



THE DATASHEET OF AOT414



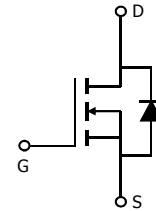
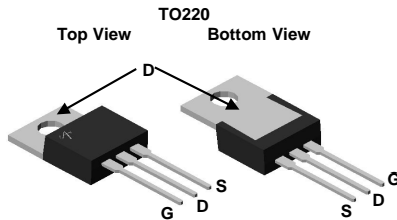
General Description

The AOT414 is fabricated with SDMOS™ trench technology that combines excellent $R_{DS(ON)}$ with low gate charge. The result is outstanding efficiency with controlled switching behavior. This universal technology is well suited for PWM, load switching and general purpose applications. AOT414 and AOT414L are electrically identical.

Product Summary

V_{DS}	100V
I_D (at $V_{GS}=10V$)	43A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 25m Ω
$R_{DS(ON)}$ (at $V_{GS} = 7V$)	< 31m Ω

100% UIS Tested
100% R_g Tested



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 25	V
Continuous Drain Current ^G	I_D	$T_C=25^\circ\text{C}$	43
		$T_C=100^\circ\text{C}$	31
Pulsed Drain Current ^C	I_{DM}	100	A
Continuous Drain Current	I_{DSM}	$T_A=25^\circ\text{C}$	5.6
		$T_A=70^\circ\text{C}$	4.5
Avalanche Current ^C	I_{AR}	28	A
Repetitive avalanche energy $L=0.1\text{mH}$ ^C	E_{AR}	39	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	115
		$T_C=100^\circ\text{C}$	58
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$	1.9
		$T_A=70^\circ\text{C}$	1.23
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	$R_{\theta JA}$	11.6	13.9	$^\circ\text{C/W}$
$t \leq 10\text{s}$				
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JC}$	0.7	1.3	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Case	Steady-State			

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	100			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =100V, V _{GS} =0V T _J =55°C			10 50	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±25V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	2	3.3	4	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	100			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		20.5 36	25 43	mΩ
		V _{GS} =7V, I _D =15A		25	31	
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		37		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.66	1	V
I _S	Maximum Body-Diode Continuous Current				40	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =50V, f=1MHz	1400	1770	2200	pF
C _{oss}	Output Capacitance		115	165	214	pF
C _{riss}	Reverse Transfer Capacitance		33	55	80	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	0.3	0.65	1.0	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =50V, I _D =20A	14	28	42	nC
Q _{gs}	Gate Source Charge		4	9	14	nC
Q _{gd}	Gate Drain Charge		6	10	14	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =50V, R _L =2.5Ω, R _{GEN} =3Ω		12		ns
t _r	Turn-On Rise Time			4		ns
t _{D(off)}	Turn-Off DelayTime			17		ns
t _f	Turn-Off Fall Time			5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=100A/μs	20	29	38	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=100A/μs	25	36	46	nC
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=500A/μs	12	20	26	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=500A/μs	60	82	110	nC

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The Power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 175° C. 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° 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° C. Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{qJC} and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300ms 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° C. The SOA curve provides a single pulse rating.

G. 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° C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

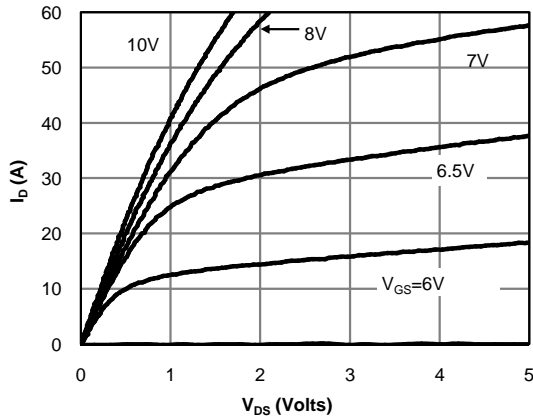


Figure 1: On-Region Characteristics (Note E)

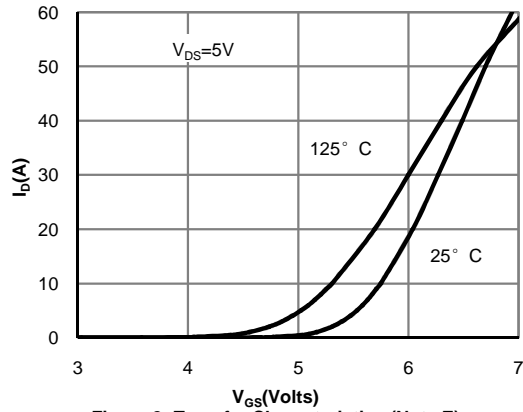


Figure 2: Transfer Characteristics (Note E)

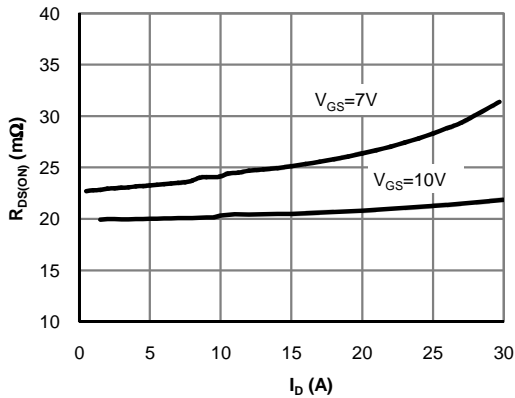


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

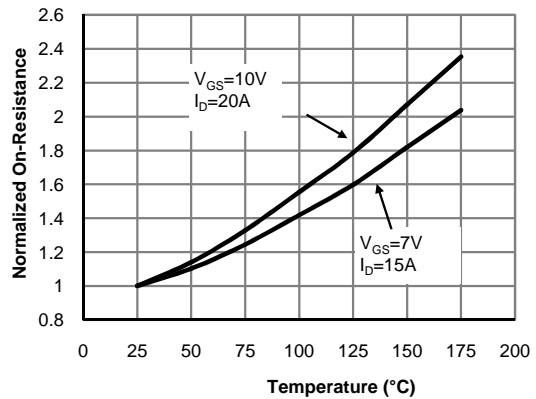


Figure 4: On-Resistance vs. Junction Temperature (Note E)

