

P/N: YZPST-SP13N50KF

500V N-Channel Power MOSFET

FEATURES

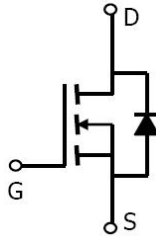
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

APPLICATIONS

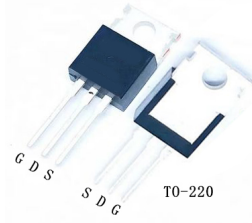
- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

Parameters Summary

VDS:500V **ID** (at VGS=10V) :**13A** **Rds(on)** (at VGS=10V):**0.40Ω(Typ.)**



Symbol



SP13N50KF

Device Ordering Marking Packing Information

Ordering Number	Package	Marking	Packing
SP13N50KF	TO-220	SP13N50KF	Tube

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

Parameter	Symbol	Value	Unit
		TO-220	
Drain-Source Voltage ($V_{GS} = 0V$)	V_{DSS}	500	V
Continuous Drain Current	I_D	13	A
Pulsed Drain Current (note1)	I_{DM}	52	A
Gate-Source Voltage	V_{GSS}	± 30	V
Single Pulse Avalanche Energy (note2)	E_{AS}	550	mJ
Repetitive Avalanche Energy (note1)	E_{AR}	65	mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	60	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ\text{C}$

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Resistance

Parameter	Symbol	Value	Unit
		TO-220	
Thermal Resistance, Junction-to-Case	R_{thJC}	2.1	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	100	

Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	500	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1.0	μA
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$I_{DS} = 250\mu A$	2.0	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 6.5A$	--	0.40	0.50	Ω
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 25V,$ $f = 1.0\text{MHz}$	--	2100	--	pF
Output Capacitance	C_{oss}		--	23	--	
Reverse Transfer Capacitance	C_{rss}		--	210	--	
Total Gate Charge	Q_g	$V_{DD} = 250V, I_D = 13A,$ $V_{GS} = 10V$	--	45	--	nC
Gate-Source Charge	Q_{gs}		--	11	--	
Gate-Drain Charge	Q_{gd}		--	18	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 250V, I_D = 13A,$ $R_G = 6.1 \Omega$	--	14	--	ns
Turn-on Rise Time	t_r		--	27	--	
Turn-off Delay Time	$t_{d(off)}$		--	45	--	
Turn-off Fall Time	t_f		--	36	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^\circ\text{C}$	--	--	13	A
Pulsed Diode Forward Current	I_{SM}		--	--	52	
Body Diode Voltage	V_{SD}	$T_J = 25^\circ\text{C}, I_{SD} = 13A, V_{GS} = 0V$	--	--	1.4	V
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V, I_S = 13A,$ $di_F/dt = 100A/\mu s$	--	300	--	ns
Reverse Recovery Charge	Q_{rr}		--	2.0	--	μC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $V_{DD} = 50V, R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 1\%$

Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

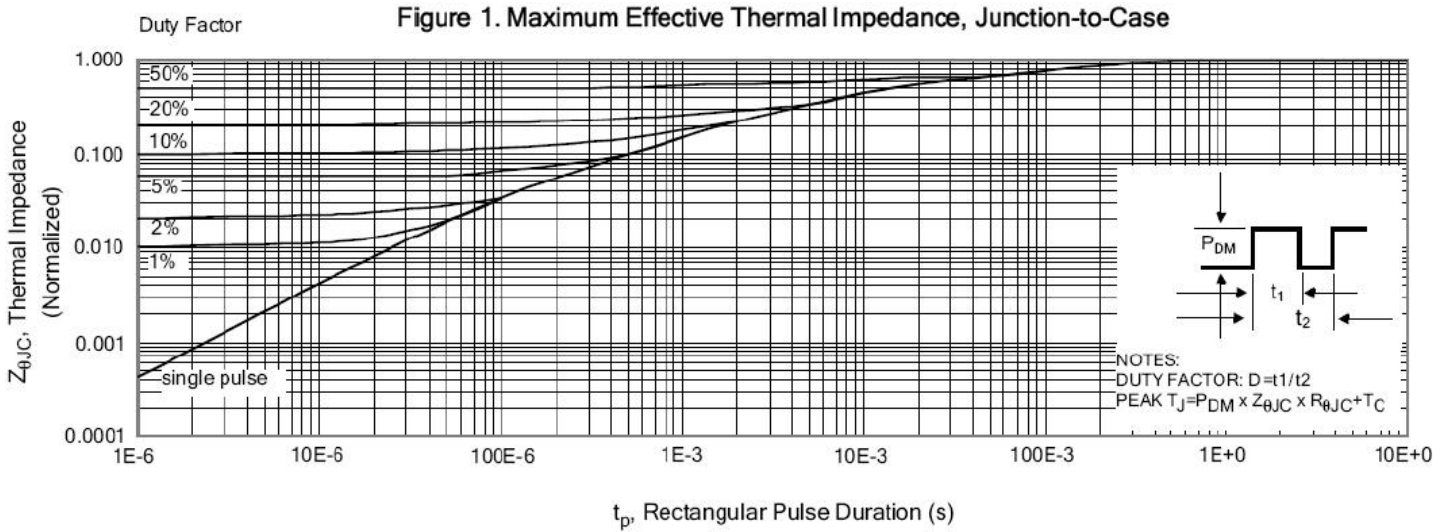


Figure 2. Maximum Power Dissipation vs Case Temperature

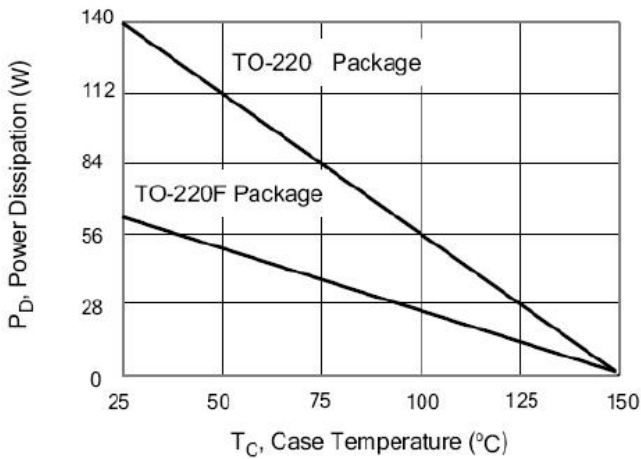


Figure 3. Maximum Continuous Drain Current vs Case Temperature

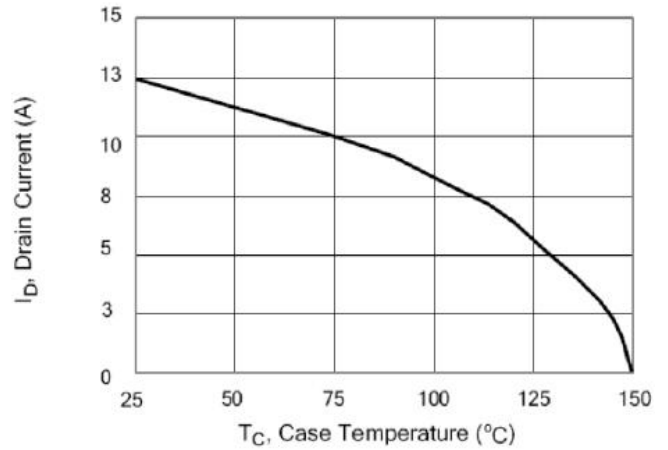


Figure 4. Typical Output Characteristics

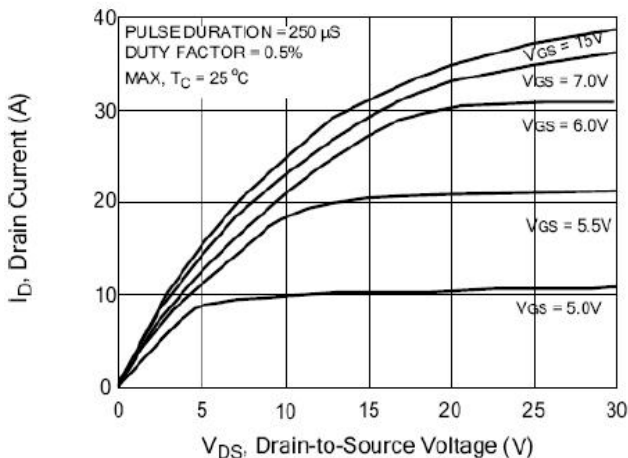
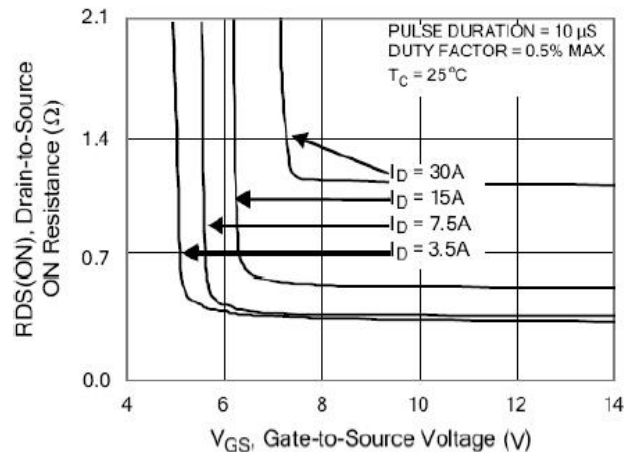


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 6. Maximum Peak Current Capability

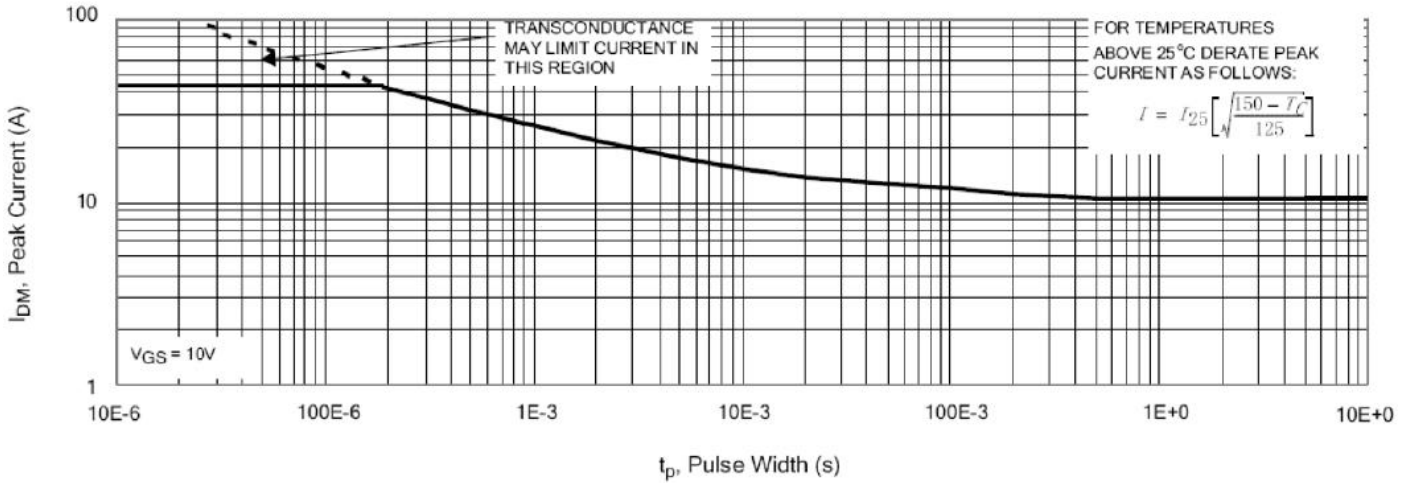


Figure 7. Typical Transfer Characteristics

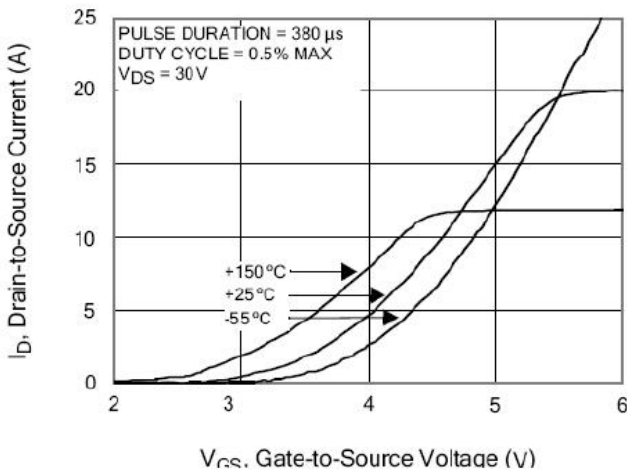


Figure 8. Unclamped Inductive Switching Capability

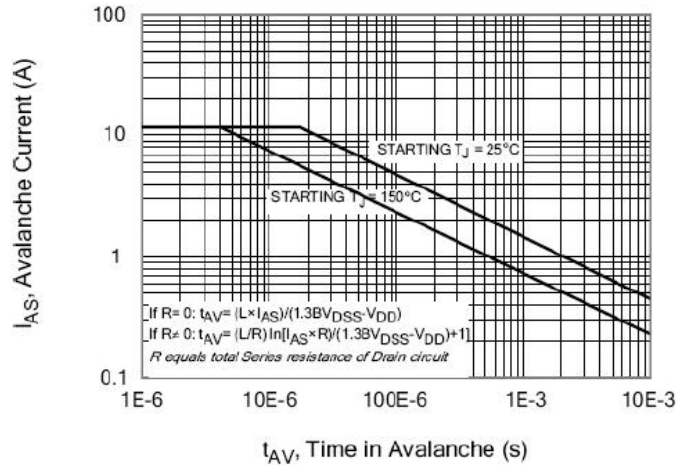


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

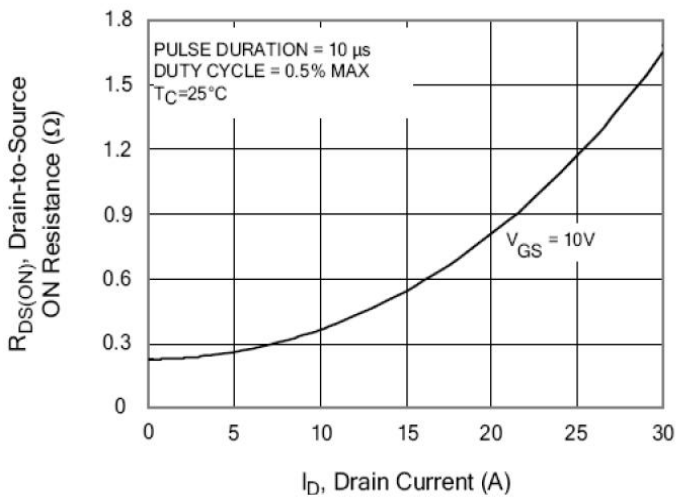
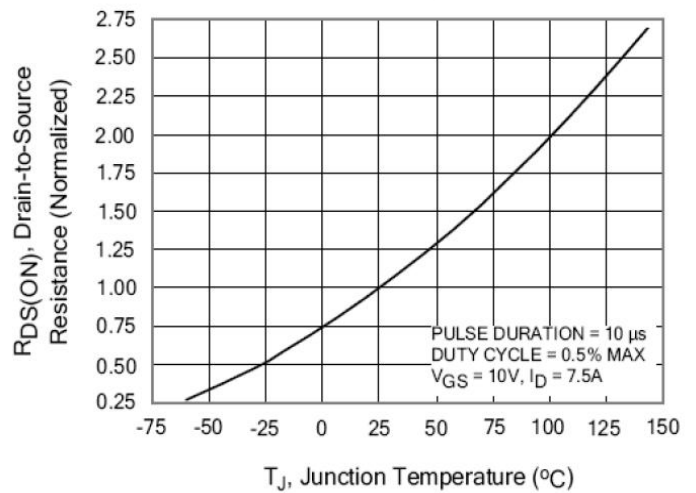


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 11. Typical Breakdown Voltage vs Junction Temperature

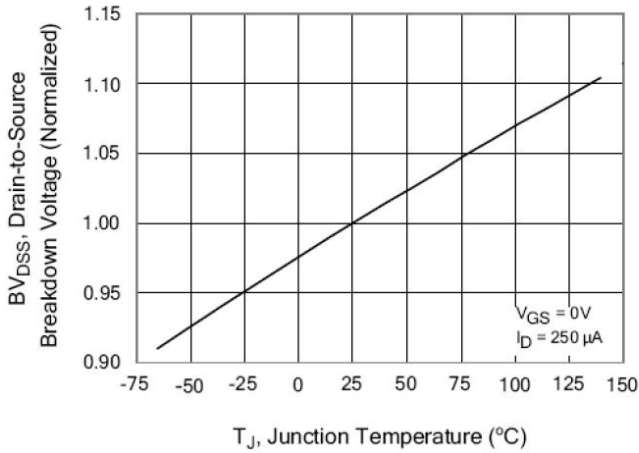


Figure 12. Typical Threshold Voltage vs Junction Temperature

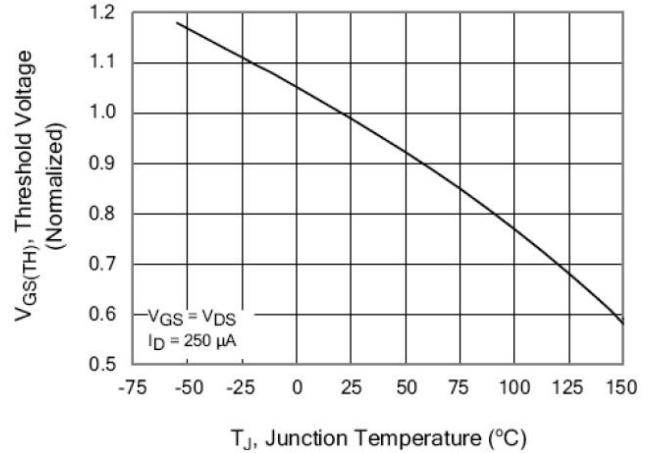


Figure 13. Maximum Forward Bias Safe Operating Area

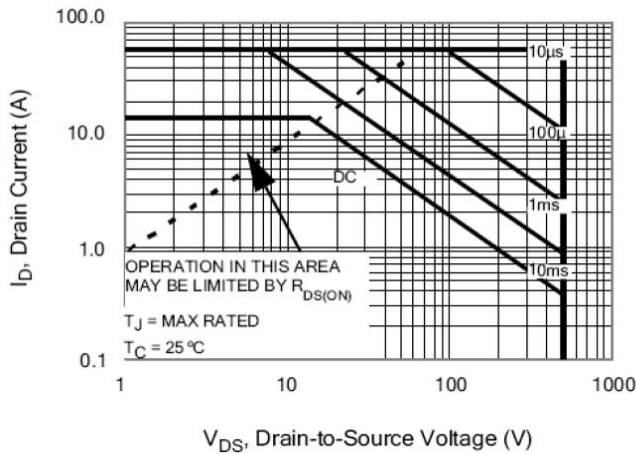


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

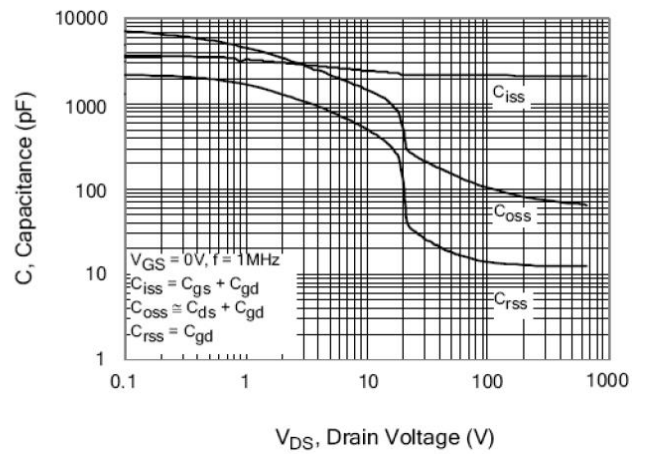


Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

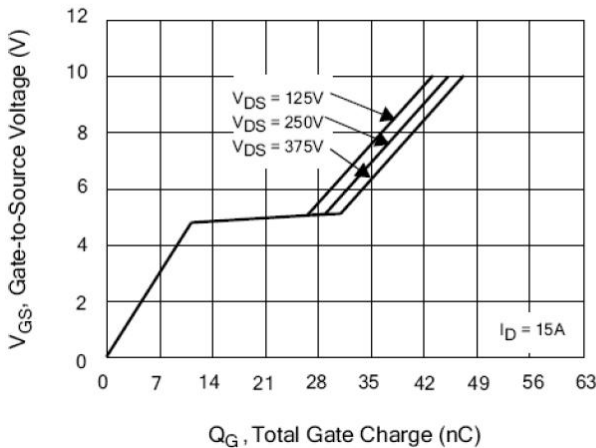
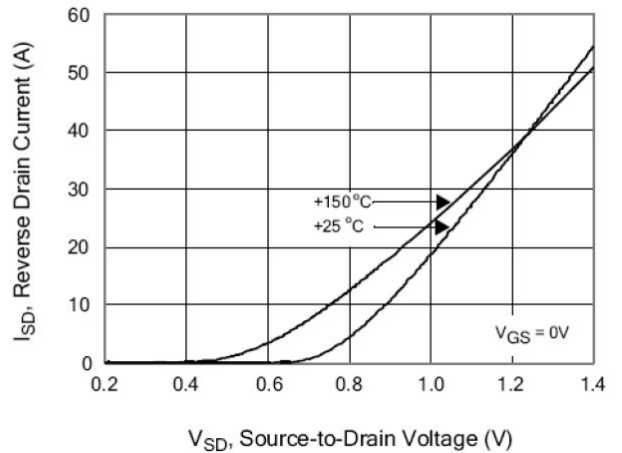


