

UTC UNISONIC TECHNOLOGIES CO., LTD

## 7N65K

Preliminary

# 7.4A, 650V N-CHANNEL POWER MOSFET

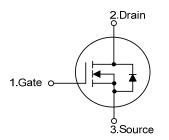
#### DESCRIPTION

The UT C 7N65K is a high voltag e po wer MOSF ET and is designed to have better ch aracteristics, such as fast sw itching time, low gate charge, low on-state resistance and have a high rugged av alanche ch aracteristics. This power MOSFET is usually used at hig h spee d s witching a pplications in s witching po wer supplies and adaptors.

#### **FEATURES**

- $* R_{DS(ON)} < 1.4\Omega @V_{GS} = 10 V$
- \* Ultra low gate charge (typical 29 nC)
- \* Low reverse transfer Capacitance ( C<sub>RSS</sub> = typical 16pF )
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

#### **SYMBOL**

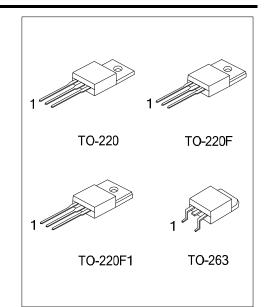


#### **ORDERING INFORMATION**

Ordering Nu	Deelvere	Pin	Assignm	Deaking			
Lead Free	Halogen Free	Package	1	2	3	Packing	
7N65KL-TA3-T 7N65	KG-TA3-T	TO-220	G	D	S	Tube	
7N65KL-TF3-T 7N65	KG-TF3-T	TO-220F	G	D	S	Tube	
7N65KL-TF1-T 7N65	KG-TF1-T	TO-220F1	G	D	S	Tube	
7N65KL-TQ2-T 7N65	KG-TQ2-T	TO-263	G	D	S	Tube	
7N65KL-TQ2-R 7N65	KG-TQ2-R	TO-263	G	D	S	Tape Reel	

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

7N65KL-TA3-T (1)Packing Type (2)Package Type (3)Lead Free	<ul> <li>(1) T: Tube, R: Tape Reel</li> <li>(2) TA3: TO-220 ,TF3: TO-220F, TF1: TO-220F1, TQ2: TO-263</li> <li>(3) L: Lead Free, G: Halogen Free</li> </ul>
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#### ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub> = 25°C, unless otherwise specified)

PARAMETER SYMBOL			RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub> 650		V
Gate-Source Voltage		V <sub>GSS</sub> ±30		V
Avalanche Current (No	ote 2)	I <sub>AR</sub> 7.4		А
Drain Current	Continuous I	<sub>D</sub> 7.4		А
Drain Current	Pulsed (Note 2)	I <sub>DM</sub> 29.6		А
	Single Pulsed (Note 3)	E <sub>AS</sub> 200		mJ
Avalanche Energy	Repetitive (Note 2)	E <sub>AR</sub> 14.2		mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
	TO-220		142 W	
Power Dissipation	TO-220F/TO-220F1 48	PD		W
	TO-263 50			W
Junction Temperature		T <sub>J</sub> +	150	°C
Storage Temperature		T <sub>STG</sub>	-55 ~ +150	

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 = 8.16mH, I<sub>AS</sub> = 7A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25  $\Omega$ , Starting T<sub>J</sub> = 25°C
- $I_{SD} \le 7.4A$ , di/dt $\le 200A/\mu s$ ,  $V_{DD} \le BV_{DSS}$ , Starting  $T_J = 25^{\circ}C$

#### THERMAL DATA

4.

PARAMETER SYMBOL			RATINGS	UNIT
Junction to Ambient		θ <sub>JA</sub>	62.5	°C/W
	TO-220		0.88 °C/W	
Junction to Case	TO-220F/TO-220F1 2.6	θ <sub>JC</sub>		°C/W
	TO-263		2.5	°C/W



