



3N90

Power MOSFET

3 Amps, 900 Volts N-CHANNEL POWER MOSFET

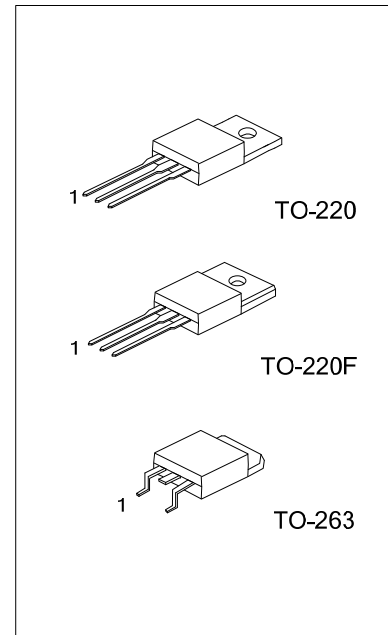
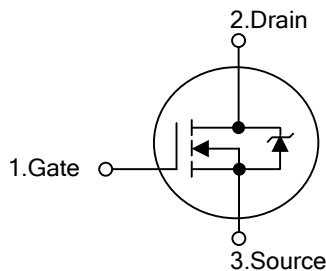
DESCRIPTION

The UTC **3N90** provides 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.

FEATURES

- * $R_{DS(ON)}=4.1\Omega$ @ $V_{GS}=10\text{ V}$
- * Ultra Low Gate Charge (typical 22.7 nC)
- * Low Reverse Transfer Capacitance (C_{RSS} = Typical 13 pF)
- * 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	
3N90L-TA3-T	3N90G-TA3-T	TO-220	G	D	S	Tube
3N90L-TF3-T	3N90G-TF3-T	TO-220F	G	D	S	Tube
3N90L-TQ2-T	3N90G-TQ2-T	TO-263	G	D	S	Tube
3N90L-TQ2-R	3N90G-TQ2-R	TO-263	G	D	S	Tape Reel

3N90L-TA3-T (1)Packing Type (2)Package Type (3)Lead Free	(1) T: Tube (2) TA3: TO-220, TF3: TO-220F, TQ2: TO-263 (3) G: Halogen Free, L: Lead Free
--	---

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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage ($V_{GS}=0\text{V}$)	V_{DSS}	900	V
Drain-Gate Voltage ($R_G=20\text{k}\Omega$)	V_{DGR}	900	V
Gate-Source Voltage	V_{GSS}	± 30	V
Gate-Source Breakdown Voltage ($I_{GS}=\pm 1\text{mA}$)	BV_{GSO}	30(MIN)	V
Insulation Withstand Voltage (DC)	TO-220F	V_{ISO}	2500
Avalanche Current (Note 2)	I_{AR}	3	A
Continuous Drain Current	I_D	3	A
Pulsed Drain Current	I_{DM}	10	A
Single Pulse Avalanche Energy (Note 3)	E_{AS}	180	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	TO-220/ TO-263	P_D	90
	TO-220F		25
Junction Temperature	T_J	+150	$^{\circ}\text{C}$
Storage Temperature	T_{STG}	-55 ~ +150	$^{\circ}\text{C}$

Note: 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. Pulse width limited by $T_{J(MAX)}$

3. starting $T_J=25^{\circ}\text{C}$, $I_D=I_{AR}$, $V_{DD}=50\text{V}$

4. $I_{SD} \leq 3\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, $T_J \leq T_{J(MAX)}$.

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ TO-263	θ_{JA}	62.5
	TO-220F		62.5
Junction to Case	TO-220/ TO-263	θ_{JC}	1.38
	TO-220F		5

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0\text{V}$, $I_D=250\mu\text{A}$	900			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=900\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30\text{V}$, $V_{DS}=0\text{V}$			± 10	μA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	3	3.75	4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=1.5\text{A}$		4.1	4.8	Ω
Forward Transconductance (Note 1)	g_{FS}	$V_{DS}=15\text{V}$, $I_D=1.5\text{A}$		2.1		S
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS}=25\text{V}$, $V_{GS}=0\text{V}$, $f=1\text{MHz}$		590		pF
Output Capacitance	C_{OSS}			63		pF
Reverse Transfer Capacitance	C_{RSS}			13		pF
Equivalent Output Capacitance (Note 2)	$C_{OSS(EQ)}$	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V} \sim 400\text{V}$		34		pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=450\text{V}$, $I_D=1.5\text{A}$, $R_G=4.7\Omega$		18		ns
Turn-On Rise Time	t_R	$V_{GS}=10\text{V}$		7		ns
Turn-Off Delay Time	$t_{D(OFF)}$	$V_{DD}=720\text{V}$, $I_D=1.5\text{A}$, $R_G=4.7\Omega$		45		ns
Turn-Off Fall Time	t_F	$V_{GS}=10\text{V}$		18		ns
Total Gate Charge	Q_G	$V_{DD}=720\text{V}$, $I_D=3\text{A}$, $V_{GS}=10\text{V}$		22.7		nC
Gate-Source Charge	Q_{GS}			4.2		nC
Gate-Drain Charge	Q_{DD}			12		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Diode Forward Voltage(Note 1)	V_{SD}	$I_{SD}=3A, V_{GS}=0V$			1.6	V
Source-Drain Current	I_{SD}				3	A
Source-Drain Current (Pulsed)	I_{SDM}				12	A
Reverse Recovery Current	I_{RRM}	$I_{SD}=3A, di/dt=100A/\mu s,$ $V_{DD}=100V, T_J=25^{\circ}C$		8.7		A
Body Diode Reverse Recovery Time	t_{RR}			510		ns
Body Diode Reverse Recovery Charge	Q_{RR}			2.2		nC

Note: 1.Pulse width=300 μ s, Duty cycle $\leq$ 1.5%

2. $C_{OSS(EQ)}$ is defined as a constant equivalent capacitance giving the same charging time as C_{OSS} when V_{DS} increases from 0 to 80% V_{DSS} .

■ TEST CIRCUITS AND WAVEFORMS

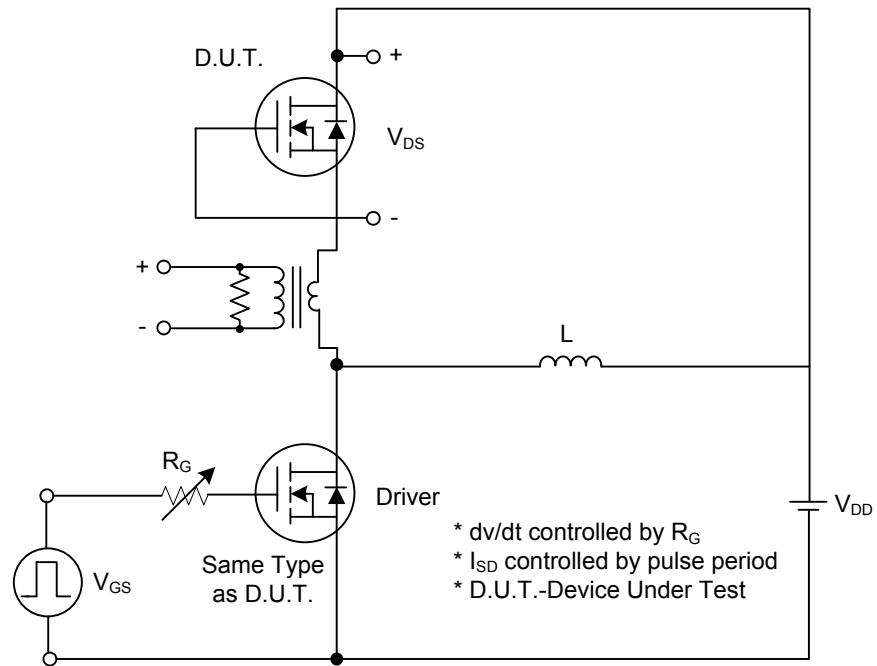


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

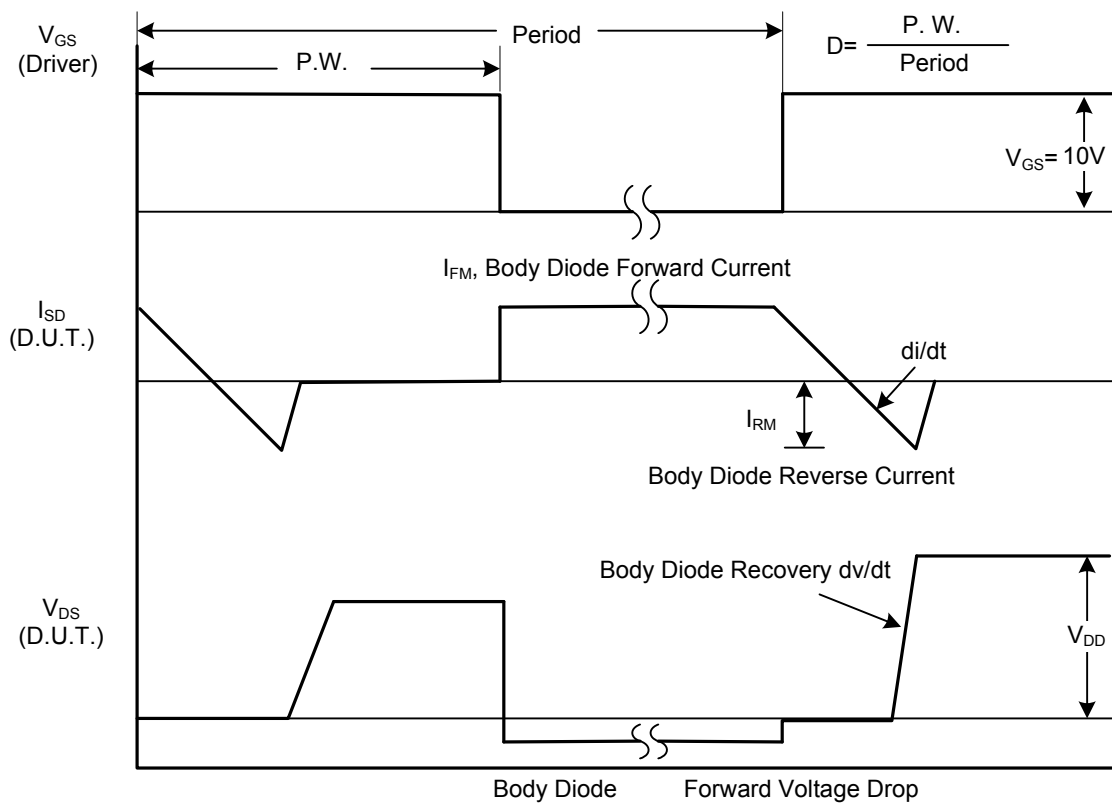


Fig. 1B Peak Diode Recovery dv/dt Waveforms

TEST CIRCUITS AND WAVEFORMS (Cont.)

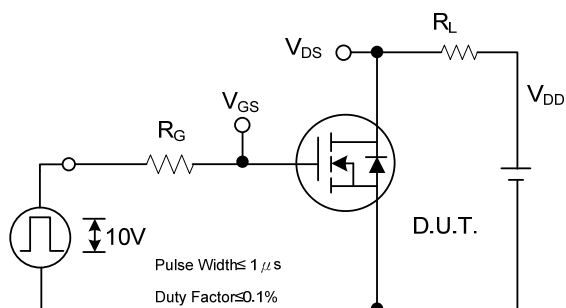


Fig. 2A Switching Test Circuit

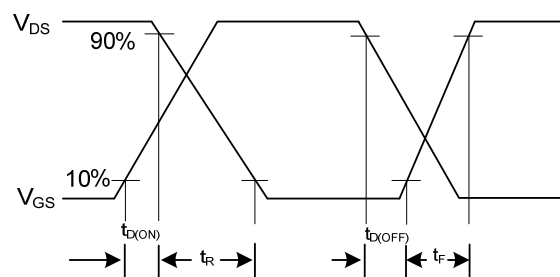


Fig. 2B Switching Waveforms

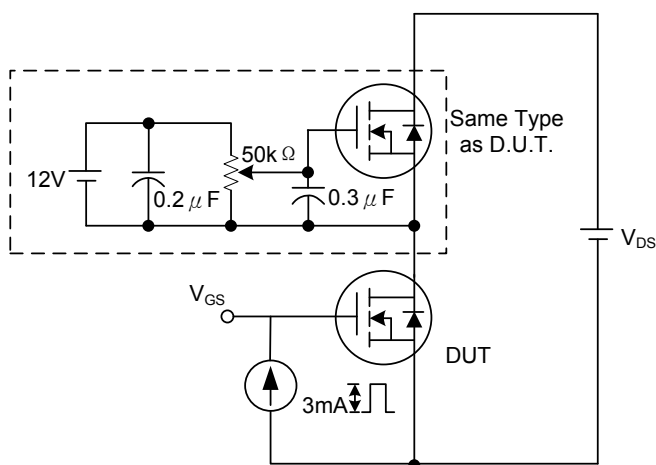


Fig. 3A Gate Charge Test Circuit

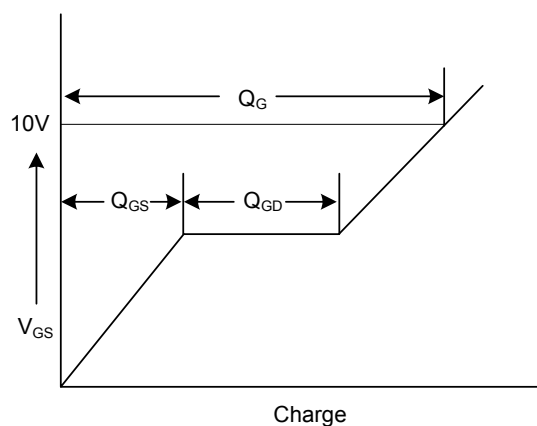


Fig. 3B Gate Charge Waveform

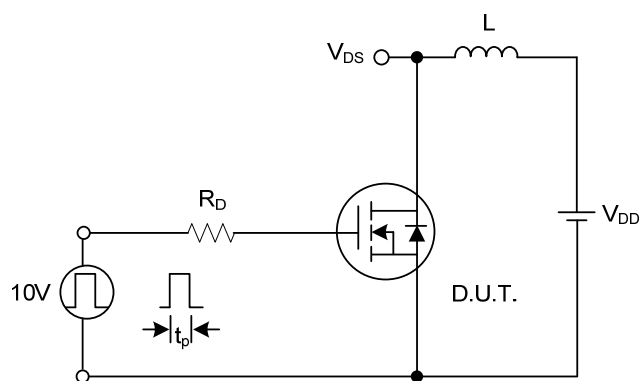


Fig. 4A Unclamped Inductive Switching Test Circuit

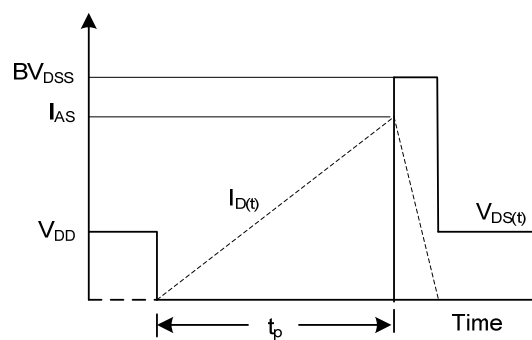
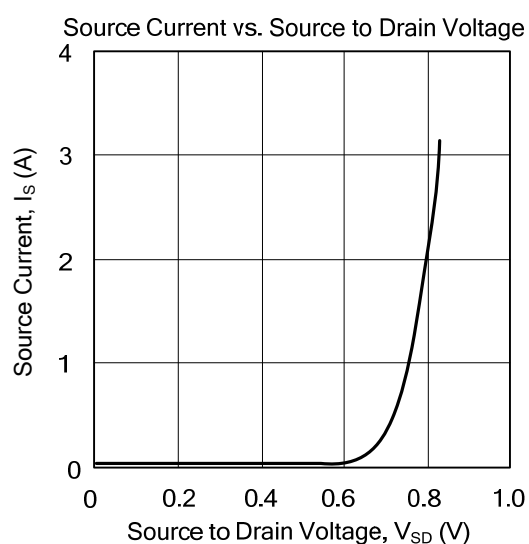
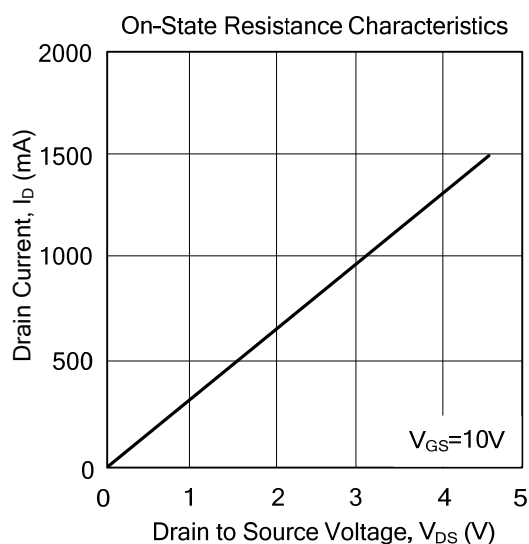
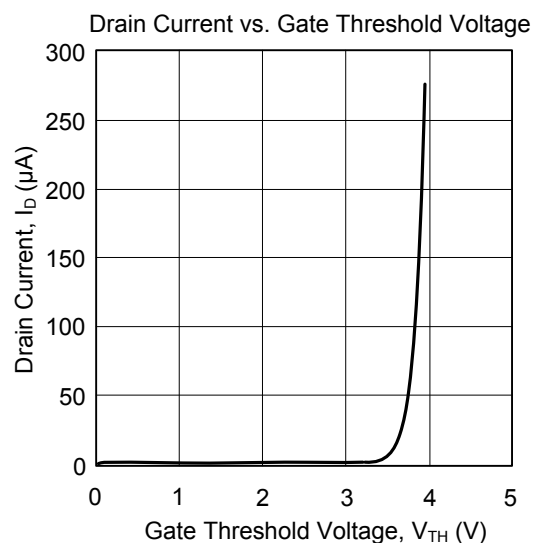
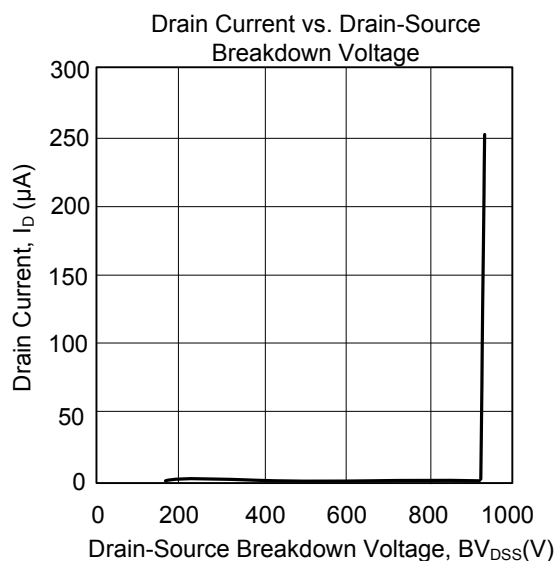


Fig. 4B Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.