

### General Description

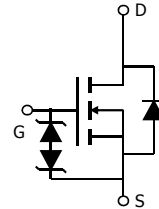
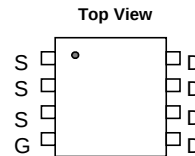
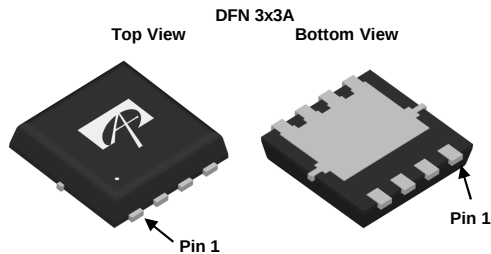
• The AON7406 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in SMPS and general purpose applications.

• RoHS and Halogen-Free Compliant

### Product Summary

|                                  |                |
|----------------------------------|----------------|
| $V_{DS}$                         | 30V            |
| $I_D$ (at $V_{GS}=10V$ )         | 25A            |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )  | < 17m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=4.5V$ ) | < 23m $\Omega$ |
| Typical ESD protection           | HBM Class 2    |

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                           | $V_{DS}$         | 30         | V                |
| Gate-Source Voltage                            | $V_{GS}$         | $\pm 20$   | V                |
| Continuous Drain Current                       | $I_D$            | 25         | A                |
| $T_C=25^\circ\text{C}$                         |                  |            |                  |
| $T_C=100^\circ\text{C}$                        |                  | 15         |                  |
| Pulsed Drain Current <sup>C</sup>              | $I_{DM}$         | 50         |                  |
| Continuous Drain Current                       | $I_{DSM}$        | 9          | A                |
| $T_A=25^\circ\text{C}$                         |                  |            |                  |
| $T_A=70^\circ\text{C}$                         |                  | 7          |                  |
| Avalanche Current <sup>C</sup>                 | $I_{AS}, I_{AR}$ | 19         | A                |
| Avalanche energy $L=0.1\text{mH}$ <sup>C</sup> | $E_{AS}, E_{AR}$ | 18         | mJ               |
| Power Dissipation <sup>B</sup>                 | $P_D$            | 15.5       | W                |
| $T_C=25^\circ\text{C}$                         |                  |            |                  |
| $T_C=100^\circ\text{C}$                        |                  | 6          |                  |
| Power Dissipation <sup>A</sup>                 | $P_{DSM}$        | 3.1        | W                |
| $T_A=25^\circ\text{C}$                         |                  |            |                  |
| $T_A=70^\circ\text{C}$                         |                  | 2          |                  |
| Junction and Storage Temperature Range         | $T_J, T_{STG}$   | -55 to 150 | $^\circ\text{C}$ |

### 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> | $R_{\theta JA}$ | 60  | 75  | $^\circ\text{C/W}$ |
| Steady-State                                |                 |     |     |                    |
| Maximum Junction-to-Case                    | $R_{\theta JC}$ | 6.6 | 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> =250μA, 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> =55°C                          |     |          | 1<br>5   | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±16V                                                |     |          | 10       | μA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                   | 1.2 | 1.8      | 2.4      | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V                                                  | 50  |          |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =9A<br>T <sub>j</sub> =125°C                          |     | 14<br>20 | 17<br>24 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A                                                  |     | 18       | 23       | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =9A                                                    |     | 40       |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V                                                    |     | 0.75     | 1        | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                            |     |          | 15       | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                            |     |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz                                          | 600 | 740      | 888      | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                            | 77  | 110      | 145      | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                            | 50  | 82       | 115      | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                           | 0.5 | 1.1      | 1.7      | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                            |     |          |          |       |
| Q <sub>g(10V)</sub>         | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =9A                             | 12  | 15       | 18       | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |                                                                                            | 6   | 7.5      | 9        | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                            |     | 2.5      |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                            |     | 3        |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.67Ω,<br>R <sub>GEN</sub> =3Ω |     | 5        |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                            |     | 3.5      |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                            |     | 19       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                            |     | 3.5      |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =9A, dI/dt=500A/μs                                                          | 6   | 8        | 10       | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =9A, dI/dt=500A/μs                                                          | 14  | 18       | 22       | 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> t ≤ 10s value 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. 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. 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

