



12N90

Power MOSFET

12A, 900V N-CHANNEL POWER MOSFET

DESCRIPTION

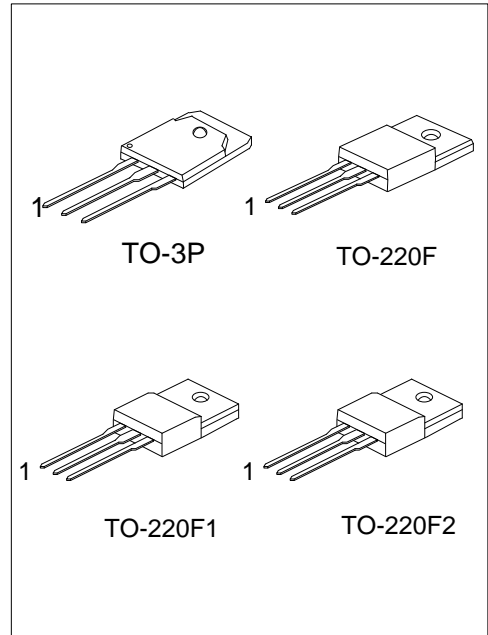
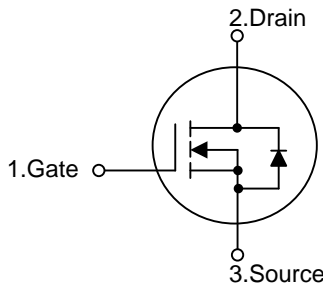
The UTC 12N90 is an N-channel enhancement mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse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



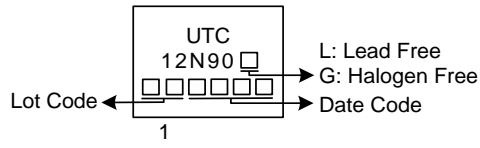
ORDERING INFORMATION

| 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

| | |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>12N90G-TF1-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p> | <p>(1) T: Tube</p> <p>(2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F T3P: TO-3P</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|

MARKING



■ 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 ($T_C=25^\circ\text{C}$) | 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 | P_D | 38 | W |
| | TO-220F2 | | | |
| | TO-3P | | 182 | W |
| Junction Temperature | | T_J | +150 | $^\circ\text{C}$ |
| Storage Temperature | | T_{STG} | -55 ~ +150 | $^\circ\text{C}$ |

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. $L=12\text{mH}$, $I_{AS}=11\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.

■ THERMAL DATA

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

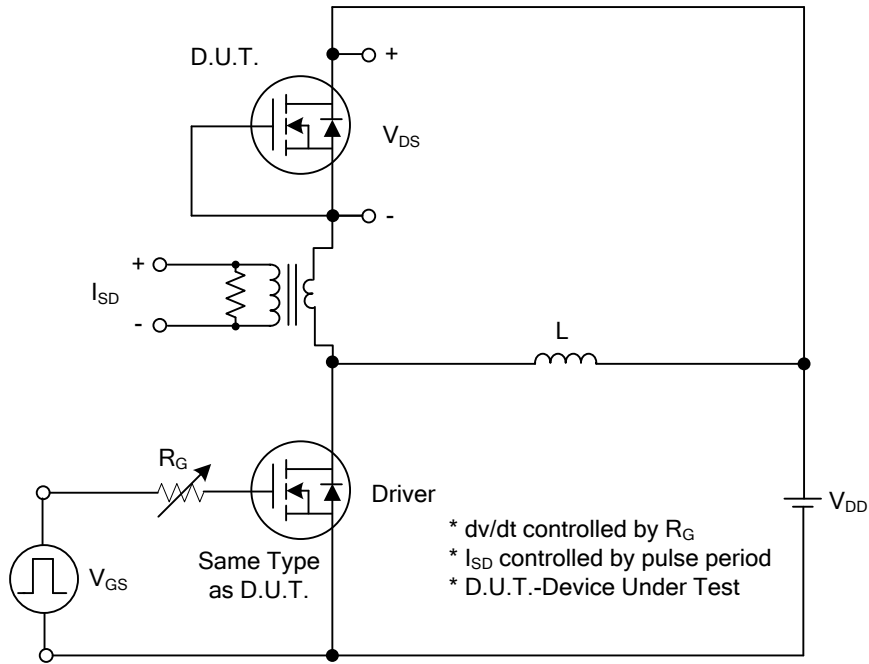
■ ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

| 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 | Δ BV _{DSS} /Δ 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 | 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, | | 1000 | | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | dI _F /dt=100A/μs (Note 1) | | 17.0 | | μC |

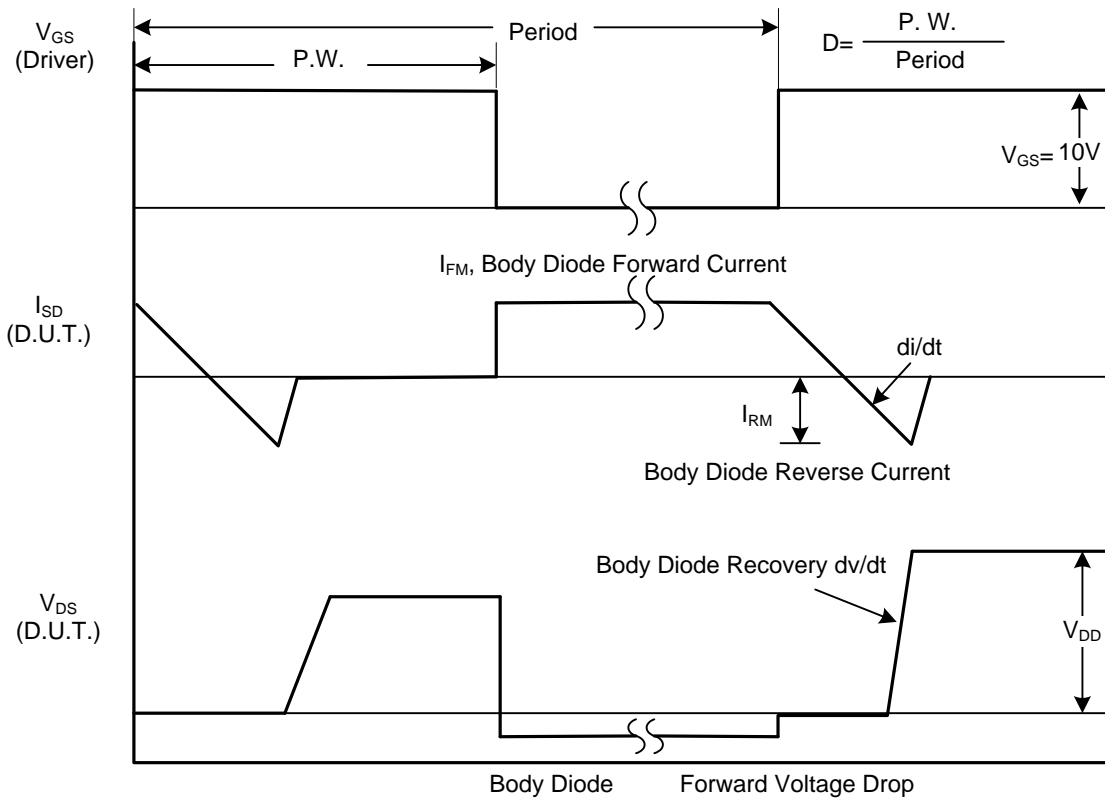
Notes: 1. Pulse Test: Pulse width ≤ 250μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

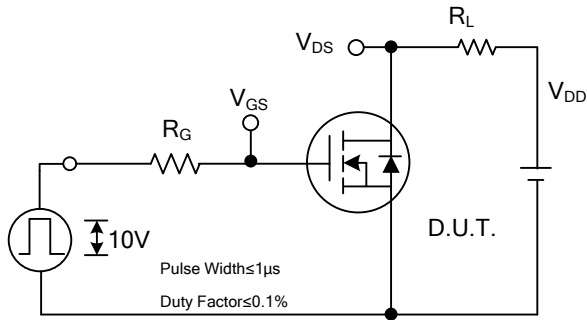


Peak Diode Recovery dv/dt Test Circuit

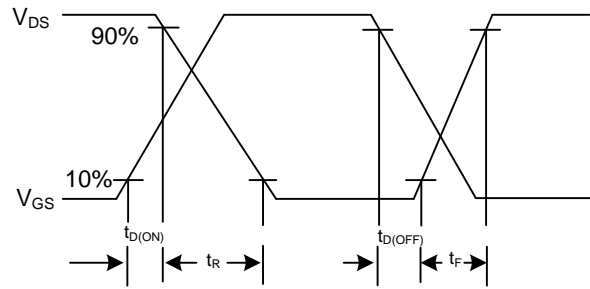


Peak Diode Recovery dv/dt Waveforms

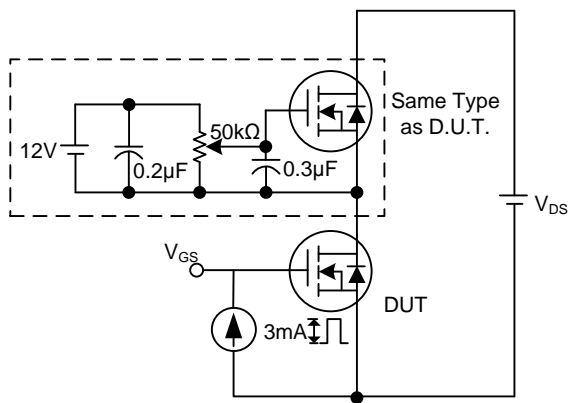
TEST CIRCUITS AND WAVEFORMS



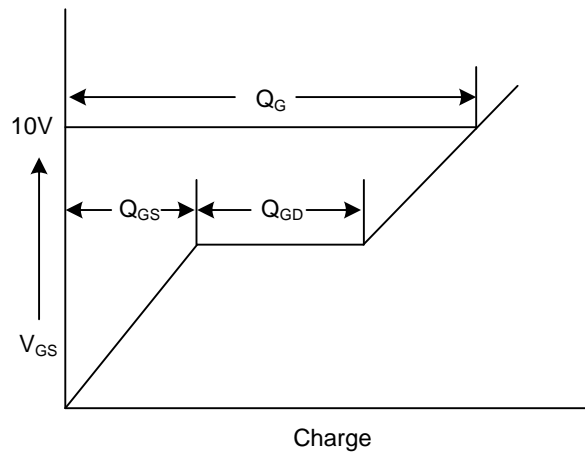
Switching Test Circuit



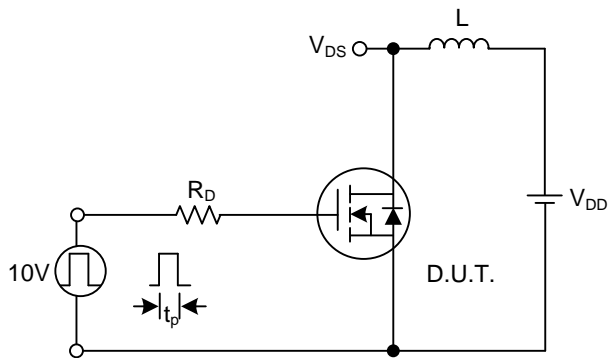
Switching Waveforms



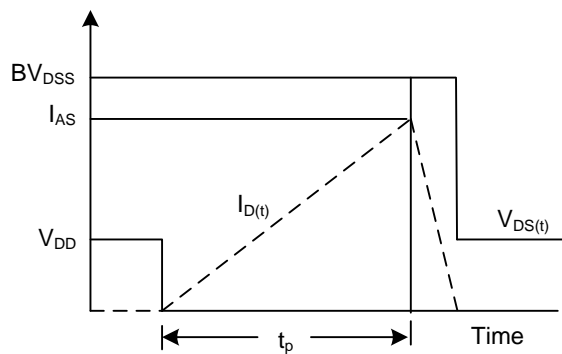
Gate Charge Test Circuit



Gate Charge Waveform

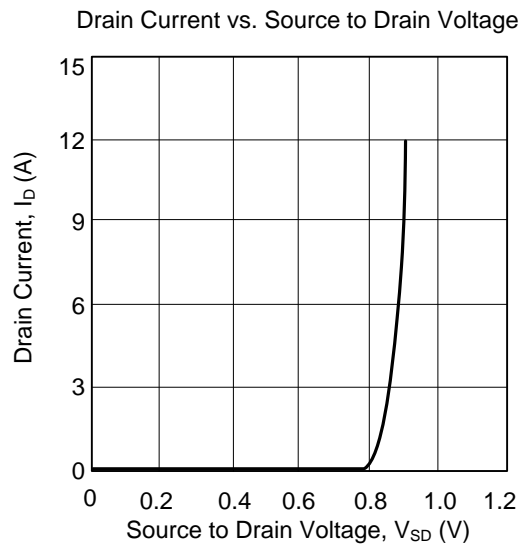
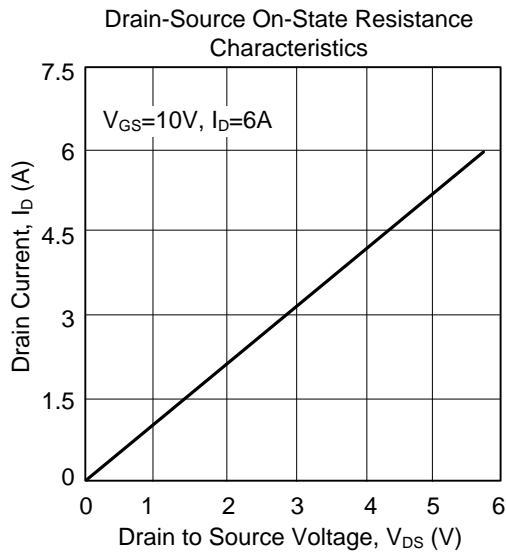
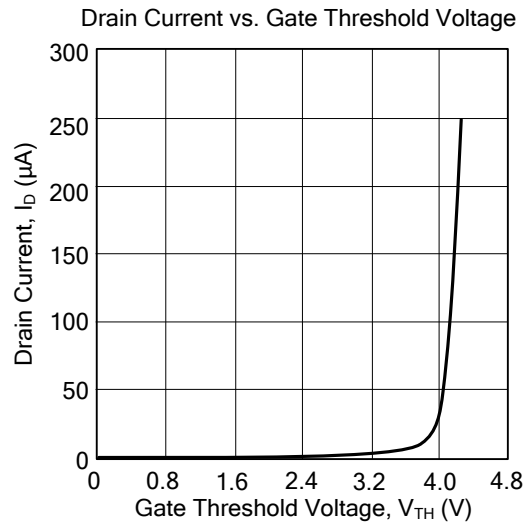
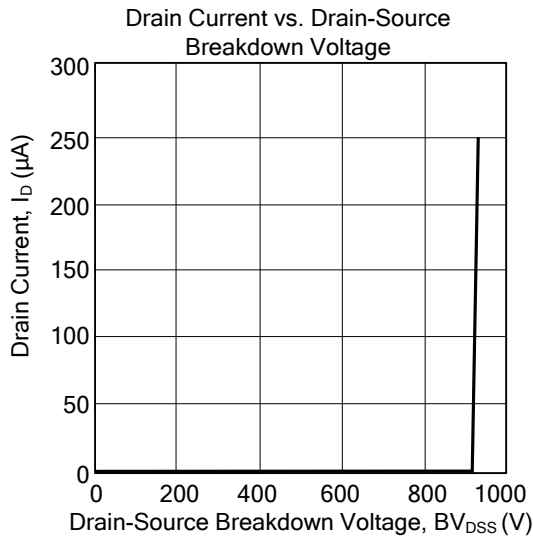


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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