Figure 16. Typical Body Diode Transfer Characteristics



TEST CIRCUITS AND WAVEFORMS

Figure A: Gate Charge Test Circuit and Waveform

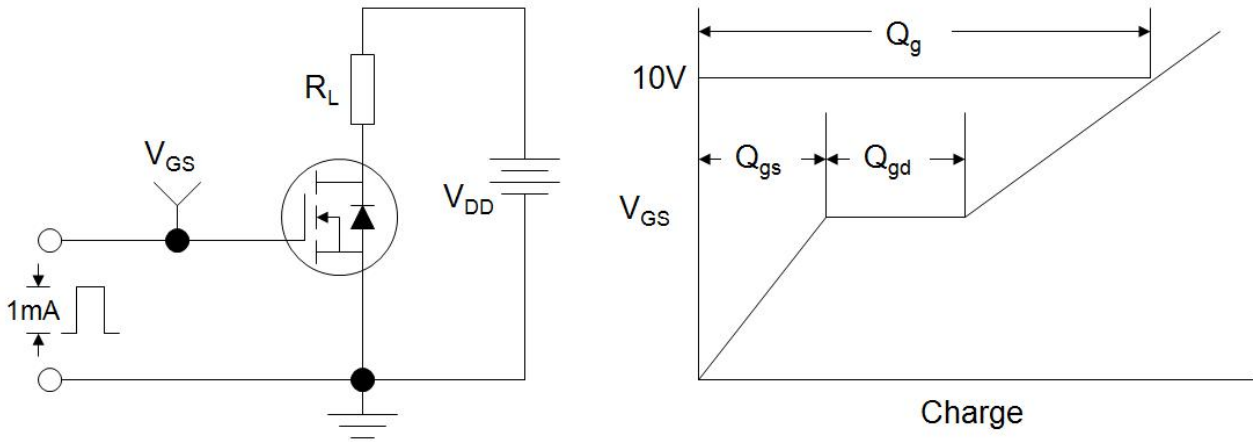


Figure B: Resistive Switching Test Circuit and Waveform

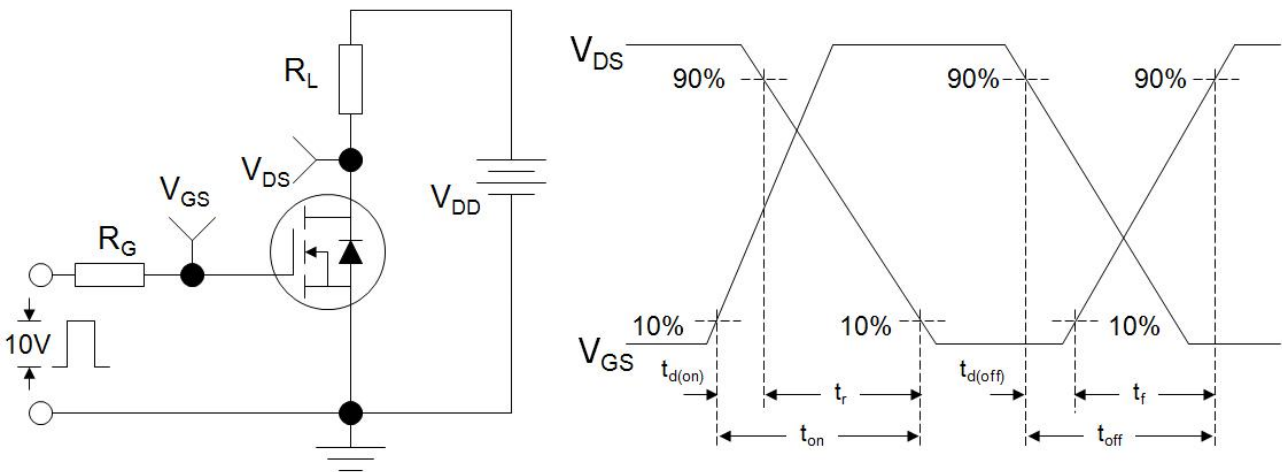


Figure C: Unclamped Inductive Switching Test Circuit and Waveform

