



7N90

Preliminary

Power MOSFET

900V N-CHANNEL POWER MOSFET

DESCRIPTION

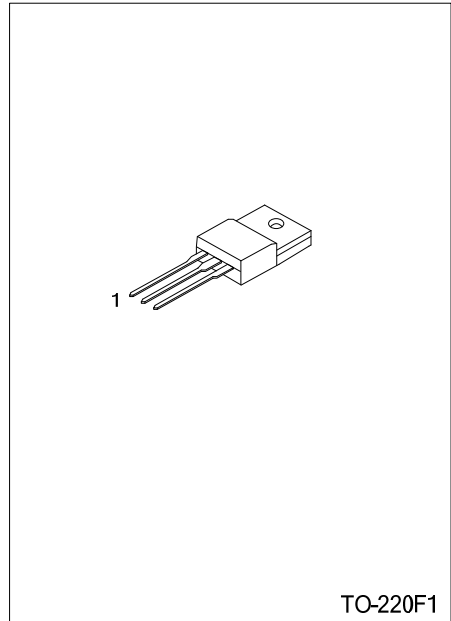
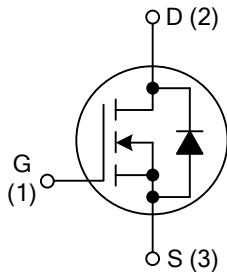
The UTC **7N90** is an N-channel mode Power FET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **7N90** is universally applied in active power factor correction, electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

FEATURES

- * High switching speed
- * 7.0A, 900V, $R_{DS(ON)}=1.8\Omega @ V_{GS}=10V$
- * Typically 40nC low gate charge
- * 100% avalanche tested
- * Typically 17pF low C_{RSS}
- * Improved dv/dt capability

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N90L-TF1-T	7N90G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>7N90L-TF1-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Plating</p>	<p>(1) T: Tube (2) TF1: TO-220F1 (3) G: Halogen Free, L:Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT	
Drain to Source Voltage	V_{DSS}	900	V	
Gate to Source Voltage	V_{GSS}	± 30	V	
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	7.0	A
		$T_C=100^\circ\text{C}$	4.4	A
Pulsed Drain Current (Note 1)	I_{DM}	28	A	
Avalanche Current (Note 1)	I_{AR}	6.4	A	
Single Pulsed Avalanche Energy (Note 2)	E_{AS}	780	mJ	
Repetitive Avalanche Energy (Note 1)	E_{AR}	21	mJ	
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.0	V/ns	
Power Dissipation	P_D	32	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	TYP.	MAX.	UNIT
Junction-to-Case	θ_{JC}		3.87	$^\circ\text{C}/\text{W}$
Junction-to-Ambient	θ_{JA}		62.5	$^\circ\text{C}/\text{W}$

■ 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		0.96		V/°C
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=900V, V_{GS}=0V$			10	μA
		$V_{DS}=720V, T_C=125^\circ C$			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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.5A$		1.5	1.8	Ω
Forward Transconductance	g_{FS}	$V_{DS}=50V, I_D=3.5A$ (Note 4)		5.7		S
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$		1440	1880	pF
Output Capacitance	C_{OSS}			140	185	pF
Reverse Transfer Capacitance	C_{RSS}			17	23	pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{DS}=720V, V_{GS}=10V,$ $I_D=7.0A$ (Note 4,5)		40	52	nC
Gate-Source Charge	Q_{GS}			8.5		nC
Gate-Drain Charge	Q_{GD}			20		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=450V, I_D=7.0A,$ $R_G=25\Omega$ (Note 4.,5)		35	80	ns
Turn-ON Rise Time	t_R			80	170	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			95	200	ns
Turn-OFF Fall Time	t_F			55	120	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				6.4	A
Maximum Body-Diode Pulsed Current	I_{SM}				25.6	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=7.0A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time	t_{RR}	$V_{GS}=0V, I_S=7.0A,$		400		ns
Body Diode Reverse Recovery Charge	Q_{RR}	$di/dt=100A/\mu s$ (Note 4)		4.3		μC

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

2. $L=30mH, I_{AS}=7.0A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J=25^\circ C$

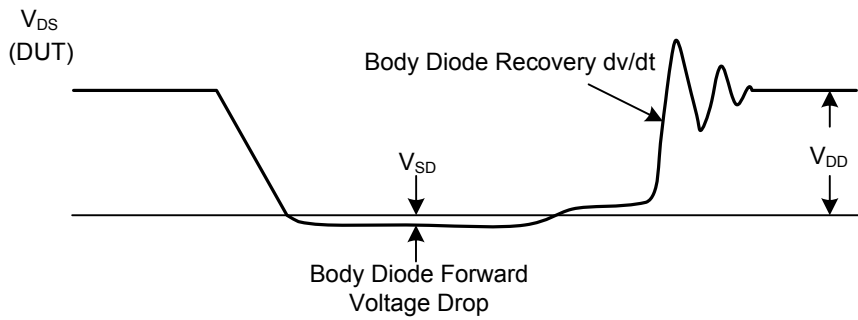
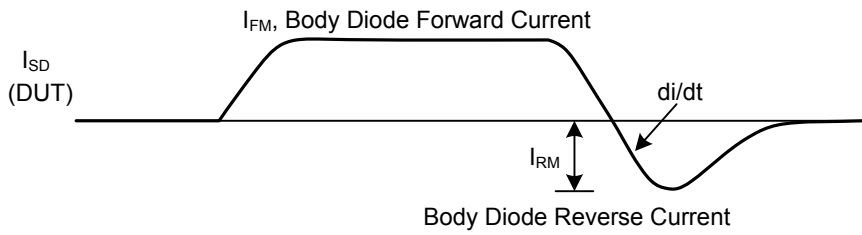
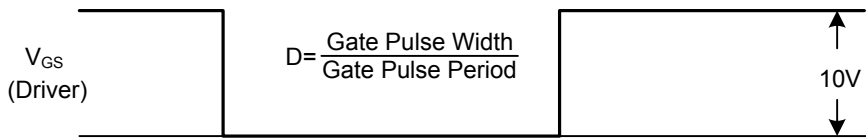
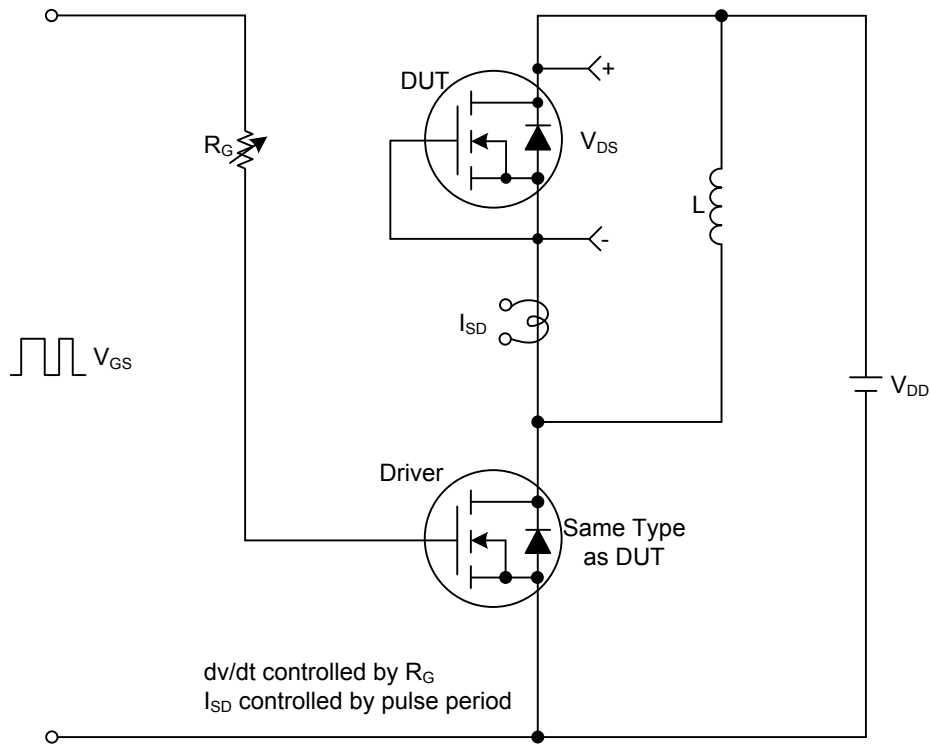
3. $I_{SD} \leq 7.0A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J=25^\circ C$

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

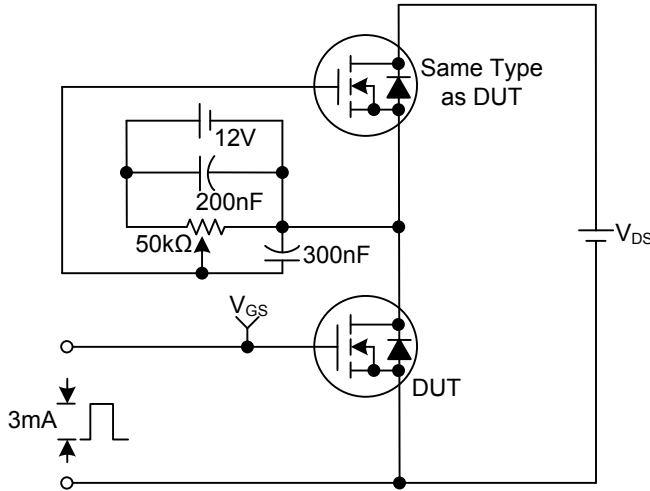
5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

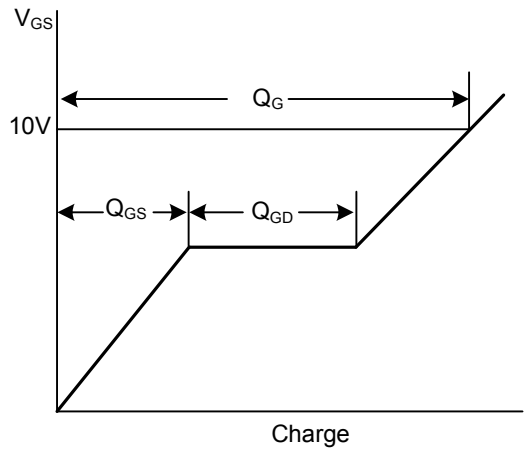
Peak Diode Recovery dv/dt Test Circuit & Waveforms



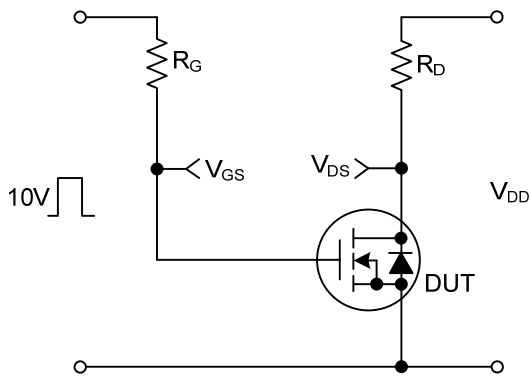
Gate Charge Test Circuit



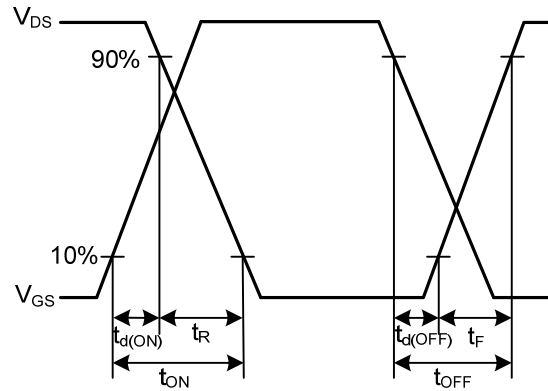
Gate Charge Waveforms



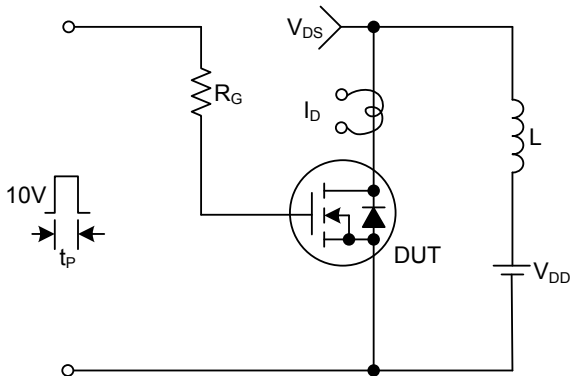
Resistive Switching Test Circuit



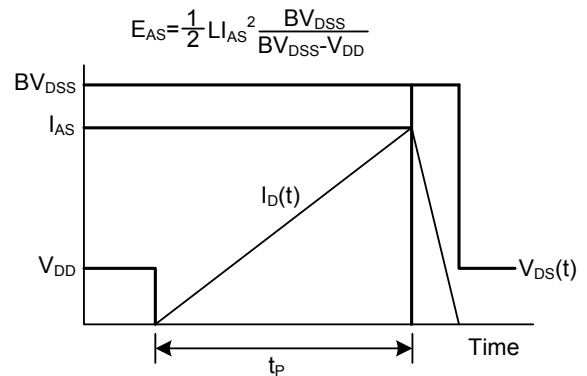
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



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