



ALPHA & OMEGA
SEMICONDUCTOR



AOL1412

N-Channel Enhancement Mode Field Effect Transistor

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.

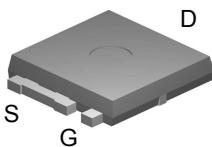
- RoHS Compliant
- Halogen and Antimony Free Green Device*

Features

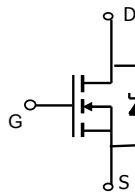
$V_{DS} (V) = 30V$
 $I_D = 85A (V_{GS} = 10V)$
 $R_{DS(ON)} < 3.9m\Omega (V_{GS} = 10V)$
 $R_{DS(ON)} < 4.6m\Omega (V_{GS} = 4.5V)$

UIS Tested
 Rg,Ciss,Coss,Crss Tested

Ultra SO-8™ Top View



Bottom tab connected to drain



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 ^B	I_D	$T_C=25^\circ C$ ^I	85
		$T_C=100^\circ C$	84
Pulsed Drain Current	I_{DM}	200	A
Continuous Drain Current ^H	I_{DSM}	$T_A=25^\circ C$	17
		$T_A=70^\circ C$	14
Avalanche Current ^C	I_{AR}	40	A
Repetitive avalanche energy $L=0.3mH$ ^C	E_{AR}	240	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ C$	100
		$T_C=100^\circ C$	50
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ C$	2
		$T_A=70^\circ C$	1.33
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10s$	19.6	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	50	$^\circ C/W$
Maximum Junction-to-Case ^C	$R_{\theta JC}$	1	1.5	$^\circ C/W$

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	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$		9	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	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.4	1.8	2.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	200			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$		3.2	3.9	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=20\text{A}$		5.0	6.2	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$		112		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.4	0.5	V
I_S	Maximum Body-Diode Continuous Current				85	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		6430	7716	pF
C_{oss}	Output Capacitance			756		pF
C_{rss}	Reverse Transfer Capacitance			352	493	pF
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	0.3	0.6	0.9	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=20\text{A}$		96	115	
$Q_g(4.5\text{V})$	Total Gate Charge			44	53	nC
Q_{gs}	Gate Source Charge			17		nC
Q_{gd}	Gate Drain Charge			13		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.75\Omega,$ $R_{GEN}=3\Omega$		17.5		ns
t_r	Turn-On Rise Time			10		ns
$t_{D(off)}$	Turn-Off Delay Time			56		ns
t_f	Turn-Off Fall Time			10.5		ns
t_{rr}	Body Diode Reverse Recovery Time		$I_F=20\text{A}, dI/dt=300\text{A}/\mu\text{s}$		20	25
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, dI/dt=300\text{A}/\mu\text{s}$		26		nC

A: The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A=25^\circ\text{C}$. The power dissipation P_{DSM} and current rating I_{DSM} are based on $T_{J(MAX)}=150^\circ\text{C}$, using steady-state junction-to-ambient thermal resistance.

B: The power dissipation P_D is based on $T_{J(MAX)}=175^\circ\text{C}$, 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 $T_{J(MAX)}=175^\circ\text{C}$.

D: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

E: The static characteristics in Figures 1 to 6 are obtained using $<300 \mu\text{s}$ pulses, duty cycle 0.5% max.

F: These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}=175^\circ\text{C}$.

G: 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.

H: Surface mounted on a 1 in 2 FR-4 board with 2oz. Copper.

I: The maximum current rating is limited by bond-wires.

