



**ALPHA & OMEGA**  
SEMICONDUCTOR



**AOL1700**

**N-Channel Enhancement Mode Field Effect Transistor**

**SRFET™**

### General Description

**SRFET™** AOL1700 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.

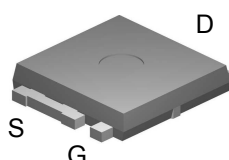
-RoHS Compliant  
-Halogen and Antimony Free Green Device\*

### Features

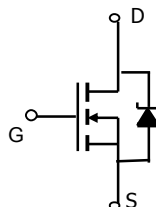
$V_{DS}$  (V) = 30V  
 $I_D$  = 85A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 4.2m\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 6.0m\Omega$  ( $V_{GS}$  = 4.5V)

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	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>B</sup>	$I_D$	85	A
$T_C=25^\circ\text{C}^H$			
$T_C=100^\circ\text{C}$	$I_D$	81	A
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	200	A
Continuous Drain Current <sup>A</sup>	$I_{DSM}$	26	A
$T_A=25^\circ\text{C}$			
$T_A=70^\circ\text{C}$	$I_{DSM}$	21	A
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>	$P_D$	100	W
		50	
Power Dissipation <sup>A</sup>	$P_{DSM}$	5.0	W
		3.2	
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 <sup>A</sup>	$R_{\theta JA}$	19.6	25	$^\circ\text{C/W}$
$t \leq 10s$				
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	50	60	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Case <sup>D</sup>	$R_{\theta JC}$	1	1.5	$^\circ\text{C/W}$
Steady-State				

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =1mA, V <sub>GS</sub> =0V	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V T <sub>J</sub> =125°C			0.1 20	mA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V			0.1	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	1.2	1.5	2.2	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	200			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A T <sub>J</sub> =125°C		3.4	4.2	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A		5.2	6.5	
				4.8	6.0	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		90		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.36	0.5	V
I <sub>S</sub>	Maximum Body-Diode + Schottky Diode Continuous Current <sup>H</sup>				85	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		3760	4512	pF
C <sub>oss</sub>	Output Capacitance			682		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			314		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		0.75	1.5	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub> (10V)	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A		62	74	nC
Q <sub>g</sub> (4.5V)	Total Gate Charge			29	35	nC
Q <sub>gs</sub>	Gate Source Charge			12		nC
Q <sub>gd</sub>	Gate Drain Charge			12		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω		9.5		ns
t <sub>r</sub>	Turn-On Rise Time			8.5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			34		ns
t <sub>f</sub>	Turn-Off Fall Time			9		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, dI/dt=300A/μs		18	27	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, dI/dt=300A/μs		22		nC

A: The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25°C. The power dissipation P<sub>DSM</sub> and current rating I<sub>DSM</sub> are based on T<sub>J(MAX)</sub>=150°C, using steady-state junction-to-ambient thermal resistance.

B: The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=175°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<sub>J(MAX)</sub>=175°C.

D: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.

E: The static characteristics in Figures 1 to 6 are obtained using <300 μs 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<sub>J(MAX)</sub>=175°C. The SOA curve provides a single pulse rating.

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<sub>A</sub>=25°C.

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

\* This device is guaranteed green after date code 8P11 (June 8<sup>th</sup> 2008)

