ALPHA & OMEGA
SEMICONDUCTOR

AOT410L/AOB410L

100V N-Channel MOSFET

SDMOS[TM]

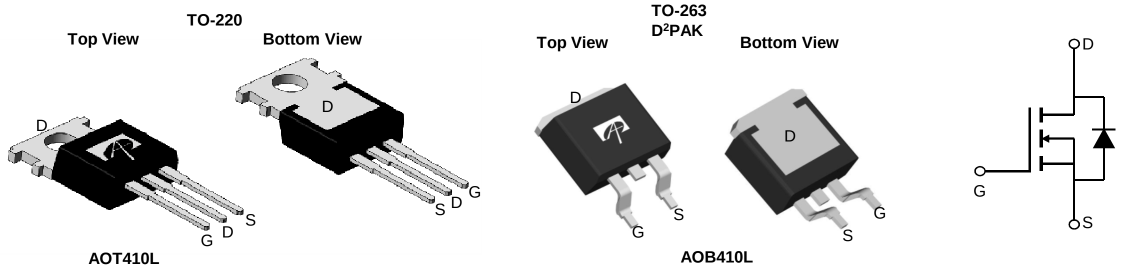
General Description

The AOT410L/AOB410L is fabricated with SDMOS[TM] trench technology that combines excellent $R_{DS(ON)}$ with low gate charge & low Q_{rr}. The result is outstanding efficiency with controlled switching behavior. This universal technology is well suited for PWM, load switching and general purpose applications.

Product Summary

V_{DS}	100V
I_D (at V_{GS}=10V)	150A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 6.5mΩ (< 6.2mΩ*)
$R_{DS(ON)}$ (at V_{GS}= 7V)	< 7.5mΩ (< 7.2mΩ*)

100% UIS Tested
100% R_g Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOT410L	TO-220	Tube	1000
AOB410L	TO-263	Tape & Reel	800

Absolute Maximum Ratings T_A=25°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]	T_C=25°C	I_D	150	A
	T_C=100°C		108	
Pulsed Drain Current [C]		I_{DM}	405	
Continuous Drain Current	T_A=25°C	I_{DSM}	12	A
	T_A=70°C		10	
Avalanche Current [C]		I_{AS},I_{AR}	50	A
Avalanche energy L=0.1mH [C]		E_{AS},E_{AR}	125	mJ
Power Dissipation [B]	T_C=25°C	P_D	333	W
	T_C=100°C		167	
Power Dissipation [A]	T_A=25°C	P_{DSM}	1.9	W
	T_A=70°C		1.2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	12	15	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		54	65	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	0.35	0.45	°C/W

* Surface mount package TO263

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	100			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=100V, V_{GS}=0V			10	µA
		T_J=55℃			50	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±25V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=5V, I_D=250µA	2	3	4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		405		A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A T0220		5.1	6.5	mΩ
		T_J=125℃		8.8	11	
		V_{GS}=7V, I_D=20A T0220		5.8	7.5	mΩ
		V_{GS}=10V, I_D=20A TO263		4.8	6.2	mΩ
		V_{GS}=7V, I_D=20A TO263		5.5	7.2	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		70		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.63	1	V
I_S	Maximum Body-Diode Continuous Current				150	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=50V, f=1MHz	5290	6622	7950	pF
C_{oss}	Output Capacitance		415	594	770	pF
C_{rss}	Reverse Transfer Capacitance		130	215	300	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.3	0.64	1	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=50V, I_D=20A	85	107	129	nC
Q_{gs}	Gate Source Charge		23	28.5	34	nC
Q_{gd}	Gate Drain Charge		24	40	56	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=50V, R_L=2.5Ω, R_{GEN}=3Ω		28		ns
t_r	Turn-On Rise Time			22		ns
$t_{D(off)}$	Turn-Off DelayTime			43.5		ns
t_f	Turn-Off Fall Time			14.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs	19	27	35	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs	124	177	230	nC

A. The value of $R_{\theta JA}$ 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 $_{\theta JA}$ and the maximum allowed junction temperature of 150° 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ and case to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-case thermal impedence 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. The maximum current limited by package.
H. 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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

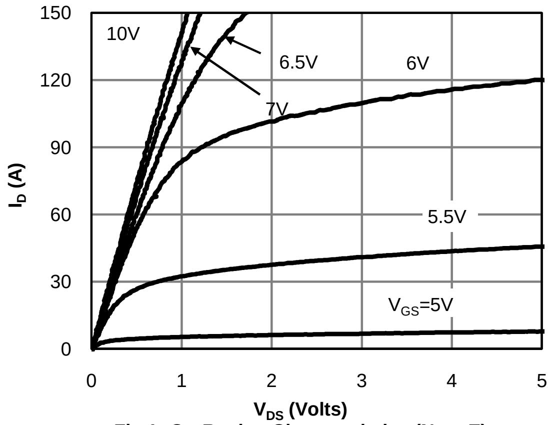


Fig 1: On-Region Characteristics (Note E)

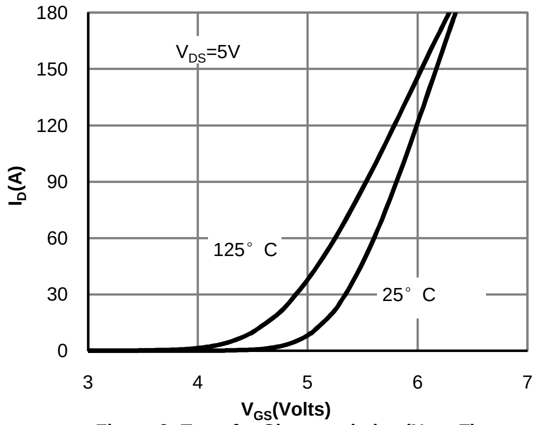


Figure 2: Transfer Characteristics (Note E)

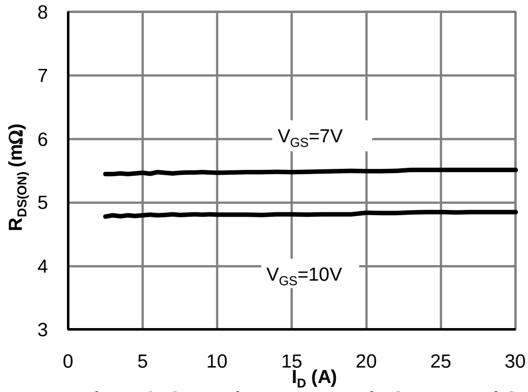


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

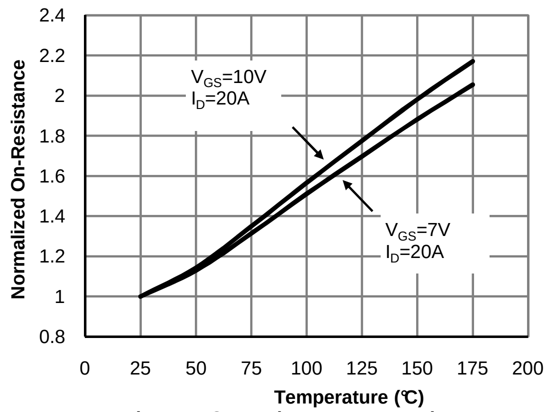


Figure 4: On-Resistance vs. Junction Temperature (Note E)

