



## 21NM70

## Advance

## Power MOSFET

### 21A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

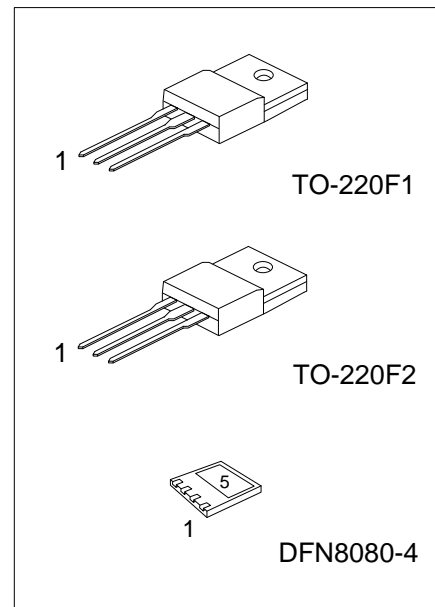
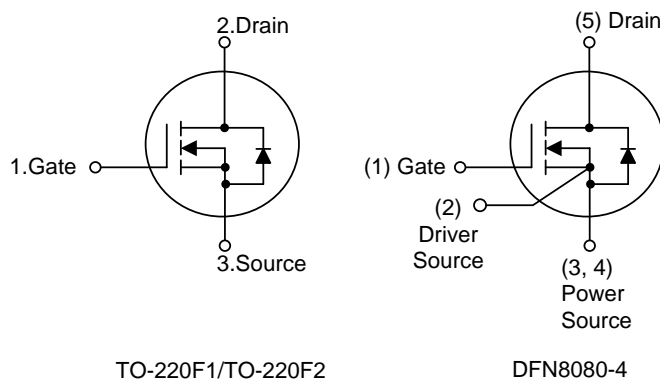
#### DESCRIPTION

The **UTC 21NM70** 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

- \*  $R_{DS(ON)} \leq 0.24 \Omega$  @  $V_{GS}=10V$ ,  $I_D=10.5A$
- \* High Switching Speed
- \* 100% Avalanche Tested

#### SYMBOL



#### ORDERING INFORMATION

| Ordering Number    |                    | Package   | Pin Assignment |   |   |   |   | Packing   |
|--------------------|--------------------|-----------|----------------|---|---|---|---|-----------|
| Lead Free          | Halogen Free       |           | 1              | 2 | 3 | 4 | 5 |           |
| 21NM70L-TF1-T      | 21NM70G-TF1-T      | TO-220F1  | G              | D | S | - | - | Tube      |
| 21NM70L-TF2-T      | 21NM70G-TF2-T      | TO-220F2  | G              | D | S | - | - | Tube      |
| 21NM70L-K04-8080-R | 21NM70G-K04-8080-R | DFN8080-4 | G              | S | S | S | D | Tape Reel |

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

|   |  |
|---|--|
| <p>21NM70G-TF1-T</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Green Package</p> | <p>(1) T: Tube, R: Tape Reel<br/>(2) TF1: TO-220F1, TF2: TO-220F2,<br/>K04-8080: DFN8080-4<br/>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|---|--|

MARKING

| TO-220F1 / TO-220F2   | DFN8080-4   |
|---|---|
| <div><div>UTC<br/>21NM70</div><div><div>Lot Code</div><div>□□□□□□</div><div>1</div></div><div><div>L: Lead Free</div><div>G: Halogen Free</div><div>Date Code</div></div></div> | <div><div>UTC<br/>21NM70</div><div><div>Lot Code</div><div>• □□□□□□</div></div><div>Date Code</div></div> |

# ■ **ABSOLUTE MAXIMUM RATINGS** ( $T_C=25^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER            |                   | SYMBOL    | RATINGS    | UNIT               |
|----------------------|-------------------|-----------|------------|--------------------|
| Drain-Source Voltage |                   | $V_{DSS}$ | 700        | V                  |
| Gate-Source Voltage  |                   | $V_{GSS}$ | $\pm 30$   | V                  |
| Drain Current        | Continuous        | $I_D$     | 21         | A                  |
|                      | Pulsed (Note 2)   | $I_{DM}$  | 42         | A                  |
| Power Dissipation    | TO-220F1/TO-220F2 | $P_D$     | 35         | W                  |
|                      | DFN8080-4         |           | 64         | W                  |
| Junction Temperature |                   | $T_J$     | +150       | $^{\circ}\text{C}$ |
| Storage Temperature  |                   | $T_{STG}$ | -55 ~ +150 | $^{\circ}\text{C}$ |

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.

# ■ **THERMAL DATA**

| PARAMETER           |                   | SYMBOL        | RATINGS    | UNIT                 |
|---------------------|-------------------|---------------|------------|----------------------|
| Junction to Ambient | TO-220F1/TO-220F2 | $\theta_{JA}$ | 62.5       | $^{\circ}\text{C/W}$ |
|                     | DFN8080-4         |               | 27 (Note)  | $^{\circ}\text{C/W}$ |
| Junction to Case    | TO-220F1/TO-220F2 | $\theta_{JC}$ | 3.57       | $^{\circ}\text{C/W}$ |
|                     | DFN8080-4         |               | 1.9 (Note) | $^{\circ}\text{C/W}$ |

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

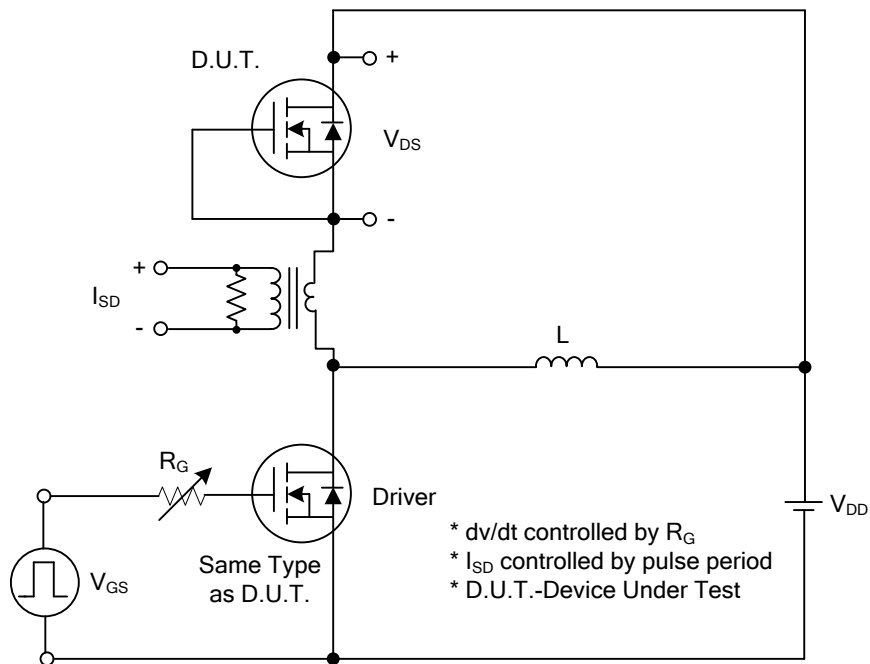
# ■ **ELECTRICAL CHARACTERISTICS** ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER   |         | SYMBOL              | TEST CONDITIONS  | MIN | TYP | MAX  | UNIT |
|---|---------|---------------------|--|-----|-----|------|------|
| OFF CHARACTERISTICS                                   |         |                     |  |     |     |      |      |
| Drain-Source Breakdown Voltage                        |         | BV <sub>DSS</sub>   | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V               | 700 |     |      | V    |
| Drain-Source Leakage Current                          |         | I <sub>DSS</sub>    | V <sub>DS</sub> =700V, V <sub>GS</sub> =0V               |     |     | 10   | μA   |
| Gate- Source Leakage Current                          | Forward | I <sub>GSS</sub>    | V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V               |     |     | +100 | nA   |
|   | Reverse |                     | V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V               |     |     | -100 | nA   |
| ON CHARACTERISTICS                                    |         |                     |  |     |     |      |      |
| Gate Threshold Voltage                                |         | V <sub>GS(TH)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA | 2.5 |     | 4.5  | V    |
| Static Drain-Source On-State Resistance               |         | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =10.5A              |     |     | 0.24 | Ω    |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS       |         |                     |  |     |     |      |      |
| Maximum Continuous Drain-Source Diode Forward Current |         | I <sub>S</sub>      |  |     |     | 21   | A    |
| Maximum Pulsed Drain-Source Diode Forward Current     |         | I <sub>SM</sub>     |  |     |     | 42   | A    |
| Drain-Source Diode Forward Voltage (Note 1)           |         | V <sub>SD</sub>     | I <sub>S</sub> =21A, V <sub>GS</sub> =0V                 |     |     | 1.4  | V    |

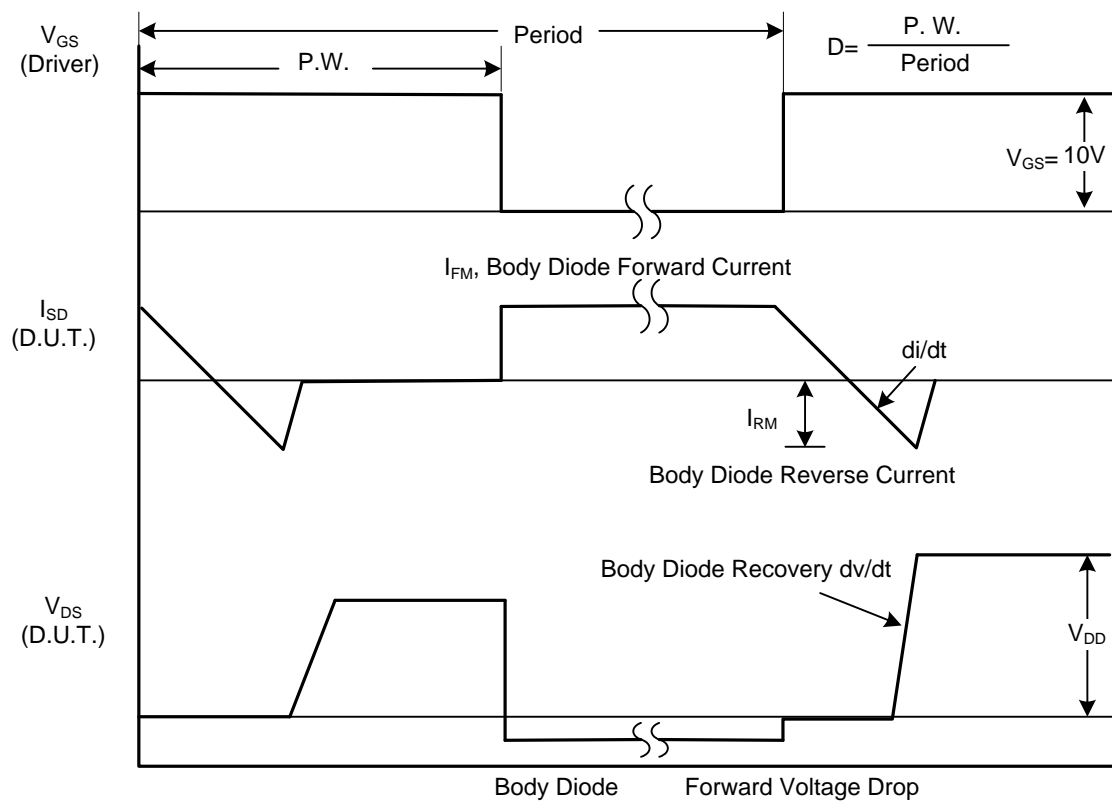
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating ambient temperature.

## ■ TEST CIRCUITS AND WAVEFORMS

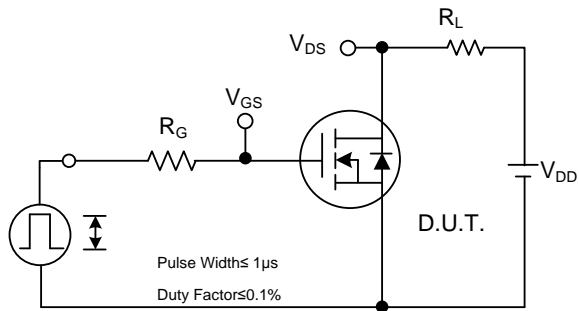


Peak Diode Recovery  $dv/dt$  Test Circuit

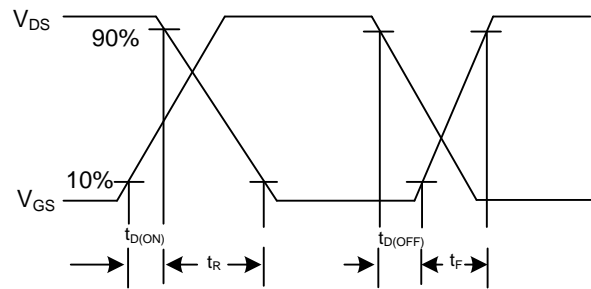


Peak Diode Recovery  $dv/dt$  Waveforms

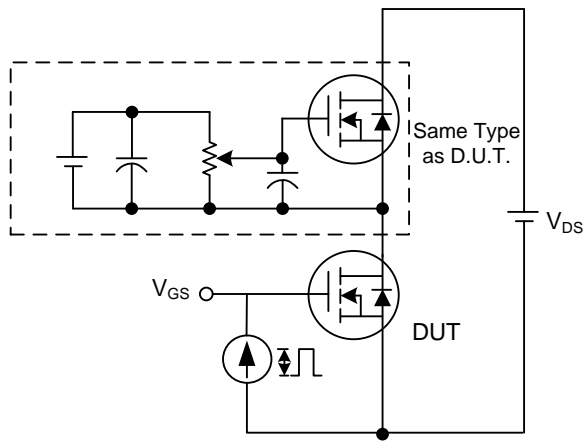
## ■ TEST CIRCUITS AND WAVEFORMS



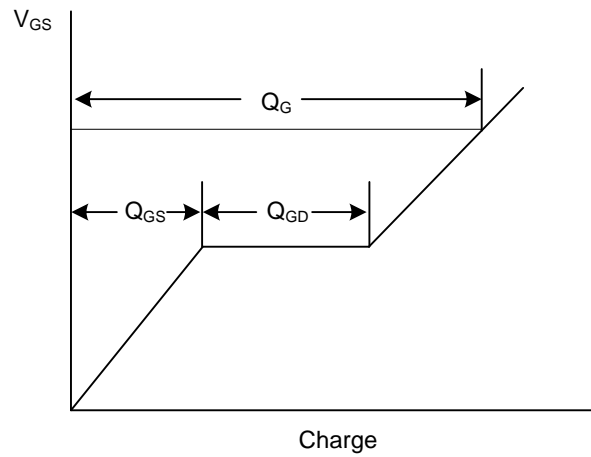
Switching Test Circuit



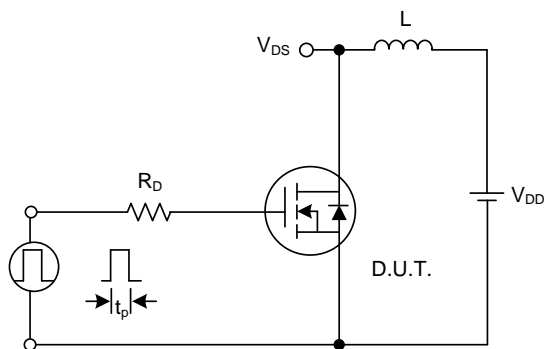
Switching Waveforms



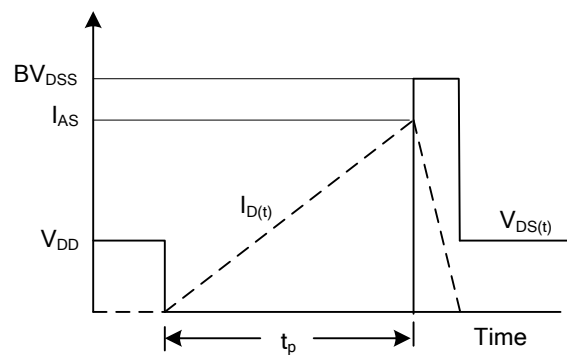
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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