



# 7N65-M

**Power MOSFET**

## 7.4A, 650V N-CHANNEL POWER MOSFET

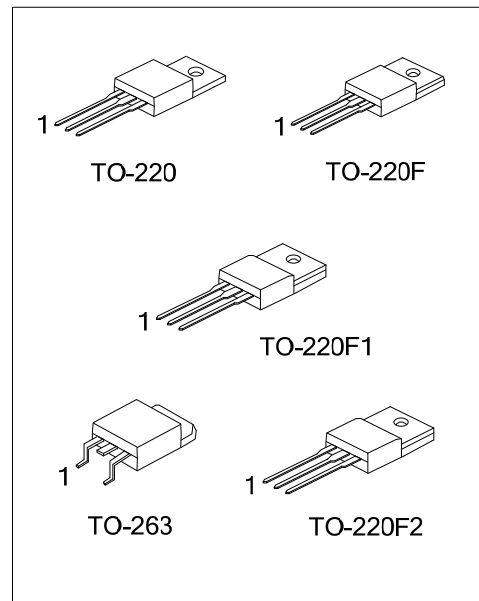
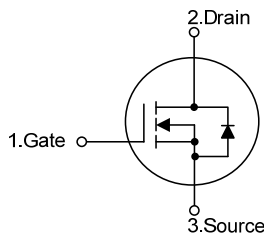
### DESCRIPTION

The UTC **7N65-M** 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 switching power supplies and adaptors.

### FEATURES

- \*  $R_{DS(ON)} < 1.2\Omega$  @  $V_{GS} = 10V, I_D = 3.7A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved  $dv/dt$  capability, high ruggedness

### SYMBOL



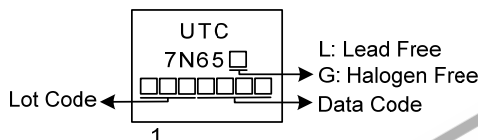
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N65L-TA3-T	7N65G-TA3-T	TO-220	G	D	S	Tube
7N65L-TF3-T	7N65G-TF3-T	TO-220F	G	D	S	Tube
7N65L-TF1-T	7N65G-TF1-T	TO-220F1	G	D	S	Tube
7N65L-TF2-T	7N65G-TF2-T	TO-220F2	G	D	S	Tube
7N65L-TQ2-T	7N65G-TQ2-T	TO-263	G	D	S	Tube
7N65L-TQ2-R	7N65G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>7N65L-TA3-T</p>	<p>(1) T: Tube, R: Tape Reel                  (2) TA3: TO-220, TF1: TO220-F1, TF2: TO-220F2                  TF3: TO-220F, TQ2: TO-263                  (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		$V_{DSS}$	650	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Avalanche Current (Note 2)		$I_{AR}$	7.4	A
Drain Current	Continuous	$I_D$	7.4	A
	Pulsed (Note 2)	$I_{DM}$	29.6	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	530	mJ
	Repetitive (Note 2)	$E_{AR}$	14.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220/TO-263	$P_D$	142	W
	TO-220F/TO-220F1		48	
	TO-220F2		50	
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.  $L = 19.5\text{mH}$ ,  $I_{AS} = 7.4\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 7.4\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

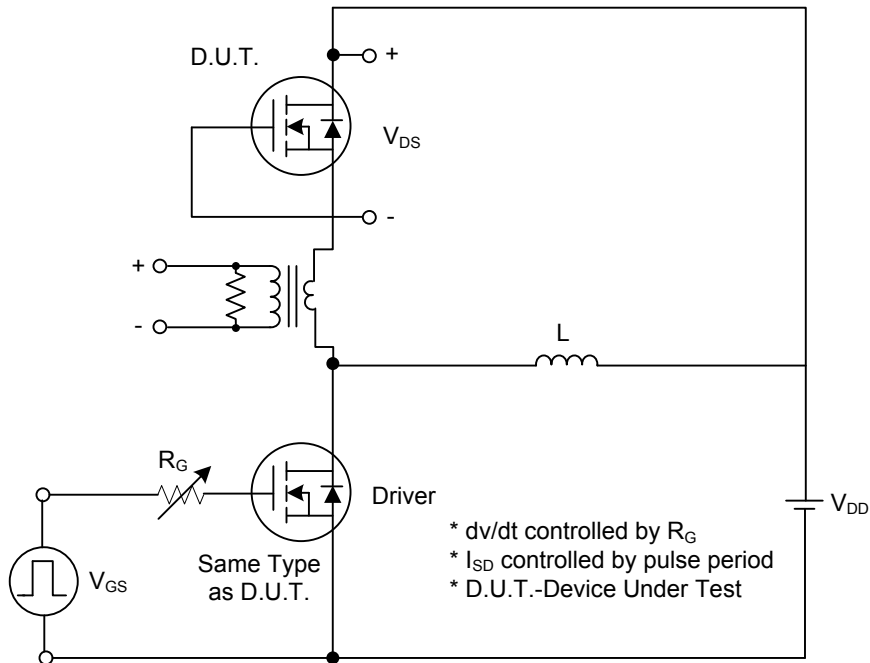
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-263	$\theta_{JC}$	0.88	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		2.6	
	TO-220F2		2.5	

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

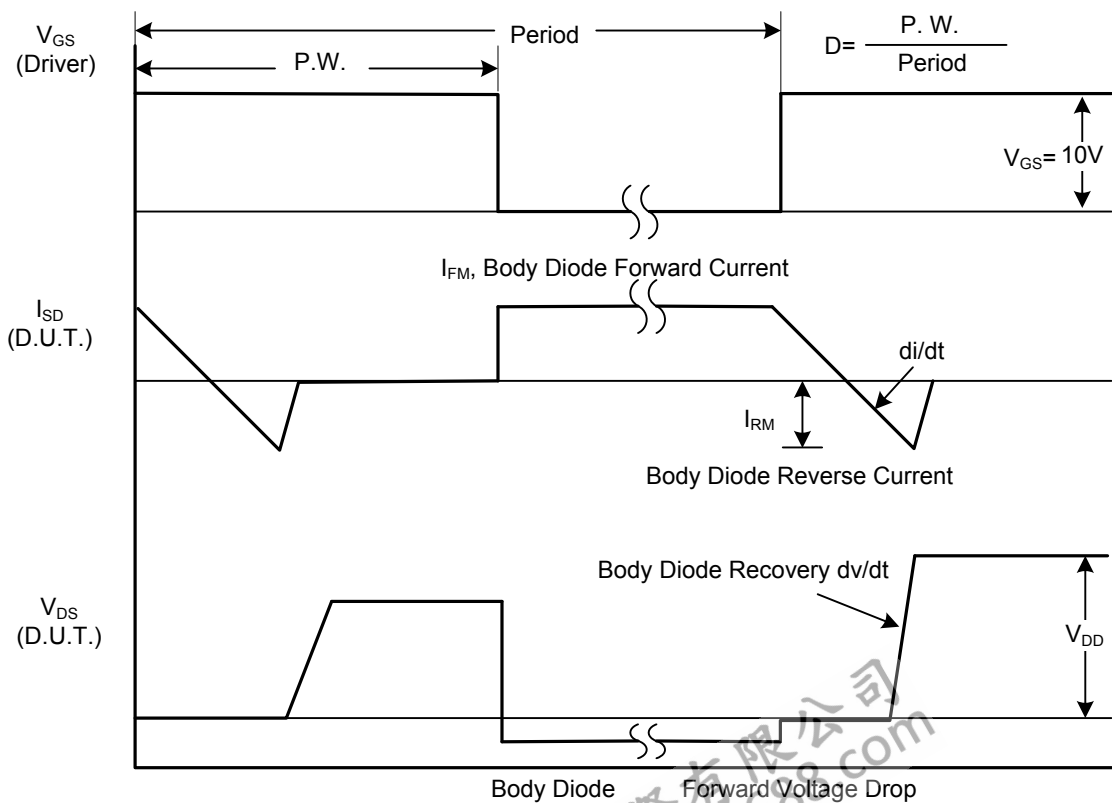
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	650			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V			1	μA
		V <sub>DS</sub> =520V, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C			100	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>				
	Reverse					
		V <sub>GS</sub> =30V, V <sub>DS</sub> =0V			100	nA
		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA, Referenced to 25°C		0.67		V/°C
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.7A		1.07	1.2	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0 MHz		700	1400	pF
Output Capacitance	C <sub>OSS</sub>			100	200	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			20	40	pF
Gate Resistance	R <sub>G</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz		0.8	5.0	Ω
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =325V, I <sub>D</sub> =7.4A, R <sub>G</sub> =25Ω (Note 1, 2)		72	95	ns
Turn-On Rise Time	t <sub>R</sub>			58	75	ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			308	350	ns
Turn-Off Fall Time	t <sub>F</sub>			64	80	ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =520V, I <sub>D</sub> =7.4A, V <sub>GS</sub> =10V (Note 1, 2)		130	140	nC
Gate-Source Charge	Q <sub>GS</sub>			18		nC
Gate-Drain Charge	Q <sub>GD</sub>			23		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 7.4 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				7.4	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				29.6	A
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 7.4 A, dI <sub>F</sub> / dt = 100A/μs (Note 1)		320		ns
Reverse Recovery Charge	Q <sub>RR</sub>			2.4		μC

- Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%  
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

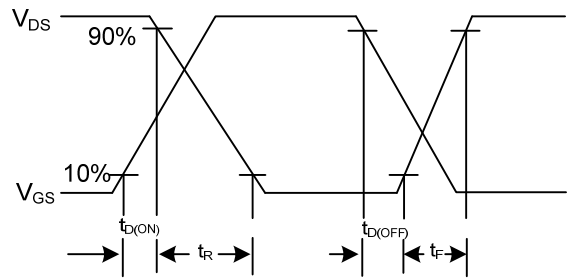
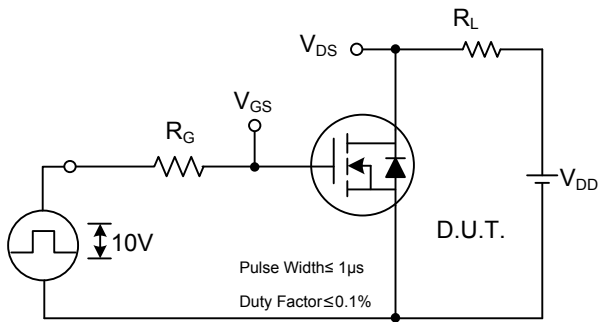


Peak Diode Recovery dv/dt Test Circuit



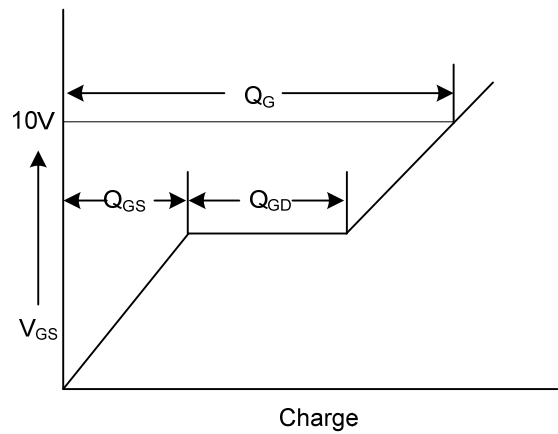
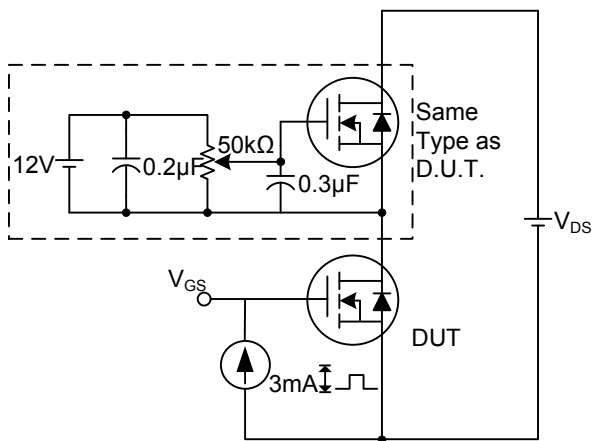
Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)



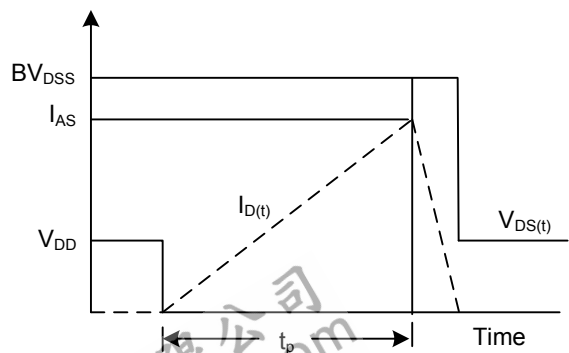
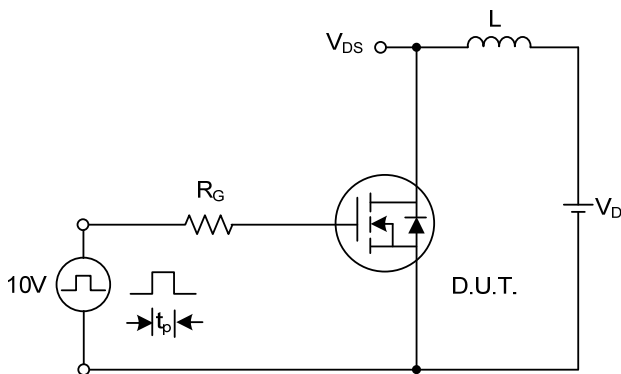
Switching Test Circuit

Switching Waveforms



Gate Charge Test Circuit

Gate Charge Waveform



Unclamped Inductive Switching Test Circuit

Unclamped Inductive Switching Waveforms

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