



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AOD4184A**

**40V N-Channel MOSFET**

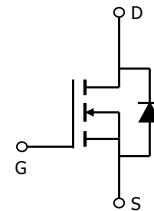
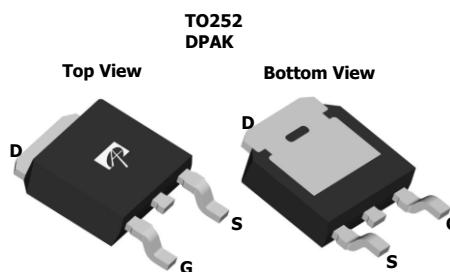
### General Description

The AOD4184A combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . This device is well suited for high current load applications.

### Product Summary

$V_{DS}$	40V
$I_D$ (at $V_{GS}=10V$ )	50A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 7mΩ
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$ )	< 9.5mΩ

**100% UIS Tested  
100% Rg Tested**



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>G</sup>	$I_D$	50	A
$T_C=100^\circ C$		40	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	120	
Continuous Drain Current	$I_{DSM}$	13	A
$T_A=70^\circ C$		10	
Avalanche Current <sup>C</sup>	$I_{AS}, I_{AR}$	35	A
Avalanche energy $L=0.1mH$ <sup>C</sup>	$E_{AS}, E_{AR}$	61	mJ
Power Dissipation <sup>B</sup>	$P_D$	50	W
$T_C=100^\circ C$		25	
Power Dissipation <sup>A</sup>	$P_{DSM}$	2.3	W
$T_A=70^\circ C$		1.5	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	°C

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$	$R_{\theta JA}$	18	22	°C/W
Maximum Junction-to-Ambient <sup>A,D</sup> Steady-State		44	55	°C/W
Maximum Junction-to-Case Steady-State	$R_{\theta JC}$	2.4	3	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	40			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS}=40\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$			$\pm 100$	nA
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.7	2.1	2.6	V
$I_{\text{D(ON)}}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	120			A
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$		5.8 9.6	7 12	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=15\text{A}$		7.6	9.5	$\text{m}\Omega$
$g_{\text{FS}}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=5\text{A}$		37		S
$V_{\text{SD}}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.7	1	V
$I_S$	Maximum Body-Diode Continuous Current				20	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=20\text{V}, f=1\text{MHz}$	1200	1500	1800	pF
$C_{\text{oss}}$	Output Capacitance		150	215	280	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance		80	135	190	pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	2	3.5	5	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=20\text{V}, I_D=20\text{A}$	21	27	33	nC
$Q_g(4.5\text{V})$	Total Gate Charge		10	14	17	nC
$Q_{\text{gs}}$	Gate Source Charge		3	5	6	nC
$Q_{\text{gd}}$	Gate Drain Charge		3	6	9	nC
$t_{\text{D(on)}}$	Turn-On DelayTime	$V_{GS}=10\text{V}, V_{DS}=20\text{V}, R_L=1\Omega, R_{\text{GEN}}=3\Omega$		6		ns
$t_r$	Turn-On Rise Time			17		ns
$t_{\text{D(off)}}$	Turn-Off DelayTime			30		ns
$t_f$	Turn-Off Fall Time			17		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}, dI/dt=100\text{A}/\mu\text{s}$	20	29	38	ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, dI/dt=100\text{A}/\mu\text{s}$	18	26	34	nC

A. The value of  $R_{\text{vJA}}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{\text{DSM}}$  is based on  $R_{\text{vJA}}$  and the maximum allowed junction temperature of  $150^\circ\text{C}$ . The value in any given application depends on the user's specific board design, and the maximum temperature of  $175^\circ\text{C}$  may be used if the PCB allows it.

B. The power dissipation  $P_D$  is based on  $T_{J(\text{MAX})}=175^\circ\text{C}$ , 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  $T_{J(\text{MAX})}=175^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .

D. The  $R_{\text{vJA}}$  is the sum of the thermal impedance from junction to case  $R_{\text{vJC}}$  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.

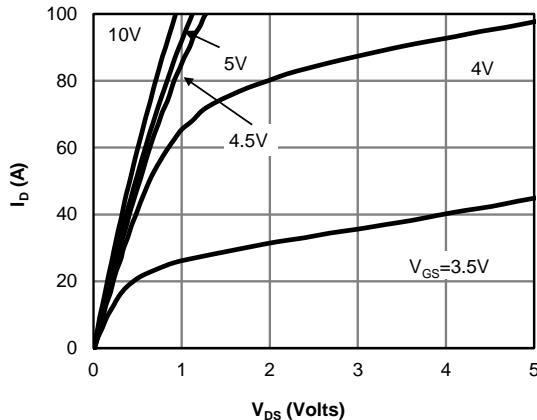
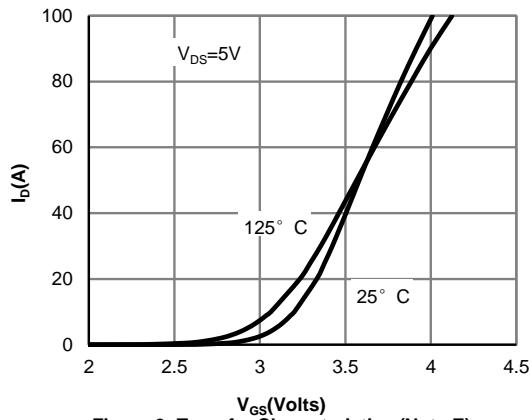
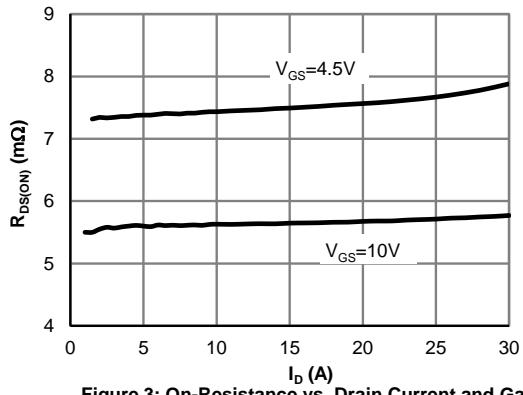
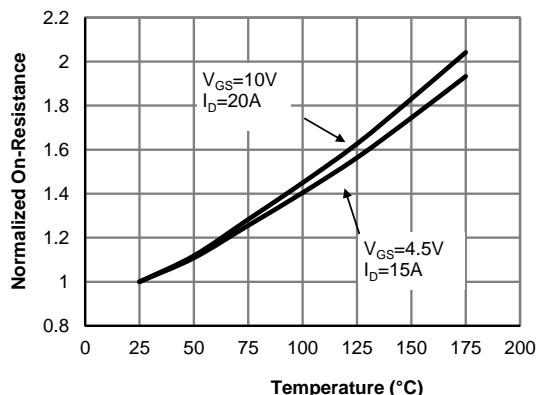
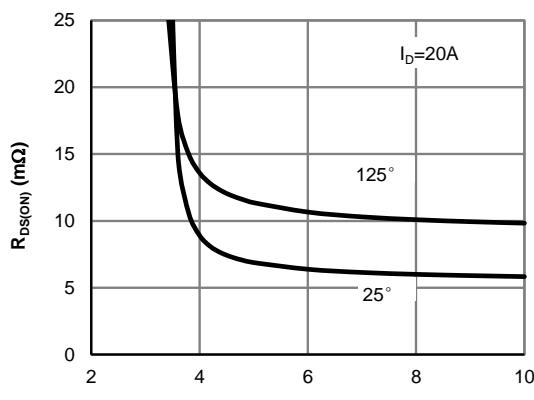
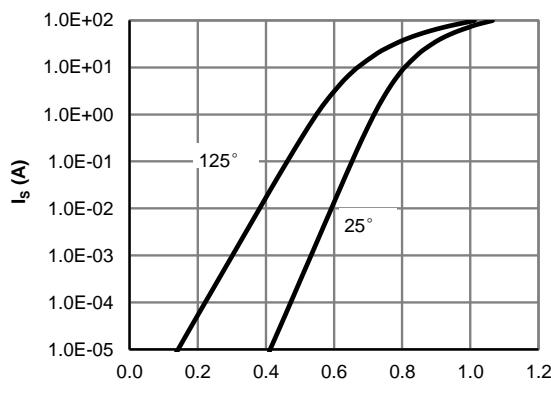
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(\text{MAX})}=175^\circ\text{C}$ . The SOA curve provides a single pulse rating.

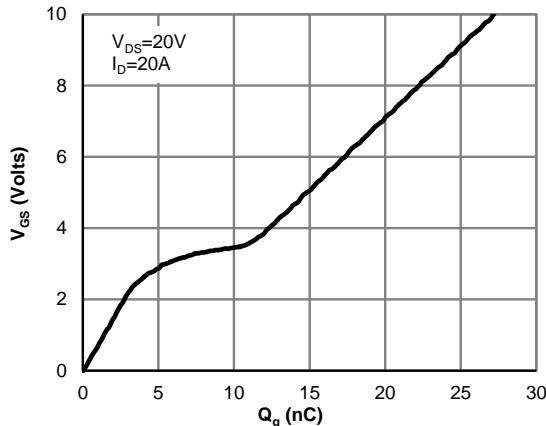
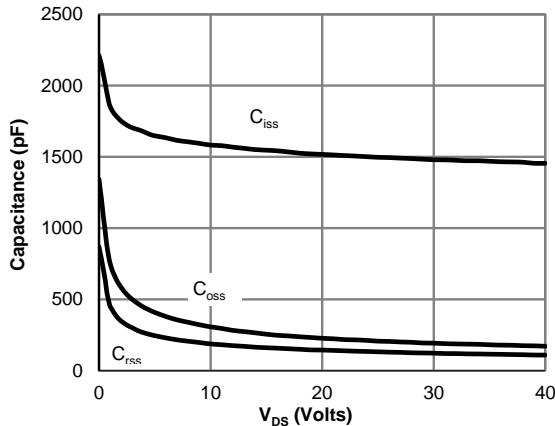
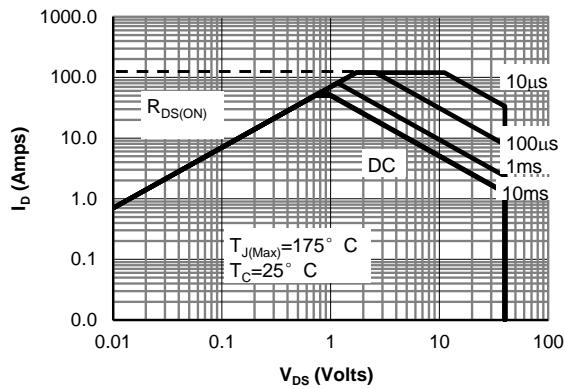
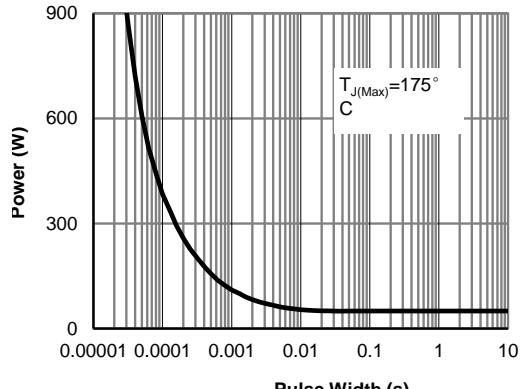
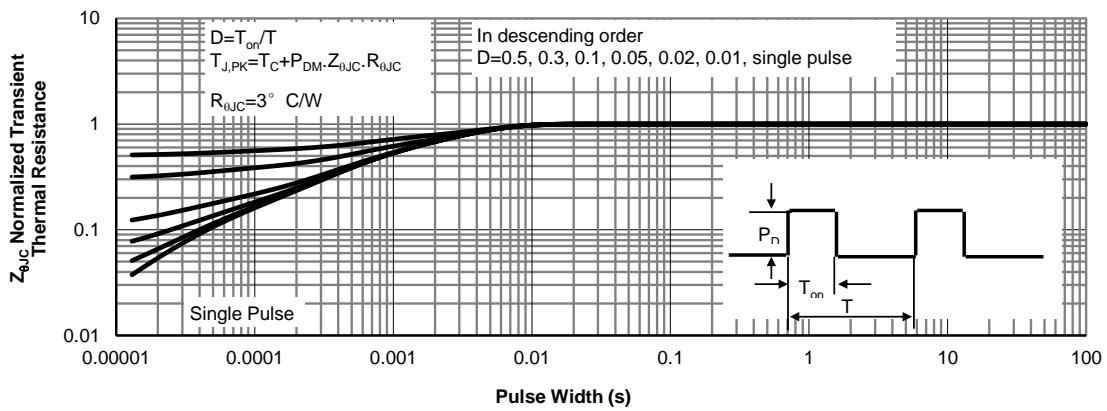
G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ .

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**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)**

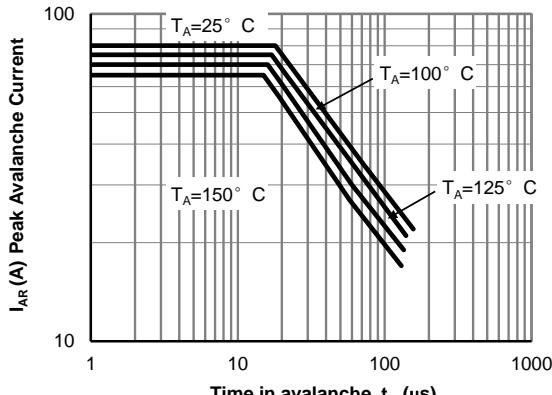
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**


Figure 12: Single Pulse Avalanche capability (Note C)

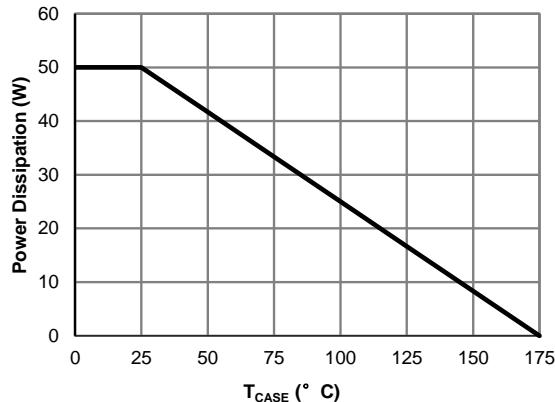


Figure 13: Power De-rating (Note F)

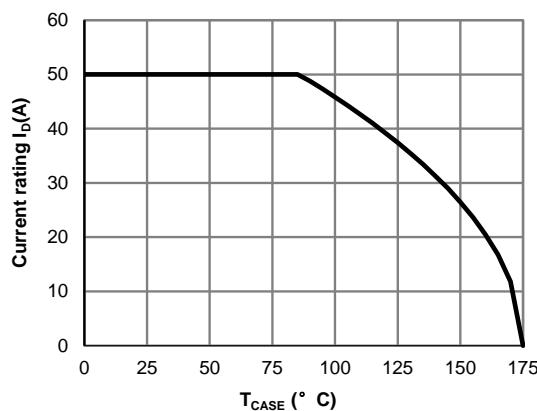


Figure 14: Current De-rating (Note F)

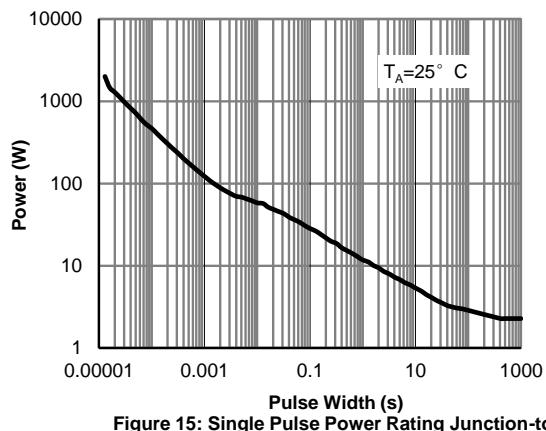


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

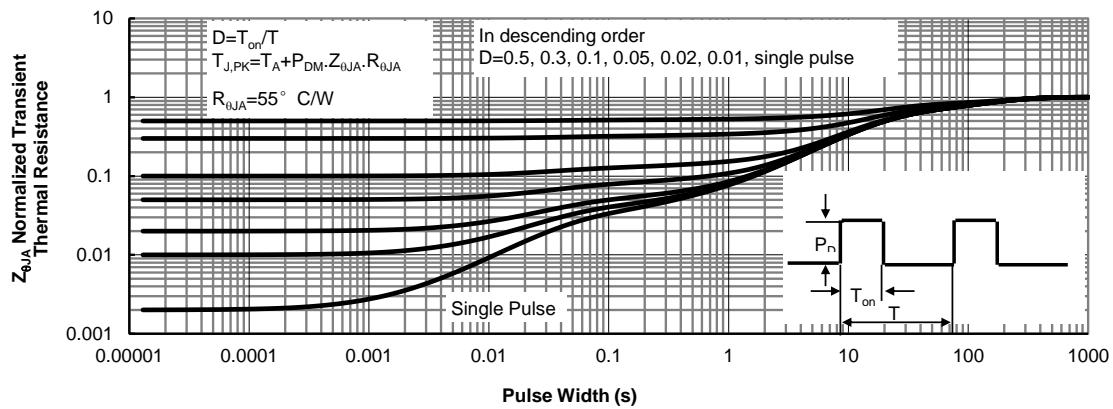
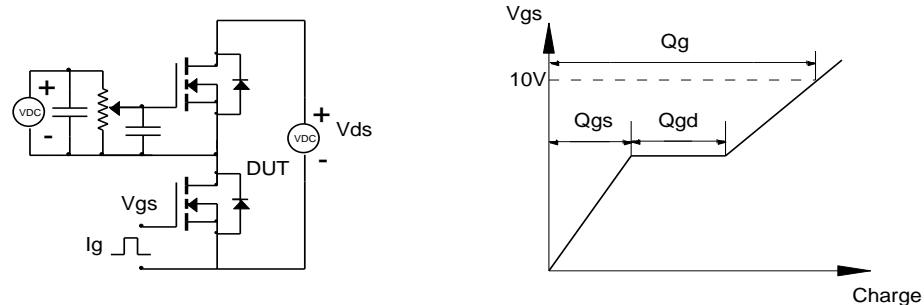
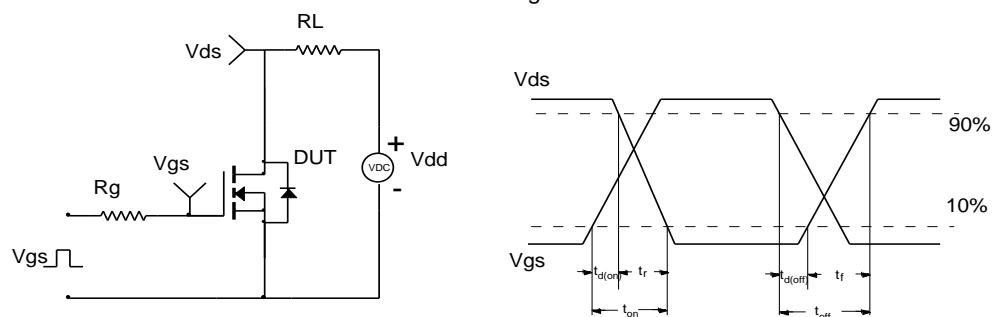
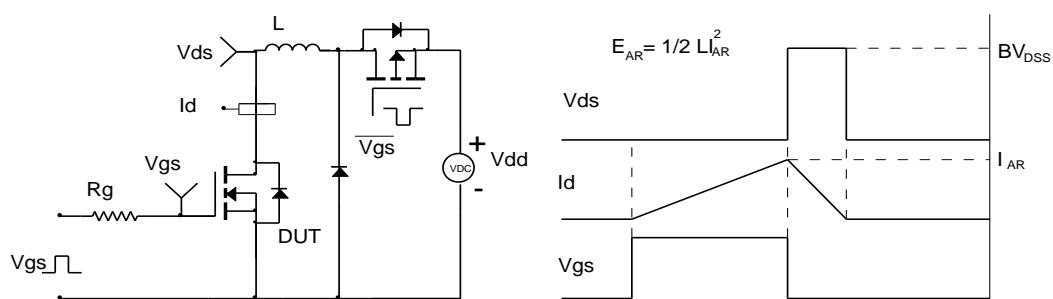


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

**Gate Charge Test Circuit & Waveform**

**Resistive Switching Test Circuit & Waveforms**

**Unclamped Inductive Switching (UIS) Test Circuit & Waveforms**

**Diode Recovery Test Circuit & Waveforms**
