

AOD4189
P-Channel Enhancement Mode Field Effect Transistor
General Description

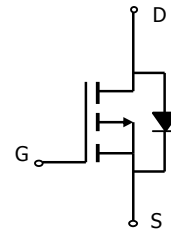
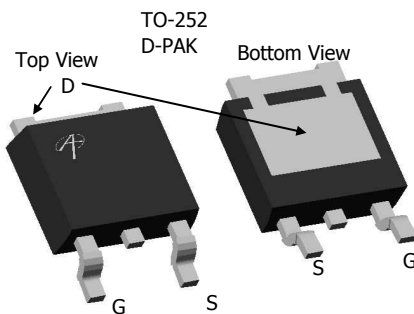
The AOD4189 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. With the excellent thermal resistance of the DPAK package, this device is well suited for high current load applications.

-RoHS Compliant
 -Halogen Free*

Features

V_{DS} (V) = -40V
 I_D = -40A (V_{GS} = -10V)
 $R_{DS(ON)}$ < 22m Ω (V_{GS} = -10V)
 $R_{DS(ON)}$ < 29m Ω (V_{GS} = -4.5V)

100% UIS Tested!
100% Rg Tested!


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

Parameter	Symbol	Maximum	Units	
Drain-Source Voltage	V_{DS}	-40	V	
Gate-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current ^{B,H}	I_D	$T_C=25^\circ\text{C}$	A	
		$T_C=100^\circ\text{C}$		-28
Pulsed Drain Current ^C	I_{DM}	-50		
Avalanche Current ^C	I_{AR}	-35		
Repetitive avalanche energy $L=0.1\text{mH}^C$	E_{AR}	61	mJ	
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	W	
		$T_C=100^\circ\text{C}$		31
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$		
		$T_A=70^\circ\text{C}$		1.6
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,G}	$R_{\theta JA}$	$t \leq 10\text{s}$	15	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A,G}		Steady-State	41	
Maximum Junction-to-Case ^{D,F}	$R_{\theta JC}$	2	2.4	$^\circ\text{C/W}$

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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-40			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-40\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1.7	-1.9	-3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$	-50			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-12\text{A}$ $T_J=125^\circ\text{C}$ $V_{GS}=-4.5\text{V}$, $I_D=-8\text{A}$		18 27 23	22 33 29	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-12\text{A}$		35		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.74	-1	V
I_S	Maximum Body-Diode Continuous Current				-20	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-20\text{V}$, $f=1\text{MHz}$		1870		pF
C_{oss}	Output Capacitance			185		pF
C_{rss}	Reverse Transfer Capacitance			155		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$	2.5	4.5	6.5	Ω
SWITCHING PARAMETERS						
$Q_g(-10\text{V})$	Total Gate Charge	$V_{GS}=-10\text{V}$, $V_{DS}=-20\text{V}$, $I_D=-12\text{A}$		31.4	41	nC
$Q_g(-4.5\text{V})$	Total Gate Charge			7.9	10	
Q_{gs}	Gate Source Charge			7.6		nC
Q_{gd}	Gate Drain Charge			6.2		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-10\text{V}$, $V_{DS}=-20\text{V}$, $R_L=1.6\Omega$, $R_{GEN}=3\Omega$		10		ns
t_r	Turn-On Rise Time			18		ns
$t_{D(off)}$	Turn-Off Delay Time			38		ns
t_f	Turn-Off Fall Time			24		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-12\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		32	42	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-12\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		30		nC

A: The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A=25^\circ\text{C}$. The power dissipation P_{DSM} and current rating I_{DSM} are based on $T_{J(MAX)}=150^\circ\text{C}$, using steady state junction-to-ambient thermal resistance.

B: The power dissipation P_D is based on $T_{J(MAX)}=175^\circ\text{C}$, 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 $T_{J(MAX)}=175^\circ\text{C}$.

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 $t \leq 300 \mu\text{s}$ 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 $T_{J(MAX)}=175^\circ\text{C}$. 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 $T_A=25^\circ\text{C}$.

H: The maximum current rating is limited by bond-wires.

*This device is guaranteed green after data code 8X11 (Sep 1ST 2008).

Rev1: Oct 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

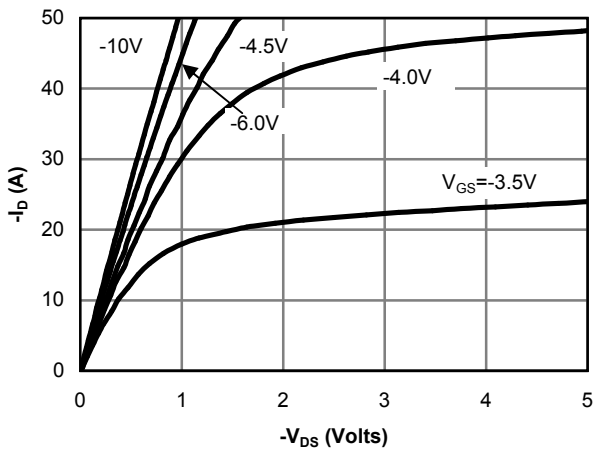


Figure 1: On-Region Characteristics

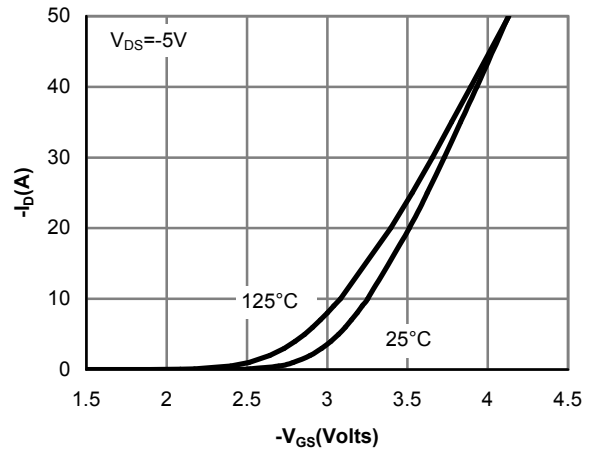


Figure 2: Transfer Characteristics

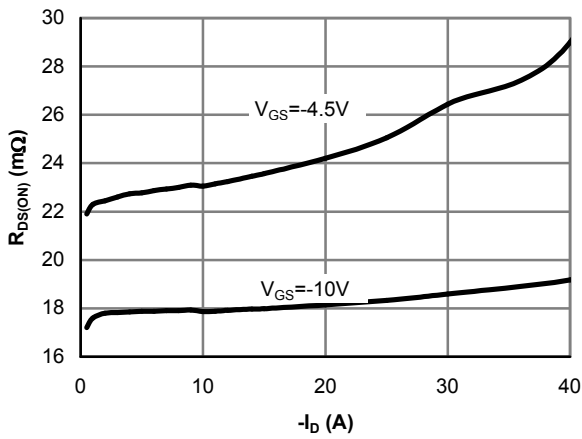


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

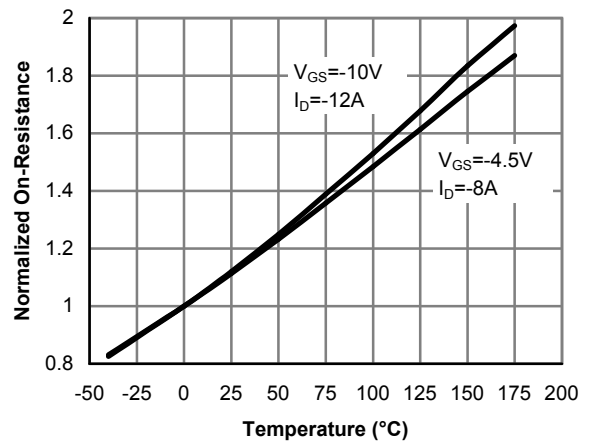


Figure 4: On-Resistance vs. Junction Temperature

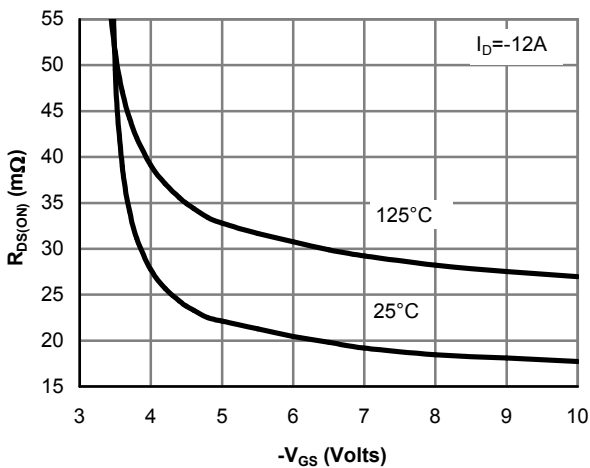


Figure 5: On-Resistance vs. Gate-Source Voltage

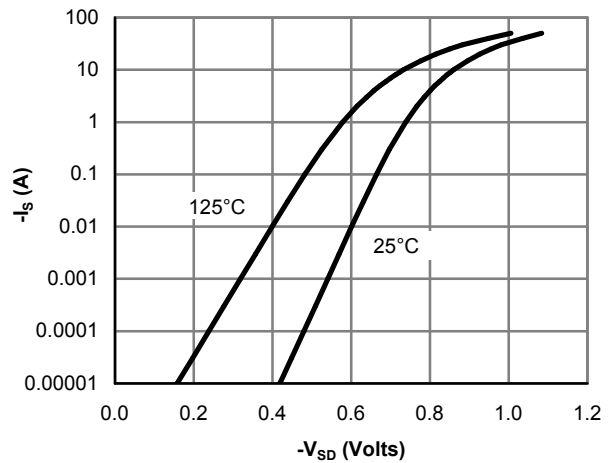


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

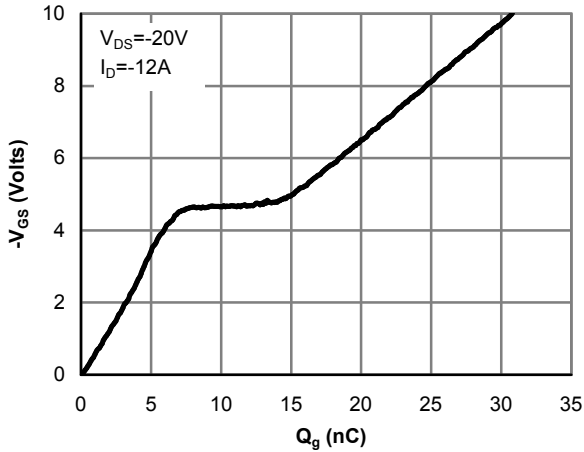


Figure 7: Gate-Charge Characteristics

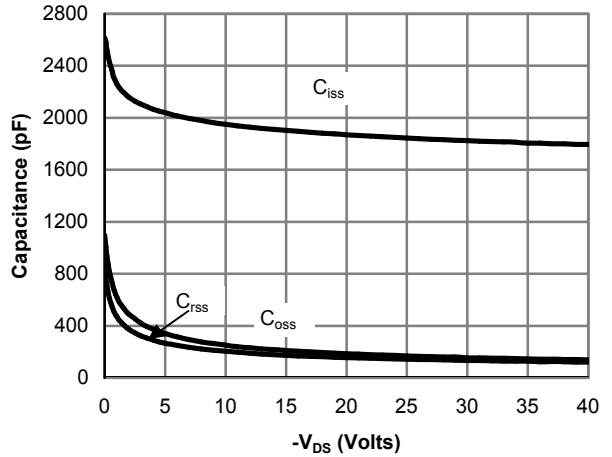


Figure 8: Capacitance Characteristics

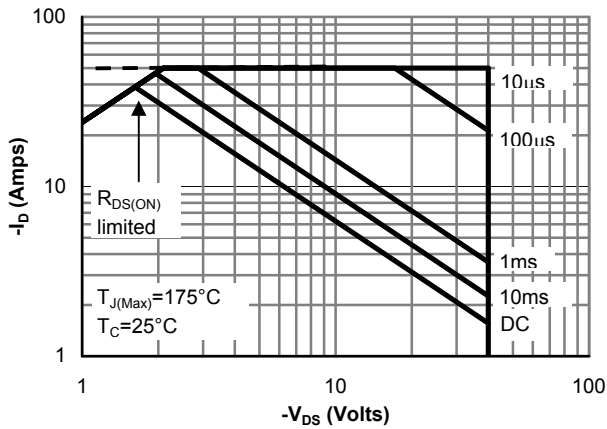


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

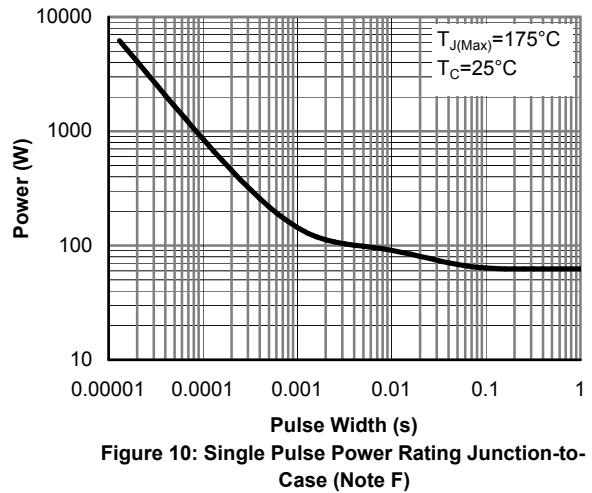


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

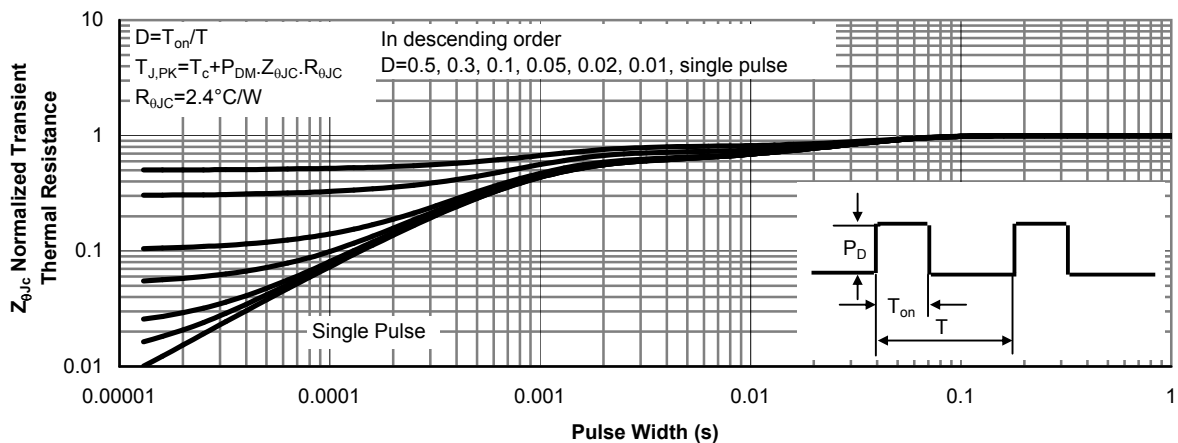


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

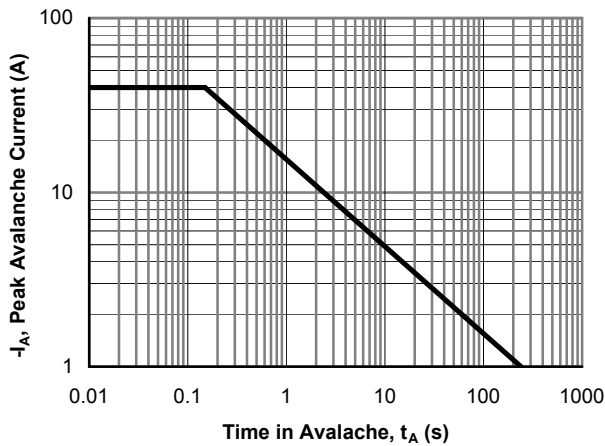


Figure 12: Single Pulse Avalanche Capability

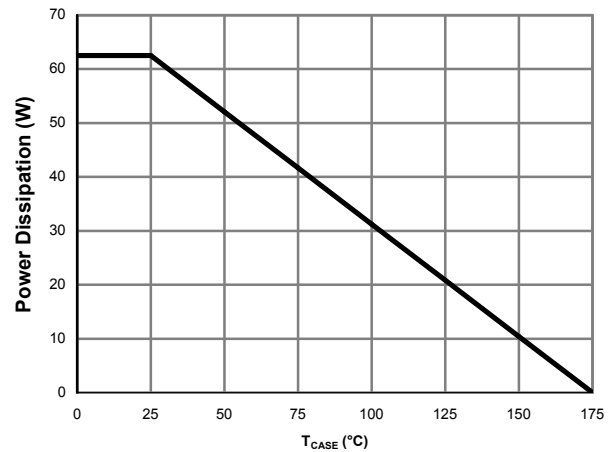


Figure 13: Power De-rating (Note B)

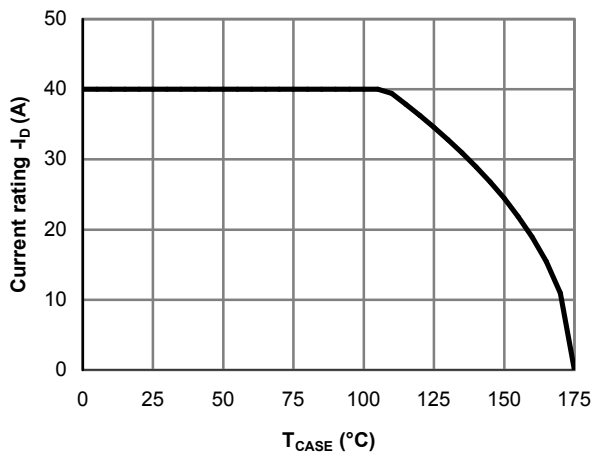


Figure 14: Current De-rating (Note B)

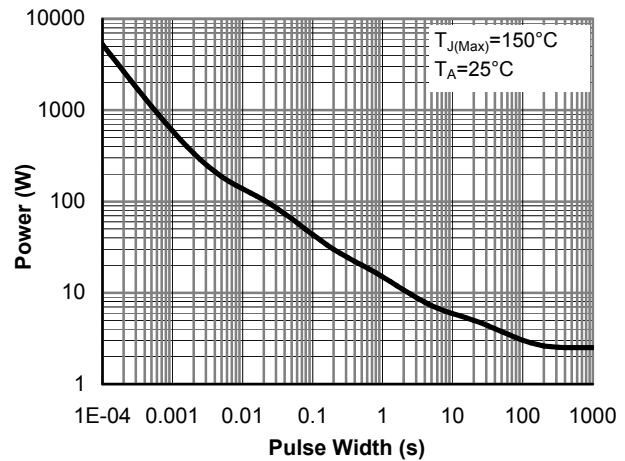


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

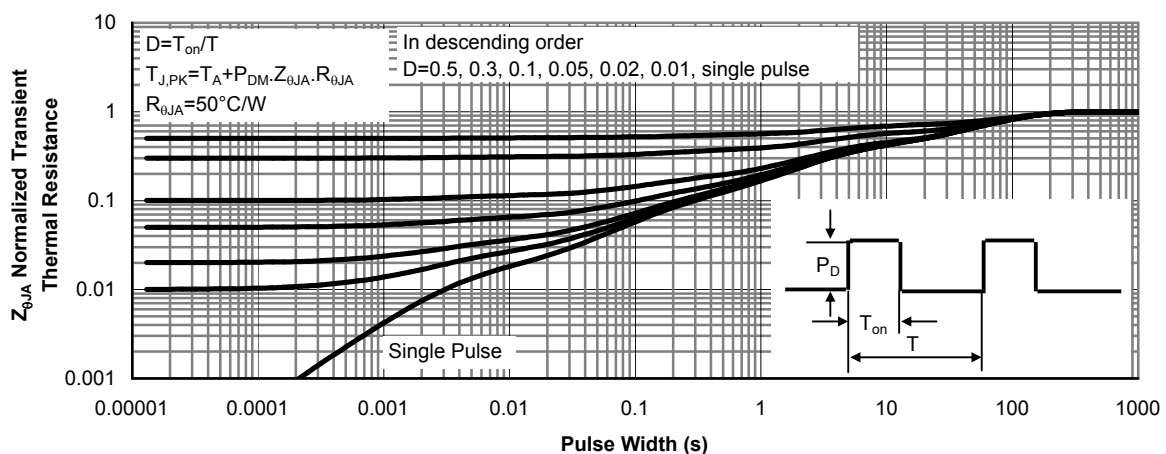
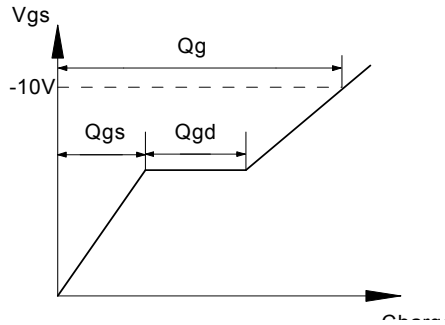
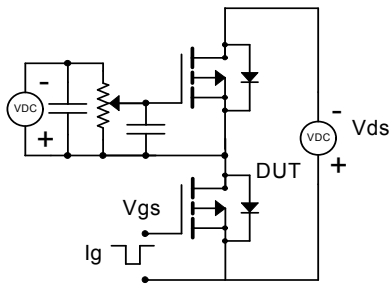
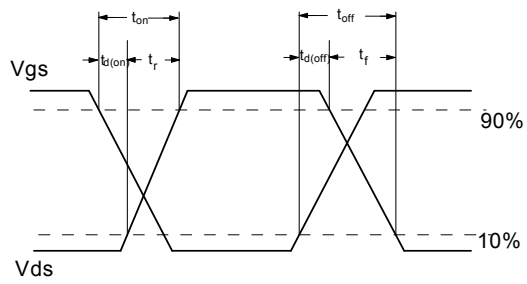
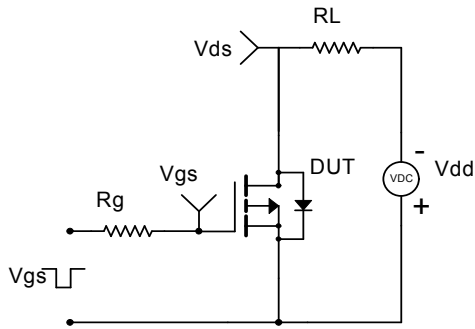


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

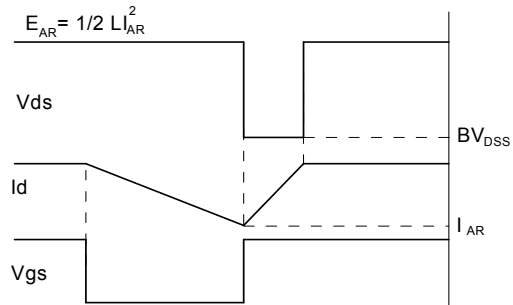
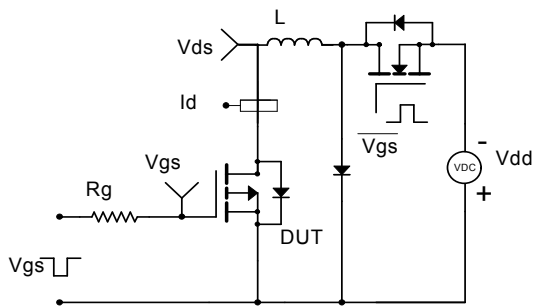
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

