

General Description

- Trench Power AlphaMOS-II technology
- Low $R_{DS(ON)}$
- Low C_{iss} and C_{rss}
- High Current Capability
- RoHS and Halogen Free Compliant

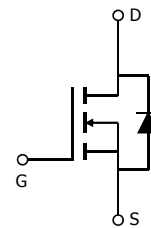
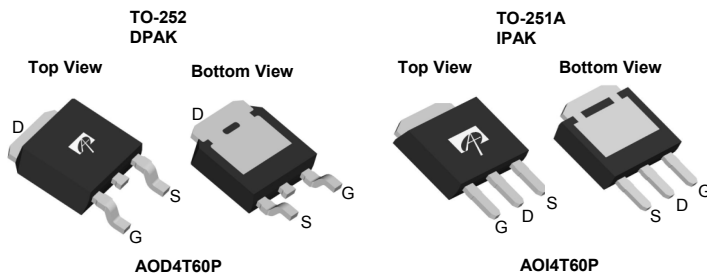
Applications

- General Lighting for LED and CCFL
- AC/DC Power supplies for Industrial, Consumer, and Telecom

Product Summary

| | |
|----------------------|----------------|
| $V_{DS} @ T_{j,max}$ | 700V |
| I_{DM} | 16A |
| $R_{DS(ON),max}$ | < 2.1 Ω |
| $Q_{g,typ}$ | 8.3nC |
| $E_{oss} @ 400V$ | 1.6 μ J |

100% UIS Tested
 100% R_g Tested



| Orderable Part Number | Package Type | Form | Minimum Order Quantity |
|-----------------------|--------------|-------------|------------------------|
| AOD4T60P | TO-252 | Tape & Reel | 2500 |
| AOI4T60P | TO-251A | Tube | 4000 |

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

| Parameter | Symbol | Maximum | Units |
|--|----------------|---------------------------------|------------------|
| Drain-Source Voltage | V_{DS} | 600 | V |
| Gate-Source Voltage | V_{GS} | ± 30 | V |
| Continuous Drain Current | I_D | $T_C=25^\circ\text{C}$ | 4 |
| | | $T_C=100^\circ\text{C}$ | 2.4 |
| Pulsed Drain Current ^C | I_{DM} | 16 | A |
| Avalanche Current ^C $L=1\text{mH}$ | I_{AR} | 4 | A |
| Repetitive avalanche energy ^C | E_{AR} | 8 | mJ |
| Single pulsed avalanche energy ^H | E_{AS} | 203 | mJ |
| MOSFET dv/dt ruggedness | | 50 | V/ns |
| Peak diode recovery dv/dt | dv/dt | 5 | V/ns |
| Power Dissipation ^B | P_D | $T_C=25^\circ\text{C}$ | 83 |
| | | Derate above 25°C | 0.7 |
| 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 | T_L | 300 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Typical | Maximum | Units |
|--|-----------------|---------|---------|--------------------|
| Maximum Junction-to-Ambient ^{A,D} | $R_{\theta JA}$ | 40 | 50 | $^\circ\text{C/W}$ |
| Maximum Case-to-sink ^A | $R_{\theta CS}$ | - | 0.5 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case ^{D,F} | $R_{\theta JC}$ | 1.25 | 1.5 | $^\circ\text{C/W}$ |

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, T _J =25°C | 600 | | | V | |
| | | I _D =250μA, V _{GS} =0V, T _J =150°C | | 700 | | | |
| BV _{DSS} /ΔT _J | Breakdown Voltage Temperature Coefficient | I _D =250μA, V _{GS} =0V | | 0.55 | | V/°C | |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =600V, V _{GS} =0V | | | 1 | μA | |
| | | V _{DS} =480V, T _J =125°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 | 3 | 4.2 | 5 | V | |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =2A | | 1.75 | 2.1 | Ω | |
| g _{FS} | Forward Transconductance | V _{DS} =40V, I _D =2A | | 3.2 | | S | |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.78 | 1 | V | |
| I _S | Maximum Body-Diode Continuous Current | | | | 4 | A | |
| I _{SM} | Maximum Body-Diode Pulsed Current ^C | | | | 16 | A | |
| DYNAMIC PARAMETERS | | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =100V, f=1MHz | | 522 | | pF | |
| C _{oss} | Output Capacitance | | | | 22 | | pF |
| C _{o(er)} | Effective output capacitance, energy related ^I | V _{GS} =0V, V _{DS} =0 to 480V, f=1MHz | | 20 | | pF | |
| C _{o(tr)} | Effective output capacitance, time related ^J | | | | 32 | | pF |
| C _{rss} | Reverse Transfer Capacitance | V _{GS} =0V, V _{DS} =100V, f=1MHz | | 2 | | pF | |
| R _g | Gate resistance | f=1MHz | | 2.9 | | Ω | |
| SWITCHING PARAMETERS | | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =10V, V _{DS} =480V, I _D =4A | | 8.3 | 15 | nC | |
| Q _{gs} | Gate Source Charge | | | | 3.4 | | nC |
| Q _{gd} | Gate Drain Charge | | | | 1.9 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =300V, I _D =4A, R _G =25Ω | | 21 | | ns | |
| t _r | Turn-On Rise Time | | | | 19 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | | 25 | | ns |
| t _f | Turn-Off Fall Time | | | | 11 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =4A, dI/dt=100A/μs, V _{DS} =100V | | 309 | | ns | |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =4A, dI/dt=100A/μs, V _{DS} =100V | | 2.7 | | μC | |

A. The value of R_{qJA} 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 in a TO252 package, 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.

D. The R_{qJA} is the sum of the thermal impedance from junction to case R_{qJC} 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.

G. These tests are performed with the device mounted on a 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.

H. L=60mH, I_{AS}=2.6A, V_{DD}=150V, R_G=10Ω, Starting T_J=25°C.

I. 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}.

J. 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}.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

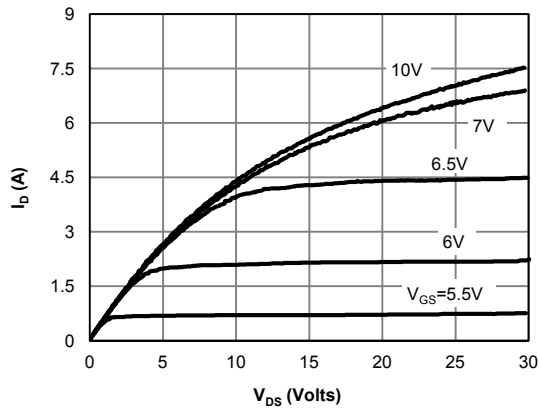


Figure 1: On-Region Characteristics

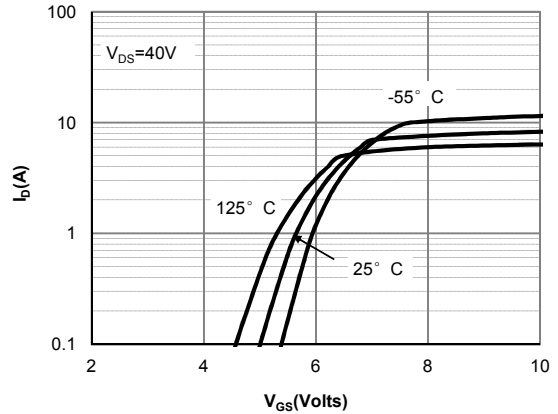


Figure 2: Transfer Characteristics

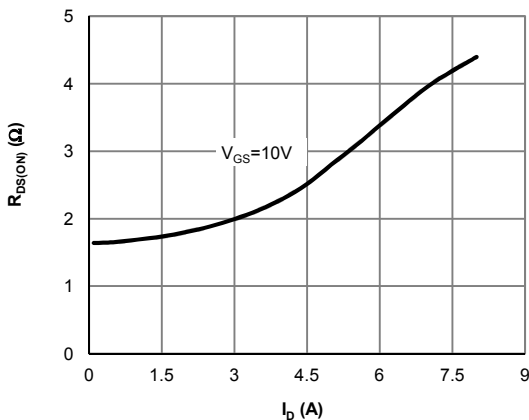


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

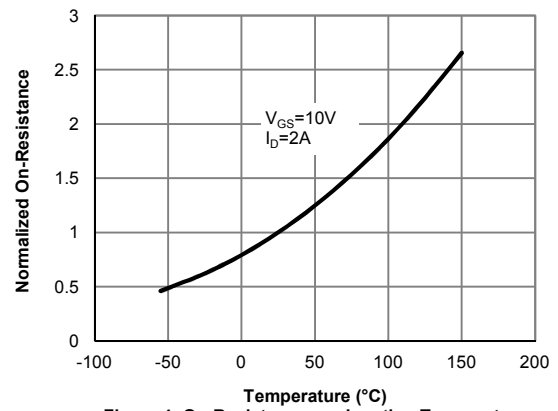


Figure 4: On-Resistance vs. Junction Temperature

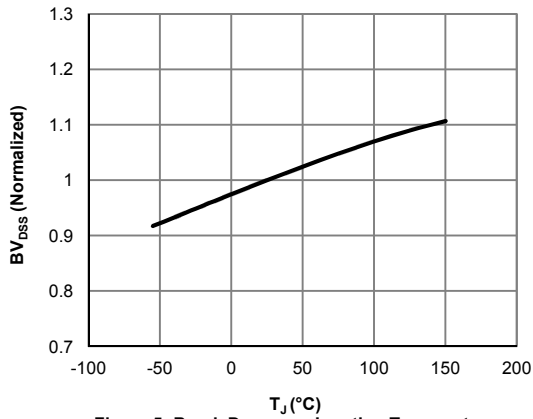


Figure 5: Break Down vs. Junction Temperature

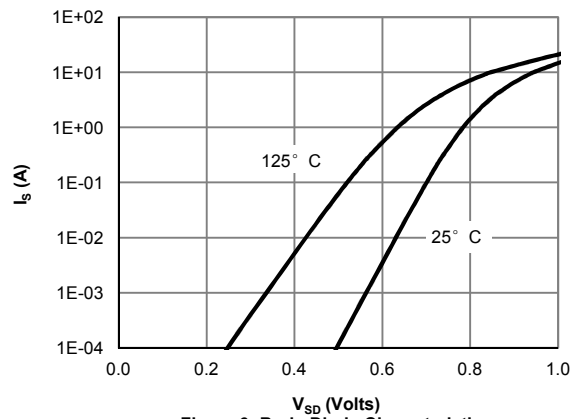


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

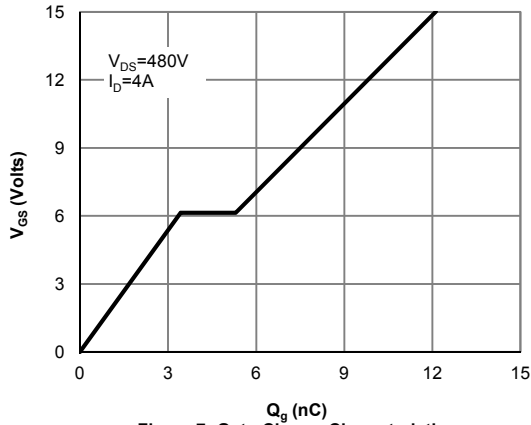


Figure 7: Gate-Charge Characteristics

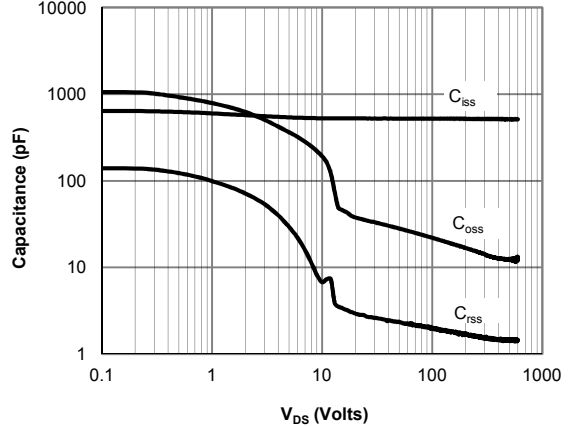


Figure 8: Capacitance Characteristics

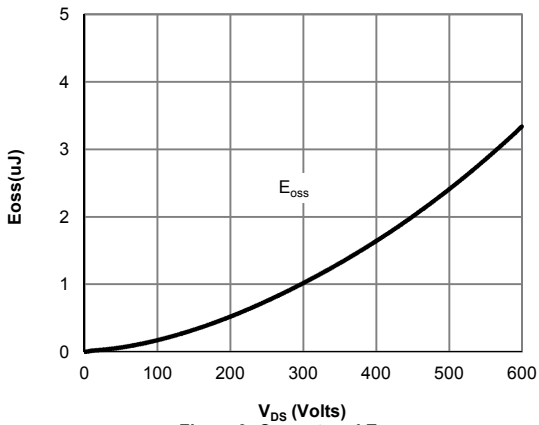


Figure 9: C_{oss} stored Energy

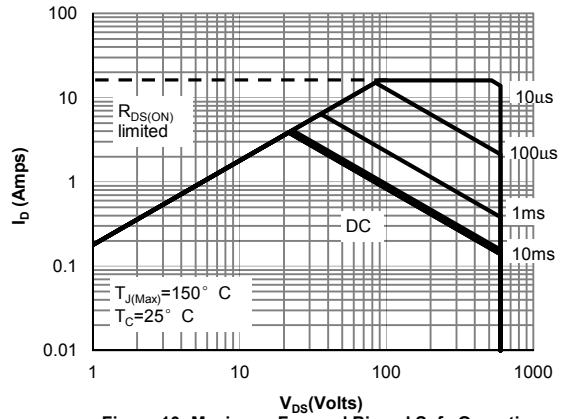


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

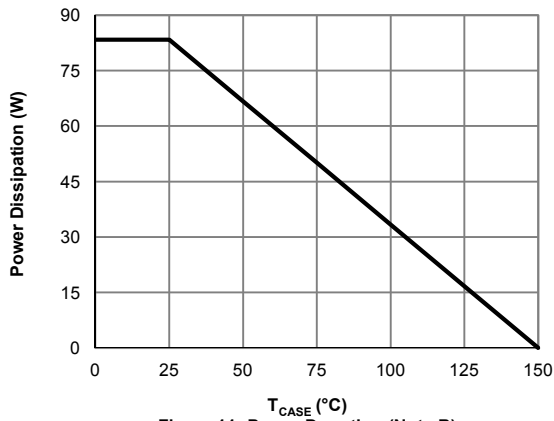


Figure 11: Power De-rating (Note B)

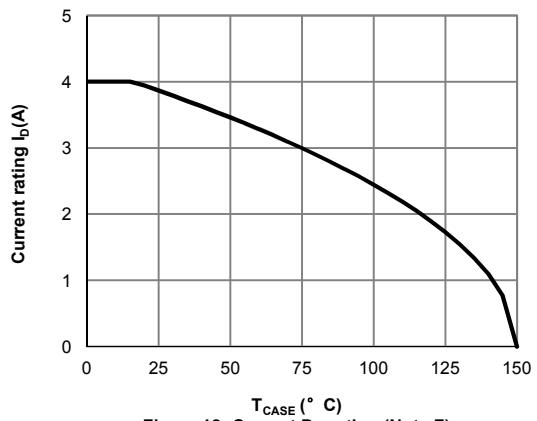


Figure 12: Current De-rating (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

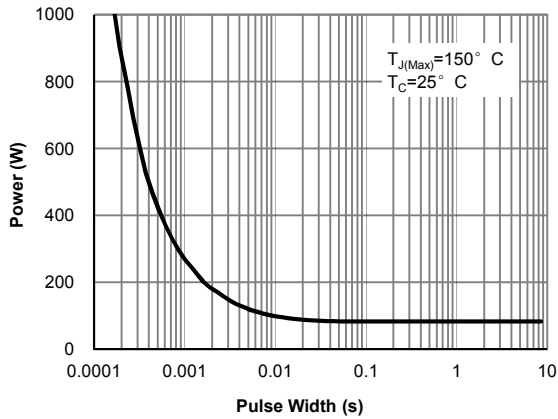


Figure 13: Single Pulse Power Rating Junction-to-Case (Note F)

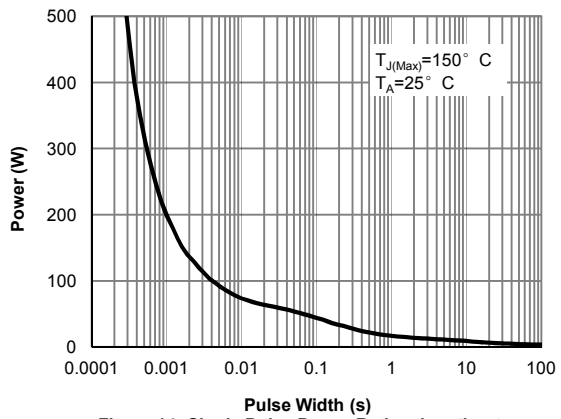


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

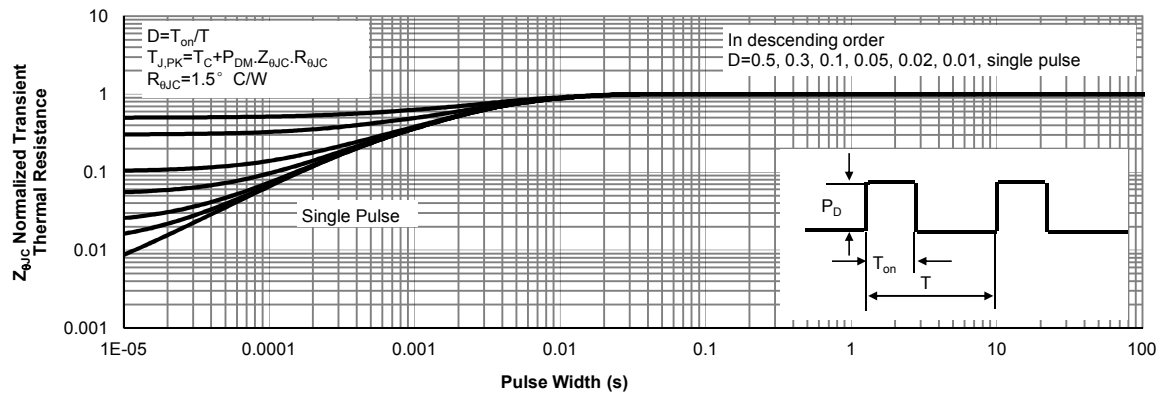


Figure 15: Normalized Maximum Transient Thermal Impedance (Note F)

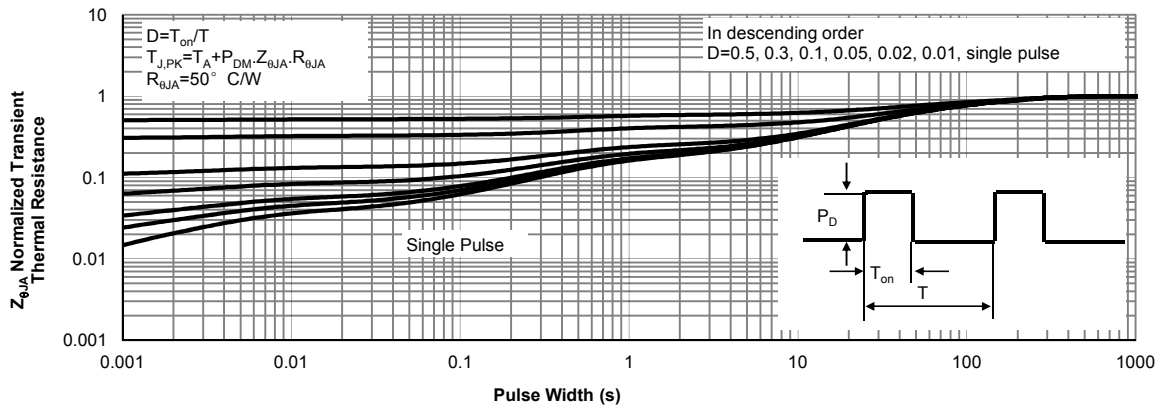
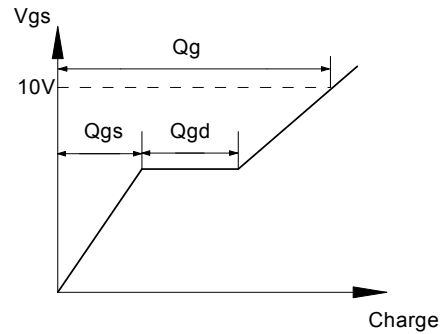
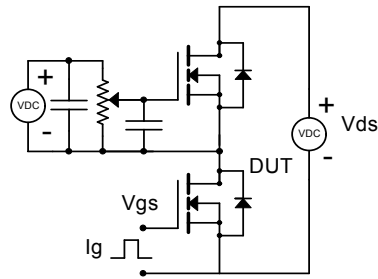
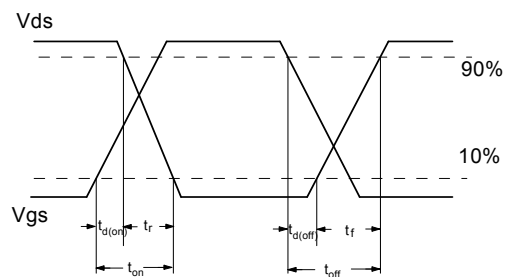
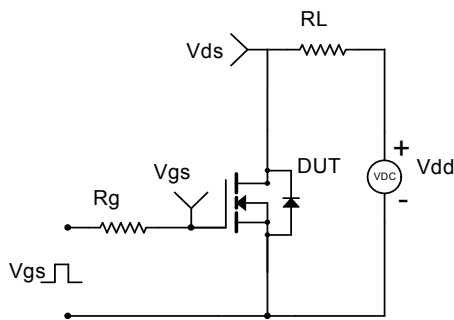


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

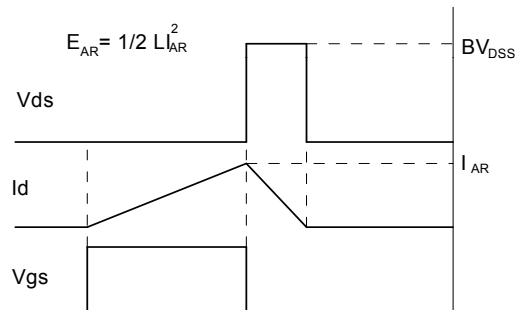
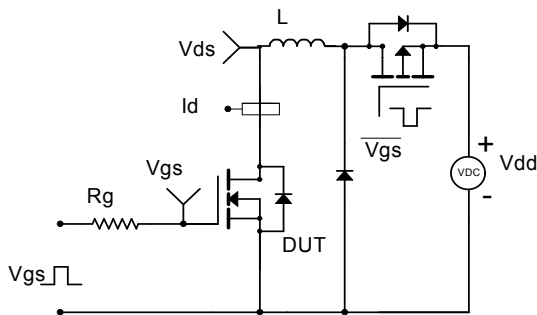
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

