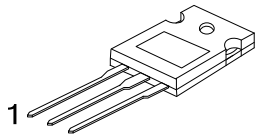
# F50NM90-Q

**Preliminary** ***Power MOSFET***

## 50A, 900V N-CHANNEL SUPER-JUNCTION MOSFET




TO-247

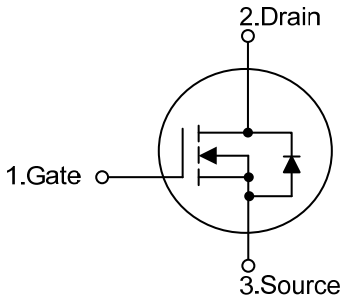
### ■ DESCRIPTION

The **UTC F50NM90-Q** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

### ■ FEATURES

* $R_{DS(ON)} \leq 0.13\ \Omega$ @ $V_{GS}$=10V, $I_D$=25A
* Fast switching capability
* Avalanche energy tested
* Improved dv/dt capability, high ruggedness

### ■ SYMBOL




### ■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| F50NM90L-T47-T | F50NM90G-T47-T | TO-247 | G | D | S | Tube |

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

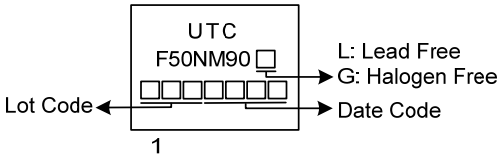
F50NM90G-T47-T

(1)Packing Type — (1) T: Tube

(2)Package Type — (2) T47: TO-247

(3)Green Package — (3) G: Halogen Free and Lead Free, L: Lead Free

### ■ MARKING





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## ■ 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 | $I_D$ | 50 | A |
| | Pulsed (Note 2) | $I_{DM}$ | 100 | A |
| Avalanche Energy | Single Pulsed (Note 3) | $E_{AS}$ | 1300 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 10 | V/ns |
| Power Dissipation | | $P_D$ | 350 | 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 = 100mH, $I_{AS}$ =5.1A, $V_{DD}$ = 90V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
4. $I_{SD}$ ≤ 30A, di/dt ≤ 200A/μs, $V_{DD}$ ≤ $BV_{DSS}$, Starting $T_J$ = 25°C

## ■ THERMAL DATA

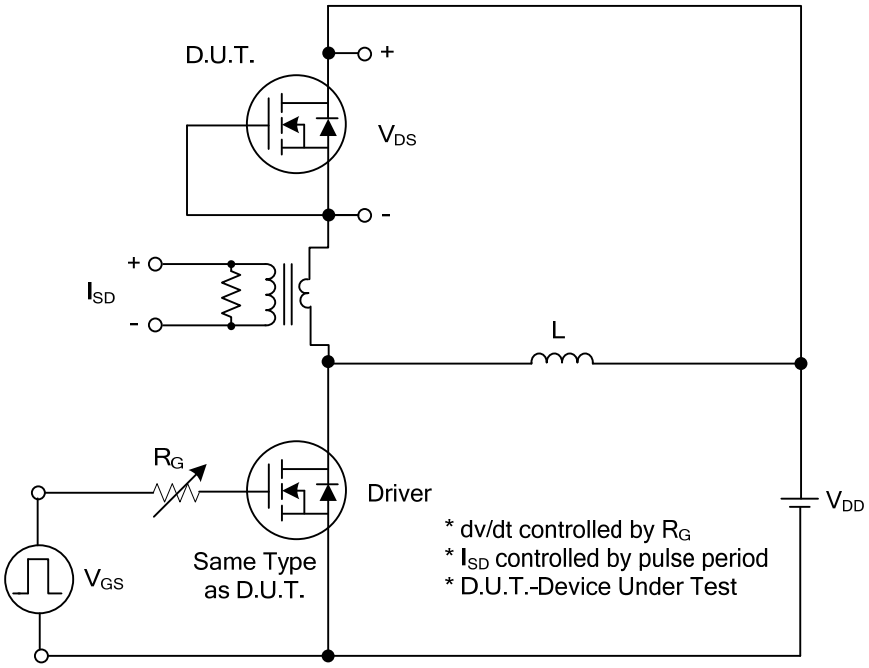
| PARAMETER | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Junction to Ambient | $\theta_{JA}$ | 40 | °C/W |
| Junction to Case | $\theta_{JC}$ | 0.35 | °C/W |

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

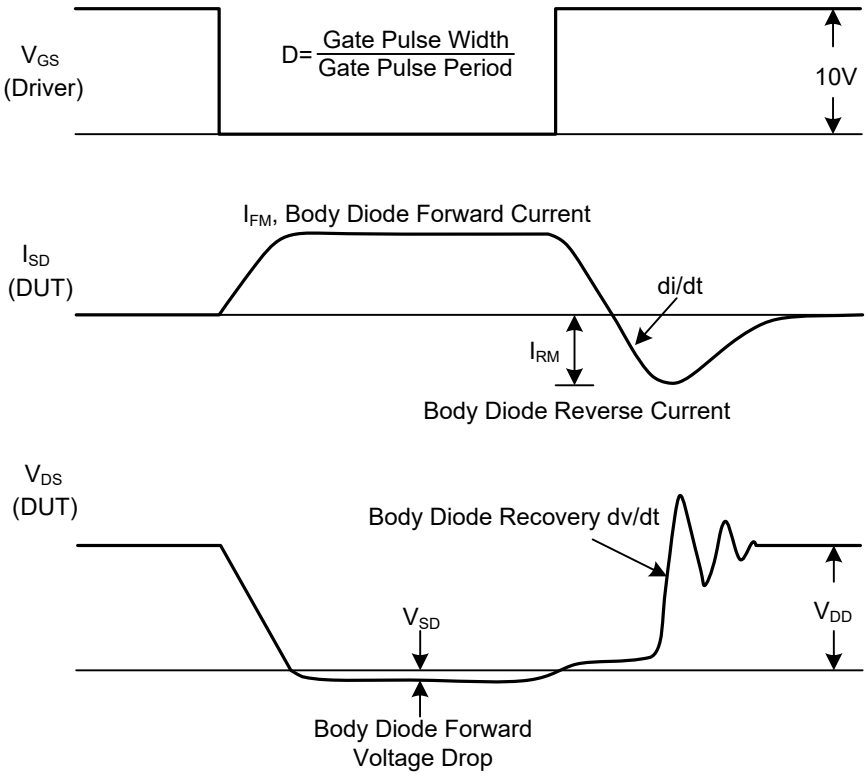
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 900 | | | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=900V, $V_{GS}$=0V | | | 10 | μA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±30V, $V_{DS}$=0V | | | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 2.5 | | 4.5 | V |
| Static Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=25A | | | 0.13 | Ω |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$=0V, $V_{DS}$=50V, f=1MHz | | 4888 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 413 | | pF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 1.2 | | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Total Gate Charge | $Q_G$ | $V_{DS}$=720V, $V_{GS}$=10V, $I_D$=50A (Note 1, 2) | | 168 | | nC |
| Gate-Source Charge | $Q_{GS}$ | | | 40 | | nC |
| Gate-Drain Charge | $Q_{DD}$ | | | 74 | | nC |
| Turn-On Delay Time | $t_{D(ON)}$ | $V_{DD}$=100V, $V_{GS}$=10V, $I_D$=50A, $R_G$ =3Ω (Note 1, 2) | | 24 | | ns |
| Turn-On Rise Time | $t_R$ | | | 25 | | ns |
| Turn-Off Delay Time | $t_{D(OFF)}$ | | | 108 | | ns |
| Turn-Off Fall Time | $t_F$ | | | 28 | | ns |
| **SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | $I_S$ | | | | 50 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | $I_{SM}$ | | | | 100 | A |
| Drain-Source Diode Forward Voltage | $V_{SD}$ | $I_S$=50A, $V_{GS}$=0V | | | 1.4 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_S$=30A, $V_{GS}$=0V, $dI_F/dt$=100A/μs | | 280 | | nS |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | | 2.85 | | μC |

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

## ■ TEST CIRCUITS AND WAVEFORMS

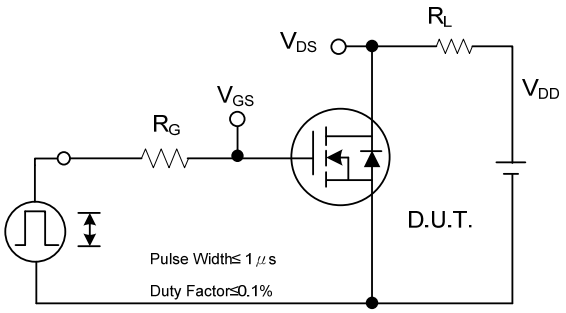



**Peak Diode Recovery dv/dt Test Circuit**

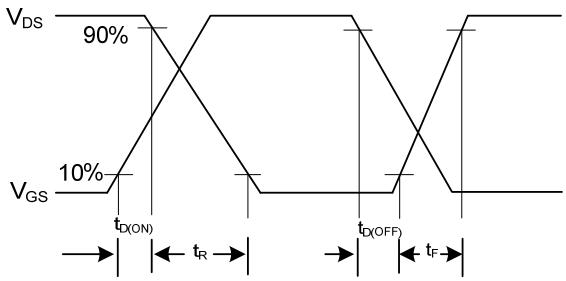



**Peak Diode Recovery dv/dt Waveforms**

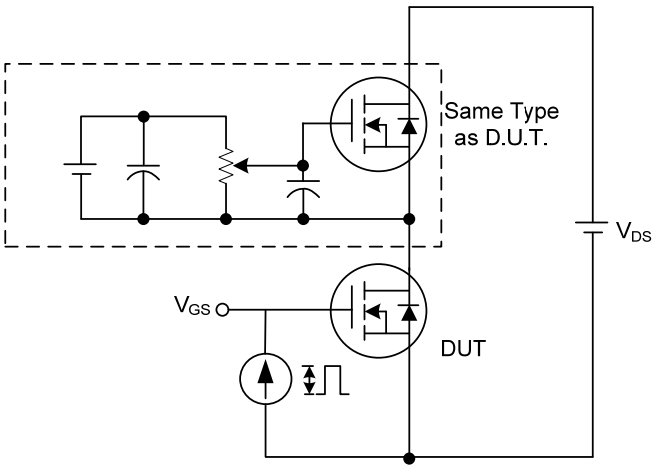
## ■ TEST CIRCUITS AND WAVEFORMS



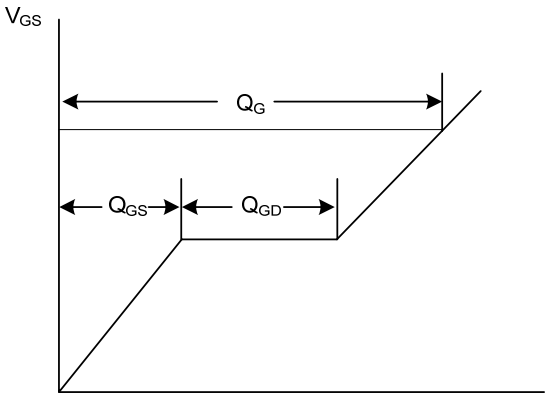

Switching Test Circuit



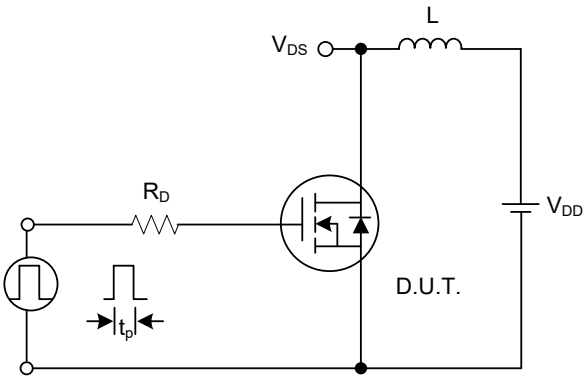

Switching Waveforms



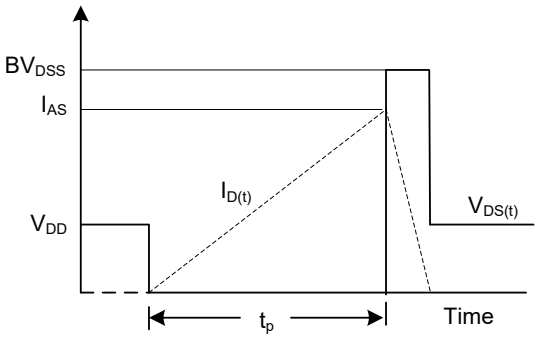

Gate Charge Test Circuit




Gate Charge Waveform




Unclamped Inductive Switching Test Circuit




Unclamped Inductive Switching Waveforms

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