



**4N70-R**

Preliminary

*Power MOSFET*

**4A, 700V N-CHANNEL  
POWER MOSFET**

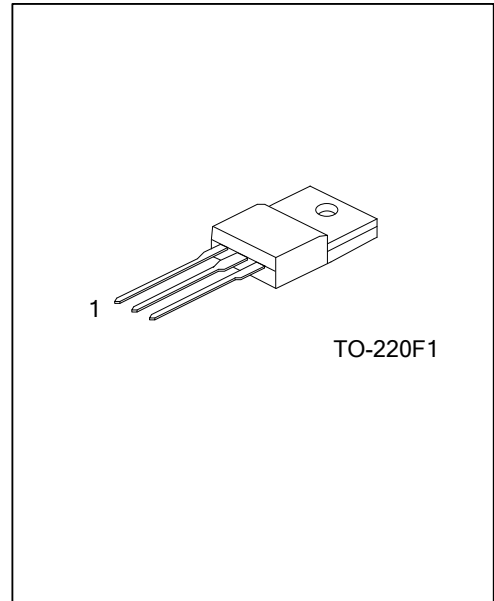
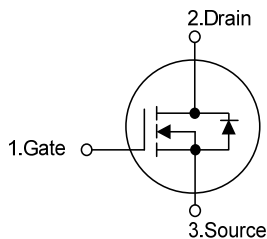
■ DESCRIPTION

The UTC **4N70-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 high rugged avalanche. This high speed switching power MOSFET is usually used in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

- \*  $R_{DS(ON)} < 2.8\Omega @ V_{GS} = 10V$
- \* Ultra Low Gate Charge ( Typical 16nC )
- \* Low Reverse Transfer Capacitance (  $C_{RSS} = \text{Typical } 6\text{ pF}$  )
- \* 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	
4N70L-TF1-T	4N70G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>4N70L-TF1-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) T: Tube (2) TF1: TO-220F1 (3) L: Lead Free, G: Halogen Free</p>
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■ MARKING INFORMATION

PACKAGE	MARKING
TO-220F1	

■ ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	700	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Avalanche Current (Note 2)	$I_{AR}$	4	A
Drain Current	Continuous	$I_D$	4
	Pulsed (Note 2)	$I_{DM}$	16
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	55
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	$P_D$	36	W
Junction Temperature	$T_J$	+150	$^\circ\text{C}$
Operating 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. Repetitive Rating : Pulse width limited by maximum junction temperature

3.  $L = 6.87\text{mH}$ ,  $I_{AS} = 4\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 4.4\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	3.47	$^\circ\text{C}/\text{W}$

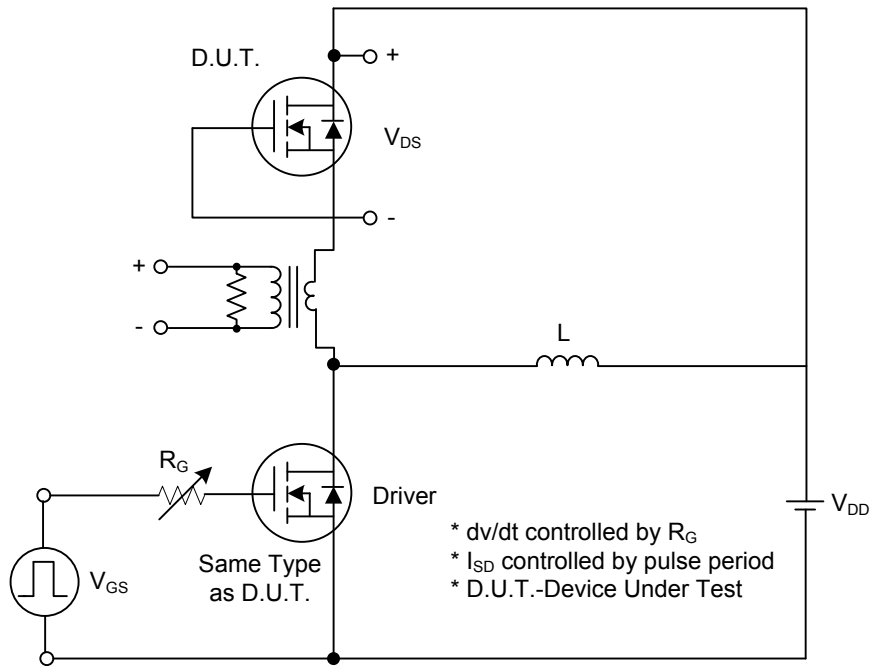
■ ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	700			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 700\text{ V}, V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse				-100	
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		0.6		$\text{V}/^\circ\text{C}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	3.0		5.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 2.2\text{ A}$		3.3	3.8	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$		450	690	pF
Output Capacitance	$C_{OSS}$			45	90	pF
Reverse Transfer Capacitance	$C_{RSS}$			6	11	pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 30\text{ V}, I_D = 0.5\text{ A},$ $R_G = 25\ \Omega$ (Note 1, 2)		72	90	ns
Turn-On Rise Time	$t_R$			32	50	ns
Turn-Off Delay Time	$t_{D(OFF)}$			50	70	ns
Turn-Off Fall Time	$t_F$			40	60	ns
Total Gate Charge	$Q_G$	$V_{DS} = 50\text{ V}, I_D = 1.3\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 1, 2)		16	20	nC
Gate-Source Charge	$Q_{GS}$			5.6		nC
Gate-Drain Charge	$Q_{GD}$			3.4		nC
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 4.4\text{ A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				4.4	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				17.6	A
Reverse Recovery Time	$t_{rr}$	$V_{GS} = 0\text{ V}, I_S = 4.4\text{ A},$ $dI/dt = 100\text{ A}/\mu\text{s}$ (Note 1)		250		ns
Reverse Recovery Charge	$Q_{RR}$			1.5		$\mu\text{C}$

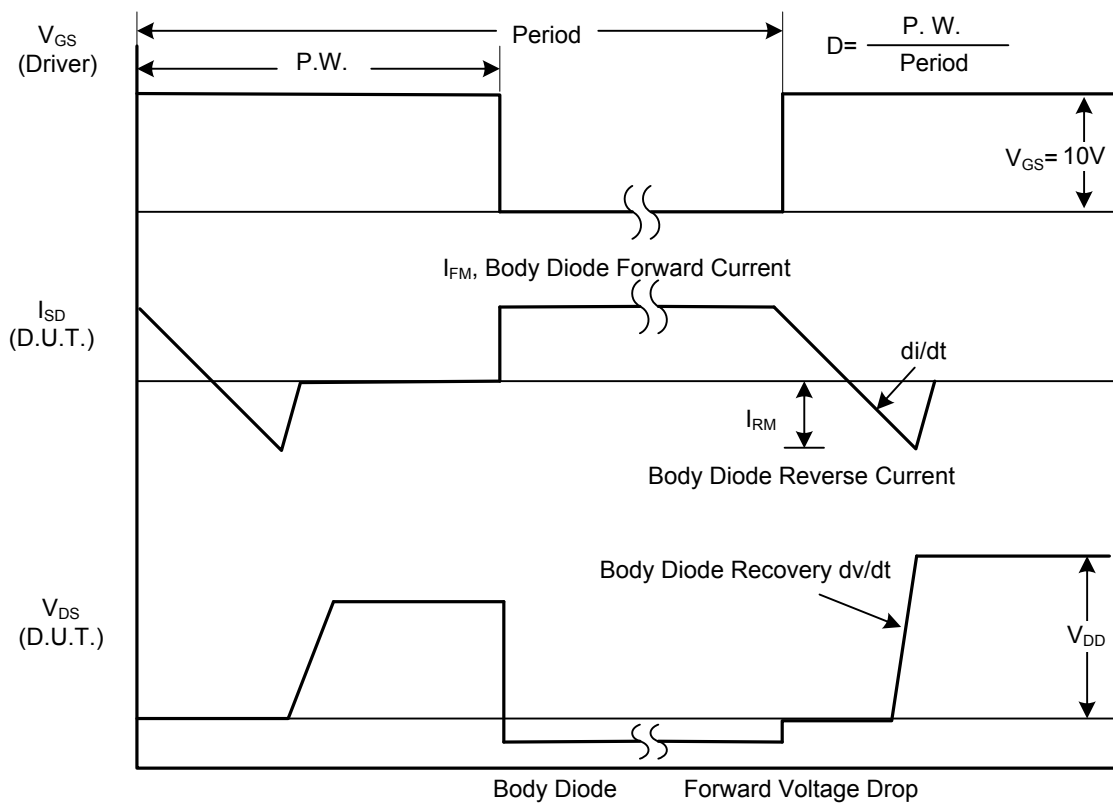
Notes: 1. Pulse Test: Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

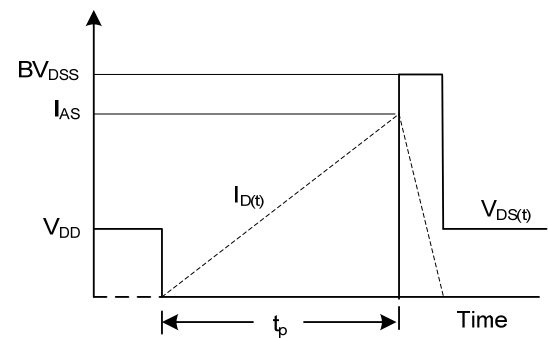
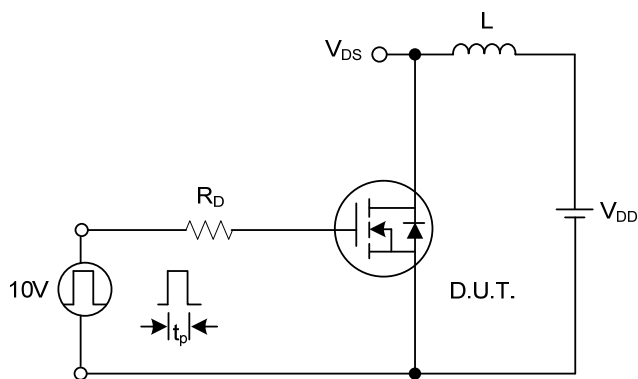
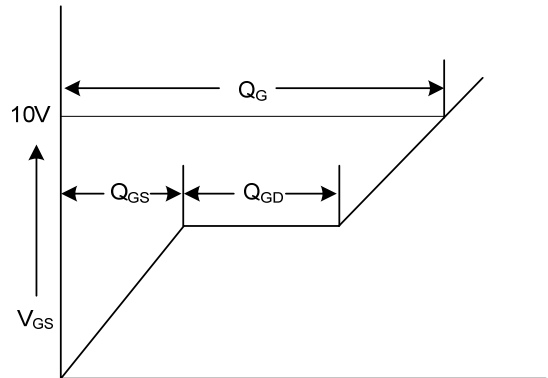
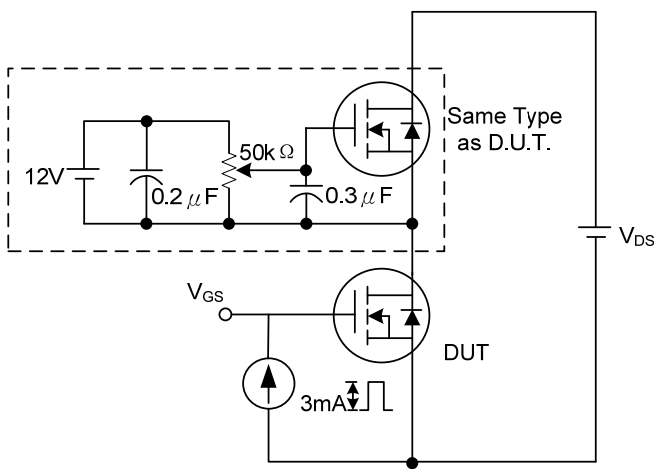
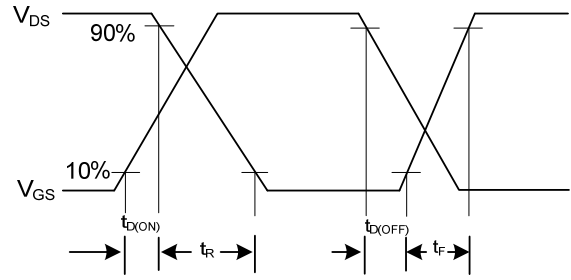
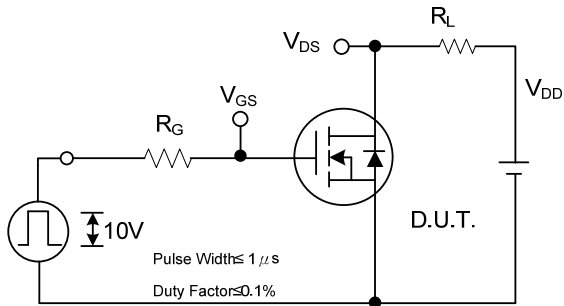


Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)



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