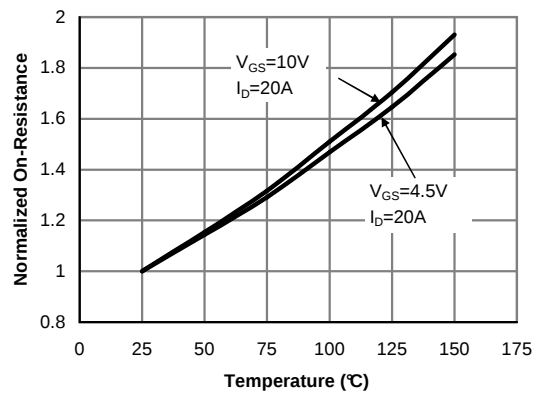


Figure 4: On-Resistance vs. Junction Temperature (Note E)

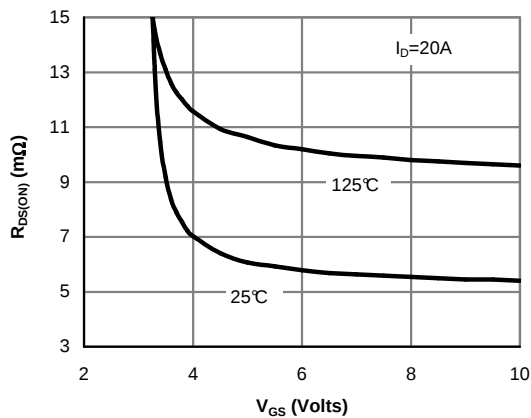


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

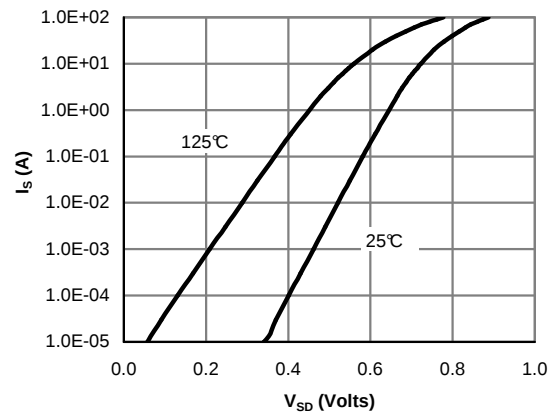


Figure 6: Body-Diode Characteristics (Note E)

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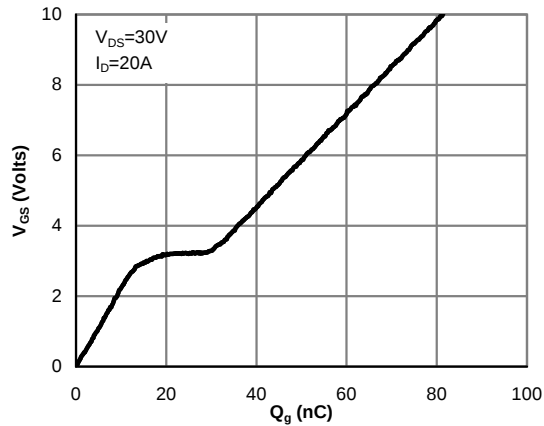


Figure 7: Gate-Charge Characteristics

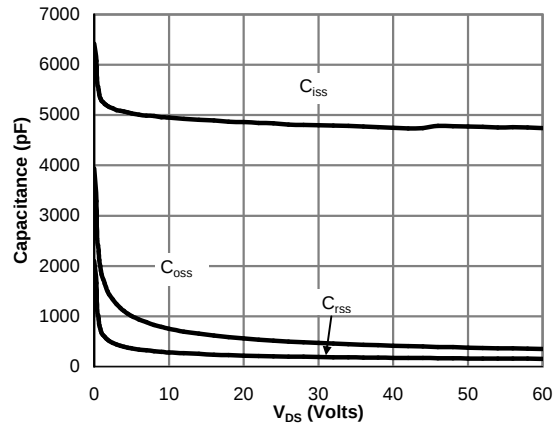


Figure 8: Capacitance Characteristics

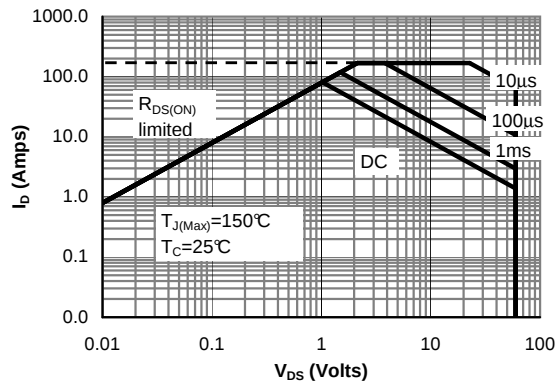


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

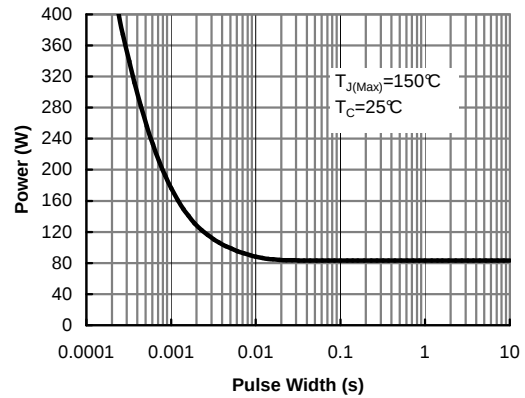


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

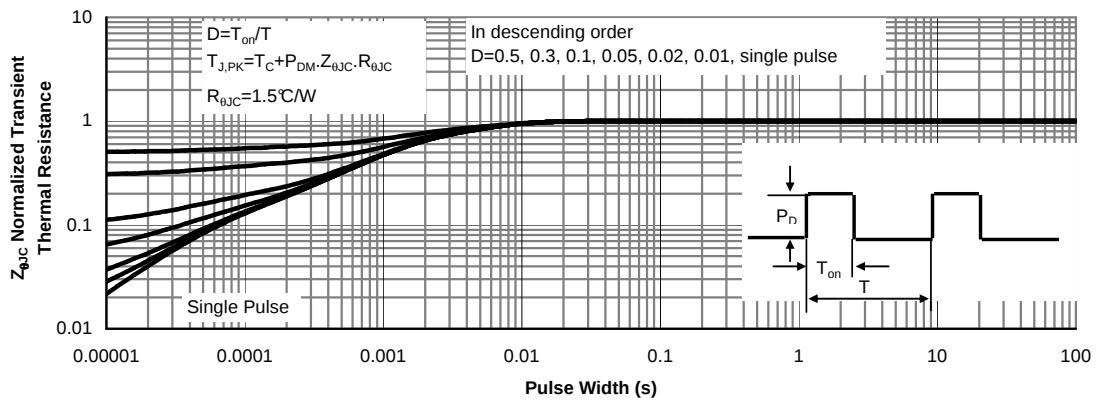


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

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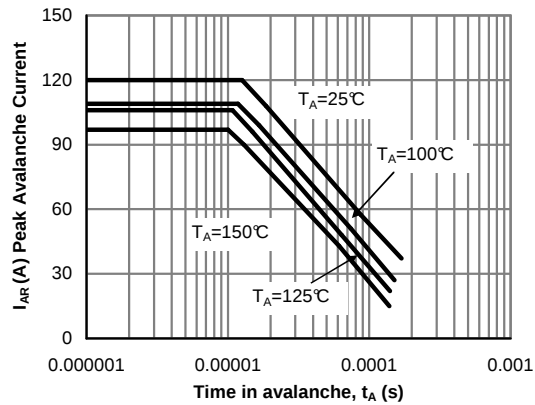


Figure 12: Single Pulse Avalanche capability (Note C)

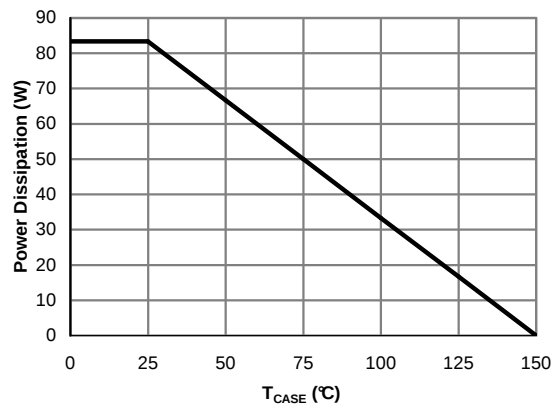


Figure 13: Power De-rating (Note F)

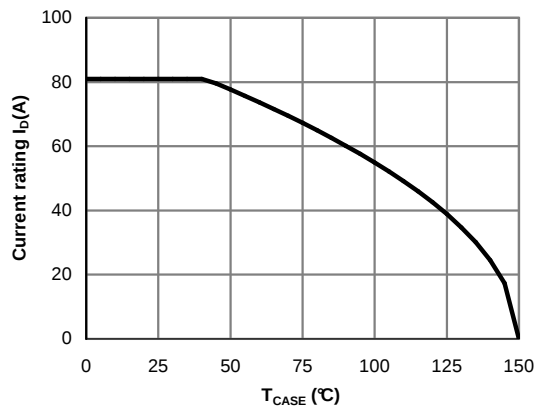


Figure 14: Current De-rating (Note F)

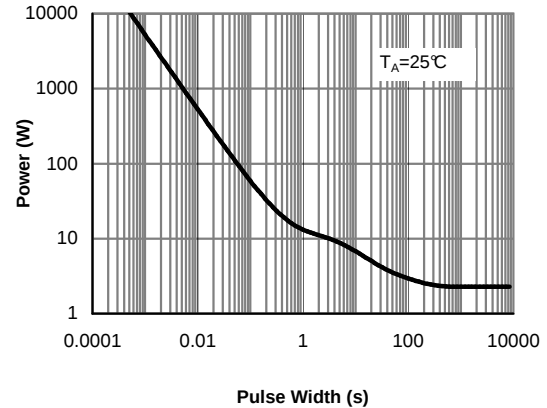


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

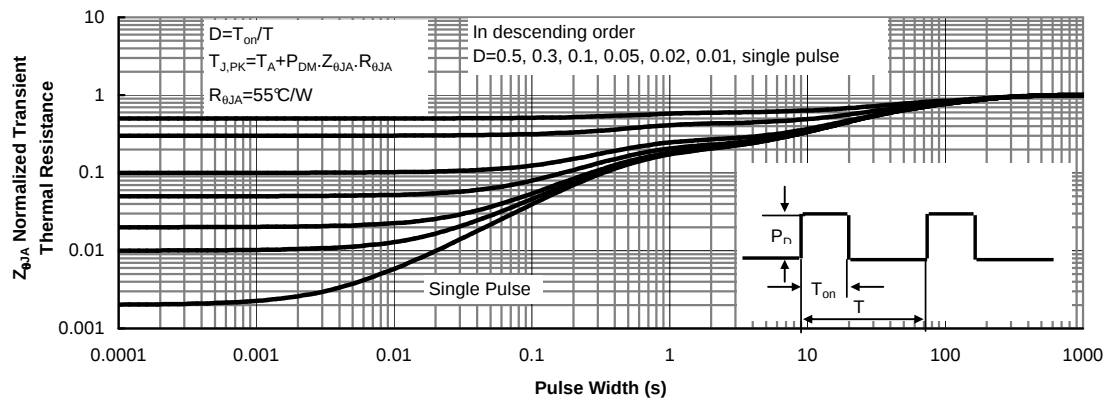
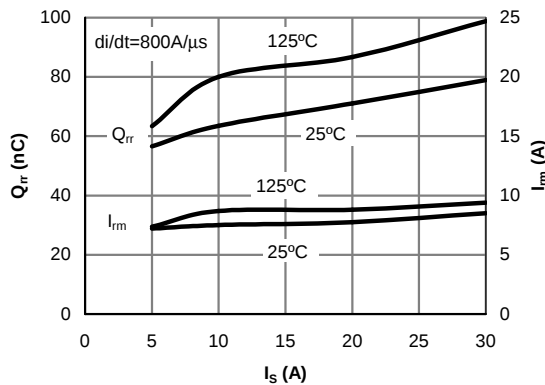
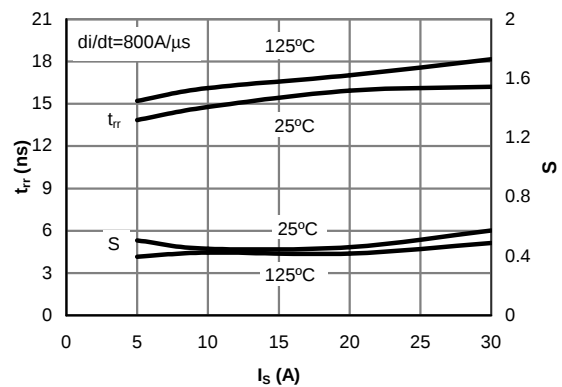


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

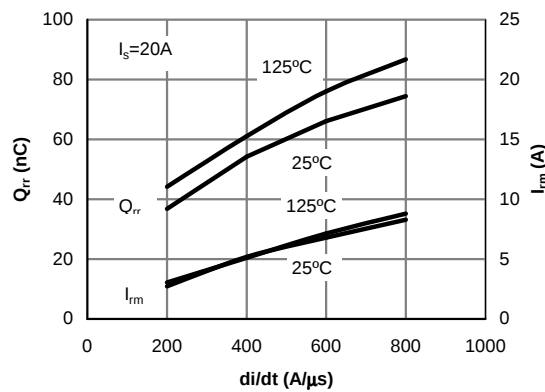
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



