FQP22N50/FQPF22N50

500V,22A N-Channel MOSFET

General Description

The FQP22N50 & FQPF22N50 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.

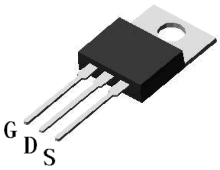
Product Summary

V_{DS}	600V@150℃
I_D (at V_{GS}=10V)	22A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 0.26Ω

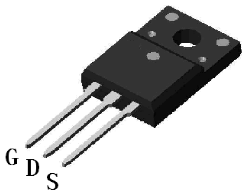
100% UIS Tested
100% R_g Tested

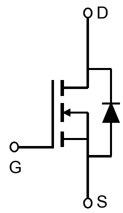
Top View

TO-220



TO-220F





Orderable Part Number	Package Type	Form	Minimum Order Quantity
FQP22N50L	TO220 Green	Tube	1000
FQPF22N50	TO-220F Pb Free	Tube	1000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	FQP22N50	FQB22N50	FQPF22N50	Units
Drain-Source Voltage		V_{DS}	500			V
Gate-Source Voltage		V_{GS}	±30			V
Continuous Drain Current	T_C=25°C	I_D	22	22*	22*	A
	T_C=100°C		15	15*	15*	
Pulsed Drain Current [C]		I_{DM}	88			
Avalanche Current [C]		I_{AR}	7			A
Repetitive avalanche energy [C]		E_{AR}	735			mJ
Single plused avalanche energy [G]		E_{AS}	1470			mJ
Peak diode recovery dv/dt		dv/dt	5			V/ns
Power Dissipation [B]	T_C=25°C	P_D	417	50	39	W
	Derate above 25°C		3.3	0.4	0.3	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	FQP22N50	FQB22N50	FQPF22N50	Units
Maximum Junction-to-Ambient [A,D]	$R_{\theta JA}$	65	65	65	°C/W
Maximum Case-to-sink [A]	$R_{\theta CS}$	0.5	--	--	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.3	2.5	3.2	°C/W

* Drain current limited by maximum junction temperature.

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	500			V
		I_D=250µA, V_{GS}=0V, T_J=150°C		600		
BV_{DSS} /ΔTJ	Breakdown Voltage Temperature Coefficient	I_D=250µA, V_{GS}=0V		0.57		V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=500V, V_{GS}=0V			1	µA
		V_{DS}=400V, 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	4	4.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=11A		0.21	0.26	Ω
g_{FS}	Forward Transconductance	V_{DS}=40V, I_D=11A		25		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				22	A
I_{SM}	Maximum Body-Diode Pulsed Current				88	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz	2465	3086	3710	pF
C_{oss}	Output Capacitance		200	290	380	pF
C_{rss}	Reverse Transfer Capacitance		14	24	35	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.7	1.4	2.1	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=400V, I_D=22A	55	69	83	nC
Q_{gs}	Gate Source Charge		17	22	27	nC
Q_{gd}	Gate Drain Charge		12	24	36	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=250V, I_D=22A, R_G=25Ω		60		ns
t_r	Turn-On Rise Time			122		ns
$t_{D(off)}$	Turn-Off DelayTime			124		ns
t_f	Turn-Off Fall Time			77		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=22A,dI/dt=100A/µs,V_{DS}=100V	415	524	630	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=22A,dI/dt=100A/µs,V_{DS}=100V	7.5	9.6	12	µC

A. The value of $R_{\theta JA}$ 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, 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, 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 <300 µs 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 $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.
G. L=60mH, I_{AS}=7A, V_{DD}=150V, R_G=25Ω, Starting T_J=25° C

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

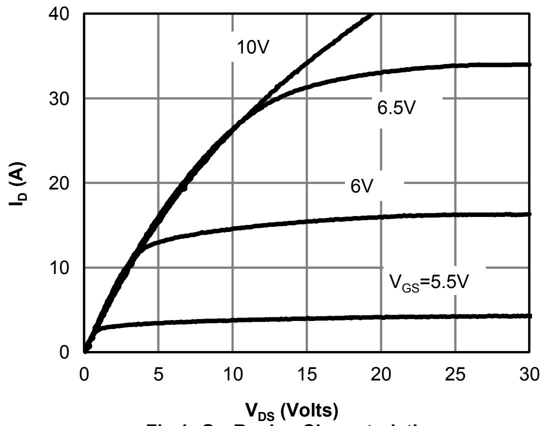


Fig 1: On-Region Characteristics

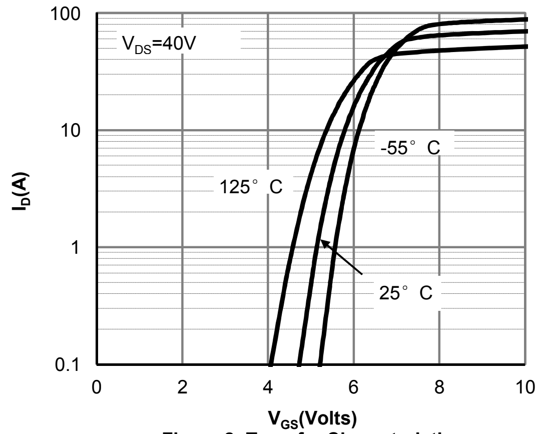


Figure 2: Transfer Characteristics

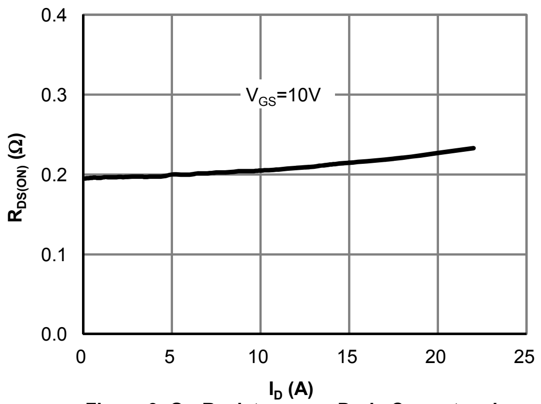


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

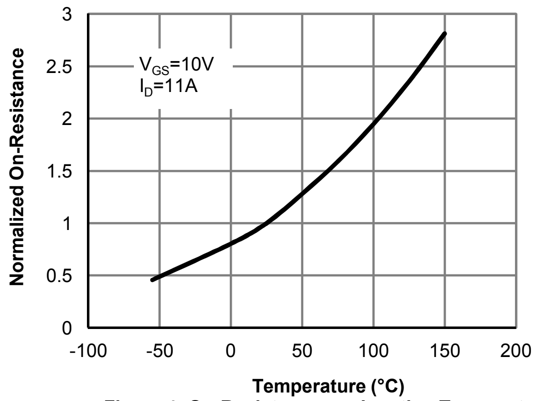


Figure 4: On-Resistance vs. Junction Temperature

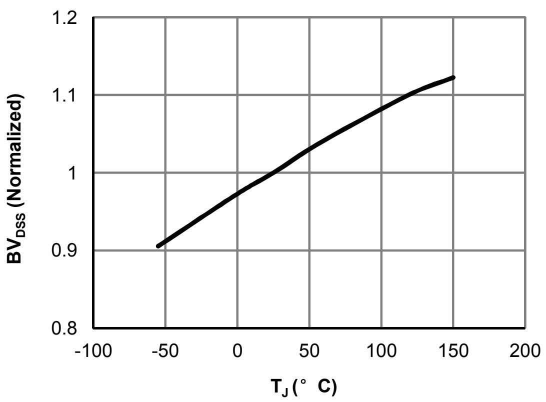


Figure 5:Break Down vs. Junction Temparature

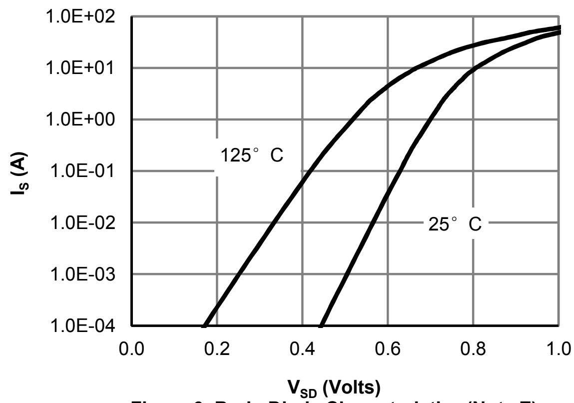


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

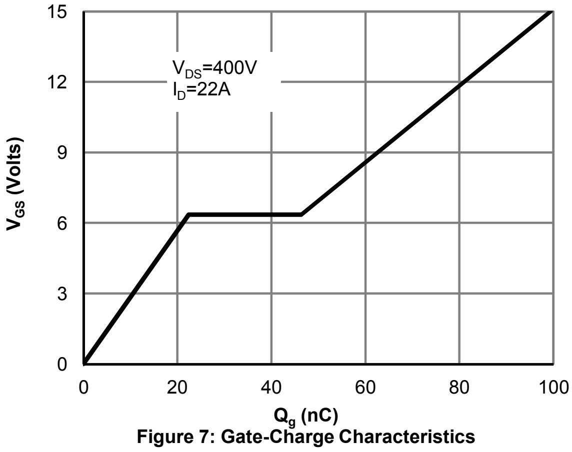


Figure 7: Gate-Charge Characteristics

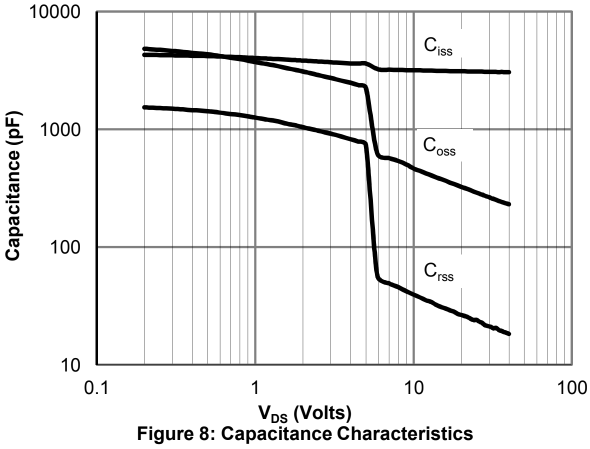


Figure 8: Capacitance Characteristics

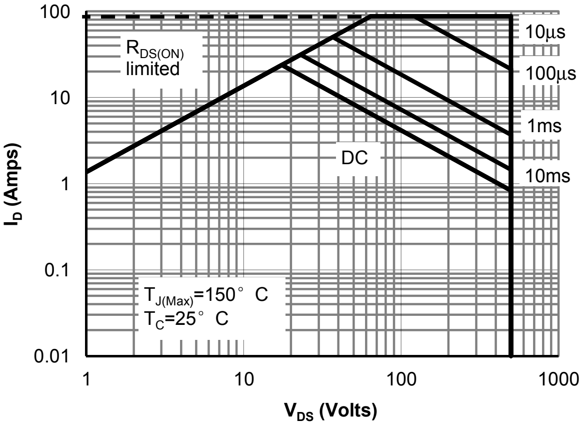


Figure 9: Maximum Forward Biased Safe Operating Area for AOT22N50 (Note F)

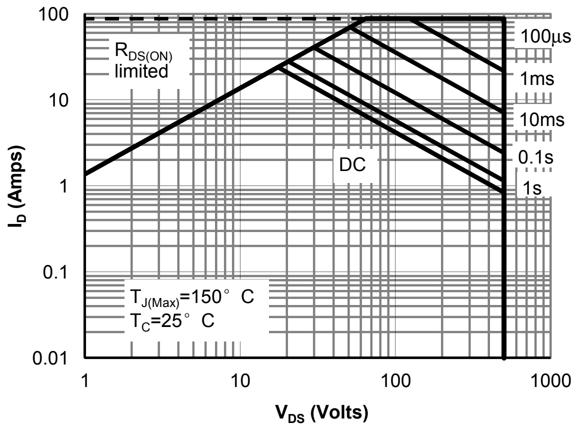


Figure 10: Maximum Forward Biased Safe Operating Area for AOTF22N50 (Note F)

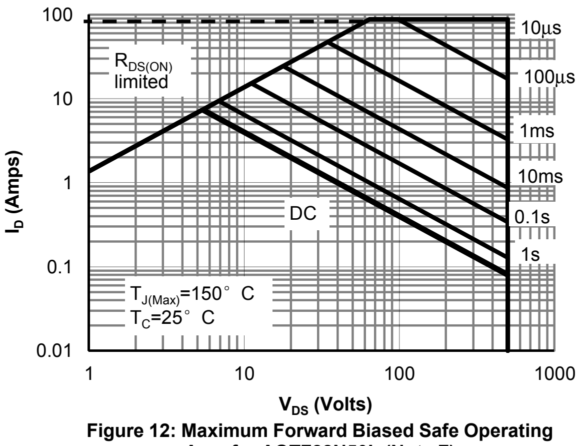


Figure 12: Maximum Forward Biased Safe Operating Area for AOTF22N50L (Note F)

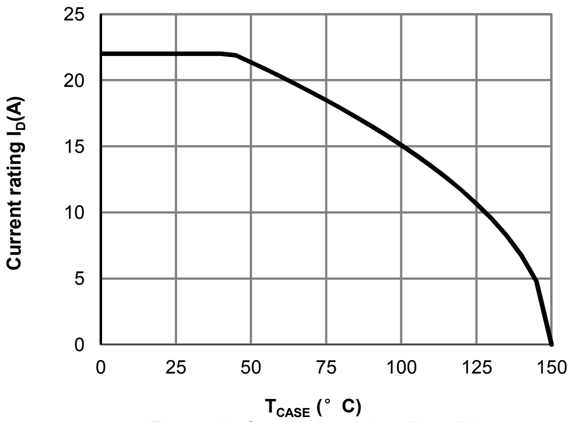


Figure 11: Current De-rating (Note B)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

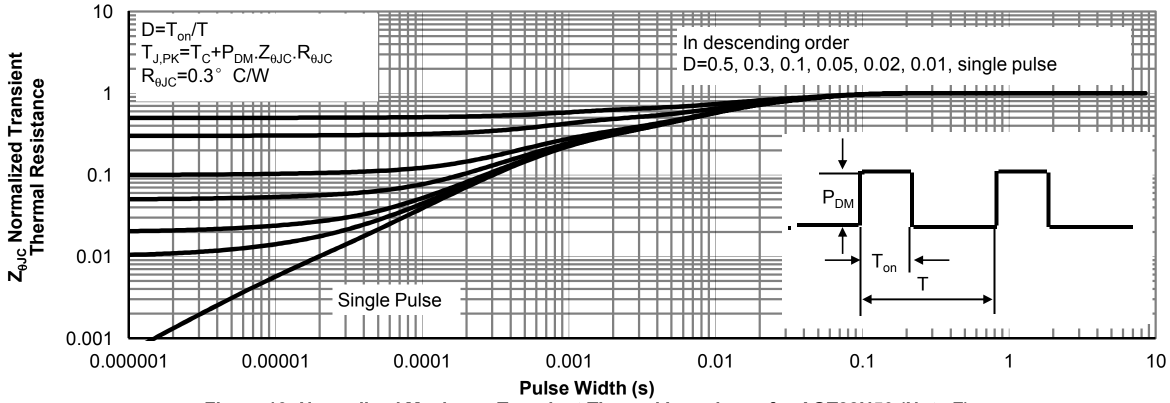


Figure 13: Normalized Maximum Transient Thermal Impedance for AOT22N50 (Note F)

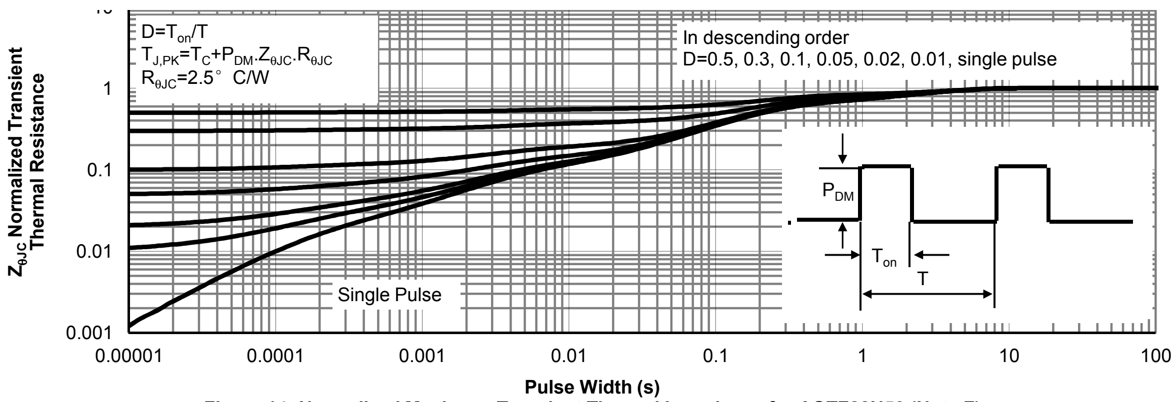


Figure 14: Normalized Maximum Transient Thermal Impedance for AOTF22N50 (Note F)

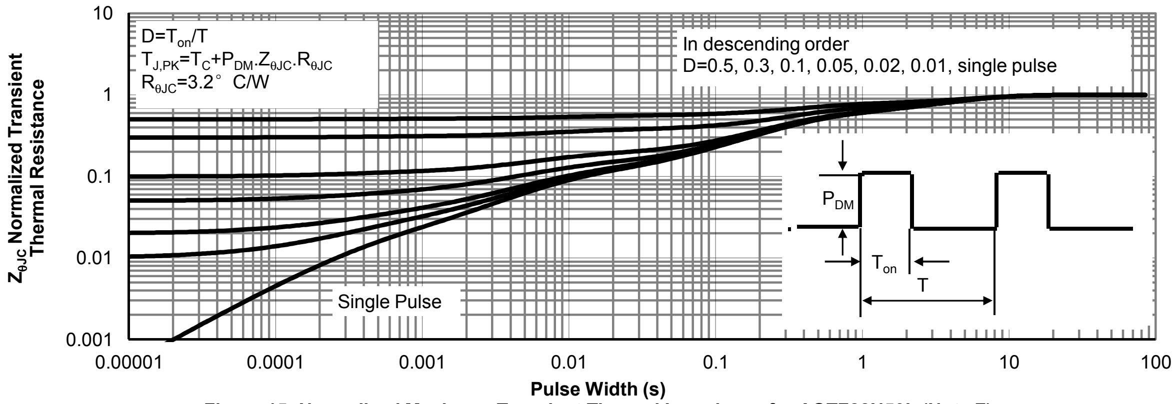
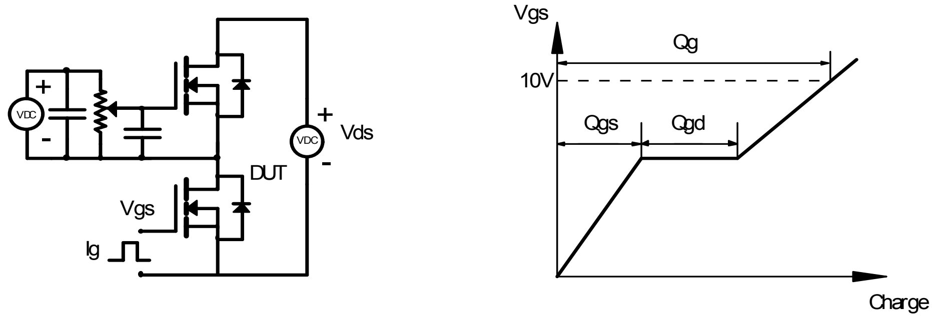
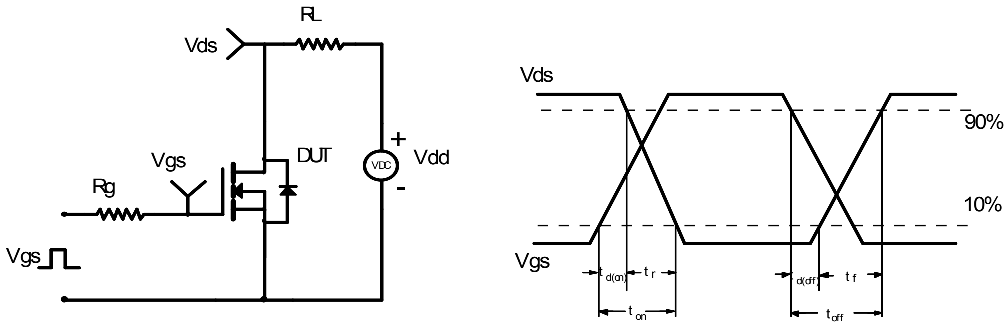


Figure 15: Normalized Maximum Transient Thermal Impedance for AOTF22N50L (Note F)

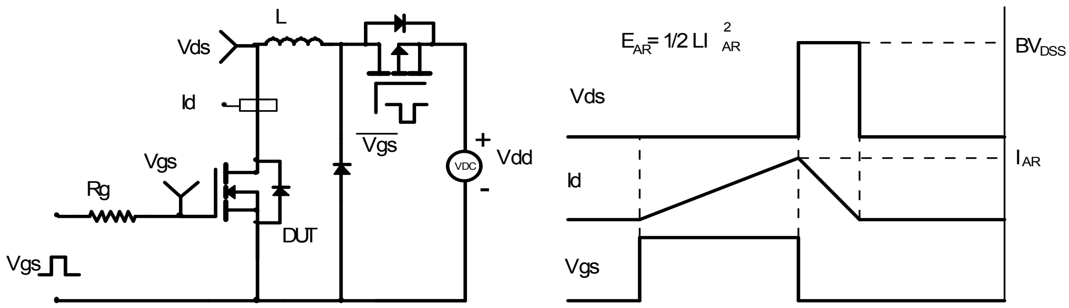
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms