



11N90

Preliminary

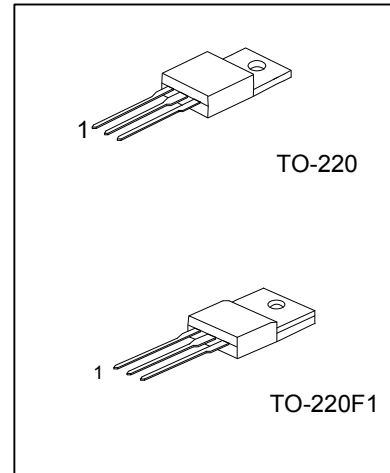
Power MOSFET

11 Amps, 900 Volts N-CHANNEL POWER MOSFET

DESCRIPTION

The UTC **11N90** is an N-channel enhancement mode Power FET using UTC's advanced technology to provide customers 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.

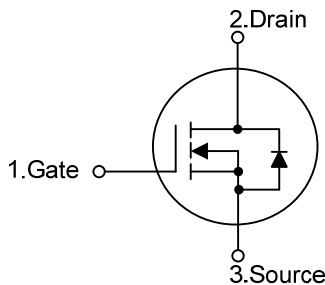
The UTC **11N90** is universally applied in high efficiency switch mode power supply,



FEATURES

- * 11A, 900V, $R_{DS(on)} = 1.1\Omega @ V_{GS} = 10V$
- * High switching speed
- * Improved dv/dt capability
- * 100% avalanche tested
- * Halogen Free

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
11N90L-TA3-T	11N90G-TA3-T	TO-220	G	D	S	Tube
11N90L-TF1-T	11N90G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>11N90L - 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, 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	11	A
	Pulsed (Note 1)	I_{DM}	28.0	A
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	960	mJ
	Repetitive (Note 1)	E_{AR}	12	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.0	V/ns
Power Dissipation	TO-220	P_D	160	W
	TO-220F1		50	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 CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^{\circ}\text{C/W}$
	TO-220F1		62.5	$^{\circ}\text{C/W}$
Junction to Case	TO-220	θ_{JC}	0.78	$^{\circ}\text{C/W}$
	TO-220F1		2.48	$^{\circ}\text{C/W}$

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	900			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu\text{A}$, Referenced to 25°C		1.0		$V/^\circ\text{C}$
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=900\text{V}$, $V_{GS}=0\text{V}$			10	μA
		$V_{DS}=720\text{V}$, $T_C=125^\circ\text{C}$			100	
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$			100	nA
	Reverse	$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			-100	nA
ON CHARACTERISTICS						
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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=5.5\text{A}$		0.91	1.1	Ω
Forward Transconductance	g_{FS}	$V_{DS}=50\text{V}$, $I_D=5.5\text{A}$ (Note 4)				S
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		2530	3290	pF
Output Capacitance	C_{OSS}			215	280	
Reverse Transfer Capacitance	C_{RSS}			23	30	
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{GS}=10\text{V}$, $V_{DS}=720\text{V}$, $I_D=11.0\text{A}$ (Note 4, 5)		60	80	nC
Gate to Source Charge	Q_{GS}			13		
Gate to Drain Charge	Q_{GD}			25		
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=450\text{V}$, $I_D=11.0\text{A}$, $R_G=25\Omega$ (Note 4, 5)		60	130	ns
Rise Time	t_R			130	270	
Turn-OFF Delay Time	$t_{D(OFF)}$			130	270	
Fall-Time	t_F			85	180	
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				11	A
Maximum Body-Diode Pulsed Current (Note1)	I_{SM}				28.0	A
Drain-Source Diode Forward Voltage (Note 4)	V_{SD}	$I_S=11\text{A}$, $V_{GS}=0\text{V}$			1.4	V
Body Diode Reverse Recovery Time	t_{RR}	$V_{GS}=0\text{V}$, $I_S=11.0\text{A}$, $di_F/dt=100\text{A}/\mu\text{s}$		1000		ns
Body Diode Reverse Recovery Charge	Q_{RR}	(Note 4)		17.0		μC

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

2. $L = 37\text{mH}$, $I_{AS} = 7.0\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

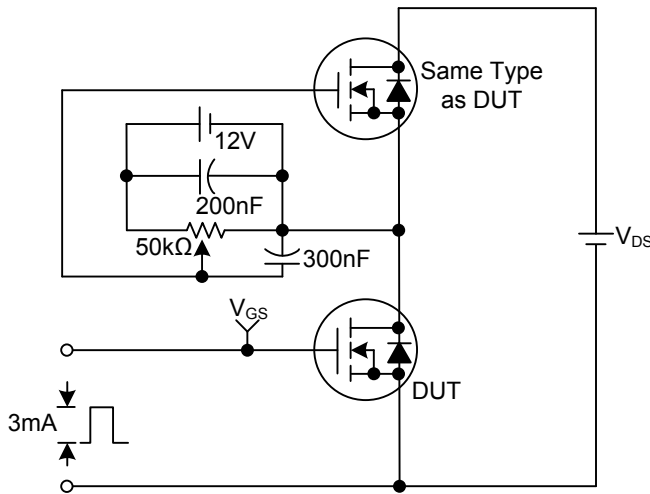
3. $I_{SD} \leq 11.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

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

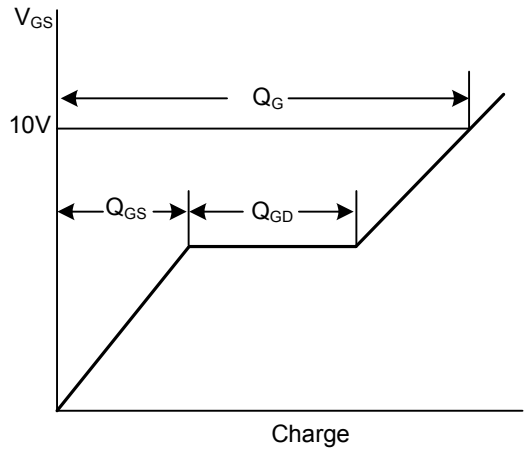
5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

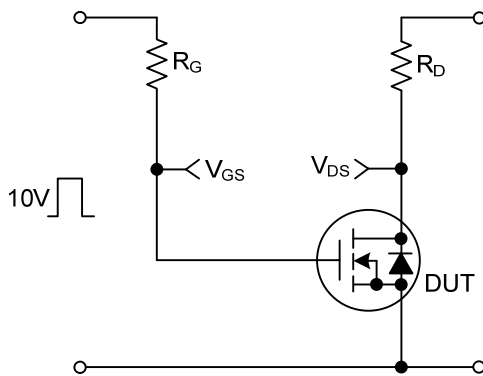
Gate Charge Test Circuit



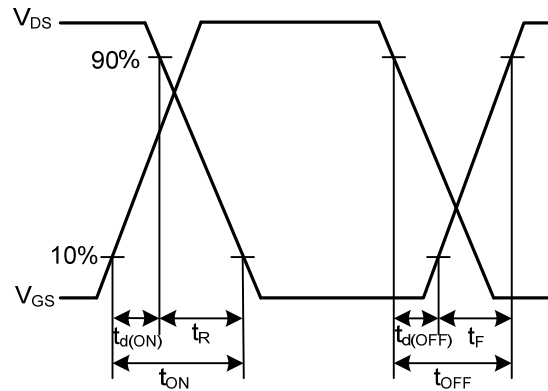
Gate Charge Waveforms



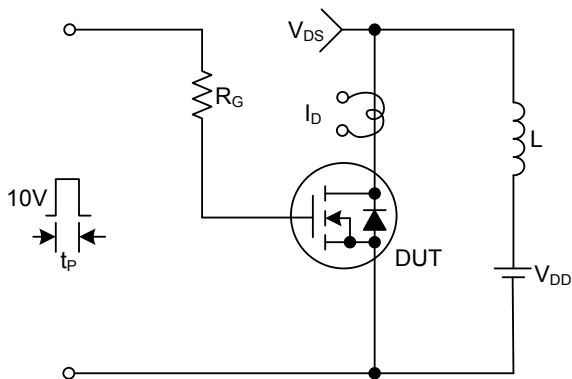
Resistive Switching Test Circuit



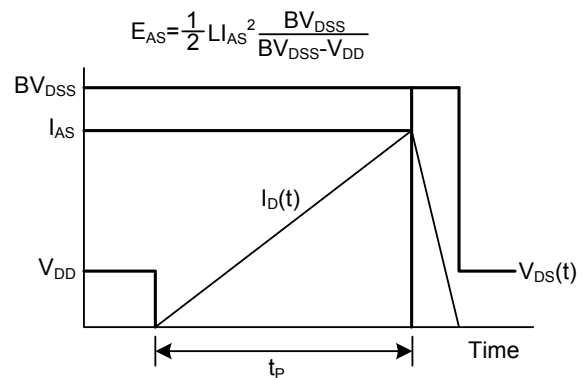
Resistive Switching Waveforms



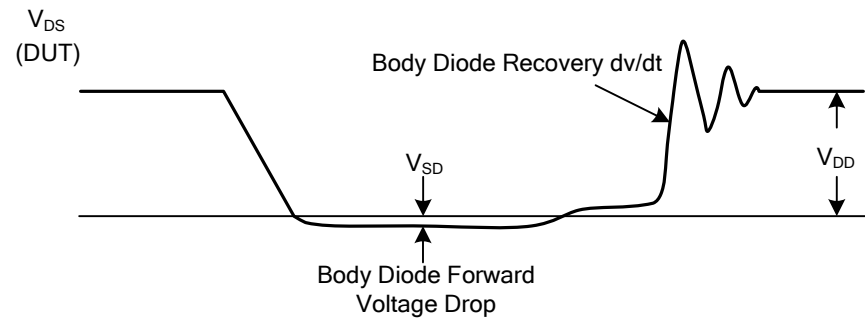
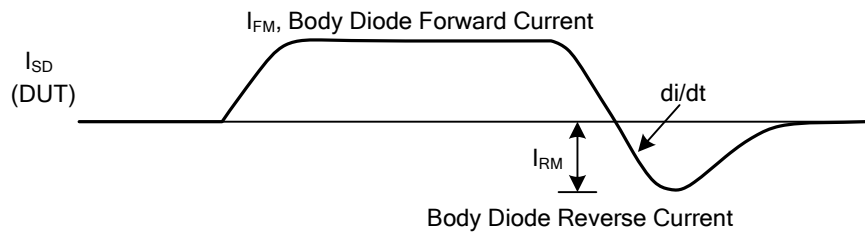
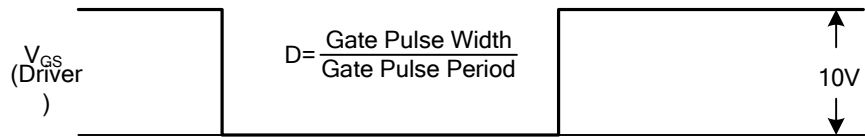
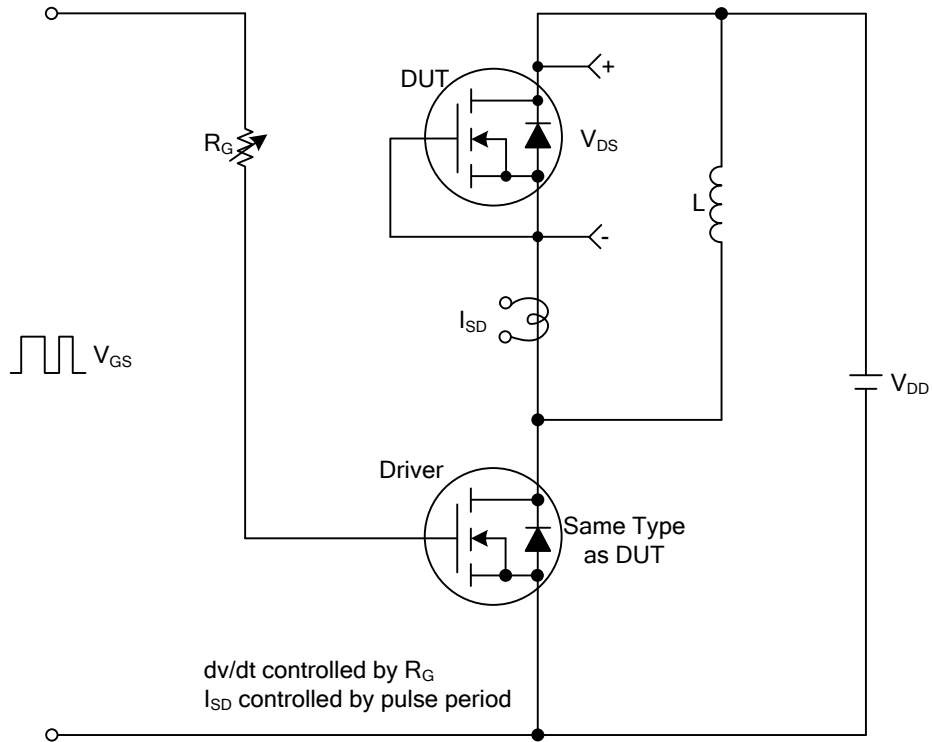
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms



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