



# 3N90-E

*Power MOSFET*

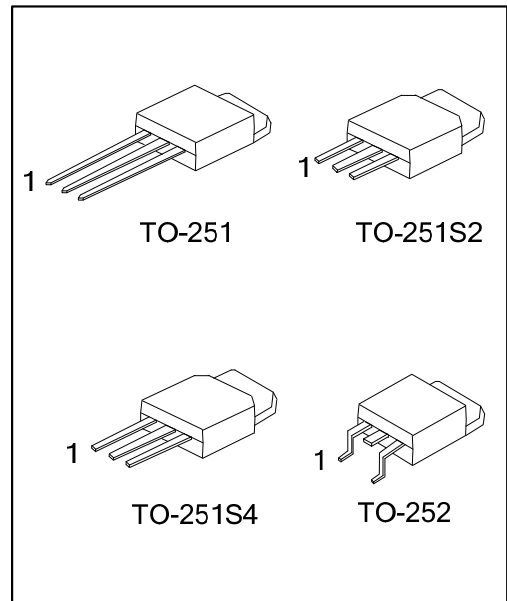
## 3.0A, 900V N-CHANNEL POWER MOSFET

■ DESCRIPTION

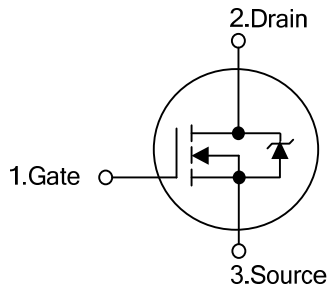
The UTC **3N90-E** provides excellent  $R_{DS(ON)}$ , low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

■ FEATURES

- \*  $R_{DS(ON)} < 6.2\Omega$  @  $V_{GS}=10V, I_D=1.5A$
- \* Fast Switching Capability
- \* Avalanche Energy Specified
- \* Improved dv/dt Capability, High Ruggedness



■ SYMBOL



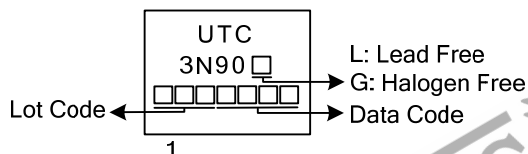
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N90L-TM3-T	3N90G-TM3-T	TO-251	G	D	S	Tube
3N90L-TMS2-T	3N90G-TMS2-T	TO-251S2	G	D	S	Tube
3N90L-TMS4-T	3N90G-TMS4-T	TO-251S4	G	D	S	Tube
3N90L-TN3-R	3N90G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>3N90L-TM3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TM3: TO-251, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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■ MARKING



■ 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	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	3	A
Pulsed Drain Current	$I_{DM}$	10	A
Avalanche Current (Note 2)	$I_{AR}$	3	A
Single Pulse Avalanche Energy (Note 3)	$E_{AS}$	100	mJ
Peak Diode Recovery $dv/dt$ (Note 4)	$dv/dt$	2.94	V/ns
Power Dissipation	$P_D$	45	W
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.  $L = 22.2\text{mH}$ ,  $I_{AS} = 3\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

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

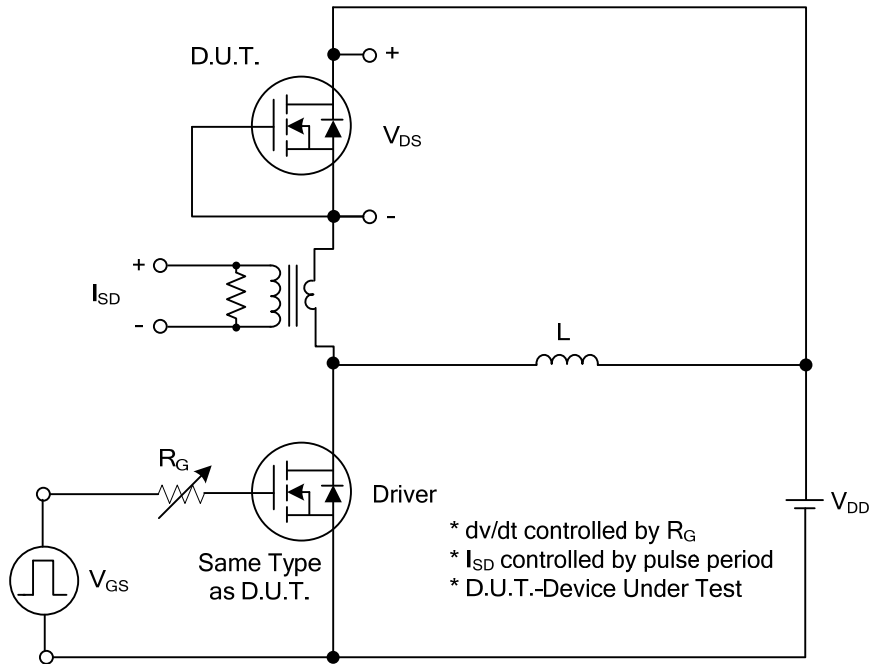
PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	$\theta_{JA}$	110	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	2.77	$^\circ\text{C}/\text{W}$

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

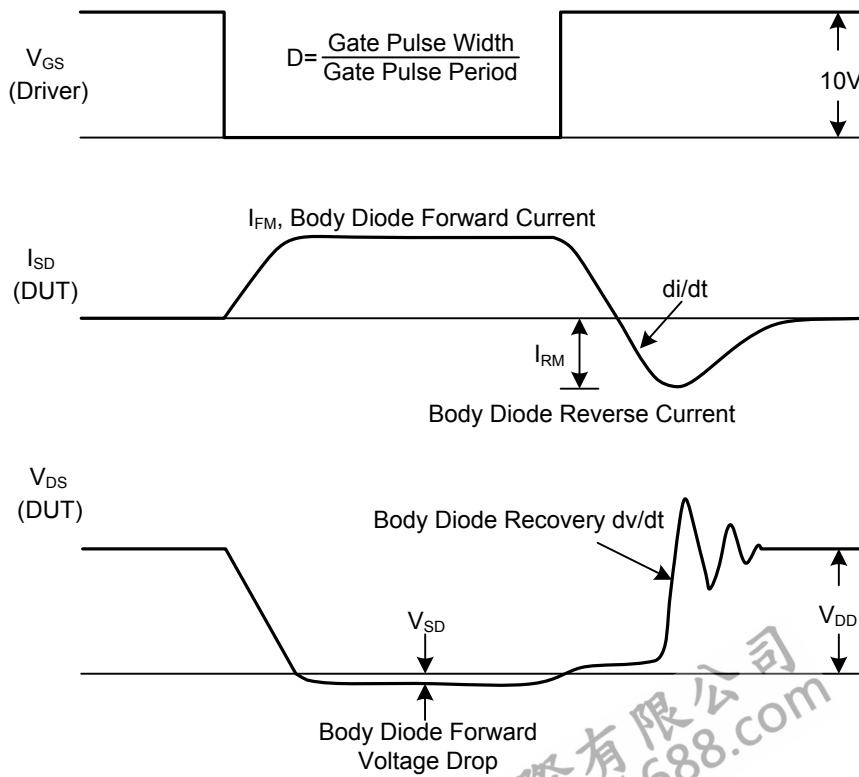
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0\text{V}$ , $I_D=250\mu\text{A}$	900			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=900\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30\text{V}$ , $V_{DS}=0\text{V}$			$\pm 10$	$\mu\text{A}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	3.0	4.1	5.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=1.5\text{A}$		5.0	6.2	$\Omega$
Forward Transconductance (Note)	$g_{FS}$	$V_{DS}=15\text{V}$ , $I_D=1.5\text{A}$		2.1		S
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1\text{MHz}$		430		pF
Output Capacitance	$C_{OSS}$			47		pF
Reverse Transfer Capacitance	$C_{RSS}$			7.7		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	$Q_G$	$V_{DD}=50\text{V}$ , $I_D=1.3\text{A}$ , $V_{GS}=10\text{V}$		19.25		nC
Gate-Source Charge	$Q_{GS}$			5.3		nC
Gate-Drain Charge	$Q_{GD}$			5		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DS}=30\text{V}$ , $I_D=0.5\text{A}$ , $R_G=25\ \Omega$		45		ns
Turn-On Rise Time	$t_R$			56		ns
Turn-Off Delay Time	$t_{D(OFF)}$			80		ns
Turn-Off Fall Time	$t_F$			52		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Source-Drain Current	$I_{SD}$				3	A
Source-Drain Current (Pulsed)	$I_{SDM}$				12	A
Diode Forward Voltage(Note)	$V_{SD}$	$I_{SD}=3\text{A}$ , $V_{GS}=0\text{V}$			1.6	V
Body Diode Reverse Recovery Time	$t_{rr}$	$V_{GS}=0\text{V}$ , $I_S=17\text{A}$ , $dI_F/dt=100\text{A}/\mu\text{s}$		530		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$	(Note 1)		3.4		$\mu\text{C}$

Note: Pulse width=300 $\mu\text{s}$ , Duty cycle  $\leq 1.5\%$ .

TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

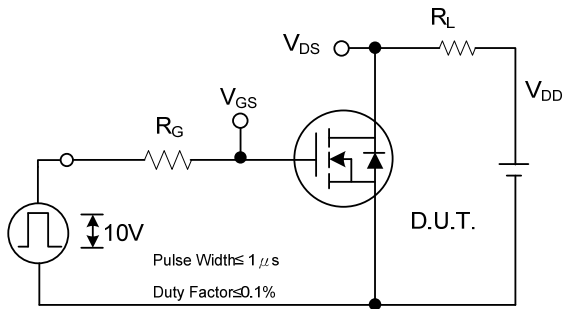


Fig. 2A Switching Test Circuit

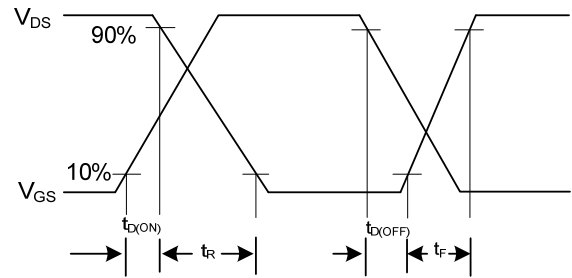


Fig. 2B Switching Waveforms

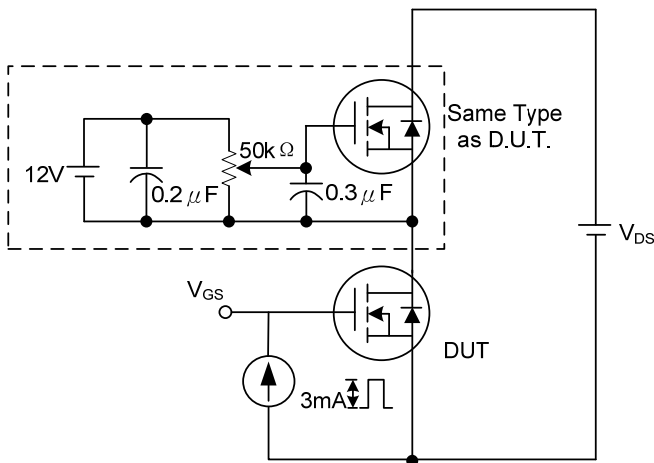


Fig. 3A Gate Charge Test Circuit

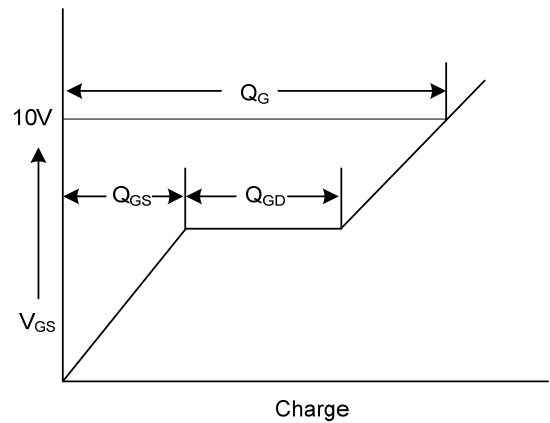


Fig. 3B Gate Charge Waveform

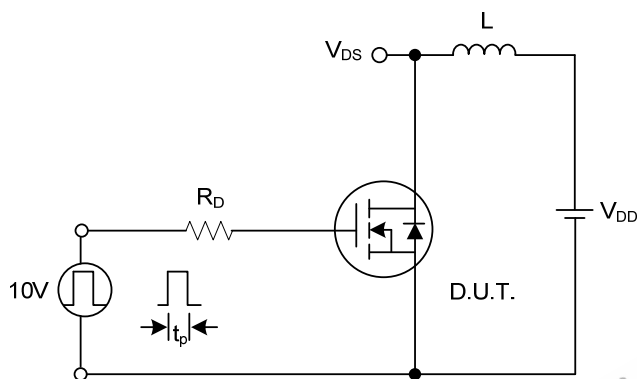


Fig. 4A Unclamped Inductive Switching Test Circuit

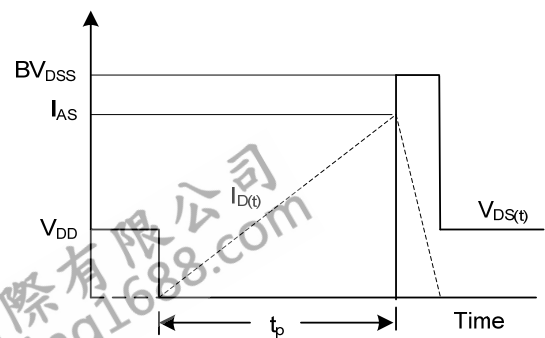
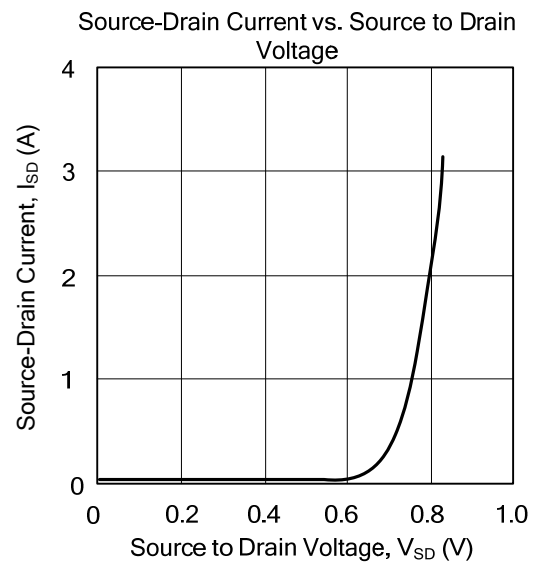
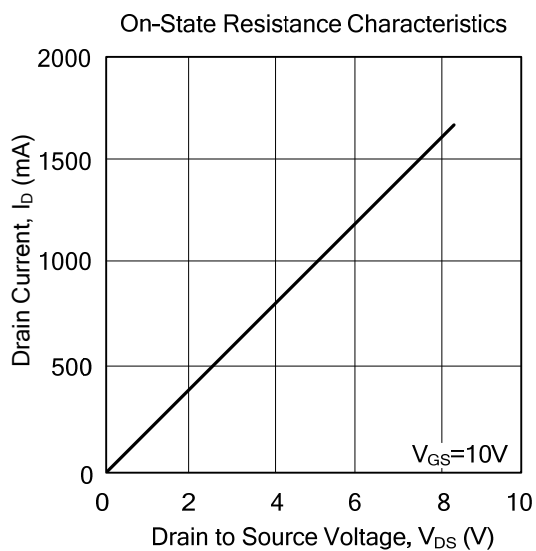
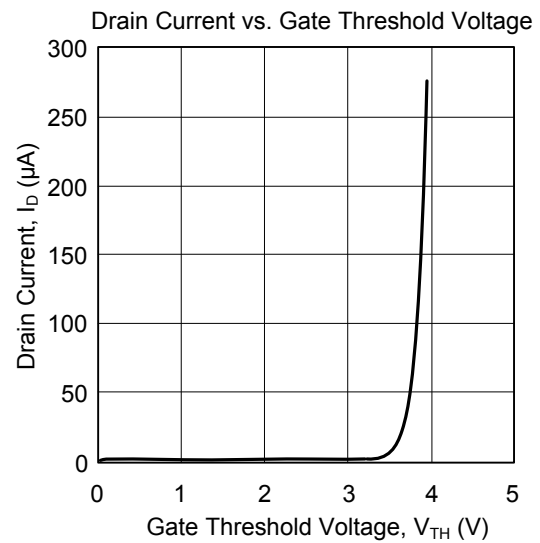
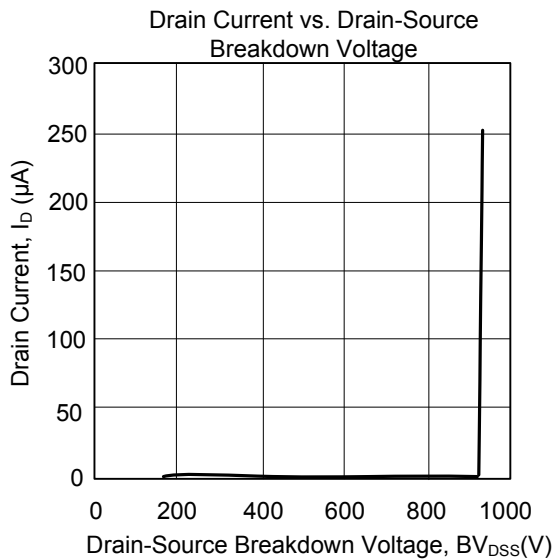


Fig. 4B Unclamped Inductive Switching Waveforms

### TYPICAL CHARACTERISTICS



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