



13NM70

Power MOSFET

13A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

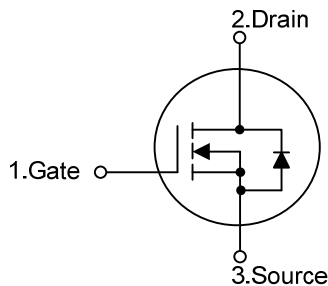
DESCRIPTION

The UTC 13NM70 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

- * $R_{DS(ON)} < 0.55\Omega$ @ $V_{GS}=10V$, $I_D=6.5A$
- * By using Super Junction Structure
- * Fast Switching
- * With 100% Avalanche Tested

SYMBOL

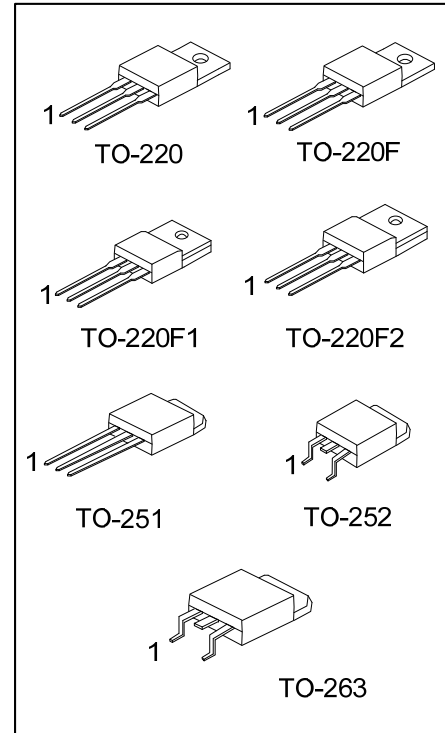


ORDERING INFORMATION

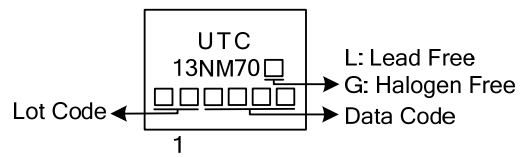
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13NM70L-TA3-T	13NM70G-TA3-T	TO-220	G	D	S	Tube
13NM70L-TF1-T	13NM70G-TF1-T	TO-220F1	G	D	S	Tube
13NM70L-TF2-T	13NM70G-TF2-T	TO-220F2	G	D	S	Tube
13NM70L-TF3-T	13NM70G-TF3-T	TO-220F	G	D	S	Tube
13NM70L-TM3-T	13NM70G-TM3-T	TO-251	G	D	S	Tube
13NM70L-TN3-R	13NM70G-TN3-R	TO-252	G	D	S	Tape Reel
13NM70L-TQ2-T	13NM70G-TQ2-T	TO-263	G	D	S	Tube
13NM70L-TQ2-R	13NM70G-TQ2-R	TO-263	G	D	S	Tape Reel

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

13NM70L-TA3-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252 TQ2: TO-263 (3) L: Lead Free, G: Halogen Free and Lead Free
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■ MARKING



■ **ABSOLUTE MAXIMUM RATINGS** ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain to Source Voltage		V_{DSS}	700	V
Gate to Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current	Continuous	I_D	13	A
Pulsed Drain Current	Pulsed (Note 2)	I_{DM}	52	A
Avalanche Current		I_{AR}	2.9	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	273	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.2	V/ns
Power Dissipation	TO-220/TO-263	P_D	168	W
	TO-220F/TO-220F1 TO-220F2		54	W
	TO-251/TO-252		80	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. $L=65\text{mH}$, $I_{AS}=2.9\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.

4. $I_{SD}\leq 13\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$.

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-263	θ_{JA}	62.5	$^{\circ}\text{C/W}$
	TO-251/TO-252		110	
	Junction to Case	TO-220/TO-263	θ_{JC}	0.74
TO-220F/TO-220F1 TO-220F2		2.31		
TO-251/TO-252		1.56		

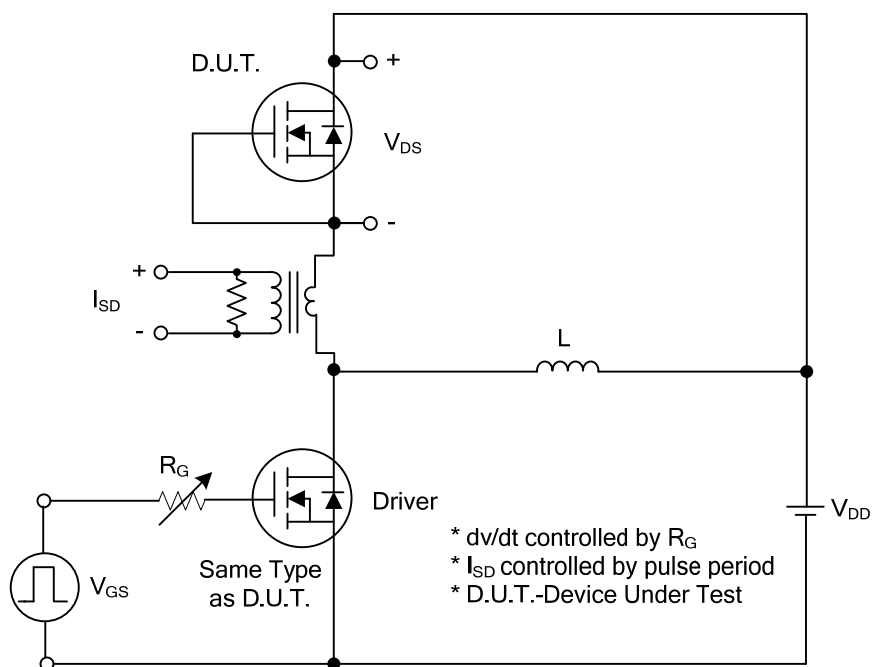
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	700			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =700V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	I _{GSS}	V _{DS} =0V ,V _{GS} =±30V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D =250μA	2.5		4.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =6.5A			0.55	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{GS} =0V,V _{DS} =25V, f=1.0MHz		850		pF
Output Capacitance	C _{OSS}			220		pF
Reverse Transfer Capacitance	C _{RSS}			12		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =50V, V _{GS} =10V, I _D =1.3A , I _G =100μA (Note 1, 2)		70		nC
Gate to Source Charge	Q _{GS}			8.0		nC
Gate to Drain Charge	Q _{GD}			18		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)		65		ns
Rise Time	t _R			62		ns
Turn-OFF Delay Time	t _{D(OFF)}			220		ns
Fall-Time	t _F			78		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				13	A
Maximum Body-Diode Pulsed Current	I _{SM}				44	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =13A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =13A, V _{GS} =0V		420		ns
Body Diode Reverse Recovery Charge	Q _{rr}	dl _F /dt=100A/μs		5.6		μC

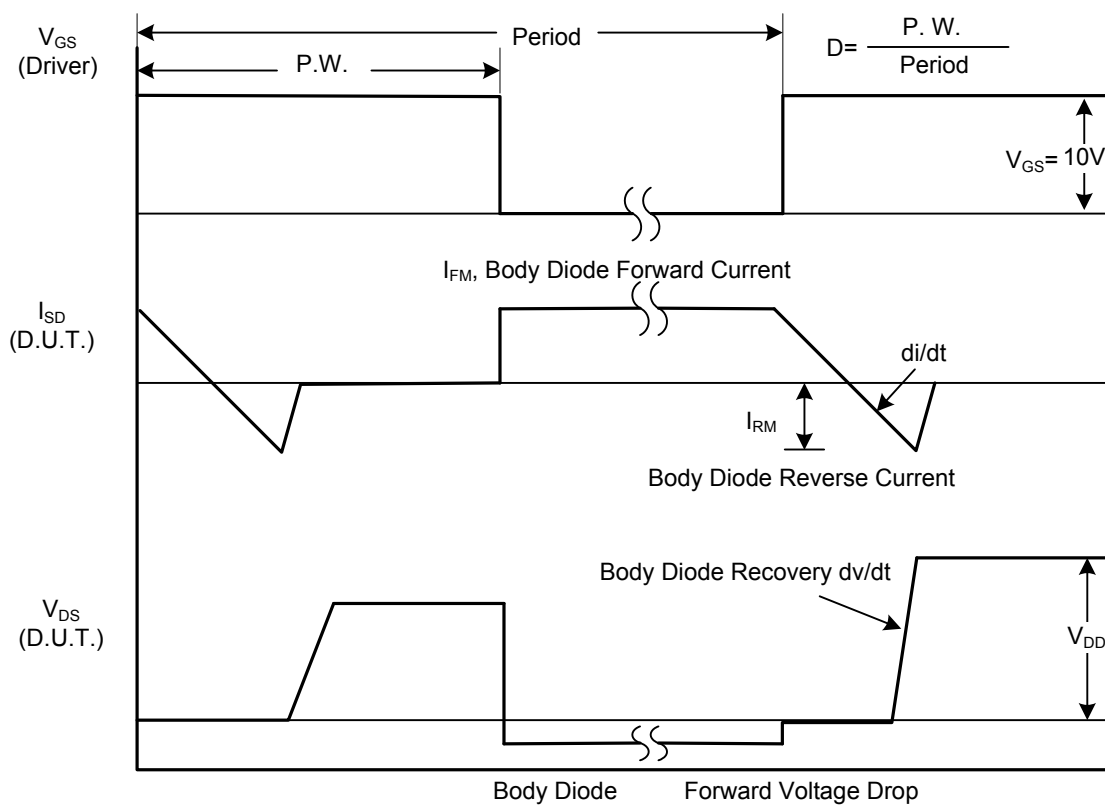
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS

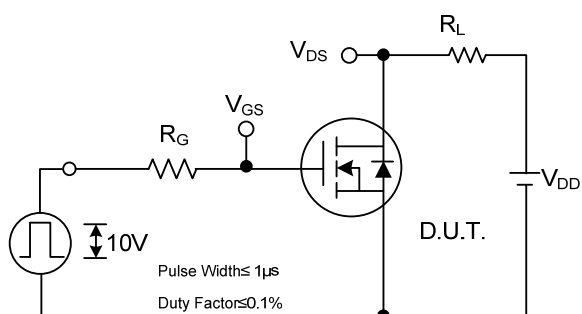


Peak Diode Recovery dv/dt Test Circuit

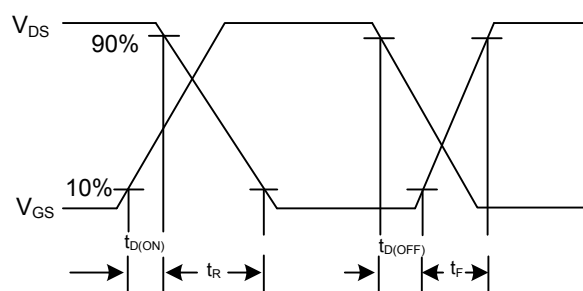


Peak Diode Recovery dv/dt Waveforms

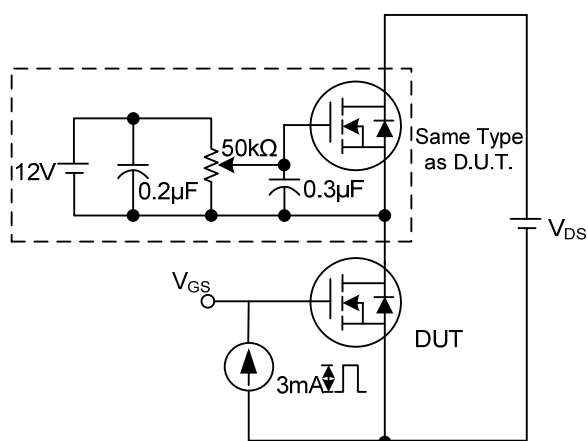
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



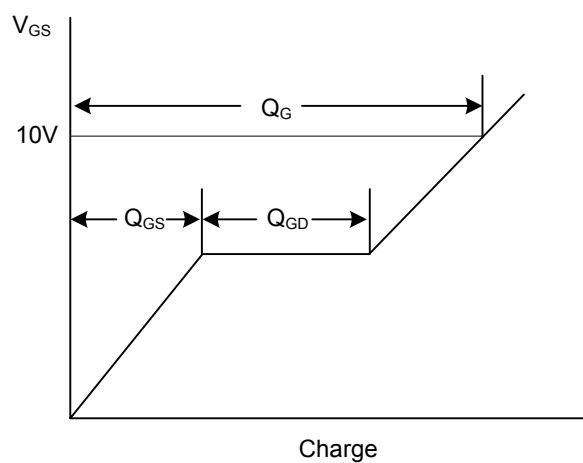
Switching Test Circuit



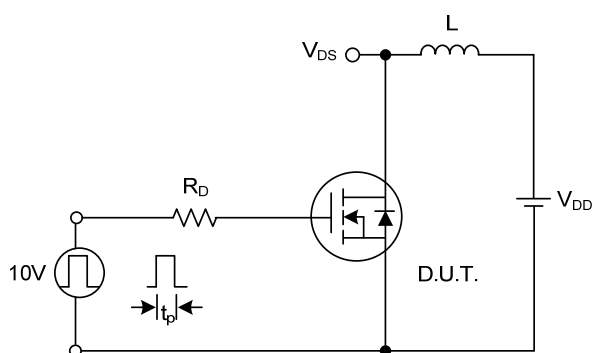
Switching Waveforms



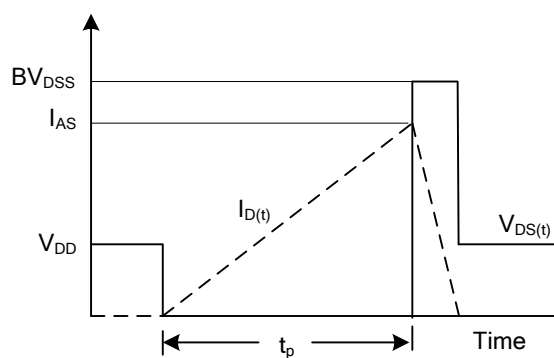
Gate Charge Test Circuit



Gate Charge Waveform

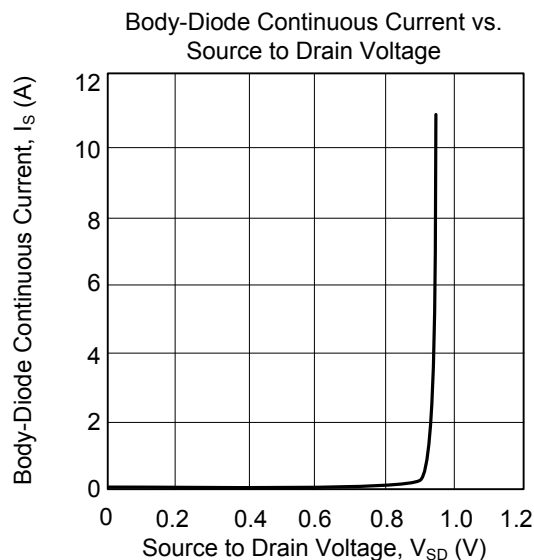
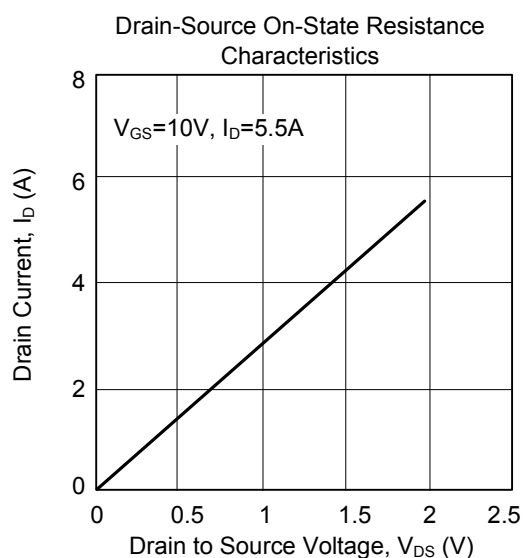
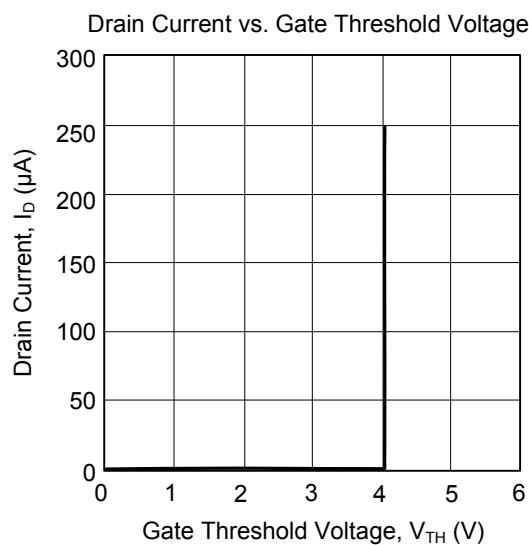
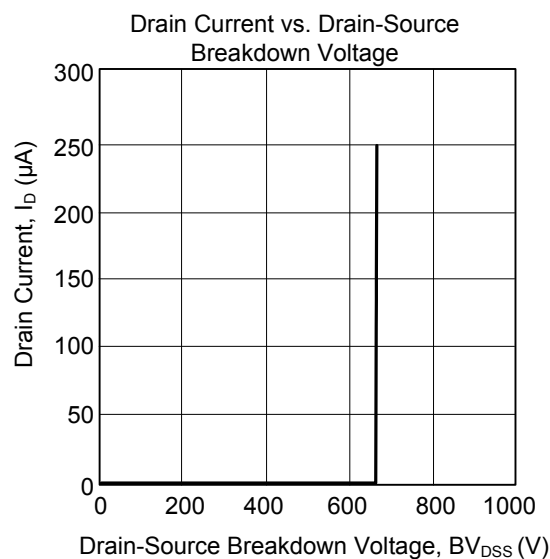


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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