



ALPHA & OMEGA
SEMICONDUCTOR



AOL1708

N-Channel Enhancement Mode Field Effect Transistor

SRFET™

General Description

The AOL1708 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.

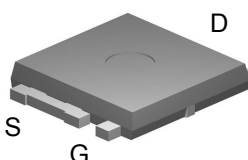
-RoHS Compliant
-Halogen and Antimony Free Green Device*

Features

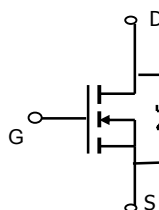
V_{DS} (V) = 30V
 I_D = 70A (V_{GS} = 10V)
 $R_{DS(ON)} < 5.9m\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 9.5m\Omega$ (V_{GS} = 4.5V)

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

Ultra SO-8™ Top View



Bottom tab
connected to
drain



SRFET™
Soft Recovery MOSFET:
Integrated Schottky Diode

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current ^B	$T_C=25^\circ\text{C}$ ^G	I_D	70	A
	$T_C=100^\circ\text{C}$		60	
Pulsed Drain Current ^C		I_{DM}	180	A
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	I_{DSM}	15	A
	$T_A=70^\circ\text{C}$		12.0	
Avalanche Current ^C		I_{AR}	25	A
Repetitive avalanche energy $L=0.3\text{mH}$ ^C		E_{AR}	94	mJ
Power Dissipation ^B	$T_C=25^\circ\text{C}$	P_D	71	W
	$T_C=100^\circ\text{C}$		36	
Power Dissipation ^A	$T_A=25^\circ\text{C}$	P_{DSM}	2.1	W
	$T_A=70^\circ\text{C}$		1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10\text{s}$	$R_{\theta JA}$	20	25	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		50	60	$^\circ\text{C/W}$
Maximum Junction-to-Case ^D	Steady-State	$R_{\theta JC}$	1.5	2.1	$^\circ\text{C/W}$

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	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	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 20	mA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			0.1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1.3	1.55	2	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}$, $V_{DS}=5\text{V}$	180			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=20\text{A}$ $T_J=125^{\circ}\text{C}$		5.2 7.8	5.9 9.8	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=20\text{A}$		7.6	9.5	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=20\text{A}$		55		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.37	0.5	V
I_S	Maximum Body-Diode + Schottky Continuous Current				65	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		2154	2650	pF
C_{oss}	Output Capacitance			474		pF
C_{rss}	Reverse Transfer Capacitance			185		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		0.75	1.1	Ω
SWITCHING PARAMETERS						
$Q_{g(10V)}$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=20\text{A}$		37	45	nC
$Q_{g(4.5V)}$	Total Gate Charge			17.8		nC
Q_{gs}	Gate Source Charge			6.6		nC
Q_{gd}	Gate Drain Charge			7.6		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=0.75\Omega$, $R_{GEN}=3\Omega$		6.8		ns
t_r	Turn-On Rise Time			7.2		ns
$t_{D(off)}$	Turn-Off DelayTime			25.2		ns
t_f	Turn-Off Fall Time			5.8		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=20\text{A}$, $dI/dt=300\text{A}/\mu\text{s}$		12	18	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=20\text{A}$, $dI/dt=300\text{A}/\mu\text{s}$		10.5		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, 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. The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.

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

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

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

Rev1:July. 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

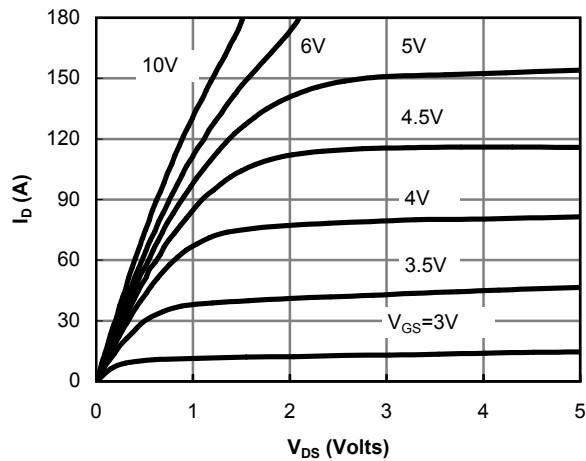


Figure 1: On-Region Characteristics

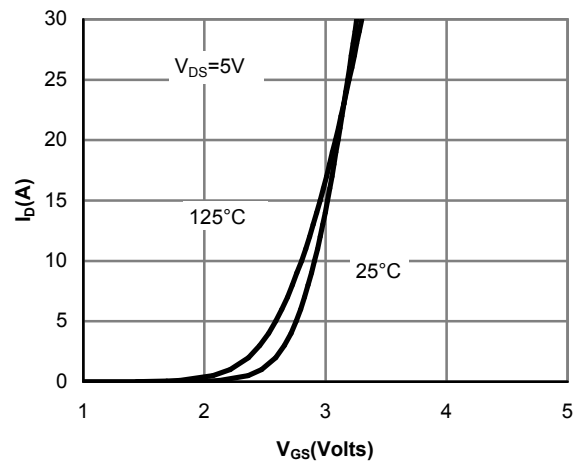


Figure 2: Transfer Characteristics

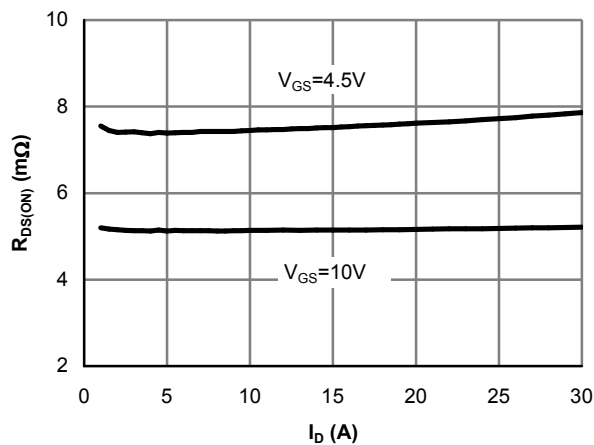


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

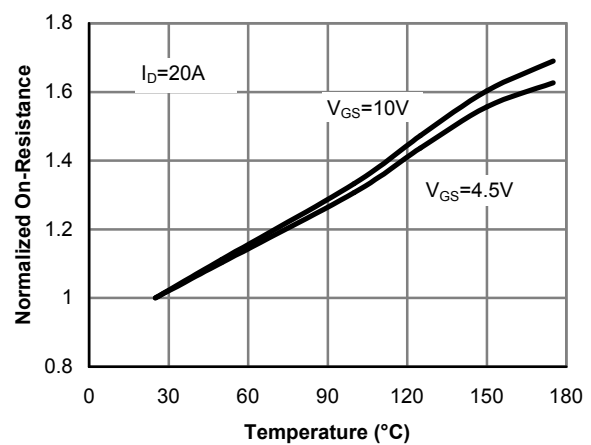


Figure 4: On-Resistance vs. Junction Temperature

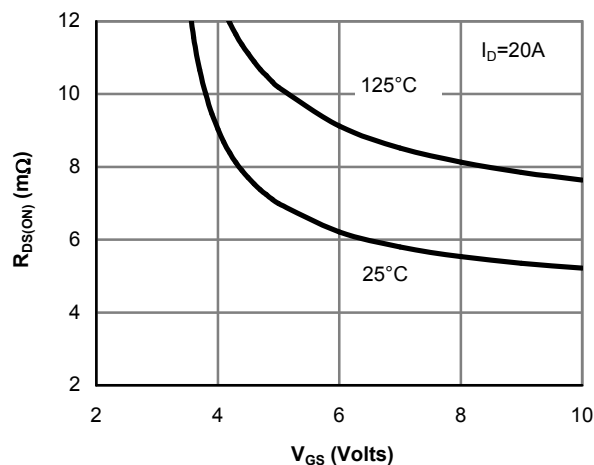


Figure 5: On-Resistance vs. Gate-Source Voltage

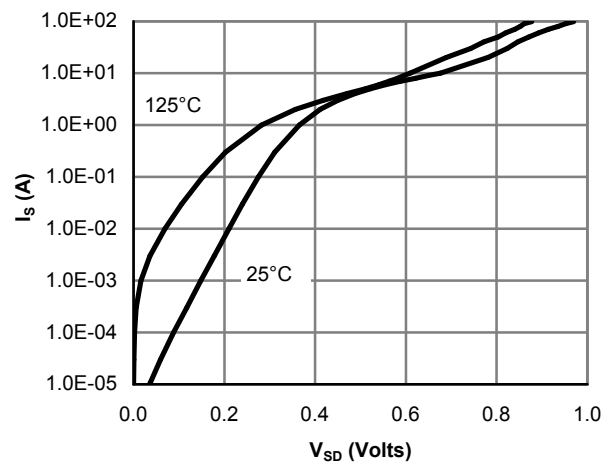


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

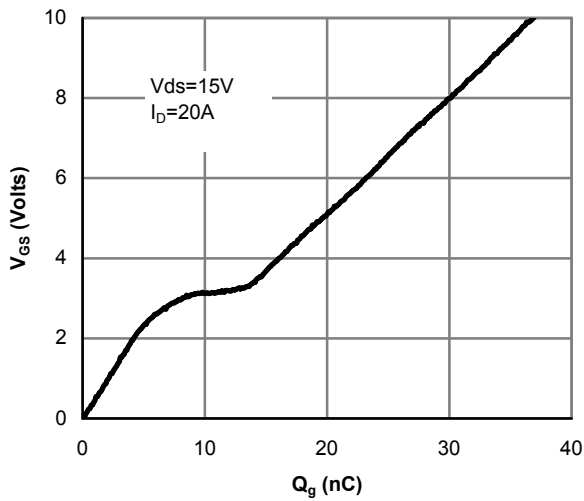


Figure 7: Gate-Charge Characteristics

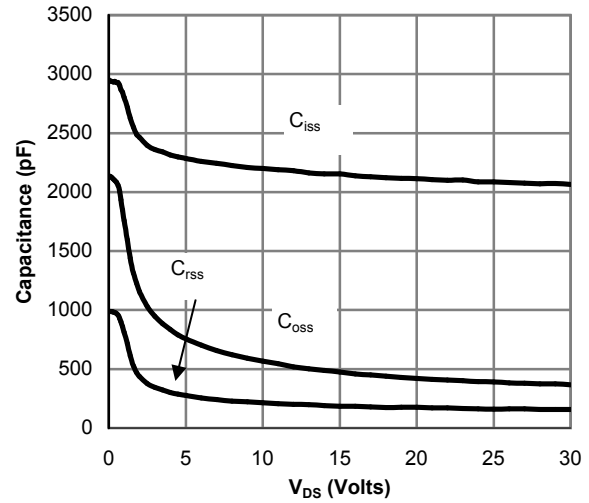


Figure 8: Capacitance Characteristics

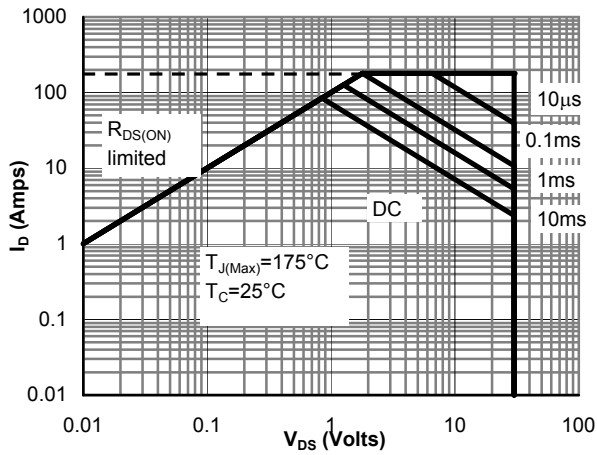


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

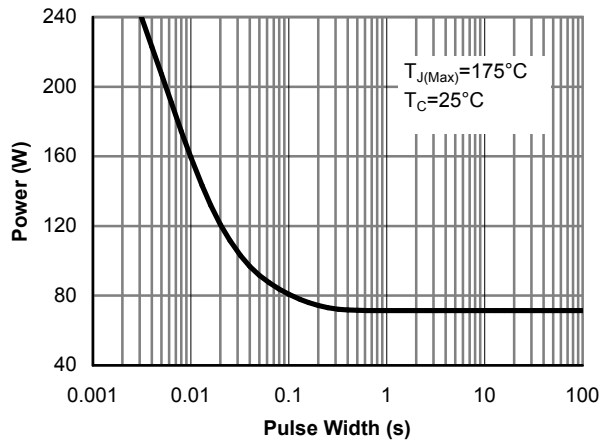


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

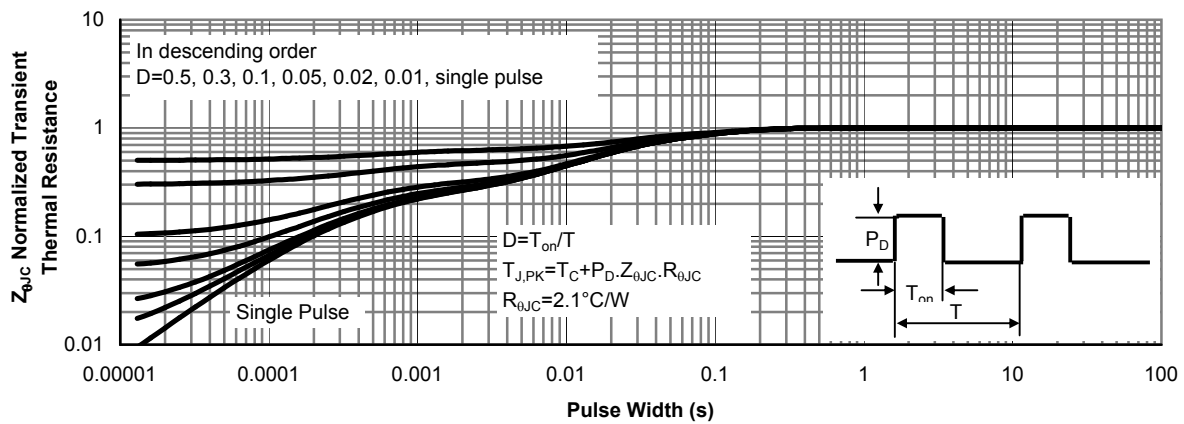


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

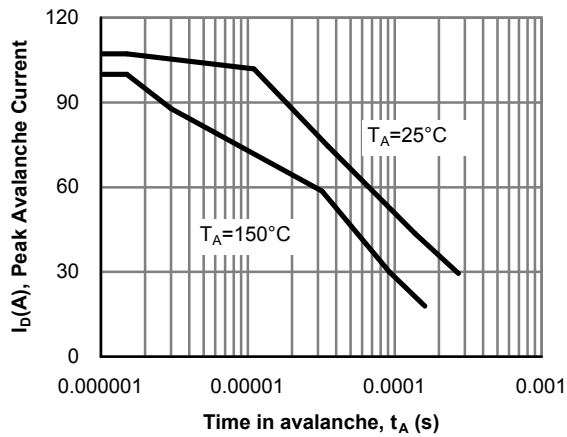


Figure 12: Single Pulse Avalanche capability

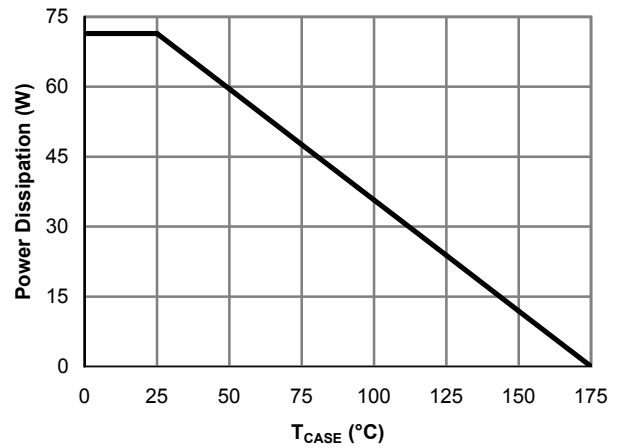


Figure 13: Power De-rating (Note B)

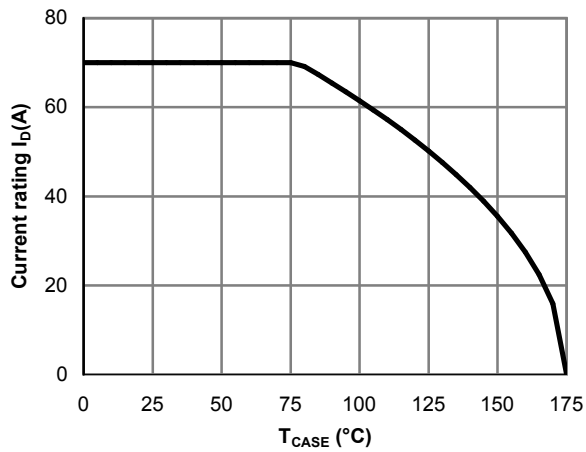


Figure 14: Current De-rating (Note B)

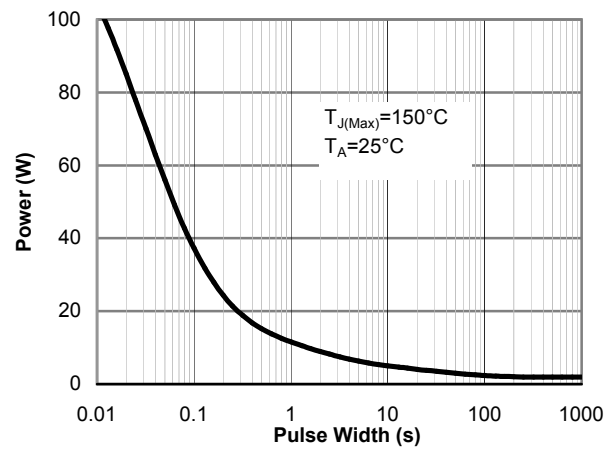


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

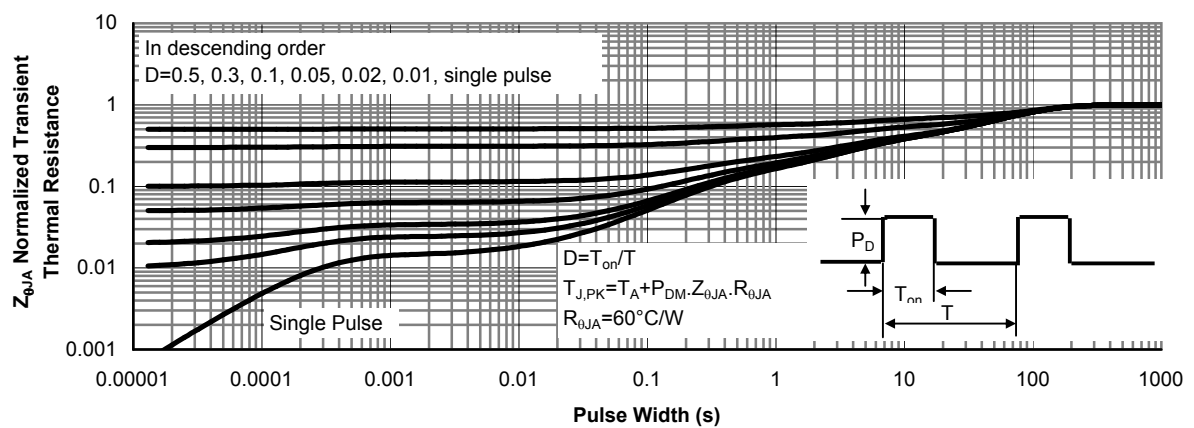


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

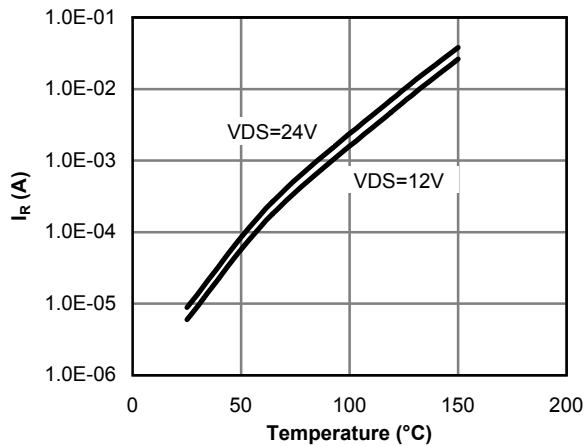


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

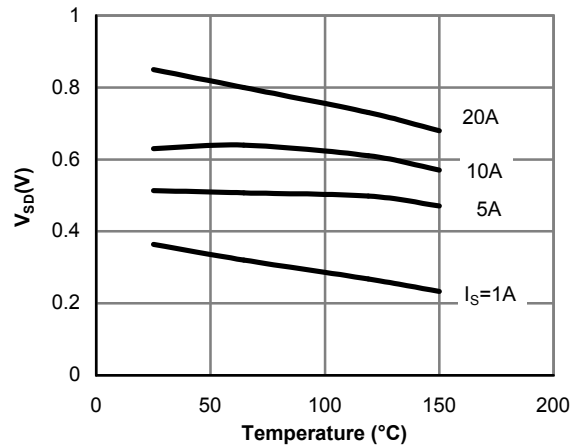


Figure 18: Diode Forward voltage vs. Junction Temperature

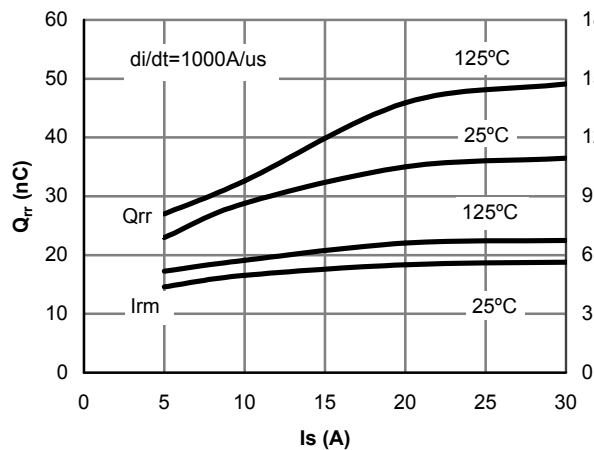


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

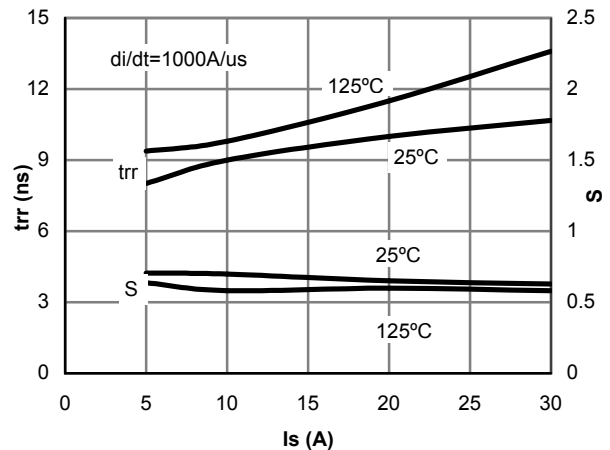


Figure 20: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

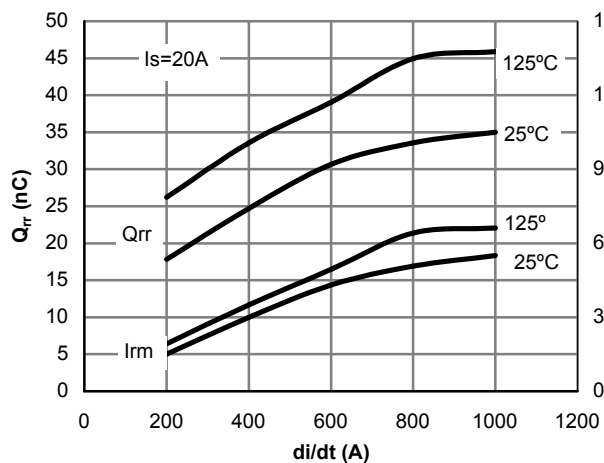


Figure 21: Diode Reverse Recovery Charge and Peak Current vs. di/dt

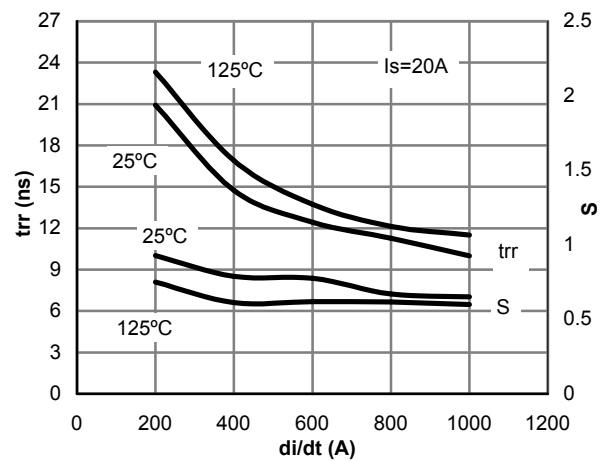
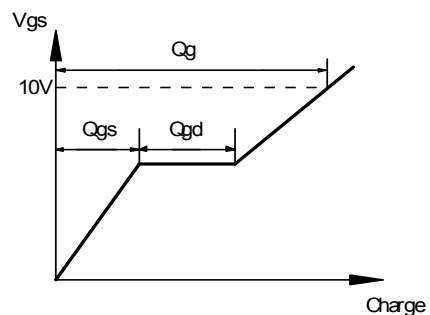
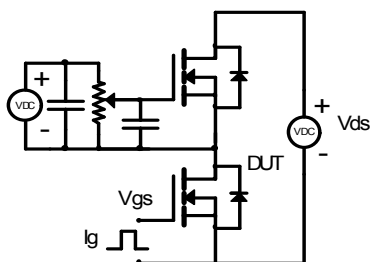
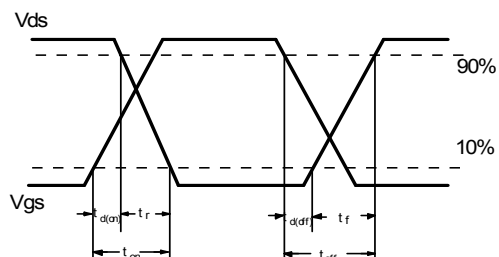
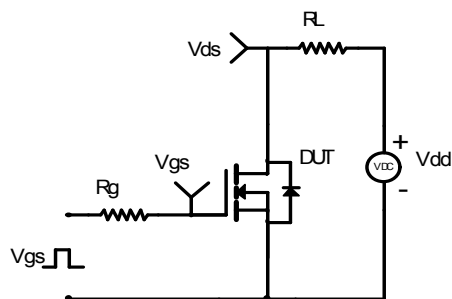


Figure 22: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

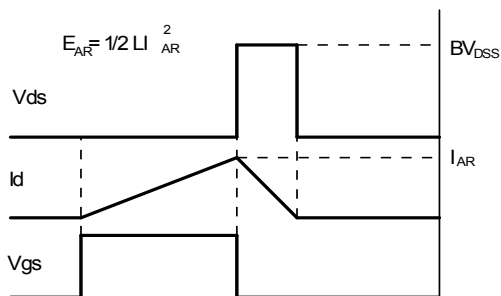
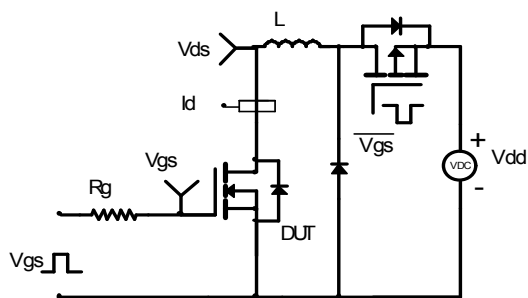
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

