ALPHA & OMEGA SEMICONDUCTOR

Green Product RoHS Compliant

AOD421
P-Channel Enhancement Mode Field Effect Transistor

General Description

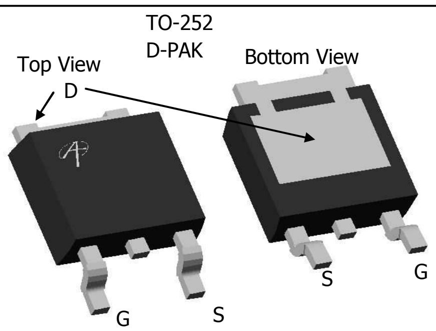
The AOD421 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for load switching. It is ESD protected.

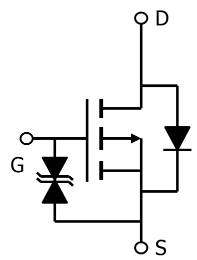
-RoHS Compliant
-Halogen Free*

Features

V_{DS} (V) = -20V
I_D = -12.5 A (V_{GS} = -10V)
$R_{DS(ON)}$ < 75mΩ (V_{GS} = -10V)
$R_{DS(ON)}$ < 95mΩ (V_{GS} = -4.5V)
$R_{DS(ON)}$ < 145mΩ (V_{GS} = -2.5V)

ESD Protected!
100% Rg Tested!





Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current [G]	T_A=25℃	I_D	-12.5	A
	T_A=70℃		-8.9	
Pulsed Drain Current [C]		I_{DM}	-30	
Power Dissipation [B]	T_C=25℃	P_D	18.8	W
	T_C=100℃		9.4	
Power Dissipation [A]	T_A=25℃	P_{DSM}	2	W
	T_A=70℃		1.33	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	23	28	℃/W
Maximum Junction-to-Ambient [A]	Steady-State		50	60	℃/W
Maximum Junction-to-Case [B]	Steady-State	$R_{\theta JC}$	6	8	℃/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		-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-16V, V_{GS}=0V				-0.5	µA
			T_J=55°C			-2.5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±10V				±1	µA
		V_{DS}=0V, V_{GS}=±12V				±10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA		-0.7	-0.9	-1.4	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}=-10V, I_D=-12.5A			61	75	mΩ
			T_J=125°C		83	105	
		V_{GS}=-4.5V, I_D=-3A			75	95	mΩ
		V_{GS}=-2.5V, I_D=-1A			110	145	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-12.5A			8.8		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-1	-0.81		V
I_S	Maximum Body-Diode Continuous Current					-8.5	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz			512	620	pF
C_{oss}	Output Capacitance				77		pF
C_{rss}	Reverse Transfer Capacitance				62		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz			9.2	13	Ω
SWITCHING PARAMETERS							
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-12.5A			4.6		nC
Q_{gs}	Gate Source Charge				0.9		nC
Q_{gd}	Gate Drain Charge				2.1		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-10V, R_L=0.75Ω, R_{GEN}=3Ω			5.2		ns
t_r	Turn-On Rise Time				38		ns
$t_{D(off)}$	Turn-Off DelayTime				17		ns
t_f	Turn-Off Fall Time				31		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-12.5A, dI/dt=100A/µs			19		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-12.5A, dI/dt=100A/µs			6.3		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.
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 <300 µs 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.
G. The maximum current rating is limited by bond-wires.
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. The SOA curve provides a single pulse rating.
*This device is guaranteed green after data code 8X11 (Sep 1ST 2008).
Rev 1: Sep 2008

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

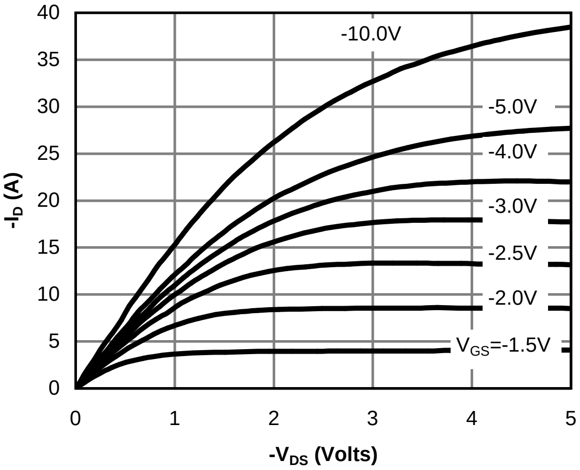


Figure 1: On-Region Characteristics

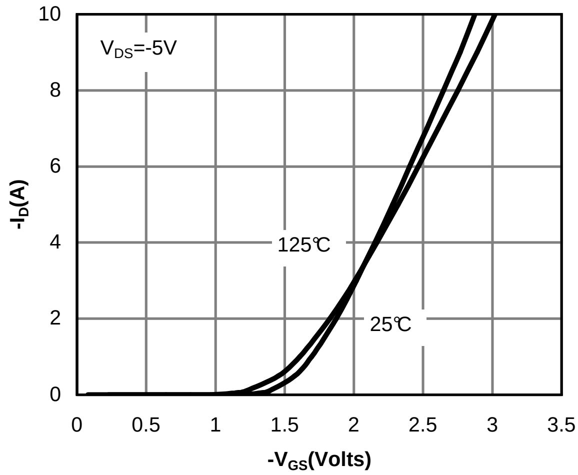


Figure 2: Transfer Characteristics

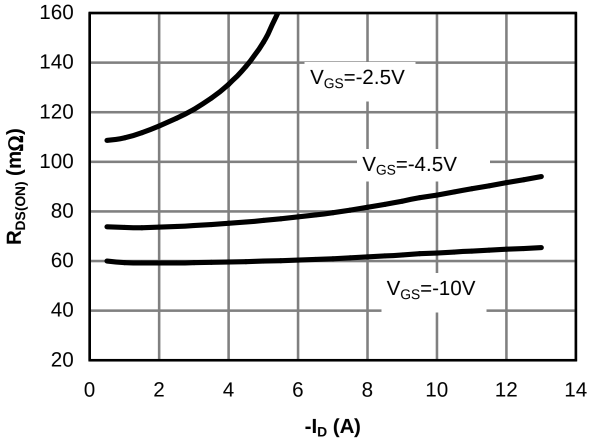


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

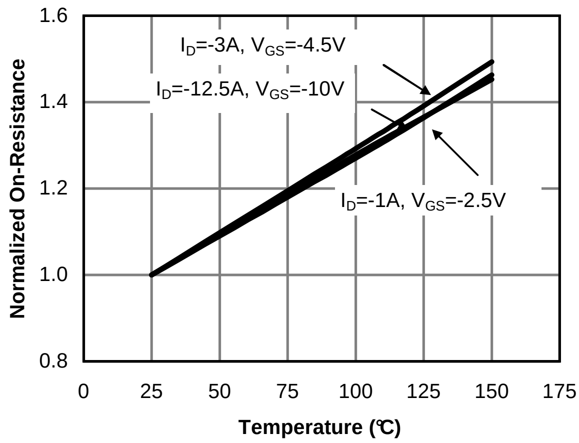


Figure 4: On-Resistance vs. Junction Temperature

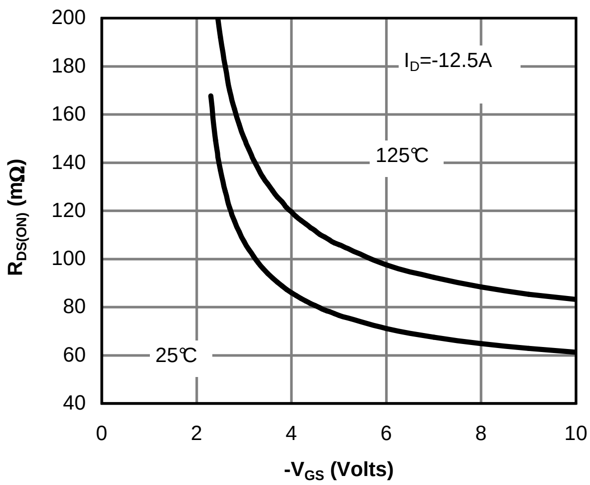


Figure 5: On-Resistance vs. Gate-Source Voltage

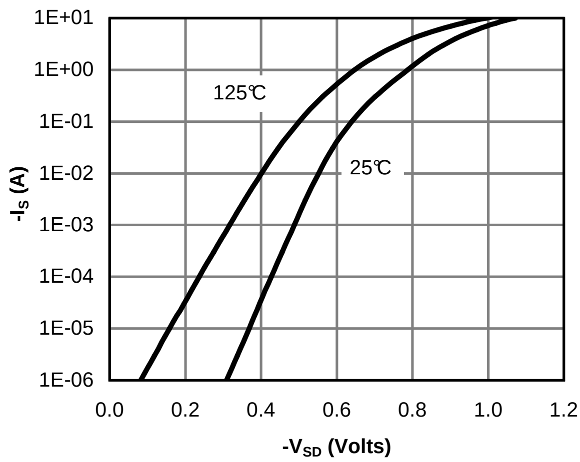


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

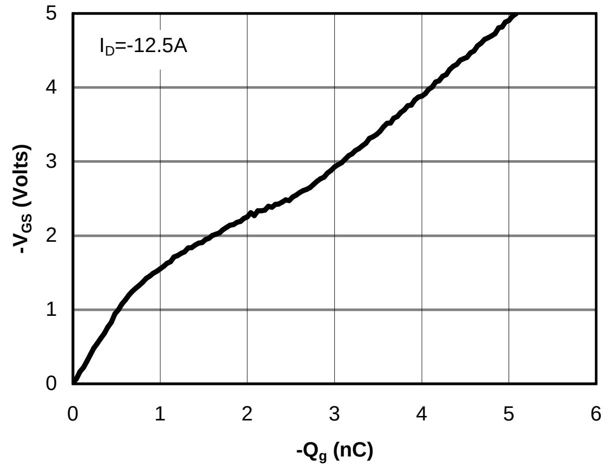


Figure 7: Gate-Charge Characteristics

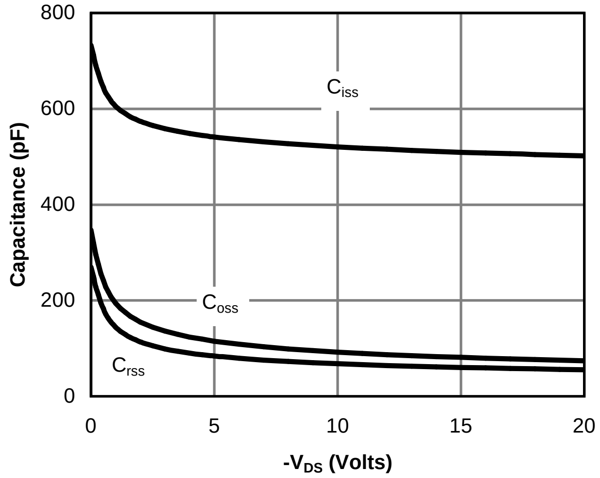


Figure 8: Capacitance Characteristics

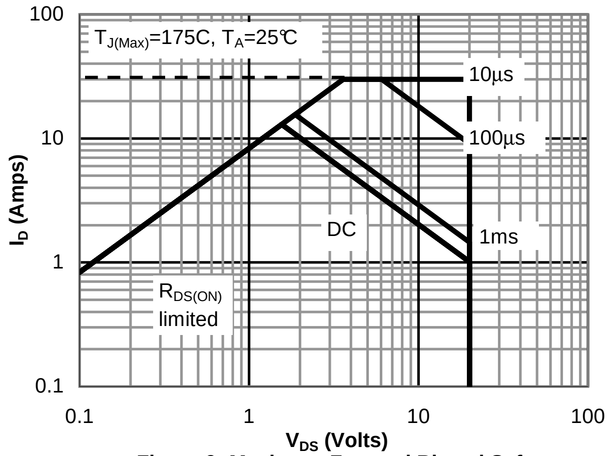


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

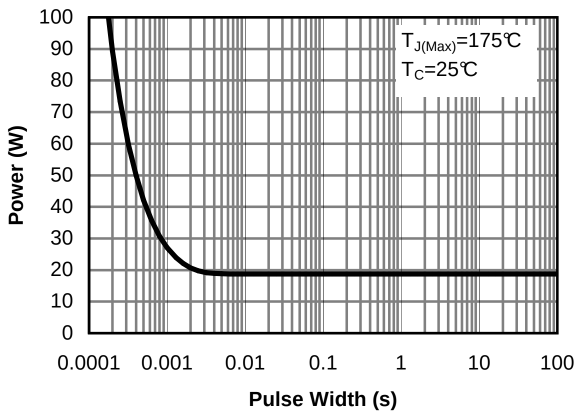


Figure 10: Single Pulse Power Rating Junction-to-case (Note F)

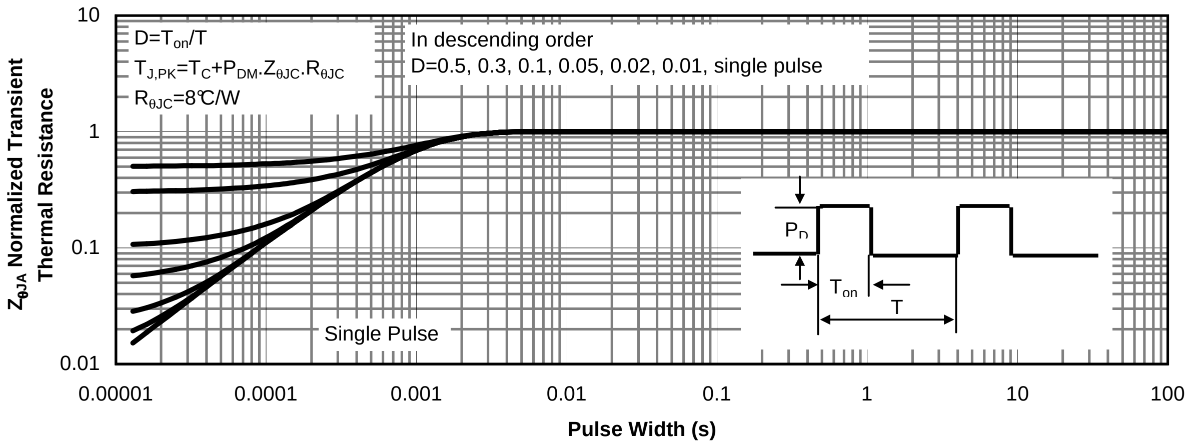


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

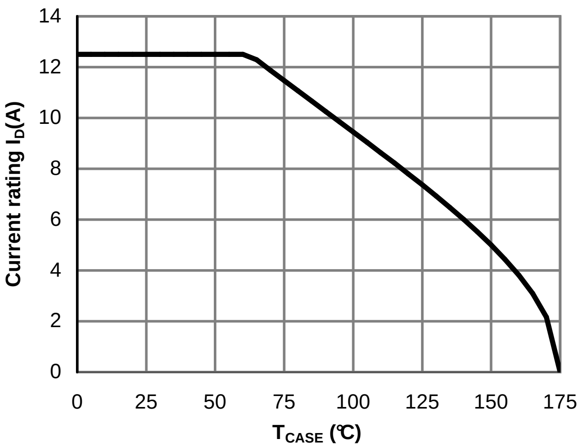


Figure 12: Current De-rating (Note B)

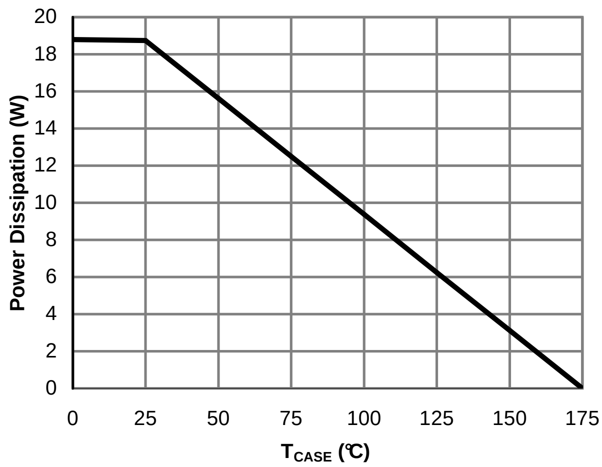


Figure 13: Power De-rating (Note B)

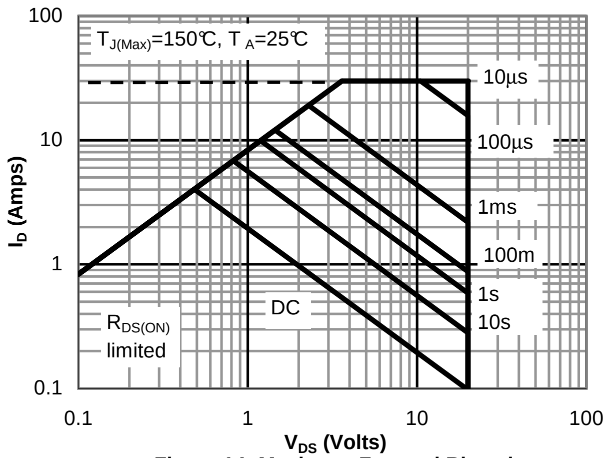


Figure 14: Maximum Forward Biased Safe Operating Area (Note H)

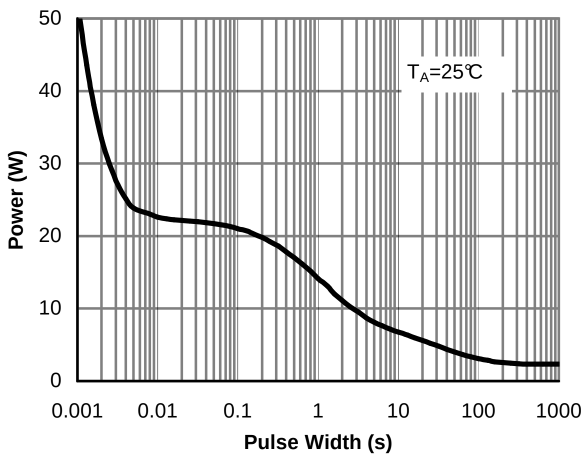


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

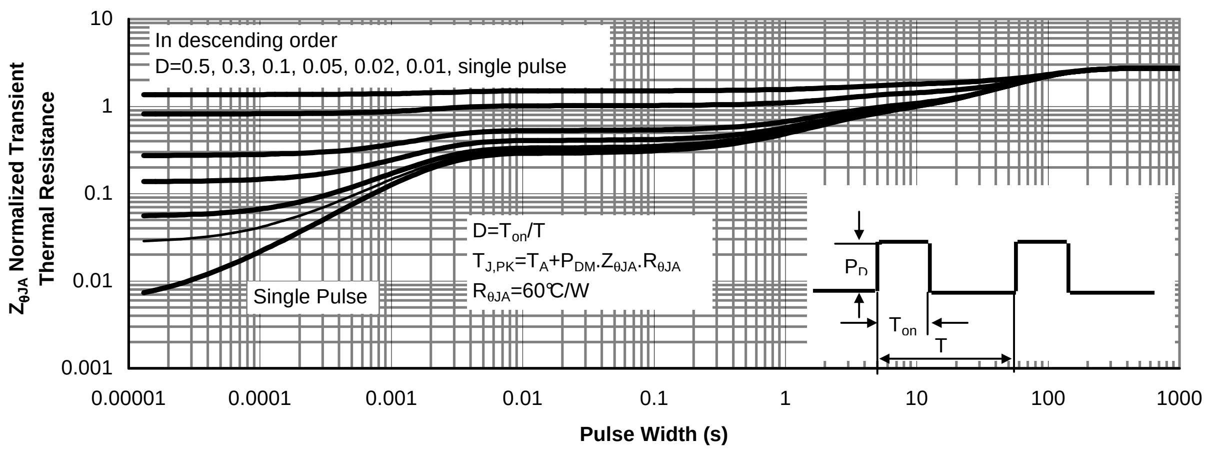
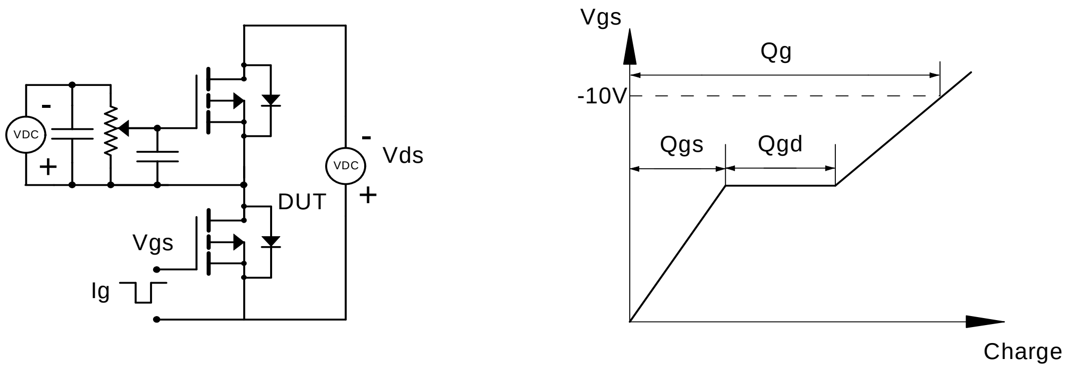
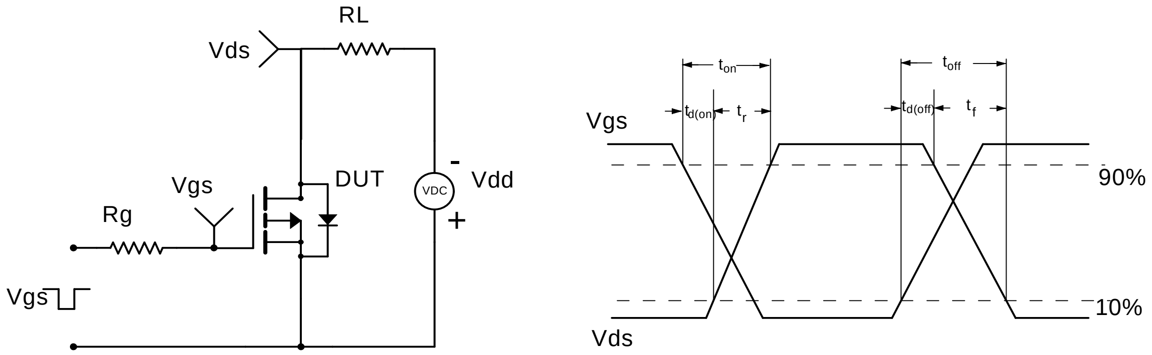


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms