ALPHA & OMEGA
SEMICONDUCTOR

AO4728
30V N-Channel MOSFET
SRFET ™

General Description

SRFET^{TM} AO4728 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$, and low gate charge. This device is ideally suited for use as a low side switch in CPU core power conversion.
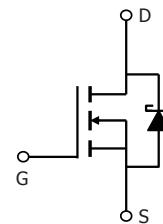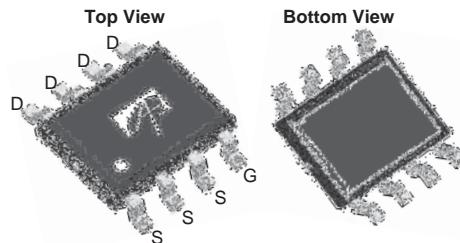
Product Summary

V_{DS} (V) = 30V

I_D = 20A   (V_{GS} = 10V)

$R_{DS(ON)}$ < 4.3mΩ   (V_{GS} = 10V)

$R_{DS(ON)}$ < 6mΩ   (V_{GS} = 4.5V)

100% UIS Tested
100% Rg Tested

Green Product

SOIC-8

Top View   **Bottom View**

D
D
D
D
G
S
S
S

SRFET^{TM}
Soft **R**ecovery MOS**FET**:
Integrated Schottky Diode

D

G

S

Absolute Maximum Ratings T$_A$=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T$_C$=25℃	I_D	20	A
	T$_C$=70℃		17	
Pulsed Drain Current ^{C}		I_{DM}	146	
Avalanche Current ^{C}		I_{AR}	40	A
Repetitive avalanche energy L=0.1mH ^{C}		E_{AR}	80	mJ
Power Dissipation ^{B}	T$_C$=25℃	P_D	3.1	W
	T$_C$=70℃		2	
Junction and Storage Temperature Range		T$_J$, T$_{STG}$	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^{A}	t ≤ 10s	$R_{θJA}$	31	40	℃/W
Maximum Junction-to-Ambient $^{A D}$	Steady-State		59	75	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{θJL}$	16	24	℃/W

Electrical Characteristics (T$_J$=25℃ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV$_{DSS}$	Drain-Source Breakdown Voltage	I$_D$=250µA, V$_{GS}$=0V		30			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=30V, V$_{GS}$=0V				0.1	mA
			T$_J$=125℃			20	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$=0V, V$_{GS}$= ±20V				0.1	µA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$ I$_D$=250µA		1.2	1.8	2.2	V
I$_{D(ON)}$	On state drain current	V$_{GS}$=10V, V$_{DS}$=5V		146			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=20A			3.6	4.3	mΩ
			T$_J$=125℃		5.5	6.6	
		V$_{GS}$=4.5V, I$_D$=18A			4.8	6	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=20A			87		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A,V$_{GS}$=0V			0.4	0.7	V
I$_S$	Maximum Body-Diode Continuous Current					6	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=15V, f=1MHz		2975	3719	4463	pF
C$_{oss}$	Output Capacitance			485	693	900	pF
C$_{rss}$	Reverse Transfer Capacitance			204	340	476	pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz		0.28	0.56	0.84	Ω
SWITCHING PARAMETERS							
Q$_g$(10V)	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=15V, I$_D$=20A		48	60	72	nC
Q$_g$(4.5V)	Total Gate Charge			20	25	30	nC
Q$_{gs}$	Gate Source Charge			12	15	18	nC
Q$_{gd}$	Gate Drain Charge			6	10	14	nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=15V, R$_L$=0.75Ω, R$_{GEN}$=3Ω			9.2		ns
t$_r$	Turn-On Rise Time				10.7		ns
t$_{D(off)}$	Turn-Off DelayTime				40		ns
t$_f$	Turn-Off Fall Time				12.5		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=20A, dI/dt=500A/µs		10	13	16	ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=20A, dI/dt=500A/µs		21	26.5	32	nC

A. The value of R$_{θJA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T$_A$ =25℃. 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℃, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T$_{J(MAX)}$=150℃. Ratings are based on low frequency and duty cycles to keep initialT$_J$=25℃.

D. The R$_{θJA}$ is the sum of the thermal impedence from junction to lead R$_{θJL}$ 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 impedance 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℃. The SOA curve provides a single pulse ratin g.

Rev1: Nov. 2010
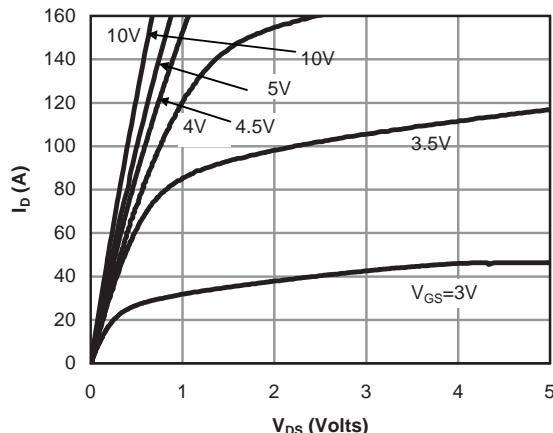
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

Fig 1: On-Region Characteristics (Note E)
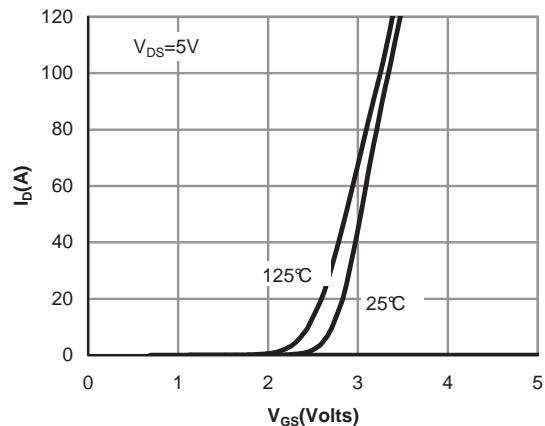
**Figure 2: Transfer Characteristics (Note E)**
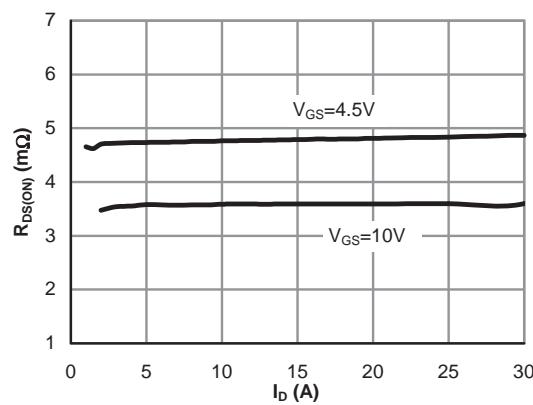
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**
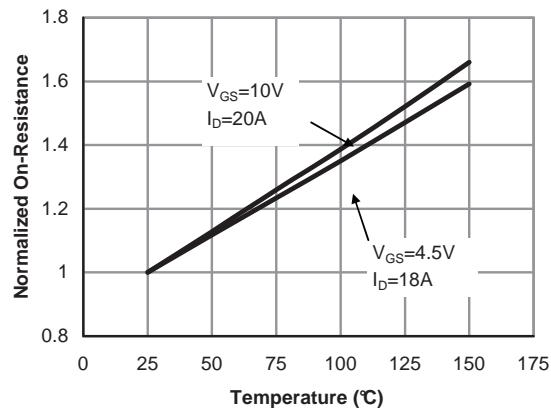
**Figure 4: On-Resistance vs. Junction Temperature (Note E)**
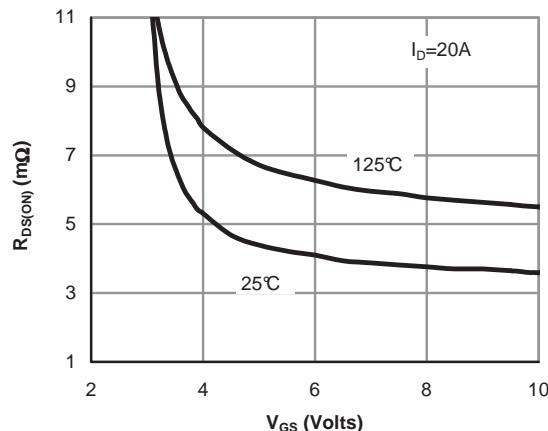
**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**
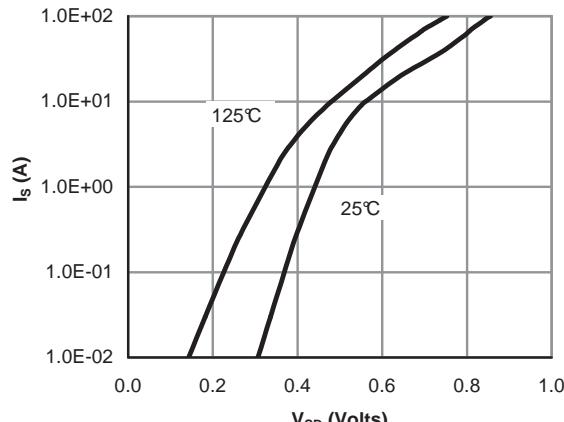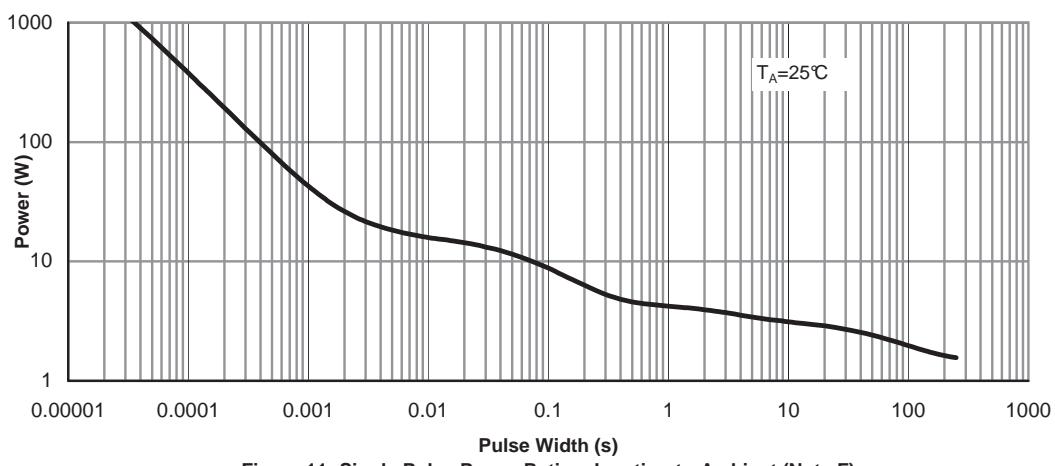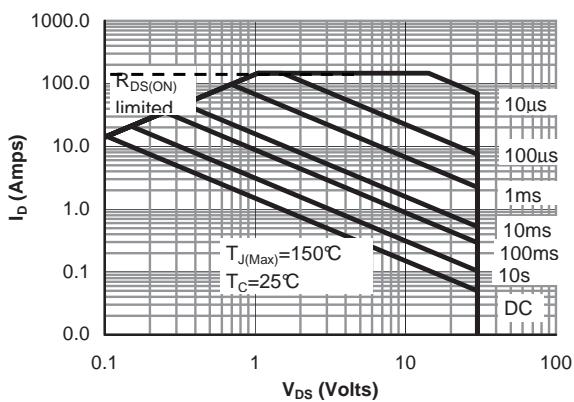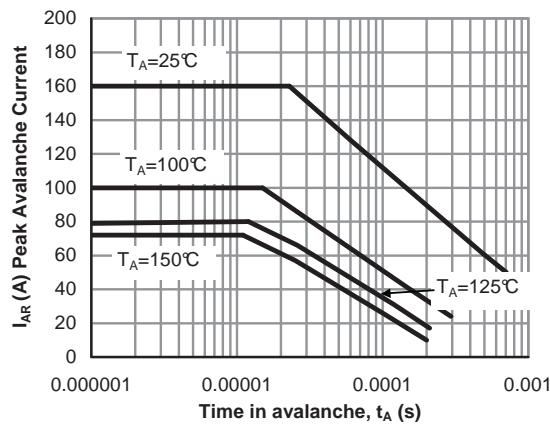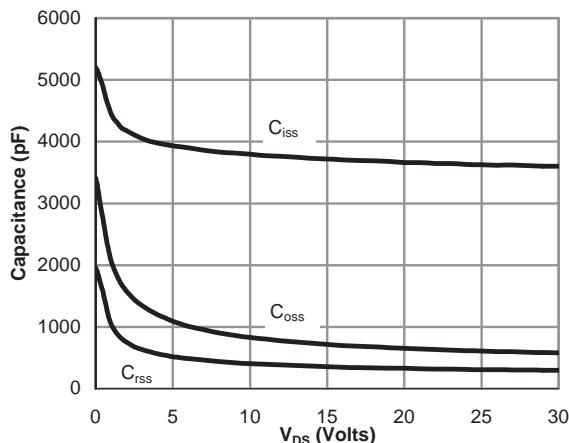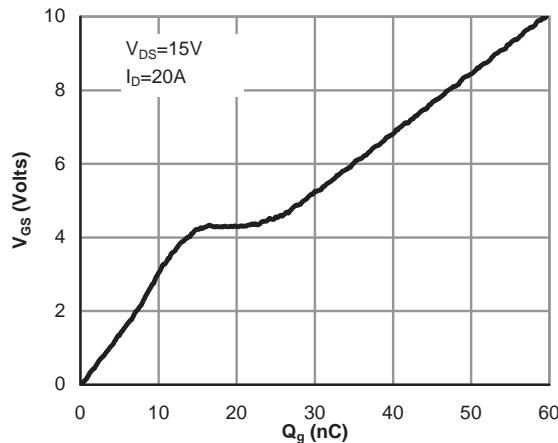
Figure 6: Body-Diode Characteristics (Note E)

