AOT474/AOTF474

75V N-Channel MOSFET

ALPHA & OMEGA SEMICONDUCTOR

General Description

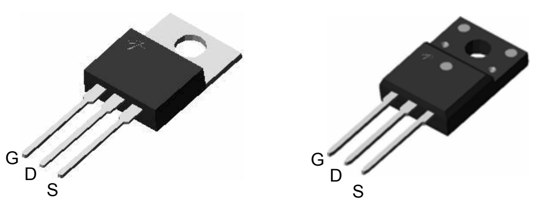
The AOT474 and AOTF474 use a robust technology that is designed to provide efficient and reliable power conversion even in the most demanding applications, including motor control. With low $R_{DS(ON)}$ and excellent thermal capability this device is appropriate for high current switching and can endure adverse operating conditions.

Product Summary

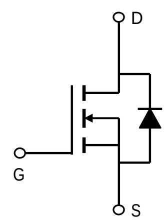
V_{DS}	75V
I_D (TO220 at V_{GS}=10V)	127A
I_D (TO220FL at V_{GS}=10V)	47A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 11.3mΩ

100% UIS Tested
100% Rg Tested

TO-220 Top View TO-220FL



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}	±20		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}	240		
Continuous Drain Current	T_A=25°C	I_{DSM}	9	9	A
	T_A=70°C		7	7	
Avalanche Current [C]		I_{AS},I_{AR}	106		A
Avalanche energy L=0.1mH [C]		E_{AS},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}= ±20V			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	240			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

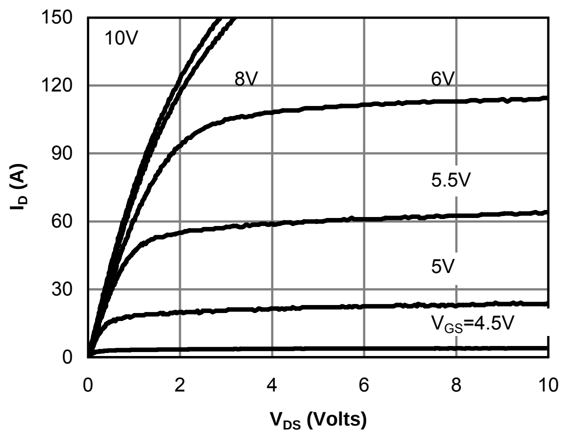


Fig 1: On-Region Characteristics (Note E)

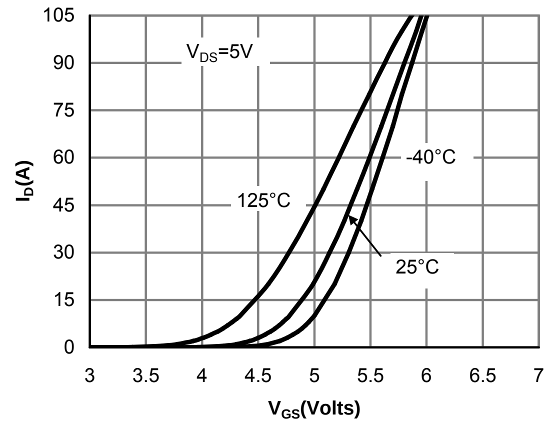


Figure 2: Transfer Characteristics (Note E)

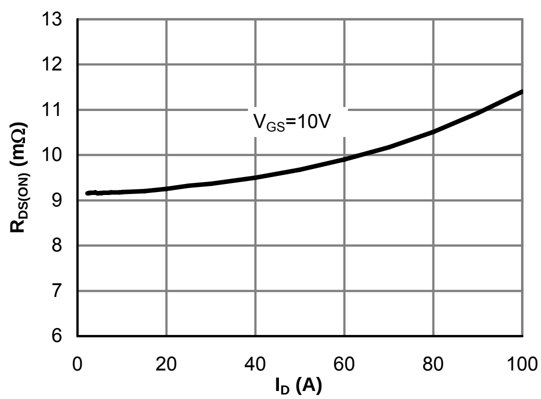


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

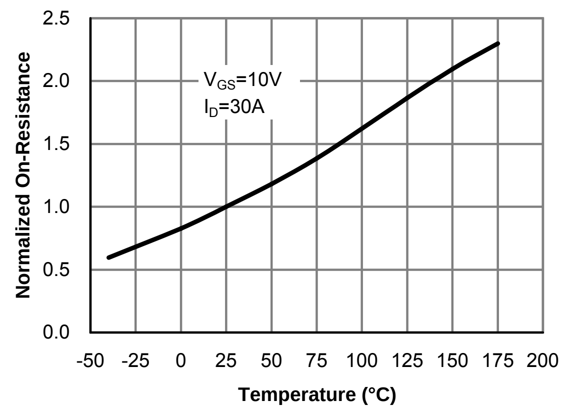


Figure 4: On-Resistance vs. Junction Temperature (Note E)

