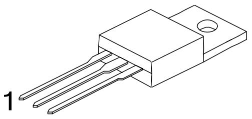
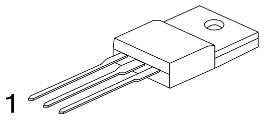
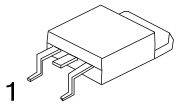
3.0A, 1200V N-CHANNEL POWER MOSFET



TO-220



TO-220F1



TO-263

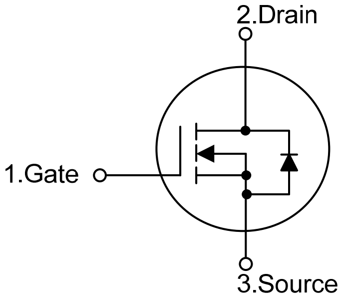
■ DESCRIPTION

The UTC **3N120-E3** provide excellent $R_{DS(ON)}$, low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

■ FEATURES0

* $R_{DS(ON)} \leq 7.0\ \Omega$ @ V_{GS}=10V, I_D=1.5A
* Low Reverse Transfer Capacitance
* Fast Switching Capability
* Avalanche Energy Specified
* Improved dv/dt Capability, High Ruggedness

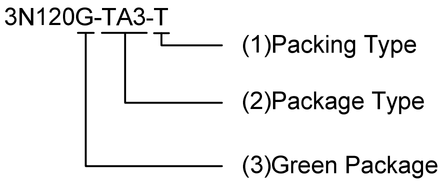
■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N120L-TA3-T	3N120G-TA3-T	TO-220	G	D	S	Tube
3N120L-TF1-T	3N120G-TF1-T	TO-220F1	G	D	S	Tube
3N120L-TQ2-T	3N120G-TQ2-T	TO-263	G	D	S	Tube
3N120L-TQ2-R	3N120G-TQ2-R	TO-263	G	D	S	Tape Reel

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

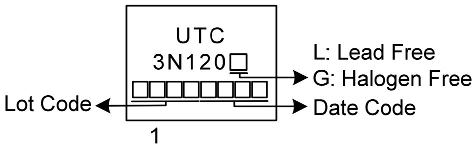


(1) T: Tube, R: Tape Reel

(2) TA3: TO-220, TF1: TO-220F1, TQ2: TO-263

(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	1200	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous	I_D	3	A
	Pulsed (Note 2)	I_{DM}	6	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	75	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.9	V/ns
Power Dissipation	TO-220/TO-263	P_D	68	W
	TO-220F1		18	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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 = 30mH, I_{AS} = 2.25A, V_{DD} = 100V, R_G = 25Ω, Starting T_J = 25°C.
4. $I_{SD} \leq$ 3.0A, di/dt ≤ 200A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C.

■ THERMAL DATA

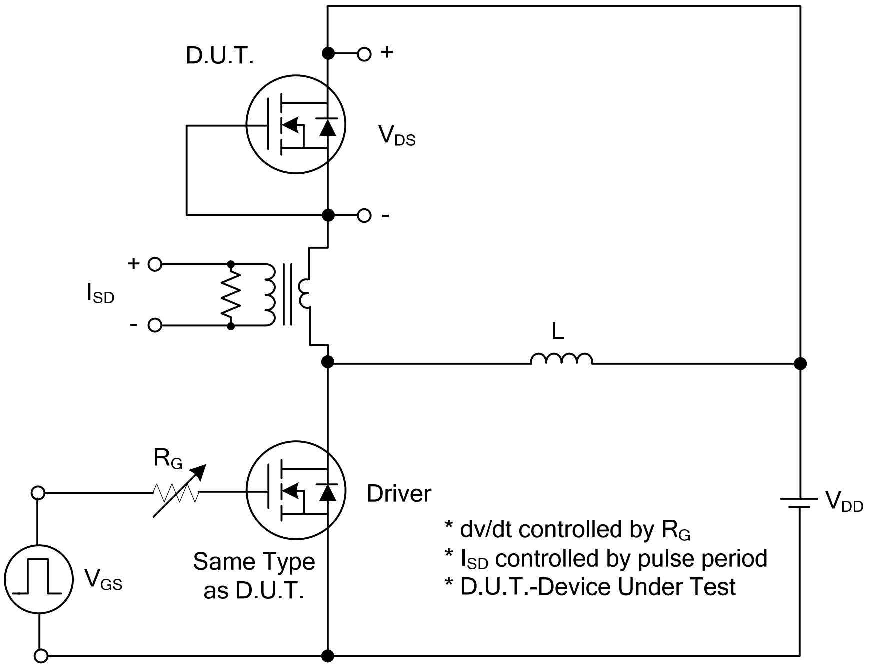
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient		θ_{JA}	62.5	°C/W
Junction to Case	TO-220/TO-263	θ_{JC}	1.83	°C/W
	TO-220F1		6.94	°C/W

■ ELECTRICAL CHARACTERISTICS (T_J =25°C, unless otherwise specified)

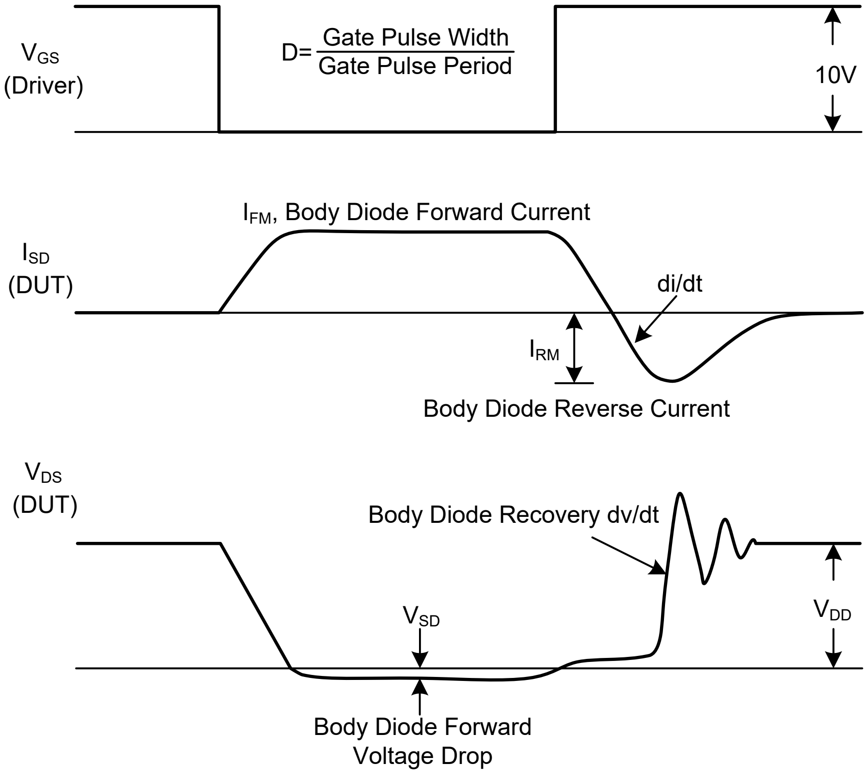
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	1200			V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±30V, V_{DS}=0V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	3.0		5.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=1.5A			7.0	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1MHz		570		pF
Output Capacitance	C_{OSS}			60		pF
Reverse Transfer Capacitance	C_{RSS}			13		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	V_{DS}=960V, V_{GS}=10V, I_D=3.0A (Note 1, 2)		28		nC
Gate-Source Charge	Q_{GS}			12		nC
Gate-Drain Charge	Q_{GD}			10		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D=3.0A, R_G=25Ω (Note 1, 2)		11		ns
Turn-On Rise Time	t_R			20		ns
Turn-Off Delay Time	$t_{D(OFF)}$			69		ns
Turn-Off Fall Time	t_F			43		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				3	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				6	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	I_S=3.0A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	I_S=3.0A, V_{GS}=0V, dI_F/dt=100A/μs		780		nS
Body Diode Reverse Recovery Charge	Q_{rr}			5.07		μC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

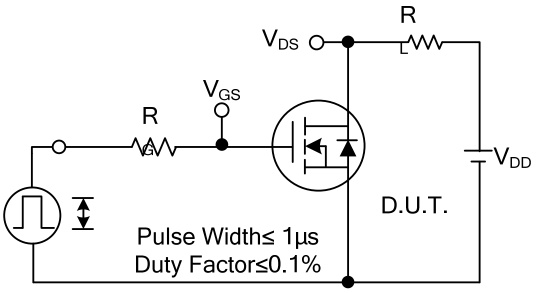


Peak Diode Recovery dv/dt Test Circuit

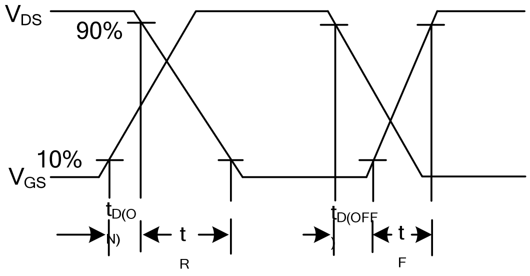


Peak Diode Recovery dv/dt Waveforms

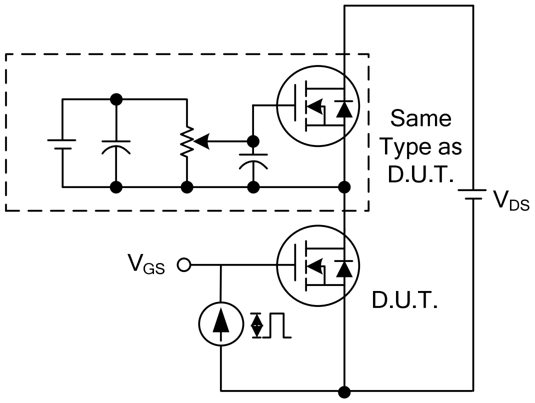
■ TEST CIRCUITS AND WAVEFORMS



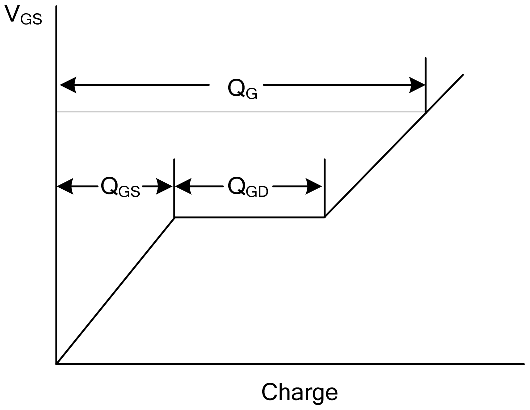
Switching Test Circuit



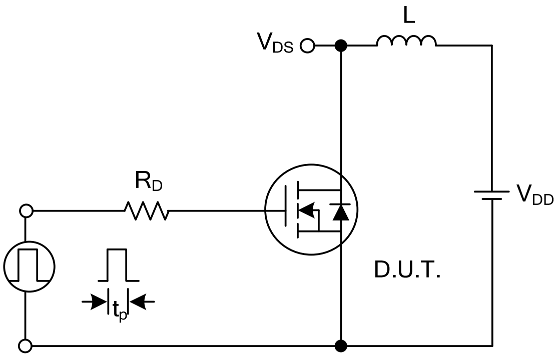
Switching Waveforms



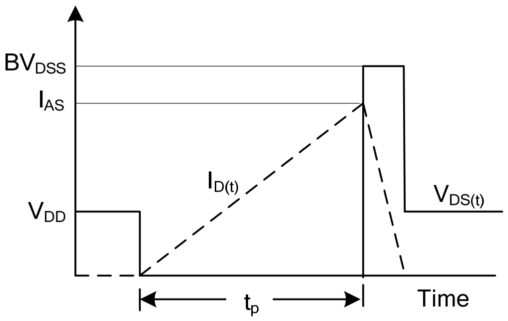
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms