



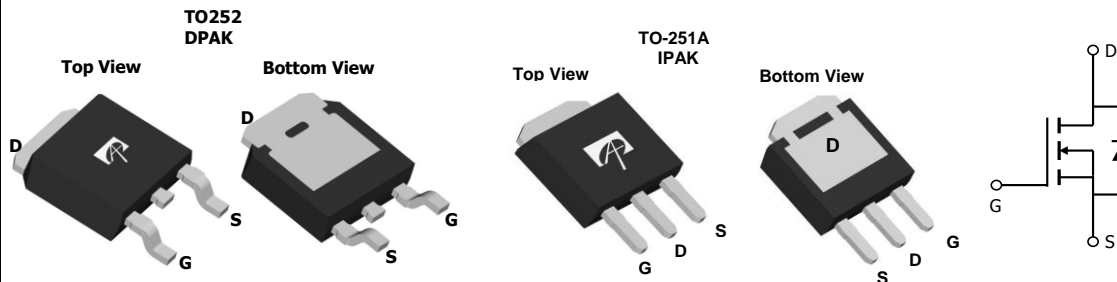
### General Description

The AOD442/AOI442 used advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. Those devices are suitable for use as a load switch or in PWM applications.

### Product Summary

|                                    |                |
|------------------------------------|----------------|
| $V_{DS}$                           | 60V            |
| $I_D$ (at $V_{GS}=10V$ )           | 37A            |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )    | < 20m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS} = 4.5V$ ) | < 25m $\Omega$ |

100% UIS Tested  
100%  $R_g$  Tested



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

| Parameter                               | Symbol           | Maximum           | Units      |
|---|------------------|-------------------|------------|
| Drain-Source Voltage                    | $V_{DS}$         | 60                | V          |
| Gate-Source Voltage                     | $V_{GS}$         | $\pm 20$          | V          |
| Continuous Drain Current <sup>G</sup>   | $I_D$            | $T_C=25^\circ C$  | 37         |
|   |                  | $T_C=100^\circ C$ | 26         |
| Pulsed Drain Current <sup>C</sup>       | $I_{DM}$         | 60                | A          |
| Continuous Drain Current                | $I_{DSM}$        | $T_A=25^\circ C$  | 7          |
|   |                  | $T_A=70^\circ C$  | 5          |
| Avalanche Current <sup>C</sup>          | $I_{AS}, I_{AR}$ | 30                | A          |
| Avalanche energy $L=0.1mH$ <sup>C</sup> | $E_{AS}, E_{AR}$ | 45                | mJ         |
| Power Dissipation <sup>B</sup>          | $P_D$            | $T_C=25^\circ C$  | 60         |
|   |                  | $T_C=100^\circ C$ | 30         |
| Power Dissipation <sup>A</sup>          | $P_{DSM}$        | $T_A=25^\circ C$  | 2.1        |
|   |                  | $T_A=70^\circ C$  | 1.3        |
| Junction and Storage Temperature Range  | $T_J, T_{STG}$   | -55 to 175        | $^\circ C$ |

### Thermal Characteristics

| Parameter                                  | Symbol          | Typ  | Max | Units        |
|--|-----------------|------|-----|--------------|
| Maximum Junction-to-Ambient <sup>A</sup>   | $R_{\theta JA}$ | 17.4 | 25  | $^\circ C/W$ |
| Maximum Junction-to-Ambient <sup>A D</sup> |                 |      |     |              |
| Maximum Junction-to-Case                   | $R_{\theta JC}$ | 1.8  | 2.5 | $^\circ C/W$ |

**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> =48V, 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> = ±20V   |      |          | 100      | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA                                    | 1.6  | 2.1      | 2.7      | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V   | 60   |          |          | 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                        |      | 16<br>31 | 20<br>37 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A  |      | 20       | 25       |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =20A  |      | 65       |          | 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 |   |      |          | 32       | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |   |      |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1MHz   | 1535 | 1920     | 2300     | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |   | 108  | 155      | 200      | pF    |
| C <sub>riss</sub>           | Reverse Transfer Capacitance          |   | 70   | 116      | 165      | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  | 0.3  | 0.65     | 0.8      | 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                           | 38   | 47.6     | 68       | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |   | 20   | 24.2     | 30       | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |   | 4.8  | 6        | 7        | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |   | 8.5  | 14.4     | 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 |      | 7.4      |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |   |      | 5.1      |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |   |      | 28.2     |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |   |      | 5.5      |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =20A, dI/dt=100A/μs  |      | 34       | 41       | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =20A, dI/dt=100A/μs  |      | 46       |          | 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 175°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>=175°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>=175°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>=175°C. The SOA curve provides a single pulse rating.

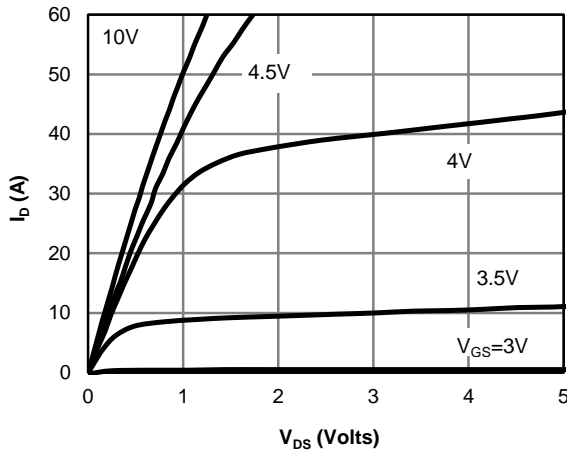
G. The maximum current rating is package limited.

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.

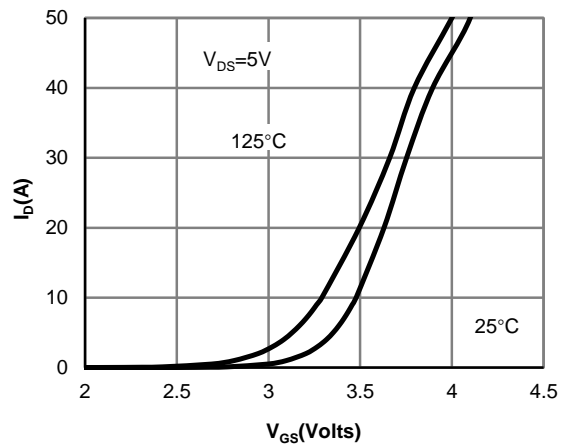
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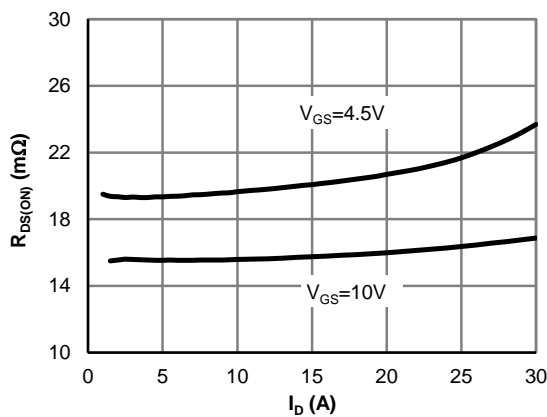
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



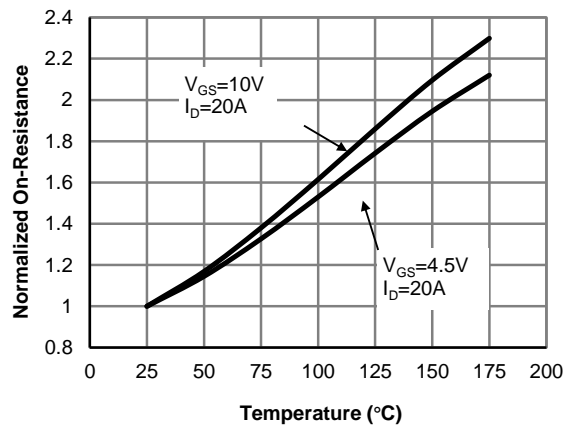
**Fig 1: On-Region Characteristics (Note E)**



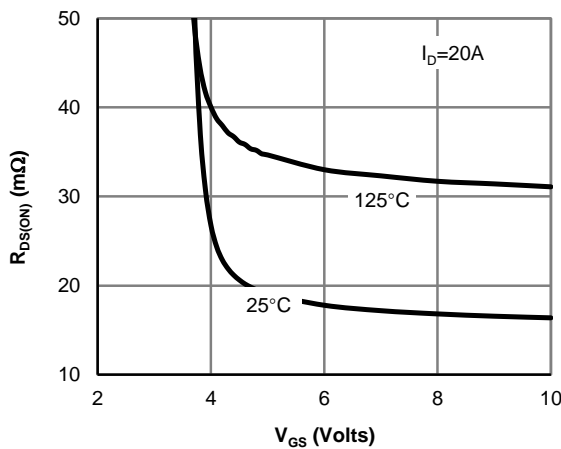
**Figure 2: Transfer Characteristics (Note E)**



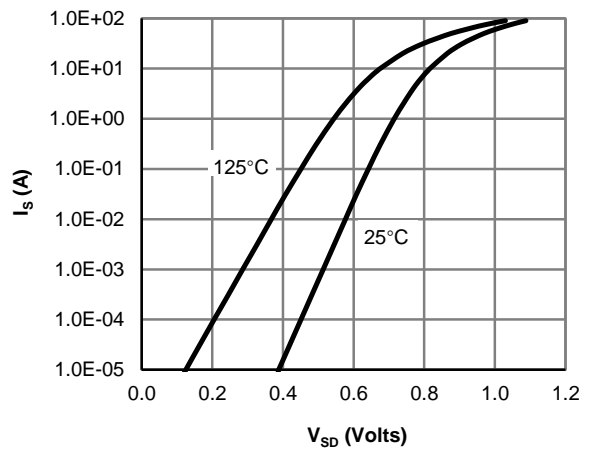
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



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

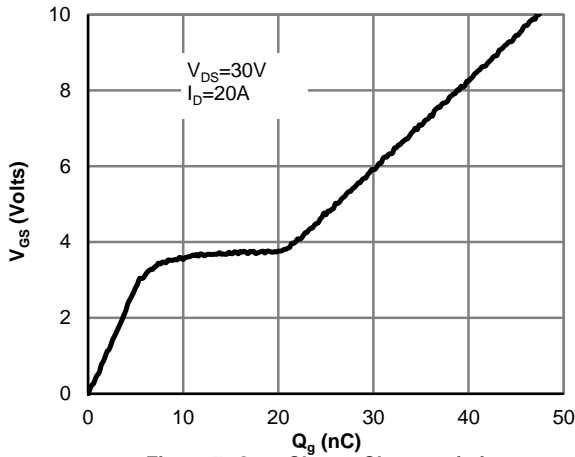


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

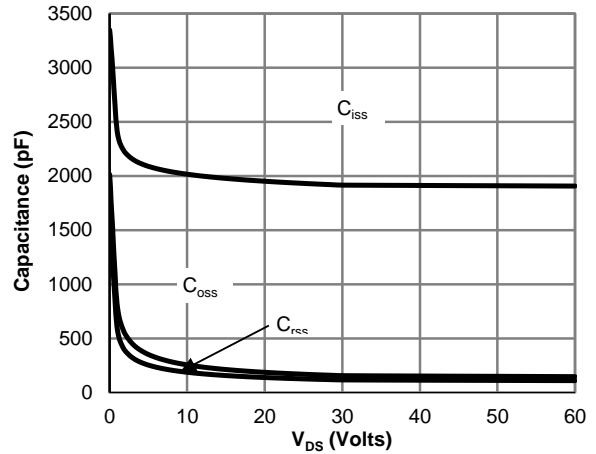


**Figure 6: Body-Diode Characteristics (Note E)**

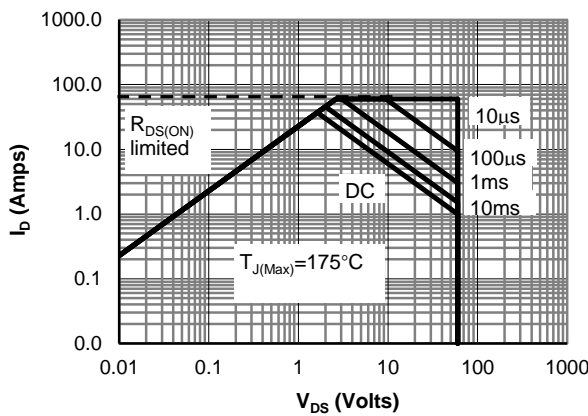
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



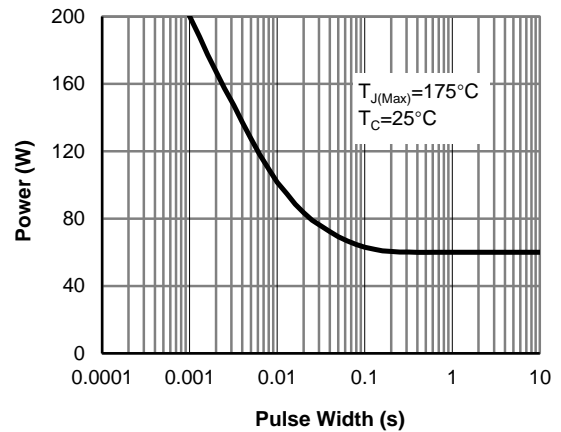
**Figure 7: Gate-Charge Characteristics**



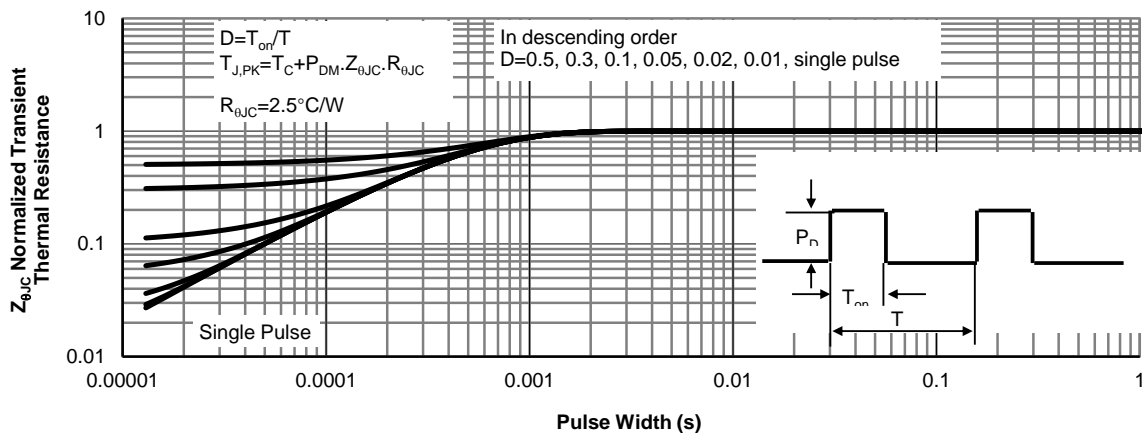
**Figure 8: Capacitance Characteristics**



**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**

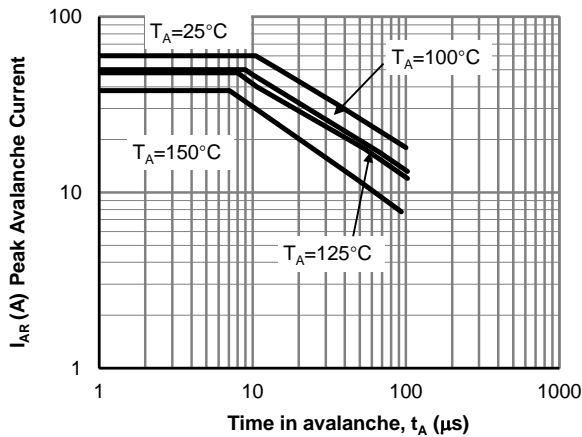


Figure 12: Single Pulse Avalanche capability (Note C)

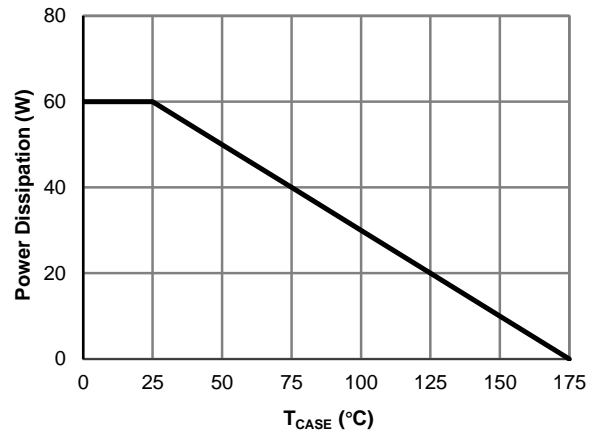


Figure 13: Power De-rating (Note F)

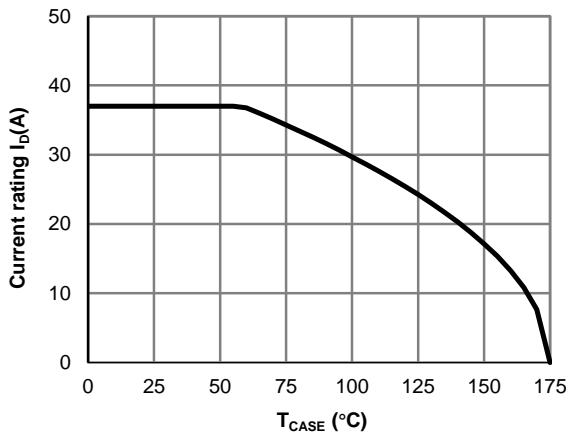


Figure 14: Current De-rating (Note F)

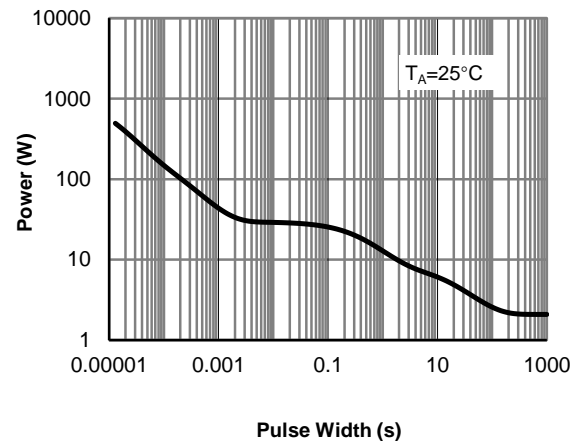


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

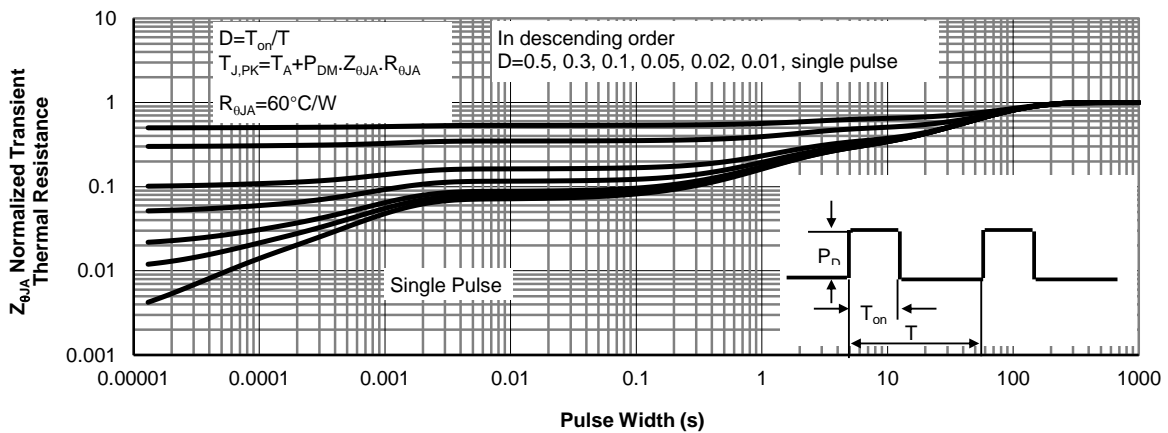
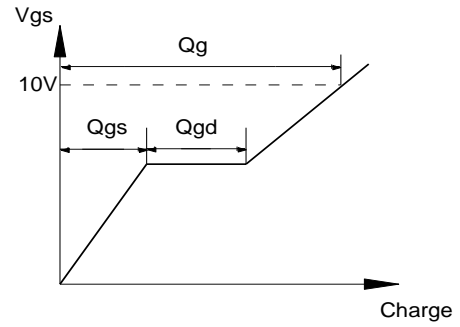
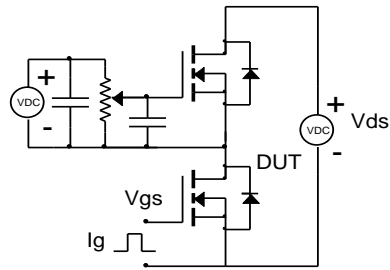
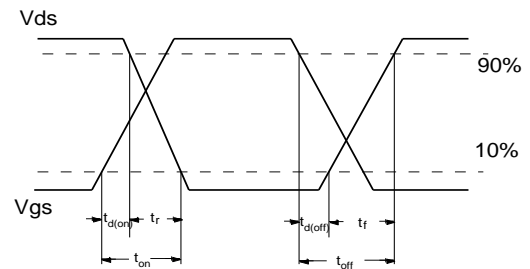
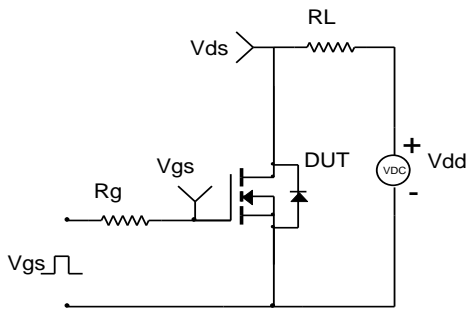


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

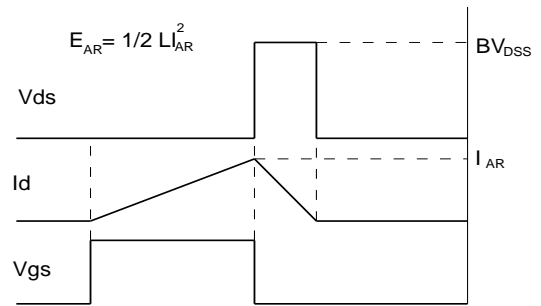
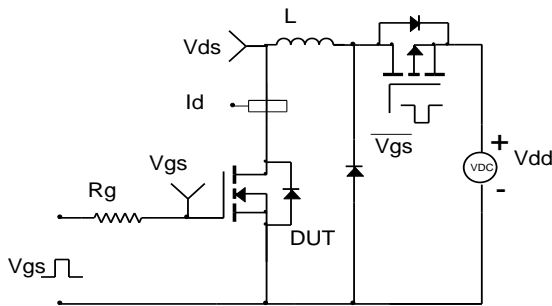
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**



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



**Diode Recovery Test Circuit & Waveforms**

