



General Description

- Bottom Source Technology
- Very Low $R_{DS(ON)}$ at 4.5V V_{GS}
- Low Gate Charge
- High Current Capability
- RoHS 2.0 and Halogen-Free Compliant

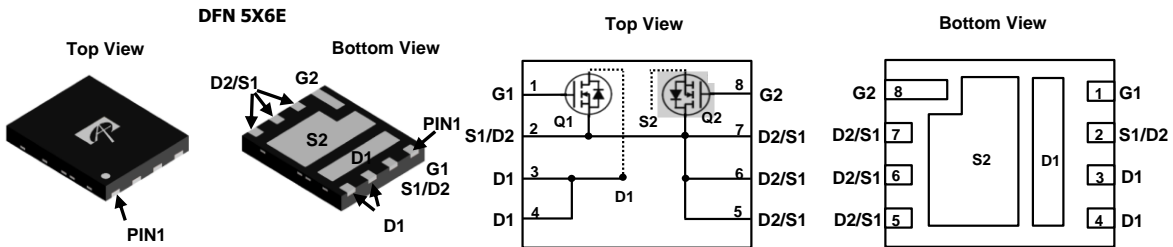
Applications

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

Product Summary

| | Q1 | Q2 |
|----------------------------------|-----------------|------------------|
| V_{DS} | 30V | 30V |
| I_D (at $V_{GS}=10V$) | 66A | 233A |
| $R_{DS(ON)}$ (at $V_{GS}=10V$) | < 3.5m Ω | < 0.8m Ω |
| $R_{DS(ON)}$ (at $V_{GS}=4.5V$) | < 5.3m Ω | < 1.02m Ω |

100% UIS Tested
100% Rg Tested



| Orderable Part Number | Package Type | Form | Minimum Order Quantity |
|-----------------------|--------------|-------------|------------------------|
| AONX38320 | DFN 5x6E | Tape & Reel | 3000 |

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

| Parameter | Symbol | Max Q1 | Max Q2 | Units | |
|---|----------------|-------------------------|----------|------------------|---|
| Drain-Source Voltage | V_{DS} | 30 | 30 | V | |
| Gate-Source Voltage | V_{GS} | ± 16 | ± 12 | V | |
| Continuous Drain Current | I_D | $T_C=25^\circ\text{C}$ | 66 | 233 | A |
| | | $T_C=100^\circ\text{C}$ | 42 | 147 | |
| Pulsed Drain Current ^c | I_{DM} | 143 | 590 | | |
| Continuous Drain Current | I_{DSM} | $T_A=25^\circ\text{C}$ | 27 | 57 | A |
| | | $T_A=70^\circ\text{C}$ | 22 | 45 | |
| Avalanche Current ^c | I_{AS} | 66 | 80 | A | |
| Avalanche energy $L=0.01\text{mH}$ ^c | E_{AS} | 22 | 32 | mJ | |
| Power Dissipation ^B | P_D | $T_C=25^\circ\text{C}$ | 24 | 73 | W |
| | | $T_C=100^\circ\text{C}$ | 9.6 | 29 | |
| Power Dissipation ^A | P_{DSM} | $T_A=25^\circ\text{C}$ | 4.1 | 4.4 | W |
| | | $T_A=70^\circ\text{C}$ | 2.6 | 2.8 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | | $^\circ\text{C}$ | |

Thermal Characteristics

| Parameter | Symbol | Typ Q1 | Typ Q2 | Max Q1 | Max Q2 | Units |
|--|-----------------|--------|--------|--------|--------|---------------------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 23 | 22 | 30 | 28 | $^\circ\text{C}/\text{W}$ |
| Maximum Junction-to-Ambient ^{A D} | | 45 | 43 | 60 | 58 | |
| Maximum Junction-to-Case | $R_{\theta JC}$ | 4 | 1.35 | 5.2 | 1.7 | $^\circ\text{C}/\text{W}$ |

Q1 Electrical Characteristics (T_J=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|--|-----|-----------|------------|-------|
| STATIC PARAMETERS | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | I _D =250μA, V _{GS} =0V | 30 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =30V, V _{GS} =0V T _J =55°C | | | 1 5 | μA |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±16V | | | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 1.3 | 1.7 | 2.1 | V |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =20A T _J =125°C | | 2.85 4 | 3.5 4.9 | mΩ |
| | | V _{GS} =4.5V, I _D =20A | | 4.15 | 5.3 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =20A | | 85 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.7 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 30 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =15V, f=1MHz | | 1220 | | pF |
| C _{oss} | Output Capacitance | | | 460 | | pF |
| C _{riss} | Reverse Transfer Capacitance | | | 50 | | pF |
| R _g | Gate resistance | f=1MHz | 0.5 | 1 | 1.5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _{g(10V)} | Total Gate Charge | V _{GS} =10V, V _{DS} =15V, I _D =20A | | 18 | 26 | nC |
| Q _{g(4.5V)} | Total Gate Charge | | | 8.7 | 13 | nC |
| Q _{gs} | Gate Source Charge | | | 2.9 | | nC |
| Q _{gd} | Gate Drain Charge | | | 3.2 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω, R _{GEN} =3Ω | | 6 | | ns |
| t _r | Turn-On Rise Time | | | 17 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 24 | | ns |
| t _f | Turn-Off Fall Time | | | 3 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =20A, di/dt=500A/μs | | 13 | | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =20A, di/dt=500A/μs | | 31 | | nC |

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The Power dissipation P_{DSM} is based on R_{θJA} ≤ 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_D is based on T_{J(MAX)}=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_{J(MAX)}=150° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} 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_{J(MAX)}=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 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

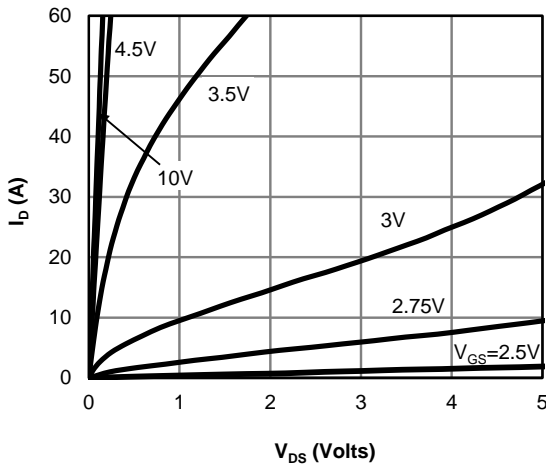


Figure 1: On-Region Characteristics (Note E)

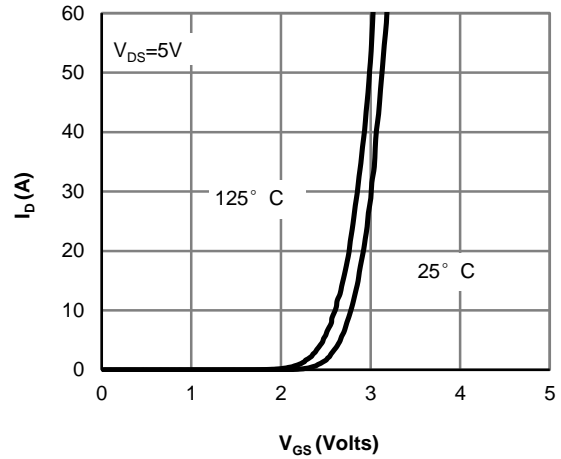


Figure 2: Transfer Characteristics (Note E)

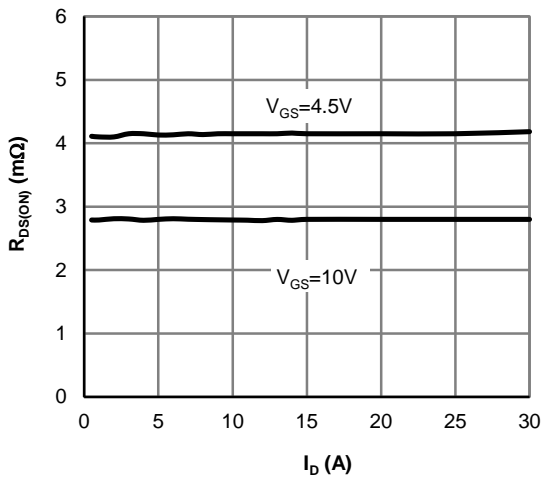


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

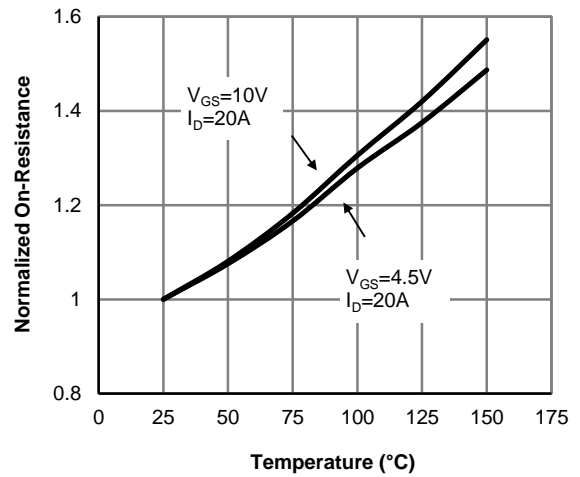


Figure 4: On-Resistance vs. Junction Temperature (Note E)

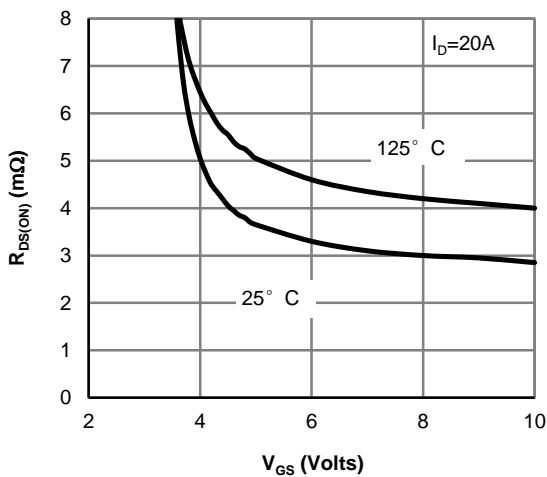


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

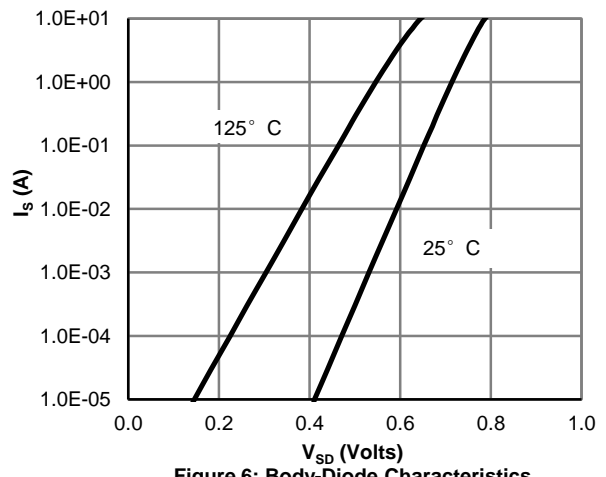


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

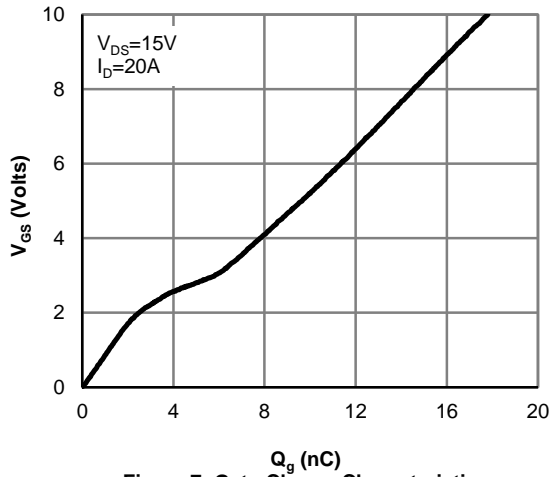


Figure 7: Gate-Charge Characteristics

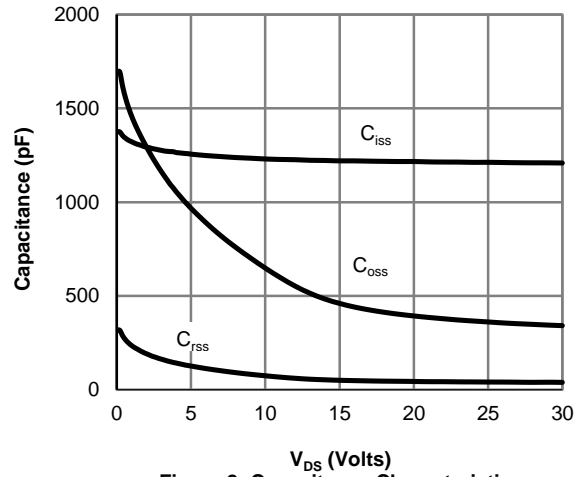


Figure 8: Capacitance Characteristics

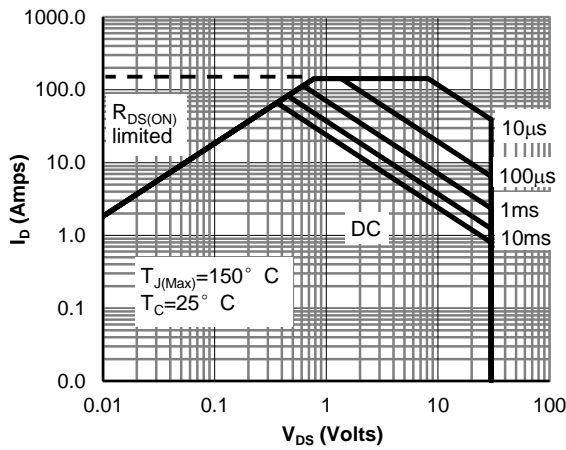


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

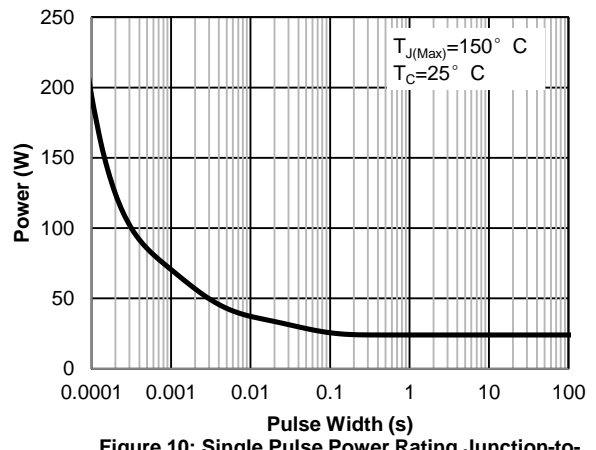


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

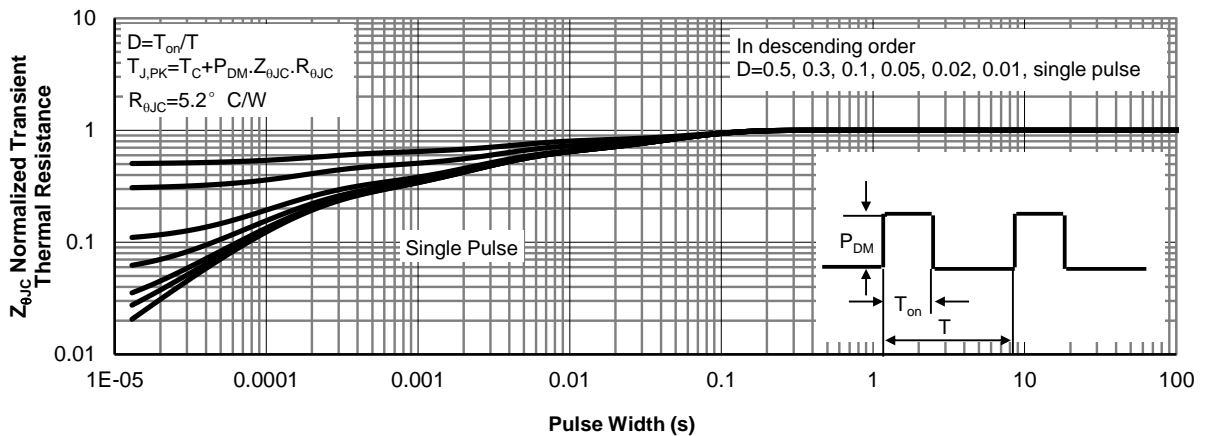


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

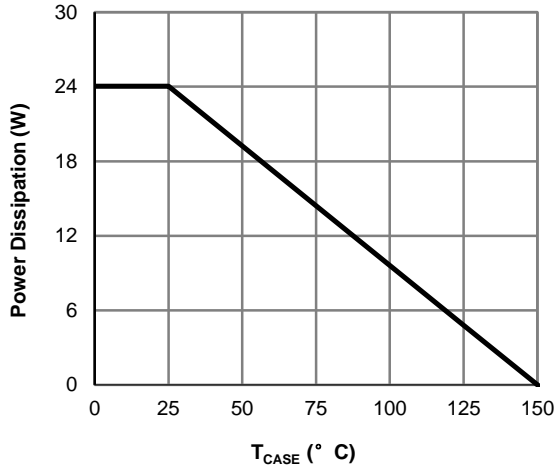


Figure 12: Power De-rating (Note F)

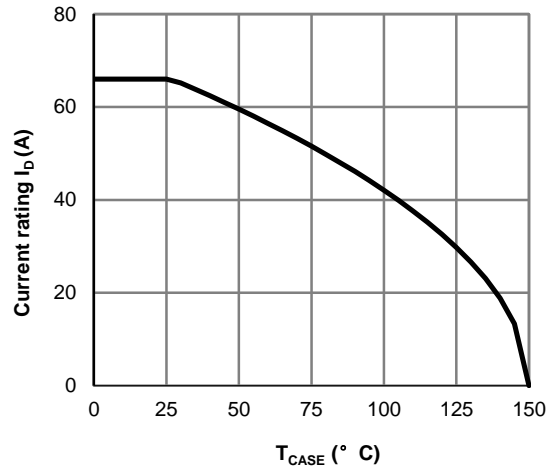


Figure 13: Current De-rating (Note F)

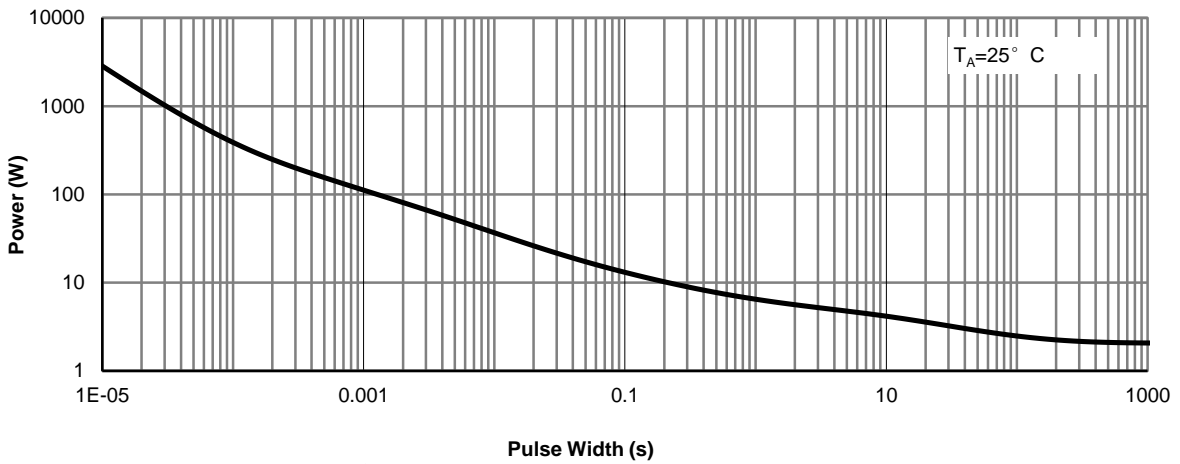


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

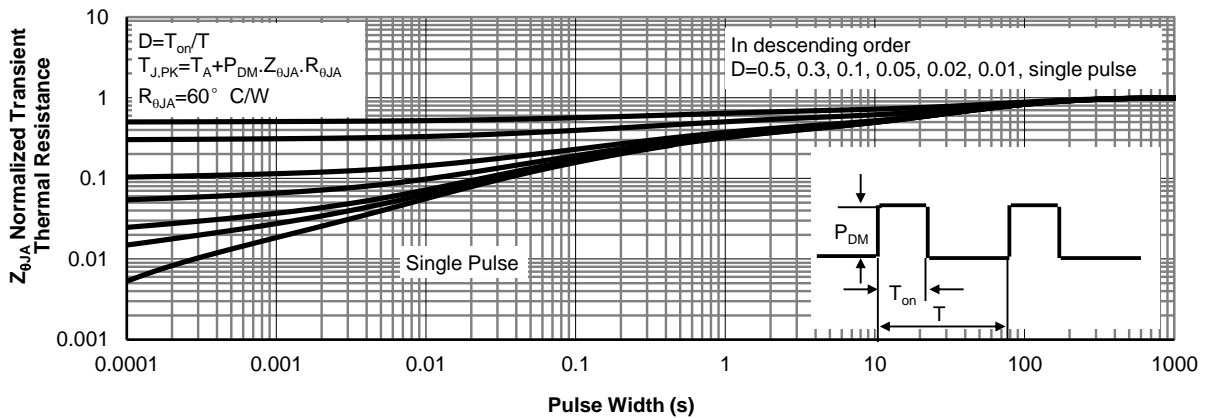


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

Q2 Electrical Characteristics (T_J=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|--|------|------------|------------|-------|
| STATIC PARAMETERS | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | I _D =250μA, V _{GS} =0V | 30 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =30V, V _{GS} =0V T _J =55°C | | | 1 5 | μA |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±12V | | | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 1.1 | 1.5 | 1.9 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =20A T _J =125°C | | 0.6 0.9 | 0.8 1.2 | mΩ |
| | | V _{GS} =4.5V, I _D =20A | | 0.72 | 1.02 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =20A | | 195 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.7 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 90 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =15V, f=1MHz | | 6260 | | pF |
| C _{oss} | Output Capacitance | | | 1600 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 160 | | pF |
| R _g | Gate resistance | f=1MHz | 0.45 | 0.9 | 1.35 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _{g(10V)} | Total Gate Charge | V _{GS} =10V, V _{DS} =15V, I _D =20A | | 88 | 123 | nC |
| Q _{g(4.5V)} | Total Gate Charge | | | 39 | 55 | nC |
| Q _{gs} | Gate Source Charge | | | 12.6 | | nC |
| Q _{gd} | Gate Drain Charge | | | 8.5 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω, R _{GEN} =3Ω | | 9 | | ns |
| t _r | Turn-On Rise Time | | | 15 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 75 | | ns |
| t _f | Turn-Off Fall Time | | | 13.5 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =20A, di/dt=500A/μs | | 24 | | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =20A, di/dt=500A/μs | | 90 | | nC |

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The Power dissipation P_{DSM} is based on R_{θJA} ≤ 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_D is based on T_{J(MAX)}=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_{J(MAX)}=150° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} 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_{J(MAX)}=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 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

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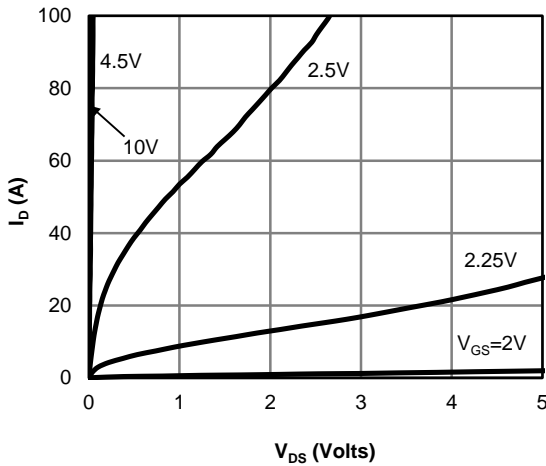


Figure 1: On-Region Characteristics (Note E)

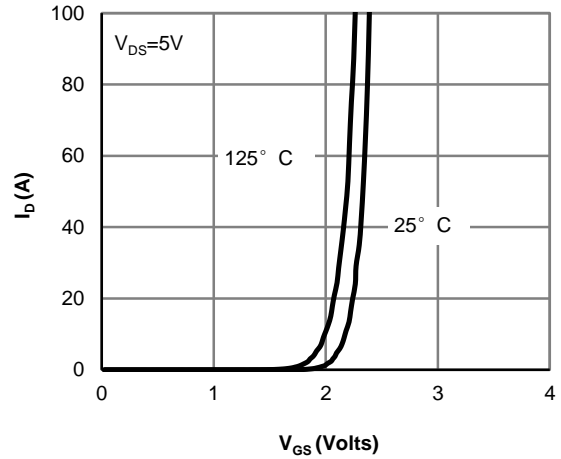


Figure 2: Transfer Characteristics (Note E)

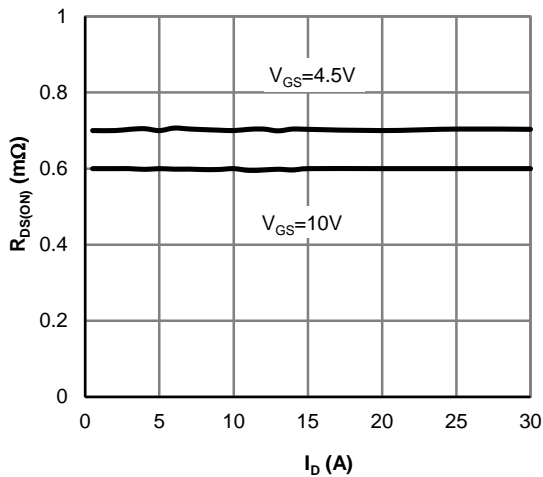


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

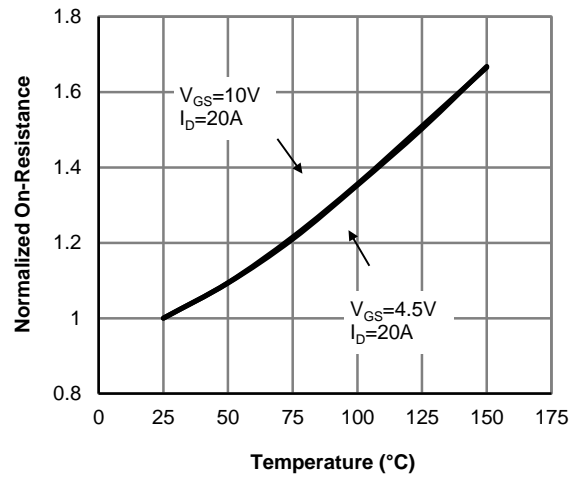


Figure 4: On-Resistance vs. Junction Temperature (Note E)

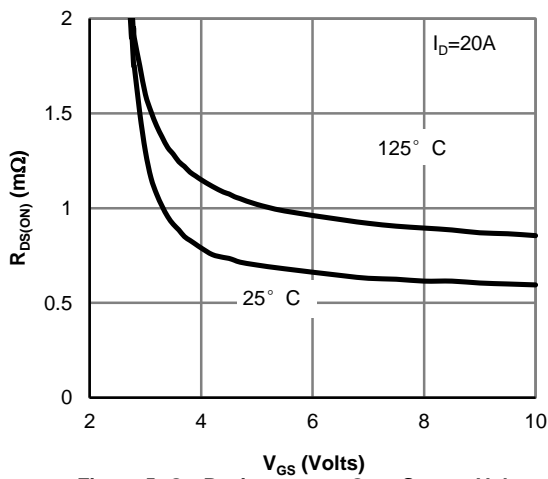


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

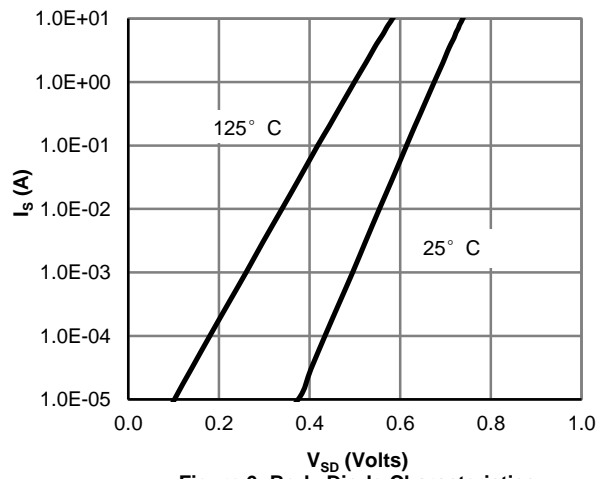


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

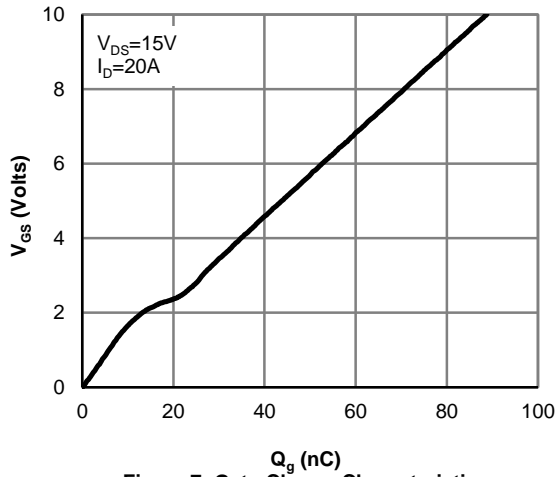


Figure 7: Gate-Charge Characteristics

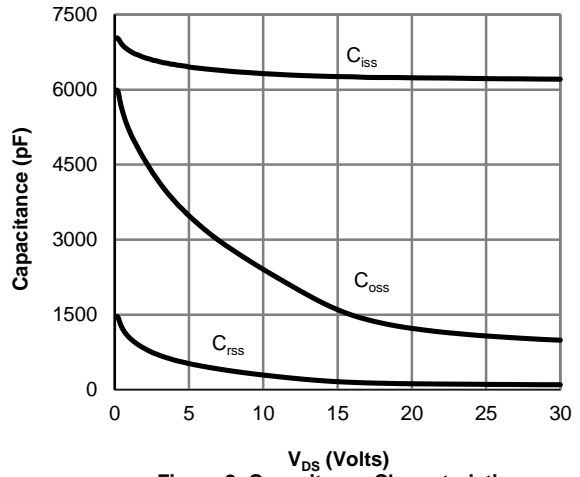


Figure 8: Capacitance Characteristics

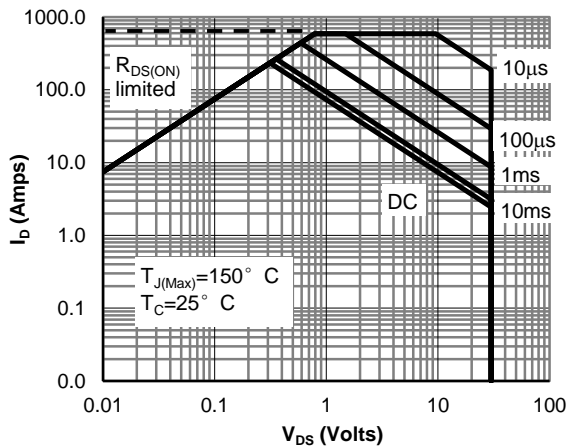


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

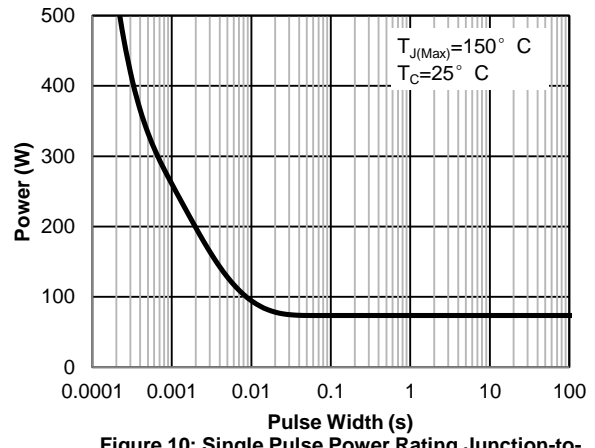


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

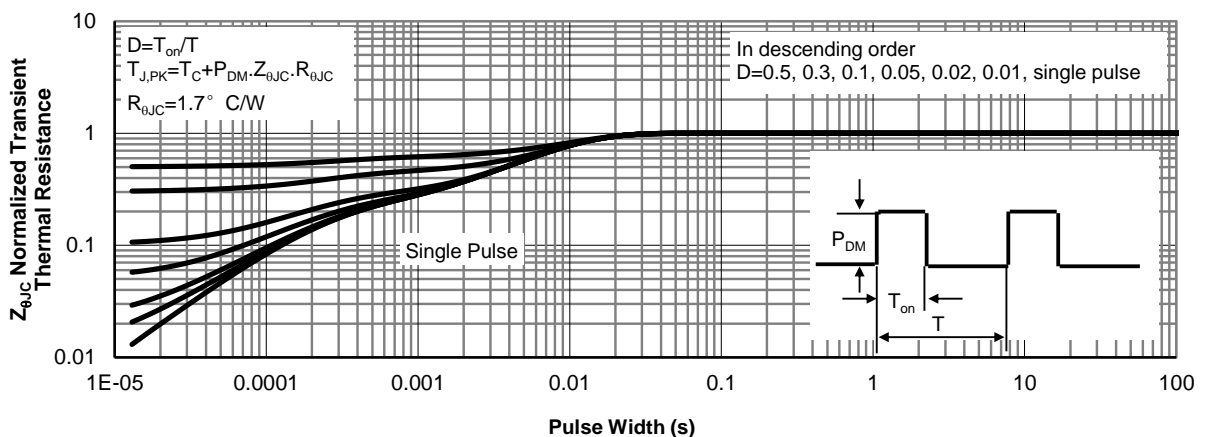


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

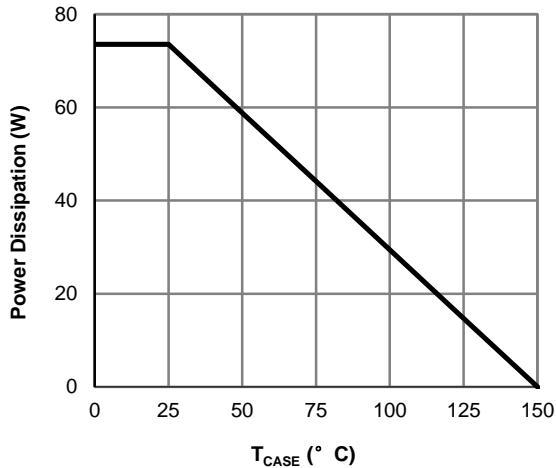


Figure 12: Power De-rating (Note F)

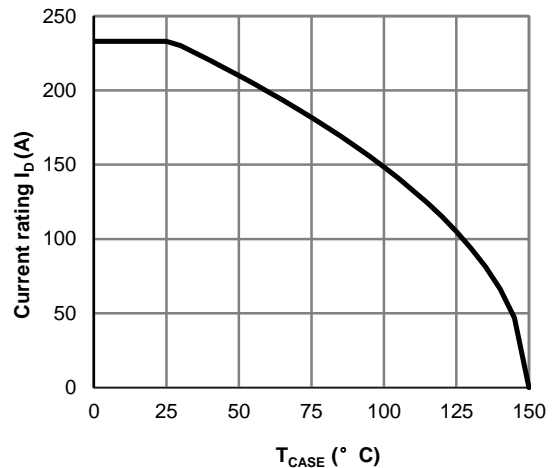


Figure 13: Current De-rating (Note F)

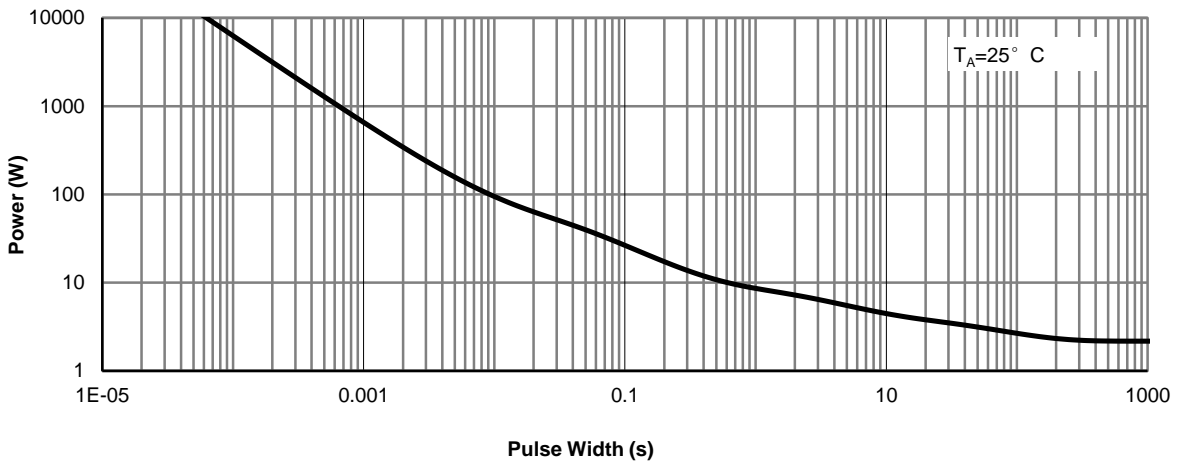


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

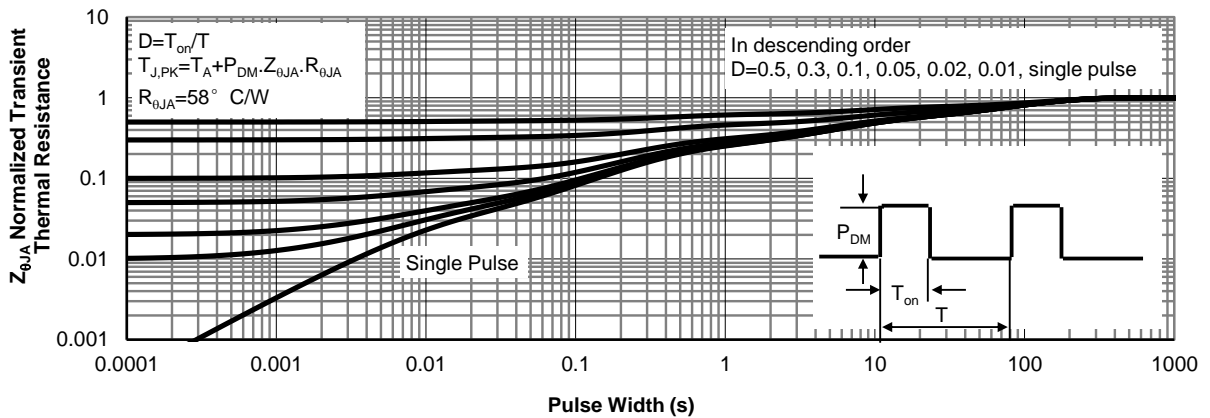


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

Figure A: Gate Charge Test Circuit & Waveforms

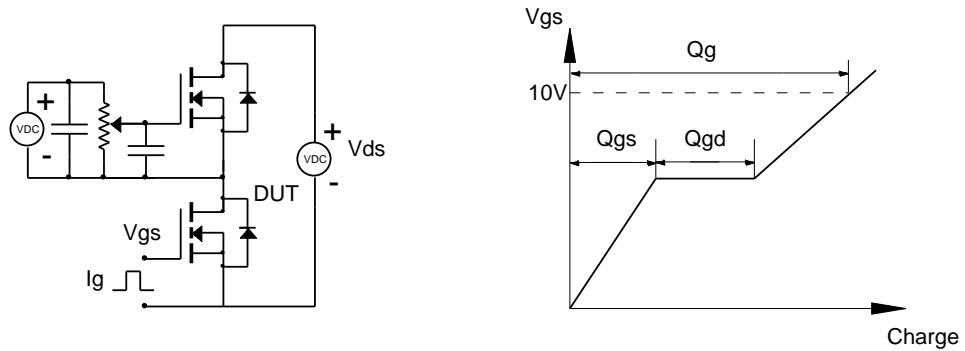


Figure B: Resistive Switching Test Circuit & Waveforms

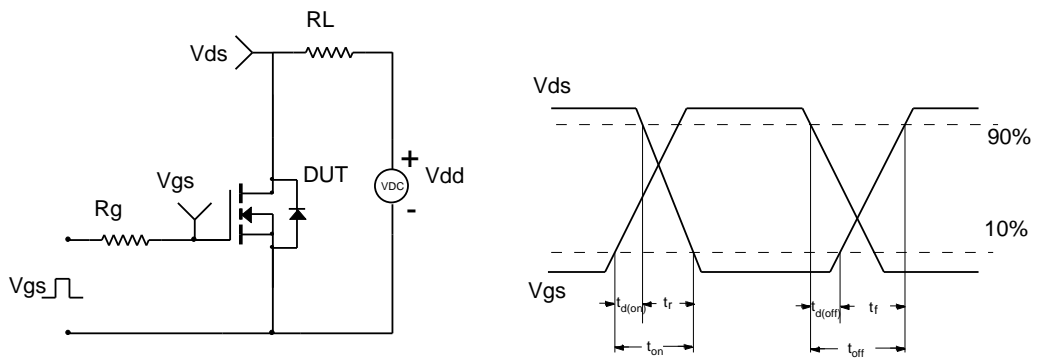


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

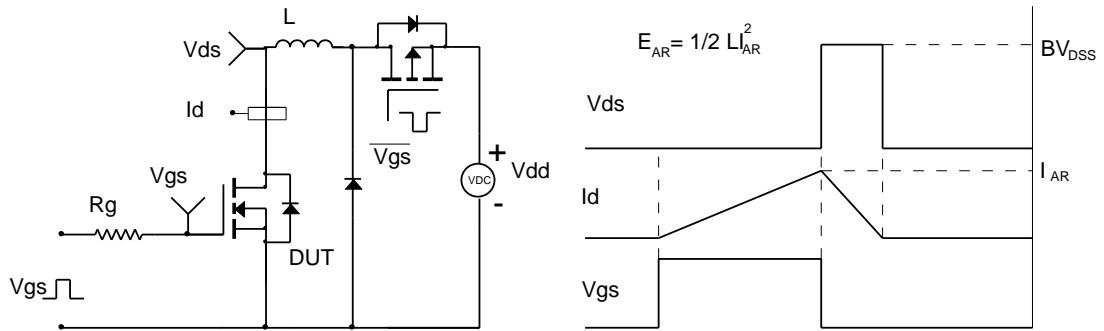


Figure D: Diode Recovery Test Circuit & Waveforms

