



4NM120

Preliminary

Power MOSFET

4.0A, 1200V N-CHANNEL SUPER-JUNCTION MOSFET

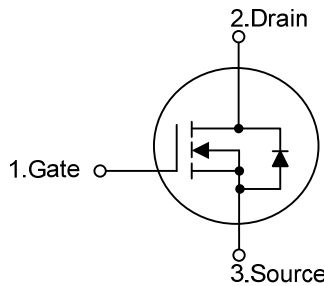
■ DESCRIPTION

The UTC **4NM120** 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 AC-DC converters for power applications.

■ FEATURES

- * $R_{DS(ON)} \leq 3.5 \Omega @ V_{GS}=10V, I_D=2.0A$
- * High Switching Speed

■ SYMBOL

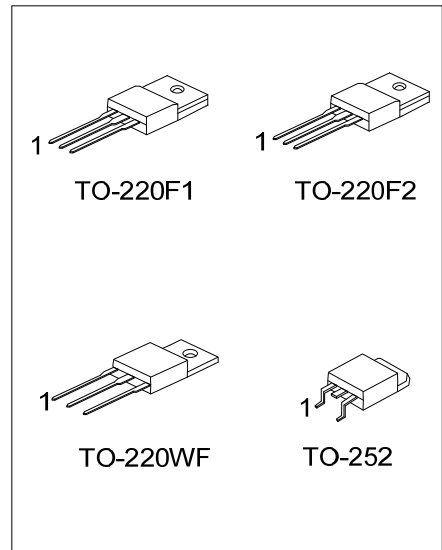


■ ORDERING INFORMATION

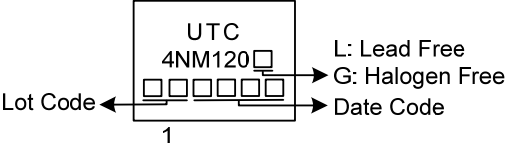
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4NM120L-TF1-T	4NM120G-TF1-T	TO-220F1	G	D	S	Tube
4NM120L-TF2-T	4NM120G-TF2-T	TO-220F2	G	D	S	Tube
4NM120L-TW1-T	4NM120G-TW1-T	TO-220WF	G	D	S	Tube
4NM120L-TN3-R	4NM120G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>4NM120G-TF1-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF2: TO-220F2, TW1: TO-220WF TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



■ ABSOLUTE MAXIMUM RATINGS (unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	1200	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current	Continuous	I_D	4	A
	Pulsed	I_{DM}	8	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	95	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2	V/ns
Power Dissipation	TO-220F1	P_D	24	W
	TO-220F2			
	TO-220WF		28	W
	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. $L = 100\text{mH}$, $I_{AS} = 1.37\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$ Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 4.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-220F2			
	TO-220WF		110	$^{\circ}\text{C}/\text{W}$
	TO-252			
Junction to Case	TO-220F1	θ_{JC}	5.2	$^{\circ}\text{C}/\text{W}$
	TO-220F2			
	TO-220WF		4.46 (Note)	$^{\circ}\text{C}/\text{W}$
	TO-252			

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

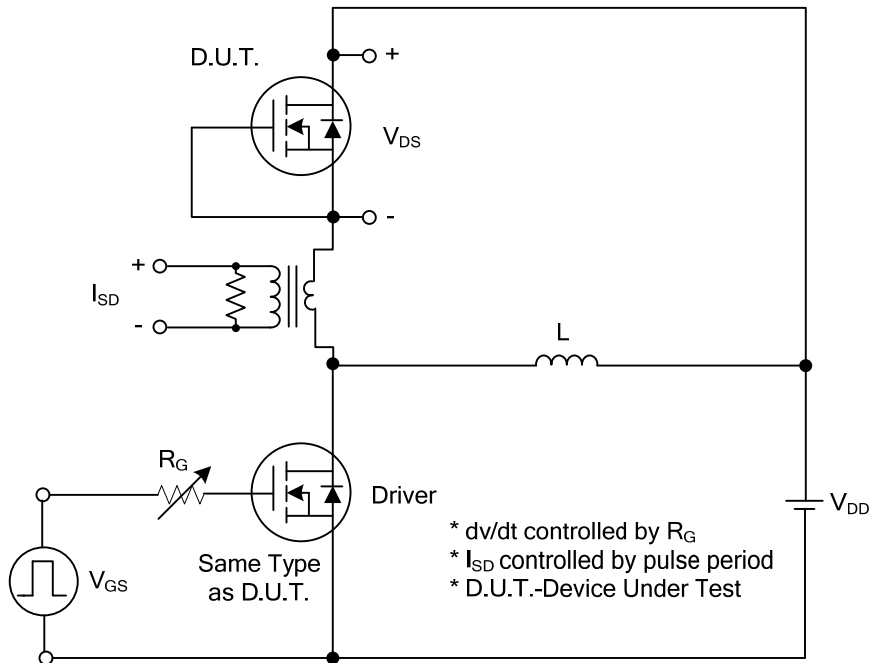
■ ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0V$	1200			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=1200V, V_{GS}=0V$			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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.0A$			3.5	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=50V, f=1.0MHz$		420		pF
Output Capacitance	C_{OSS}			28		pF
Reverse Transfer Capacitance	C_{RSS}			2.5		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{DS}=960V, V_{GS}=10V, I_D=4.0A$ (Note 1, 2)		24		nC
Gate to Source Charge	Q_{GS}			8		nC
Gate to Drain Charge	Q_{GD}			6.8		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=4.0A,$ $R_G=25\Omega$ (Note 1, 2)		7		ns
Rise Time	t_R			17.6		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			53		ns
Fall-Time	t_F			35		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				4	A
Maximum Body-Diode Pulsed Current	I_{SM}				8	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=4.0A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_S=4.0A, V_{GS}=0V,$ $dI_F/dt=100A/\mu s$ (Note 1)		490		ns
Reverse Recovery Charge	Q_{rr}			4.8		μC

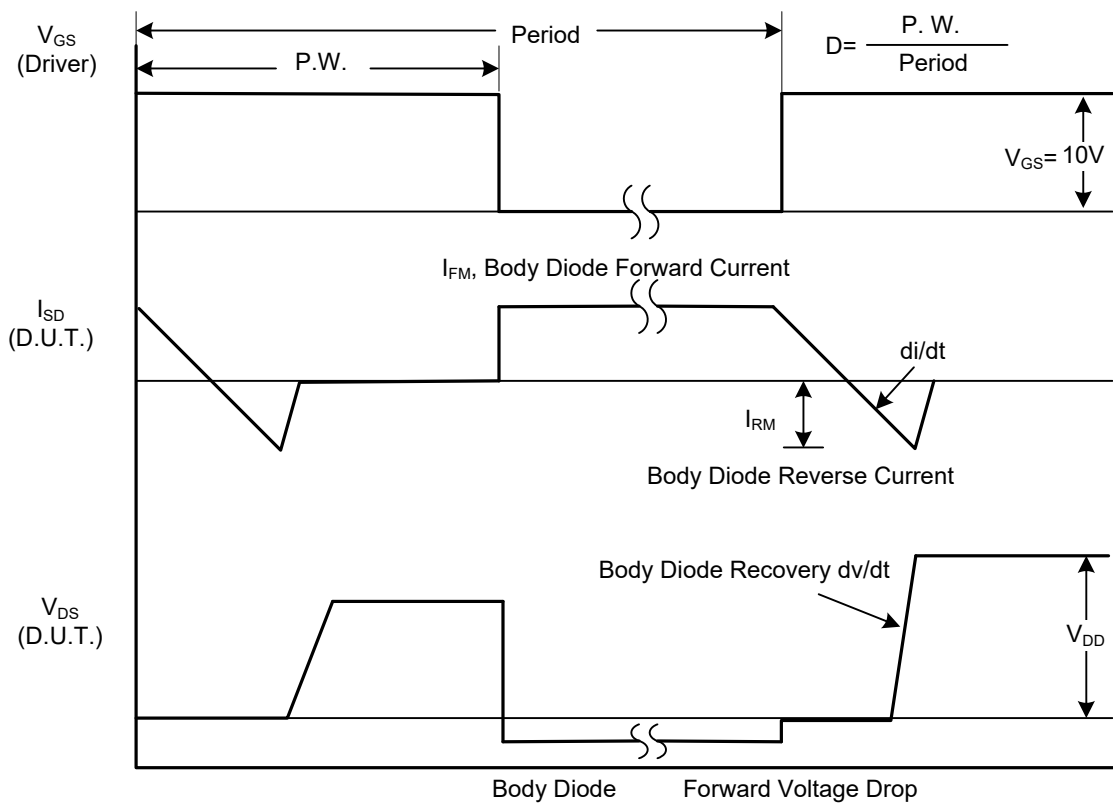
Notes: 1. Pulse Test: Pulse width $\leq 1200\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

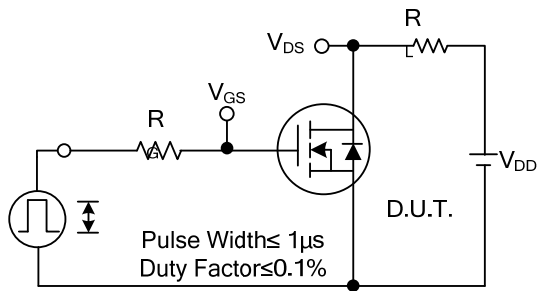


Peak Diode Recovery dv/dt Test Circuit

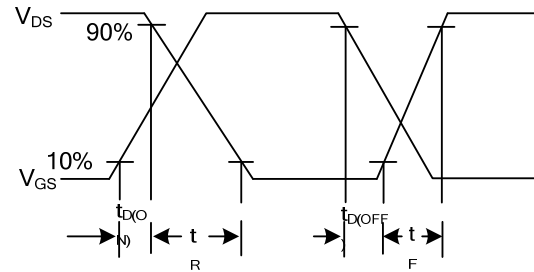


Peak Diode Recovery dv/dt Waveforms

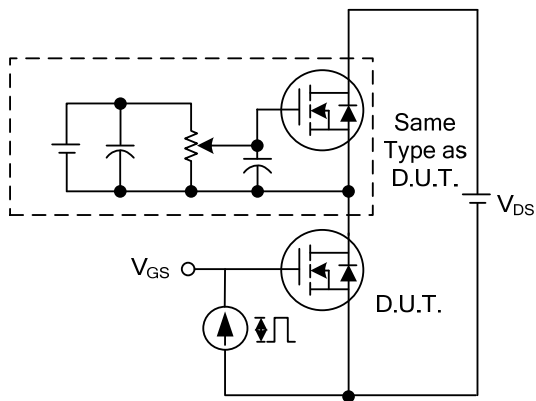
■ TEST CIRCUITS AND WAVEFORMS



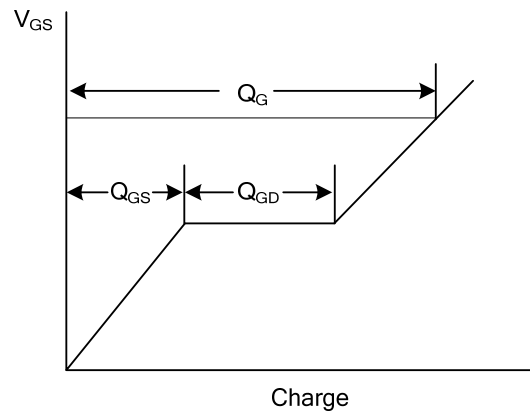
Switching Test Circuit



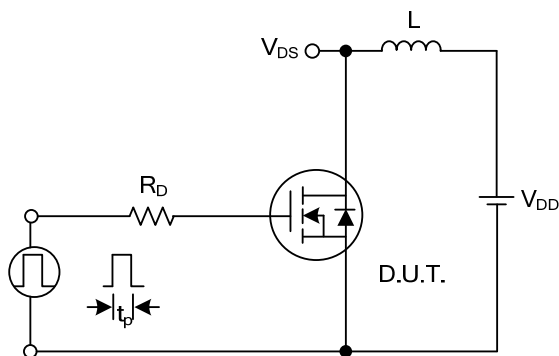
Switching Waveforms



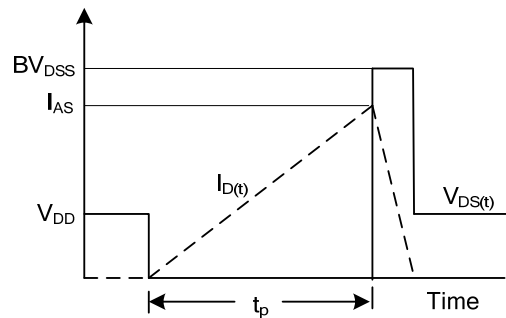
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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