



ALPHA & OMEGA
SEMICONDUCTOR

AO4712

N-Channel Enhancement Mode Field Effect Transistor

SRFET™



General Description

SRFET™ The AO4712/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. AO4712 and AO4712L are electrically identical.

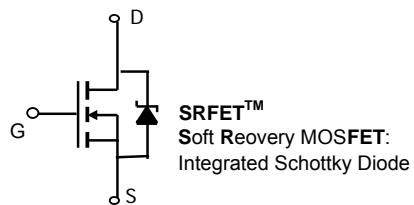
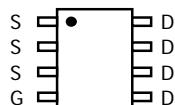
-RoHS Compliant

-AO4712L is Halogen Free

Features

V_{DS} (V) = 30V
 I_D = 11.2A (V_{GS} = 10V)
 $R_{DS(ON)} < 14.5\text{m}\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 18\text{m}\Omega$ (V_{GS} = 4.5V)

UIS TESTED!
 $R_g, C_{iss}, C_{oss}, C_{rss}$ Tested



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 ^{A,F}	I_{DSM}	11.2	A
$T_A=70^\circ\text{C}$		9.1	
Pulsed Drain Current ^B	I_{DM}	60	
Avalanche Current ^{B,G}	I_{AR}	27	A
Repetitive avalanche energy $L=0.1\text{mH}$ ^{B,G}	E_{AR}	36	mJ
Power Dissipation	P_{DSM}	3.1	W
$T_A=70^\circ\text{C}$		2.0	
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	$R_{\theta JA}$	32	40	°C/W
Steady-State		60	75	°C/W
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	17	24	°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	$V_{DS}=30\text{V}$, $V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$			0.1 10	mA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			0.1	μA
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ $I_D=250\mu\text{A}$	1.5	1.8	2.4	V
$I_{D(\text{ON})}$	On state drain current	$V_{GS}=10\text{V}$, $V_{DS}=5\text{V}$	60			A
$R_{DS(\text{ON})}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=11.2\text{A}$ $T_J=125^\circ\text{C}$		12	14.5	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=10\text{A}$		19	24	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=11.2\text{A}$		64		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.38	0.5	V
I_S	Maximum Body-Diode + Schottky Continuous Current				4.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		1450	1885	pF
C_{oss}	Output Capacitance			224		pF
C_{rss}	Reverse Transfer Capacitance			92	130	pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$	0.8	1.6	3.0	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=11.2\text{A}$	18	24.0	31	nC
$Q_g(4.5\text{V})$	Total Gate Charge		9	12.0	16	nC
Q_{gs}	Gate Source Charge			3.9		nC
Q_{gd}	Gate Drain Charge			4.2		nC
$t_{D(\text{on})}$	Turn-On Delay Time	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=1.2\Omega$, $R_{\text{GEN}}=3\Omega$		5.5		ns
t_r	Turn-On Rise Time			4.7		ns
$t_{D(\text{off})}$	Turn-Off Delay Time			24.0		ns
t_f	Turn-Off Fall Time			4.0		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=11.2\text{A}$, $dI/dt=300\text{A}/\mu\text{s}$		10	12	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=11.2\text{A}$, $dI/dt=300\text{A}/\mu\text{s}$		6.8		nC
t_{rr}	Body Diode Reverse Recovery Time	$I_F=11.2\text{A}$, $dI/dt=500\text{A}/\mu\text{s}$		9	11	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=11.2\text{A}$, $dI/dt=500\text{A}/\mu\text{s}$		12		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 $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature.

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 $<300\mu\text{s}$ 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 $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

F. The current rating is based on the $\leq 10\text{s}$ junction to ambient thermal resistance rating.

G: $L=100\mu\text{H}$, $V_{DD}=0\text{V}$, $R_G=0\Omega$, rated $V_{DS}=30\text{V}$ and $V_{GS}=10\text{V}$

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

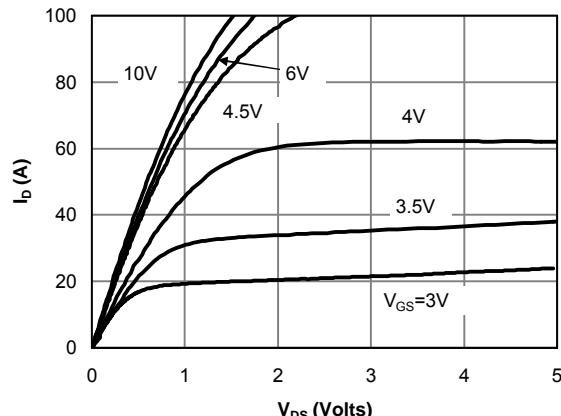


Figure 1: On-Region Characteristics

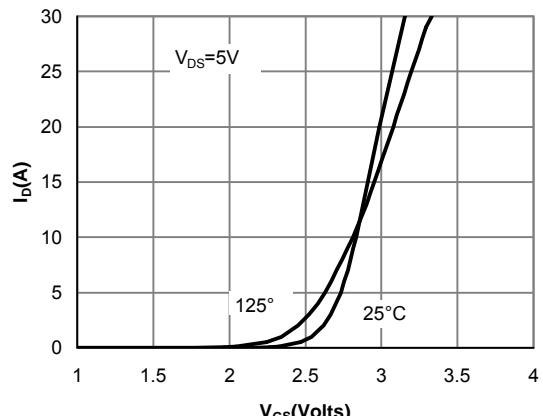


Figure 2: Transfer Characteristics

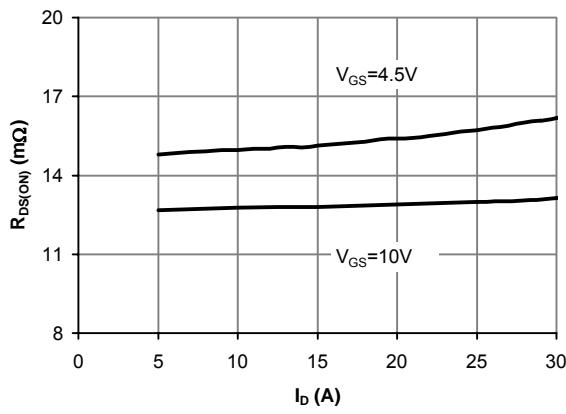


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

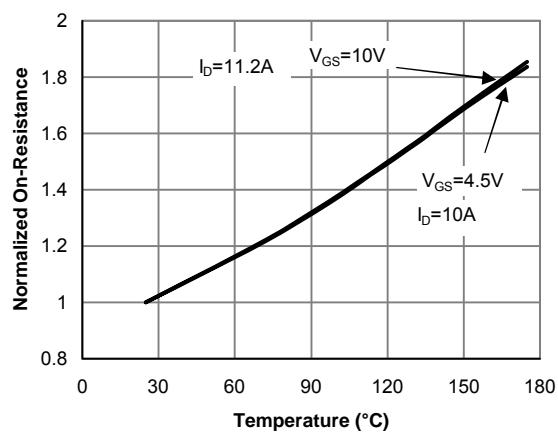


Figure 4: On-Resistance vs. Junction Temperature

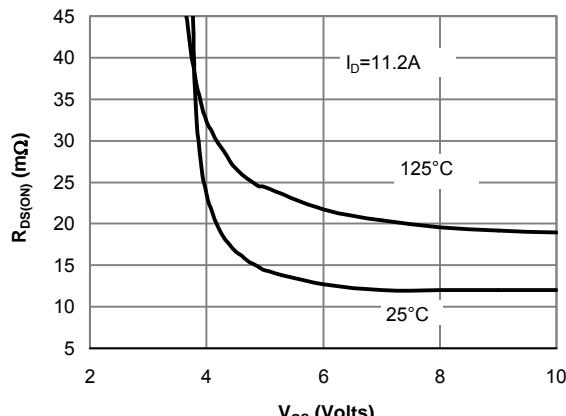


Figure 5: On-Resistance vs. Gate-Source Voltage

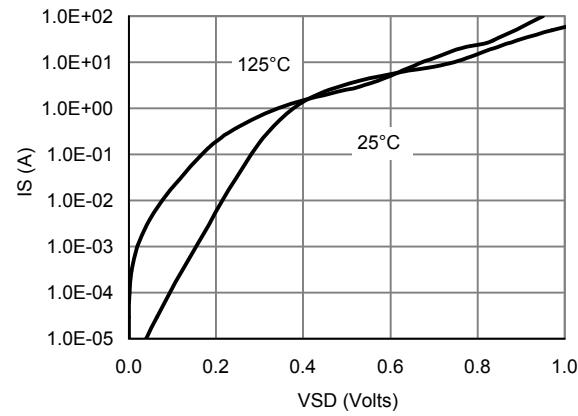


Figure 6: Body-Diode Characteristics

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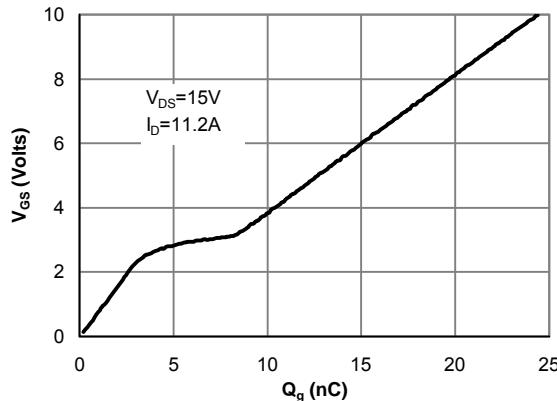


Figure 7: Gate-Charge Characteristics

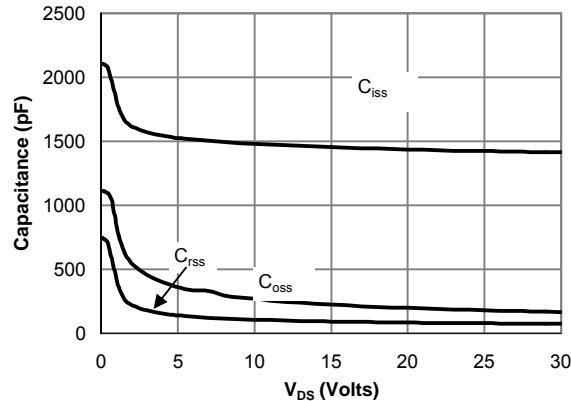


Figure 8: Capacitance Characteristics

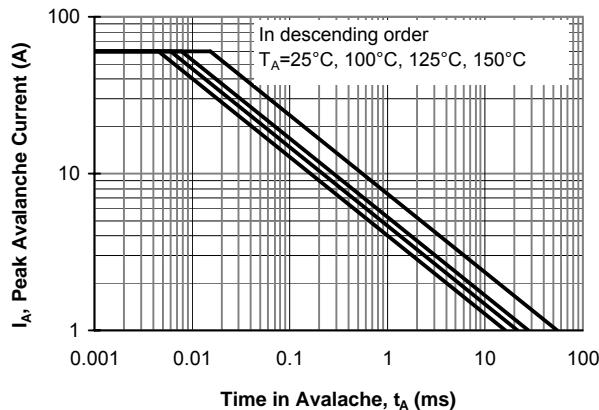


Figure 9: Single Pulse Avalanche Capability

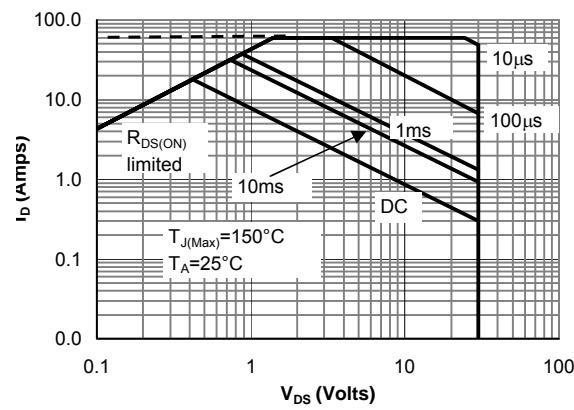


Figure 10: Maximum Forward Biased Safe Operating Area (Note E)

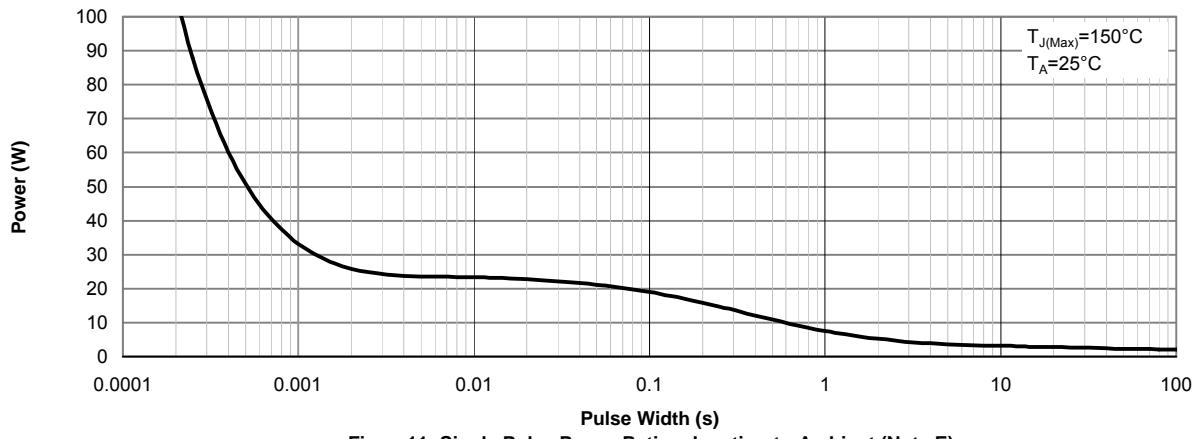


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note E)

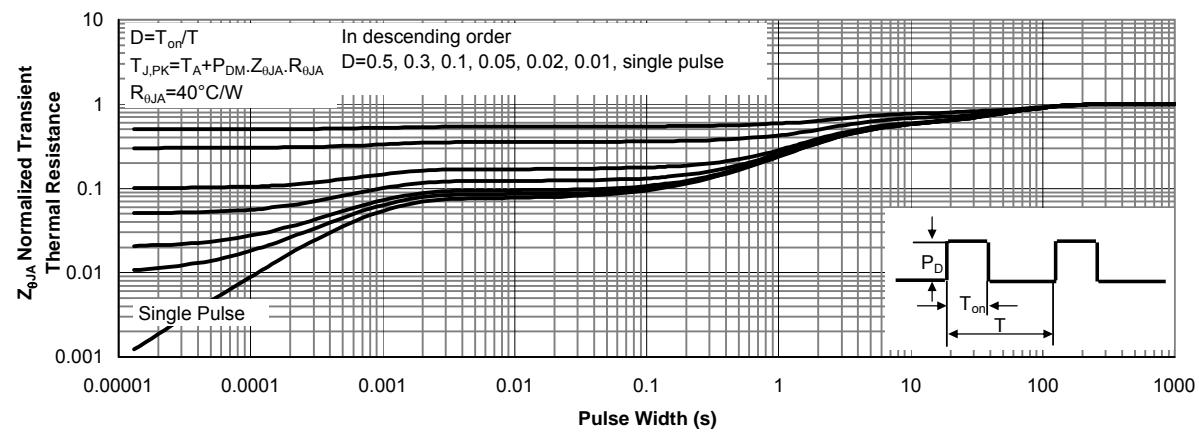
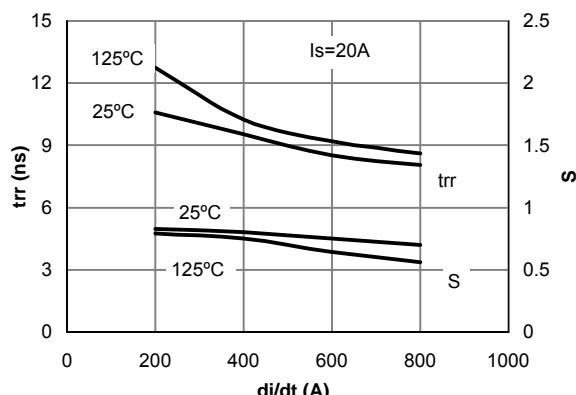
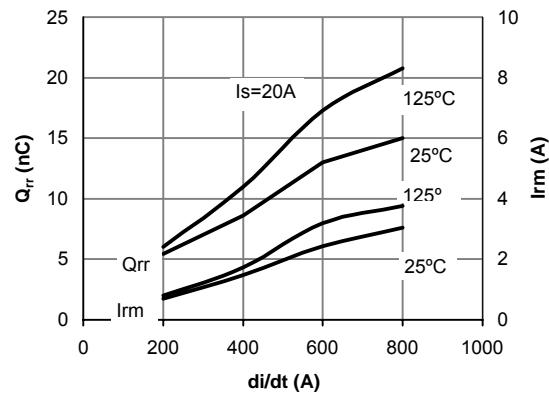
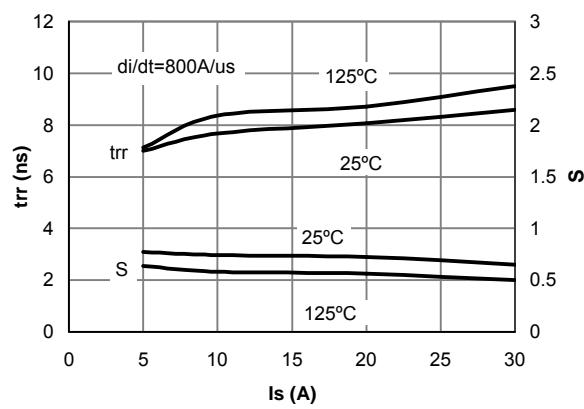
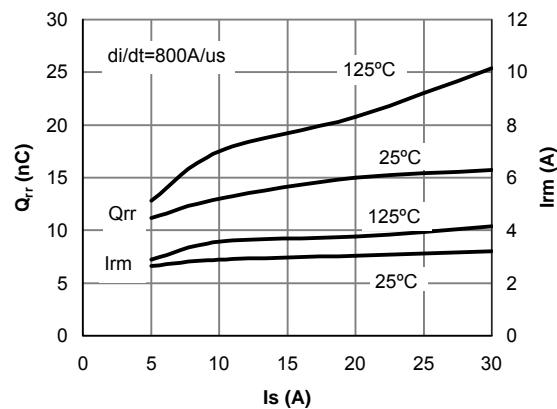
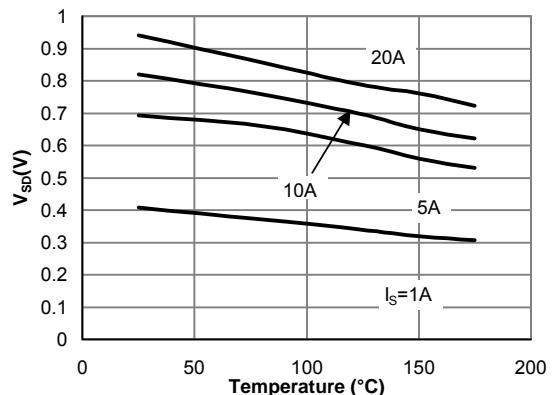
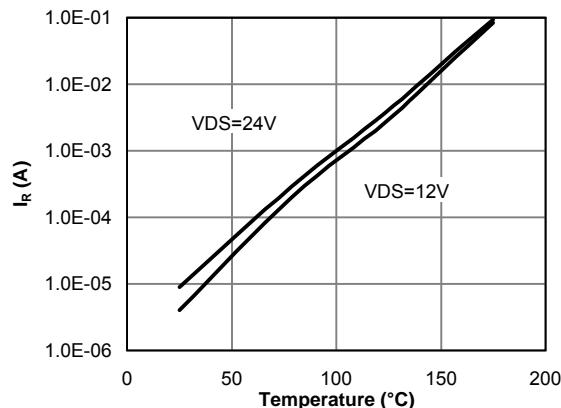
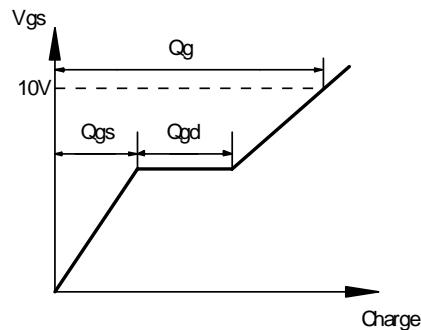
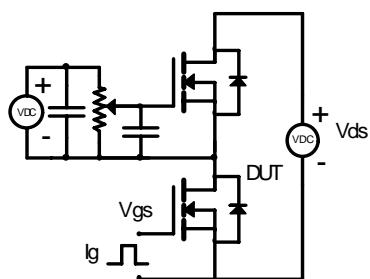
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Figure 12: Normalized Maximum Transient Thermal Impedance (Note E)

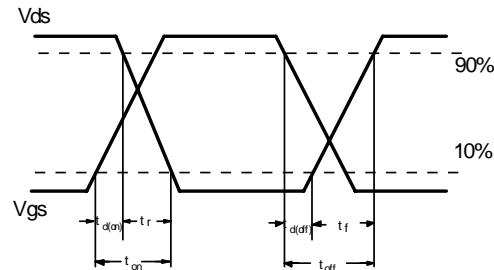
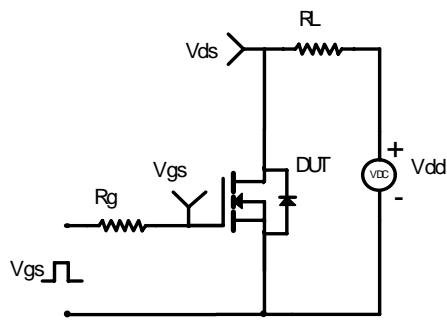
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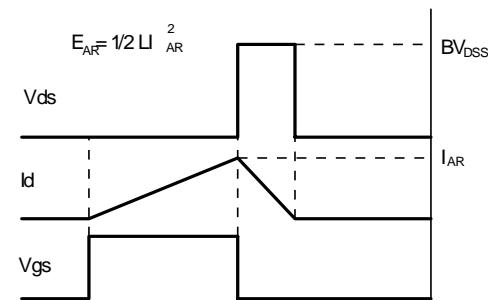
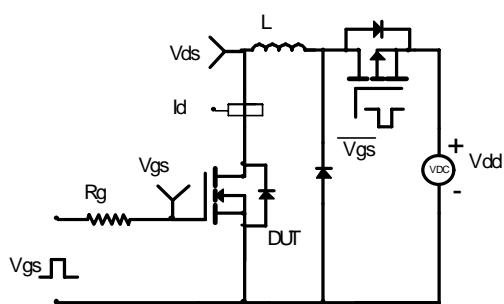
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