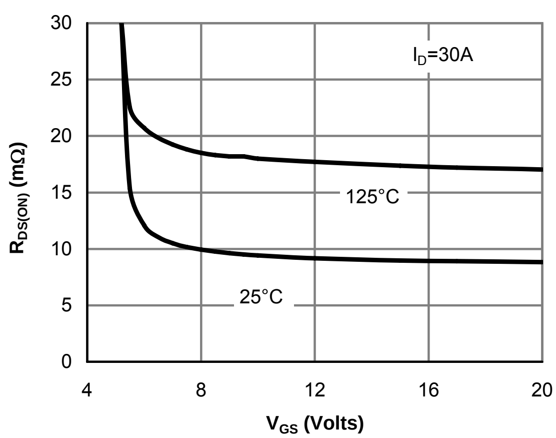


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

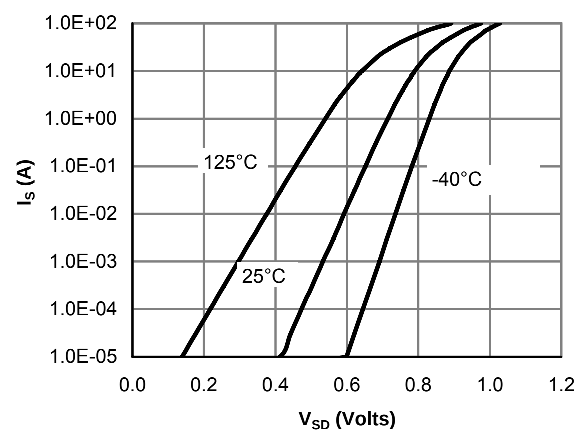


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

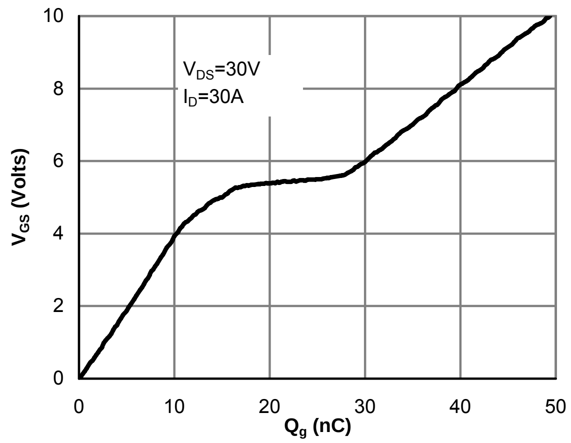


Figure 7: Gate-Charge Characteristics

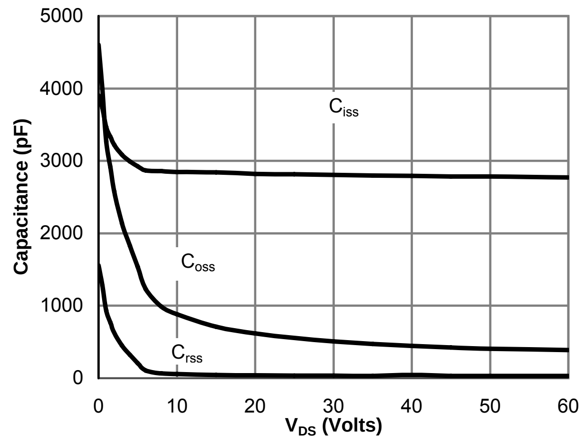


Figure 8: Capacitance Characteristics

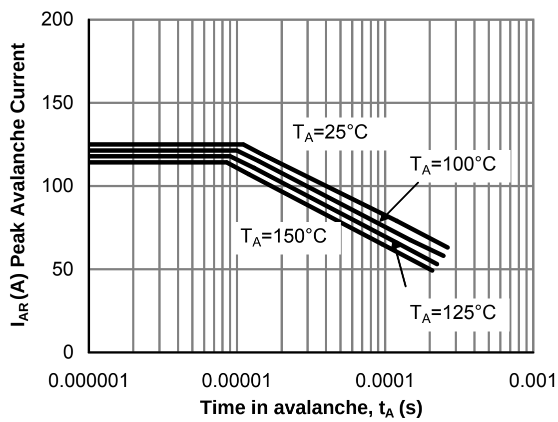


Figure 9: Single Pulse Avalanche capability (Note C)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

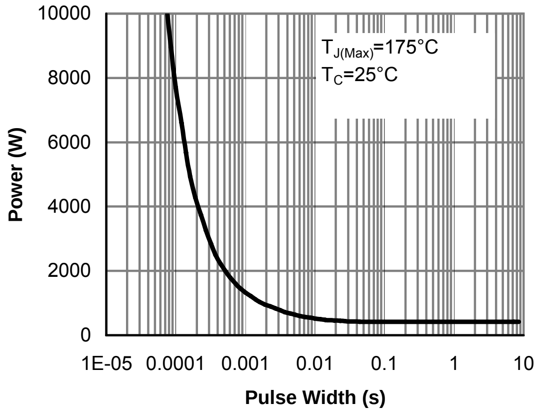


Figure 10: Single Pulse Power Rating Junction-to-Case for AOT474 (Note F)

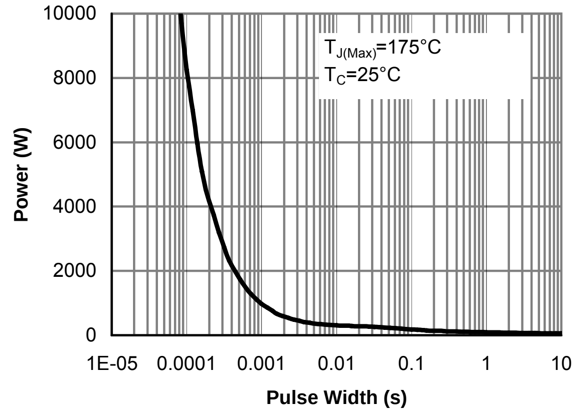


Figure 11: Single Pulse Power Rating Junction-to-Case for AOTF474 (Note F)

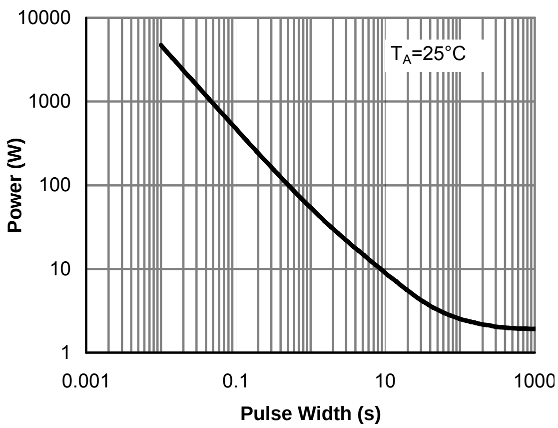


Figure 12: Single Pulse Power Rating Junction-to-Ambient for AOT474 (NoteG)

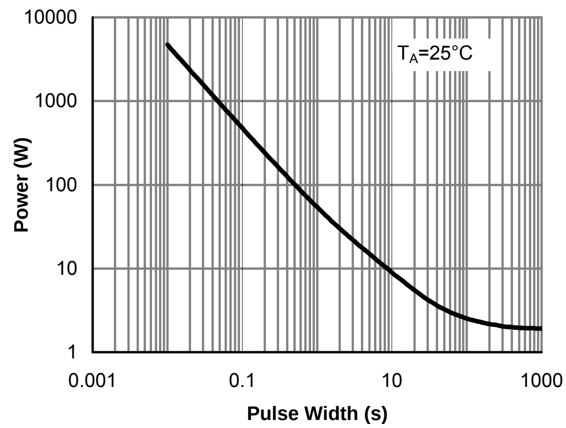


Figure 13: Single Pulse Power Rating Junction-to-Ambient for AOTF474 (Note G)

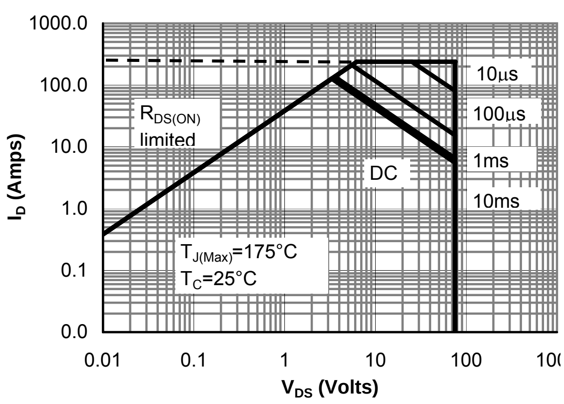


Figure 14: Maximum Forward Biased Safe Operating Area for AOT474 (Note F)

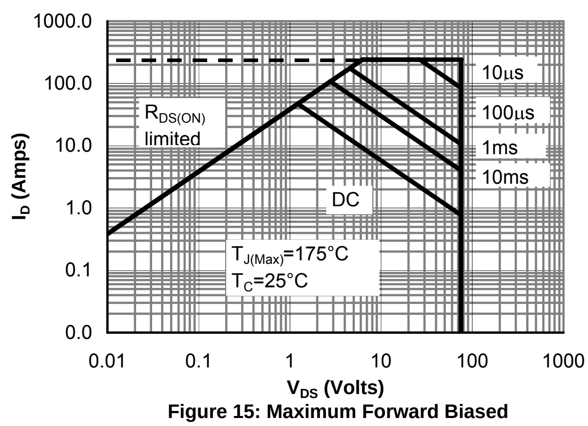


Figure 15: Maximum Forward Biased Safe Operating Area for AOTF474 (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

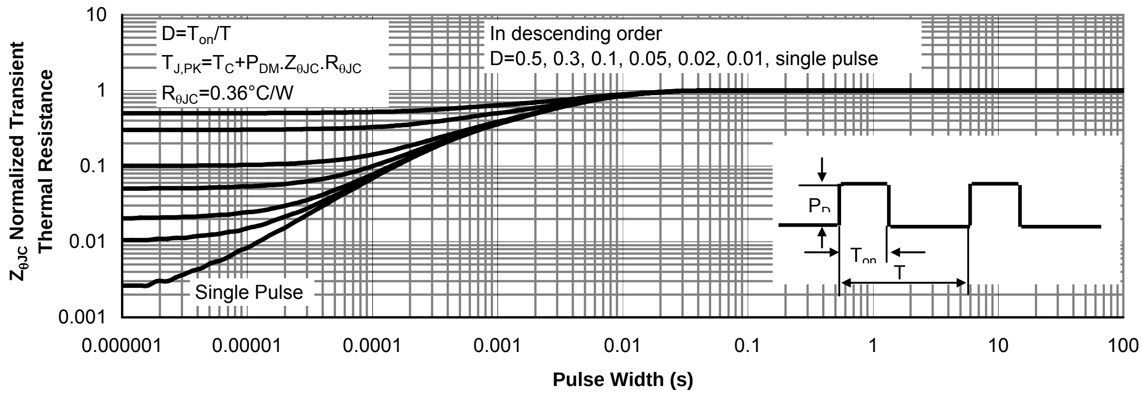


Figure 16: Normalized Maximum Transient Thermal Impedance for AOT474 (Note F)

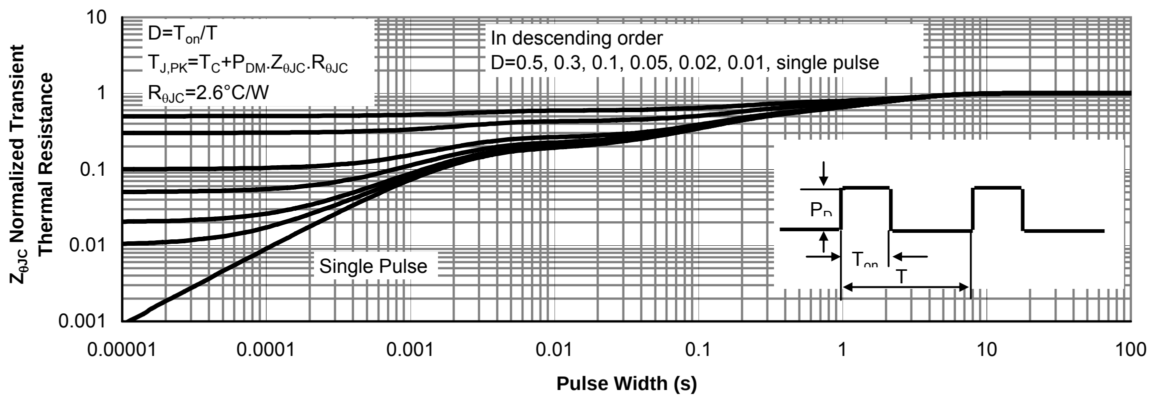
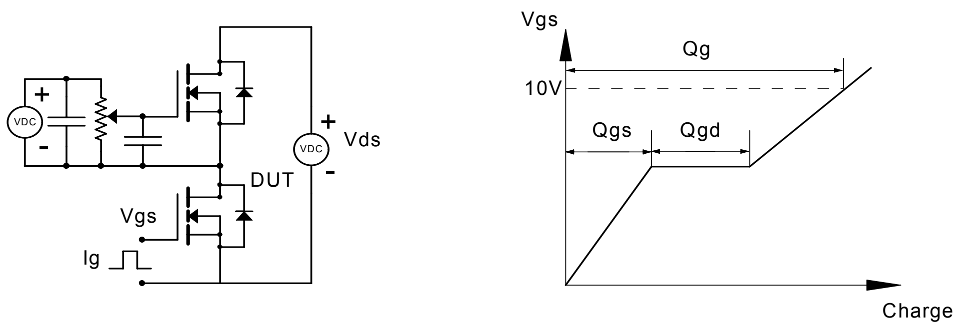
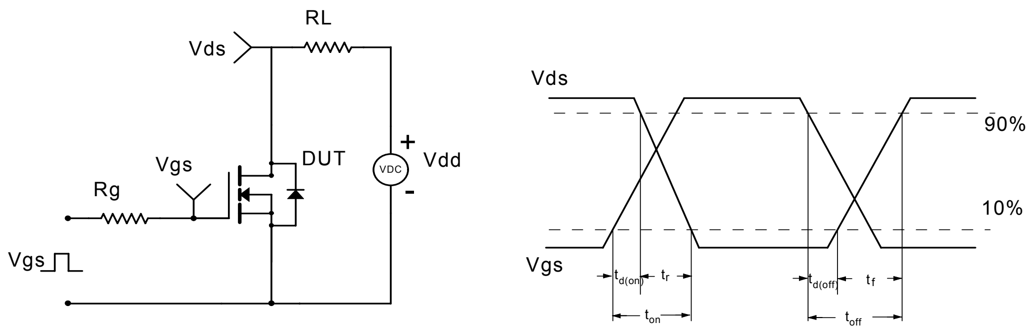


Figure 17: Normalized Maximum Transient Thermal Impedance for AOTF474 (Note F)

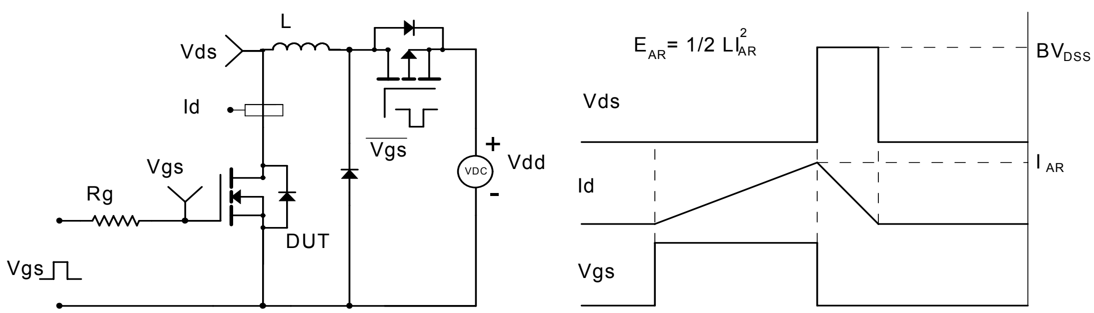
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms