ALPHA & OMEGA SEMICONDUCTOR

AO4452

100V N-Channel MOSFET SDMOS™

General Description

The AO4452 is fabricated with SDMOS™ trench technology that combines excellent $R_{DS(ON)}$ with low gate charge.The result is outstanding efficiency with controlled switching behavior. This universal technology is well suited for PWM, load switching and general purpose applications.

Product Summary

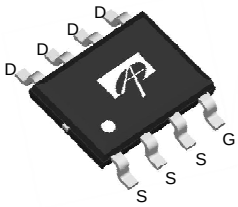
V_{DS}	100V
I_D (at V_{GS}=10V)	8A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 25mΩ
$R_{DS(ON)}$ (at V_{GS} = 7V)	< 31mΩ

100% UIS Tested
100% R_g Tested

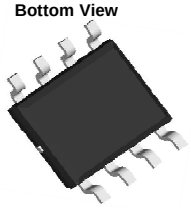
Green Product

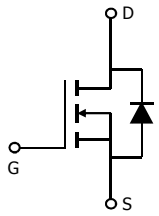
SOIC-8

Top View



Bottom View





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	**100**	V
Gate-Source Voltage		V_{GS}	**±25**	V
Continuous Drain Current	T_A=25°C	I_D	**8**	A
	T_A=70°C		**6.5**	
Pulsed Drain Current [C]		I_{DM}	**57**	
Avalanche Current [C]		I_{AR}	**28**	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	**39**	mJ
Power Dissipation [B]	T_A=25°C	P_D	**3.1**	W
	T_A=70°C		**2**	
Junction and Storage Temperature Range		T_J, T_{STG}	**-55 to 150**	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	31	40	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		59	75	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	16	24	°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	100			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=100V, V_{GS}=0V			10	µA
		T_J=55°C			50	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±25V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	2	3.2	4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=8A		20.5	25	mΩ
		T_J=125°C		36	43	
		V_{GS}=7V, I_D=6.5A		25	31	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=8A		23		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.66	1	V
I_S	Maximum Body-Diode Continuous Current				5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=50V, f=1MHz	1400	1770	2200	pF
C_{oss}	Output Capacitance		115	165	215	pF
C_{rss}	Reverse Transfer Capacitance		33	55	80	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.3	0.65	1.0	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=50V, I_D=8A	14	28	42	nC
Q_{gs}	Gate Source Charge		4	9	14	nC
Q_{gd}	Gate Drain Charge		6	10	14	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=50V, R_L=6Ω, R_{GEN}=3Ω		12		ns
t_r	Turn-On Rise Time			4		ns
$t_{D(off)}$	Turn-Off DelayTime			17		ns
t_f	Turn-Off Fall Time			5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=8A, dI/dt=500A/µs	11	16	21	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=8A, dI/dt=500A/µs	42	60	78	nC
t_{rr}	Body Diode Reverse Recovery Time	I_F=8A, dI/dt=100A/µs	21	27	33	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=8A, dI/dt=100A/µs	20	28	36	nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25° 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 ≤ 10s junction-to-ambient thermal resistance.
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 initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead 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-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

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

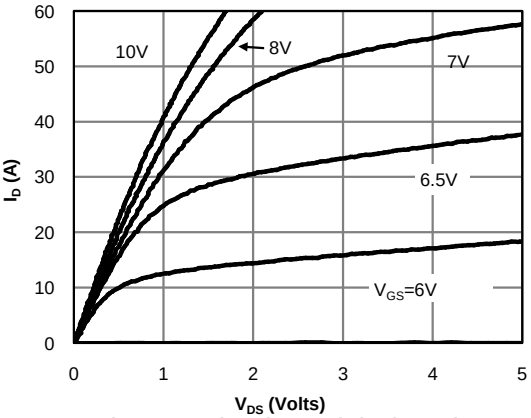


Fig 1: On-Region Characteristics (Note E)

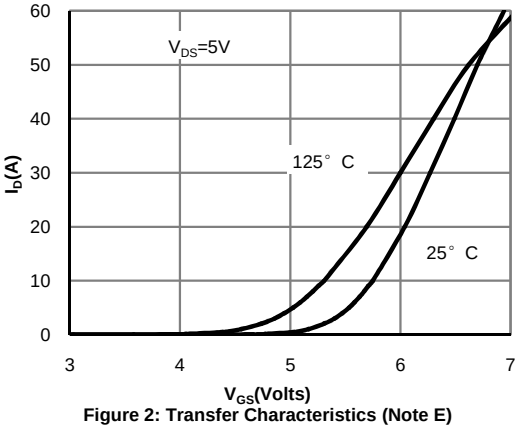


Figure 2: Transfer Characteristics (Note E)

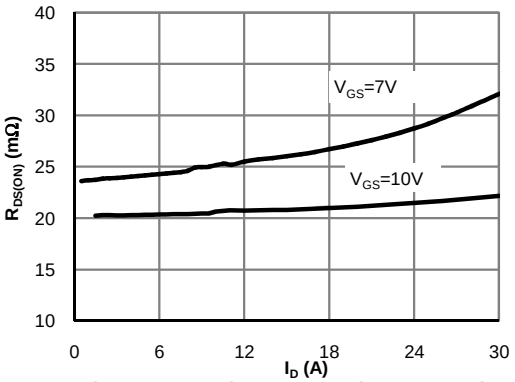


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

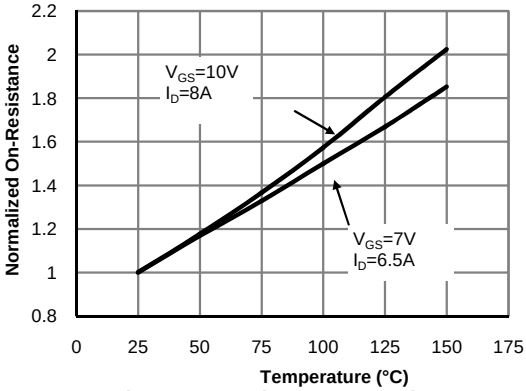


Figure 4: On-Resistance vs. Junction Temperature (Note E)

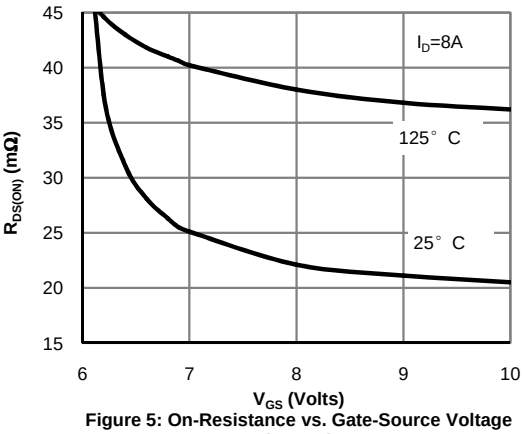


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

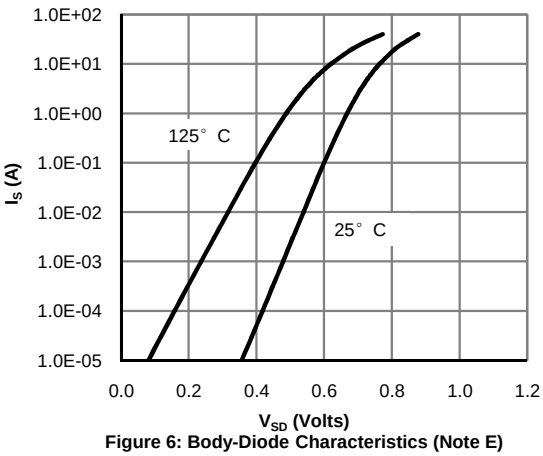


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

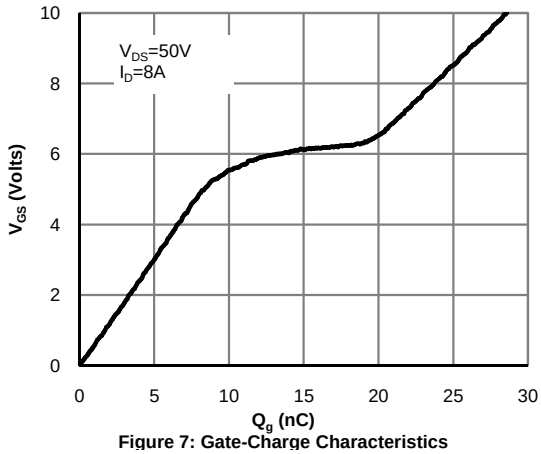


Figure 7: Gate-Charge Characteristics

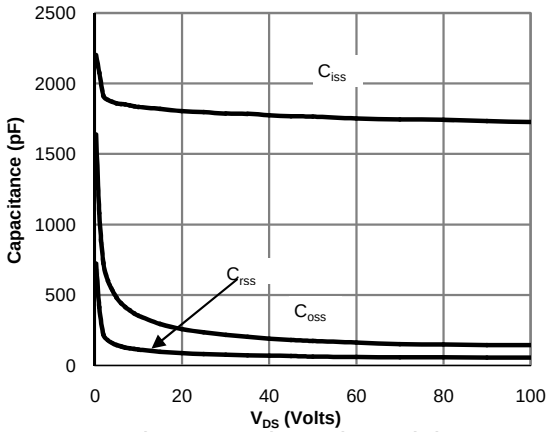


Figure 8: Capacitance Characteristics

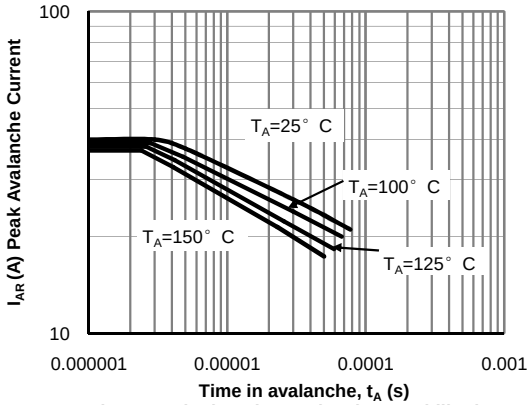


Figure 9: Single Pulse Avalanche capability (Note C)

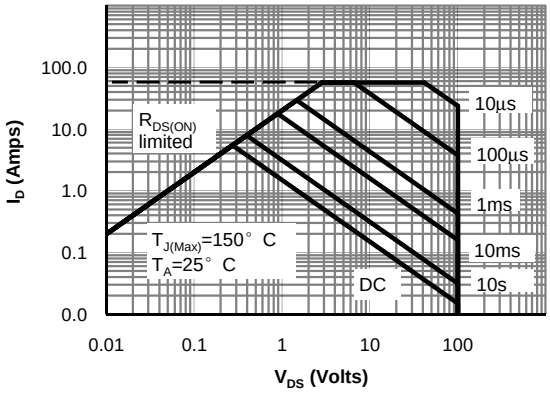


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

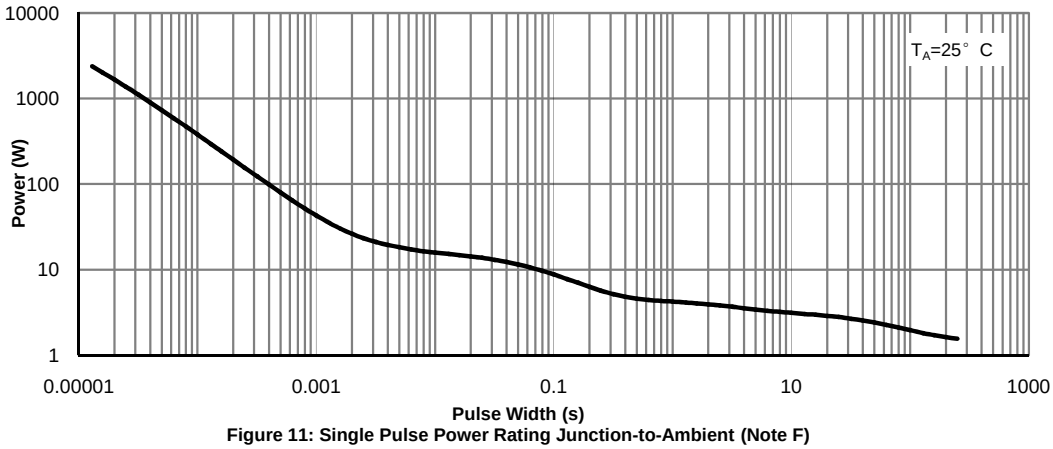


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

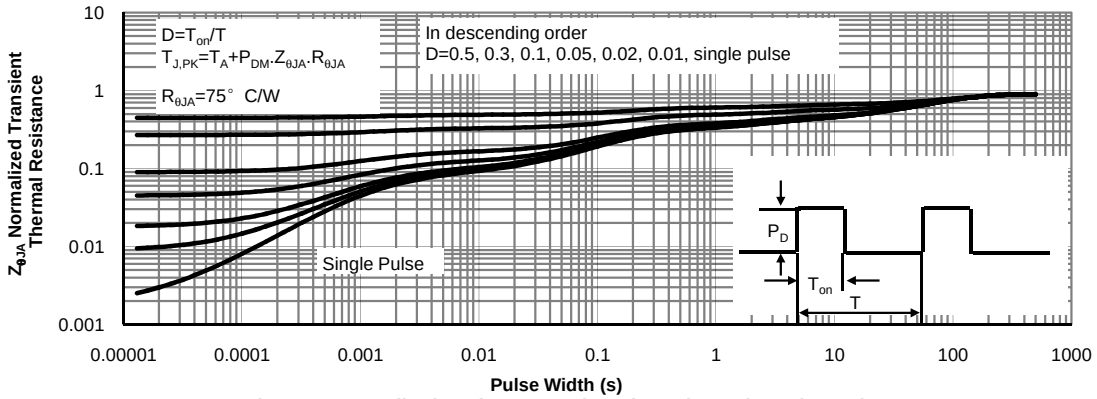


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

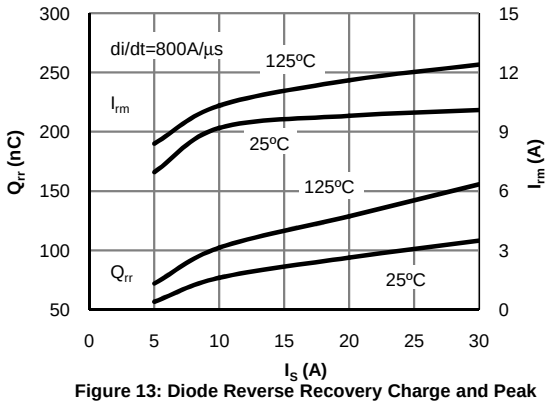


Figure 13: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

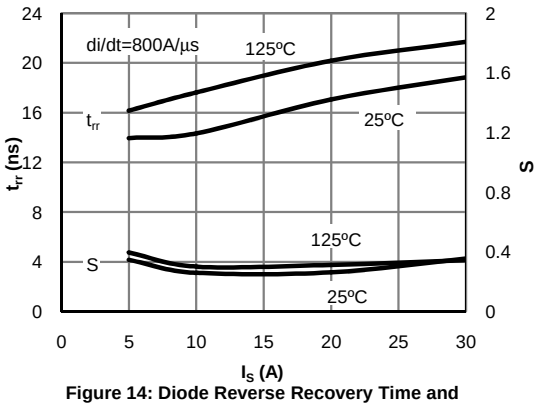


Figure 14: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

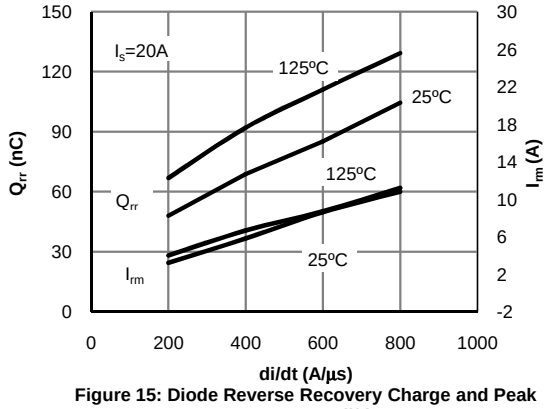


Figure 15: Diode Reverse Recovery Charge and Peak Current vs. di/dt

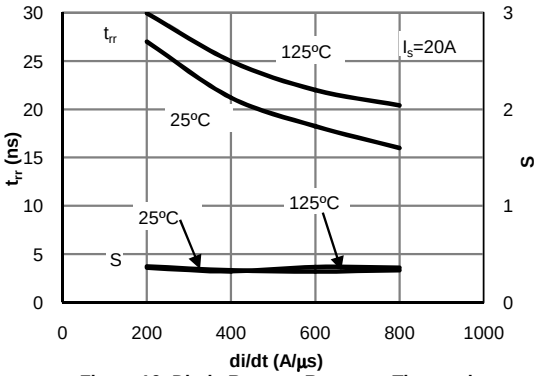
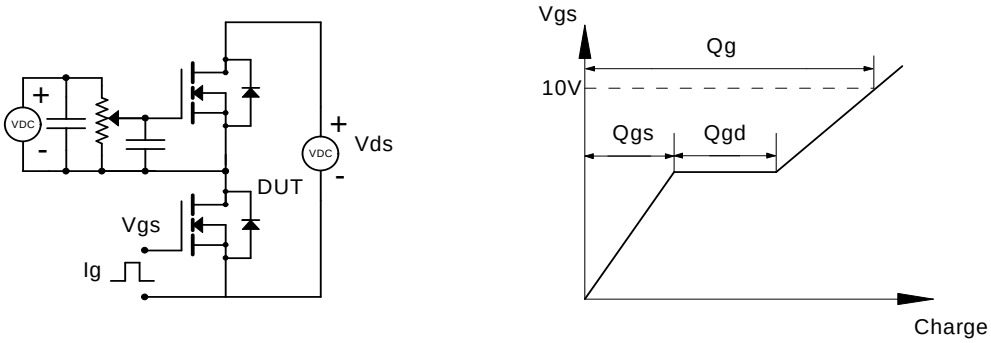
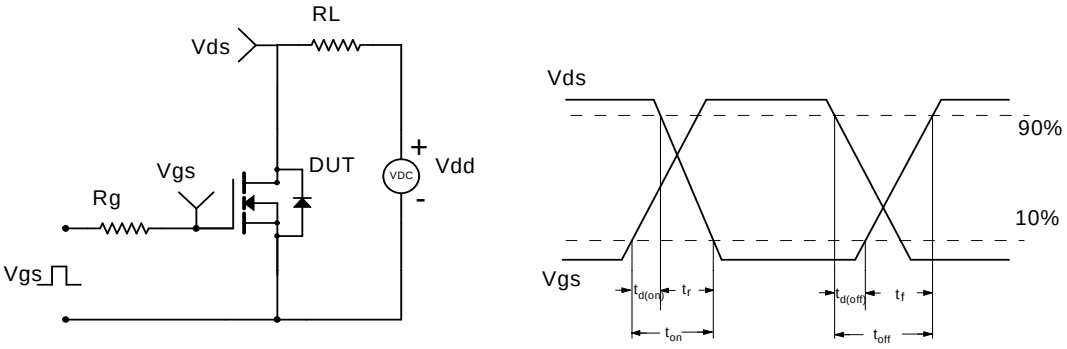


Figure 16: Diode Reverse Recovery Time and Softness Factor vs. di/dt

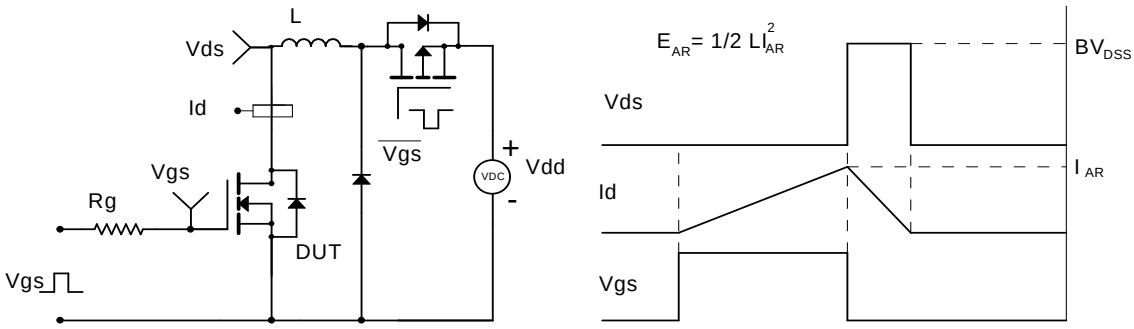
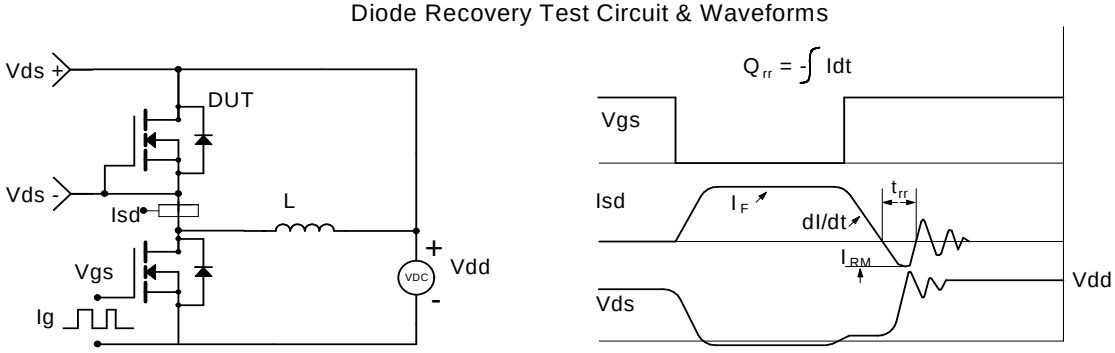
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms