



5N70K-MT

Power MOSFET

5A, 700V N-CHANNEL POWER MOSFET

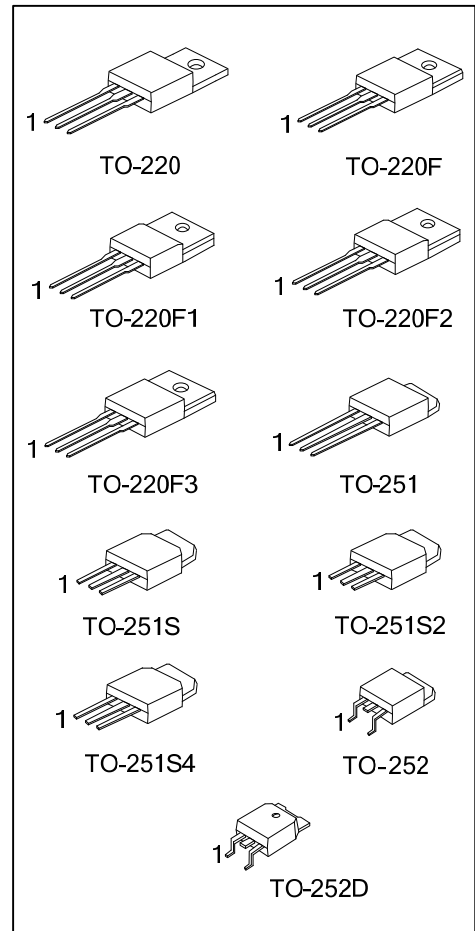
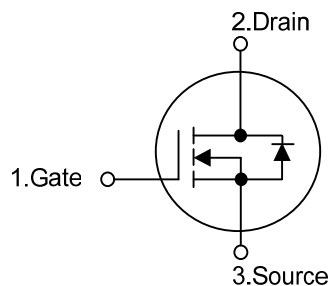
■ DESCRIPTION

The UTC **5N70K-MT** is a high voltage power MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications at power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

- * $R_{DS(ON)} < 2.4\Omega$ @ $V_{GS} = 10V$, $I_D = 2.5 A$
- * Fast Switching Capability
- * Improved dv/dt Capability, High Ruggedness

■ SYMBOL



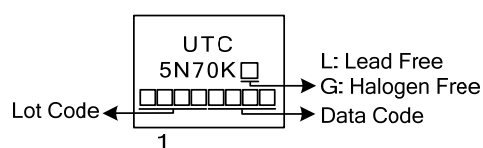
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N70KL-TA3-T	5N70KG-TA3-T	TO-220	G	D	S	Tube
5N70KL-TF3-T	5N70KG-TF3-T	TO-220F	G	D	S	Tube
5N70KL-TF1-T	5N70KG-TF1-T	TO-220F1	G	D	S	Tube
5N70KL-TF2-T	5N70KG-TF2-T	TO-220F2	G	D	S	Tube
5N70KL-TF3-T	5N70KG-TF3-T	TO-220F3	G	D	S	Tube
5N70KL-TM3-T	5N70KG-TM3-T	TO-251	G	D	S	Tube
5N70KL-TMS-T	5N70KG-TMS-T	TO-251S	G	D	S	Tube
5N70KL-TMS2-T	5N70KG-TMS2-T	TO-251S2	G	D	S	Tube
5N70KL-TMS4-T	5N70KG-TMS4-T	TO-251S4	G	D	S	Tube
5N70KL-TN3-R	5N70KG-TN3-R	TO-252	G	D	S	Tape Reel
5N70KL-TND-R	5N70KG-TND-R	TO-252D	G	D	S	Tape Reel

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

5N70KL-TA3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F3, TM3: TO-251 TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TND: TO-252D (3) L: Lead Free, G: Halogen Free and Lead Free
---	--

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
Avalanche Current (Note 2)		I_{AR}	5	A
Continuous Drain Current		I_D	5	A
Pulsed Drain Current (Note 2)		I_{DM}	20	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	150	mJ
	Repetitive (Note 2)	E_{AR}	10	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	108	W
	TO-220F/TO-220F1 TO-220F3		36	W
	TO-220F2		38	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		54	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Operation Temperature		T_{OPR}	-55~+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. Pulse width limited by $T_{J(MAX)}$

3. $L=12\text{mH}$, $I_{AS}=5\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 5\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		110	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	1.15	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F3		3.47	$^\circ\text{C}/\text{W}$
	TO-220F2		3.28	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		2.30	$^\circ\text{C}/\text{W}$

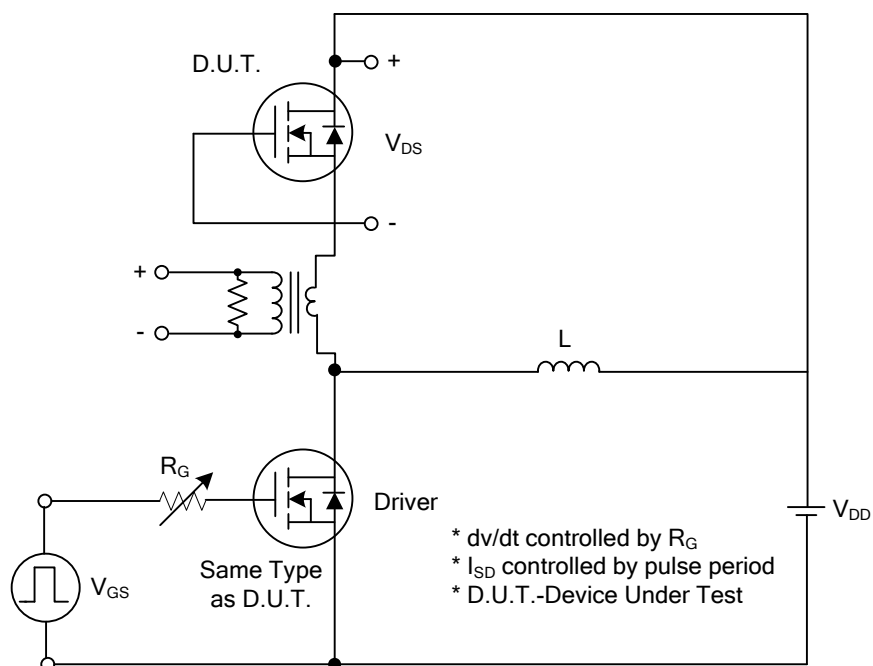
■ **ELECTRICAL CHARACTERISTICS** ($T_C = 25^\circ\text{C}$ unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D = 250μA	700			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =700V, V _{GS} = 0V			1	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V, V _{DS} = 0V			100	nA
	Reverse		V _{GS} =-30V, V _{DS} = 0V			-100	
Breakdown Voltage Temperature Coefficient		ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C		0.6		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D = 2.5A		1.86	2.4	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz		515	670	pF
Output Capacitance		C _{OSS}			55	72	pF
Reverse Transfer Capacitance		C _{RSS}			6.5	8.5	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		t _{D(ON)}	V _{DD} = 30V, I _D =0.5A, R _G = 25Ω (Note 1, 2)		50		ns
Turn-On Rise Time		t _R			40		ns
Turn-Off Delay Time		t _{D(OFF)}			180		ns
Turn-Off Fall Time		t _F			52		ns
Total Gate Charge		Q _G	V _{DS} = 50 V, I _D = 1.3A, V _{GS} = 10 V (Note 1, 2)		18	23	nC
Gate-Source Charge		Q _{GS}			6.7		nC
Gate-Drain Charge		Q _{GD}			3.9		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} = 0 V, I _S = 5A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I _S				5	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				20	A

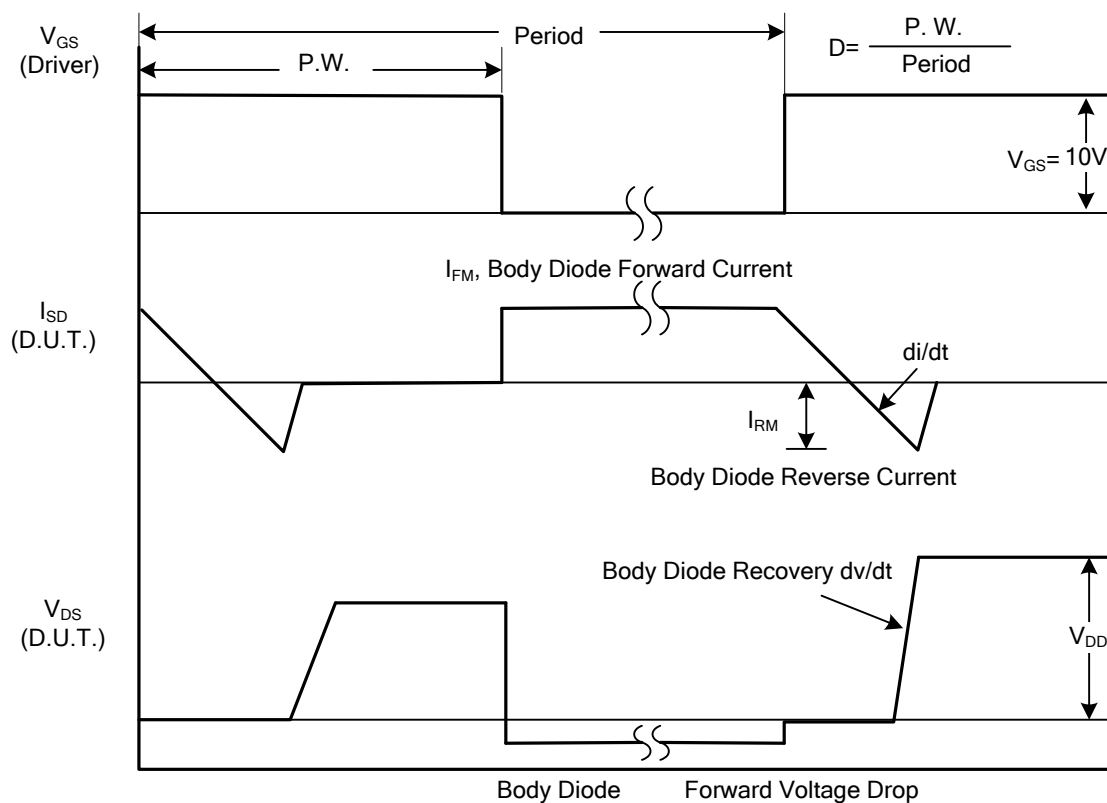
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

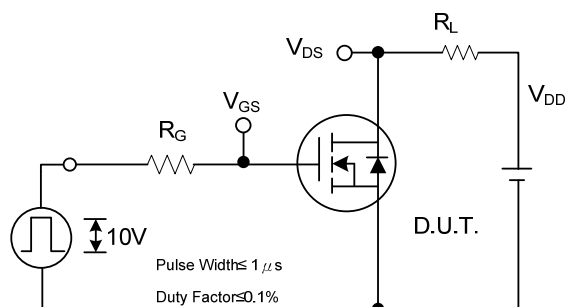


Peak Diode Recovery dv/dt Test Circuit

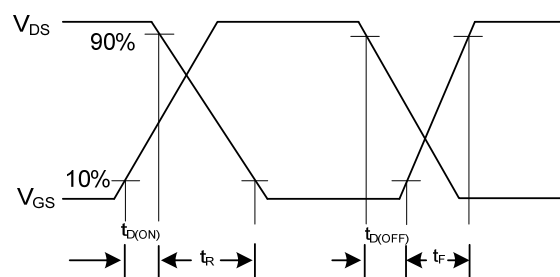


Peak Diode Recovery dv/dt Waveforms

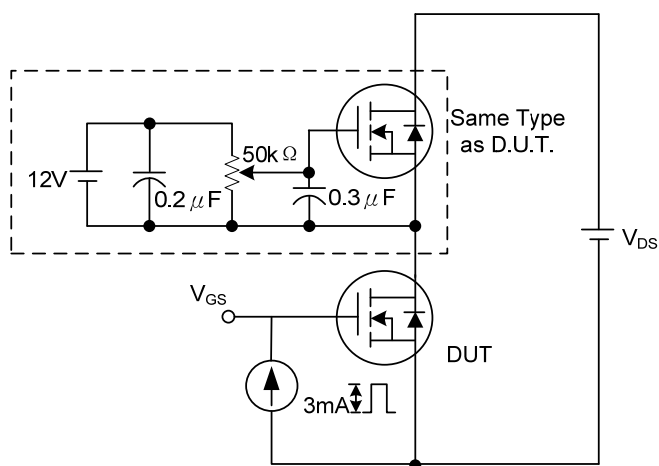
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



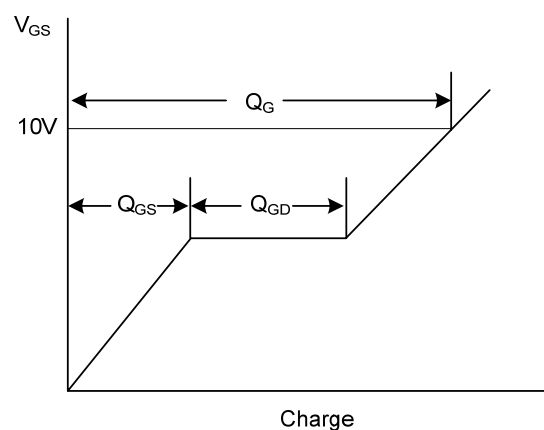
Switching Test Circuit



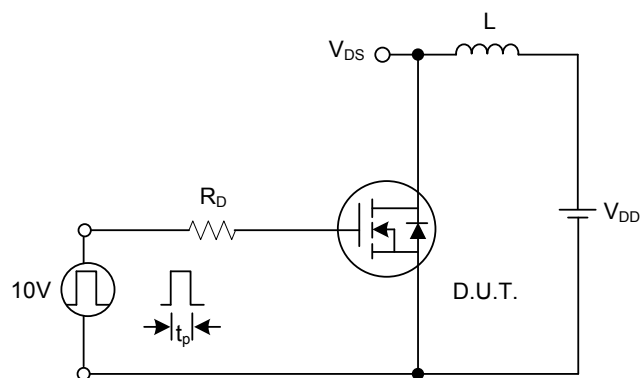
Switching Waveforms



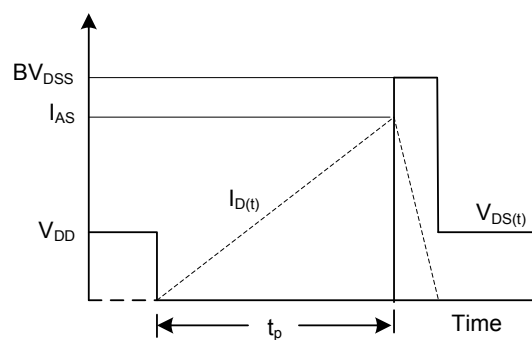
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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.