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ALPHA & OMEGA
SEMICONDUCTOR

AOW25S65/AOWF25S65

650V 25A α MOS™ Power Transistor

General Description

The AOW25S65 & AOWF25S65 have been fabricated using the advanced α MOS™ high voltage process that is designed to deliver high levels of performance and robustness in switching applications. By providing low $R_{DS(on)}$, Q_g and E_{OSS} along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.

Product Summary

$V_{DS} @ T_{j,max}$	750V
I_{DM}	104A
$R_{DS(ON),max}$	0.19 Ω
$Q_{g,typ}$	26.4nC
$E_{OSS} @ 400V$	5.8 μ C

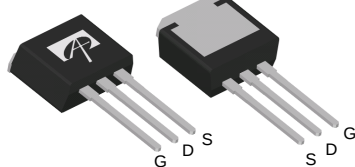
100% UIS Tested
100% R_g Tested



TO-262

Top View

Bottom View

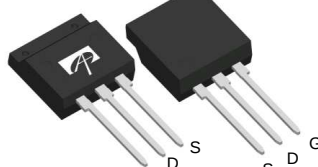


AOW25S65

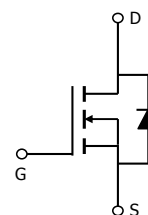
TO-262F

Top View

Bottom View



AOWF25S65



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

Parameter	Symbol	AOW25S65	AOWF25S65	Units
Drain-Source Voltage	V_{DS}	650		V
Gate-Source Voltage	V_{GS}	± 30		V
Continuous Drain Current	I_D	25	25*	A
$T_C=25^\circ\text{C}$				
$T_C=100^\circ\text{C}$		16	16*	
Pulsed Drain Current ^C	I_{DM}	104		A
Avalanche Current ^C	I_{AR}	7		A
Repetitive avalanche energy ^C	E_{AR}	96		mJ
Single pulsed avalanche energy ^G	E_{AS}	750		mJ
Power Dissipation ^B	P_D	357	28	W
		2.9	0.22	W/ $^\circ\text{C}$
$T_C=25^\circ\text{C}$				
Derate above 25°C				
MOSFET dv/dt ruggedness	dv/dt	100		V/ns
Peak diode recovery dv/dt ^H		20		
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 ^J	T_L	300		$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	AOW25S65	AOWF25S65	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	65	$^\circ\text{C/W}$
Maximum Case-to-sink ^A	$R_{\theta CS}$	0.5	--	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	0.35	4.5	$^\circ\text{C/W}$

* 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	650	-	-	V
		I _D =250μA, V _{GS} =0V, T _J =150°C	700	750	-	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V, V _{GS} =0V	-	-	1	μA
		V _{DS} =520V, T _J =150°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	2.6	3.3	4	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =12.5A, T _J =25°C	-	0.165	0.19	Ω
		V _{GS} =10V, I _D =12.5A, T _J =150°C	-	0.47	0.53	Ω
V _{SD}	Diode Forward Voltage	I _S =7.5A, V _{GS} =0V, T _J =25°C	-	0.84	-	V
I _S	Maximum Body-Diode Continuous Current		-	-	25	A
I _{SM}	Maximum Body-Diode Pulsed Current ^C		-	-	104	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =100V, f=1MHz	-	1278	-	pF
C _{oss}	Output Capacitance		-	87	-	pF
C _{o(er)}	Effective output capacitance, energy related ^H	V _{GS} =0V, V _{DS} =0 to 480V, f=1MHz	-	64.5	-	pF
C _{o(tr)}	Effective output capacitance, time related ^I		-	236.7	-	pF
C _{rss}	Reverse Transfer Capacitance	V _{GS} =0V, V _{DS} =100V, f=1MHz	-	1.4	-	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	-	4.9	-	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =480V, I _D =12.5A	-	26.4	-	nC
Q _{gs}	Gate Source Charge		-	6.2	-	nC
Q _{gd}	Gate Drain Charge		-	9.5	-	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =400V, I _D =12.5A, R _G =25Ω	-	29	-	ns
t _r	Turn-On Rise Time		-	30	-	ns
t _{D(off)}	Turn-Off DelayTime		-	112	-	ns
t _f	Turn-Off Fall Time		-	34	-	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =12.5A, dI/dt=100A/μs, V _{DS} =400V	-	408	-	ns
I _{rm}	Peak Reverse Recovery Current	I _F =12.5A, dI/dt=100A/μs, V _{DS} =400V	-	33	-	A
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =12.5A, dI/dt=100A/μs, V _{DS} =400V	-	8.27	-	μC

A. The value of R_{θJA} 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_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} 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_{J(MAX)}=150°C. The SOA curve provides a single pulse rating.

G. L=60mH, I_{AS}=5A, V_{DD}=150V, Starting T_J=25°C

H. 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}.

I. 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}.

J. Wavesoldering only allowed at leads.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

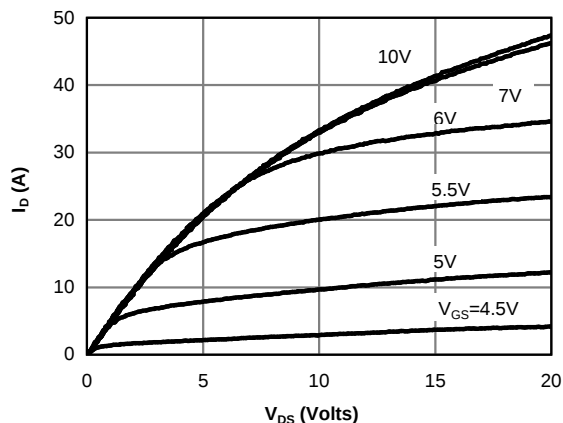


Figure 1: On-Region Characteristics@25°C

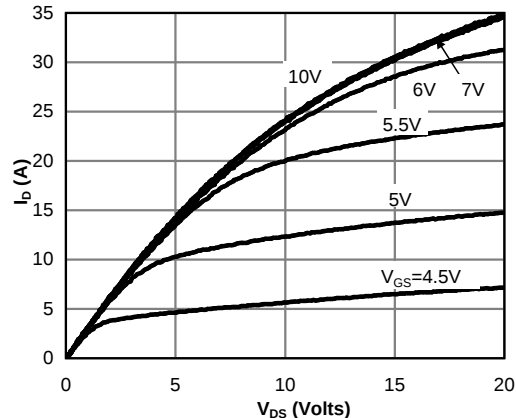


Figure 2: On-Region Characteristics@125°C

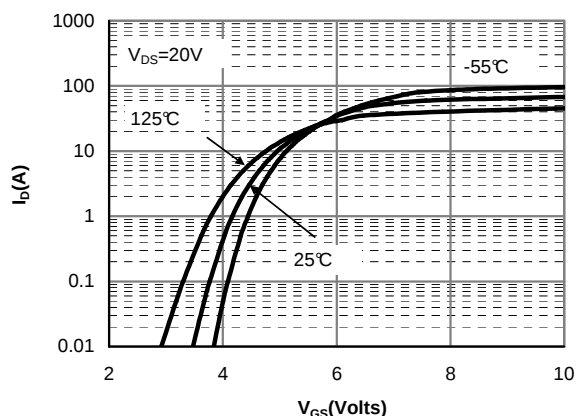


Figure 3: Transfer Characteristics

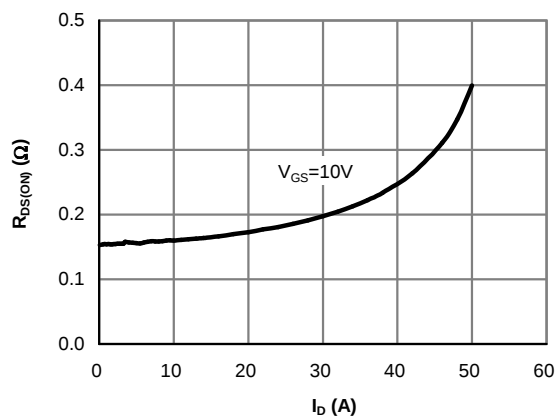


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

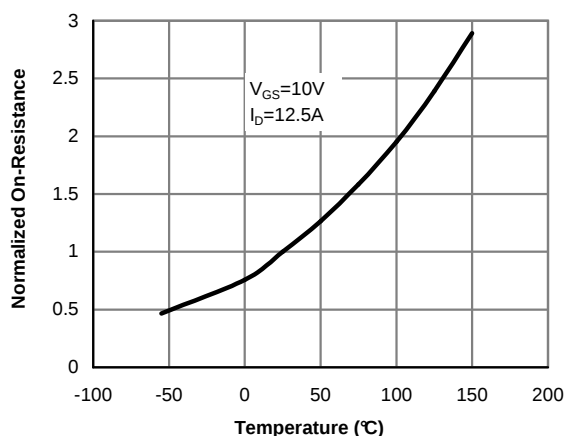


Figure 5: On-Resistance vs. Junction Temperature

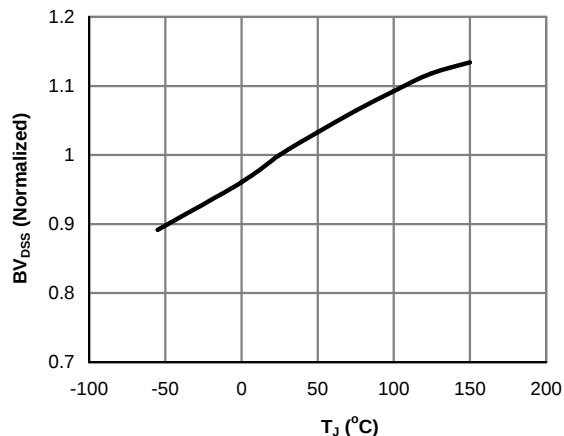


Figure 6: Break Down vs. Junction Temperature

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

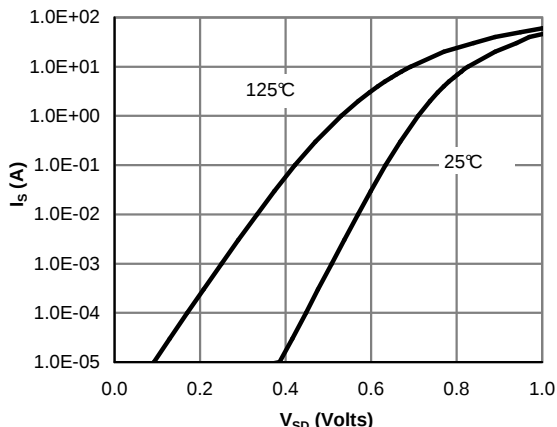


Figure 7: Body-Diode Characteristics (Note E)

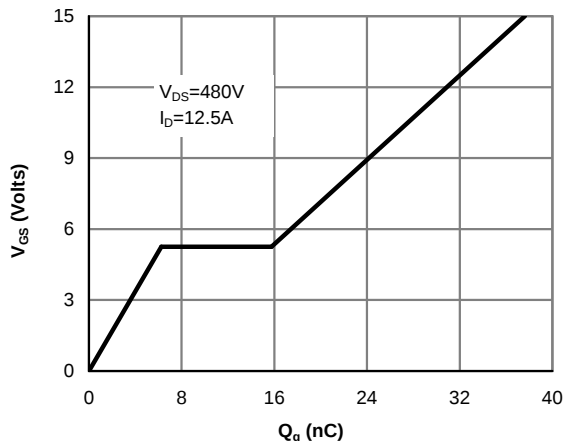


Figure 8: Gate-Charge Characteristics

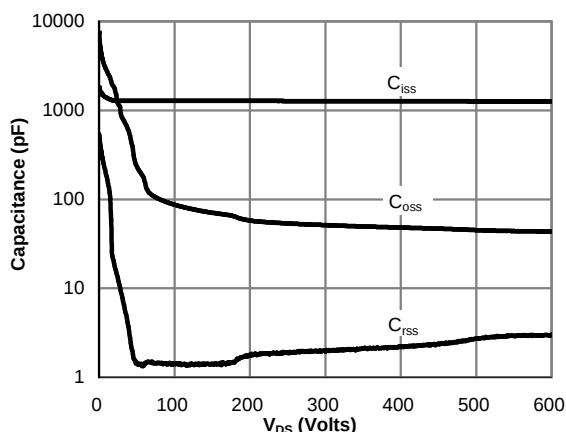


Figure 9: Capacitance Characteristics

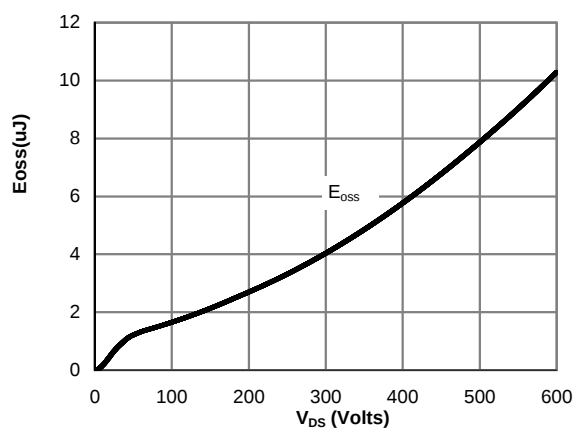


Figure 10: Coss stored Energy

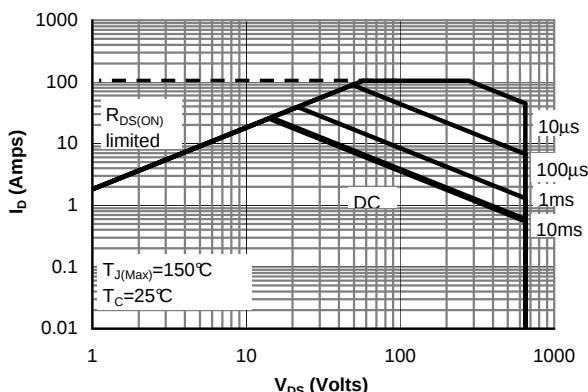


Figure 11: Maximum Forward Biased Safe Operating Area for AOW25S65 (Note F)

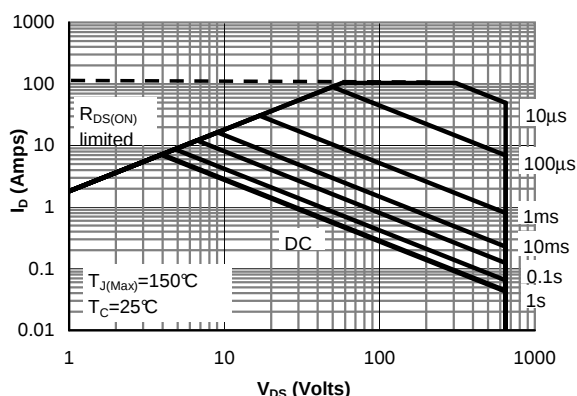


Figure 12: Maximum Forward Biased Safe Operating Area for AOWF25S65 (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

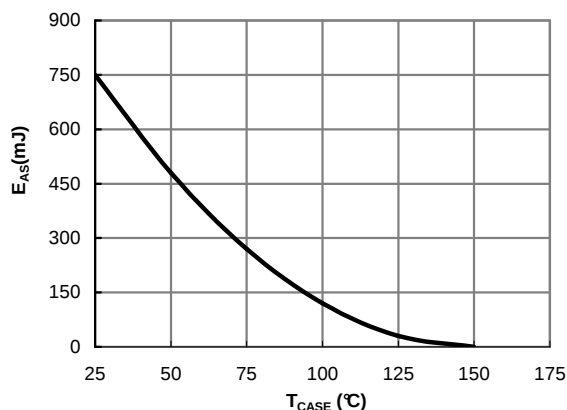


Figure 13: Avalanche energy

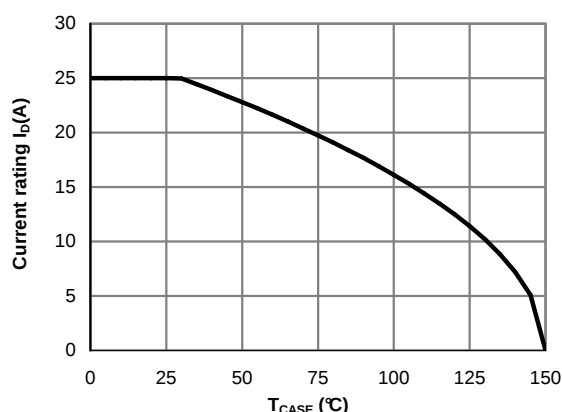


Figure 14: Current De-rating (Note B)

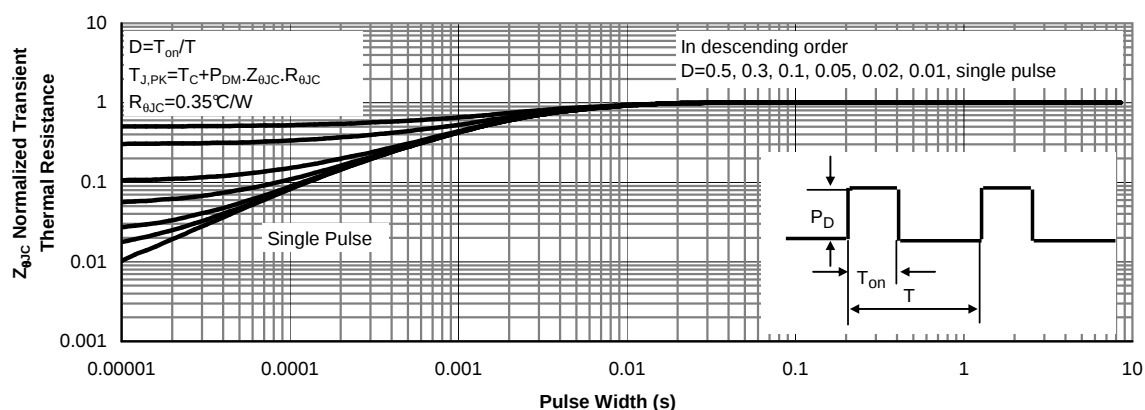


Figure 15: Normalized Maximum Transient Thermal Impedance for AOW25S65 (Note F)

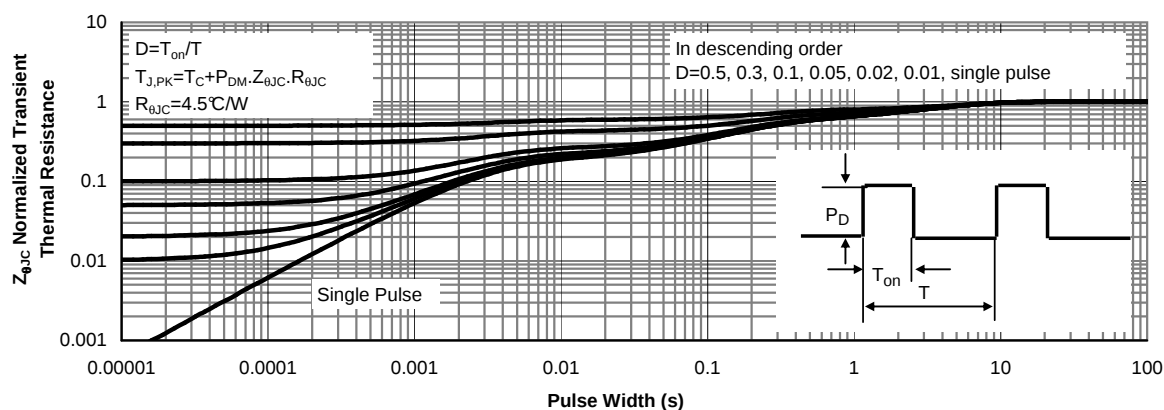
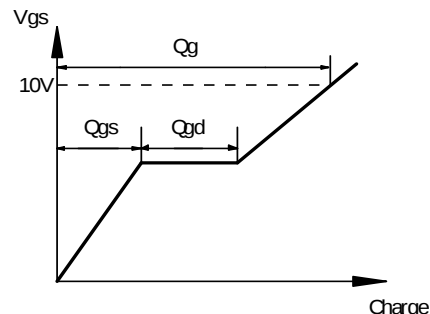
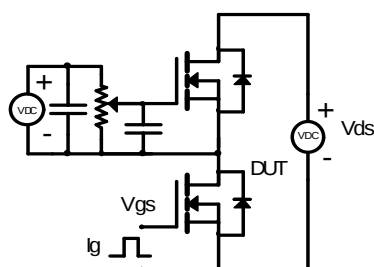
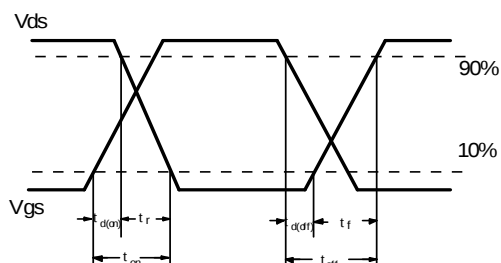
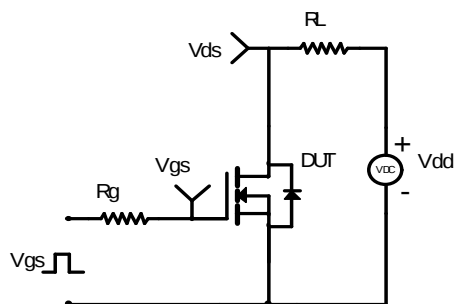


Figure 16: Normalized Maximum Transient Thermal Impedance for AOWF25S65 (Note F)

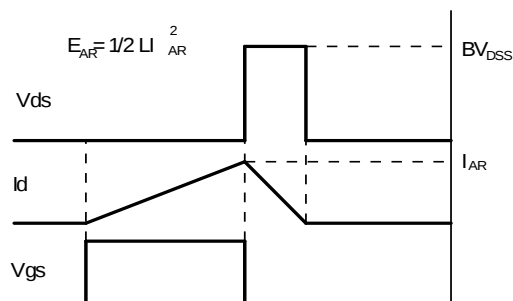
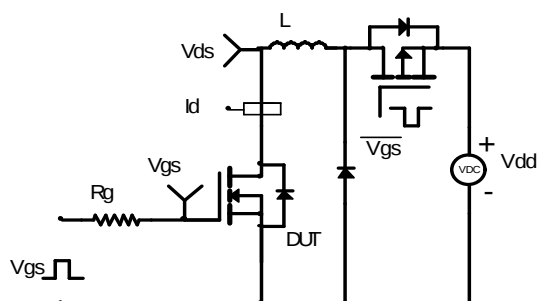
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

