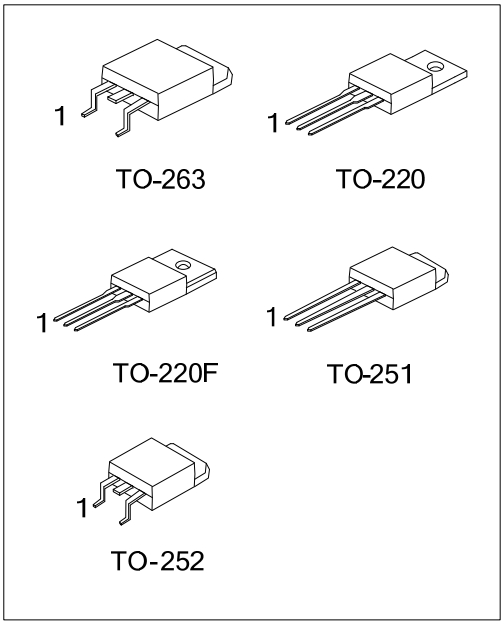
3N90

Power MOSFET

3A, 900V N-CHANNEL POWER MOSFET



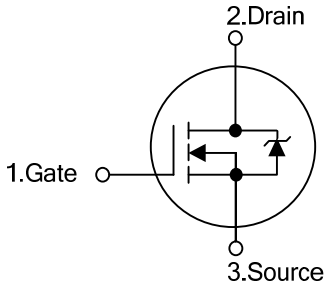
■ DESCRIPTION

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

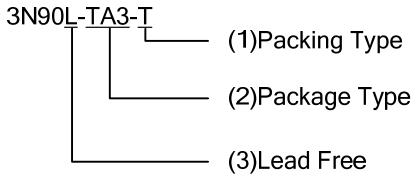
* $R_{DS(ON)}$=4.1Ω @V_{GS}=10 V
* Ultra Low Gate Charge (typical 22.7 nC)
* Low Reverse Transfer Capacitance (C_{RSS}= Typical 13 pF)
* Fast Switching Capability
* Avalanche Energy Specified
* Improved dv/dt Capability, High Ruggedness

■ SYMBOL



■ RDERING 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-TM3-T	3N90G-TM3-T	TO-251	G	D	S	Tube
3N90L-TN3-T	3N90G-TN3-T	TO-252	G	D	S	Tube
3N90L-TN3-R	3N90G-TN3-R	TO-252	G	D	S	Tape Reel



(1) T: Tube, R: Tape Reel
(2) TA3: TO-220, TF3: TO-220F, TQ2: TO-263
TM3: TO-251, TN3: TO-252
(3) L: Lead Free, G: Halogen Free

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage (V_{GS}=0V)		V_{DSS}	900	V
Drain-Gate Voltage (R_G=20kΩ)		V_{DGR}	900	V
Gate-Source Voltage		V_{GSS}	±30	V
Gate-Source Breakdown Voltage (I_{GS}=±1mA)		BV_{GSO}	30(MIN)	V
Insulation Withstand Voltage (DC)	TO-220F	V_{ISO}	2500	V
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	W
	TO-220F		25	
	TO-251/TO-252		45	
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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 °C, I_D=I_{AR}, V_{DD}=50V
4. I_{SD}≦3A, di/dt≦200A/μs, V_{DD}≦BV_{DSS}, T_J≦$T_{J(MAX)}$.

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ TO-263 TO-220F	$θ_{JA}$	62.5	°C/W
	TO-251/TO-252		110	
Junction to Case	TO-220/ TO-263	$θ_{JC}$	1.38	°C/W
	TO-220F		5	
	TO-251/TO-252		2.77	

■ ELECTRICAL CHARACTERISTICS (T_C=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	900			V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=900V, V_{GS}=0V			1	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±30V, V_{DS}=0V			±10	μA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	3	3.75	4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=1.5A		4.1	4.8	Ω
Forward Transconductance (Note 1)	g_{FS}	V_{DS}=15V, I_D=1.5A		2.1		S
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1MHz		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}=0V, V_{DS}=0V~400V		34		pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	V_{DD}=450V, I_D=1.5 A, R_G=4.7Ω		18		ns
Turn-On Rise Time	t_R	V_{GS}=10V		7		ns
Turn-Off Delay Time	$t_{D(OFF)}$	V_{DD}=720V, I_D=1.5 A, R_G=4.7Ω		45		ns
Turn-Off Fall Time	t_F	V_{GS}=10V		18		ns
Total Gate Charge	Q_G	V_{DD}=720V, I_D=3A, V_{GS}=10V		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/μs, V_{DD}=100V, T_J=25°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=300μs, Duty cycle≦1.5%

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

■ TEST CIRCUITS AND WAVEFORMS

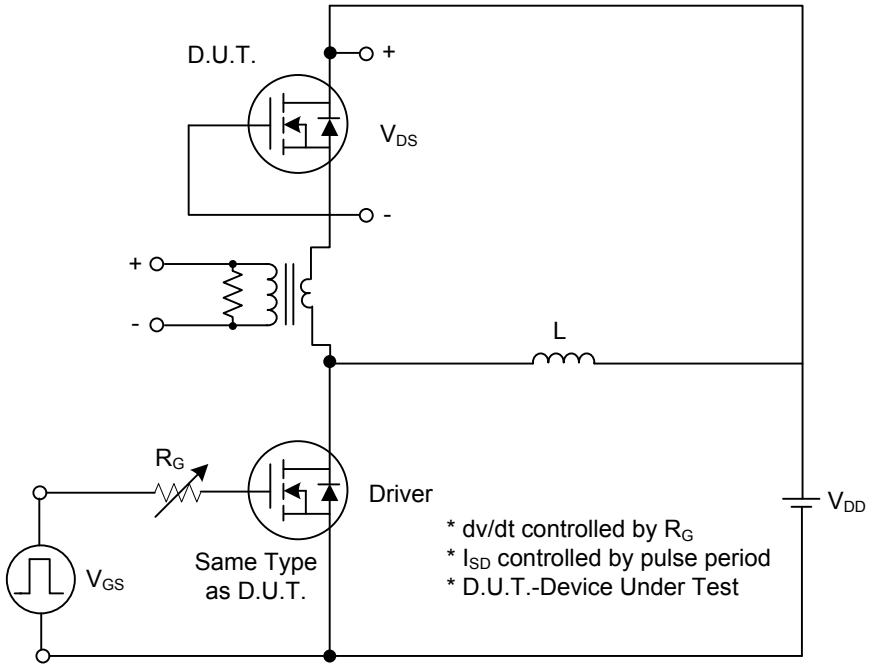


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

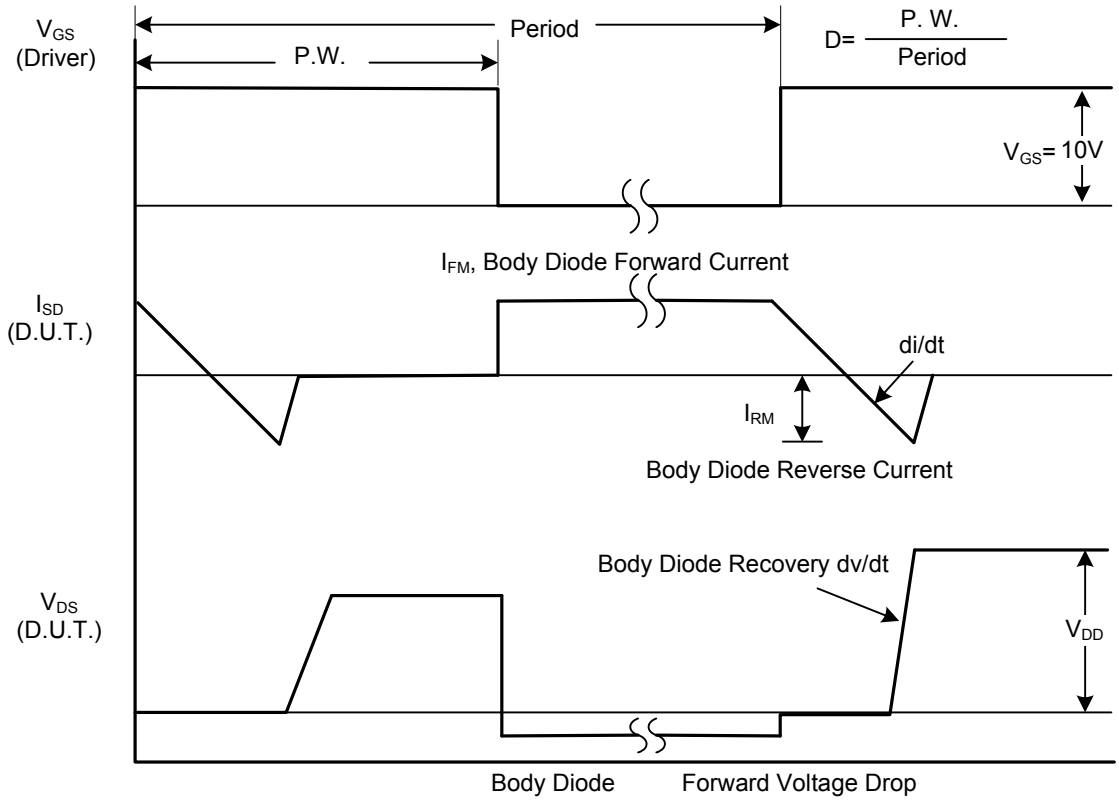


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

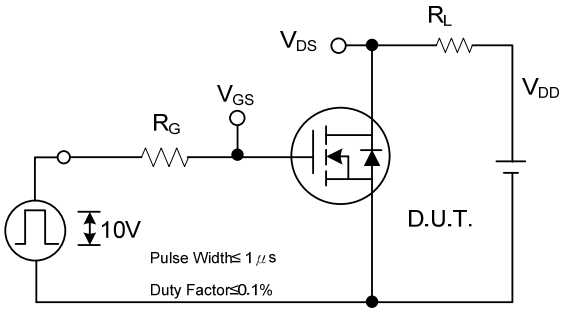


Fig. 2A Switching Test Circuit

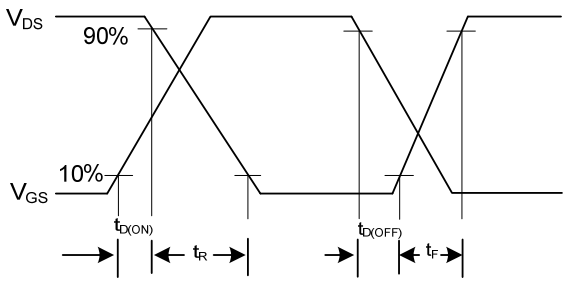


Fig. 2B Switching Waveforms

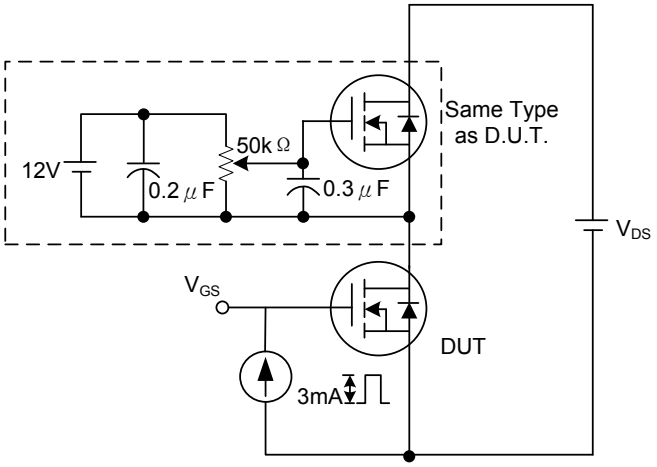


Fig. 3A Gate Charge Test Circuit

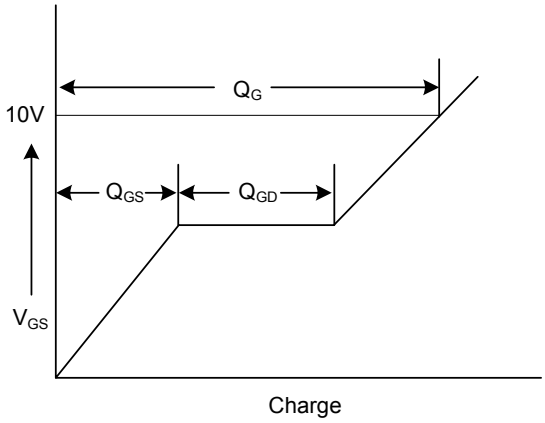


Fig. 3B Gate Charge Waveform

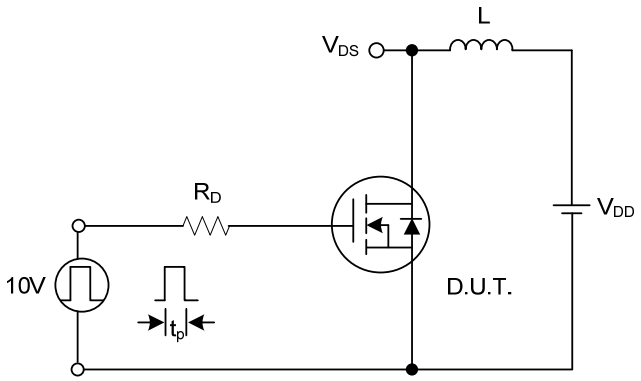


Fig. 4A Unclamped Inductive Switching Test Circuit

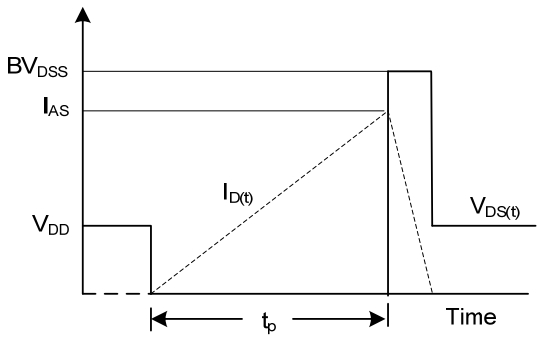
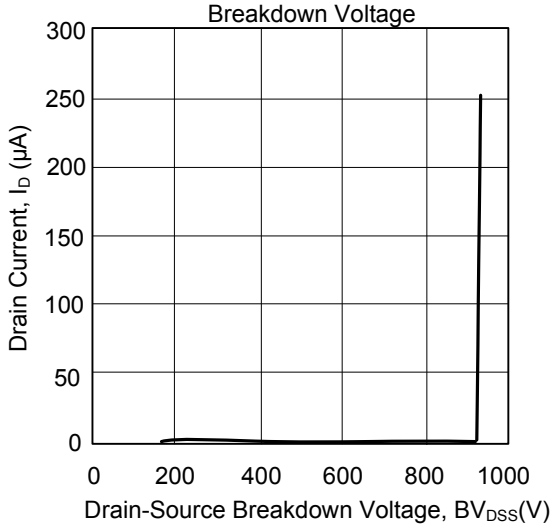


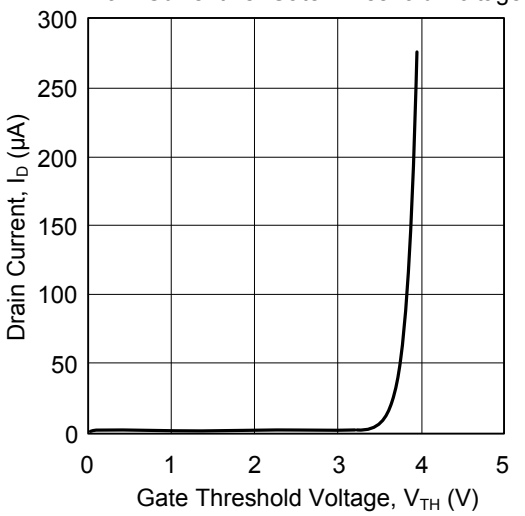
Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

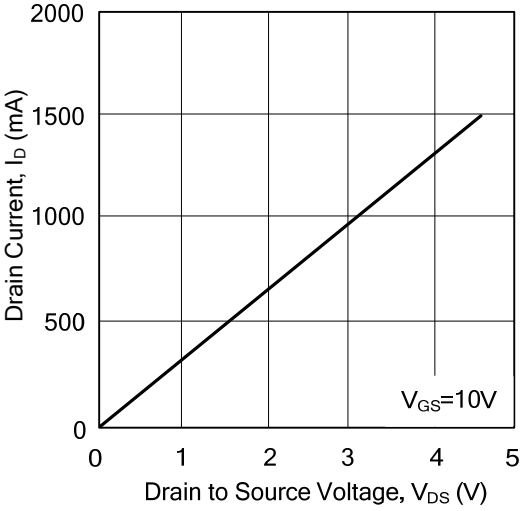
Drain Current vs. Drain-Source Breakdown Voltage



Drain Current vs. Gate Threshold Voltage



On-State Resistance Characteristics



Source Current vs. Source to Drain Voltage