



## 2N90

Preliminary

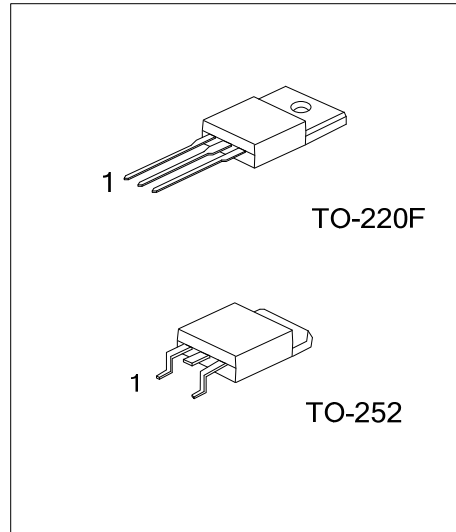
Power MOSFET

### 2 Amps, 900 Volts N-CHANNEL POWER MOSFET

#### DESCRIPTION

The UTC **2N90** is an N-channel mode Power FET 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.

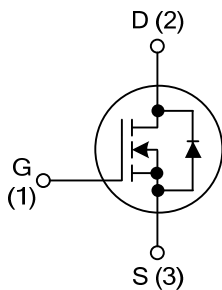
The UTC **2N90** is universally applied in high efficiency switch mode power supply.



#### FEATURES

- \* 2.2A, 900V,  $R_{DS(on)} = 7.2\Omega @ V_{GS} = 10 V$
- \* Typically 5.5 pF low Crss
- \* High switching speed
- \* Typically 12 nC low gate charge
- \* Improved dv/dt capability
- \* 100% avalanche tested

#### SYMBOL



#### ORDERING INFORMATION

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

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

<p>2N90L-TF3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Free</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TF3: TO-220F, TN3: TO-252</p> <p>(3) G: Halogen Free, L: Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage (Note 1)		$V_{DSS}$	900	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	2.2	A
	Pulsed (Note 1)	$I_{DM}$	8.8	A
Avalanche Current (Note 1)		$I_{AR}$	2.2	A
Avalanche Energy	Single Pulsed (Note 2)	$E_{AS}$	170	mJ
	Repetitive (Note 1)	$E_{AR}$	8.5	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.0	V/ns
Power Dissipation	TO-220F	$P_D$	25	W
	TO-252		43	W/°C
Junction Temperature		$T_J$	+150	°C
Storage Temperature Range		$T_{STG}$	-55~+150	°C

■ THERMAL CHARACTERISTICS

PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F	$\theta_{JA}$	62.5	°C/W
	TO-252		110	°C/W
Junction to Case	TO-220F	$\theta_{JC}$	5	°C/W
	TO-252		2.85	°C/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		$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	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		$V/^\circ\text{C}$
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 (Note 4)		$g_{FS}$	$V_{DS}=50\text{V}$ , $I_D=1.1\text{A}$		2.0		S
<b>DYNAMIC PARAMETERS</b>							
Input Capacitance		$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		390	500	pF
Output Capacitance		$C_{OSS}$			45	60	
Reverse Transfer Capacitance		$C_{RSS}$			5.5	7.0	
<b>SWITCHING PARAMETERS</b>							
Total Gate Charge (Note 4,5)		$Q_G$	$V_{GS}=10\text{V}$ , $V_{DS}=720\text{V}$ , $I_D=2.2\text{A}$		12	15	nC
Gate to Source Charge (Note 4,5)		$Q_{GS}$			2.8		
Gate to Drain Charge (Note 4,5)		$Q_{GD}$			6.1		
Turn-ON Delay Time (Note 4,5)		$t_{D(ON)}$	$V_{DD}=450\text{V}$ , $I_D=2.2\text{A}$ , $R_G=25\Omega$		15	40	ns
Rise Time (Note 4,5)		$t_R$			35	80	
Turn-OFF Delay Time (Note 4,5)		$t_{D(OFF)}$			20	50	
Fall-Time (Note 4,5)		$t_F$			30	70	
<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 (Note 4)		$t_{RR}$	$I_S=2.2\text{A}$ , $V_{GS}=0\text{V}$ , $di_F/dt=100\text{A}/\mu\text{s}$		400		ns
Reverse Recovery Charge (Note 4)		$Q_{RR}$			1.6		

Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

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

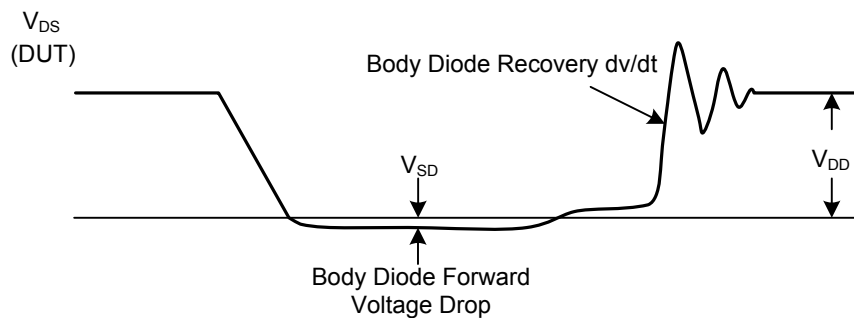
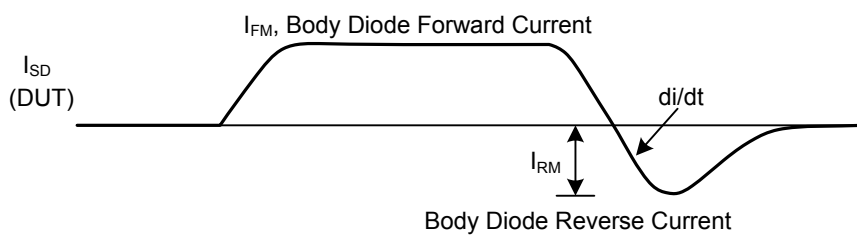
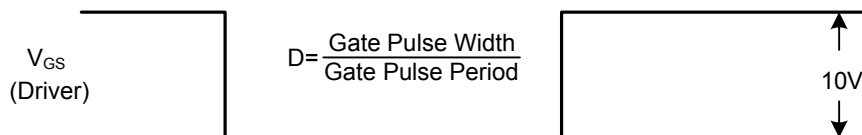
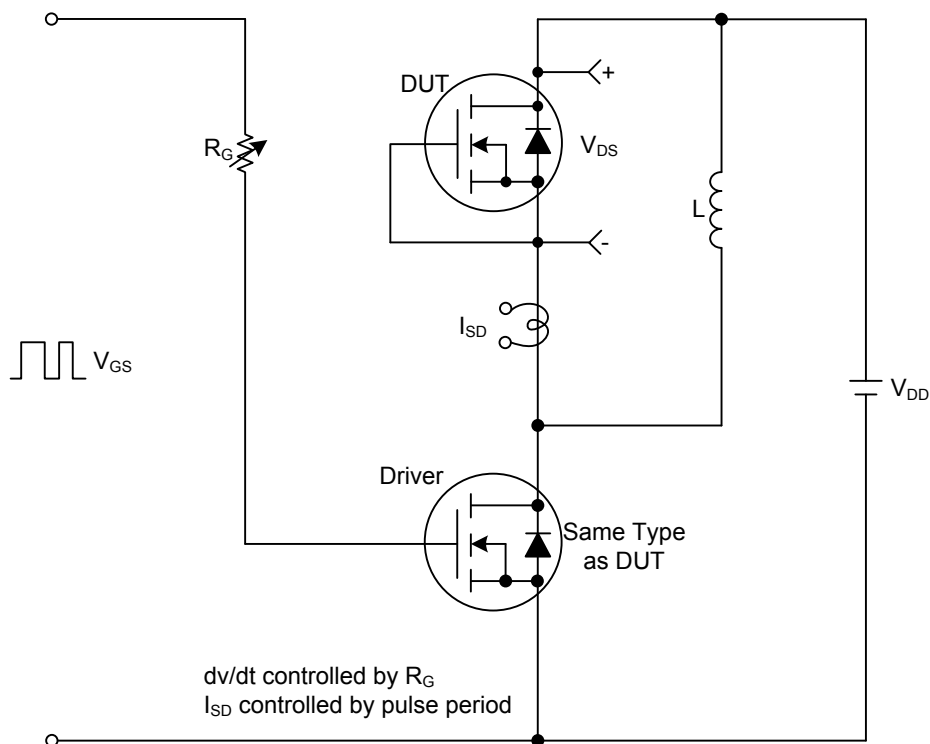
3.  $I_{SD} \leq 2.2\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

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

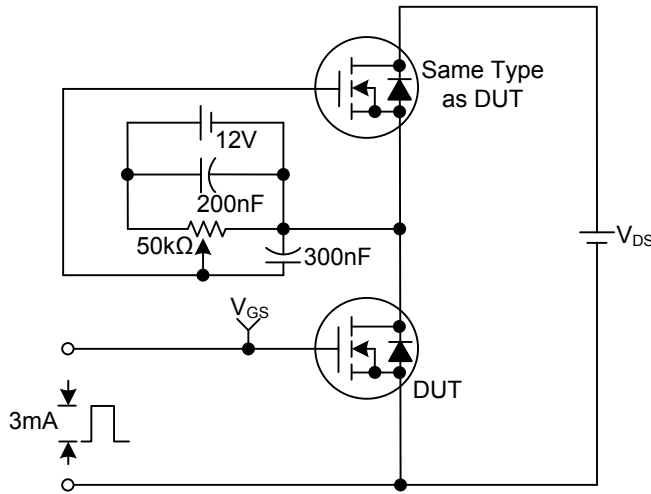
5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

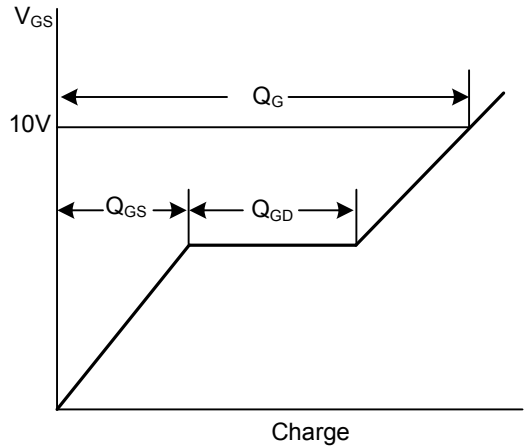
Peak Diode Recovery dv/dt Test Circuit & Waveforms



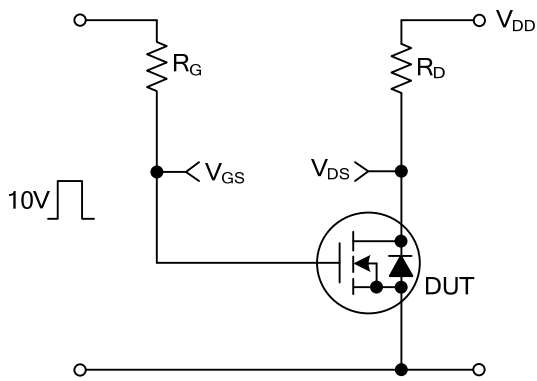
Gate Charge Test Circuit



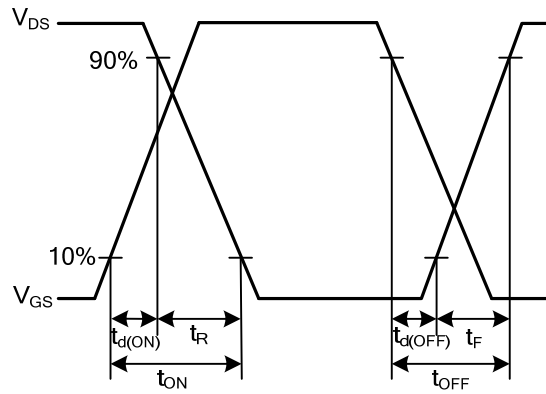
Gate Charge Waveforms



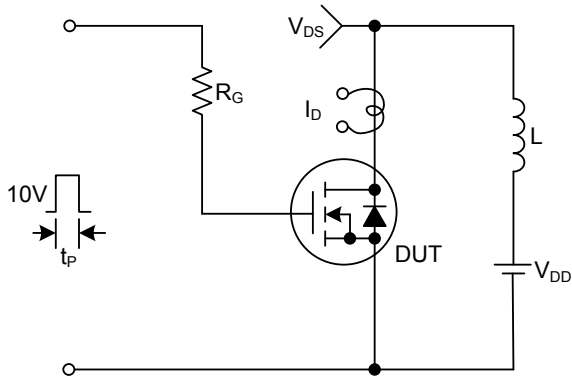
Resistive Switching Test Circuit



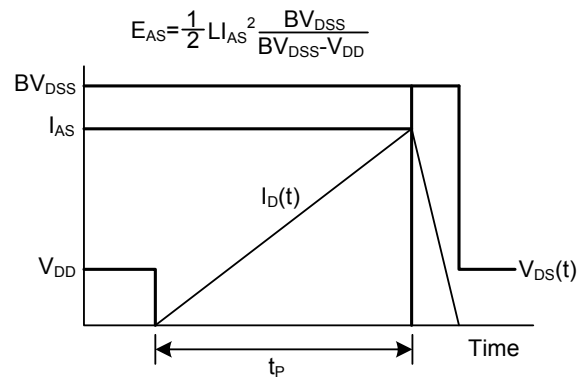
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



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