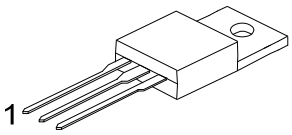
# 140A, 100V N-CHANNEL POWER MOSFET




TO-220

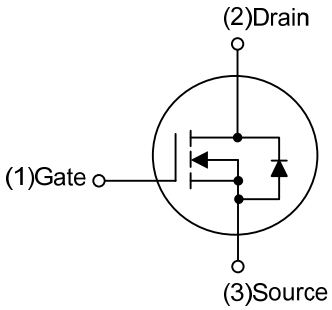
## ■ DESCRIPTION

The UTC **UT140N10H** is a N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

## ■ FEATURES

* $R_{DS(ON)} \leq 7.0\ m\Omega$ @ $V_{GS}$=10V, $I_D$=70A
* Improved dv/dt capability
* High Switching Speed
* Fast switching

## ■ SYMBOL




## ■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| UT140N10HL-TA3-T | UT140N10HG-TA3-T | TO-220 | G | D | S | Tube |

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

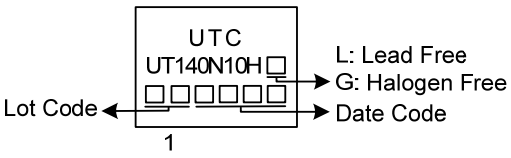
UT140N10HG-TA3-T

(1)Packing Type — (1) T: Tube

(2)Package Type — (2) TA3: TO-220

(3)Green Package — (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 | | $V_{DSS}$ | 100 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Drain Current | Continuous ($V_{GS}$=10V) | $I_D$ | 140 | A |
| | Pulsed (Note 2) | $I_{DM}$ | 280 | A |
| Avalanche Energy | Single Pulsed (Note 3) | $E_{AS}$ | 723 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 5 | V/ns |
| Power Dissipation | | $P_D$ | 282 | 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 = 0.1mH, $I_{AS}$ = 120A, $V_{DD}$ = 50V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
4. $I_{SD}$ ≤ 30A, di/dt ≤ 200A/μs, $V_{DD}$ ≤ $BV_{DSS}$, $T_J$ ≤ $T_{JMAX}$, $T_J$ = 25°C.

## ■ THERMAL DATA

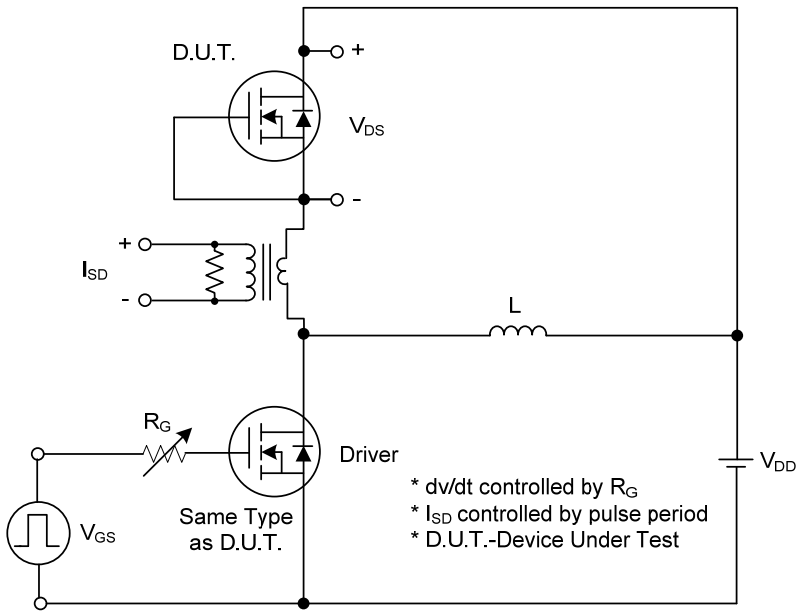
| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Junction to Ambient | $\theta_{JA}$ | 62.5 | °C/W |
| Junction to Case | $\theta_{JC}$ | 0.44 | °C/W |

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

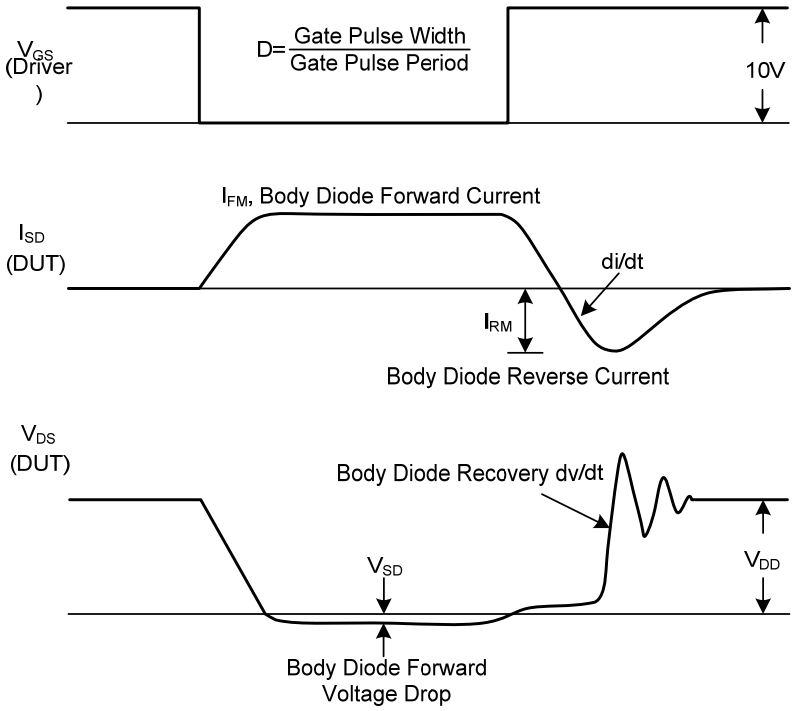
| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 100 | | | V |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=100V, $V_{GS}$=0V | | | 1 | μA |
| Gate- Source Leakage Current | Forward | $I_{GSS}$ | $V_{GS}$=+20V, $V_{DS}$=0V | | | +100 | nA |
| | Reverse | | $V_{GS}$=-20V, $V_{DS}$=0V | | | -100 | 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 , $I_D$=70A | | | 7.0 | mΩ |
| **DYNAMIC PARAMETERS** | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{GS}$=0V, $V_{DS}$=25V, f=1.0MHz | | 16 | | nF |
| Output Capacitance | | $C_{OSS}$ | | | 948 | | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | | 758 | | pF |
| **SWITCHING PARAMETERS** | | | | | | | |
| Total Gate Charge | | $Q_G$ | $V_{DS}$=80V, $V_{GS}$=10V, $I_D$=140A (Note 1,2) | | 417 | | nC |
| Gate to Source Charge | | $Q_{GS}$ | | | 74 | | nC |
| Gate to Drain Charge | | $Q_{GD}$ | | | 210 | | nC |
| Turn-ON Delay Time | | $t_{D(ON)}$ | $V_{DD}$=50V, $V_{GS}$=10V, $I_D$=140A, $R_G$=3Ω, (Note1, 2) | | 43 | | ns |
| Rise Time | | $t_R$ | | | 38 | | ns |
| Turn-OFF Delay Time | | $t_{D(OFF)}$ | | | 187 | | ns |
| Fall-Time | | $t_F$ | | | 75 | | ns |
| **SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | | $I_S$ | | | | 140 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | | $I_{SM}$ | | | | 280 | A |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $I_S$=140A,$V_{GS}$=0V | | | 1.4 | V |
| Body Diode Reverse Recovery Time | | $t_{rr}$ | $I_S$=30A, dI/dt=100A/μs | | 120 | | ns |
| Body Diode Reverse Recovery Charge | | $Q_{rr}$ | | | 543 | | nC |

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

## ■ TEST CIRCUITS AND WAVEFORMS

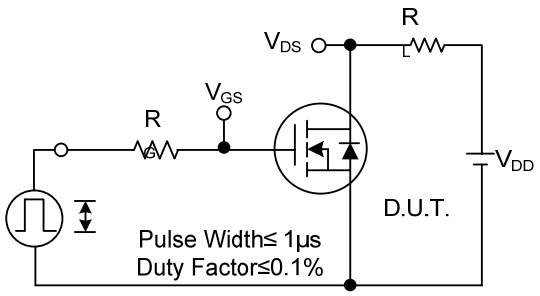



**Peak Diode Recovery dv/dt Test Circuit**

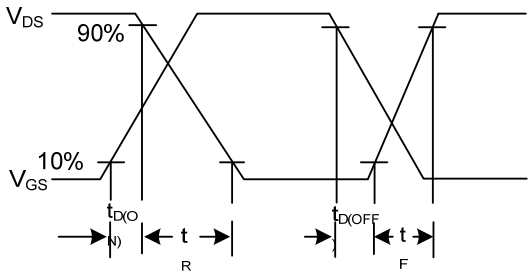



**Peak Diode Recovery dv/dt Waveforms**

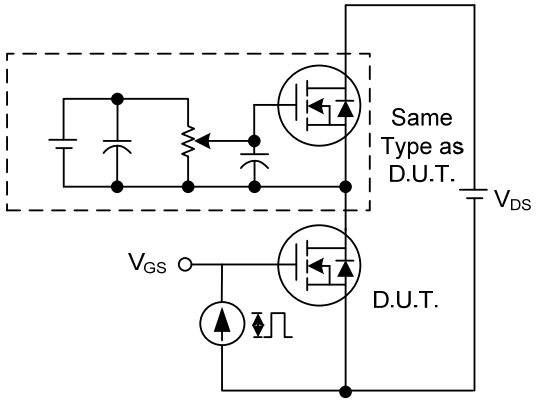
## ■ TEST CIRCUITS AND WAVEFORMS



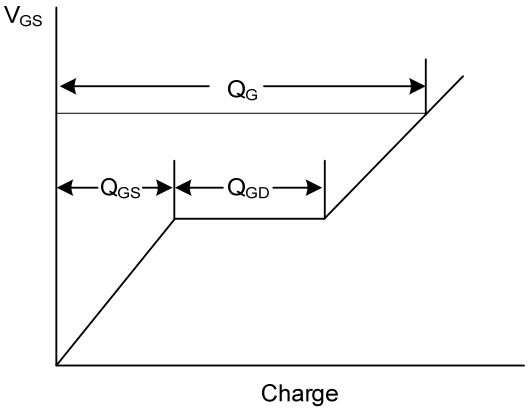

Switching Test Circuit



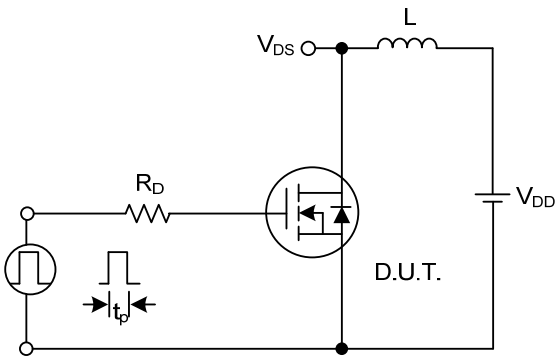

Switching Waveforms



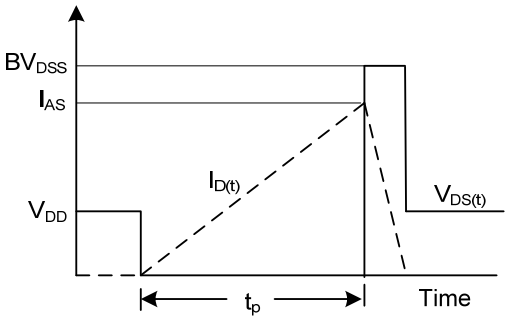

Gate Charge Test Circuit




Gate Charge Waveform




Unclamped Inductive Switching Test Circuit




Unclamped Inductive Switching Waveforms