

UNISONIC TECHNOLOGIES CO., LTD

2N70-M **Power MOSFET Preliminary**

2 Amps, 700 Volts N-CHANNEL **POWER MOSFET**

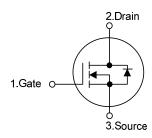
DESCRIPTION

The UTC 2N70-M is a high voltage MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)}$ < 6.3 Ω @ V_{GS} = 10V
- * Ultra Low gate charge (typical 17.2nC)
- * Low reverse transfer capacitance (C_{RSS} = typical 5.0 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness



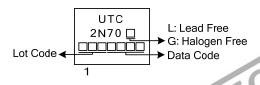


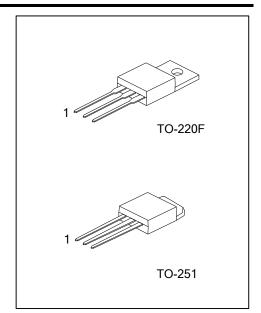
ORDERING INFORMATION

| Ordering Number | | Dookogo | Pin Assignment | | | Dooking | |
|-----------------|--------------|---------|----------------|---|---|---------|--|
| Lead Free | Halogen Free | Package | 1 | 2 | 3 | Packing | |
| 2N70L-TF3-T | 2N70G-TF3-T | TO-220F | G | D | S | Tube | |
| 2N70L-TM3-T | 2N70G-TM3-T | TO-251 | G | D | S | Tube | |

Note: Pin Assignment: G: Gate D: Drain S: Source 2N70L-TA3-7 (1) T: Tube (1)Packing Type (2) TF3: TO-220F, TM3: TO-251 (2)Package Type (3) L: Lead Free, G: Halogen Free and Lead Free (3)Green Package

MARKING





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

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|------------------------------------|------------------------|------------------|------------|------|
| Drain-Source Voltage | | V_{DSS} | 700 | V |
| Gate-Source Voltage | | V_{GSS} | ±30 | V |
| Avalanche Current (Note 2) | | I _{AR} | 2.0 | Α |
| Drain Current | Continuous | I _D | 2.0 | Α |
| | Pulsed (Note 2) | I _{DM} | 8.0 | Α |
| Avalanche Energy | Single Pulsed (Note 3) | E _{AS} | 140 | mJ |
| | Repetitive (Note 2) | E _{AR} | 2.8 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 4.5 | V/ns |
| Power Dissipation | TO-220F | В | 48 | W |
| | TO-251 | P_D | 30 | W |
| Junction Temperature | | T_J | +150 | Ĉ |
| 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 T_J
- 3. L=64mH, I_{AS} =2A, V_{DD} =50V, R_{G} =25 Ω , Starting T_{J} = 25°C
- 4. $I_{SD} \le 2.0A$, di/dt $\le 200A/\mu s$, $V_{DD} \le BV_{DSS}$, Starting $T_J = 25$ °C

■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---------------------|---------|---------------|---------|------|
| Junction to Ambient | TO-220F | 0 | 62.5 | °C/W |
| | TO-251 | θ_{JA} | 110 | °C/W |
| Junction to Case | TO-220F | 0 | 2.6 | °C/W |
| | TO-251 | θις | 4.24 | °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} | $V_{GS} = 0V, I_D = 250\mu A$ | | | | V |
| Drain-Source Leakage Current | | I _{DSS} | V _{DS} = 700V, V _{GS} = 0V | | | 10 | μA |
| | | | $V_{DS} = 560V, V_{GS} = 0V, T_{J} = 125^{\circ}C$ | | | 100 | μΑ |
| Gate-Source Leakage Current | Forward | less l | $V_{GS} = 30V, V_{DS} = 0V$ | | | 100 | nA |
| | Reverse | | $V_{GS} = -30V, V_{DS} = 0V$ | | | -100 | nA |
| Breakdown Voltage Temperature Coefficient | | ^ D)/ / ^ T | I_D = 250 μA, Referenced to 25°C | | 0.4 | | V/°C |
| | | △BV _{DSS} /△IJ | | | 0.4 | | V/ C |
| ON CHARACTERISTICS | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS} = V_{GS}, I_{D} = 250 \mu A$ | 2.0 | | 4.0 | V |
| Static Drain-Source On-State Resistance | | R _{DS(ON)} | $V_{GS} = 10V$, $I_D = 1A$ | | 5.4 | 6.3 | Ω |
| DYNAMIC CHARACTERISTICS | | | | | | | |
| Input Capacitance | | C _{ISS} | V _{DS} =25V, V _{GS} =0V, f =1MHz | | 270 | 350 | pF |
| Output Capacitance | | Coss | | | 38 | 50 | pF |
| Reverse Transfer Capacitance | | C _{RSS} | | | 5 | 7 | pF |
| SWITCHING CHARACTERISTIC | S | | | | | | |
| Turn-On Delay Time | | t _{D (ON)} | | | 35 | 40 | ns |
| Turn-On Rise Time | | t_R | $V_{DD} = 30V, I_D = 0.5A, R_G = 25\Omega$ | | 65 | 70 | ns |
| Turn-Off Delay Time | | t _{D(OFF)} | (Note 1, 2) | | 105 | 115 | ns |
| Turn-Off Fall Time | | t_{F} | | | 50 | 70 | ns |
| Total Gate Charge | | Q_G | \/ -560\/ \/ -10\/ -2.0A | | 17.2 | | nC |
| Gate-Source Charge | | Q_GS | V _{DS} =560V, V _{GS} =10V, I _D =2.0A (Note 1, 2) | | 1.7 | | nC |
| Gate-Drain Charge | | Q_{GD} | (Note 1, 2) | | 4.4 | | nC |
| DRAIN-SOURCE DIODE CHARA | CTERIST | ICS | | | ē. | - | |
| Drain-Source Diode Forward Voltage | | V_{SD} | $V_{GS} = 0 \text{ V}, I_{SD} = 2.0 \text{ A}$ | | | 1.4 | V |
| Continuous Drain-Source Current | | I_{SD} | | | | 2.0 | Α |
| Pulsed Drain-Source Current | | I _{SM} | | | | 8.0 | Α |
| Reverse Recovery Time | | t _{RR} | V _{GS} = 0 V, I _{SD} = 2.0A | | 260 | | ns |
| Reverse Recovery Charge | | Q_{RR} | di/dt = 100 A/µs (Note1) | | 1.09 | | μC |

Notes: 1. Pulse Test: Pulse width≤300µs, Duty cycle≤2%

2. Essentially independent of operating temperature.



■ TEST CIRCUITS AND WAVEFORMS

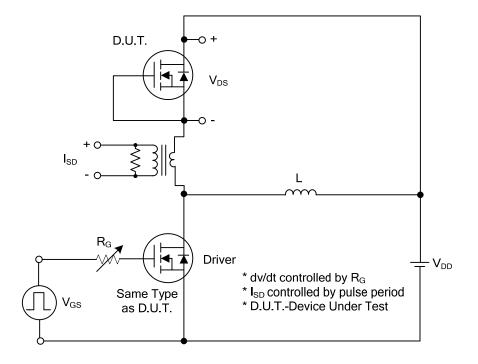


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

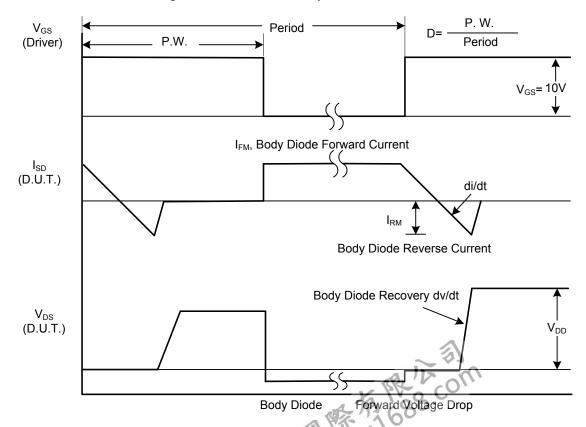
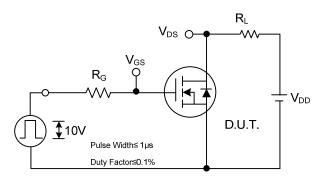


Fig. 1B Peak Diode Recovery dv/dt Waveforms

TEST CIRCUITS AND WAVEFORMS (Cont.)



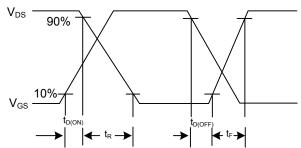
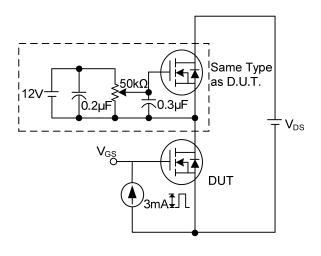


Fig. 2A Switching Test Circuit

Fig. 2B Switching Waveforms



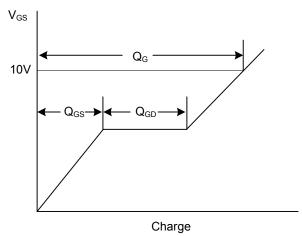
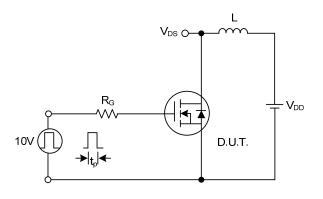


Fig. 3A Gate Charge Test Circuit

Fig. 3B Gate Charge Waveform



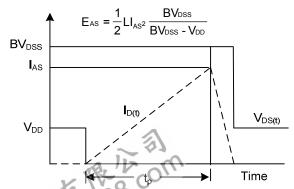


Fig. 4A Unclamped Inductive Switching Test Circuit Fig. 4B Unclamped Inductive Switching Waveforms

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