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

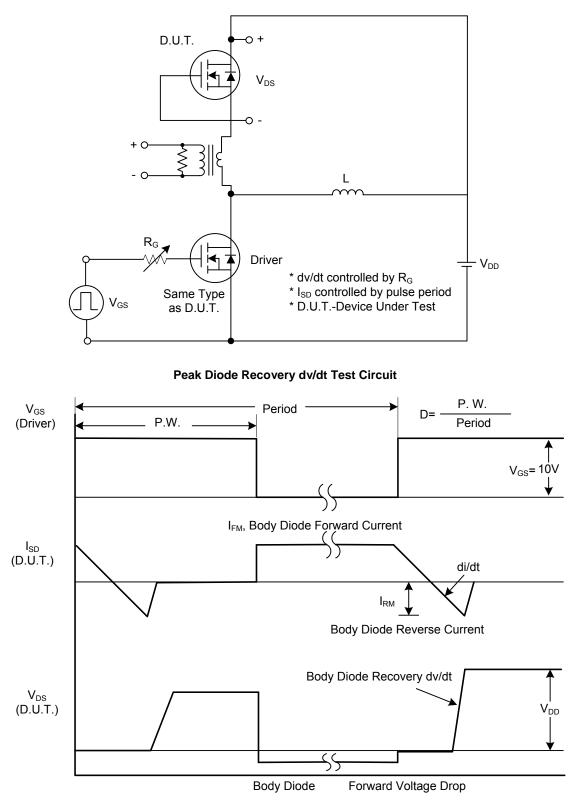
PARAMETER SYMBOL			TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA 650				V
Drain-Source Leakage Current		I <sub>DSS</sub> V	<sub>DS</sub> = 650V, V <sub>GS</sub> = 0V			1	μA
Gate- Source Leakage Current	Forward		$V_{GS} = 30V, V_{DS} = 0V$			100	nA
	Reverse V		$_{\rm GS}$ = -30V, $V_{\rm DS}$ = 0V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS} / \triangle T_J$	I <sub>D</sub> =250µA,Referenced to 25°C		0.67		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		V <sub>GS(TH)</sub>	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.5		4.5	V
Static Drain-Source On-State Res	sistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.7A		1.1	1.4	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance	· · ·					1400	pF
Output Capacitance			V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0 MHz			180	рF
Reverse Transfer Capacitance		C <sub>RSS</sub>			16	21	рF
SWITCHING CHARACTERISTIC	S						
Turn-On Delay Time		t <sub>D(ON)</sub>				70	ns
Turn-On Rise Time		t <sub>R</sub>	V <sub>DD</sub> =325V, I <sub>D</sub> =7.4A		80	170	ns
Turn-Off Delay Time Turn-Off Fall Time		t <sub>D(OFF)</sub>	R <sub>G</sub> =25Ω (Note 1, 2)			140	ns
		t <sub>F</sub>			50	130	ns
SWITCHING CHARACTERISTIC	S	_					
Total Gate Charge	Total Gate Charge		V <sub>DS</sub> =520V, I <sub>D</sub> =7.4A		29	38	nC
Gate-Source Charge		$Q_{GS}$	V <sub>DS</sub> =520V, I <sub>D</sub> =7.4A V <sub>GS</sub> =10 V (Note 1, 2)		7		nC
Gate-Drain Charge		$Q_{GD}$	$V_{GS} = 10$ V (Note 1, 2)	14	.5		nC
DRAIN-SOURCE DIODE CHARA	CTERISTIC	CS AND MAXI	MUM RATINGS				
Drain-Source Diode Forward Volta	age	V <sub>SD</sub>	$V_{GS} = 0V, I_{S} = 7.4 A$			1.4	V
Maximum Continuous Drain-Source Diode						74	^
Forward Current		I <sub>S</sub>				7.4	A
Maximum Pulsed Drain-Source Diode						29.6	Δ
Forward Current		I <sub>SM</sub>				29.0	A
Reverse Recovery Time		t <sub>rr</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 7.4 A		320		ns
Reverse Recovery Charge		Q <sub>RR</sub>	dl <sub>F</sub> / dt = 100A/µs (Note 1)	2.4	4		μC
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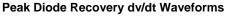
Notes: 1. Pulse Test: Pulse width $\leq$ 300µs, Duty cycle $\leq$ 2%

2. Essentially independent of operating temperature



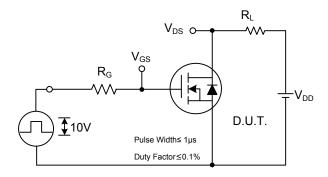
### TEST CIRCUITS AND WAVEFORMS



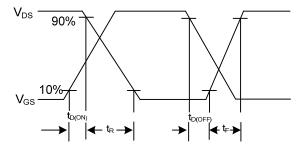




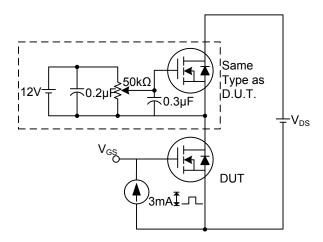
## TEST CIRCUITS AND WAVEFORMS (Cont.)



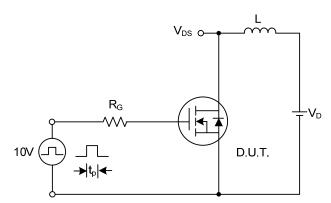
**Switching Test Circuit** 



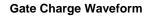
Switching Waveforms

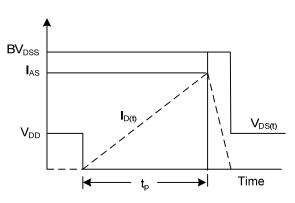


Gate Charge Test Circuit



**Unclamped Inductive Switching Test Circuit** 





**Unclamped Inductive Switching Waveforms** 



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