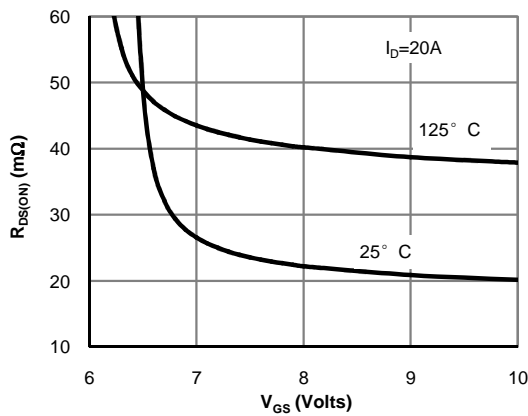


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

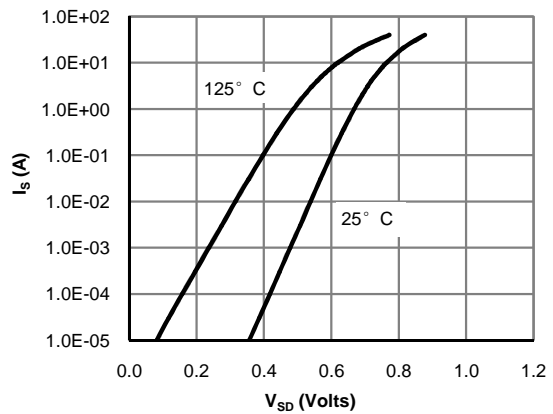


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

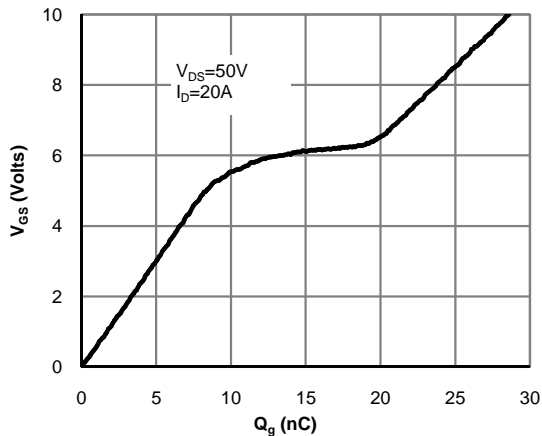


Figure 7: Gate-Charge Characteristics

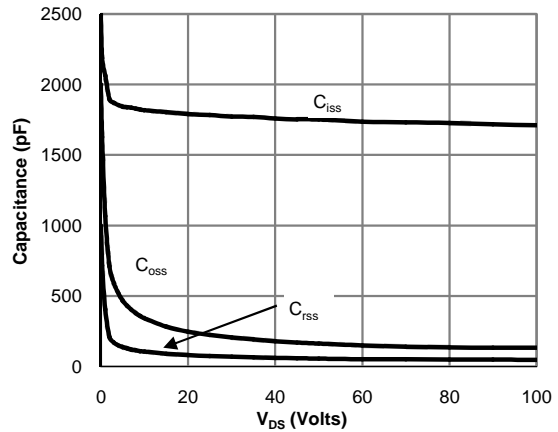


Figure 8: Capacitance Characteristics

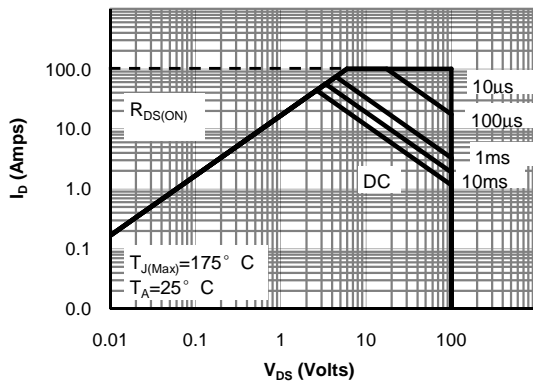


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

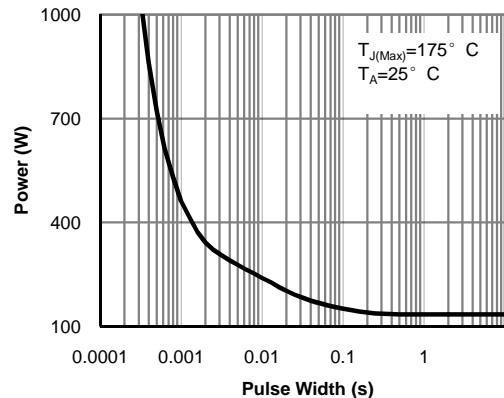


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

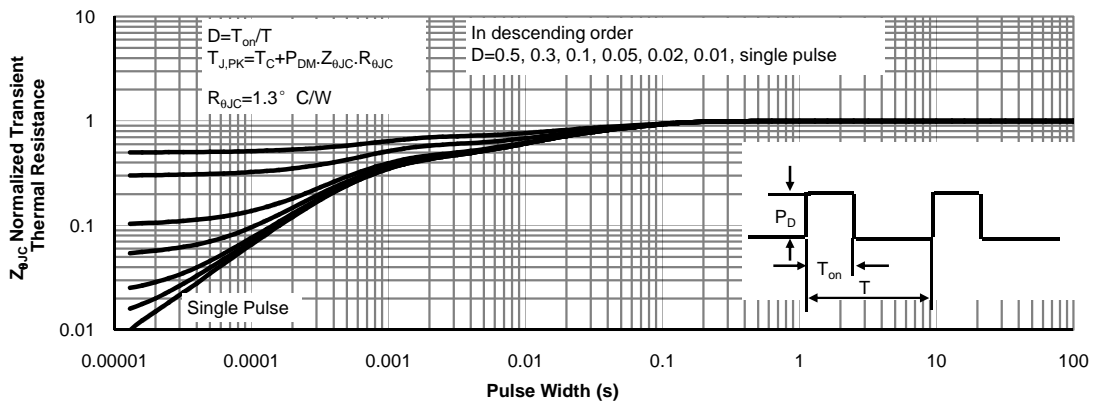


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

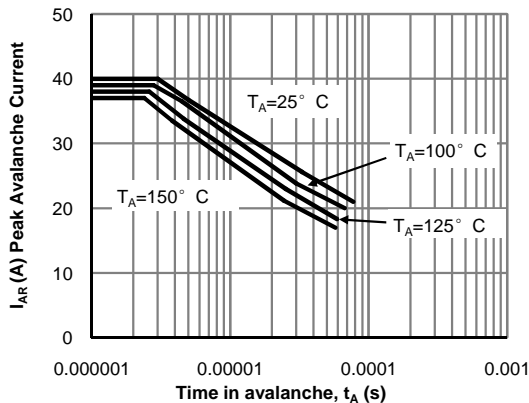


Figure 12: Single Pulse Avalanche capability (Note C)

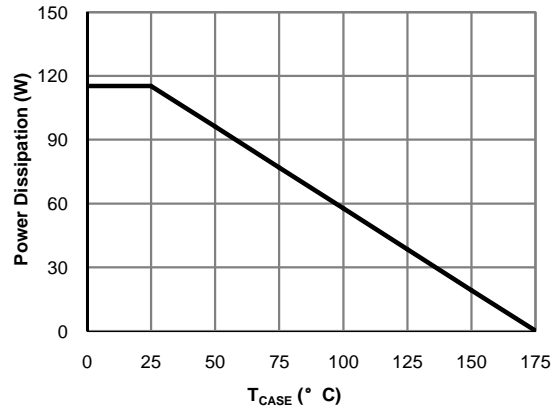


Figure 13: Power De-rating (Note F)

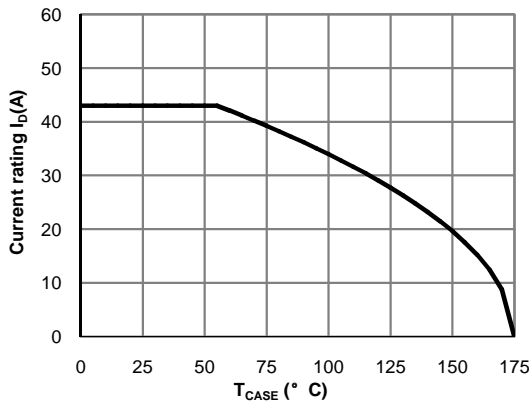


Figure 14: Current De-rating (Note F)

