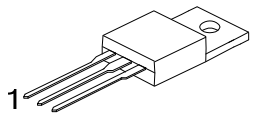
# 150A, 40V N-CHANNEL POWER MOSFET




TO-220

## ■ DESCRIPTION

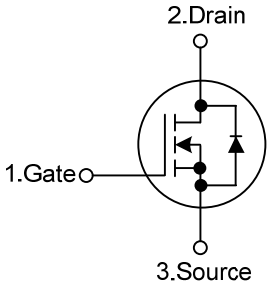
The UTC **UT150N04** is a N-channel enhancement MOSFET using UTC's advanced technology to provide the customers with perfect $R_{DS(ON)}$ and high switching speed.

The UTC **UT150N04** is suitable for all commercial-industrial applications at power dissipation levels to approximately 50 watts, etc.

## ■ FEATURES

* $R_{DS(ON)}$=3.5mΩ @ $V_{GS}$=10V,$I_D$=95A
* High Switching Speed

## ■ SYMBOL




## ■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| UT150N04L-TA3-T | UT150N04G-TA3-T | TO-220 | G | D | S | Tube |

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

| | |
|---|---|
| UT150N04L-TA3-T<br>(1)Packing Type<br>(2)Package Type<br>(3)Lead Free | (1) T: Tube<br>(2) TA3: TO-220<br>(3) G: Halogen Free, L: Lead Free |

## ■ ABSOLUTE MAXIMUM RATINGS

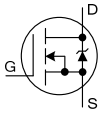
| PARAMETER | | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 40 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Drain Current | Continuous ($V_{GS}$=10V) | $T_C$=25°C | $I_D$ | 150 (Note 5) | A |
| | | $T_C$=100°C | | 115 (Note 5) | A |
| | Pulsed (Note 2) | $T_C$=25°C | $I_{DM}$ | 600 | A |
| Avalanche Current (Note 2) | | | $I_{AR}$ | 95 | A |
| Avalanche Energy | Single Pulsed (Note 3) | | $E_{AS}$ | 519 | mJ |
| | Repetitive (Note 2) | | $E_{AR}$ | 20 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | | dv/dt | 5.0 | V/ns |
| Power Dissipation ($T_C$=25°C) | | | $P_D$ | 166 | W |
| Junction Temperature | | | $T_J$ | +150 | °C |
| Storage Temperature | | | $T_{STG}$ | -55~+175 | °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. Starting $T_J$=25°C, L=0.12mH, $R_G$=25Ω, $I_{AS}$=95A
4. $I_{SD}$≤95A, di/dt≤150A/μs, $V_{DD}$≤$BV_{DSS}$, $T_J$≤175°C
5. Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A

## ■ THERMAL DATA

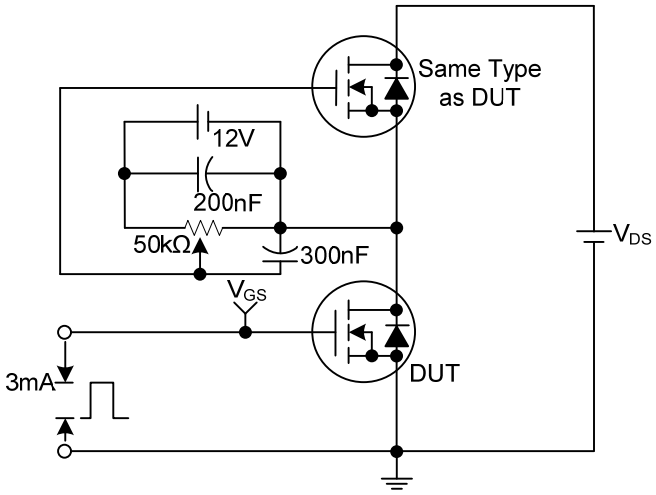
| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Junction to Ambient | $\theta_{JA}$ | 62 | °C/W |
| Junction to Case | $\theta_{JC}$ | 0.75 | °C/W |

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

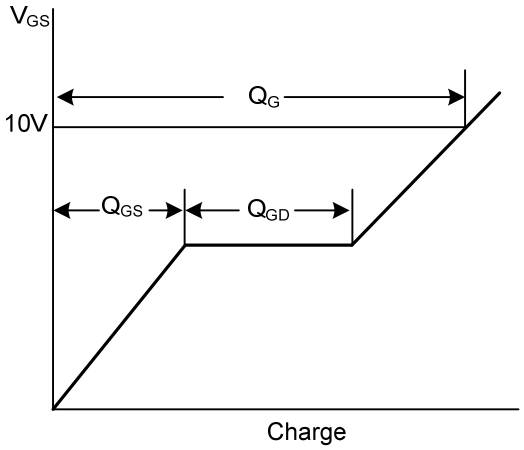
| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 40 | | | V |
| Breakdown Voltage Temperature Coefficient | | $\Delta BV_{DSS}/\Delta T_J$ | Reference to 25°C, $I_D$=1mA | | 0.036 | | V/°C |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=40V, $V_{GS}$=0V | | | 20 | μA |
| | | | $V_{DS}$=32V, $V_{GS}$=0V, $T_J$=150°C | | | 250 | μA |
| Gate- Source Leakage Current | Forward | $I_{GSS}$ | $V_{GS}$=+20V | | | +200 | nA |
| | Reverse | | $V_{GS}$=-20V | | | -200 | nA |
| **ON CHARACTERISTICS** | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 2.0 | | 4.0 | V |
| Static Drain-Source On-State Resistance | | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=95A (Note 2) | | 3.5 | 4 | mΩ |
| **DYNAMIC PARAMETERS** | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{GS}$=0V, $V_{DS}$=25V, f=1.0MHz | | 7360 | | pF |
| Output Capacitance | | $C_{OSS}$ | | | 1680 | | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | | 240 | | pF |
| Output Capacitance | | $C_{OSS}$ | $V_{GS}$=0V, $V_{DS}$=1.0V, f=1.0MHz | | 6630 | | pF |
| | | | $V_{GS}$=0V, $V_{DS}$=32V, f=1.0MHz | | 1490 | | pF |
| **SWITCHING PARAMETERS** | | | | | | | |
| Total Gate Charge | | $Q_G$ | $I_D$=95A, $V_{DS}$=32V, $V_{GS}$=10V (Note 2) | | 160 | 200 | nC |
| Gate to Source Charge | | $Q_{GS}$ | | | 35 | | nC |
| Gate to Drain Charge | | $Q_{GD}$ | | | 42 | 60 | nC |
| Turn-ON Delay Time | | $t_{D(ON)}$ | $V_{DD}$=20V, $I_D$=95A, $R_G$=2.5Ω, $R_D$=0.21Ω (Note 2) | | 17 | | ns |
| Rise Time | | $t_R$ | | | 140 | | ns |
| Turn-OFF Delay Time | | $t_{D(OFF)}$ | | | 72 | | ns |
| Fall-Time | | $t_F$ | | | 26 | | ns |
| **SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | | |
| Maximum Body-Diode Continuous Current (Note 3) | | $I_S$ | MOSFET symbol showing the integral reverse p-n junction diode.   | | | 150 | A |
| Maximum Body-Diode Pulsed Current (Note 1) | | $I_{SM}$ | | | | 600 | A |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $I_S$=150A,$V_{GS}$=0V,$T_J$=25°C(Note 3) | | | 1.3 | V |
| Body Diode Reverse Recovery Time | | $t_{rr}$ | $I_F$=95A, di/dt=100A/μs, $T_J$=25°C (Note 2) | | 71 | 110 | ns |
| Body Diode Reverse Recovery Charge | | $Q_{RR}$ | | | 180 | 270 | μC |

Notes: 1. Repetitive rating: pulse width limited by maximum junction temperature
2. Pulse width≤300μs, Duty cycle≤2%
3. Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A

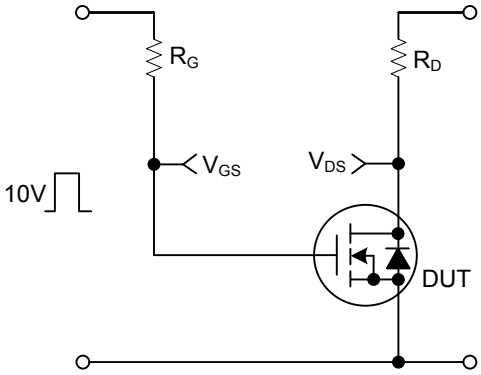
## ■ TEST CIRCUITS AND WAVEFORMS



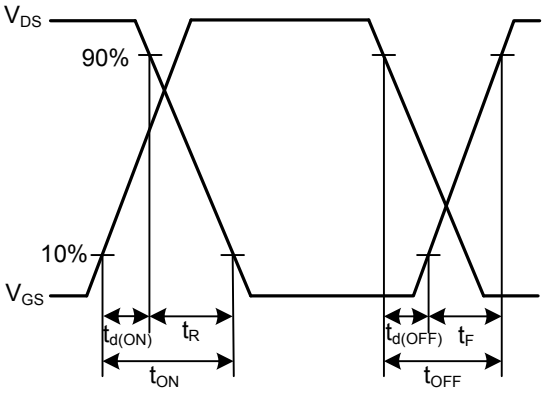

Gate Charge Test Circuit



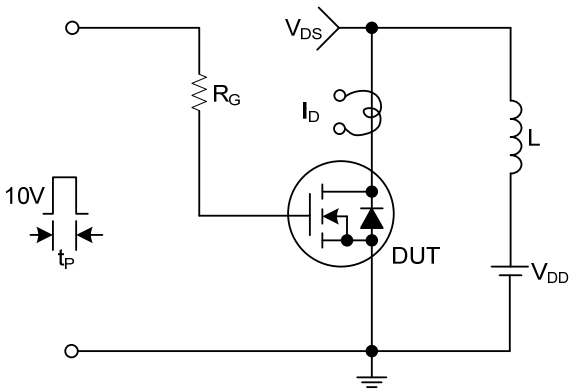

Gate Charge Waveforms



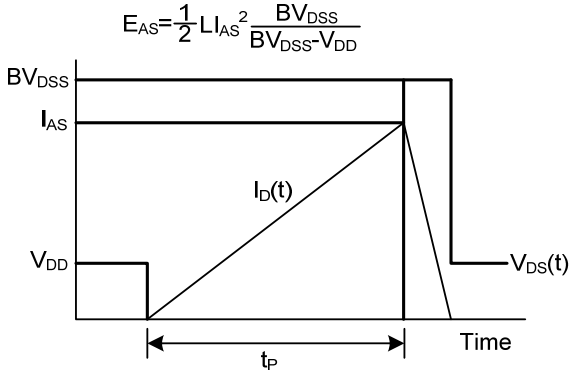

Resistive Switching Test Circuit




Resistive Switching Waveforms

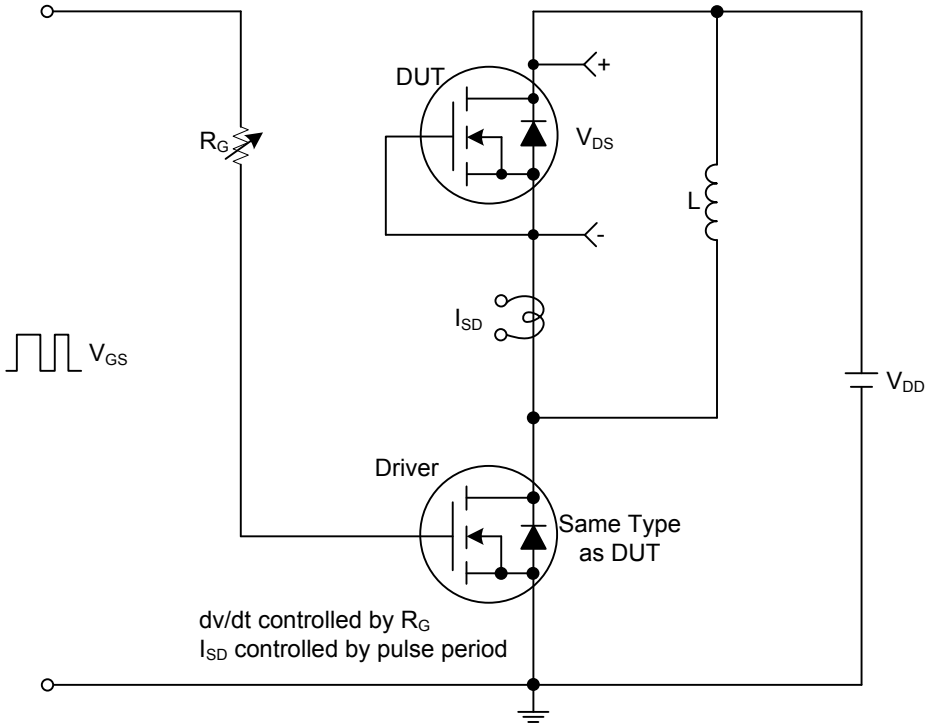


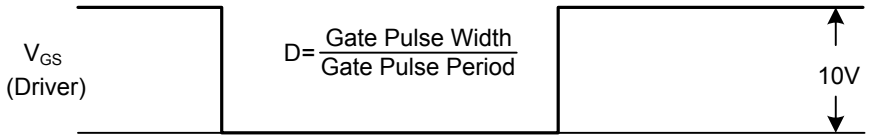

Unclamped Inductive Switching Test Circuit

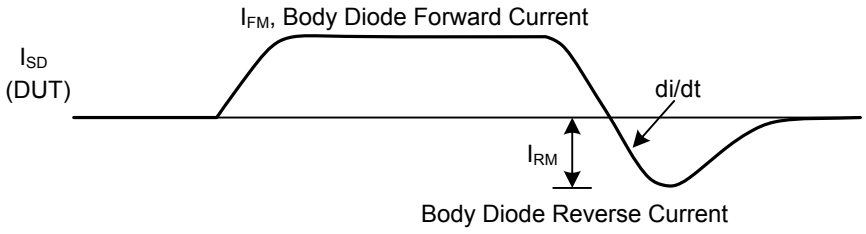


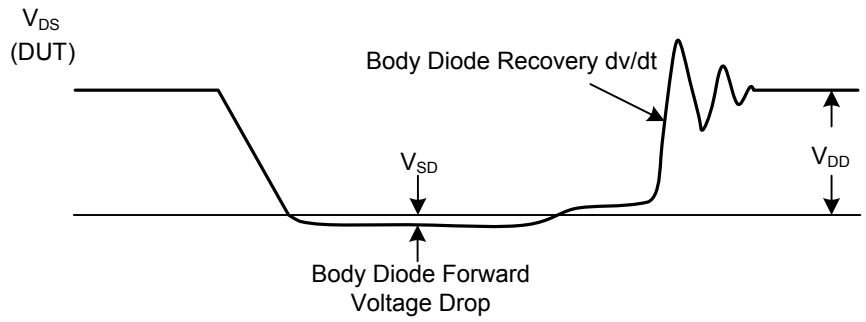

Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)




Peak Diode Recovery dv/dt Test Circuit and Waveforms