Rev2: Feb. 2008

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

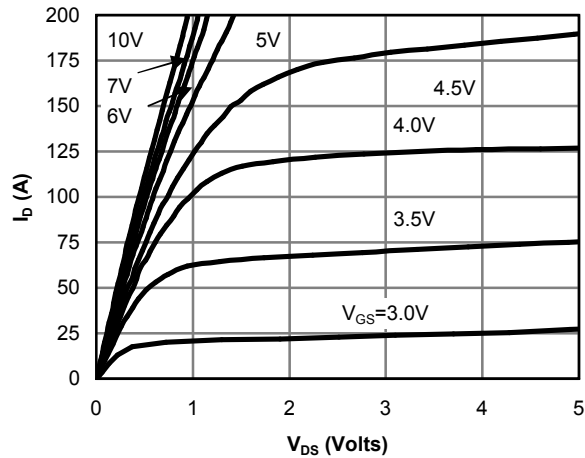


Figure 1: On-Region Characteristics

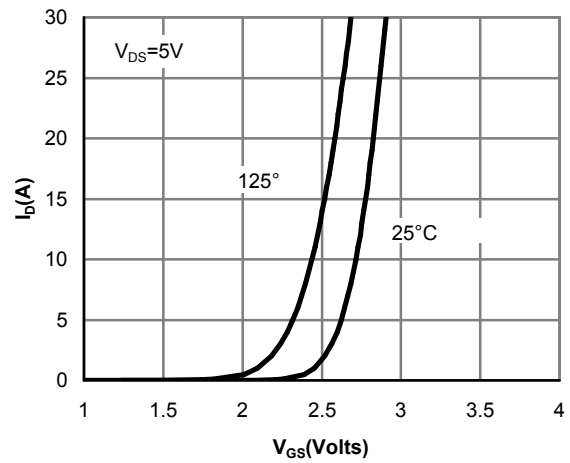


Figure 2: Transfer Characteristics

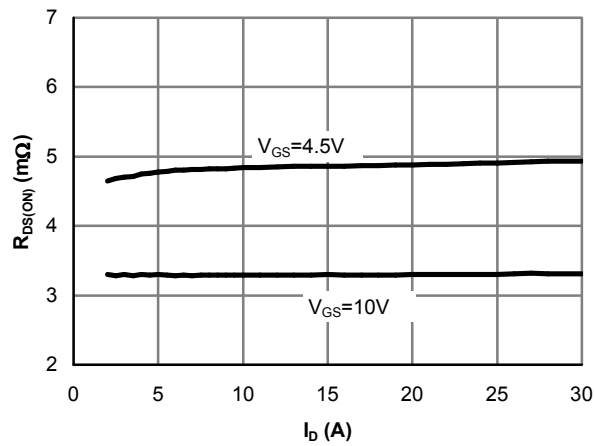


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

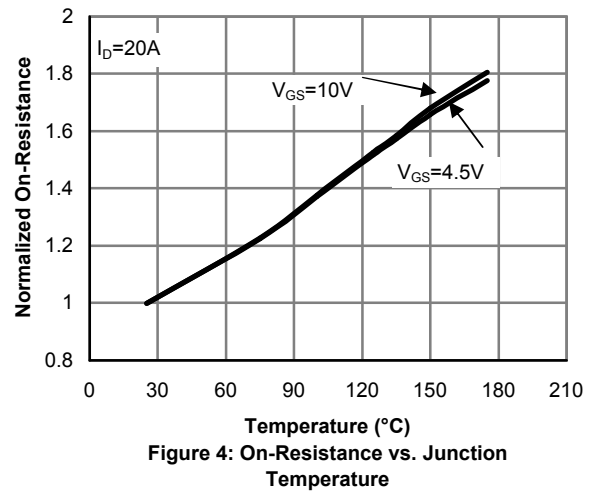


Figure 4: On-Resistance vs. Junction Temperature

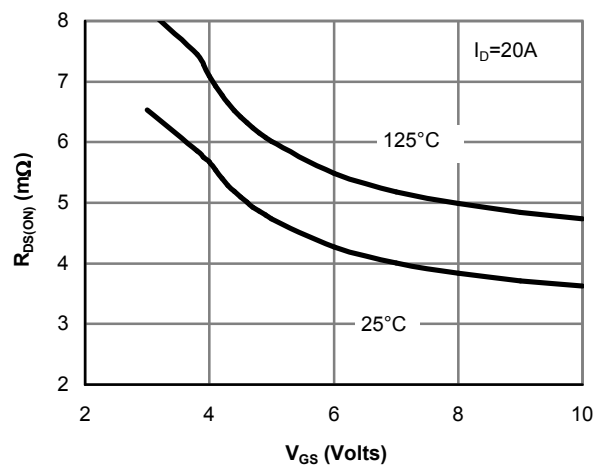


Figure 5: On-Resistance vs. Gate-Source Voltage

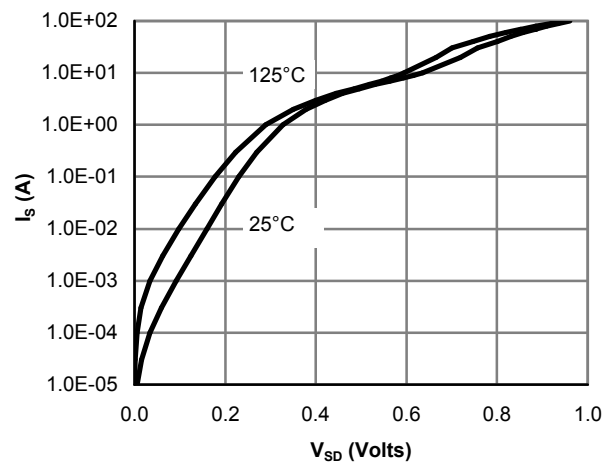


Figure 6: Body-Diode Characteristics

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

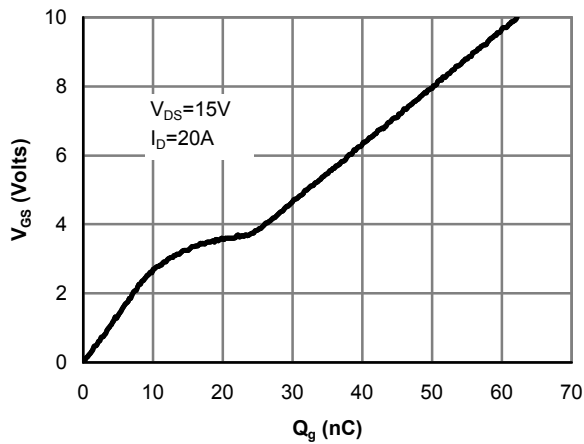


Figure 7: Gate-Charge Characteristics

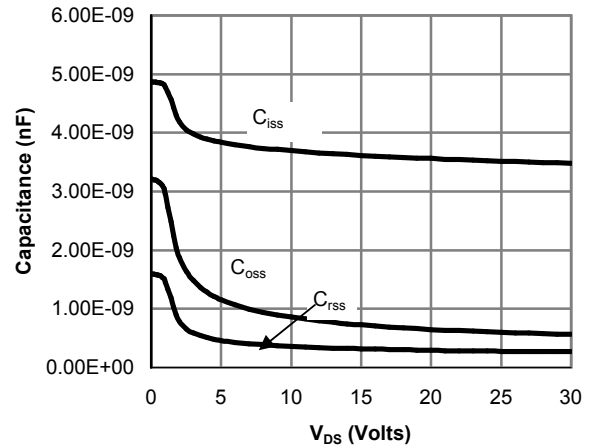


Figure 8: Capacitance Characteristics

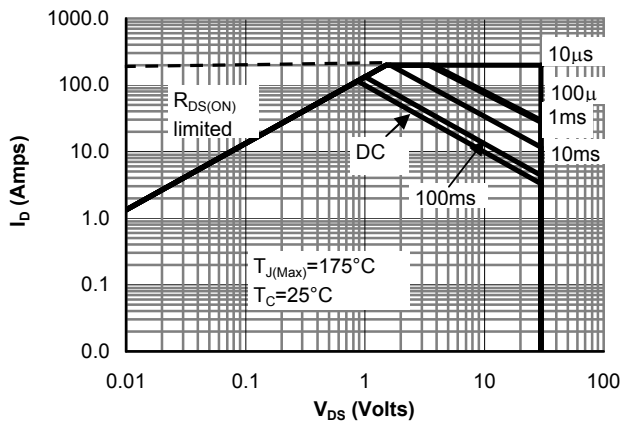


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

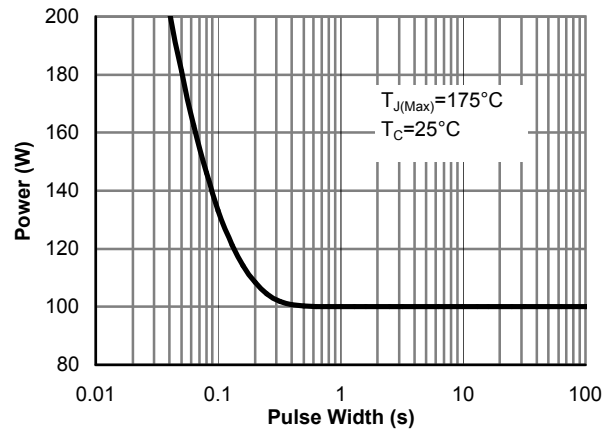


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

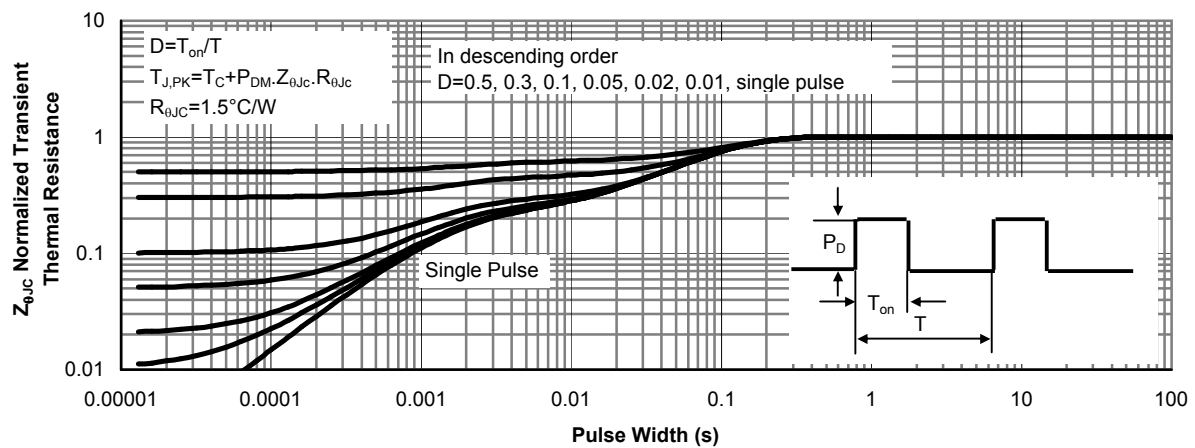


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

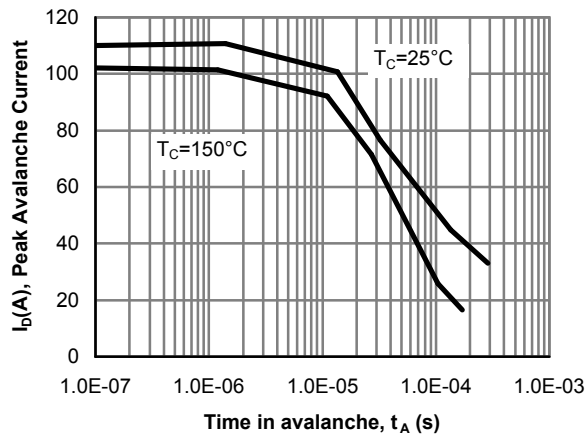


Figure 12: Single Pulse Avalanche capability

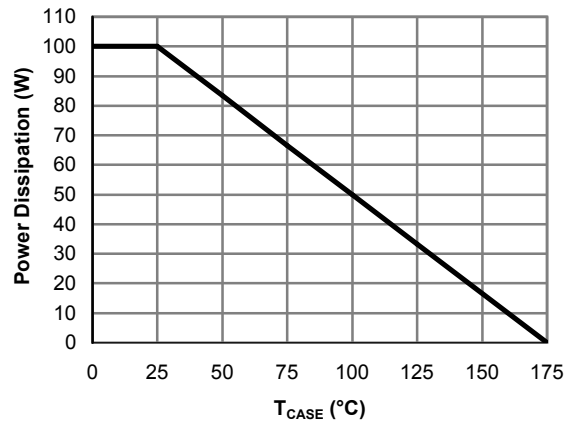


Figure 13: Power De-rating (Note B)

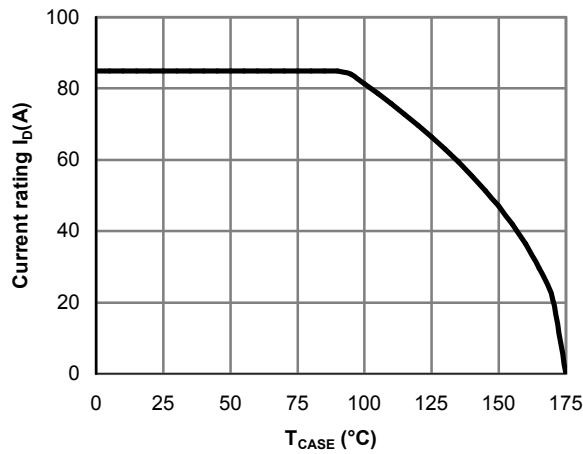


Figure 14: Current De-rating (Note B)

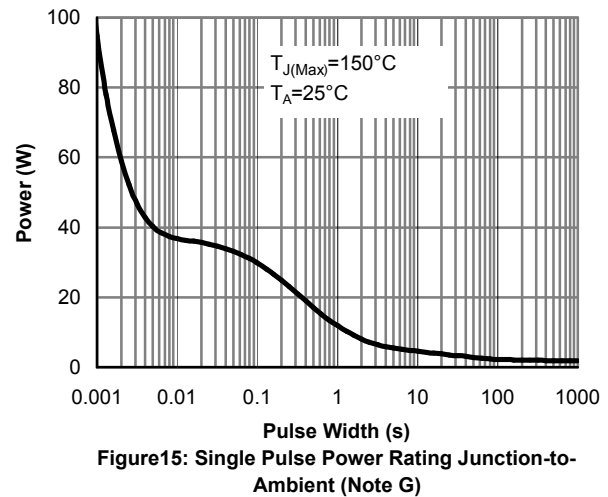


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

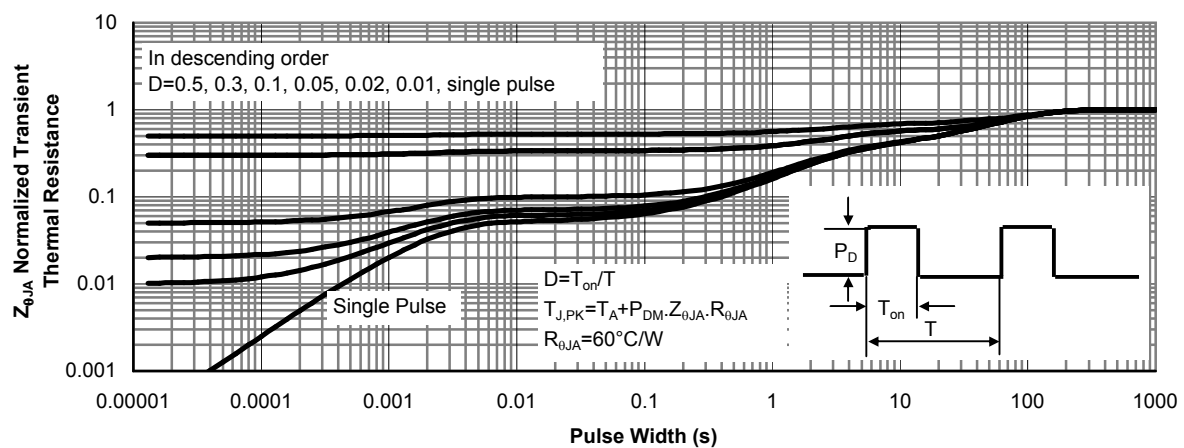
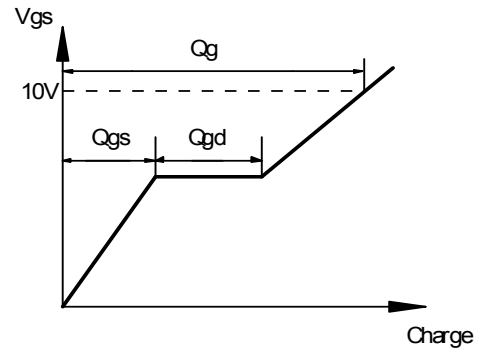
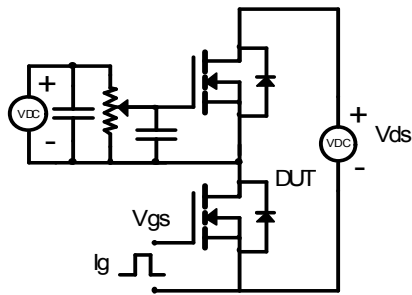
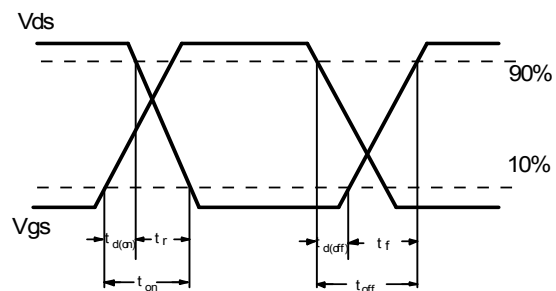
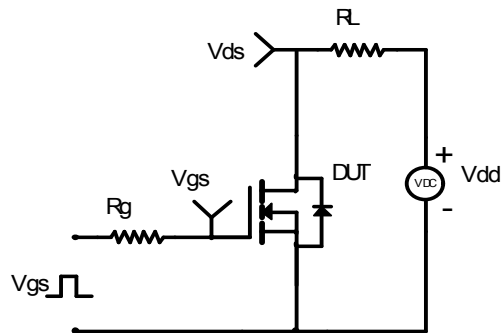


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

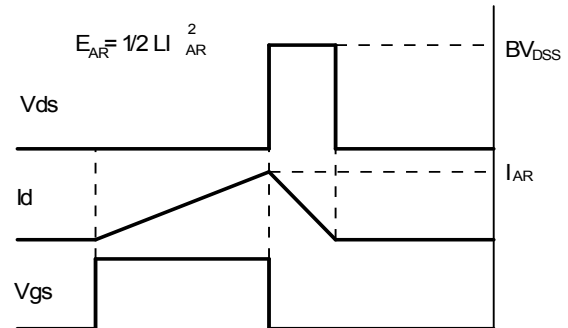
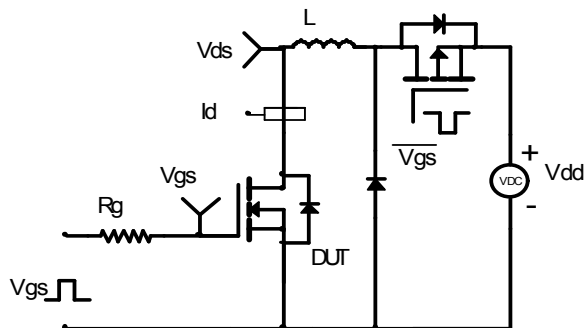
Gate Charge Test Circuit &amp; Waveform



Resistive Switching Test Circuit &amp; Waveforms



Unclamped Inductive Switching (UIS) Test Circuit &amp; Waveforms



Diode Recovery Test Circuit &amp; Waveforms

