



2NM70

Preliminary

Power MOSFET

2A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

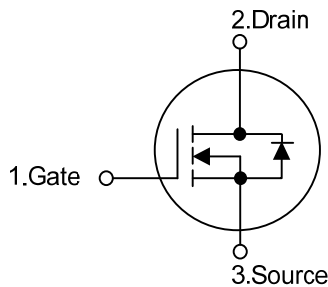
■ DESCRIPTION

The UTC **2NM70** is an Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and 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

- * $R_{DS(ON)} < 3.0\Omega @ V_{GS} = 10V, I_D = 1.0 A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

■ SYMBOL

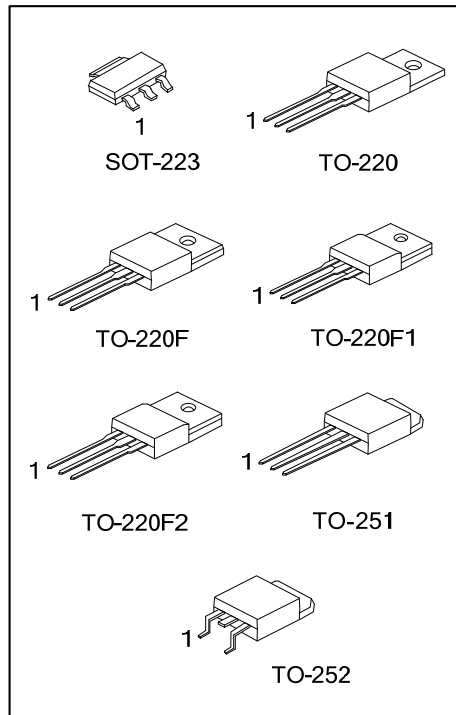


■ ORDERING INFORMATION

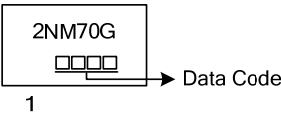
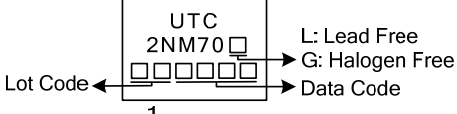
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	2NM70G-AA3-R	SOT-223	G	D	S	Tape Reel
2NM70L-TA3-T	2NM70G-TA3-T	TO-220	G	D	S	Tube
2NM70L-TF1-T	2NM70G-TF1-T	TO-220F1	G	D	S	Tube
2NM70L-TF2-T	2NM70G-TF2-T	TO-220F2	G	D	S	Tube
2NM70L-TF3-T	2NM70G-TF3-T	TO-220F	G	D	S	Tube
2NM70L-TM3-T	2NM70G-TM3-T	TO-251	G	D	S	Tube
2NM70L-TN3-R	2NM70G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>2NM70G-AA3-R</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) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
---	--



MARKING

SOT-223	TO-220 / TO-220F / TO-220F1 TO-220F2 / TO-251 / TO-252
 <p>A diagram of a SOT-223 package with the marking '2NM70G' and a four-digit data code. An arrow points from the data code to the label 'Data Code'. The number '1' is located below the package.</p>	 <p>A diagram of a TO-220 package with the marking 'UTC', '2NM70', and a four-digit data code. An arrow points from the data code to the label 'Data Code'. An arrow points from the data code to the label 'Lot Code'. The number '1' is located below the package. To the right of the package, the text 'L: Lead Free' and 'G: Halogen Free' is shown.</p>

■ 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}	± 30	V
Drain Current	Continuous	I_D	2.0	A
	Pulsed (Note 2)	I_{DM}	8.0	A
Avalanche Current (Note 2)		I_{AR}	1	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	69	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3	V/ns
Power Dissipation	SOT-223	P_D	10	W
	TO-220		45	W
	TO-220F/TO-220F1		28	W
	TO-220F2		40	W
	TO-251/TO-252		30	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 maximum junction temperature.

3. $L=138\text{mH}$, $I_{AS}=1.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 2.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	$^\circ\text{C}/\text{W}$
	TO-220/TO-220F		62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	θ_{JC}	12.5	$^\circ\text{C}/\text{W}$
	TO-220		2.76	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		4.46	$^\circ\text{C}/\text{W}$
	TO-220F2		3.13	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		4.24	$^\circ\text{C}/\text{W}$

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	700			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 700V, V_{GS} = 0V$			10	μA
Gate-Source Leakage Current	Forward	$V_{GS} = 30V, V_{DS} = 0V$			100	nA
	Reverse					
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 1.0A$			3.0	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=25V, f=1MHz$		150		pF
Output Capacitance	C_{OSS}			73		pF
Reverse Transfer Capacitance	C_{RSS}			12		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=50V, V_{GS}=10V, I_D=1.3A,$ $I_D=100\mu A$ (Note 1, 2)		21		nC
Gate to Source Charge	Q_{GS}			2.0		nC
Gate to Drain Charge	Q_{GD}			5.6		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=30V, V_{GS}=10V, I_D=0.5A,$ $R_G=25\Omega$ (Note 1, 2)		34		ns
Rise Time	t_R			4.2		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			75		ns
Fall-Time	t_F			28		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_{SD}				2.0	A
Maximum Body-Diode Pulsed Current	I_{SM}				8.0	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=2.0A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S=2.0A, V_{GS}=0V,$ $di_f/dt=100A/\mu s$		270		nS
Body Diode Reverse Recovery Charge	Q_{rr}			1140		nC

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

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

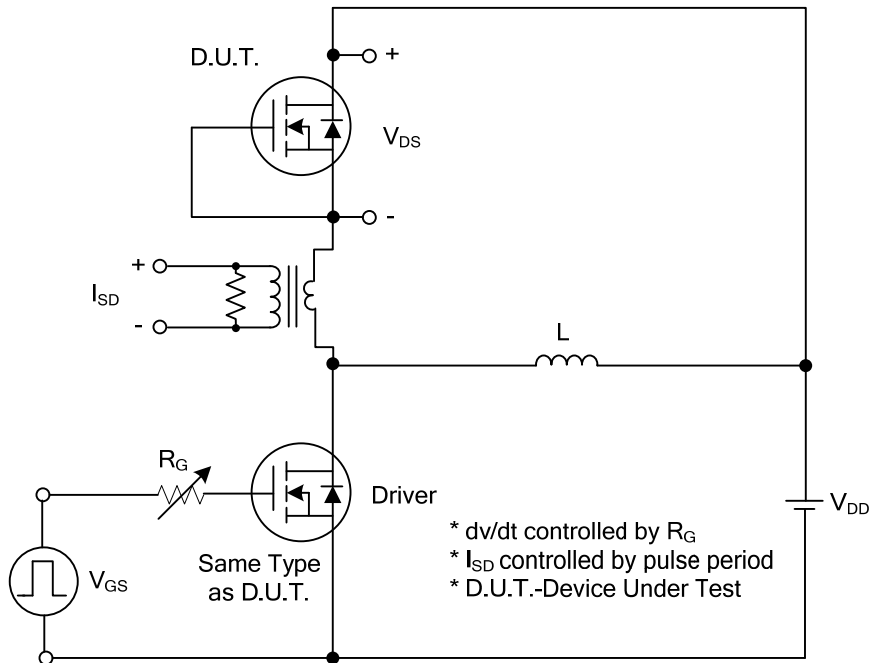


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

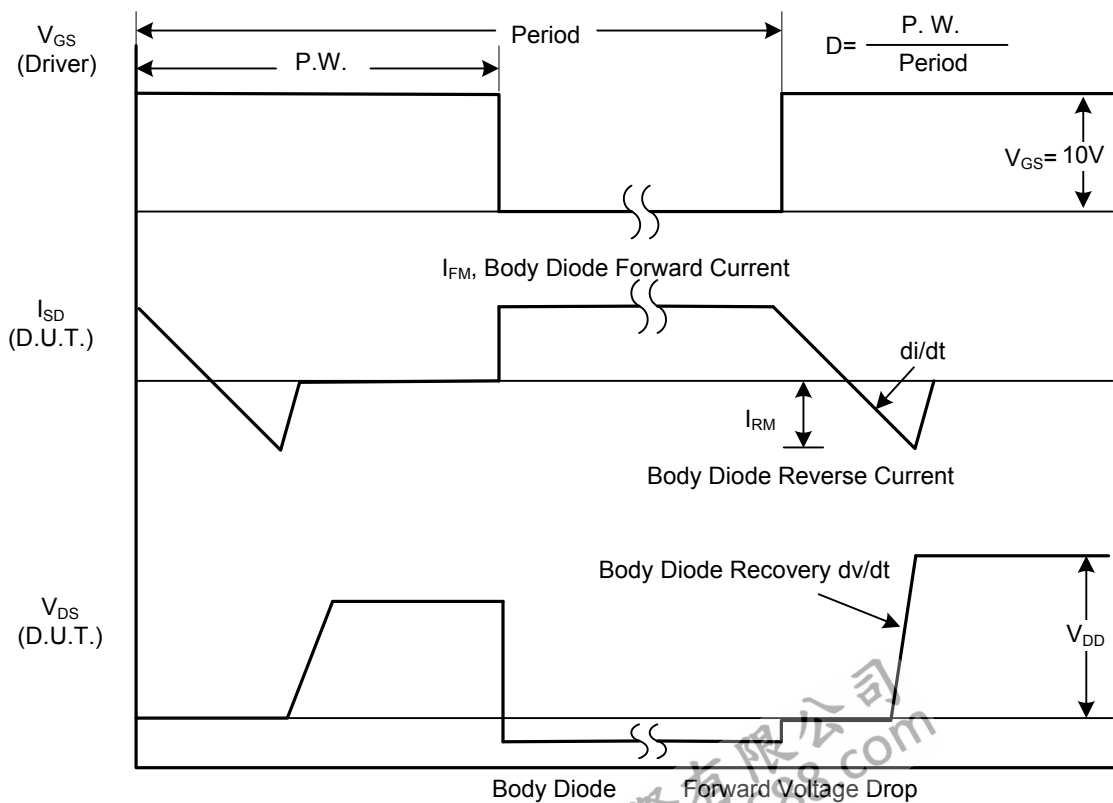


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

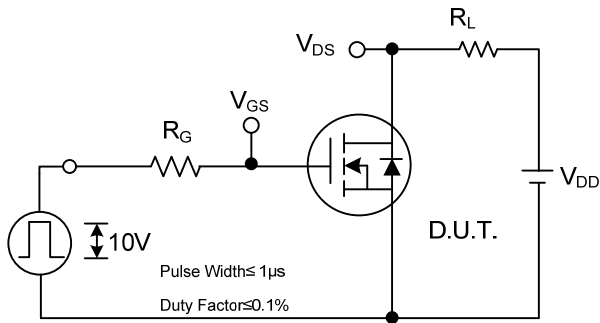


Fig. 2A Switching Test Circuit

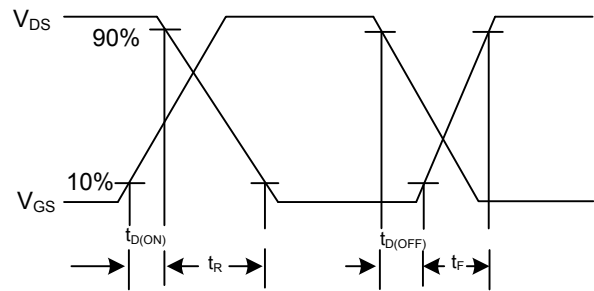


Fig. 2B Switching Waveforms

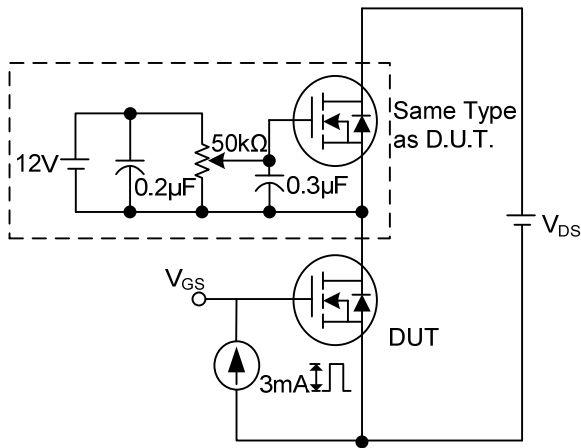


Fig. 3A Gate Charge Test Circuit

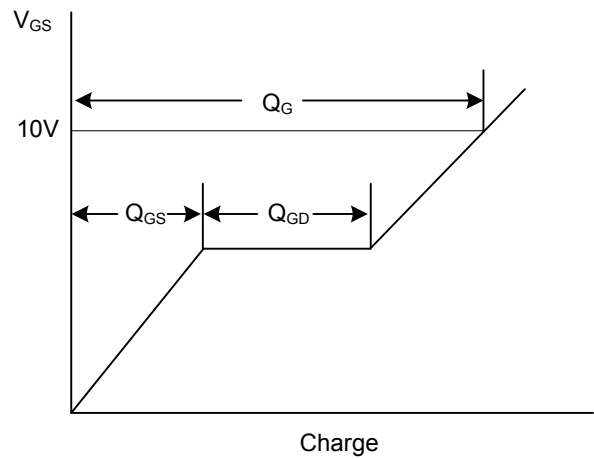


Fig. 3B Gate Charge Waveform

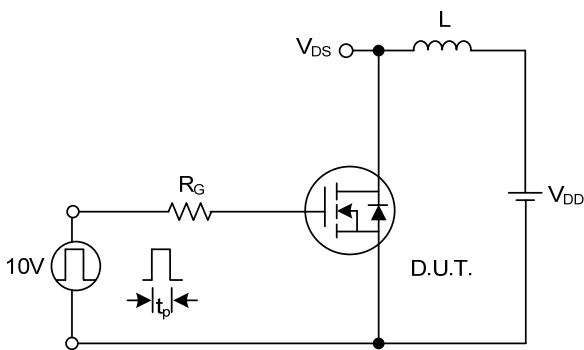


Fig. 4A Unclamped Inductive Switching Test Circuit

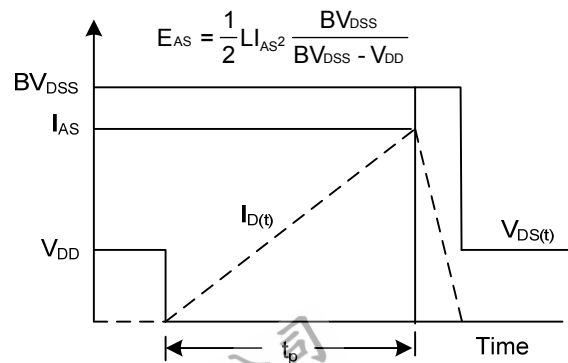


Fig. 4B Unclamped Inductive Switching Waveforms

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.