* This device is guaranteed green after date code 8P11 (June 1ST 2008)

Rev 6: June 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

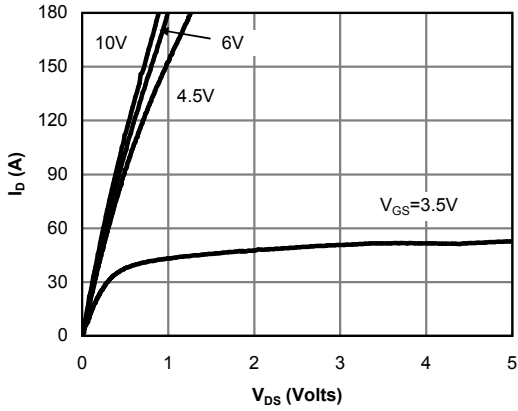


Figure 1: On-Region Characteristics

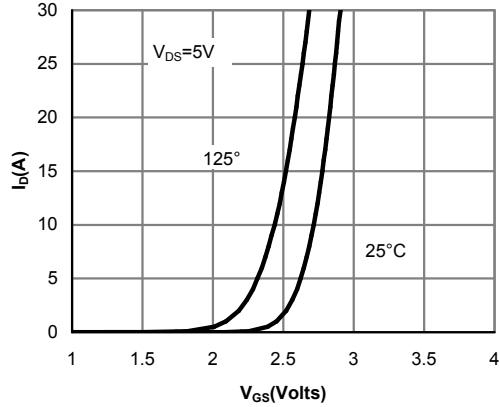


Figure 2: Transfer Characteristics

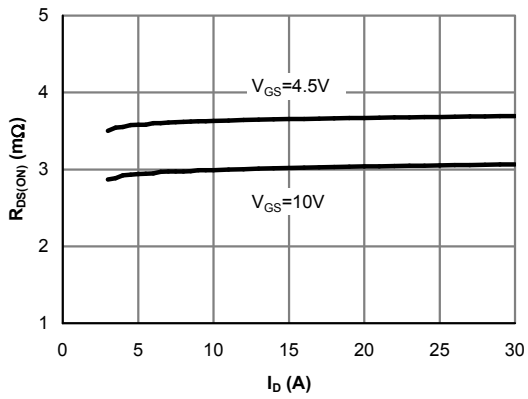


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

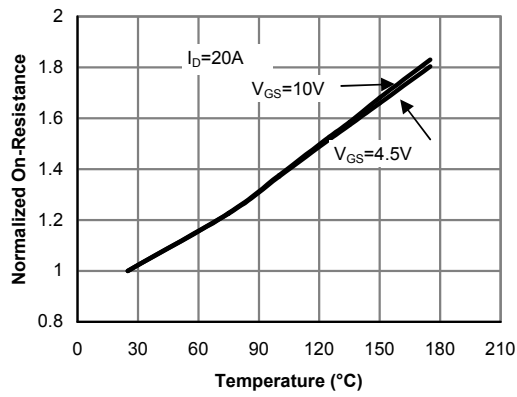


Figure 4: On-Resistance vs. Junction Temperature

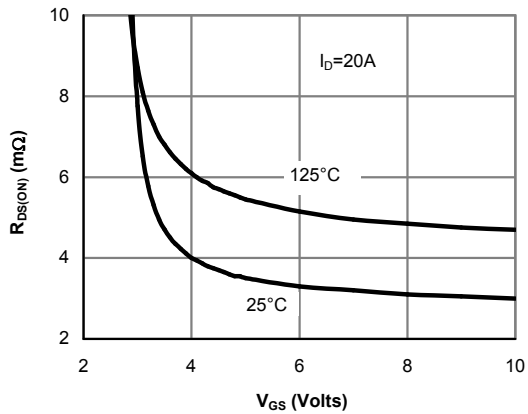


Figure 5: On-Resistance vs. Gate-Source Voltage

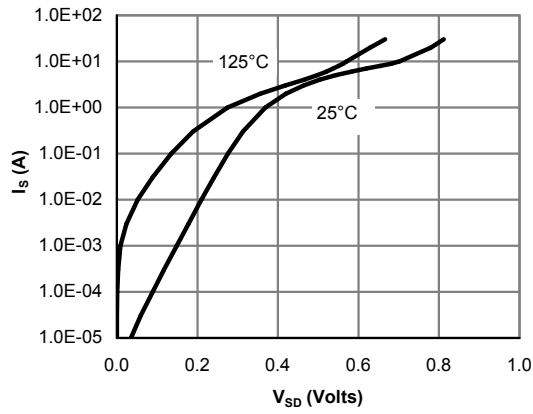


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

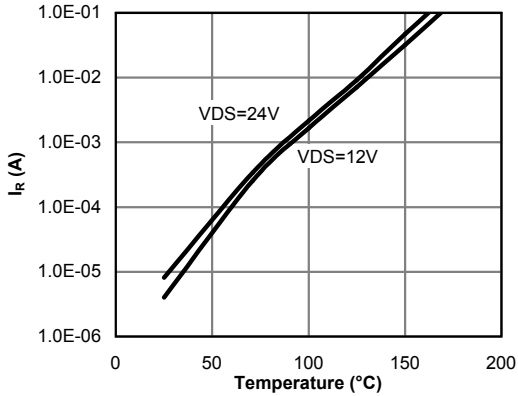


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

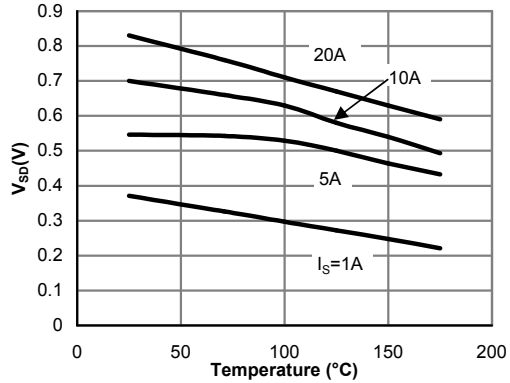


Figure 18: Diode Forward voltage vs. Junction Temperature

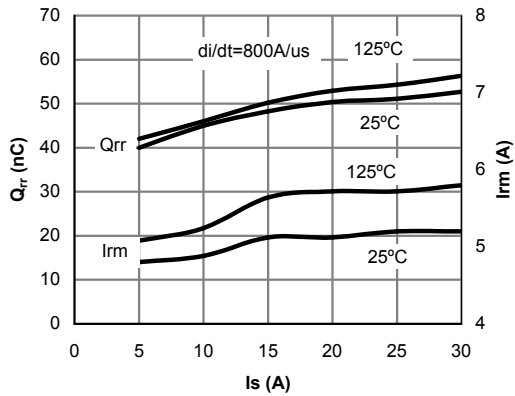


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

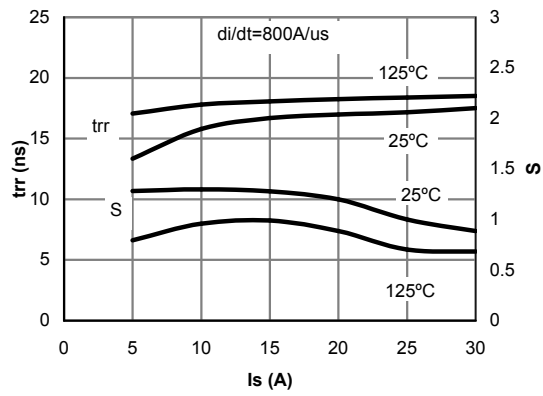


Figure 20: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

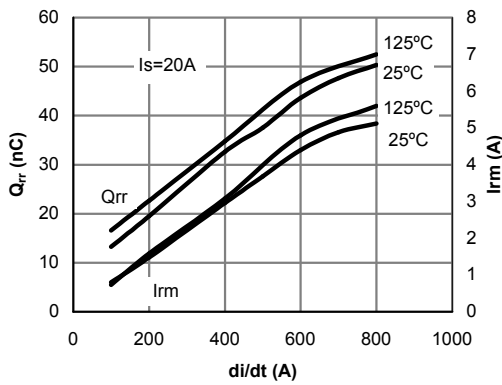


Figure 21: Diode Reverse Recovery Charge and Peak Current vs. di/dt

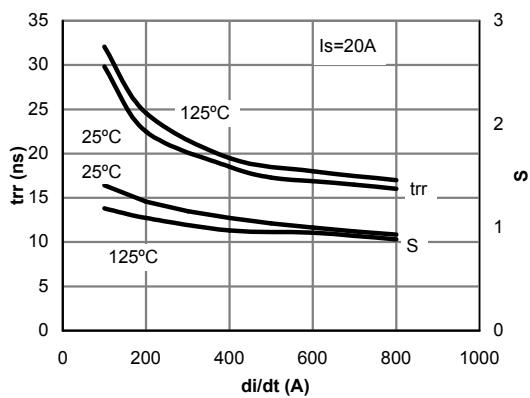


Figure 22: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

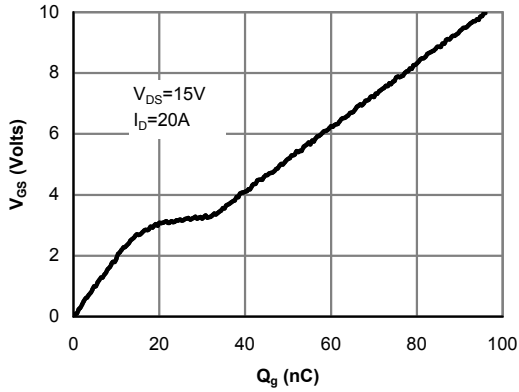


Figure 7: Gate-Charge Characteristics

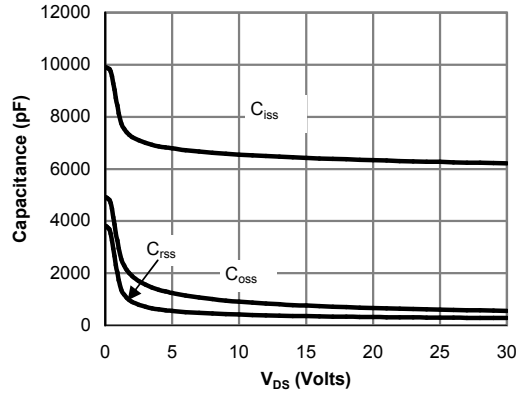


Figure 8: Capacitance Characteristics

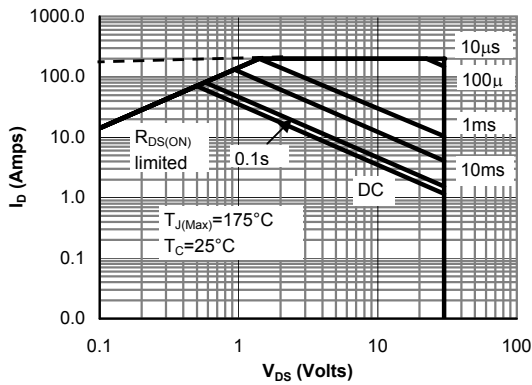


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

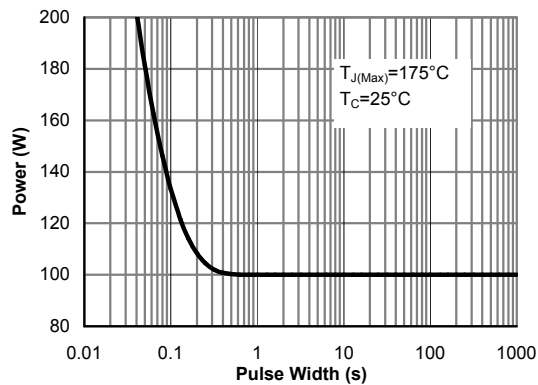


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

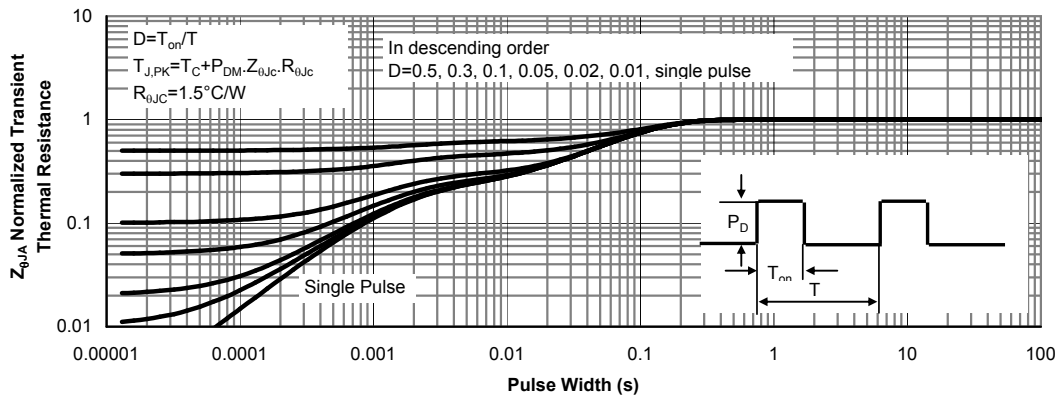


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

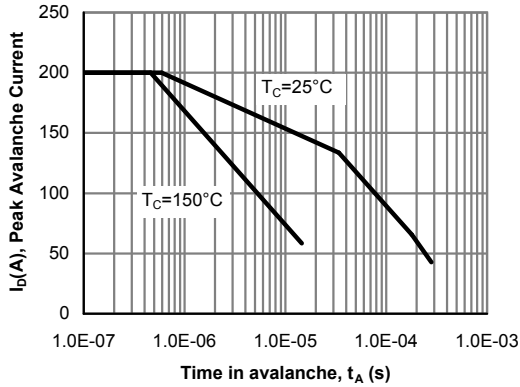


Figure 12: Single Pulse Avalanche capability

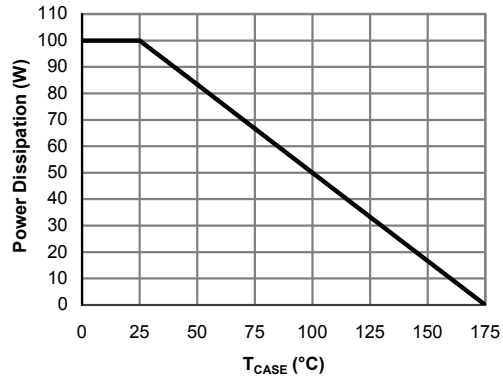


Figure 13: Power De-rating (Note B)

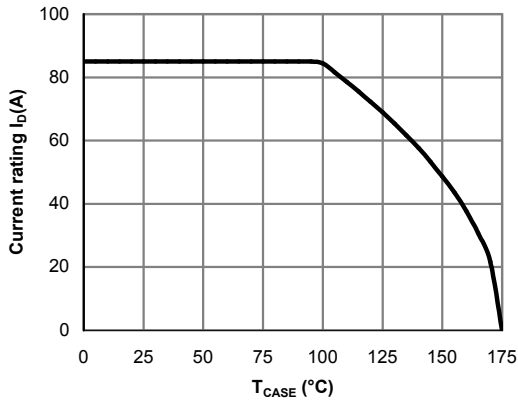


Figure 14: Current De-rating (Note B)

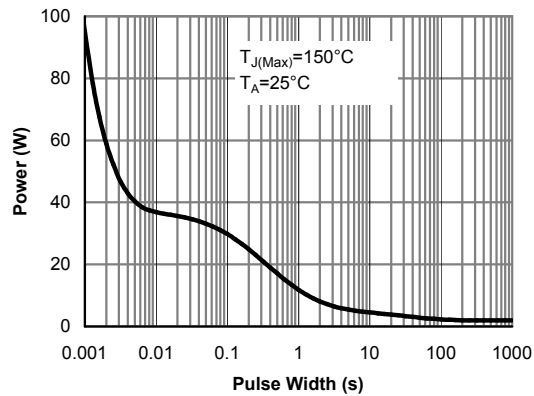


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

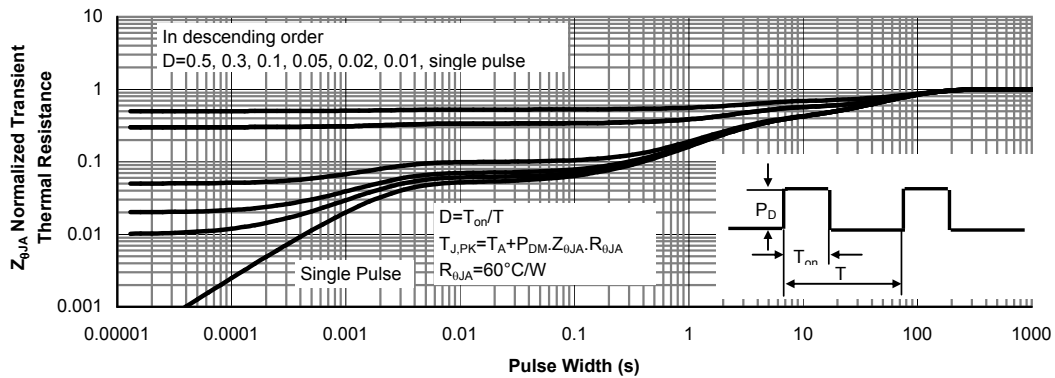
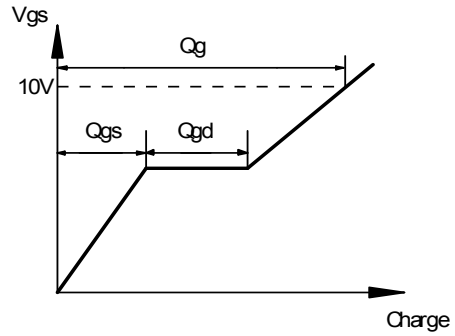
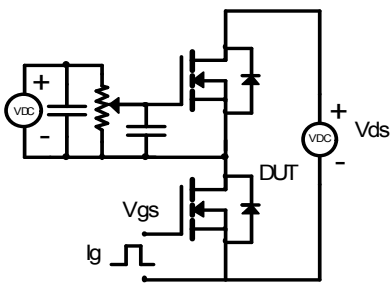
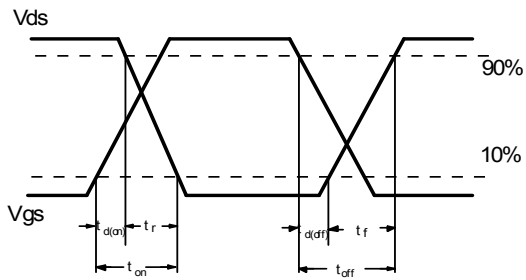
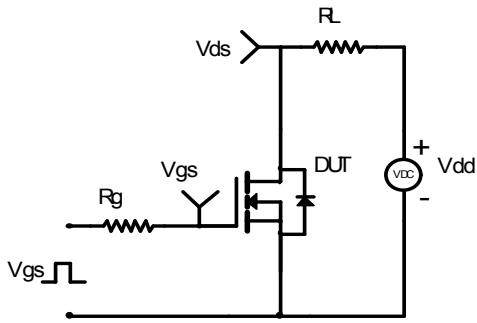


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

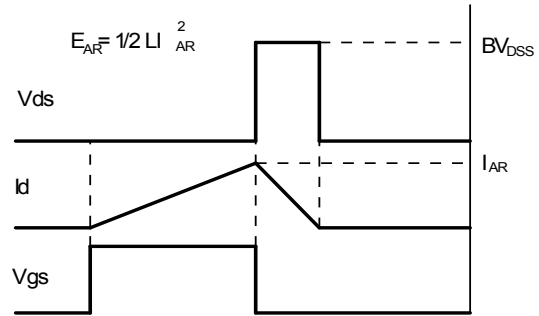
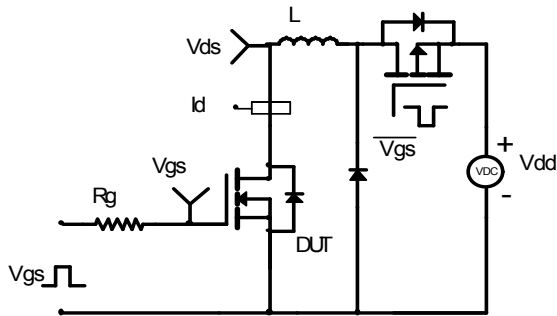
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

