



2NM70-Q

Preliminary

Power MOSFET

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

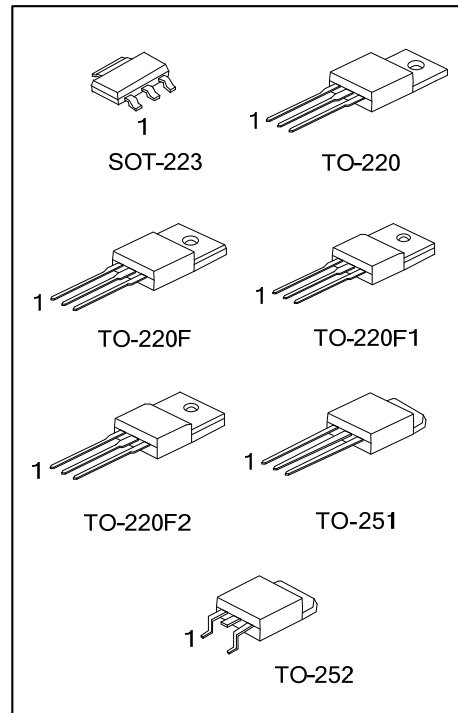
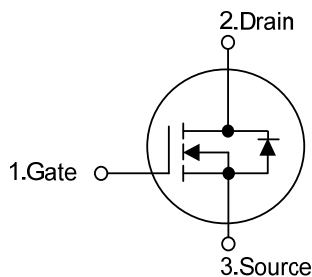
DESCRIPTION

The **UTC 2NM70-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

- * $R_{DS(ON)} < 3.3\Omega @ V_{GS} = 10V, I_D = 1.0A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



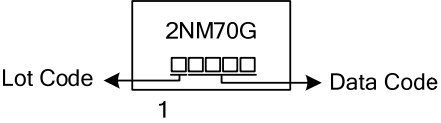
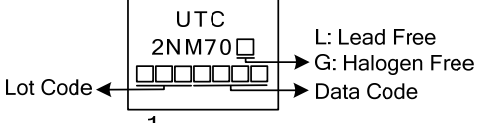
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	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-R	2NM70G-TM3-R	TO-251	G	D	S	Tape Reel
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 (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>Diagram showing the marking on a SOT-223 package. The top surface contains the part number '2NM70G' and a five-digit data code. The bottom surface contains a five-digit lot code. A '1' is printed below the lot code. Arrows indicate the direction of the Lot Code and Data Code.</p>	 <p>Diagram showing the marking on a TO-220 package. The top surface contains 'UTC', the part number '2NM70', and a five-digit data code. The bottom surface contains a five-digit lot code. A '1' is printed below the lot code. Arrows indicate the direction of the Lot Code and Data Code. A legend on the right defines '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	2.0	A
	Pulsed (Note 2)	I_{DM}	8.0	A
Avalanche Current (Note 2)		I_{AR}	1.0	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	69	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.7	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	$^\circ\text{C}$
Operating Temperature		T_{OPR}	-55 ~ +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 T_J .
 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		4.17	$^\circ\text{C}/\text{W}$

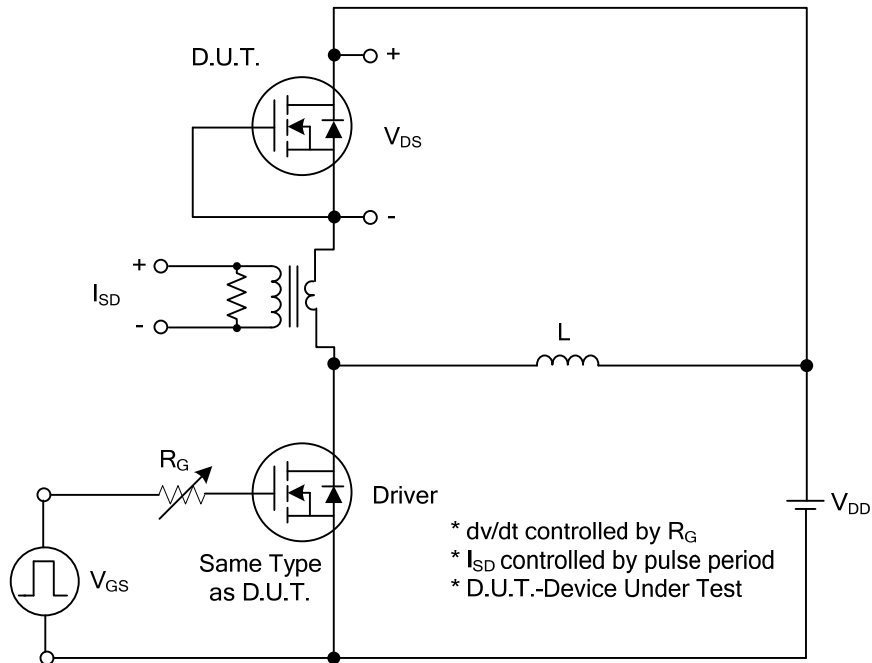
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

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	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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 1.0A$			3.3	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$		125		pF
Output Capacitance	C_{OSS}			85		pF
Reverse Transfer Capacitance	C_{RSS}			10		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q_G	$V_{DS} = 50V, V_{GS} = 10V, I_D = 1.3A$ $I_G = 100\mu A$ (Note 1, 2)		23		nC
Gate-Source Charge	Q_{GS}			2.5		nC
Gate-Drain Charge	Q_{GD}			6		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 30V, V_{GS} = 10V, I_D = 0.5A,$ $R_G = 25\Omega$ (Note 1, 2)		35		ns
Turn-On Rise Time	t_R			24		ns
Turn-Off Delay Time	$t_{D(OFF)}$			73		ns
Turn-Off Fall Time	t_F			53		ns
DRAIN-SOURCE DIODE CHARACTERISTICS						
Continuous Drain-Source Current	I_S				2.0	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				8.0	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S = 2.0A, V_{GS} = 0V$			1.4	V
Body Diode Reverse Recovery Time	t_{RR}	$I_S = 2.0A, V_{GS} = 0V$ $dI/dt = 100A/\mu s$		240		nS
Body Diode Reverse Recovery Charge	Q_{RR}			1.15		μC

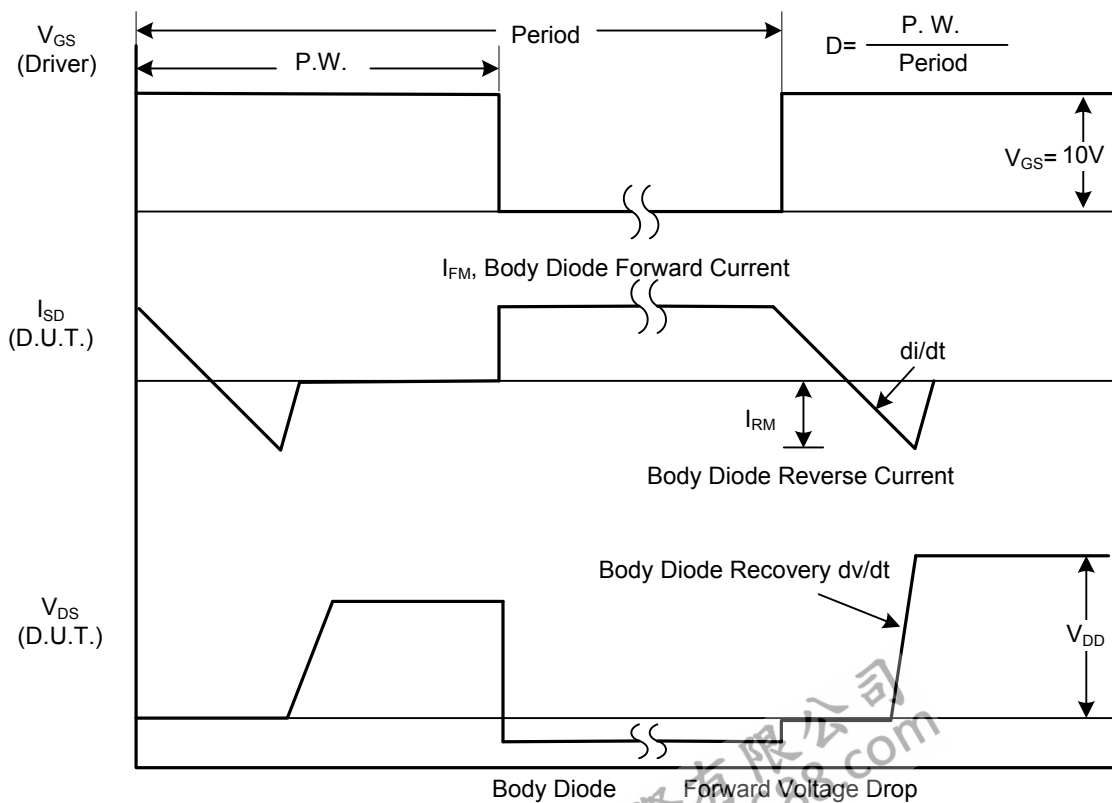
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

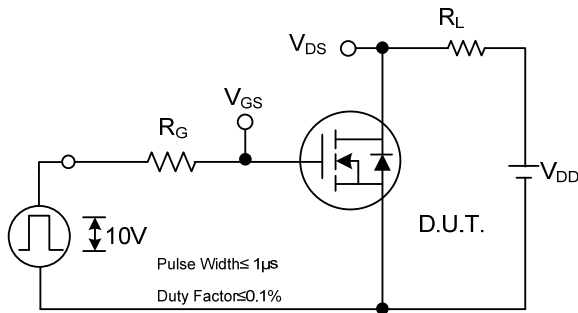


Peak Diode Recovery dv/dt Test Circuit

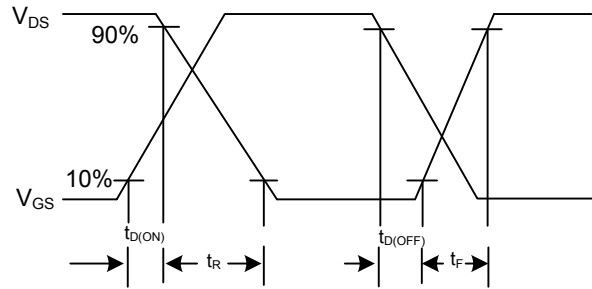


Peak Diode Recovery dv/dt Waveforms

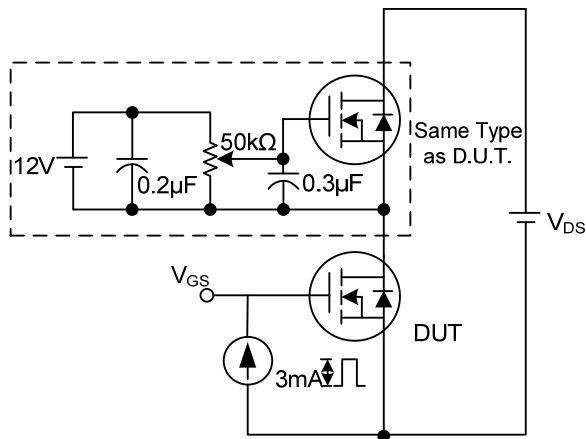
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



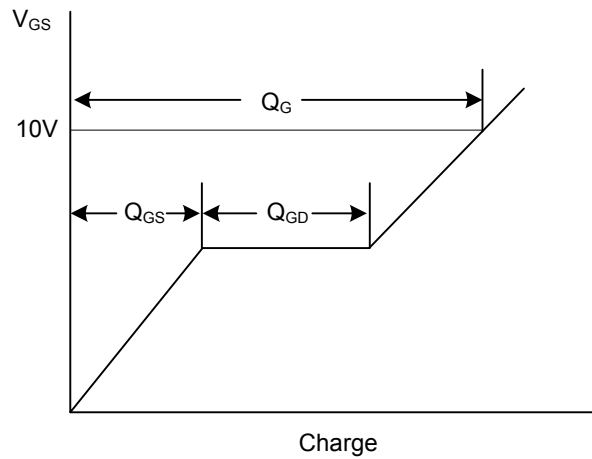
Switching Test Circuit



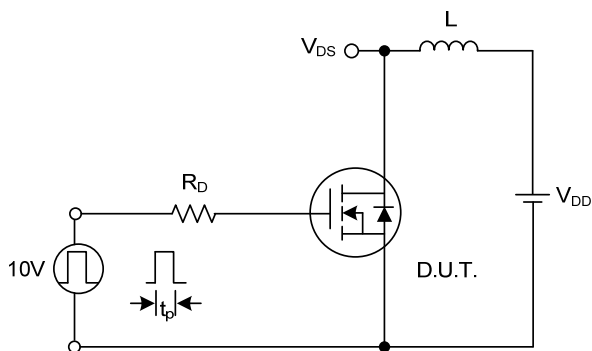
Switching Waveforms



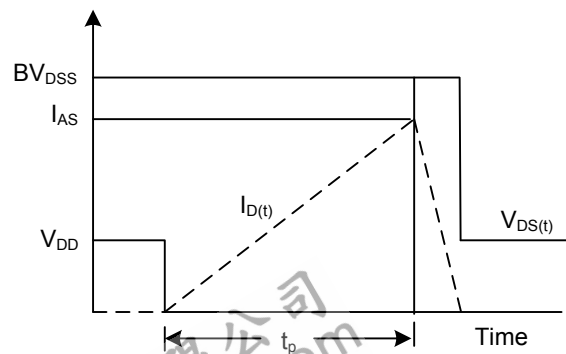
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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