



## 12N70K-MT

Power MOSFET

### 12A, 700V N-CHANNEL POWER MOSFET

#### DESCRIPTION

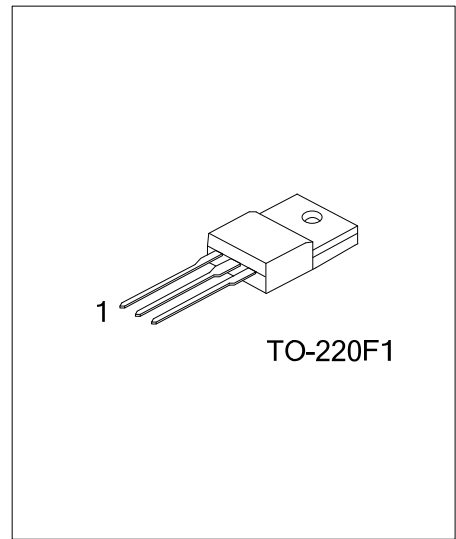
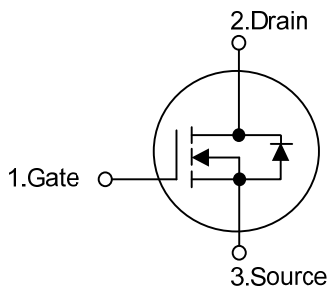
The UTC **12N70K-MT** are N-Channel enhancement mode power MOSFET which are produced using UTC's proprietary, planar stripe, DMOS technology.

These devices are suited for high efficiency switch mode power supply. To minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode the advanced technology has been especially tailored.

#### FEATURES

- \*  $R_{DS(ON)} < 0.83\Omega$  @  $V_{GS} = 10V, I_D = 6.0A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

#### SYMBOL



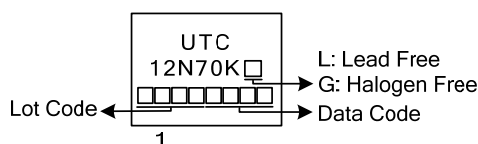
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
12N70KL-TF1-T	12N70KG-TF1-T	TO-220F1	G	D	S	Tube

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

<p>12N70KL-TF1-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) TF1: TO220-F1 (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
Drain Current	Continuous	$I_D$	12	A
	Pulsed (Note 2)	$I_{DM}$	48	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	220	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation		$P_D$	52	$^\circ\text{C/W}$
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.  $L=3\text{mH}$ ,  $I_{AS}=12\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$
4.  $I_{SD} \leq 12\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

■ THERMAL DATA

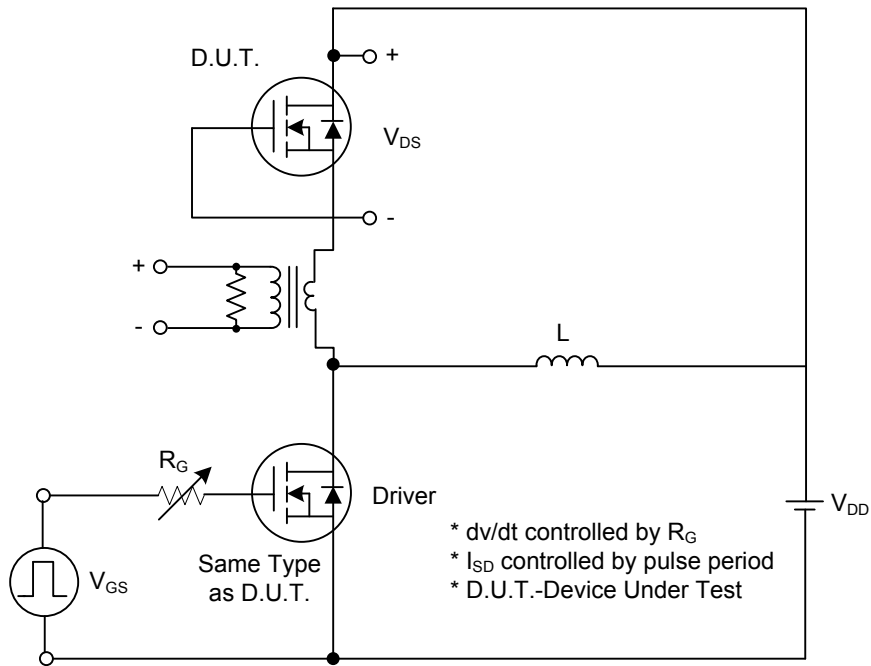
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C/W}$
Junction to Case	$\theta_{JC}$	2.40	$^\circ\text{C/W}$

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

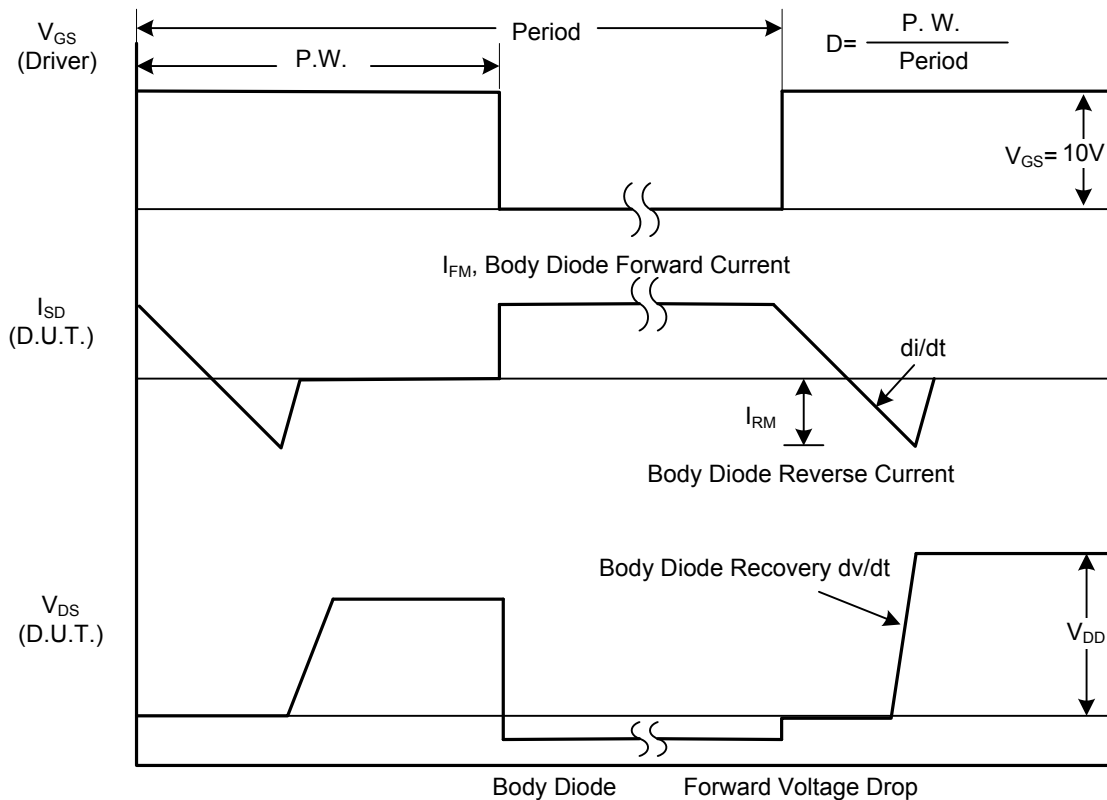
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{V}$ , $I_D = 250\ \mu\text{A}$	700			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 700\text{V}$ , $V_{GS} = 0\text{V}$			10	$\mu\text{A}$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 30\text{V}$ , $V_{DS} = 0\text{V}$			$\pm 100$	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		0.7		$\text{V}/^\circ\text{C}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{V}$ , $I_D = 6.0\text{A}$		0.70	0.83	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$		1600	1900	pF
Output Capacitance	$C_{OSS}$			160	270	pF
Reverse Transfer Capacitance	$C_{RSS}$			9	18	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)		96	120	ns
Turn-On Rise Time	$t_R$			122	135	ns
Turn-Off Delay Time	$t_{D(OFF)}$			184	200	ns
Turn-Off Fall Time	$t_F$			102	135	ns
Total Gate Charge	$Q_G$	$V_{DS} = 50\text{V}$ , $V_{GS} = 1.0\text{V}$ , $I_D = 1.3\text{A}$ (Note 1, 2)		44	60	nC
Gate-Source Charge	$Q_{GS}$			10		nC
Gate-Drain Charge	$Q_{GD}$			17		nC
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{V}$ , $I_S = 12\text{A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				12	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				48	A

- 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

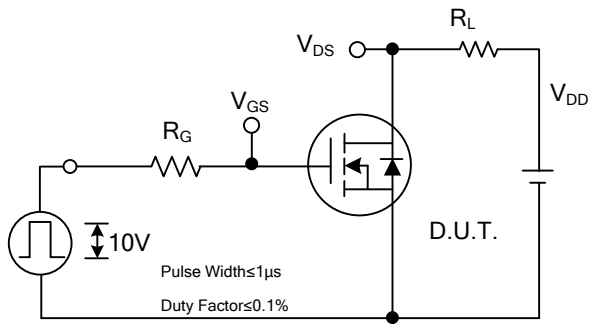


**Peak Diode Recovery  $dv/dt$  Test Circuit**

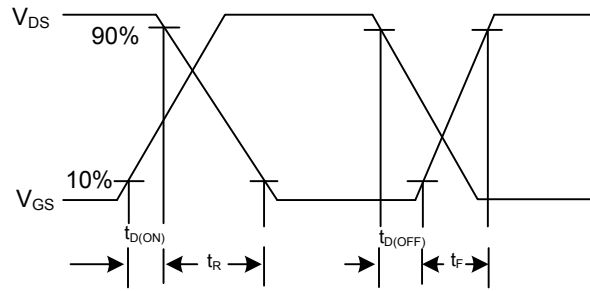


**Peak Diode Recovery  $dv/dt$  Waveforms**

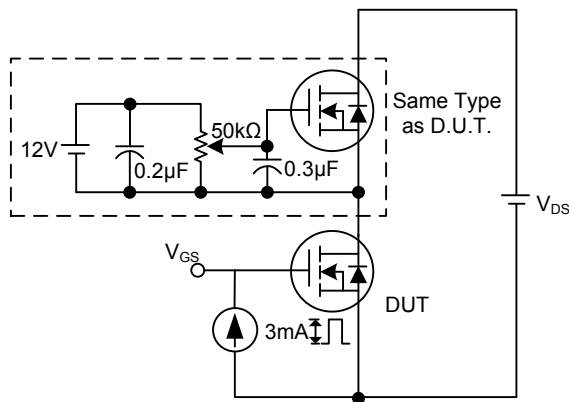
## TEST CIRCUITS AND WAVEFORMS (Cont.)



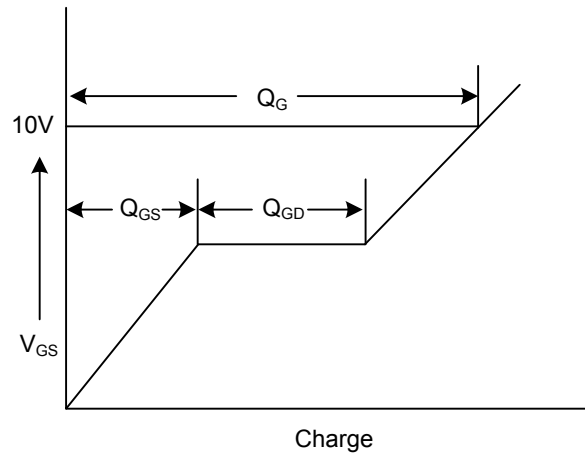
**Switching Test Circuit**



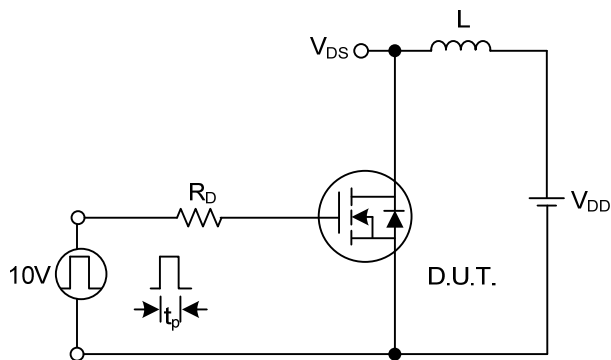
**Switching Waveforms**



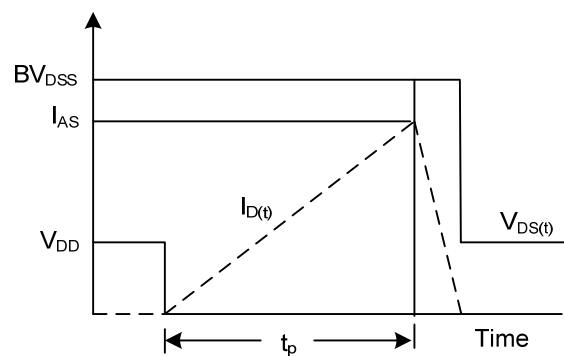
**Gate Charge Test Circuit**



**Gate Charge Waveform**

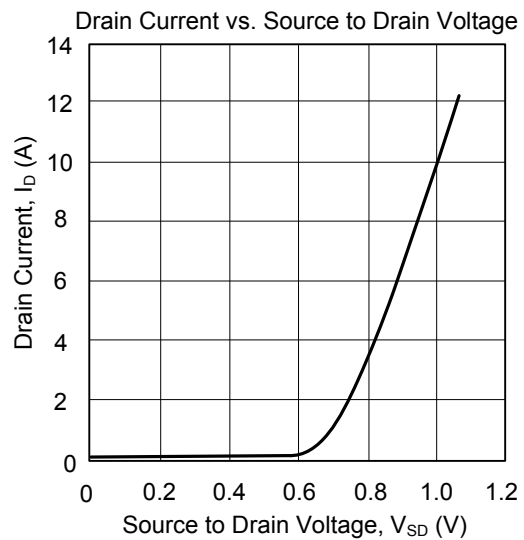
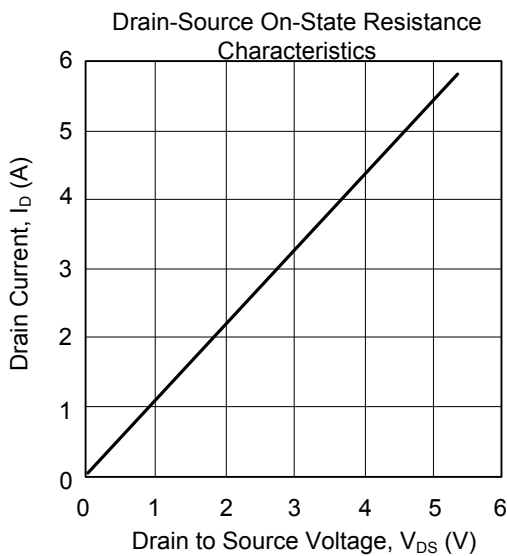
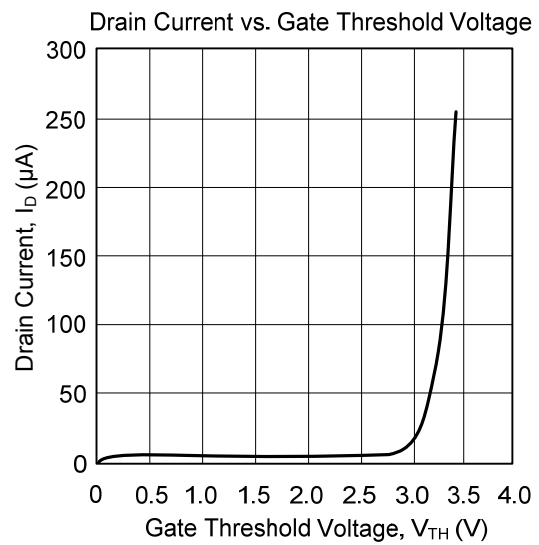
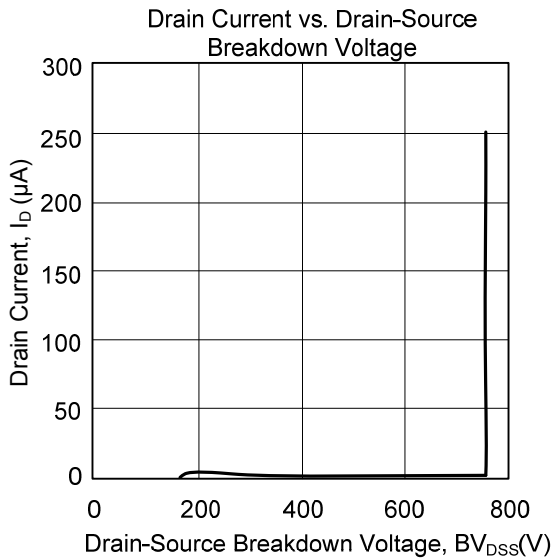


**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

### TYPICAL CHARACTERISTICS



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