



## 6NM70-Q

Preliminary

Power MOSFET

### 6.0A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

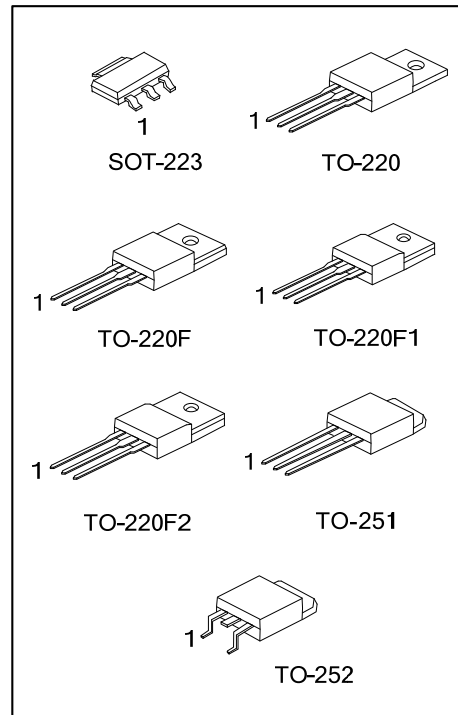
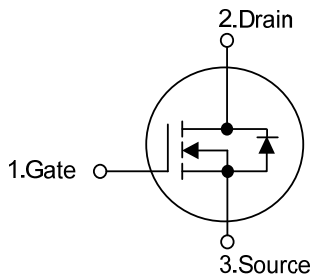
#### DESCRIPTION

The **UTC 6NM70-Q** 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

- \*  $R_{DS(ON)} < 1.44\Omega @ V_{GS} = 10V, I_D = 3.0A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

#### SYMBOL



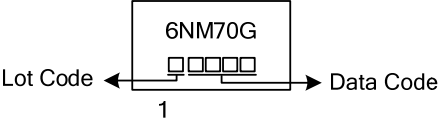
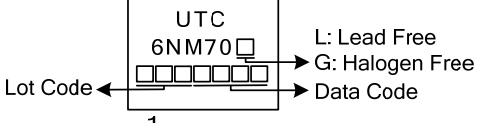
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	6NM70G-AA3-R	SOT-223	G	D	S	Tape Reel
6NM70L-TA3-T	6NM70G-TA3-T	TO-220	G	D	S	Tube
6NM70L-TF3-T	6NM70G-TF3-T	TO-220F	G	D	S	Tube
6NM70L-TF1-T	6NM70G-TF1-T	TO-220F1	G	D	S	Tube
6NM70L-TF2-T	6NM70G-TF2-T	TO-220F2	G	D	S	Tube
6NM70L-TM3-T	6NM70G-TM3-T	TO-251	G	D	S	Tube
6NM70L-TN3-R	6NM70G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>6NM70G-AA3-R</p>	<p>(1) T: Tube, R: Tape Reel  (2) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252  (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>Diagram showing marking on a SOT-223 package. The marking consists of the part number '6NM70G' above a five-digit code. An arrow labeled 'Lot Code' points to the first digit, and an arrow labeled 'Data Code' points to the remaining four digits. A '1' is printed below the code.</p>	 <p>Diagram showing marking on a TO-220 package. The marking consists of 'UTC' above '6NM70' above a five-digit code. An arrow labeled 'Lot Code' points to the first digit, and an arrow labeled 'Data Code' points to the remaining four digits. A '1' is printed below the code. To the right, a legend indicates: 'L: Lead Free' and 'G: Halogen Free'.</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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	6.0	A
	Pulsed (Note 2)	$I_{DM}$	24	A
Avalanche Current (Note 2)		$I_{AR}$	1.3	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	123	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.9	V/ns
Power Dissipation	SOT-223	$P_D$	5	W
	TO-220		125	W
	TO-220F/TO-220F1		40	W
	TO-220F2			
	TO-251/TO-252		55	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.  $L=145\text{mH}$ ,  $I_{AS}=1.3\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD}\leq 6.0\text{A}$ ,  $di/dt\leq 200\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-223	$\theta_{JA}$	150	$^\circ\text{C}/\text{W}$
	TO-220/TO-220F		62.5	
	TO-220F1/TO-220F2			
	TO-251/TO-252		110	
Junction to Case	SOT-223	$\theta_{JC}$	25	$^\circ\text{C}/\text{W}$
	TO-220		1.0	
	TO-220F/TO-220F1		3.13	
	TO-220F2			
	TO-251/TO-252		2.27	

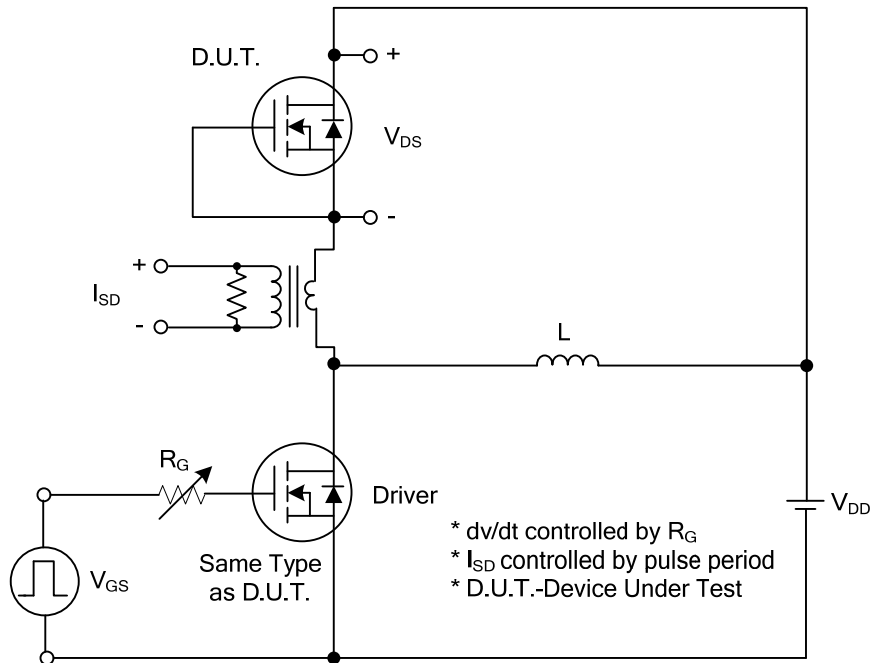
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	700			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 700V, V_{GS} = 0V$			10	$\mu A$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse					
<b>ON CHARACTERISTICS</b>						
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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 3.0A$			1.44	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$		330		pF
Output Capacitance	$C_{OSS}$			215		pF
Reverse Transfer Capacitance	$C_{RSS}$			20		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS} = 50V, V_{GS} = 10V, I_D = 1.3A$ $I_G = 100\mu A$ (Note 1, 2)		50		nC
Gate to Source Charge	$Q_{GS}$			4.0		nC
Gate to Drain Charge	$Q_{GD}$			11		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD} = 30V, V_{GS} = 10V, I_D = 0.5A,$ $R_G = 25\Omega$ (Note 1, 2)		36		ns
Rise Time	$t_R$			65		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			140		ns
Fall-Time	$t_F$			45		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				6.0	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				24	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$I_S = 6.0A, V_{GS} = 0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S = 6.0A, V_{GS} = 0V,$ $di_F/dt = 200A/\mu s$		310		nS
Body Diode Reverse Recovery Charge	$Q_{rr}$			2.7		$\mu C$

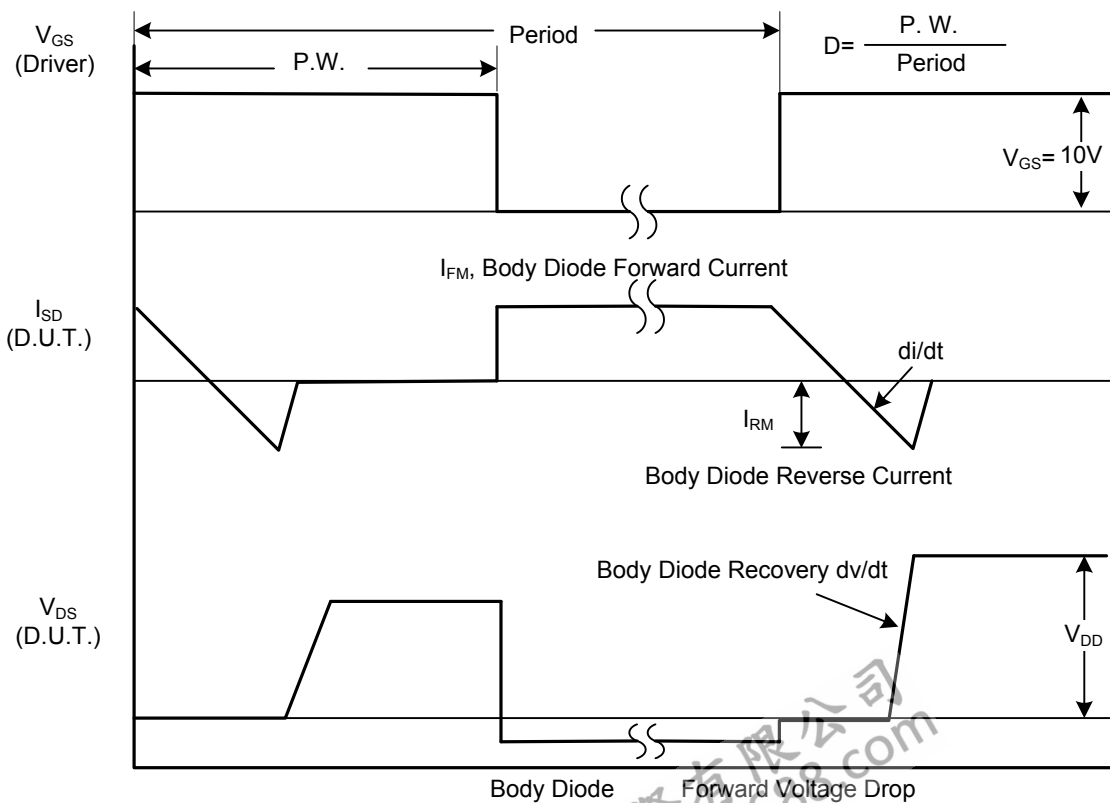
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

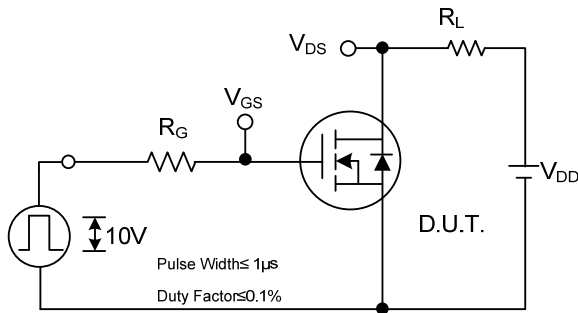


Peak Diode Recovery dv/dt Test Circuit

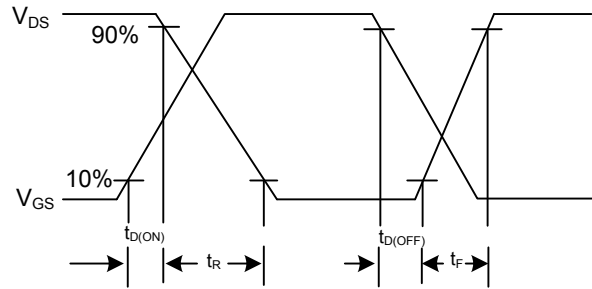


Peak Diode Recovery dv/dt Waveforms

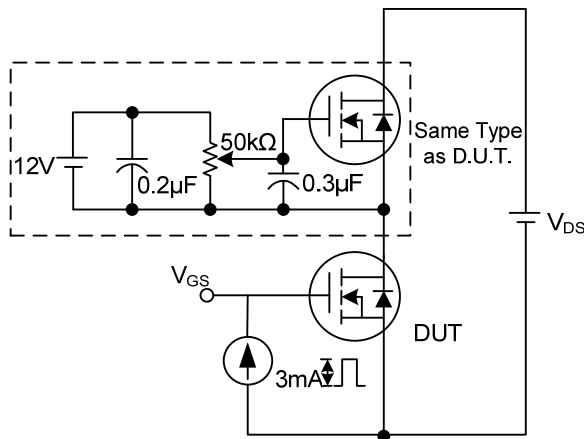
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



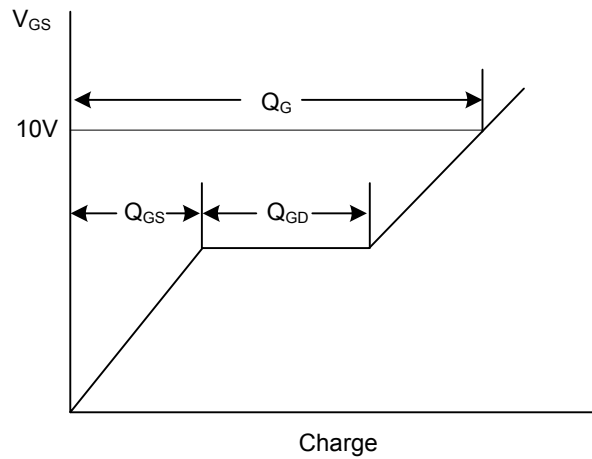
Switching Test Circuit



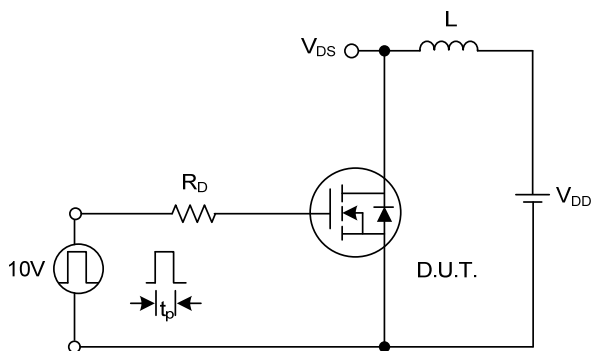
Switching Waveforms



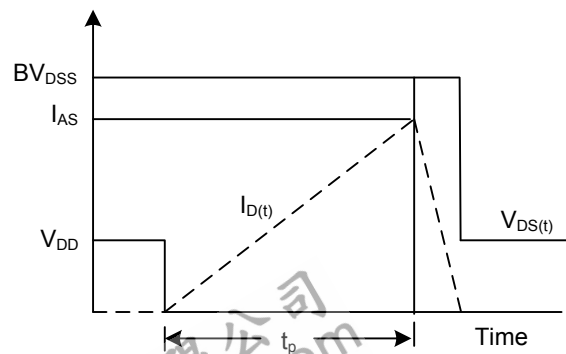
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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