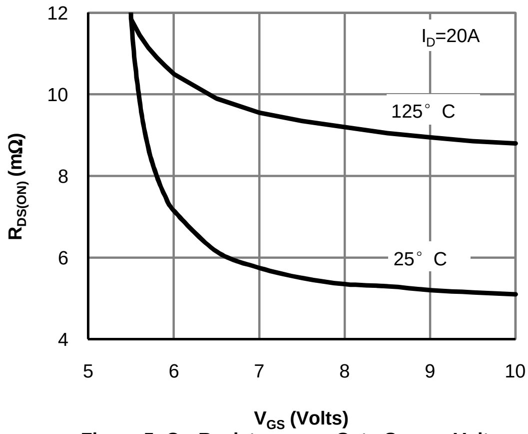


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

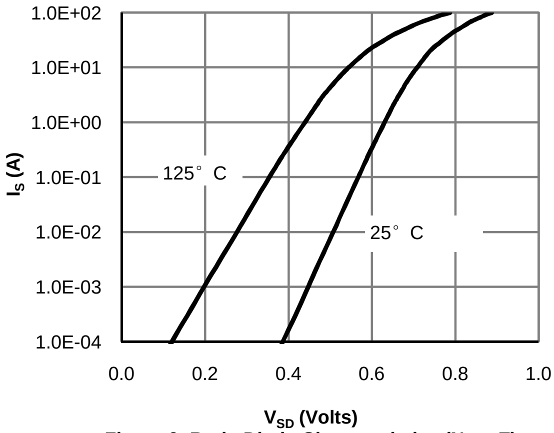


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

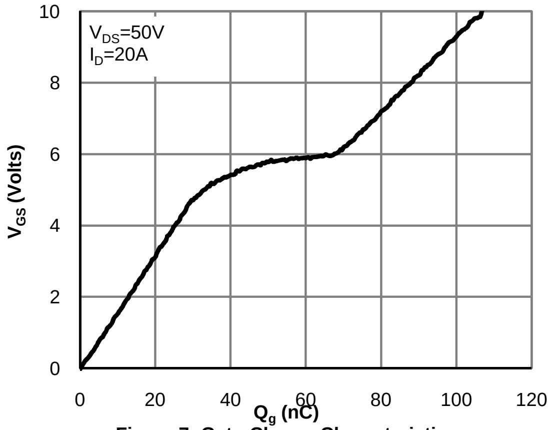


Figure 7: Gate-Charge Characteristics

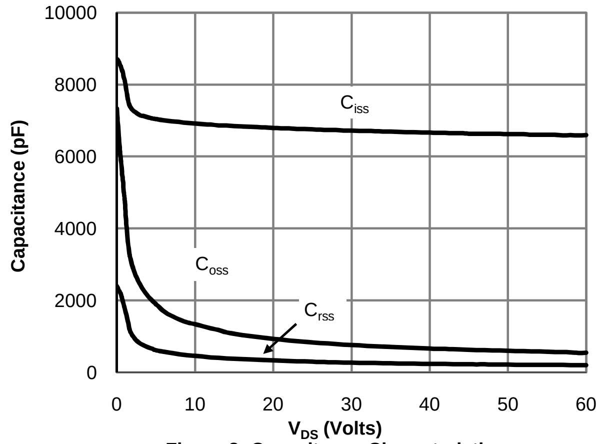


Figure 8: Capacitance Characteristics

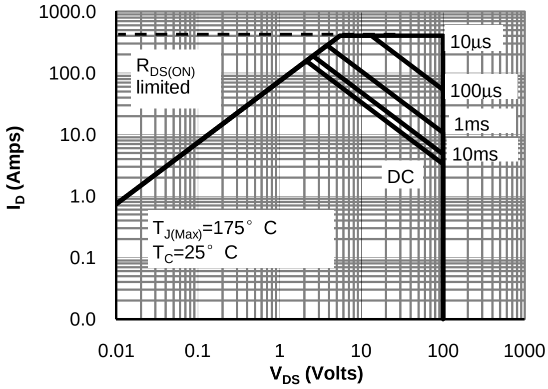


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

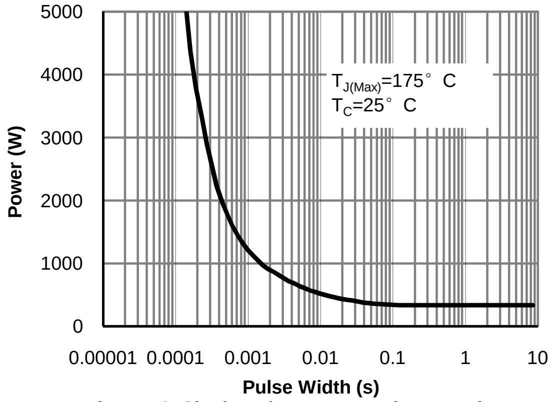


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

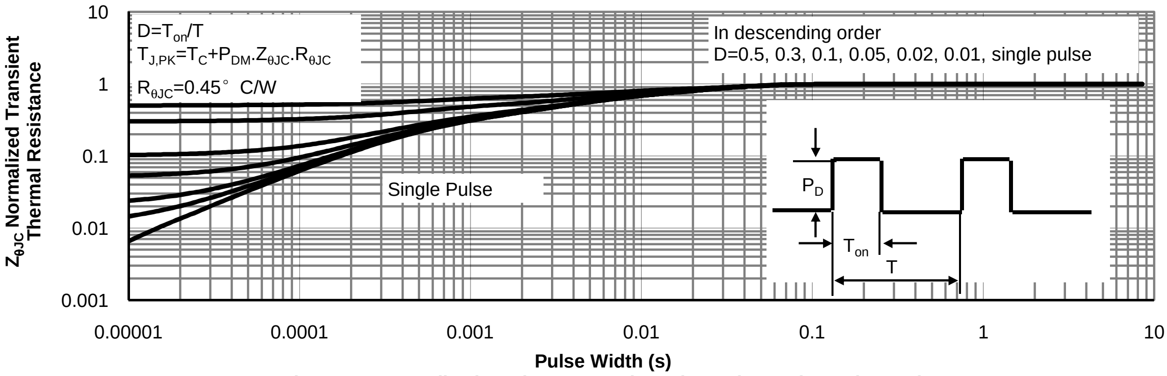


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

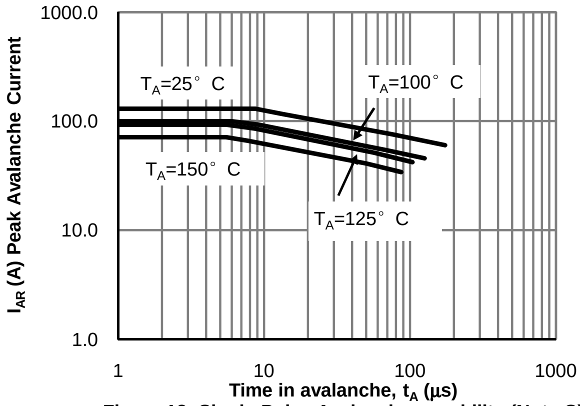


Figure 12: Single Pulse Avalanche capability (Note C)

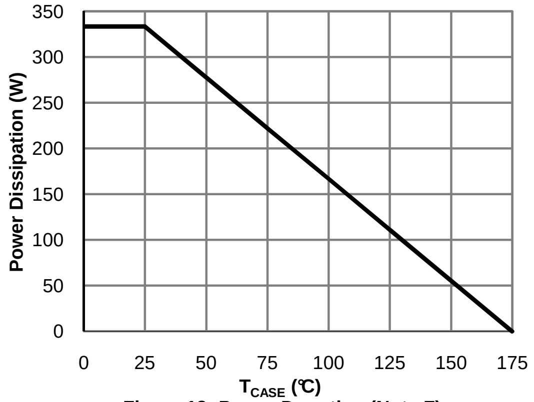


Figure 13: Power De-rating (Note F)

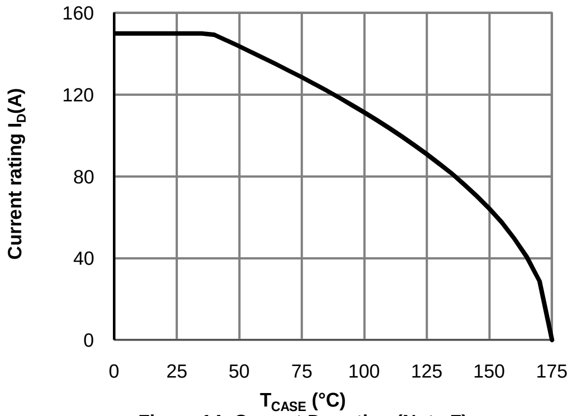


Figure 14: Current De-rating (Note F)

