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Alpha & Omega Semiconductor Inc.
AOL1440

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ALPHA & OMEGA SEMICONDUCTOR

AOL1440
N-Channel Enhancement Mode Field Effect Transistor

General Description

The AOL1440 uses advanced trench technology to provide excellent $R_{DS(ON)}$, shoot-through immunity and body diode characteristics. This device is ideally suite for use as a low side switch in CPU core power conversion.

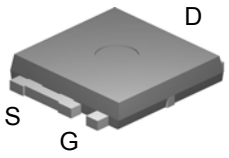
-RoHS Compliant
-Halogen and Antimony Free Green Device*

Features

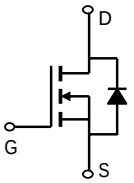
V_{DS} (V) = 25V
I_D = 75A (V_{GS} = 10V)
$R_{DS(ON)}$ < 3.2mΩ (V_{GS} = 20V)
$R_{DS(ON)}$ < 4.0mΩ (V_{GS} = 12V)
$R_{DS(ON)}$ < 5.2mΩ (V_{GS} = 10V)

UIS Tested
Rg,Ciss,Coss,Crss Tested

Ultra SO-8™ Top View



Bottom tab connected to drain



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	25	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current [B,G,]	T_C=25°C [G]	I_D	85	A
	T_C=100°C [B]		66	
Pulsed Drain Current		I_{DM}	200	
Continuous Drain Current [G]	T_A=25°C	I_{DSM}	21	A
	T_A=70°C		17	
Avalanche Current [C]		I_{AR}	30	A
Repetitive avalanche energy L=0.3mH [C]		E_{AR}	135	mJ
Power Dissipation [B]	T_C=25°C	P_D	75	W
	T_C=100°C		37	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.3	W
	T_A=70°C		1.4	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	19	25	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		45	55	°C/W
Maximum Junction-to-Case [C]	Steady-State	$R_{\theta JC}$	1.5	2	°C/W

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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	25			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=20V, V_{GS}=0V		0.005	1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±30V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	2	3	4	V
$I_{D(ON)}$	On state drain current	V_{GS}=12V, V_{DS}=5V	200			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=20V, I_D=20A		2.7	3.2	mΩ
		V_{GS}=12V, I_D=20A		3.5	4	mΩ
		V_{GS}=10V, I_D=20A		4	5.2	mΩ
		T_J=125°C		5.6		mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		75		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				55	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=12.5V, f=1MHz		2100	2400	pF
C_{oss}	Output Capacitance			850		pF
C_{rss}	Reverse Transfer Capacitance			400		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.35	1	Ω
SWITCHING PARAMETERS						
Q_g(12V)	Total Gate Charge	V_{GS}=10V, V_{DS}=12.5V, I_D=20A		40	50	nC
Q_g(10V)	Total Gate Charge			33		nC
Q_{gs}	Gate Source Charge			11		nC
Q_{gd}	Gate Drain Charge			14		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=12.5V, R_L=0.68Ω, R_{GEN}=3Ω		12		ns
t_r	Turn-On Rise Time			19		ns
$t_{D(off)}$	Turn-Off DelayTime			15		ns
t_f	Turn-Off Fall Time			8.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=100A/µs		42		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=100A/µs		34		nC

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 $T_{J(MAX)}$=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.
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.
G. The maximum current rating is limited by bond-wires.
H. 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. The SOA curve provides a single pulse rating.
* This device is guaranteed green after date code 8P11 (June 1ST 2008)
Rev1. June 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

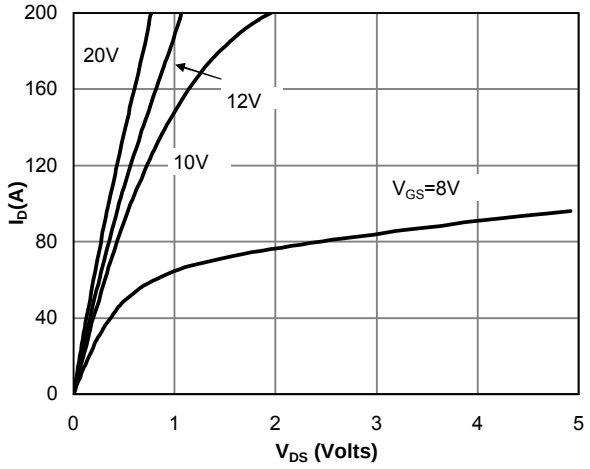

Figure 1: On-Region Characteristics

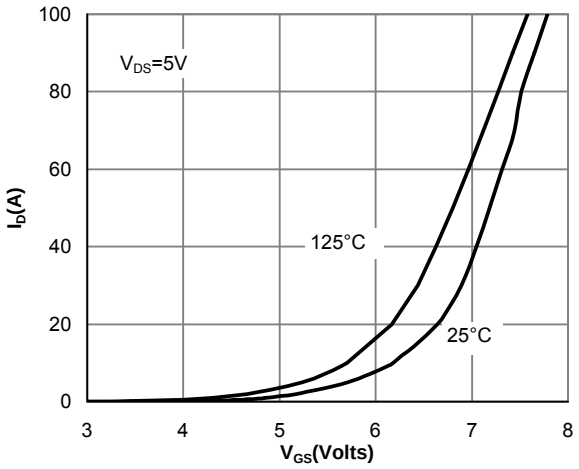

Figure 2: Transfer Characteristics

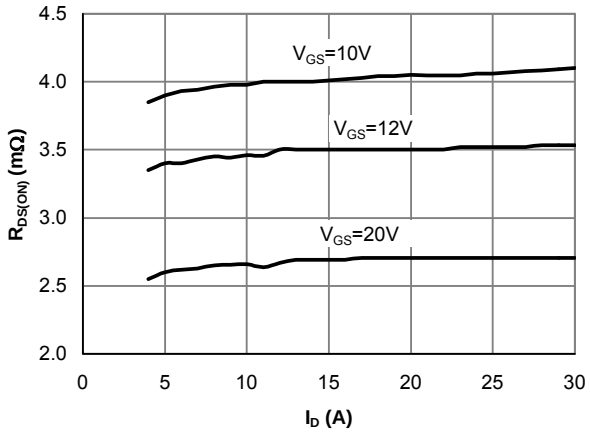

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

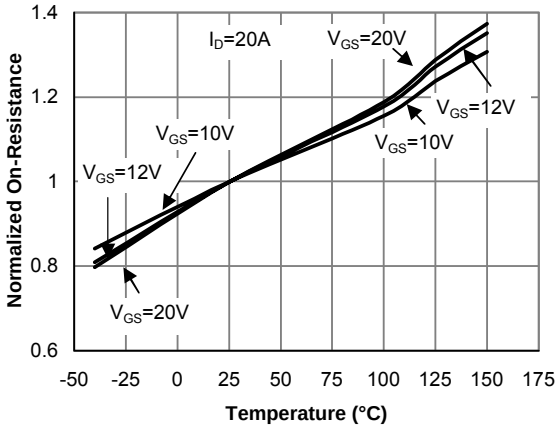

Figure 4: On-Resistance vs. Junction Temperature

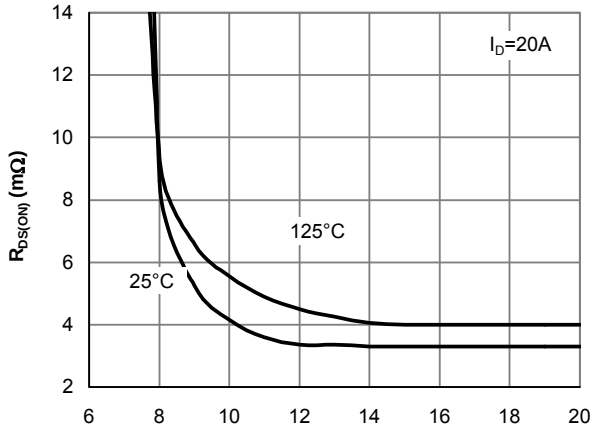

Figure 5: On-Resistance vs. Gate-Source Voltage

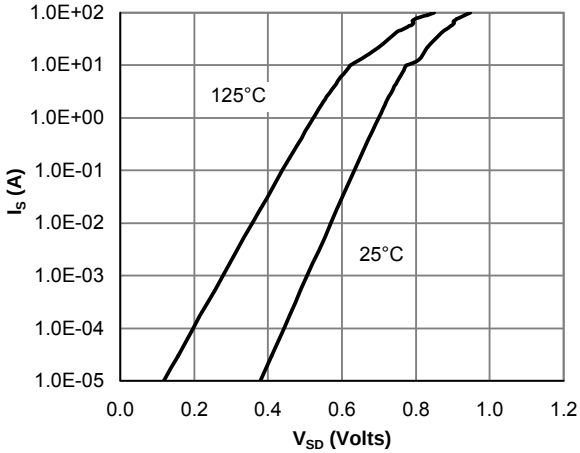

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

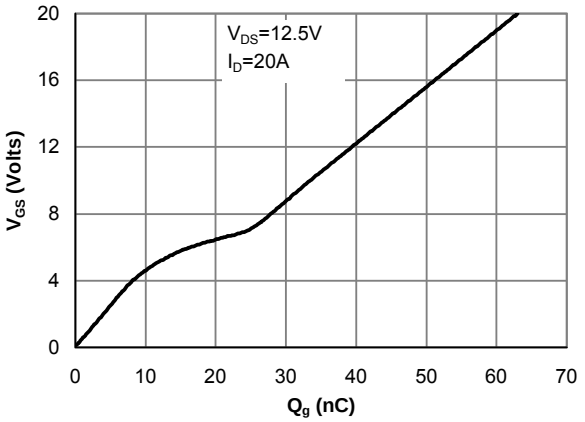

Figure 7: Gate-Charge Characteristics

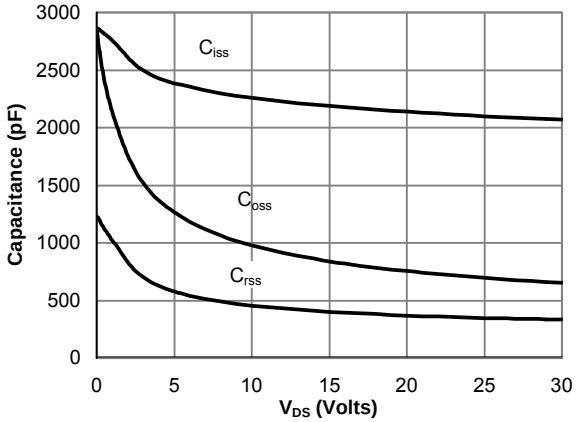

Figure 8: Capacitance Characteristics

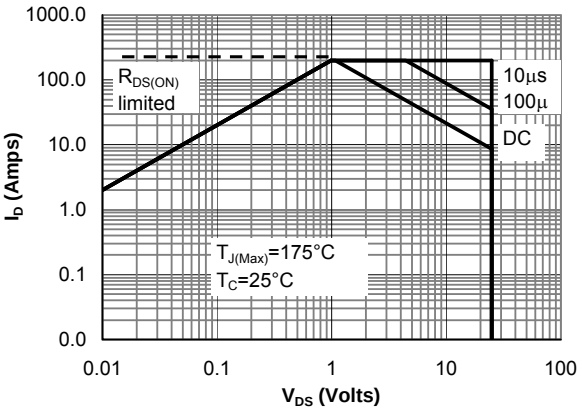

Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

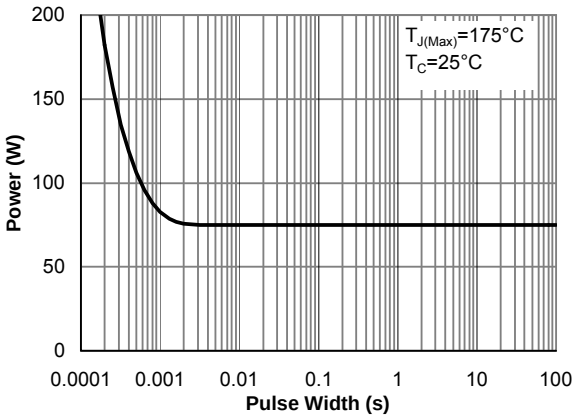

Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

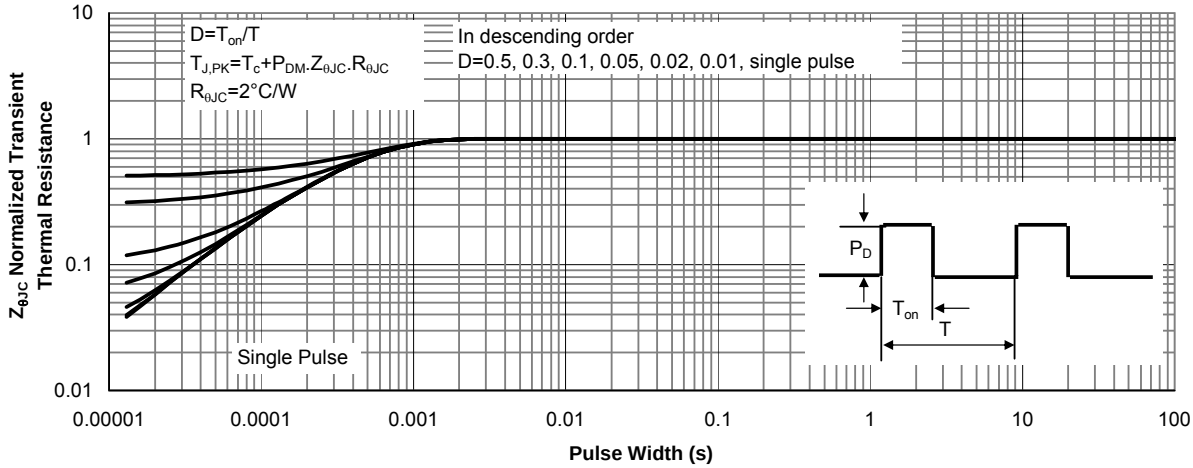

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

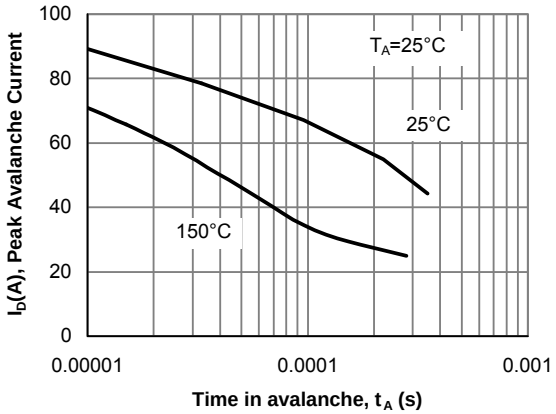

Figure 12: Single Pulse Avalanche capability

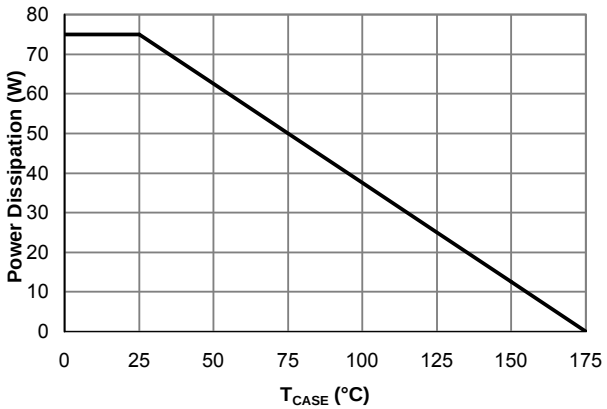

Figure 13: Power De-rating (Note B)

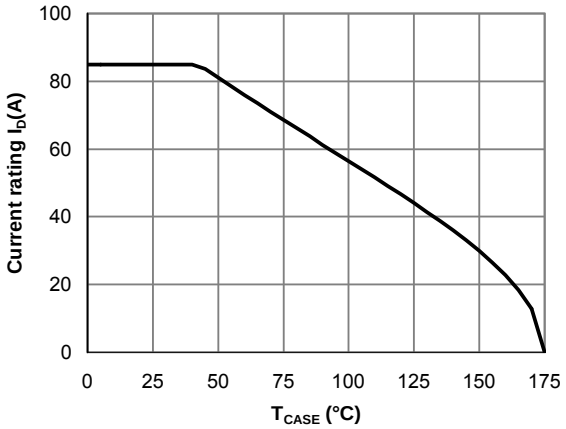

Figure 14: Current De-rating (Note B)

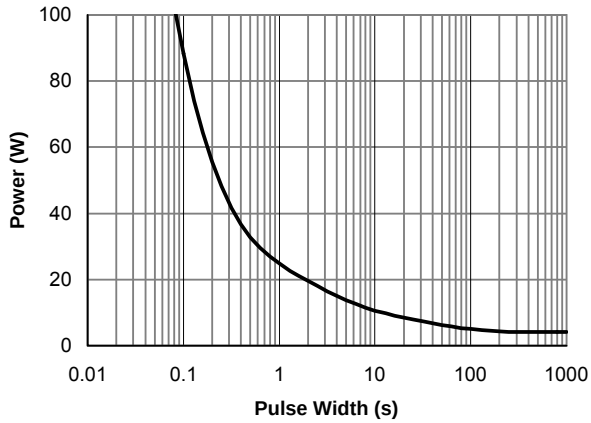

Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

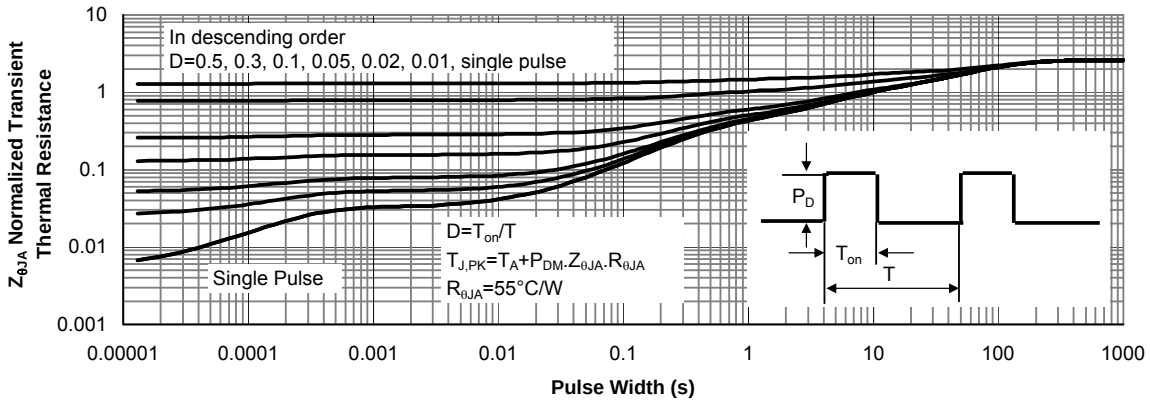

Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

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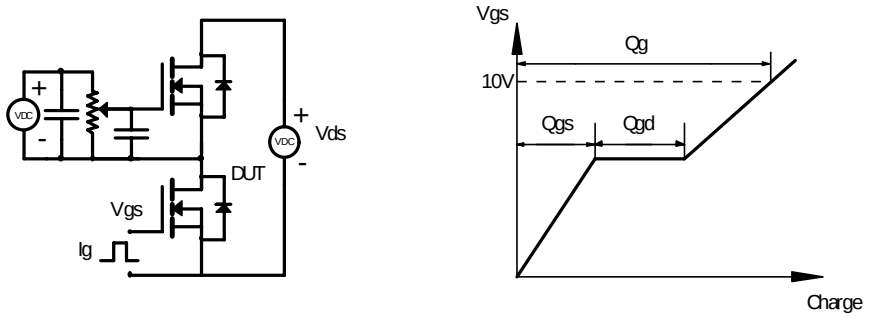
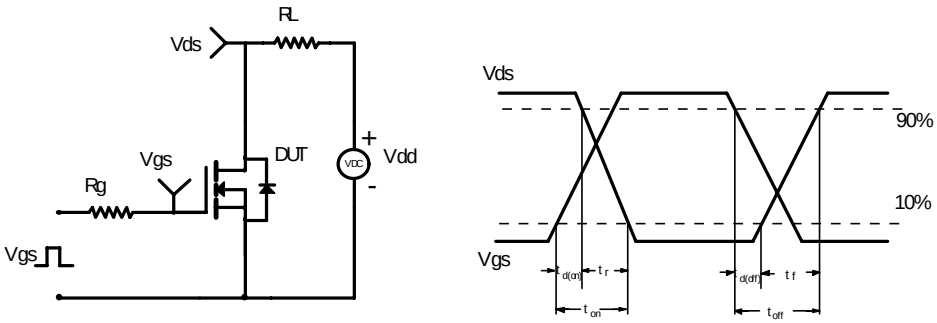
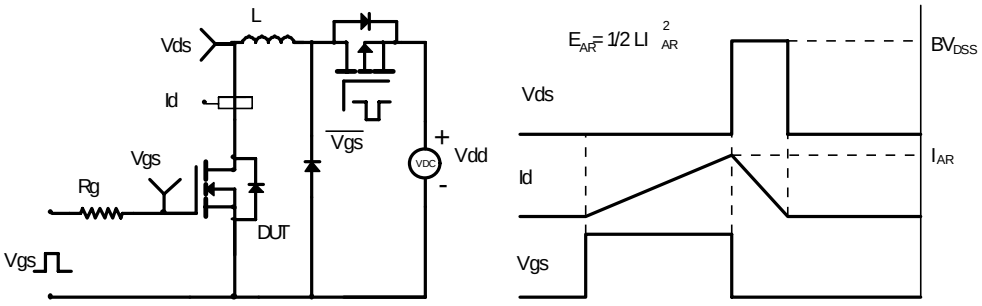
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms