



## 5N90

Preliminary

Power MOSFET

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

#### DESCRIPTION

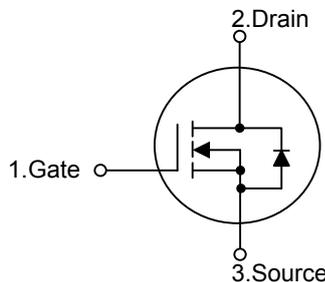
The UTC **5N90** is a N-channel mode Power FET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **5N90** is universally applied in high efficiency switch mode power supply.

#### FEATURES

- \* 5A, 900V,  $R_{DS(on)}=2.3\Omega @V_{GS}=10V$
- \* High switching speed
- \* Improved dv/dt capability
- \* 100% avalanche tested

#### SYMBOL

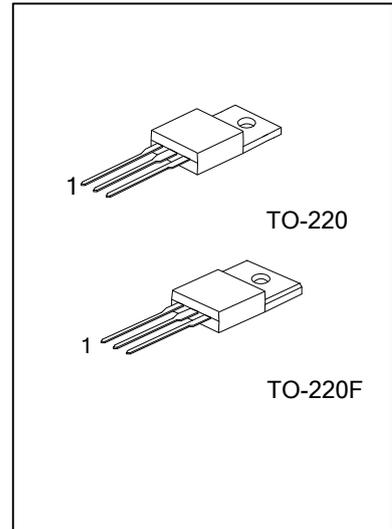


#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N90L-TA3-T	5N90G-TA3-T	TO-220	G	D	S	Tube
5N90L-TF3-T	5N90G-TF3-T	TO-220F	G	D	S	Tube

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

<p>5N90L - TA3 - T</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220, TF3: TO-220F</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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	5	A
	Pulsed (Note 1)	$I_{DM}$	12	A
Avalanche Energy	Single Pulsed (Note 2)	$E_{AS}$	660	mJ
	Repetitive (Note 1)	$E_{AR}$	5.1	mJ
Peak Diode Recovery $dv/dt$ (Note 3)		$dv/dt$	4.0	V/ns
Power Dissipation	TO-220	$P_D$	125	W
	TO-220F		38	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature Range		$T_{STG}$	-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	$\theta_{JA}$	62.5	$^\circ\text{C/W}$
	TO-220F		62.5	$^\circ\text{C/W}$
Junction to Case	TO-220	$\theta_{JC}$	1	$^\circ\text{C/W}$
	TO-220F		3.25	$^\circ\text{C/W}$

■ 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	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	900			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$ , Referenced to $25^\circ\text{C}$		1.0		$V/^\circ\text{C}$
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=900V, V_{GS}=0V$			10	$\mu A$
		$V_{DS}=720V, T_C=125^\circ\text{C}$			100	$\mu A$
Gate-Source Leakage Current	Forward	$V_{DS}=0V, V_{GS}=30V$			100	nA
	Reverse	$V_{DS}=0V, V_{GS}=-30V$			-100	nA
<b>ON CHARACTERISTICS</b>						
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.5A$		1.8	2.3	$\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=50V, I_D=2.5A$ (Note 4)		4.0		S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$		1200	1550	pF
Output Capacitance	$C_{OSS}$			110	145	pF
Reverse Transfer Capacitance	$C_{RSS}$			13	17	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=720V, V_{GS}=10V, I_D=5A$ (Note 4,5)		31	40	nC
Gate-Source Charge	$Q_{GS}$			7.2		nC
Gate-Drain Charge	$Q_{GD}$			15		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=450V, I_D=5A, R_G=25\Omega$ (Note 4,5)		28	65	ns
Turn-ON Rise Time	$t_R$			65	140	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			65	140	ns
Turn-OFF Fall Time	$t_F$			50	110	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				5	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				12	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S=5A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time	$t_{RR}$	$V_{GS}=0V, I_S=5.4A$ ,		610		ns
Body Diode Reverse Recovery Charge	$Q_{RR}$	$di/dt=100A/\mu s$ (Note 4)		5.26		$\mu C$

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

2.  $L=52.8\text{mH}, I_{AS}=5A, V_{DD}=50V, R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$

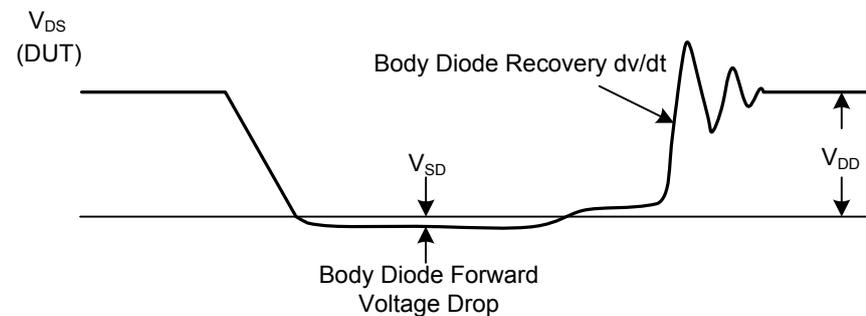
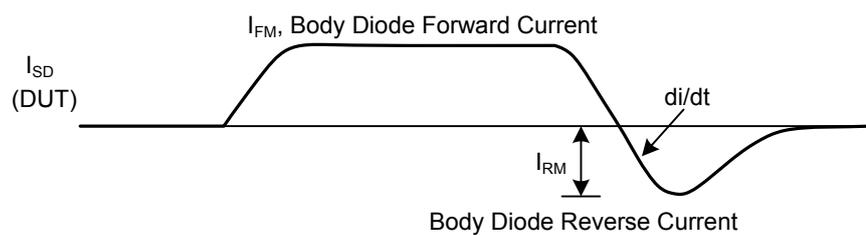
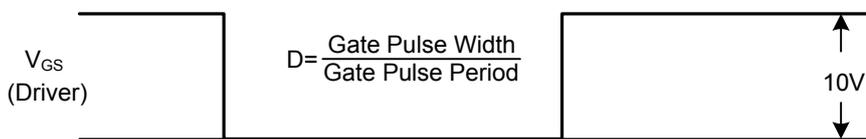
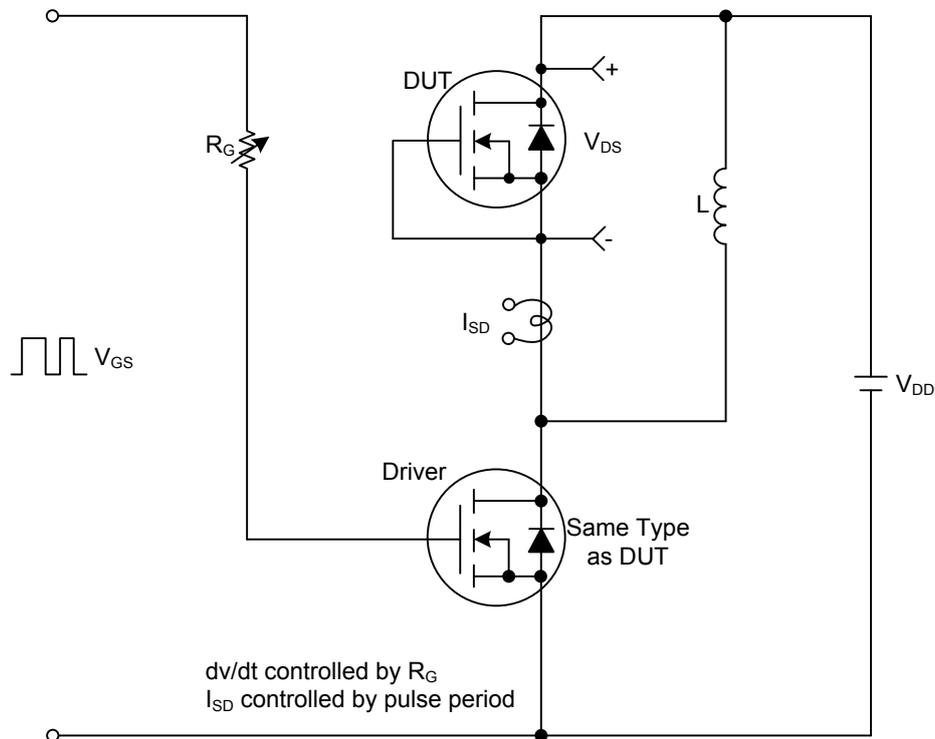
3.  $I_{SD} \leq 5.4A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

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

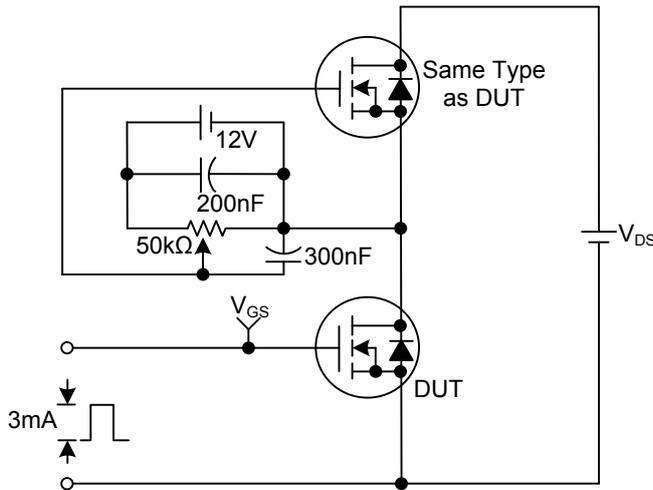
5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

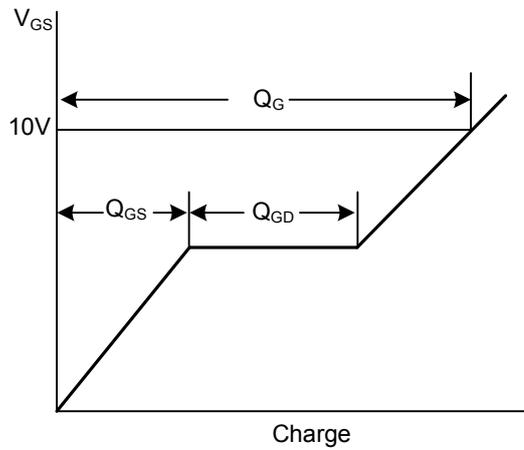
Peak Diode Recovery dv/dt Test Circuit & Waveforms



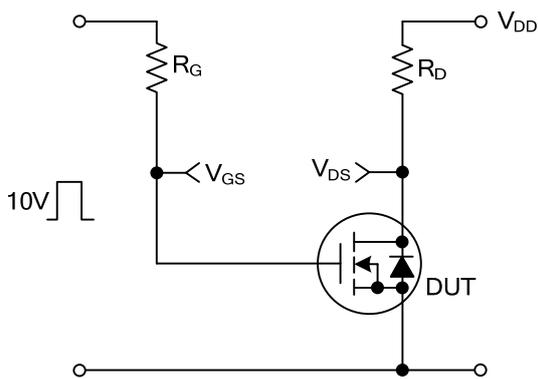
Gate Charge Test Circuit



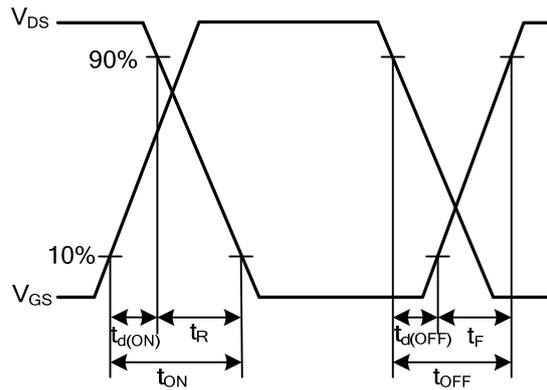
Gate Charge Waveforms



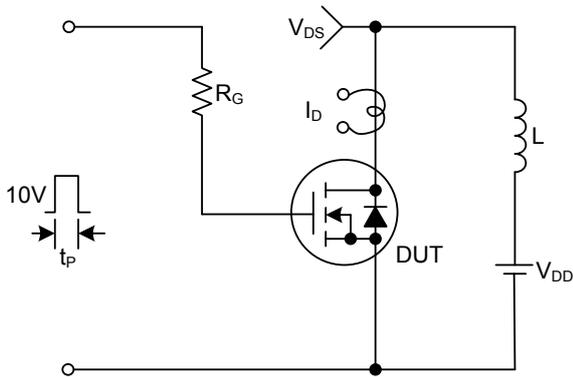
Resistive Switching Test Circuit



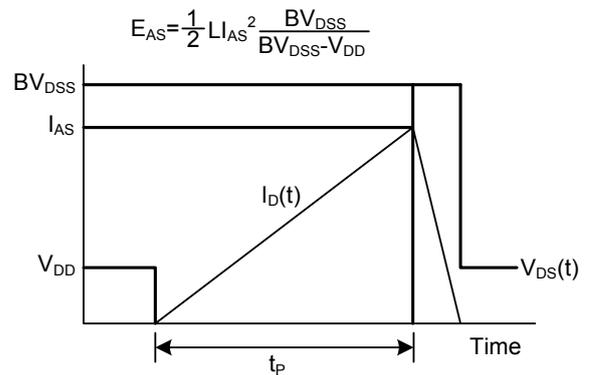
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



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