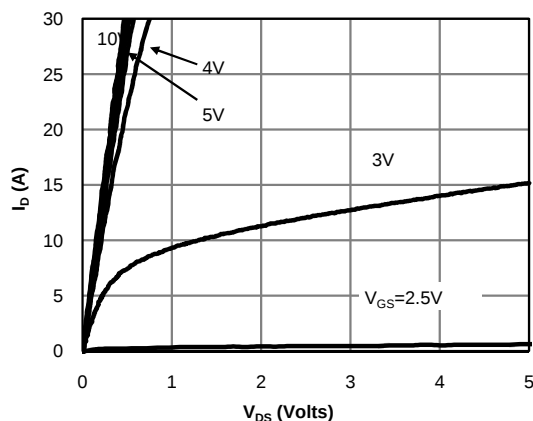


Fig 1: On-Region Characteristics (Note E)

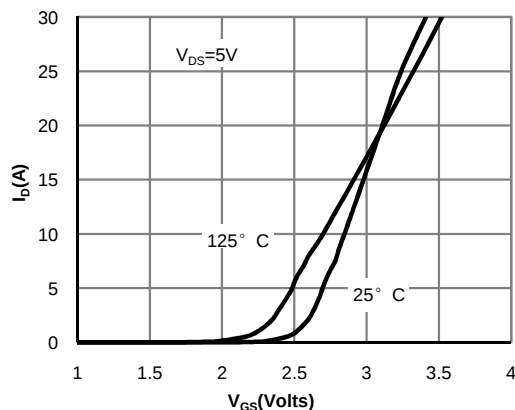


Figure 2: Transfer Characteristics (Note E)

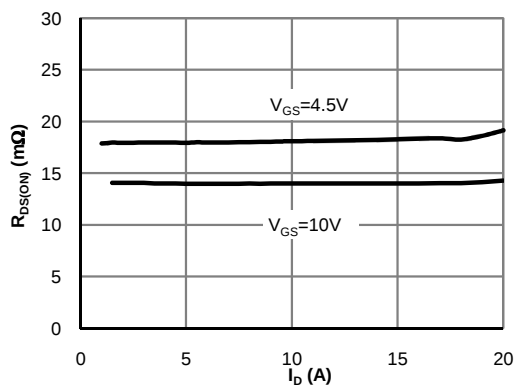


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

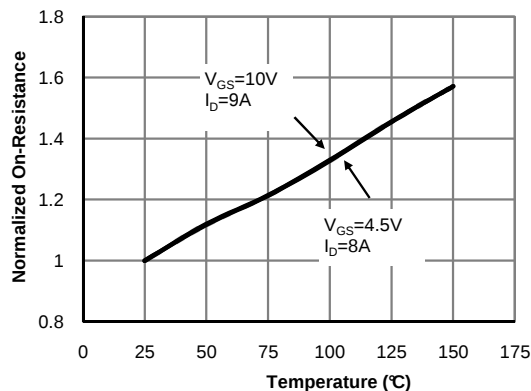


Figure 4: On-Resistance vs. Junction Temperature (Note E)

