



ALPHA & OMEGA
SEMICONDUCTOR

AO4706

N-Channel Enhancement Mode Field Effect Transistor

SRFET™



General Description

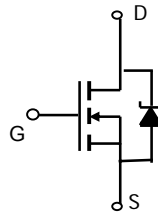
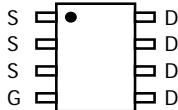
SRFET™ The AO4706/L uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$, and low gate charge. This device is suitable for use as a low side FET in SMPS, load switching and general purpose applications. *AO4706 and AO4706L are electrically identical.*

- RoHS Compliant
- AO4706L is Halogen Free

Features

- $V_{DS} (V) = 30V$
- $I_D = 16.5A (V_{GS} = 10V)$
- $R_{DS(ON)} < 6.8m\Omega (V_{GS} = 10V)$
- $R_{DS(ON)} < 8.2m\Omega (V_{GS} = 4.5V)$

UIS TESTED!
Rg, Ciss, Coss, Crss Tested



SRFET™
Soft Recovery MOSFET:
Integrated Schottky Diode

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ^{AF}	I_{DSM}	$T_A=25^\circ C$	16.5
		$T_A=70^\circ C$	13.2
Pulsed Drain Current ^B	I_{DM}	100	A
Avalanche Current ^B	I_{AR}	30	A
Repetitive avalanche energy $L=0.3mH$ ^B	E_{AR}	135	mJ
Power Dissipation	P_{DSM}	$T_A=25^\circ C$	3.1
		$T_A=70^\circ C$	2.0
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10s$	31	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	59	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	16	24	$^\circ C/W$

Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=1\text{mA}, V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$		0.02 10	0.1 20	mA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 12\text{V}$			0.1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.5	1.85	2.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	100			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=16.5\text{A}$ $T_J=125^\circ\text{C}$		5.6 8.4	6.8 10.5	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=15\text{A}$		6.8	8.2	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}, I_D=16.5\text{A}$		112		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.37	0.5	V
I_S	Maximum Body-Diode + Schottky Continuous Current				5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		4000	5000	pF
C_{oss}	Output Capacitance		520		pF	
C_{rss}	Reverse Transfer Capacitance		217		pF	
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		0.6	0.9	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=17\text{A}$		59	77	nC
$Q_g(4.5\text{V})$	Total Gate Charge		27	35	nC	
Q_{gs}	Gate Source Charge		12		nC	
Q_{gd}	Gate Drain Charge		11		nC	
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.9\Omega,$ $R_{GEN}=3\Omega$		9		ns
t_r	Turn-On Rise Time		9		ns	
$t_{D(off)}$	Turn-Off Delay Time		37		ns	
t_f	Turn-Off Fall Time		8		ns	
t_{rr}	Body Diode Reverse Recovery Time	$I_F=16.5\text{A}, dI/dt=300\text{A}/\mu\text{s}$		17	20	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=16.5\text{A}, dI/dt=300\text{A}/\mu\text{s}$		21		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using <300 us pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

F: The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

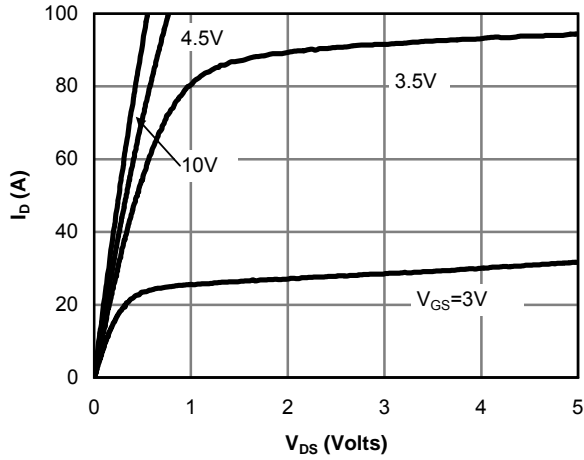


Figure 1: On-Region Characteristics

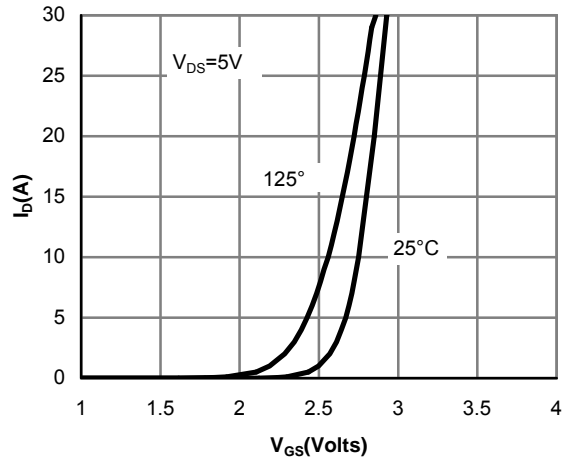


Figure 2: Transfer Characteristics

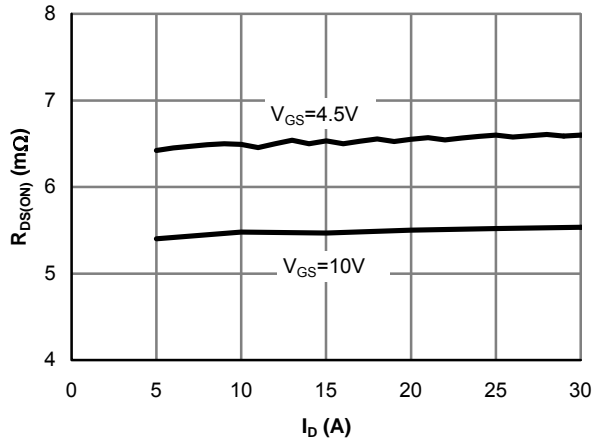


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

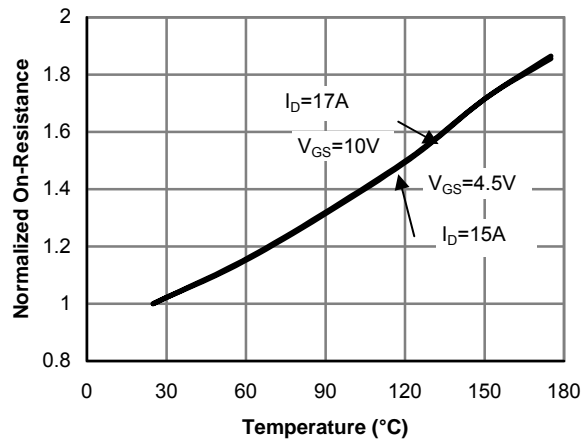


Figure 4: On-Resistance vs. Junction Temperature

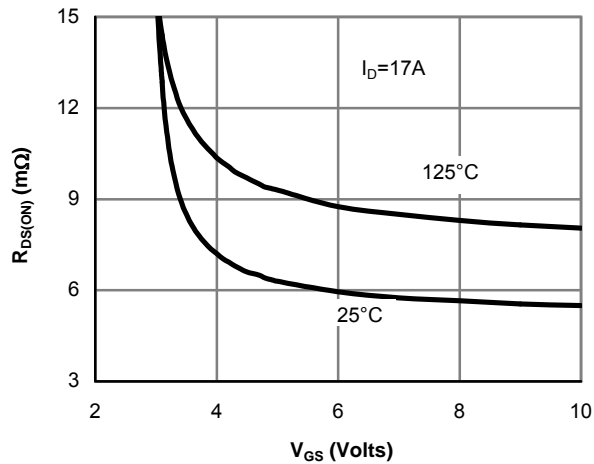


Figure 5: On-Resistance vs. Gate-Source Voltage

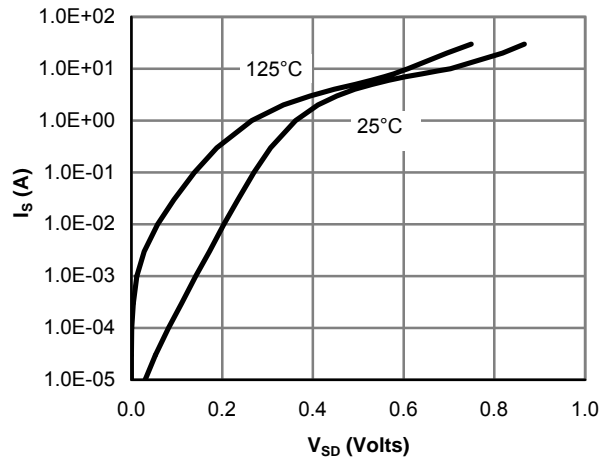


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

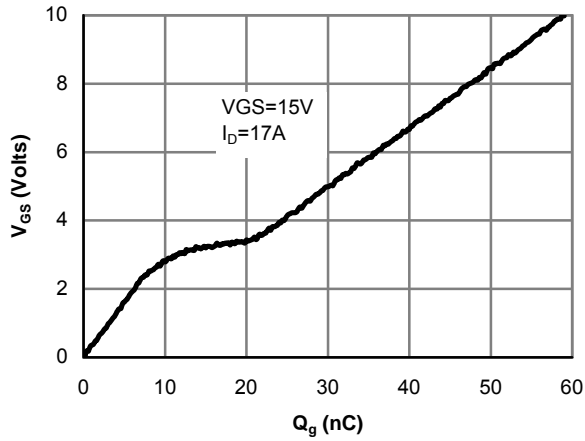


Figure 7: Gate-Charge Characteristics

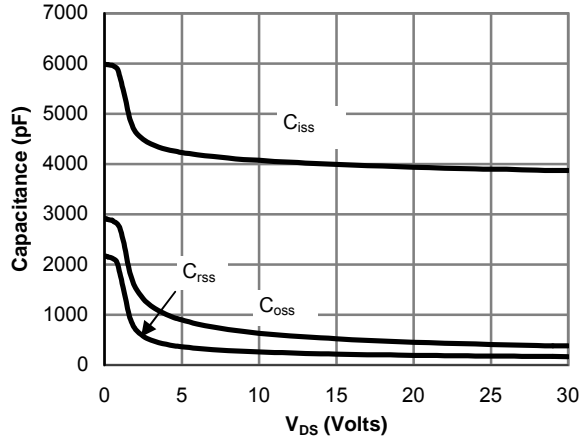


Figure 8: Capacitance Characteristics

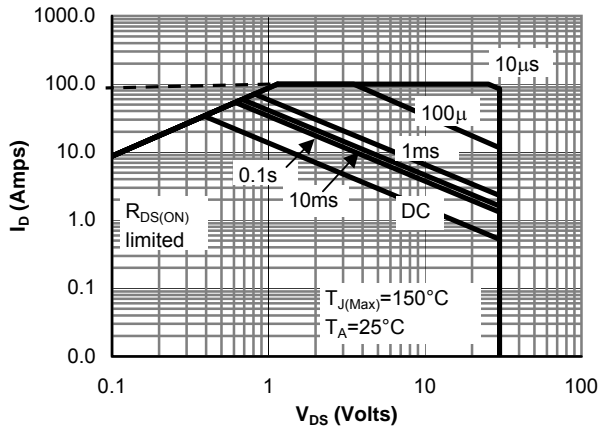


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

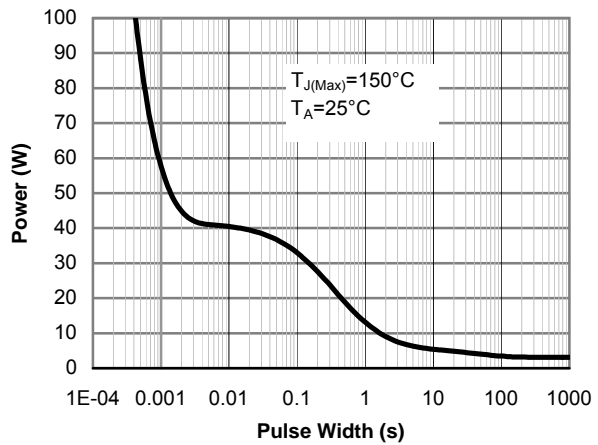


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

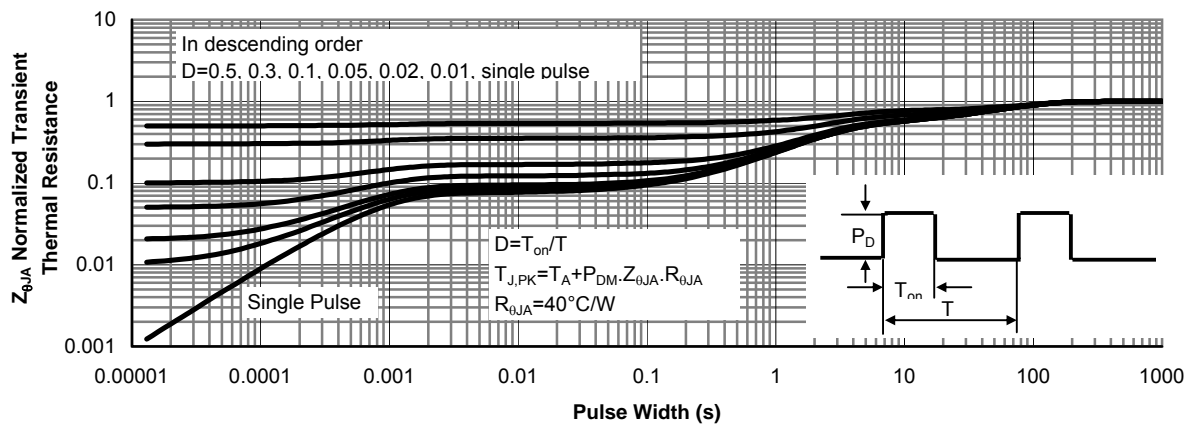


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

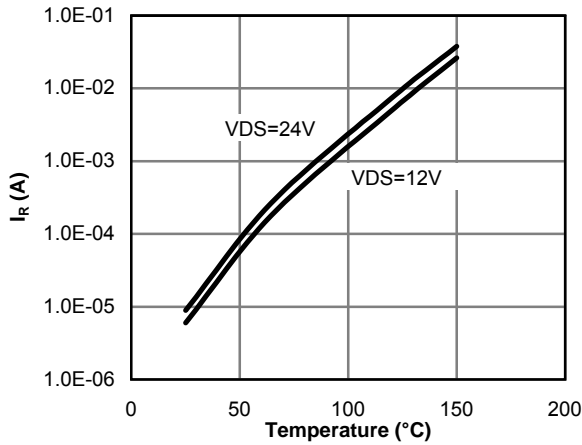


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

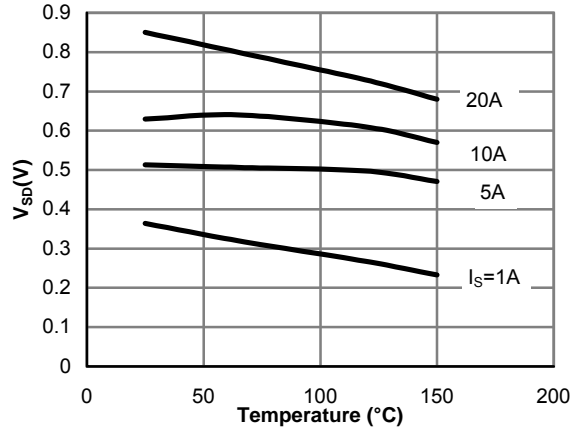


Figure 13: Diode Forward voltage vs. Junction Temperature

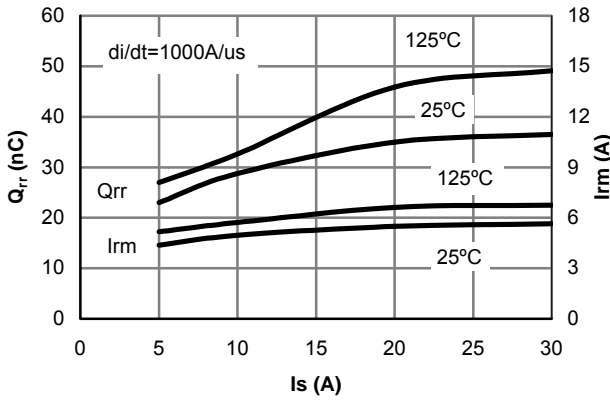


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

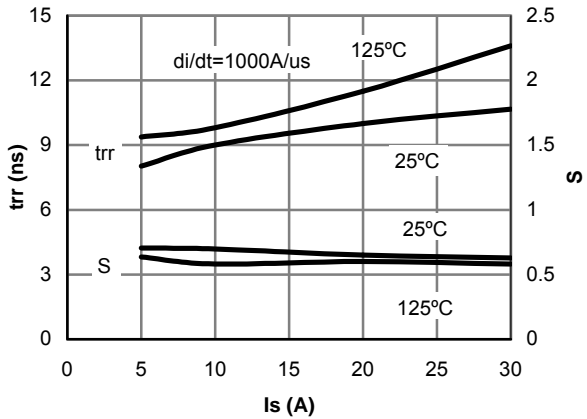


Figure 15: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

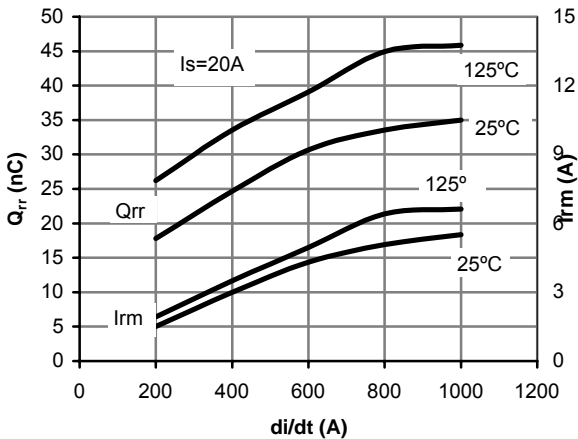


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

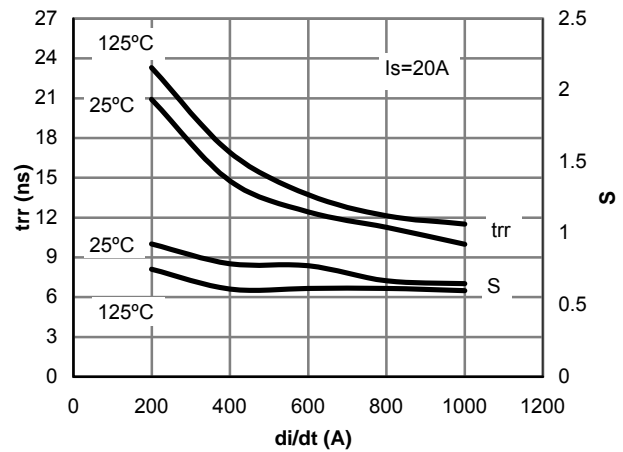
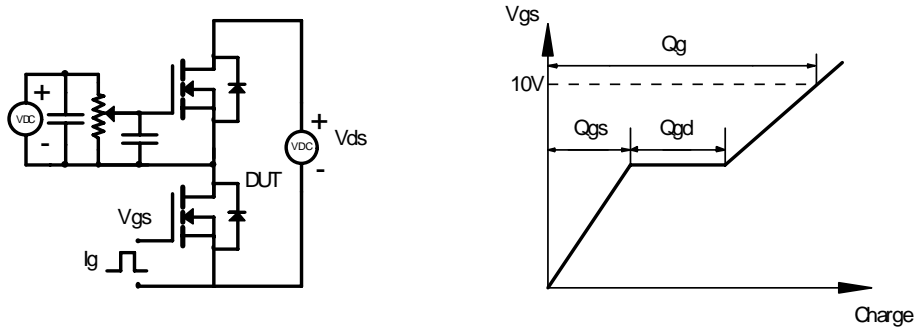
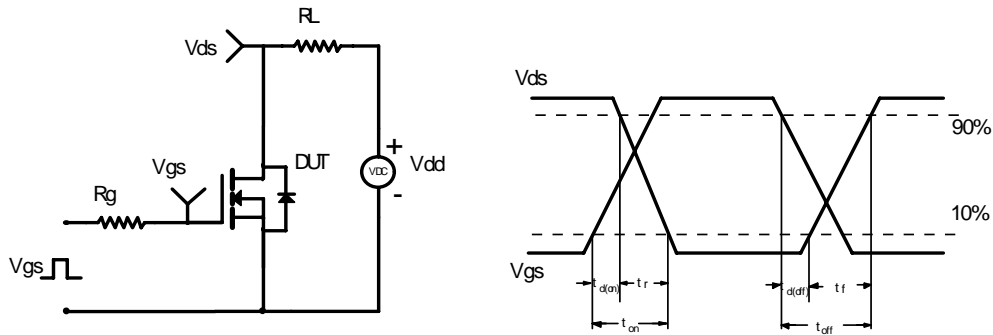


Figure 17: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

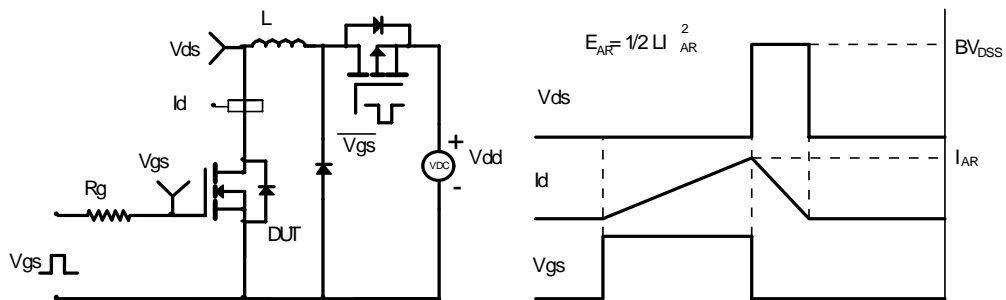
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

