

**9N50Z-TC**

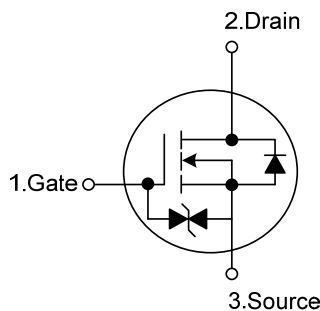
Preliminary

Power MOSFET**9A, 500V N-CHANNEL
POWER MOSFET****DESCRIPTION**

The UTC **9N50Z-TC** is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} \leq 0.8 \Omega$ @ $V_{GS}=10V$, $I_D=4.5A$
- * High Switching Speed

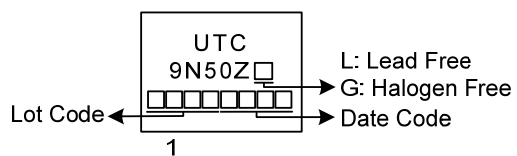
SYMBOL**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9N50ZL-TF1-T	9N50ZG-TF1-T	TO-220F1	G	D	S	Tube
9N50ZL-TF2-T	9N50ZG-TF2-T	TO-220F2	G	D	S	Tube
9N50ZL-TF3-T	9N50ZG-TF3-T	TO-220F	G	D	S	Tube
9N50ZL-TM3-T	9N50ZG-TM3-T	TO-251	G	D	S	Tube
9N50ZL-TN3-R	9N50ZG-TN3-R	TO-252	G	D	S	Tape Reel

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

9N50ZG-TF1-T		(1) T: Tube, R: Tape Reel (2) TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2 TM3: TO-251, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	± 20	V
Drain Current	Continuous	I_D	9	A
	Pulsed (Note 2)	I_{DM}	18	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	126	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2	V/ns
Power Dissipation	TO-220F/TO-220F1	P_D	35	W
	TO-220F2			
	TO-251/TO-252		55	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. $L = 30\text{mH}$, $I_{AS} = 2.8\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$ 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-220F/TO-220F1	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F2			
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1	θ_{JC}	3.57	$^\circ\text{C}/\text{W}$
	TO-220F2			
	TO-251/TO-252		2.27 (Note)	$^\circ\text{C}/\text{W}$

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

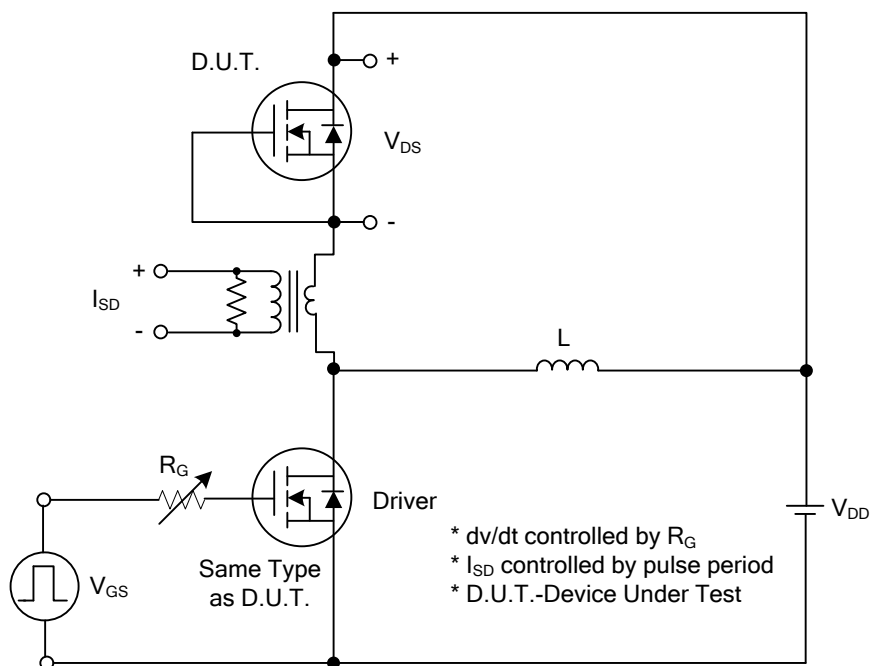
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D = 250μA	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} =20V, V _{DS} =0V			10	μA
	Reverse		V _{GS} =-20V, V _{DS} =0V			10	μA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =4.5A			0.8	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V f=1.0 MHz		1036.4		pF
Output Capacitance		C _{OSS}			111.7		pF
Reverse Transfer Capacitance		C _{RSS}			5.2		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =400V, V _{GS} =10V, I _D =6.0A, I _G =1mA (Note 1, 2)		29.4		nC
Gateource Charge		Q _{GS}			8.8		nC
Gate-Drain Charge		Q _{GD}			5		nC
Turn-on Delay Time (Note 1)		t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =9.0A, R _G =25Ω (Note 1, 2)		11.2		ns
Rise Time		t _R			18.2		ns
Turn-off Delay Time		t _{D(OFF)}			72.2		ns
Fall-Time		t _F			29.7		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				9	A
Maximum Body-Diode Pulsed Current		I _{SM}				18	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	V _{GS} =0V, I _S =9.0A			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	V _{GS} =0V, I _S =9.0A,		672		ns
Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs (Note1)		30.7		μC

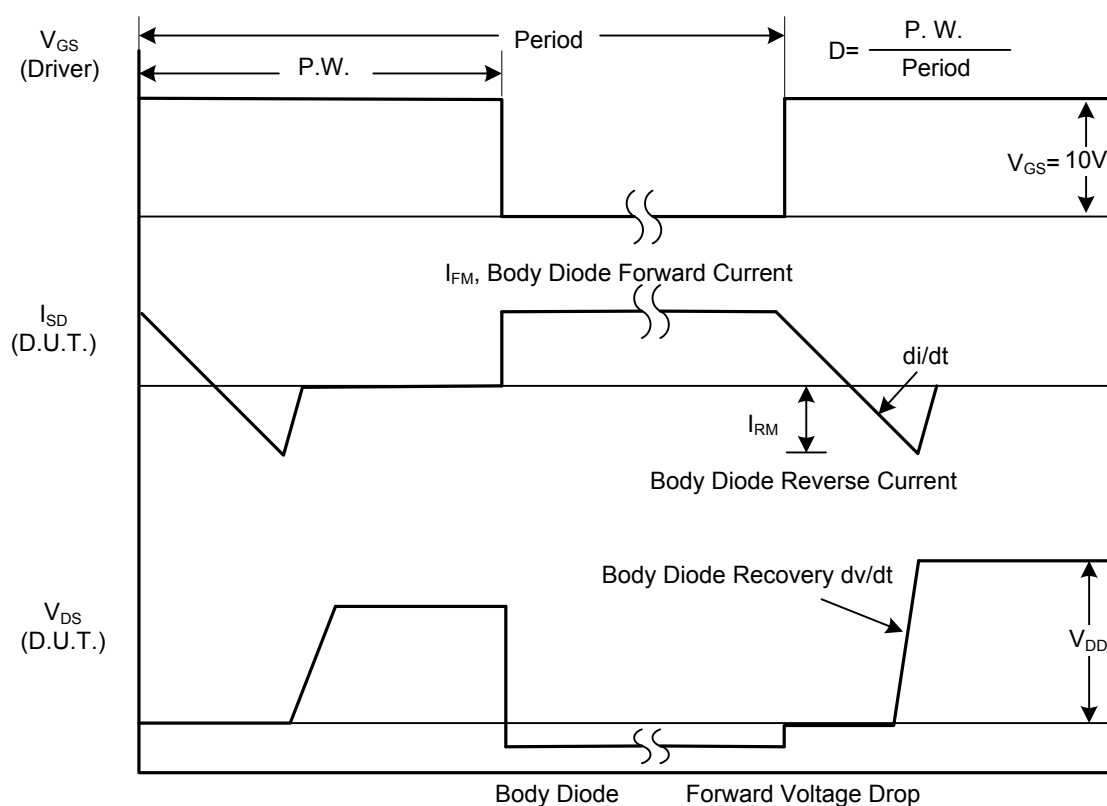
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

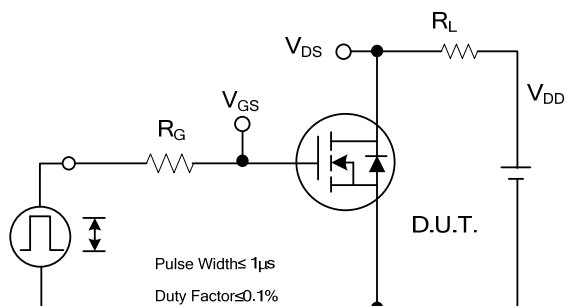


Peak Diode Recovery dv/dt Test Circuit

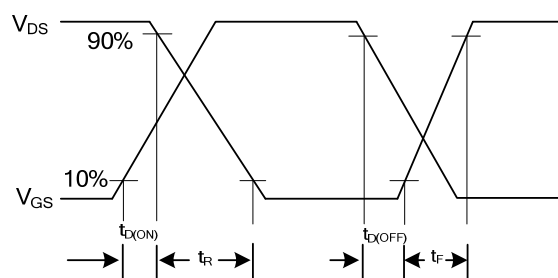


Peak Diode Recovery dv/dt Waveforms

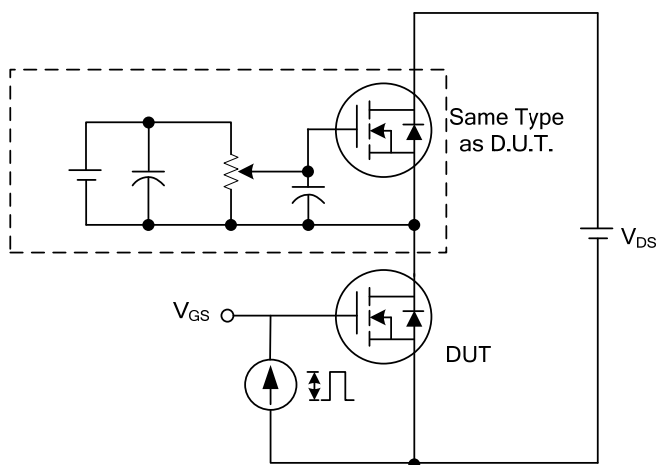
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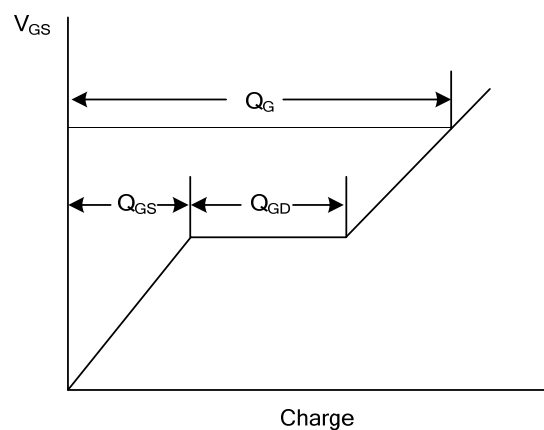
Switching Test Circuit



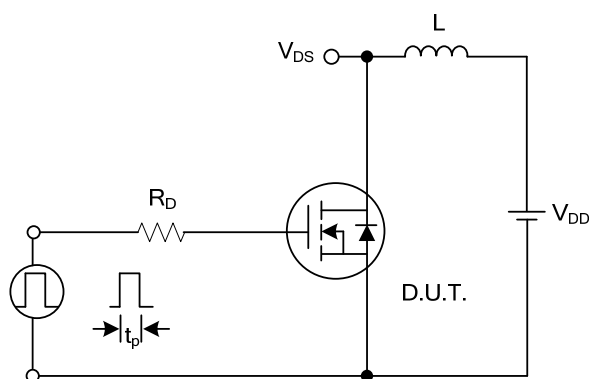
Switching Waveforms



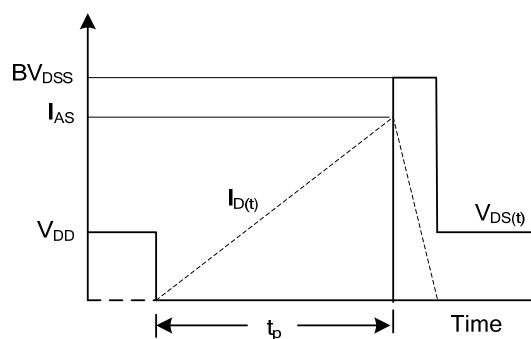
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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