



5NM70A-U2

Preliminary

Power MOSFET

5.0A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

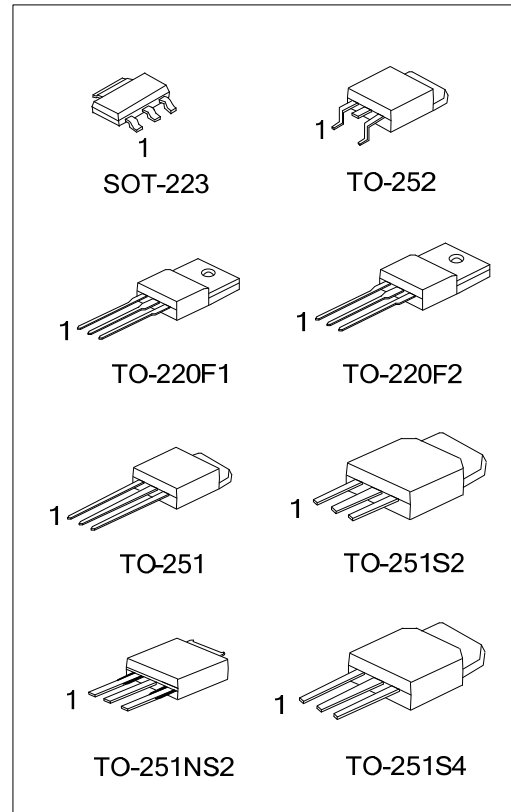
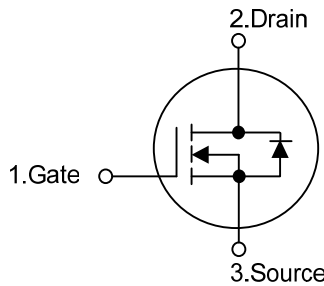
■ DESCRIPTION

The UTC **5NM70A-U2** 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 high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications at power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

■ FEATURES

- * $R_{DS(ON)} < 1.8\Omega @ V_{GS} = 10V, I_D = 2.5A$
- * Fast Switching Capability
- * Improved dv/dt Capability, High Ruggedness

■ SYMBOL




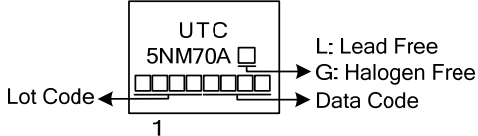
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	5NM70AG-AA3-R	SOT-223	G	D	S	Tape Reel
5NM70AL-TF1-T	5NM70AG-TF1-T	TO-220F1	G	D	S	Tube
5NM70AL-TF2-T	5NM70AG-TF2-T	TO-220F2	G	D	S	Tube
5NM70AL-TM3-T	5NM70AG-TM3-T	TO-251	G	D	S	Tube
5NM70AL-TMS2-T	5NM70AG-TMS2-T	TO-251S2	G	D	S	Tube
5NM70AL-TMS4-T	5NM70AG-TMS4-T	TO-251S4	G	D	S	Tube
5NM70AL-TMN2-T	5NM70AG-TMN2-T	TO-251NS2	G	D	S	Tube
5NM70AL-TN3-R	5NM70AG-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>5NM70G-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, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TMN2: TO-251NS2</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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MARKING

SOT-223	TO-220F1 / TO-220F2 / TO-251 / TO-251S2 / TO-251S4 / TO-252 / TO-251NS2
 <p>Diagram showing the marking on a SOT-223 package. The marking consists of the part number '5NM70AG' above a row of five small squares. Below these squares is the number '1'. An arrow labeled 'Lot Code' points to the left, and an arrow labeled 'Data Code' points to the right.</p>	 <p>Diagram showing the marking on TO-220F1 / TO-220F2 / TO-251 / TO-251S2 / TO-251S4 / TO-252 / TO-251NS2 packages. The marking consists of 'UTC' above '5NM70A', followed by a small square, then a row of five small squares, and finally the number '1'. An arrow labeled 'Lot Code' points to the left, and an arrow labeled 'Data Code' points to the right. A legend indicates: 'L: Lead Free' and 'G: Halogen Free'.</p>

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■ 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	$T_C=25^\circ\text{C}$	5.0	A
			$T_C=100^\circ\text{C}$	3.4	A
	Pulsed (Note 2)		I_{DM}	20	A
Avalanche Energy	Single Pulsed (Note 3)		E_{AS}	116	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.0	V/ns	
Power Dissipation	SOT-223		P_D	12	W
	TO-220F1/TO-220F2			36	W
	TO-251/TO-251S2			54	W
	TO-251S4/TO-251NS2				
	TO-252				
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. $L=144\text{mH}$, $I_{AS}=1.27\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 5.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, 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-220F1/TO-220F2			62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S2			110	$^\circ\text{C}/\text{W}$
	TO-251S4/TO-251NS2				
	TO-252				
Junction to Case	SOT-223		θ_{JC}	10.4	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			3.47	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S2			2.3	$^\circ\text{C}/\text{W}$
	TO-251S4/TO-251NS2				
	TO-252				

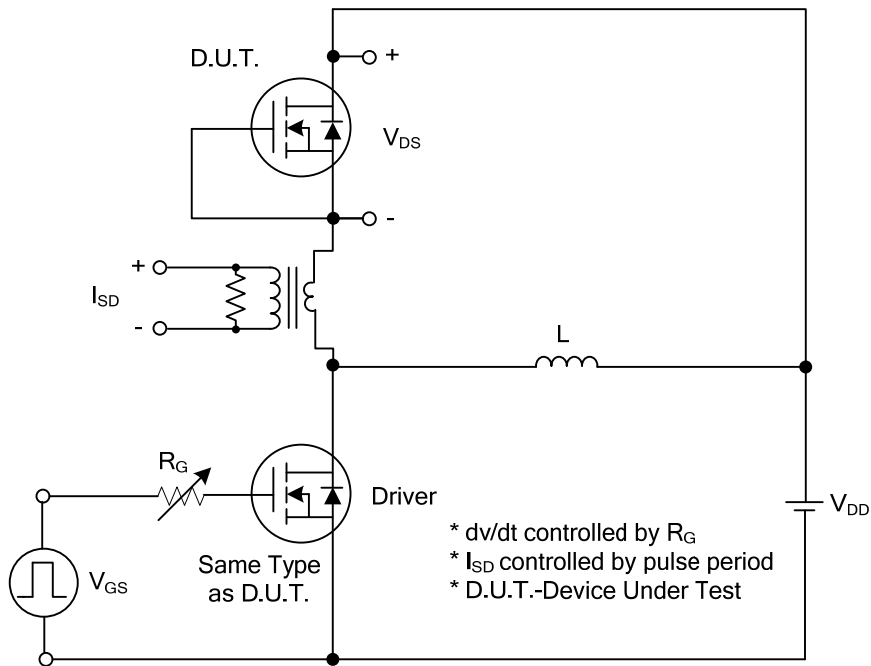
■ ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	700			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =700V, V _{GS} =0V			1	μA
Gate-Source Leakage Current	Forward	I _{GSS}			100	nA
	Reverse				-100	
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.5		4.5	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =2.5A			1.8	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		250		pF
Output Capacitance	C _{OSS}			150		pF
Reverse Transfer Capacitance	C _{RSS}			14		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =50V, V _{GS} =10V, I _D =1.3A, I _G =100μA (Note 1, 2)		24		nC
Gate to Source Charge	Q _{GS}			3		nC
Gate to Drain Charge	Q _{GD}			7		nC
Turn-ON Delay Time (Note 1)	t _{D(ON)}	V _{DD} =30V, V _{GS} =10V, I _D =0.5A, R _G =25Ω (Note 1, 2)		40		ns
Rise Time	t _R			55		ns
Turn-OFF Delay Time	t _{D(OFF)}			120		ns
Fall-Time	t _F			30		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				5	A
Maximum Body-Diode Pulsed Current	I _{SM}				20	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =5.0A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =5.0A, V _{GS} =0V, dI _F /dt=100A/μs		310		ns
Body Diode Reverse Recovery Charge	Q _{rr}				3	

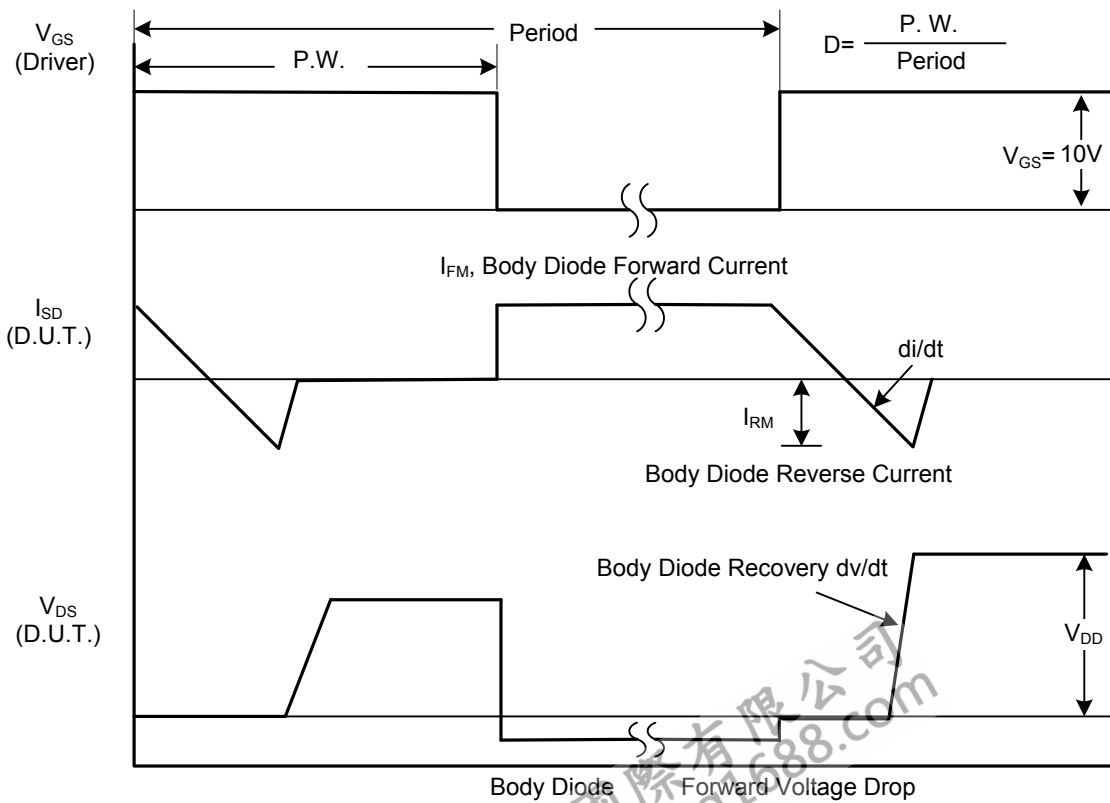
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

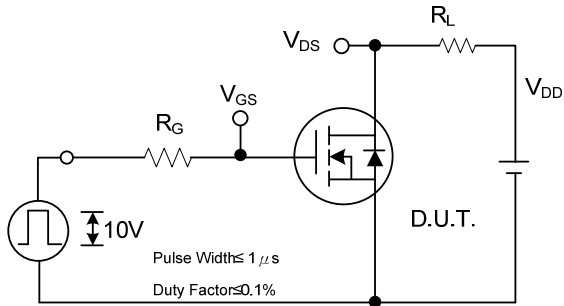


Peak Diode Recovery dv/dt Test Circuit

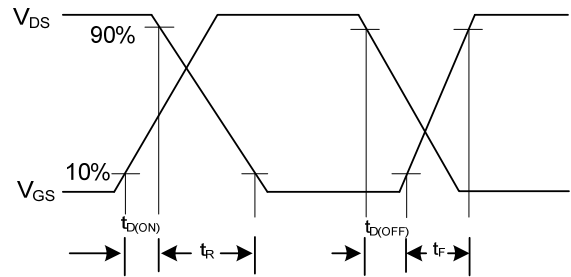


Peak Diode Recovery dv/dt Waveforms

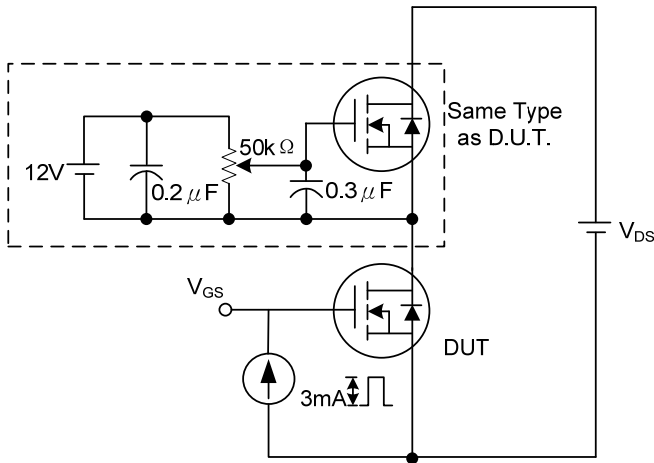
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



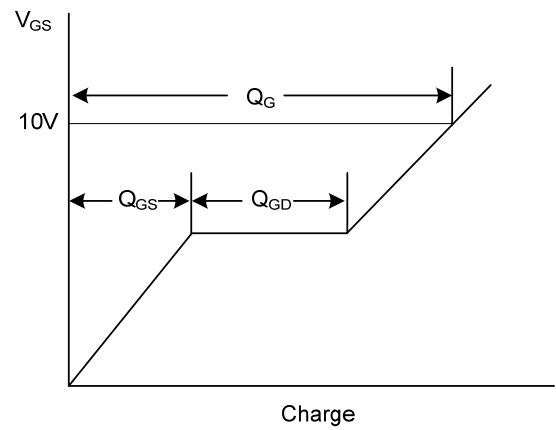
Switching Test Circuit



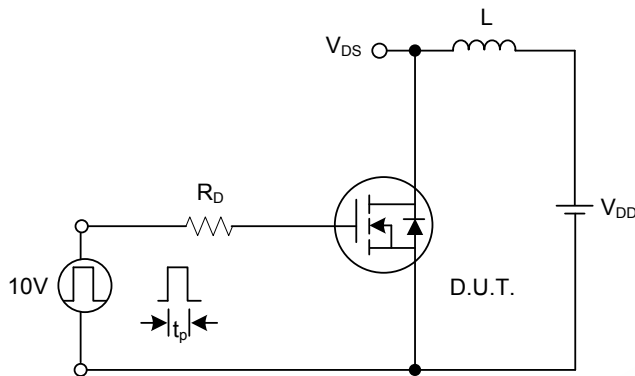
Switching Waveforms



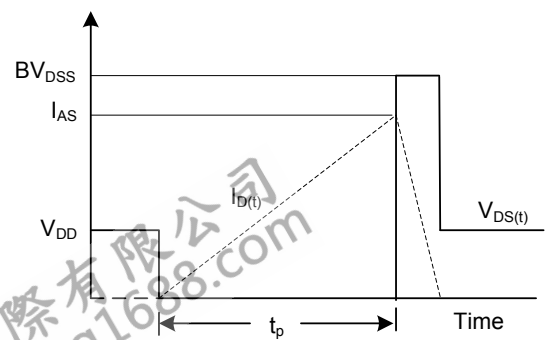
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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