



ALPHA & OMEGA
SEMICONDUCTOR

AOD5N50

500V,5A N-Channel MOSFET

General Description

The AOD5N50 is fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications. By providing low $R_{DS(on)}$, C_{iss} and C_{rss} along with guaranteed avalanche capability this device can be adopted quickly into new and existing offline power supply designs.

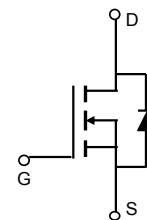
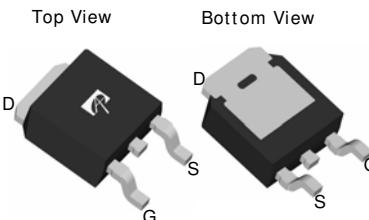
Product Summary

V_{DS}	600V@150°C
I_D (at $V_{GS}=10V$)	5A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 1.6Ω

100% UIS Tested!
100% R_g Tested!



TO252
DPAK



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current ^B	I_D	5	A
$T_C=100^\circ C$		3.1	
Pulsed Drain Current ^C	I_{DM}	17	
Avalanche Current ^C	I_{AR}	2.8	A
Repetitive avalanche energy ^C	E_{AR}	118	mJ
Single pulsed avalanche energy ^H	E_{AS}	235	mJ
Peak diode recovery dv/dt	dv/dt	5	V/ns
Power Dissipation ^B	P_D	104	W
$T_C=25^\circ C$		0.83	W/°C
Junction and Storage Temperature Range	T_J, T_{STG}	-50 to 150	°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	T_L	300	°C

Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Units
Maximum Junction-to-Ambient ^{A,G}	$R_{\theta JA}$	43	55	°C/W
Maximum Case-to-sink ^A	$R_{\theta CS}$	-	0.5	°C/W
Maximum Junction-to-Case ^{D,F}	$R_{\theta JC}$	1	1.2	°C/W

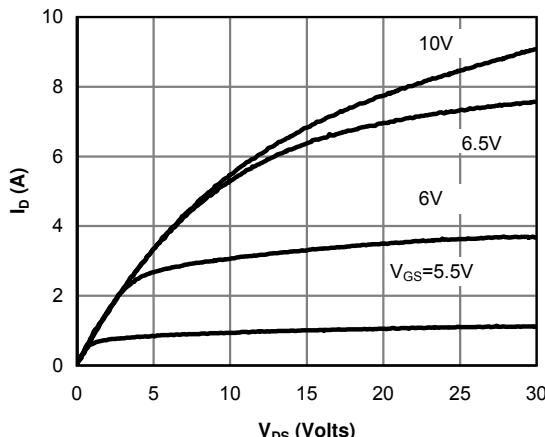
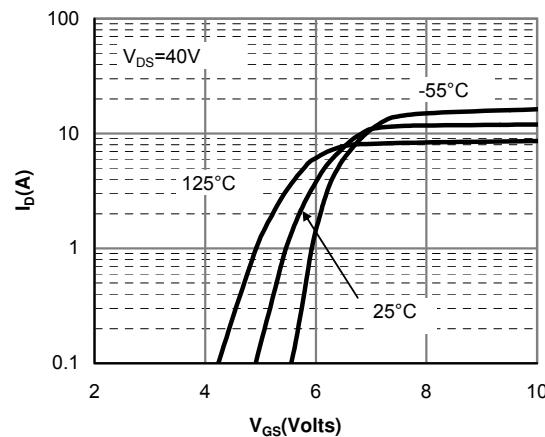
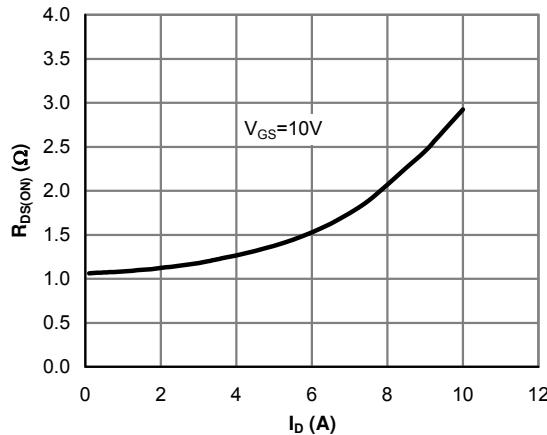
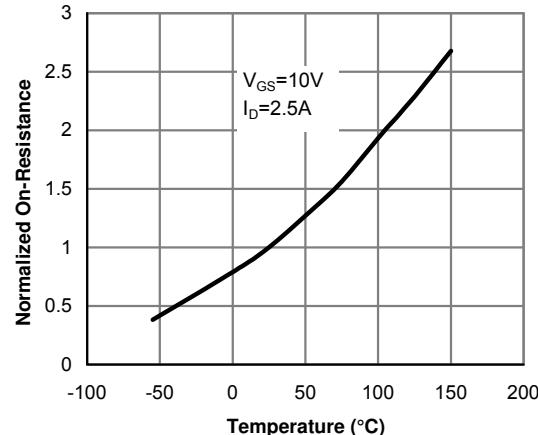
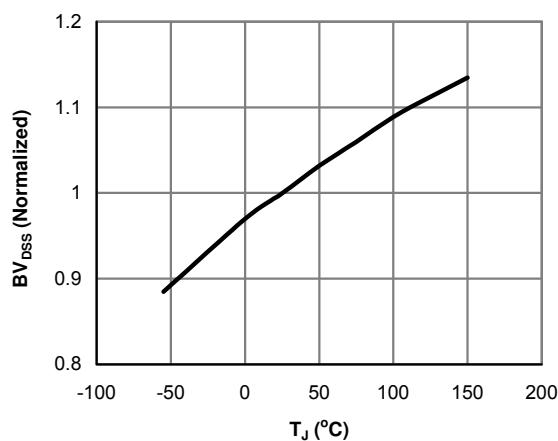
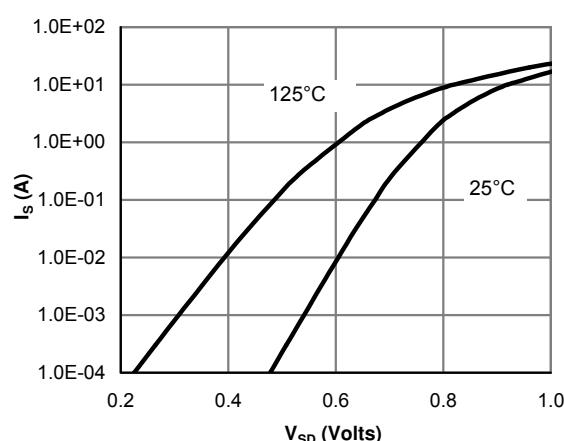
Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

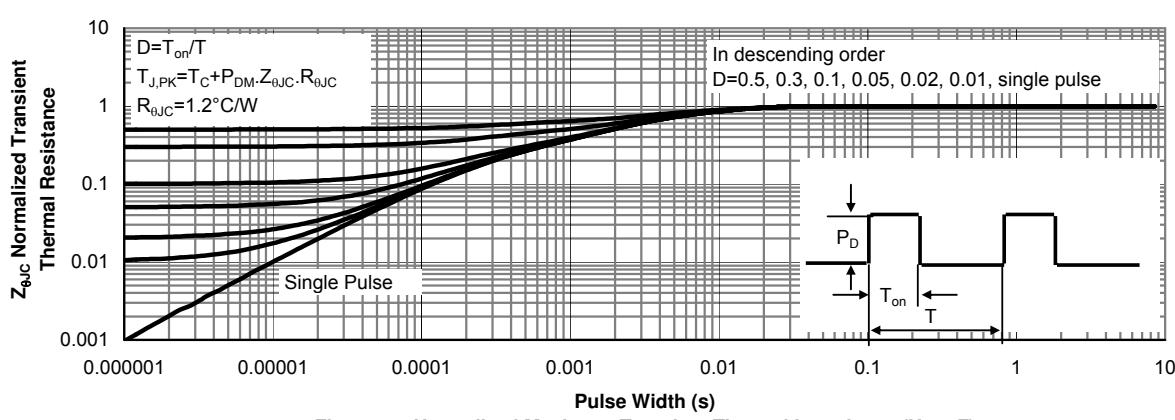
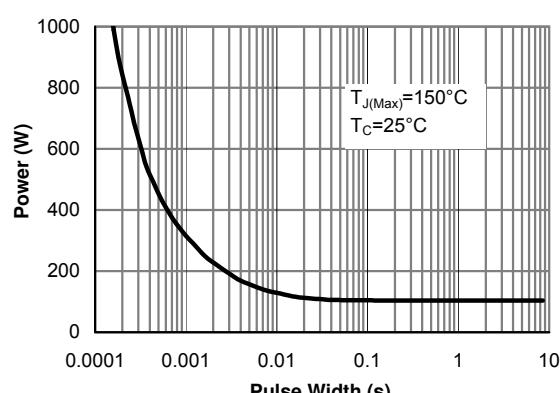
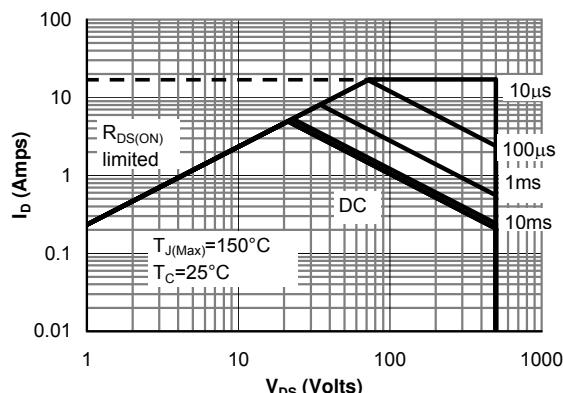
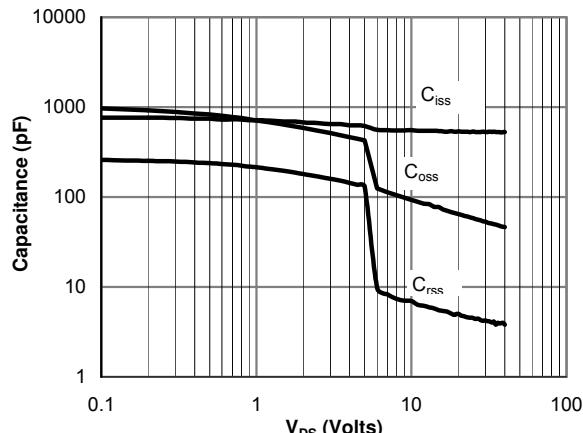
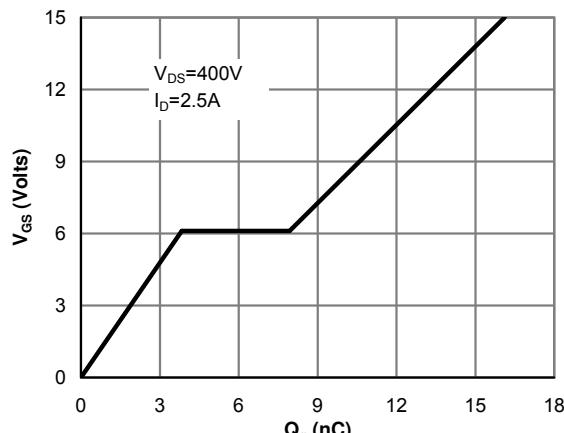
Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}, T_J=25^\circ\text{C}$	500			V
		$I_D=250\mu\text{A}, V_{GS}=0\text{V}, T_J=150^\circ\text{C}$		600		
$\text{BV}_{\text{DSS}}/\Delta T_J$	Zero Gate Voltage Drain Current	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$		0.6		$\text{V}/^\circ\text{C}$
		$V_{DS}=500\text{V}, V_{GS}=0\text{V}$			1	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=400\text{V}, T_J=125^\circ\text{C}$			10	μA
		$V_{DS}=0\text{V}, V_{GS}=\pm 30\text{V}$			± 100	
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS}=5\text{V}, I_D=250\mu\text{A}$	3.4	4.1	4.5	V
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=2.5\text{A}$		1.2	1.6	Ω
g_{FS}	Forward Transconductance	$V_{DS}=40\text{V}, I_D=2.5\text{A}$		5		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.76	1	V
I_S	Maximum Body-Diode Continuous Current			5		A
I_{SM}	Maximum Body-Diode Pulsed Current			17		A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1\text{MHz}$	430	538	670	pF
C_{oss}	Output Capacitance		40	58	80	pF
C_{rss}	Reverse Transfer Capacitance		2.5	4.5	7	pF
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	1.2	2.3	3.5	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=400\text{V}, I_D=5\text{A}$	9	11.5	14	nC
Q_{gs}	Gate Source Charge		3	3.8	4.6	nC
Q_{gd}	Gate Drain Charge		2	4.1	6.2	nC
$t_{\text{D(on)}}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=250\text{V}, I_D=5\text{A}, R_G=25\Omega$		18		ns
t_r	Turn-On Rise Time			32		ns
$t_{\text{D(off)}}$	Turn-Off Delay Time			34		ns
t_f	Turn-Off Fall Time			22		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=5\text{A}, dI/dt=100\text{A}/\mu\text{s}, V_{DS}=100\text{V}$	145	182	220	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=5\text{A}, dI/dt=100\text{A}/\mu\text{s}, V_{DS}=100\text{V}$	1.7	2.2	2.7	μC

