



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AOD240**

**40V N-Channel MOSFET**

### General Description

The AOD240 uses Trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance. Power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $C_{rss}$ . In addition, switching behavior is well controlled with a "Schottky style" soft recovery body diode.

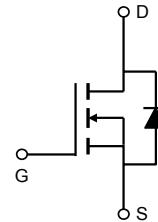
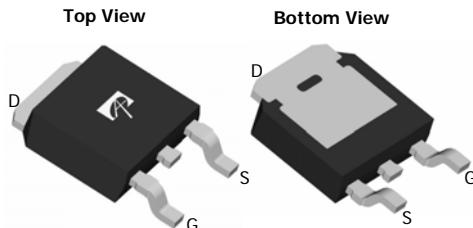
### Product Summary

$V_{DS}$	40V
$I_D$ (at $V_{GS}=10V$ )	70A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 3mΩ
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$ )	< 3.9mΩ

100% UIS Tested  
100%  $R_g$  Tested



T0252  
DPAK



### 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>	$I_D$	70	A
$T_C=100^\circ C$		55	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	300	
Continuous Drain Current	$I_{DSM}$	23	A
$T_A=70^\circ C$		18	
Avalanche Current <sup>C</sup>	$I_{AS}, I_{AR}$	68	A
Avalanche energy $L=0.1mH$ <sup>C</sup>	$E_{AS}, E_{AR}$	231	mJ
Power Dissipation <sup>B</sup>	$P_D$	150	W
$T_C=100^\circ C$		75	
Power Dissipation <sup>A</sup>	$P_{DSM}$	2.7	W
$T_A=70^\circ C$		1.7	
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>	$R_{\theta JA}$	14.2	17	°C/W
Maximum Junction-to-Ambient <sup>A,D</sup>		39	47	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.8	1	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$V_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	40			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm20\text{V}$			100	nA
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1	1.7	2.2	V
$I_{D(\text{ON})}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	300			A
$R_{DS(\text{ON})}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$		2.4 3.7	3 4.8	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=20\text{A}$		2.95	3.9	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$		78		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.65	1	V
$I_S$	Maximum Body-Diode Continuous Current <sup>G</sup>				70	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=20\text{V}, f=1\text{MHz}$	2800	3510	4300	pF
$C_{oss}$	Output Capacitance		760	1070	1420	pF
$C_{rss}$	Reverse Transfer Capacitance		50	68	155	pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	0.5	1	1.5	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=20\text{V}, I_D=20\text{A}$	39	49	60	nC
$Q_g(4.5\text{V})$	Total Gate Charge		17	22	27	nC
$Q_{gs}$	Gate Source Charge		7	9	11	nC
$Q_{gd}$	Gate Drain Charge		4	7	10	nC
$t_{D(\text{on})}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=20\text{V}, R_L=1\Omega, R_{\text{GEN}}=3\Omega$		11		ns
$t_r$	Turn-On Rise Time			10		ns
$t_{D(\text{off})}$	Turn-Off Delay Time			38		ns
$t_f$	Turn-Off Fall Time			11		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$	14	21	28	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$	40	58	76	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 <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  $T_{J(\text{MAX})}=175^\circ\text{C}$ . 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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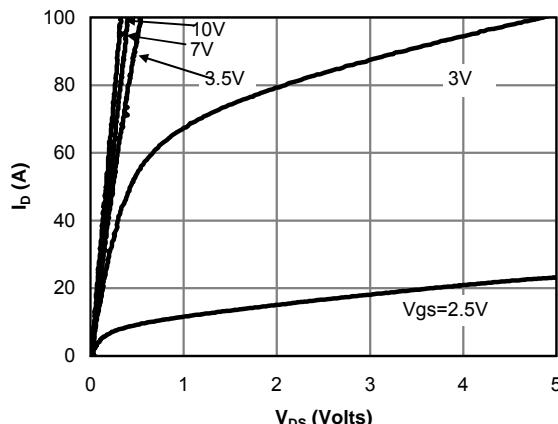
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**


Fig 1: On-Region Characteristics (Note E)

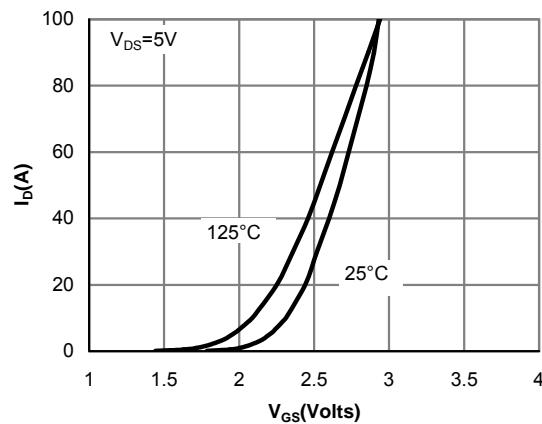


Figure 2: Transfer Characteristics (Note E)

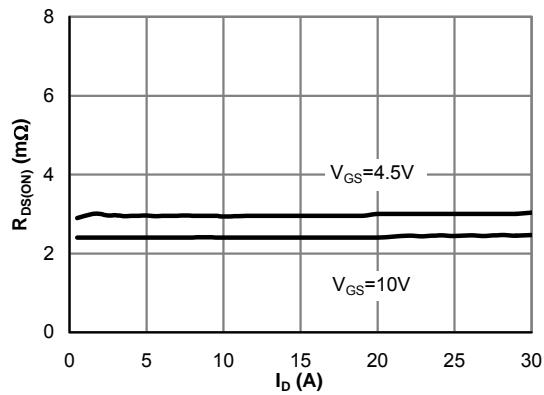


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

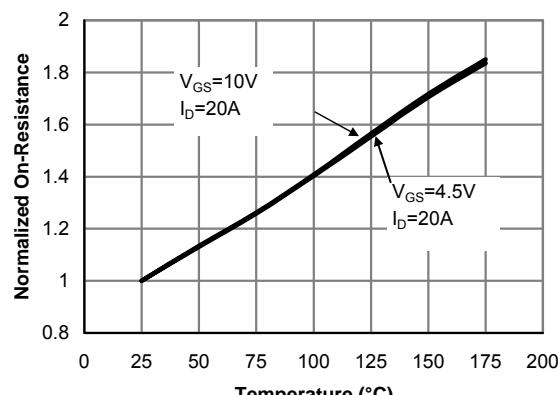


Figure 4: On-Resistance vs. Junction Temperature (Note E)

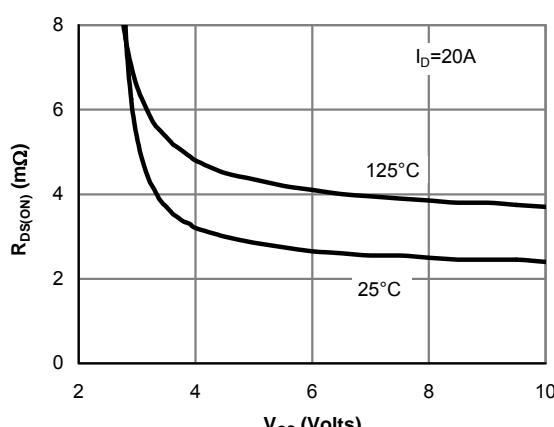


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

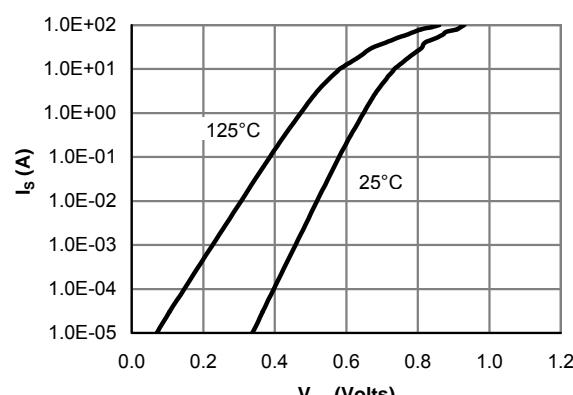


Figure 6: Body-Diode Characteristics (Note E)

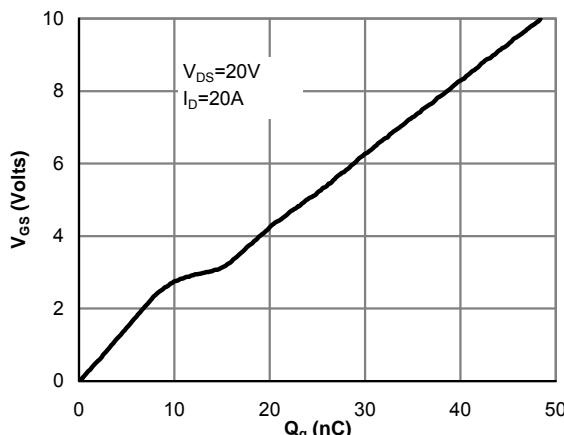
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**


Figure 7: Gate-Charge Characteristics

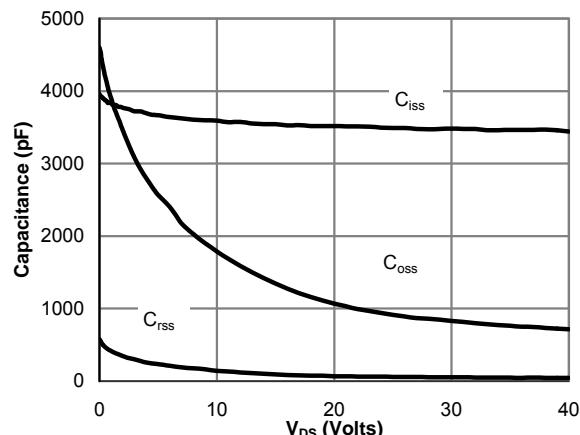


Figure 8: Capacitance Characteristics

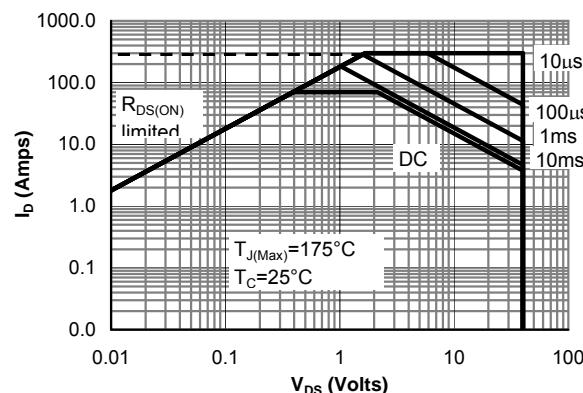


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

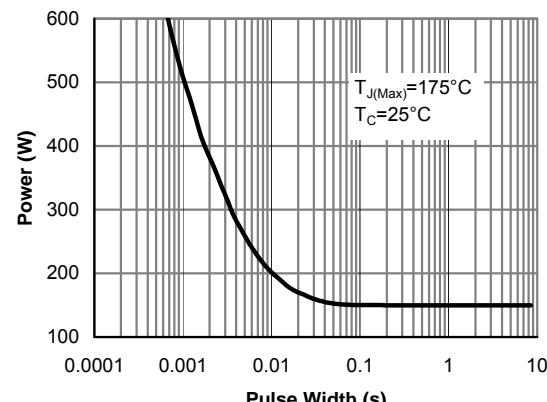


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

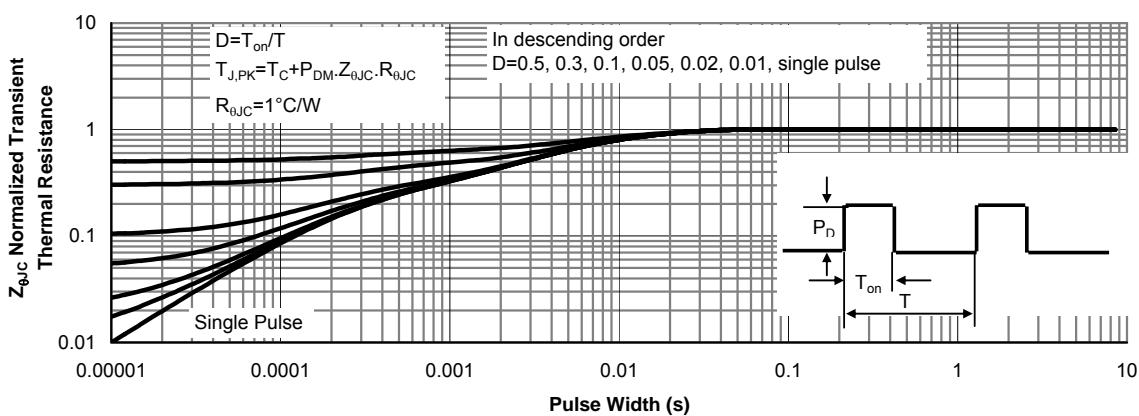
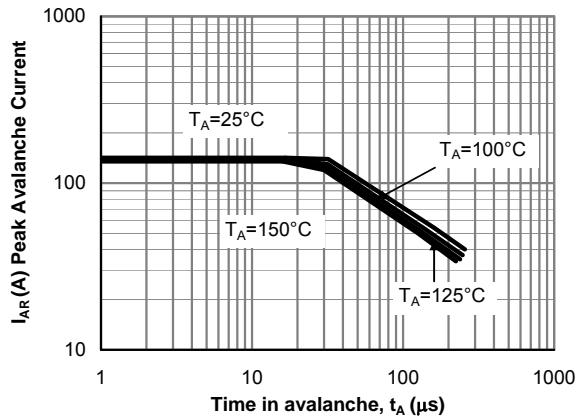
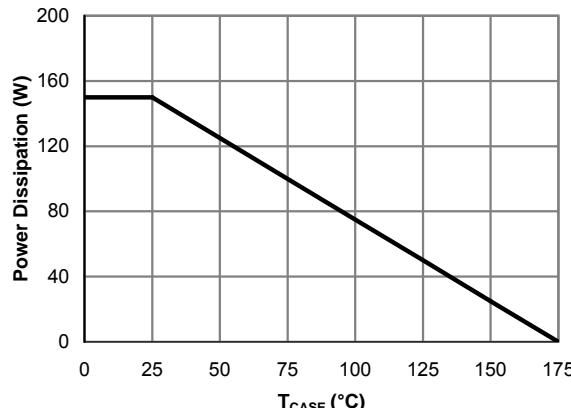
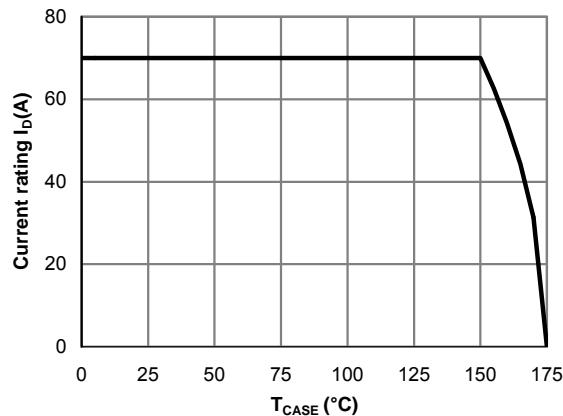
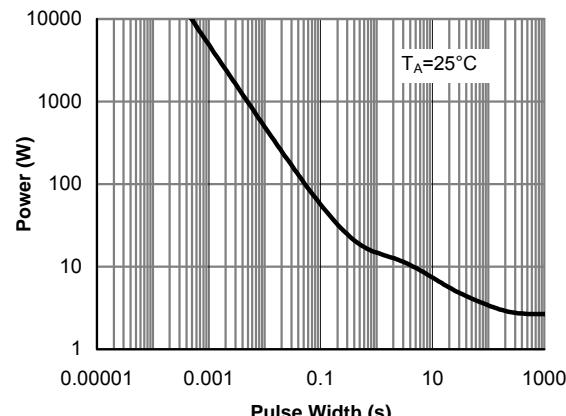
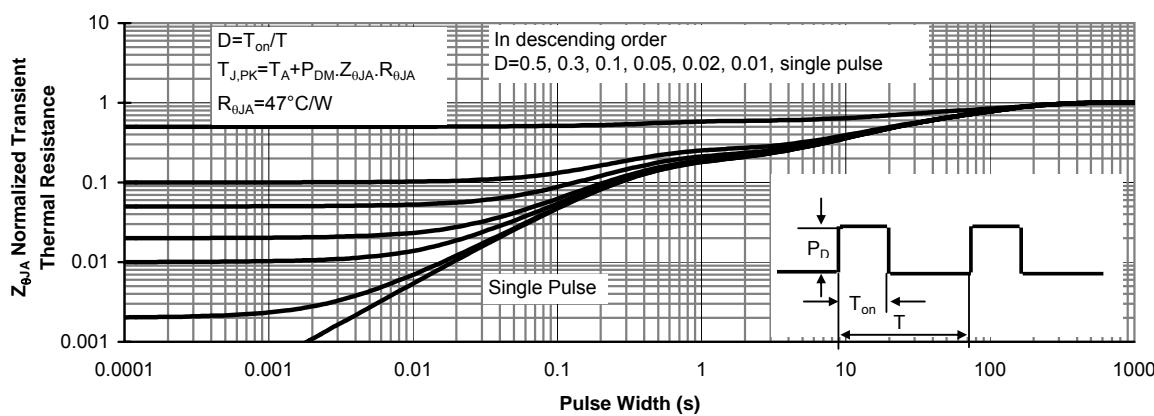
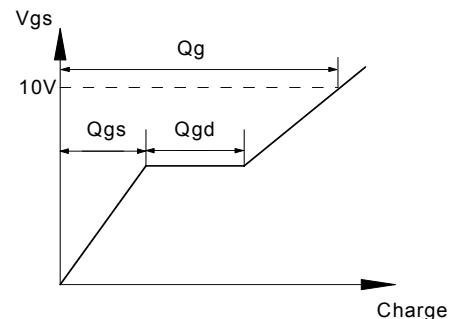
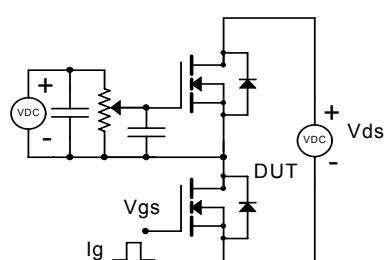
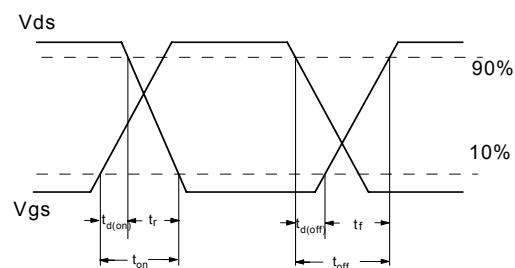
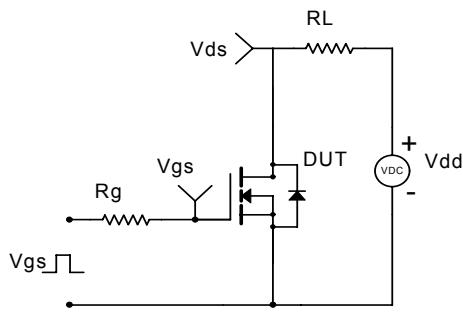
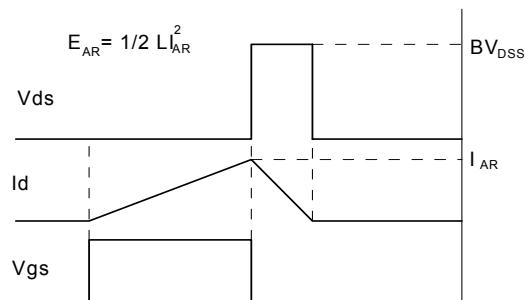
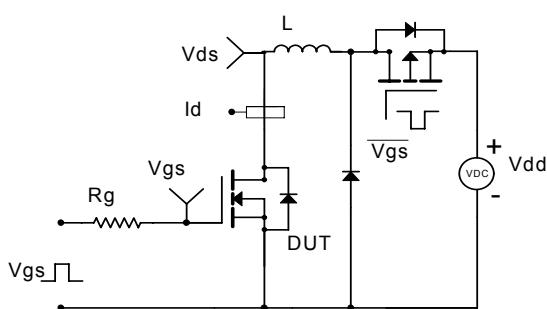


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

**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**
