



# 3N50K-MK

Power MOSFET

## 3A, 500V N-CHANNEL POWER MOSFET

### DESCRIPTION

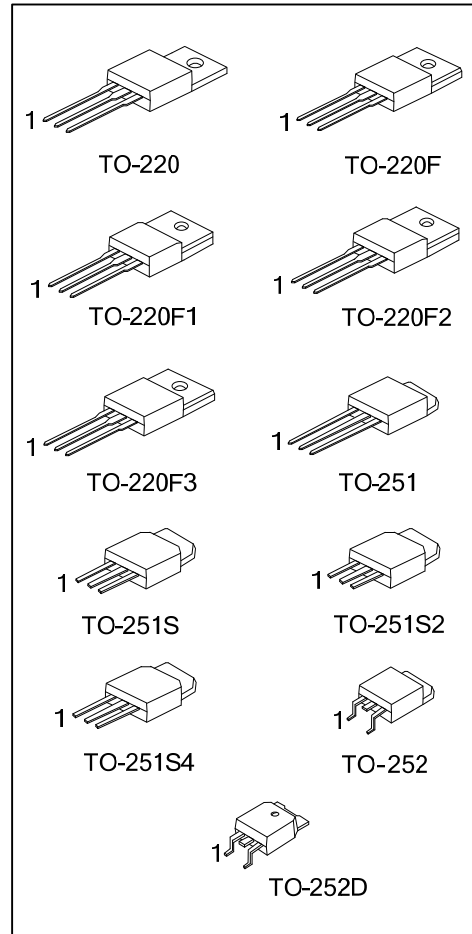
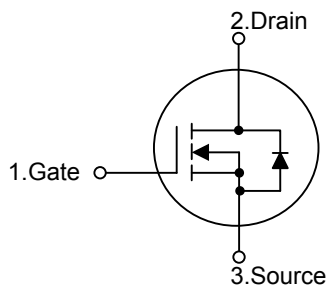
The UTC **3N50K-MK** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **3N50K-MK** is generally applied in high efficiency switch mode power supplies, active power factor correction and electronic lamp ballasts based on half bridge topology.

### FEATURES

- \*  $R_{DS(ON)} < 3.2\Omega$  @  $V_{GS} = 10V, I_D = 1.5A$
- \* High Switching Speed
- \* 100% Avalanche Tested

### SYMBOL



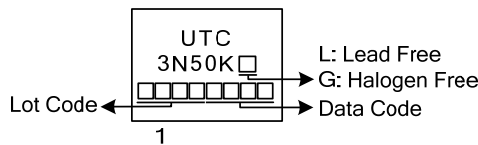
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N50KL-TA3-T	3N50KG-TA3-T	TO-220	G	D	S	Tube
3N50KL-TF3-T	3N50KG-TF3-T	TO-220F	G	D	S	Tube
3N50KL-TF1-T	3N50KG-TF1-T	TO-220F1	G	D	S	Tube
3N50KL-TF2-T	3N50KG-TF2-T	TO-220F2	G	D	S	Tube
3N50KL-TF3-T	3N50KG-TF3-T	TO-220F3	G	D	S	Tube
3N50KL-TM3-T	3N50KG-TM3-T	TO-251	G	D	S	Tube
3N50KL-TMS-T	3N50KG-TMS-T	TO-251S	G	D	S	Tube
3N50KL-TMS2-T	3N50KG-TMS2-T	TO-251S2	G	D	S	Tube
3N50KL-TMS4-T	3N50KG-TMS4-T	TO-251S4	G	D	S	Tube
3N50KL-TN3-R	3N50KG-TN3-R	TO-252	G	D	S	Tape Reel
3N50KL-TND-R	3N50KG-TND-R	TO-252D	G	D	S	Tape Reel

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

<p>3N50KL-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F3, TM3: TO-251 TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TND: TO-252D (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous ( $T_c=25^\circ\text{C}$ )	$I_D$	3 (Note 5)	A
	Pulsed (Note 2)	$I_{DM}$	12 (Note 5)	A
Avalanche Current (Note 2)		$I_{AR}$	3	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	150	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	$P_D$	75	W
	TO-220F/TO-220F1 TO-220F3		25	W
	TO-220F2		26	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		50	W
	Derate above $25^\circ\text{C}$			
Derate above $25^\circ\text{C}$	TO-220	$P_D$	0.5	W/ $^\circ\text{C}$
	TO-220F/TO-220F1 TO-220F3		0.2	W/ $^\circ\text{C}$
	TO-220F2		0.208	W/ $^\circ\text{C}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		0.4	W/ $^\circ\text{C}$
	Power Dissipation			
Derate above $25^\circ\text{C}$		$P_D$	36	W
Derate above $25^\circ\text{C}$			0.288	W/ $^\circ\text{C}$
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.  $L = 33.3 \text{ mH}$ ,  $I_{AS} = 3\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

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

5. Drain current limited by maximum junction temperature.

■ THERMAL DATA

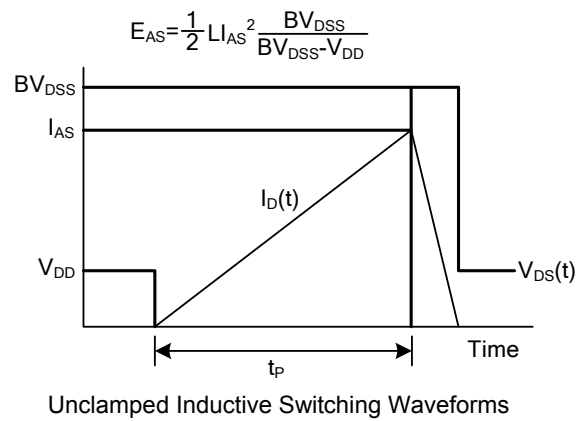
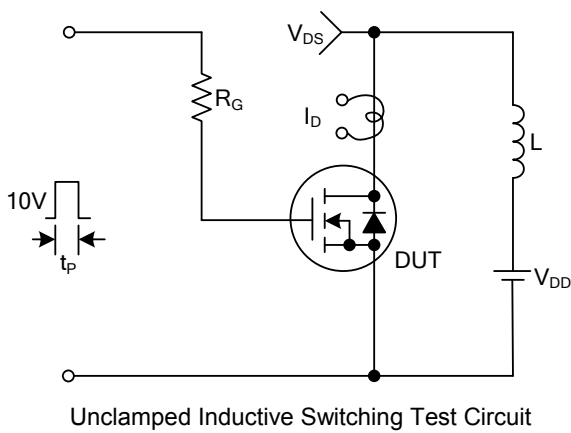
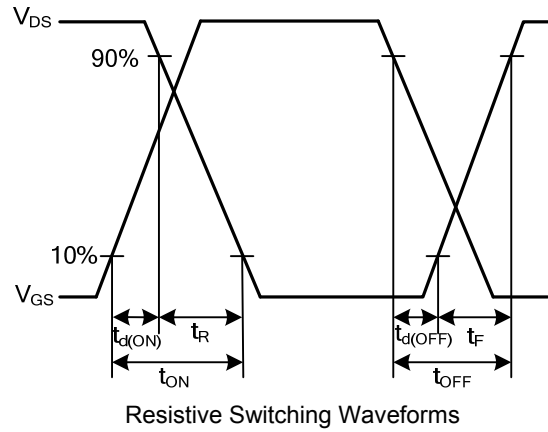
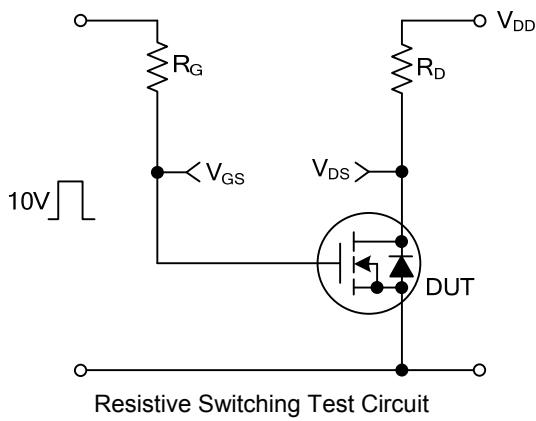
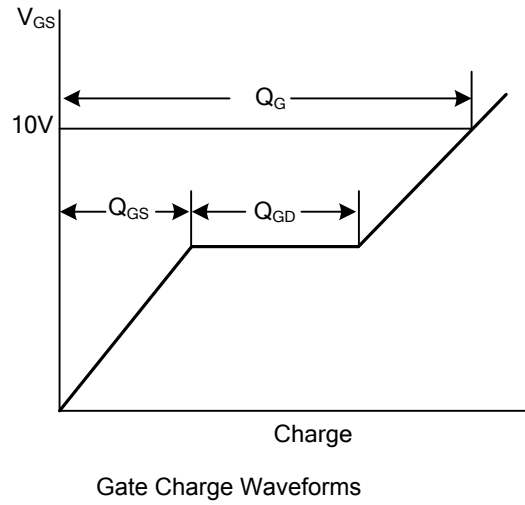
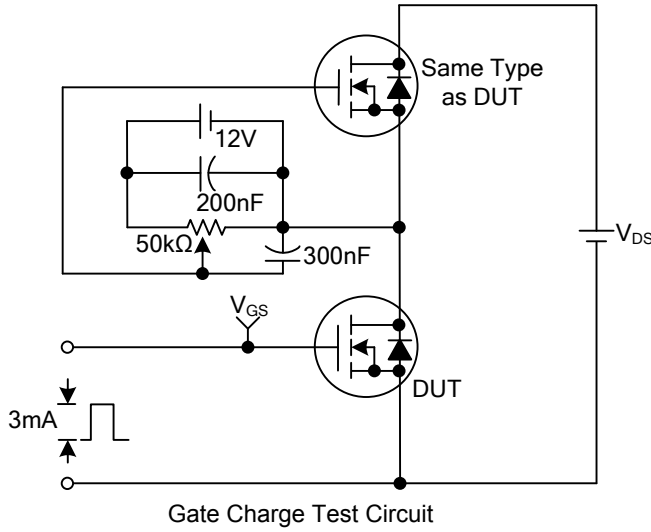
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		110	
	Junction to Case			
Junction to Case	TO-220	$\theta_{JC}$	1.67	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F3		4.9	
	TO-220F2		4.8	
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		2.5	

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

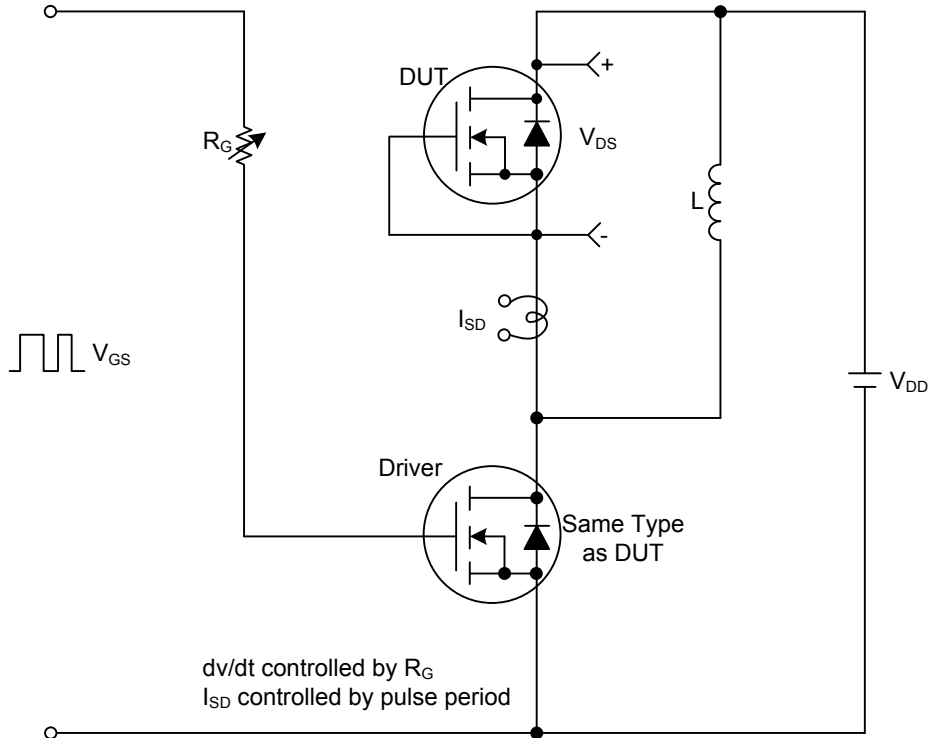
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	500			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=500\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$			+100	nA
	Reverse				-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	3.0		5.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=1.5\text{A}$			3.2	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		415	530	pF
Output Capacitance	$C_{OSS}$			250	350	pF
Reverse Transfer Capacitance	$C_{RSS}$			50	60	pF
<b>SWITCHING PARAMETERS</b>						
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=30\text{V}$ , $I_D=0.5\text{A}$ , $R_G=25\Omega$ (Note 1, 2)		42	60	ns
Rise Time	$t_R$			18	25	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			103	130	ns
Fall-Time	$t_F$			18	25	ns
Total Gate Charge	$Q_G$	$V_{GS}=10\text{V}$ , $V_{DS}=50\text{V}$ , $I_D=1.3\text{A}$ (Note 1, 2)		10	13	nC
Gate to Source Charge	$Q_{GS}$			1.5		nC
Gate to Drain Charge	$Q_{GD}$			5.5		nC
<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

- Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$   
2. Essentially independent of operating temperature

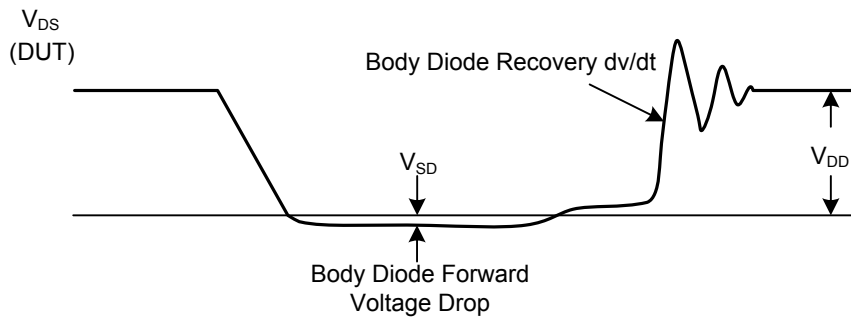
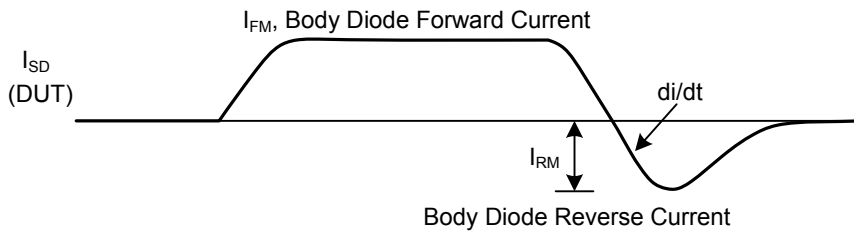
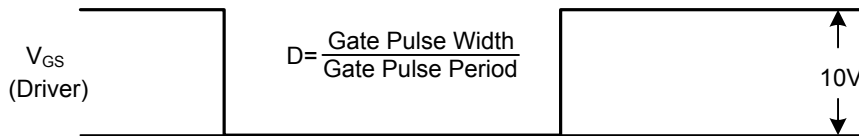
## TEST CIRCUITS AND WAVEFORMS



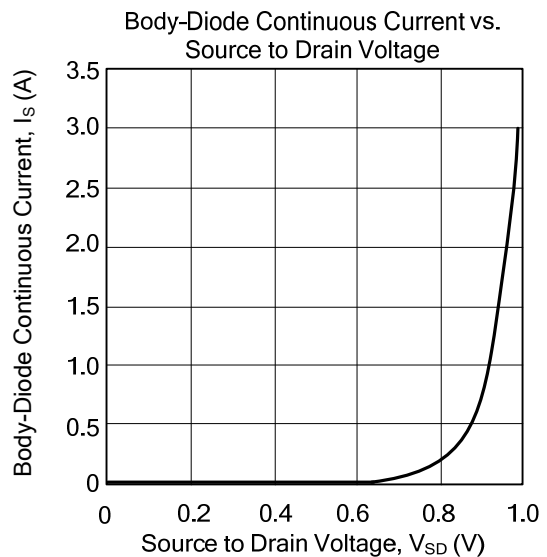
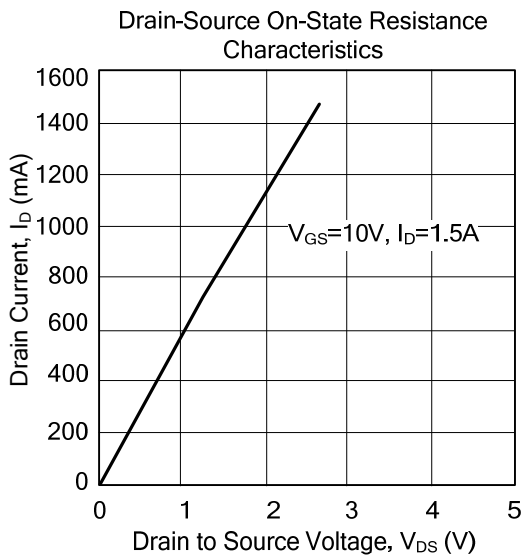
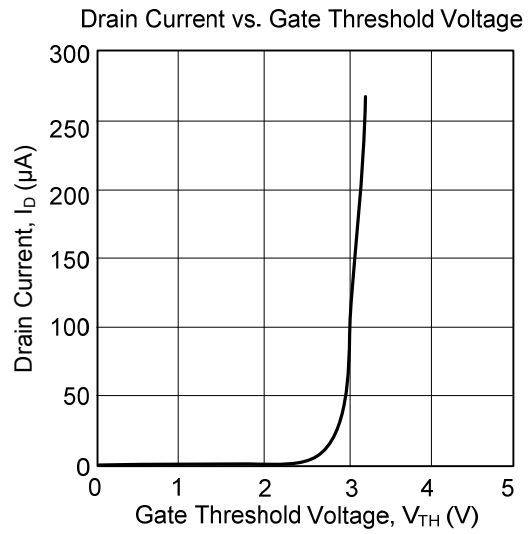
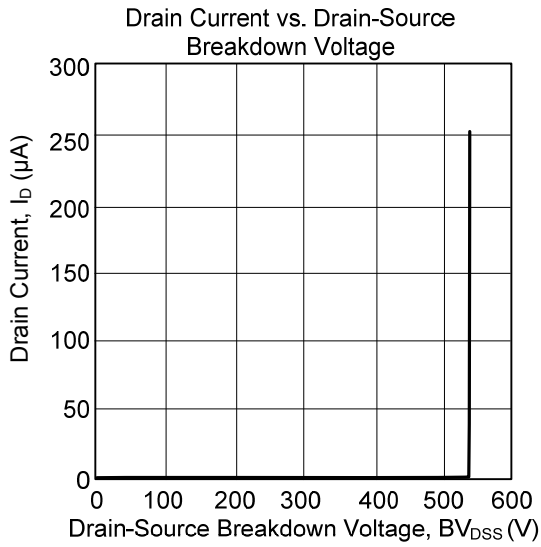
■ TEST CIRCUITS AND WAVEFORMS(Cont.)



Peak Diode Recovery dv/dt Test Circuit & Waveforms



### TYPICAL CHARACTERISTICS



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