

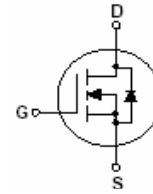
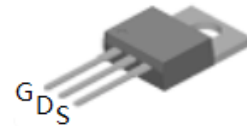


WGP11N40

400V N-Channel MOSFET

Features

- Low Intrinsic Capacitances
- Excellent Switching Characteristics
- Extended Safe Operating Area
- Unrivalled Gate Charge : 35 nC (Typ.)
- BVDSS=400V, ID=11.4 A
- Lower $R_{DS(on)}$: 0.55 Ω (Max) @VG=10V
- 100% Avalanche Tested



TO-220

G-Gate, D-Drain, S-Source

Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless other wise noted

Symbol	Parameter	WG11N40	Units
V_{DSS}	Drain-Source Voltage	400	V
I_D	Drain Current -continuous ($T_c=25^\circ\text{C}$)	11.4	A
	-continuous ($T_c=100^\circ\text{C}$)	7.2	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Plused Avanche Energy (Note1)	520	mJ
I_{AR}	Avalanche Current (Note2)	11.4	A
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	147	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 ~ +150	$^\circ\text{C}$
TL	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ.	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	--	0.85	$^\circ\text{C/W}$
$R_{\theta CS}$	Thermal Resistance, Case to Sink	0.5	--	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	62.5	$^\circ\text{C/W}$

Electrical Characteristics $T_c=25^{\circ}\text{C}$ unless other wise noted

Symbol	Parameter	Test Condition	Min.	Typ.	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\ \mu\text{A}$, $V_{GS}=0$	400	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D=250\ \mu\text{A}$, Reference to 25°C	--	0.42	--	$\text{V}/^{\circ}\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{ds}=400\text{V}$, $V_{gs}=0\text{V}$	--	--	1	μA
		$V_{ds}=320\text{V}$, $T_c=125^{\circ}\text{C}$			10	μA
I_{GSSF}	Gate-body leakage Current, Forward	$V_{gs}=+30\text{V}$, $V_{ds}=0\text{V}$	--	--	100	nA
I_{GSSR}	Gate-body leakage Current, Reverse	$V_{gs}=-30\text{V}$, $V_{ds}=0\text{V}$	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$I_D=250\ \mu\text{A}$, $V_{ds}=V_{gs}$	2	--	4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$I_D=5.5\text{A}$, $V_{gs}=10\text{V}$	--	--	0.55	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=25\text{V}$, $V_{GS}=0$, $f=1.0\text{MHz}$	--	1100	1400	pF
C_{oss}	Output Capacitance		--	180	240	pF
C_{rss}	Reverse Transfer Capacitance		--	20	30	pF
Switching Characteristics						
$T_d(on)$	Turn-On Delay Time	$V_{DD}=200\text{V}$, $I_D=11.4\text{A}$, $R_G=25\ \Omega$ (Note 3,4)	--	30	70	nS
T_r	Turn-On Rise Time		--	100	210	nS
$T_d(off)$	Turn-Off Delay Time		--	60	130	nS
T_f	Turn-Off Fall Time		--	60	130	nS
Q_g	Total Gate Charge	$V_{DS}=320\text{V}$, $V_{GS}=10\text{V}$, $I_D=11.4\text{A}$ (Note 3,4)	--	27	35	nC
Q_{gs}	Gate-Source Charge		--	7.3	--	nC
Q_{gd}	Gate-Drain Charge		--	12.3	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	11.4	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	45.6	A
V_{SD}	Drain-Source Diode Forward Voltage	$I_D=11.4\text{A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$I_S=11.4\text{A}$, $V_{GS}=0\text{V}$	--	240	--	nS
Q_{rr}	Reverse Recovery Charge	$di_F/dt=100\text{A}/\mu\text{s}$ (Note3)	--	1.8	--	μC
*Notes	1, $L=7.0\text{mH}$, $I_{AS}=11.4\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J=25^{\circ}\text{C}$ 2, Repetitive Rating : Pulse width limited by maximum junction temperature 3, Pulse Test : Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$ 4, Essentially Independent of Operating Temperature					

