

**AOL1702**
**N-Channel Enhancement Mode Field Effect Transistor**
**SRFET™**
**General Description**

The AOL1702 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.

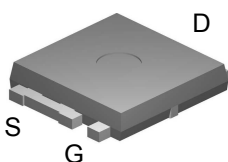
- RoHS Compliant
- Halogen and Antimony Free Green Device\*

**Features**

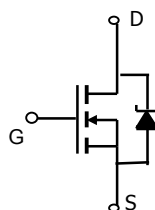
- $V_{DS}$  (V) = 30V
- $I_D = 70A$  ( $V_{GS} = 10V$ )
- $R_{DS(ON)} < 5.8m\Omega$  ( $V_{GS} = 10V$ )
- $R_{DS(ON)} < 7.2m\Omega$  ( $V_{GS} = 4.5V$ )

- 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  $T_A=25^\circ C$  unless otherwise noted**

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>B</sup>	$T_C=25^\circ C^G$	70	A
	$T_C=100^\circ C$	52	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	100	
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ C$	14	A
	$T_A=70^\circ C$	11	
Avalanche Current <sup>C</sup>	$I_{AR}$	30	A
Repetitive avalanche energy $L=0.3mH^C$	$E_{AR}$	135	mJ
Power Dissipation <sup>B</sup>	$T_C=25^\circ C$	58	W
	$T_C=100^\circ C$	29	
Power Dissipation <sup>A</sup>	$T_A=25^\circ C$	2.1	W
	$T_A=70^\circ C$	1.3	
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 <sup>A</sup>	$R_{\theta JA}$	20	25	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	50	
Maximum Junction-to-Case <sup>D</sup>	$R_{\theta JC}$	2.1	2.6	$^\circ C/W$

Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=24\text{V}, V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$			0.1 20	mA
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 12\text{V}$			0.1	$\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.5	1.85	2.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}, V_{DS}=5\text{V}$	100			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$		4.8	5.8	m $\Omega$
		$V_{GS}=4.5\text{V}, I_D=20\text{A}$		7.2	9.0	
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$		110		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				55	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		4000	5000	pF
$C_{oss}$	Output Capacitance			520		pF
$C_{rss}$	Reverse Transfer Capacitance			217		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		0.6	0.9	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=20\text{A}$		59	77	
$Q_g(4.5\text{V})$	Total Gate Charge			27		nC
$Q_{gs}$	Gate Source Charge			12		nC
$Q_{gd}$	Gate Drain Charge			11		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.75\Omega,$ $R_{GEN}=3\Omega$		9		ns
$t_r$	Turn-On Rise Time			9		ns
$t_{D(off)}$	Turn-Off Delay Time			37		ns
$t_f$	Turn-Off Fall Time			8		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}, dI/dt=300\text{A}/\mu\text{s}$		16		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, dI/dt=300\text{A}/\mu\text{s}$		22		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in<sup>2</sup> 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  $t \leq 10\text{s}$  junction-to-ambient thermal resistance. The value in any given application depends on the user's specific board design, and the maximum temperature of  $175^\circ\text{C}$  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<sup>2</sup> 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

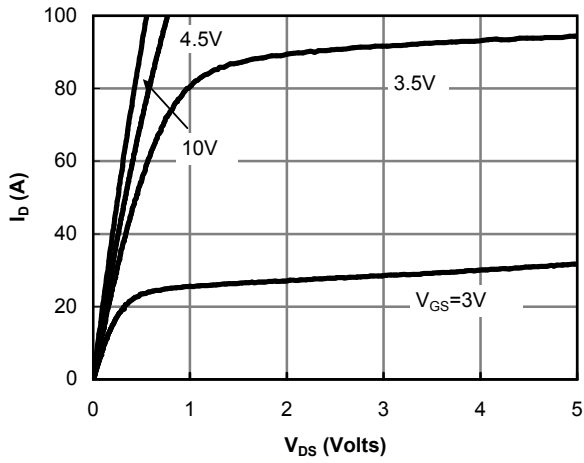


Figure 1: On-Region Characteristics

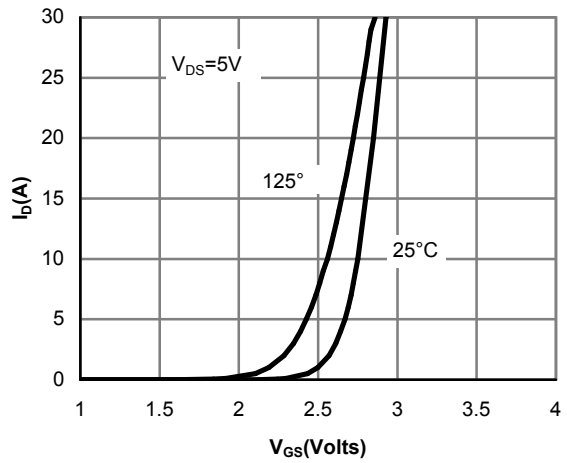


Figure 2: Transfer Characteristics

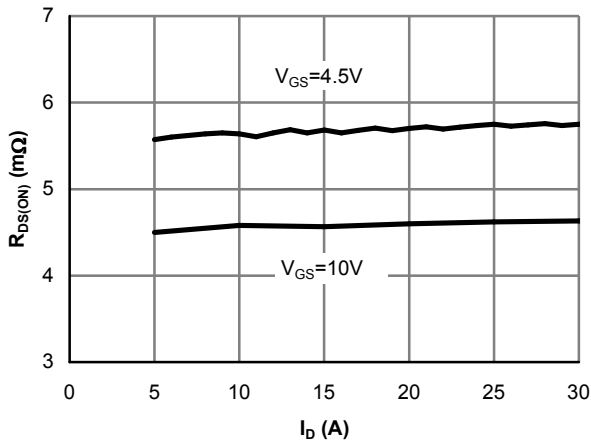


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

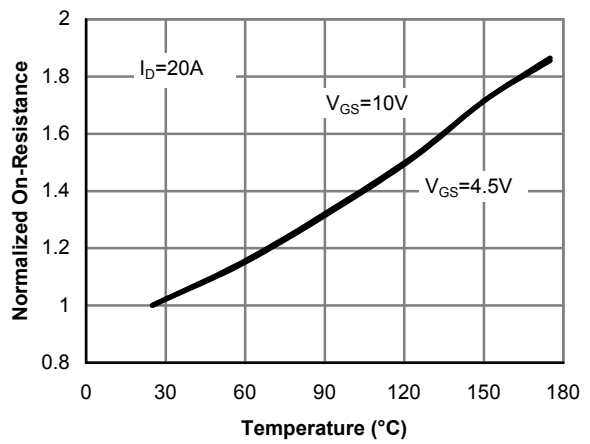


Figure 4: On-Resistance vs. Junction Temperature

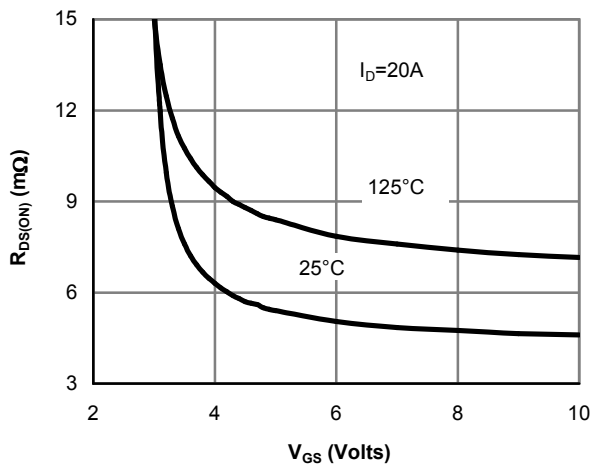


Figure 5: On-Resistance vs. Gate-Source Voltage

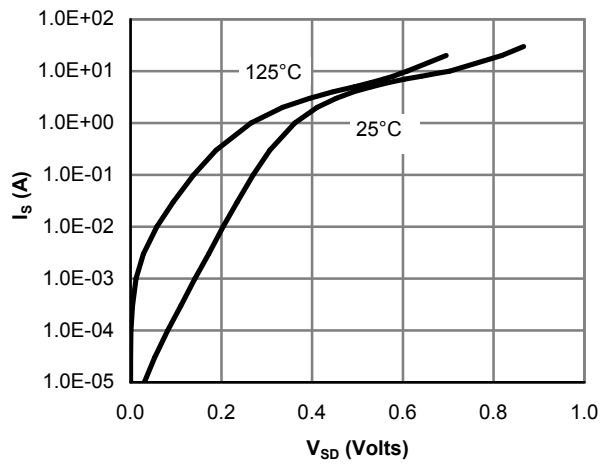


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

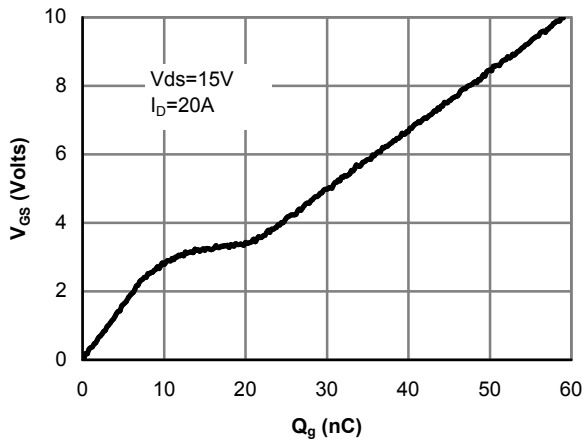


Figure 7: Gate-Charge Characteristics

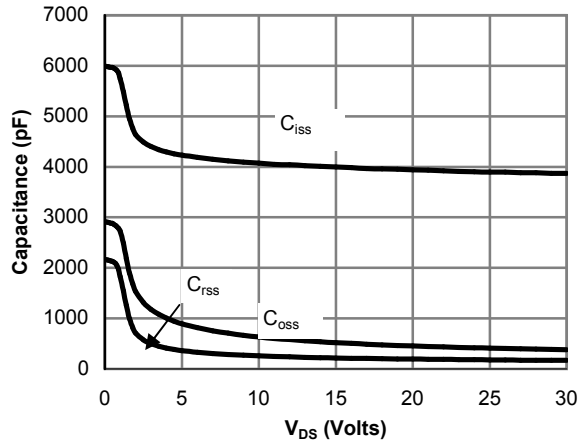


Figure 8: Capacitance Characteristics

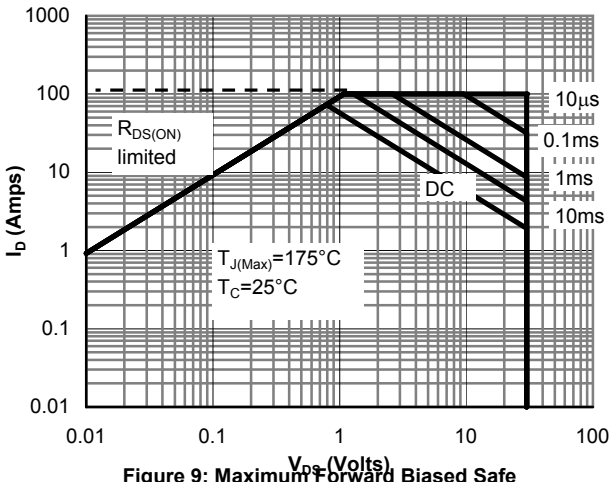


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

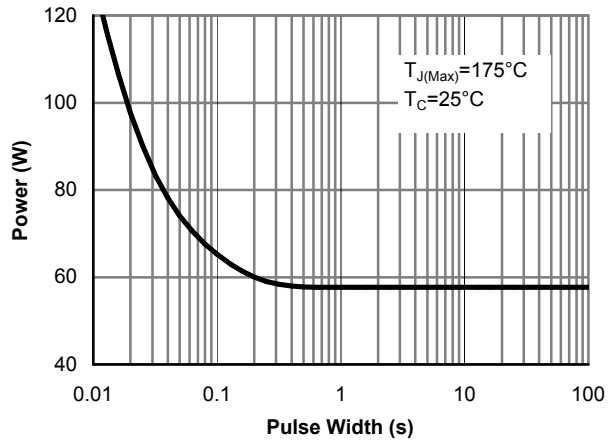


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

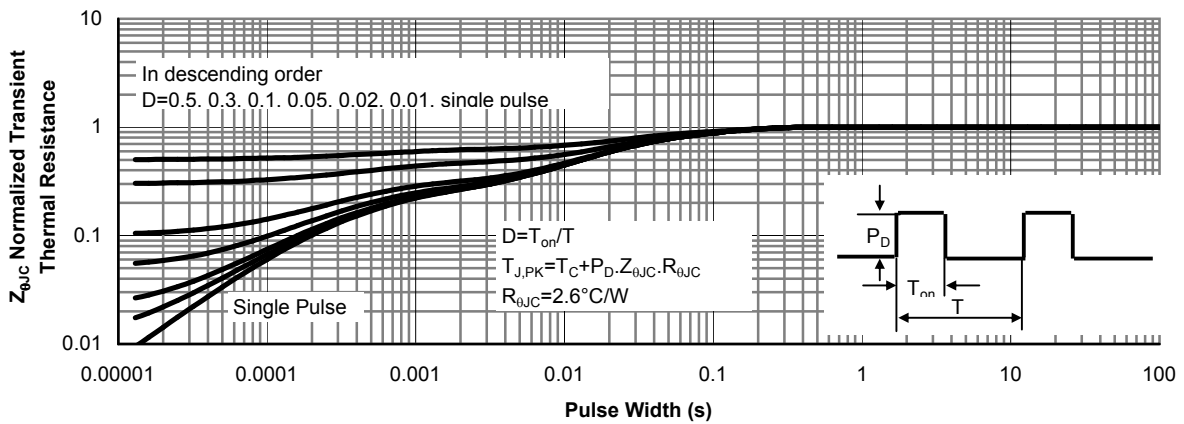


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

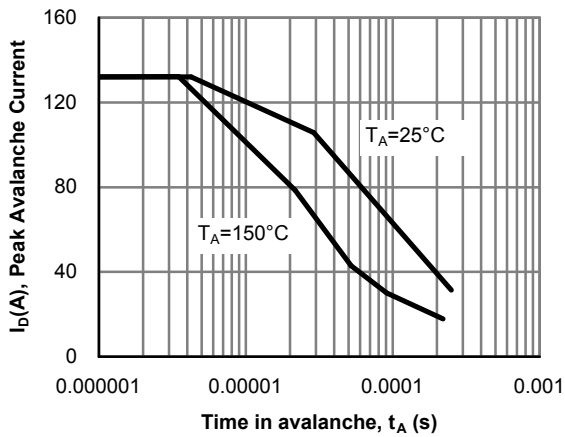


Figure 12: Single Pulse Avalanche capability

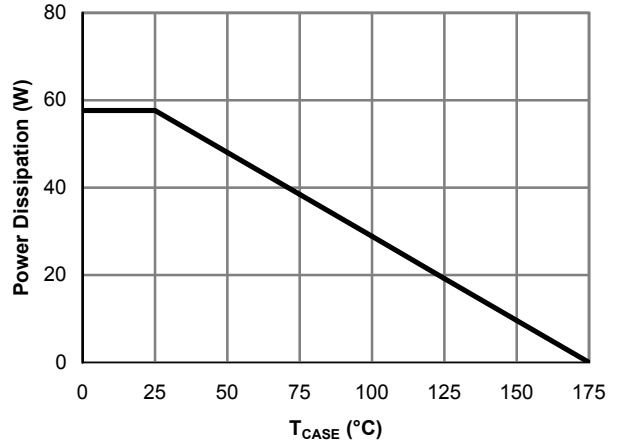


Figure 13: Power De-rating (Note B)

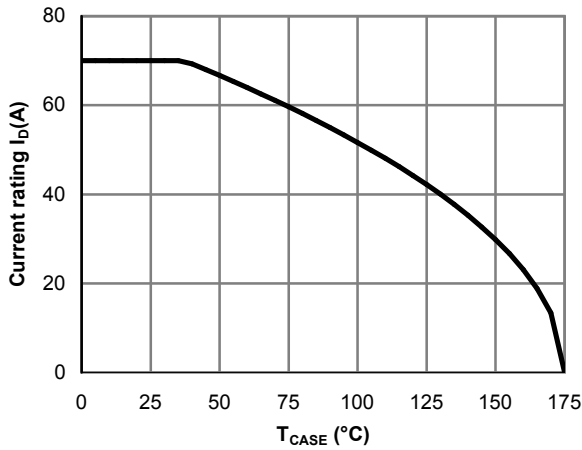


Figure 14: Current De-rating (Note B)

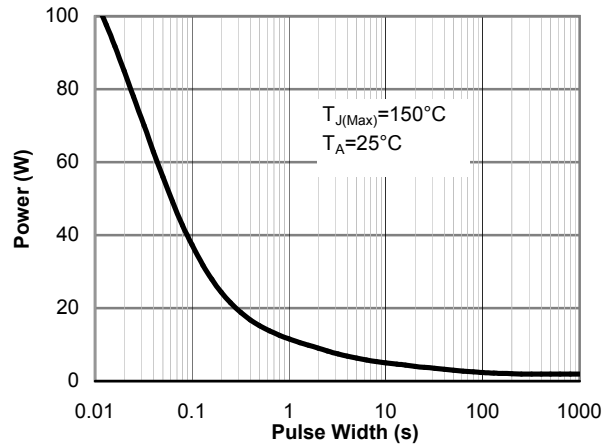


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

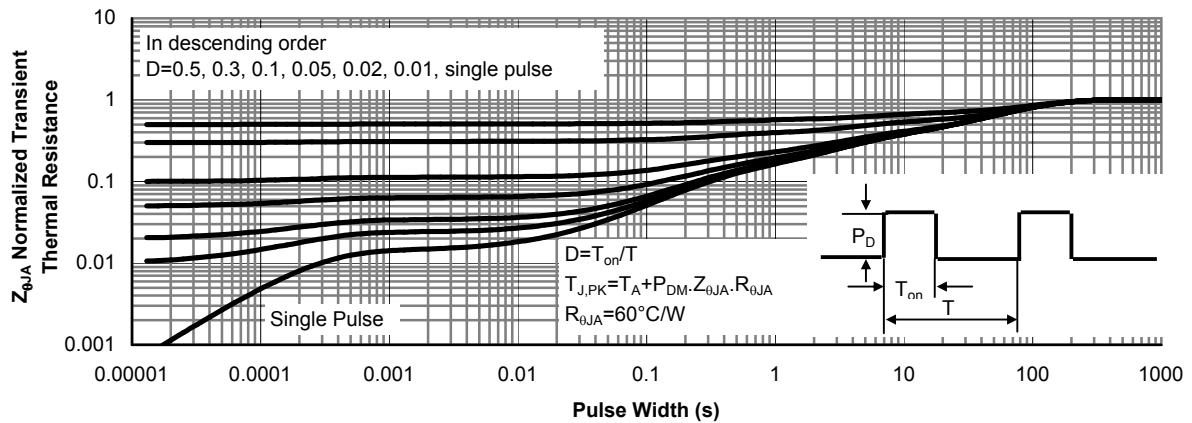


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

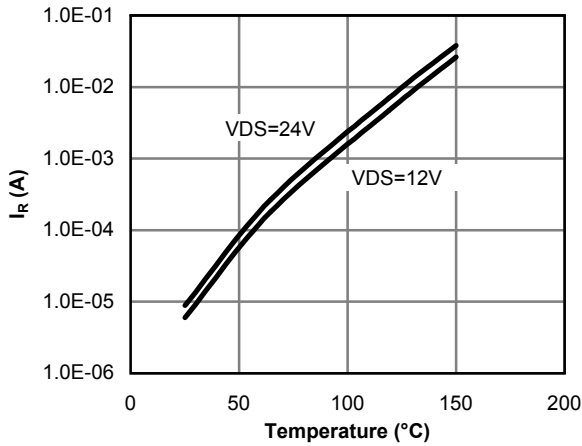


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

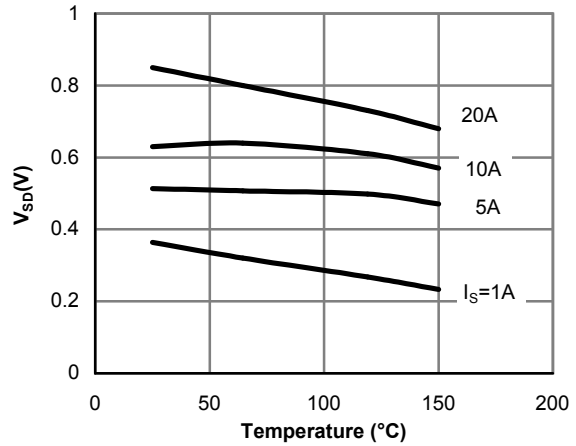


