



# AOD4191L

## P-Channel Enhancement Mode Field Effect Transistor

### General Description

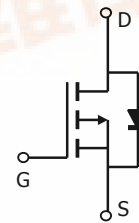
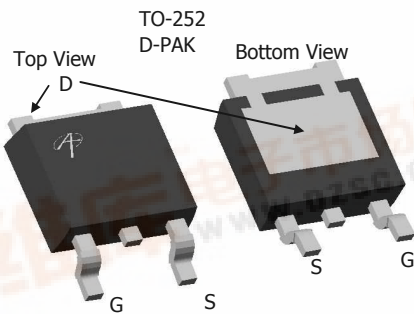
The AOD4191 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and low gate resistance. The device well suited for high current applications.

- RoHS Compliant
- Halogen Free\*

### Features

- $V_{DS}$  (V) = -40V
- $I_D$  = -34A ( $V_{GS}$  = -10V)
- $R_{DS(ON)}$  < 25m $\Omega$  ( $V_{GS}$  = -10V)
- $R_{DS(ON)}$  < 34m $\Omega$  ( $V_{GS}$  = -4.5V)

**100% UIS Tested!**  
**100% R<sub>g</sub> Tested!**



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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>B</sup>	$I_D$	$T_C=25^\circ\text{C}$	A
		$T_C=100^\circ\text{C}$	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	-70	
Continuous Drain Current <sup>A</sup>	$I_D$	$T_C=25^\circ\text{C}$	-7
		$T_C=100^\circ\text{C}$	-6
Avalanche Current <sup>C</sup>	$I_{AR}$	-31	A
Repetitive avalanche energy $L=0.1\text{mH}$ <sup>C</sup>	$E_{AR}$	48	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>	$P_{DSM}$	$T_A=25^\circ\text{C}$	2.5
		$T_A=70^\circ\text{C}$	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 <sup>A</sup>	$R_{\theta JA}$	$t \leq 10\text{s}$	16.7	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	40	$^\circ\text{C/W}$
Maximum Junction-to-Case <sup>B</sup>	$R_{\theta JC}$	2.5	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	-40			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-40V, 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> =±20V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =-250μA	-1.7	-1.9	-3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V	-70			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-12A T <sub>J</sub> =125°C		20.5 31	25 38	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-8A		27	34	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-12A		30		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V		-0.74	-1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				-45	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-20V, f=1MHz	1200	1440	1750	pF
C <sub>oss</sub>	Output Capacitance		125	160	200	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		90	125	175	pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	2	5	10	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(-10V)</sub>	Total Gate Charge	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-20V, I <sub>D</sub> =-12A	24	29	35	nC
Q <sub>g(-4.5V)</sub>	Total Gate Charge		11	14	17	nC
Q <sub>gs</sub>	Gate Source Charge		3.5	4.3	5.5	nC
Q <sub>gd</sub>	Gate Drain Charge		4.5	6.7	9.4	nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-20V, R <sub>L</sub> =1.6Ω, R <sub>GEN</sub> =3Ω		9.6		ns
t <sub>r</sub>	Turn-On Rise Time			16.8		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			38		ns
t <sub>f</sub>	Turn-Off Fall Time			22		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =-12A, dI/dt=500A/μs	15	18	22	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-12A, dI/dt=500A/μs	56	68	82	nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> 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 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 μs 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.

G. The maximum current rating is limited by bond-wires.

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<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

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

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

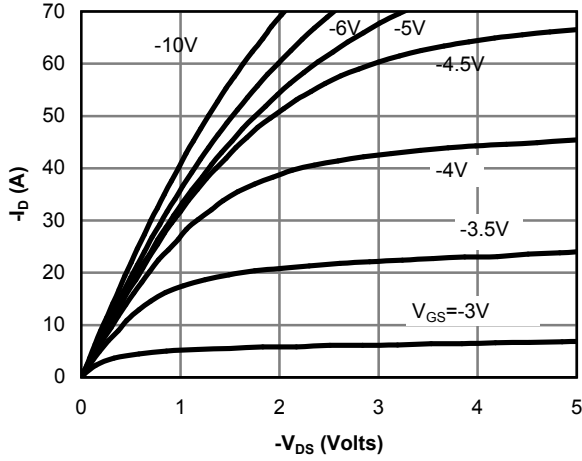


Fig 1: On-Region Characteristics

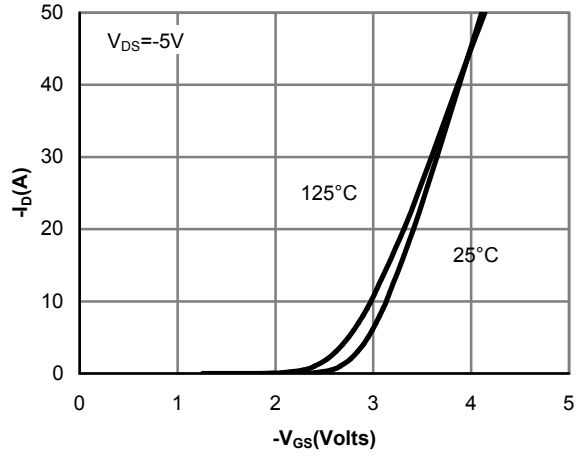


Figure 2: Transfer Characteristics

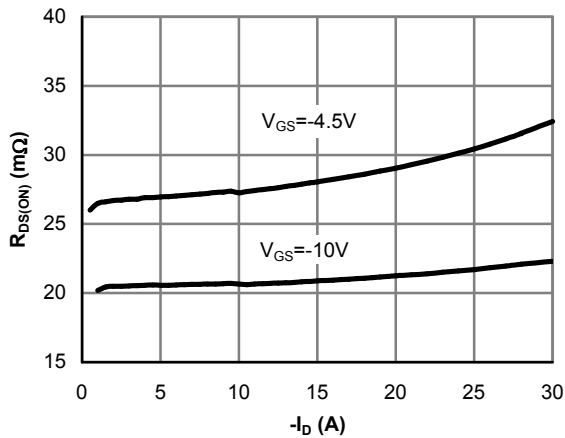


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

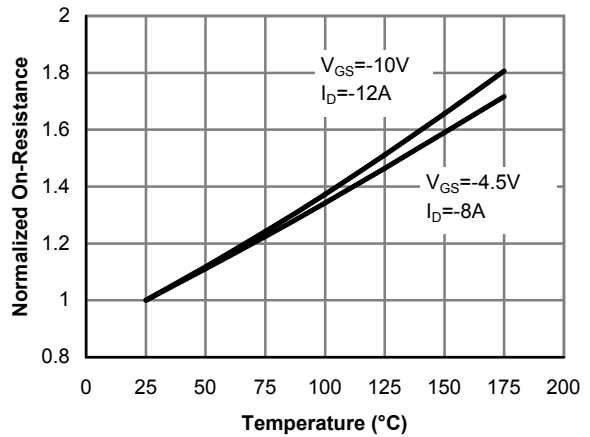


Figure 4: On-Resistance vs. Junction Temperature

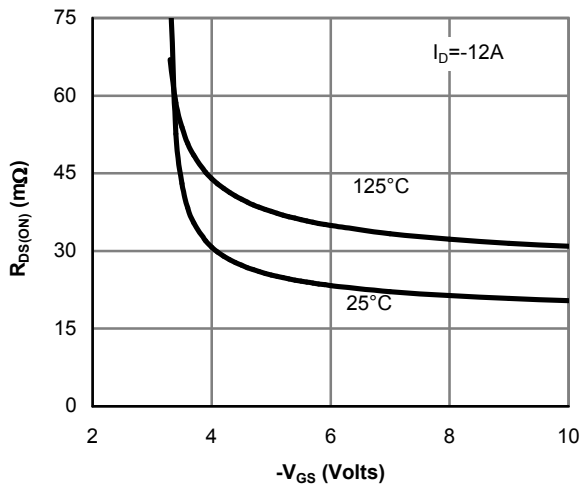


Figure 5: On-Resistance vs. Gate-Source Voltage

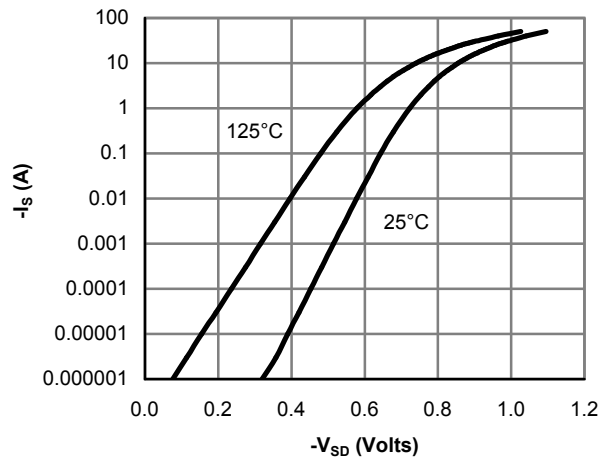


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

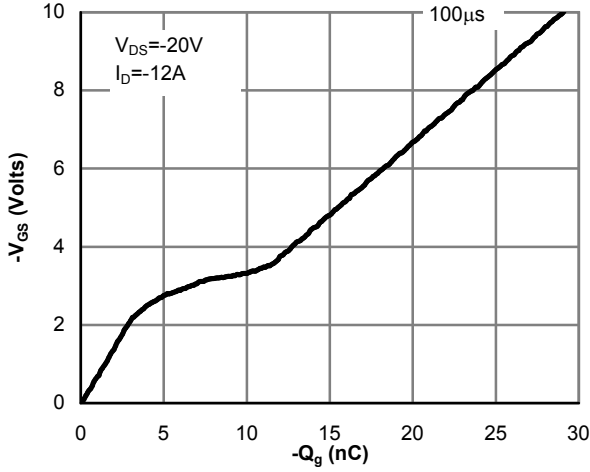


Figure 7: Gate-Charge Characteristics

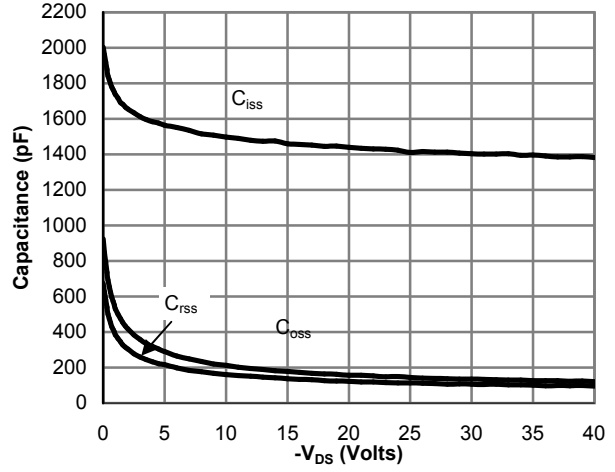


Figure 8: Capacitance Characteristics

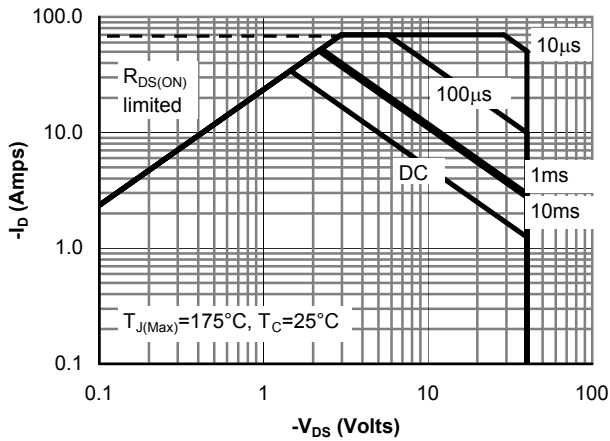


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

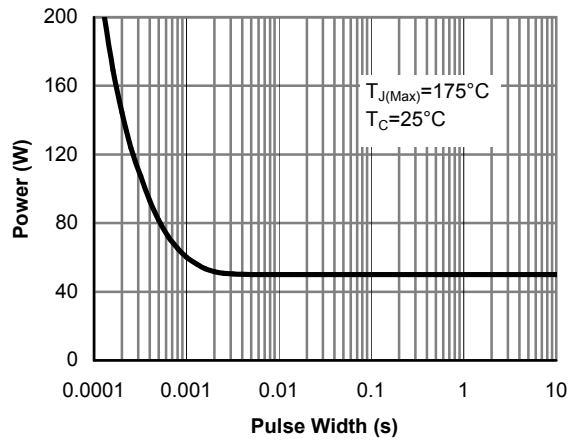


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

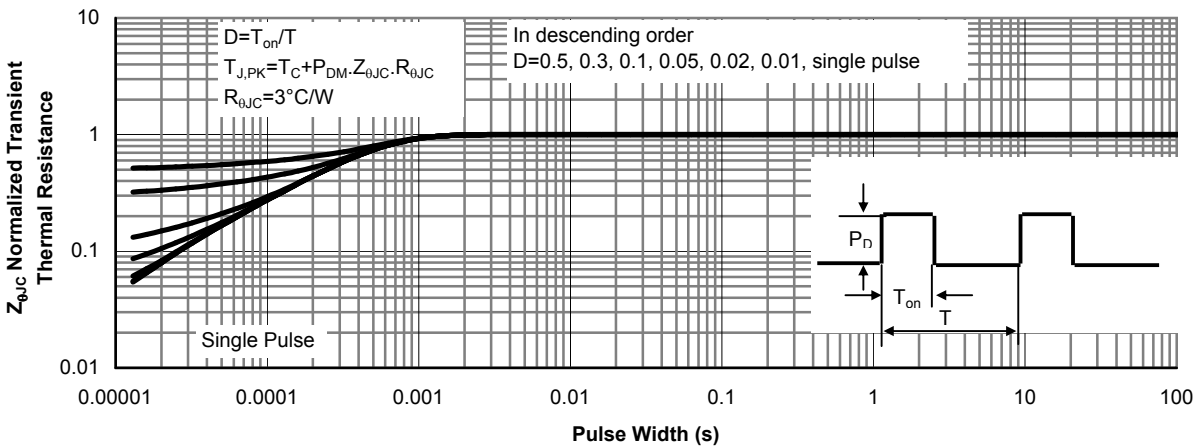


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

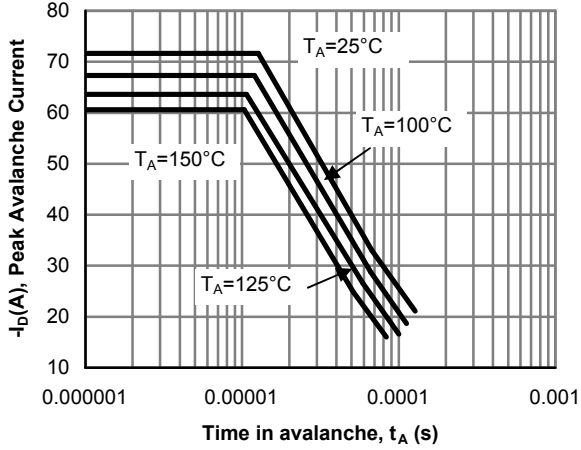


Figure 12: Single Pulse Avalanche capability

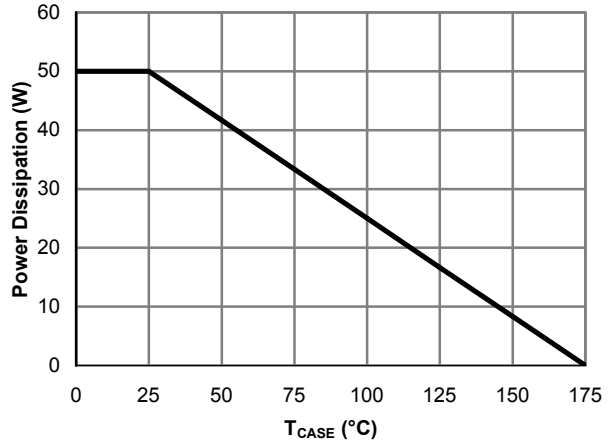


Figure 13: Power De-rating (Note F)

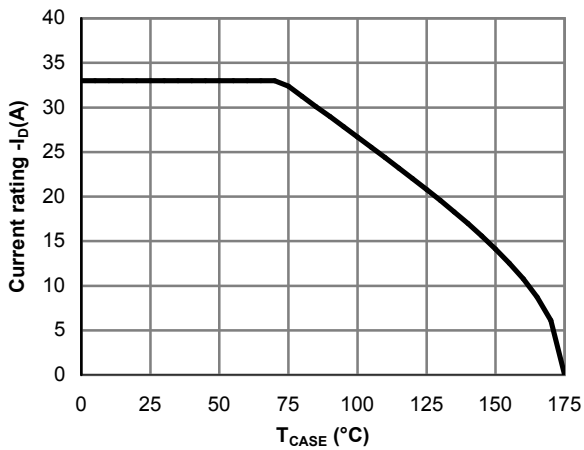


Figure 14: Current De-rating (Note F)

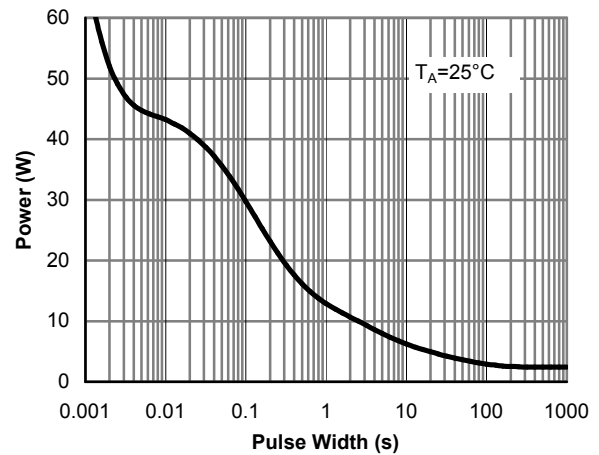


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

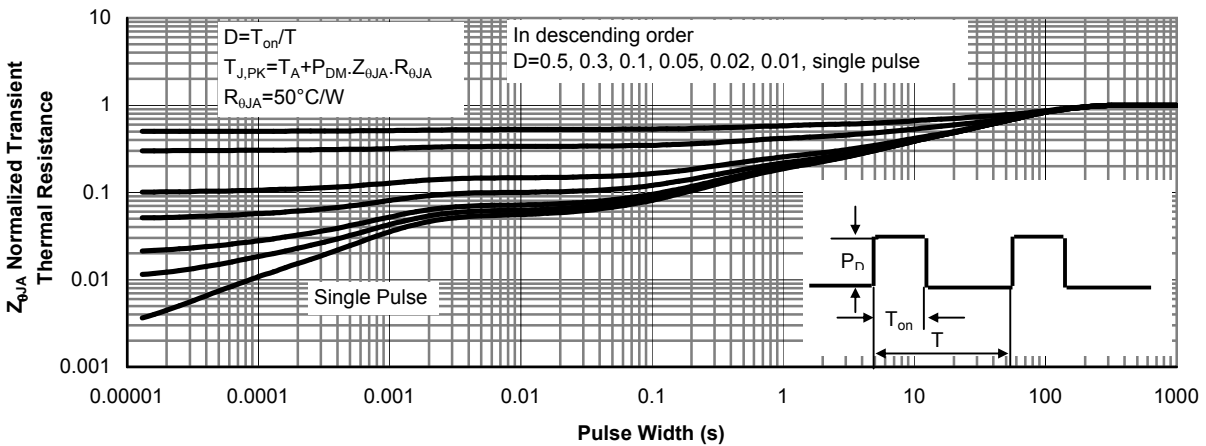
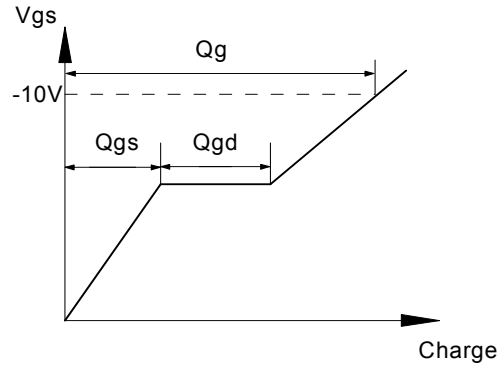
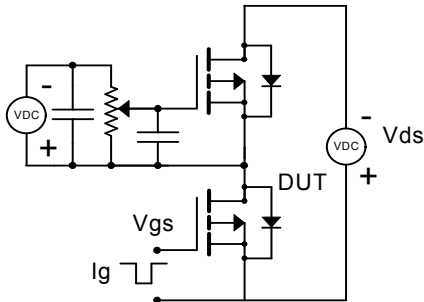
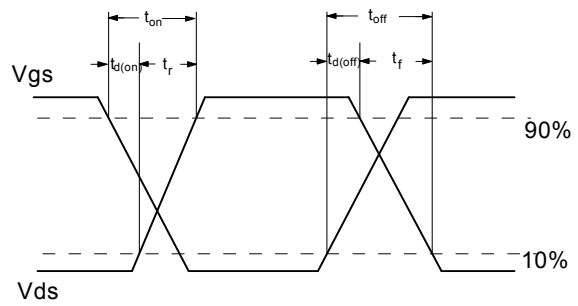
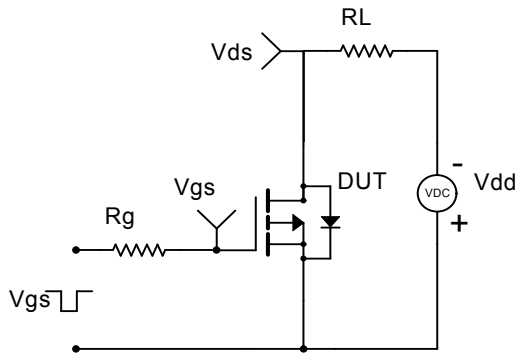


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

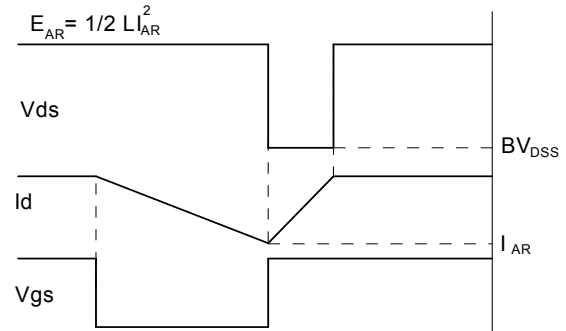
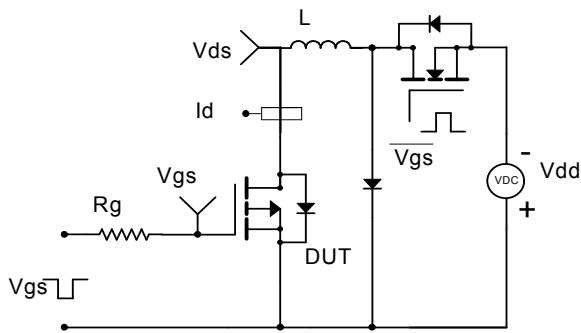
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

