



# 15NM70-U2

*Power MOSFET*

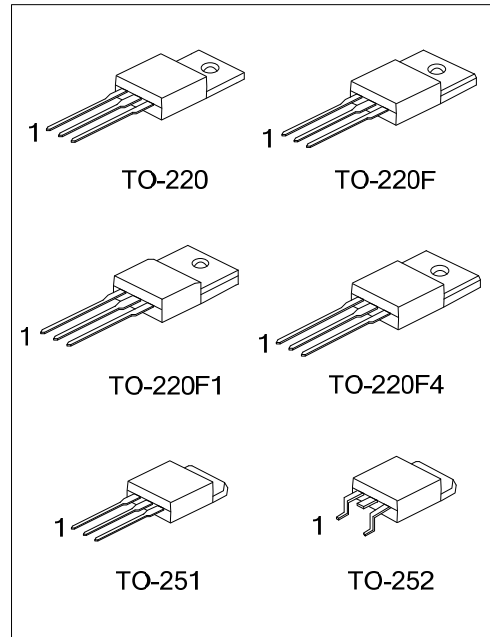
## 15A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

■ DESCRIPTION

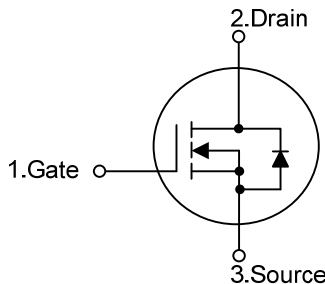
The **UTC 15NM70-U2** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at DC-DC, AC-DC converters for power applications.

■ FEATURES

- \*  $R_{DS(ON)} < 0.45\Omega$  @  $V_{GS}=10V, I_D=7.5A$
- \* By using Super Junction Structure
- \* Fast Switching
- \* With 100% Avalanche Tested



■ SYMBOL



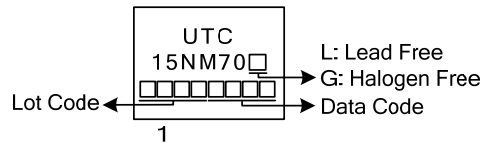
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
15NM70L-TA3-T	15NM70G-TA3-T	TO-220	G	D	S	Tube
<b>15NM70L-TF3-T</b>	<b>15NM70G-TF3-T</b>	<b>TO-220F</b>	<b>G</b>	<b>D</b>	<b>S</b>	<b>Tube</b>
15NM70L-TF1-T	15NM70G-TF1-T	TO-220F1	G	D	S	Tube
15NM70L-TF34-T	15NM70G-TF34-T	TO-220F4	G	D	S	Tube
15NM70L-TM3-T	15NM70G-TM3-T	TO-251	G	D	S	Tube
15NM70L-TN3-R	15NM70G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>15NM70G-TA3-T</p>	<p>(1) T: Tube, R: Tape Reel                  (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF34: TO-220F4, TM3: TO-251, TN3: TO-252                  (3) G: Halogen Free and Lead Free, L: 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	Continuous	$I_D$	15	A
Pulsed Drain Current	Pulsed (Note 2)	$I_{DM}$	60	A
Avalanche Current (Note 3)		$I_{AR}$	2.9	A
Avalanche energy	Single Pulsed (Note 3)	$E_{AS}$	429	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.6	V/nS
Power Dissipation	TO-220	$P_D$	260	W
	TO-220F/TO-220F1		54	W
	TO-220F4			
	TO-251/TO-252		90	W
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature Range		$T_{STG}$	-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.  $L=102\text{mH}$ ,  $I_{AS}=2.9\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$ .

4.  $I_{SD} \leq 15\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J = 25^{\circ}\text{C}$ .

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	$\theta_{JA}$	62.5	$^{\circ}\text{C}/\text{W}$
	TO-220F1/TO-220F4			
	TO-251/TO-252		110	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	0.48	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1		2.31	$^{\circ}\text{C}/\text{W}$
	TO-220F4			
	TO-251/TO-252		1.39	$^{\circ}\text{C}/\text{W}$

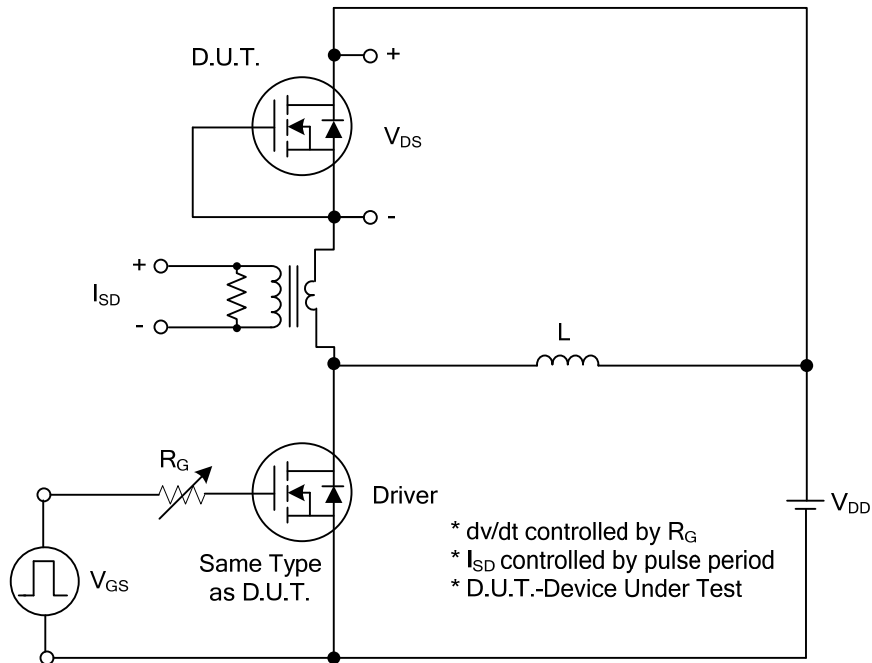
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> =25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	700			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =700V, V <sub>GS</sub> =0V			10	μA
Gate-Source Leakage Current	Forward	V <sub>DS</sub> =0V, V <sub>GS</sub> =+30V			+100	nA
	Reverse		V <sub>DS</sub> =0V, V <sub>GS</sub> =-30V			-100
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5		4.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =7.5A			0.45	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		1064		pF
Output Capacitance	C <sub>OSS</sub>			543		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			37		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =1.3A, I <sub>G</sub> =100μA (Note 1, 2)		95		nC
Gate to Source Charge	Q <sub>GS</sub>			7.8		nC
Gate to Drain Charge	Q <sub>GD</sub>			26		nC
Turn-on Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A, R <sub>G</sub> =25Ω (Note 1, 2)		62		ns
Rise Time	t <sub>R</sub>			132		ns
Turn-off Delay Time	t <sub>D(OFF)</sub>			240		ns
Fall-Time	t <sub>F</sub>			145		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Pulsed Current	I <sub>S</sub>				15	A
Drain-Source Diode Forward Voltage (Note 1)	I <sub>SM</sub>				60	A
Maximum Body-Diode Continuous Current	V <sub>SD</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0V			1.4	V
Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0V, di <sub>F</sub> /dt=100A/μs		395		ns
Reverse Recovery Charge	Q <sub>rr</sub>				5.92	

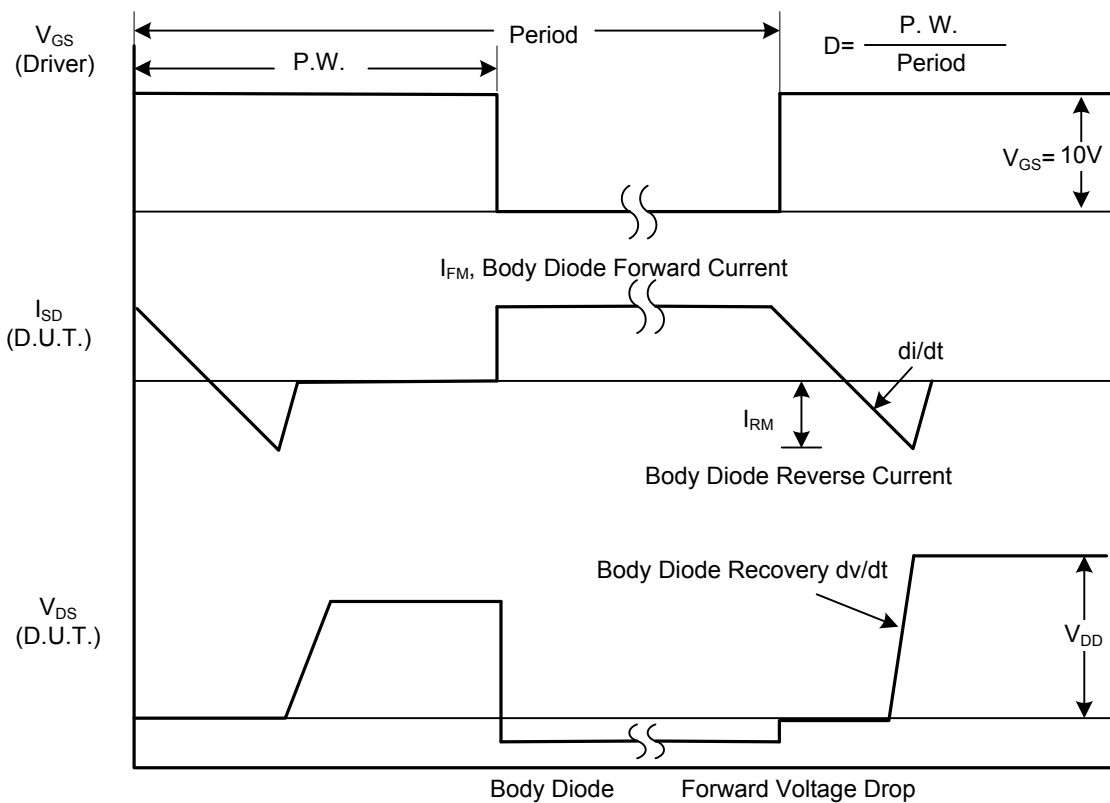
Note: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature

## TEST CIRCUITS AND WAVEFORMS



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

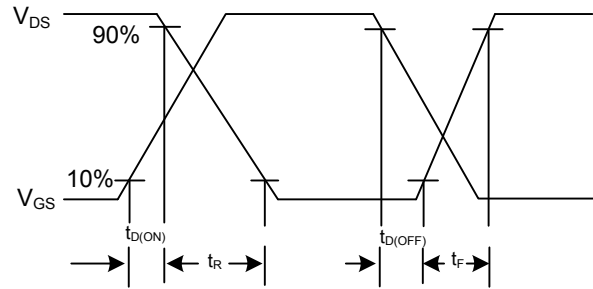


**Peak Diode Recovery  $dv/dt$  Waveforms**

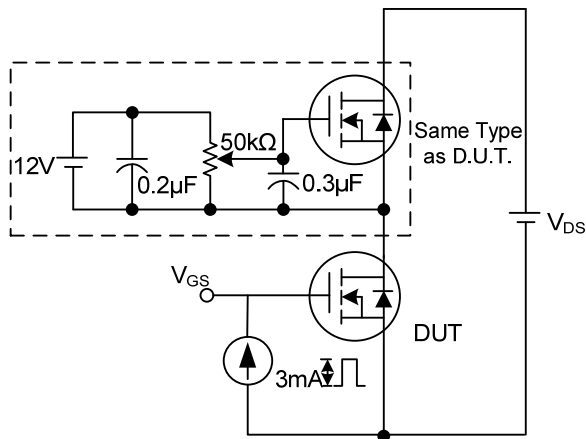
## ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



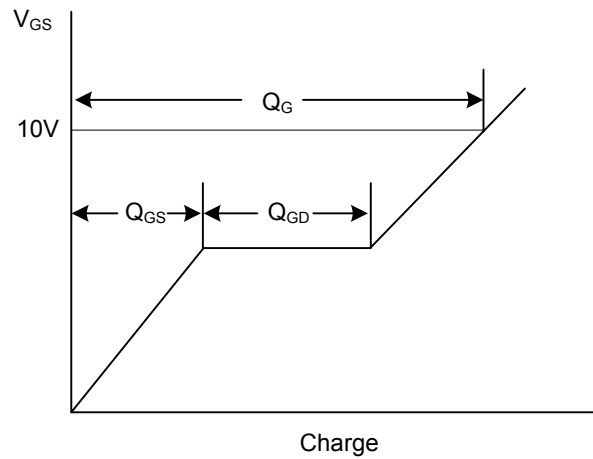
**Switching Test Circuit**



**Switching Waveforms**



**Gate Charge Test Circuit**



**Gate Charge Waveform**



**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

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