CS7N60FA9HDY

600V Silicon N-Channel Power MOSFET

■ Features

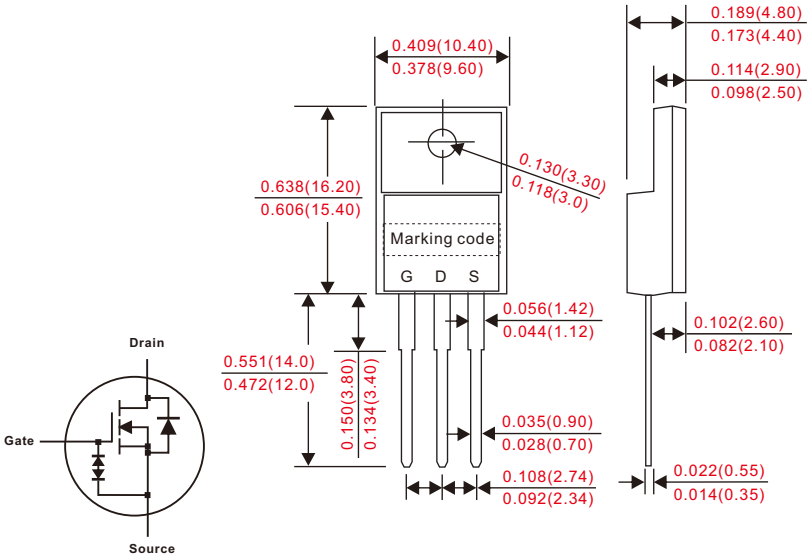
- Fast switching.
- ESD improved capability.
- Low gate charge.
- Low reverse transfer capacitances.
- 100% single pulse avalanche energy test.

■ Mechanical data

- Epoxy : UL94-V0 rated flame retardant.
- Case : JEDEC TO-220F molded plastic body.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Polarity: As marked.
- Mounting Position : Any.
- Weight : Approximated 2.25 gram.

■ Outline

TO-220F



Dimensions in inches and (millimeters)

■ Absolute(T_C = 25°C unless otherwise specified)

PARAMETER	CONDITIONS	Symbol	CS7N60FA9HDY	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Continuous Drain Current		I_D	7	A
Continuous Drain Current	T_C = 100°C		4.5	
Pulsed Drain Current(1)		I_{DM}	28	
Gate-Source Voltage		V_{GS}	±30	V
Single Pulse Avalanche Energy(2)		E_{AS}	450	mJ
Avalanche Current(1)		I_{AR}	3.3	A
Repetitive Avalanche Energy(1)		E_{AR}	54	mJ
Power Dissipation		P_D	40	W
	Derating factor above 25°C		0.32	W/°C
Peak Diode Recovery dv/dt(3)		dV/dt	5.0	V/ns
Gate source ESD	HBM-C = 100pf, R = 1.5kΩ	$V_{ESD(G-S)}$	3000	V
Operating and Storage Temperature Range		T_J, T_{STG}	-55 ~ +150	°C
Maximum temperature for soldering		T_L	300	°C

NOTE : 1.Repetitive rating; pulse width limited by maximum junction temperature.
2.L=10.0mH, I_D = 9.5A, Start T_J = 25°C.
3.I_{SD} =7A,di/dt ≤100A/us, V_{DD}≤BV_{DS}, Start T_J = 25°C.

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■ Electrical characteristics(T_C = 25°C unless otherwise specified)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	V_{DSS}	600			V
Bvdss Temperature Coefficient	I_D = 250uA, Reference 25°C	BV_{DSS} / T_J		0.61		V/°C
Drain-Source Leakage Current	V_{DS} = 600V, V_{GS} = 0V, T_a = 25°C	I_{DSS}			10	uA
	V_{DS} = 480V, V_{GS} = 0V, T_a = 125°C				100	
Gate-Source Leakage Current, Forward	V_{GS} = 20V	$I_{GSS(F)}$			10	uA
Gate-Source Leakage Current, Reverse	V_{GS} = -20V	$I_{GSS(R)}$			-10	

■ ON Characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	$V_{GS(th)}$	2.0		4.0	V
Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 3.5A	$R_{DS(on)}$		1.0	1.3	Ω

■ Dynamic Characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Forward Transconductance	V_{DS} = 15V, I_D = 3.5A	g_{fs}		5.0		S
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	C_{iss}		950		pF
Output Capacitance		C_{oss}		98		
Reverse Transfer Capacitance		C_{rss}		10		

■ Resistive Switching Characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Turn-on Delay Time	I_D = 7A, V_{DD} = 325V, V_{GS} = 10V, R_G = 9.1Ω	$td_{(ON)}$		11		ns
Rise Time		tr		10		
Turn-off Delay Time		$td_{(OFF)}$		36		
Fail Time		tf		18		
Total Gate Charge	I_D = 7A, V_{DD} = 325V, V_{GS} = 10V	Q_g		25		nC
Gate-Source Charge		Q_{gs}		4		
Gate-Drain Charge		Q_{gd}		10		

■ Source-Drain Diode Characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Continuous Source-Drain Diode Current	Boby Diode	I_S			7	A
Pulse Diode Forward Current	Boby Diode	I_{SM}			28	
Body Diode Voltage	I_S = 7.0A, V_{GS} = 0V	V_{SD}			1.5	V
Reverse recovery time	I_S = 7A, T_J = 25°C, dI_F/dt = 100A/μs, V_{GS} = 0V	t_{rr}		201		ns
Reverse recovery charge		Q_{rr}		989		uC

■ Thermal characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Thermal Resistance	Junction to Case	$R_{\theta JC}$		3.13		°C/W
	Junction to Ambient	$R_{\theta JA}$		100		

■ Thermal characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Gate-Source Breakdown Voltage	I_{GS} = ±1mA(open Drain)	V_{GSO}	30			V

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■ Rating and characteristic curves

