



## 9N50

Preliminary

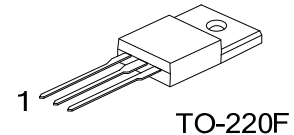
Power MOSFET

## 9A, 500V N-CHANNEL POWER MOSFET

### DESCRIPTION

The UTC **9N50** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers planar stripe and DMOS technology. This technology allows a minimum on-state resistance, superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

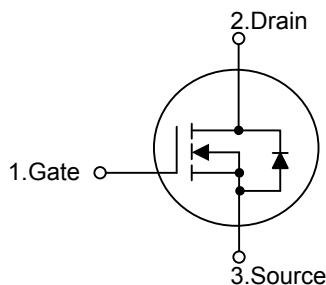
The UTC **9N50** is generally applied in high efficiency switch mode power supplies, active power factor correction and electronic lamp ballasts based on half bridge topology.



### FEATURES

- \*  $R_{DS(ON)}=0.85\Omega$  @  $V_{GS}=10V$
- \* High Switching Speed
- \* Improved dv/dt Capability
- \* 100% Avalanche Tested

### SYMBOL



### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9N50L-TF3-T	9N50G-TF3-T	TO-220F	G	D	S	Tube

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

<div>9N50L-TF3-T</div> <div><div></div><div>(1)Packing Type</div></div> <div><div></div><div>(2)Package Type</div></div> <div><div></div><div>(3)Lead Free</div></div>		<div>(1) T: Tube</div> <div>(2) TF3: TO-220F</div> <div>(3) G: Halogen Free, L: Lead Free</div>
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■ ABSOLUTE MAXIMUM RATINGS ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	500	V
Gate-Source Voltage		V <sub>GSS</sub>	±30	V
Drain Current	Continuous (T <sub>C</sub> =25°C)	I <sub>D</sub>	9 (Note 5)	A
	Pulsed (Note 2)	I <sub>DM</sub>	36 (Note 5)	A
Avalanche Current (Note 2)		I <sub>AR</sub>	9	A
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	360	mJ
	Repetitive (Note 4)	E <sub>AR</sub>	13.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation		P <sub>D</sub>	44	W
Derate above 25°C			0.35	W/°C
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature		T <sub>STG</sub>	-55~+150	°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.  $L = 8\text{mH}$ ,  $I_{AS} = 9\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 9\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

5. Drain current limited by maximum junction temperature

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	2.86	$^\circ\text{C}/\text{W}$

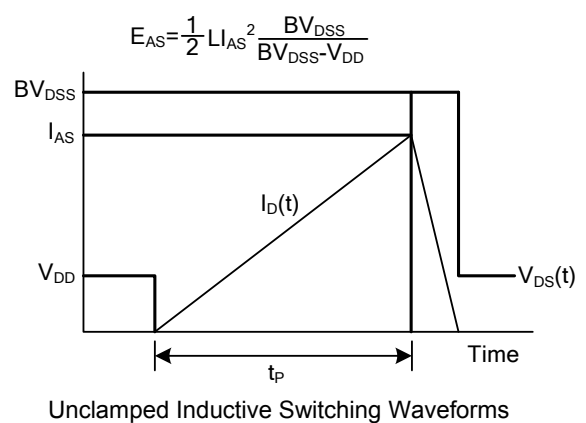
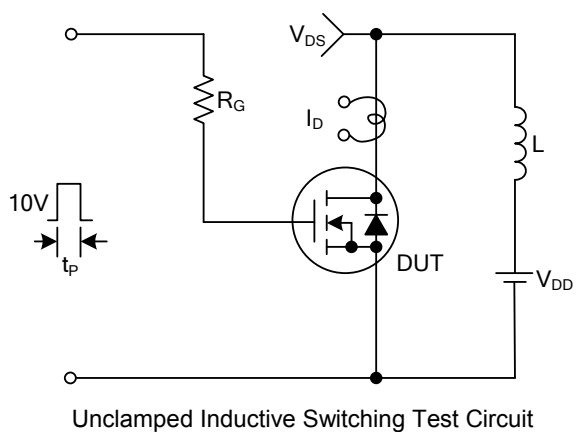
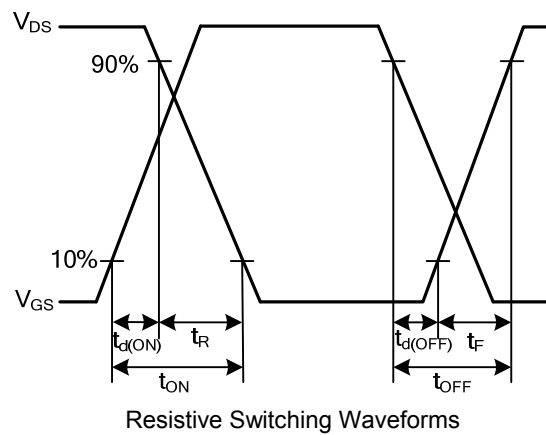
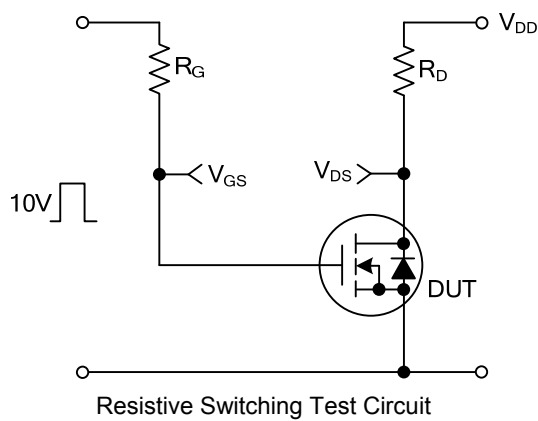
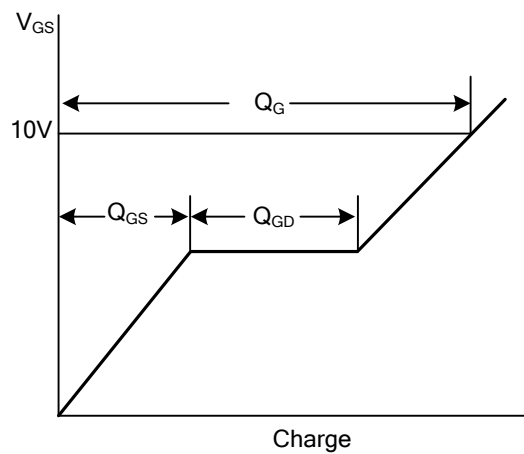
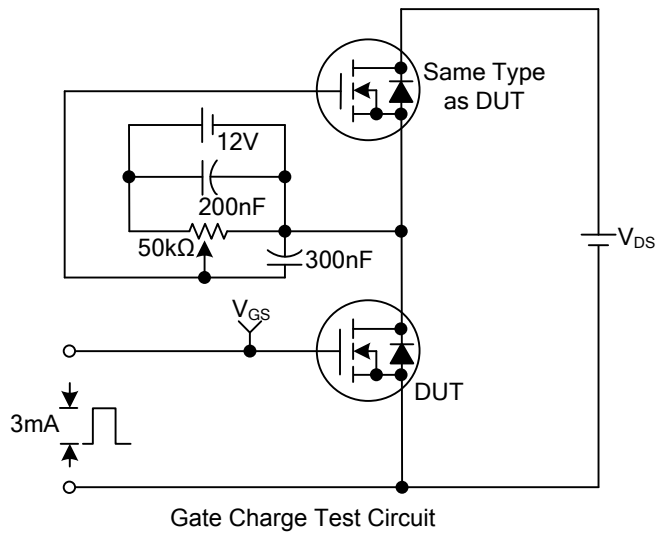
■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	500			V
Drain-Source Leakage Current		I <sub>DSS</sub>	V <sub>DS</sub> =500V, V <sub>GS</sub> =0V			1	μA
			V <sub>DS</sub> =400V, T <sub>C</sub> =125°C			10	
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V			+100	nA
	Reverse		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A		0.7	0.85	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		790	1030	pF
Output Capacitance		C <sub>OSS</sub>			130	170	pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			24	30	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q <sub>G</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =400V, I <sub>D</sub> =9A (Note 1, 2)		28	35	nC
Gate to Source Charge		Q <sub>GS</sub>			4		nC
Gate to Drain Charge		Q <sub>GD</sub>			15		nC
Turn-ON Delay Time		t <sub>D(ON)</sub>	V <sub>DD</sub> =250V, I <sub>D</sub> =9A, R <sub>G</sub> =25Ω (Note 1, 2)		18	45	ns
Rise Time		t <sub>R</sub>			65	140	ns
Turn-OFF Delay Time		t <sub>D(OFF)</sub>			93	195	ns
Fall-Time		t <sub>F</sub>			64	125	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I <sub>S</sub>				9	A
Maximum Body-Diode Pulsed Current		I <sub>SM</sub>				36	A
Drain-Source Diode Forward Voltage		V <sub>SD</sub>	I <sub>S</sub> =9A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time		t <sub>rr</sub>	I <sub>S</sub> =9A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs		335		ns
Body Diode Reverse Recovery Charge		Q <sub>RR</sub>	(Note 1)		2.95		μC

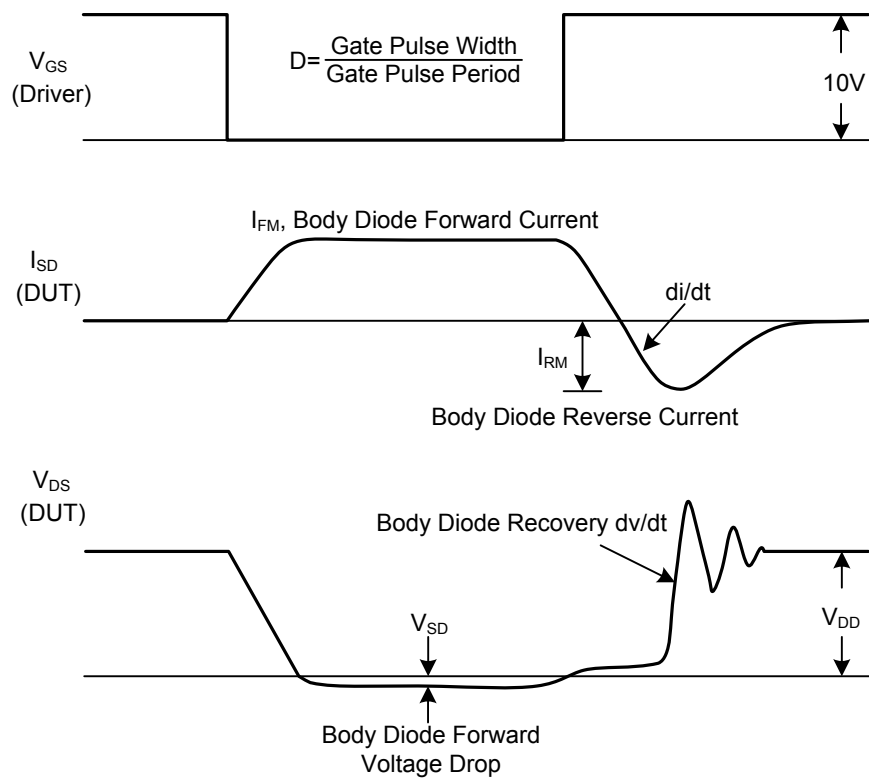
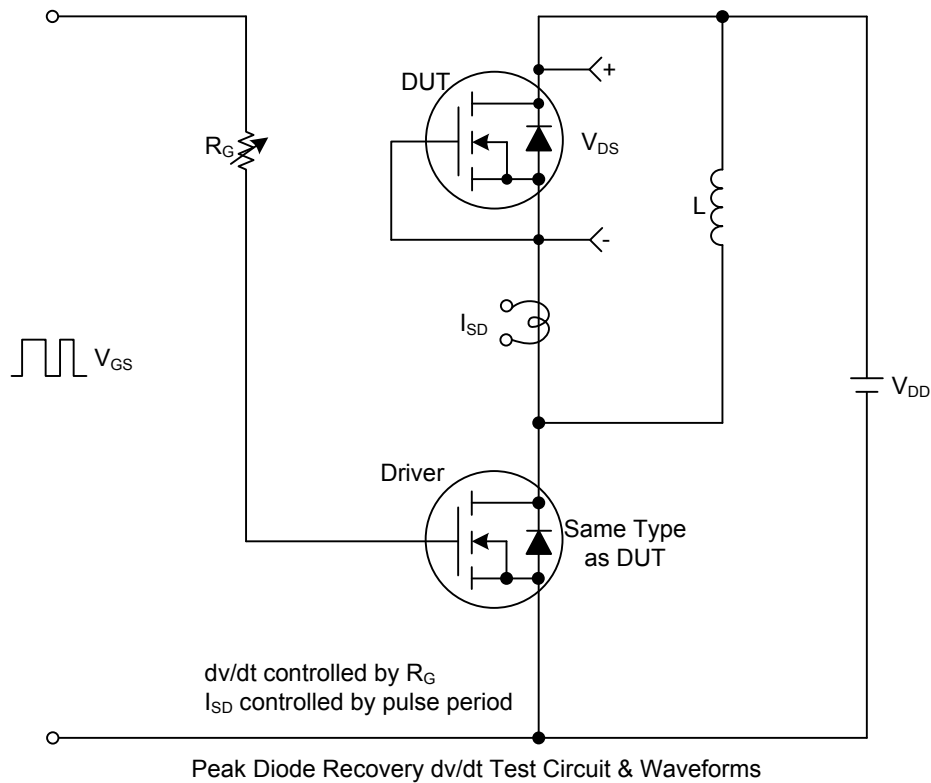
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

# ■ TEST CIRCUITS AND WAVEFORMS



■ TEST CIRCUITS AND WAVEFORMS(Cont.)



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