



7NM70

Power MOSFET

7A, 700V N-CHANNEL POWER MOSFET

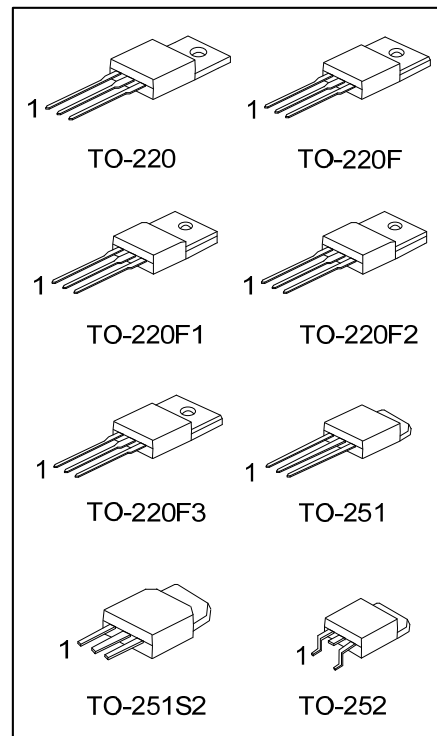
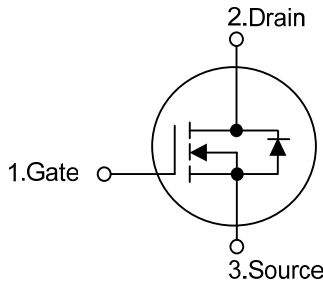
■ DESCRIPTION

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



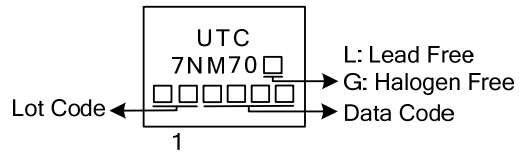
■ ORDERING INFORMATION

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}	± 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	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S2 TO-252		110	
Junction to Case	TO-220	θ_{JC}	0.88	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		2.6	
	TO-220F3			
	TO-220F2		2.5	
	TO-251/TO-251S2 TO-252		2.08	

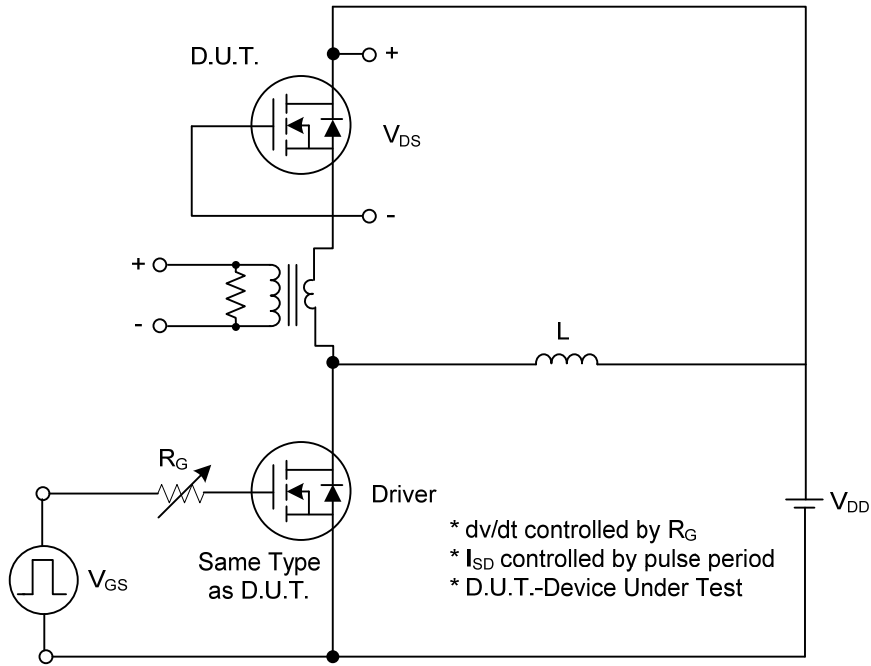
■ ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
OFF CHARACTERISTICS							
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	μA	
		$V_{DS} = 560V, T_C = 125^\circ\text{C}$			1	μA	
Gate-Source Leakage Current	Forward	I_{GSS}			100	nA	
	Reverse						$V_{GS} = 30V, V_{DS} = 0V$
		$V_{GS} = -30V, V_{DS} = 0V$			-100	nA	
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250mA$ Referenced to 25°C		0.67		$V/^\circ\text{C}$	
ON CHARACTERISTICS							
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	Ω	
DYNAMIC CHARACTERISTICS							
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
SWITCHING CHARACTERISTICS							
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
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
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		μC

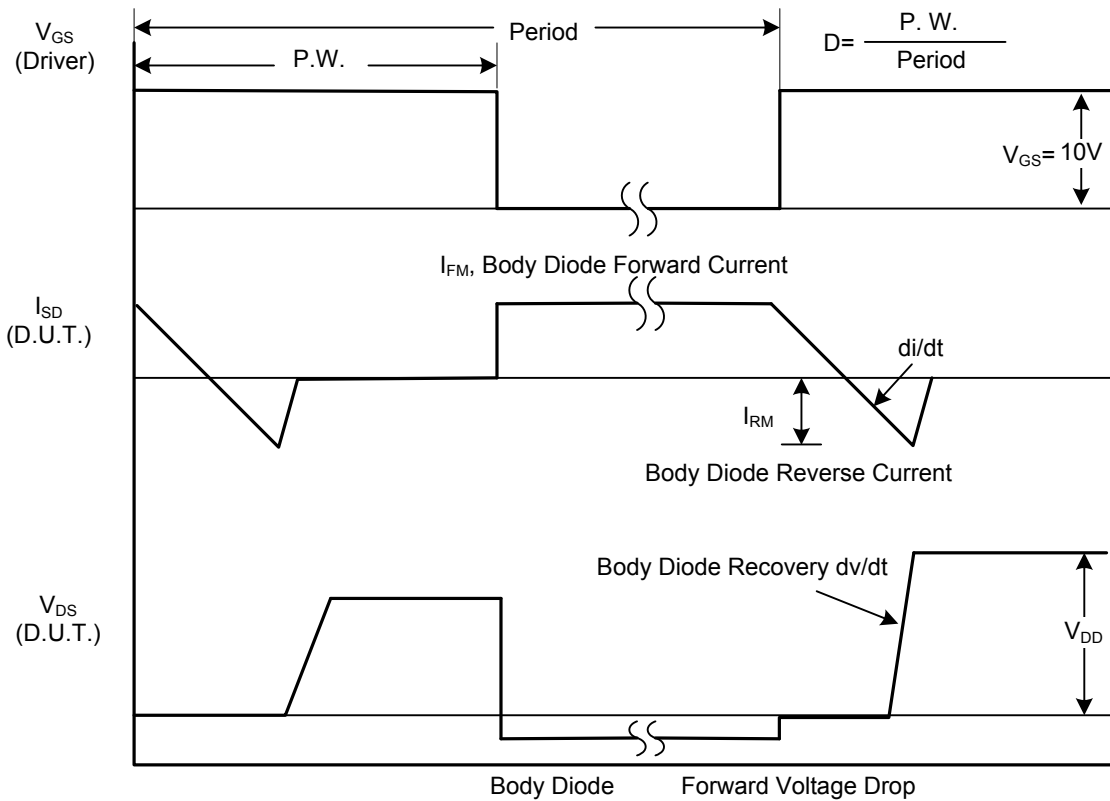
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

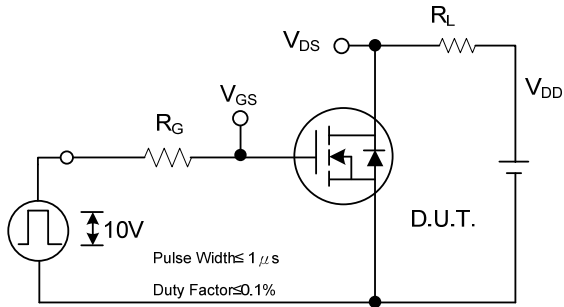


Peak Diode Recovery dv/dt Test Circuit

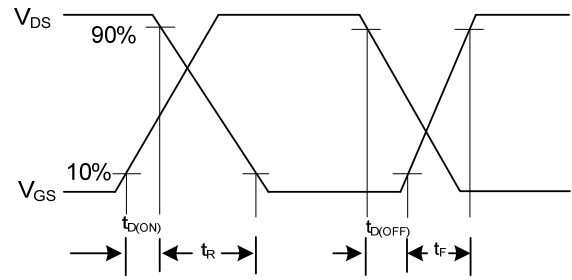


Peak Diode Recovery dv/dt Waveforms

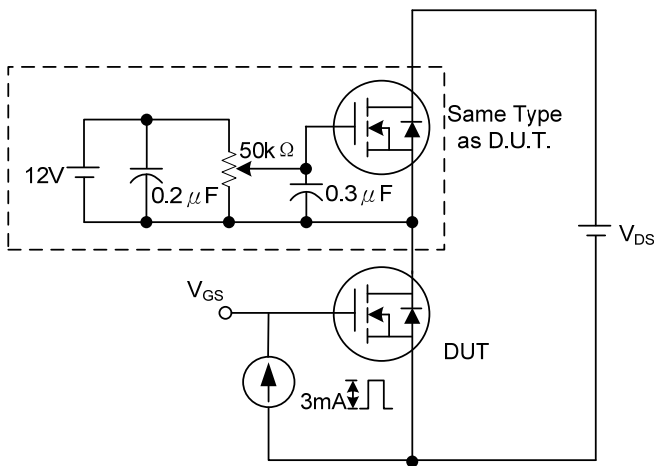
TEST CIRCUITS AND WAVEFORMS (Cont.)



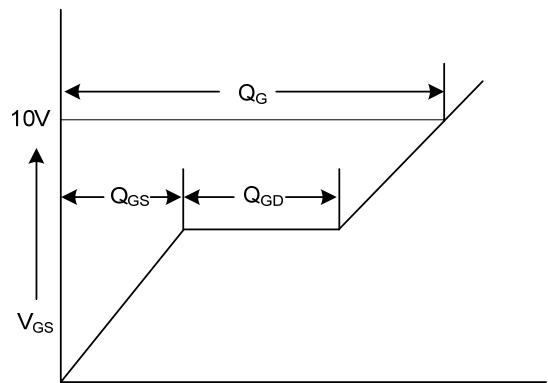
Switching Test Circuit



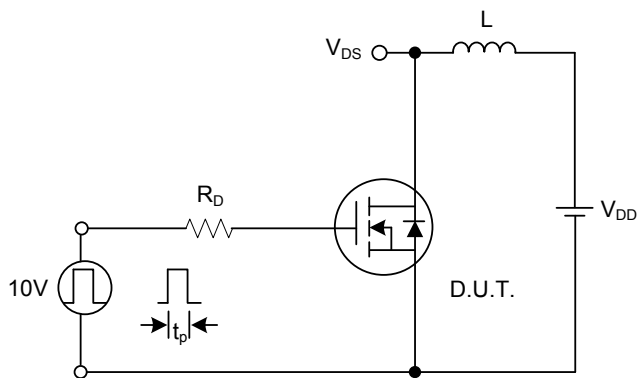
Switching Waveforms



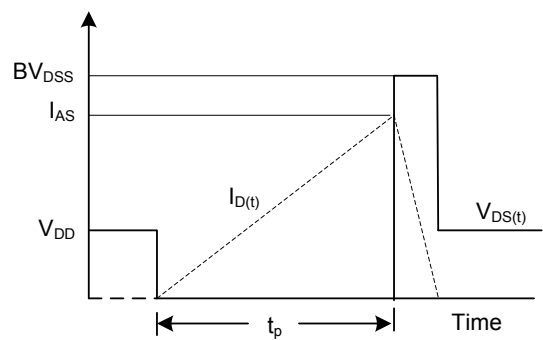
Gate Charge Test Circuit



Gate Charge Waveform

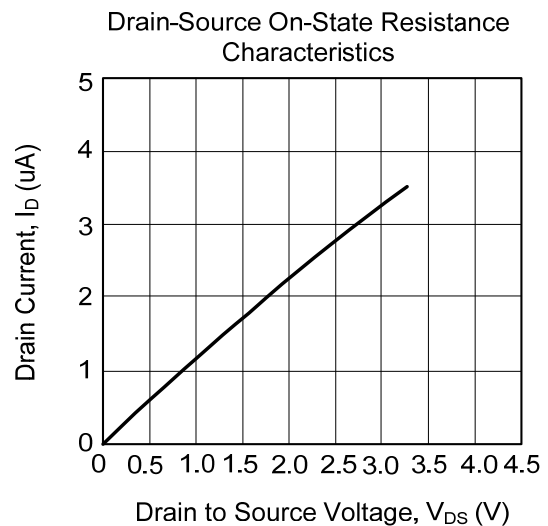
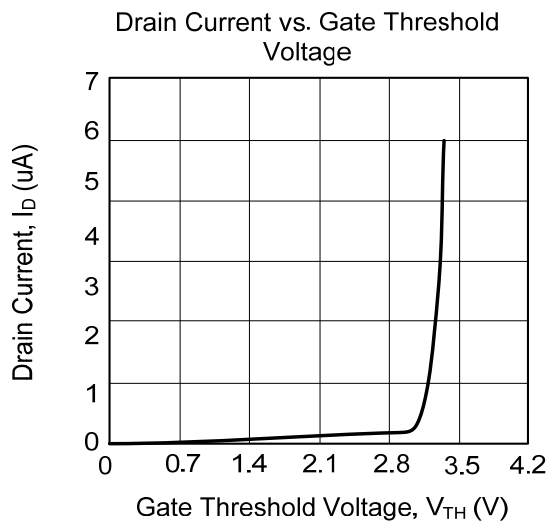
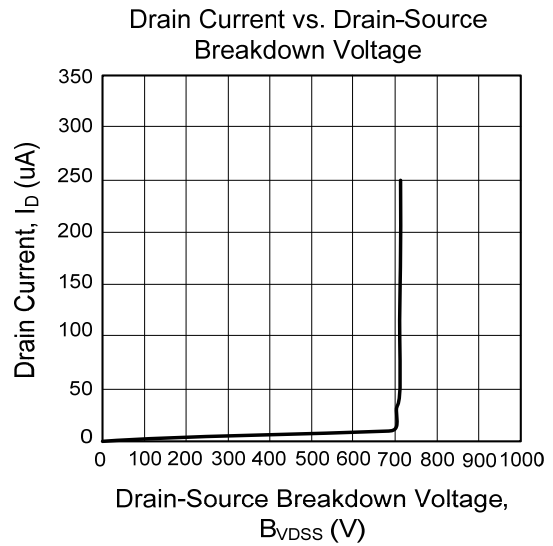
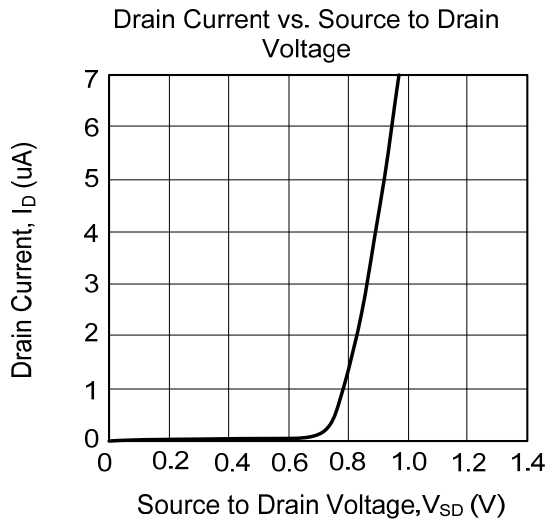


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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