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

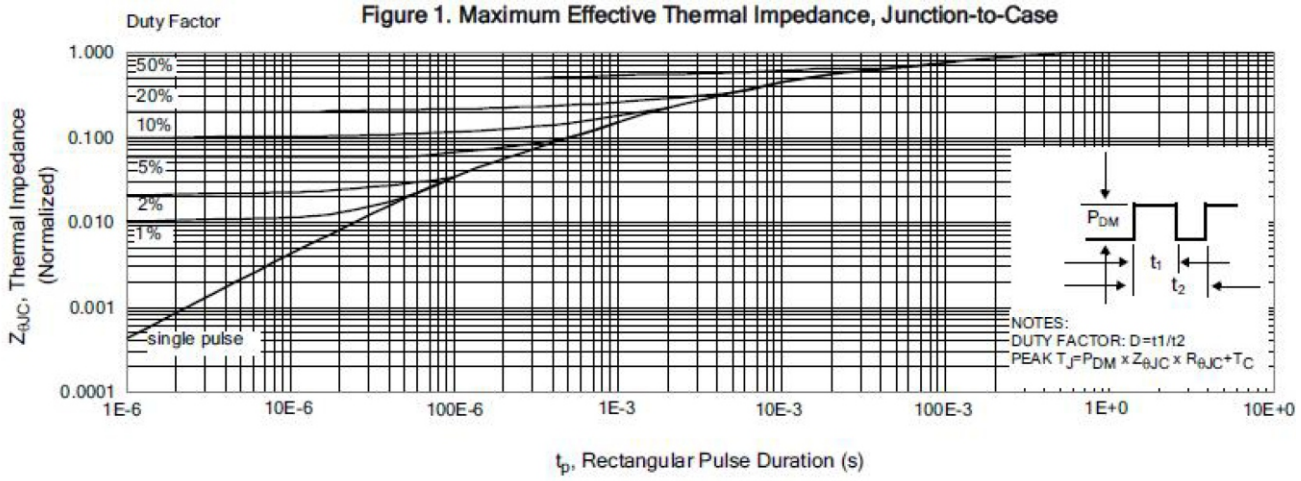


Figure 2. Maximum Power Dissipation vs Case Temperature

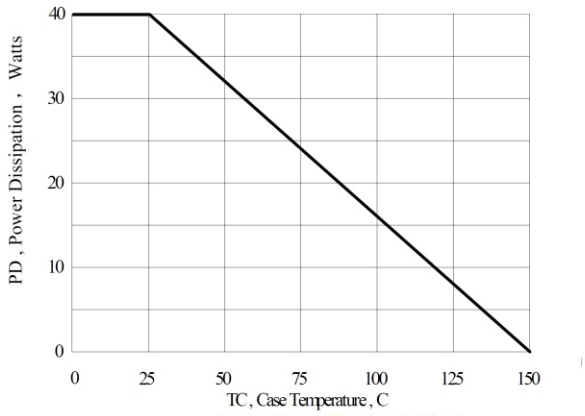


Figure 3. Maximum Continuous Drain Current vs Case Temperature

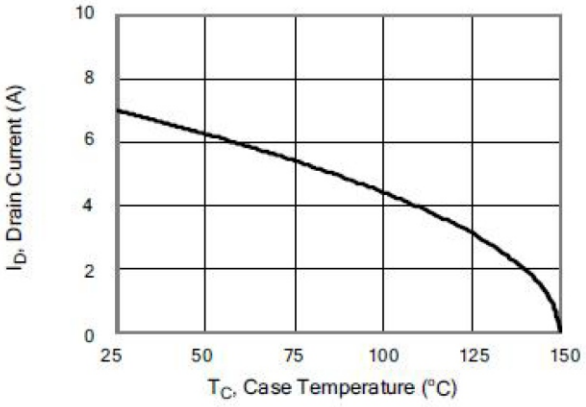


Figure 4. Typical Output Characteristics

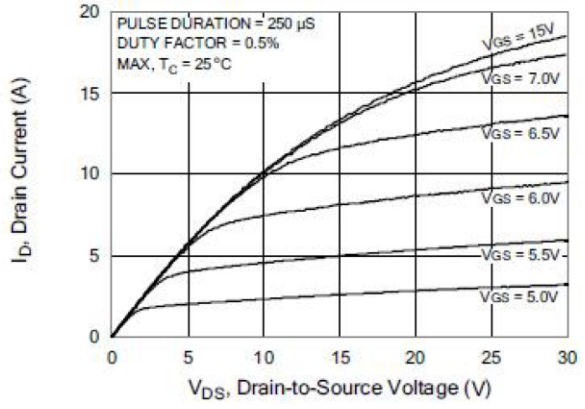
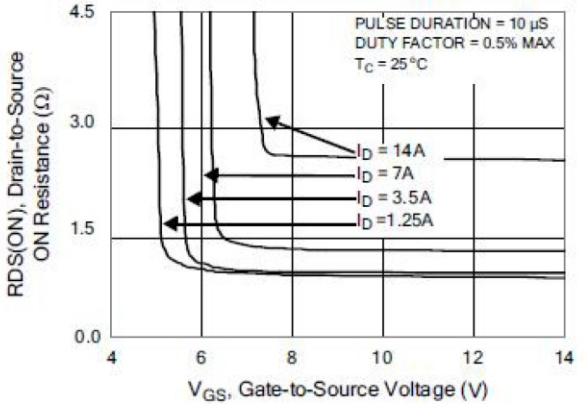


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current



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■ Rating and characteristic curves

Figure 6. Maximum Peak Current Capability

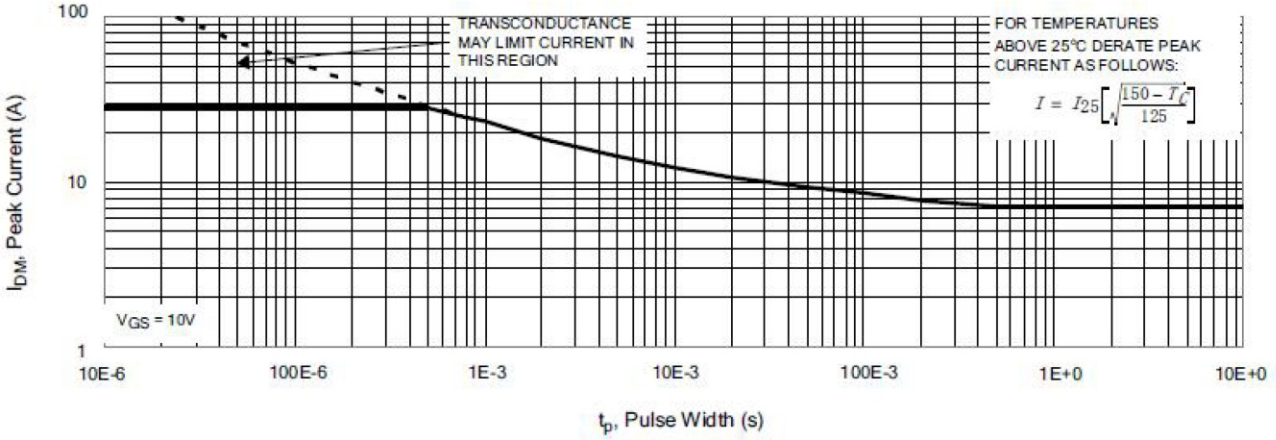


Figure 7. Typical Transfer Characteristics

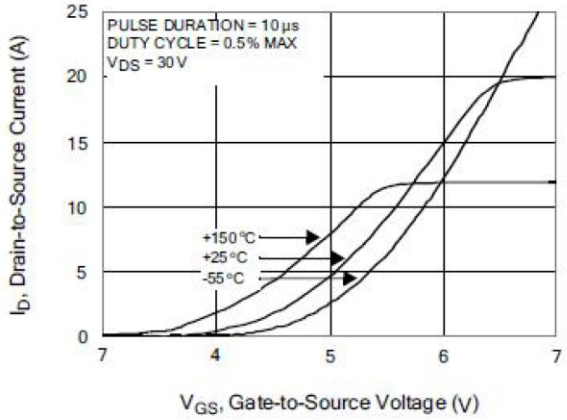


Figure 8. Unclamped Inductive Switching Capability

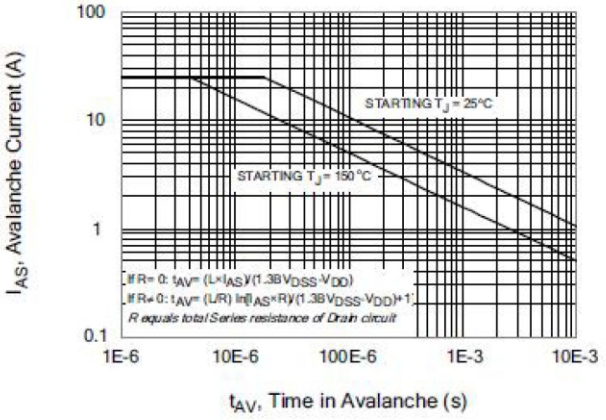


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

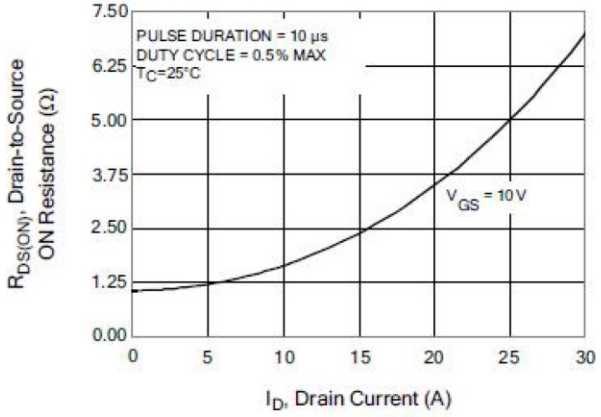
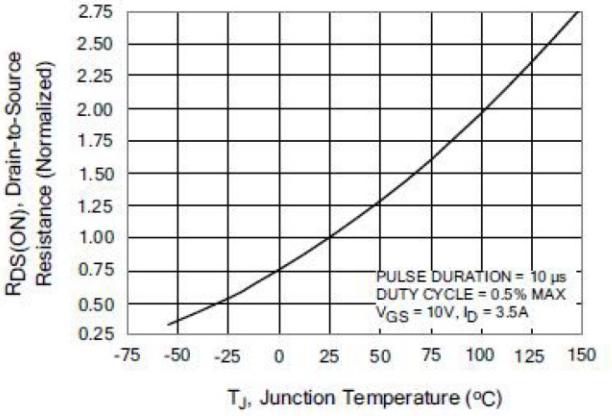


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature



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■ Rating and characteristic curves

Figure 11. Typical Breakdown Voltage vs Junction Temperature

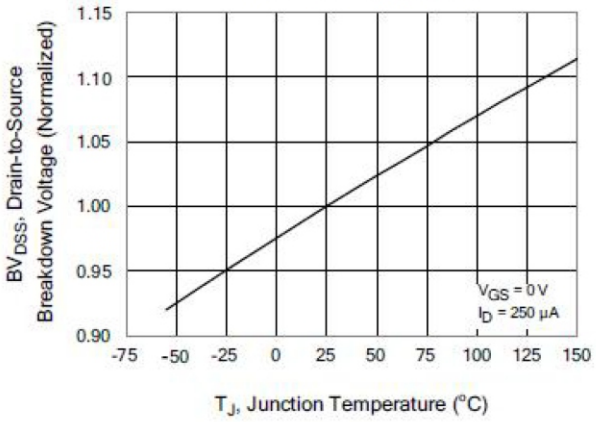


Figure 12. Typical Threshold Voltage vs Junction Temperature

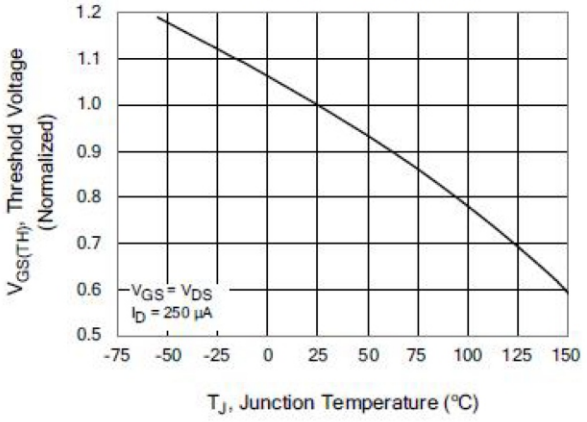


Figure 13. Maximum Forward Bias Safe Operating Area

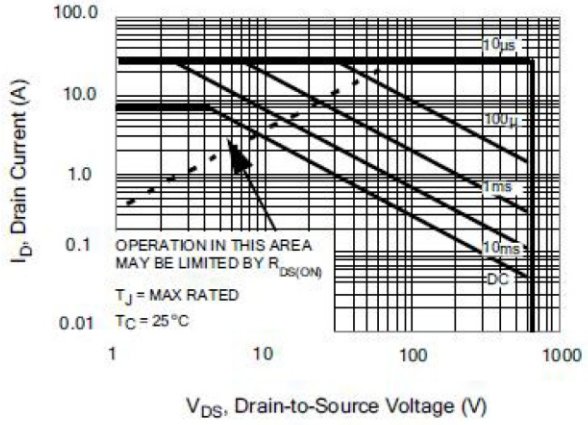


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

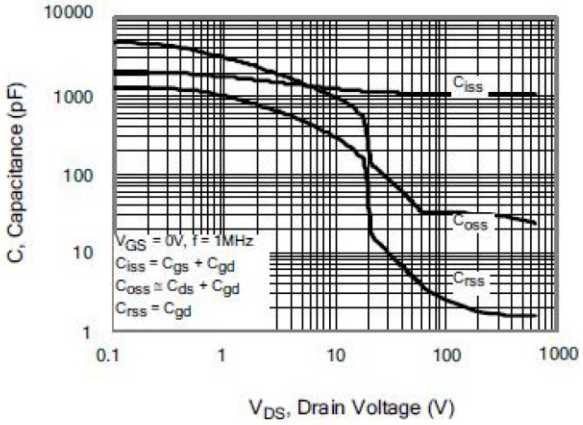


Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

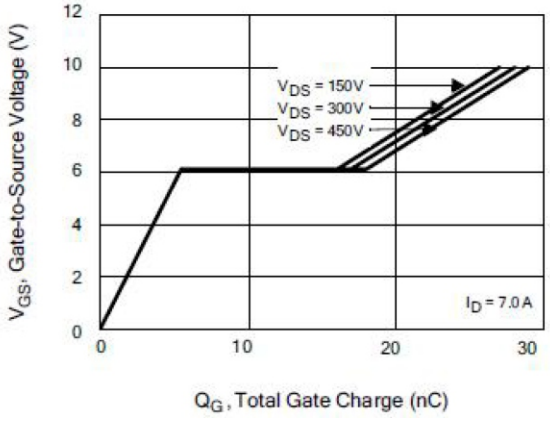
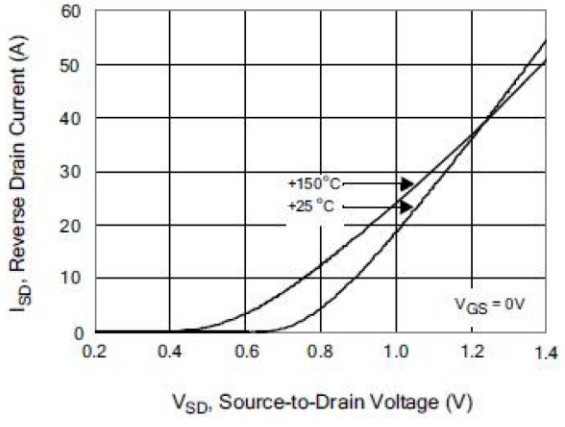


Figure 16. Typical Body Diode Transfer Characteristics



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■ Test circuit and waveform

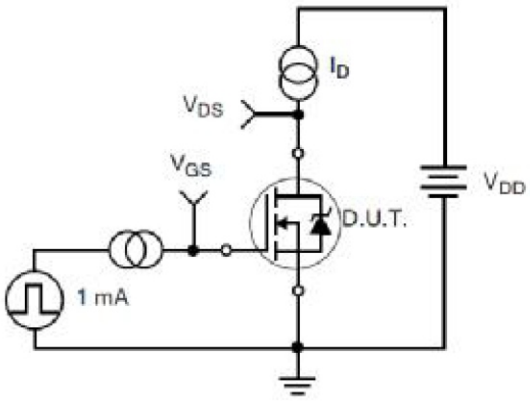

Figure 17. Gate Charge Test Circuit

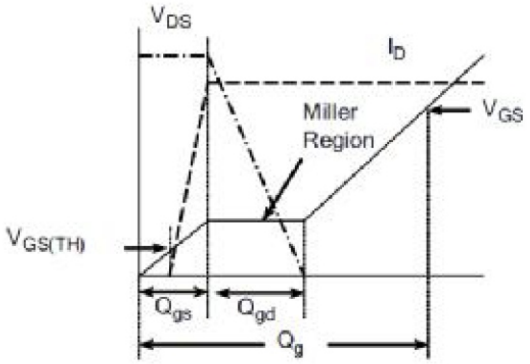

Figure 18. Gate Charge Waveform

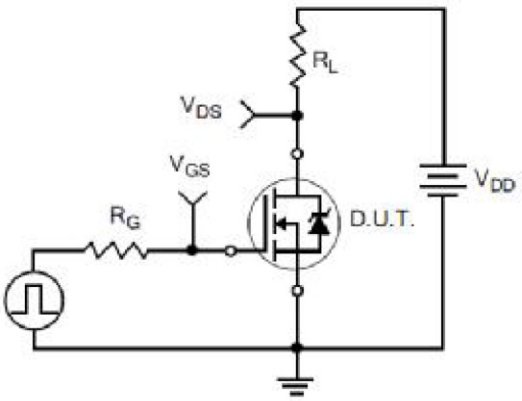

Figure 19. Resistive Switching Test Circuit

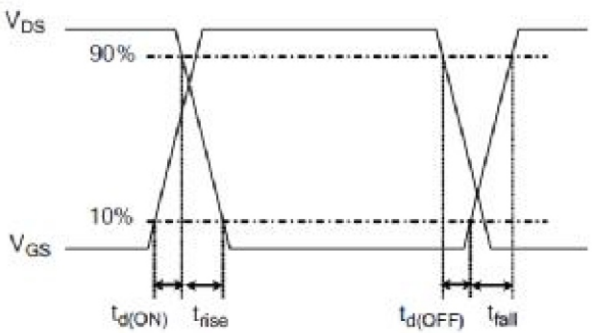

Figure 20. Resistive Switching Waveforms

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■ Test circuit and waveform

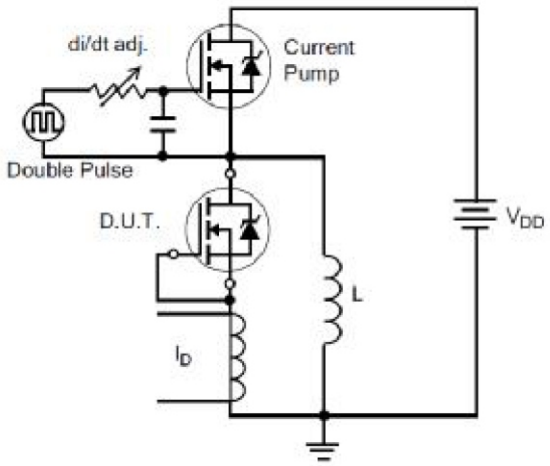

Figure 21. Diode Reverse Recovery Test Circuit

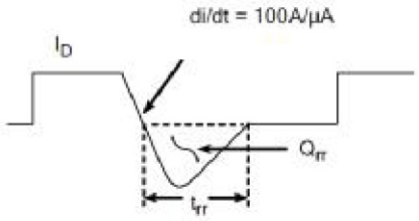

Figure 22. Diode Reverse Recovery Waveform

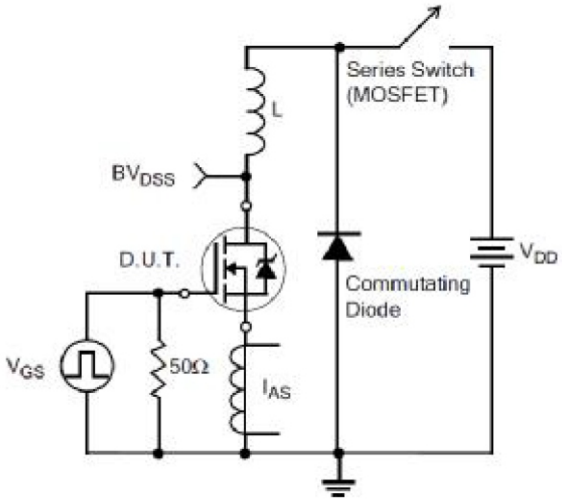

Figure 23. Unclamped Inductive Switching Test Circuit

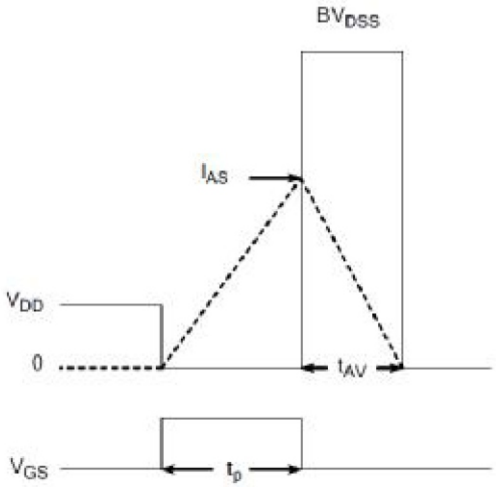

Figure 24. Unclamped Inductive Switching Waveforms

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