Typical Characteristics

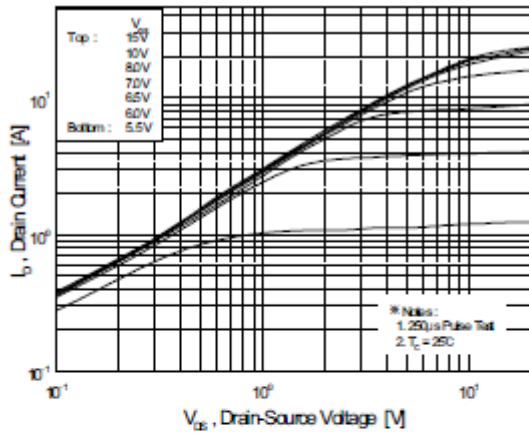


Figure 1. On-Region Characteristics

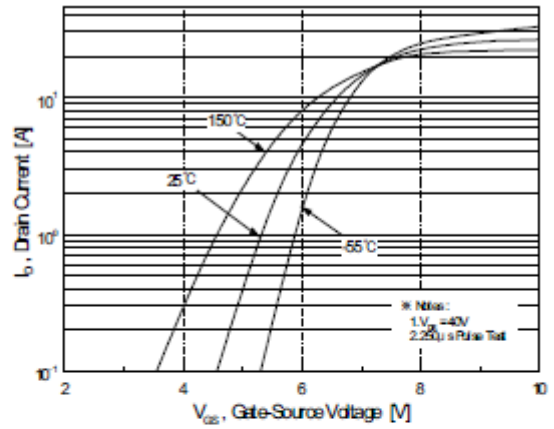


Figure 2. Transfer Characteristics

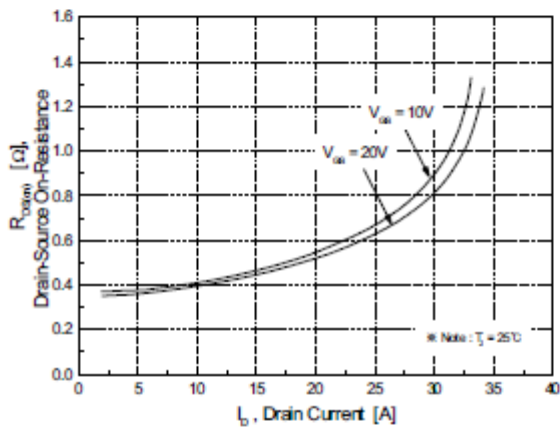


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

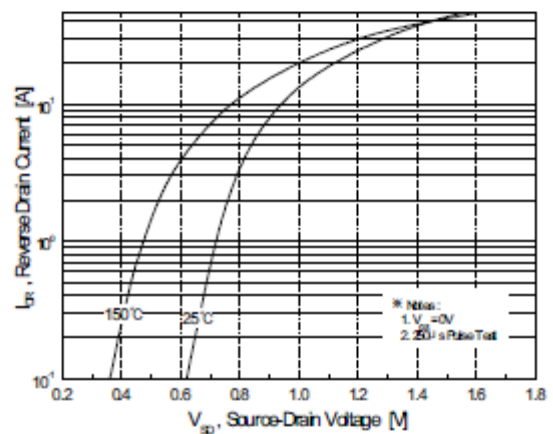


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

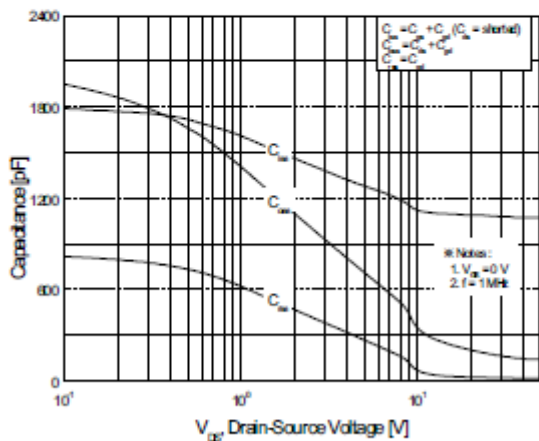


Figure 5. Capacitance Characteristics

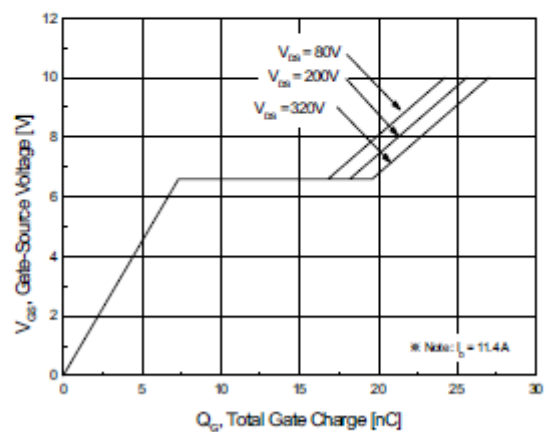


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

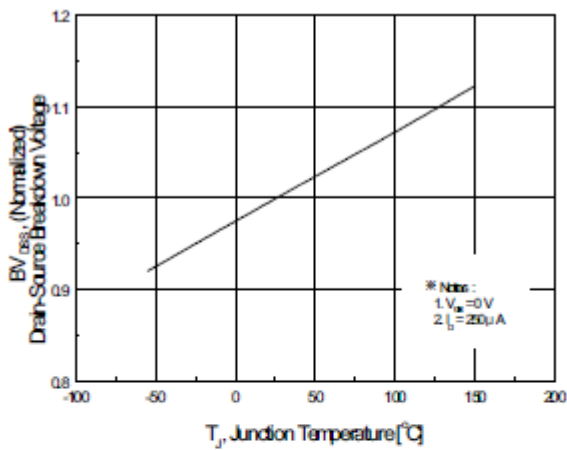


Figure 7. Breakdown Voltage Variation vs. Temperature

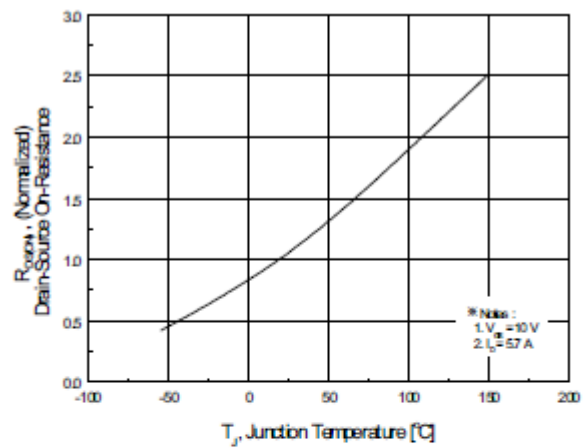


Figure 8. On-Resistance Variation vs. Temperature

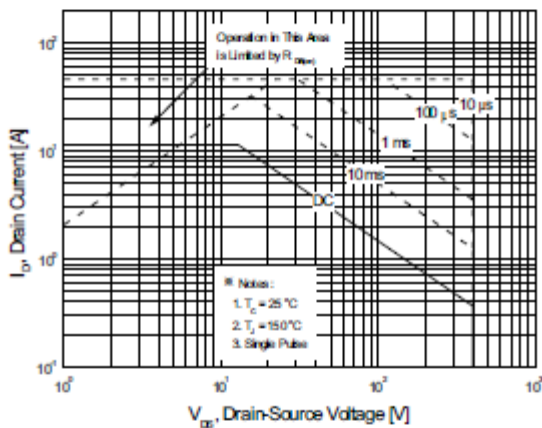


Figure 9. Maximum Safe Operating Area

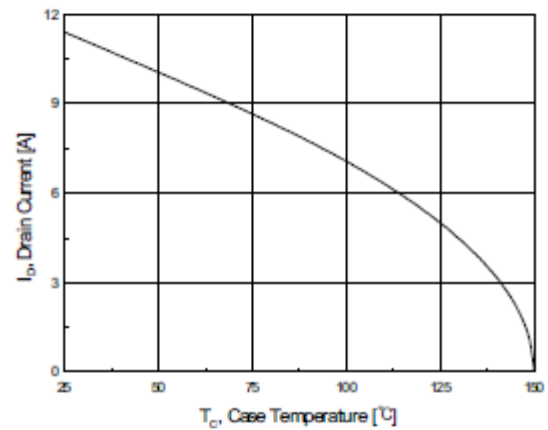


Figure 10. Maximum Drain Current vs. Case Temperature

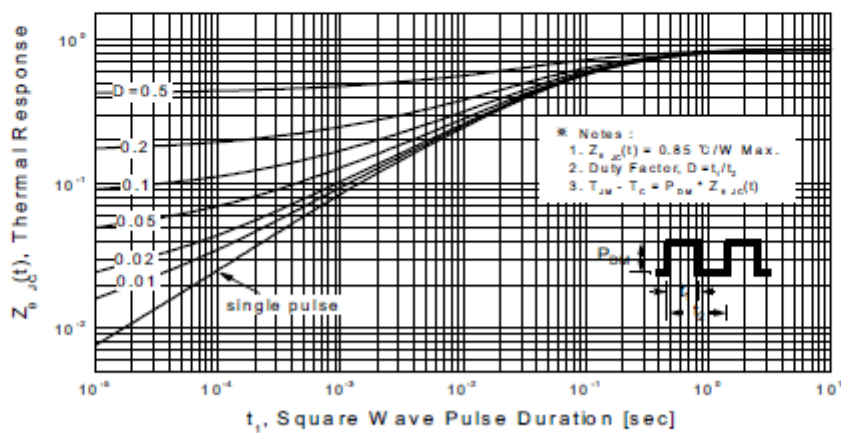
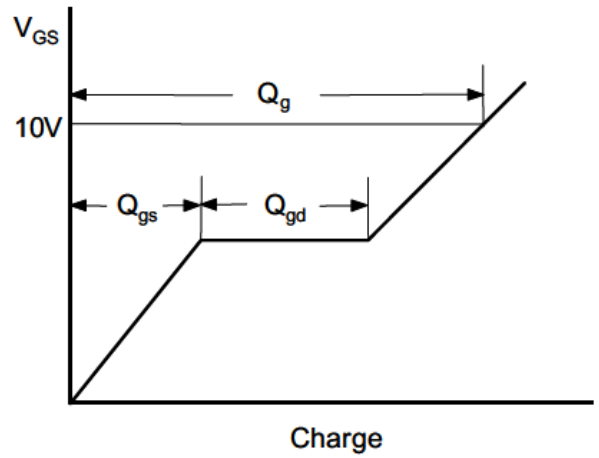
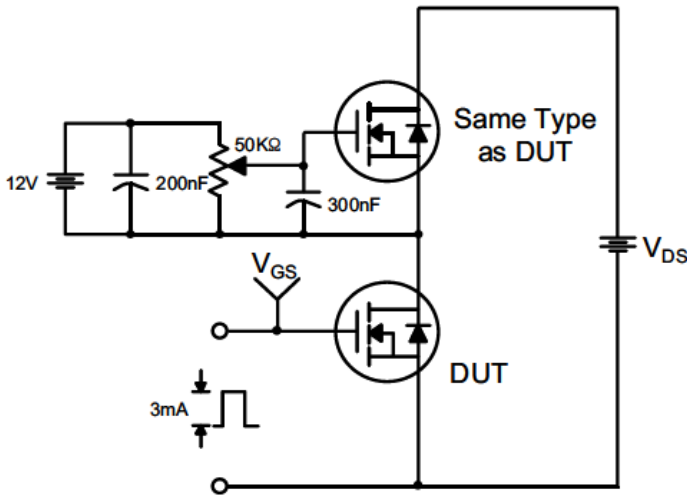
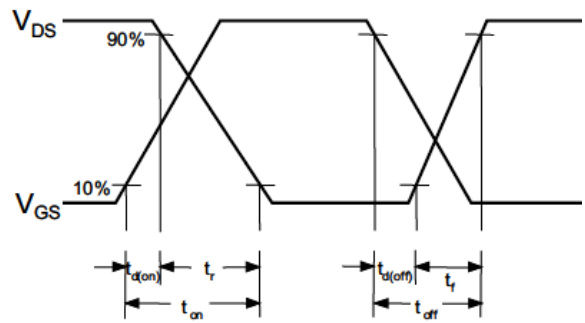
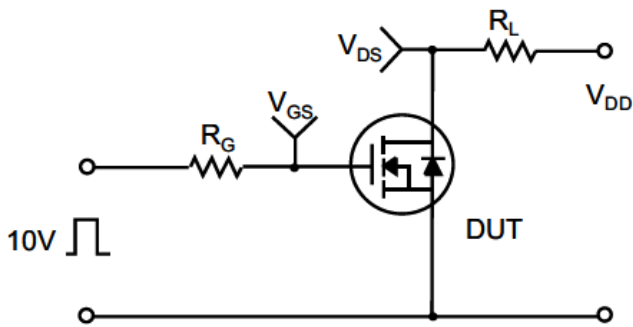


Figure 11. Transient Thermal Response Curve

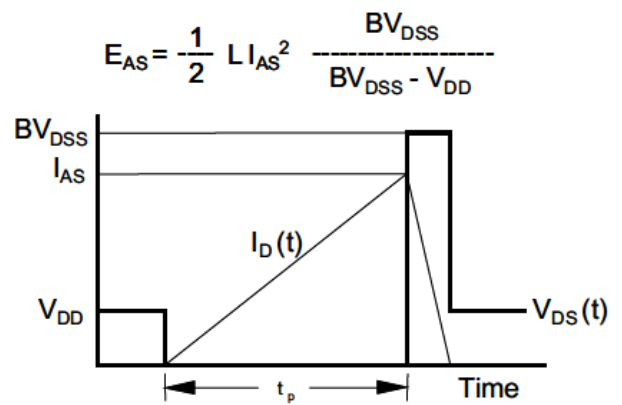
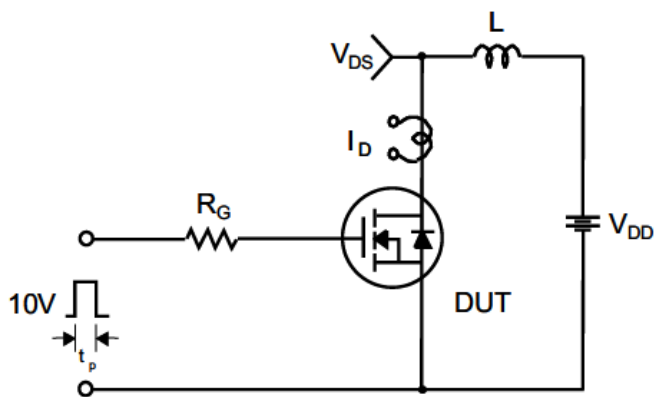
Gate Charge Test Circuit & Waveform



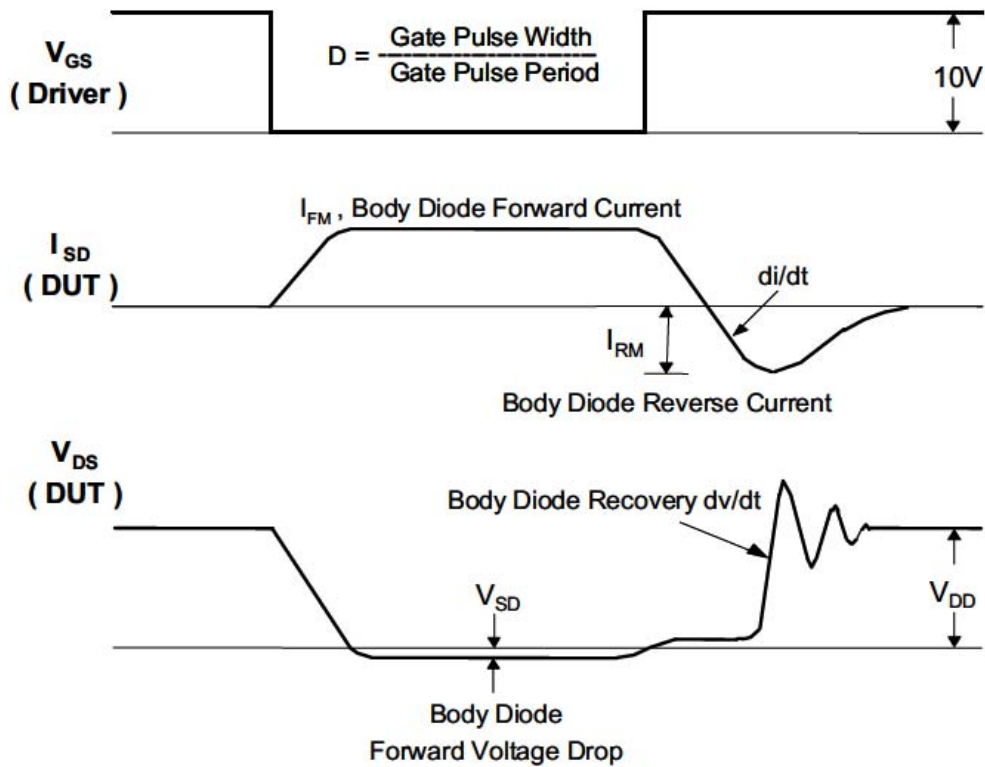
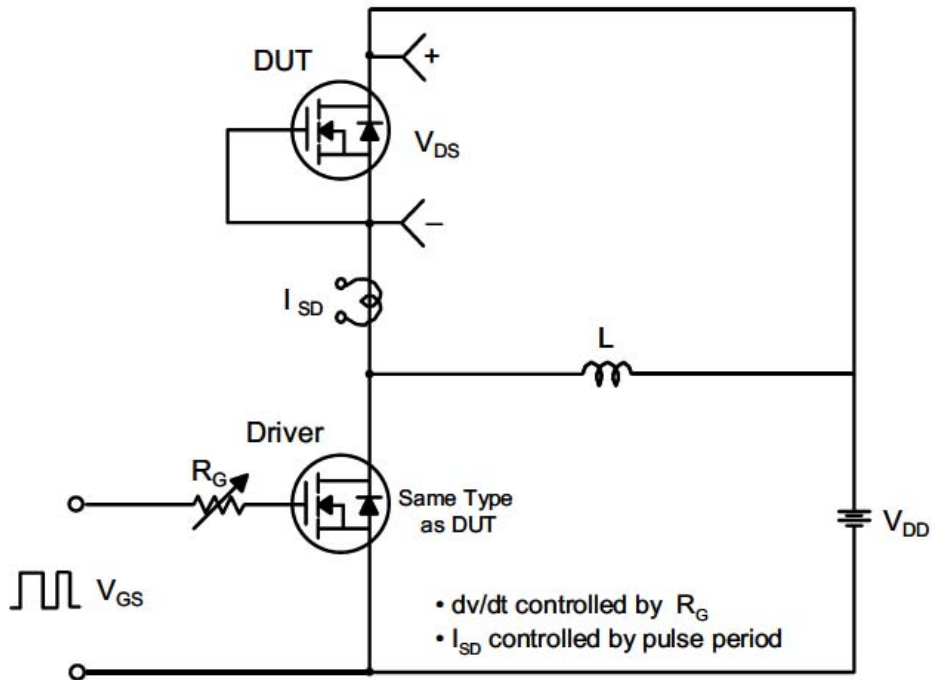
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

TO-220