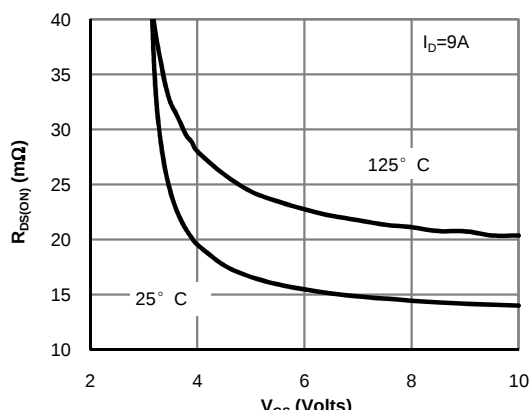


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

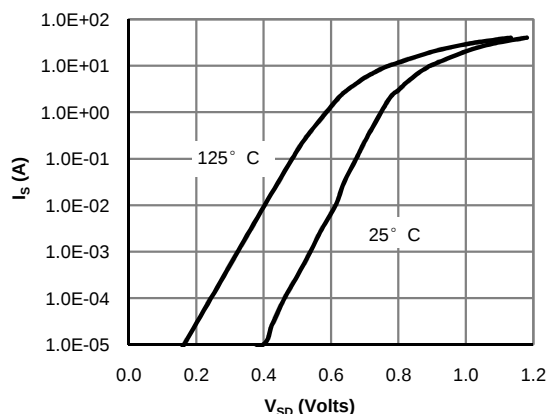
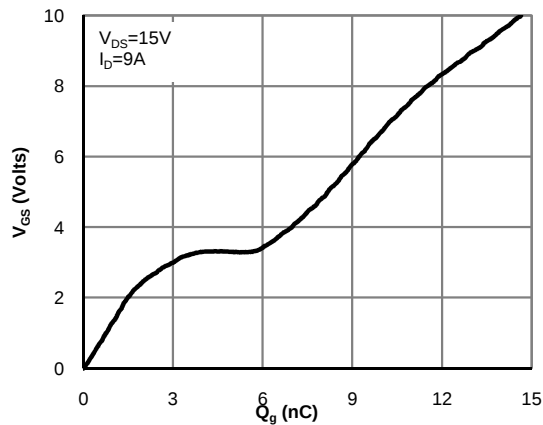
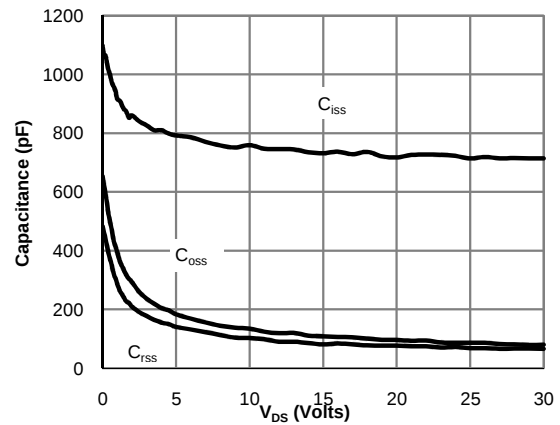


Figure 6: Body-Diode Characteristics (Note E)

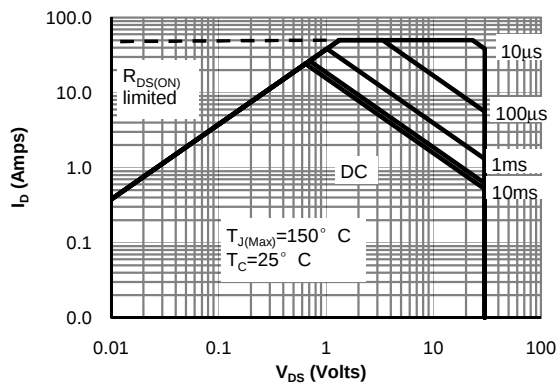
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



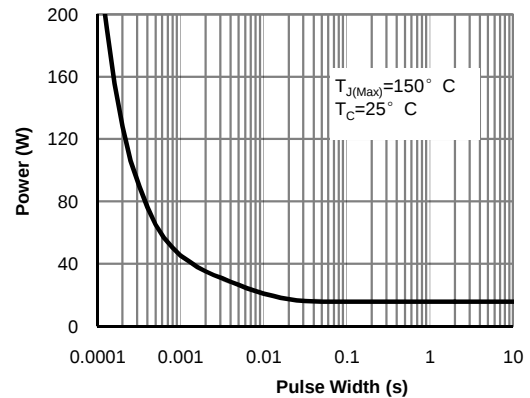
**Figure 7: Gate-Charge Characteristics**



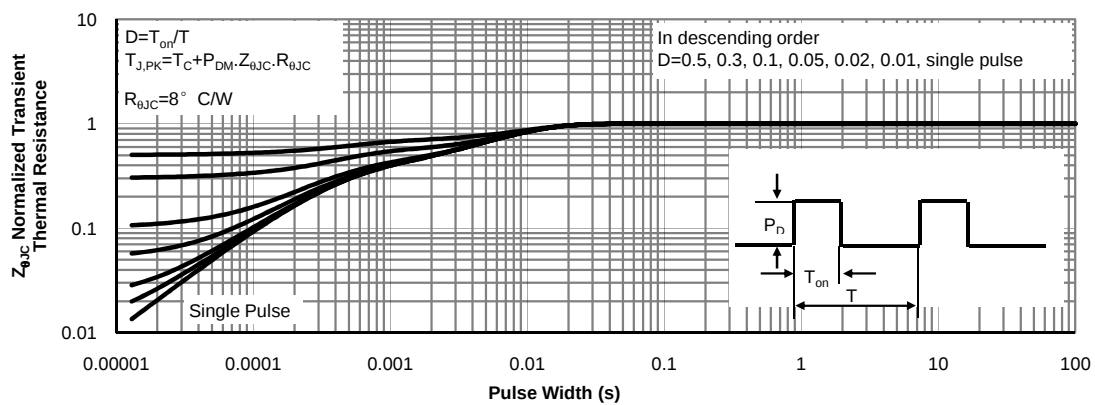
**Figure 8: Capacitance Characteristics**



**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**

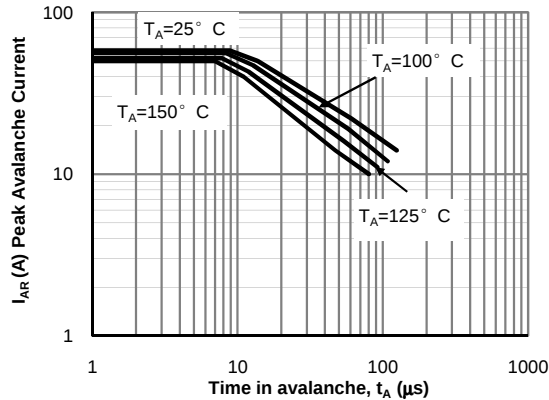


Figure 12: Single Pulse Avalanche capability (Note C)

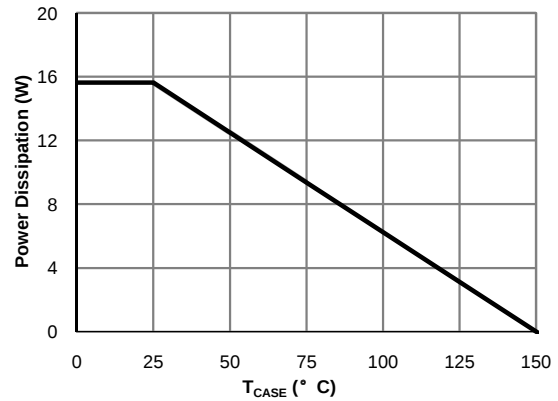


Figure 13: Power De-rating (Note F)

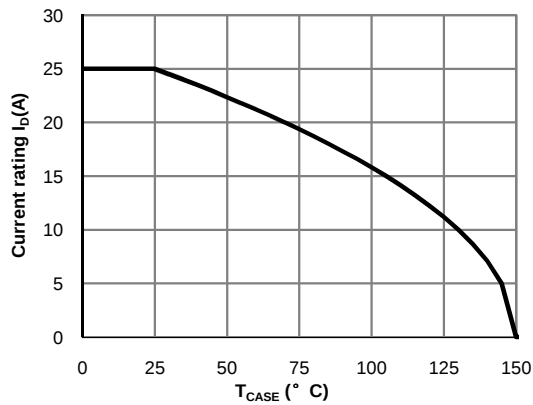


Figure 14: Current De-rating (Note F)

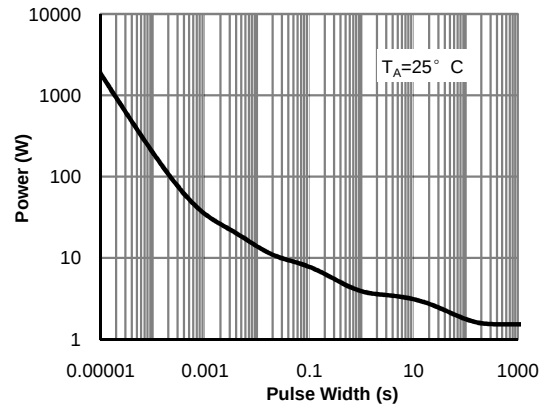


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

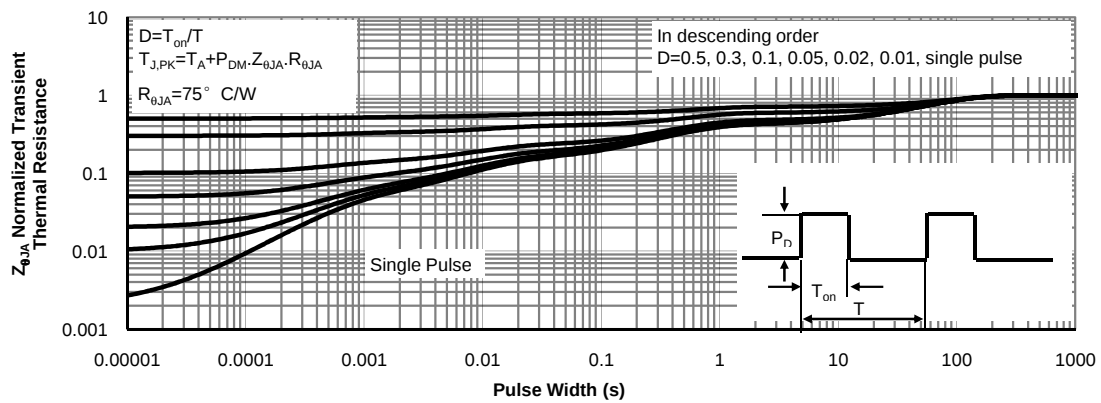
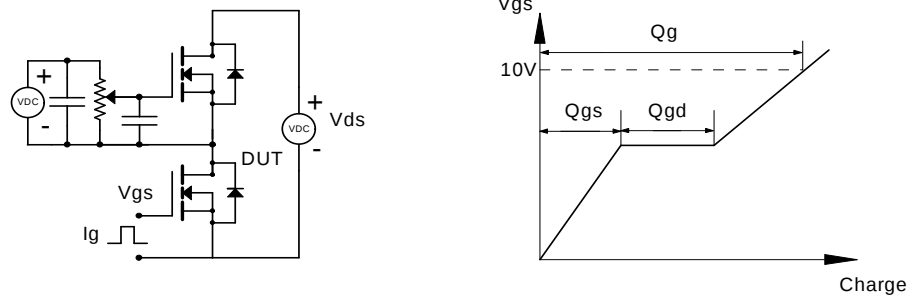
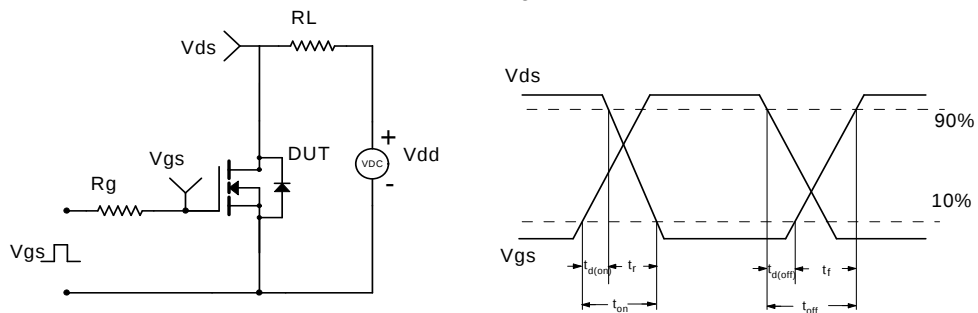


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

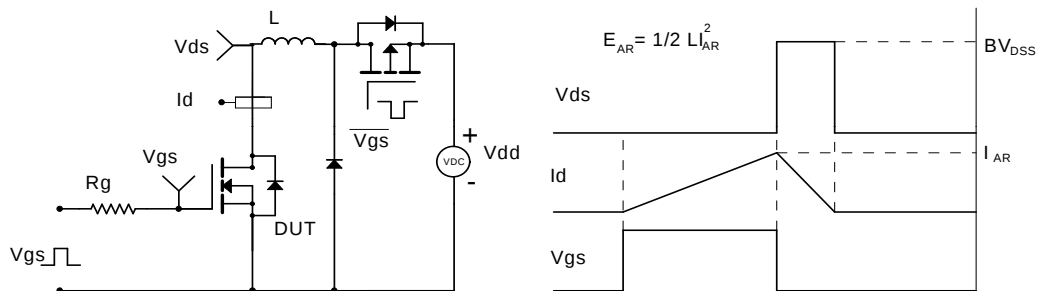
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



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



### Diode Recovery Test Circuit & Waveforms

