



ALPHA & OMEGA
SEMICONDUCTOR

AOD423/AOI423/AOY423

30V P-Channel MOSFET

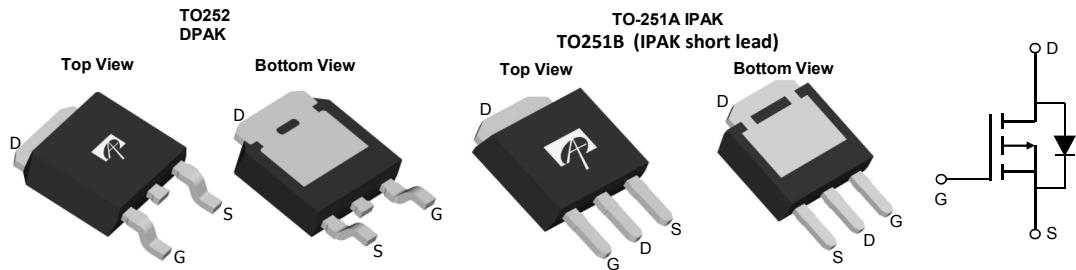
General Description

The AOD423/AOI423/AOY423 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and low gate resistance. With the excellent thermal resistance of the DPAK/IPAK package, this device is well suited for high current load applications.

Product Summary

V_{DS}	-30V
I_D (at $V_{GS} = -20V$)	-70A
$R_{DS(ON)}$ (at $V_{GS} = -20V$)	< 6.2mΩ ($< 6.7mΩ^*$)
$R_{DS(ON)}$ (at $V_{GS} = -10V$)	< 8mΩ ($< 8.5mΩ^*$)

100% UIS Tested
100% R_g Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOD423	TO-252	Tape & Reel	2500
AOI423	TO-251A	Tube	4000
AOY423	TO-251B	Tube	4000

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 25	V
Continuous Drain Current ^G	I_D	-70	A
$T_C=100^\circ C$		-67	
Pulsed Drain Current ^C	I_{DM}	-200	
Continuous Drain Current	I_{DSM}	-15	A
$T_A=70^\circ C$		-12	
Avalanche Current ^C	I_{AS}, I_{AR}	-50	A
Avalanche energy $L=0.1mH$ ^C	E_{AS}, E_{AR}	125	mJ
Power Dissipation ^B	P_D	90	W
$T_C=100^\circ C$		45	
Power Dissipation ^A	P_{DSM}	2.5	W
$T_A=70^\circ C$		1.6	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	16	20	°C/W
Maximum Junction-to-Ambient ^{A,D}		41	50	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.9	1.6	°C/W

* package TO251A, TO251B

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	$I_D=-250\mu\text{A}, V_{GS}=0\text{V}$	-30			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	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 25\text{V}$			± 100	nA
$\text{V}_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-1.5	-2.5	-3.5	V
$\text{I}_{\text{D(ON)}}$	On state drain current	$V_{GS}=-10\text{V}, V_{DS}=-5\text{V}$	-200			A
$\text{R}_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=-20\text{V}, I_D=-20\text{A}$ TO252 $T_J=125^\circ\text{C}$		5.1	6.2	$\text{m}\Omega$
		$V_{GS}=-10\text{V}, I_D=-20\text{A}$ TO252		7.6	9.2	
		$V_{GS}=-20\text{V}, I_D=-20\text{A}$ TO251A, TO251B		6.2	8	$\text{m}\Omega$
		$V_{GS}=-10\text{V}, I_D=-20\text{A}$ TO251A, TO251B		5.6	6.7	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}, I_D=-20\text{A}$		42		S
V_{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 ^G				-70	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=-15\text{V}, f=1\text{MHz}$		2760		pF
C_{oss}	Output Capacitance			550		pF
C_{rss}	Reverse Transfer Capacitance			375		pF
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	1.5	3	6.0	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-10\text{V}, V_{DS}=-15\text{V}, I_D=-20\text{A}$		45	65	nC
Q_{gs}	Gate Source Charge			10		nC
Q_{gd}	Gate Drain Charge			12		nC
$t_{\text{D(on)}}$	Turn-On DelayTime	$V_{GS}=-10\text{V}, V_{DS}=-15\text{V}, R_L=0.75\Omega, R_{\text{GEN}}=3\Omega$		13		ns
t_r	Turn-On Rise Time			23		ns
$t_{\text{D(off)}}$	Turn-Off DelayTime			35		ns
t_f	Turn-Off Fall Time			26		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-20\text{A}, dI/dt=500\text{A}/\mu\text{s}$		15		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-20\text{A}, dI/dt=500\text{A}/\mu\text{s}$		30		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ 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_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 $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

