

General Description

- Trench Power AlphaSGT™ technology
- Low $R_{DS(ON)}$
- Low Gate Charge

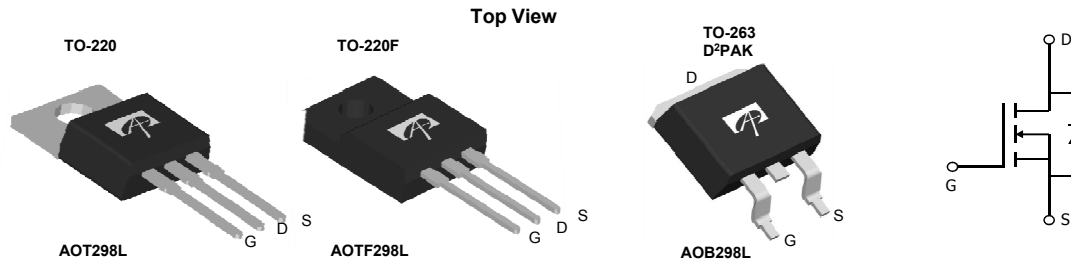
Applications

- Synchronous Rectification in DC/DC and AC/DC Converters
- Notebook Adaptor, TV Power Supply applications

Product Summary

| | |
|---------------------------------|------------------|
| V_{DS} | 100V |
| I_D (at $V_{GS}=10V$) | 58A/33A |
| $R_{DS(ON)}$ (at $V_{GS}=10V$) | < 14.5m Ω |

100% UIS Tested
 100% R_g Tested



| Orderable Part Number | Package Type | Form | Minimum Order Quantity |
|-----------------------|--------------|-------------|------------------------|
| AOT298L | TO-220 | Tube | 1000 |
| AOB298L | TO-263 | Tape & Reel | 800 |
| AOTF298L | TO-220F | Tube | 1000 |

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

| Parameter | Symbol | AOT298L/AOB298L | AOTF298L | Units |
|--|------------------|-------------------------|----------|------------------|
| Drain-Source Voltage | V_{DS} | 100 | | V |
| Gate-Source Voltage | V_{GS} | ± 20 | | V |
| Continuous Drain Current | I_D | $T_C=25^\circ\text{C}$ | 58 | A |
| | | $T_C=100^\circ\text{C}$ | 41 | |
| Pulsed Drain Current ^C | I_{DM} | 130 | | |
| Continuous Drain Current | I_{DSM} | $T_A=25^\circ\text{C}$ | 9 | A |
| | | $T_A=70^\circ\text{C}$ | 7 | |
| Avalanche Current ^C | I_{AS}, I_{AR} | 20 | | A |
| Avalanche energy $L=0.1\text{mH}$ ^C | E_{AS}, E_{AR} | 20 | | mJ |
| V_{DS} Spike ^I | V_{SPIKE} | 120 | | V |
| Power Dissipation ^B | P_D | $T_C=25^\circ\text{C}$ | 100 | W |
| | | $T_C=100^\circ\text{C}$ | 50 | |
| Power Dissipation ^A | P_{DSM} | $T_A=25^\circ\text{C}$ | 2.1 | |
| | | $T_A=70^\circ\text{C}$ | 1.33 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 175 | | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | AOT298L/AOB298L | AOTF298L | Units |
|--|-----------------|-----------------|----------|--------------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 15 | | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient ^{A,D} | | 60 | | |
| Maximum Junction-to-Case | $R_{\theta JC}$ | 1.5 | 4.5 | $^\circ\text{C/W}$ |

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 | 100 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =100V, V _{GS} =0V T _J =55°C | | | 1 5 | μA |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±20V | | | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 2.7 | 3.3 | 4.1 | V |
| I _{D(ON)} | On state drain current | V _{GS} =10V, V _{DS} =5V | 130 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =20A T _J =125°C | | 12 19 | 14.5 24 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =20A | | 30 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.7 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current ^G | | | | 70 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =50V, f=1MHz | | 1250 | 1670 | pF |
| C _{oss} | Output Capacitance | | 727 | 970 | pF | |
| C _{rss} | Reverse Transfer Capacitance | | 25 | 43 | pF | |
| R _g | Gate resistance | f=1MHz | 0.8 | 2 | 3 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _{g(10V)} | Total Gate Charge | V _{GS} =10V, V _{DS} =50V, I _D =20A | | 19 | 27 | nC |
| Q _{gs} | Gate Source Charge | | 5.5 | | nC | |
| Q _{gd} | Gate Drain Charge | | 6 | | nC | |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =50V, R _L =2.5Ω, R _{GEN} =3Ω | | 7.5 | | ns |
| t _r | Turn-On Rise Time | | 14 | | ns | |
| t _{D(off)} | Turn-Off DelayTime | | 15 | | ns | |
| t _f | Turn-Off Fall Time | | 14 | | ns | |
| t _{rr} | Body Diode Reverse Recovery Time | | I _F =20A, dI/dt=500A/μs | | 39 | |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =20A, dI/dt=500A/μs | | 140 | | 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_{D(SM)} is based on R_{θJA} 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_D is based on T_{J(MAX)}=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_{J(MAX)}=175° 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 <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)}=175° C. The SOA curve provides a single pulse rating.

G. The maximum current limited by package.

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.

I. The spike duty cycle 5% max, limited by junction temperature T_{J(MAX)}=120° C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

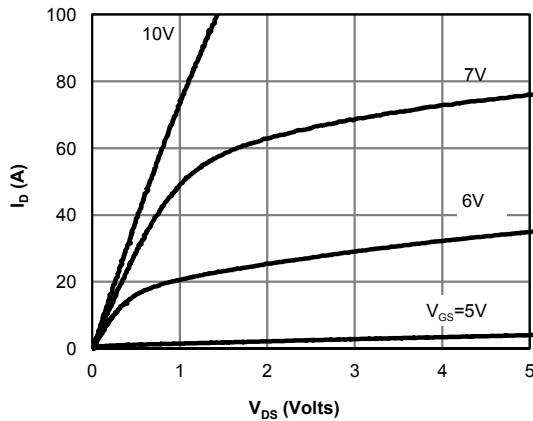


Fig 1: On-Region Characteristics (Note E)

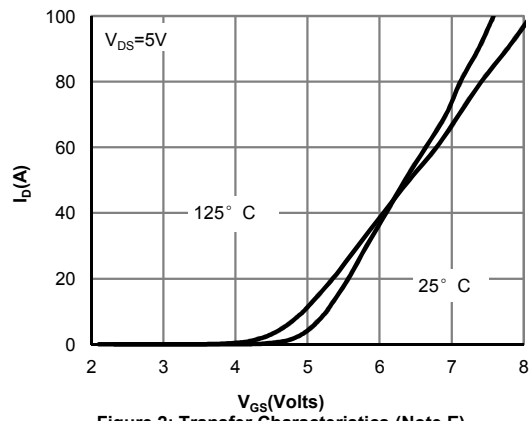


Figure 2: Transfer Characteristics (Note E)

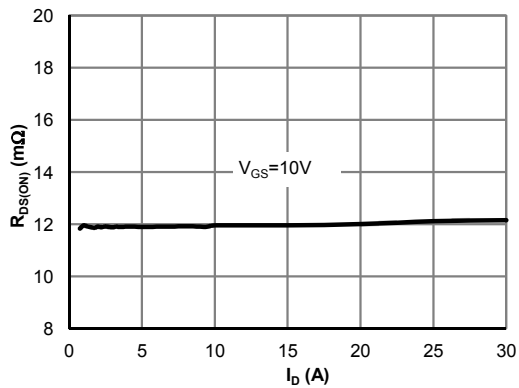


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

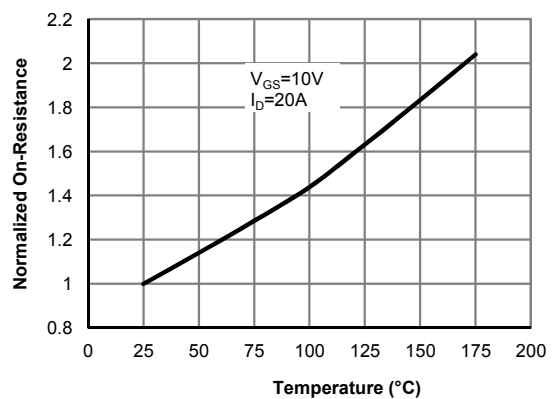


Figure 4: On-Resistance vs. Junction Temperature (Note E)

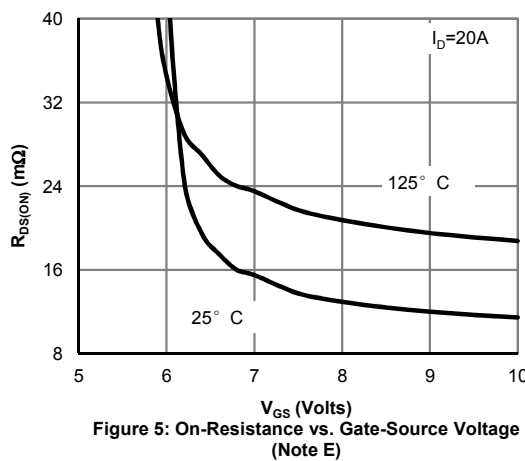


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

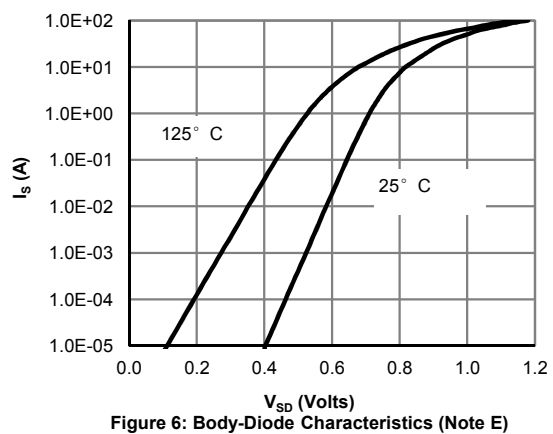


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

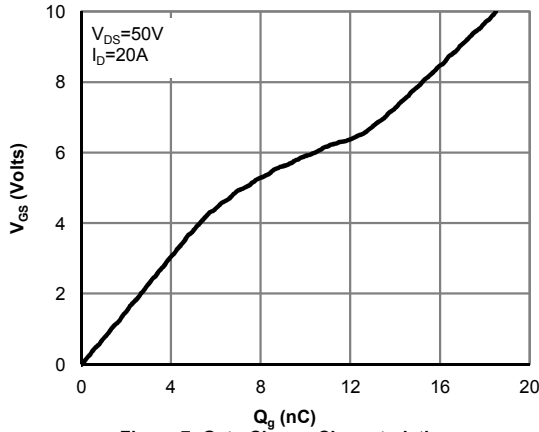


Figure 7: Gate-Charge Characteristics

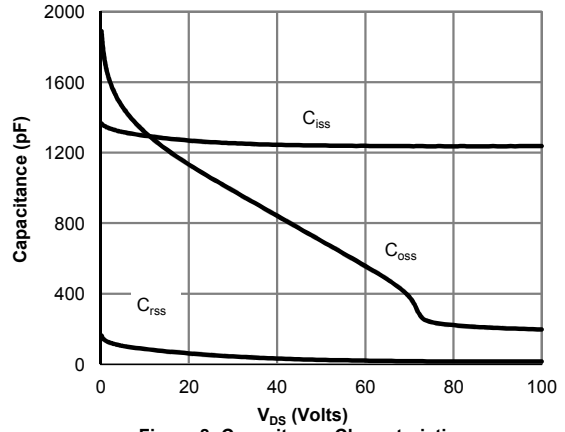


Figure 8: Capacitance Characteristics

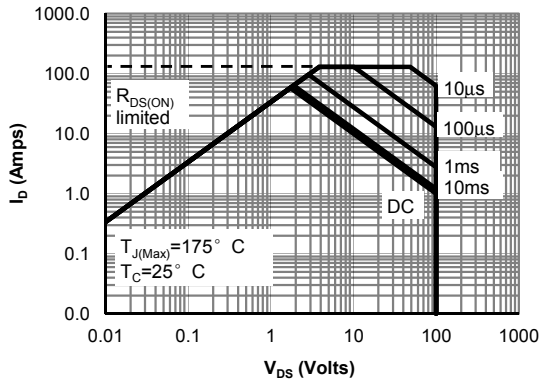


Figure 9: Maximum Forward Biased Safe Operating Area for AOT298L and AOB298L (Note F)

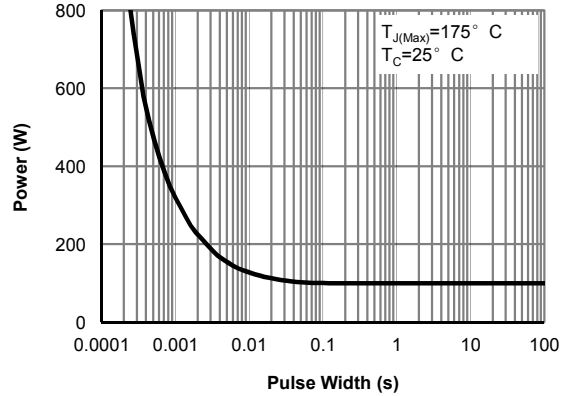


Figure 10: Single Pulse Power Rating Junction-to-Case for AOT298L and AOB298L (Note F)

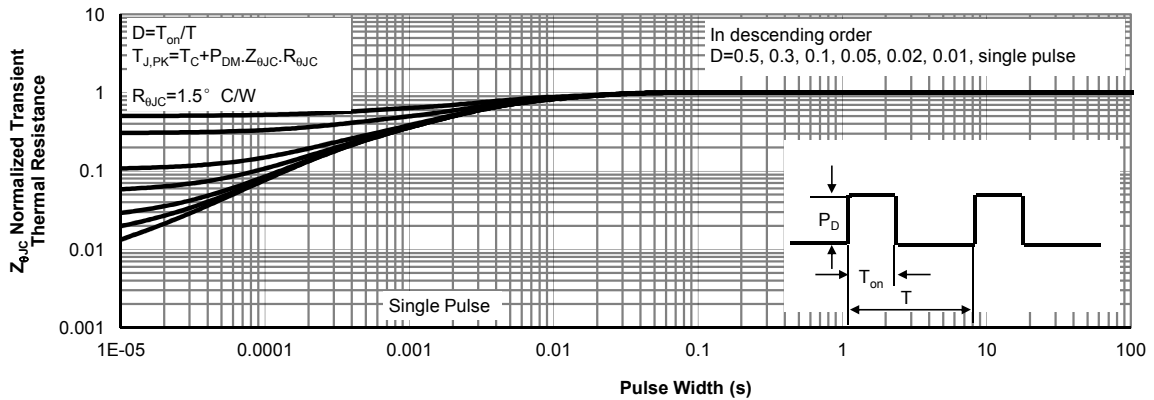


Figure 11: Normalized Maximum Transient Thermal Impedance for AOT298L and AOB298L (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

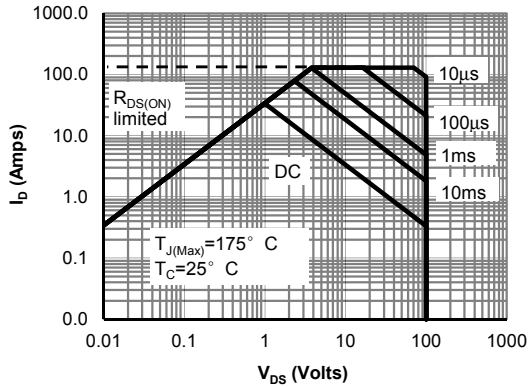


Figure 12: Maximum Forward Biased Safe Operating Area for AOTF298L (Note F)

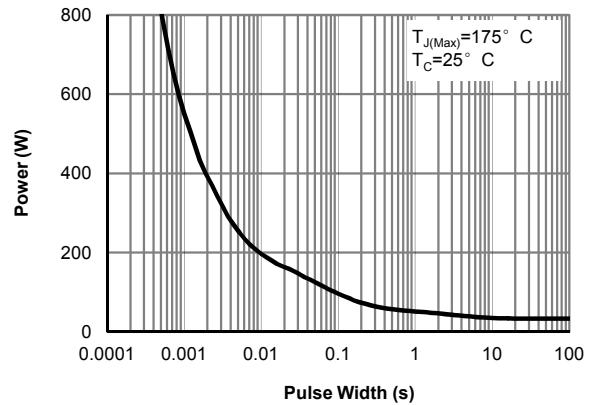


Figure 13: Single Pulse Power Rating Junction-to-Case for AOTF298L (Note F)

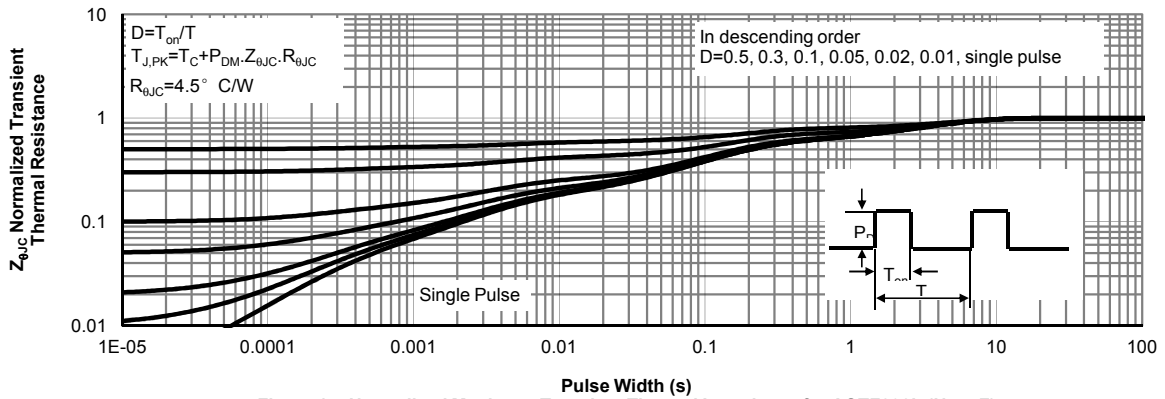


Figure 14: Normalized Maximum Transient Thermal Impedance for AOTF298L (Note F)

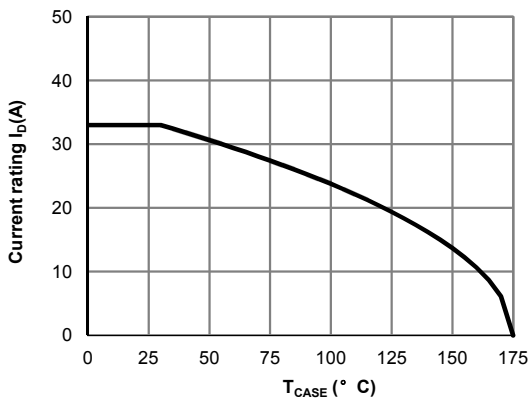


Figure 15: Current De-rating for AOTF298L (Note F)

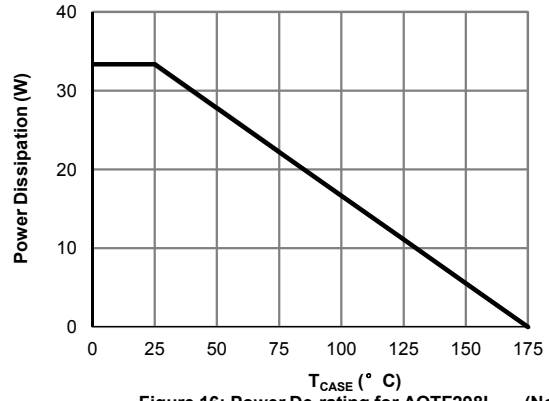


Figure 16: Power De-rating for AOTF298L (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

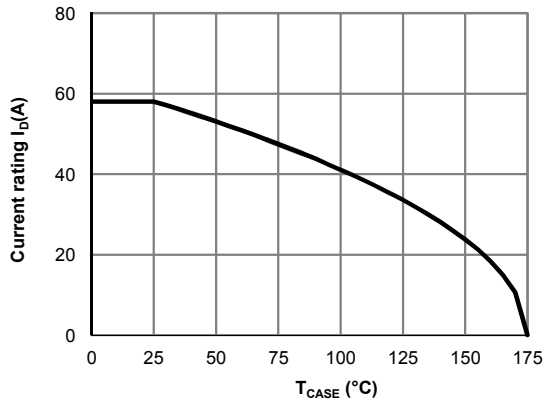


Figure 17: Current De-rating for AOT298L and AOB298L (Note F)

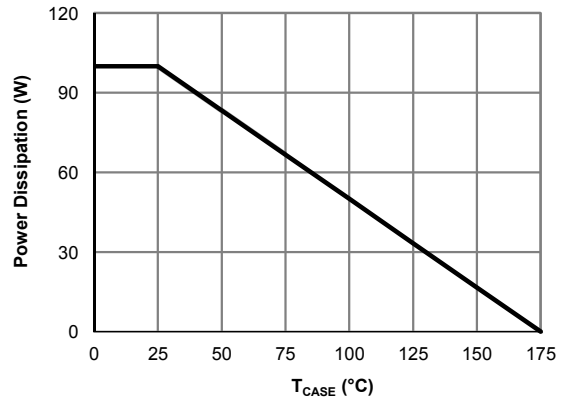


Figure 18: Power De-rating for AOT298L and AOB298L (Note F)

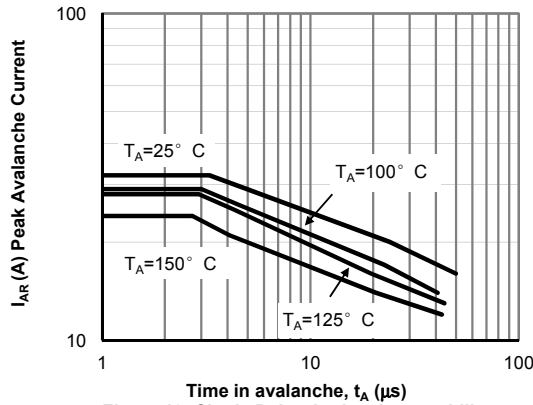


Figure 19: Single Pulse Avalanche capability (Note C)

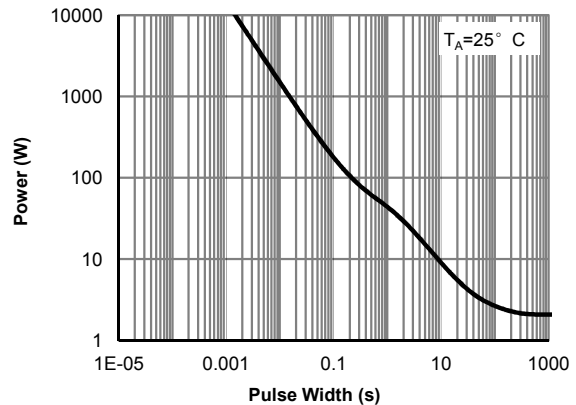


Figure 20: Single Pulse Power Rating Junction-to-Ambient (Note H)

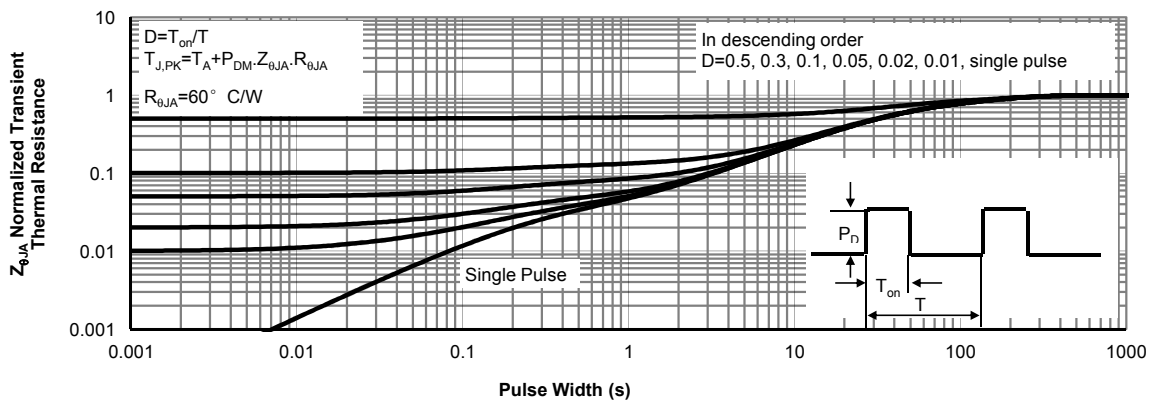
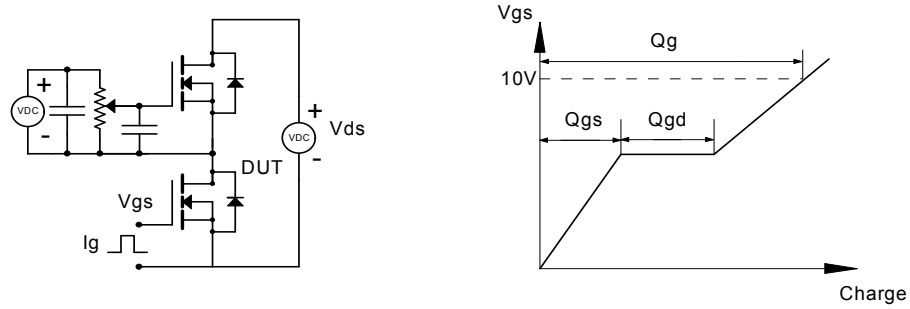
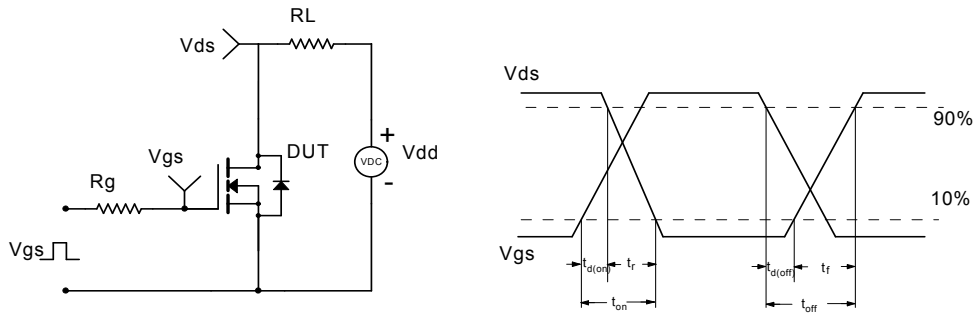


Figure 21: Normalized Maximum Transient Thermal Impedance (Note H)

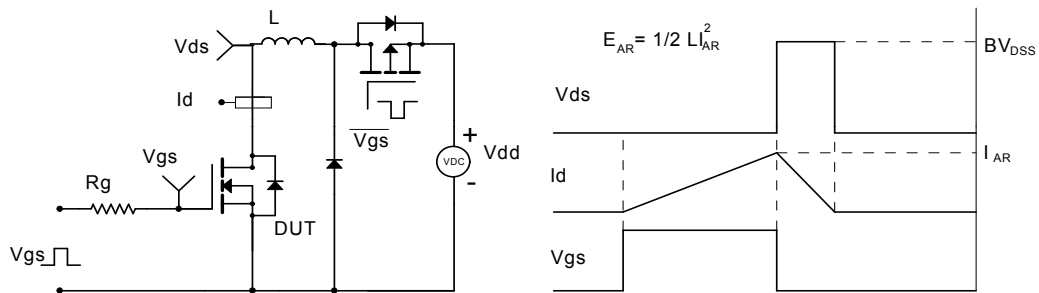
Gate Charge Test Circuit & Waveform



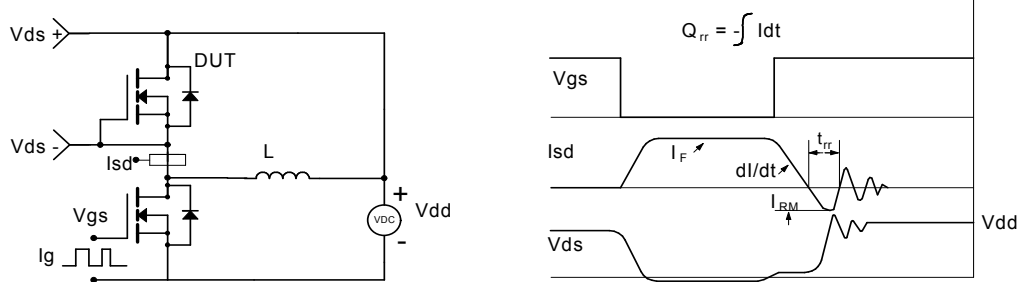
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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