

## AOD4100

### N-Channel Enhancement Mode Field Effect Transistor

#### General Description

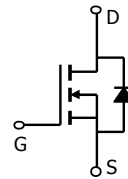
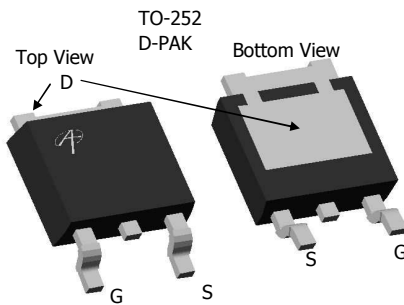
The AOD4100 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , shoot-through immunity and body diode characteristics. This device is ideally suited for use as a High side switch in CPU core power conversion.

- RoHS Compliant
- Halogen Free\*

#### Features

$V_{DS}$  (V) = 25V  
 $I_D$  = 50A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 6.5m\Omega$  ( $V_{GS}$  = 20V)  
 $R_{DS(ON)} < 9m\Omega$  ( $V_{GS}$  = 12V)  
 $R_{DS(ON)} < 12m\Omega$  ( $V_{GS}$  = 10V)

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



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	25	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current <sup>B</sup>	$I_D$	$T_C=25^\circ\text{C}$ <sup>G</sup>	50
		$T_C=100^\circ\text{C}$	49
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	120	A
Avalanche Current <sup>C</sup>	$I_{AR}$	28	A
Repetitive avalanche energy $L=0.3\text{mH}$ <sup>C</sup>	$E_{AR}$	118	mJ
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	50
		$T_C=100^\circ\text{C}$	25
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ\text{C}$	6.5
		$T_A=70^\circ\text{C}$	4.2
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 <sup>A</sup>	$R_{\theta JA}$	16	19	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>				
Maximum Junction-to-Case <sup>D</sup>	$R_{\theta JC}$	2	3	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	25			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±30V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	2	3.2	4	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =12V, V <sub>DS</sub> =5V	120			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =20V, I <sub>D</sub> =20A T <sub>J</sub> =125°C		5.4 7.5	6.5 9	mΩ
		V <sub>GS</sub> =12V, I <sub>D</sub> =20A		7.3	9	
		V <sub>GS</sub> =10V, I <sub>D</sub> =20A		9.8	12	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		43		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.72	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				50	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =12.5V, f=1MHz		1100	1350	pF
C <sub>OSS</sub>	Output Capacitance			420		pF
C <sub>RSS</sub>	Reverse Transfer Capacitance			200		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		0.8	1.5	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub> (12V)	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =12.5V, I <sub>D</sub> =20A		20	24	nC
Q <sub>g</sub> (10V)	Total Gate Charge			17		
Q <sub>gs</sub>	Gate Source Charge			6.5		nC
Q <sub>gd</sub>	Gate Drain Charge			6.8		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =12.5V, R <sub>L</sub> =0.68Ω, R <sub>GEN</sub> =0.6Ω		9.5		ns
t <sub>r</sub>	Turn-On Rise Time			13.5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			11.5		ns
t <sub>f</sub>	Turn-Off Fall Time			5.4		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =20A, dI/dt=100A/μs		32	
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, dI/dt=100A/μs		19		nC

A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The Power dissipation P<sub>DSM</sub> is based on t<10s R<sub>θJA</sub> 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<sub>D</sub> is based on T<sub>J(MAX)</sub>=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<sub>J(MAX)</sub>=175°C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 us 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<sub>J(MAX)</sub>=175°C. The SOA curve provides a single pulse rating.

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<sub>A</sub>=25°C.

\*This device is guaranteed green after data code 8X11 (Sep 1<sup>ST</sup> 2008).

Re1: Oct 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

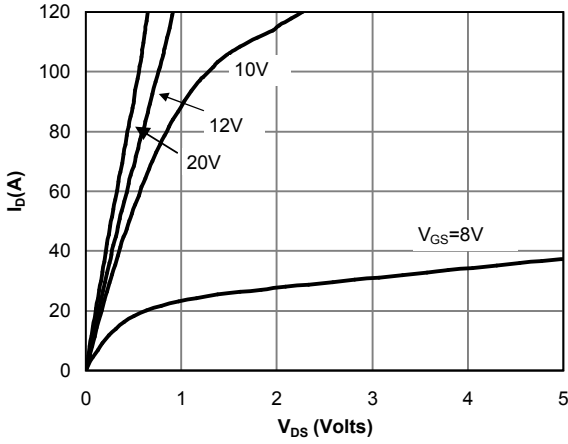


Figure 1: On-Region Characteristics

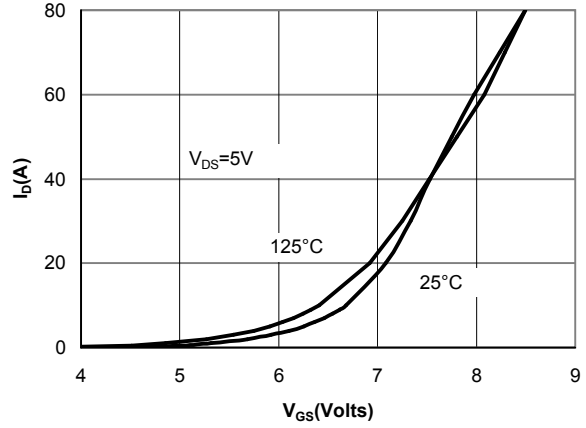


Figure 2: Transfer Characteristics

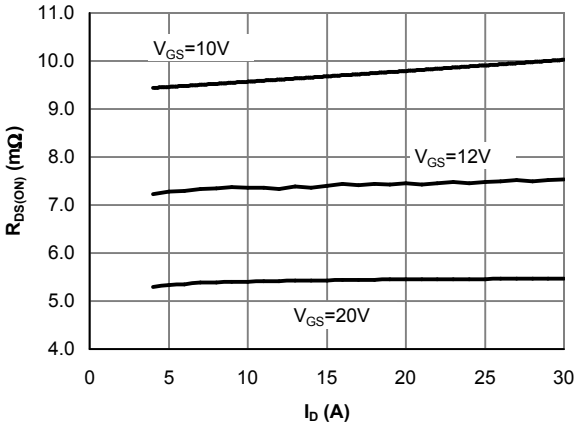


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

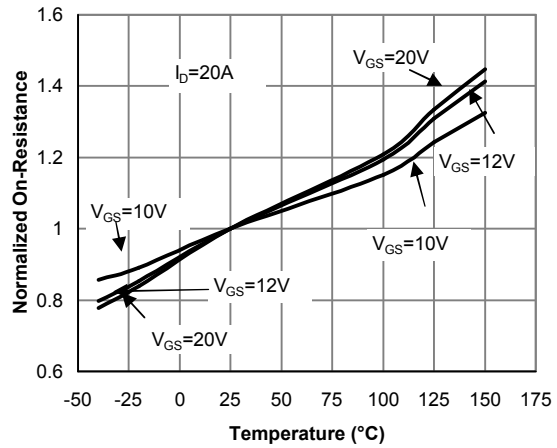


Figure 4: On-Resistance vs. Junction Temperature

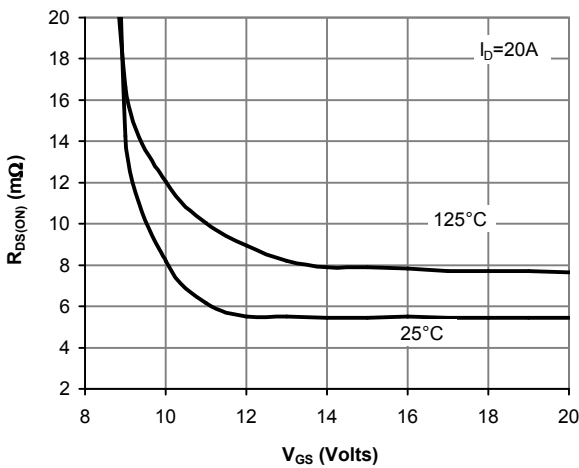


Figure 5: On-Resistance vs. Gate-Source Voltage

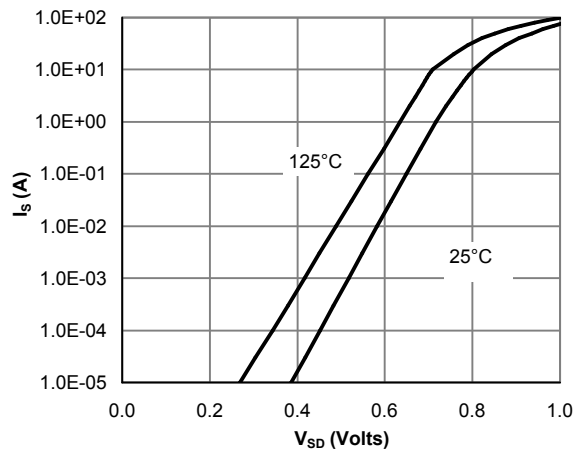


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

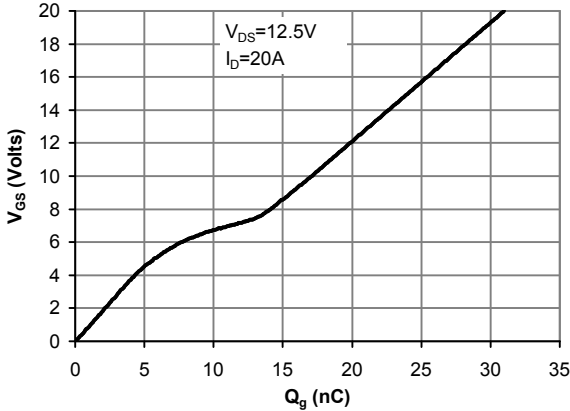


Figure 7: Gate-Charge Characteristics

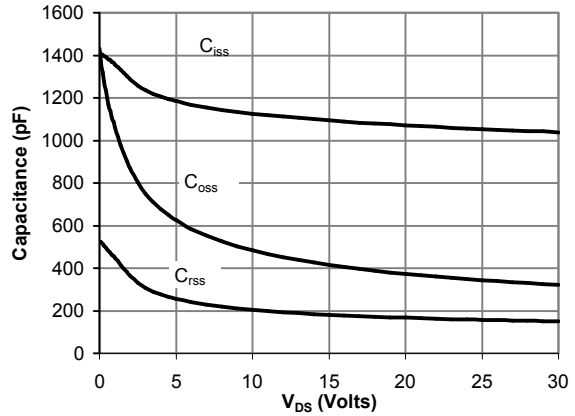


Figure 8: Capacitance Characteristics

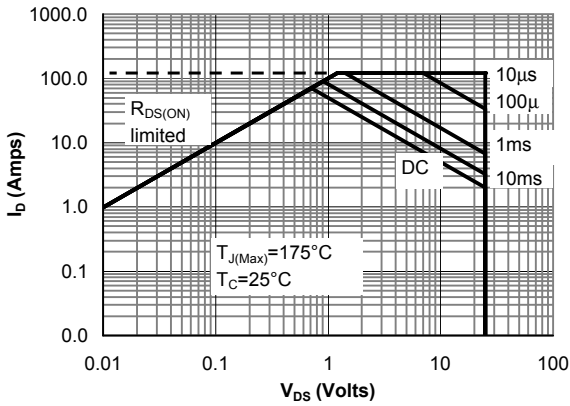


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

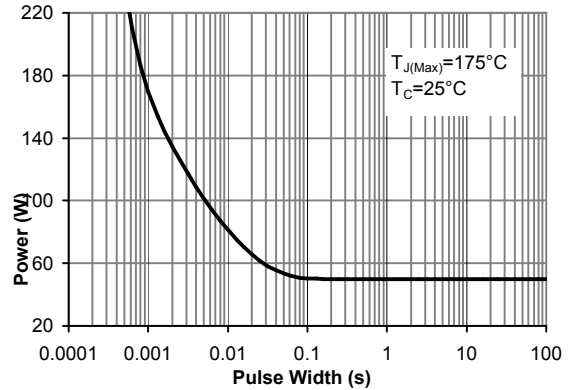


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

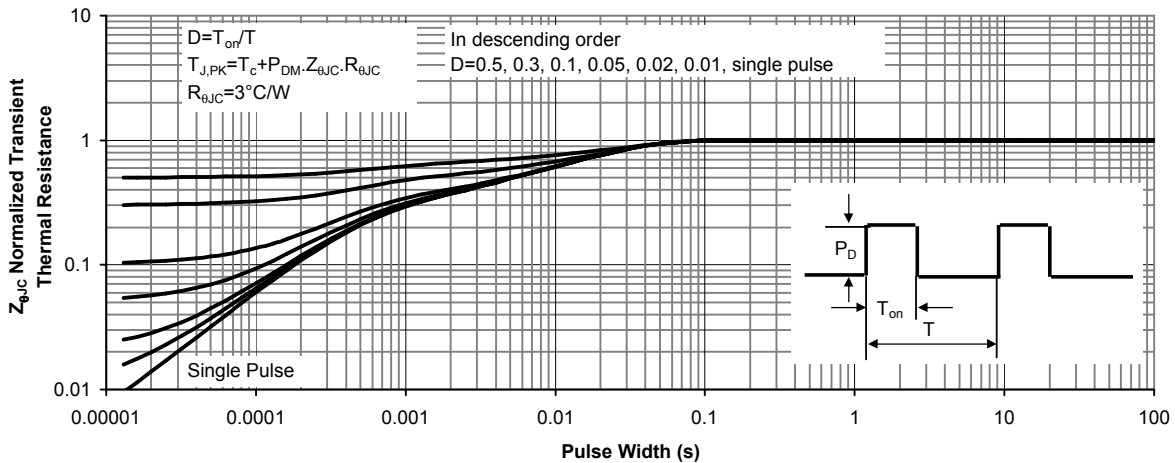


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

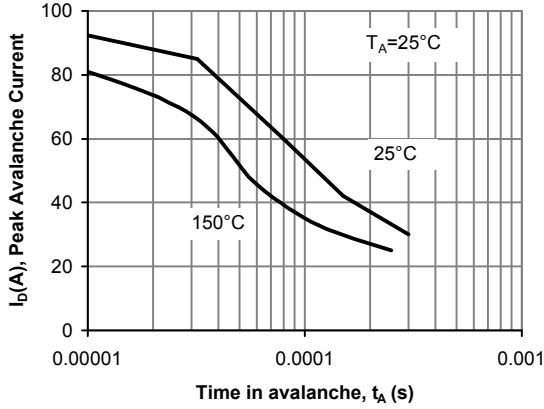


Figure 12: Single Pulse Avalanche capability

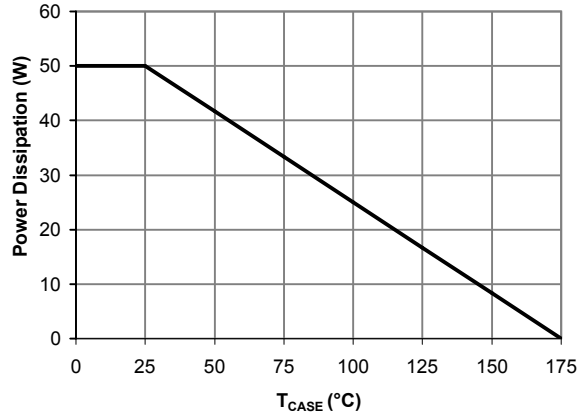


Figure 13: Power De-rating (Note B)

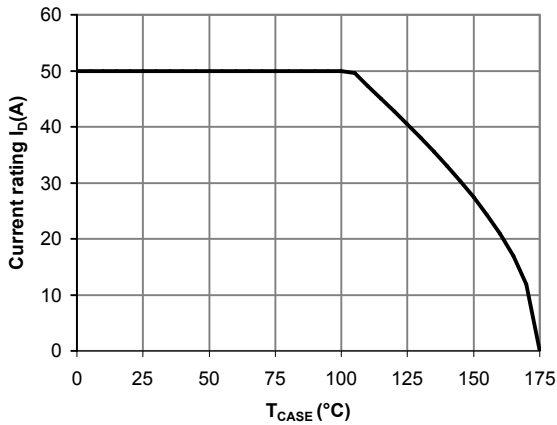


Figure 14: Current De-rating (Note B)

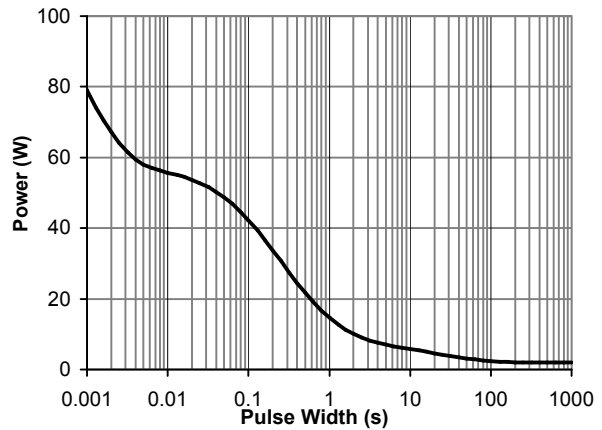


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

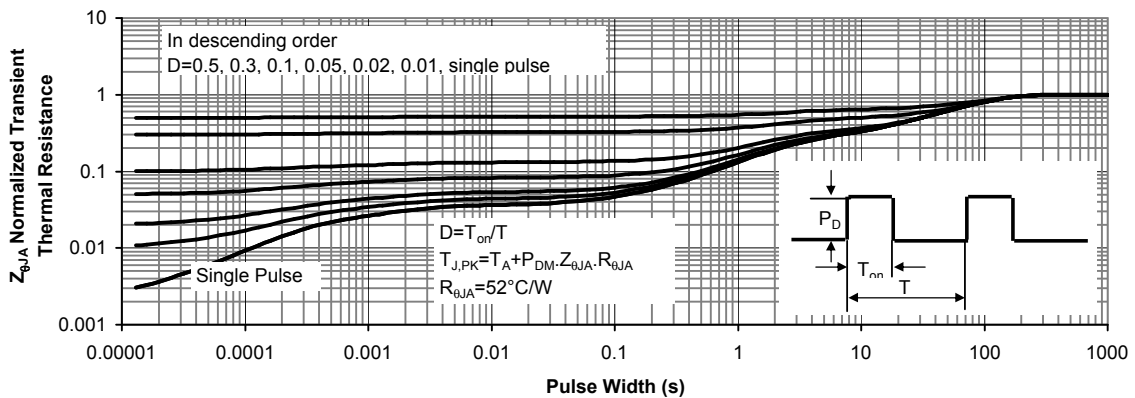
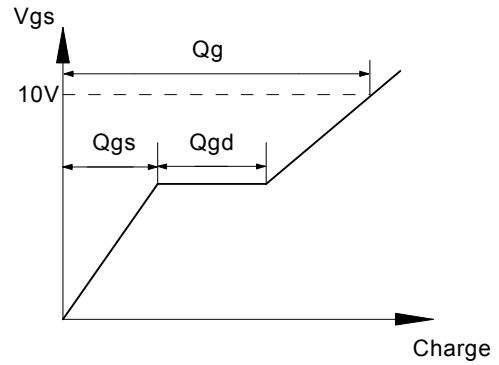
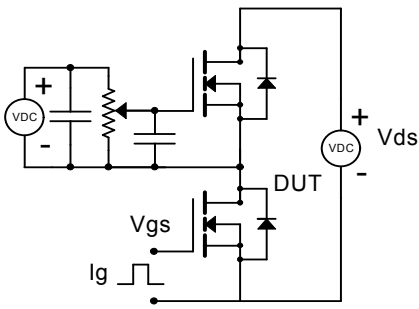
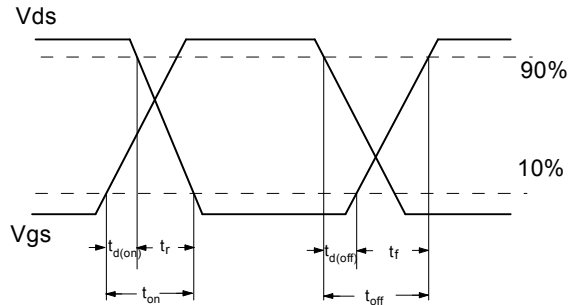
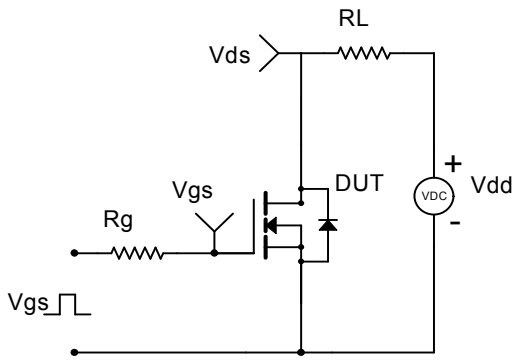


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

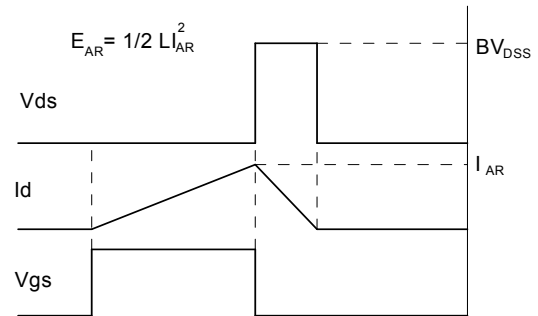
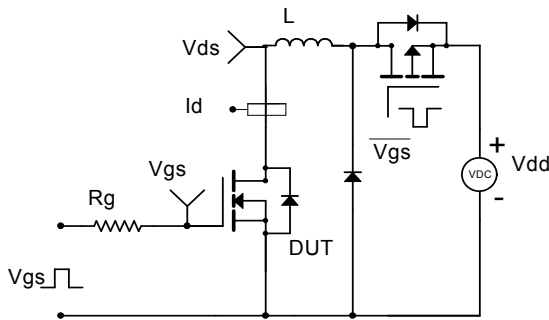
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

