



10N90

Power MOSFET

10A, 900V N-CHANNEL POWER MOSFET

DESCRIPTION

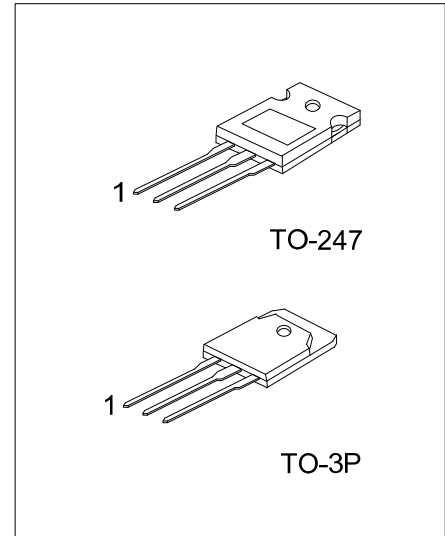
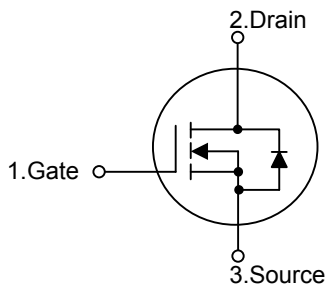
The UTC10N90 is a N-channel mode power MOSFET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC 10N90 is generally applied in high efficiency switch mode power supply.

FEATURES

- * $R_{DS(ON)} = 1.35\Omega @ V_{GS} = 10V$
- * Lower Leakage Current: $25\mu A$ (Max.) @ $V_{DS} = 900V$
- * Improved Gate Charge

SYMBOL



ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-----------------|--------------|---------|----------------|---|---|---------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| 10N90L-T3P-T | 10N90G-T3P-T | TO-3P | G | D | S | Tube |
| 10N90L-T47-T | 10N90G-T47-T | TO-247 | G | D | S | Tube |

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

| | |
|--|--|
| <p>10N90L-T3P-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Free</p> | <p>(1) T: Tube (2) T3P: TO-3P, T47: TO-247 (3) G: Halogen Free, L: Lead Free</p> |
|--|--|

■ 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 | 10 | A |
| | Pulsed (Note 2) | I_{DM} | 40 | A |
| Avalanche Current (Note 2) | | I_{AR} | 10 | A |
| Avalanche Energy | Single Pulsed (Note 3) | E_{AS} | 794 | mJ |
| | Repetitive (Note 2) | E_{AR} | 28 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 1.5 | V/ns |
| Power Dissipation | | P_D | 183 | W |
| Junction Temperature | | T_J | +150 | $^\circ\text{C}$ |
| Storage Temperature | | T_{STG} | -55~+150 | $^\circ\text{C}$ |

Note: 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. $L = 15\text{mH}$, $I_{AS} = 10\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 27\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 10\text{A}$, $di/dt \leq 190\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width $\leq 250\mu\text{s}$, Duty cycle $\leq 2\%$

■ THERMAL DATA

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---------------------|---------------|---------|---------------------------|
| Junction to Ambient | θ_{JA} | 40 | $^\circ\text{C}/\text{W}$ |
| Junction to Case | θ_{JC} | 0.68 | $^\circ\text{C}/\text{W}$ |

■ 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} | $I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$ | 900 | | | V |
| Breakdown Voltage Temperature Coefficient | $\Delta BV_{DSS}/\Delta T_J$ | $I_D=250\mu\text{A}$ | | 1.11 | | $\text{V}/^\circ\text{C}$ |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS}=900\text{V}$ | | | 25 | μA |
| Gate- Source Leakage Current | Forward | $V_{GS}=+30\text{V}$ | | | 100 | nA |
| | Reverse | $V_{GS}=-30\text{V}$ | | | -100 | nA |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}=V_{DS}$, $I_D=250\mu\text{A}$ | 3.0 | | 5.0 | V |
| Static Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10\text{V}$, $I_D=5\text{A}$ | | 1.15 | 1.35 | Ω |
| DYNAMIC PARAMETERS | | | | | | |
| Input Capacitance | C_{ISS} | $V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$ | | 2760 | 3580 | pF |
| Output Capacitance | C_{OSS} | | | 245 | 290 | pF |
| Reverse Transfer Capacitance | C_{RSS} | | | 105 | 125 | pF |

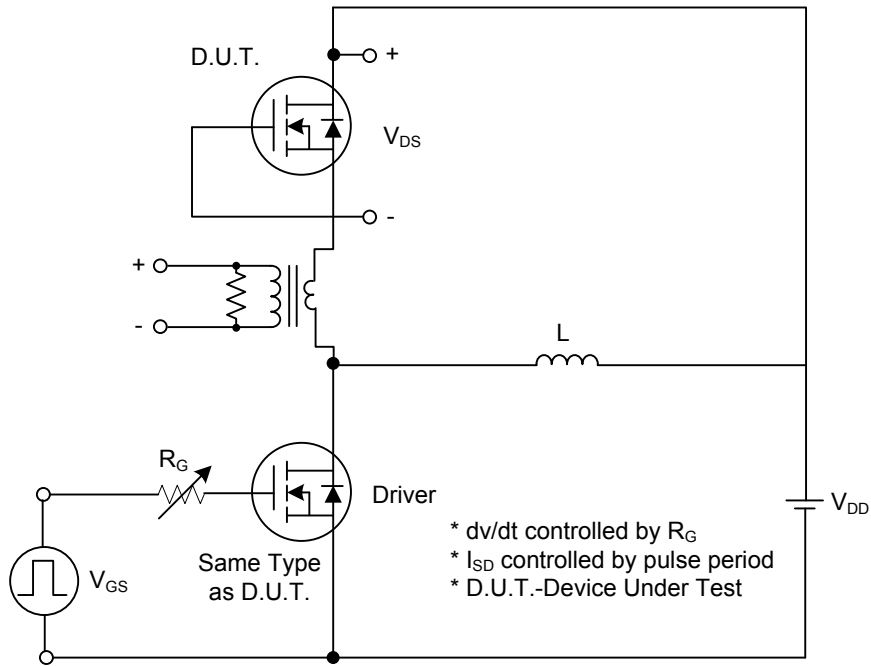
■ ELECTRICAL CHARACTERISTICS(Cont.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|--------------|---|-----|-------|-----|---------|
| SWITCHING PARAMETERS | | | | | | |
| Total Gate Charge | Q_G | $V_{GS}=10V, V_{DS}=720V, I_D=10A$ (Note 1, 2) | | 127 | 165 | nC |
| Gate to Source Charge | Q_{GS} | | | 19.2 | | nC |
| Gate to Drain Charge | Q_{GD} | | | 56.8 | | nC |
| Turn-ON Delay Time | $t_{D(ON)}$ | $V_{DD}=450V, I_D=10A, R_G=9.6\Omega$ (Note 1, 2) | | 29 | 70 | ns |
| Rise Time | t_R | | | 54 | 20 | ns |
| Turn-OFF Delay Time | $t_{D(OFF)}$ | | | 161 | 330 | ns |
| Fall-Time | t_F | | | 47 | 105 | ns |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | | | | | | |
| Maximum Body-Diode Continuous Current | I_S | Integral Reverse Pn-Diode In The MOSFET | | | 10 | A |
| Maximum Body-Diode Pulsed Current (Note1) | I_{SM} | | | | 40 | A |
| Drain-Source Diode Forward Voltage (Note 1) | V_{SD} | $I_S=10A, V_{GS}=0V, T_J=25^\circ C$ | | | 1.4 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $I_F=10A, dI_F/dt=100A/\mu s,$ $T_J=25^\circ C$ (Note 1) | | 690 | | ns |
| Body Diode Reverse Recovery Charge | Q_{RR} | | | 11.94 | | μC |

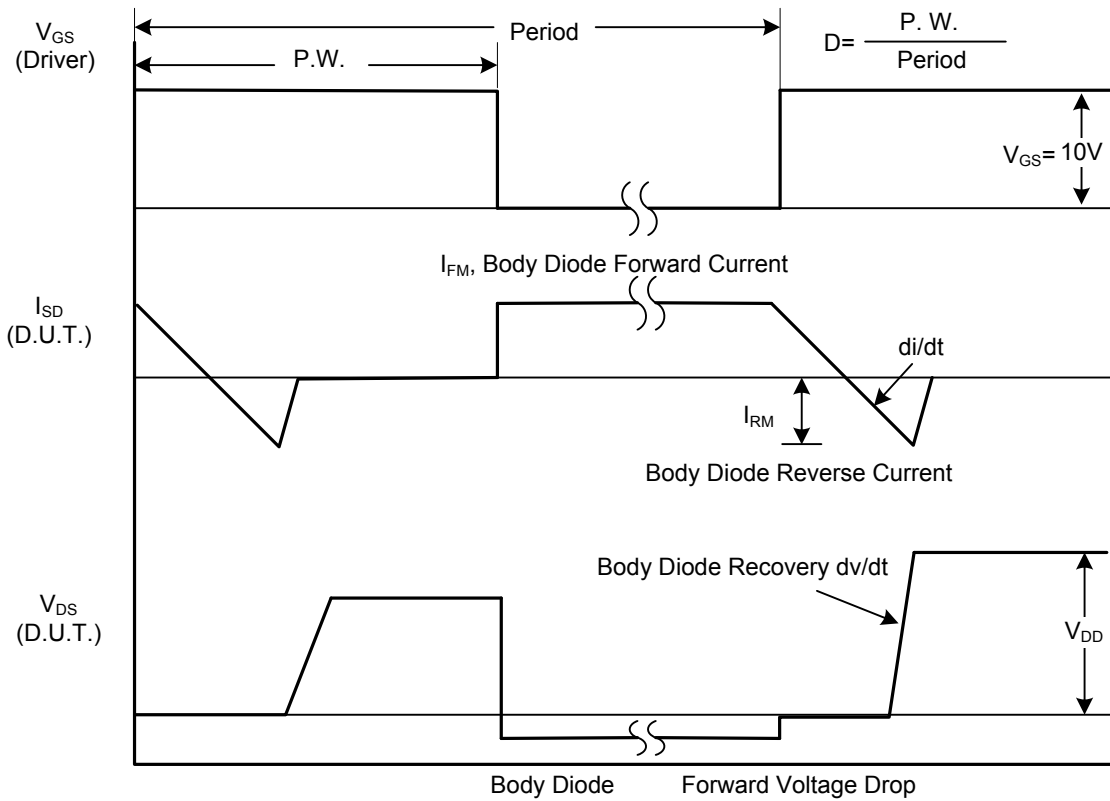
Note: 1. Pulse Test: Pulse width $\leq 250\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

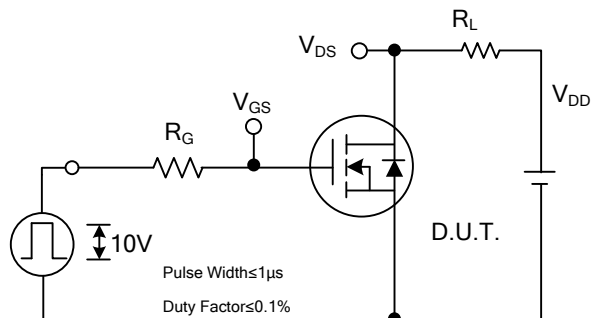


Peak Diode Recovery dv/dt Test Circuit

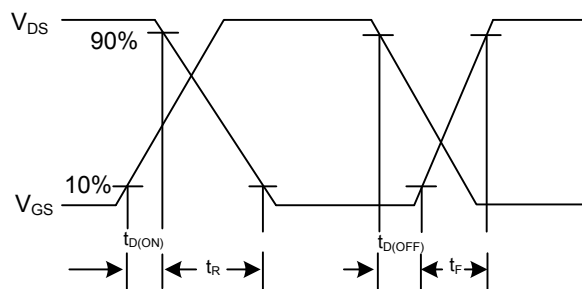


Peak Diode Recovery dv/dt Waveforms

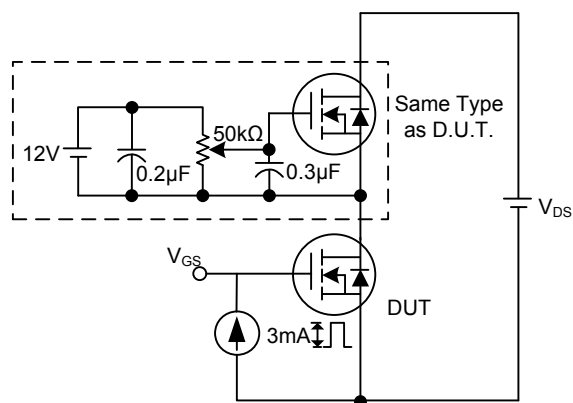
TEST CIRCUITS AND WAVEFORMS (Cont.)



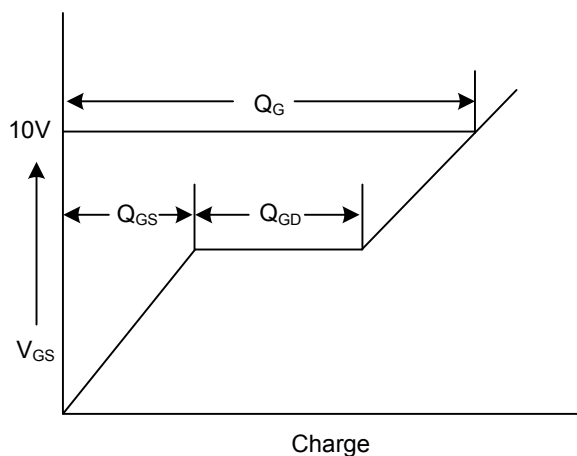
Switching Test Circuit



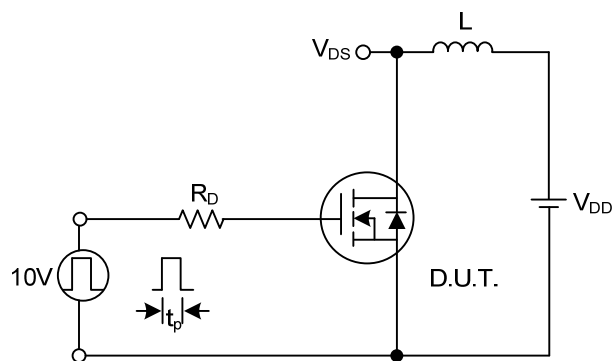
Switching Waveforms



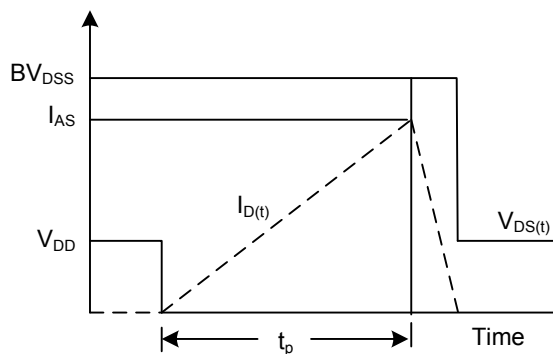
Gate Charge Test Circuit



Gate Charge Waveform



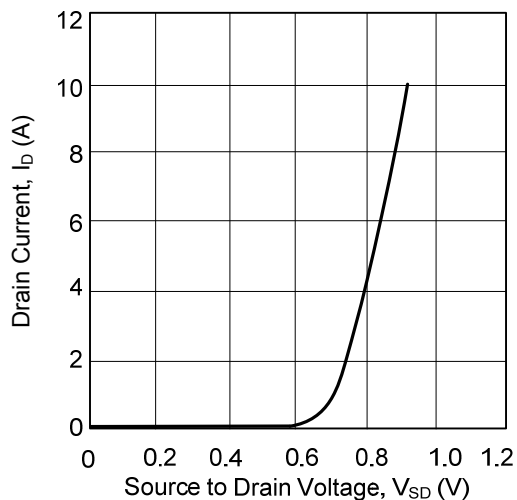
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

Drain Current vs. Source to Drain Voltage



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