



**2N90**

**Power MOSFET**

**2A, 900V N-CHANNEL  
POWER MOSFET**

■ DESCRIPTION

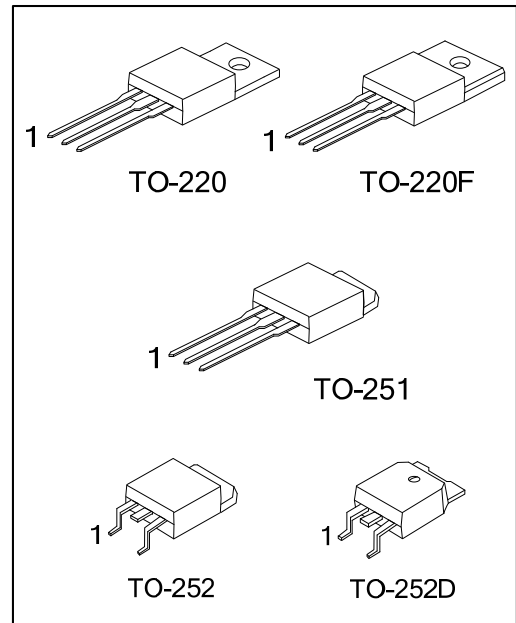
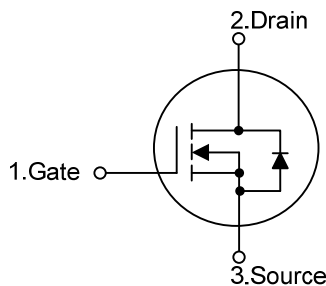
The UTC **2N90** is an N-channel mode power MOSFET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **2N90** is universally applied in high efficiency switch mode power supply.

■ FEATURES

- \*  $R_{DS(ON)} < 7.2\Omega @ V_{GS}=10V, I_D=1.1A$
- \* High switching speed
- \* Improved dv/dt capability
- \* 100% avalanche tested

■ SYMBOL



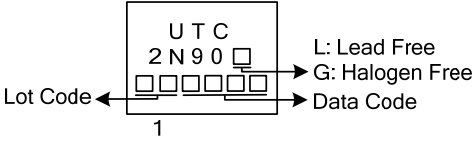
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N90L-TA3-T	2N90G-TA3-T	TO-220	G	D	S	Tube
2N90L-TF3-T	2N90G-TF3-T	TO-220F	G	D	S	Tube
2N90L-TM3-T	2N90G-TM3-T	TO-251	G	D	S	Tube
2N90L-TN3-R	2N90G-TN3-R	TO-252	G	D	S	Tape Reel
2N90L-TND-R	2N90G-TND-R	TO-252D	G	D	S	Tape Reel

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

<p>2N90L-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TM3: TO-251, TN3: TO-252, TND: TO-252D (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 (Note 2)		$V_{DSS}$	900	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	2.2	A
	Pulsed (Note 2)	$I_{DM}$	8.8	A
Avalanche Current (Note 2)		$I_{AR}$	2.2	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	170	mJ
	Repetitive (Note 2)	$E_{AR}$	8.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/ns
Power Dissipation	TO-220	$P_D$	85	W
	TO-220F		25	
	TO-251/ TO-252		43	
	TO-252D			
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-55~+150	$^\circ\text{C}$

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.  $L = 65\text{mH}$ ,  $I_{AS} = 2.2\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 2.2\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-251/ TO-252		110	
	TO-252D			
Junction to Case	TO-220	$\theta_{JC}$	1.47	$^\circ\text{C}/\text{W}$
	TO-220F		5	
	TO-251/ TO-252		2.85	
	TO-252D			

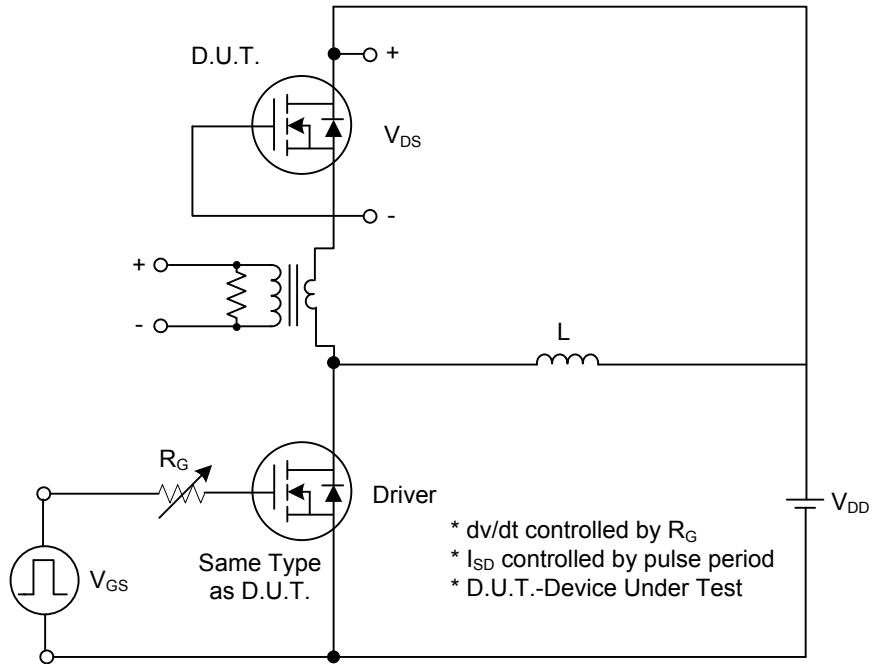
■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage		$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	900			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ\text{C}$ , $I_D=250\mu\text{A}$		1.0		$\text{V}/^\circ\text{C}$
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=900\text{V}$ , $V_{GS}=0\text{V}$			10	$\mu\text{A}$
			$V_{DS}=720\text{V}$ , $T_C=125^\circ\text{C}$			100	
Gate- Source Leakage Current	Forward	$I_{GSS}$	$V_{GS}=+30\text{V}$ , $V_{DS}=0\text{V}$			+100	nA
	Reverse		$V_{GS}=-30\text{V}$ , $V_{DS}=0\text{V}$			-100	nA
<b>ON CHARACTERISTICS</b>							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	3.0		5.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=1.1\text{A}$		5.6	7.2	$\Omega$
Forward Transconductance		$g_{FS}$	$V_{DS}=50\text{V}$ , $I_D=1.1\text{A}$ (Note 1)		2.0		S
<b>DYNAMIC PARAMETERS</b>							
Input Capacitance		$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		480	520	pF
Output Capacitance		$C_{OSS}$			45		
Reverse Transfer Capacitance		$C_{RSS}$			7		
<b>SWITCHING PARAMETERS</b>							
Turn-ON Delay Time		$t_{D(ON)}$	$V_{GS}=10\text{V}$ , $V_{DD}=30\text{V}$ , $I_D=0.5\text{A}$ , $R_G=25\Omega$ (Note 1,2)		50		ns
Rise Time		$t_R$			65		
Turn-OFF Delay Time		$t_{D(OFF)}$			90		
Fall-Time		$t_F$			45		
Total Gate Charge		$Q_G$	$V_{GS}=10\text{V}$ , $V_{DS}=50\text{V}$ , $I_D=1.3\text{A}$ $I_G=100\mu\text{A}$ (Note 1,2)		16	26	nC
Gate to Source Charge		$Q_{GS}$			5.5		
Gate to Drain Charge		$Q_{GD}$			4.5		
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>							
Maximum Continuous Drain-Source Diode Forward Current		$I_S$				2.2	A
Maximum Pulsed Drain-Source Diode Forward Current		$I_{SM}$				8.8	A
Drain-Source Diode Forward Voltage		$V_{SD}$	$I_S=2.2\text{A}$ , $V_{GS}=0\text{V}$			1.4	V
Reverse Recovery Time		$t_{rr}$	$I_S=2.2\text{A}$ , $V_{GS}=0\text{V}$ , $dI_F/dt=100\text{A}/\mu\text{s}$		400		ns
Reverse Recovery Charge		$Q_{RR}$	s (Note 1)		1.6		$\mu\text{C}$

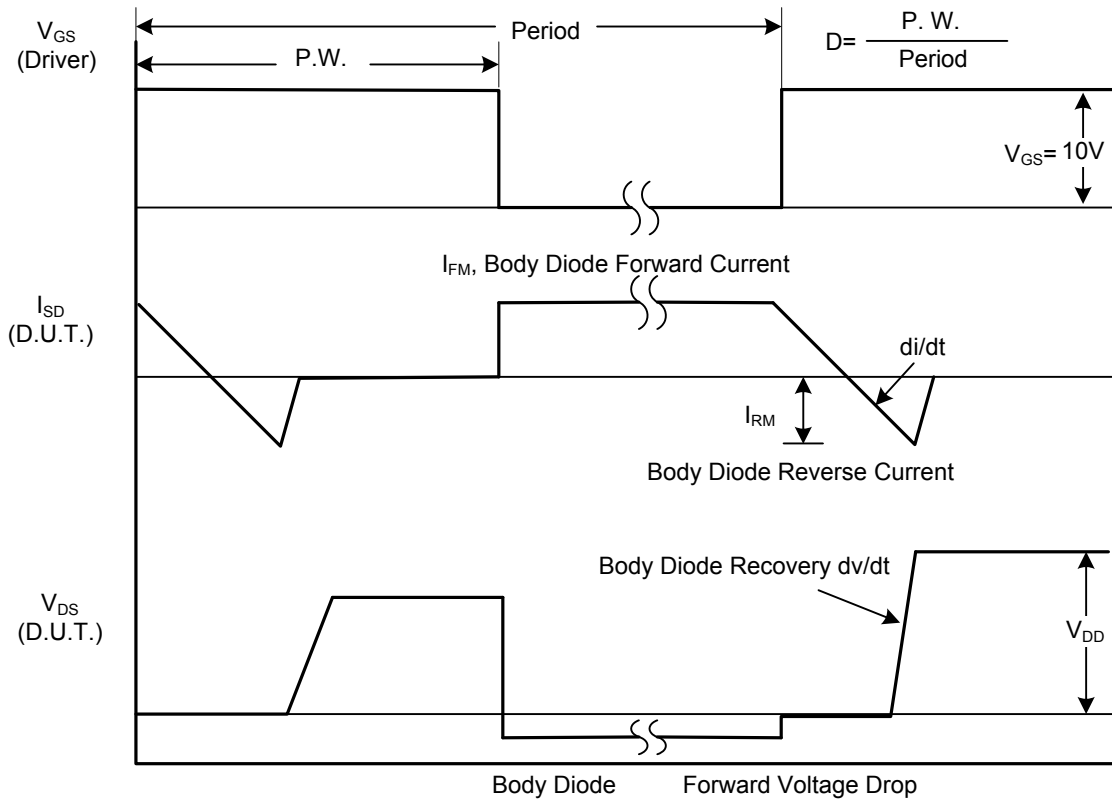
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

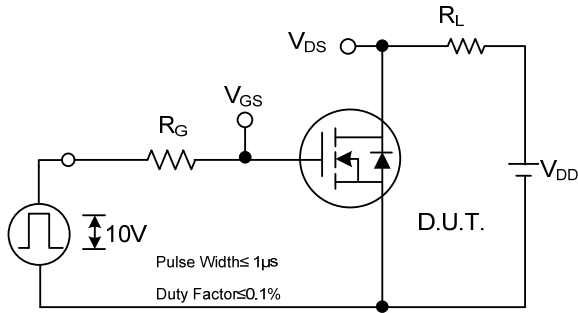


Peak Diode Recovery  $dv/dt$  Test Circuit

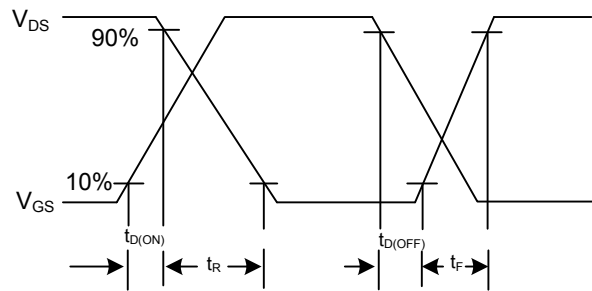


Peak Diode Recovery  $dv/dt$  Waveforms

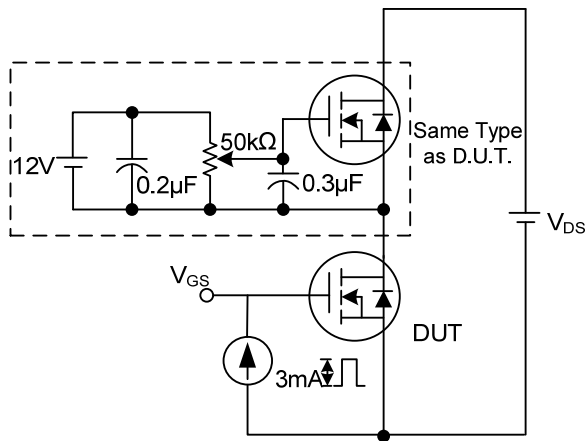
TEST CIRCUITS AND WAVEFORMS (Cont.)



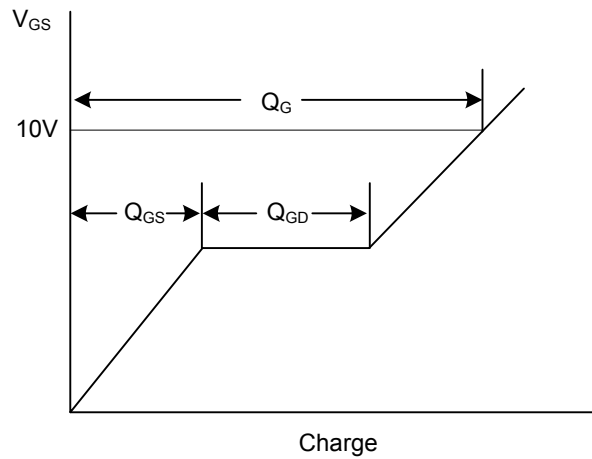
Switching Test Circuit



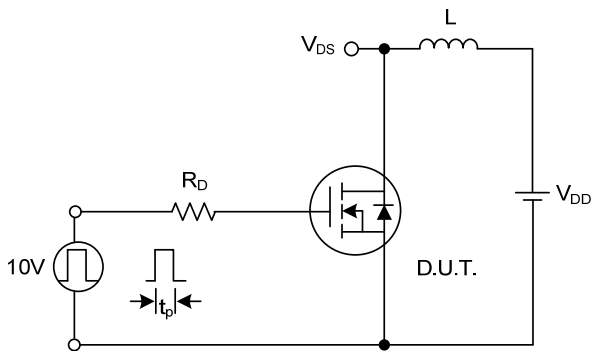
Switching Waveforms



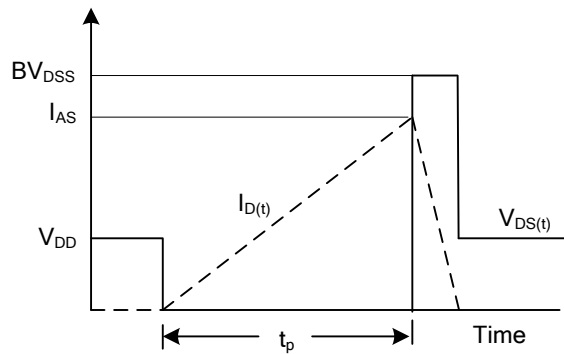
Gate Charge Test Circuit



Gate Charge Waveform

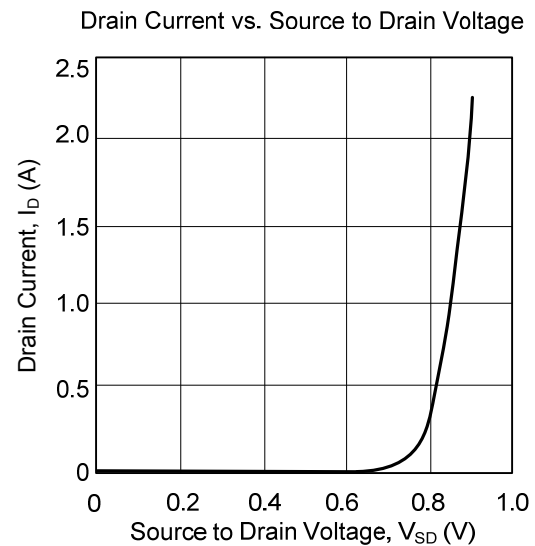
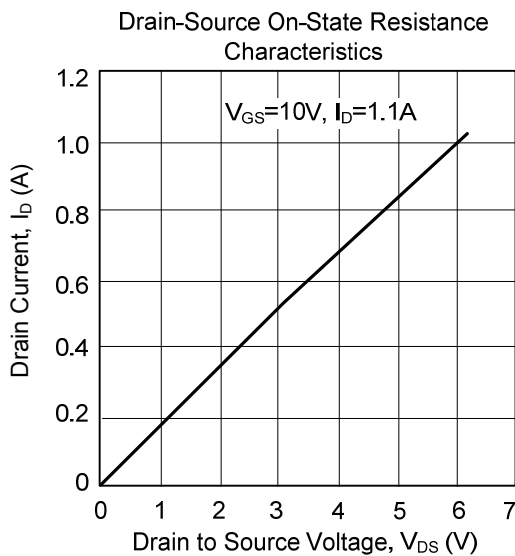
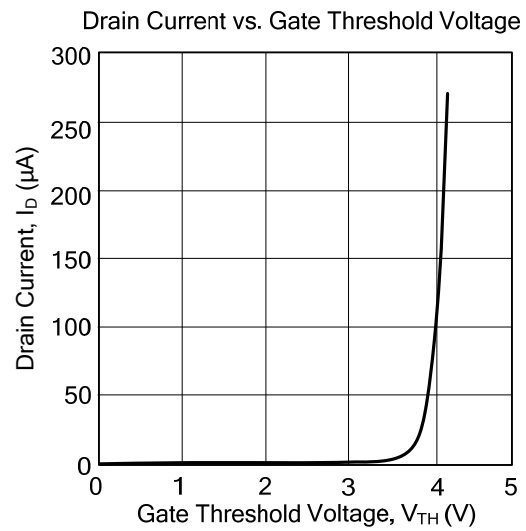
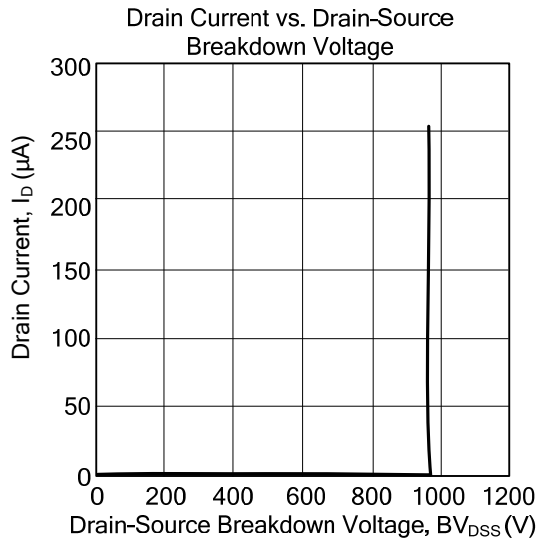


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS



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