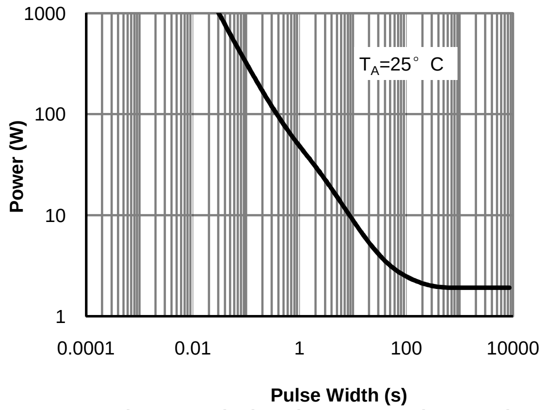


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

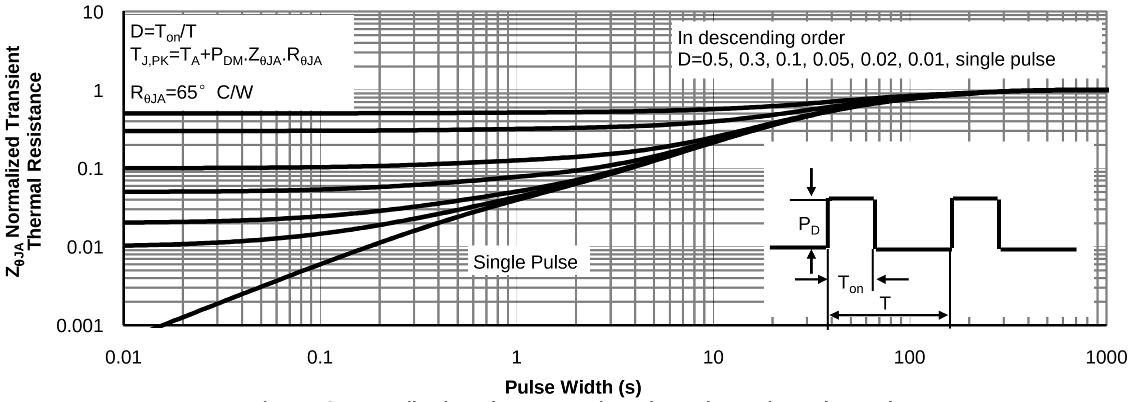


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

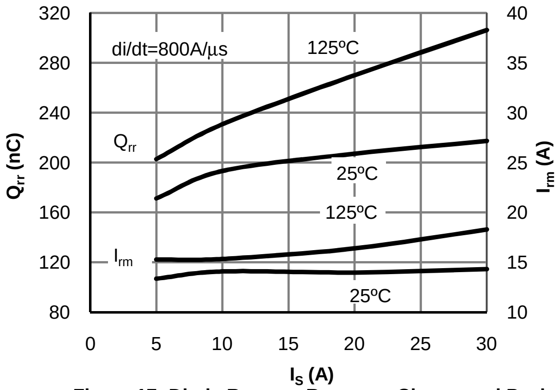


Figure 17: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

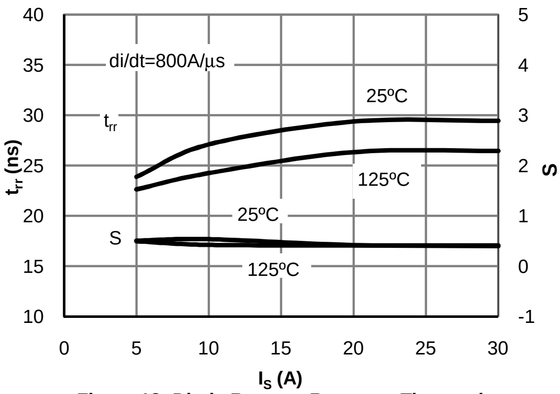


Figure 18: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

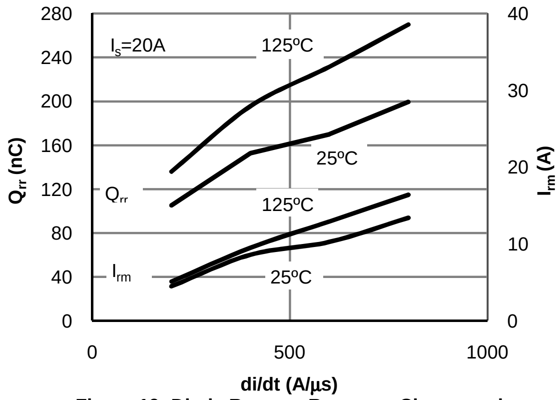


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. di/dt

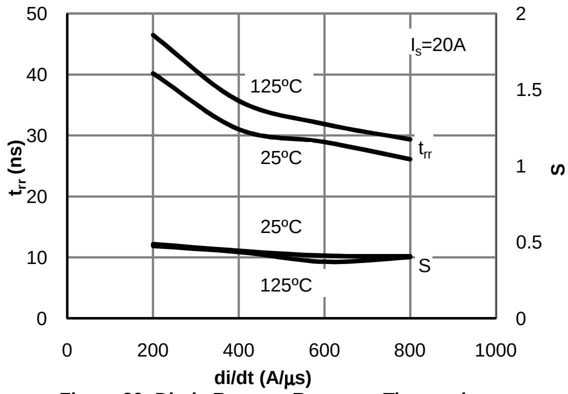
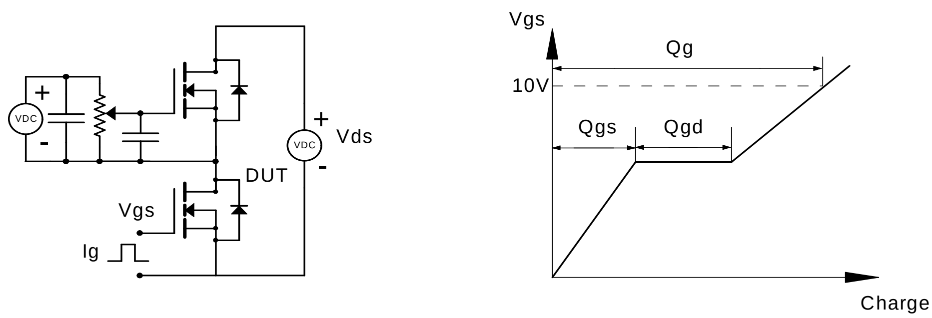
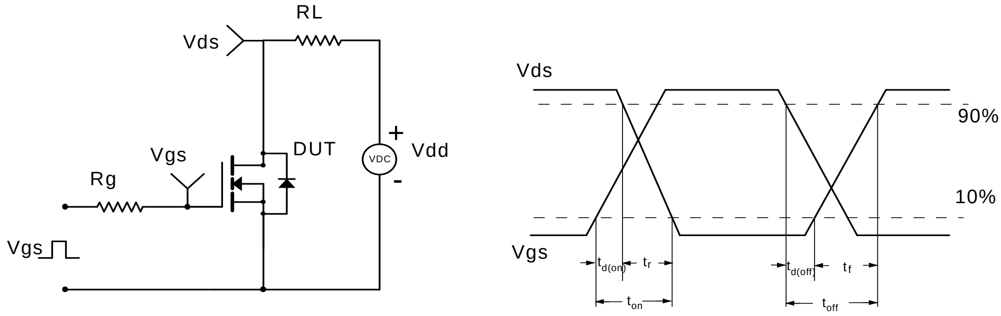


Figure 20: Diode Reverse Recovery Time and Softness Factor vs. di/dt

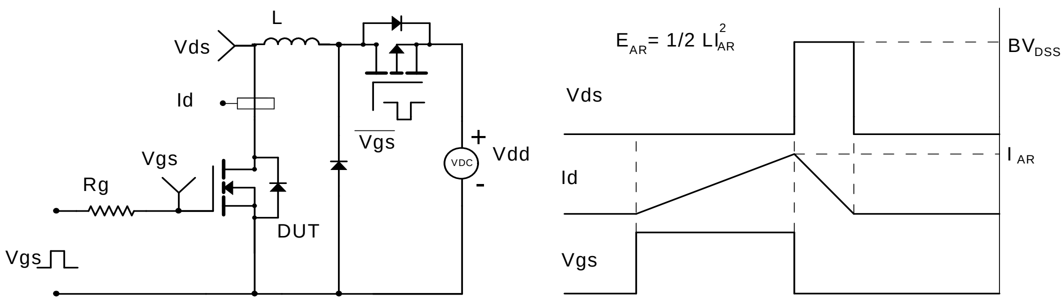
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms