



# 7NM70

**Power MOSFET**

## 7A, 700V N-CHANNEL POWER MOSFET

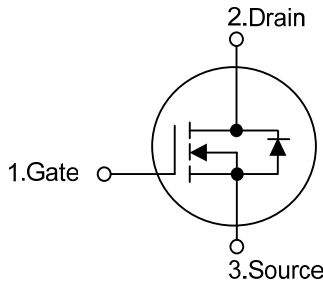
■ DESCRIPTION

The **UTC 7NM70** is a high voltage super junction 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 power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

- \*  $R_{DS(ON)} < 1.2\Omega @ V_{GS} = 10V, I_D = 3.5A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

■ SYMBOL

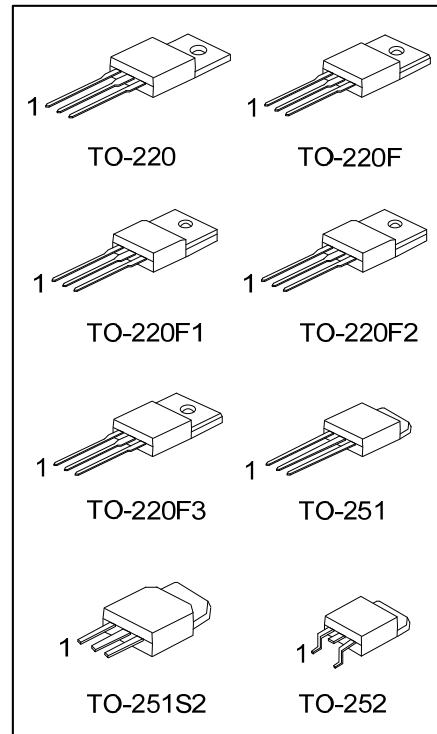


■ ORDERING INFORMATION

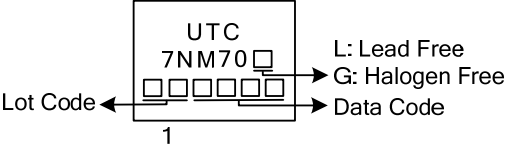
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7NM70L-TA3-T	7NM70G-TA3-T	TO-220	G	D	S	Tube
7NM70L-TF3-T	7NM70G-TF3-T	TO-220F	G	D	S	Tube
7NM70L-TF1-T	7NM70G-TF1-T	TO-220F1	G	D	S	Tube
7NM70L-TF2-T	7NM70G-TF2-T	TO-220F2	G	D	S	Tube
7NM70L-TF3T-T	7NM70G-TF3T-T	TO-220F3	G	D	S	Tube
7NM70L-TM3-T	7NM70G-TM3-T	TO-251	G	D	S	Tube
7NM70L-TMS2-T	7NM70G-TMS2-T	TO-251S2	G	D	S	Tube
7NM70L-TN3-R	7NM70G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>7N65KL-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220F, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TF3T: TO-220F3, TM3: TO-251, TMS2: TO-251S2, TN3: TO-252 (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		$V_{DSS}$	700	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$T_C = 25^\circ\text{C}$	$I_D$	7.0	A
	$T_C = 100^\circ\text{C}$		4.7	A
Drain Current Pulsed (Note 2)		$I_{DM}$	28	A
Avalanche Energy, Single Pulsed (Note 3)		$E_{AS}$	40	mJ
Avalanche Energy, Repetitive, Limited by $T_{JMAX}$		$E_{AR}$	14.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.2	V/ns
Power Dissipation ( $T_C = 25^\circ\text{C}$ )	TO-220	$P_D$	142	W
	TO-220F/TO-220F1		48	W
	TO-220F3			
	TO-220F2		50	W
	TO-251/TO-251S2 TO-252		60	W
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  $T_J$

3.  $L=20\text{mH}$ ,  $I_{AS}=2\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=0\ \Omega$ , Starting  $T_J=25^\circ\text{C}$

4.  $I_{SD} \leq 7.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	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-251S2 TO-252				110
	Junction to Case	TO-220	$\theta_{JC}$	0.88	$^\circ\text{C}/\text{W}$
		TO-220F/TO-220F1 TO-220F3		2.6	
TO-220F2		2.5			
TO-251/TO-251S2 TO-252		2.08			

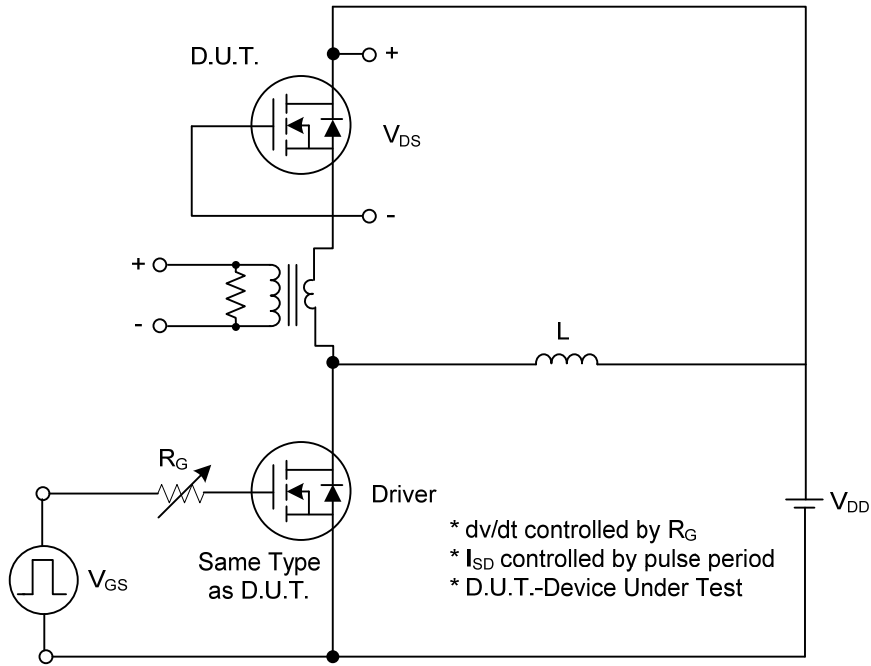
■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	700			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 700V, V_{GS} = 0V$			1	$\mu A$
		$V_{DS} = 560V, T_C = 125^\circ\text{C}$			1	$\mu A$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse					
		$V_{GS} = -30V, V_{DS} = 0V$			-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250mA$ Referenced to $25^\circ\text{C}$		0.67		$V/^\circ\text{C}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0		4.0	V
Drain-Source ON-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 3.5A$			1.2	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1MHz$		340		pF
Output Capacitance	$C_{OSS}$			120		pF
Reverse Transfer Capacitance	$C_{RSS}$			6.5		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	$Q_G$	$V_{DS} = 50V, V_{GS} = 10V$ $I_D = 1.3A, I_G = 100\mu A$ (Note 1, 2)		19		nC
Gate-Source Charge	$Q_{GS}$			5		nC
Gate-Drain Charge	$Q_{DD}$			5.2		nC
Turn-on Delay Time	$t_{D(ON)}$	$V_{DD} = 30V, V_{GS} = 10V$ $I_D = 0.5A, R_G = 25\Omega$ (Note 1, 2)		50		ns
Turn-on Rise Time	$t_R$			70		ns
Turn-off Delay Time	$t_{D(OFF)}$			140		ns
Turn-off Fall Time	$t_F$			65		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0V, I_S = 7.0A$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				7.0	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				28	A
Reverse Recovery Time	$t_{rr}$	$V_{GS} = 0V, I_S = 7.0A,$ $di/dt = 100 A/\mu s$		317		ns
Reverse Recovery Charge (Note 1)	$Q_{RR}$			3.03		$\mu C$

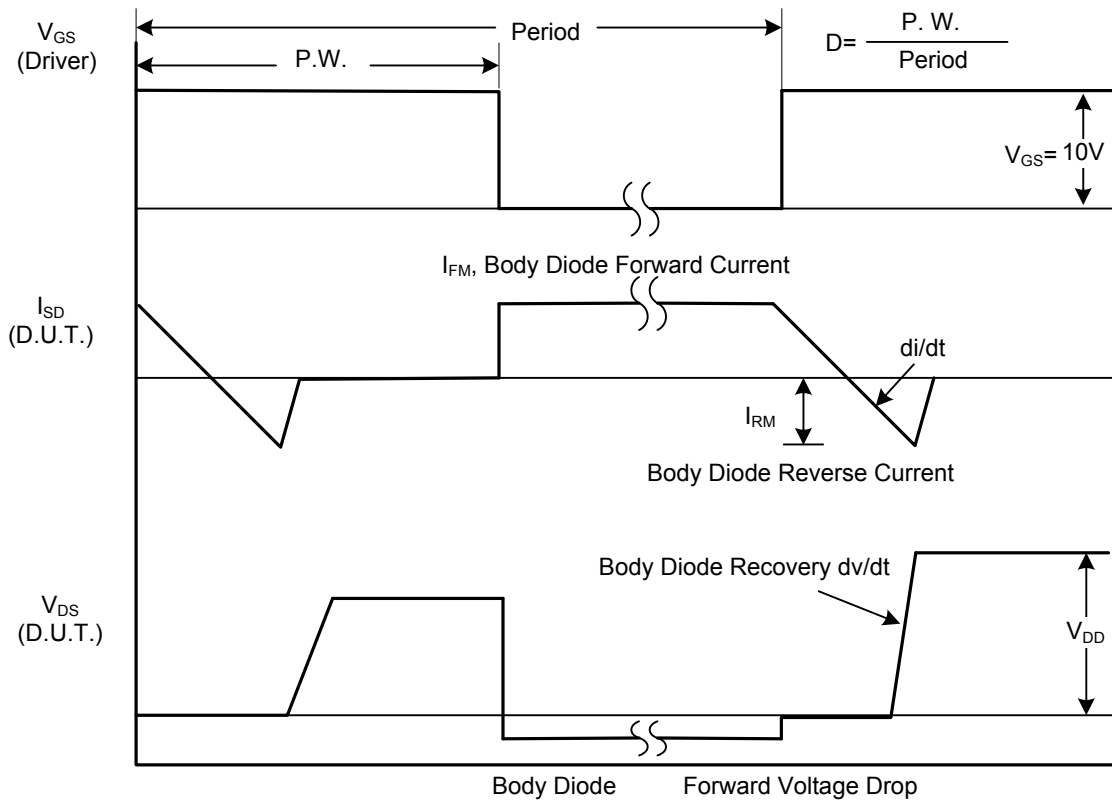
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

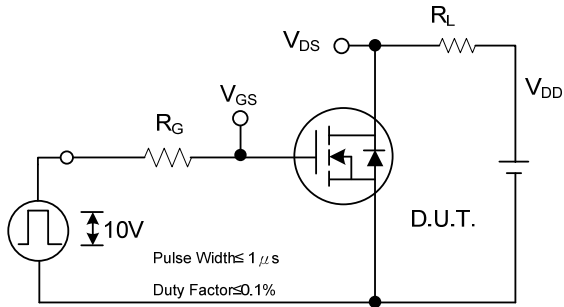


Peak Diode Recovery dv/dt Test Circuit

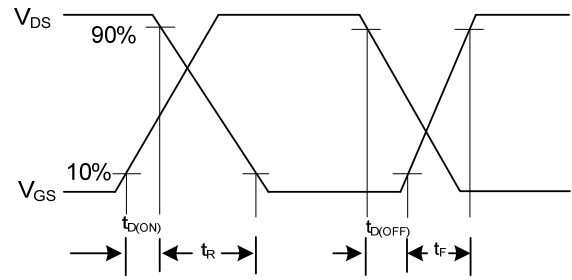


Peak Diode Recovery dv/dt Waveforms

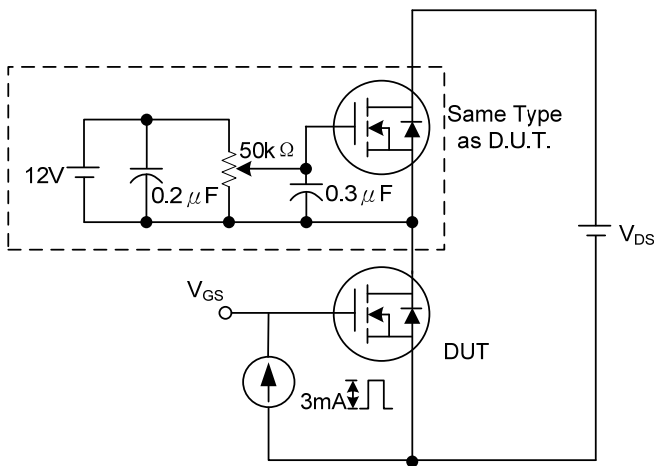
## TEST CIRCUITS AND WAVEFORMS (Cont.)



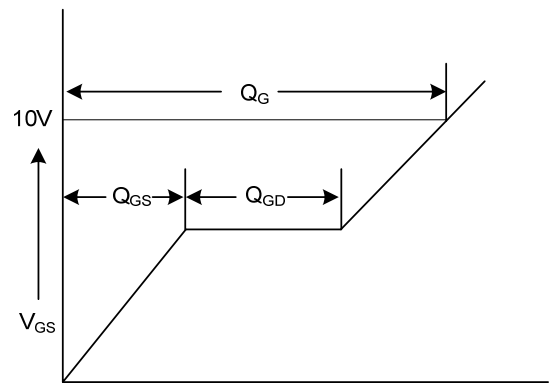
Switching Test Circuit



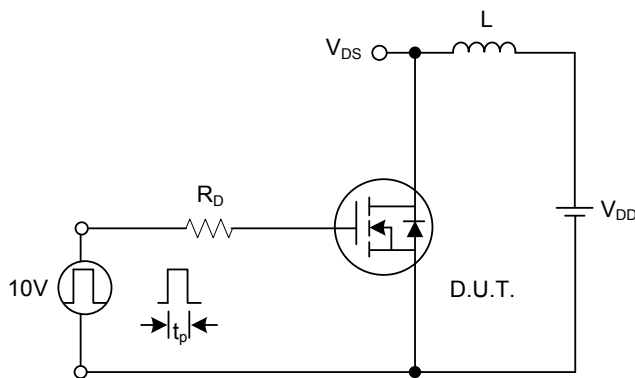
Switching Waveforms



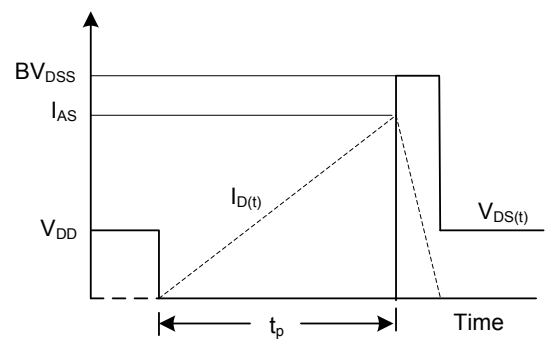
Gate Charge Test Circuit



Gate Charge Waveform

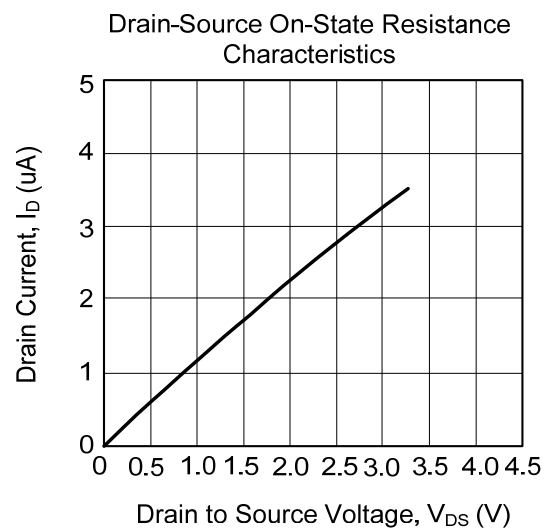
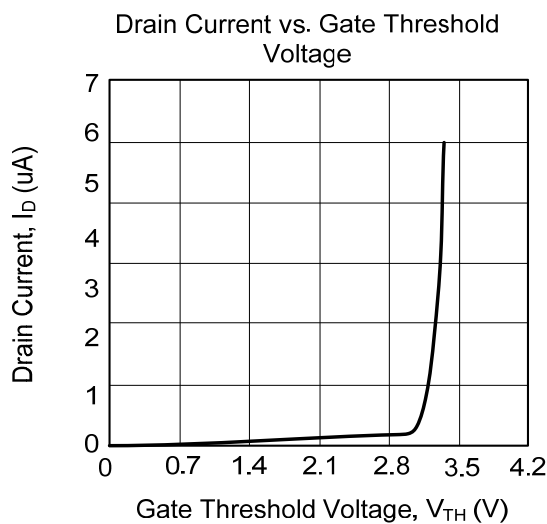
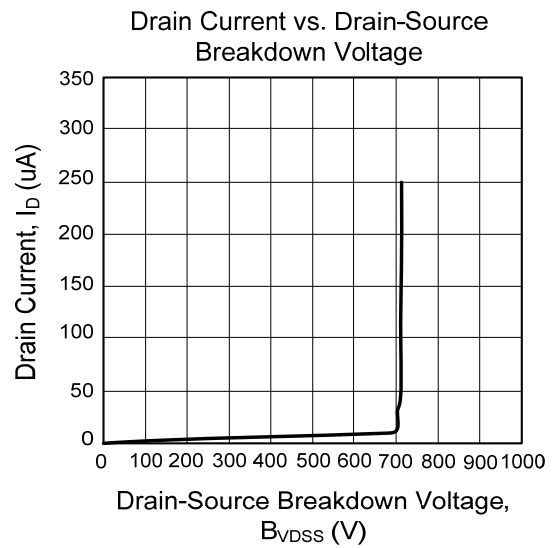
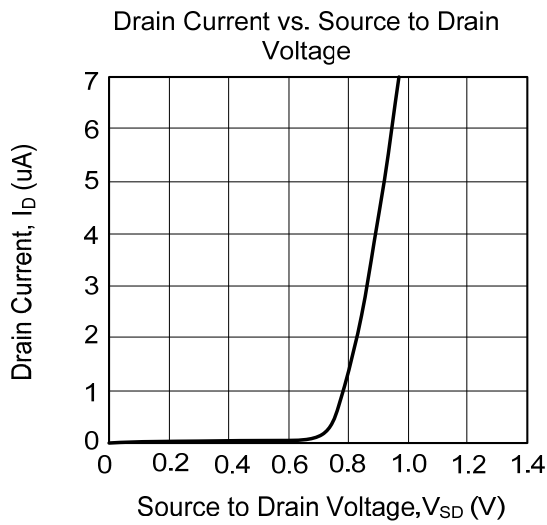


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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