



**7N80**

Preliminary

*Power MOSFET*

**7A, 800V N-CHANNEL  
POWER MOSFET**

■ DESCRIPTION

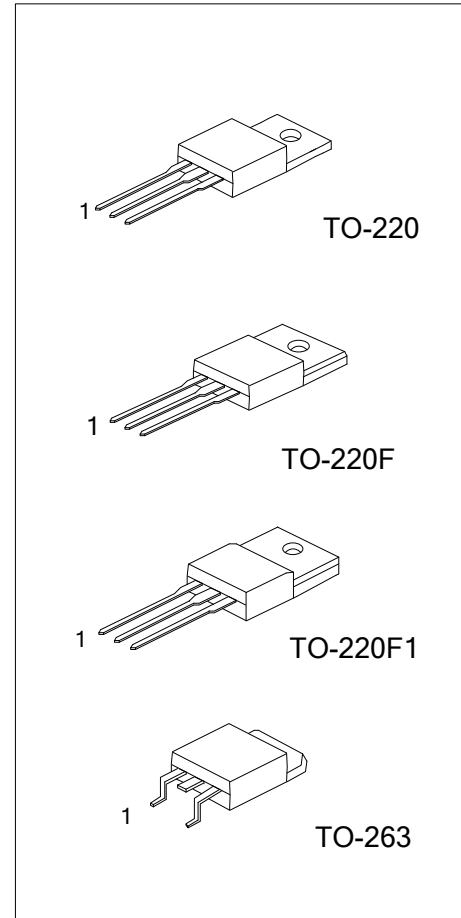
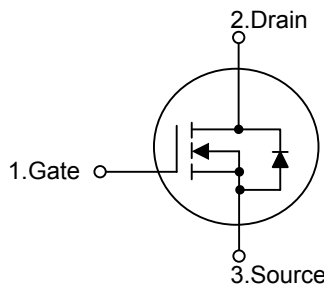
The UTC **7N80** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **7N80** is universally applied in high efficiency switch mode power supply.

■ FEATURES

- \*  $R_{DS(on)}=1.8\Omega@V_{GS}=10V$
- \* High switching speed
- \* 100% avalanche tested

■ SYMBOL



■ ORDERING INFORMATION

| Ordering Number |              | Package  | Pin Assignment |   |   | Packing   |
|-----------------|--------------|----------|----------------|---|---|-----------|
| Lead Free       | Halogen Free |          | 1              | 2 | 3 |           |
| 7N80L-TA3-T     | 7N80G-TA3-T  | TO-220   | G              | D | S | Tube      |
| 7N80L-TF3-T     | 7N80G-TF3-T  | TO-220F  | G              | D | S | Tube      |
| 7N80L-TF1-T     | 7N80G-TF1-T  | TO-220F1 | G              | D | S | Tube      |
| 7N80L-TQ2-R     | 7N80G-TQ2-R  | TO-263   | G              | D | S | Tape Reel |
| 7N80L-TQ2-T     | 7N80G-TQ2-T  | TO-263   | G              | D | S | Tube      |

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

|   |  |
|---|--|
| <p>7N80L - TA3 - T</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Lead Free</p> | <p>(1) T: Tube, R: Tape Reel<br/>(2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F, TQ2: TO-263<br/>(3) G: Halogen Free, L: Lead Free</p> |
|---|--|

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

| PARAMETER                            |                        | SYMBOL    | RATINGS  | UNIT             |
|--------------------------------------|------------------------|-----------|----------|------------------|
| Drain-Source Voltage                 |                        | $V_{DSS}$ | 800      | V                |
| Gate-Source Voltage                  |                        | $V_{GSS}$ | $\pm 30$ | V                |
| Drain Current                        | Continuous             | $I_D$     | 7        | A                |
|                                      | Pulsed (Note 1)        | $I_{DM}$  | 26.4     | A                |
| Avalanche Energy                     | Single Pulsed (Note 2) | $E_{AS}$  | 580      | mJ               |
|                                      | Repetitive (Note 1)    | $E_{AR}$  | 16.7     | mJ               |
| Peak Diode Recovery $dv/dt$ (Note 3) |                        | $dv/dt$   | 4.5      | V/ns             |
| Power Dissipation                    | TO-220 /TO-263         | $P_D$     | 142      | W                |
|                                      | TO-220F/ TO-220F1      |           | 48       | W                |
| Junction Temperature                 |                        | $T_J$     | +150     | $^\circ\text{C}$ |
| Storage Temperature                  |                        | $T_{STG}$ | -55~+150 | $^\circ\text{C}$ |

Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2.  $L=25\text{mH}$ ,  $I_{AS}=6.6\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$

3.  $I_{SD} \leq 8\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

4. 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.

■ THERMAL DATA

| PARAMETER           |                    | SYMBOL        | RATINGS | UNIT                      |
|---------------------|--------------------|---------------|---------|---------------------------|
| Junction to Ambient |                    | $\theta_{JA}$ | 62.5    | $^\circ\text{C}/\text{W}$ |
| Junction to Case    | TO-220/TO-263      | $\theta_{JC}$ | 0.88    | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F / TO-220F1 |               | 2.6     | $^\circ\text{C}/\text{W}$ |

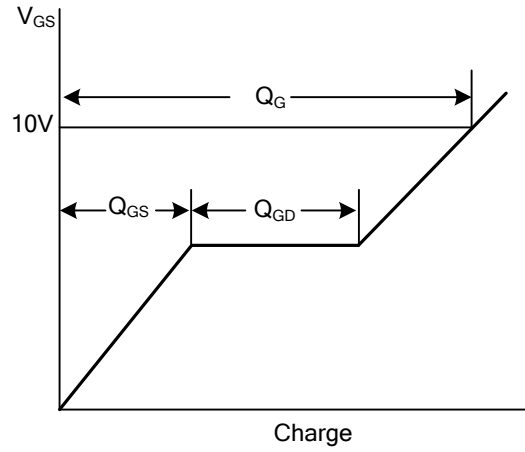
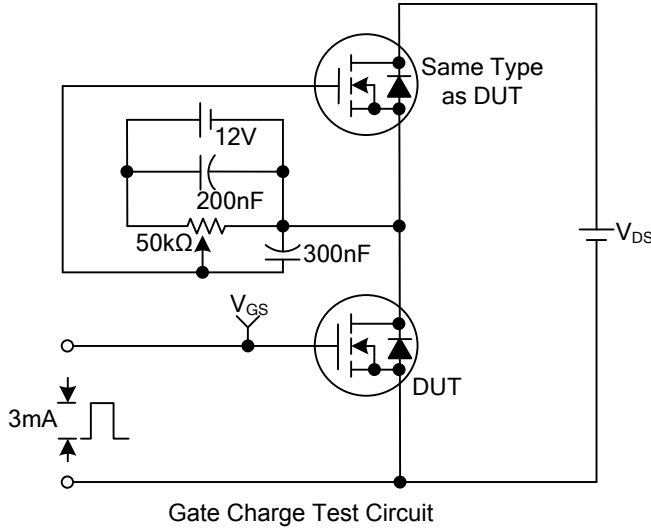
■ ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C, unless otherwise specified)

| PARAMETER  | SYMBOL                              | TEST CONDITIONS  | MIN | TYP  | MAX  | UNIT |
|--|-------------------------------------|--|-----|------|------|------|
| <b>OFF CHARACTERISTICS</b>                             |                                     |  |     |      |      |      |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>                   | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA   | 800 |      |      | V    |
| Breakdown Voltage Temperature Coefficient              | ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | I <sub>D</sub> =250μA, Referenced to 25°C  |     | 0.93 |      | V/°C |
| Drain-Source Leakage Current                           | I <sub>DSS</sub>                    | V <sub>DS</sub> =800V, V <sub>GS</sub> =0V   |     |      | 10   | μA   |
|  |                                     | V <sub>DS</sub> =640V, T <sub>C</sub> =125°C                                       |     |      | 100  | μA   |
| Gate-Source Leakage Current                            | Forward                             | I <sub>GSS</sub>   |     |      |      | 100  |
|  | Reverse                             |  |     |      |      |      |
|  |                                     | V <sub>DS</sub> =0V, V <sub>GS</sub> =-30V   |     |      | -100 | nA   |
| <b>ON CHARACTERISTICS</b>                              |                                     |  |     |      |      |      |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub>                 | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                           | 3.0 |      | 5.0  | V    |
| Drain-Source On-State Resistance                       | R <sub>DS(ON)</sub>                 | V <sub>GS</sub> =10V, I <sub>D</sub> =3.3A   |     | 1.4  | 1.8  | Ω    |
| Forward Transconductance                               | g <sub>FS</sub>                     | V <sub>DS</sub> =50V, I <sub>D</sub> =3.3A (Note 1)                                |     | 5.5  |      | S    |
| <b>DYNAMIC PARAMETERS</b>                              |                                     |  |     |      |      |      |
| Input Capacitance                                      | C <sub>ISS</sub>                    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz                                |     | 1290 | 1680 | pF   |
| Output Capacitance                                     | C <sub>OSS</sub>                    |  |     | 120  | 155  | pF   |
| Reverse Transfer Capacitance                           | C <sub>RSS</sub>                    |  |     | 10   | 13   | pF   |
| <b>SWITCHING PARAMETERS</b>                            |                                     |  |     |      |      |      |
| Total Gate Charge                                      | Q <sub>G</sub>                      | V <sub>DS</sub> =640V, V <sub>GS</sub> =10V, I <sub>D</sub> =6.6A<br>(Note 1,2)    |     | 27   | 35   | nC   |
| Gate-Source Charge                                     | Q <sub>GS</sub>                     |  |     | 8.2  |      | nC   |
| Gate-Drain Charge                                      | Q <sub>GD</sub>                     |  |     | 11   |      | nC   |
| Turn-ON Delay Time                                     | t <sub>D(ON)</sub>                  | V <sub>DD</sub> =400V, I <sub>D</sub> =6.6A, R <sub>G</sub> =25Ω<br>(Note 1,2)     |     | 35   | 80   | ns   |
| Turn-ON Rise Time                                      | t <sub>R</sub>                      |  |     | 100  | 210  | ns   |
| Turn-OFF Delay Time                                    | t <sub>D(OFF)</sub>                 |  |     | 50   | 110  | ns   |
| Turn-OFF Fall Time                                     | t <sub>F</sub>                      |  |     | 60   | 130  | ns   |
| <b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b> |                                     |  |     |      |      |      |
| Maximum Body-Diode Continuous Current                  | I <sub>S</sub>                      |  |     |      | 6.6  | A    |
| Maximum Body-Diode Pulsed Current                      | I <sub>SM</sub>                     |  |     |      | 26.4 | A    |
| Drain-Source Diode Forward Voltage                     | V <sub>SD</sub>                     | I <sub>S</sub> =6.6A, V <sub>GS</sub> =0V  |     |      | 1.4  | V    |
| Body Diode Reverse Recovery Time                       | t <sub>rr</sub>                     | V <sub>GS</sub> =0V, I <sub>S</sub> =6.6A,<br>dI <sub>F</sub> /dt=100A/μs (Note 1) |     | 650  |      | ns   |
| Body Diode Reverse Recovery Charge                     | Q <sub>RR</sub>                     |  |     |      | 7.0  |      |

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

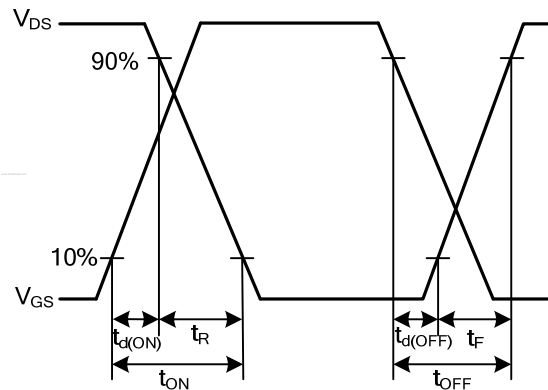
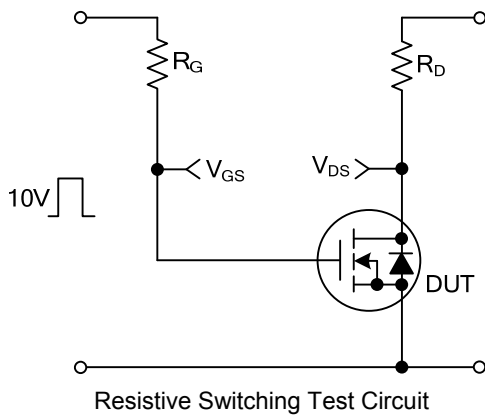
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS



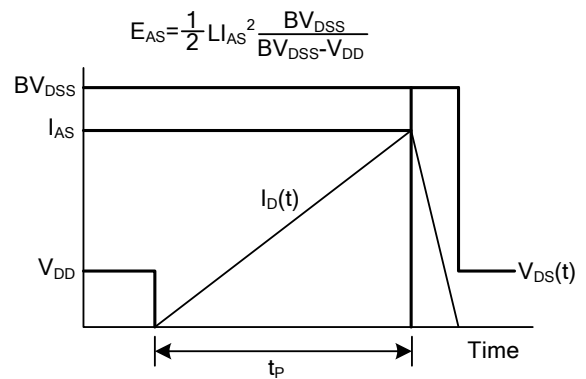
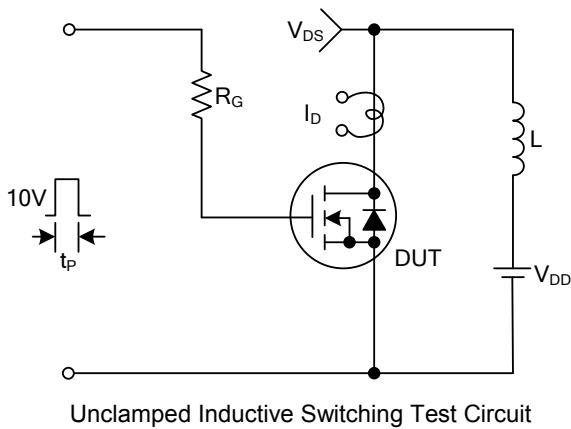
Gate Charge Test Circuit

Gate Charge Waveforms



Resistive Switching Test Circuit

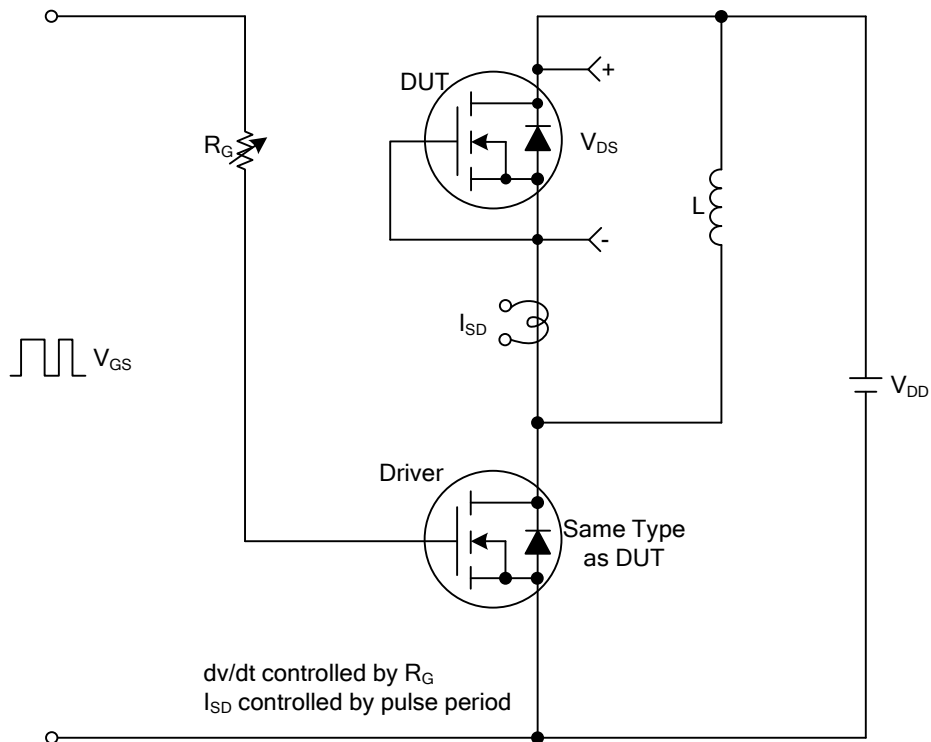
Resistive Switching Waveforms



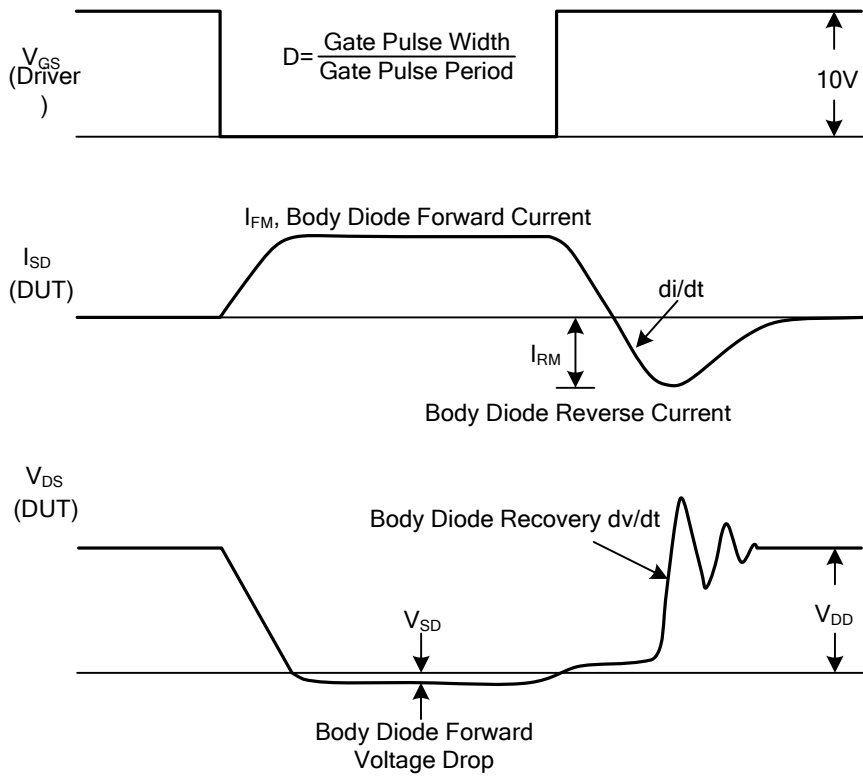
Unclamped Inductive Switching Test Circuit

Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)



Peak Diode Recovery dv/dt Test Circuit & Waveforms



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