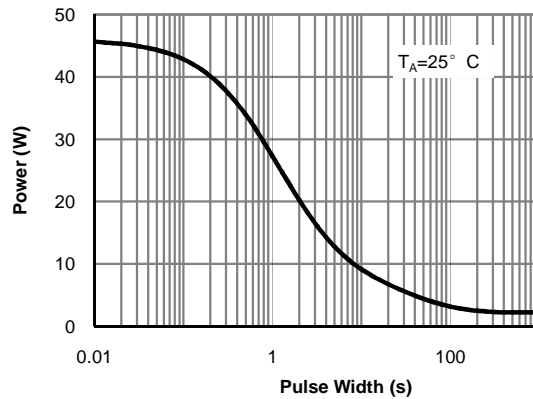


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

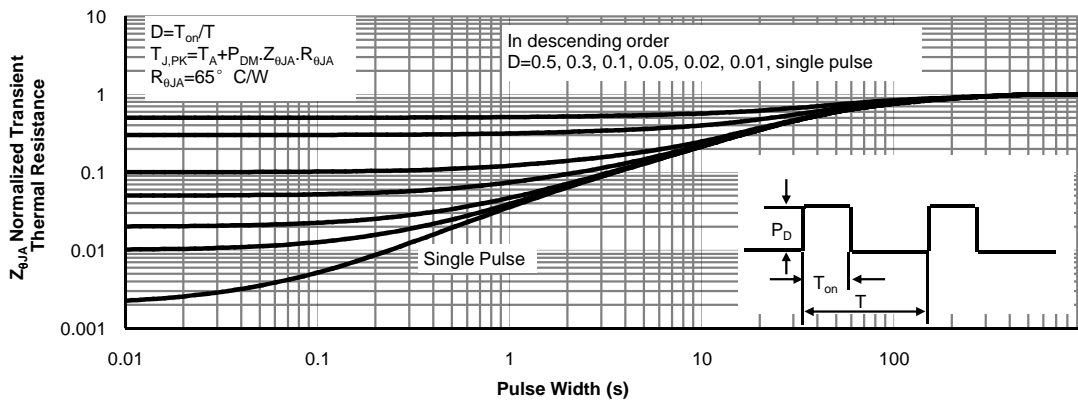


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

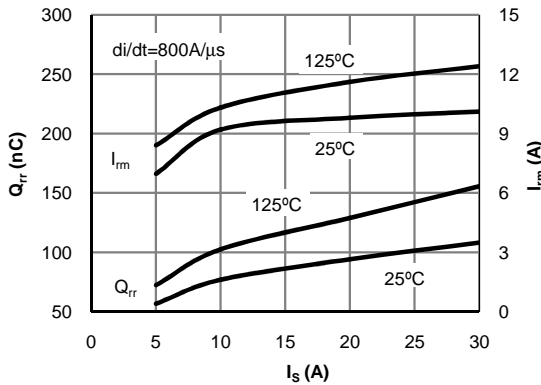


Figure 17: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

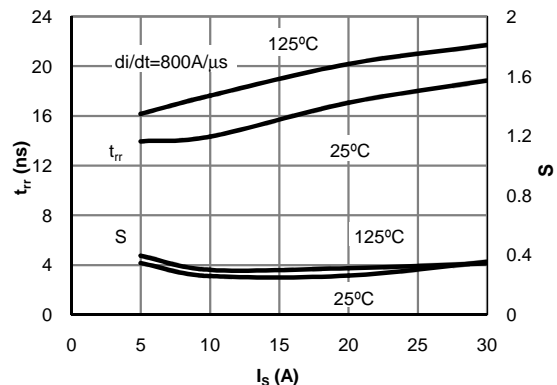


Figure 18: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

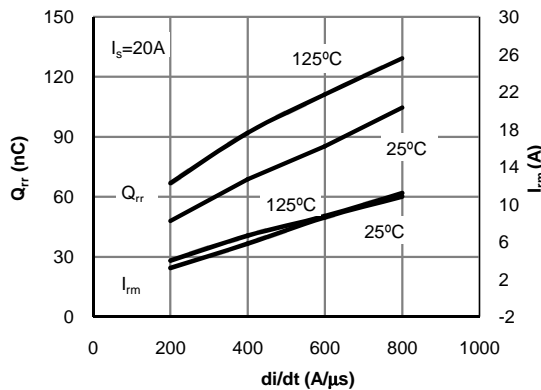


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. di/dt

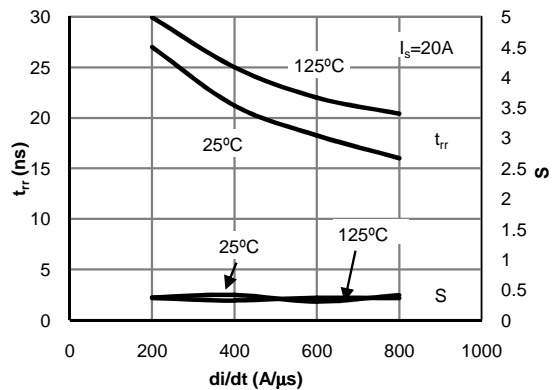
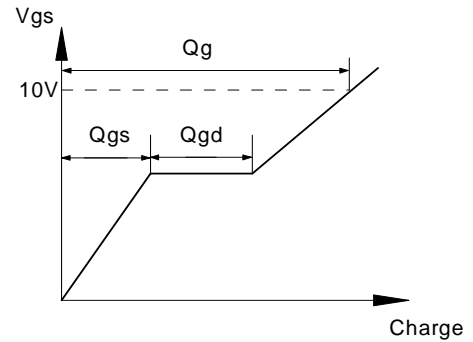
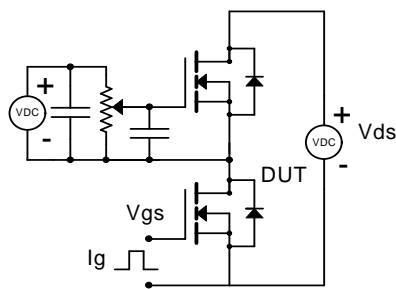
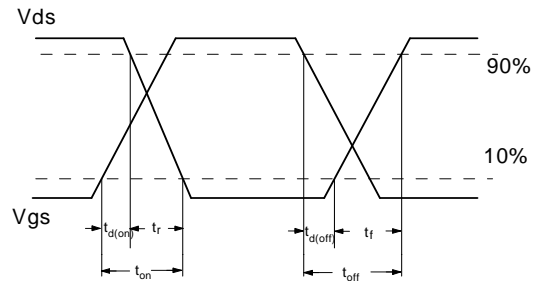
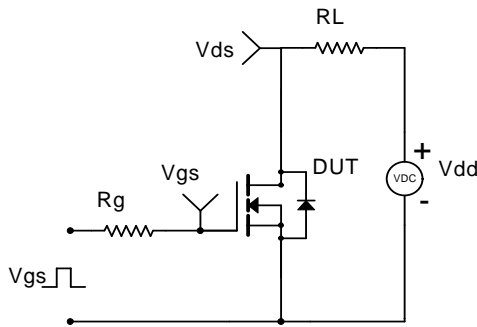


Figure 20: Diode Reverse Recovery Time and Softness Factor vs. di/dt

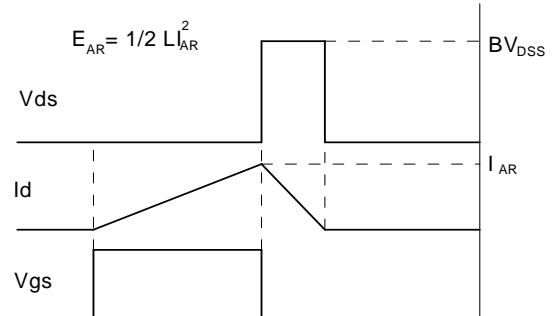
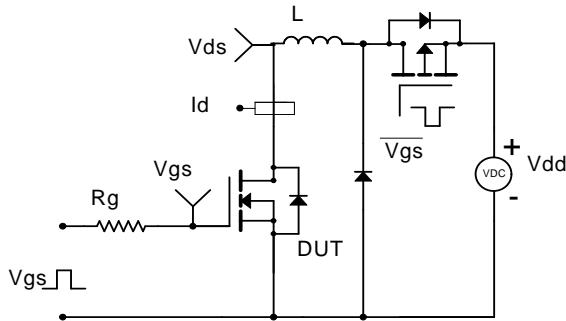
Gate Charge Test Circuit & Waveform



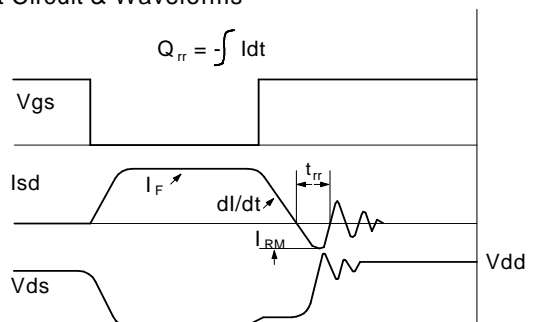
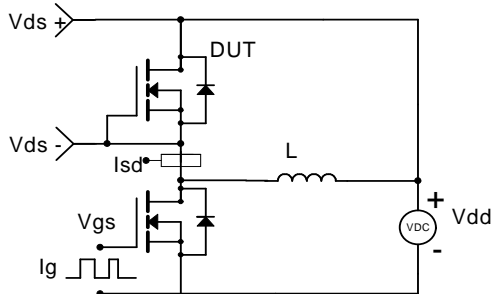
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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