# UNISONIC TECHNOLOGIES CO., LTD

## 30N06V-Q       Preliminary       *Power MOSFET*

# 60V, 30A   N-CHANNEL POWER MOSFET

TO-251

■ **DESCRIPTION**

The UTC **30N06V-Q** is a low voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and excellent avalanche characteristics. This power MOSFET is usually used at automotive applications in power supplies, high efficient DC to DC converters and battery operated products.

■ **FEATURES**

* $R_{DS(ON)}$ < 40mΩ@$V_{GS}$ = 10 V, $I_D$=15A
* Fast switching capability
* Avalanche energy specified

■ **SYMBOL**

2.Drain

1.Gate
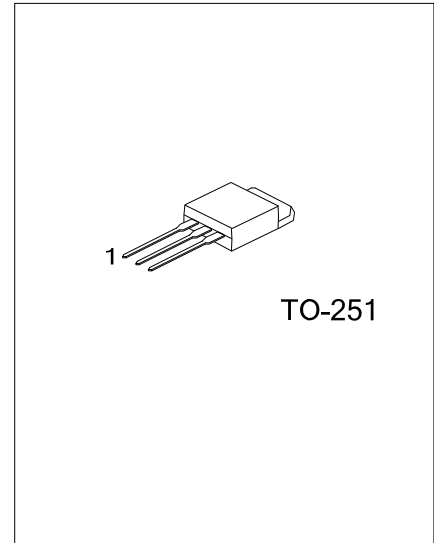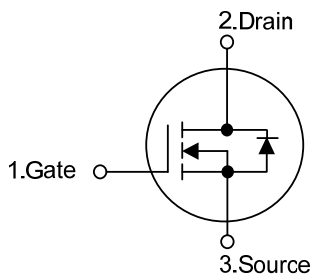
3.Source

■ **ORDERING INFORMATION**

| Ordering Number | | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| 30N06VL-TM3-T | 30N06VG-TM3-T | TO-251 | G | D | S | Tube |

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

30N06VL-TM3-T

    (1)Packing Type      (1) T: Tube

    (2)Package Type      (2) TM3: TO-251

    (3)Lead Free      (3) L: Lead Free, G: Halogen Free

■ **ABSOLUTE MAXIMUM RATINGS**($T_C$ = 25°C, unless otherwise specified)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 60 | V |
| Gate to Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current | $T_C$ = 25°C | $I_D$ | 30 | A |
| | $T_C$ = 100°C | | 21.3 | A |
| Pulsed Drain Current (Note 2) | | $I_{DM}$ | 120 | A |
| Avalanche Energy | Single Pulsed (Note 3) | $E_{AS}$ | 250 | mJ |
| | Repetitive (Note 2) | $E_{AR}$ | 8 | mJ |
| Power Dissipation | | $P_D$ | 46 | W |
| Junction Temperature | | $T_J$ | +150 | °C |
| Operation Temperature | | $T_{OPR}$ | -55 ~ +150 | °C |
| Storage Temperature | | $T_{STG}$ | -55 ~ +150 | °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. Repeativity rating: pulse width limited by junction temperature
3. L=0.66mH, $I_{AS}$=30A, $V_{DD}$=25V, $R_G$=20Ω, Starting $T_J$=25°C

■ **THERMAL DATA**

| PARAMETER | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Junction to Ambient | $θ_{JA}$ | 110 | °C/W |
| Junction to Case | $θ_{JC}$ | 2.85 | °C/W |

# 30N06V-Q

■ **ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C, unless otherwise specified)

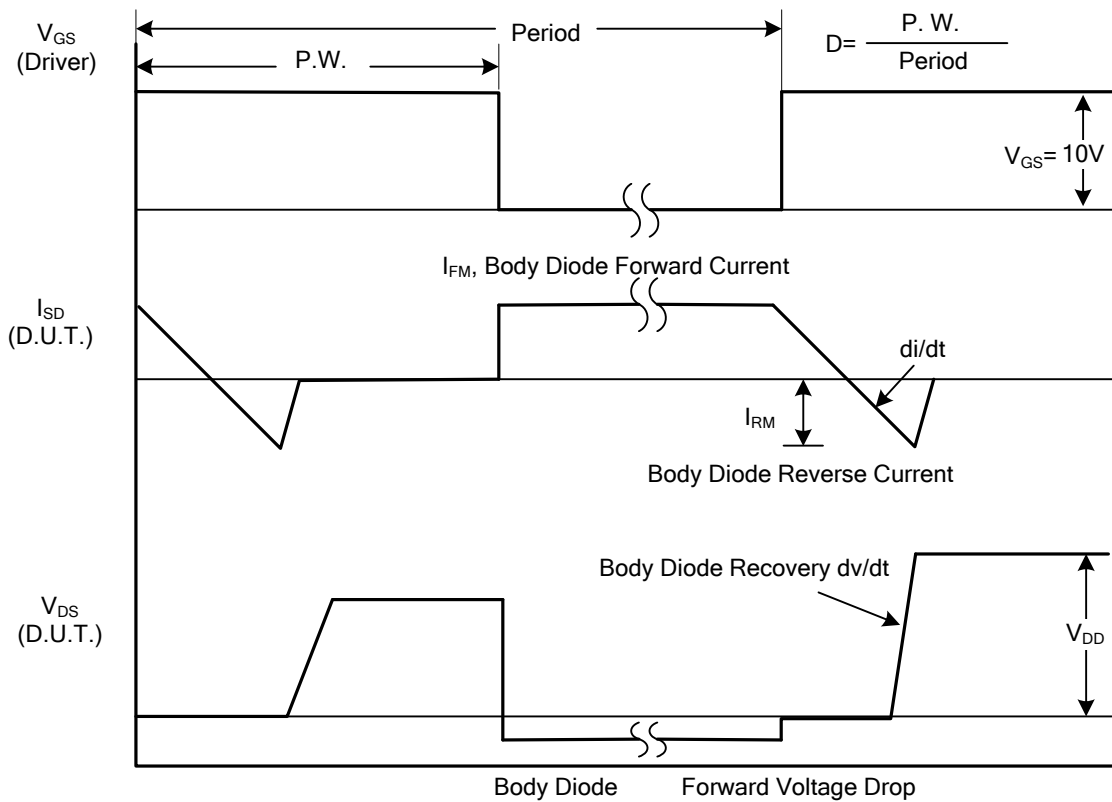| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 µA | 60 | | | V |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$ = 60 V, $V_{GS}$ = 0 V | | | 10 | µA |
| Gate-Source Leakage Current | Forward | $I_{GSS}$ | $V_{GS}$ = 20V, $V_{DS}$ = 0 V | | | 100 | nA |
| | Reverse | | $V_{GS}$ = -20V, $V_{DS}$ = 0 V | | | -100 | nA |
| Breakdown Voltage Temperature Coefficient | | $\triangle BV_{DSS}/\triangle T_J$ | $I_D$ =250µA, Referenced to 25°C | | 0.06 | | V/°C |
| **ON CHARACTERISTICS** | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 1.6 | | 2.4 | V |
| Static Drain-Source On-State Resistance | | $R_{DS(ON)}$ | $V_{GS}$ = 10 V, $I_D$ = 15 A | | | 40 | mΩ |
| **DYNAMIC CHARACTERISTICS** | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1MHz | | 800 | | pF |
| Output Capacitance | | $C_{OSS}$ | | | 300 | | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | | 50 | | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | | |
| Turn-On Delay Time | | $t_{D(ON)}$ | $V_{DD}$ = 30V, $I_D$ =15 A, $V_{GS}$=10V (Note 1, 2) | | 30 | | ns |
| Turn-On Rise Time | | $t_R$ | | | 50 | | ns |
| Turn-Off Delay Time | | $t_{D(OFF)}$ | | | 280 | | ns |
| Turn-Off Fall Time | | $t_F$ | | | 120 | | ns |
| Total Gate Charge | | $Q_G$ | $V_{DS}$ = 60V, $V_{GS}$ = 10 V, $I_D$ = 24A (Note 1, 2) | | 30 | | nC |
| Gate-Source Charge | | $Q_{GS}$ | | | 5 | | nC |
| Gate-Drain Charge | | $Q_{GD}$ | | | 8 | | nC |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | | |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 30A | | | 1.4 | V |
| Maximum Continuous Drain-Source Diode Forward Current | | $I_S$ | | | | 30 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | | $I_{SM}$ | | | | 120 | A |

Notes: 1. Pulse Test : Pulse width ≤300µs, Duty cycle ≤ 2%
        2. Essentially independent of operating temperature.
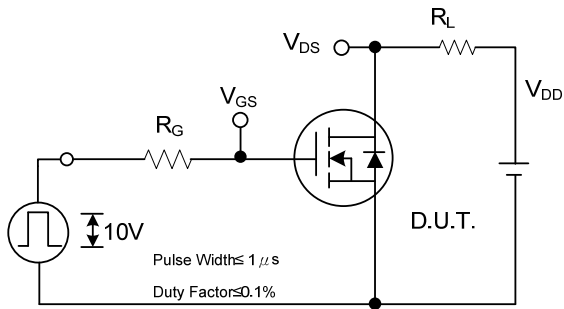
■ **TEST CIRCUITS AND WAVEFORMS**



* dv/dt controlled by $R_G$
* $I_{SD}$ controlled by pulse period
* D.U.T.-Device Under Test
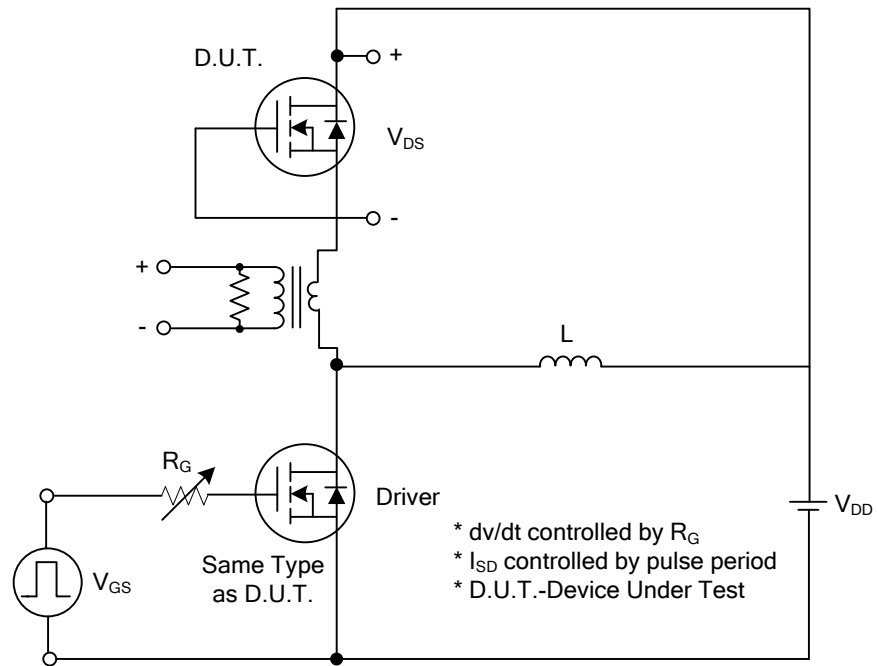
**Peak Diode Recovery dv/dt Test Circuit**



$$D= \frac{P.\,W.}{Period}$$

$V_{GS}= 10V$

$I_{FM}$, Body Diode Forward Current

di/dt

$I_{RM}$

Body Diode Reverse Current

Body Diode Recovery dv/dt
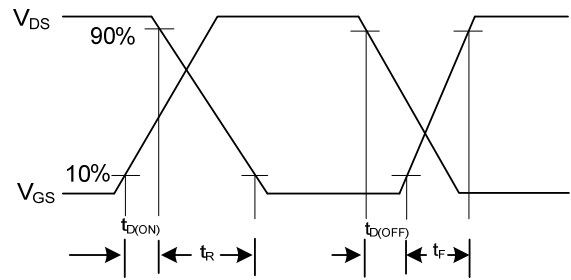
$V_{DD}$

Body Diode     Forward Voltage Drop

**Peak Diode Recovery dv/dt Waveforms**

## ■ TEST CIRCUITS AND WAVEFORMS (Cont.)

**Switching Test Circuit**

**Switching Waveforms**
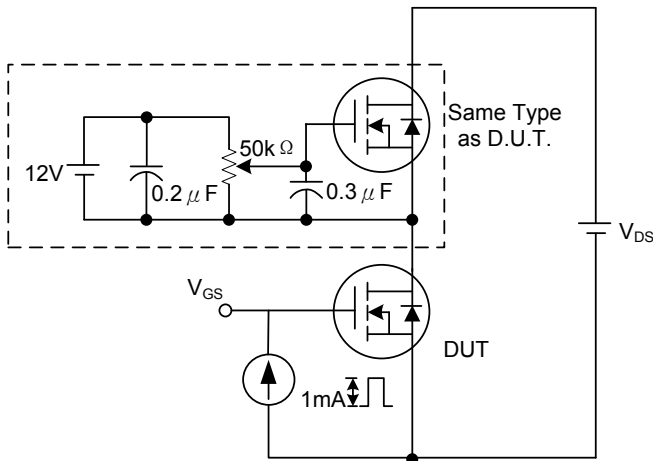
**Gate Charge Test Circuit**
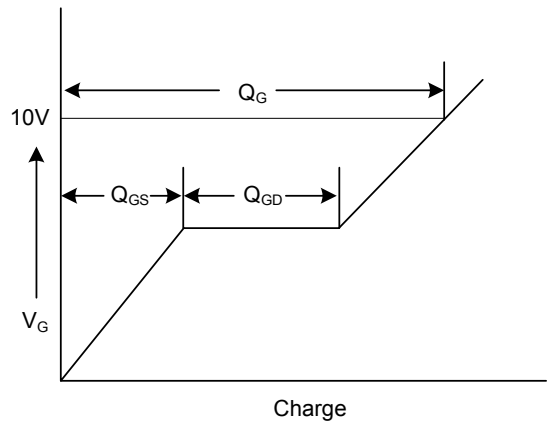
**Gate Charge Waveform**
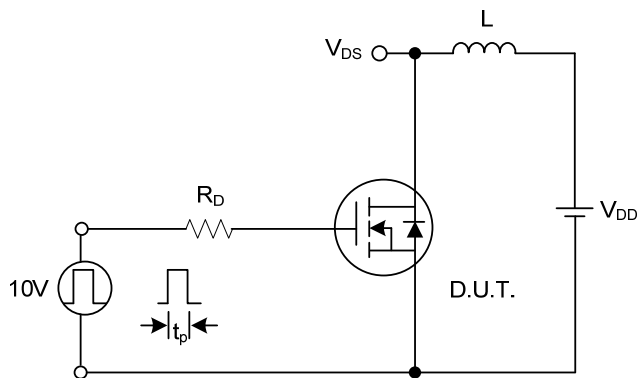
**Unclamped Inductive Switching Test Circuit**
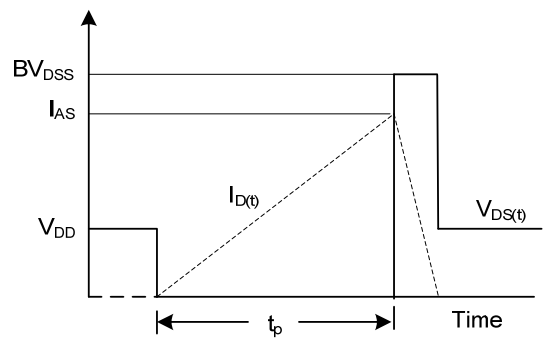
**Unclamped Inductive Switching Waveforms**