

# UNISONIC TECHNOLOGIES CO., LTD

3N70K-MK Preliminary Power MOSFET

## 3A, 700V N-CHANNEL POWER MOSFET

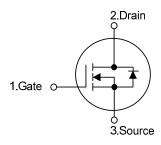
#### ■ DESCRIPTION

The UTC **3N70K-MK** is a high voltage and high current power MOSFET, 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 DC to DC converters and bridge circuits.

#### ■ FEATURES

- \*  $R_{DS(ON)}$  <4.20 @ $V_{GS}$  = 10 V
- \* Low reverse transfer capacitance
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

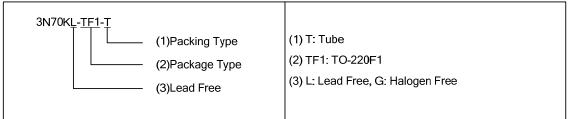
#### ■ SYMBOL



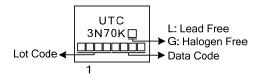
#### ORDERING INFORMATION

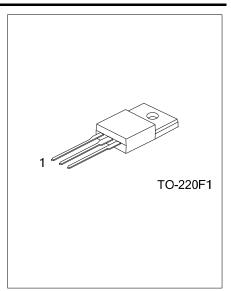
Ordering Number		Dookogo	Pin Assignment			Dooking	
Lead Free	Halogen Free	Package	1	2	3	Packing	
3N70KL-TF1-T	3N70KG-TF1-T	TO-220F1	G	D	S	Tube	

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



#### MARKING





<u>www.unisonic.com.tw</u> 1 of 6

## ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		$V_{DSS}$	700	V	
Gate-Source Voltage		$V_{GSS}$	±30	V	
Avalanche Current (Note 2)		I <sub>AR</sub>	3.0	Α	
Continuous Drain Current		I <sub>D</sub>	3.0	Α	
Pulsed Drain Current (Note 2)		I <sub>DM</sub>	12	Α	
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	60	mJ	
	Repetitive (Note 2)	E <sub>AR</sub>	7.5	mJ	
Power Dissipation		7	34	W	
Derate above 25°C		P <sub>D</sub>	0.27	W/°C	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns	
Junction Temperature		$T_J$	+150	°C	
Operating Temperature		T <sub>OPR</sub>	-55 ~ +150	°C	
Storage Temperature		T <sub>STG</sub>	-55 ~ <b>+</b> 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 = 13.33mH,  $I_{AS}$  = 3A,  $V_{DD}$  = 50V,  $R_G$  = 25  $\Omega$ , Starting  $T_J$  = 25°C
- 4.  $I_{SD} \le 3.0 A$ , di/dt  $\le 200 A/\mu s$ ,  $V_{DD} \le BV_{DSS}$ , Starting  $T_J = 25^{\circ}C$

## ■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT	
Junction to Ambient	$\theta_{JA}$	62.5	°C/W	
Junction to Case	θ.ιс	3.7	°C/W	

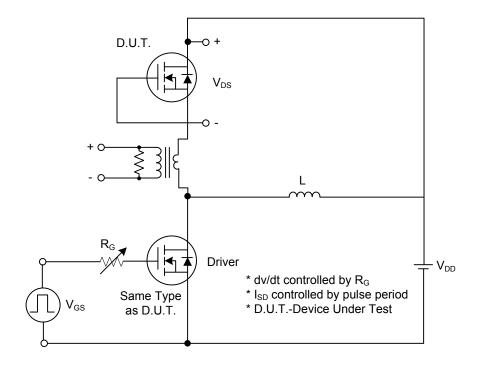
## ■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub> =25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		TYP	MAX	UNIT		
OFF CHARACTERISTICS								
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	700			V		
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 700 V, V <sub>GS</sub> = 0 V			10	μΑ		
Forward	d ,	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V			100	nA		
Gate-Source Leakage Current Revers	e I <sub>GSS</sub>	$V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$			-100	nA		
Breakdown Voltage Temperature Coefficie	ent ∆BV <sub>DSS</sub> /∆T <sub>J</sub>	I <sub>D</sub> = 250μA,Referenced to 25°C		0.6		V/°C		
ON CHARACTERISTICS								
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.5		4.5	V		
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 1.5A			4.20	Ω		
DYNAMIC CHARACTERISTICS								
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1MHz		422	510	pF		
Output Capacitance	Coss			37	55	pF		
Reverse Transfer Capacitance	C <sub>RSS</sub>			4.4	11	pF		
SWITCHING CHARACTERISTICS								
Turn-On Delay Time	t <sub>D(ON)</sub>			42		ns		
Turn-On Rise Time	t <sub>R</sub>	$V_{DD} = 30V, I_D = 0.5A,$		14		ns		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	$R_G = 25\Omega \text{ (Note 1, 2)}$		94		ns		
Turn-Off Fall Time	t <sub>F</sub>			14		ns		
Total Gate Charge	$Q_G$	\\ - F0\\  - 1 2 A		13.7	16	nC		
Gate-Source Charge	$Q_GS$	V <sub>DS</sub> = 50V,I <sub>D</sub> = 1.3A, V <sub>GS</sub> = 10 V (Note 1, 2)		4.3		nC		
Gate-Drain Charge	$Q_{GD}$	V <sub>GS</sub> - 10 V (Note 1, 2)		1.38		nC		
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS								
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0 \text{ V}, I_{S} = 3.0 \text{ A}$			1.4	V		
Maximum Continuous Drain-Source Diode	) la				3.0	Α		
Forward Current	Is				3.0	A		
Maximum Pulsed Drain-Source Diode	I <sub>SM</sub>				12	Α		
Forward Current	ISM				12	^		

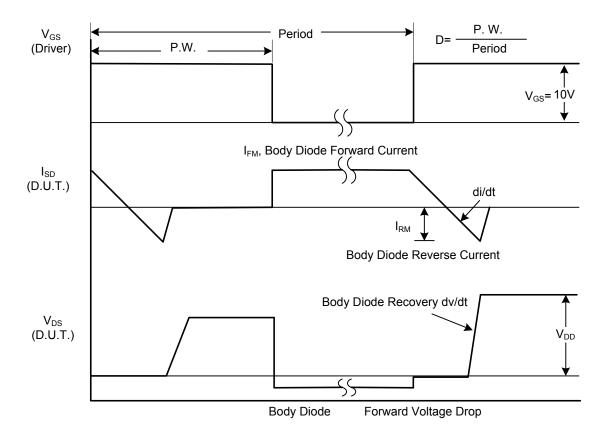
Notes: 1. Pulse Test: Pulse width ≤ 300µs, Duty cycle≤2%

<sup>2.</sup> Essentially independent of operating temperature

#### TEST CIRCUITS AND WAVEFORMS

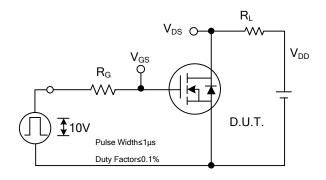


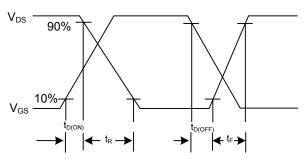
## Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

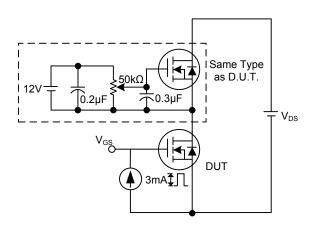
■ TEST CIRCUITS AND WAVEFORMS (Cont.)

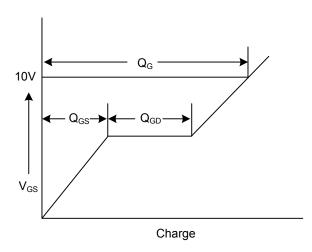




**Switching Test Circuit** 

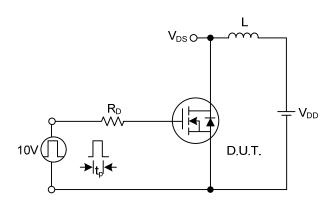
**Switching Waveforms** 

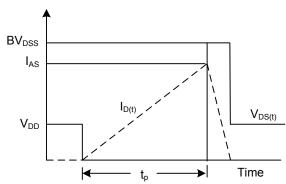




**Gate Charge Test Circuit** 

**Gate Charge Waveform** 





**Unclamped Inductive Switching Test Circuit** 

**Unclamped Inductive Switching Waveforms** 

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.