## 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)
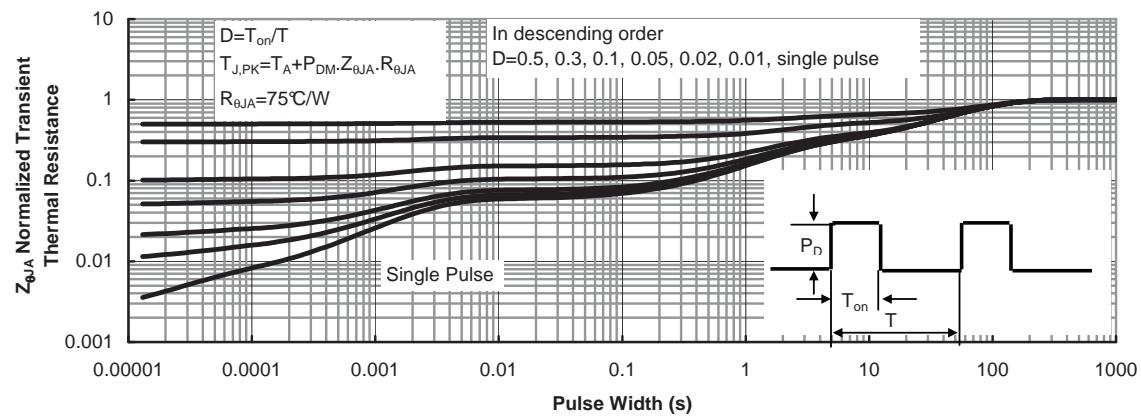
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)
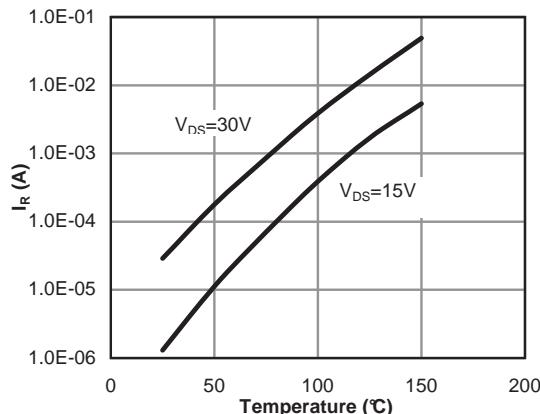
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 13: Diode Reverse Leakage Current vs. Junction Temperature
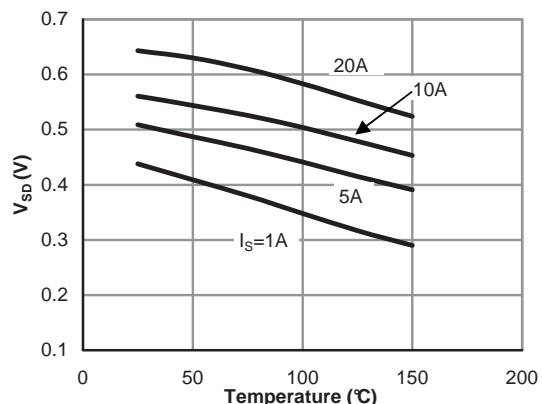
Figure 14: Diode Forward voltage vs. Junction Temperature
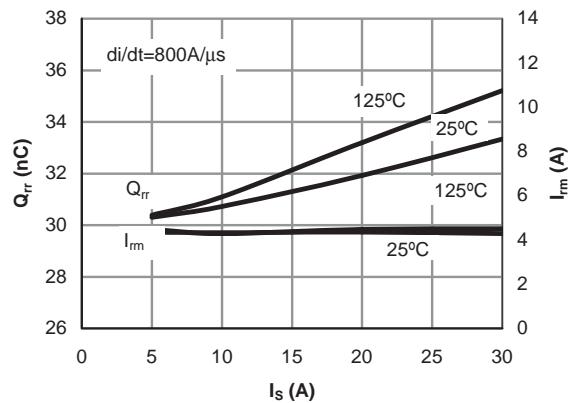
Figure 15: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current
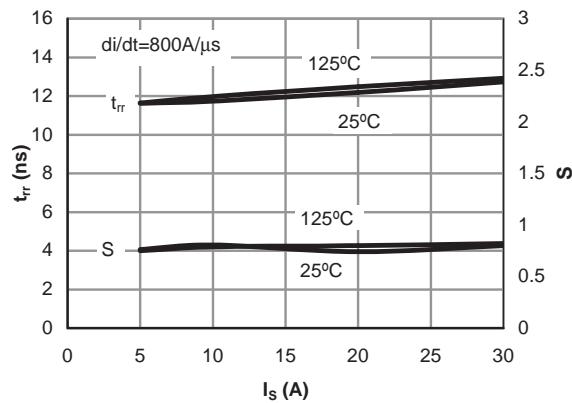
Figure 16: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current
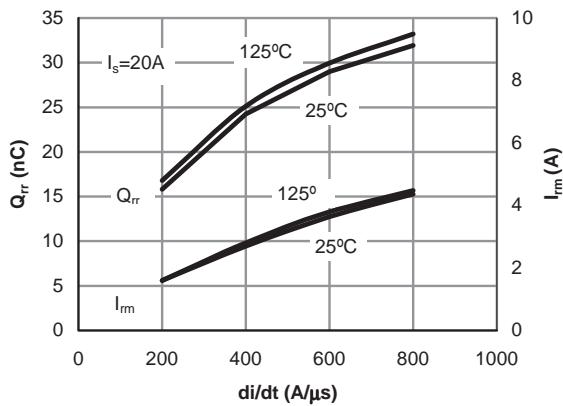
Figure 17: Diode Reverse Recovery Charge and Peak Current vs. di/dt
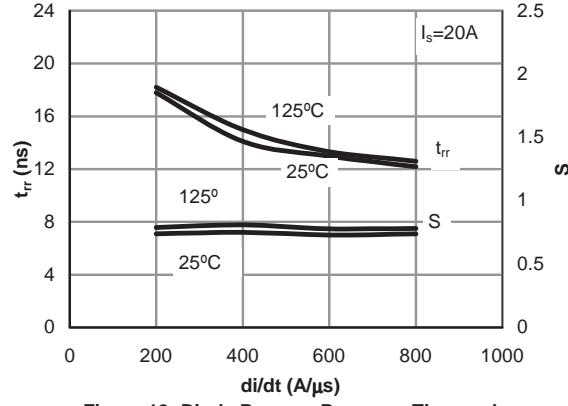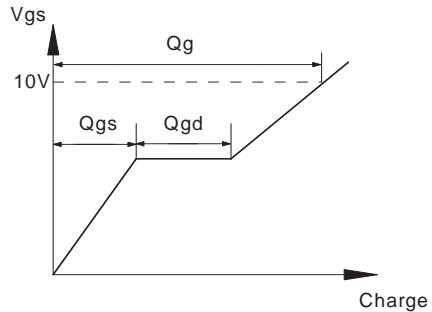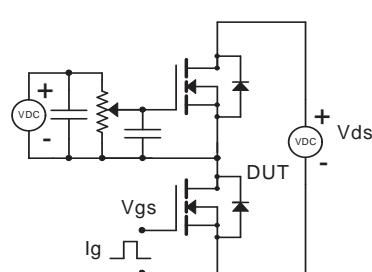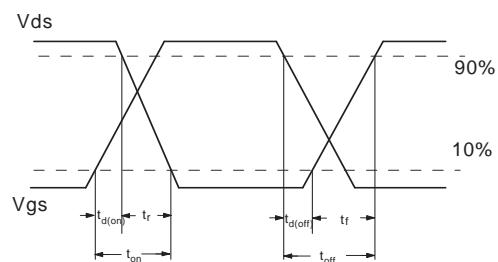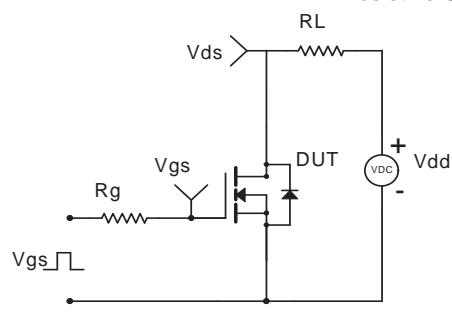
Figure 18: Diode Reverse Recovery Time and Softness Factor vs. di/dt
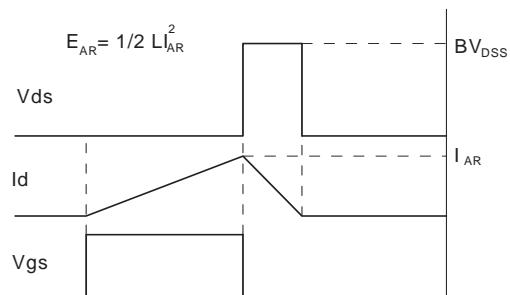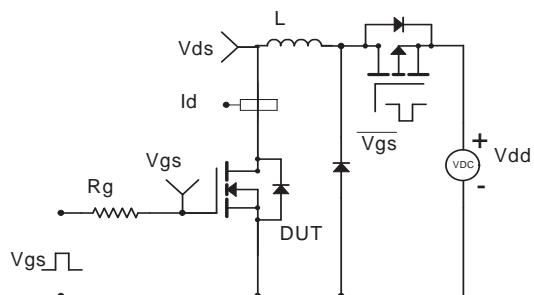
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2 \, LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int Idt$$