



1N90

Preliminary

Power MOSFET

1 Amps, 900 Volts N-CHANNEL POWER MOSFET

DESCRIPTION

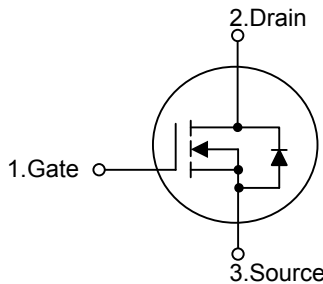
The UTC **1N90** is an N-channel mode power MOSFET, using UTC's advanced technology to provide customers planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance, superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **1N90** is universally applied in high efficiency switch mode power supply.

FEATURES

- * 1.0A, 900V, $R_{DS(on)}=16\Omega$ @ $V_{GS}=10V$
- * High switching speed
- * Improved dv/dt capability
- * 100% avalanche tested

SYMBOL

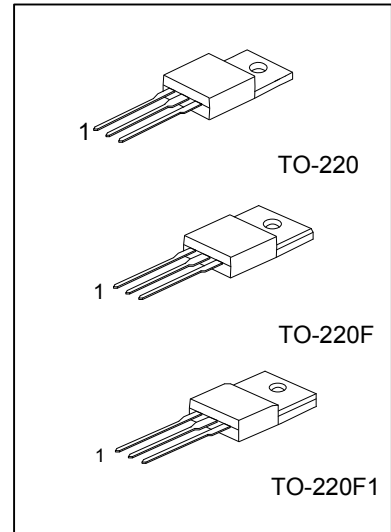


ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N90L-TA3-T	1N90G-TA3-T	TO-220	G	D	S	Tube
1N90L-TF3-T	1N90G-TF3-T	TO-220F	G	D	S	Tube
1N90L-TF1-T	1N90G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>1N90L - TA3 - T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Free</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1</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		V_{DSS}	900	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	1.0	A
	Pulsed (Note 1)	I_{DM}	4.0	A
Avalanche Current (Note 1)		I_{AR}	1.0	A
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	90	mJ
	Repetitive (Note 1)	E_{AR}	4.5	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.0	V/ns
Power Dissipation	TO-220	P_D	2.5	W
	TO-220F/TO-220F1		45	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55~+150	$^\circ\text{C}$

Note: 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.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-220F/TO-220F1		62.5	$^\circ\text{C/W}$
Junction to Case	TO-220	θ_{JC}	3.13	$^\circ\text{C/W}$
	TO-220F/TO-220F1		5.35	$^\circ\text{C/W}$

■ 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}	$V_{GS}=0V, I_D=250\mu A$	900			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$, Referenced to 25°C		1.0		$V/^\circ\text{C}$
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=900V, V_{GS}=0V$			10	μA
		$V_{DS}=640V, T_C=125^\circ\text{C}$			100	μA
Gate-Source Leakage Current	Forward	$V_{DS}=0V, V_{GS}=30V$			100	nA
	Reverse	$V_{DS}=0V, V_{GS}=-30V$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3.0		5.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=0.5A$		10.3	16.0	Ω
Forward Transconductance	g_{FS}	$V_{DS}=50V, I_D=0.5A$ (Note 4)		0.75		S
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$		150	195	pF
Output Capacitance	C_{OSS}			20	26	pF
Reverse Transfer Capacitance	C_{RSS}			2.7	3.5	pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{DS}=640V, V_{GS}=10V, I_D=1.0A$ (Note 4,5)		5.5	7.2	nC
Gate-Source Charge	Q_{GS}			1.1		nC
Gate-Drain Charge	Q_{GD}			3.3		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=400V, I_D=1.0A, R_G=25\Omega$ (Note 4,5)		10	30	ns
Turn-ON Rise Time	t_R			25	60	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			15	40	ns
Turn-OFF Fall Time	t_F			25	60	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				1.0	A
Maximum Body-Diode Pulsed Current	I_{SM}				4.0	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=1.0A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time	t_{RR}	$V_{GS}=0V, I_S=1.0A$,		300		ns
Body Diode Reverse Recovery Charge	Q_{RR}	$di/dt=100A/\mu s$ (Note 4)		0.6		μC

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

2. $L=170\text{mH}, I_{AS}=1.0A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

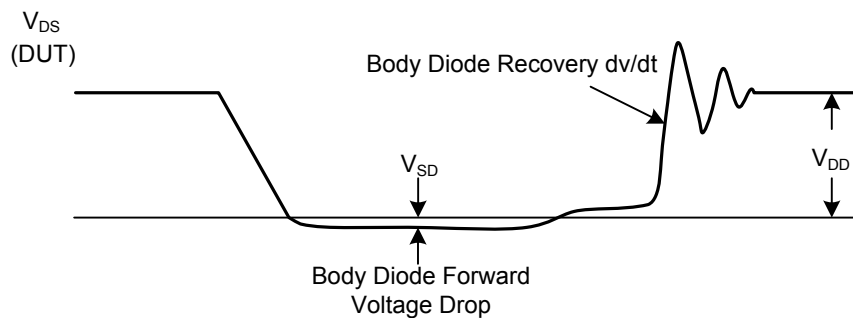
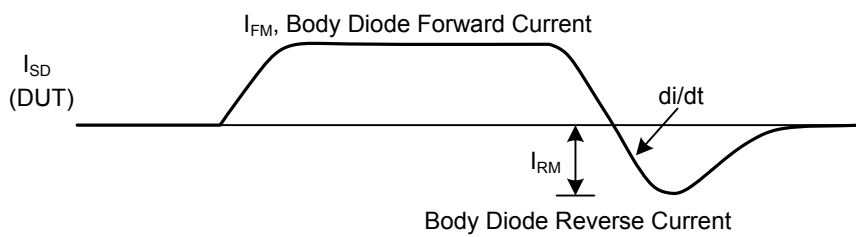
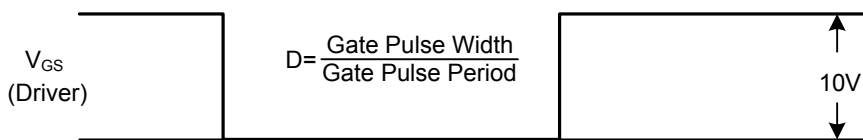
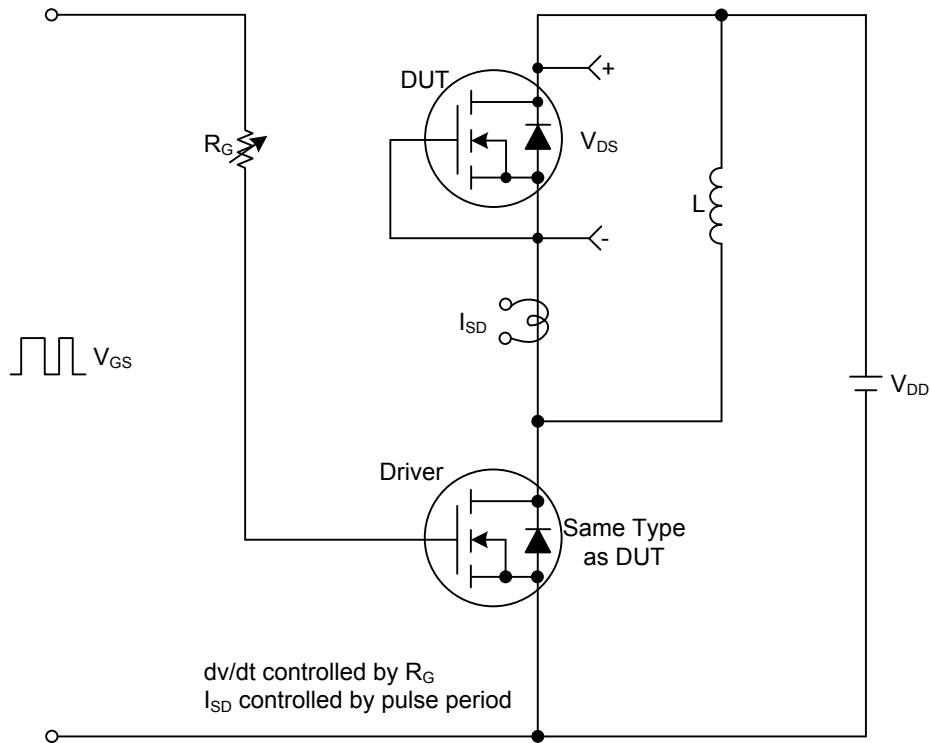
3. $I_{SD} \leq 1.0A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$

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

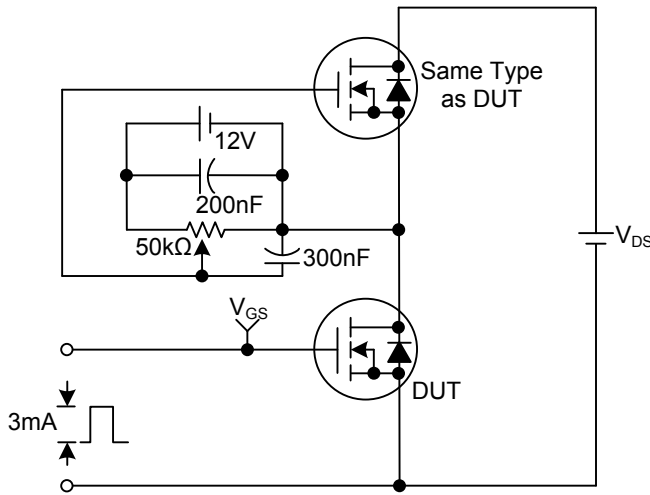
5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

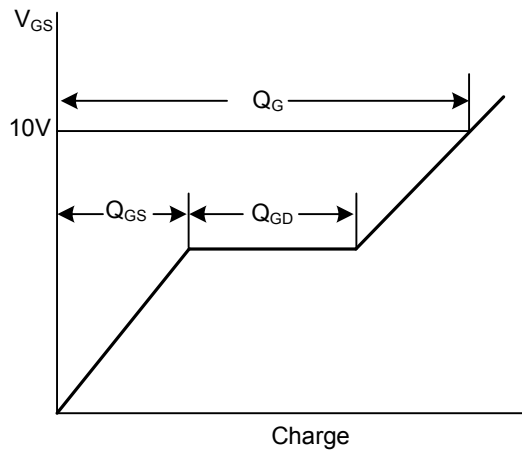
Peak Diode Recovery dv/dt Test Circuit & Waveforms



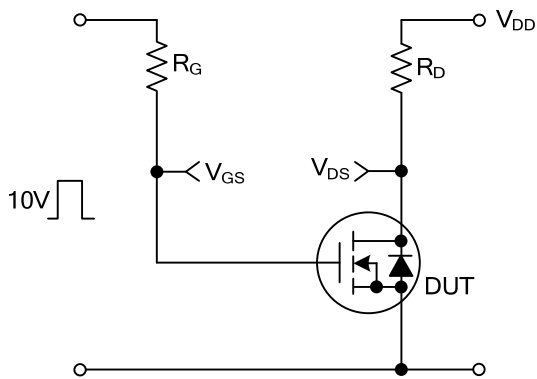
Gate Charge Test Circuit



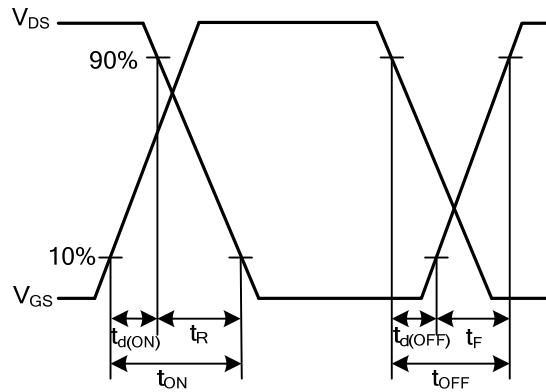
Gate Charge Waveforms



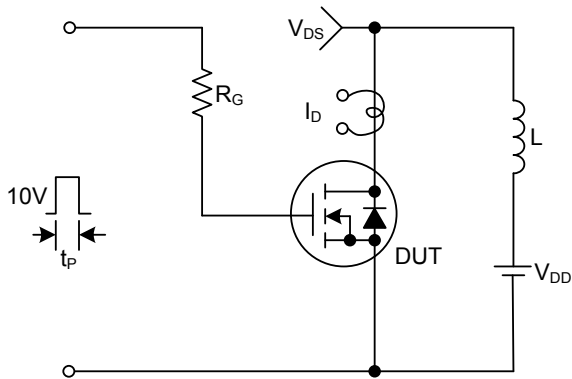
Resistive Switching Test Circuit



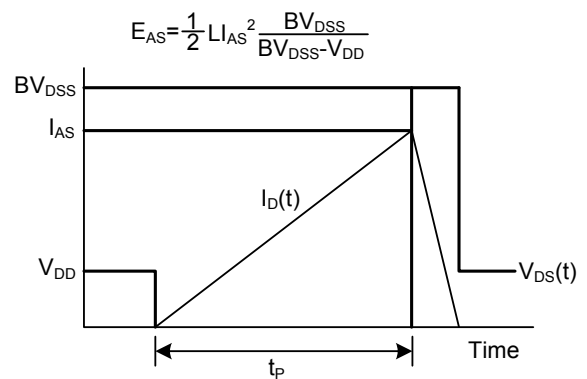
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



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