



# THE DATASHEET OF AOT9N70



### General Description

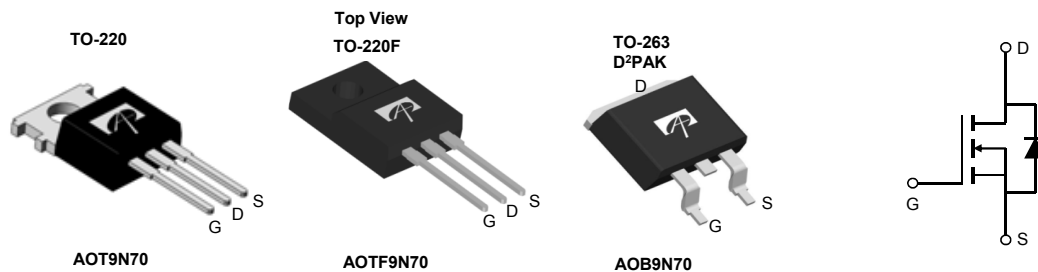
The AOT9N70 & AOTF9N70 & AOB9N70 have been fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications.

By providing low  $R_{DS(ON)}$ ,  $C_{iss}$  and  $C_{rss}$  along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.

### Product Summary

$V_{DS}$	800V@150°C
$I_D$ (at $V_{GS}=10V$ )	9A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 1.2Ω

100% UIS Tested  
 100%  $R_g$  Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOT9N70	TO-220 Pb Free	Tube	1000
AOTF9N70	TO-220F Pb Free	Tube	1000
AOTF9N70L	TO-220F Green	Tube	1000
AOB9N70L	TO-263 Green	Tape & Reel	800

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

Parameter	Symbol	AOT(B)9N70	AOTF9N70	AOTF9N70L	Units	
Drain-Source Voltage	$V_{DS}$	700			V	
Gate-Source Voltage	$V_{GS}$	±30			V	
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	9	9*	A	
		$T_C=100^\circ\text{C}$	5.8	5.8*		
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	33			A	
Avalanche Current <sup>C</sup>	$I_{AR}$	3.2			A	
Repetitive avalanche energy <sup>C</sup>	$E_{AR}$	77			mJ	
Single pulsed avalanche energy <sup>G</sup>	$E_{AS}$	154			mJ	
Peak diode recovery dv/dt	dv/dt	5			V/ns	
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	236	50	27.8	W
		Derate above 25°C	1.8	0.4	0.22	W/°C
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150			°C	
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	$T_L$	300			°C	

### Thermal Characteristics

Parameter	Symbol	AOT(B)9N70	AOTF9N70	AOTF9N70L	Units
Maximum Junction-to-Ambient <sup>A,D</sup>	$R_{\theta JA}$	65	65	65	°C/W
Maximum Case-to-sink <sup>A</sup>	$R_{\theta CS}$	0.5	--	--	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.53	2.5	4.5	°C/W

\* Drain current limited by maximum junction temperature.

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	700			V
		I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C		800		
BV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V		0.84		V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =700V, V <sub>GS</sub> =0V			1	μA
		V <sub>DS</sub> =560V, T <sub>J</sub> =125°C			10	
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =5V, I <sub>D</sub> =250μA	3	3.9	4.5	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A		0.94	1.2	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =40V, I <sub>D</sub> =4.5A		10		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.74	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				9	A
I <sub>SM</sub>	Maximum Body-Diode Pulsed Current				33	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz	1085	1357	1630	pF
C <sub>oss</sub>	Output Capacitance		90	113	147	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		6	7.4	11	pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	2	4	6	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =560V, I <sub>D</sub> =9A	23	28.5	35	nC
Q <sub>gs</sub>	Gate Source Charge		5.5	6.8	8.2	nC
Q <sub>gd</sub>	Gate Drain Charge		9.3	11.6	18	nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =350V, I <sub>D</sub> =9A, R <sub>G</sub> =25Ω		35		ns
t <sub>r</sub>	Turn-On Rise Time			61		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			76		ns
t <sub>f</sub>	Turn-Off Fall Time			48		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =9A, di/dt=100A/μs, V <sub>DS</sub> =100V	300	375	450	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =9A, di/dt=100A/μs, V <sub>DS</sub> =100V	6	7.5	9	μC

A. The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25° C.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=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<sub>J(MAX)</sub>=150° C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25° C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.

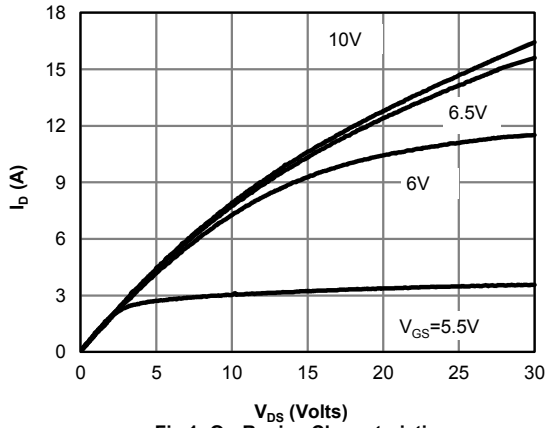
E. The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

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<sub>J(MAX)</sub>=150° C. The SOA curve provides a single pulse rating.

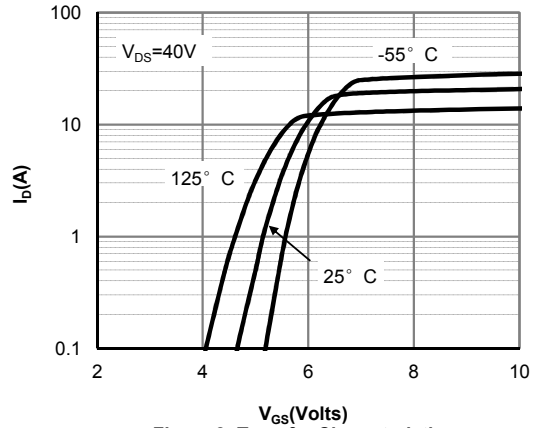
G. L=30mH, I<sub>AS</sub>=3.2A, V<sub>DD</sub>=150V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25° C

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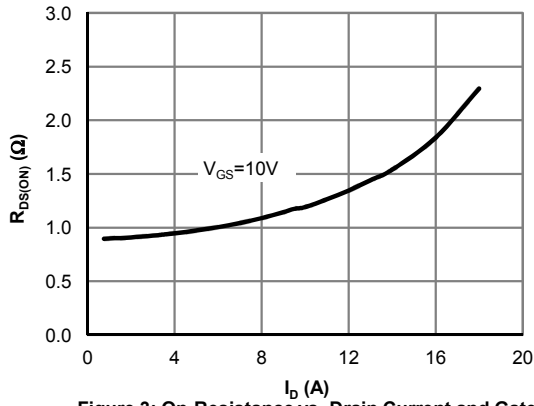
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



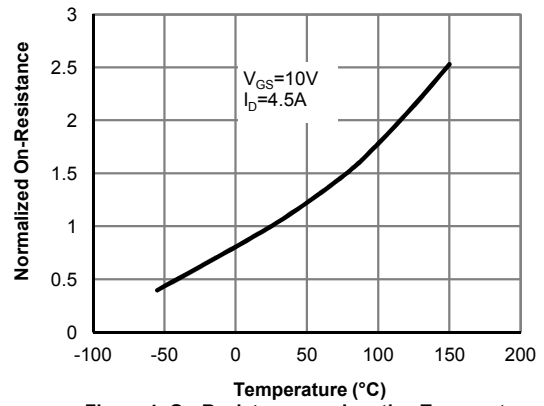
**Fig 1: On-Region Characteristics**



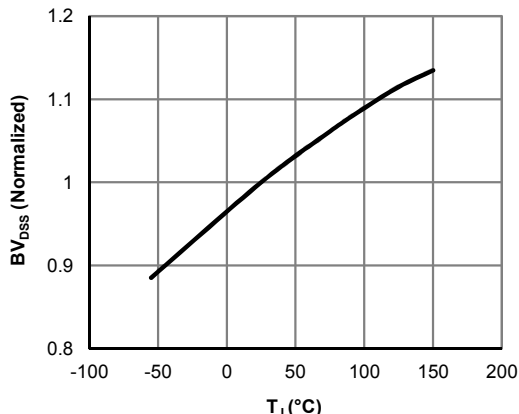
**Figure 2: Transfer Characteristics**



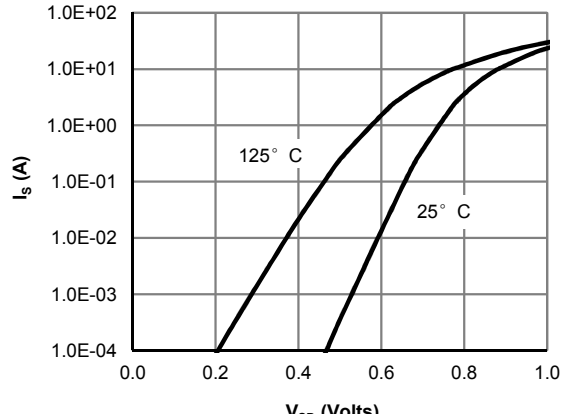
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**

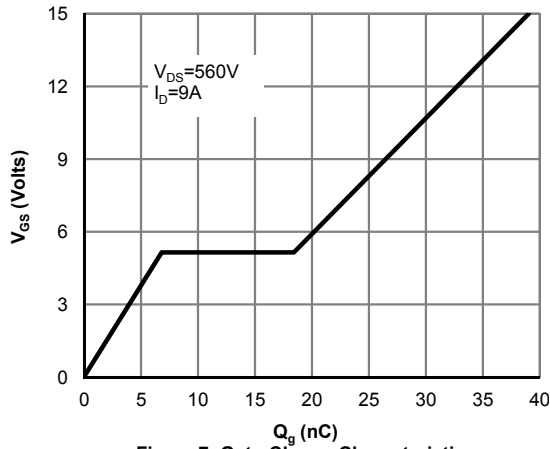


**Figure 5: Break Down vs. Junction Temperature**

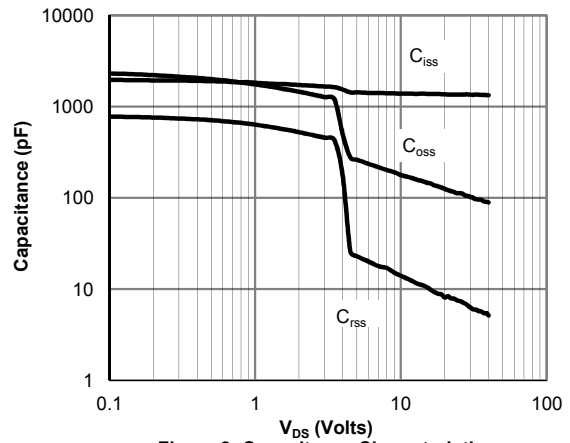


**Figure 6: Body-Diode Characteristics (Note E)**

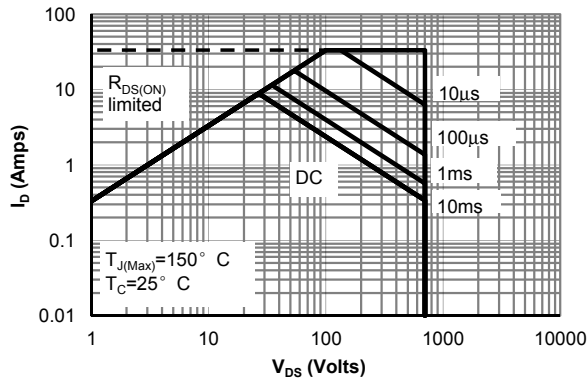
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



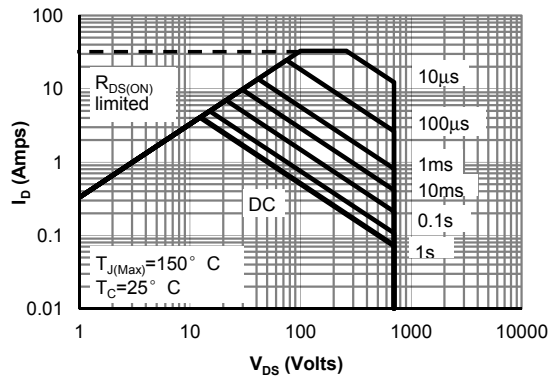
**Figure 7: Gate-Charge Characteristics**



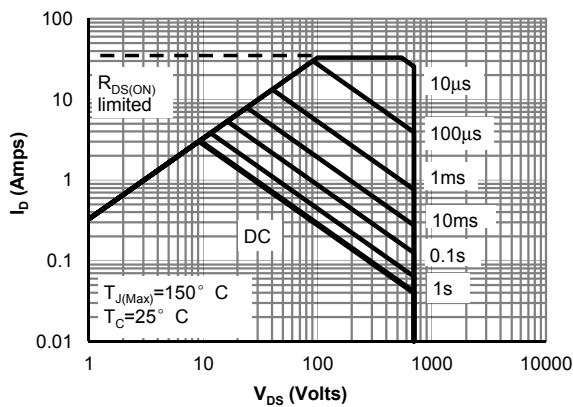
**Figure 8: Capacitance Characteristics**



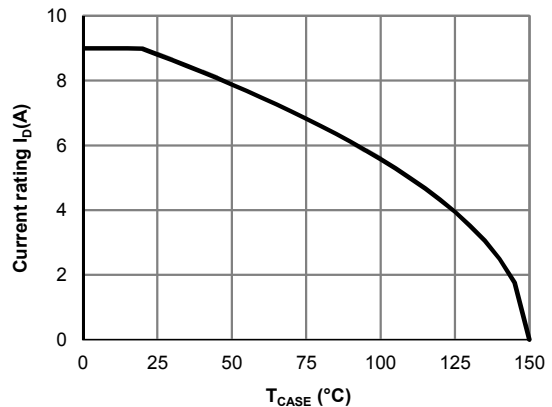
**Figure 9: Maximum Forward Biased Safe Operating Area for AOT(B)9N70 (Note F)**



**Figure 10: Maximum Forward Biased Safe Operating Area for AOTF9N70 (Note F)**

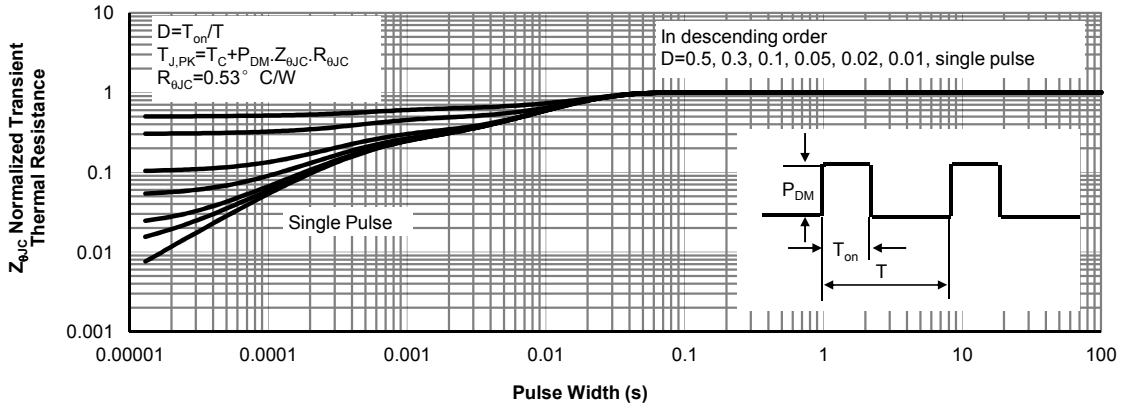


**Figure 11: Maximum Forward Biased Safe Operating Area for AOTF9N70L (Note F)**

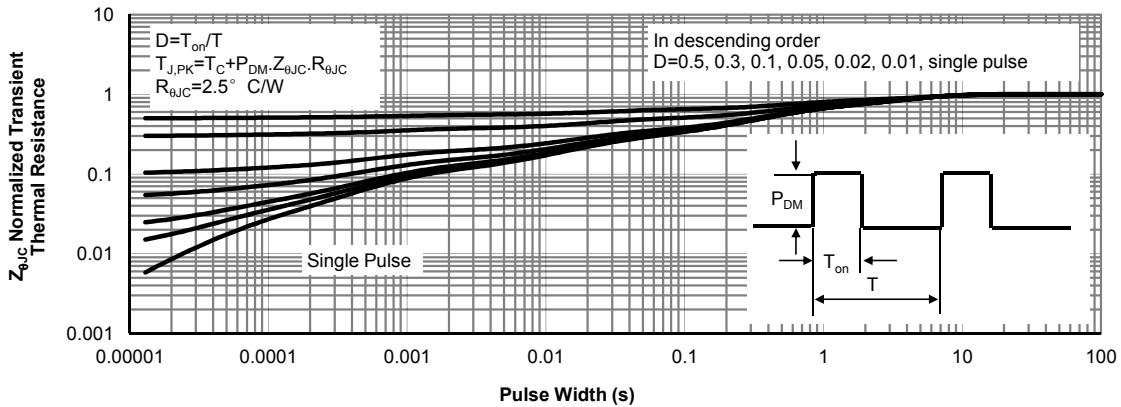


**Figure 12: Current De-rating (Note B)**

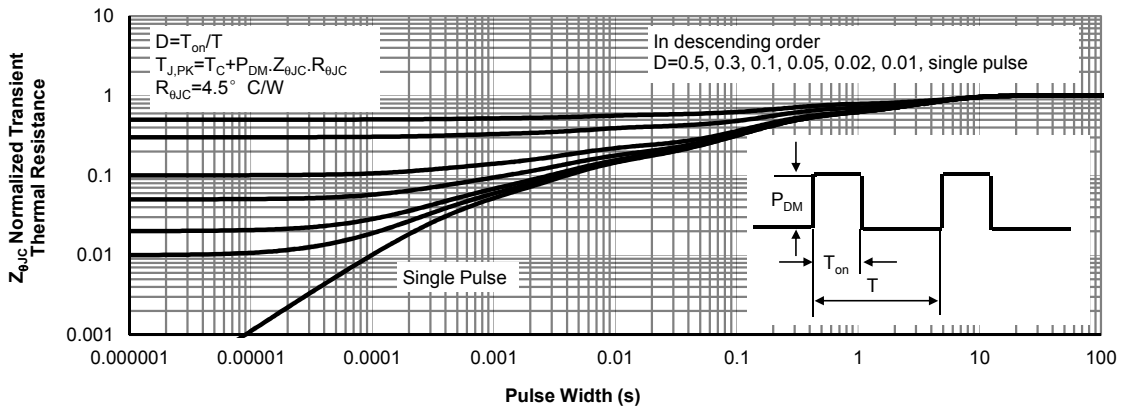
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



