



3NM70

Preliminary

Power MOSFET

3.0A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

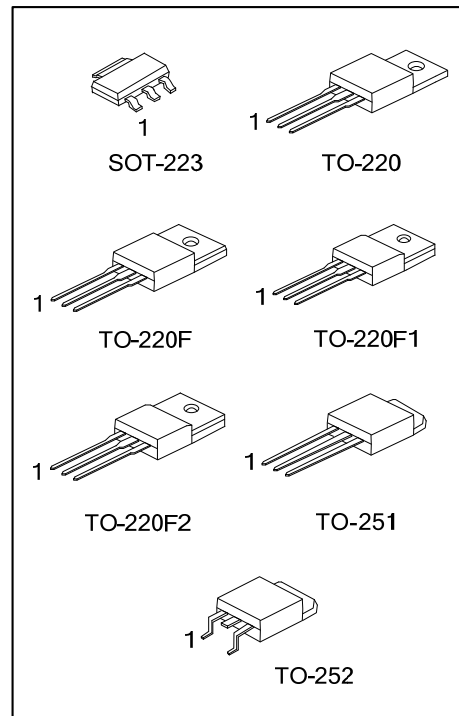
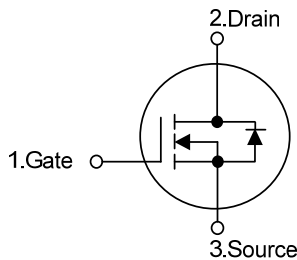
DESCRIPTION

The UTC 3NM70 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

- * $R_{DS(ON)} < 2.28\Omega @ V_{GS} = 10V, I_D = 1.5A$
- * Low reverse transfer capacitance
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



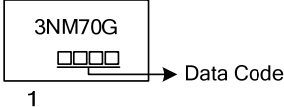
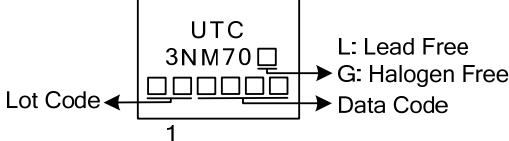
ORDERING INFORMATION

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

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

<p>3NM70G-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>
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MARKING

SOT-223	TO-220 / TO-220F / TO-220F1 TO-220F2 / TO-251 / TO-252
 <p>A diagram of a SOT-223 package. The top surface is marked with "3NM70G" and three small squares representing a data code. A "1" is printed at the bottom left corner. An arrow points from the data code to the text "Data Code".</p>	 <p>A diagram of a TO-220 package. The top surface is marked with "UTC", "3NM70", and a small square. Below this is a row of five squares representing a lot code. An arrow points from the lot code to the text "Lot Code". To the right of the package, there are two legends: "L: Lead Free" and "G: Halogen Free". Below the package is a row of five squares representing a data code, with an arrow pointing from it to the text "Data Code". A "1" is printed at the bottom left corner.</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
Continuous Drain Current		I_D	3.0	A
Pulsed Drain Current (Note 2)		I_{DM}	12	A
Avalanche Current (Note 2)		I_{AR}	1.6	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	13	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.0	V/ns
Power Dissipation	SOT-223	P_D	10	W
	TO-220		78	W
	TO-220F/TO-220F1		34	W
	TO-220F2		35	W
	TO-251/TO-252		50	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. $L = 10\text{mH}$, $I_{AS} = 1.6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 3.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

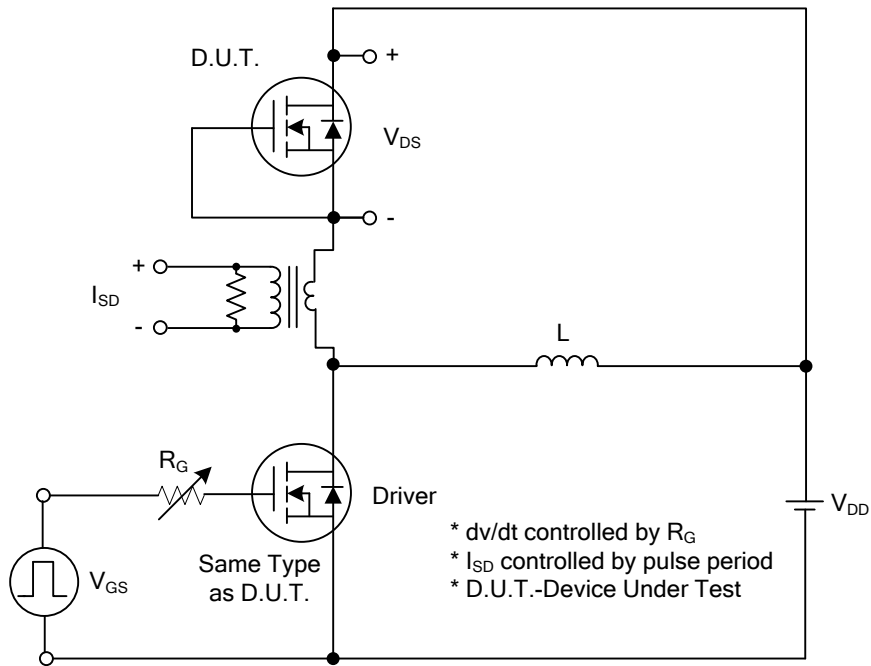
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	$^\circ\text{C}/\text{W}$
	TO-220/TO-220F		62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	θ_{JC}	12.5	$^\circ\text{C}/\text{W}$
	TO-220		1.6	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.68	$^\circ\text{C}/\text{W}$
	TO-220F2		3.58	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		2.5	$^\circ\text{C}/\text{W}$

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

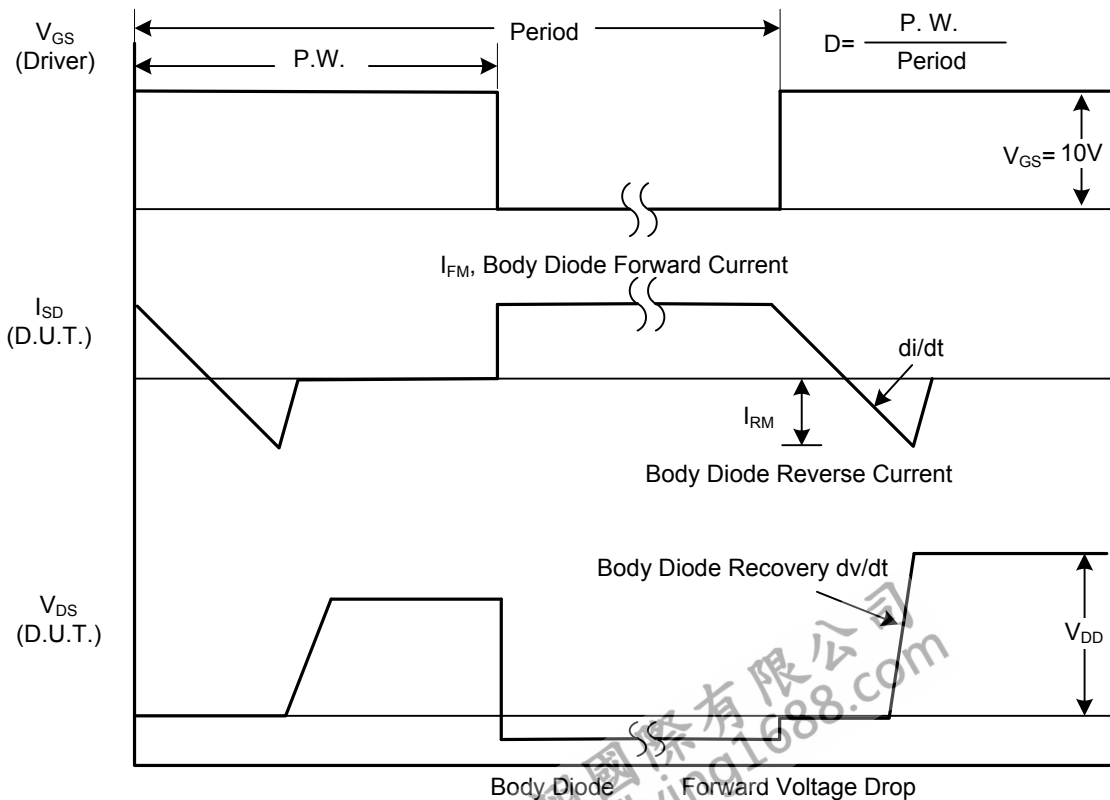
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{ V}, I_D = 250\mu\text{A}$	700			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 700\text{ V}, V_{GS} = 0\text{ V}$			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}			100	nA
	Reverse					
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 1.5\text{A}$			2.28	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1\text{MHz}$		146		pF
Output Capacitance	C_{OSS}			131		pF
Reverse Transfer Capacitance	C_{RSS}			16		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=50\text{V}, V_{GS}=10\text{V}, I_D=1.3\text{A}, I_D=100\mu\text{A}$ (Note 1, 2)		37		nC
Gate to Source Charge	Q_{GS}			5.2		nC
Gate to Drain Charge	Q_{GD}			6.4		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=30\text{V}, V_{GS}=10\text{V}, I_D=0.5\text{A}, R_G=25\Omega$ (Note 1, 2)		32		ns
Rise Time	t_R			59		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			104		ns
Fall-Time	t_F			36		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				3.0	A
Maximum Body-Diode Pulsed Current	I_{SM}				12	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=3.0\text{A}, V_{GS}=0\text{V}$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S=3.0\text{A}, V_{GS}=0\text{V}, dI_F/dt=100\text{A}/\mu\text{s}$		258		ns
Body Diode Reverse Recovery Charge	Q_{rr}			1.6		μC

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

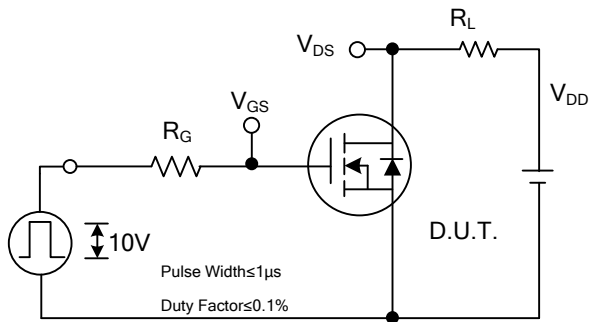


Peak Diode Recovery dv/dt Test Circuit

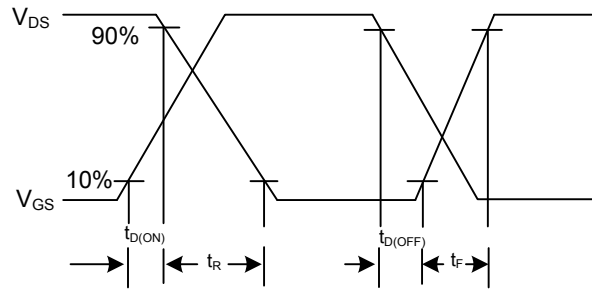


Peak Diode Recovery dv/dt Waveforms

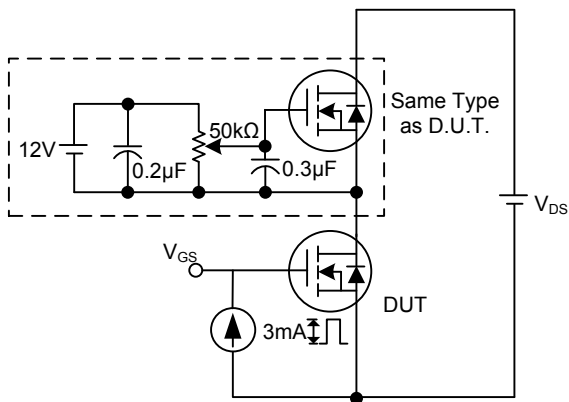
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



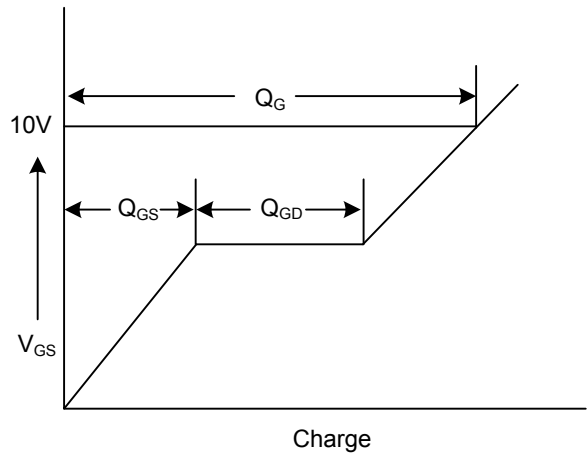
Switching Test Circuit



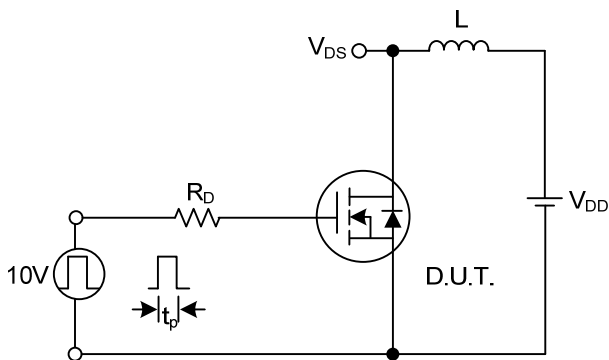
Switching Waveforms



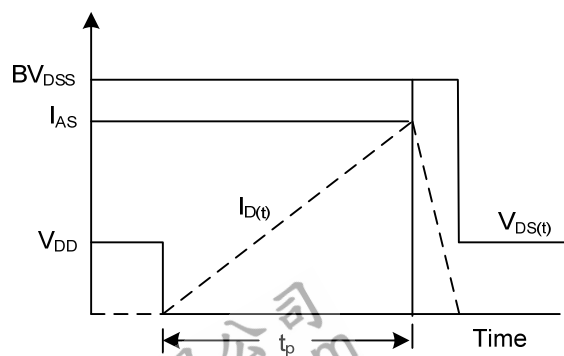
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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