- A. The value of R_{QJA} is measured with the device in a still air environment with $T_A=25^\circ\text{C}$.
B. The power dissipation P_D is based on $T_{J(\text{MAX})}=150^\circ\text{C}$ in a TO252 package, 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 $T_{J(\text{MAX})}=150^\circ\text{C}$.
D. The R_{QJA} 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 $<300\ \mu\text{s}$ 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 $T_{J(\text{MAX})}=150^\circ\text{C}$.

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. L=60mH, $I_{AS}=2.8\text{A}$, $V_{DD}=150\text{V}$, $R_G=10\Omega$, Starting $T_J=25^\circ\text{C}$

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Fig 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: Break Down vs. Junction Temperature

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS


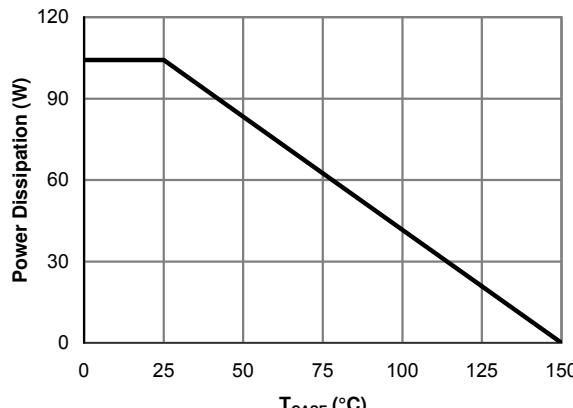
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS


Figure 12: Power De-rating (Note B)

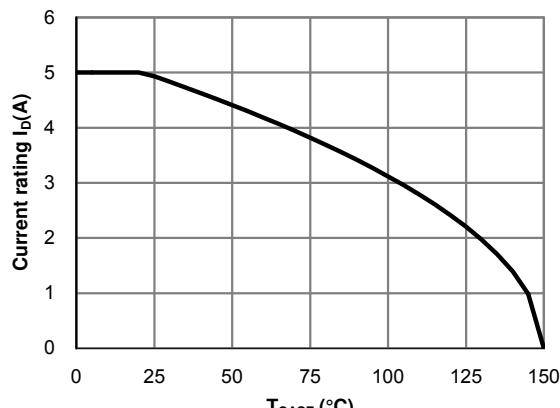


Figure 13: Current De-rating (Note B)

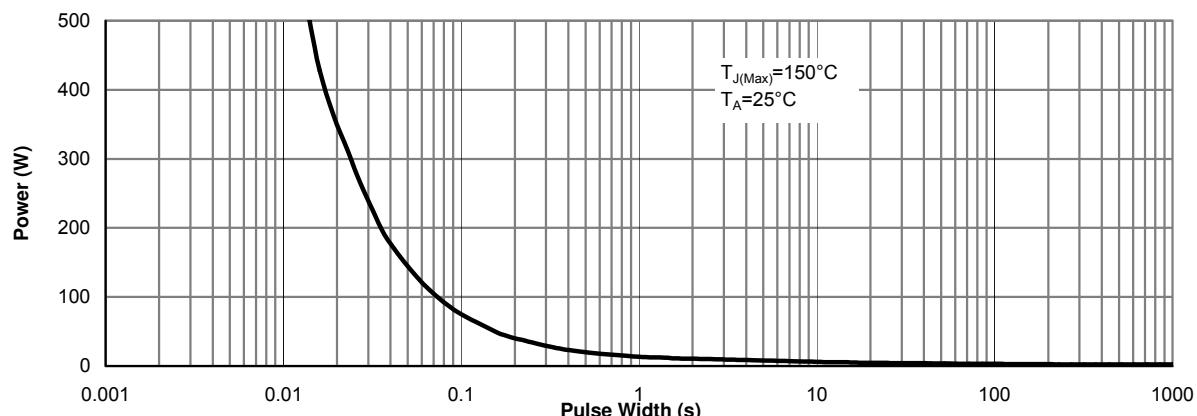


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

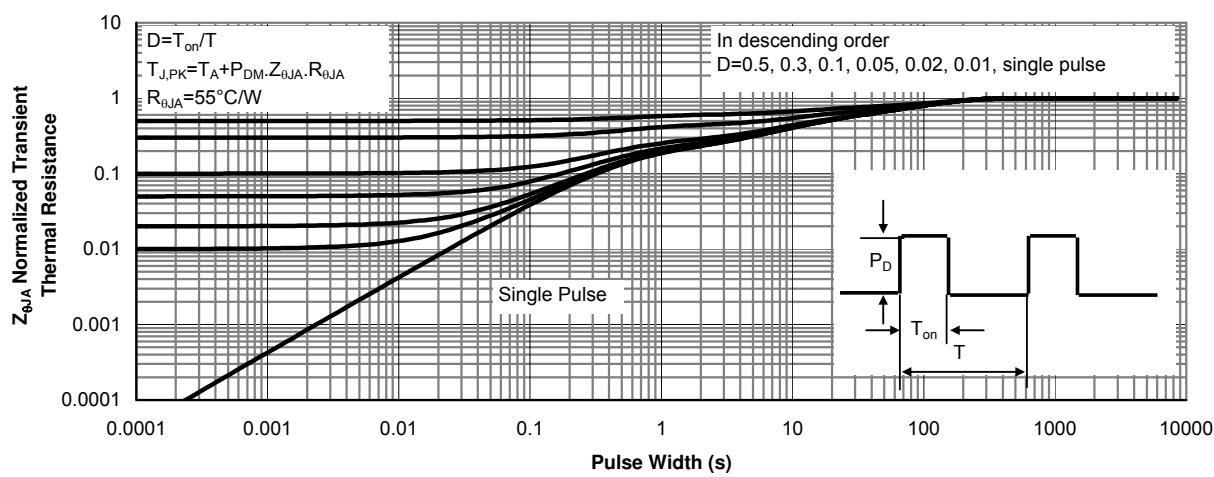
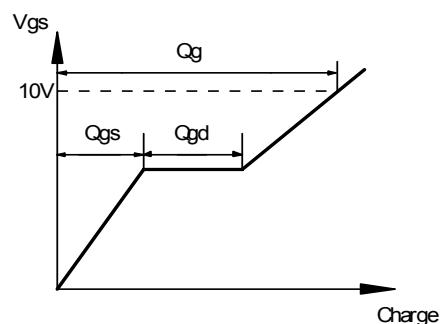
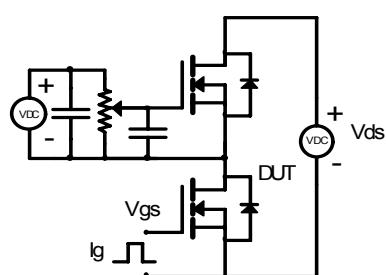
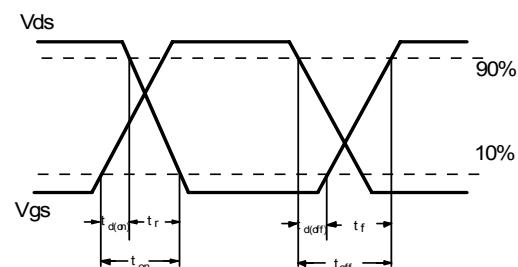
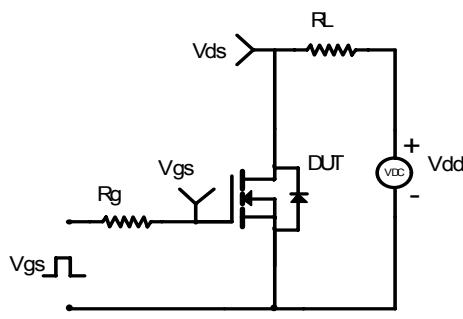
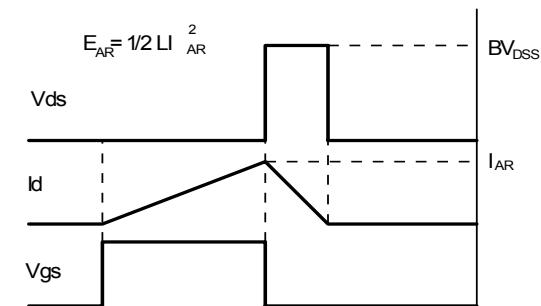
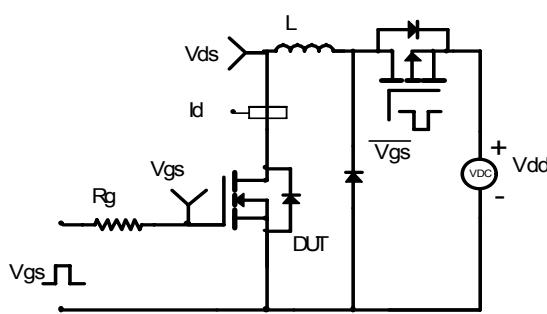


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

Diode Recovery Test Circuit & Waveforms
