# AOT474/AOTF474

## N-Channel Enhancement Mode Field Effect Transistor

### General Description

The AOT(F)474/L uses a robust technology that is designed to provide efficient and reliable power conversion even in the most demanding applications, including motor control. With low $R_{DS(ON)}$ and excellent thermal capability this device is appropriate for high current switching and can endure adverse operating conditions.

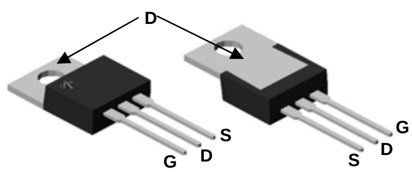
AOT(F)474/AOT(F)474L are electrically Identical

AOT(F)474 -RoHS Compliant
AOT(F)474L -Halogen Free

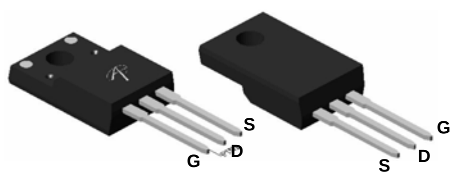
### Product Summary

| | |
|---|---|
| $V_{DS}$ | 75V |
| $I_D$_TO220 (at $V_{GS}$=10V) | 127A |
| $I_D$_TO220FL (at $V_{GS}$=10V) | 47A |
| $R_{DS(ON)}$ (at $V_{GS}$=10V) | < 11.3mΩ |

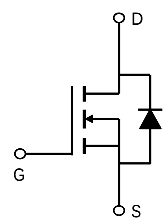
100% UIS Tested



AOT474



AOTF474




| Absolute Maximum Ratings $T_A$=25°C unless otherwise noted | | | | | |
|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **AOT474** | **AOTF474** | **Units** |
| Drain-Source Voltage | | $V_{DS}$ | **75** | | V |
| Gate-Source Voltage | | $V_{GS}$ | **±25** | | V |
| Continuous Drain Current | $T_C$=25°C | $I_D$ | **127** | **47** | A |
| | $T_C$=100°C | | **89** | **33** | |
| Pulsed Drain Current [C] | | $I_{DM}$ | **200** | | |
| Continuous Drain Current | $T_A$=25°C | $I_{DSM}$ | **9** | **9** | A |
| | $T_A$=70°C | | **7** | **7** | |
| Avalanche Current [C] | | $I_{AR}$ | **106** | | A |
| Repetitive avalanche energy L=0.1mH [C] | | $E_{AR}$ | **562** | | mJ |
| Power Dissipation [B] | $T_C$=25°C | $P_D$ | **417** | **57.5** | W |
| | $T_C$=100°C | | **208** | **29** | |
| Power Dissipation [A] | $T_A$=25°C | $P_{DSM}$ | **1.9** | **1.9** | W |
| | $T_A$=70°C | | **1.2** | **1.2** | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | **-55 to 175** | | °C |

| Thermal Characteristics | | | | | |
|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **AOT474** | **AOTF474** | **Units** |
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 13.9 | 13.9 | °C/W |
| Maximum Junction-to-Ambient [A D] | Steady-State | | 65 | 65 | °C/W |
| Maximum Junction-to-Case | Steady-State | $R_{\theta JC}$ | 0.36 | 2.6 | °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 | 75 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=75V, $V_{GS}$=0V | | | 1 | µA |
| | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$= ±25V | | | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ $I_D$=250µA | 2.6 | 3.4 | 4 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=10V, $V_{DS}$=5V | 200 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=30A | | 9.4 | 11.3 | mΩ |
| | | $T_J$=125°C | | 18 | 21.5 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=30A | | 67 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A,$V_{GS}$=0V | | 0.73 | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | 128 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=30V, f=1MHz | 2240 | 2805 | 3370 | pF |
| $C_{oss}$ | Output Capacitance | | 355 | 507 | 660 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | 22 | 36 | 50 | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | 1.4 | 2.8 | 4.2 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=30V, $I_D$=30A | 39 | 49.6 | 60 | nC |
| $Q_{gs}$ | Gate Source Charge | | 11 | 13.8 | 17 | nC |
| $Q_{gd}$ | Gate Drain Charge | | 8 | 14 | 20 | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=30V, $R_L$=1Ω, $R_{GEN}$=3Ω | | 15 | | ns |
| $t_r$ | Turn-On Rise Time | | | 34 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 42 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 4.5 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=30A, dI/dt=500A/µs | 35 | 50 | 65 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=30A, dI/dt=500A/µs | 330 | 472 | 614 | nC |

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in$^2$ 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 $_{\theta JA}$ 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ 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 impedence 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. These tests are performed with the device mounted on 1 in$^2$ 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

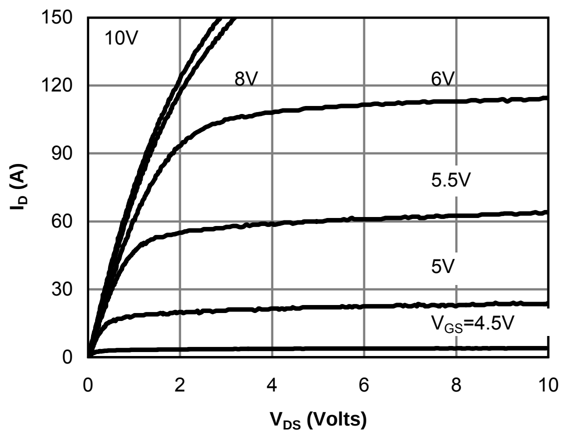


Fig 1: On-Region Characteristics (Note E)

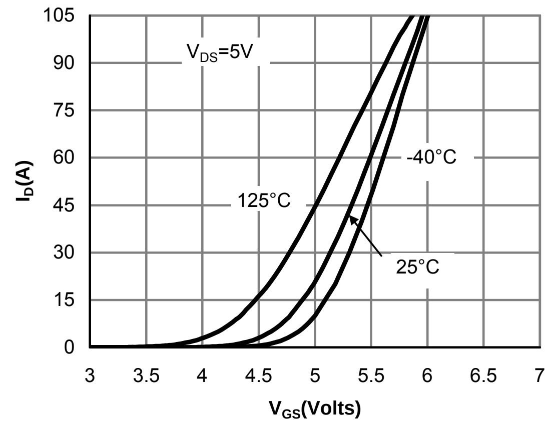


Figure 2: Transfer Characteristics (Note E)

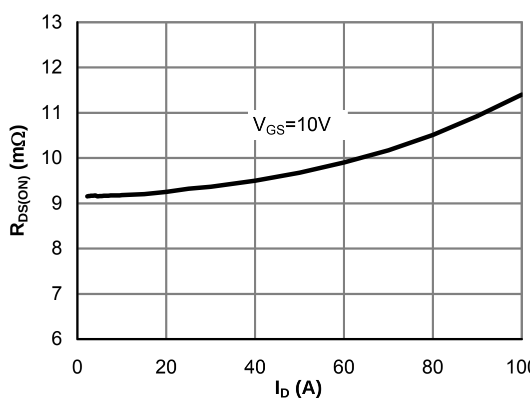


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

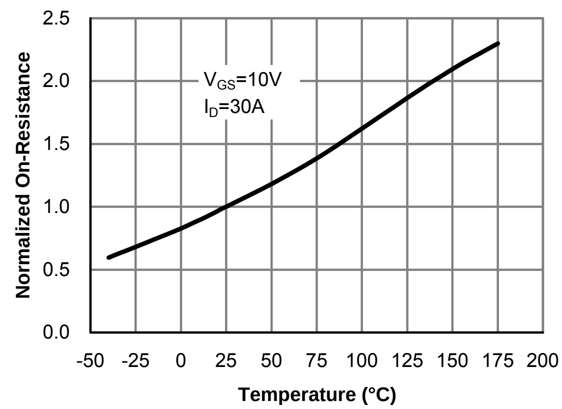


Figure 4: On-Resistance vs. Junction Temperature (Note E)

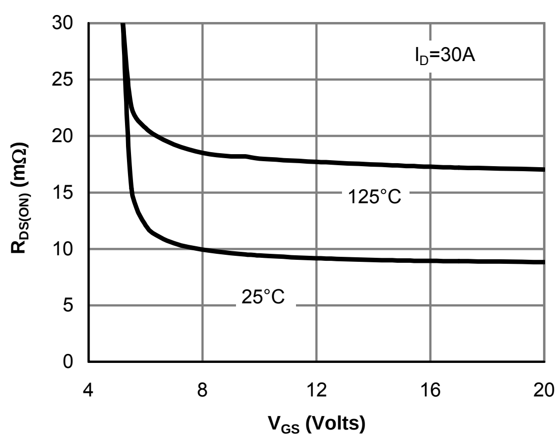


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

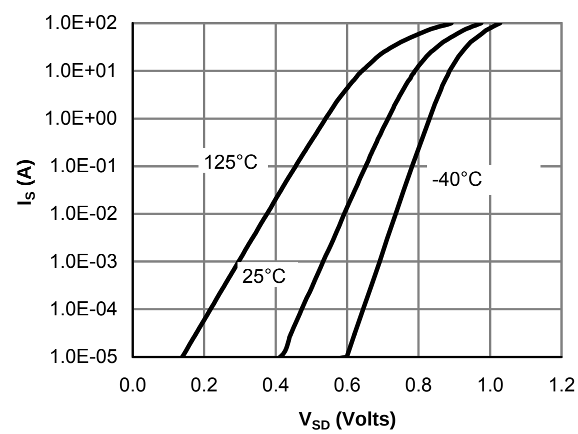


Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

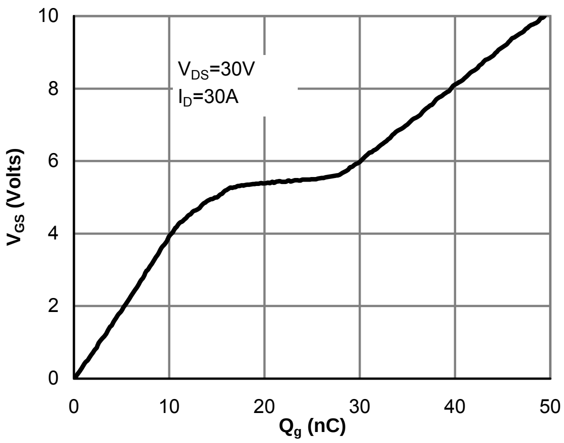


**Figure 7: Gate-Charge Characteristics**

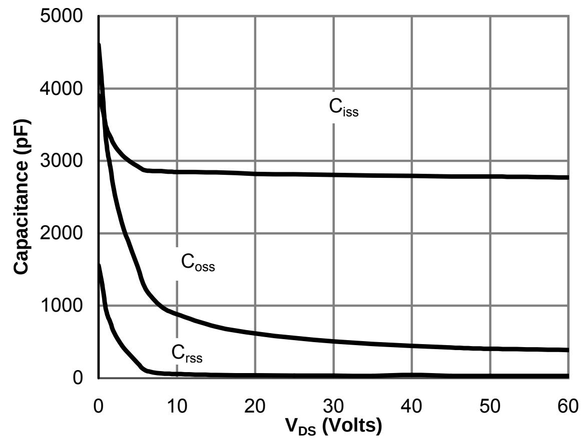


**Figure 8: Capacitance Characteristics**

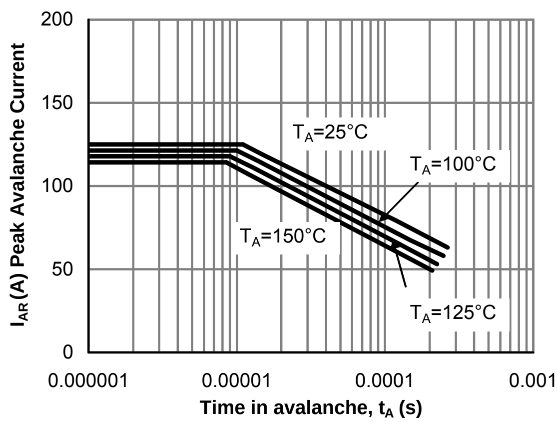


**Figure 9: Single Pulse Avalanche capability (Note C)**

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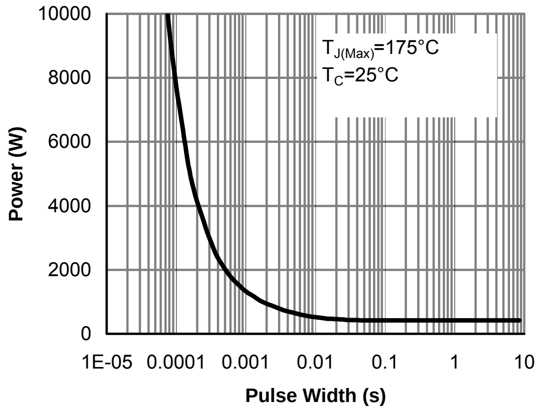



Figure 10: Single Pulse Power Rating Junction-to-Case for AOT474 (Note F)

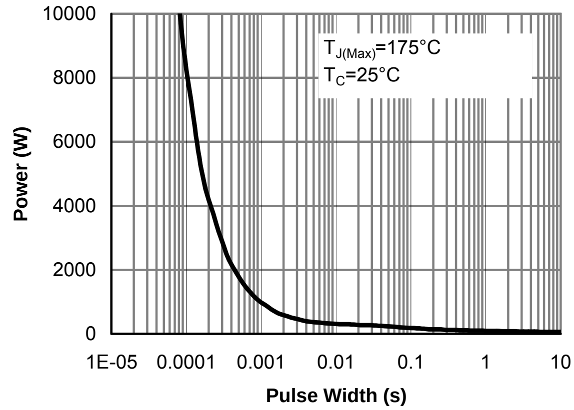



Figure 11: Single Pulse Power Rating Junction-to-Case for AOTF474 (Note F)

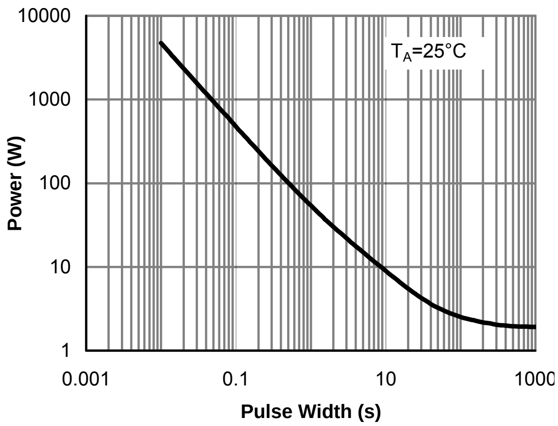



Figure 12: Single Pulse Power Rating Junction-to-Ambient for AOT474 (NoteG)

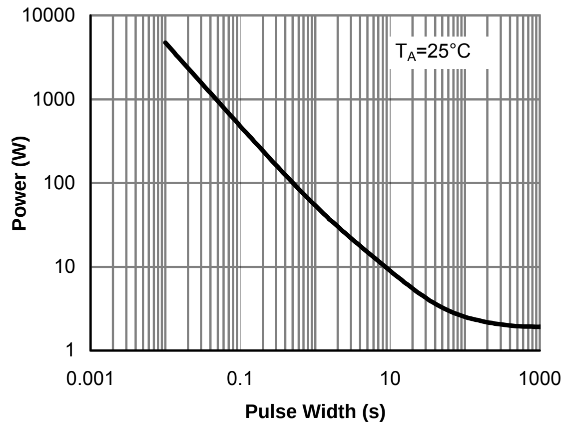



Figure 13: Single Pulse Power Rating Junction-to-Ambient for AOTF474 (Note G)

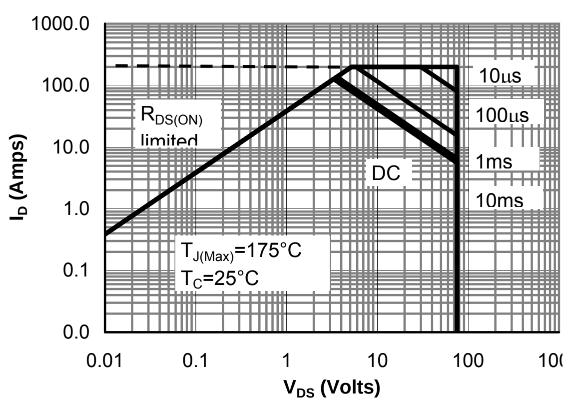



Figure 14: Maximum Forward Biased Safe Operating Area for AOT474 (Note F)

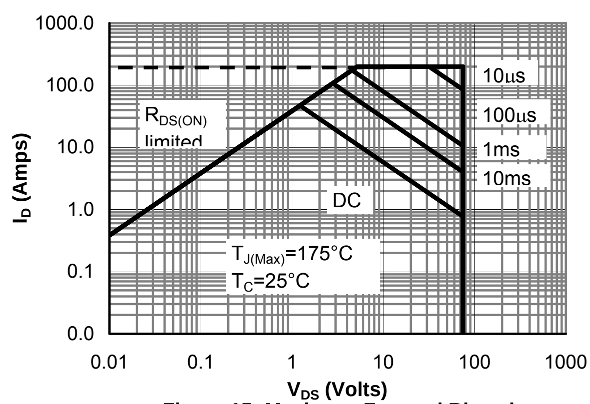



Figure 15: Maximum Forward Biased Safe Operating Area for AOTF474 (Note F)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

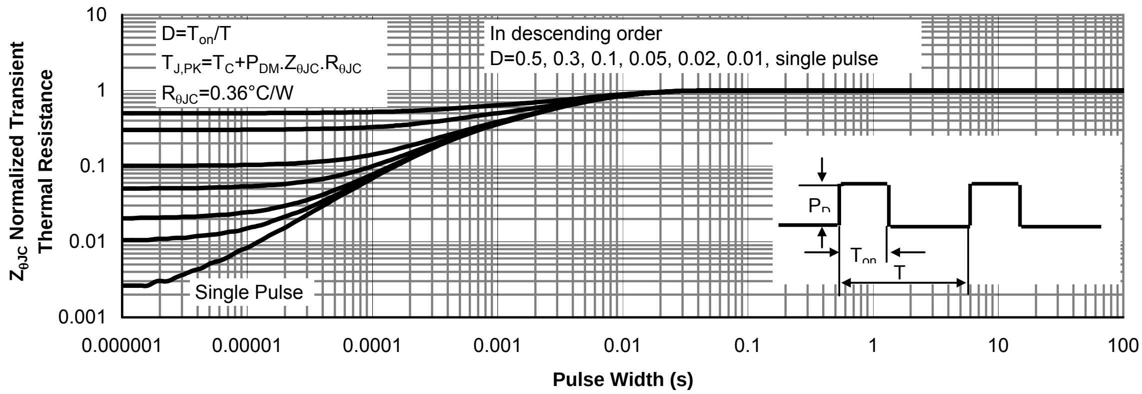



**Figure 16: Normalized Maximum Transient Thermal Impedance for AOT474 (Note F)**

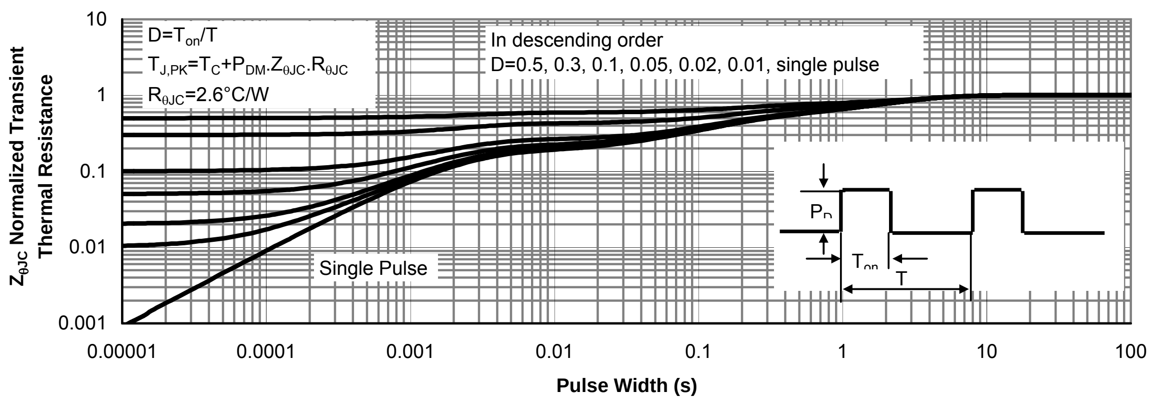
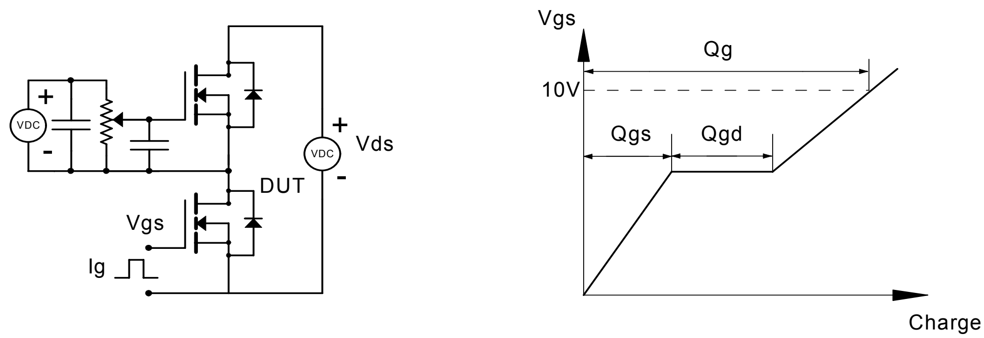
