



ALPHA & OMEGA
SEMICONDUCTOR

AO4706

30V N-Channel MOSFET

SRFET™

General Description

SRFET™ The AO4706 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.

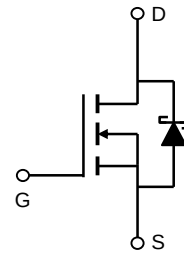
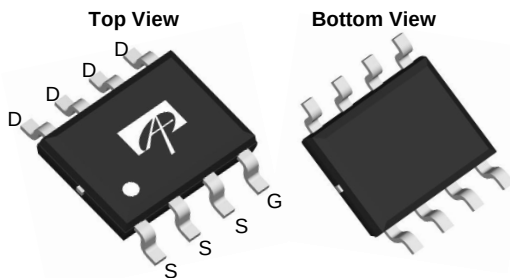
Product Summary

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

100% UIS Tested
 100% Rg Tested



SOIC-8



SRFET™
 Soft Recovery MOSFET:
 Integrated Schottky Diode

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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}	$T_A=25^\circ\text{C}$	16.5	A
	$T_A=70^\circ\text{C}$	13.2	
Pulsed Drain Current ^B	I_{DM}	100	A
Avalanche Current ^B	I_{AR}	30	A
Repetitive avalanche energy $L=0.3\text{mH}$ ^B	E_{AR}	135	mJ
Power Dissipation	$T_A=25^\circ\text{C}$	3.1	W
	$T_A=70^\circ\text{C}$	2.0	
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	$t \leq 10\text{s}$	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		59	75	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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 =1mA, V _{GS} =0V	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =30V, V _{GS} =0V T _J =125°C		0.02 10	0.1 20	mA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±12V			0.1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1.5	1.85	2.4	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	100			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =16.5A T _J =125°C		5.6 8.4	6.8 10.5	mΩ
		V _{GS} =4.5V, I _D =15A		6.8	8.2	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =16.5A		112		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.37	0.5	V
I _S	Maximum Body-Diode + Schottky Continuous Current				5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		4000	5000	pF
C _{oss}	Output Capacitance			520		pF
C _{rss}	Reverse Transfer Capacitance			217		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.6	0.9	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =17A		59	77	nC
Q _g (4.5V)	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 DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =0.9Ω, R _{GEN} =3Ω		9		ns
t _r	Turn-On Rise Time			9		ns
t _{D(off)}	Turn-Off DelayTime			37		ns
t _f	Turn-Off Fall Time			8		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =16.5A, dI/dt=300A/μs		17	20	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =16.5A, dI/dt=300A/μs		21		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 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°C.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} 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 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.

F: The current rating is based on the t ≤ 10s thermal resistance rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

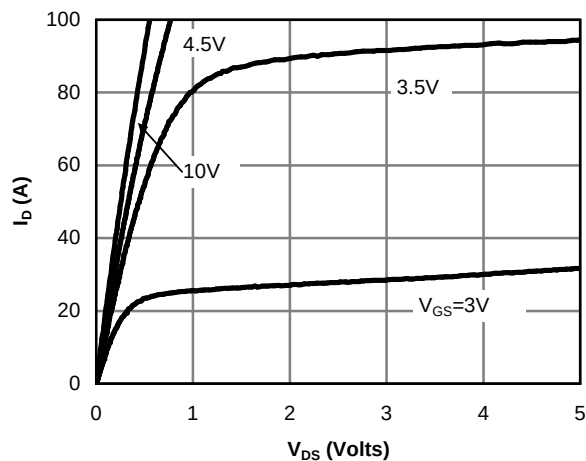


Figure 1: On-Region Characteristics

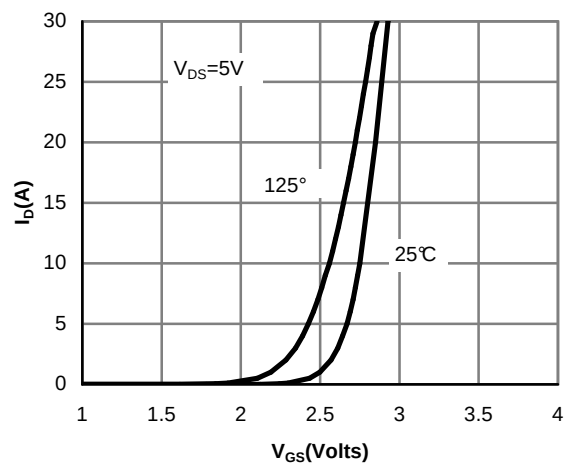


Figure 2: Transfer Characteristics

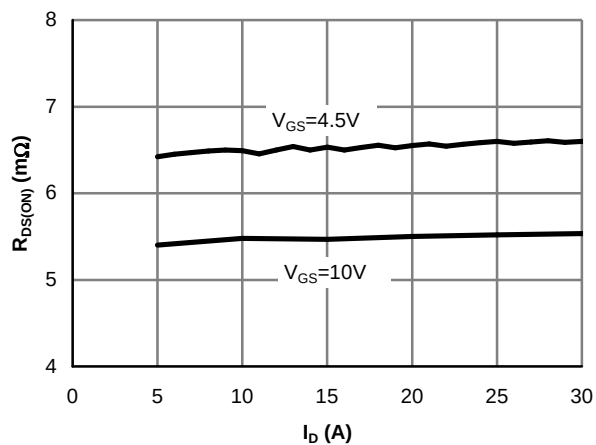


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

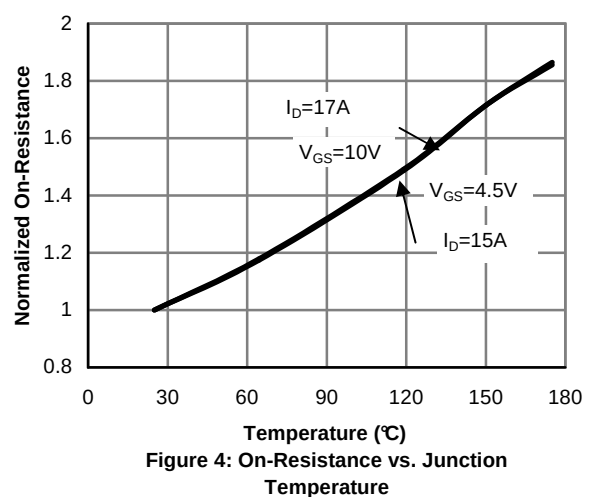


Figure 4: On-Resistance vs. Junction Temperature

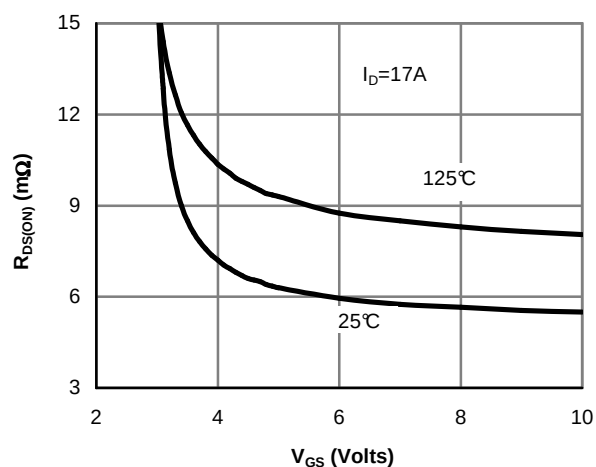


Figure 5: On-Resistance vs. Gate-Source Voltage

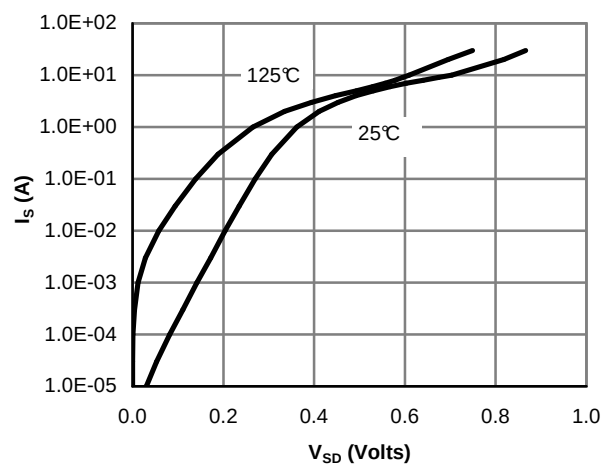


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

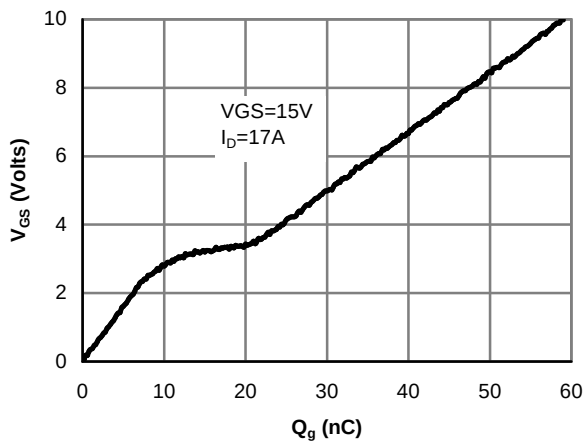


Figure 7: Gate-Charge Characteristics

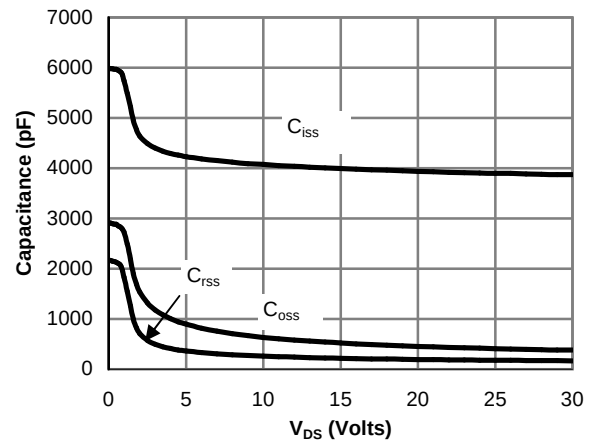


Figure 8: Capacitance Characteristics

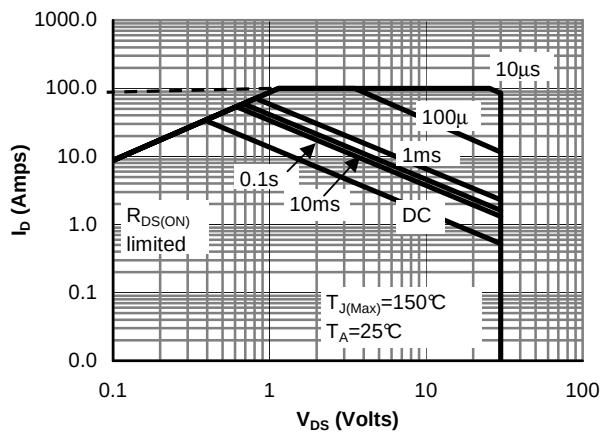


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

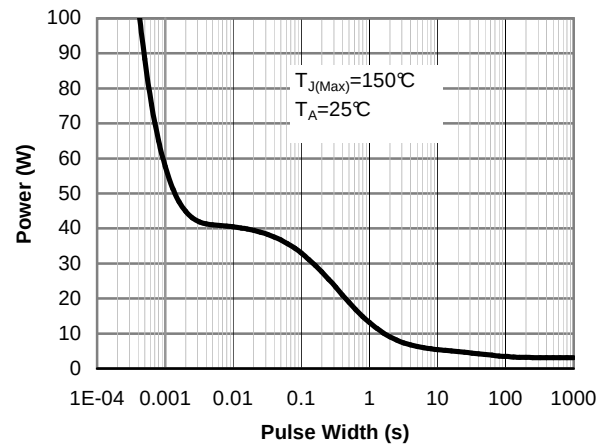


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

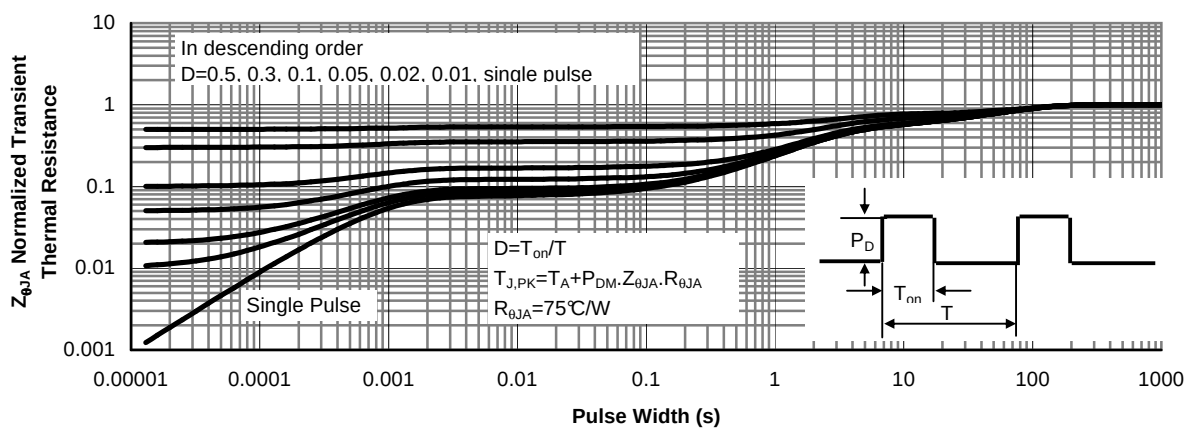


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

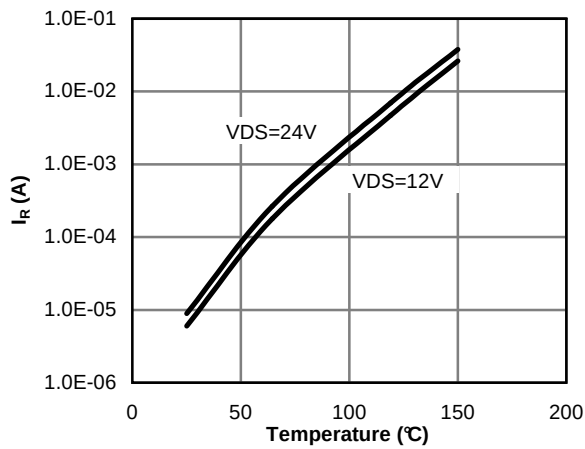


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

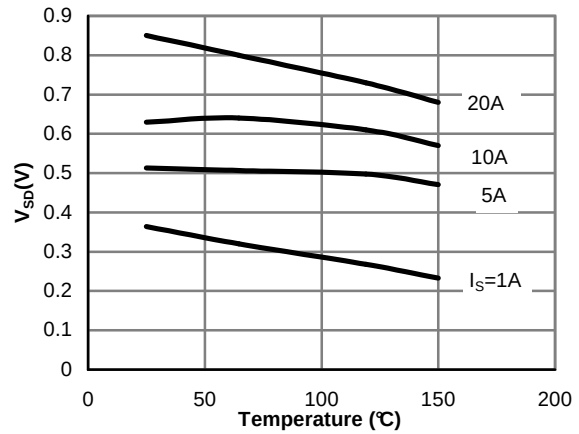


Figure 13: Diode Forward voltage vs. Junction Temperature

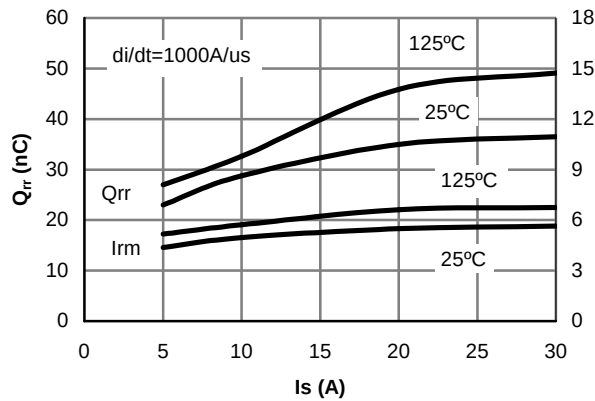


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

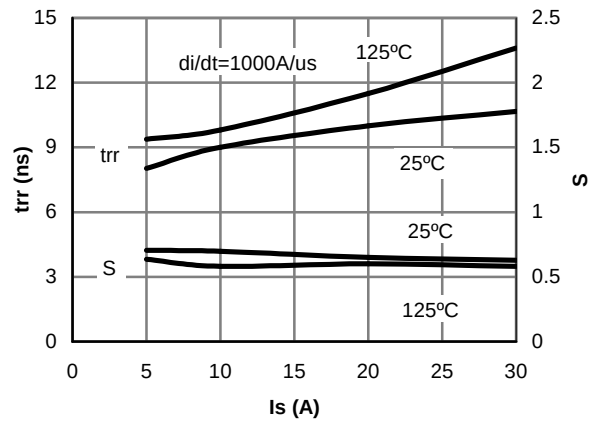


Figure 15: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

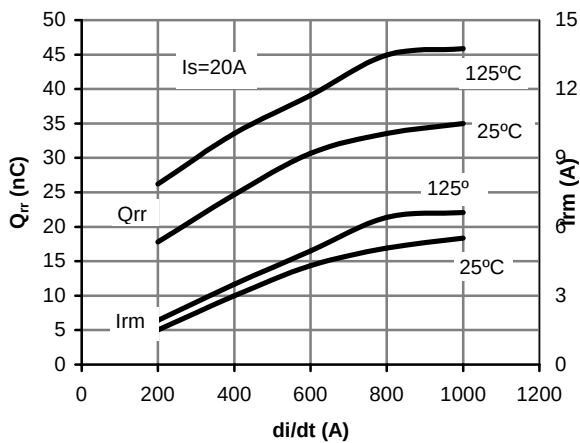


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

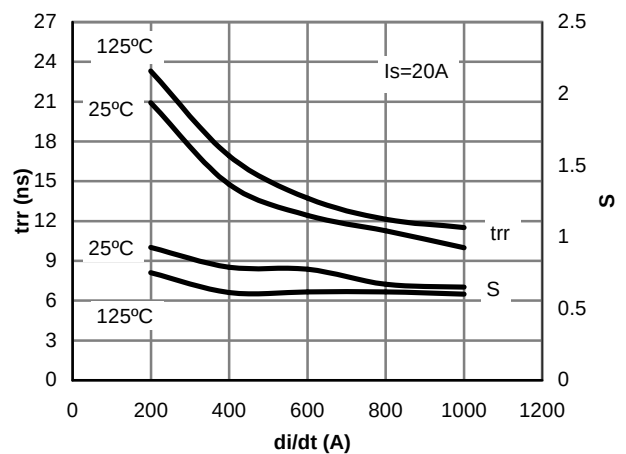
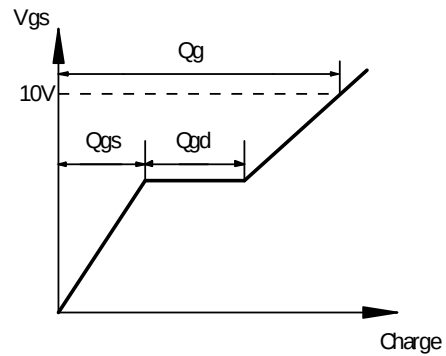
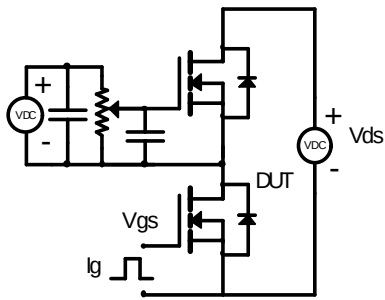
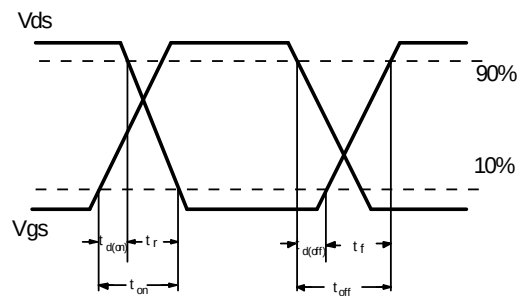
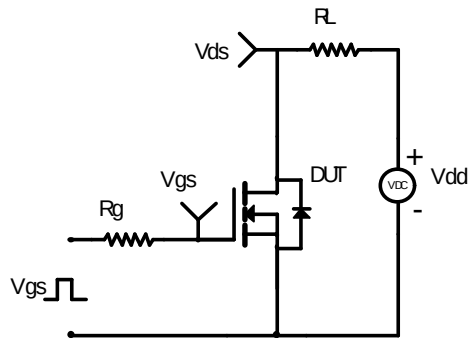


Figure 17: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

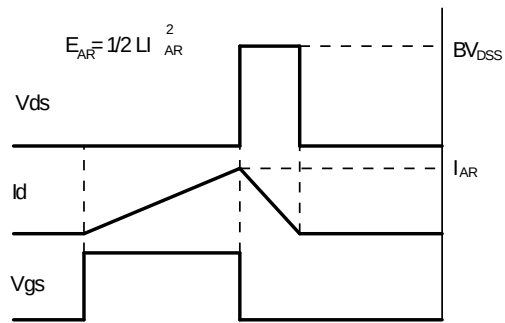
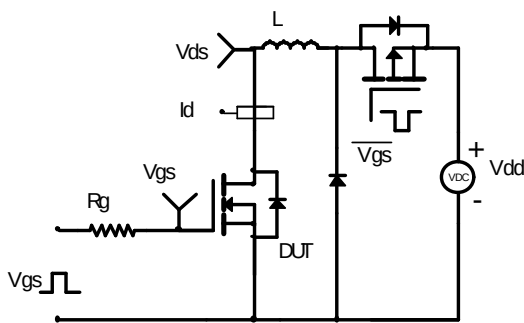
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

