

AON2701

P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

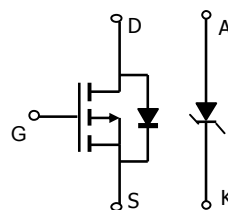
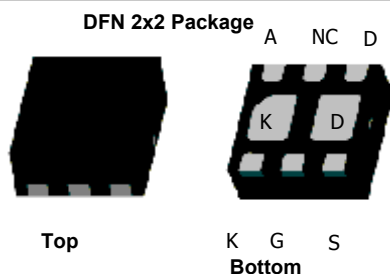
General Description

The AON2701/L 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 DC-DC conversion applications. AON2701 and AON2701L are electrically identical.

- RoHS Compliant
- Halogen Free*

Features

V_{DS} (V) = -20V
 I_D = -3A (V_{GS} = -4.5V)
 $R_{DS(ON)}$ < 120m Ω (V_{GS} = -4.5V)
 $R_{DS(ON)}$ < 160m Ω (V_{GS} = -2.5V)
 $R_{DS(ON)}$ < 200m Ω (V_{GS} = -1.8V)
SCHOTTKY
 V_{KA} (V) = 20V, I_F = 2A, V_F < 0.45V@1A



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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	$T_A=25^\circ\text{C}$	-3		A
	$T_A=70^\circ\text{C}$	-2.3		
Pulsed Drain Current ^B	I_{DM}	-15		
Schottky reverse voltage	V_{KA}		20	V
Continuous Forward Current ^A	$T_A=25^\circ\text{C}$		2.5	A
	$T_A=70^\circ\text{C}$		1.5	
Pulsed Forward Current ^B	I_{FM}		15	
Power Dissipation	$T_A=25^\circ\text{C}$	1.5	1.45	W
	$T_A=70^\circ\text{C}$	0.95	0.92	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Parameter: Thermal Characteristics MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	35	45	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		65	85	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	36	47	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		67	87	

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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-20\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.3	-0.5	-1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-3\text{A}$ $T_J=125^{\circ}\text{C}$		100 135	120 170	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$, $I_D=-2.6\text{A}$		128	160	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}$, $I_D=-1.5\text{A}$		160	200	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-3\text{A}$		6		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.76	-1	V
I_S	Maximum Body-Diode Continuous Current				-1.1	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$		540	700	pF
C_{oss}	Output Capacitance			90		pF
C_{rss}	Reverse Transfer Capacitance			63		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		9.5	13	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $I_D=-3\text{A}$		5	6.5	nC
Q_{gs}	Gate Source Charge			1.2		nC
Q_{gd}	Gate Drain Charge			1		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $R_L=1.5\Omega$, $R_{GEN}=3\Omega$		5		ns
t_r	Turn-On Rise Time			40		ns
$t_{D(off)}$	Turn-Off DelayTime			28.5		ns
t_f	Turn-Off Fall Time			46		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-3\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		21	28	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-3\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		9.1		nC
SCHOTTKY PARAMETERS						
V_F	Forward Voltage Drop	$I_F=1\text{A}$		0.4	0.45	V
I_{rm}	Maximum reverse leakage current	$V_R=5\text{V}$			0.05	mA
		$V_R=5\text{V}$, $T_J=125^{\circ}\text{C}$			10	
I_{rm}	Maximum reverse leakage current	$V_R=16\text{V}$			0.1	mA
		$V_R=16\text{V}$, $T_J=125^{\circ}\text{C}$			20	
C_T	Junction Capacitance	$V_R=10\text{V}$		53		pF
t_{rr}	Schottky Reverse Recovery Time	$I_F=1\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		11	14	ns
Q_{rr}	Schottky Reverse Recovery Charge	$I_F=1\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		2.5		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

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

E: These tests are performed with the device mounted on 1 in² 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 data code 7111 (Oct 15 2007).

Rev4: Sep, 2008

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: MOSFET

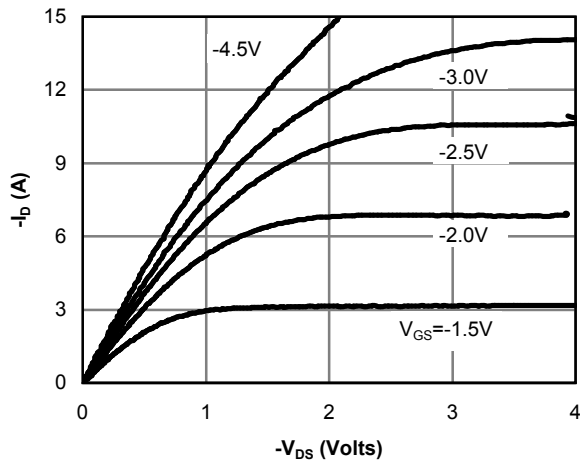


Figure 1: On-Region Characteristics

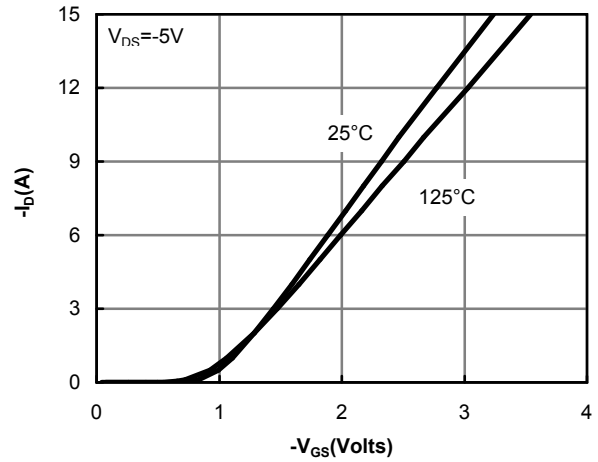


Figure 2: Transfer Characteristics

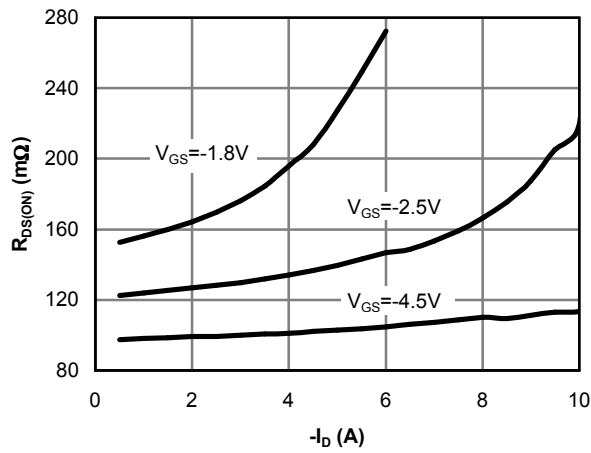


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

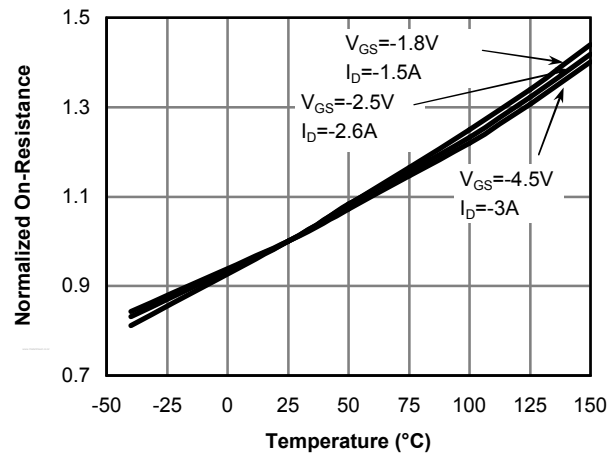


Figure 4: On-Resistance vs. Junction Temperature

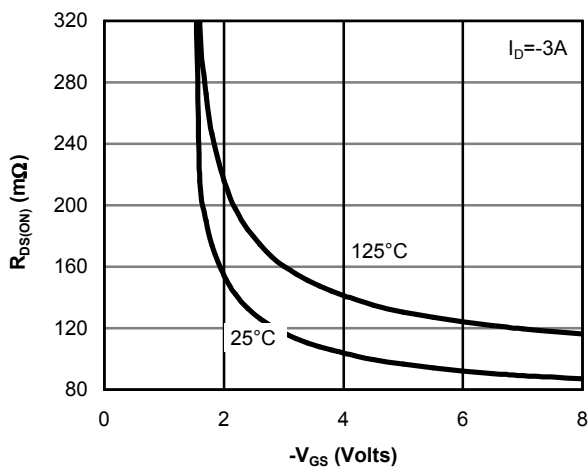


Figure 5: On-Resistance vs. Gate-Source Voltage

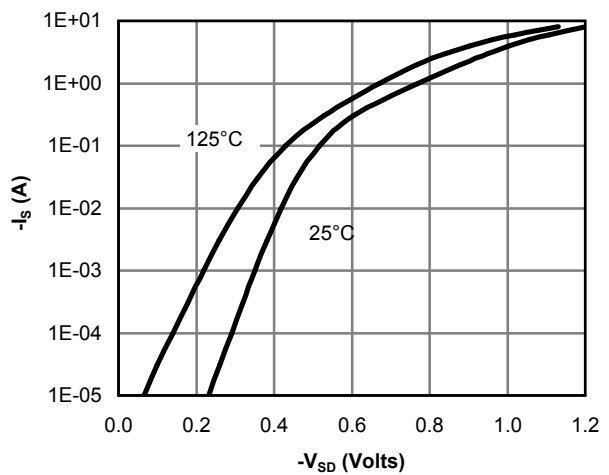


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: MOSFET

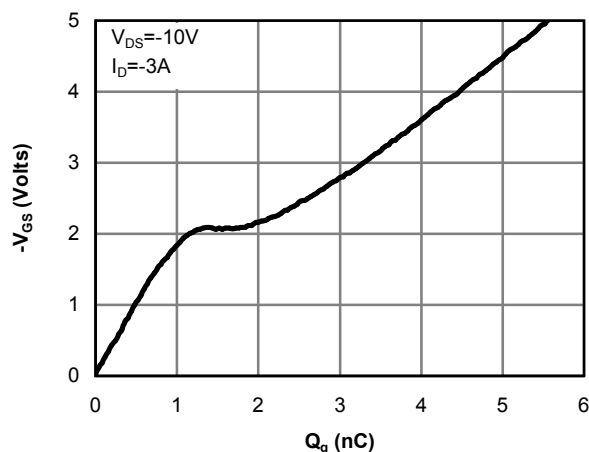


Figure 7: Gate-Charge Characteristics

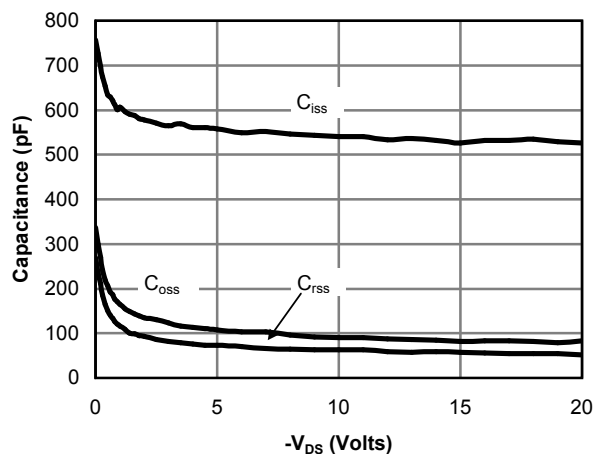


Figure 8: Capacitance Characteristics

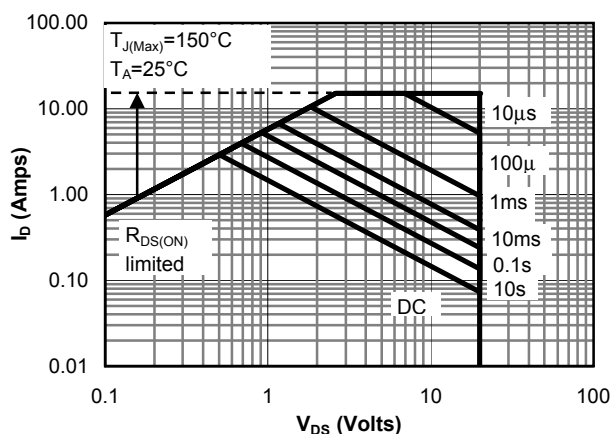


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

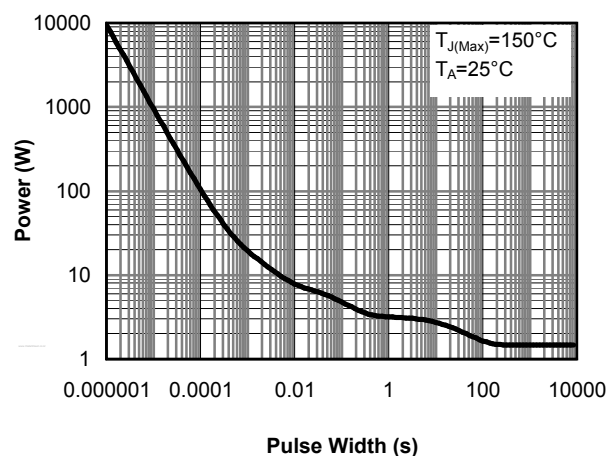


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

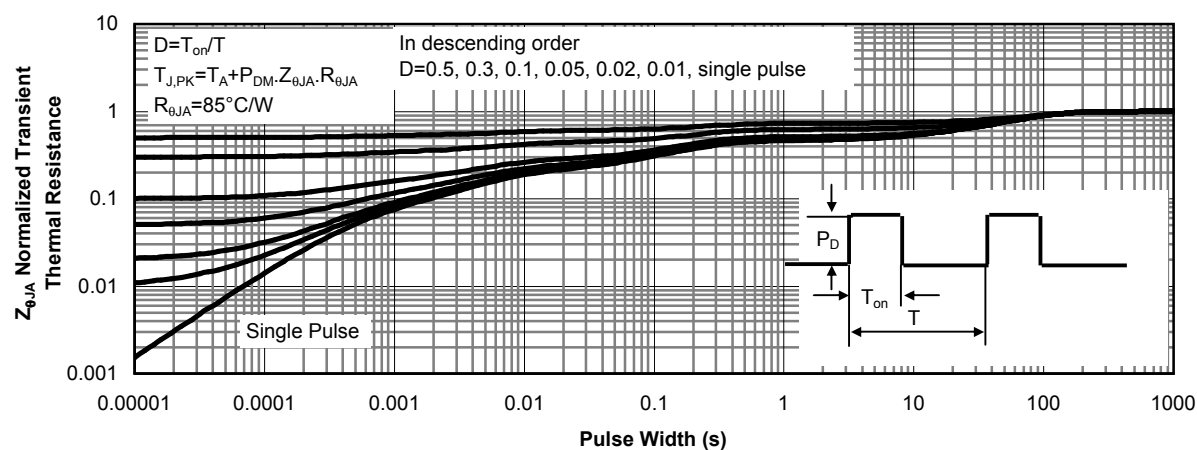


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

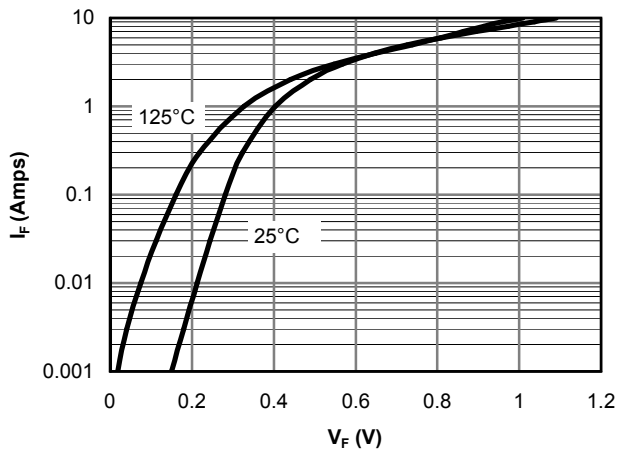


Figure 12: Schottky Forward Characteristics

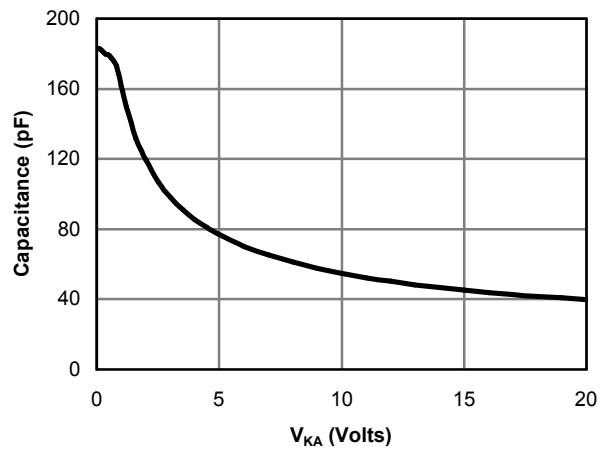


Figure 13: Schottky Capacitance Characteristics

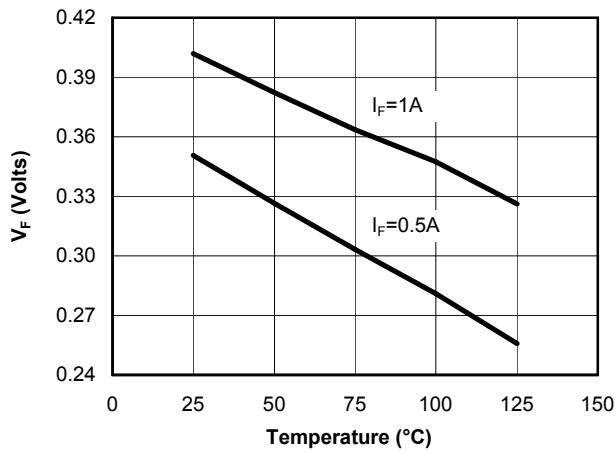


Figure 14: Schottky Forward Drop vs. Junction Temperature

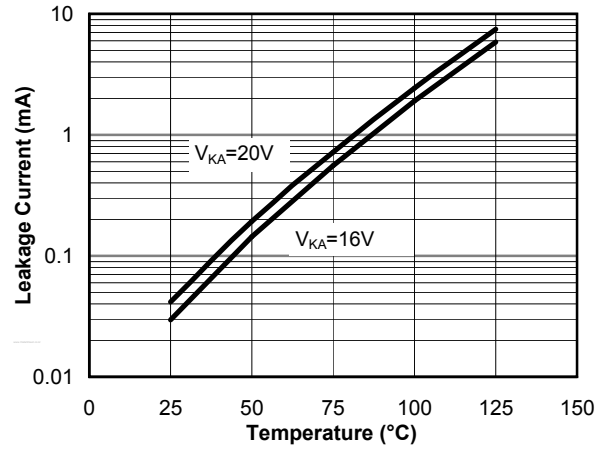


Figure 15: Schottky Leakage Current vs. Junction Temperature

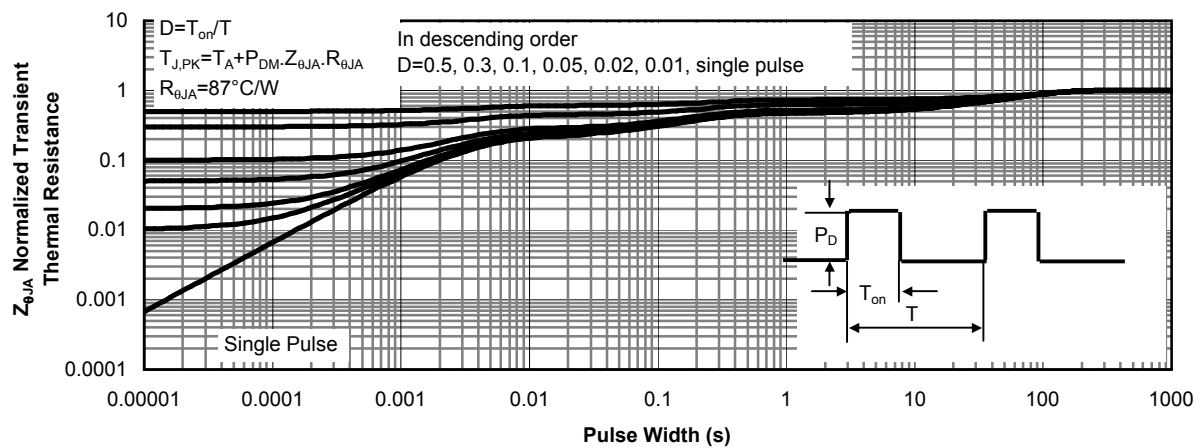
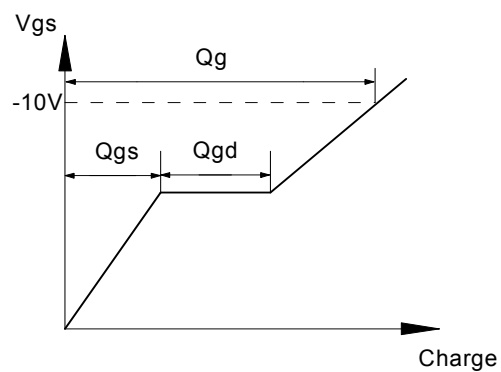
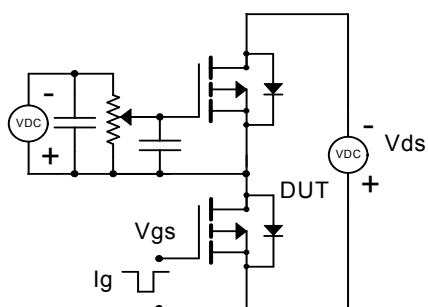
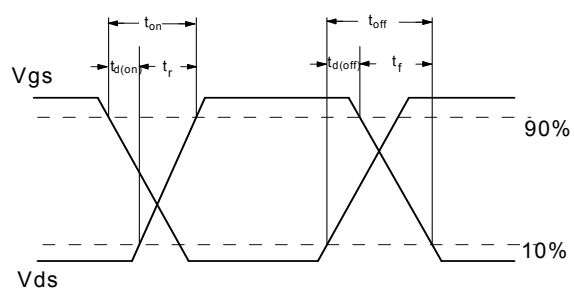
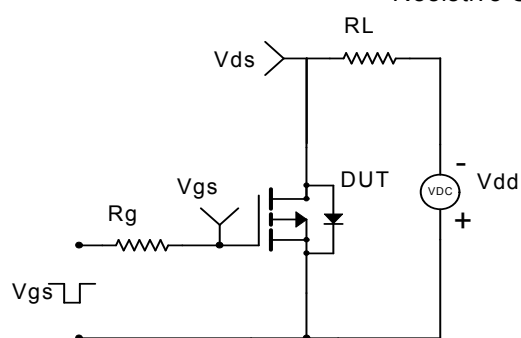


Figure 16: Schottky Normalized Maximum Transient Thermal Impedance (Note E)

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