Figure 18: Diode Forward voltage vs. Junction Temperature

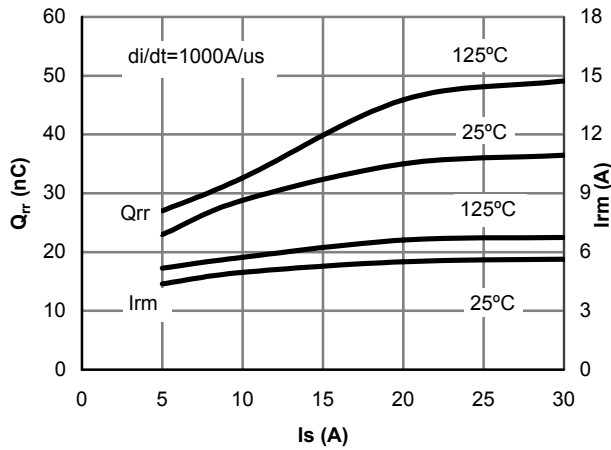


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

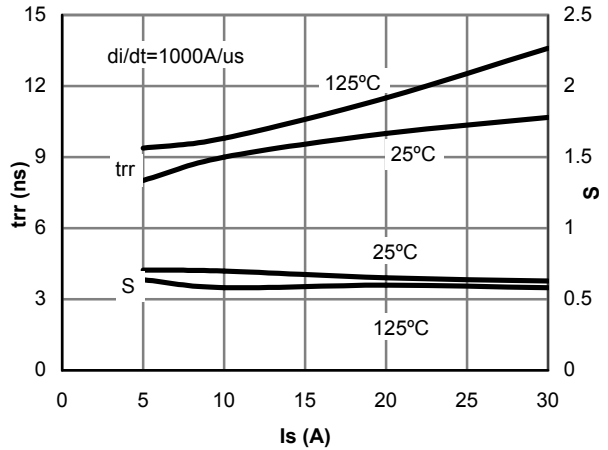


Figure 20: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

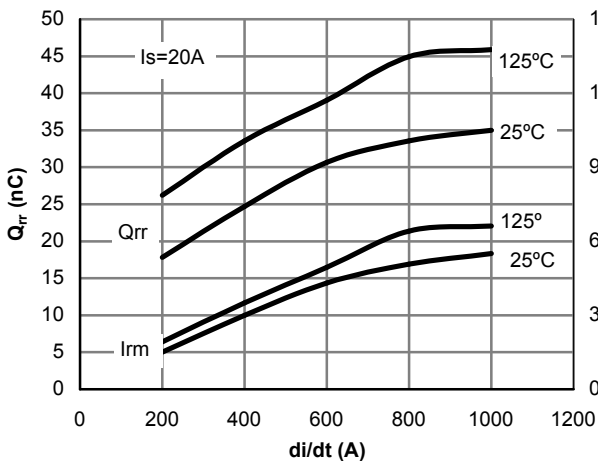


Figure 21: Diode Reverse Recovery Charge and Peak Current vs. di/dt

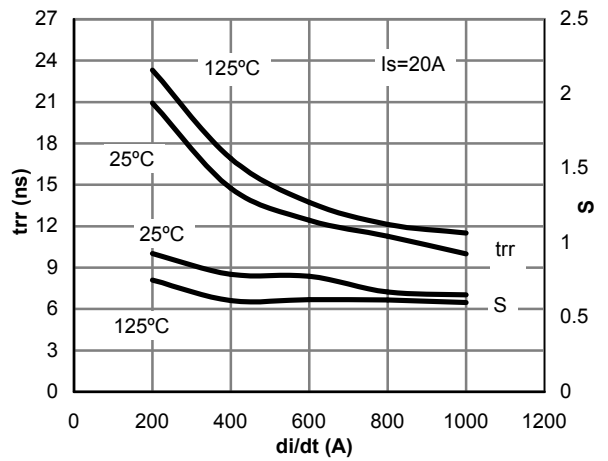
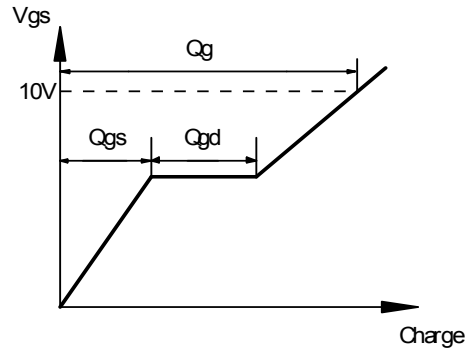
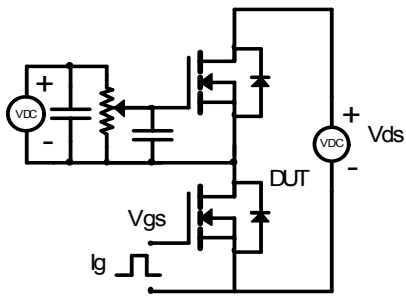
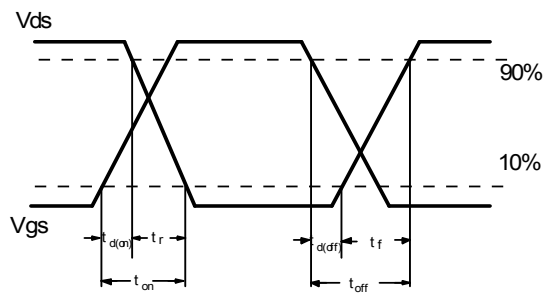
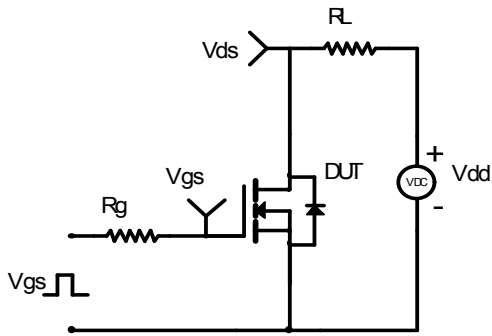


Figure 22: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

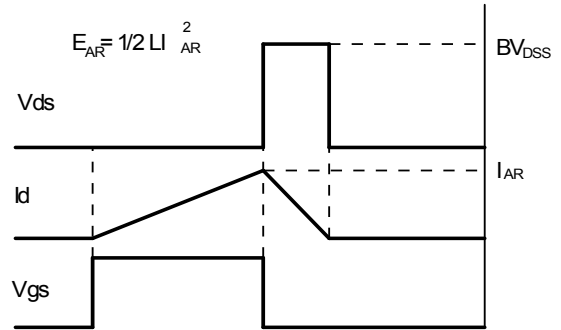
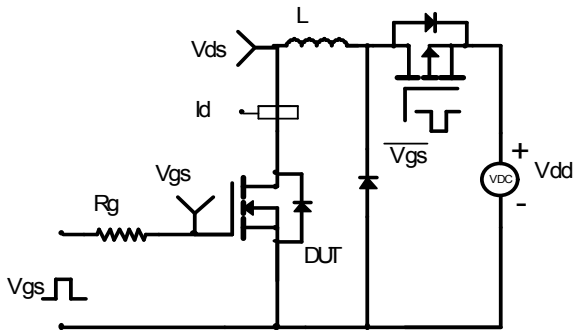
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

