ALPHA & OMEGA
SEMICONDUCTOR

AON4703

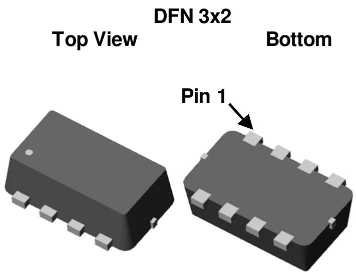
20V P-Channel MOSFET with Schottky Diode

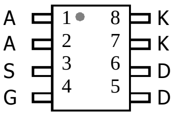
General Description

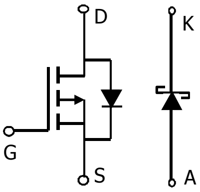
The AON4703 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for buck converter applications.

Features

V_{DS} (V) = -20V
I_D = -3.4A   (V_{GS} = -4.5V)
$R_{DS(ON)} < 90m\Omega$ (V_{GS} = -4.5V)
$R_{DS(ON)} < 120m\Omega$ (V_{GS} = -2.5V)
$R_{DS(ON)} < 160m\Omega$ (V_{GS} = -1.8V)
SCHOTTKY
V_{KA} (V) = 20V, I_F = 1A, V_F<0.5V @ 1A







Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	MOSFET	Schottky	Units
Drain-Source Voltage		V_{DS}	-20		V
Gate-Source Voltage		V_{GS}	±8		V
Continuous Drain Current [A]	T_A=25°C	I_D	-3.4		A
	T_A=70°C		-2.7		
Pulsed Drain Current [B]		I_{DM}	-15		
Schottky reverse voltage		V_{KA}		20	V
Continuous Forward Current [A]	T_A=25°C	I_F		1.9	A
	T_A=70°C			1.2	
Pulsed Forward Current [B]		I_{FM}		7	
Power Dissipation	T_A=25°C	P_D	1.7	0.96	W
	T_A=70°C		1.1	0.62	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Parameter: Thermal Characteristics MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	51	75	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		88	110	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	28	35	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	66	80	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		95	130	
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	40	50	

Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=-250µA, V_{GS}=0V	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-20V, V_{GS}=0V			-1	µA
		T_J=55℃			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.4	-0.65	-1	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-3.4A		51	90	mΩ
		T_J=125℃		64	135	
		V_{GS}=-2.5V, I_D=-2.5A		65	120	mΩ
		V_{GS}=-1.8V, I_D=-1.5A		83	160	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3.4A		12		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current				-2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		560	745	pF
C_{oss}	Output Capacitance			80		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		15	23	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3.4A		8.5	11	nC
Q_{gs}	Gate Source Charge			1.2		nC
Q_{gd}	Gate Drain Charge			2.1		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=2.9Ω, R_{GEN}=3Ω		7.2		ns
t_r	Turn-On Rise Time			36		ns
$t_{D(off)}$	Turn-Off DelayTime			53		ns
t_f	Turn-Off Fall Time			56		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-3.4A, dI/dt=100A/µs		37	49	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-3.4A, dI/dt=100A/µs		27		nC
SCHOTTKY PARAMETERS						
V_F	Forward Voltage Drop	I_F=1A		0.4	0.5	V
I_{rm}	Maximum reverse leakage current	V_R=16V			0.2	mA
		V_R=16V, T_J=125℃			20	
C_T	Junction Capacitance	V_R=10V		44		pF
t_{rr}	Schottky Reverse Recovery Time	I_F=1A, dI/dt=100A/µs		11	14	ns
Q_{rr}	Schottky Reverse Recovery Charge	I_F=1A, dI/dt=100A/µs		2.5		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 value in any given application depends on the user's specific board design.
B: Repetitive rating, pulse width limited by junction temperature.
C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
D. The static characteristics in Figures 1 to 6 are obtained using t ≤ 300µs pulses, duty cycle 0.5% max.
E. 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. The SOA curve provides a single pulse rating.
F. The current rating is based on the t ≤ 10s thermal resistance rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

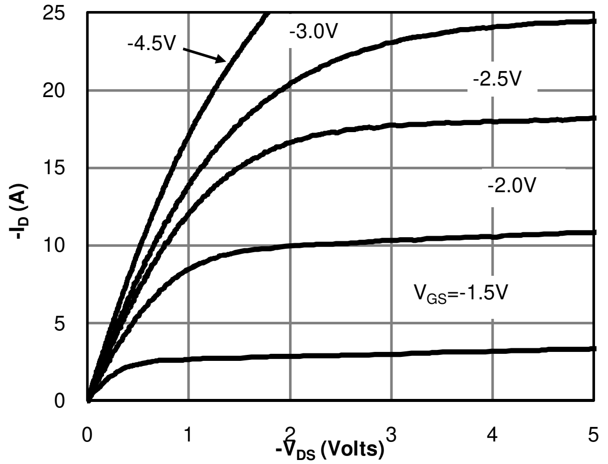


Fig 1: On-Region Characteristics

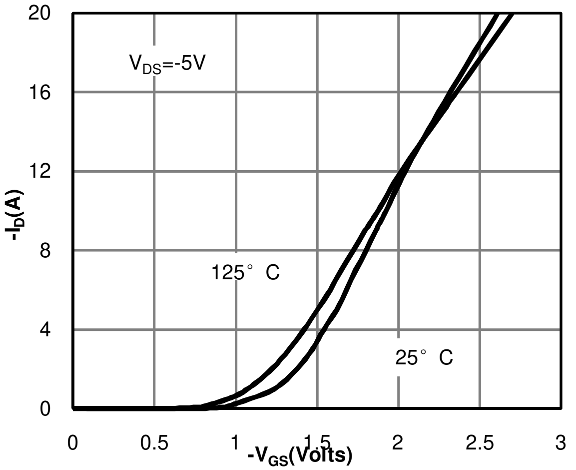


Figure 2: Transfer Characteristics

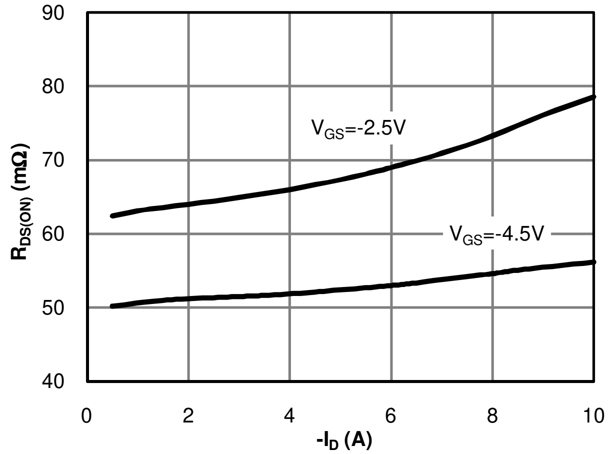


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

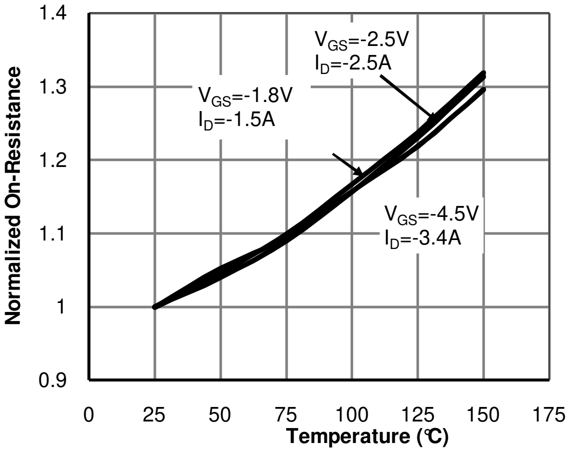


Figure 4: On-Resistance vs. Junction Temperature

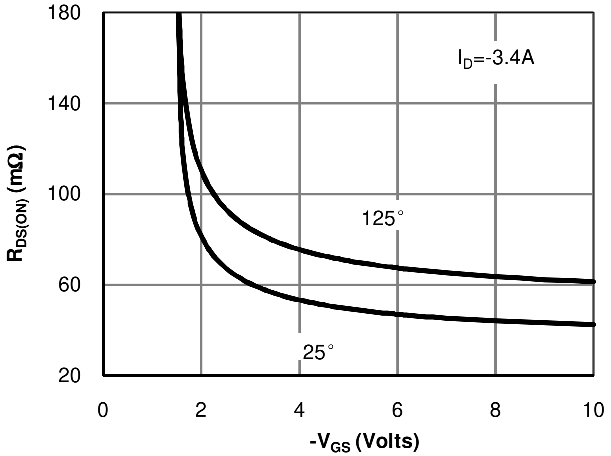


Figure 5: On-Resistance vs. Gate-Source Voltage

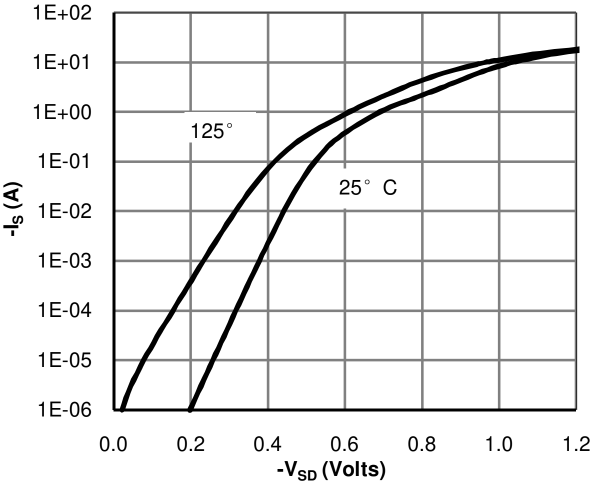


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

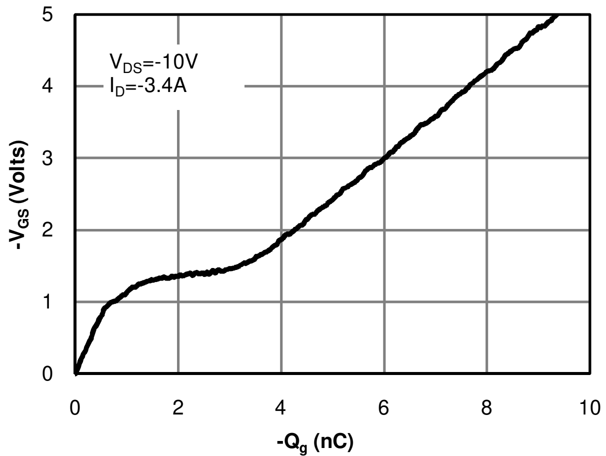


Figure 7: Gate-Charge Characteristics

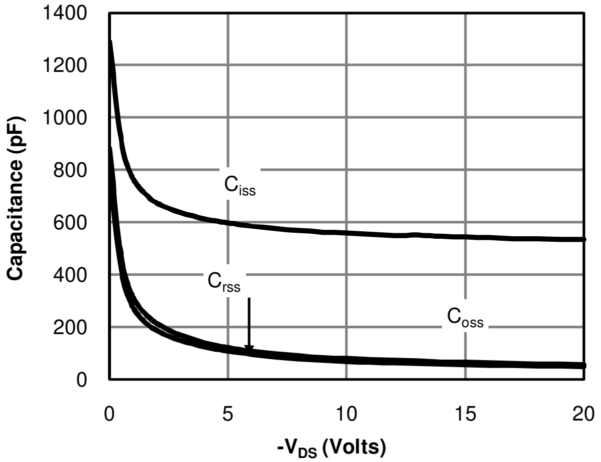


Figure 8: Capacitance Characteristics

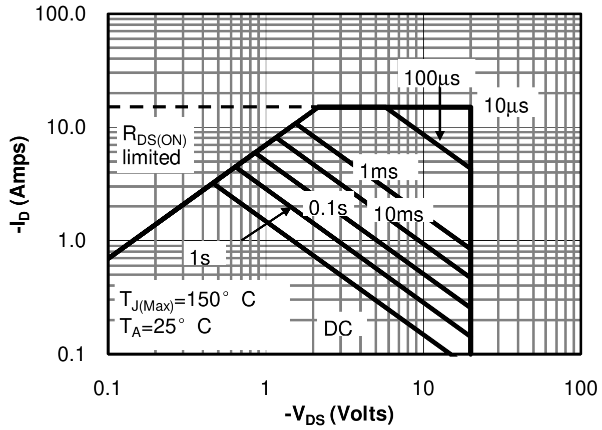


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

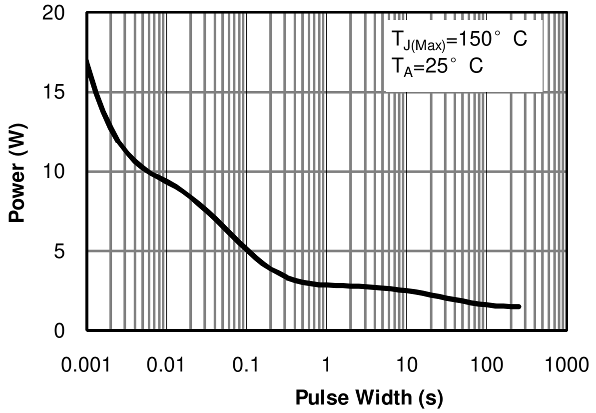


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

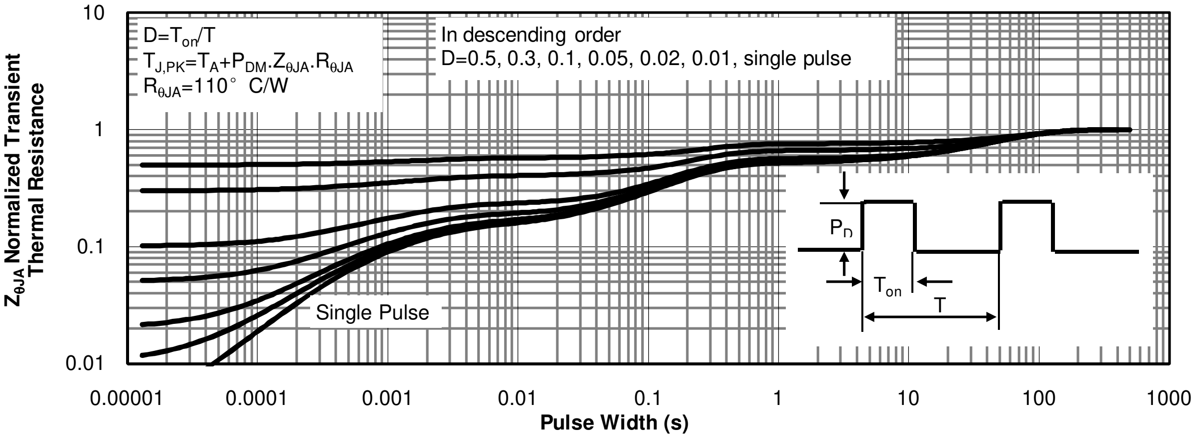


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

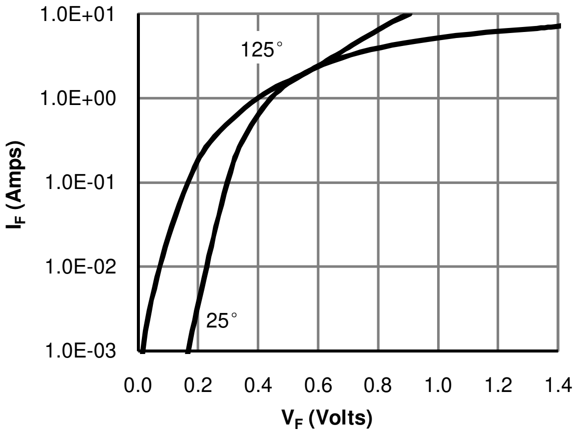


Figure 12: Schottky Forward Characteristics

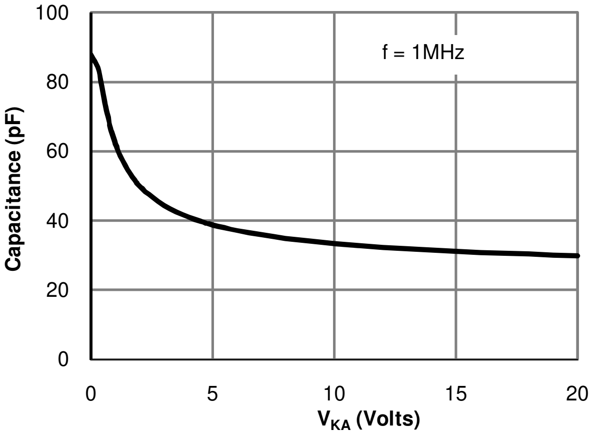


Figure 13: Schottky Capacitance Characteristics

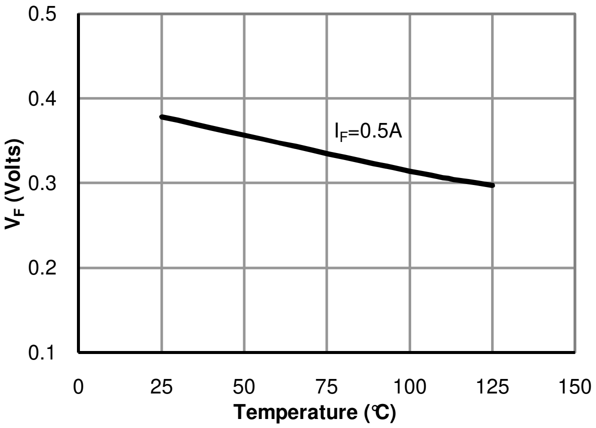


Figure 14: Schottky Forward Drop vs. Junction Temperature

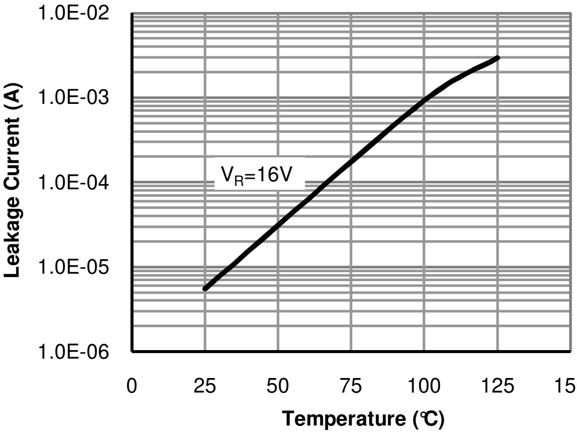


Figure 15: Schottky Leakage current vs. Junction Temperature

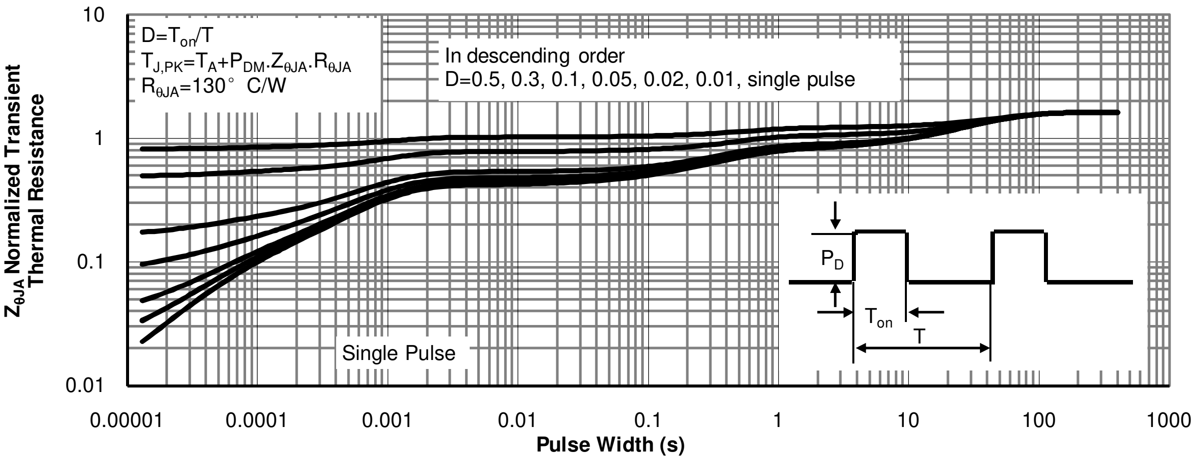
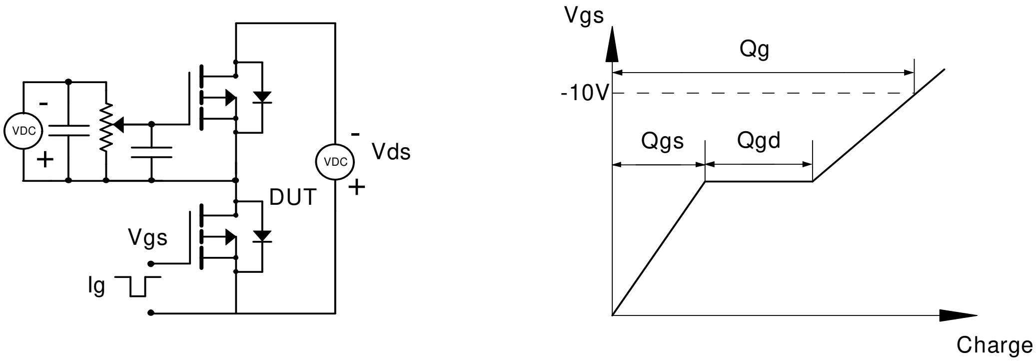
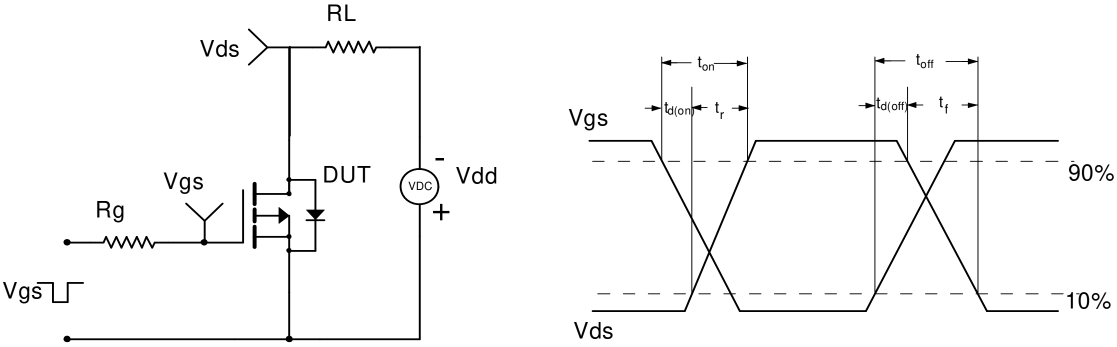


Figure 16: Schottky Normalized Maximum Transient Thermal Impedance

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms