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AOW11S60/AOWF11S60 600V 11A α MOS™ Power Transistor

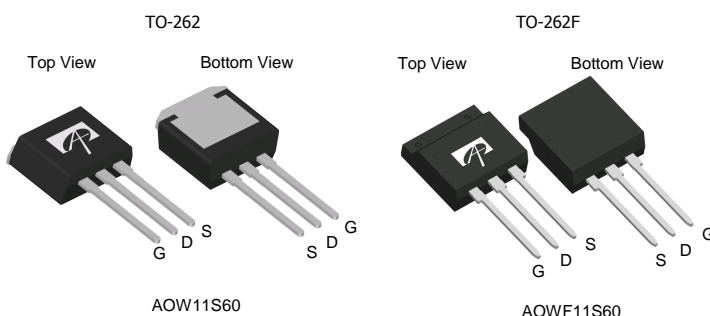
General Description

The AOW11S60 & AOWF11S60 have been fabricated using the advanced α MOS™ high voltage process that is designed to deliver high levels of performance and robustness in switching applications. By providing low $R_{DS(on)}$, Q_g and E_{OSS} along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.

Product Summary

| | |
|----------------------|----------------|
| $V_{DS} @ T_{j,max}$ | 700V |
| I_{DM} | 45A |
| $R_{DS(ON),max}$ | 0.399 Ω |
| $Q_{g,typ}$ | 11nC |
| $E_{oss} @ 400V$ | 2.7 μ J |

100% UIS Tested
100% R_g Tested



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

| Parameter | Symbol | AOW11S60 | AOWF11S60 | Units |
|---|----------------|---------------------------------|-----------|------------------|
| Drain-Source Voltage | V_{DS} | 600 | | V |
| Gate-Source Voltage | V_{GS} | ± 30 | | V |
| Continuous Drain Current | I_D | $T_C=25^\circ\text{C}$ | 11 | 11* |
| | | $T_C=100^\circ\text{C}$ | 8 | 8* |
| Pulsed Drain Current ^C | I_{DM} | 45 | | A |
| Avalanche Current ^C | I_{AR} | 2 | | A |
| Repetitive avalanche energy ^C | E_{AR} | 60 | | mJ |
| Single pulsed avalanche energy ^G | E_{AS} | 120 | | mJ |
| Power Dissipation ^B | P_D | $T_C=25^\circ\text{C}$ | 178 | 28 |
| | | Derate above 25°C | 1.4 | 0.22 |
| MOSFET dv/dt ruggedness | | 100 | | V/ns |
| Peak diode recovery dv/dt ^H | dv/dt | 20 | | V/ns |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | | $^\circ\text{C}$ |
| Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds ^J | T_L | 300 | | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | AOW11S60 | AOWF11S60 | Units |
|--|-----------------|----------|-----------|--------------------|
| Maximum Junction-to-Ambient ^{A,D} | $R_{\theta JA}$ | 65 | 65 | $^\circ\text{C/W}$ |
| Maximum Case-to-sink ^A | $R_{\theta CS}$ | 0.5 | -- | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case | $R_{\theta JC}$ | 0.7 | 4.5 | $^\circ\text{C/W}$ |

* Drain current limited by maximum junction temperature.

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, T _J =25°C | 600 | - | - | V |
| | | I _D =250μA, V _{GS} =0V, T _J =150°C | 650 | 700 | - | |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =600V, V _{GS} =0V | - | - | 1 | μA |
| | | V _{DS} =480V, T _J =150°C | - | 10 | - | |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±30V | - | - | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =5V, I _D =250μA | 2.8 | 3.5 | 4.1 | V |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =3.8A, T _J =25°C | - | 0.35 | 0.399 | Ω |
| | | V _{GS} =10V, I _D =3.8A, T _J =150°C | - | 0.98 | 1.11 | Ω |
| V _{SD} | Diode Forward Voltage | I _S =5.5A, V _{GS} =0V, T _J =25°C | - | 0.84 | - | V |
| I _S | Maximum Body-Diode Continuous Current | | - | - | 11 | A |
| I _{SM} | Maximum Body-Diode Pulsed Current ^C | | - | - | 45 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =100V, f=1MHz | - | 545 | - | pF |
| C _{oss} | Output Capacitance | | - | 37.3 | - | pF |
| C _{o(er)} | Effective output capacitance, energy related ^H | V _{GS} =0V, V _{DS} =0 to 480V, f=1MHz | - | 30.8 | - | pF |
| C _{o(tr)} | Effective output capacitance, time related ^I | | - | 93.6 | - | pF |
| C _{rss} | Reverse Transfer Capacitance | V _{GS} =0V, V _{DS} =100V, f=1MHz | - | 1.42 | - | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | - | 16.5 | - | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =10V, V _{DS} =480V, I _D =5.5A | - | 11 | - | nC |
| Q _{gs} | Gate Source Charge | | - | 2.8 | - | nC |
| Q _{gd} | Gate Drain Charge | | - | 3.8 | - | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =400V, I _D =5.5A, R _G =25Ω | - | 20 | - | ns |
| t _r | Turn-On Rise Time | | - | 20 | - | ns |
| t _{D(off)} | Turn-Off DelayTime | | - | 59 | - | ns |
| t _f | Turn-Off Fall Time | | - | 20 | - | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =5.5A, di/dt=100A/μs, V _{DS} =400V | - | 250 | - | ns |
| I _{rm} | Peak Reverse Recovery Current | I _F =5.5A, di/dt=100A/μs, V _{DS} =400V | - | 21 | - | A |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =5.5A, di/dt=100A/μs, V _{DS} =400V | - | 3.3 | - | μC |

A. The value of R_{θJA} is measured with the device in a still air environment with T_A=25°C.

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. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150°C, Ratings are based on low frequency and duty cycles to keep initial T_J=25°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 <300 μs 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. L=60mH, I_{AS}=2A, V_{DD}=150V, Starting T_J=25°C

H. C_{o(er)} is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{(BR)DSS}.

I. C_{o(tr)} is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{(BR)DSS}.

J. Wavesoldering only allowed at leads.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

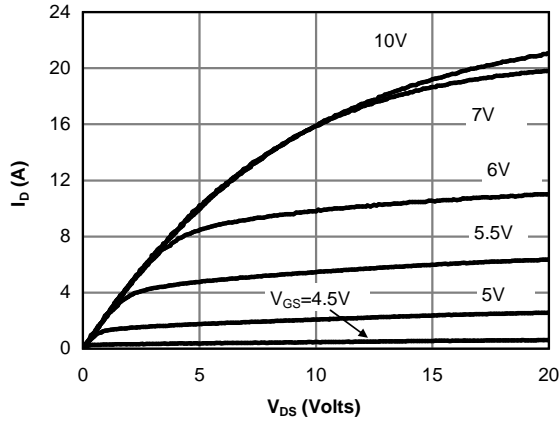


Figure 1: On-Region Characteristics @ 25°C

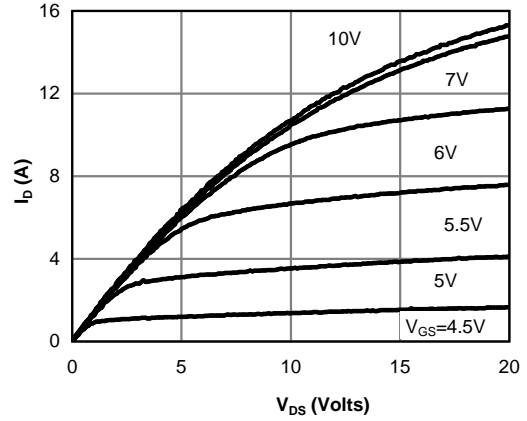


Figure 2: On-Region Characteristics @ 125°C

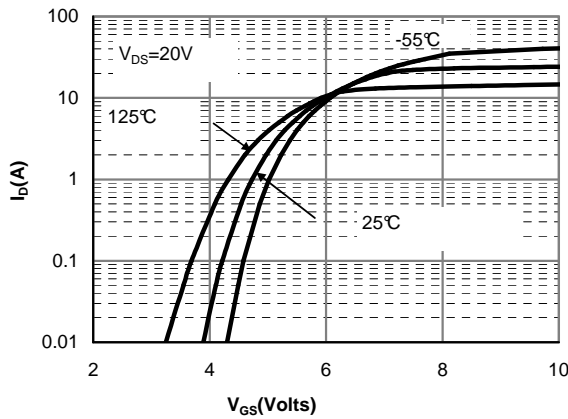


Figure 3: Transfer Characteristics

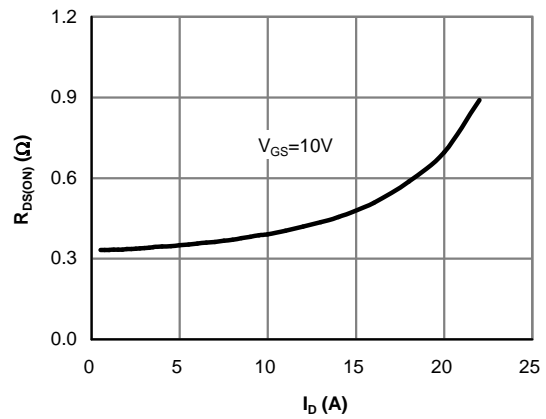


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

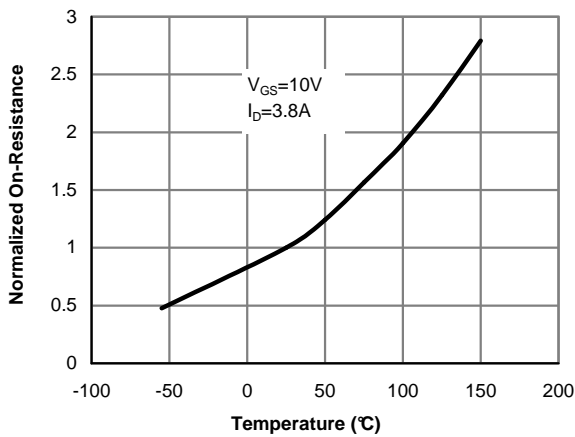


Figure 5: On-Resistance vs. Junction Temperature

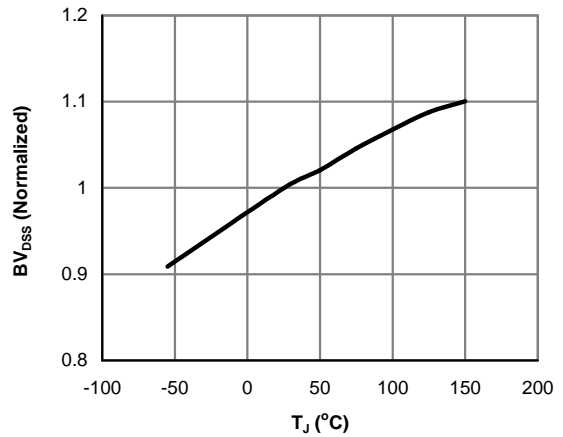


Figure 6: Break Down vs. Junction Temperature

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

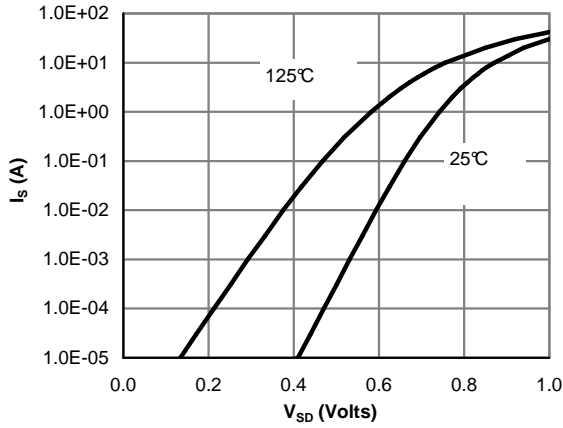


Figure 7: Body-Diode Characteristics (Note E)

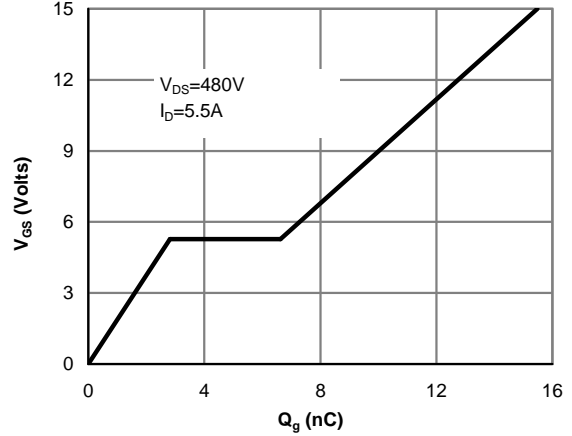


Figure 8: Gate-Charge Characteristics

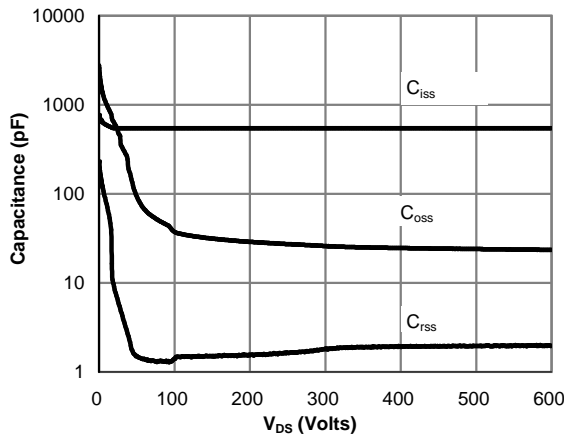


Figure 9: Capacitance Characteristics

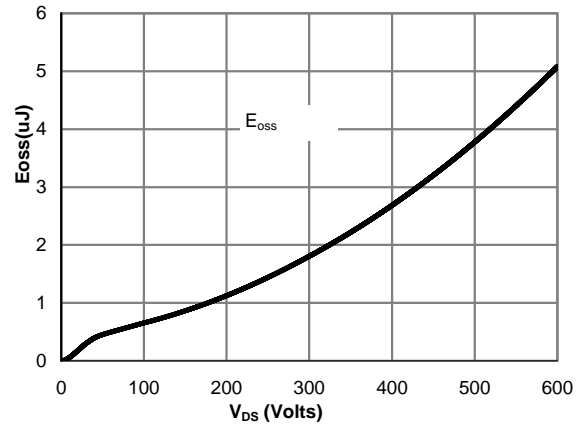


Figure 10: Coss stored Energy

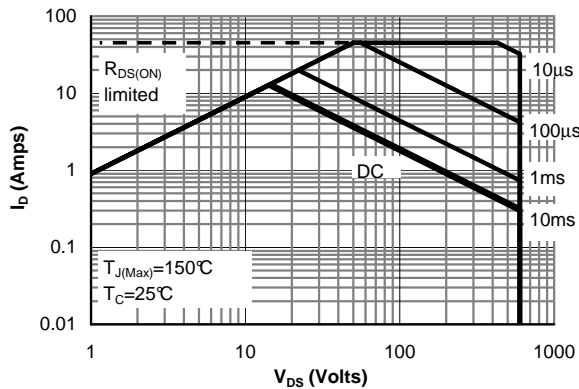


Figure 11: Maximum Forward Biased Safe Operating Area for AOW11S60 (Note F)

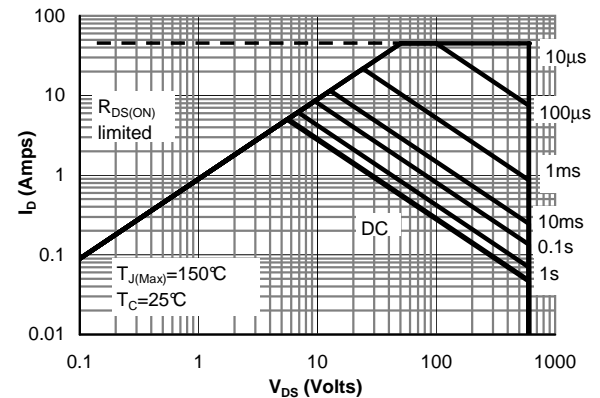


Figure 12: Maximum Forward Biased Safe Operating Area for AOWF11S60 (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

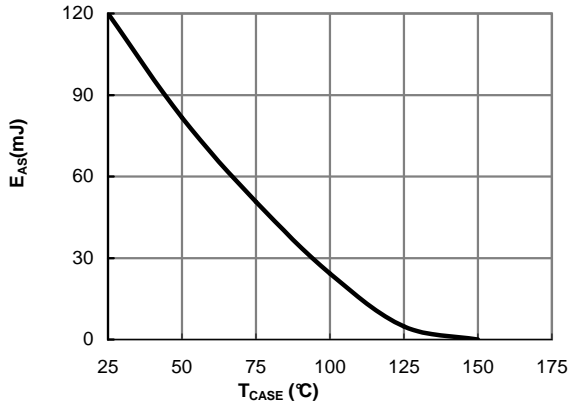


Figure 13: Avalanche energy

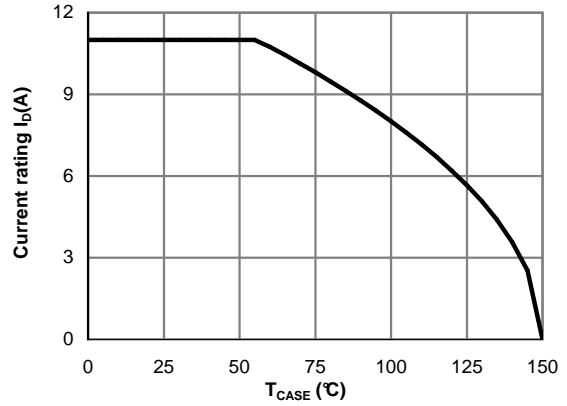


Figure 14: Current De-rating (Note B)

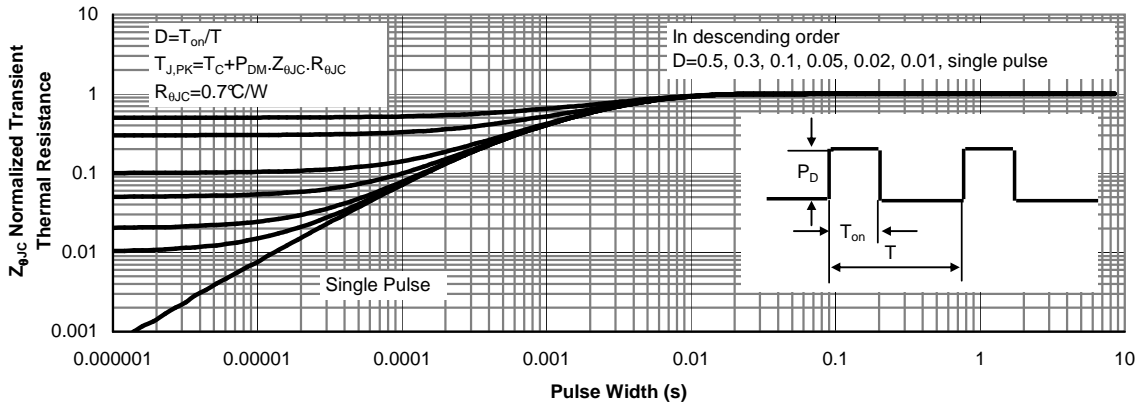


Figure 15: Normalized Maximum Transient Thermal Impedance for AOW11S60 (Note F)

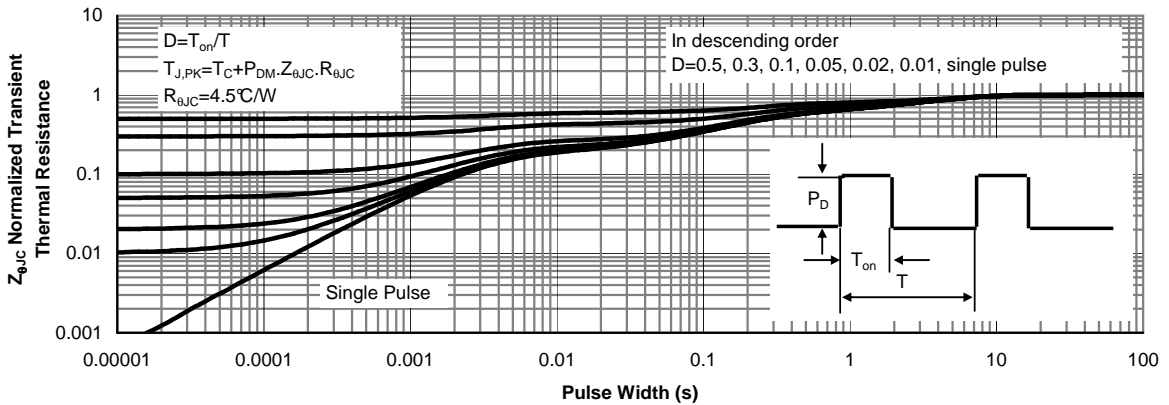
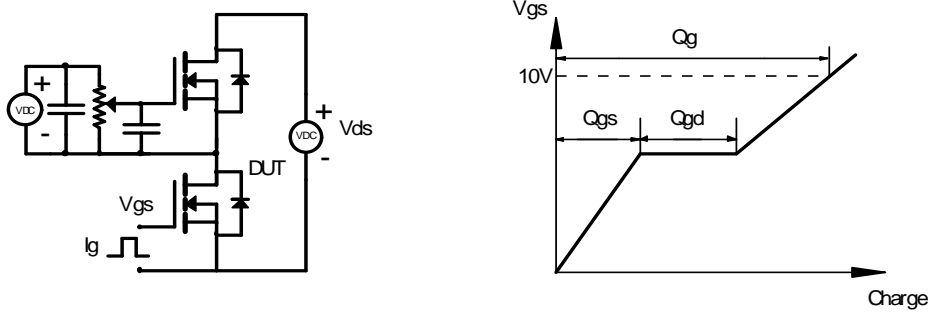
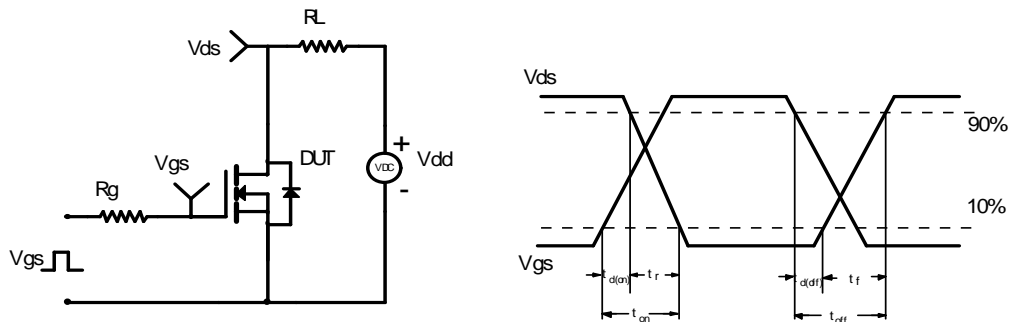


Figure 16: Normalized Maximum Transient Thermal Impedance for AOWF11S60 (Note F)

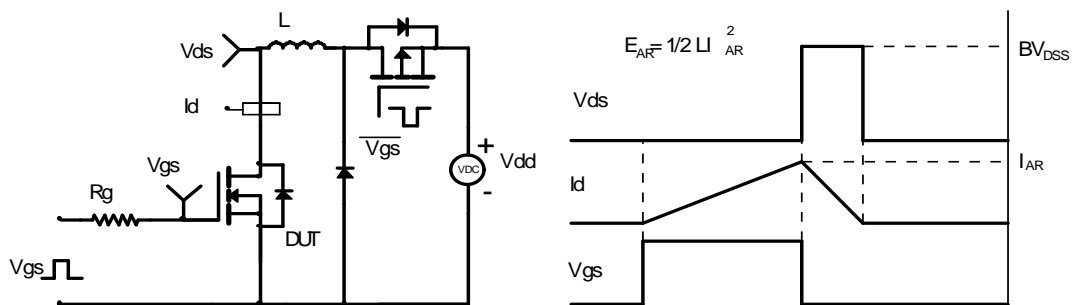
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

