



**7N70-R**

Preliminary

*Power MOSFET*

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

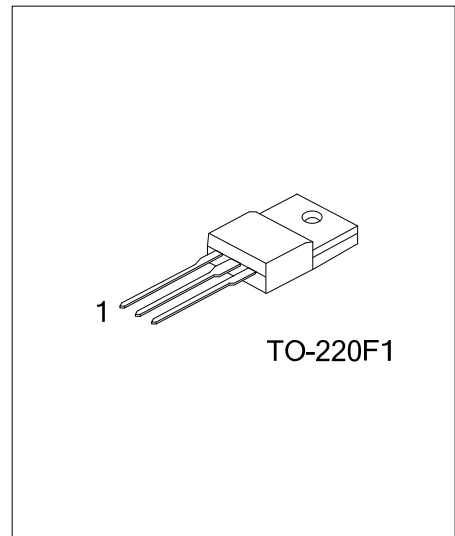
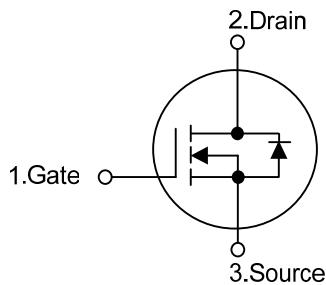
■ DESCRIPTION

The **UTC 7N70-R** is a high voltage power 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

- \*  $R_{DS(ON)} < 1.4\Omega @ V_{GS} = 10V, I_D = 3.5A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

■ SYMBOL



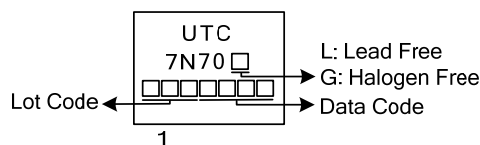
■ ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N70L-TF1-T	7N70G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>7N70L-TF1-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube</p> <p>(2) TF1: TO-220F1</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	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	$T_C = 25^\circ\text{C}$	7.0
		$T_C = 100^\circ\text{C}$	4.7
Drain Current Pulsed (Note 2)	$I_{DM}$	28	A
Avalanche Energy, Single Pulsed (Note 3)	$E_{AS}$	490	mJ
Avalanche Energy, Repetitive, Limited by $T_{JMAX}$	$E_{AR}$	14.2	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_D$	48	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.  $L=20\text{mH}$ ,  $I_{AS}=7.0\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=0\ \Omega$ , Starting  $T_J=25^\circ\text{C}$

4.  $I_{SD} \leq 7.0\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

■ THERMAL DATA

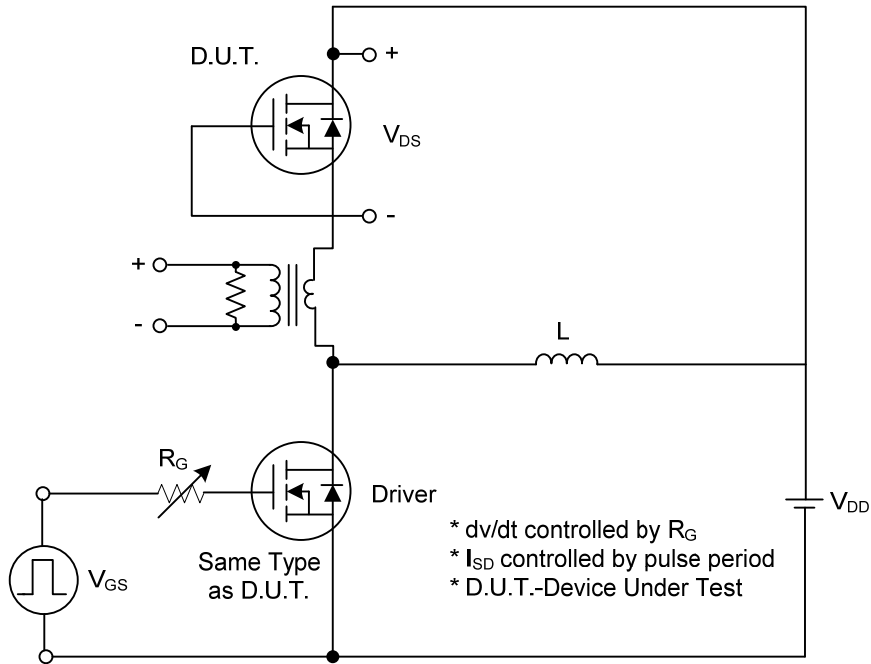
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	2.6	$^\circ\text{C}/\text{W}$

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

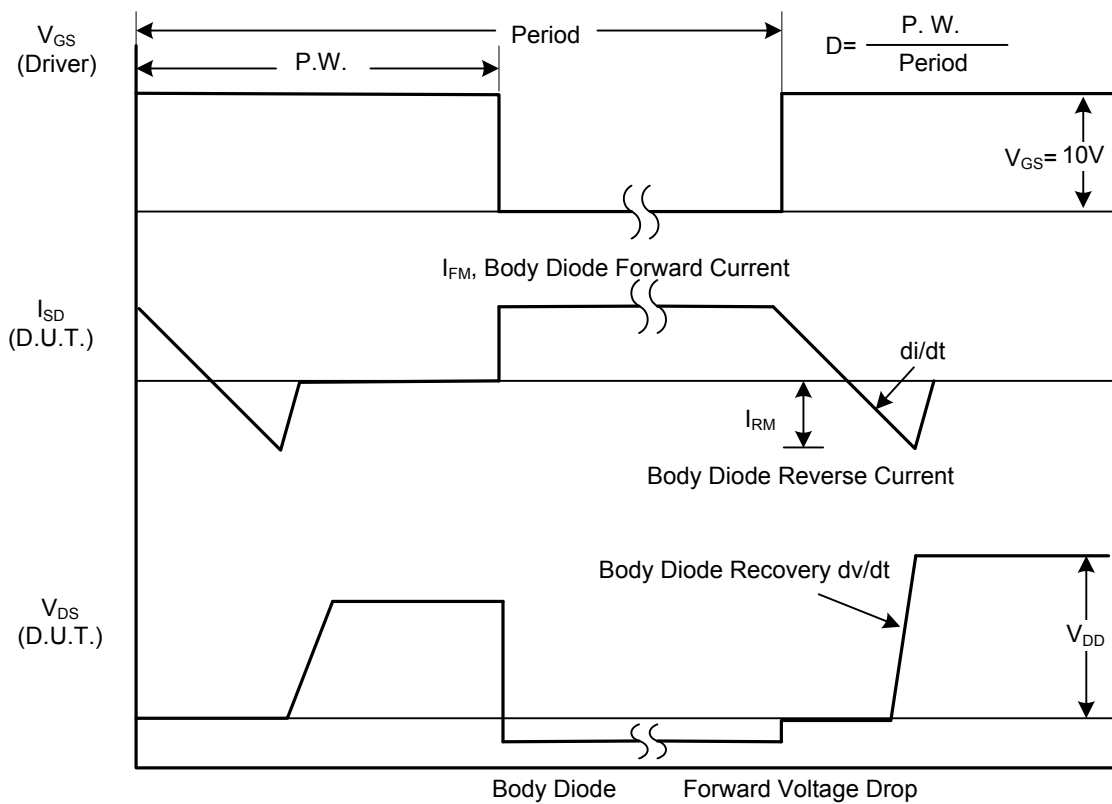
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	700			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 700V, V_{GS} = 0V$			1	$\mu A$
		$V_{DS} = 560V, T_C = 125^\circ\text{C}$			1	$\mu A$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse					
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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 3.5A$			1.4	$\Omega$
Forward Transconductance (Note 1)	$g_{FS}$	$V_{DS} = 40V, I_D = 3.5A$		8.0		S
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1MHz$		750		pF
Output Capacitance	$C_{OSS}$			100		pF
Reverse Transfer Capacitance	$C_{RSS}$			13		pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-on Delay Time	$t_{D(ON)}$	$V_{DD} = 30V, I_D = 0.5A$ $R_G = 25\Omega, V_{GS} = 10V$ (Note 1, 2)		78		ns
Turn-on Rise Time	$t_R$			74		ns
Turn-off Delay Time	$t_{D(OFF)}$			218		ns
Turn-off Fall Time	$t_F$			63		ns
Total Gate Charge	$Q_G$	$V_{DS} = 50V, I_D = 1.3A,$ $V_{GS} = 10V$ (Note 1, 2)		33		nC
Gate-Source Charge	$Q_{GS}$			8.6		nC
Gate-Drain Charge	$Q_{DD}$			8.3		nC
<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	$t_{rr}$	$V_{GS} = 0V, I_S = 7.0A,$ $di_F/dt = 100 A/\mu s$ (Note 1)		320		ns
Reverse Recovery Charge	$Q_{RR}$			2.4		$\mu C$

- Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$   
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

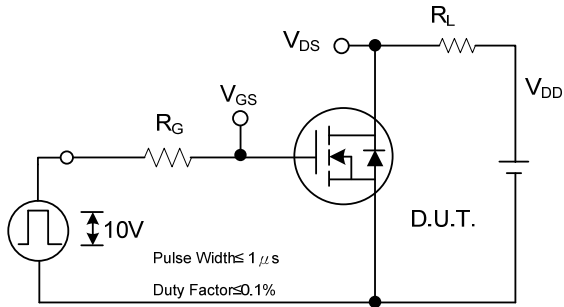


Peak Diode Recovery  $dv/dt$  Test Circuit

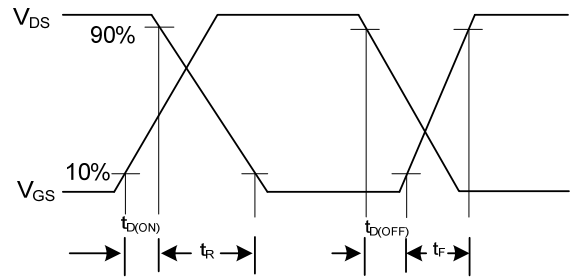


Peak Diode Recovery  $dv/dt$  Waveforms

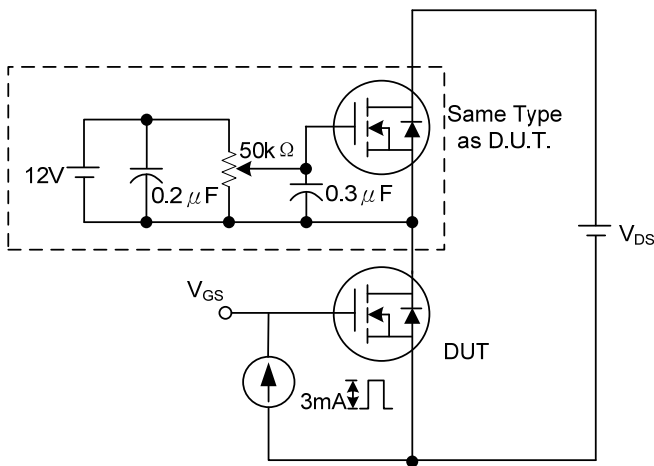
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



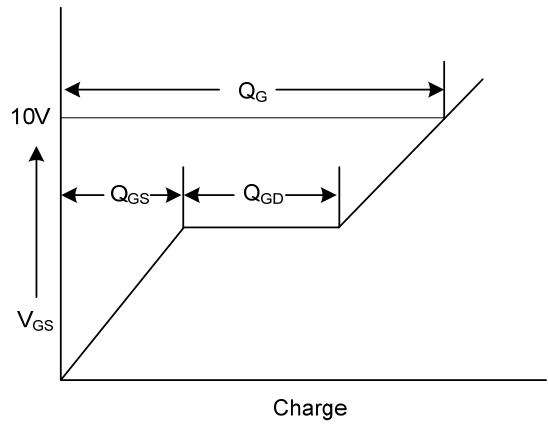
Switching Test Circuit



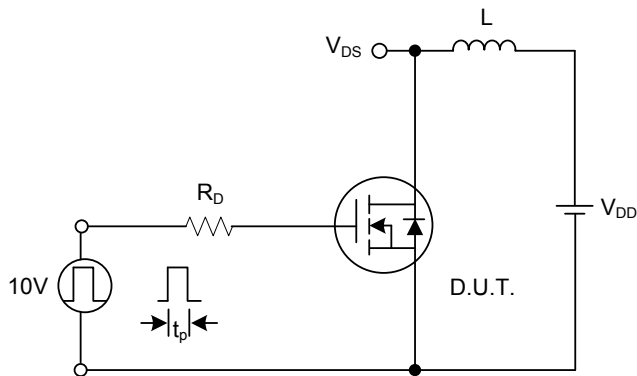
Switching Waveforms



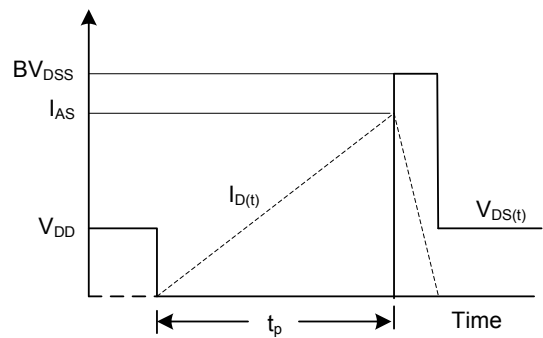
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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