



**3NM120-Q**

Preliminary

*Power MOSFET*

**3.0A, 1200V N-CHANNEL SUPER-JUNCTION MOSFET**

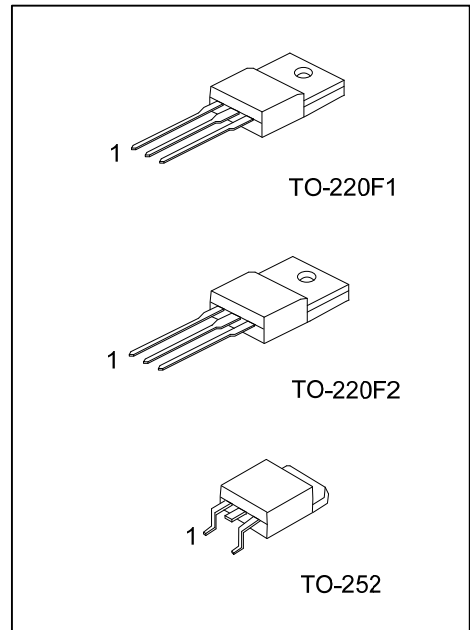
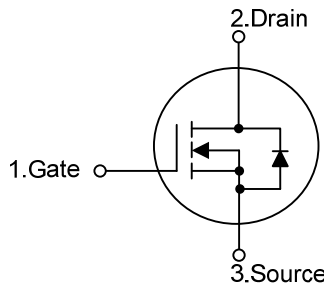
■ DESCRIPTION

The UTC **3NM120-Q** 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

- \*  $R_{DS(ON)} \leq 5.6 \Omega @ V_{GS}=10V, I_D=1.5A$
- \* High Switching Speed

■ SYMBOL



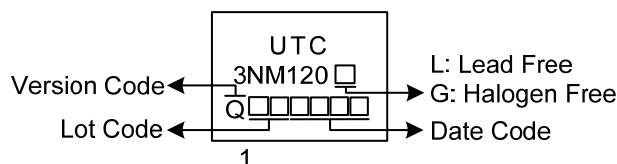
■ ORDERING INFORMATION

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

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

<p>3NM120G-Q-TF1-T</p>	<p>(1) T: Tube, R: Tape Reel                  (2) TF1: TO-220F1, TF2: TO-220F2, TN3: TO-252                  (3) Version Q                  (4) 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		$V_{GSS}$	$\pm 30$	V	
Continuous Drain Current	Continuous	$I_D$	3	A	
	Pulsed	$I_{DM}$	6	A	
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	65	mJ	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2	V/ns	
Power Dissipation	TO-220F1/TO-220F2	$P_D$	22	W	
	TO-252		Steady State	24	W
			$t \leq 5s$	45	W
Junction Temperature		$T_J$	+150	$^{\circ}C$	
Storage Temperature		$T_{STG}$	-55 ~ +150	$^{\circ}C$	

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.  $L = 100mH$ ,  $I_{AS} = 1.14A$ ,  $V_{DD} = 50V$ ,  $R_G = 25 \Omega$  Starting  $T_J = 25^{\circ}C$

4.  $I_{SD} \leq 3.0A$ ,  $di/dt \leq 200A/\mu s$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^{\circ}C$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT	
Junction to Ambient	TO-220F1/TO-220F2	$\theta_{JA}$	62.5	$^{\circ}C/W$	
	TO-252		110	$^{\circ}C/W$	
Junction to Case	TO-220F1/TO-220F2	$\theta_{JC}$	5.68	$^{\circ}C/W$	
	TO-252		Steady State	5.2 (Note)	$^{\circ}C/W$
			$t \leq 5s$	2.77 (Note)	$^{\circ}C/W$

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

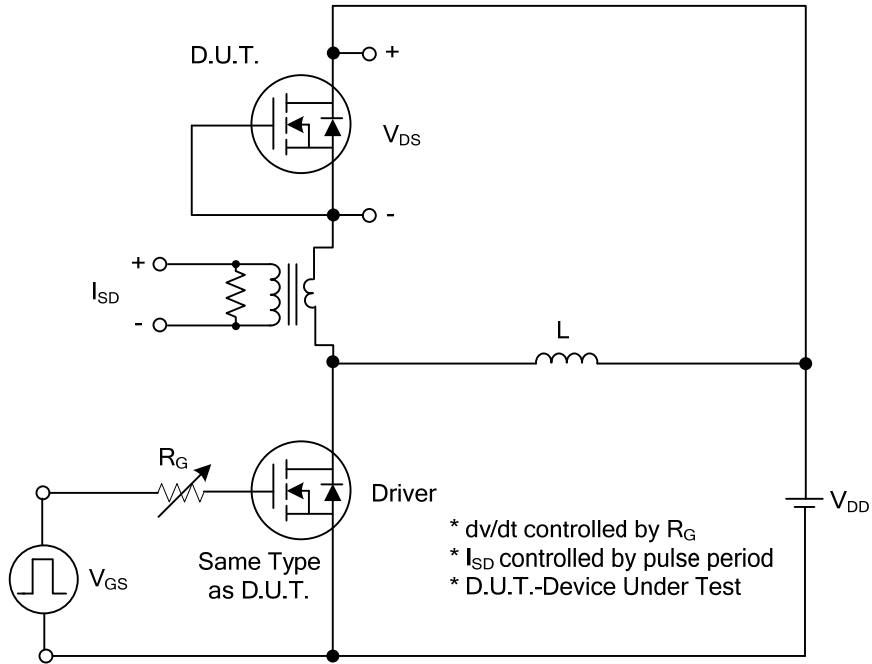
■ ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
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	$\mu A$
Gate-Source Leakage Current	Forward	$V_{GS}=+30V, V_{DS}=0V$			+100	nA
	Reverse		$V_{GS}=-30V, V_{DS}=0V$			-100
<b>ON CHARACTERISTICS</b>						
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=1.5A$			5.6	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=50V, f=1.0MHz$		290		pF
Output Capacitance	$C_{OSS}$			22		pF
Reverse Transfer Capacitance	$C_{RSS}$			2.3		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=960V, V_{GS}=10V, I_D=3.0A$ (Note 1, 2)		18		nC
Gate to Source Charge	$Q_{GS}$			6		nC
Gate to Drain Charge	$Q_{GD}$			5		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=3.0A,$ $R_G=25\Omega$ (Note 1, 2)		6.4		ns
Rise Time	$t_R$			17		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			38		ns
Fall-Time	$t_F$			32		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				3	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				6	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S=3.0A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_S=3.0A, V_{GS}=0V,$ $dI_F/dt=100A/\mu s$ (Note 1)		516		ns
Reverse Recovery Charge	$Q_{rr}$				4.3	$\mu C$

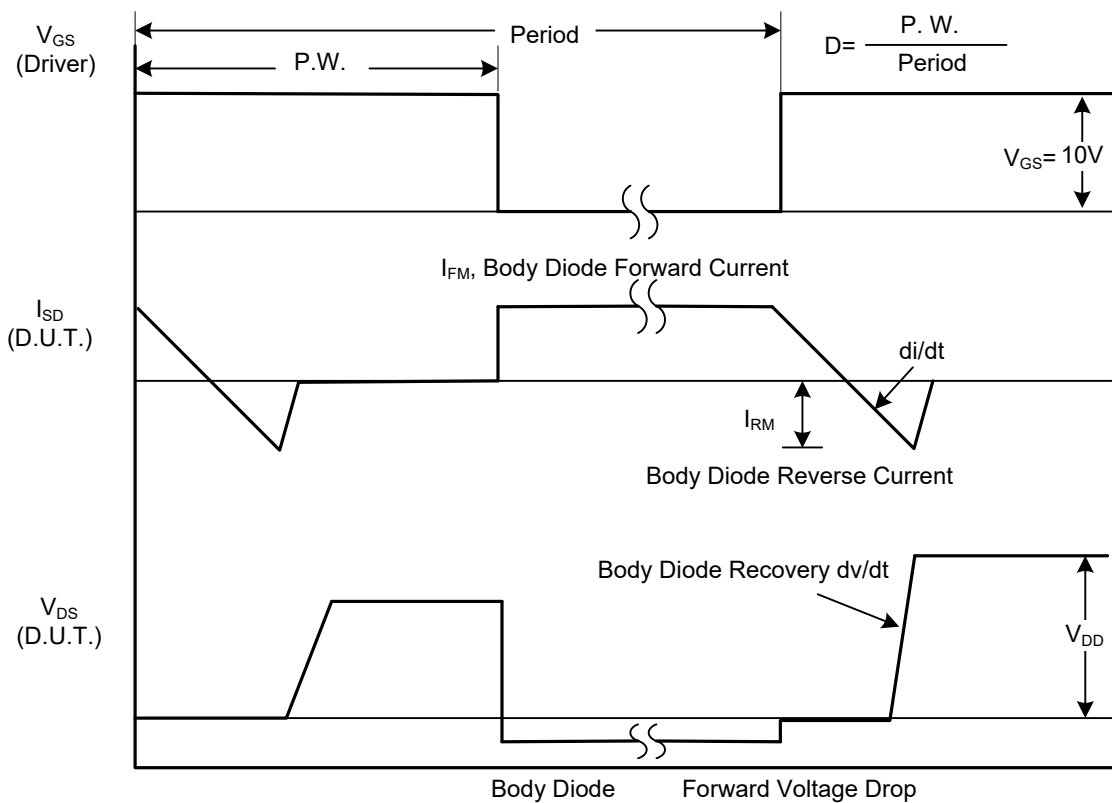
Notes: 1. Pulse Test: Pulse width  $\leq 1200\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

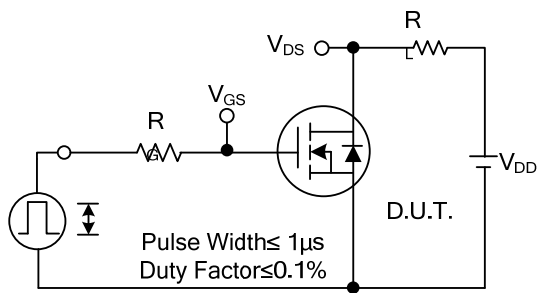


Peak Diode Recovery  $dv/dt$  Test Circuit

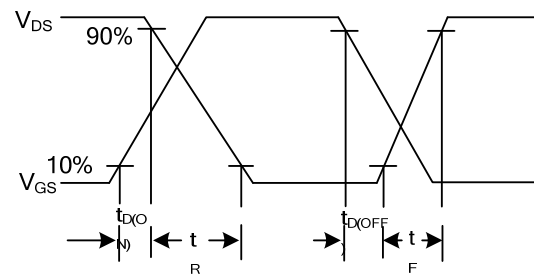


Peak Diode Recovery  $dv/dt$  Waveforms

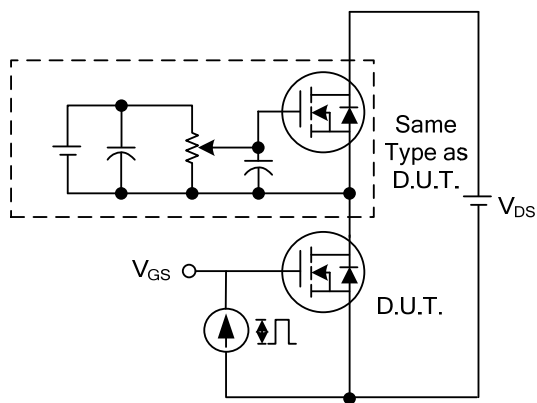
### TEST CIRCUITS AND WAVEFORMS



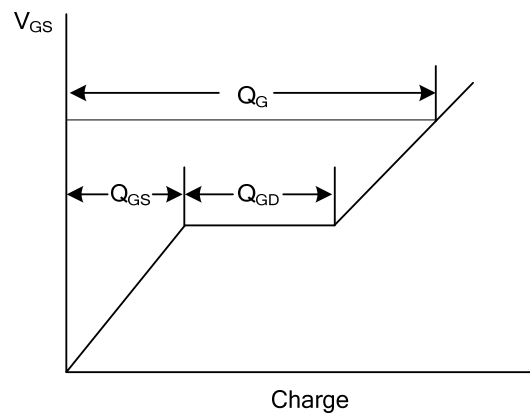
Switching Test Circuit



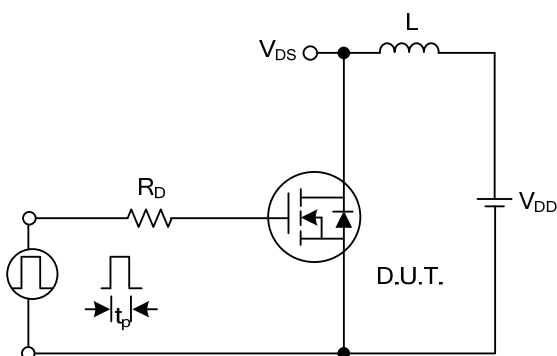
Switching Waveforms



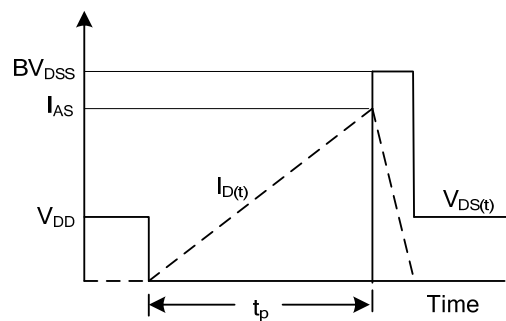
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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