

**9NM50-S**

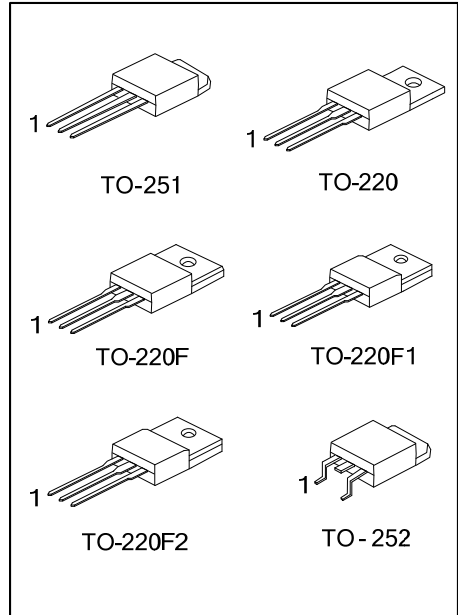
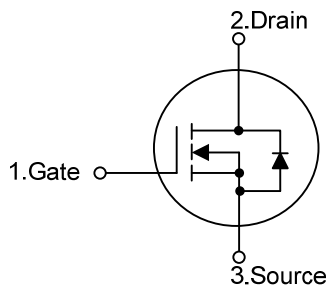
Preliminary

Power MOSFET**9.0A, 500V N-CHANNEL
SUPER-JUNCTION MOSFET****DESCRIPTION**

The UTC 9NM50-S is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at DC-DC, AC-DC converters for power applications.

FEATURES

- * $R_{DS(ON)} < 0.43\Omega$ @ $V_{GS}=10V$, $I_D=4.5A$
- * High switching Speed
- * 100% avalanche tested
- * Improved dv/dt capability

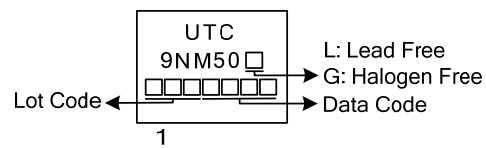
SYMBOL**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9NM50L-TA3-T	9NM50G-TA3-T	TO-220	G	D	S	Tube
9NM50L-TF1-T	9NM50G-TF1-T	TO-220F1	G	D	S	Tube
9NM50L-TF2-T	9NM50G-TF2-T	TO-220F2	G	D	S	Tube
9NM50L-TF3-T	9NM50G-TF3-T	TO-220F	G	D	S	Tube
9NM50L-TM3-T	9NM50G-TM3-T	TO-251	G	D	S	Tube
9NM50L-TN3-R	9NM50G-TN3-R	TO-252	G	D	S	Tape Reel

Note: Pin Assignment: G: Gate D: Drain S: Source

9NM50L-TA3-T	(1)Packing Type	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252 (3) L: Lead Free, G: Halogen Free and Lead Free
	(2)Package Type	
	(3)Green Package	

■ MARKING



■ **ABSOLUTE MAXIMUM RATINGS** ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	500	V
Gate-Source Voltage		V_{GS}	± 30	V
Drain Current	Continuous	I_D	9.0	A
	Pulsed (Note 2)	I_{DM}	36	A
Avalanche Current (Note 2)		I_{AR}	3.7	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	212	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	10.47	V/ns
Power Dissipation	TO-220	P_D	140	W
	TO-220F/TO-220F1		47	W
	TO-251/TO-252		100	W
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^{\circ}\text{C}$

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3. $L = 31\text{mH}$, $I_{AS} = 3.7\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 9.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-251/TO-252		110	
Junction to Case	TO-220	θ_{JC}	0.89	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1		2.66	
	TO-251/TO-252		1.25	

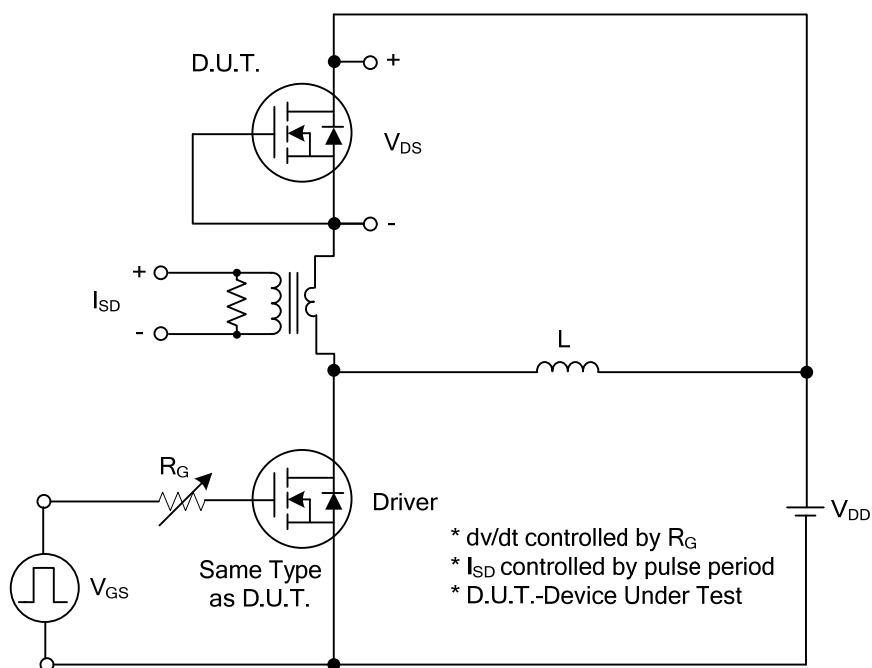
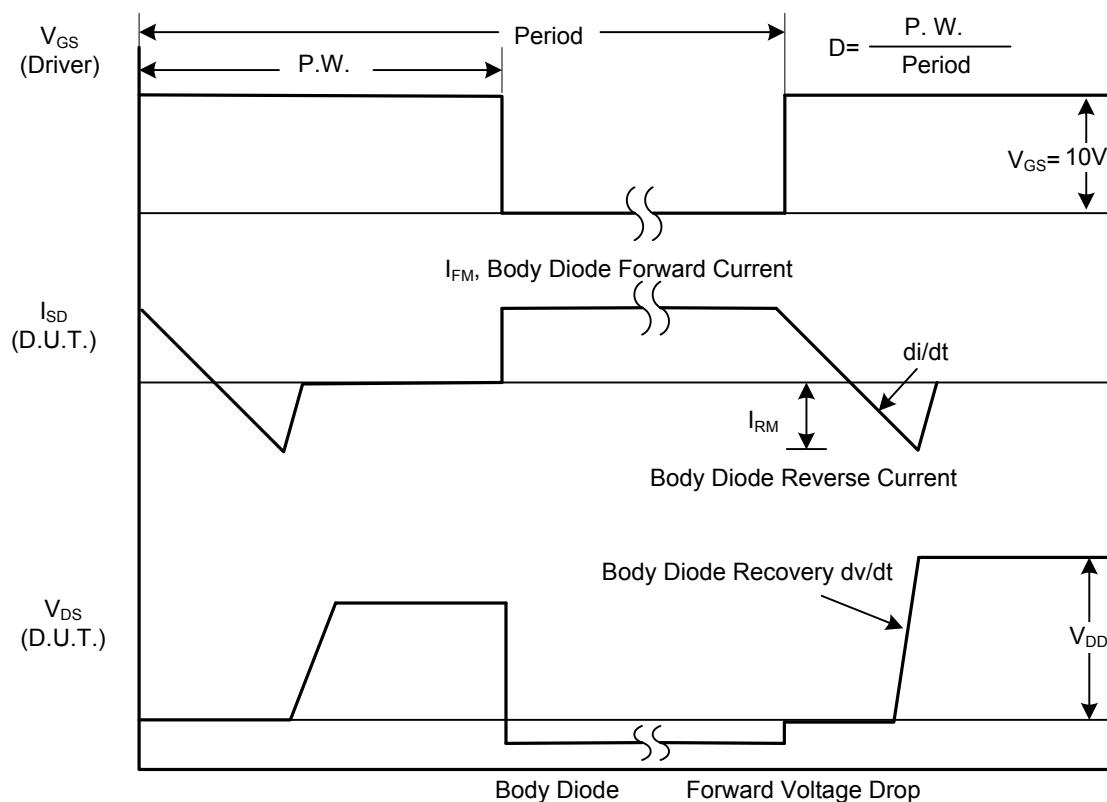
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	500			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =500V, V _{GS} =0V			10	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V			+100	nA
	Reverse		V _{GS} =-30V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.5		4.5	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =4.5A			0.43	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		65.2		pF
Output Capacitance		C _{OSS}			460		pF
Reverse Transfer Capacitance		C _{RSS}			62		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =50V, V _{GS} =10V, I _D =1.3A , I _G =100μA (Note 1, 2)		35		nC
Gate to Source Charge		Q _{GS}			3.5		nC
Gate to Drain Charge		Q _{GD}			15.5		nC
Turn-ON Delay Time (Note 1)		t _{D(ON)}	V _{DD} =30V, V _{GS} =10V, I _D =0.5A, R _G =25Ω (Note 1, 2)		50		ns
Rise Time		t _R			110		ns
Turn-OFF Delay Time		t _{D(OFF)}			170		ns
Fall-Time		t _F			100		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				9	A
Maximum Body-Diode Pulsed Current		I _{SM}				36	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =9.0A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	I _S =9.0A, V _{GS} =0V,		290		ns
Reverse Recovery Charge		Q _{rr}	dl _F /dt = 100 A/μs		3.34		μC

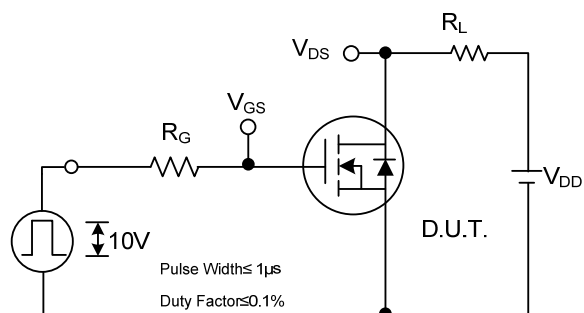
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

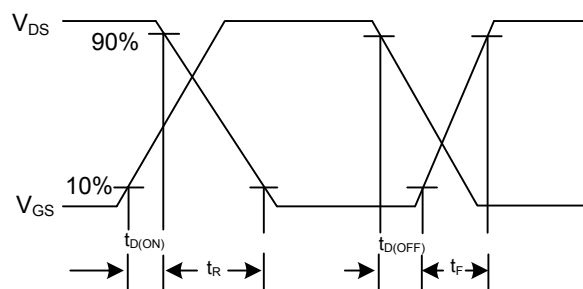
TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test CircuitPeak Diode Recovery dv/dt Waveforms

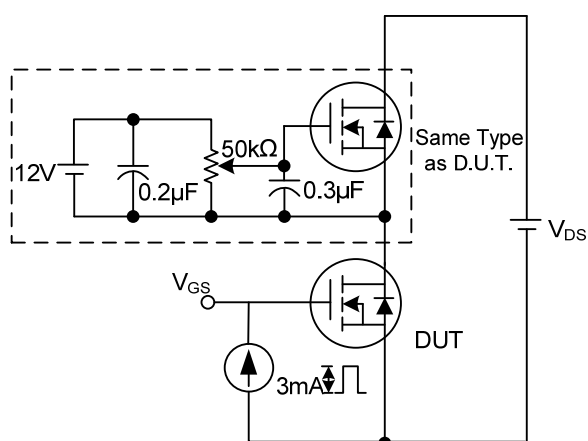
TEST CIRCUITS AND WAVEFORMS (Cont.)



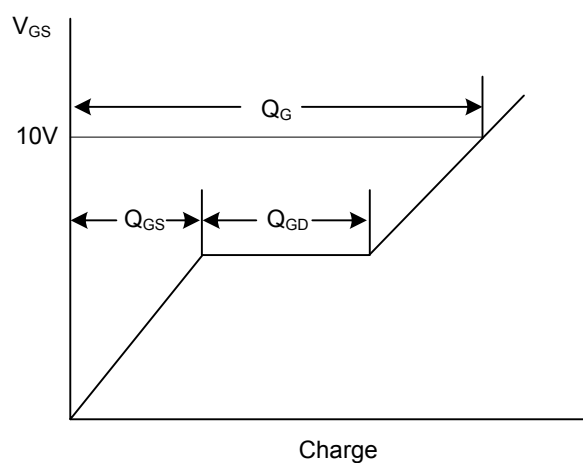
Switching Test Circuit



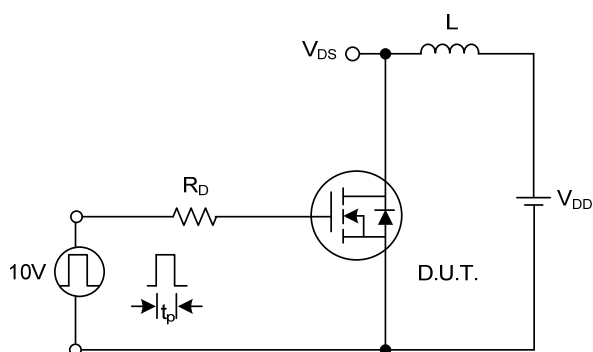
Switching Waveforms



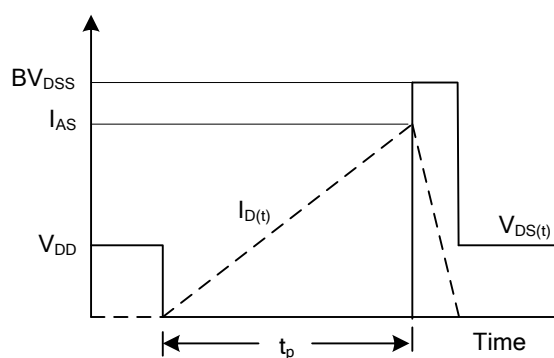
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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