



**General Description**

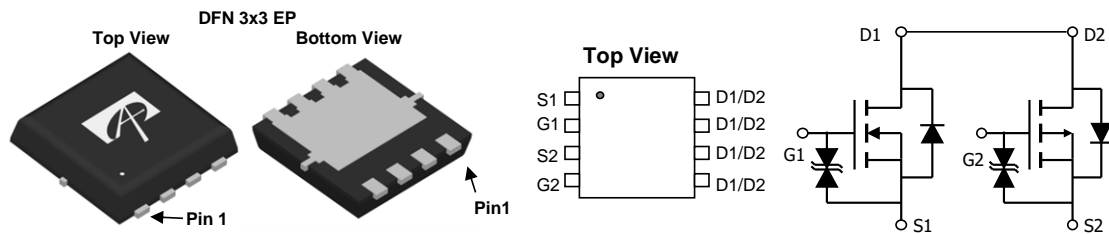
The AONR26309A uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs may be used in inverter and other applications.

**Product Summary**

|                          |                          |                         |
|--------------------------|--------------------------|-------------------------|
| N-channel                | P-channel                |                         |
| $V_{DS} (V) = 30V$       | $V_{DS} (V) = -30V$      |                         |
| $I_D = 14A$              | $I_D = -21A$             | ( $V_{GS} = \pm 10V$ )  |
| $R_{DS(ON)} < 20m\Omega$ | $R_{DS(ON)} < 32m\Omega$ | ( $V_{GS} = \pm 10V$ )  |
| $R_{DS(ON)} < 26m\Omega$ | $R_{DS(ON)} < 55m\Omega$ | ( $V_{GS} = \pm 4.5V$ ) |

ESD protection

100% UIS Tested  
100%  $R_g$  Tested



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

| Parameter  | Symbol         | Max N-channel     | Max P-channel | Units      |
|--|----------------|-------------------|---------------|------------|
| Drain-Source Voltage                               | $V_{DS}$       | 30                | -30           | V          |
| Gate-Source Voltage                                | $V_{GS}$       | $\pm 20$          | $\pm 20$      | V          |
| Continuous Drain Current                           | $I_D$          | $T_C=25^\circ C$  | 14            | A          |
|  |                | $T_C=100^\circ C$ | 9             |            |
| Pulsed Drain Current <sup>C</sup>                  | $I_{DM}$       | 35                | -44           | A          |
| Continuous Drain Current <sup>A</sup>              | $I_{DSM}$      | $T_A=25^\circ C$  | 6.5           | W          |
|  |                | $T_A=70^\circ C$  | 5             |            |
| Avalanche Current <sup>C</sup>                     | $I_{AR}$       | 15                | -20           | A          |
| Repetitive avalanche energy $L=0.1mH$ <sup>C</sup> | $E_{AR}$       | 11                | 20            | mJ         |
| Power Dissipation <sup>B</sup>                     | $P_D$          | $T_C=25^\circ C$  | 7             | W          |
|  |                | $T_C=100^\circ C$ | 2.8           |            |
| Power Dissipation <sup>A</sup>                     | $P_{DSM}$      | $T_A=25^\circ C$  | 1.5           | W          |
|  |                | $T_A=70^\circ C$  | 0.9           |            |
| Junction and Storage Temperature Range             | $T_J, T_{STG}$ | -55 to 150        | -55 to 150    | $^\circ C$ |

**Thermal Characteristics: N-channel**

| Parameter   | Symbol          | Typ | Max | Units        |
|---|-----------------|-----|-----|--------------|
| Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$   | $R_{\theta JA}$ | 40  | 50  | $^\circ C/W$ |
| Maximum Junction-to-Ambient <sup>A D</sup> Steady-State |                 | 70  | 85  | $^\circ C/W$ |
| Maximum Junction-to-Case <sup>B</sup> Steady-State      | $R_{\theta JC}$ | 15  | 18  | $^\circ C/W$ |

**Thermal Characteristics: P-channel**

| Parameter   | Symbol          | Typ | Max | Units        |
|---|-----------------|-----|-----|--------------|
| Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$   | $R_{\theta JA}$ | 40  | 50  | $^\circ C/W$ |
| Maximum Junction-to-Ambient <sup>A D</sup> Steady-State |                 | 70  | 85  | $^\circ C/W$ |
| Maximum Junction-to-Case <sup>B</sup> Steady-State      | $R_{\theta JC}$ | 5   | 6   | $^\circ C/W$ |

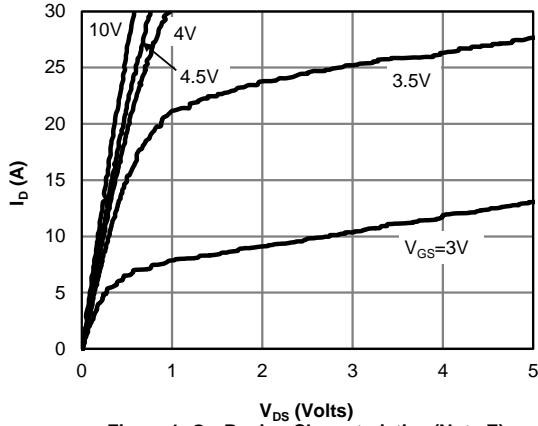
**N-channel Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| 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> =±20V  |     |          | ±10      | μA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                    | 1.3 | 1.8      | 2.3      | V     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =6.5A<br>T <sub>J</sub> =125°C                         |     | 16<br>24 | 20<br>30 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A   |     | 20       | 26       |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =6.5A   |     | 33       |          | 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 |   |     |          | 2        | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |   |     |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz   |     | 600      |          | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |   |     | 70       |          | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |   |     | 60       |          | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  | 1.2 | 2.4      | 3.6      | 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> =6.5A                            |     | 12       | 20       | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |   |     | 6        | 12       | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |   |     | 2.2      |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |   |     | 2.5      |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =2.307Ω,<br>R <sub>GEN</sub> =3Ω |     | 4.5      |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |   |     | 4        |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |   |     | 20       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |   |     | 4        |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =6.5A, di/dt=500A/μs   |     | 5        |          | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =6.5A, di/dt=500A/μs   |     | 6        |          | nC    |

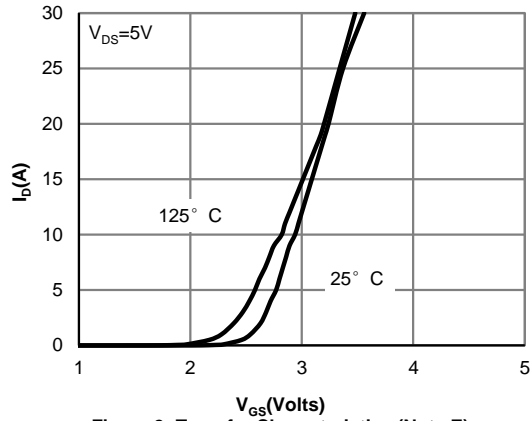
- A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150° C. The value 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.
- 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.
- G. The maximum current rating is limited by bond-wires.
- H. These tests are performed 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 SOA curve provides a single pulse rating.

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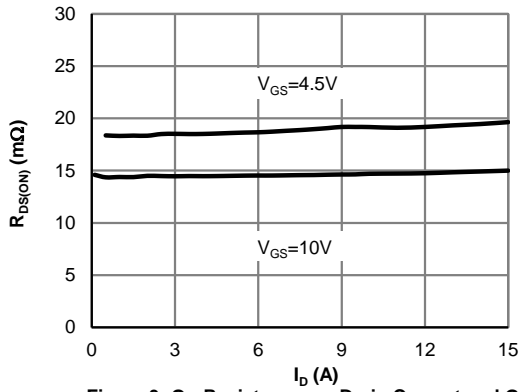
**N-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



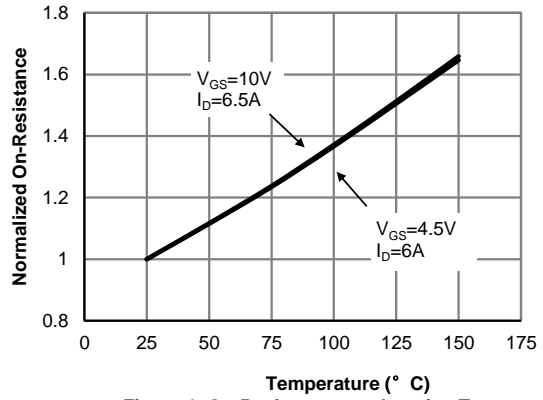
**Figure 1: On-Region Characteristics (Note E)**



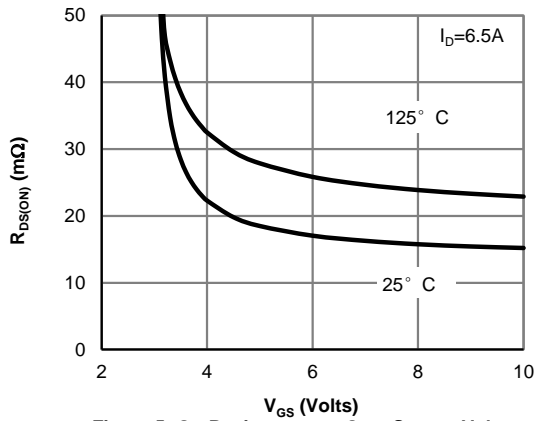
**Figure 2: Transfer Characteristics (Note E)**



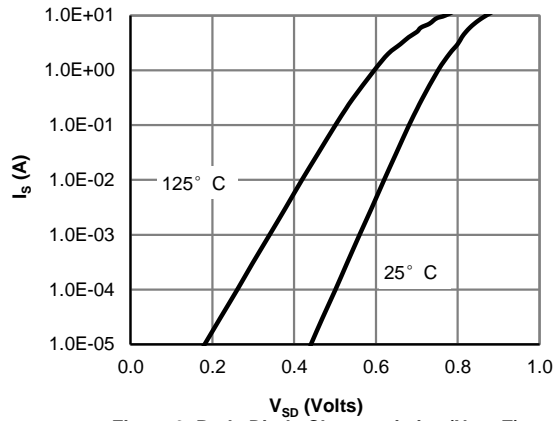
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



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

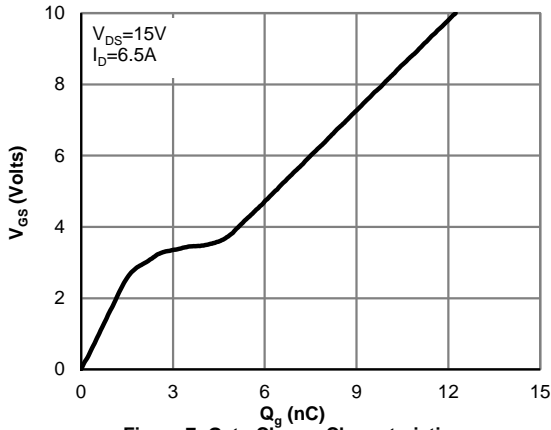


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

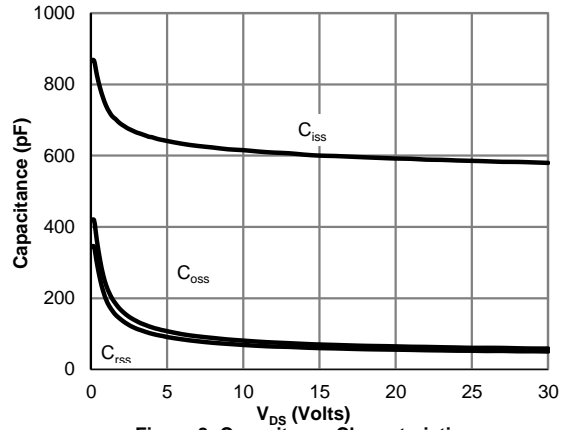


**Figure 6: Body-Diode Characteristics (Note E)**

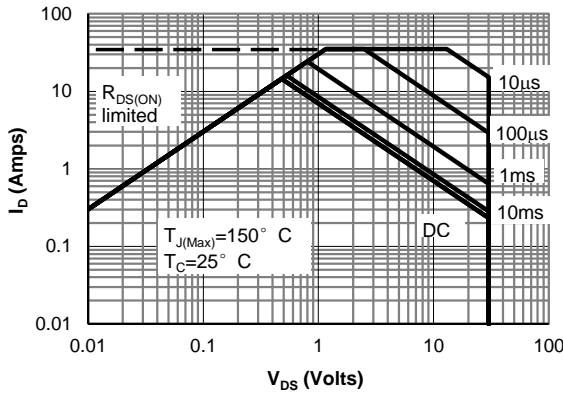
**N-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



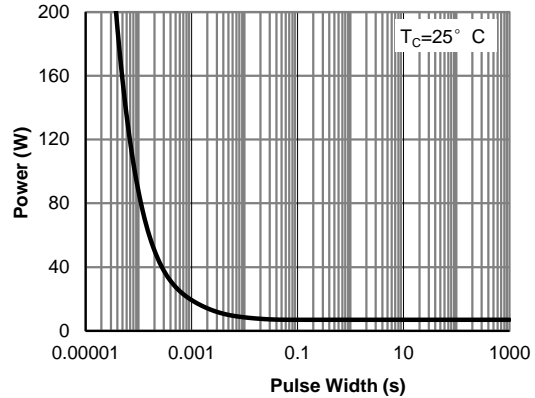
**Figure 7: Gate-Charge Characteristics**



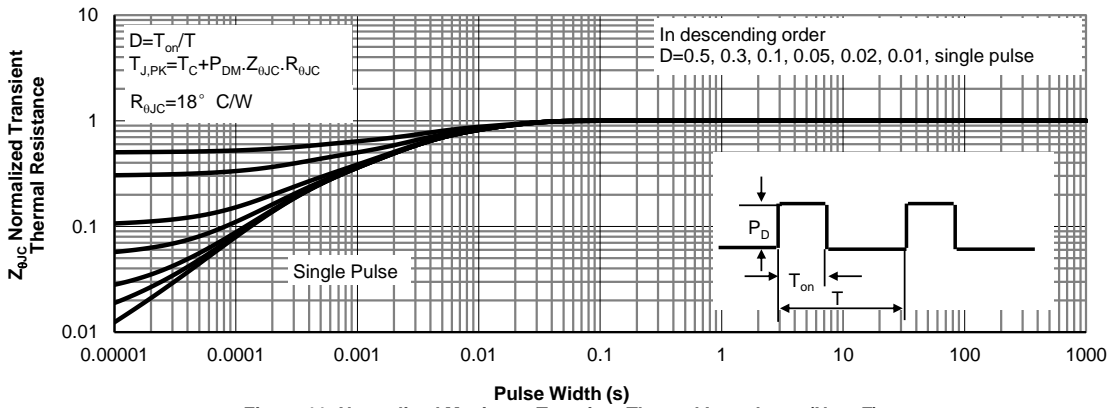
**Figure 8: Capacitance Characteristics**



**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)**

**N-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

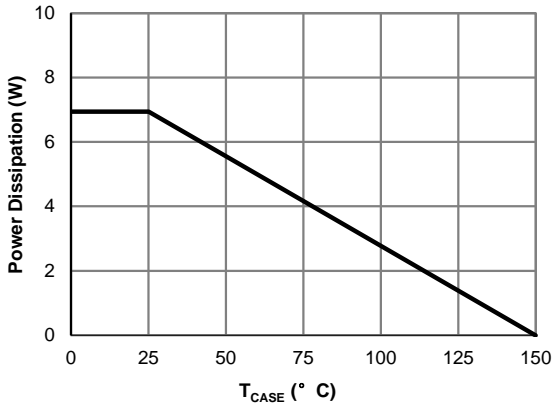


Figure 12: Power De-rating (Note F)

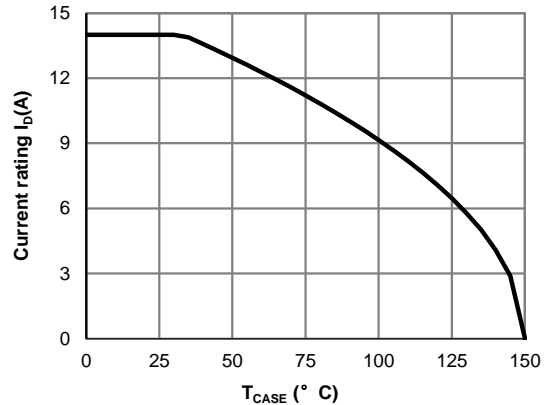


Figure 13: Current De-rating (Note F)

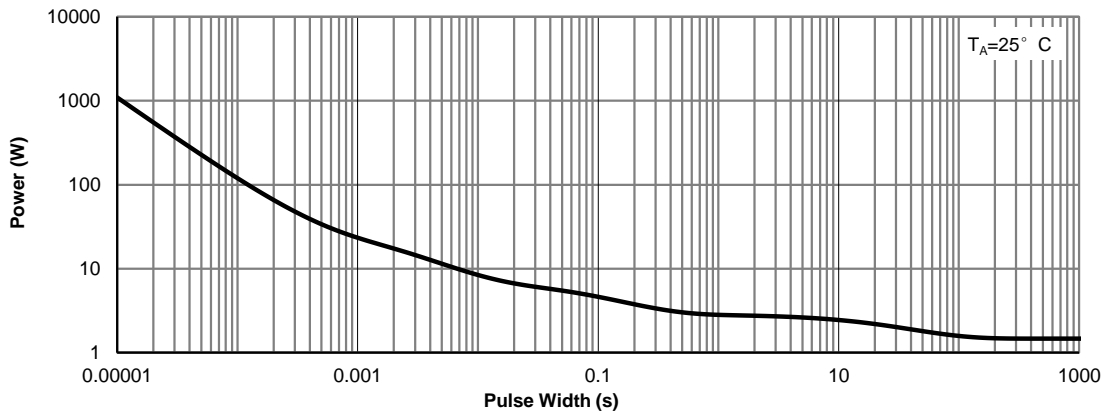


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

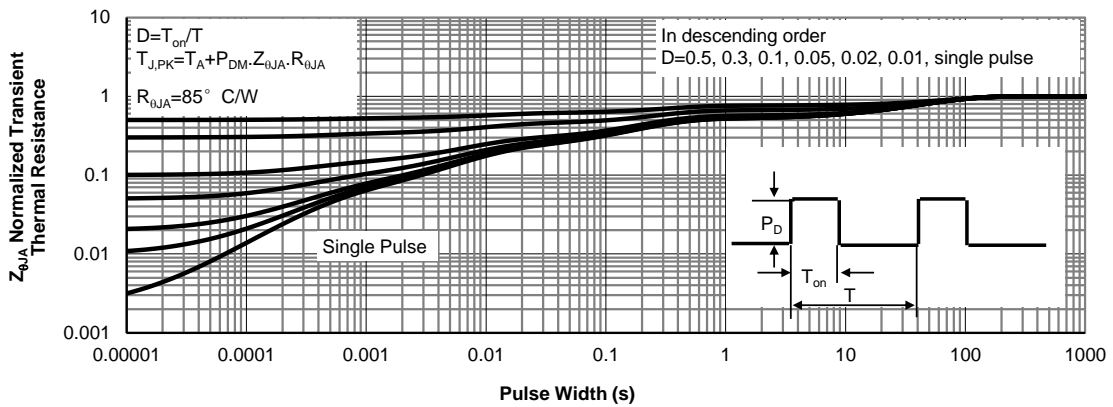
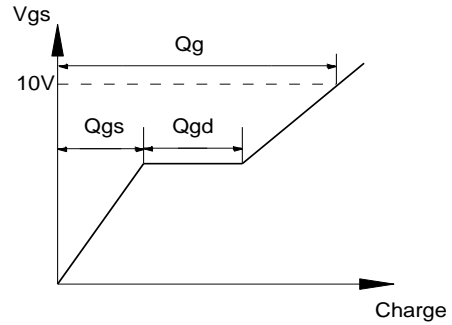
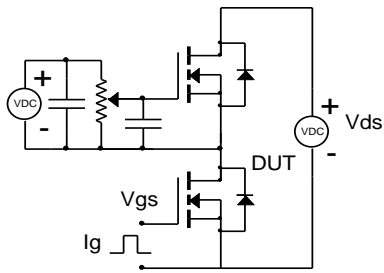
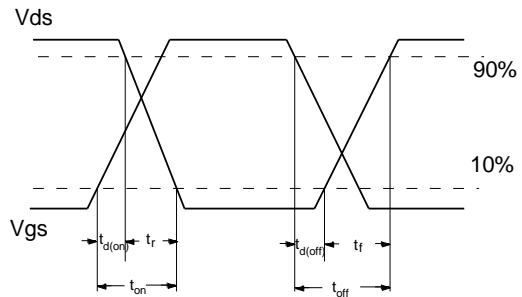
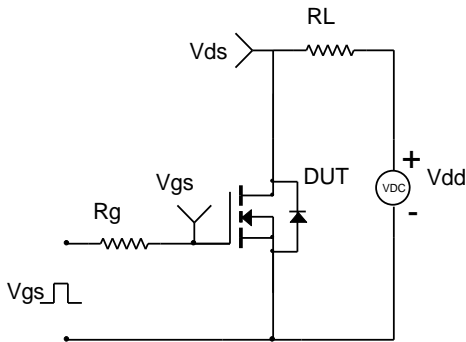


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

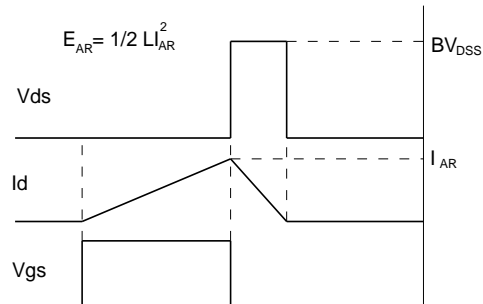
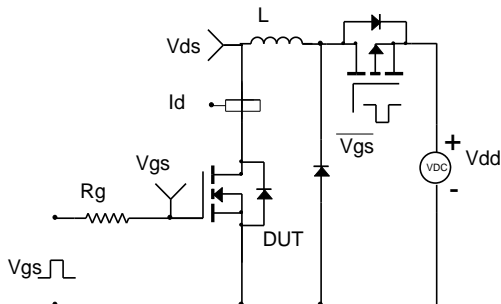
**Gate Charge Test Circuit & Waveform**



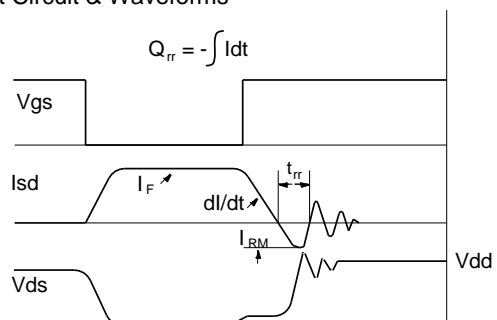
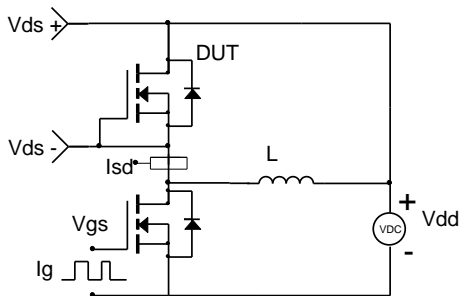
**Resistive Switching Test Circuit & Waveforms**



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



**Diode Recovery Test Circuit & Waveforms**



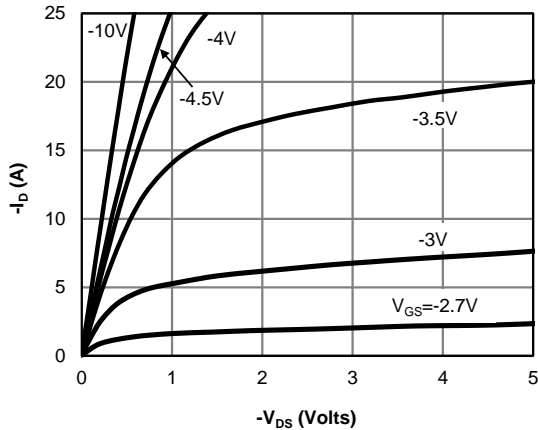
**P-channel Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| 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> =±20V   |      |          | ±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 | -1.7     | -2.2     | V     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-10V, I <sub>D</sub> =-5.7A<br>T <sub>J</sub> =125°C                        |      | 25<br>32 | 32<br>41 | mΩ    |
|                             |                                       | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.4A  |      | 35       | 55       | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-5.7A  |      | 17       |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V   |      | -0.8     | -1       | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |  |      |          | -2       | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |  |      |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz   |      | 1100     |          | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |  |      | 120      |          | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |  |      | 105      |          | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz   |      | 11       | 18       | 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> =-5.7A                          |      | 22       | 33       | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |  |      | 11       | 18       | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |  |      | 2.5      |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |  |      | 6.5      |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =2.63Ω,<br>R <sub>GEN</sub> =3Ω |      | 12       |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |  |      | 9        |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |  |      | 55       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |  |      | 19       |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-5.7A, di/dt=500A/μs   |      | 12       |          | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-5.7A, di/dt=500A/μs   |      | 17       |          | nC    |

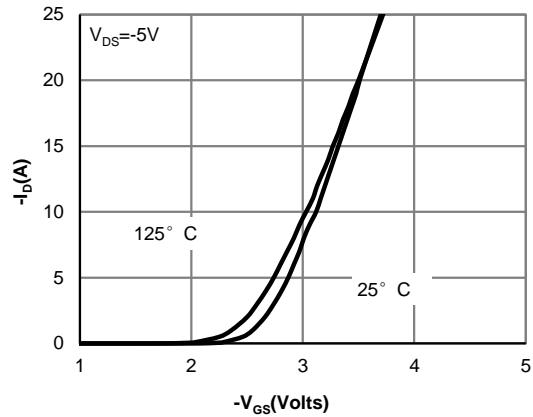
- A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150° C. The value 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.
- 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.
- G. The maximum current rating is limited by bond-wires.
- 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. The SOA curve provides a single pulse rating.

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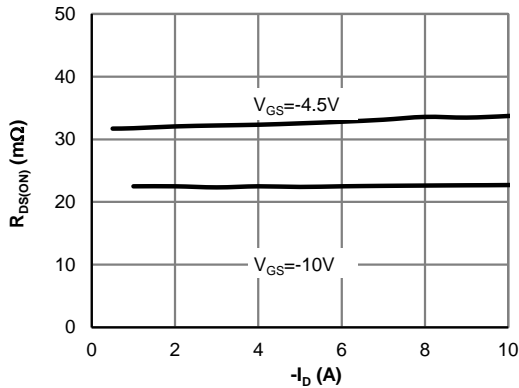
**P-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



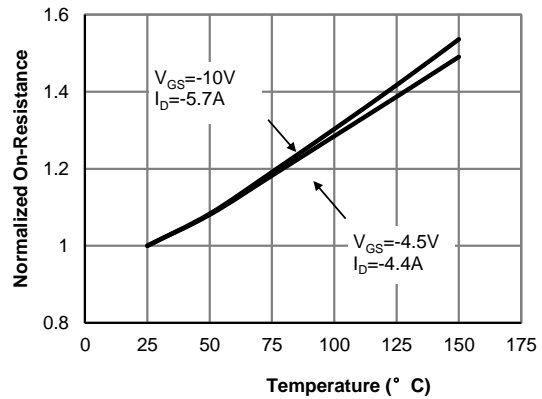
**Figure 1: On-Region Characteristics (Note E)**



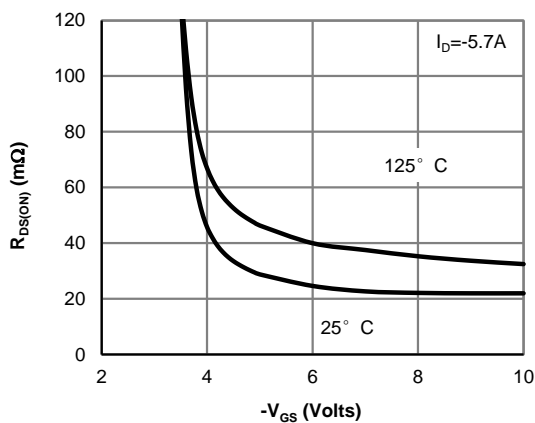
**Figure 2: Transfer Characteristics (Note E)**



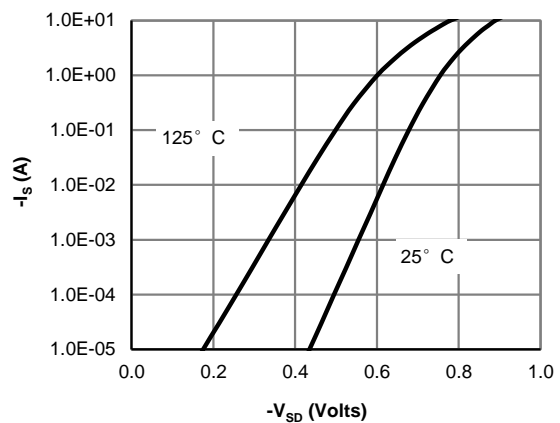
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



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



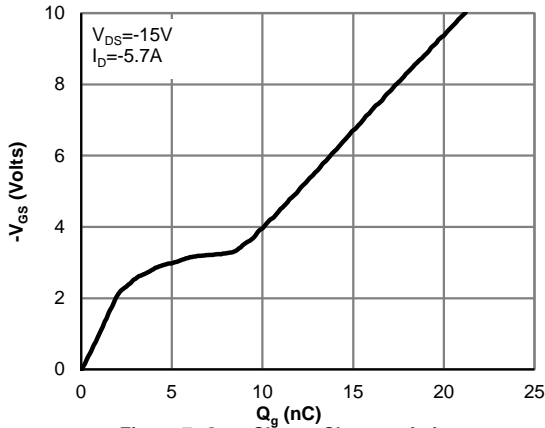
**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**



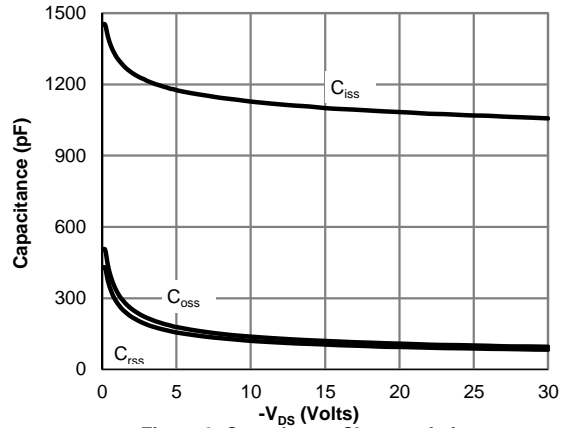
**Figure 6: Body-Diode Characteristics (Note E)**



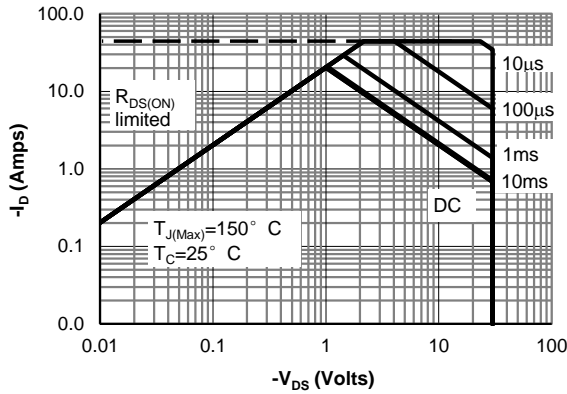
**P-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



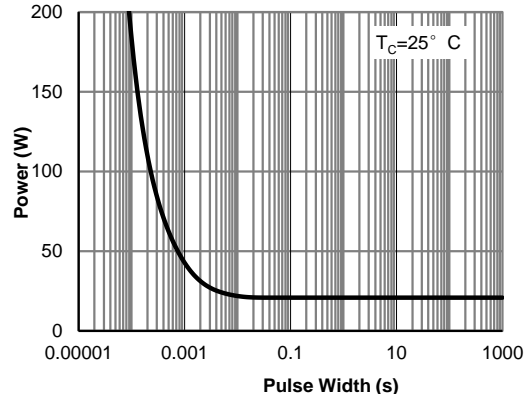
**Figure 7: Gate-Charge Characteristics**



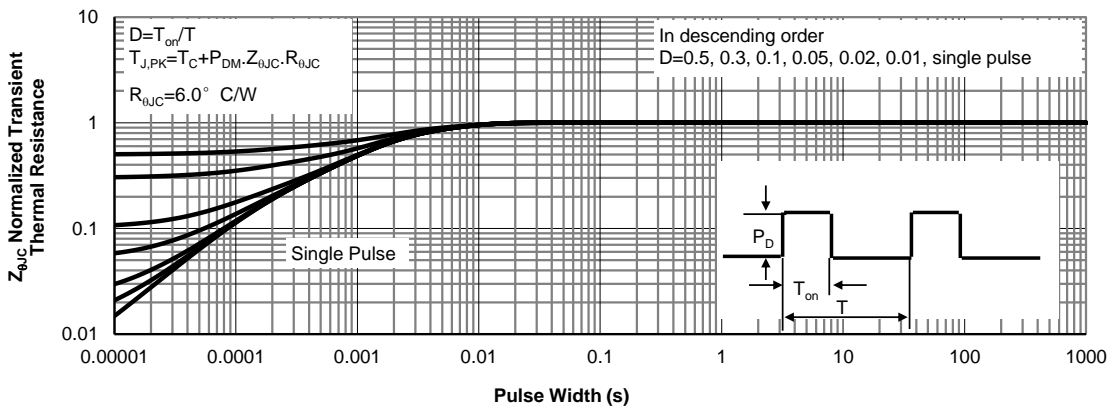
**Figure 8: Capacitance Characteristics**



**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)**

**P-channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

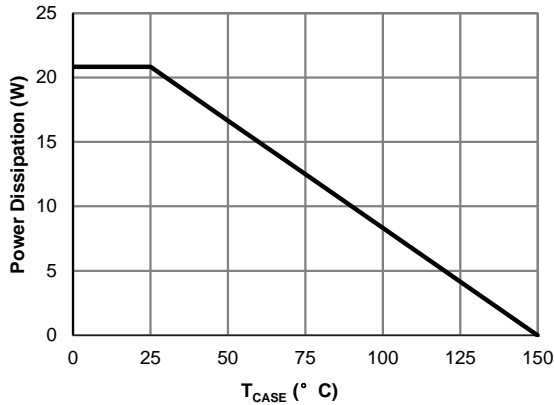


Figure 12: Power De-rating (Note F)

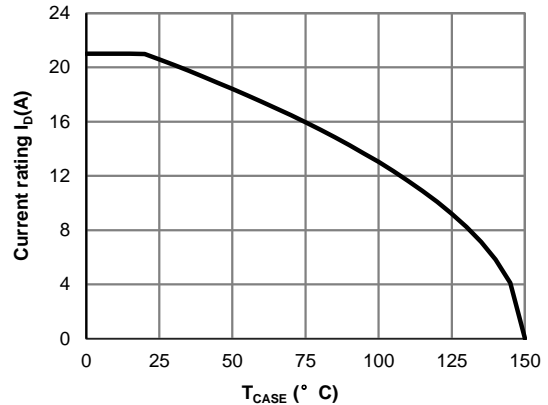


Figure 13: Current De-rating (Note F)

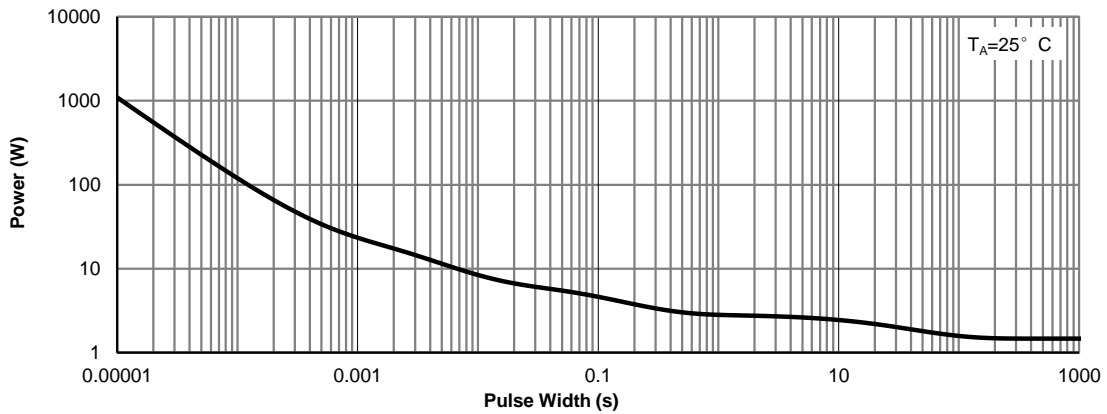


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

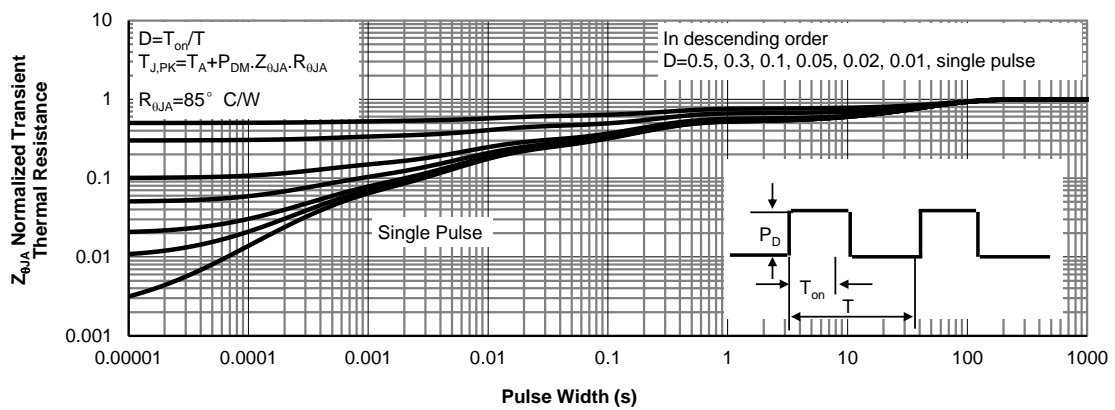
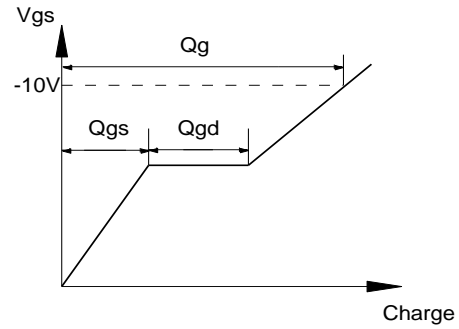
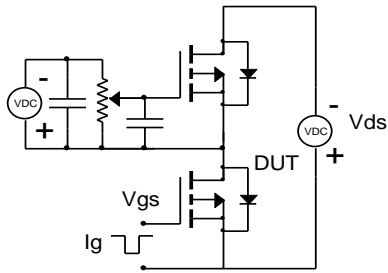
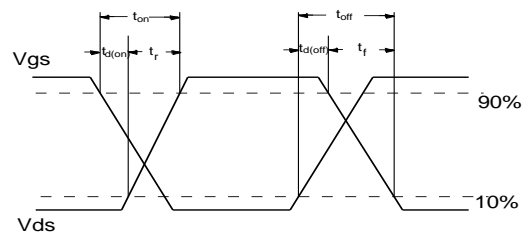
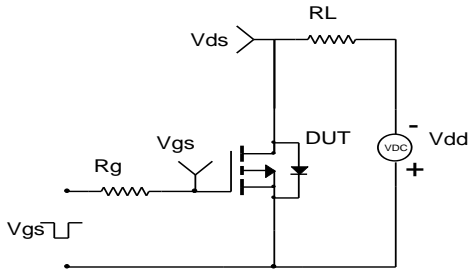


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

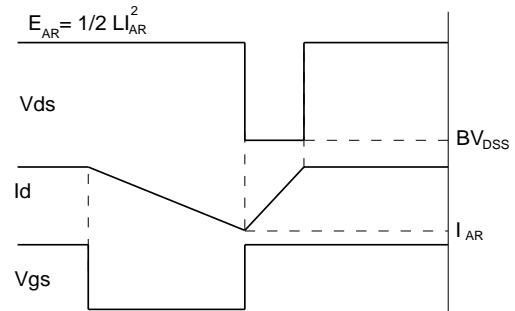
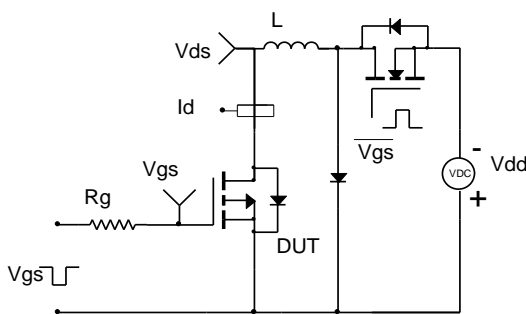
**Gate Charge Test Circuit & Waveform**



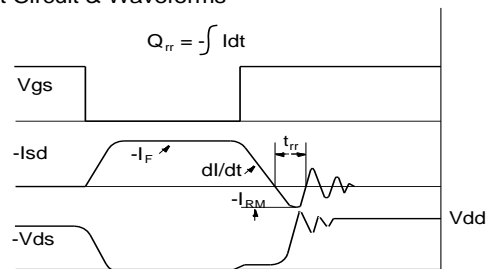
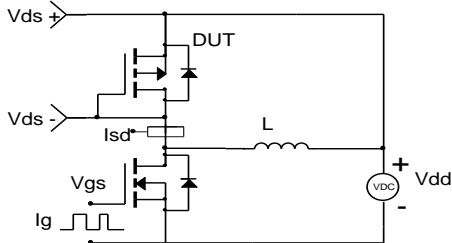
**Resistive Switching Test Circuit & Waveforms**



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



**Diode Recovery Test Circuit & Waveforms**



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