ALPHA & OMEGA SEMICONDUCTOR

AON6444

60V N-Channel MOSFET

SDMOS™

General Description

The AON6444 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

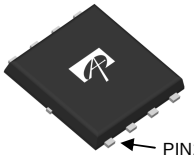
V_{DS}	60V
I_D (at V_{GS}=10V)	81A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 6.5mΩ
$R_{DS(ON)}$ (at V_{GS} = 4.5V)	< 8mΩ

100% UIS Tested
100% R_g Tested

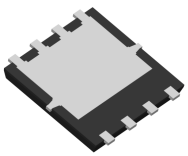
Green Product

DFN5X6

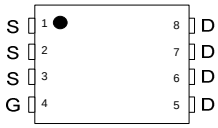
Top View

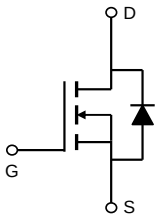


Bottom View



Top View





Absolute Maximum Ratings T_A=25°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	T_C=25°C	I_D	**81**	A
	T_C=100°C		**51**	
Pulsed Drain Current [C]		I_{DM}	**170**	
Continuous Drain Current	T_A=25°C	I_{DSM}	**14**	A
	T_A=70°C		**11**	
Avalanche Current [C]		I_{AR}	**58**	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	**168**	mJ
Power Dissipation [B]	T_C=25°C	P_D	**83**	W
	T_C=100°C		**33**	
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 150**	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	14	17	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		40	55	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	1	1.5	°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				100	µA
			T_J=55°C			500	
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	2.5	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		170			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A			5.4	6.5	mΩ
			T_J=125°C		9.6	11.5	
		V_{GS}=4.5V, I_D=20A			6.4	8	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					81	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=30V, f=1MHz		3800	4800	5800	pF
C_{oss}	Output Capacitance			330	470	610	pF
C_{rss}	Reverse Transfer Capacitance			110	190	270	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.5	1	1.5	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=30V, I_D=20A		64	80	96	nC
Q_g(4.5V)	Total Gate Charge			32	40	48	nC
Q_{gs}	Gate Source Charge			12	15	18	nC
Q_{gd}	Gate Drain Charge			8	14	20	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=30V, R_L=1.5Ω, R_{GEN}=3Ω			13.5		ns
t_r	Turn-On Rise Time				4.2		ns
$t_{D(off)}$	Turn-Off DelayTime				51		ns
t_f	Turn-Off Fall Time				7		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs		14	18	22	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs		43	54	65	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 Power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.

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 <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 $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.

G. 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

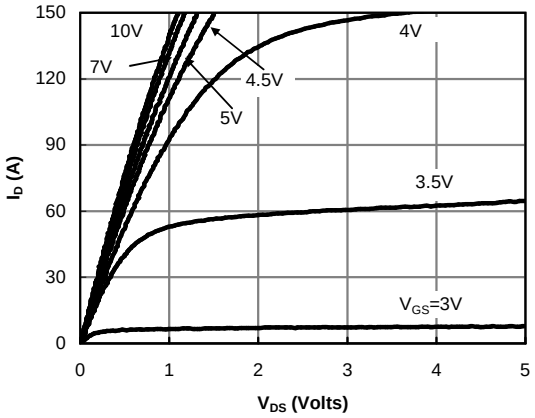


Fig 1: On-Region Characteristics (Note E)

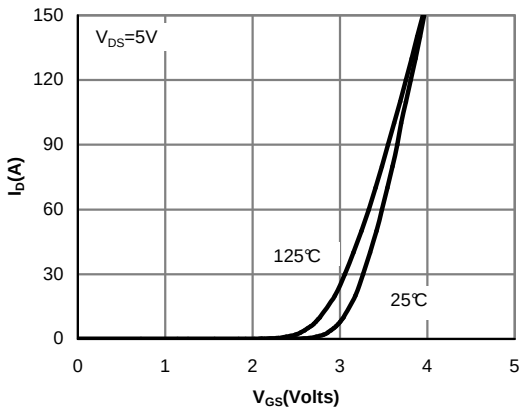


Figure 2: Transfer Characteristics (Note E)

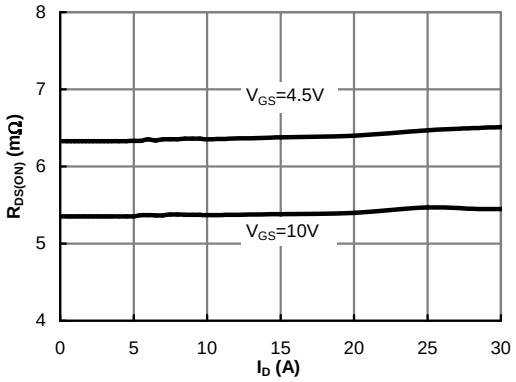


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

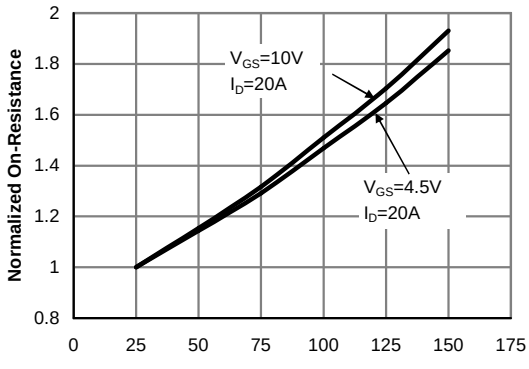


Figure 4: On-Resistance vs. Junction Temperature (Note E)

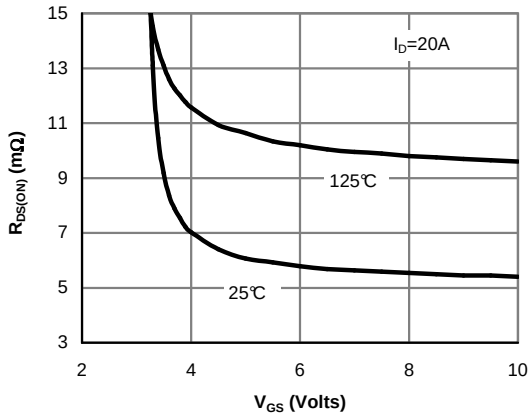


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

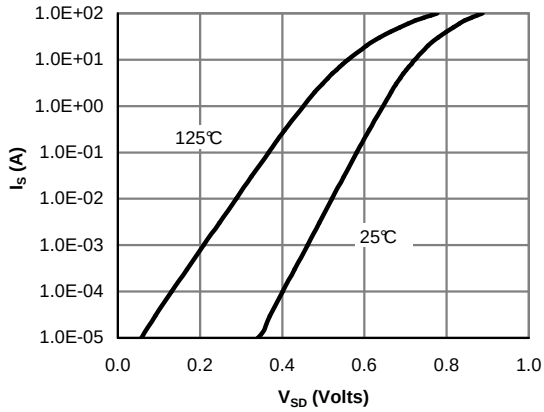


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

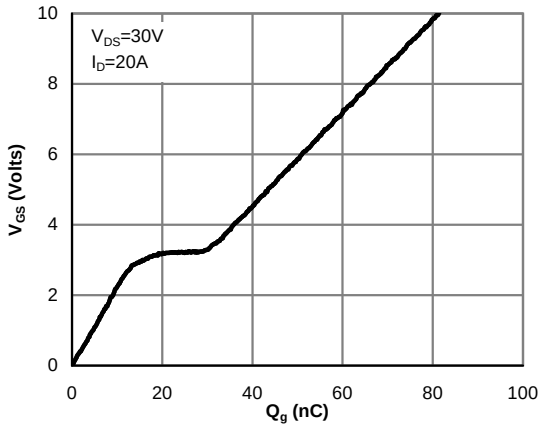


Figure 7: Gate-Charge Characteristics

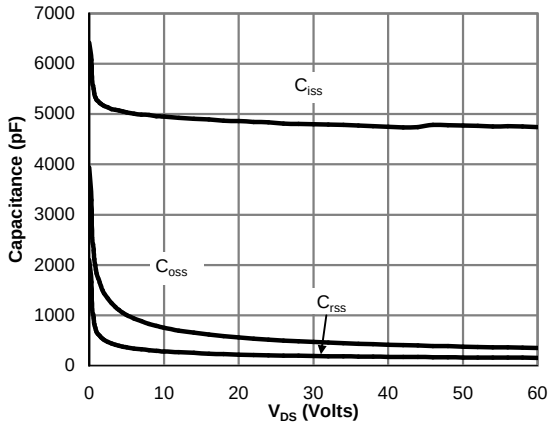


Figure 8: Capacitance Characteristics

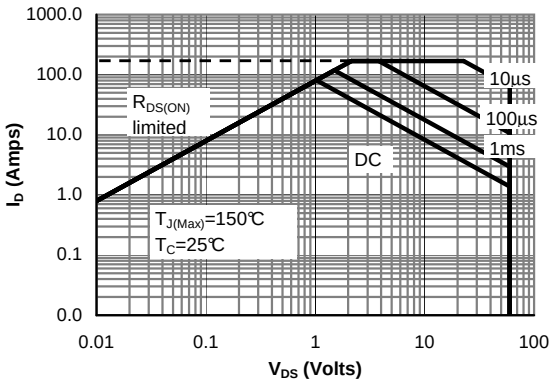


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

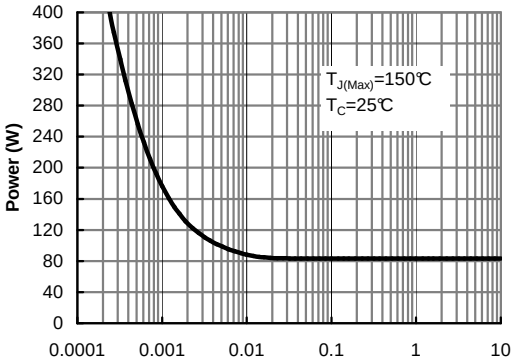


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

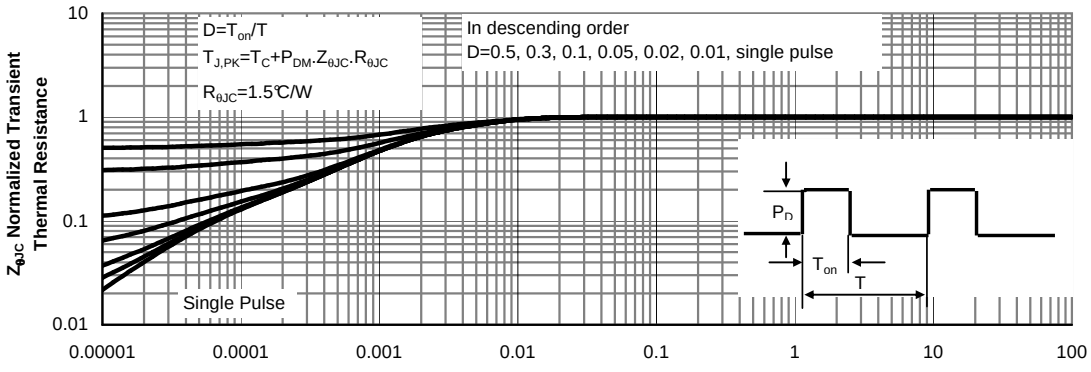


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

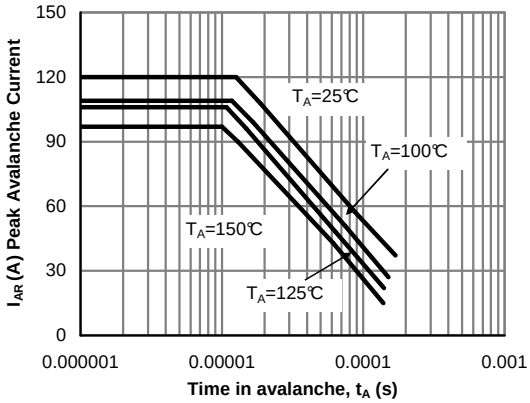


Figure 12: Single Pulse Avalanche capability (Note C)

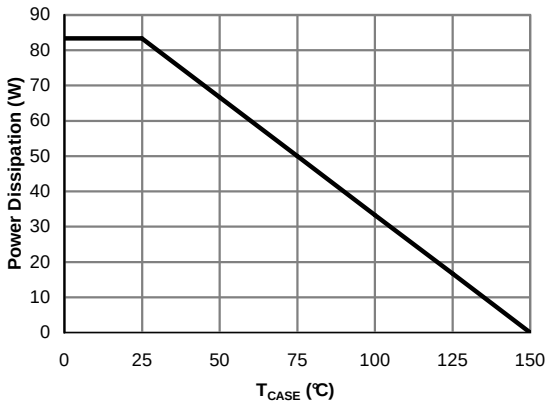


Figure 13: Power De-rating (Note F)

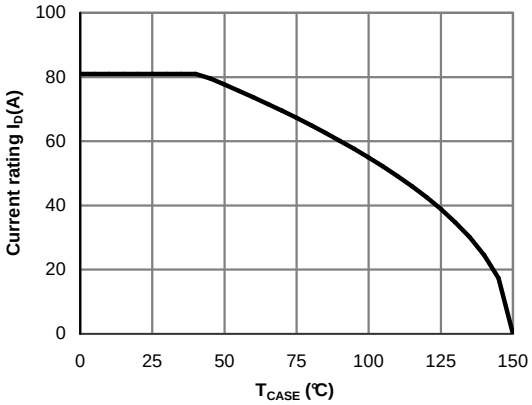


Figure 14: Current De-rating (Note F)

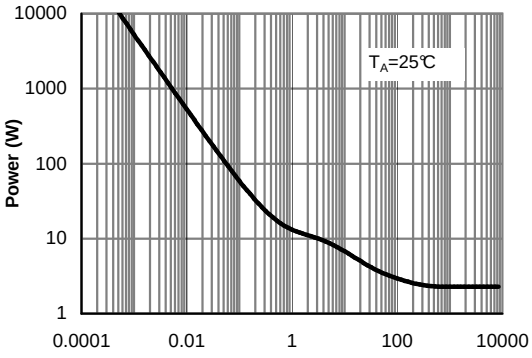


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

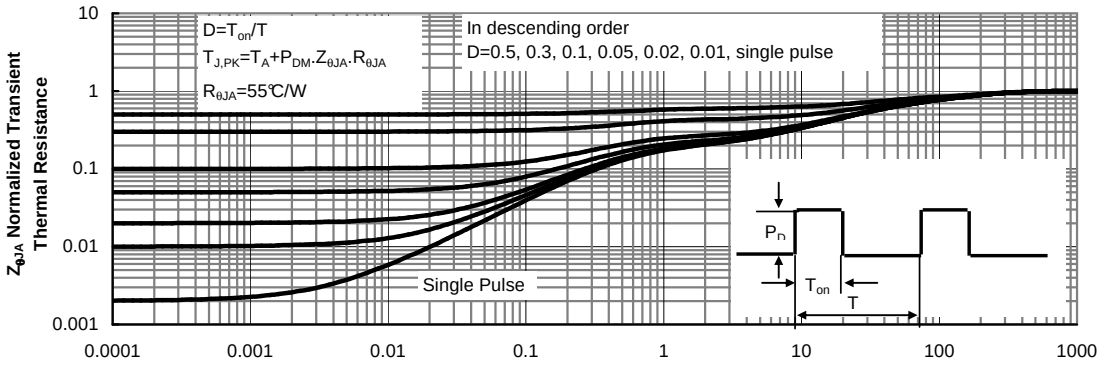


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

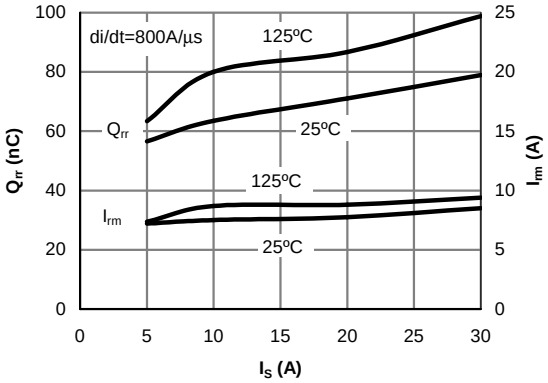


Figure 17: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

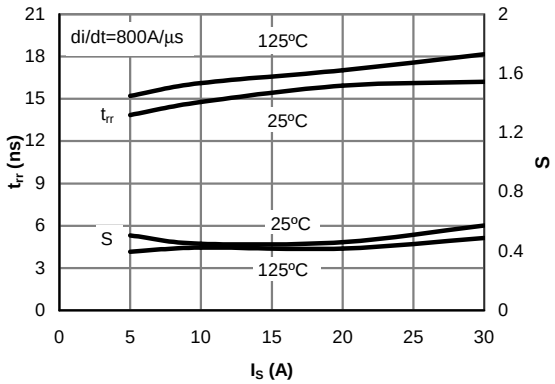


Figure 18: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

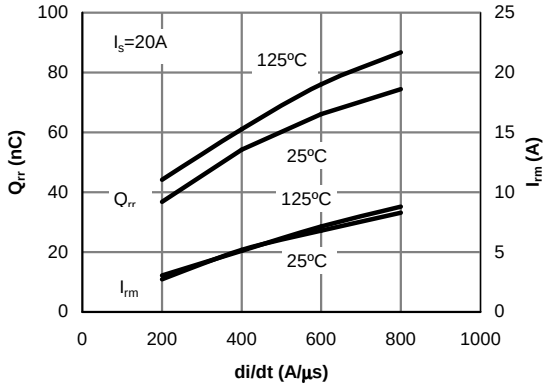


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. di/dt

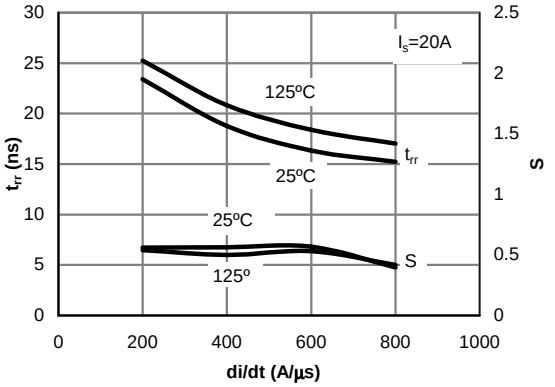
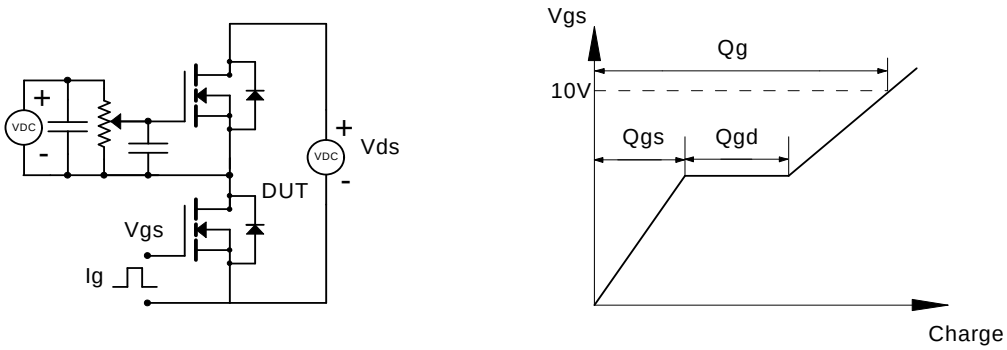
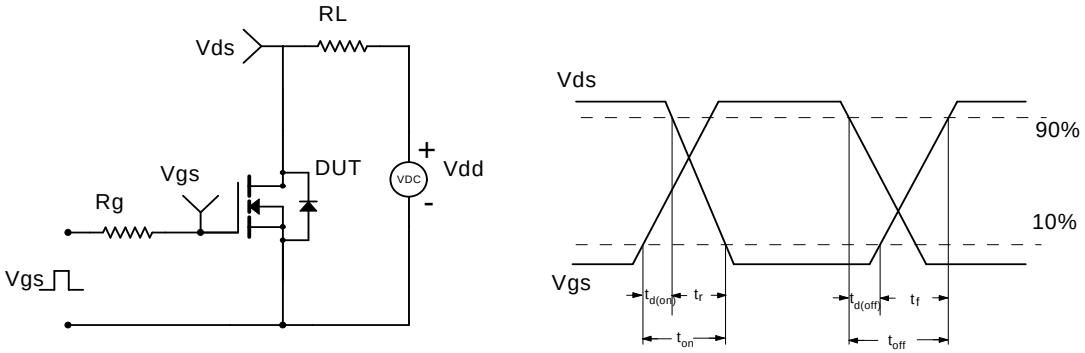


Figure 20: Diode Reverse Recovery Time and Softness Factor vs. di/dt

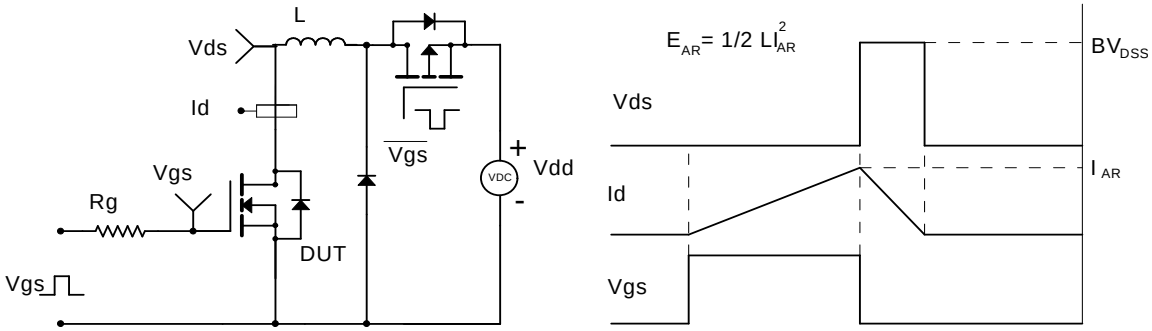
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

