AOL1412

30V N-Channel MOSFET

SRFET™

General Description

SRFET™ AOL1412 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.

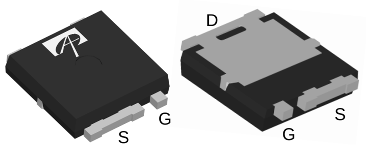
Product Summary

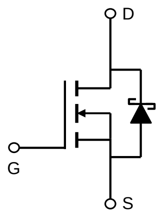
V_{DS}	30V
I_D (at V_{GS}=10V)	70A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 3.8mΩ
$R_{DS(ON)}$ (at V_{GS} = 4.5V)	< 4.5mΩ

100% UIS Tested
100% R_g Tested

UltraSO-8™

Top View **Bottom View**





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

Absolute Maximum Ratings T_A=25°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	T_C=25°C	I_D	70	A
	T_C=100°C		44	
Pulsed Drain Current [C]		I_{DM}	170	
Continuous Drain Current	T_A=25°C	I_{DSM}	17	A
	T_A=70°C		14	
Avalanche Current [C]		I_{AS}, I_{AR}	30	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	45	mJ
Power Dissipation [B]	T_C=25°C	P_D	36	W
	T_C=100°C		14	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.1	W
	T_A=70°C		1.3	
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	$R_{\theta JA}$	20	25	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		50	60	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	2.5	3.5	°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=10mA, V_{GS}=0V	30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V			0.5	mA
		T_J=125°C			100	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±12V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	1.2	1.6	2.1	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		2.9	3.8	mΩ
		T_J=125°C		4.8	5.8	
		V_{GS}=4.5V, I_D=20A		3.5	4.5	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		150		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.4	0.7	V
I_S	Maximum Body-Diode Continuous Current				40	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz	2500	3160	3800	pF
C_{oss}	Output Capacitance		240	350	460	pF
C_{rss}	Reverse Transfer Capacitance		150	260	370	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.4	0.8	1.2	Ω
SWITCHING PARAMETERS						
Q_g(4.5V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=20A	21	27	33	nC
Q_{gs}	Gate Source Charge			8		nC
Q_{gd}	Gate Drain Charge			9		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.75Ω, R_{GEN}=3Ω		10		ns
t_r	Turn-On Rise Time			3		ns
$t_{D(off)}$	Turn-Off DelayTime			50		ns
t_f	Turn-Off Fall Time			6		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs	8	10	12	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs	11	14	17	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 allow s 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 ratin g.
H. 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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

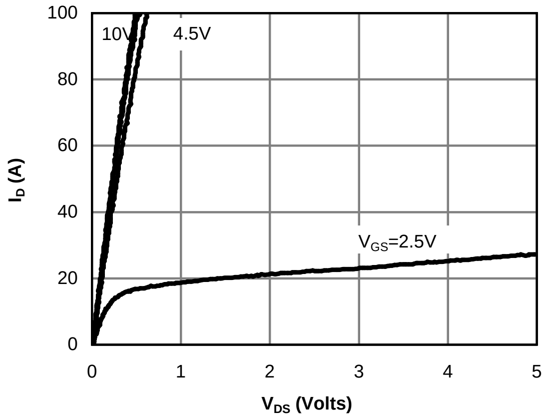


Fig 1: On-Region Characteristics (Note E)

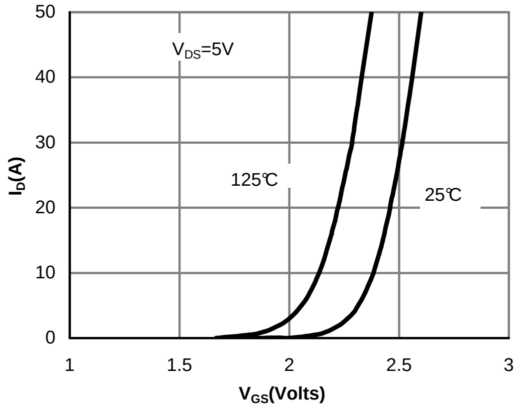


Figure 2: Transfer Characteristics (Note E)

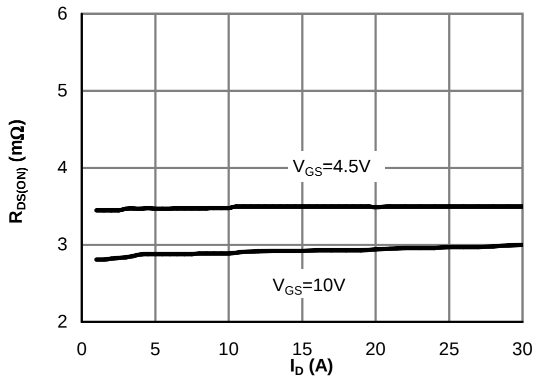


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

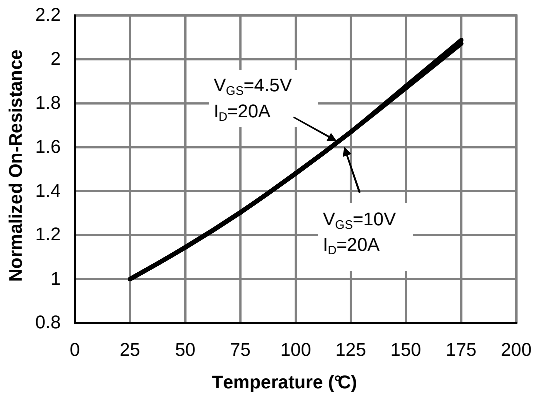


Figure 4: On-Resistance vs. Junction Temperature (Note E)

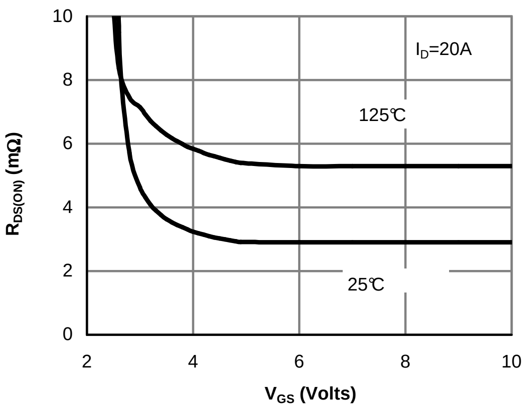


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

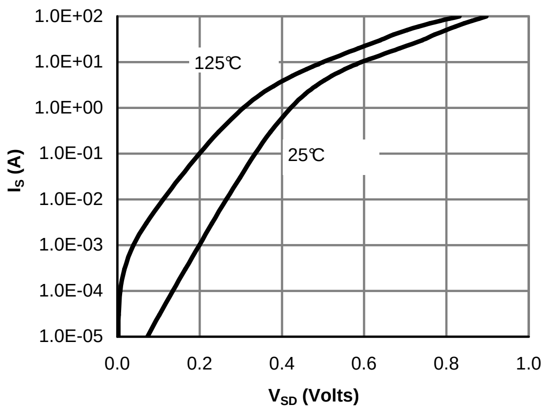


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

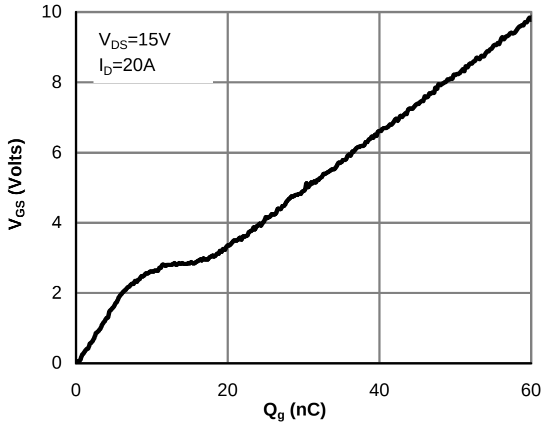


Figure 7: Gate-Charge Characteristics

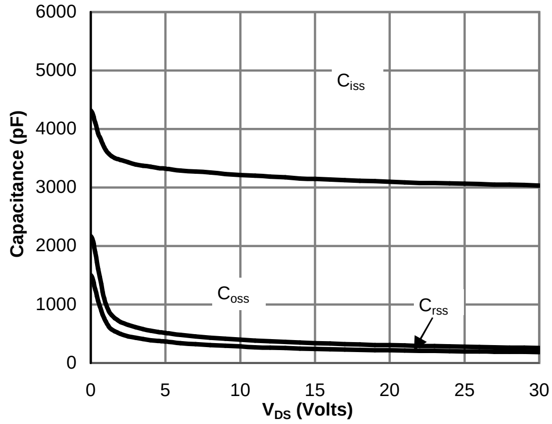


Figure 8: Capacitance Characteristics

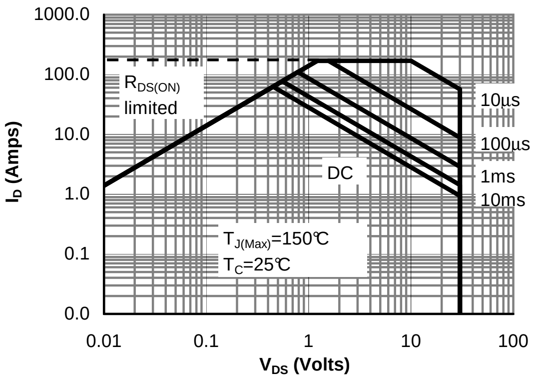


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

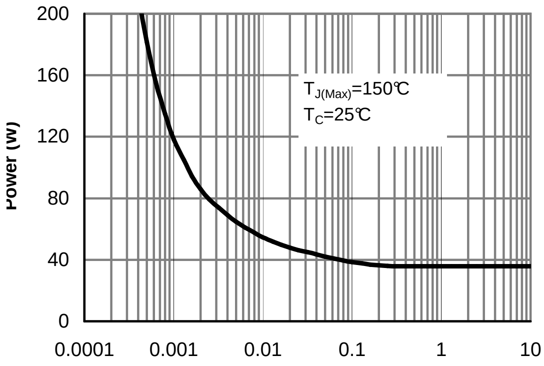


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

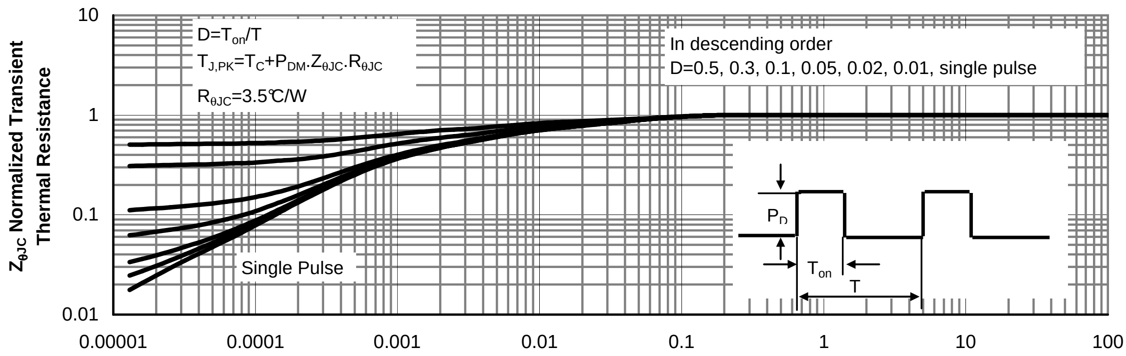


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

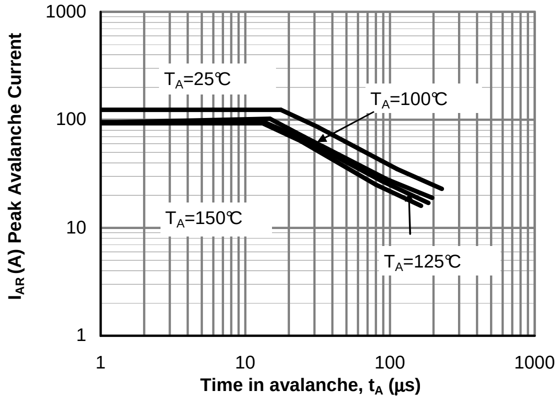


Figure 12: Single Pulse Avalanche capability (Note C)

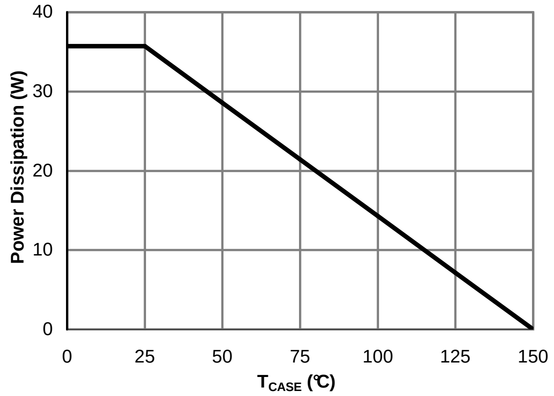


Figure 13: Power De-rating (Note F)

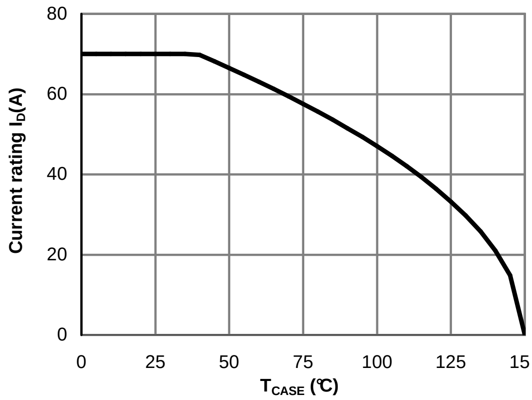


Figure 14: Current De-rating (Note F)

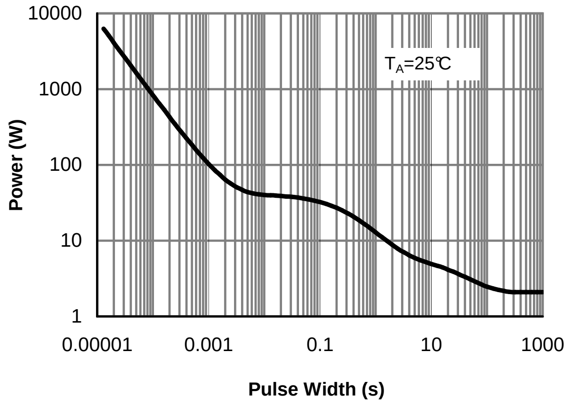


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

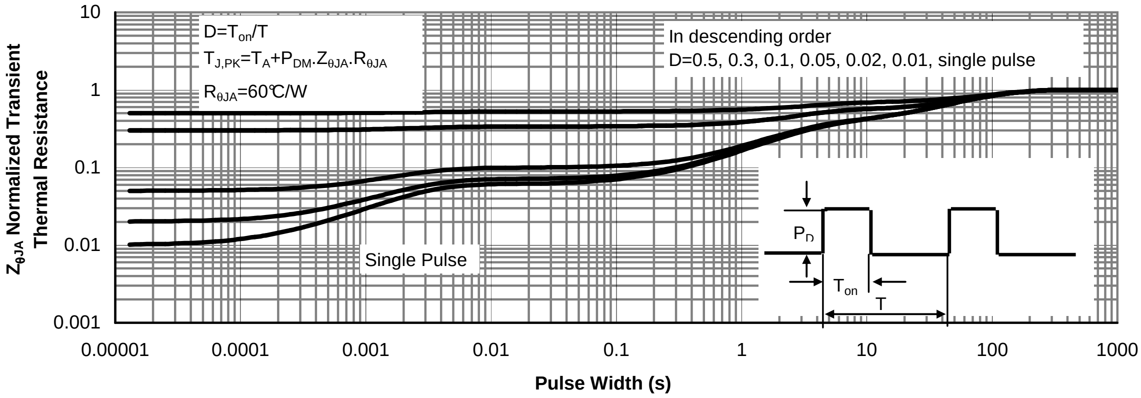


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

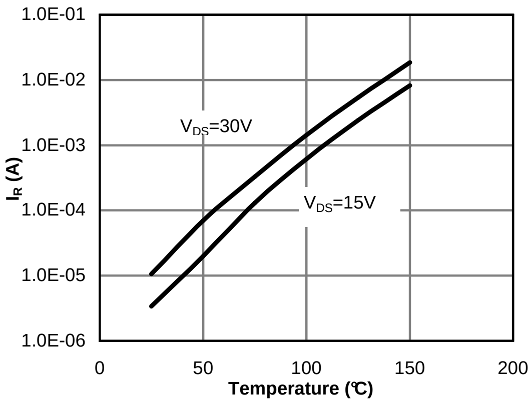


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

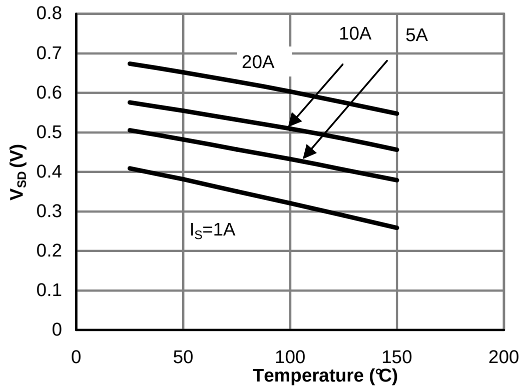


Figure 18: Diode Forward voltage vs. Junction Temperature

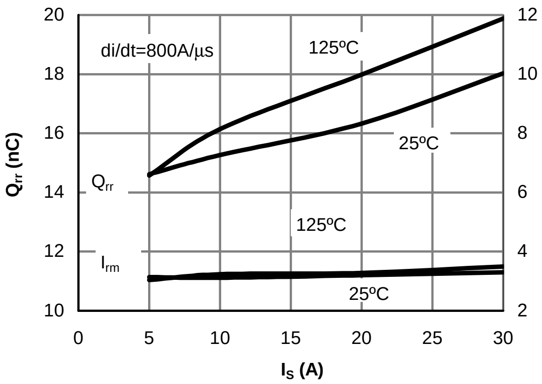


Figure 18: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

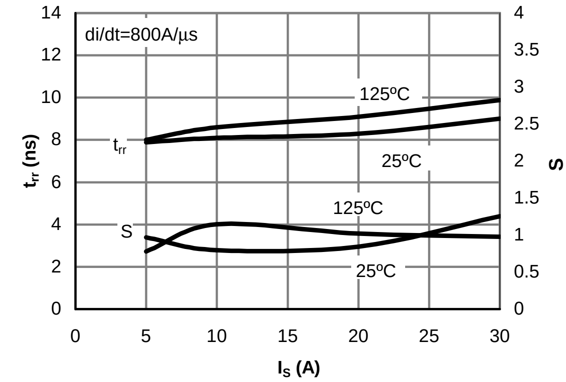


Figure 19: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

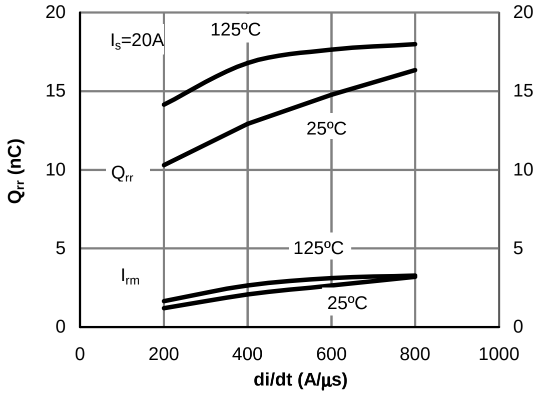


Figure 20: Diode Reverse Recovery Charge and Peak Current vs. di/dt

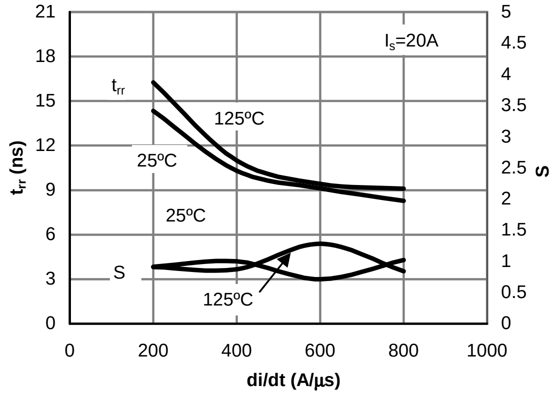
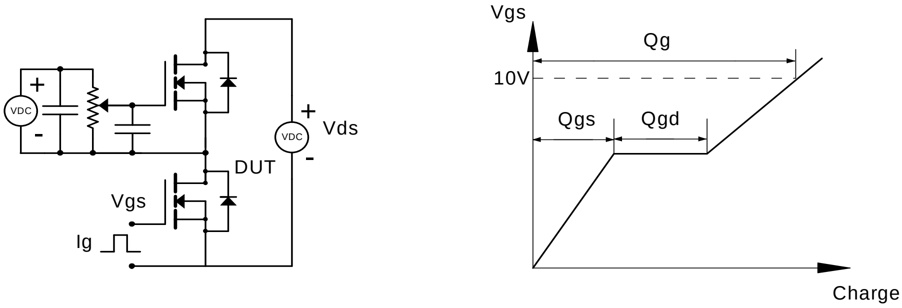
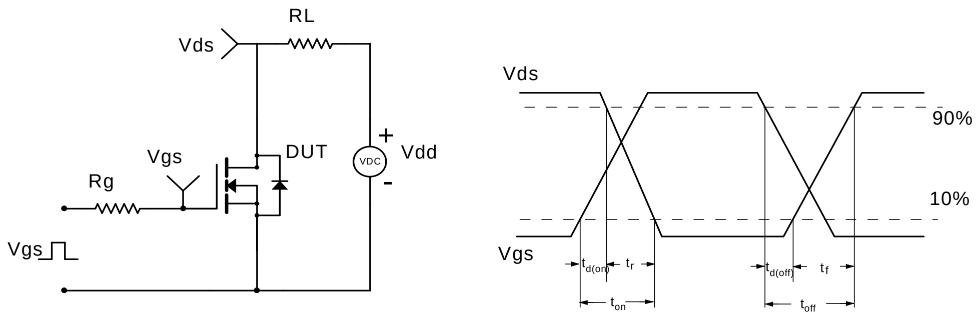


Figure 21: Diode Reverse Recovery Time and Softness Factor vs. di/dt

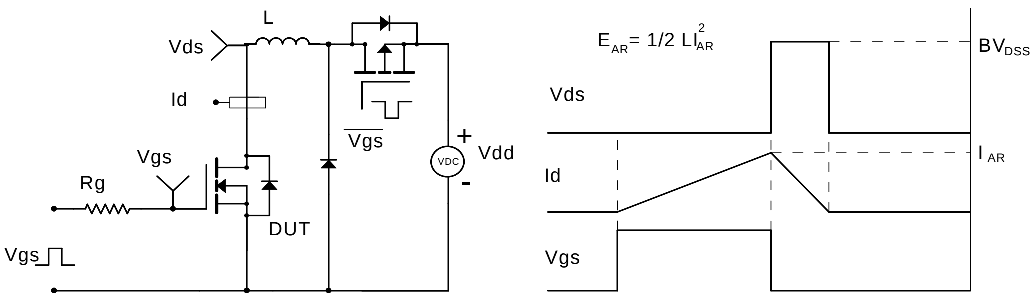
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms