



6N70K-MTQ

Power MOSFET

6.0A, 700V N-CHANNEL POWER MOSFET

DESCRIPTION

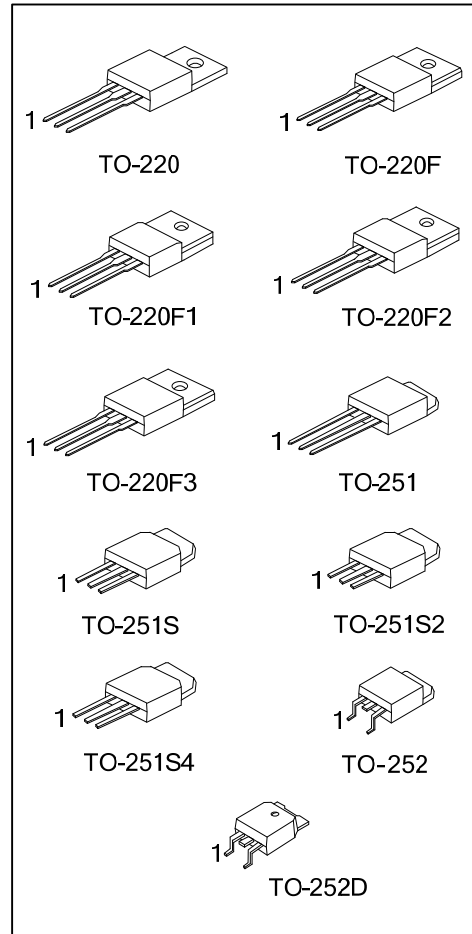
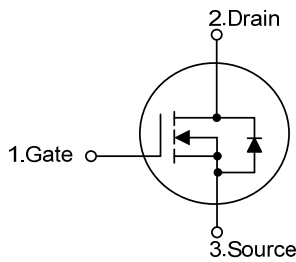
The UTC **6N70K-MTQ** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, high switching speed, low gate charge and low input capacitance.

The UTC **6N70K-MTQ** is universally applied in high efficiency switch mode power supply.

FEATURES

- * $R_{DS(ON)} < 2.4\Omega$ @ $V_{GS} = 10V$, $I_D = 3 A$
- * High switching speed

SYMBOL



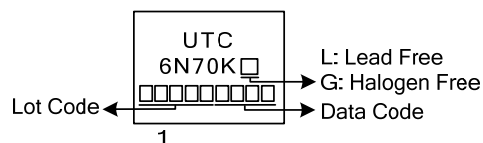
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N70KL-TA3-T	6N70KG-TA3-T	TO-220	G	D	S	Tube
6N70KL-TF3-T	6N70KG-TF3-T	TO-220F	G	D	S	Tube
6N70KL-TF1-T	6N70KG-TF1-T	TO-220F1	G	D	S	Tube
6N70KL-TF2-T	6N70KG-TF2-T	TO-220F2	G	D	S	Tube
6N70KL-TF3-T	6N70KG-TF3-T	TO-220F3	G	D	S	Tube
6N70KL-TM3-T	6N70KG-TM3-T	TO-251	G	D	S	Tube
6N70KL-TMS-T	6N70KG-TMS-T	TO-251S	G	D	S	Tube
6N70KL-TMS2-T	6N70KG-TMS2-T	TO-251S2	G	D	S	Tube
6N70KL-TMS4-T	6N70KG-TMS4-T	TO-251S4	G	D	S	Tube
6N70KL-TN3-R	6N70KG-TN3-R	TO-252	G	D	S	Tape Reel
6N70KL-TND-R	6N70KG-TND-R	TO-252D	G	D	S	Tape Reel

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

<p>6N70KL-TA3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(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</p> <p>(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 (Note 2)		V_{GSS}	± 30	V		
Drain Current	Continuous $T_C=25^\circ\text{C}$	I_D	6	A		
	Pulsed	I_{DM}	24	A		
Avalanche Current (Note 2)		I_{AR}	6	A		
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	75	mJ		
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.5	V/ns		
Power Dissipation	TO-220	P_D	125	W		
	TO-220F/TO-220F1 TO-220F2/TO-220F3		42			
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		55			
	TO-220		1			
Linear Derating Factor	TO-220F		0.32	W/ $^\circ\text{C}$		
	TO-220F1/TO-220F2 TO-220F3		0.336			
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		0.44			
	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. $L = 5\text{mH}$, $I_{AS} = 5.5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 6\text{A}$, $di/dt \leq 140\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

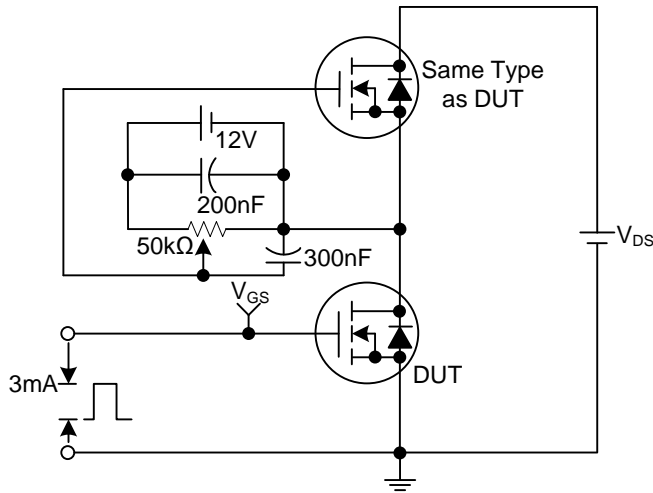
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		110	
Junction to Case	TO-220	θ_{JC}	3.1	$^\circ\text{C}/\text{W}$
	TO-220F		1.0	
	TO-220F1/TO-220F2 TO-220F3		2.9	
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		2.27	

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

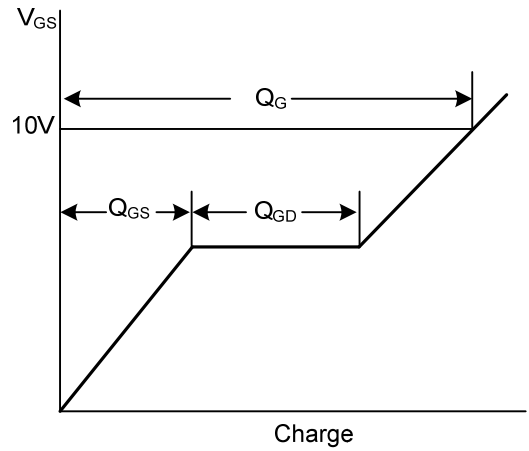
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	700			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu\text{A}$		0.79		$V/^\circ\text{C}$
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=700\text{V}$, $V_{GS}=0\text{V}$			1	μA
			$V_{DS}=560\text{V}$, $T_C=125^\circ\text{C}$			250	μA
Gate-Source Leakage Current	Forward	I_{GSS}	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$			+100	nA
	Reverse		$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=3\text{A}$ (Note 1)		2.0	2.4	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$ (Note 1, 2)		480		pF
Output Capacitance		C_{OSS}			65		pF
Reverse Transfer Capacitance		C_{RSS}			7.5		pF
SWITCHING PARAMETERS							
Turn-ON Delay Time		$t_{D(ON)}$	$V_{DD}=30\text{V}$, $I_D=0.5\text{A}$, $R_G=25\Omega$ $V_{GS}=10\text{V}$		70		ns
Rise Time		t_R			61		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			140		ns
Fall-Time		t_F			41		ns
Total Gate Charge		Q_G	$V_{GS}=10\text{V}$, $V_{DS}=50\text{V}$, $I_D=1.3\text{A}$, $I_G=100\mu\text{A}$ (Note 1, 2)		45		nC
Gate to Source Charge		Q_{GS}			7		nC
Gate to Drain Charge		Q_{GD}			7		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S	Integral reverse pn-diode in the MOSFET			6	A
Maximum Body-Diode Pulsed Current (Note 3)		I_{SM}				24	A
Drain-Source Diode Forward Voltage (Note 2)		V_{SD}	$I_S=6\text{A}$, $V_{GS}=0\text{V}$, $T_J = 25^\circ\text{C}$			1.4	V

- Notes: 1. Pulse Test: Pulse width $\leq 250\mu\text{s}$, Duty cycle $\leq 2\%$
 2. Essentially independent of operating temperature
 3. Repetitive Rating: Pulse width limited by maximum junction temperature

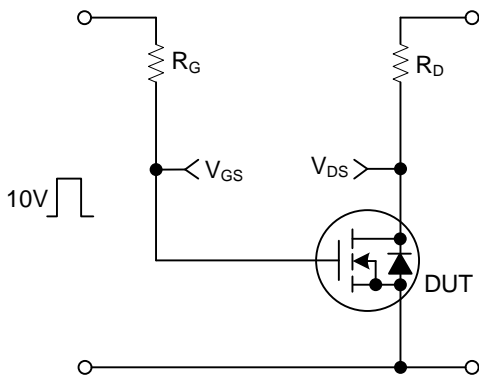
TEST CIRCUITS AND WAVEFORMS



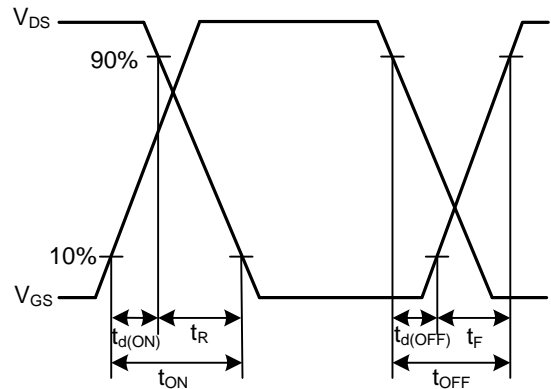
Gate Charge Test Circuit



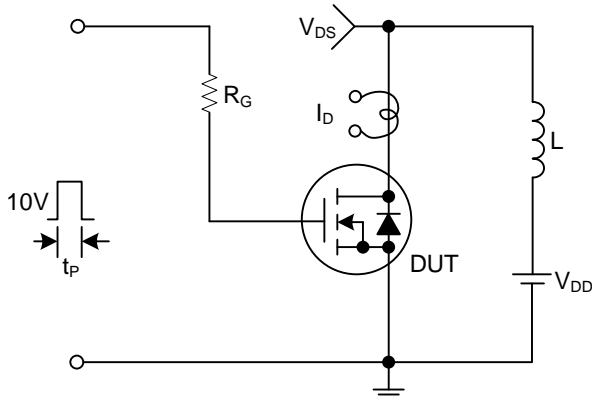
Gate Charge Waveforms



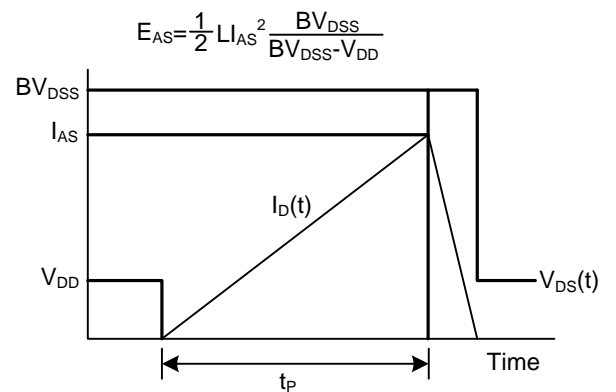
Resistive Switching Test Circuit



Resistive Switching Waveforms

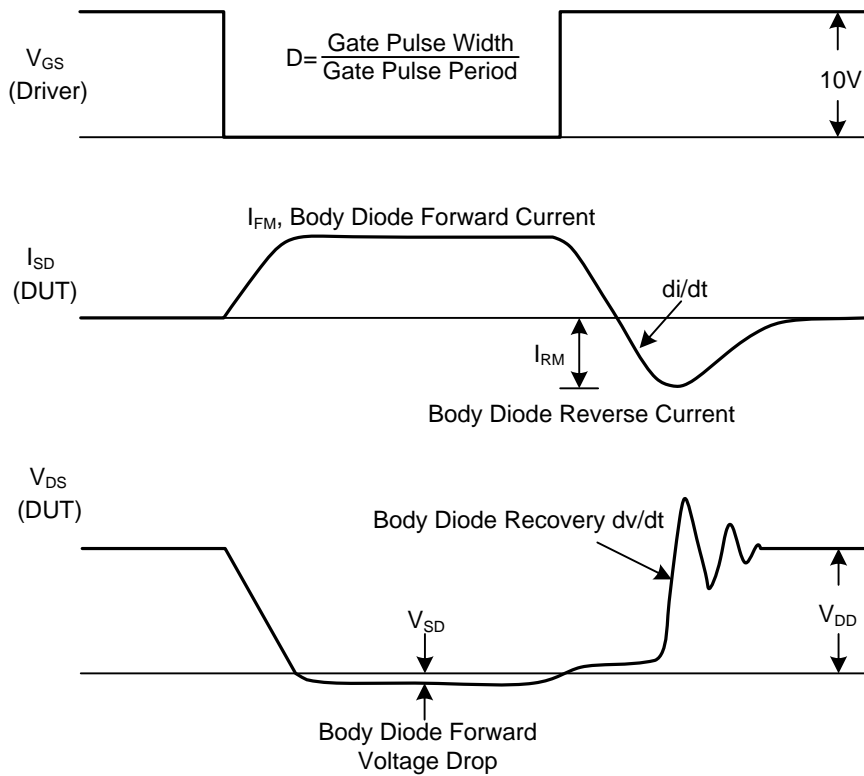
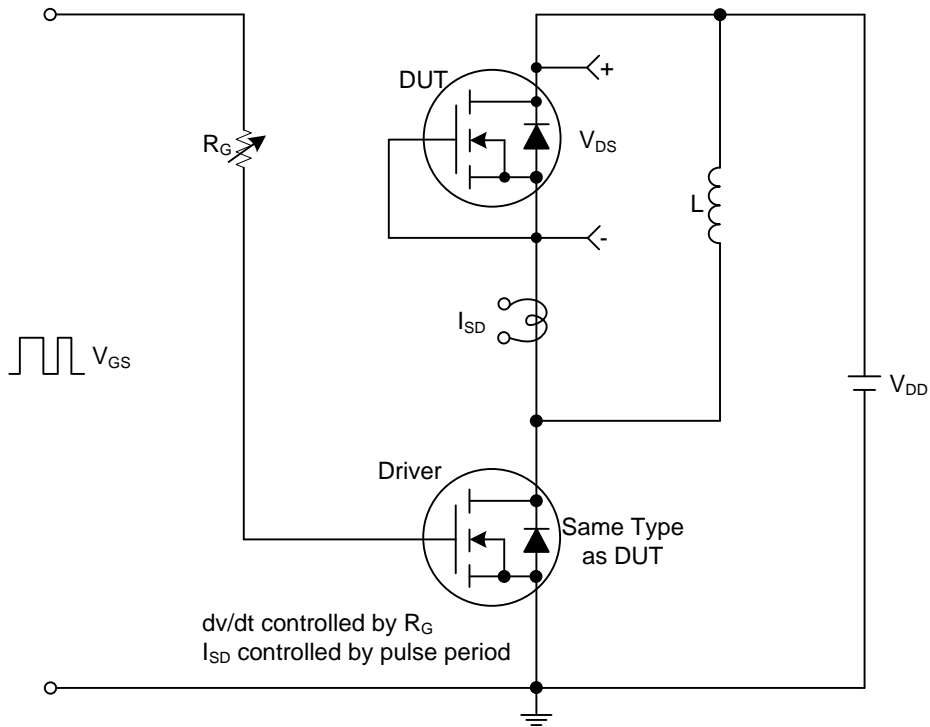


Unclamped Inductive Switching Test Circuit



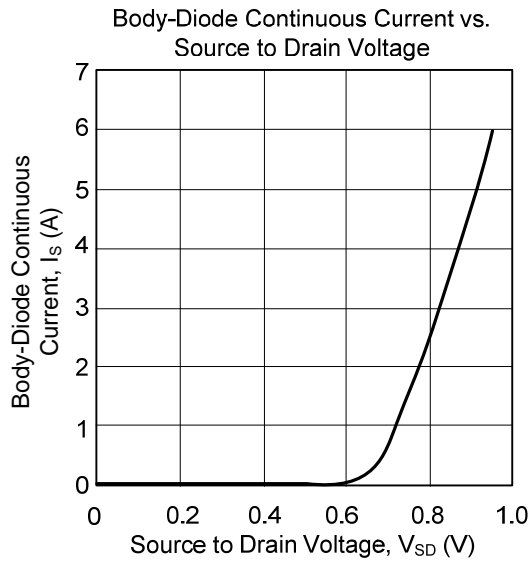
Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)



Peak Diode Recovery dv/dt Test Circuit and Waveforms

■ TYPICAL CHARACTERISTICS



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