

2NM70

Preliminary

Power MOSFET

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

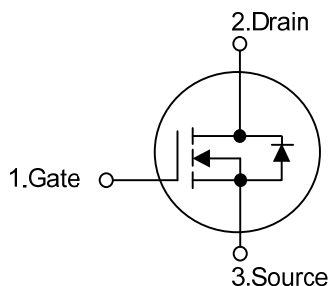
DESCRIPTION

The **2NM70** is an 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 at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} < 3.0\Omega$ @ $V_{GS} = 10V$, $I_D = 1.0 A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL

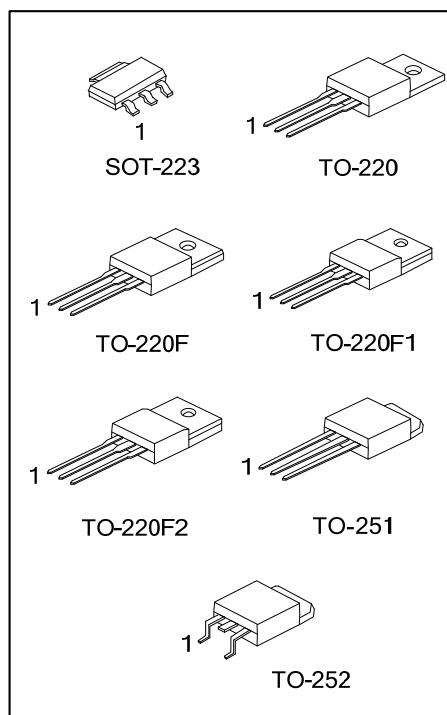


ORDERING INFORMATION

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-T	2NM70G-TM3-T	TO-251	G	D	S	Tube
2NM70L-TN3-R	2NM70G-TN3-R	TO-252	G	D	S	Tape Reel

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

2NM70G-AA3-R (1)Packing Type (2)Package Type (3)Green Package	(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
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MARKING

SOT-223	TO-220 / TO-220F / TO-220F1 TO-220F2 / TO-251 / TO-252
2NM70G 1 Data Code	2NM70 1 Lot Code L: Lead Free G: Halogen Free Data Code

■ **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	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	69	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3	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	$^\circ\text{C}$
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. $L=138\text{mH}$, $I_{AS}=1.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, 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		4.24	$^\circ\text{C}/\text{W}$

■ **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}	$V_{GS} = 30V, V_{DS} = 0V$			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		$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 1.0A$			3.0	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	$V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$		150		pF
Output Capacitance		C_{OSS}			73		pF
Reverse Transfer Capacitance		C_{RSS}			12		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q_G	$V_{DS} = 50V, V_{GS} = 10V, I_D = 1.3A, I_D = 100\mu A$ (Note 1, 2)		21		nC
Gate to Source Charge		Q_{GS}			2.0		nC
Gate to Drain Charge		Q_{GD}			5.6		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	$V_{DS} = 30V, V_{GS} = 10V, I_D = 0.5A, R_G = 25\Omega$ (Note 1, 2)		34		ns
Rise Time		t_R			4.2		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			75		ns
Fall-Time		t_F			28		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_{SD}				2.0	A
Maximum Body-Diode Pulsed Current		I_{SM}				8.0	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	$I_S = 2.0A, V_{GS} = 0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	$I_S = 2.0A, V_{GS} = 0V,$		270		nS
Body Diode Reverse Recovery Charge		Q_{rr}	$dl_F/dt = 100A/\mu s$		1140		nC

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

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

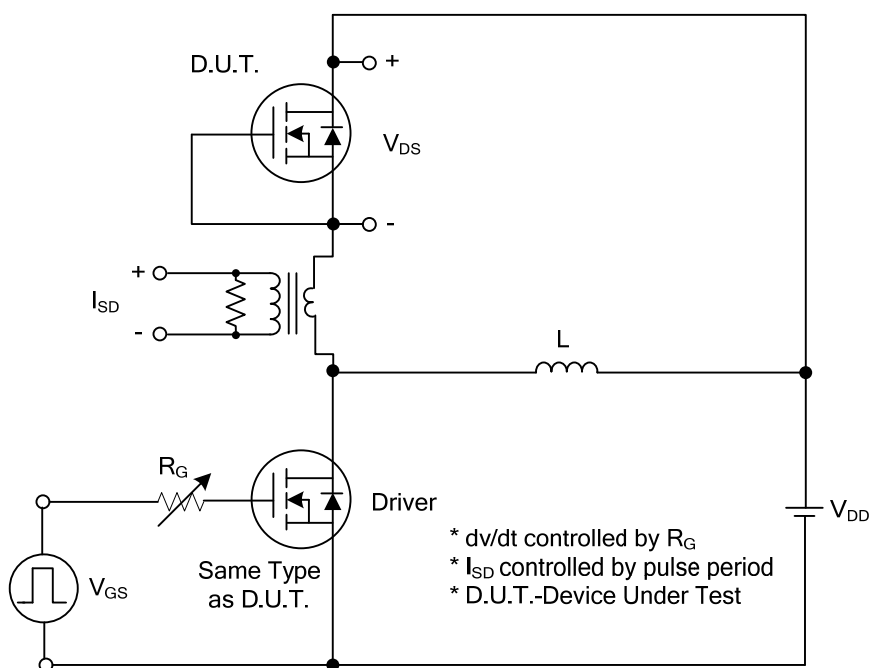


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

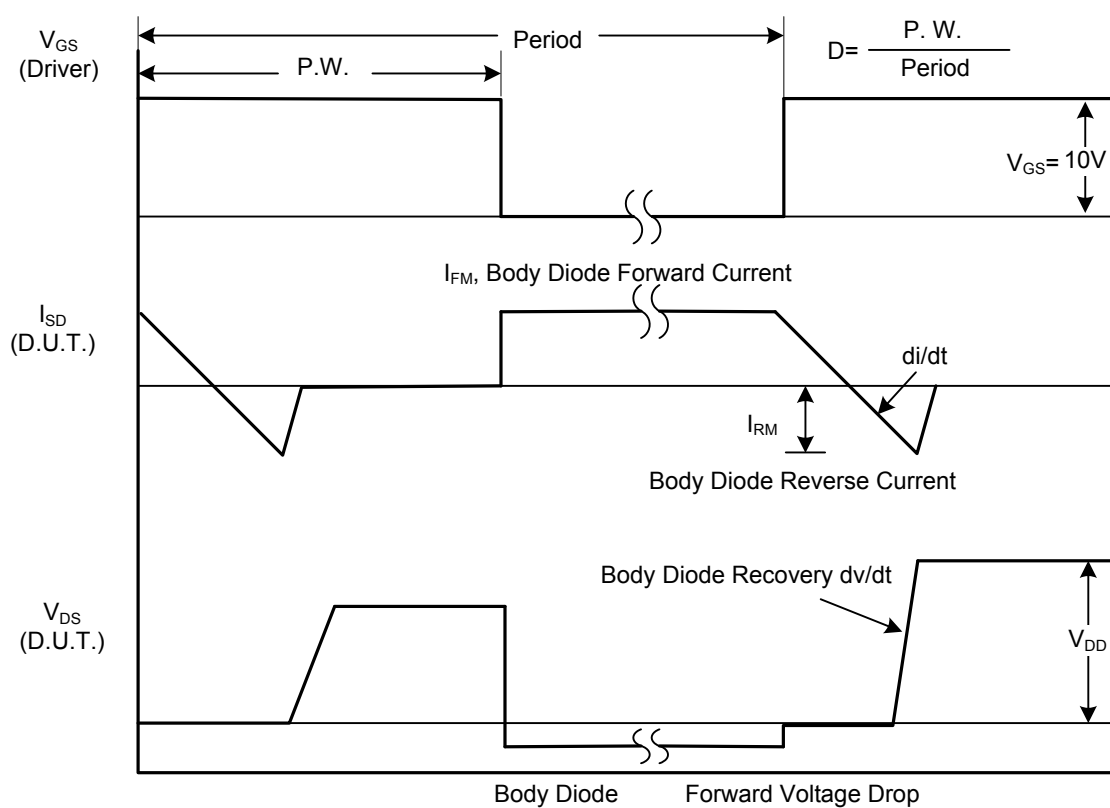


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

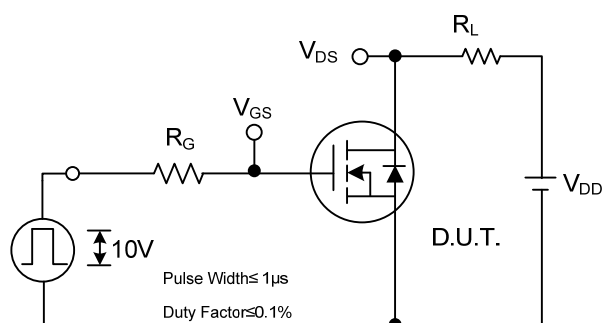


Fig. 2A Switching Test Circuit

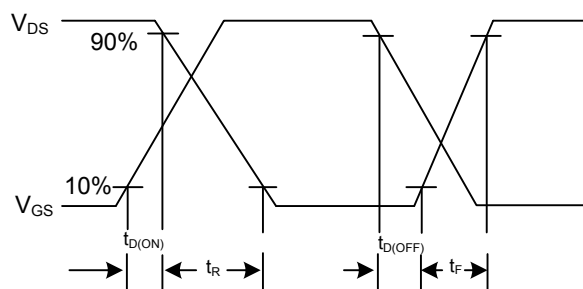


Fig. 2B Switching Waveforms

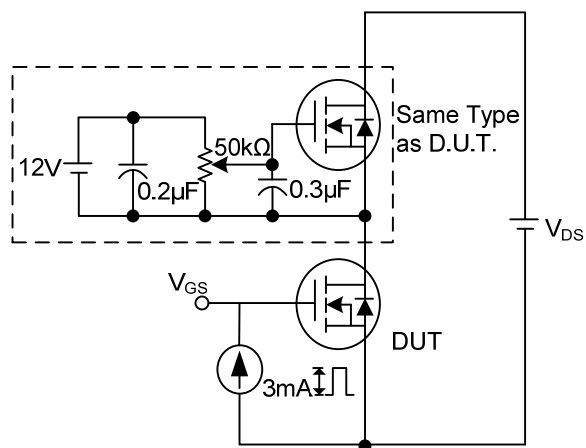


Fig. 3A Gate Charge Test Circuit

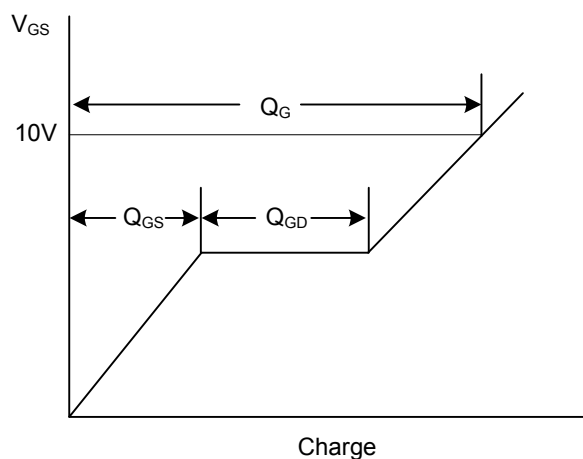


Fig. 3B Gate Charge Waveform

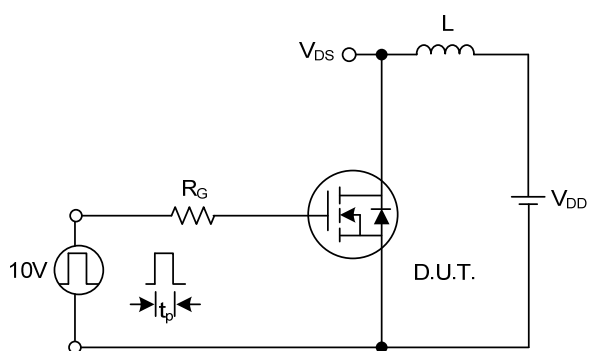


Fig. 4A Unclamped Inductive Switching Test Circuit

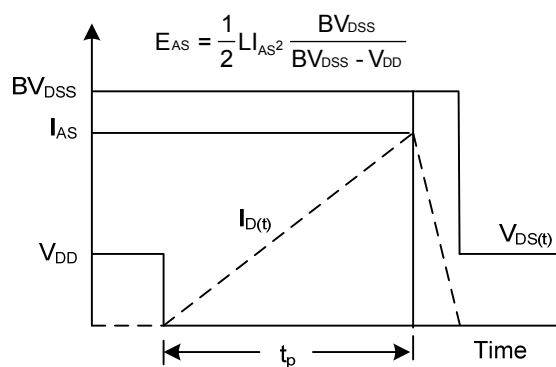


Fig. 4B Unclamped Inductive Switching Waveforms