



6NM70-Q

Preliminary

Power MOSFET

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

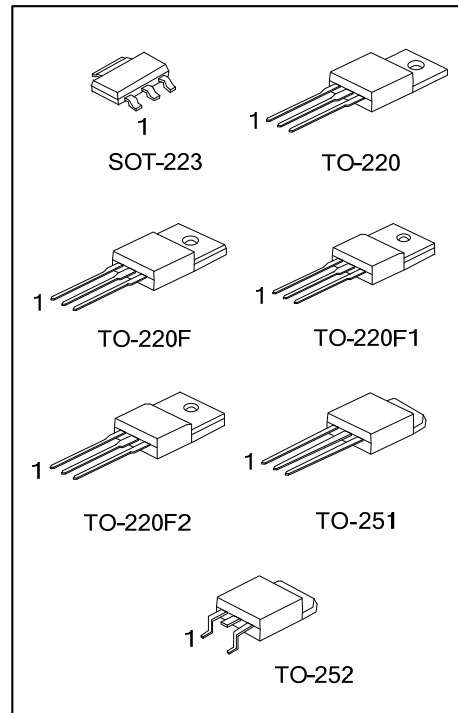
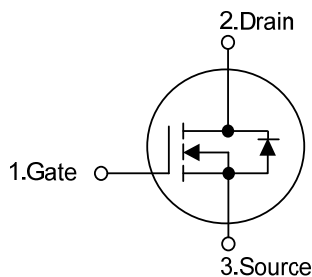
DESCRIPTION

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



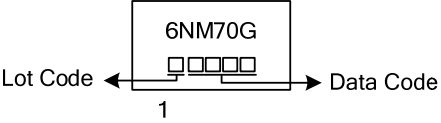
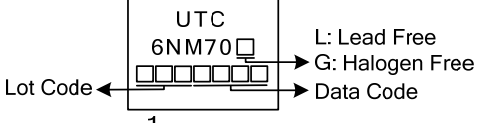
ORDERING INFORMATION

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) Packing Type (2) Package Type (3) Green Package</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>The diagram shows a rectangular package with the text "6NM70G" at the top. Below it are four small squares representing a data code. An arrow labeled "Lot Code" points to the left from the first square, and an arrow labeled "Data Code" points to the right from the last square. A "1" is centered below the package.</p>	 <p>The diagram shows a rectangular package with "UTC" at the top, "6NM70" below it, and a small square to the right. Below these are four small squares representing a data code. An arrow labeled "Lot Code" points to the left from the first square, and an arrow labeled "Data Code" points to the right from the last square. A "1" is centered below the package. To the right of the package, there is a legend: "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}	± 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	θ_{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	θ_{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	

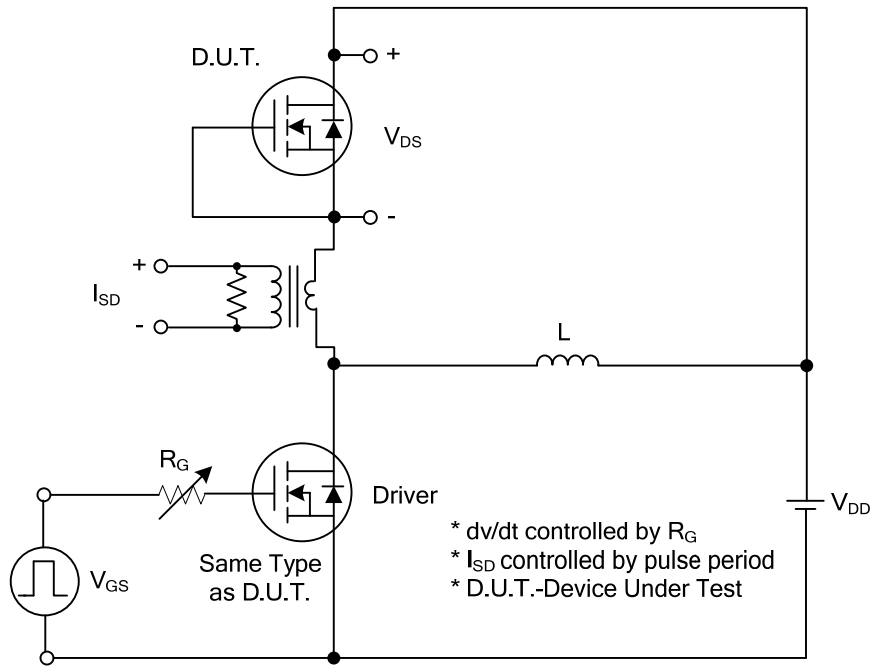
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
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	I_{GSS}			100	nA
	Reverse					
		$V_{GS} = -30V, V_{DS} = 0V$			-100	nA
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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 3.0A$			1.44	Ω
DYNAMIC CHARACTERISTICS						
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
SWITCHING CHARACTERISTICS						
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
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
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		μC

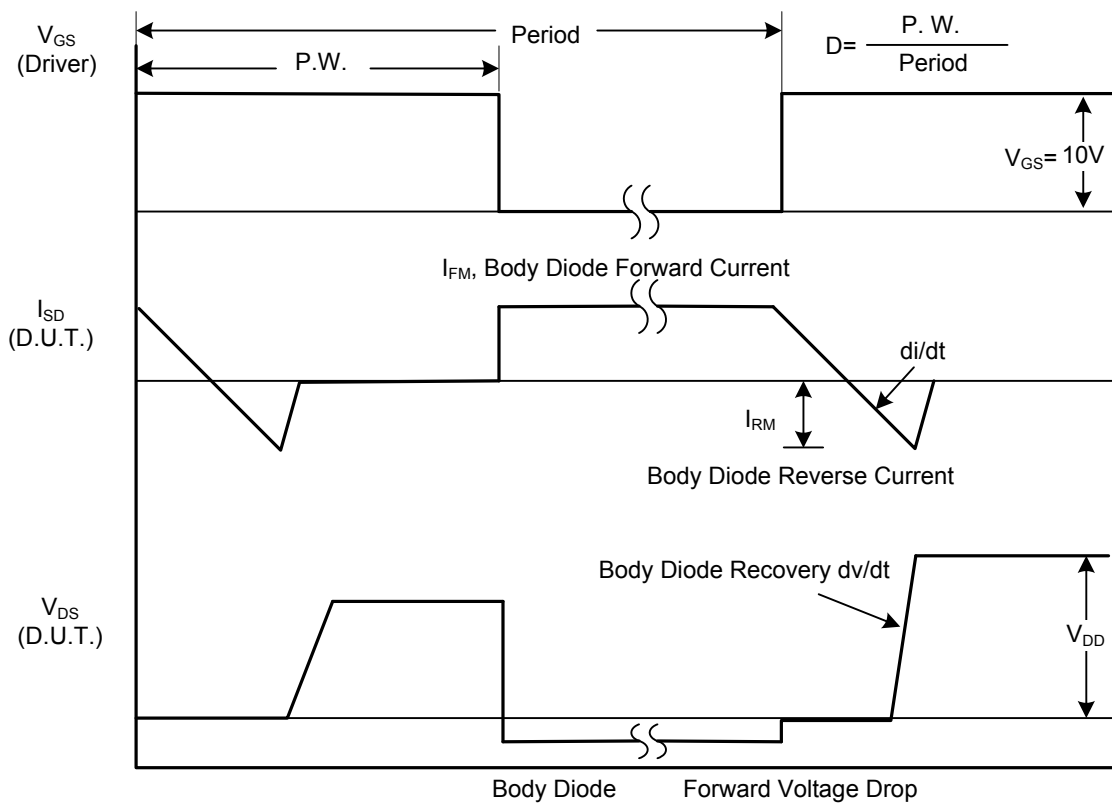
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

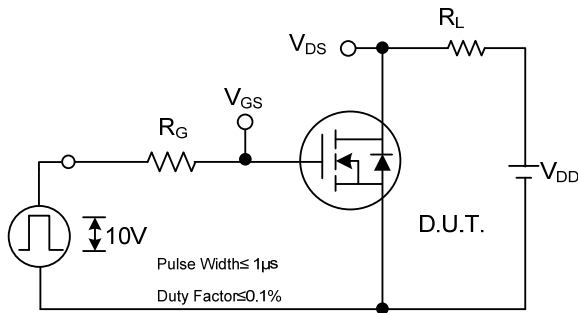


Peak Diode Recovery dv/dt Test Circuit

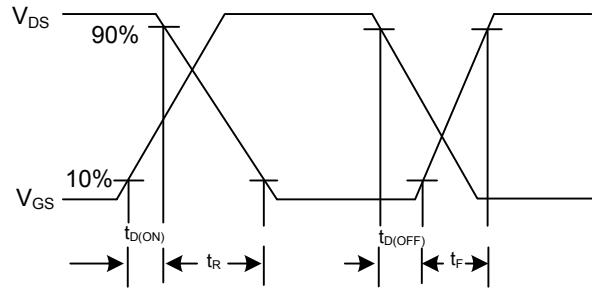


Peak Diode Recovery dv/dt Waveforms

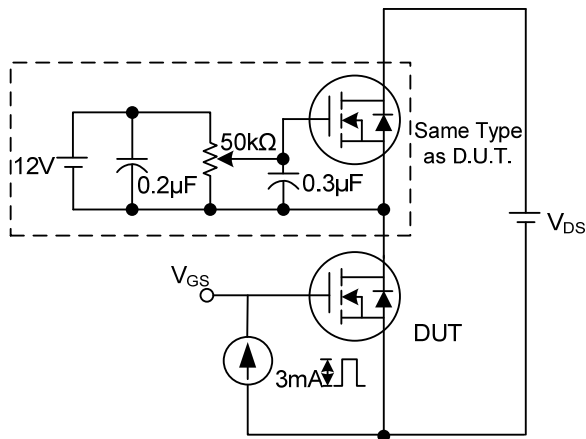
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



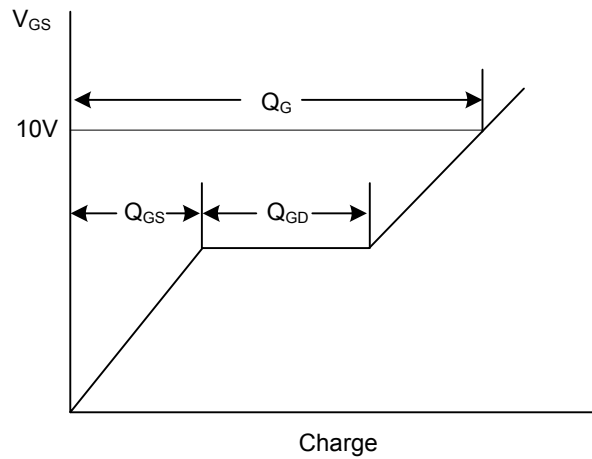
Switching Test Circuit



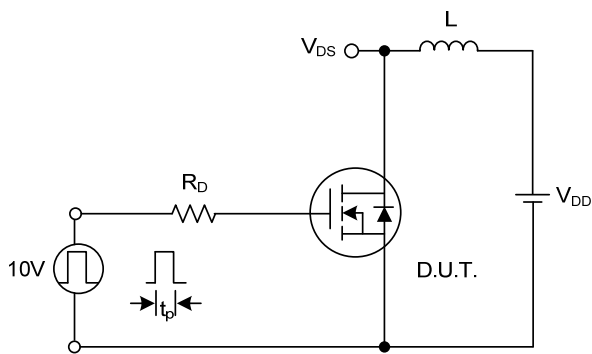
Switching Waveforms



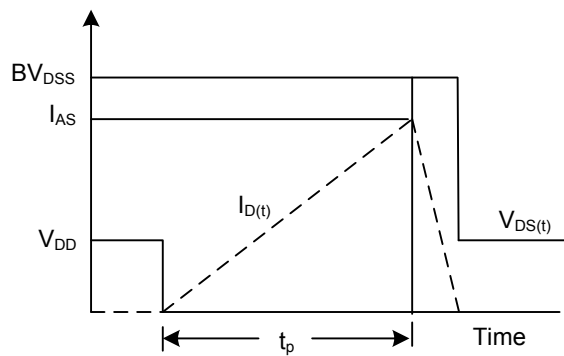
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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