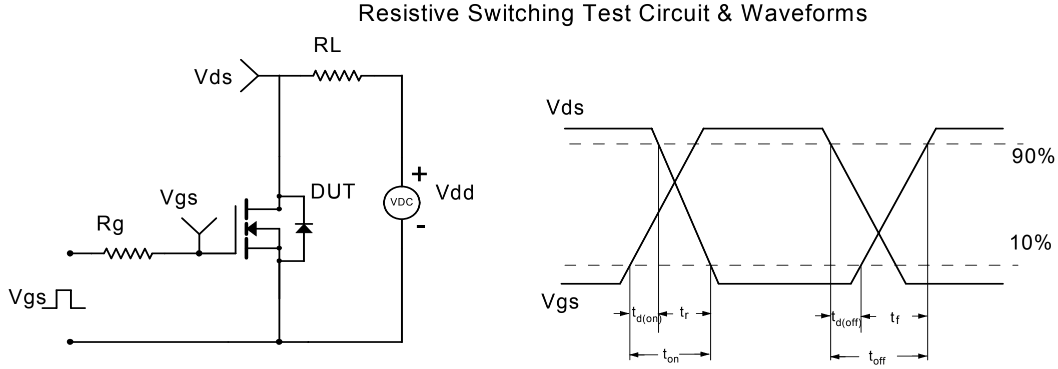



**Figure 17: Normalized Maximum Transient Thermal Impedance for AOTF474 (Note F)**

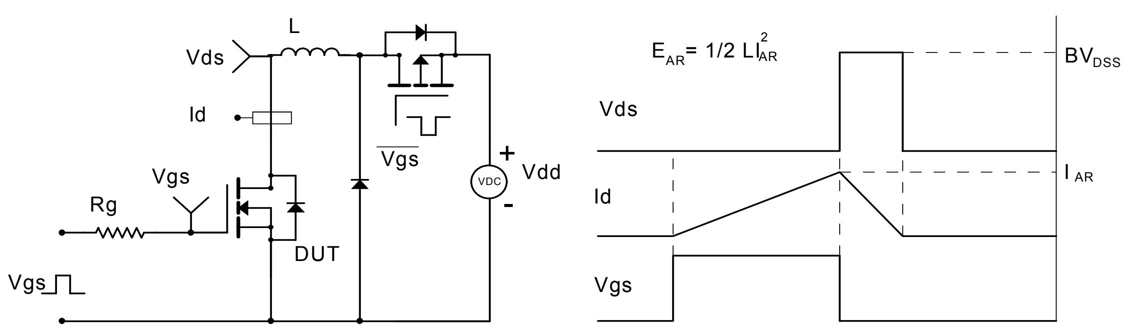
## Gate Charge Test Circuit & Waveform




## Resistive Switching Test Circuit & Waveforms




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




## Diode Recovery Test Circuit & Waveforms