



5NM70A-U2

Preliminary

Power MOSFET

5A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

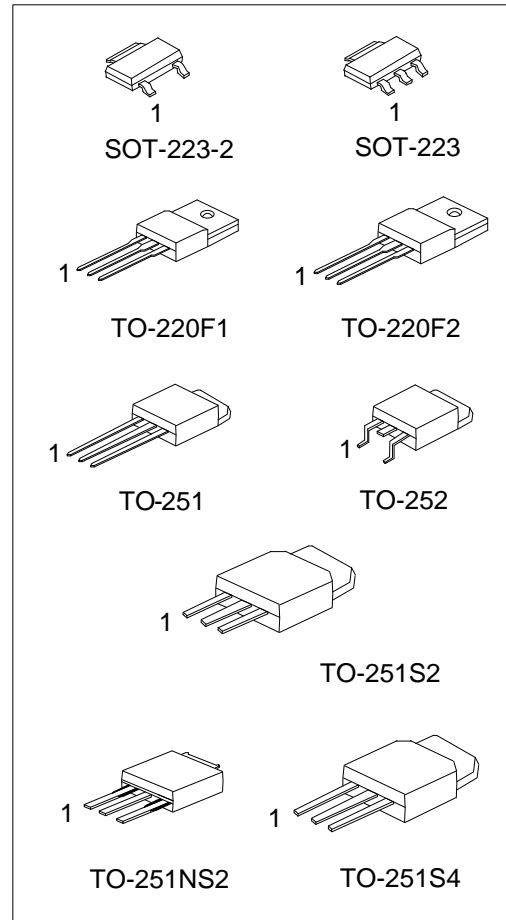
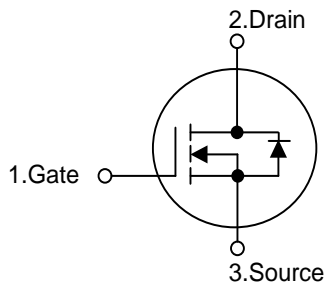
DESCRIPTION

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

- * $R_{DS(ON)} \leq 1.8 \Omega @ V_{GS} = 10V, I_D = 2.5A$
- * 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	
5NM70AL-AA2-R	5NM70AG-AA2-R	SOT-223-2	G	D	S	Tape Reel
5NM70AL-AA3-R	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>5NM70AG-AA2-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) AA2: SOT-223-2, AA3: SOT-223, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TMN2: TO-251NS2 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
---	--

MARKING

SOT-223-2 / SOT-223	TO-220F1 / TO-220F2 / TO-251 / TO-251S2 / TO-251S4 / TO-252 / TO-251NS2

■ **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-223-2/SOT-223		P_D	8	W
	TO-220F1/TO-220F2			30	W
	TO-251/TO-251S2			48	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-223-2/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-223-2/SOT-223		θ_{JC}	15.6	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			4.17	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S2			2.6	$^\circ\text{C}/\text{W}$
	TO-251S4/TO-251NS2				
	TO-252				

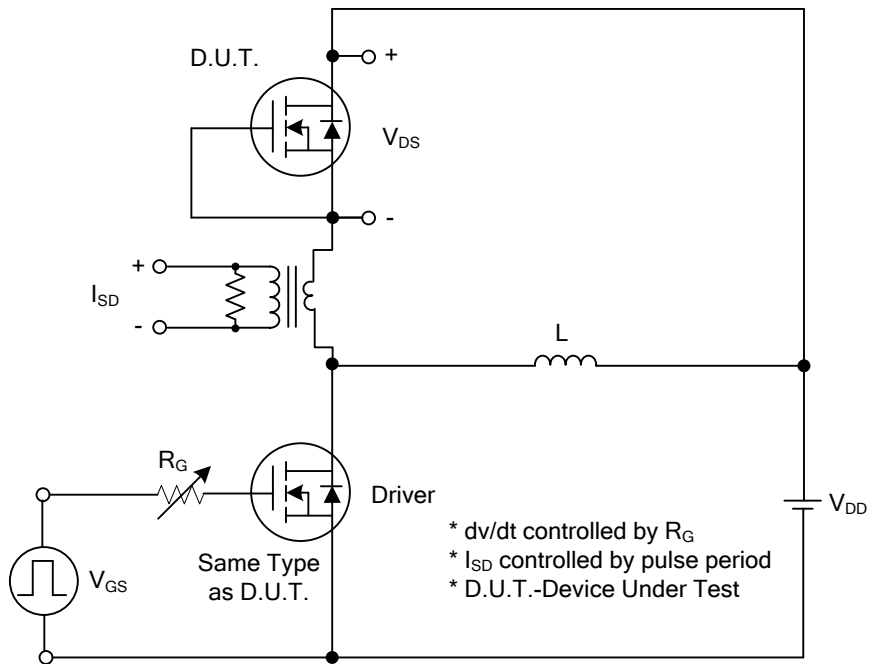
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$ unless otherwise specified)

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}	$V_{DS}=700V, V_{GS}=0V$			1	μA
Gate-Source Leakage Current	Forward	$V_{GS}=30V, V_{DS}=0V$ $V_{GS}=-30V, V_{DS}=0V$			100	nA
	Reverse				-100	
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.5A$			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	$V_{DS}=50V, V_{GS}=10V, I_D=1.3A,$ $I_G=100\mu A$ (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)	$t_{D(ON)}$	$V_{DD}=30V, V_{GS}=10V, I_D=0.5A,$ $R_G=25\Omega$ (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}	$I_S=5.0A, V_{GS}=0V,$ $dI_F/dt=100A/\mu s$		310		ns
Body Diode Reverse Recovery Charge	Q_{rr}			3		μC

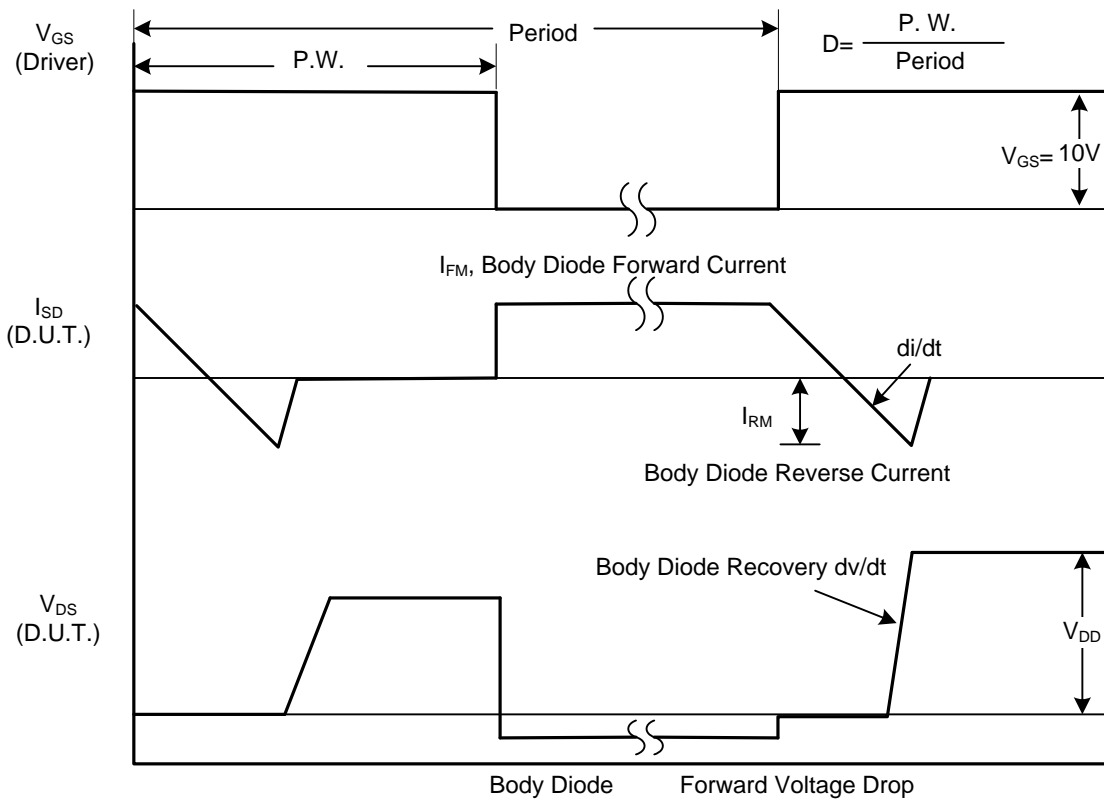
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

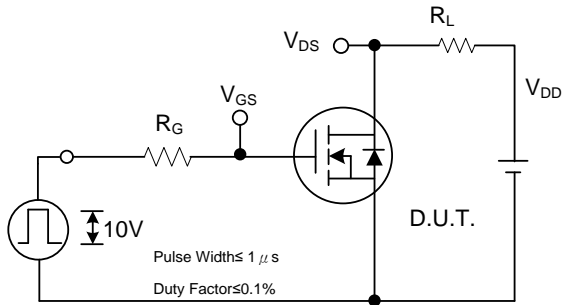


Peak Diode Recovery dv/dt Test Circuit

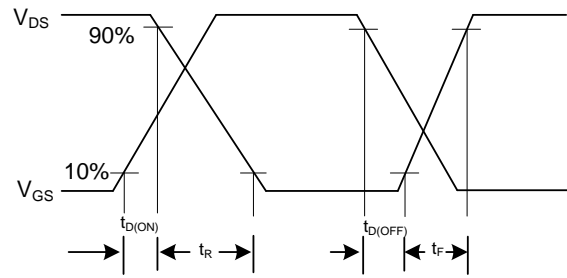


Peak Diode Recovery dv/dt Waveforms

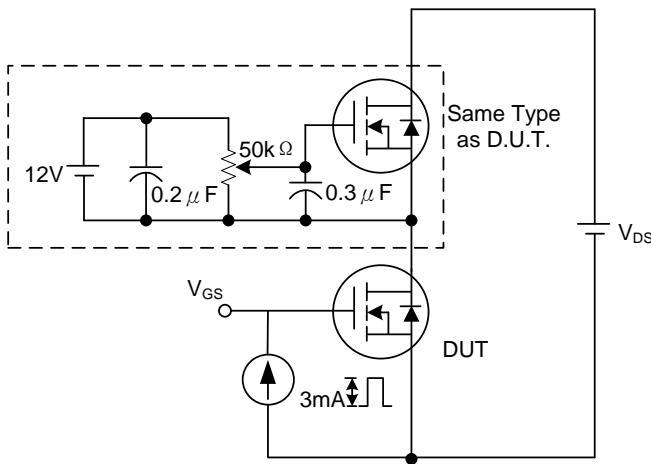
TEST CIRCUITS AND WAVEFORMS



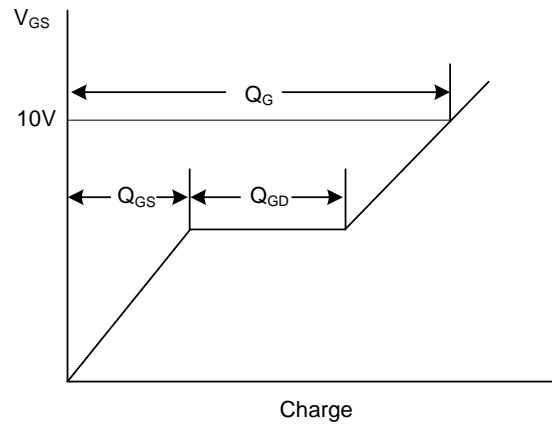
Switching Test Circuit



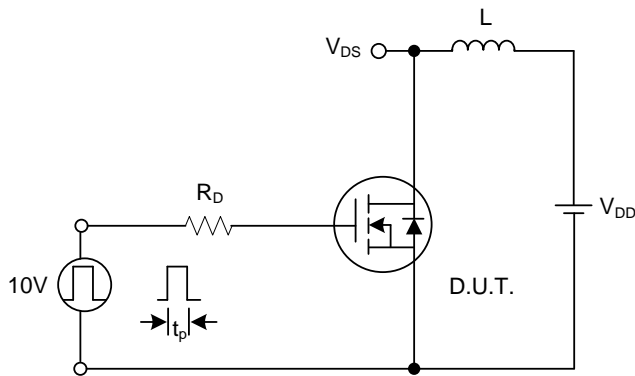
Switching Waveforms



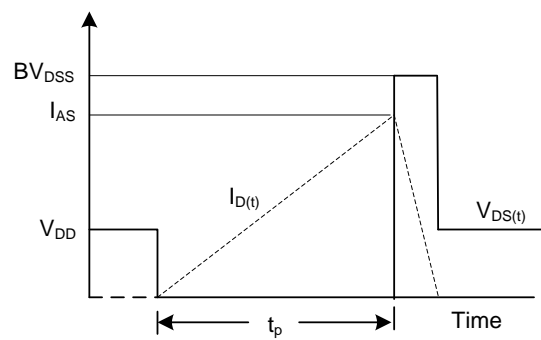
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.