




AOD403/AOI403

30V P-Channel MOSFET

<p>General Description</p> <p>The AOD403/AOI403 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.</p>	<p>Product Summary</p> <table border="0"> <tr> <td>V_{DS}</td> <td>-30V</td> </tr> <tr> <td>I_D (at $V_{GS} = -20V$)</td> <td>-70A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS} = -20V$)</td> <td>< 6.2mΩ (< 6.7mΩ^*)</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS} = -10V$)</td> <td>< 8mΩ (< 8.5mΩ^*)</td> </tr> </table> <p>100% UIS Tested 100% R_g Tested</p> 	V_{DS}	-30V	I_D (at $V_{GS} = -20V$)	-70A	$R_{DS(ON)}$ (at $V_{GS} = -20V$)	< 6.2m Ω (< 6.7m Ω^*)	$R_{DS(ON)}$ (at $V_{GS} = -10V$)	< 8m Ω (< 8.5m Ω^*)
V_{DS}	-30V								
I_D (at $V_{GS} = -20V$)	-70A								
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$R_{DS(ON)}$ (at $V_{GS} = -10V$)	< 8m Ω (< 8.5m Ω^*)								



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	$T_C=25^\circ C$	-70
		$T_C=100^\circ C$	-55
Pulsed Drain Current ^C	I_{DM}	-200	A
Continuous Drain Current	I_{DSM}	$T_A=25^\circ C$	-15
		$T_A=70^\circ C$	-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	$T_C=25^\circ C$	90
		$T_C=100^\circ C$	45
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ C$	2.5
		$T_A=70^\circ C$	1.6
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ C$

Thermal Characteristics

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

* package TO251A

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =-250μA, V _{GS} =0V	-30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-30V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±25V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =-250μA	-1.5	-2.5	-3.5	V
I _{D(ON)}	On state drain current	V _{GS} =-10V, V _{DS} =-5V	-200			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-20V, I _D =-20A TO252 T _J =125°C		5.1 7.6	6.2 9.2	mΩ
		V _{GS} =-10V, I _D =-20A TO252		6.2	8	mΩ
		V _{GS} =-20V, I _D =-20A TO251A		5.6	6.7	mΩ
		V _{GS} =-10V, I _D =-20A TO251A		6.7	8.5	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-20A		42		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.7	-1	V
I _S	Maximum Body-Diode Continuous Current ^G				-70	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz	2310	2890	3500	pF
C _{oss}	Output Capacitance		410	585	760	pF
C _{rss}	Reverse Transfer Capacitance		280	470	660	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.9	3.8	5.7	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-10V, V _{DS} =-15V, I _D =-20A	40	51	61	nC
Q _{gs}	Gate Source Charge		10	12	14	nC
Q _{gd}	Gate Drain Charge		10	16	22	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =0.75Ω, R _{GEN} =3Ω		16		ns
t _r	Turn-On Rise Time			12		ns
t _{D(off)}	Turn-Off DelayTime			45		ns
t _f	Turn-Off Fall Time			22		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-20A, di/dt=100A/μs	14	18	22	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-20A, di/dt=100A/μs	9	11	13	nC

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The Power dissipation P_{DSM} is based on R_{θJA} 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(MAX)}=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_{J(MAX)}=175° C. Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} 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(MAX)}=175° 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° C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

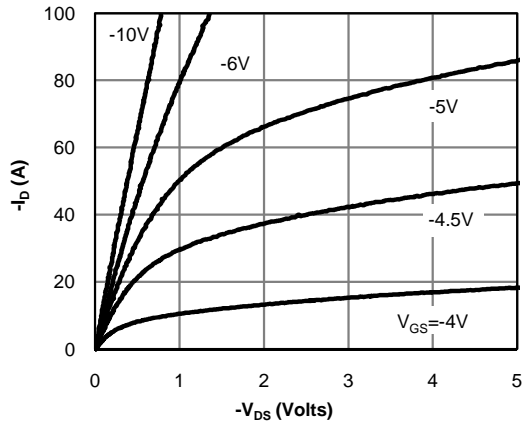


Figure 1: On-Region Characteristics (Note E)

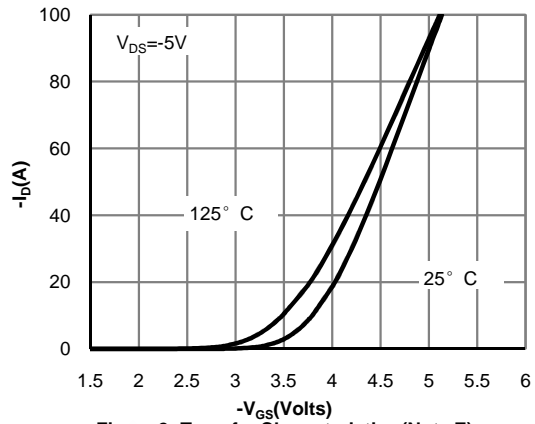


Figure 2: Transfer Characteristics (Note E)

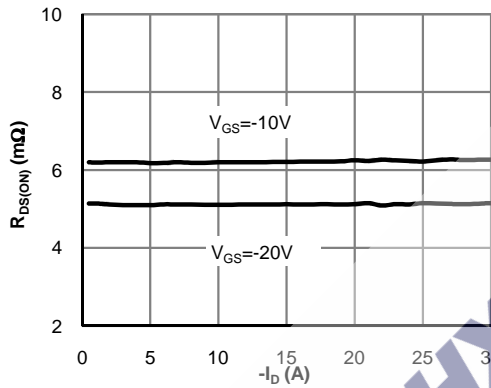


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

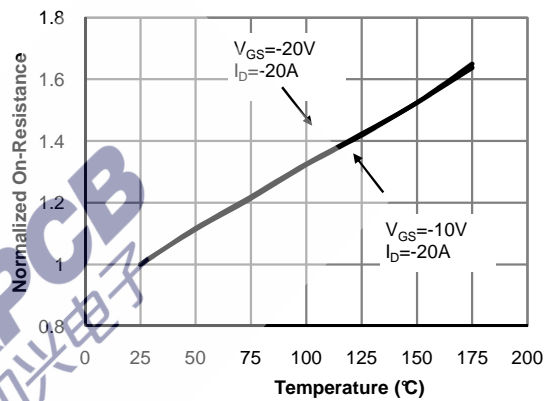


Figure 4: On-Resistance vs. Junction Temperature (Note E)

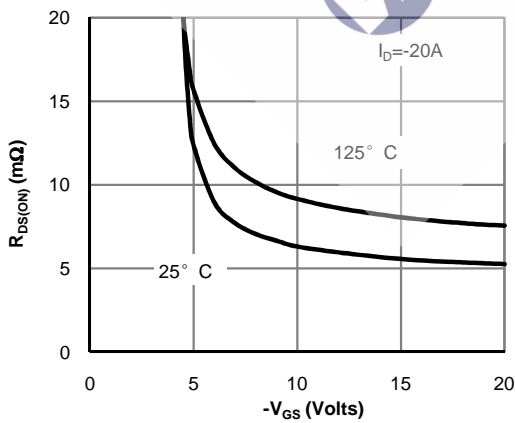


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

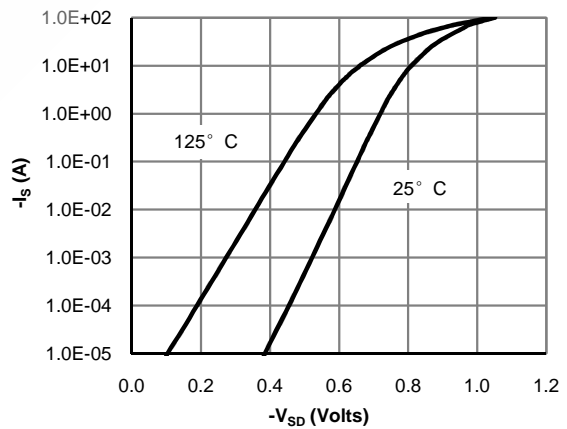


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

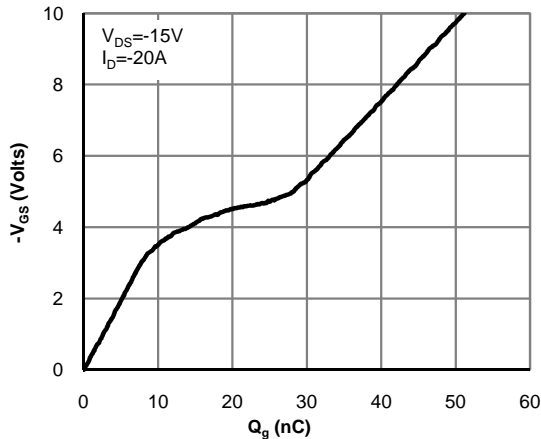


Figure 7: Gate-Charge Characteristics

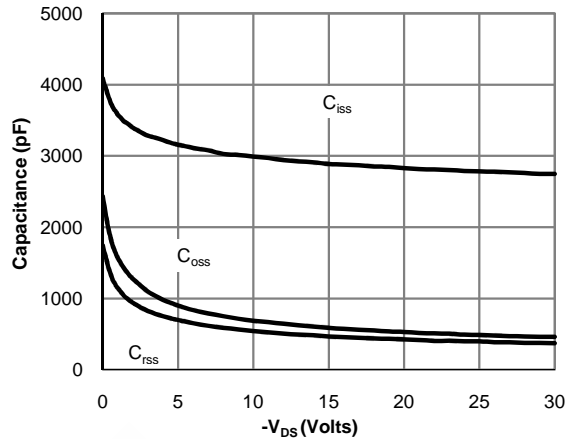


Figure 8: Capacitance Characteristics

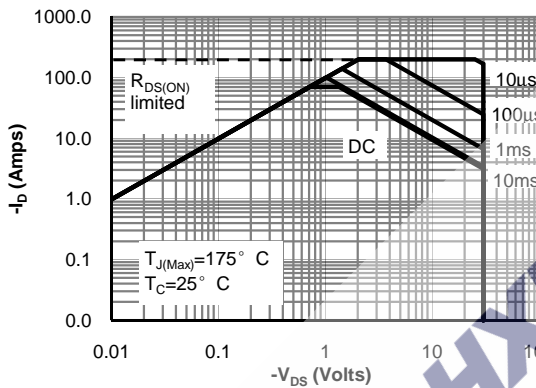


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

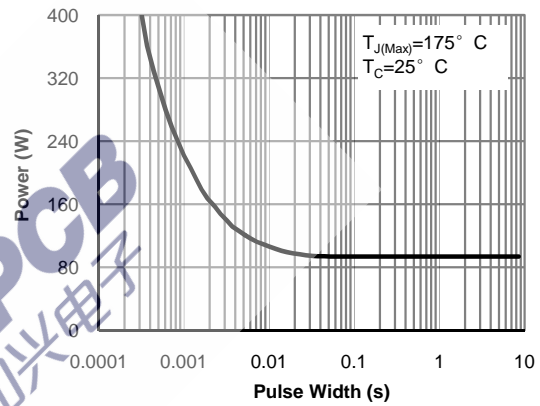


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

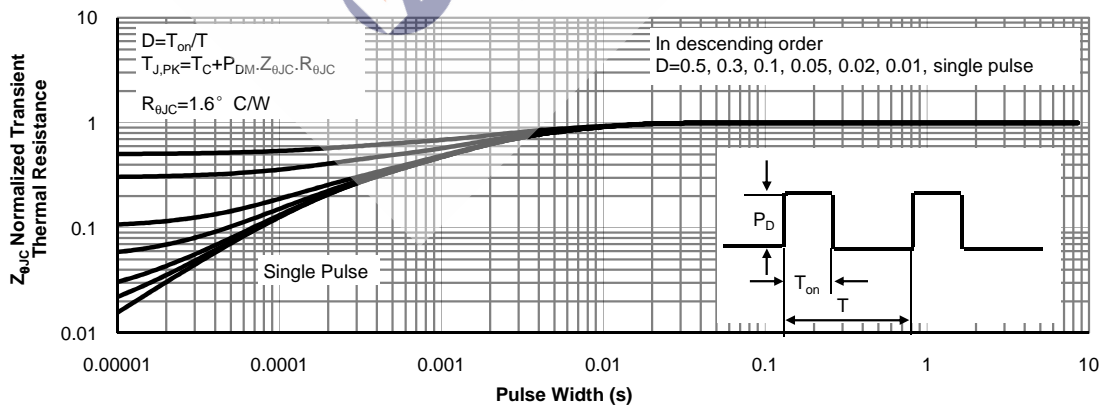


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

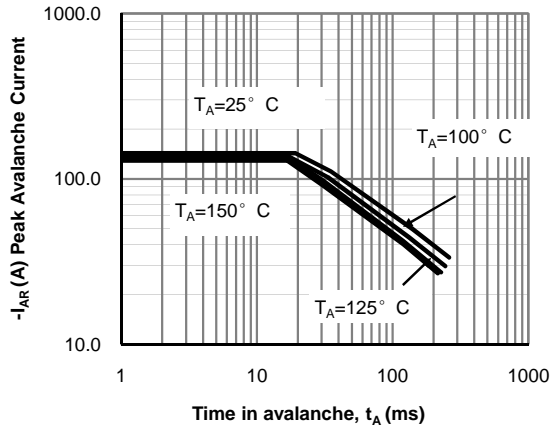


Figure 12: Single Pulse Avalanche capability (Note C)

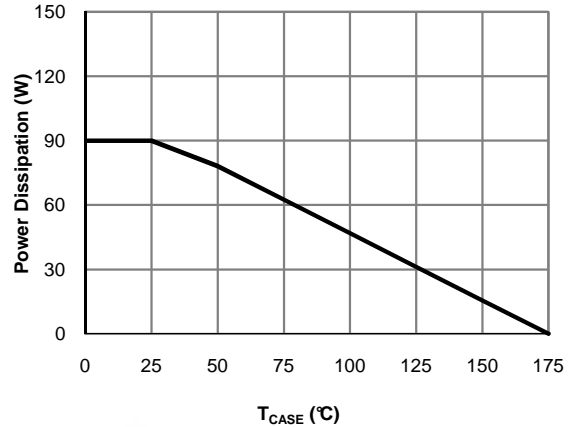


Figure 13: Power De-rating (Note F)

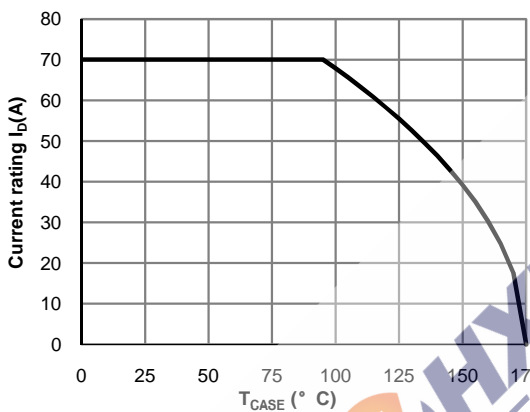


Figure 14: Current De-rating (Note F)

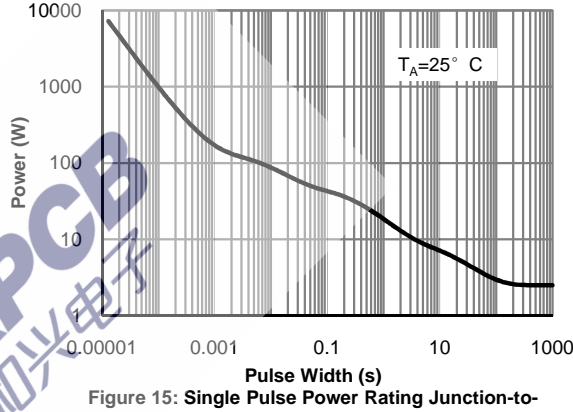


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

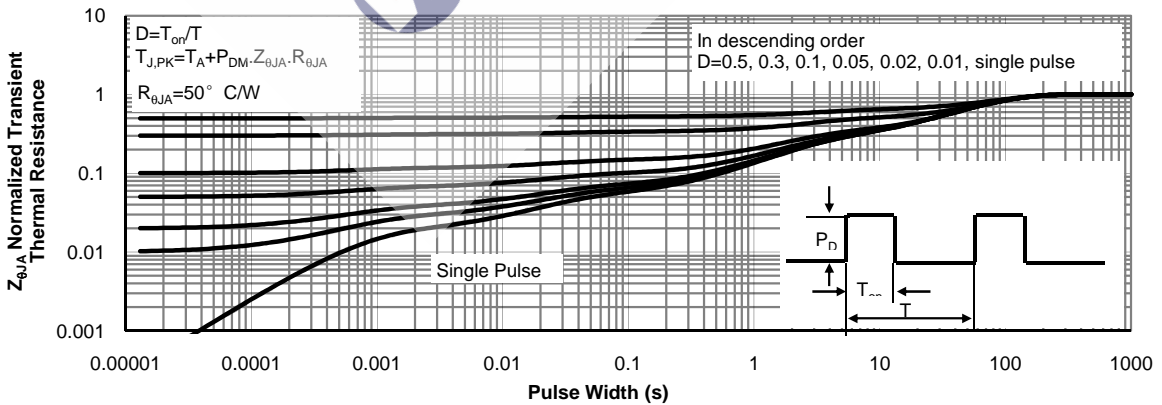
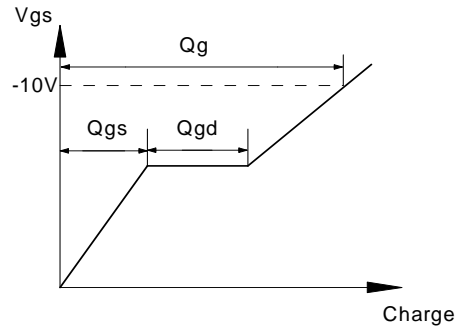
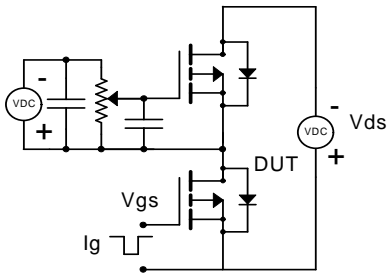
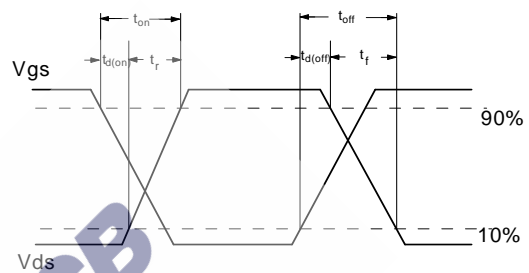
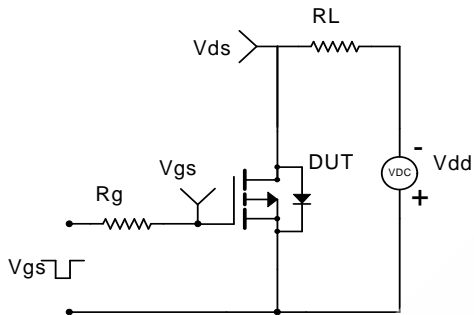


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

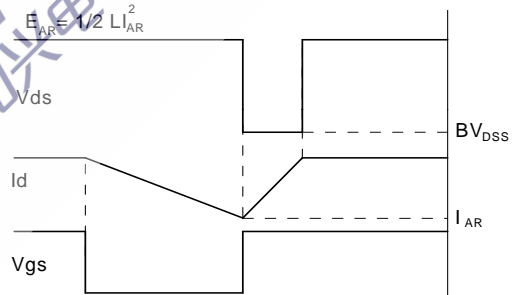
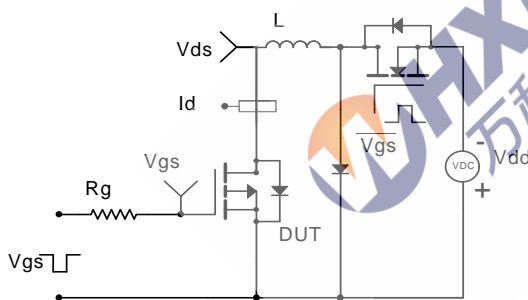
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

