

### General Description

- Latest Trench Power AlphaMOS (αMOS LV) technology
- Integrated Schottky Diode (SRFET)
- Very Low  $R_{DS(ON)}$  at 4.5V  $V_{GS}$
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

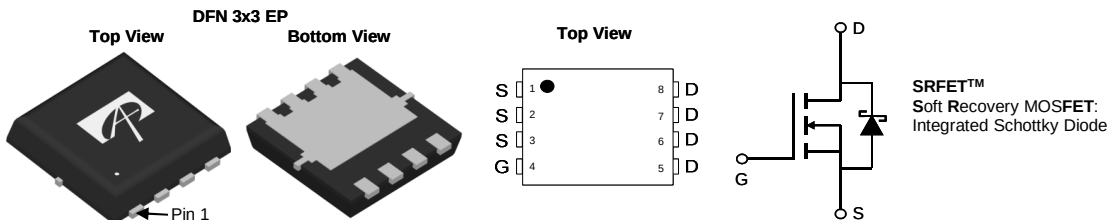
### Application

- DC/DC Converters in Computing, Servers, and POL
- Isolated DC/DC Converters in Telecom and Industrial

### Product Summary

|                                  |         |
|----------------------------------|---------|
| $V_{DS}$                         | 30V     |
| $I_D$ (at $V_{GS}=10V$ )         | 32A     |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )  | < 3.6mΩ |
| $R_{DS(ON)}$ (at $V_{GS}=4.5V$ ) | < 5mΩ   |

100% UIS Tested  
100%  $R_g$  Tested



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

| Parameter                              |                      | Symbol                            | Maximum    | Units |
|----------------------------------------|----------------------|-----------------------------------|------------|-------|
| Drain-Source Voltage                   |                      | V <sub>DS</sub>                   | 30         | V     |
| Gate-Source Voltage                    |                      | V <sub>GS</sub>                   | ±20        | V     |
| Continuous Drain Current <sup>G</sup>  | T <sub>C</sub> =25℃  | I <sub>D</sub>                    | 32         | A     |
|                                        | T <sub>C</sub> =100℃ |                                   | 25         |       |
| Pulsed Drain Current <sup>C</sup>      |                      | I <sub>DM</sub>                   | 128        |       |
| Continuous Drain Current               | T <sub>A</sub> =25℃  | I <sub>DSM</sub>                  | 24         | A     |
|                                        | T <sub>A</sub> =70℃  |                                   | 19         |       |
| Avalanche Current <sup>C</sup>         |                      | I <sub>AS</sub>                   | 50         | A     |
| Avalanche energy L=0.05mH <sup>C</sup> |                      | E <sub>AS</sub>                   | 63         | mJ    |
| V <sub>DS</sub> Spike                  | 100ns                | V <sub>SPIKE</sub>                | 36         | V     |
| Power Dissipation <sup>B</sup>         | T <sub>C</sub> =25℃  | P <sub>D</sub>                    | 70         | W     |
|                                        | T <sub>C</sub> =100℃ |                                   | 28         |       |
| Power Dissipation <sup>A</sup>         | T <sub>A</sub> =25℃  | P <sub>DSM</sub>                  | 3.1        | W     |
|                                        | T <sub>A</sub> =70℃  |                                   | 2          |       |
| Junction and Storage Temperature Range |                      | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150 | ℃     |

### Thermal Characteristics

| Parameter                                  | Symbol          | Typ | Max | Units              |
|--------------------------------------------|-----------------|-----|-----|--------------------|
| Maximum Junction-to-Ambient <sup>A</sup>   | $R_{\theta JA}$ | 30  | 40  | $^\circ\text{C/W}$ |
| $t \leq 10\text{s}$                        |                 |     |     |                    |
| Maximum Junction-to-Ambient <sup>A D</sup> |                 | 60  | 75  | $^\circ\text{C/W}$ |
| Steady-State                               |                 |     |     |                    |
| Maximum Junction-to-Case                   | $R_{\theta JC}$ | 1.3 | 1.8 | $^\circ\text{C/W}$ |
| Steady-State                               |                 |     |     |                    |

**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> =10mA, 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                         |     |            | 0.5<br>100 | mA    |
| 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                                   | 1.4 | 1.8        | 2.4        | V     |
| 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                         |     | 2.9<br>3.9 | 3.6<br>4.8 | mΩ    |
|                             |                                                    | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                                 |     | 3.9        | 5          | mΩ    |
|                             |                                                    |                                                                                            |     |            |            |       |
| g <sub>FS</sub>             | Forward Transconductance                           | V <sub>DS</sub> =5V, I <sub>D</sub> =20A                                                   |     | 85         |            | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                              | I <sub>S</sub> =1A, V <sub>GS</sub> =0V                                                    |     | 0.48       | 0.6        | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current <sup>G</sup> |                                                                                            |     |            | 32         | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                                    |                                                                                            |     |            |            |       |
| C <sub>iss</sub>            | Input Capacitance                                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz                                          |     | 1975       |            | pF    |
| C <sub>oss</sub>            | Output Capacitance                                 |                                                                                            |     | 913        |            | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance                       |                                                                                            |     | 92         |            | pF    |
| R <sub>g</sub>              | Gate resistance                                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                           | 0.7 | 1.5        | 2.3        | 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                            |     | 29.0       | 40         | nC    |
| Q <sub>g</sub> (4.5V)       | Total Gate Charge                                  |                                                                                            |     | 13.6       | 19         | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                                 |                                                                                            |     | 5.8        |            | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                                  |                                                                                            |     | 5.3        |            | 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 |     | 7.9        |            | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                                  |                                                                                            |     | 4.0        |            | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                                 |                                                                                            |     | 27.3       |            | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                                 |                                                                                            |     | 6.5        |            | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time                   | I <sub>F</sub> =20A, dI/dt=500A/μs                                                         |     | 19         |            | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge                 | I <sub>F</sub> =20A, dI/dt=500A/μs                                                         |     | 36.7       |            | 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> ≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.

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. Single pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° 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. The maximum current rating is package limited.

H. 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

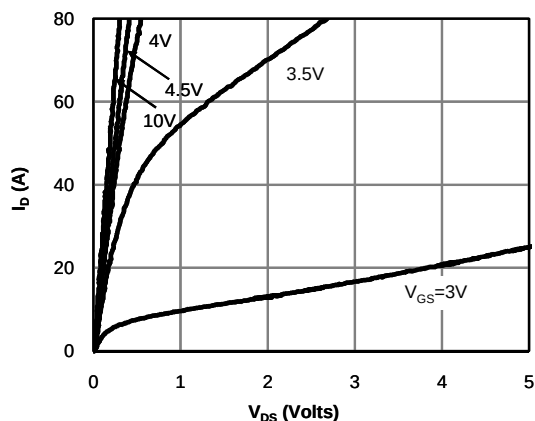


Fig 1: On-Region Characteristics (Note E)

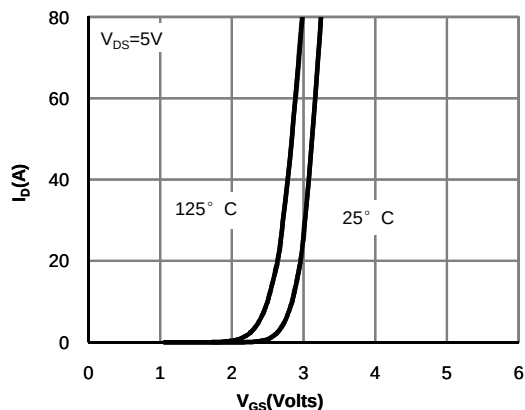


Figure 2: Transfer Characteristics (Note E)

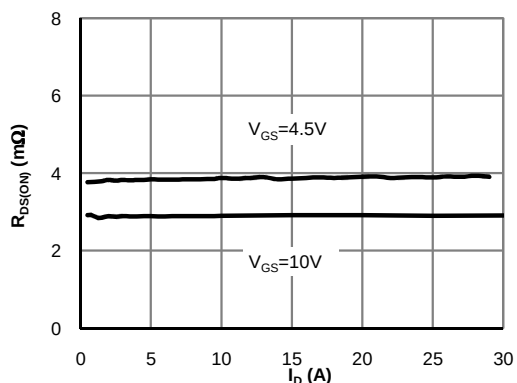


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

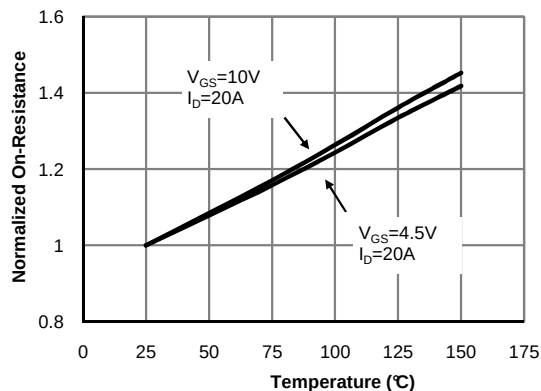


Figure 4: On-Resistance vs. Junction Temperature (Note E)

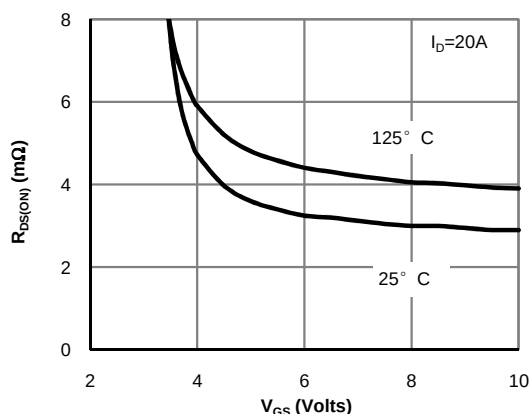


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

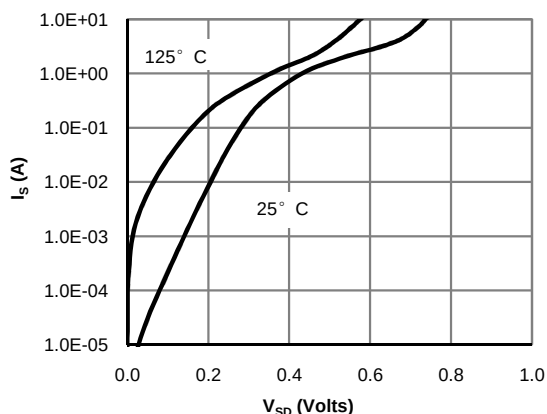
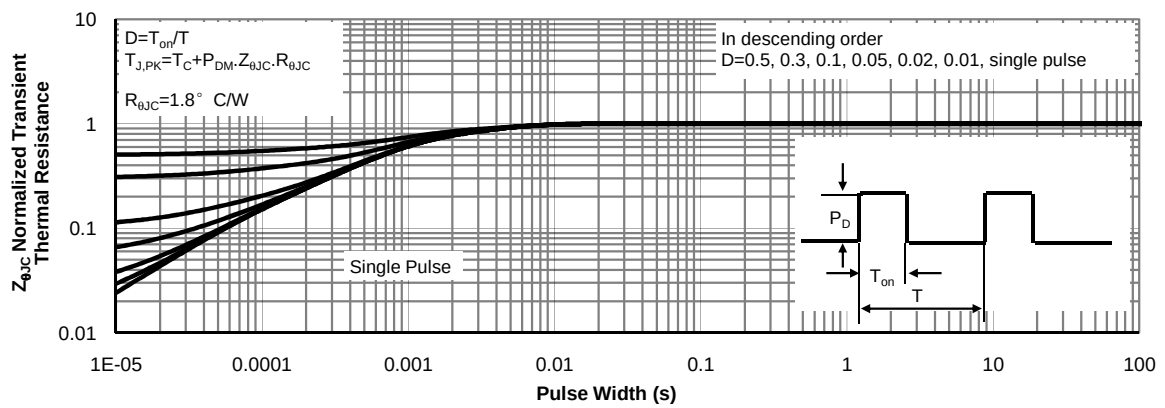
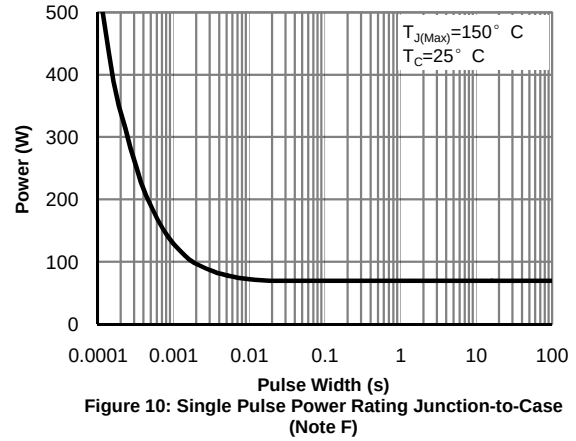
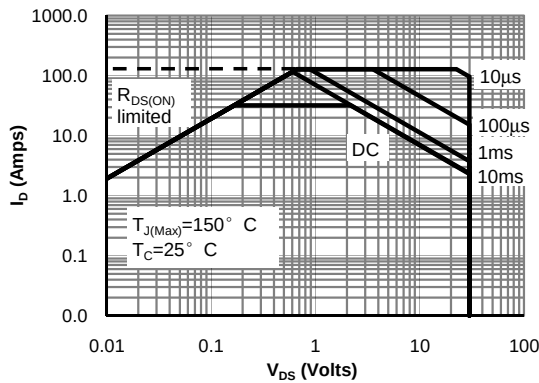
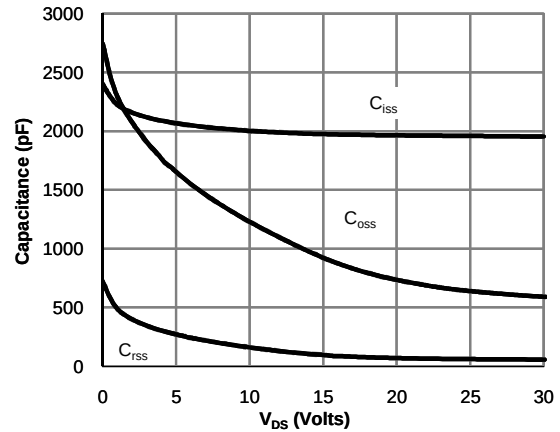
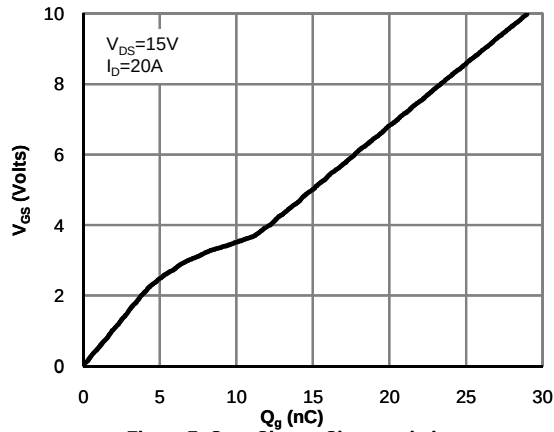


Figure 6: Body-Diode Characteristics (Note E)

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



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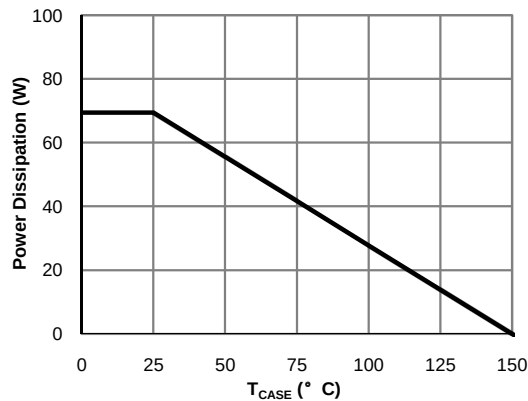


Figure 12: Power De-rating (Note F)

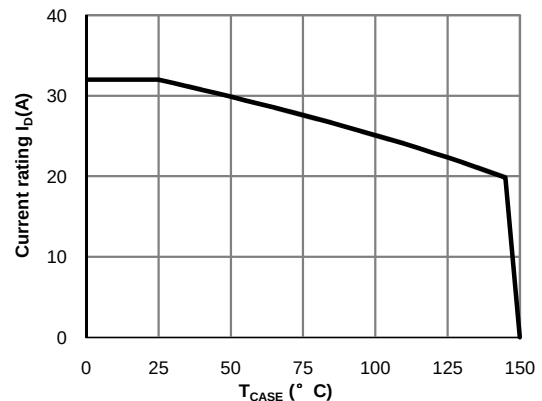


Figure 13: Current De-rating (Note F)

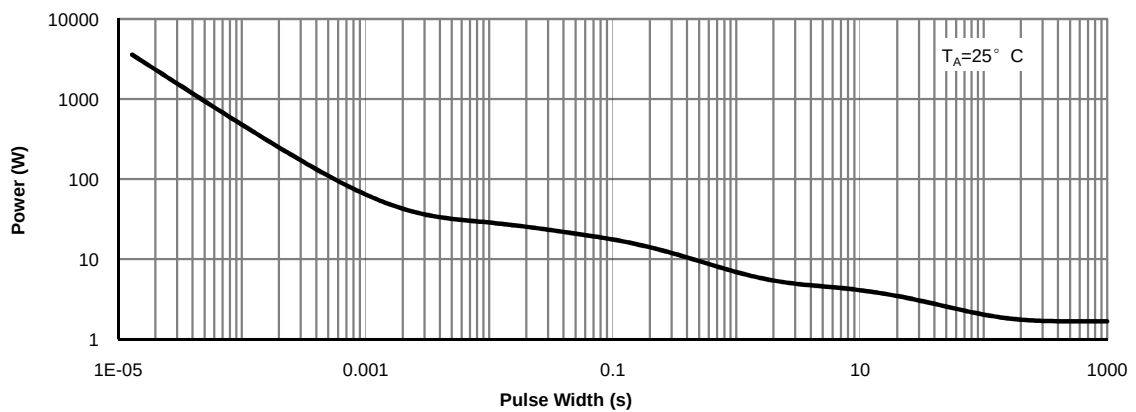


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

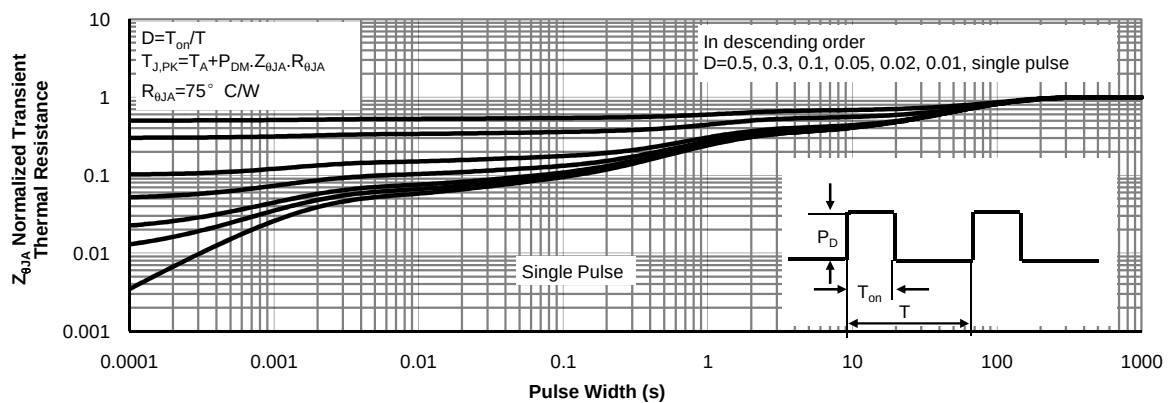
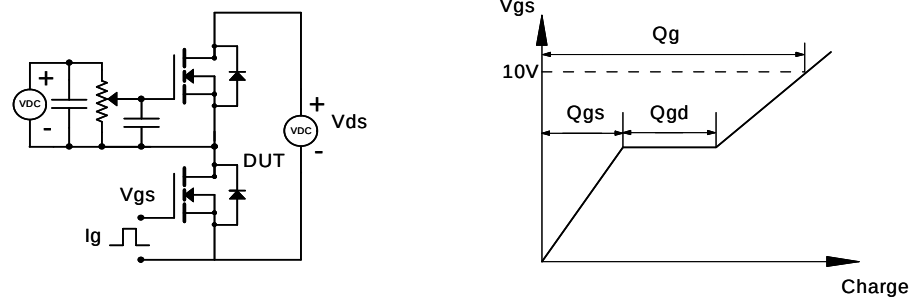
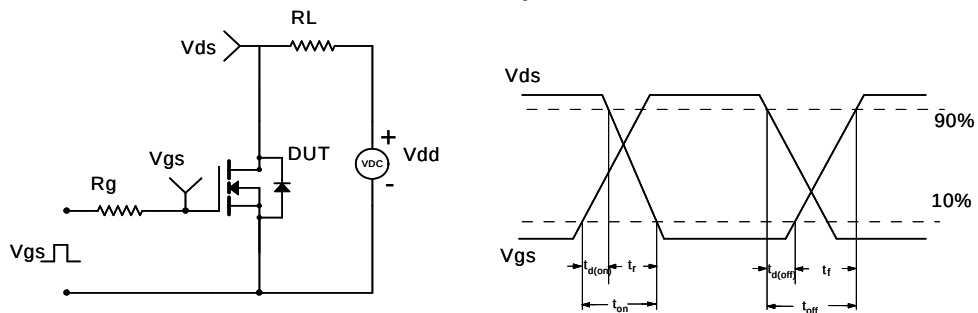


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

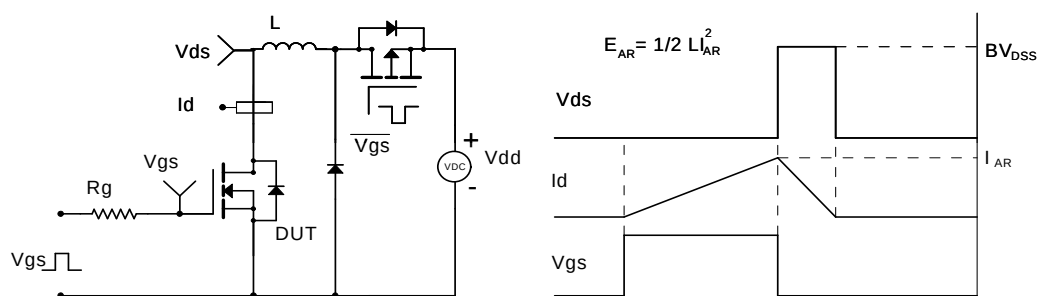
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



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



### Diode Recovery Test Circuit & Waveforms