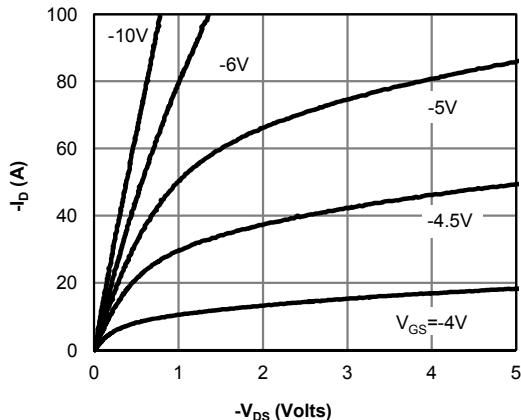
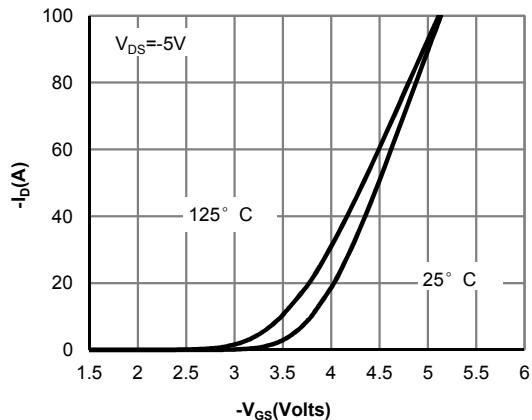
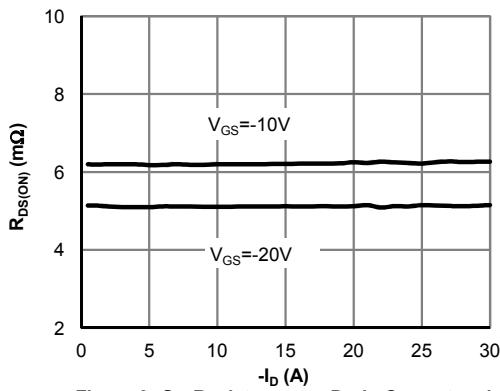
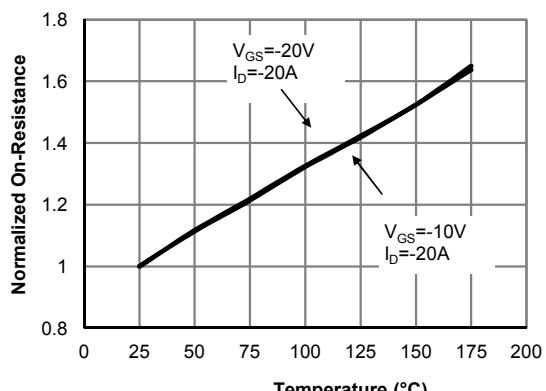
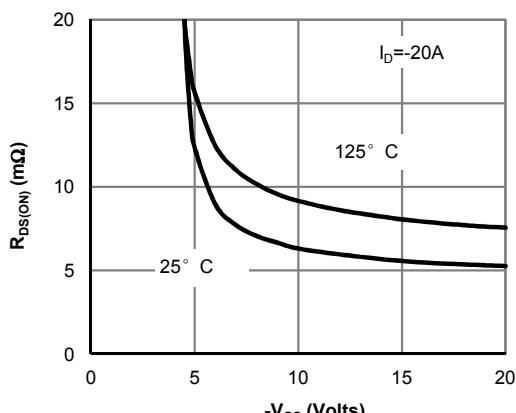
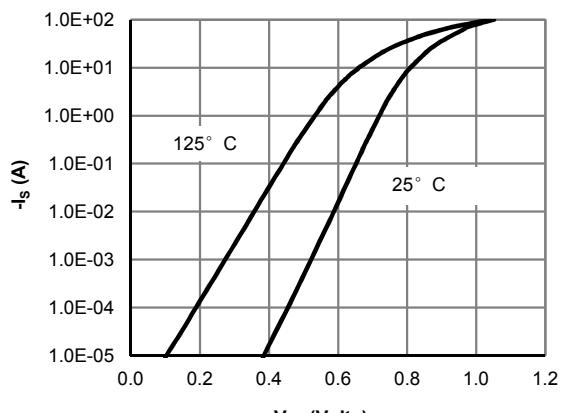
E. The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

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.

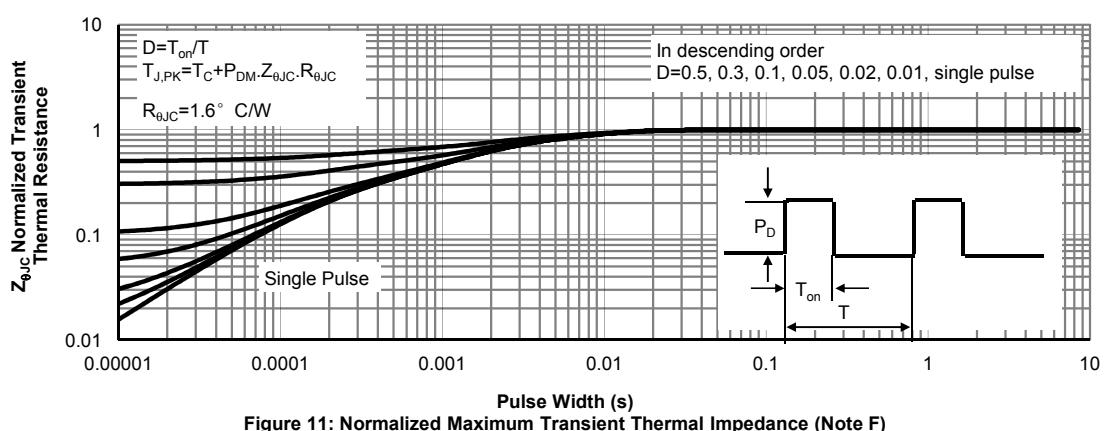
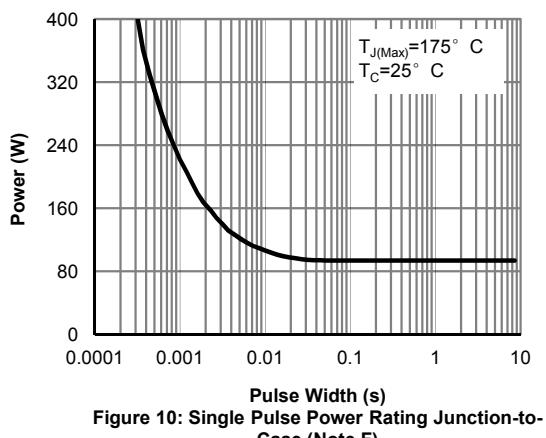
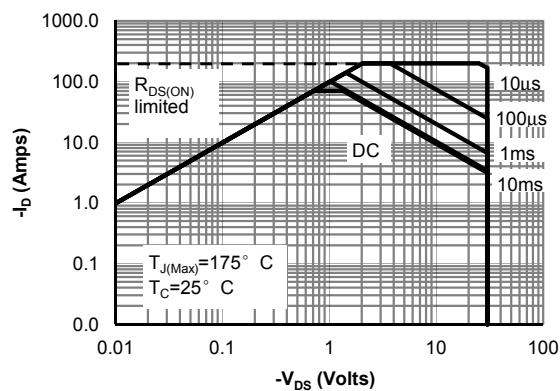
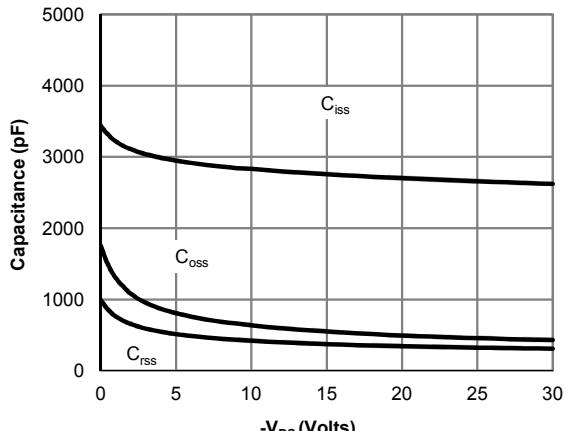
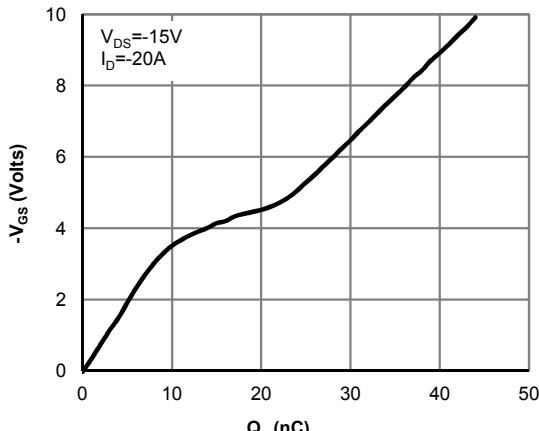
G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$.

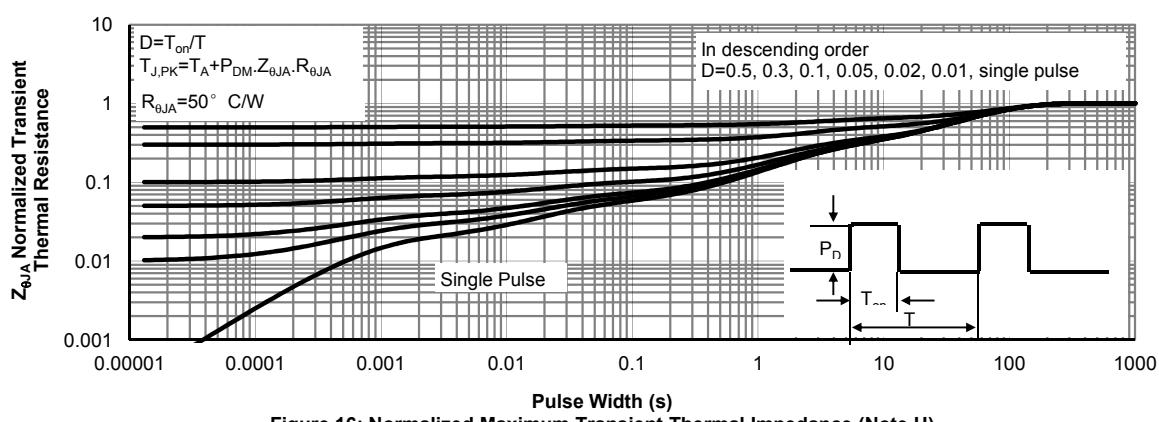
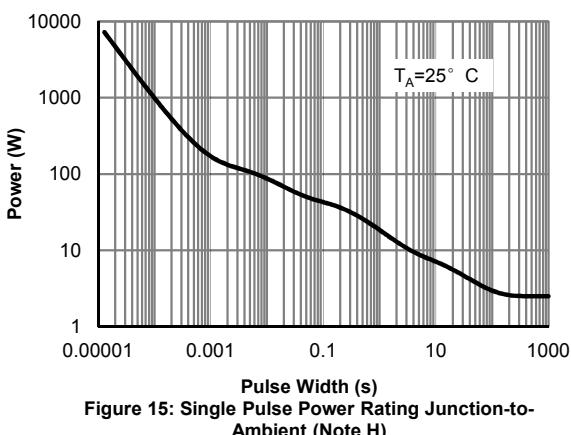
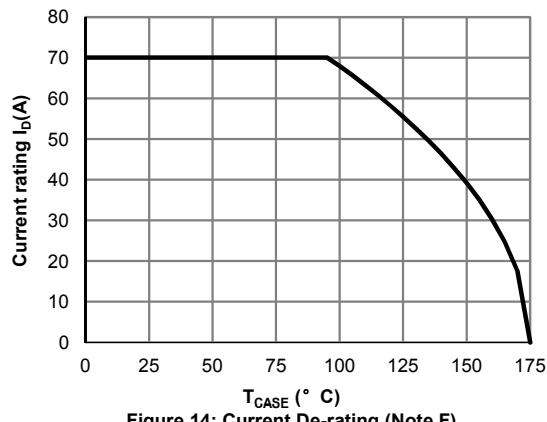
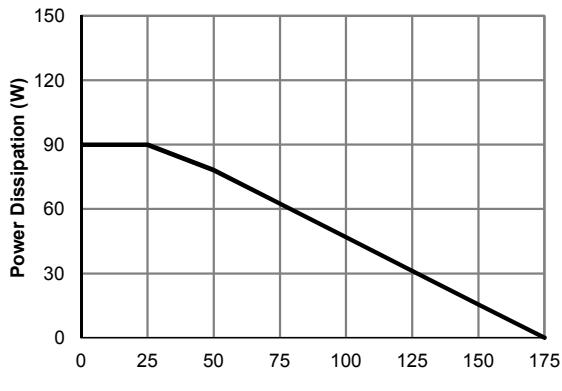
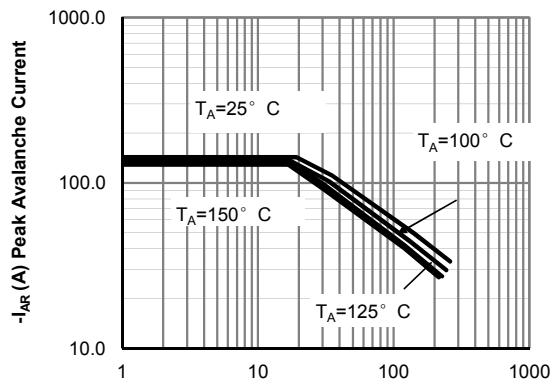
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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

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)

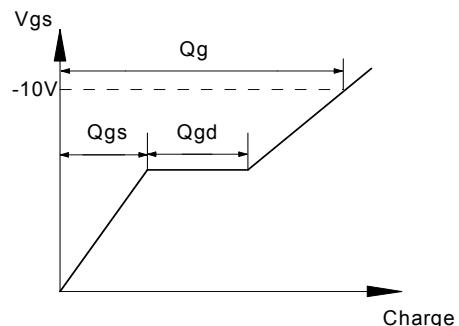
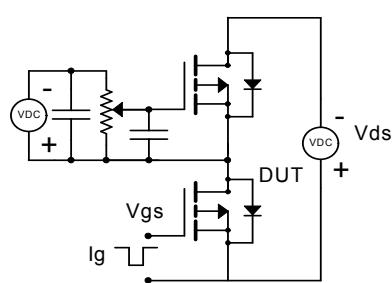
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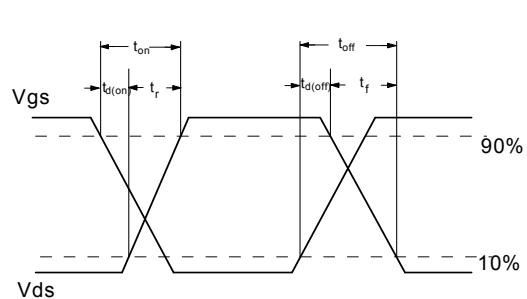
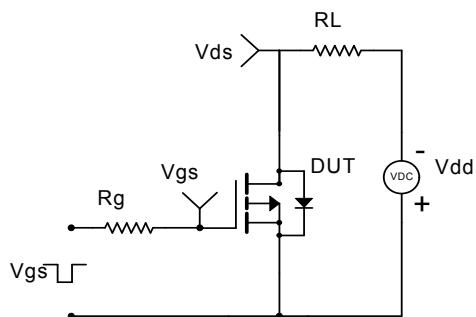
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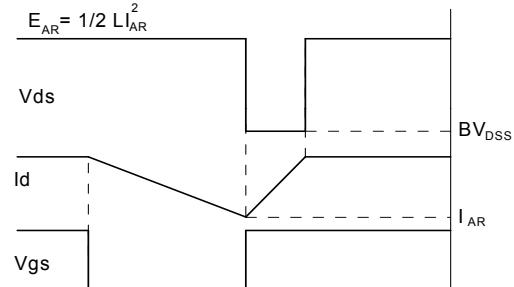
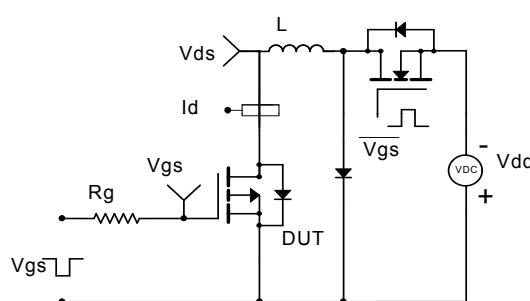
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

