



# 6N70

**Power MOSFET**

## 6.0A, 700V N-CHANNEL POWER MOSFET

■ DESCRIPTION

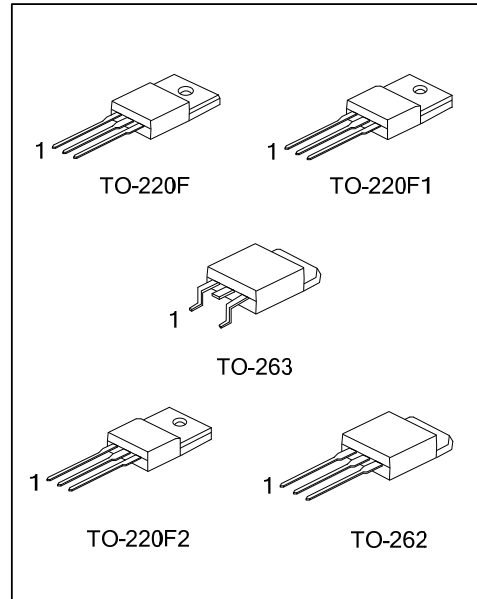
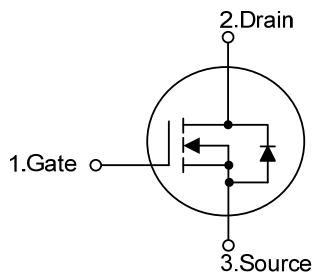
The UTC **6N70** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, high switching speed, low gate charge and low input capacitance.

The UTC **6N70** is universally applied in high efficiency switch mode power supply.

■ FEATURES

- \*  $R_{DS(ON)} < 1.8\Omega @ V_{GS}=10V, I_D=3A$
- \* High switching speed

■ SYMBOL



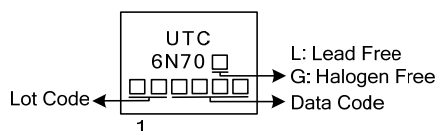
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N70L-TF1-T	6N70G-TF1-T	TO-220F1	G	D	S	Tube
6N70L-TF2-T	6N70G-TF2-T	TO-220F2	G	D	S	Tube
6N70L-TF3-T	6N70G-TF3-T	TO-220F	G	D	S	Tube
6N70L-T2Q-T	6N70G-T2Q-T	TO-262	G	D	S	Tube
6N70L-TQ2-T	6N70G-TQ2-T	TO-263	G	D	S	Tube
6N70L-TQ2-R	6N70G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>6N70L-TF2-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) TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, T2Q: TO-262, TQ2: TO-263</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		$V_{DSS}$	700	V	
Gate-Source Voltage (Note 2)		$V_{GSS}$	$\pm 30$	V	
Drain Current	Continuous	$I_D$	$T_C=25^\circ\text{C}$	6	A
			$T_C=100^\circ\text{C}$	3.8	A
	Pulsed	$I_{DM}$	24	A	
Avalanche Current (Note 2)		$I_{AR}$	6	A	
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	582	mJ	
	Repetitive (Note 2)	$E_{AR}$	13	mJ	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.5	V/ns	
Power Dissipation	TO-220F1	$P_D$	42	W	
	TO-220F2				
	TO-220F				
	TO-262/ TO-263				
Linear Derating Factor	TO-220F1	$P_D$	0.33	W/ $^\circ\text{C}$	
	TO-220F2				
	TO-220F				
	TO-262/TO-263				
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.  $L = 30\text{mH}$ ,  $I_{AS} = 6\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 27\Omega$ , 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		$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F1	$\theta_{JC}$	2.9	$^\circ\text{C}/\text{W}$
	TO-220F2			
	TO-220F			
	TO-262/TO-263			
	TO-263			

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

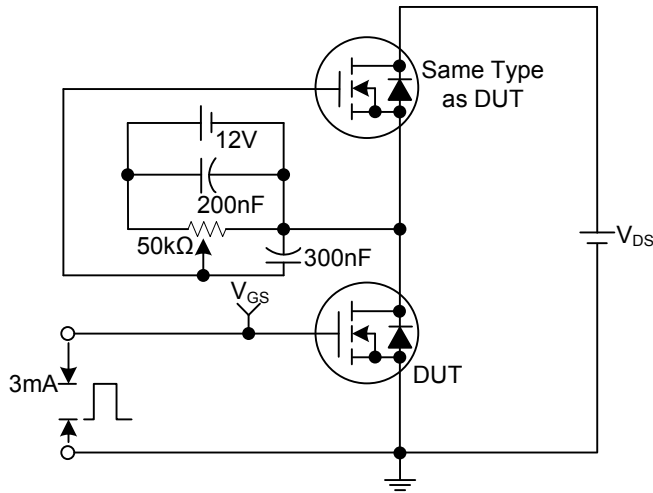
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage		$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	700			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu\text{A}$		0.79		$V/^\circ\text{C}$
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=700\text{V}$			25	$\mu\text{A}$
			$V_{DS}=560\text{V}$ , $T_C=125^\circ\text{C}$			250	$\mu\text{A}$
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
<b>ON CHARACTERISTICS</b>							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$ , $V_{DS}=5\text{V}$	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)		1.5	1.8	$\Omega$
<b>DYNAMIC PARAMETERS</b>							
Input Capacitance		$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$ (Note 1, 2)		900	1200	pF
Output Capacitance		$C_{OSS}$			90	115	pF
Reverse Transfer Capacitance		$C_{RSS}$			18	55	pF
<b>SWITCHING PARAMETERS</b>							
Turn-ON Delay Time		$t_{D(ON)}$	$V_{DD}=350\text{V}$ , $I_D=6\text{A}$ , $R_G=11.5\Omega$		40	70	ns
Rise Time		$t_R$			65	90	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			190	230	ns
Fall-Time		$t_F$			88	116	ns
Total Gate Charge		$Q_G$	$V_{GS}=10\text{V}$ , $V_{DS}=560\text{V}$ , $I_D=6\text{A}$ (Note 1, 2)		110	140	nC
Gate to Source Charge		$Q_{GS}$			9		nC
Gate to Drain Charge		$Q_{GD}$			23.1		nC
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>							
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
Body Diode Reverse Recovery Time		$t_{rr}$	$I_F=6\text{A}$ , $dI_F/dt=100\text{A}/\mu\text{s}$ , $T_J = 25^\circ\text{C}$		440		ns
Body Diode Reverse Recovery Charge		$Q_{RR}$			4.05		$\mu\text{C}$

Notes: 1. Pulse Test: Pulse width  $\leq 250\mu\text{s}$ , Duty cycle  $\leq 2\%$

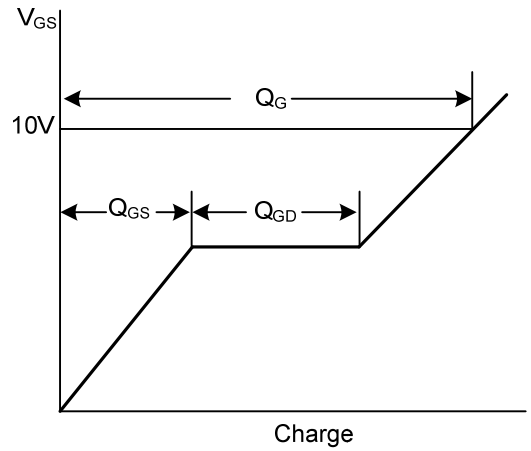
2. Essentially independent of operating temperature

3. Repetitive Rating: Pulse width limited by maximum junction temperature

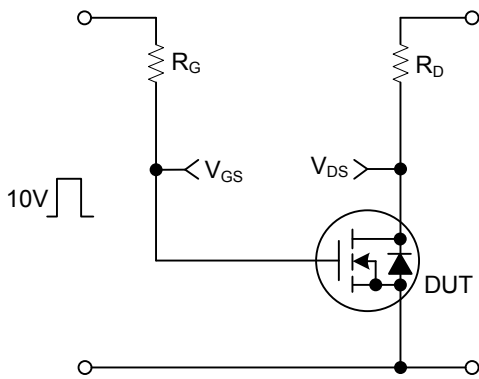
■ TEST CIRCUITS AND WAVEFORMS



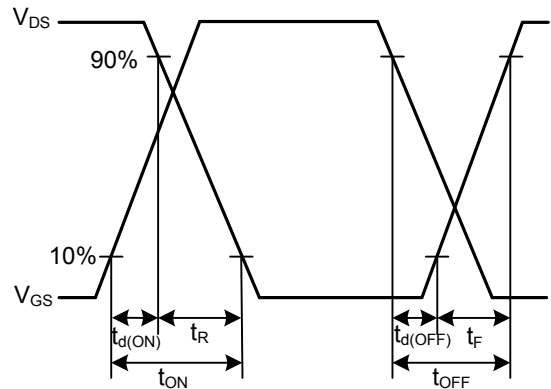
Gate Charge Test Circuit



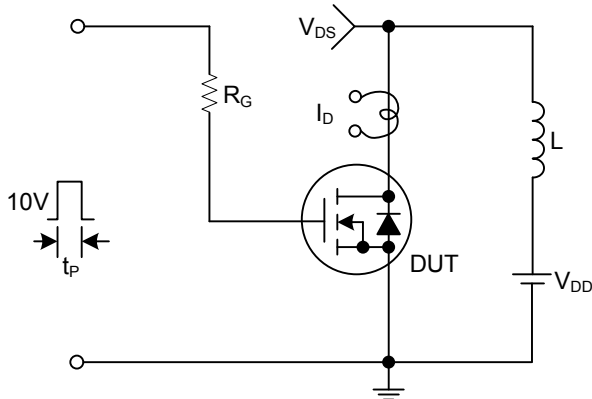
Gate Charge Waveforms



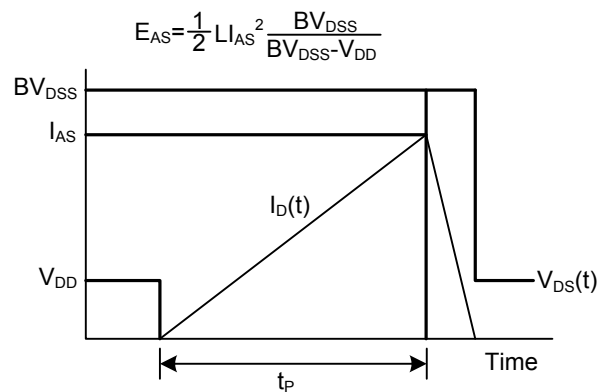
Resistive Switching Test Circuit



Resistive Switching Waveforms

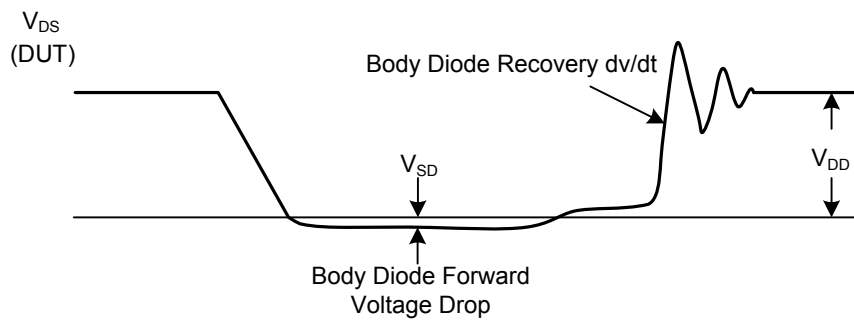
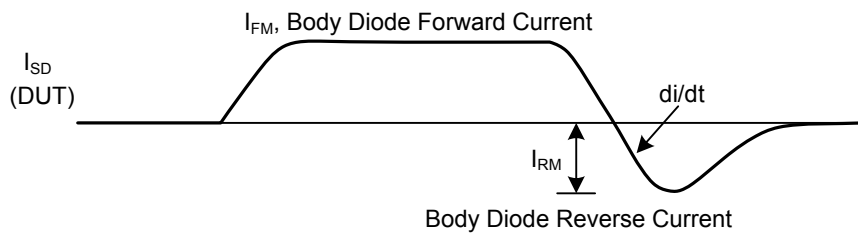
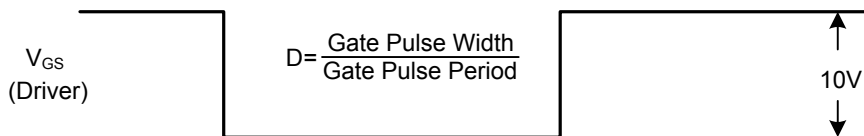
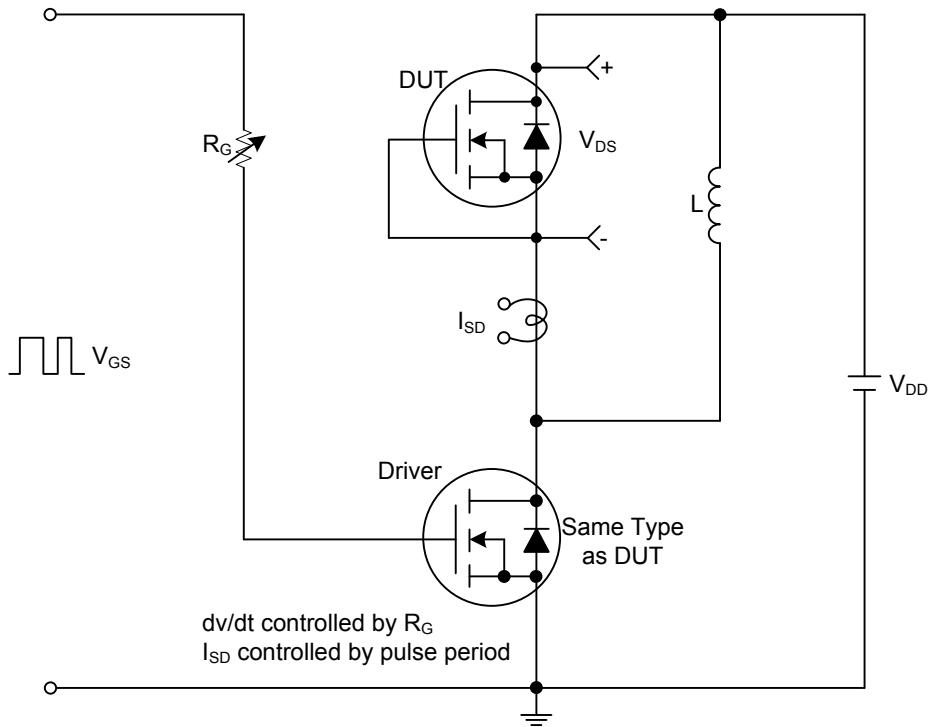


Unclamped Inductive Switching Test Circuit



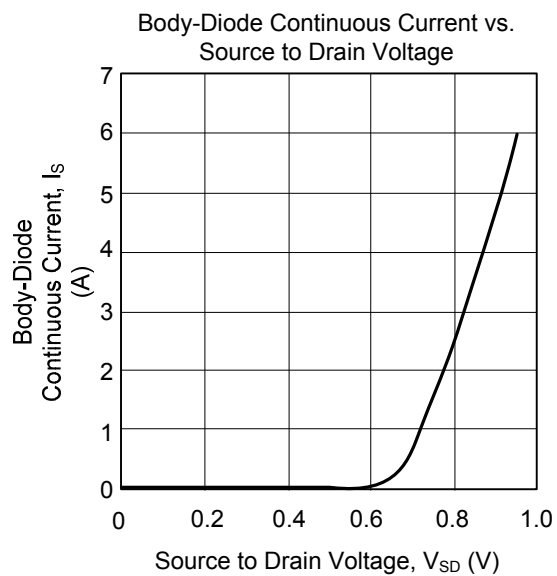
Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)



Peak Diode Recovery dv/dt Test Circuit and Waveforms

## ■ TYPICAL CHARACTERISTICS



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