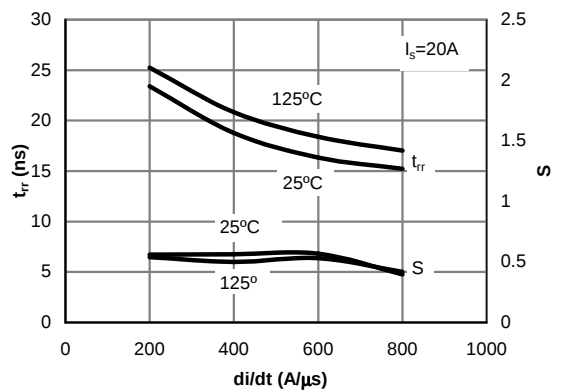
**Figure 17: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current**



**Figure 18: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current**

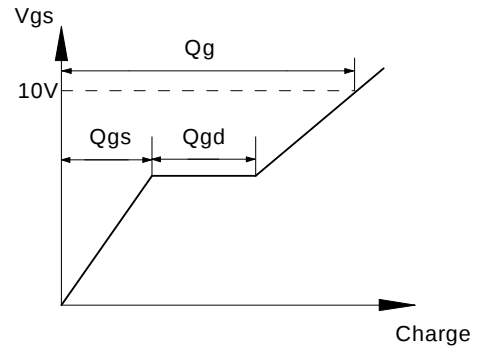
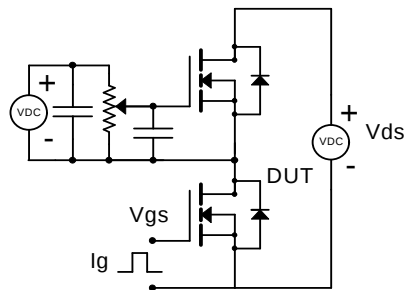


**Figure 19: Diode Reverse Recovery Charge and Peak Current vs. di/dt**

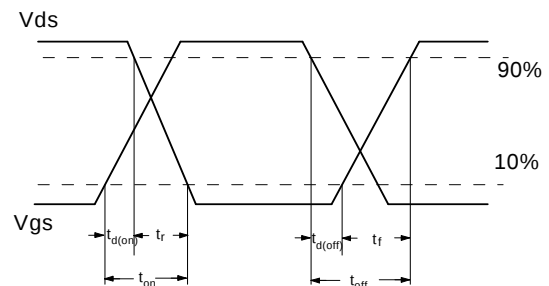
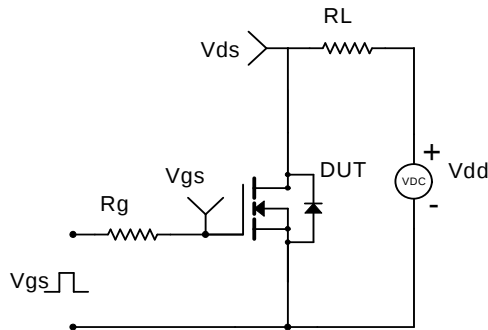


**Figure 20: Diode Reverse Recovery Time and Softness Factor vs. di/dt**

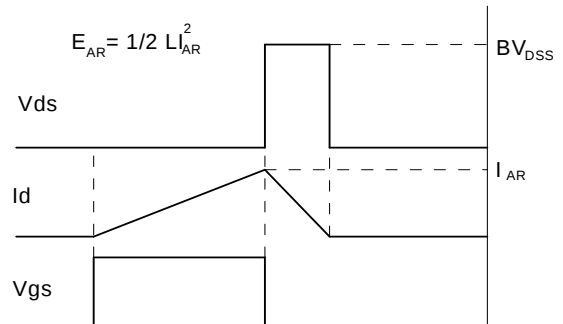
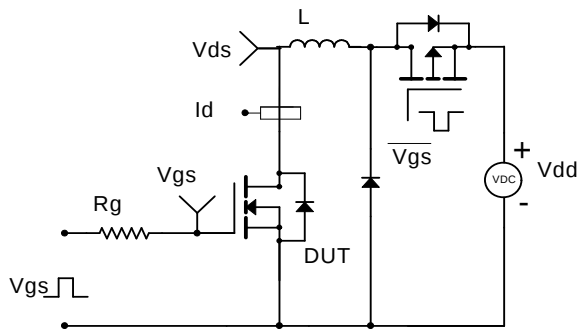
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