**Figure 13: Normalized Maximum Transient Thermal Impedance for AOT(B)9N70 (Note F)**

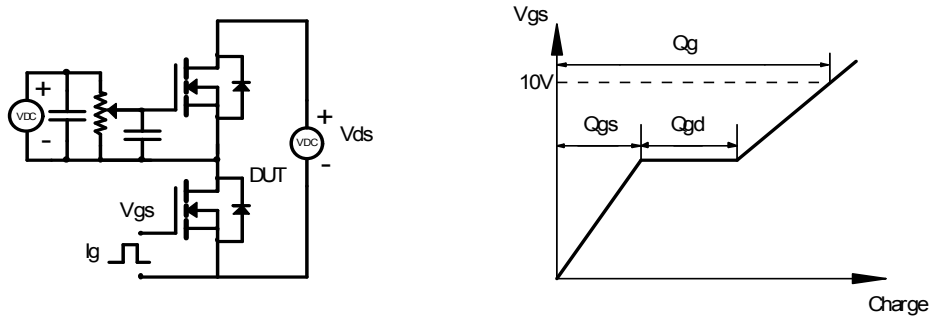


**Figure 14: Normalized Maximum Transient Thermal Impedance for AOTF9N70 (Note F)**

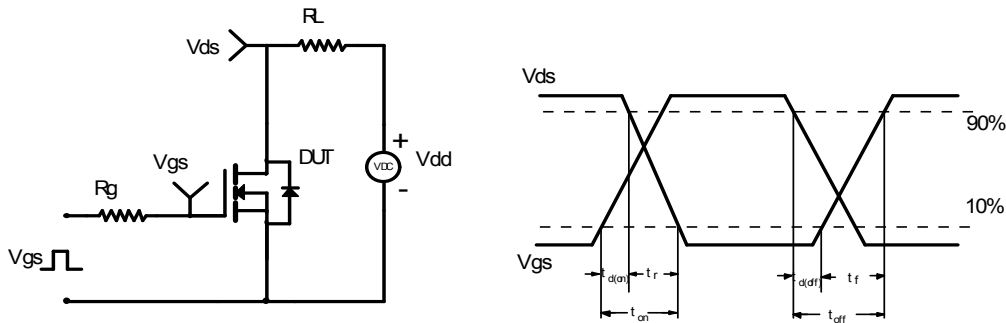


**Figure 15: Normalized Maximum Transient Thermal Impedance for AOTF9N70 L (Note F)**

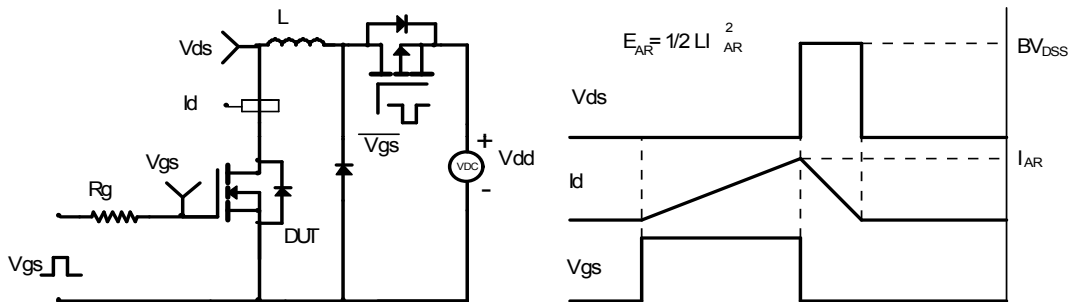
Gate Charge Test Circuit & Waveform



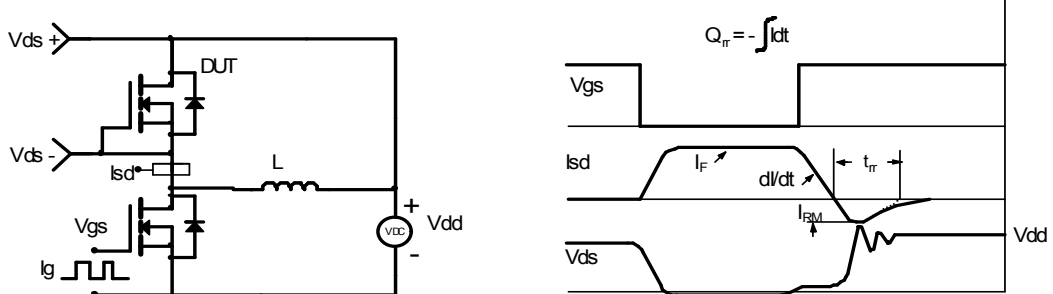
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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