

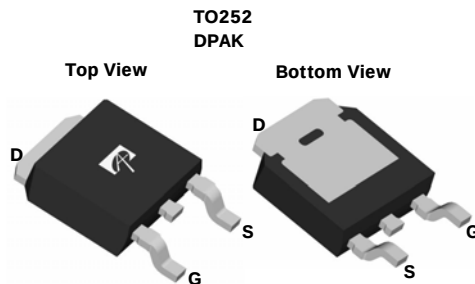
### General Description

The AOD4184A combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . This device is well suited for high current load applications.

### Product Summary

|                                    |                 |
|------------------------------------|-----------------|
| $V_{DS}$                           | 40V             |
| $I_D$ (at $V_{GS}=10V$ )           | 50A             |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )    | < 7m $\Omega$   |
| $R_{DS(ON)}$ (at $V_{GS} = 4.5V$ ) | < 9.5m $\Omega$ |

100% UIS Tested  
100% Rg Tested



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

| Parameter                                      | Symbol                  | Maximum    | Units            |
|------------------------------------------------|-------------------------|------------|------------------|
| Drain-Source Voltage                           | $V_{DS}$                | 40         | V                |
| Gate-Source Voltage                            | $V_{GS}$                | $\pm 20$   | V                |
| Continuous Drain Current <sup>G</sup>          | $T_C=25^\circ\text{C}$  | 50         | A                |
|                                                | $T_C=100^\circ\text{C}$ | 40         |                  |
| Pulsed Drain Current <sup>C</sup>              | $I_{DM}$                | 120        |                  |
| Continuous Drain Current                       | $T_A=25^\circ\text{C}$  | 13         | A                |
|                                                | $T_A=70^\circ\text{C}$  | 10         |                  |
| Avalanche Current <sup>C</sup>                 | $I_{AS}, I_{AR}$        | 35         | A                |
| Avalanche energy $L=0.1\text{mH}$ <sup>C</sup> | $E_{AS}, E_{AR}$        | 61         | mJ               |
| Power Dissipation <sup>B</sup>                 | $T_C=25^\circ\text{C}$  | 50         | W                |
|                                                | $T_C=100^\circ\text{C}$ | 25         |                  |
| Power Dissipation <sup>A</sup>                 | $T_A=25^\circ\text{C}$  | 2.3        | W                |
|                                                | $T_A=70^\circ\text{C}$  | 1.5        |                  |
| 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>   | $R_{\theta JA}$ | 18  | 22  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A D</sup> |                 | 44  | 55  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case                   | $R_{\theta JC}$ | 2.4 | 3   | $^\circ\text{C/W}$ |

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

| Symbol                      | Parameter                             | Conditions                                                                       | Min  | Typ        | Max       | Units            |
|-----------------------------|---------------------------------------|----------------------------------------------------------------------------------|------|------------|-----------|------------------|
| <b>STATIC PARAMETERS</b>    |                                       |                                                                                  |      |            |           |                  |
| $BV_{DSS}$                  | Drain-Source Breakdown Voltage        | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$                                        | 40   |            |           | V                |
| $I_{DSS}$                   | Zero Gate Voltage Drain Current       | $V_{DS}=40\text{V}$ , $V_{GS}=0\text{V}$<br>$T_J=55^\circ\text{C}$               |      |            | 1<br>5    | $\mu\text{A}$    |
| $I_{GSS}$                   | Gate-Body leakage current             | $V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$                                     |      |            | $\pm 100$ | nA               |
| $V_{GS(th)}$                | Gate Threshold Voltage                | $V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$                                           | 1.7  | 2.1        | 2.6       | V                |
| $I_{D(ON)}$                 | On state drain current                | $V_{GS}=10\text{V}$ , $V_{DS}=5\text{V}$                                         | 120  |            |           | A                |
| $R_{DS(ON)}$                | Static Drain-Source On-Resistance     | $V_{GS}=10\text{V}$ , $I_D=20\text{A}$<br>$T_J=125^\circ\text{C}$                |      | 5.8<br>9.6 | 7<br>12   | $\text{m}\Omega$ |
|                             |                                       | $V_{GS}=4.5\text{V}$ , $I_D=15\text{A}$                                          |      | 7.6        | 9.5       | $\text{m}\Omega$ |
| $g_{FS}$                    | Forward Transconductance              | $V_{DS}=5\text{V}$ , $I_D=5\text{A}$                                             |      | 37         |           | S                |
| $V_{SD}$                    | Diode Forward Voltage                 | $I_S=1\text{A}$ , $V_{GS}=0\text{V}$                                             |      | 0.7        | 1         | V                |
| $I_S$                       | Maximum Body-Diode Continuous Current |                                                                                  |      |            | 20        | A                |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                  |      |            |           |                  |
| $C_{iss}$                   | Input Capacitance                     | $V_{GS}=0\text{V}$ , $V_{DS}=20\text{V}$ , $f=1\text{MHz}$                       | 1200 | 1500       | 1800      | pF               |
| $C_{oss}$                   | Output Capacitance                    |                                                                                  | 150  | 215        | 280       | pF               |
| $C_{rss}$                   | Reverse Transfer Capacitance          |                                                                                  | 80   | 135        | 190       | pF               |
| $R_g$                       | Gate resistance                       | $V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$                        | 2    | 3.5        | 5         | $\Omega$         |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                  |      |            |           |                  |
| $Q_g(10\text{V})$           | Total Gate Charge                     | $V_{GS}=10\text{V}$ , $V_{DS}=20\text{V}$ , $I_D=20\text{A}$                     | 21   | 27         | 33        | nC               |
| $Q_g(4.5\text{V})$          | Total Gate Charge                     |                                                                                  | 10   | 14         | 17        | nC               |
| $Q_{gs}$                    | Gate Source Charge                    |                                                                                  | 3    | 5          | 6         | nC               |
| $Q_{gd}$                    | Gate Drain Charge                     |                                                                                  | 3    | 6          | 9         | nC               |
| $t_{D(on)}$                 | Turn-On DelayTime                     | $V_{GS}=10\text{V}$ , $V_{DS}=20\text{V}$ , $R_L=1\Omega$ ,<br>$R_{GEN}=3\Omega$ |      | 6          |           | ns               |
| $t_r$                       | Turn-On Rise Time                     |                                                                                  |      | 17         |           | ns               |
| $t_{D(off)}$                | Turn-Off DelayTime                    |                                                                                  |      | 30         |           | ns               |
| $t_f$                       | Turn-Off Fall Time                    |                                                                                  |      | 17         |           | ns               |
| $t_{rr}$                    | Body Diode Reverse Recovery Time      | $I_F=20\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$                               | 20   | 29         | 38        | ns               |
| $Q_{rr}$                    | Body Diode Reverse Recovery Charge    | $I_F=20\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$                               | 18   | 26         | 34        | nC               |

A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of  $150^\circ\text{C}$ . The value in any given application depends on the user's specific board design, and the maximum temperature of  $175^\circ\text{C}$  may be used if the PCB allows it.

B. The power dissipation  $P_D$  is based on  $T_{J(MAX)}=175^\circ\text{C}$ , 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  $T_{J(MAX)}=175^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .

D. The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to case  $R_{\theta JC}$  and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using  $<300\mu\text{s}$  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  $T_{J(MAX)}=175^\circ\text{C}$ . 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  $T_A=25^\circ\text{C}$ .

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# TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

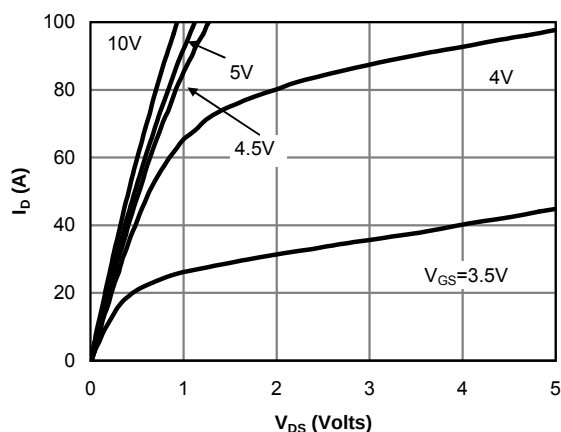


Fig 1: On-Region Characteristics (Note E)

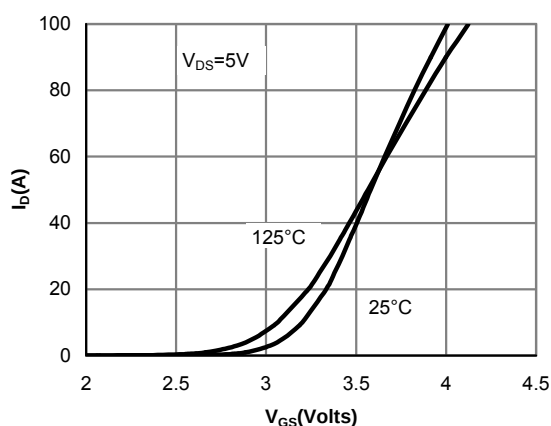


Figure 2: Transfer Characteristics (Note E)

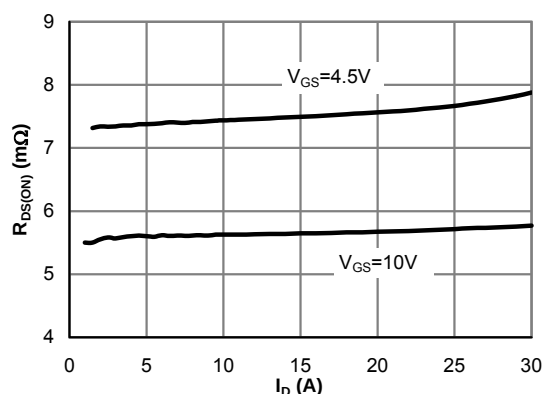


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

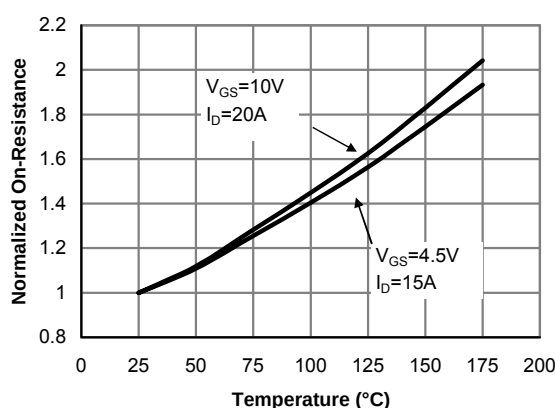


Figure 4: On-Resistance vs. Junction Temperature (Note E)

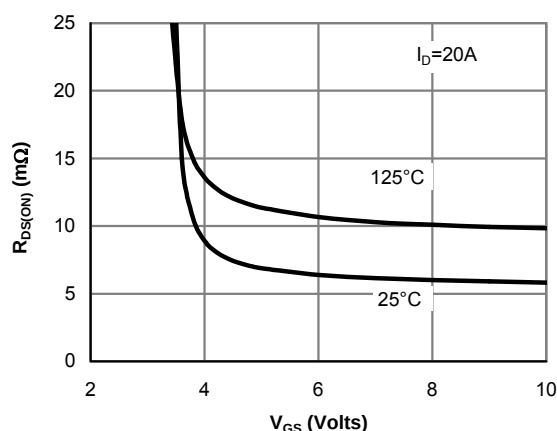


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

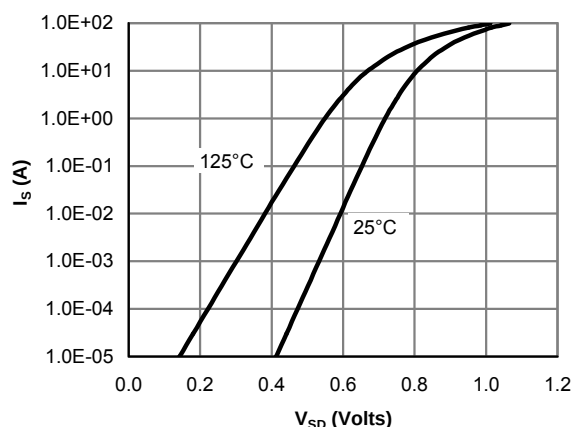
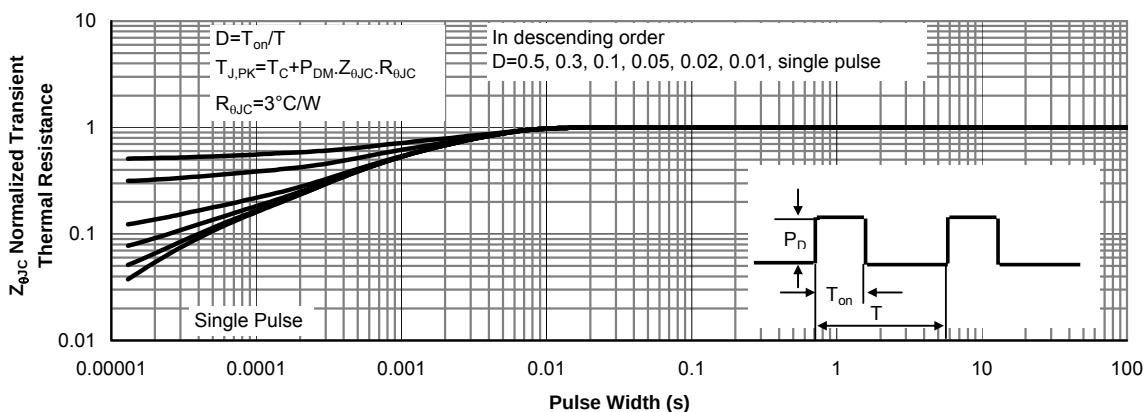
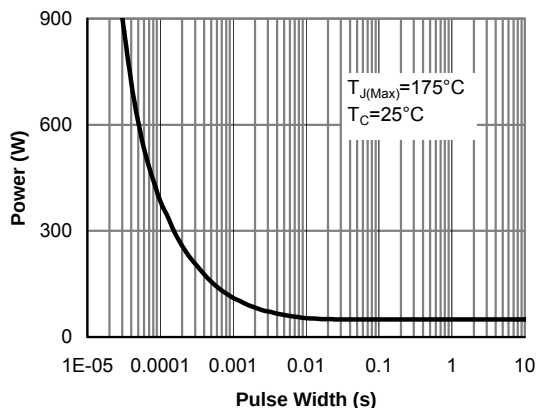
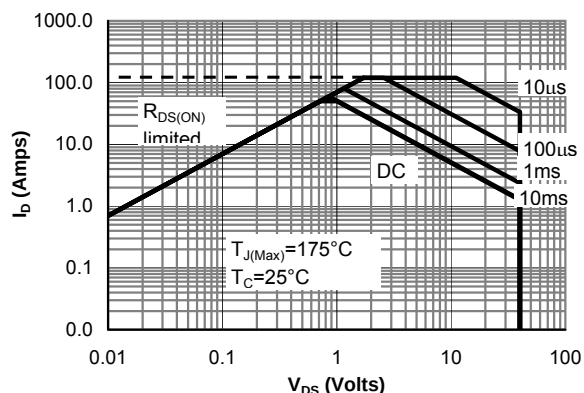
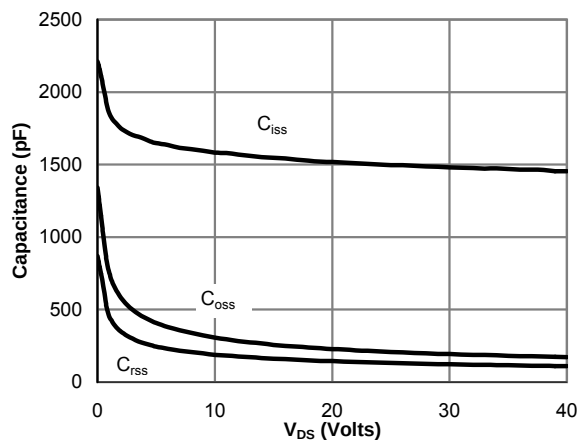
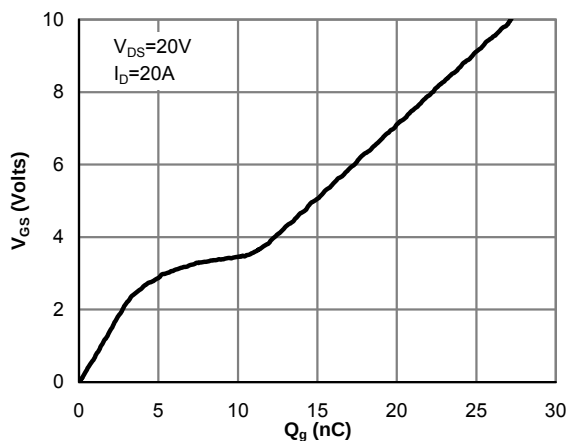


Figure 6: Body-Diode Characteristics (Note E)

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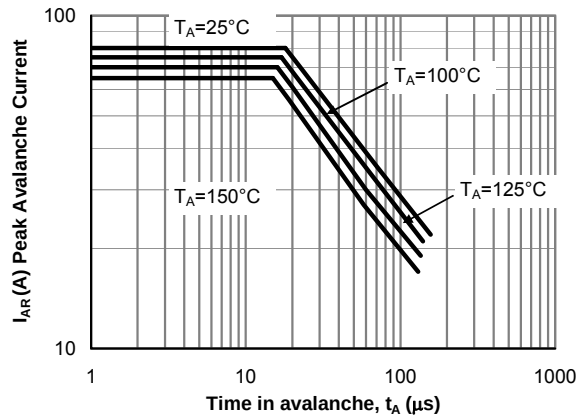


Figure 12: Single Pulse Avalanche capability (Note C)

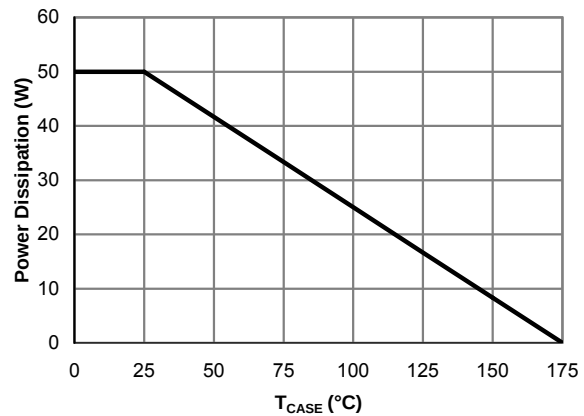


Figure 13: Power De-rating (Note F)

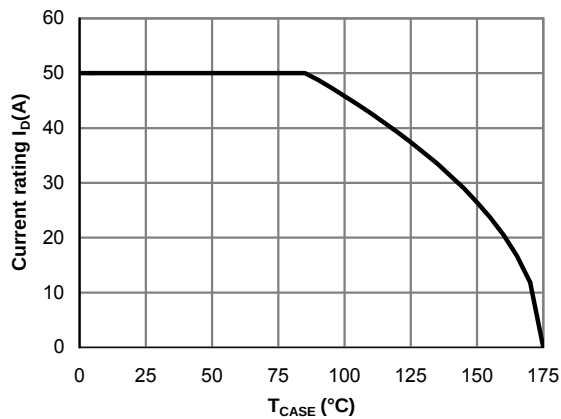


Figure 14: Current De-rating (Note F)

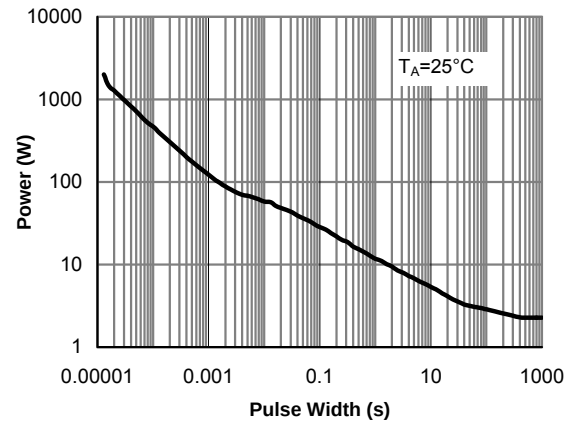


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

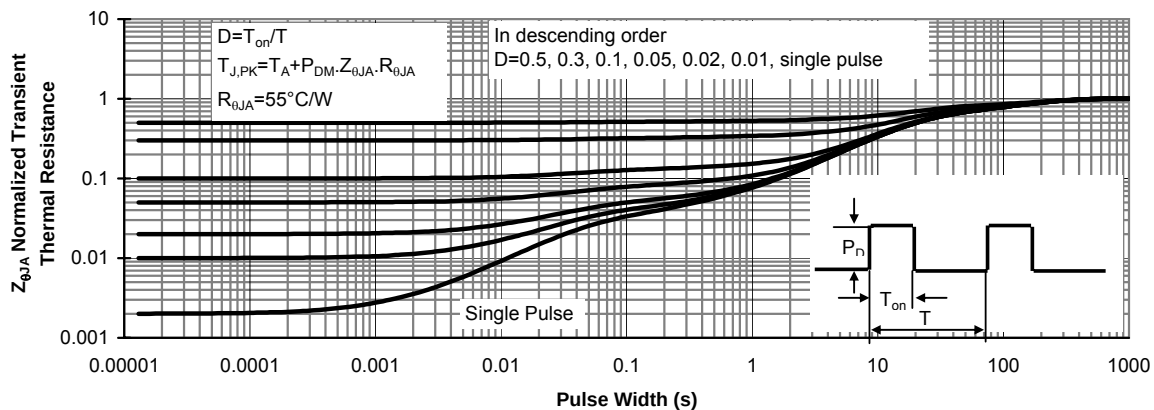
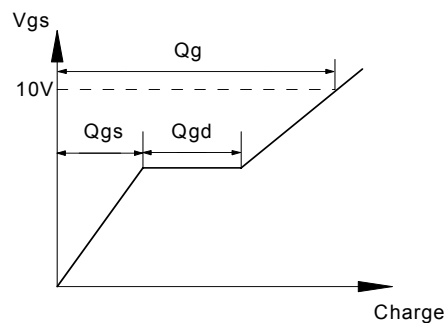
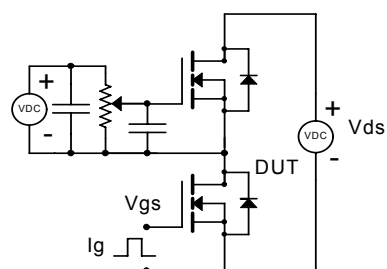
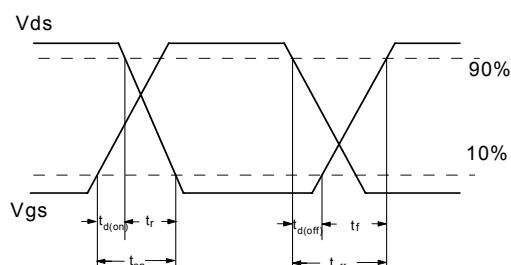
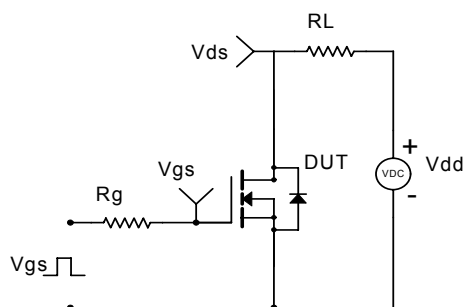


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

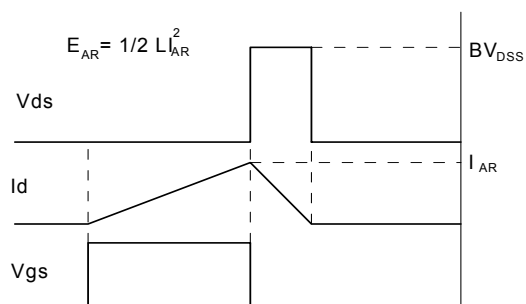
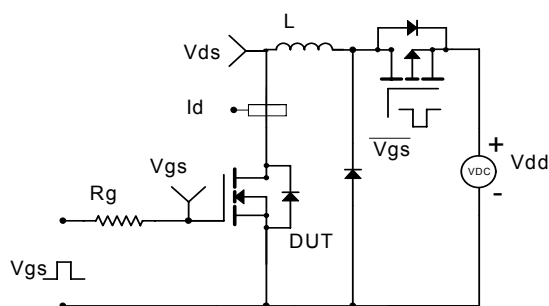
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



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



### Diode Recovery Test Circuit & Waveforms

