

# 3N50

Preliminary

Power MOSFET

## 3 Amps, 500 Volts N-CHANNEL POWER MOSFET

### DESCRIPTION

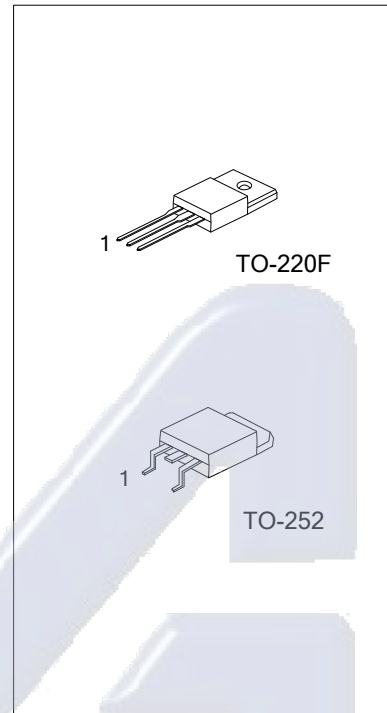
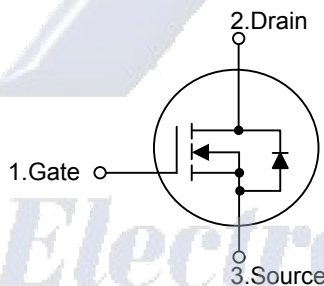
The UTC **3N50** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **3N50** is generally applied in high efficiency switch mode power supplies, active power factor correction and electronic lamp ballasts based on half bridge topology.

### FEATURES

- \* 3A, 500V,  $R_{DS(ON)}=2.5\Omega$  @  $V_{GS}=10V$
- \* High Switching Speed
- \* 100% Avalanche Tested

### SYMBOL



### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N50L-TF3-T	3N50G-TF3-T	TO-220F	G	D	S	Tube
3N50L-TN3-R	3N50G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>3N50L-TF3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Free</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TF3: TO-220F, TN3: TO-252</p> <p>(3) G: Halogen Free, L: Lead Free</p>
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■ 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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous ( $T_C=25^\circ\text{C}$ )	$I_D$	3 *	A
	Pulsed (Note 1)	$I_{DM}$	12 *	A
Avalanche Current (Note 1)		$I_{AR}$	3	A
Avalanche Energy	Single Pulsed (Note 2)	$E_{AS}$	200	mJ
	Repetitive (Note 3)	$E_{AR}$	6.2	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	V/ns
Power Dissipation	$T_C=25^\circ\text{C}$	TO-220F	25	W
		TO-252		
	Derate above $25^\circ\text{C}$	TO-220F	0.4	W/ $^\circ\text{C}$
		TO-252		
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-55~+150	$^\circ\text{C}$

Note: 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.

\* Drain current limited by maximum junction temperature

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F	$\theta_{JA}$	62.5	$^\circ\text{C/W}$
	TO-252		110	
Junction to Case	TO-220F	$\theta_{JC}$	4.9	$^\circ\text{C/W}$
	TO-252		2.5	

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	500			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=500\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$ , $V_{DS}=0\text{V}$ $V_{GS}=-30\text{V}$ , $V_{DS}=0\text{V}$			+100	nA
	Reverse				-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=1.5\text{A}$		2.1	2.5	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		280	365	pF
Output Capacitance	$C_{OSS}$			50	65	pF
Reverse Transfer Capacitance	$C_{RSS}$			8.5	11	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{GS}=10\text{V}$ , $V_{DS}=400\text{V}$ , $I_D=3\text{A}$ (Note 4, 5)		10	13	nC
Gate to Source Charge	$Q_{GS}$			1.5		nC
Gate to Drain Charge	$Q_{GD}$			5.5		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=250\text{V}$ , $I_D=3\text{A}$ , $R_G=25\Omega$ (Note 4, 5)		10	30	ns
Rise Time	$t_R$			25	60	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			35	80	ns
Fall-Time	$t_F$			25	60	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				3	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				12	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S=3\text{A}$ , $V_{GS}=0\text{V}$			1.4	V
Body Diode Reverse Recovery Time	$t_{RR}$	$I_S=3\text{A}$ , $V_{GS}=0\text{V}$ , $di_F/dt=100\text{A}/\mu\text{s}$ (Note 4)		170		ns
Body Diode Reverse Recovery Charge	$Q_{RR}$				0.7	

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2.  $L = 40\text{mH}$ ,  $I_{AS} = 3\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

3.  $I_{SD} \leq 3\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

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

5. Essentially independent of operating temperature

*Electronica S.A. de C.V.*

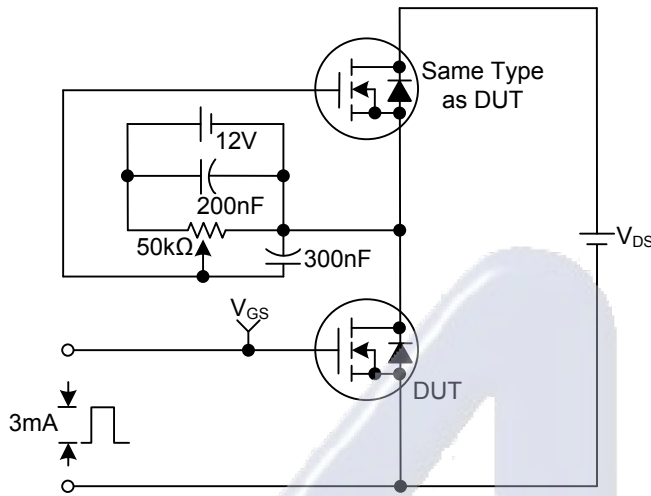
# 3N50

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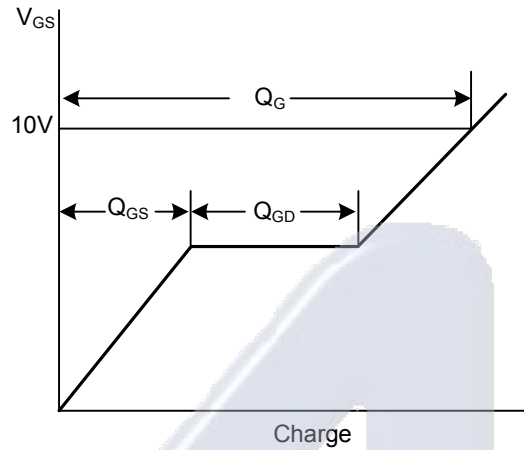
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### TEST CIRCUITS AND WAVEFORMS

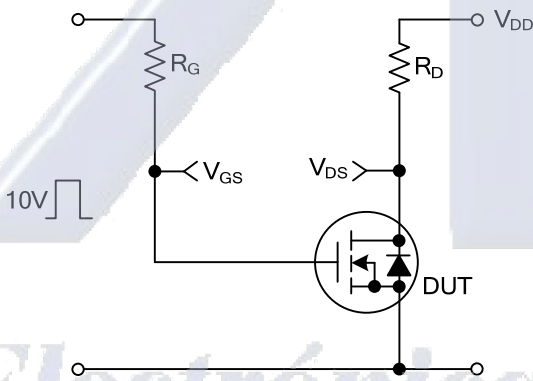
Gate Charge Test Circuit



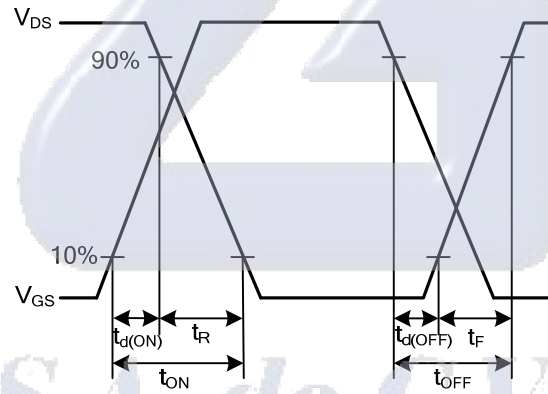
Gate Charge Waveforms



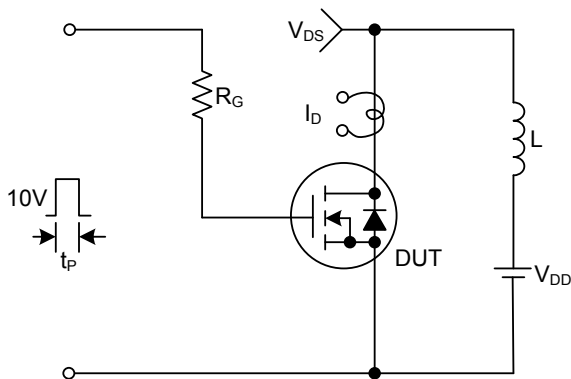
Resistive Switching Test Circuit



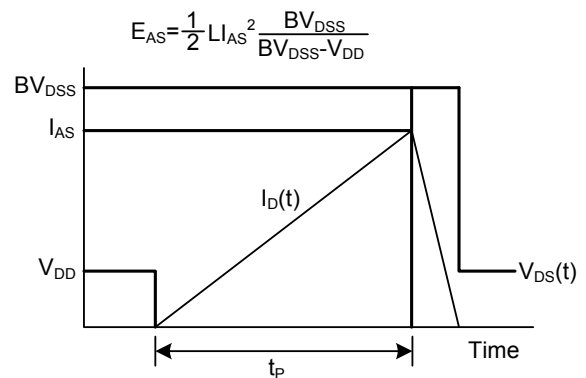
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

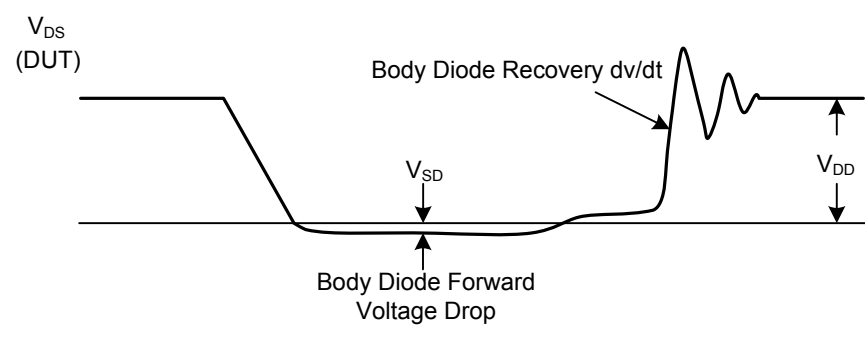
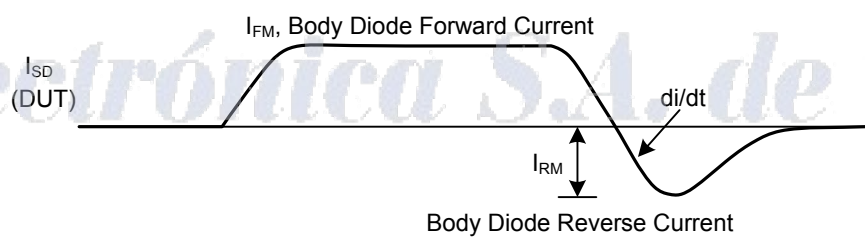
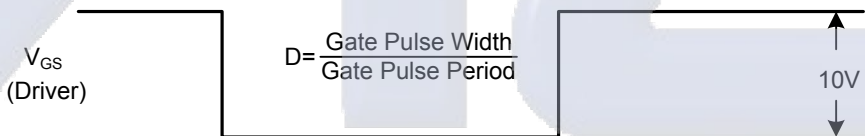
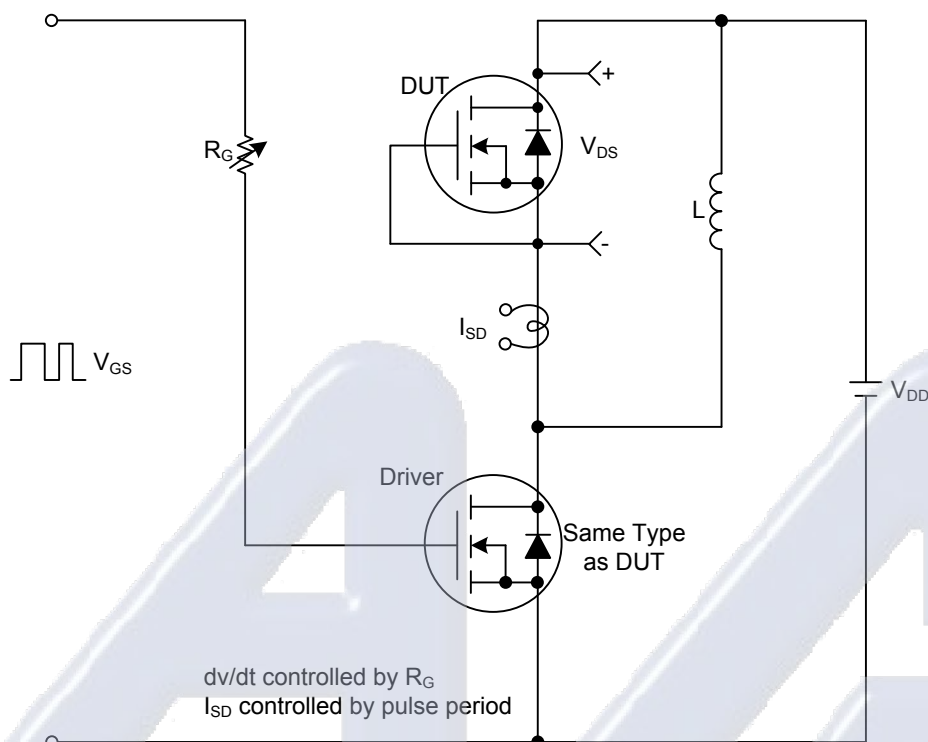


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Peak Diode Recovery dv/dt Test Circuit & Waveforms



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