



# 5NM70-U2

Power MOSFET

## 5.4A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

### DESCRIPTION

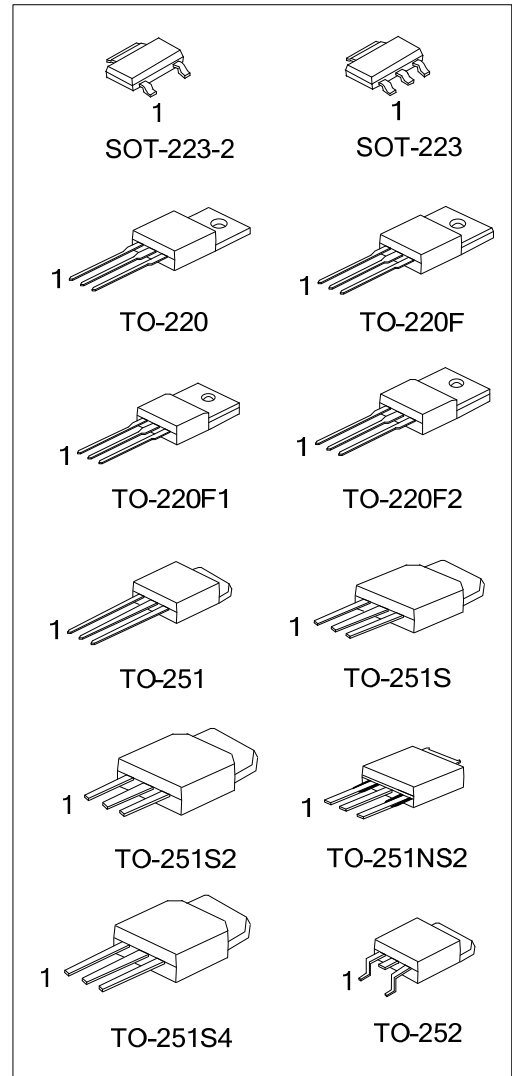
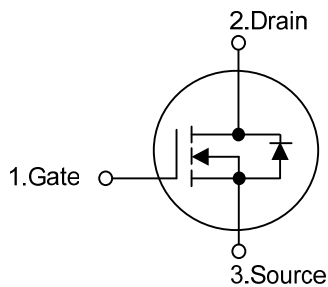
The UTC **5NM70-U2** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics.

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

- \*  $R_{DS(ON)} < 1.5\Omega @ V_{GS} = 10V, I_D = 2.5A$
- \* Fast Switching Capability
- \* Improved dv/dt Capability, High Ruggedness

### SYMBOL



FLYING 汎翔國際有限公司  
www.flying1688.com

### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5NM70L-AA2-R	5NM70G-AA2-R	SOT-223-2	G	D	S	Tape Reel
5NM70L-AA3-R	5NM70G-AA3-R	SOT-223	G	D	S	Tape Reel
5NM70L-TA3-T	5NM70G-TA3-T	TO-220	G	D	S	Tube
5NM70L-TF1-T	5NM70G-TF1-T	TO-220F1	G	D	S	Tube
5NM70L-TF2-T	5NM70G-TF2-T	TO-220F2	G	D	S	Tube
5NM70L-TF3-T	5NM70G-TF3-T	TO-220F	G	D	S	Tube
5NM70L-TM3-T	5NM70G-TM3-T	TO-251	G	D	S	Tube
5NM70L-TMS-T	5NM70G-TMS-T	TO-251S	G	D	S	Tube
5NM70L-TMS2-T	5NM70G-TMS2-T	TO-251S2	G	D	S	Tube
5NM70L-TMS4-T	5NM70G-TMS4-T	TO-251S4	G	D	S	Tube
5NM70L-TMN2-T	5NM70G-TMN2-T	TO-251NS2	G	D	S	Tube
5NM70L-TN3-R	5NM70G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>5NM70G-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, TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TM3: TO-251, TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TMN2: TO-251NS2 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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### MARKING

SOT-223-2 / SOT-223	TO-220 / TO-220F / TO-220F1 / TO-220F2 TO-251 / TO-251S / TO-251S2 / TO-251S4 TO-252 / TO-251NS2
<p>Lot Code ← 5NM70 □ □ □ □ → Data Code</p> <p>L: Lead Free G: Halogen F</p>	<p>Lot Code ← UTC 5NM70 □ □ □ □ → Data Code</p> <p>L: Lead Free 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	$I_D$	$T_C=25^\circ\text{C}$	5.4	A
			$T_C=100^\circ\text{C}$	3.4	A
	Pulsed (Note 2)		$I_{DM}$	20	A
Avalanche Current (Note 2)		$I_{AR}$	1.2	A	
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	104	mJ	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/ns	
Power Dissipation	SOT-223-2/SOT-223	$P_D$	5	W	
	TO-220		108	W	
	TO-220F/TO-220F1		36	W	
	TO-220F2				
	TO-251/TO-251S		54	W	
TO-251S2/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.  $L=144\text{mH}$ ,  $I_{AS}=1.2\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\ \Omega$ , 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	$\theta_{JA}$	160	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F		62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-251/TO-251S		110	$^\circ\text{C}/\text{W}$
	TO-251S2/TO-251S4			
TO-251NS2/TO-252				
Junction to Case	SOT-223-2/SOT-223	$\theta_{JC}$	25	$^\circ\text{C}/\text{W}$
	TO-220		1.16	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.47	$^\circ\text{C}/\text{W}$
	TO-220F2			
	TO-251/TO-251S		2.3	$^\circ\text{C}/\text{W}$
TO-251S2/TO-251S4				
TO-251NS2/TO-252				

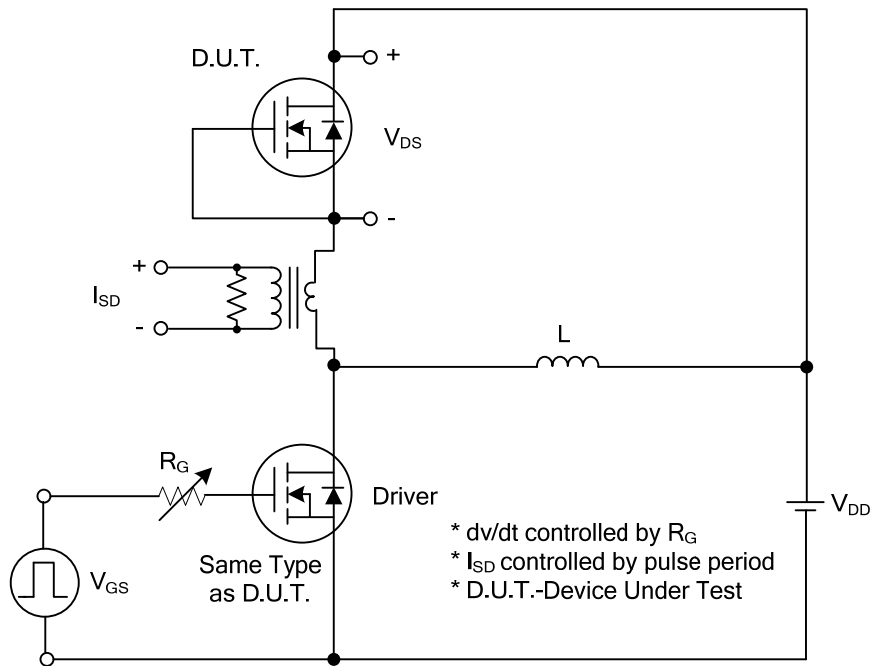
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	700			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =700V, V <sub>GS</sub> =0V			1	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>			100	nA
	Reverse				-100	
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5		4.5	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =2.5A			1.5	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		280		pF
Output Capacitance	C <sub>OSS</sub>			135		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			18		pF
Gate Resistance	R <sub>G</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1.0MHz		2.3		Ω
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =1.3A, (Note 1, 2)		15		nC
Gate to Source Charge	Q <sub>GS</sub>			5		nC
Gate to Drain Charge	Q <sub>GD</sub>			4		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A, R <sub>G</sub> =25Ω (Note 1, 2)		5		ns
Rise Time	t <sub>R</sub>			10		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			50		ns
Fall-Time	t <sub>F</sub>			60		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				5	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				20	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =5.0A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =5.0A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs		290		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>				2.5	

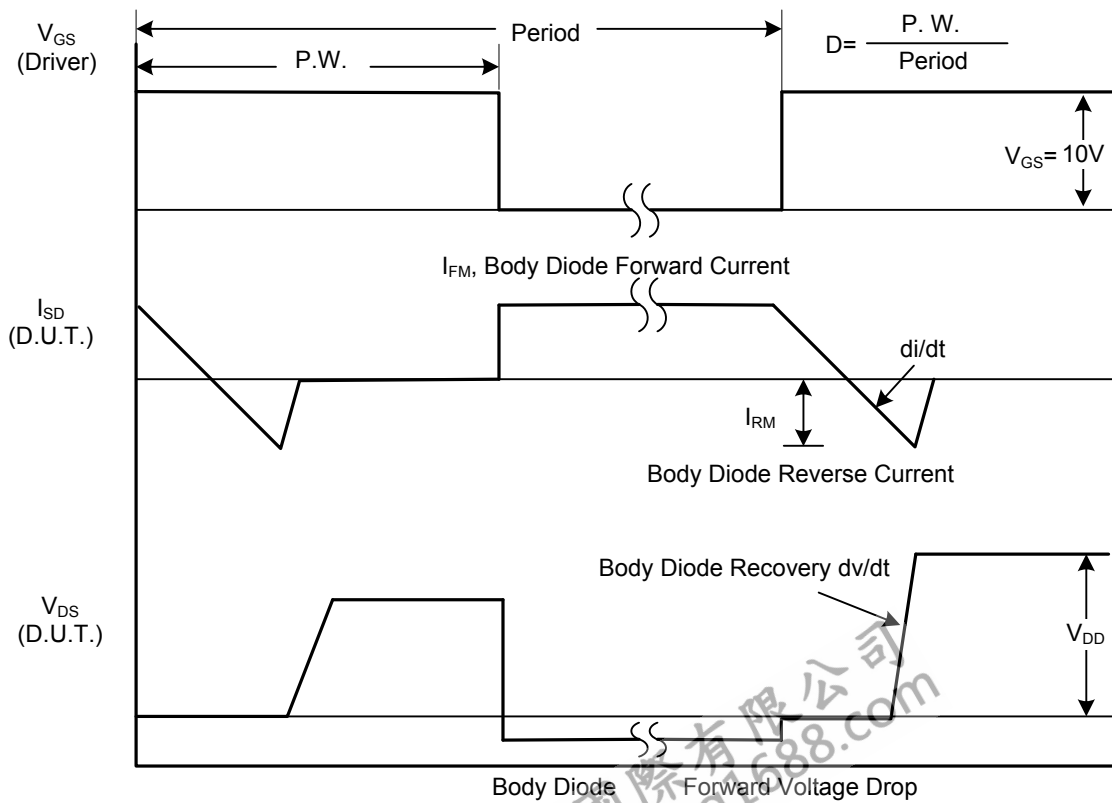
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

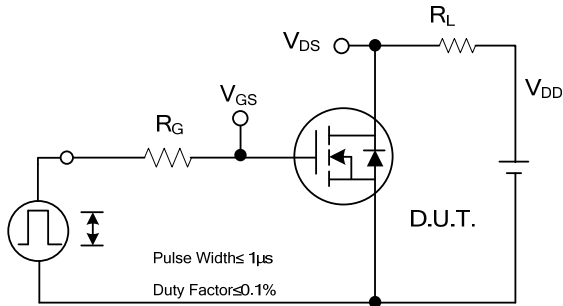


Peak Diode Recovery dv/dt Test Circuit

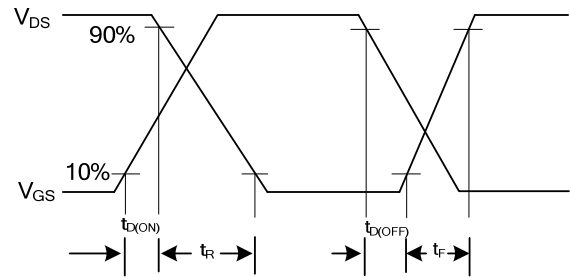


Peak Diode Recovery dv/dt Waveforms

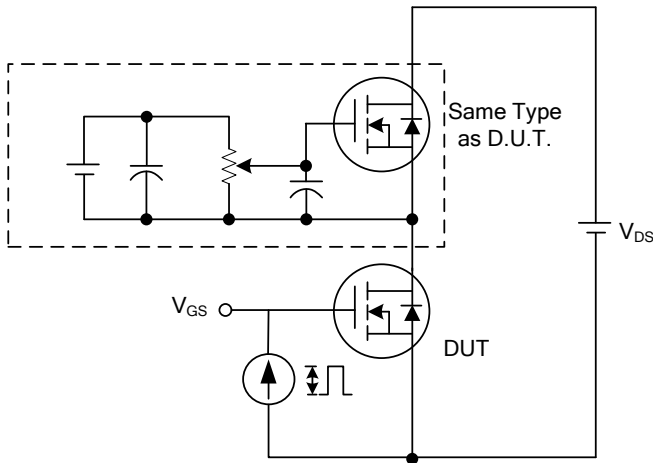
## TEST CIRCUITS AND WAVEFORMS



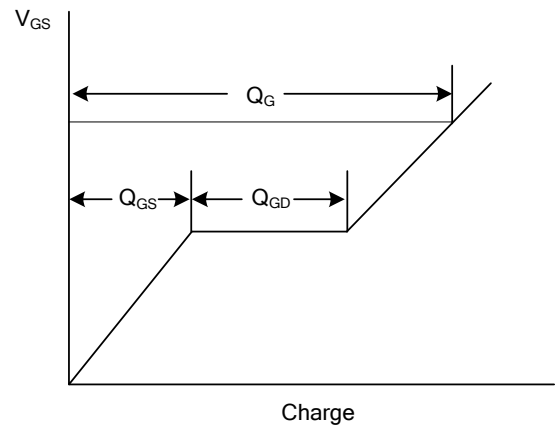
**Switching Test Circuit**



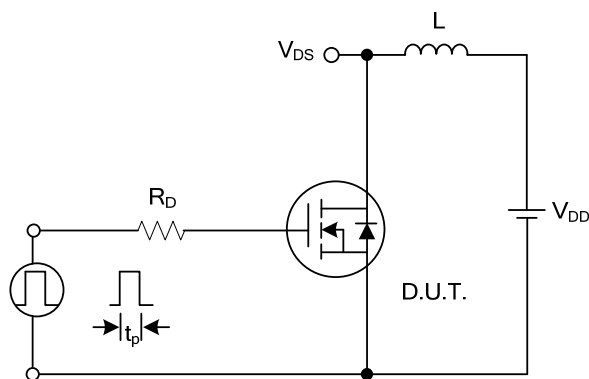
**Switching Waveforms**



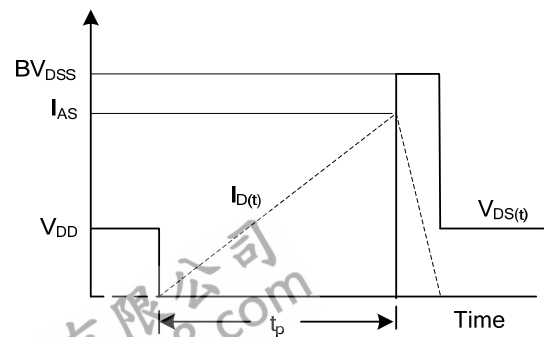
**Gate Charge Test Circuit**



**Gate Charge Waveform**



**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

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