ALPHA & OMEGA SEMICONDUCTOR

AOT298L/AOB298L/AOTF298L

100V N-Channel AlphaSGT™

General Description

- Trench Power AlphaSGT™ technology
- Low $R_{DS(ON)}$
- Low Gate Charge

Product Summary

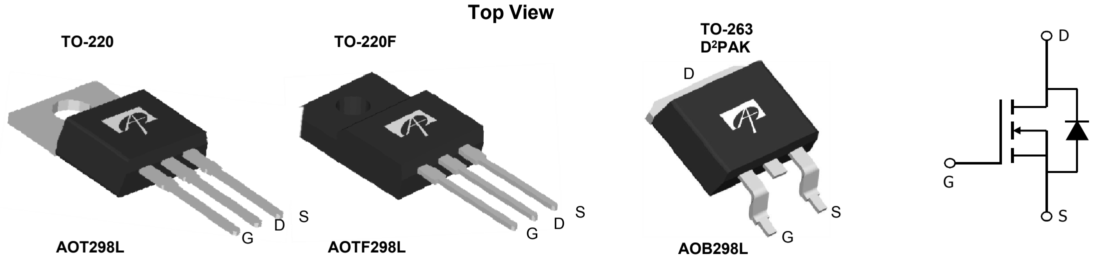
V_{DS}	100V
I_D (at V_{GS}=10V)	58A/33A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 14.5mΩ

100% UIS Tested
100% R_g Tested

Applications

- Synchronus Rectification in DC/DC and AC/DC Converters
- Notebook Adaptor, TV Power Supply applications

Top View



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOT298L	TO-220	Tube	1000
AOB298L	TO-263	Tape & Reel	800
AOTF298L	TO-220F	Tube	1000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	AOT298L/AOB298L	AOTF298L	Units
Drain-Source Voltage		V_{DS}	100		V
Gate-Source Voltage		V_{GS}	±20		V
Continuous Drain Current	T_C=25°C	I_D	58	33	A
	T_C=100°C		41	26	
Pulsed Drain Current [C]		I_{DM}	130		
Continuous Drain Current	T_A=25°C	I_{DSM}	9		A
	T_A=70°C		7		
Avalanche Current [C]		I_{AS}, I_{AR}	20		A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	20		mJ
V_{DS} Spike	10µs	V_{SPIKE}	110		V
Power Dissipation [B]	T_C=25°C	P_D	100	33	W
	T_C=100°C		50	16	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.1		W
	T_A=70°C		1.33		
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175		°C

Thermal Characteristics

Parameter		Symbol	AOT298L/AOB298L	AOTF298L	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	15	15	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		60	60	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	1.5	4.5	°C/W

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				1	µA
			T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250µA		2.7	3.3	4.1	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		130			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A			12	14.5	mΩ
			T_J=125°C		19	24	
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A			30		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.7	1	V
I_S	Maximum Body-Diode Continuous Current [G]					70	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=50V, f=1MHz			1250	1670	pF
C_{oss}	Output Capacitance				727	970	pF
C_{rss}	Reverse Transfer Capacitance				25	43	pF
R_g	Gate resistance	f=1MHz		0.8	2	3	Ω
SWITCHING PARAMETERS							
$Q_g(10V)$	Total Gate Charge	V_{GS}=10V, V_{DS}=50V, I_D=20A			19	27	nC
Q_{gs}	Gate Source Charge				5.5		nC
Q_{gd}	Gate Drain Charge				6		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=50V, R_L=2.5Ω, R_{GEN}=3Ω			7.5		ns
t_r	Turn-On Rise Time				14		ns
$t_{D(off)}$	Turn-Off DelayTime				15		ns
t_f	Turn-Off Fall Time				14		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs			39		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs			140		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 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 impedance 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 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. The maximum current limited by package.
H. 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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

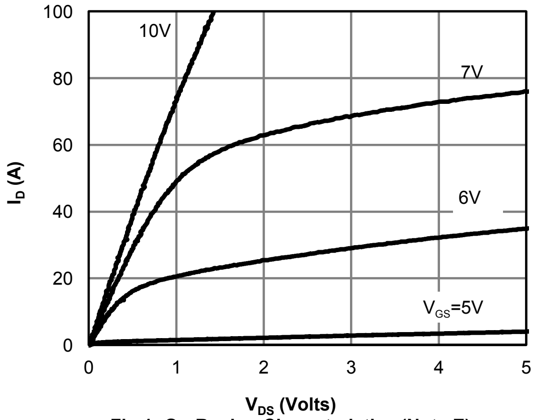


Fig 1: On-Region Characteristics (Note E)

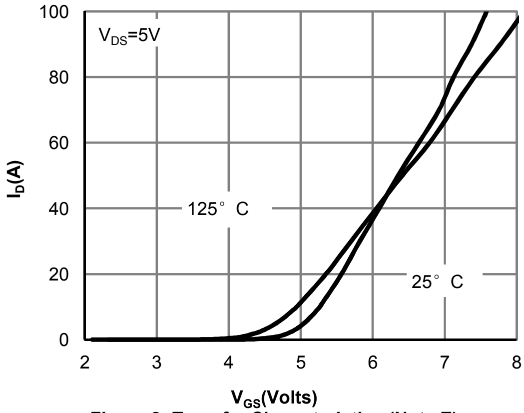


Figure 2: Transfer Characteristics (Note E)

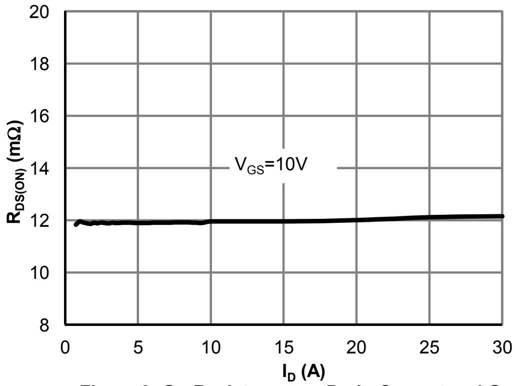


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

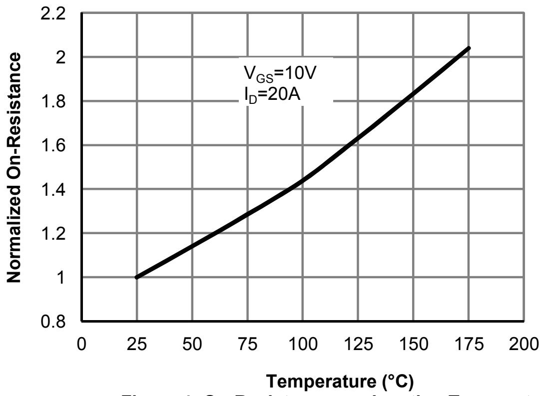


Figure 4: On-Resistance vs. Junction Temperature (Note E)

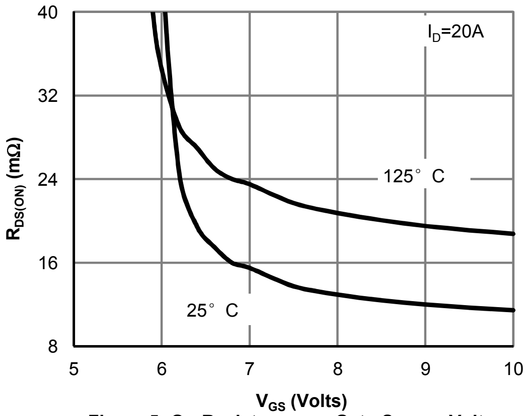


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

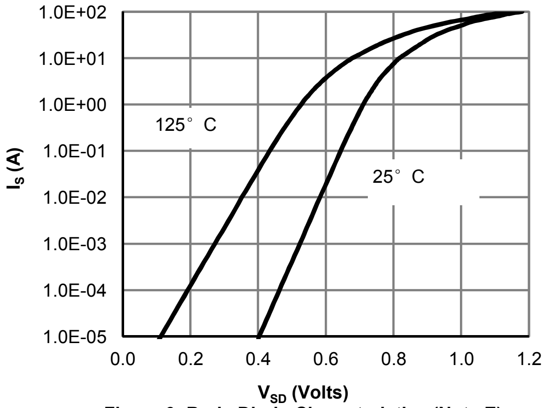


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

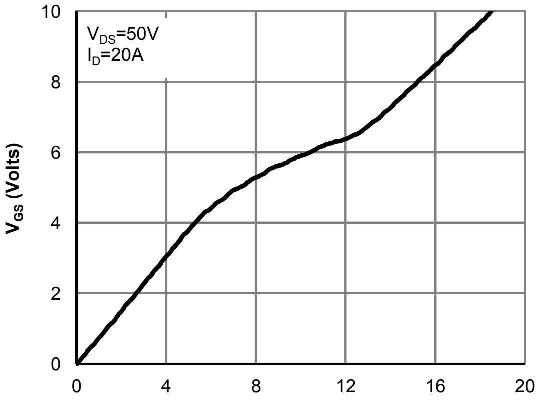


Figure 7: Gate-Charge Characteristics

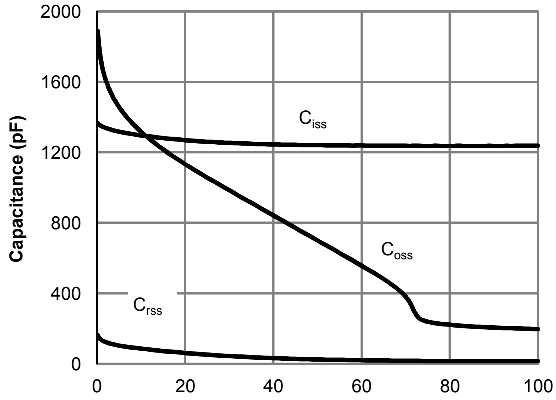


Figure 8: Capacitance Characteristics

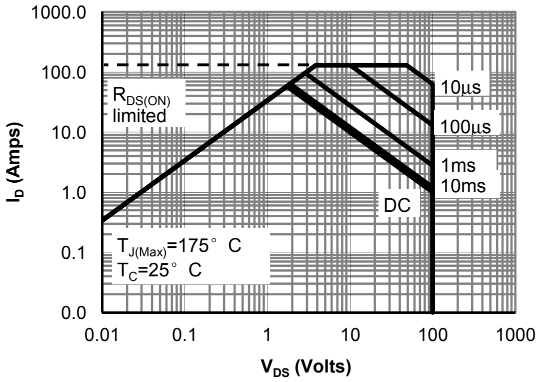


Figure 9: Maximum Forward Biased Safe Operating Area for AOT298L and AOB298L (Note F)

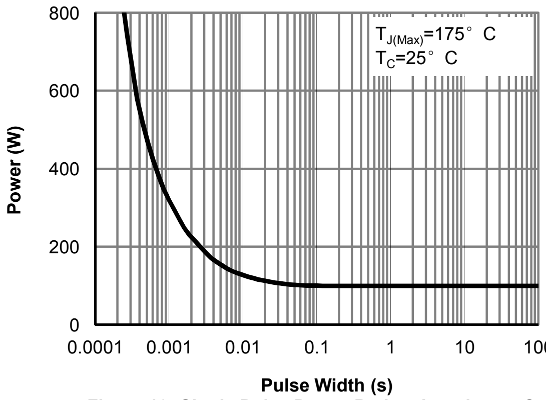


Figure 10: Single Pulse Power Rating Junction-to-Case for AOT298L and AOB298L (Note F)

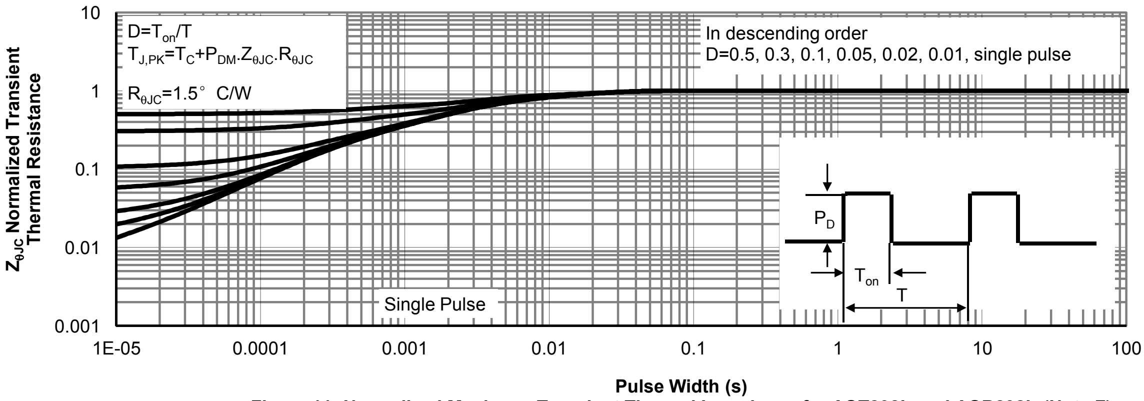


Figure 11: Normalized Maximum Transient Thermal Impedance for AOT298L and AOB298L (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

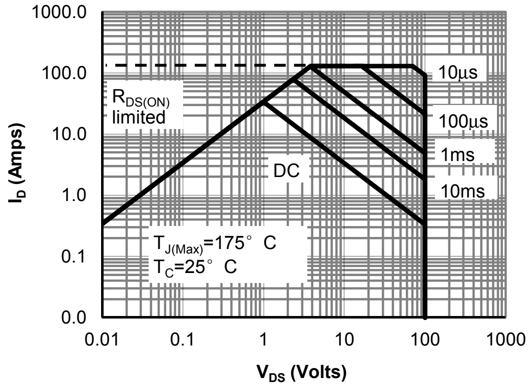


Figure 12: Maximum Forward Biased Safe Operating Area for AOTF298L (Note F)

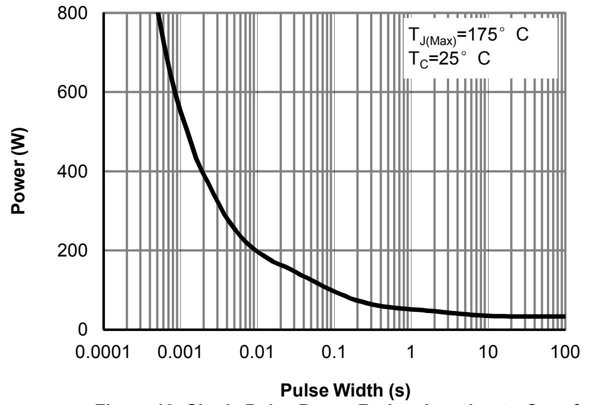


Figure 13: Single Pulse Power Rating Junction-to-Case for AOTF298L (Note F)

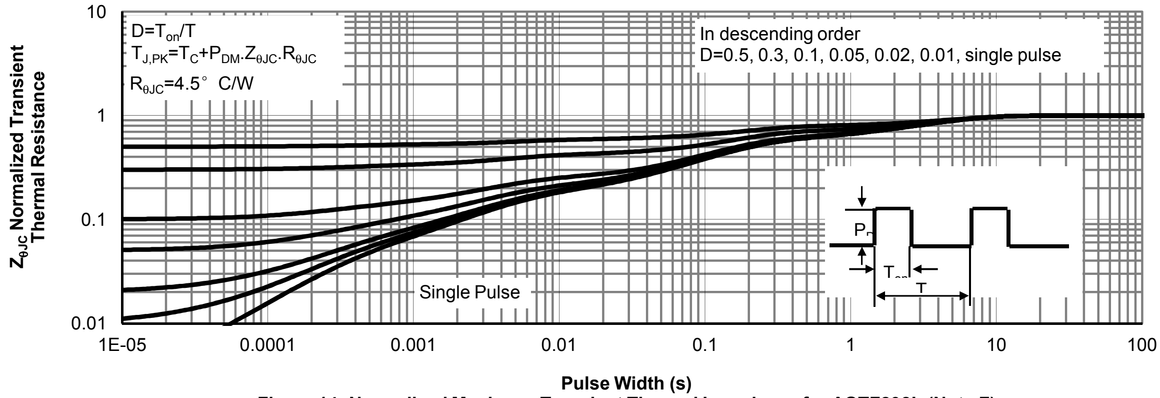


Figure 14: Normalized Maximum Transient Thermal Impedance for AOTF298L (Note F)

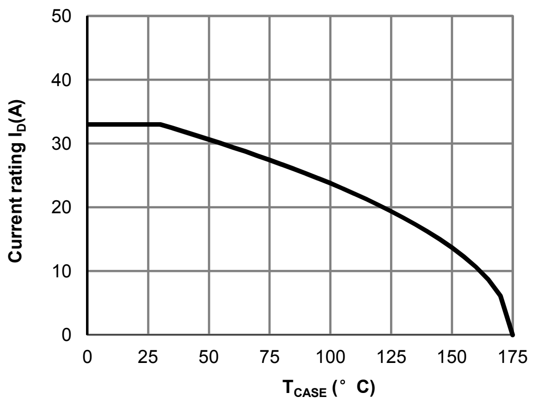


Figure 15: Current De-rating for AOTF298 (Note F)

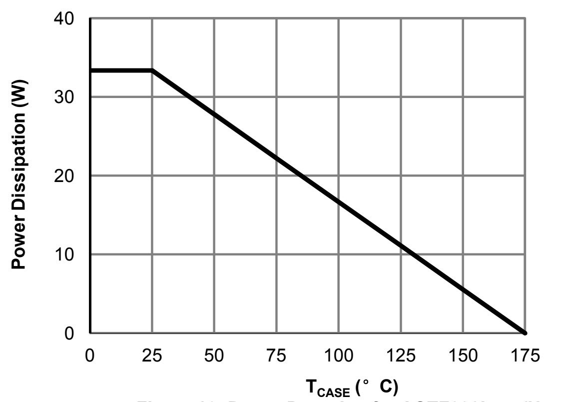


Figure 16: Power De-rating for AOTF298L (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

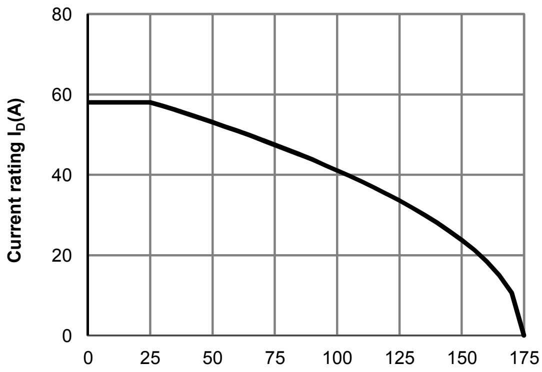


Figure 17: Current De-rating for AOT298L and AOB298L (Note F)

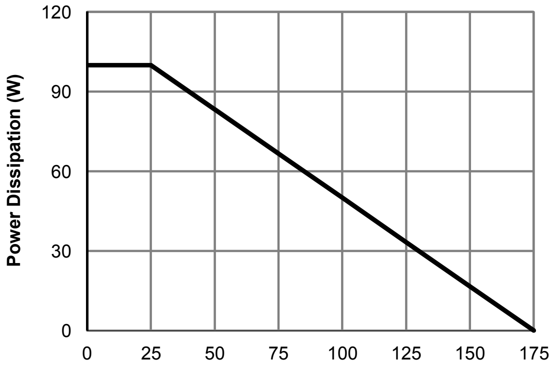


Figure 18: Power De-rating for AOT298L and AOB298L (Note F)

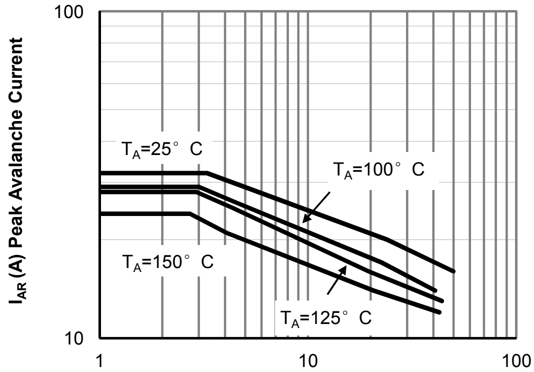


Figure 19: Single Pulse Avalanche capability (Note C)

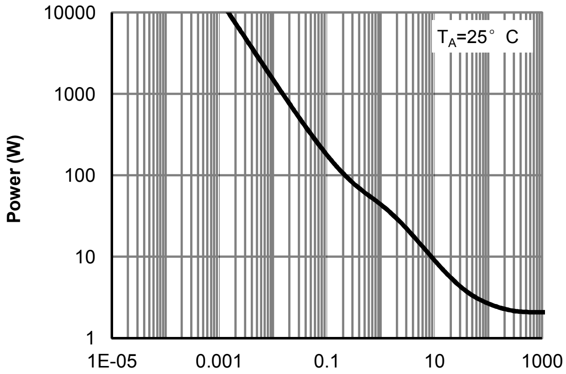


Figure 20: Single Pulse Power Rating Junction-to-Ambient (Note H)

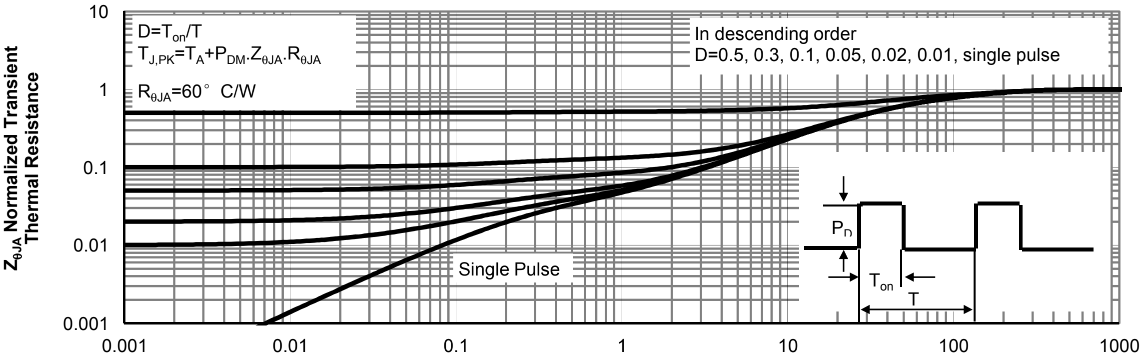
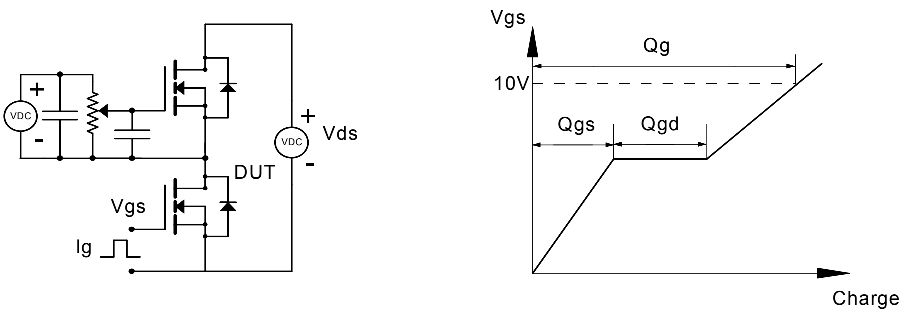
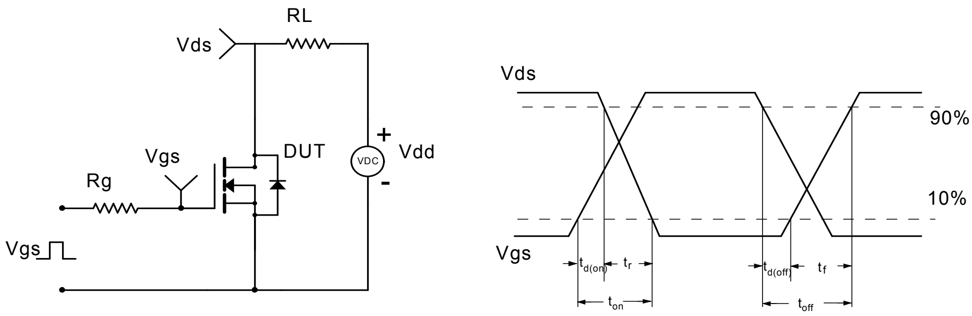


Figure 21: Normalized Maximum Transient Thermal Impedance (Note H)

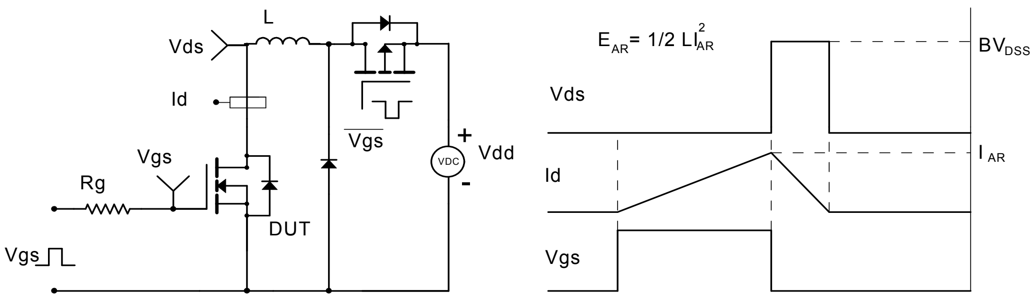
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms