

General Description

- Trench Power MOSFET technology
- Low $R_{DS(ON)}$
- Logic Level Driving
- RoHS and Halogen-Free Compliant

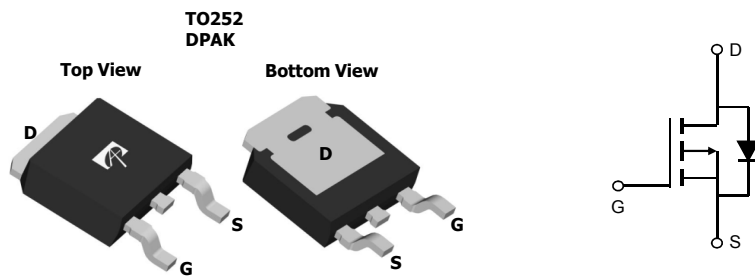
Applications

- Industrial and Motor Drive applications

Product Summary

V_{DS}	-60V
I_D (at $V_{GS}=-10V$)	-28A
$R_{DS(ON)}$ (at $V_{GS}=-10V$)	< 40m Ω
$R_{DS(ON)}$ (at $V_{GS}=-4.5V$)	< 55m Ω

100% UIS Tested
 100% Rg Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOD409G	TO-252	Tape & Reel	2500

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	-28
		$T_C=100^\circ\text{C}$	-18
Pulsed Drain Current ^C	I_{DM}	-80	A
Continuous Drain Current	I_{DSM}	$T_A=25^\circ\text{C}$	-9
		$T_A=70^\circ\text{C}$	-7
Avalanche Current ^C	I_{AS}	-26	A
Avalanche energy	E_{AS}	34	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	60
		$T_C=100^\circ\text{C}$	24
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$	6.2
		$T_A=70^\circ\text{C}$	4.0
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	15	20	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A,D}		Steady-State	40	50
Maximum Junction-to-Case	$R_{\theta JC}$	1.7	2.1	$^\circ\text{C/W}$

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	-60			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-60V, V _{GS} =0V T _J =55°C			-1 -5	μA
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	-1.5	-2.0	-2.5	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-20A T _J =125°C		33	40	mΩ
		V _{GS} =-4.5V, I _D =-20A		56	68	
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-20A		33		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.7	-1	V
I _S	Maximum Body-Diode Continuous Current				-28	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-30V, f=1MHz		2350		pF
C _{oss}	Output Capacitance			160		pF
C _{rss}	Reverse Transfer Capacitance			115		pF
R _g	Gate resistance	f=1MHz		2.0	4.0	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =-10V, V _{DS} =-30V, I _D =-20A		45	65	nC
Q _{g(4.5V)}	Total Gate Charge			22	33	
Q _{gs}	Gate Source Charge			7		
Q _{gd}	Gate Drain Charge			10		
Q _{oss}	Output Charge	V _{GS} =0V, V _{DS} =-30V		8		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-30V, R _L =1.5Ω, R _{GEN} =3Ω		10		ns
t _r	Turn-On Rise Time			6		ns
t _{D(off)}	Turn-Off DelayTime			47		ns
t _f	Turn-Off Fall Time			12		ns
t _{rr}	Body Diode Reverse Recovery Time		I _F =-20A, di/dt=500A/μs		23	
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-20A, di/dt=500A/μs		107		nC

A. The value of R_{θJA} is measured with the device mounted on 1in² 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_{θJA} ≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.

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. Single pulse width limited by junction temperature T_{J(MAX)}=150° 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 <300μs 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. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

APPLICATIONS OR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN,FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

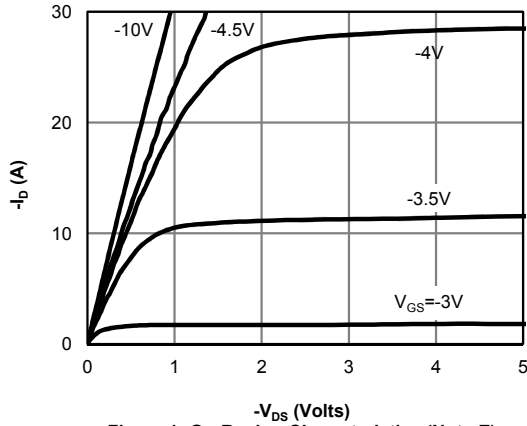


Figure 1: On-Region Characteristics (Note E)

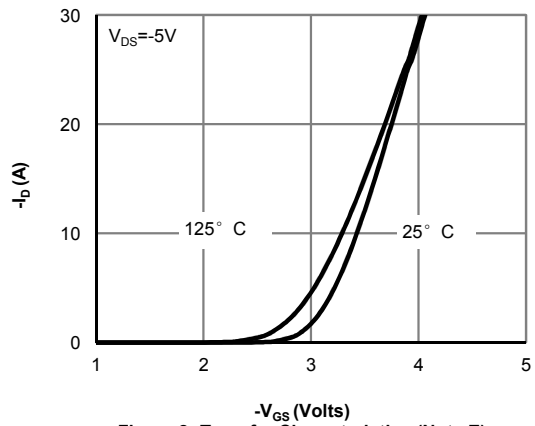


Figure 2: Transfer Characteristics (Note E)

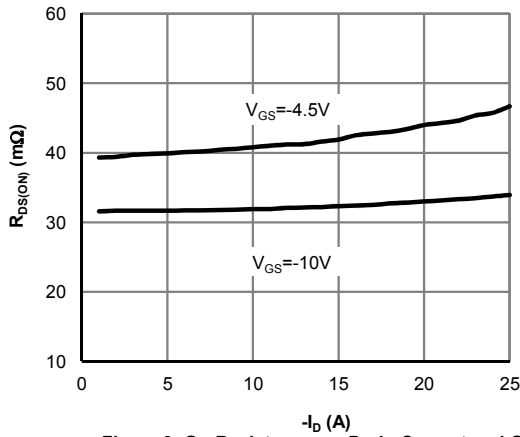


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

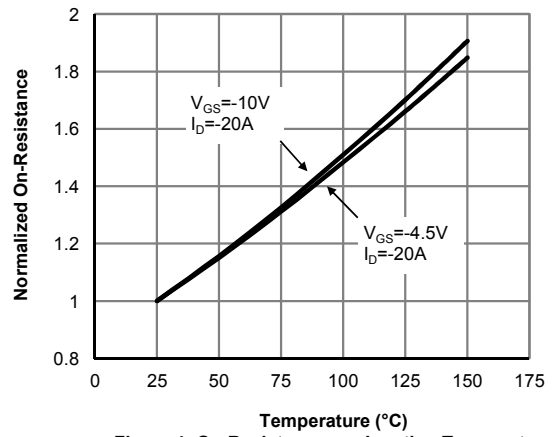


Figure 4: On-Resistance vs. Junction Temperature (Note E)

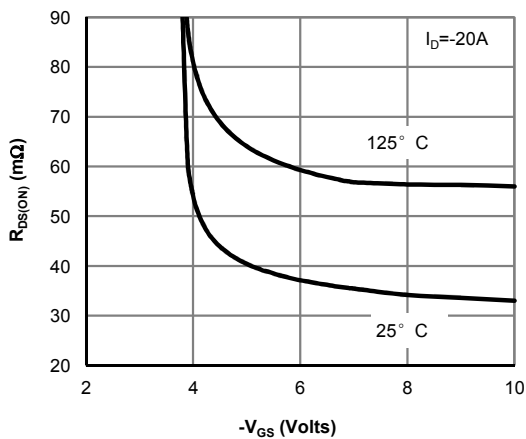


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

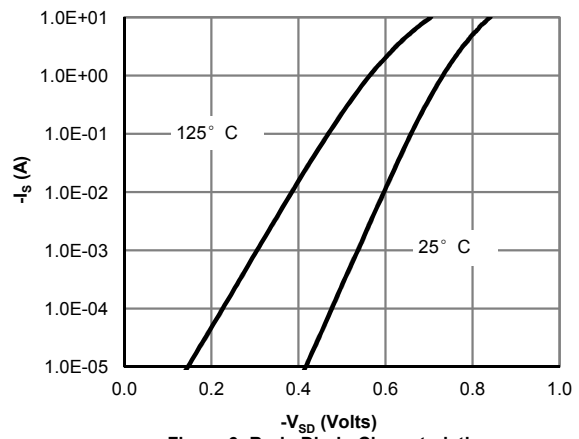


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

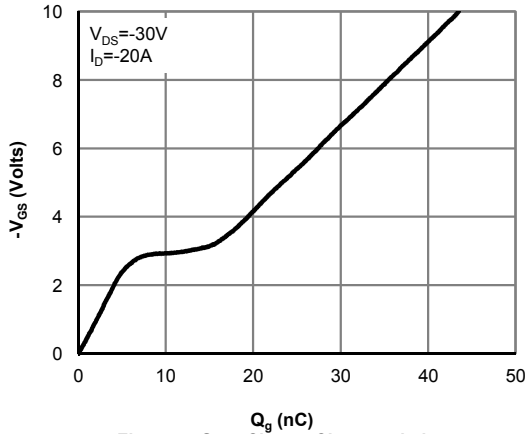


Figure 7: Gate-Charge Characteristics

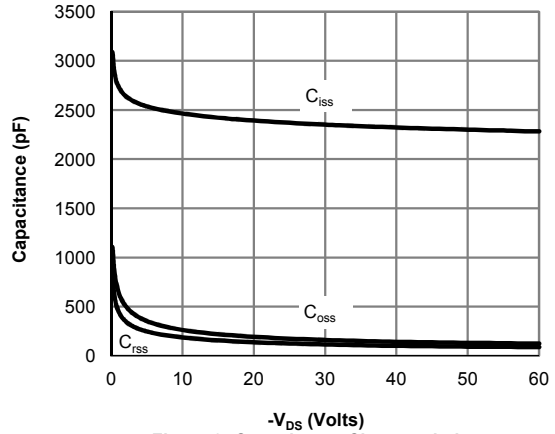


Figure 8: Capacitance Characteristics

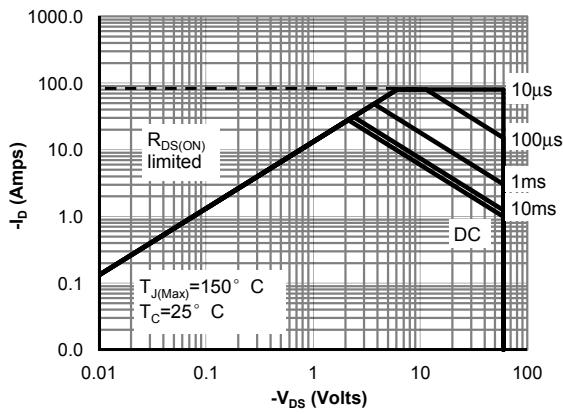


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

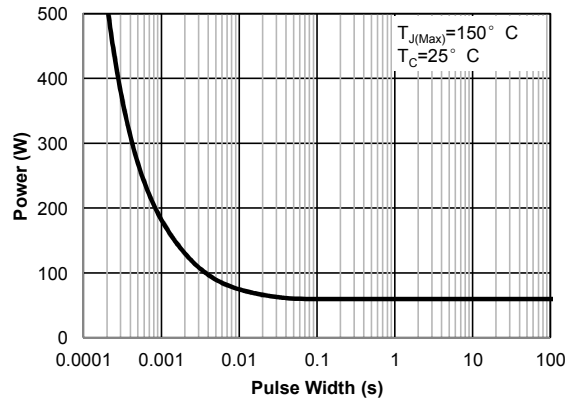


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

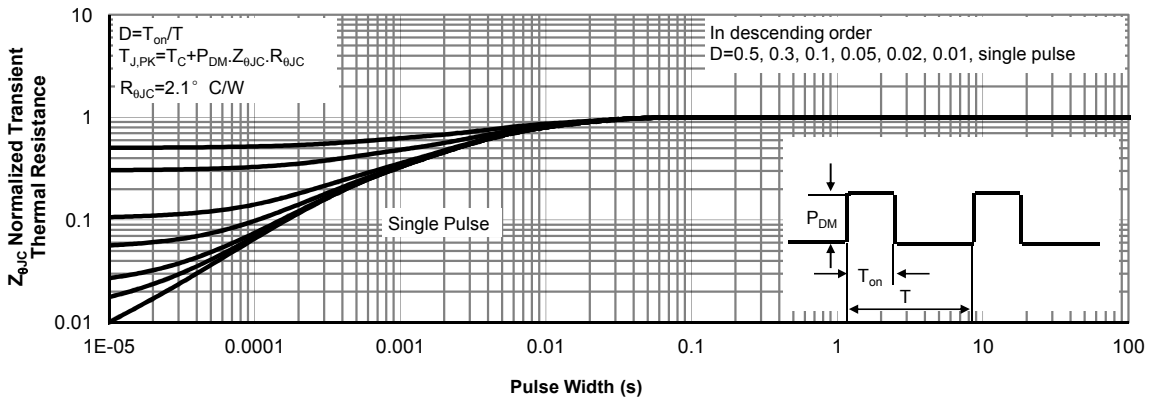


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

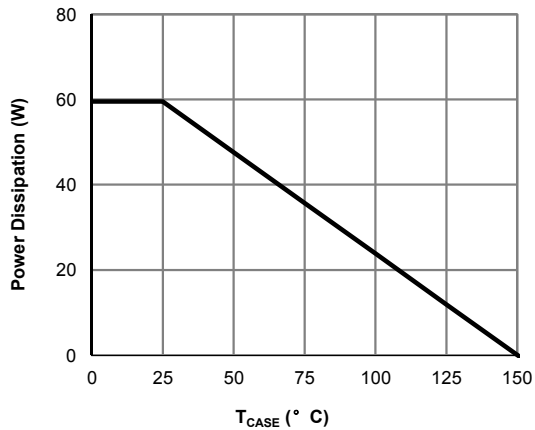


Figure 12: Power De-rating (Note F)

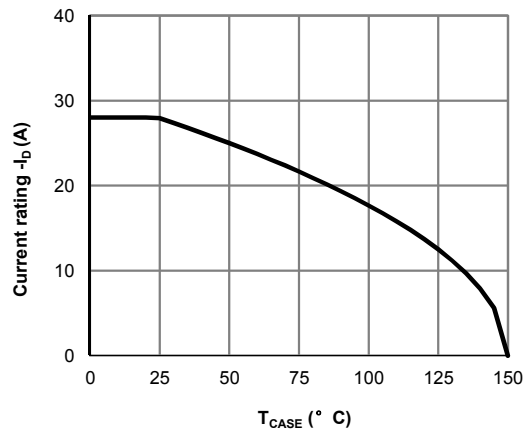


Figure 13: Current De-rating (Note F)

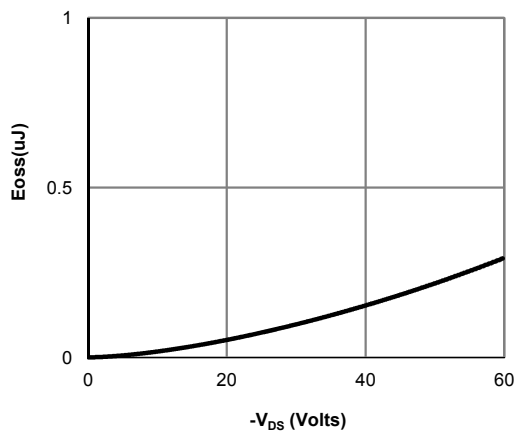


Figure 14: Coss stored Energy

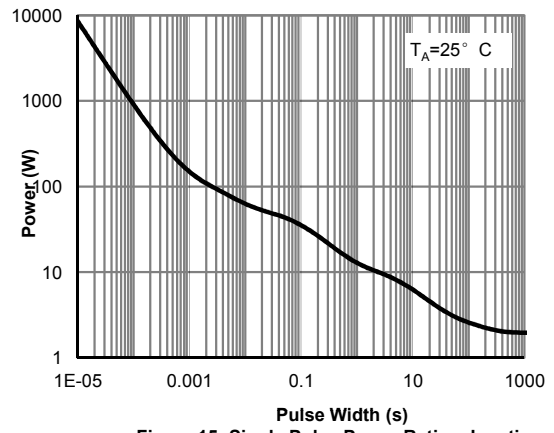


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

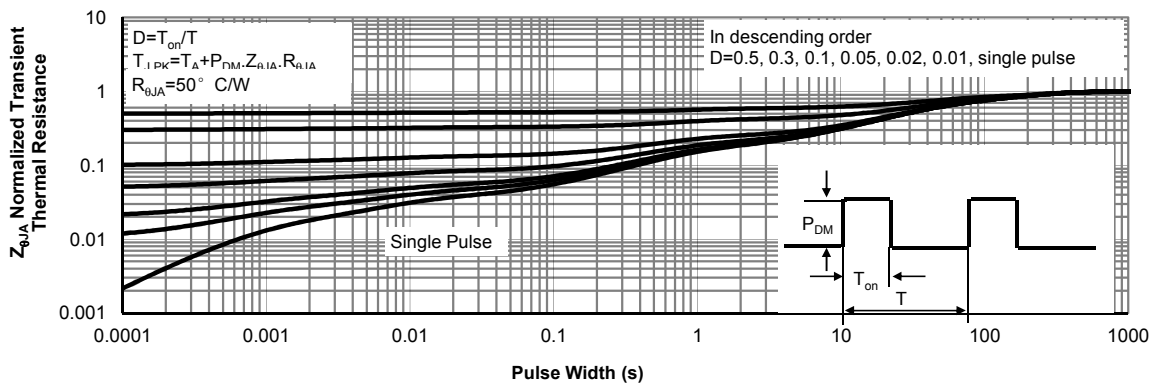
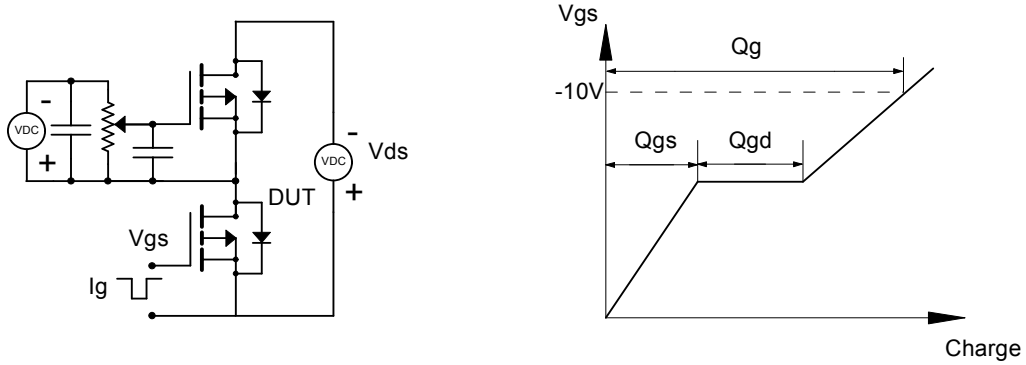
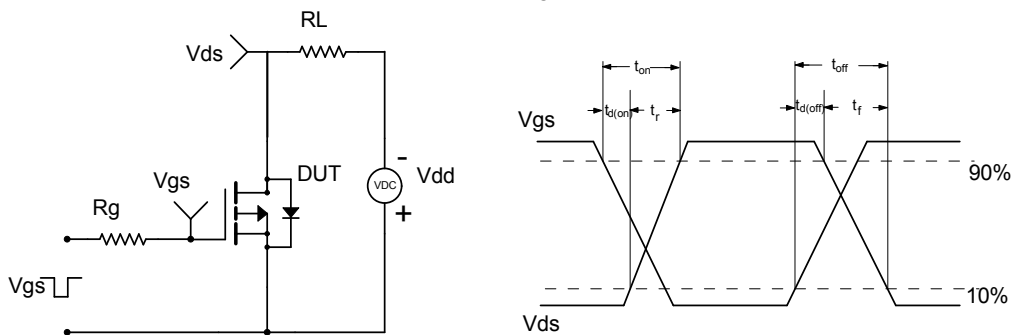


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

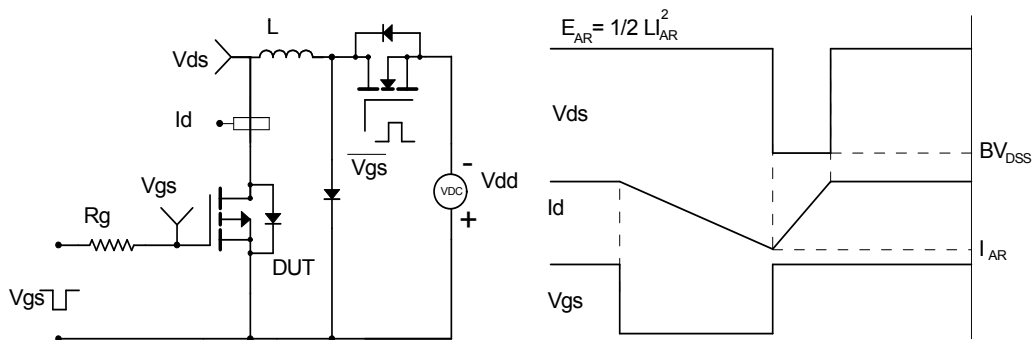
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

