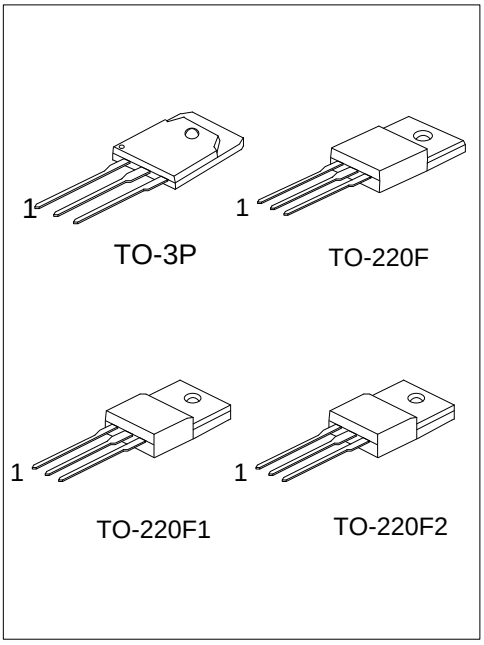
12A, 900V N-CHANNEL POWER MOSFET



■ DESCRIPTION

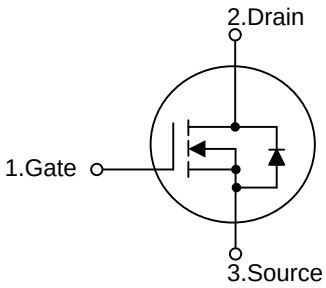
The UTC **12N90** is an N-channel enhancement mode power MOSFET useing UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **12N90** is universally applied in high efficiency switch mode power supply.

■ FEATURES

* $R_{DS(on)} \leq 1.1\Omega$ @ V_{GS}=10V, I_D=6.0A
* High switching speed
* 100% avalanche tested

■ SYMBOL



■ ORDERING INFORMATION

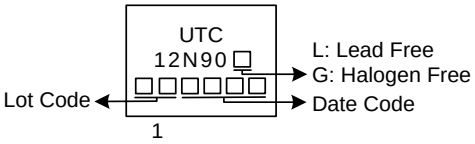
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
12N90L-TF1-T	12N90G-TF1-T	TO-220F1	G	D	S	Tube
12N90L-TF2-T	12N90G-TF2-T	TO-220F2	G	D	S	Tube
12N90L-TF3-T	12N90G-TF3-T	TO-220F	G	D	S	Tube
12N90L-T3P-T	12N90G-T3P-T	TO-3P	G	D	S	Tube

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

12N90G-TF1-T
(1) Packing Type
(2) Package Type
(3) Green Package

(1) T: Tube
(2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F
T3P: TO-3P
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°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 (T_C=25°C)	I_D	12	A
	Pulsed (Note 2)	I_{DM}	48	A
Avalanche Current (Note 2)		I_{AR}	12	A
Single Pulsed Avalanche Energy (Note 3)		E_{AS}	800	mJ
Power Dissipation	TO-220F/TO-220F1 TO-220F2	P_D	38	W
	TO-3P		182	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Notes: 1. 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.
2. Repetitive Rating: Pulse width limited by maximum junction temperature.
3. L=12mH, I_{AS}=11A, V_{DD}= 50V, R_G=25Ω, Starting T_J=25°C.

■ THERMAL DATA

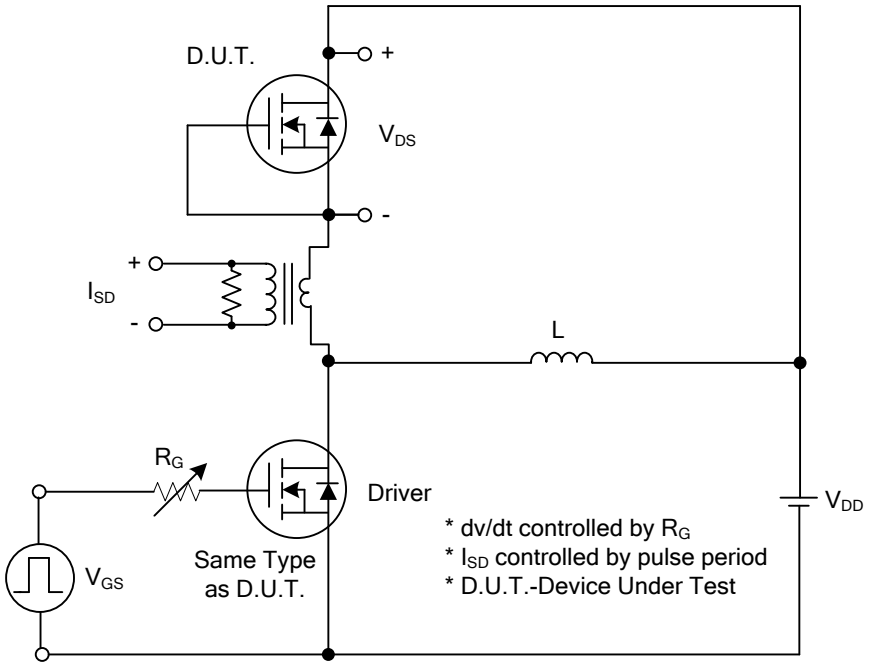
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F/TO-220F1 TO-220F2	θ_{JA}	62.5	°C/W
	TO-3P		40	
Junction to Case	TO-220F/TO-220F1 TO-220F2	θ_{JC}	3.28	°C/W
	TO-3P		0.68	

■ ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

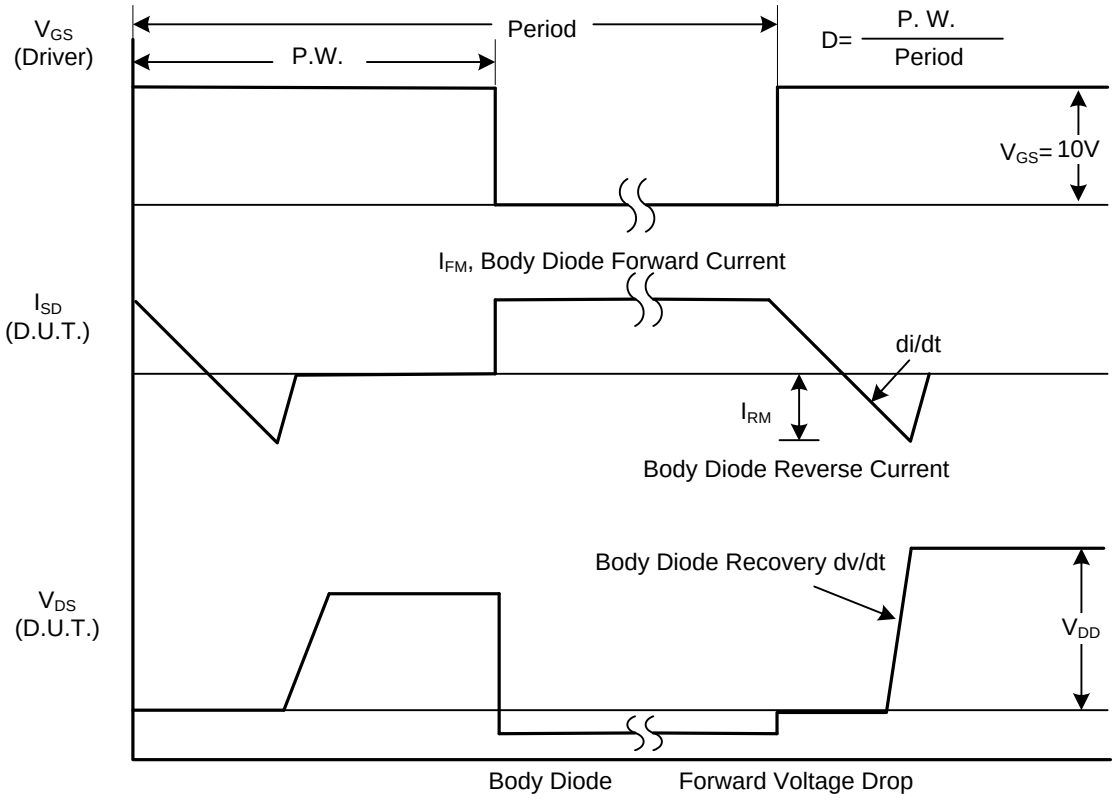
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	900			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA, Referenced to 25°C		1.0		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=900V, V_{GS}=0V			10	μA
			V_{DS}=720V, T_C=125°C			100	
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			100	nA
	Reverse		V_{GS}=-30V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	3.0		5.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=6A		0.95	1.1	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		1800		pF
Output Capacitance		C_{OSS}			190		pF
Reverse Transfer Capacitance		C_{RSS}			20		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{GS}=10V, V_{DD}=50V, I_D=1.3A, I_G=100μA (Note 1, 2)		59		nC
Gate to Source Charge		Q_{GS}			14		nC
Gate to Drain Charge		Q_{GD}			20		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{GS}=10V, V_{DD}=30V, I_D=0.5A, R_G=25Ω (Note 1, 2)		120		ns
Rise Time		t_R			200		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			335		ns
Fall-Time		t_F			240		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				12	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				48	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=12A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	V_{GS}=0V, I_S=12A, dI_F/dt=100A/μs (Note 1)		1000		ns
Body Diode Reverse Recovery Charge		Q_{rr}			17.0		μC

Notes: 1. Pulse Test: Pulse width ≤ 250μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

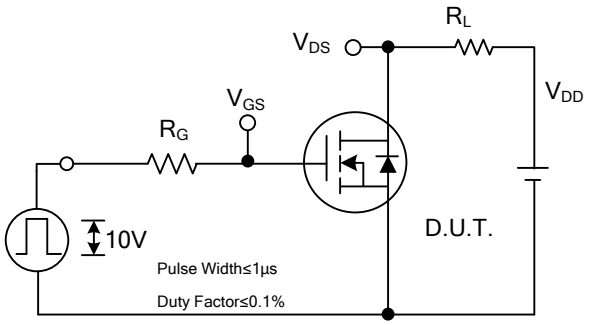


Peak Diode Recovery dv/dt Test Circuit

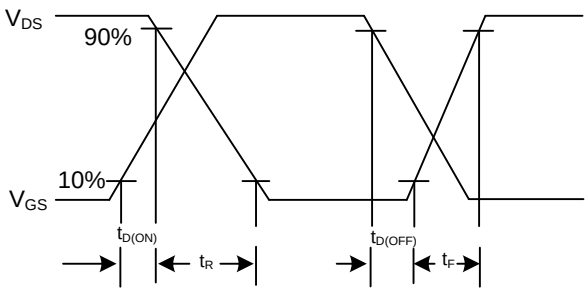


Peak Diode Recovery dv/dt Waveforms

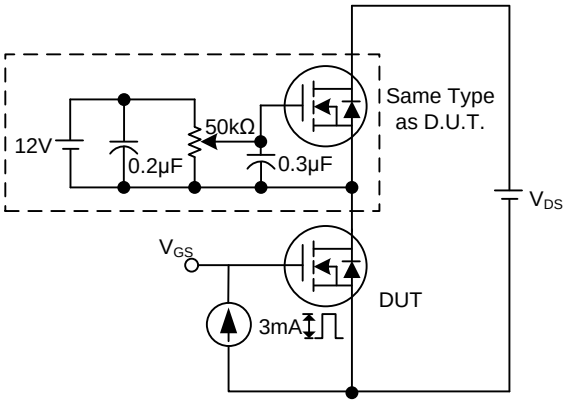
■ TEST CIRCUITS AND WAVEFORMS



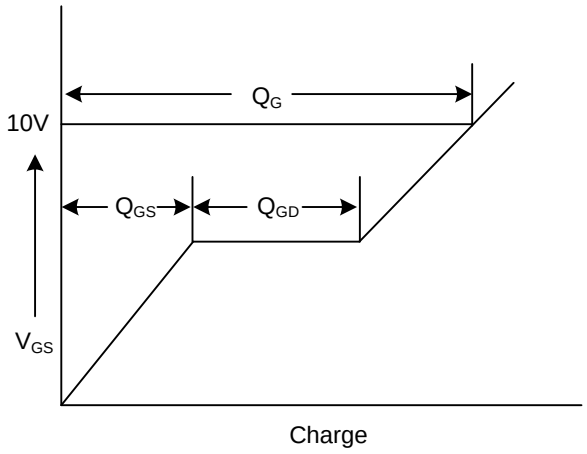
Switching Test Circuit



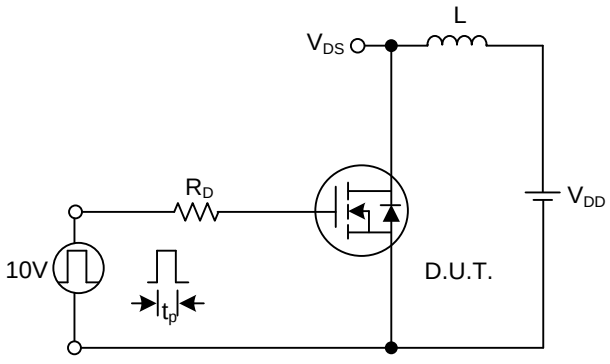
Switching Waveforms



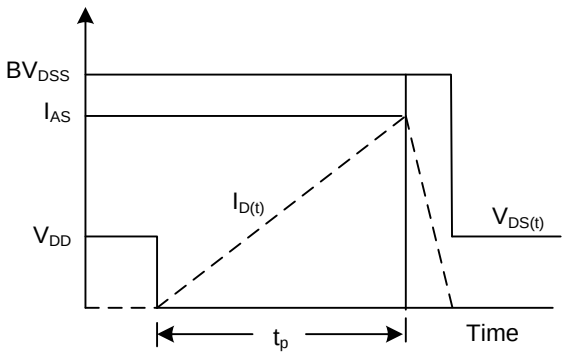
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS