



# 4N80

Power MOSFET

## 4.0A, 800V N-CHANNEL POWER MOSFET

### DESCRIPTION

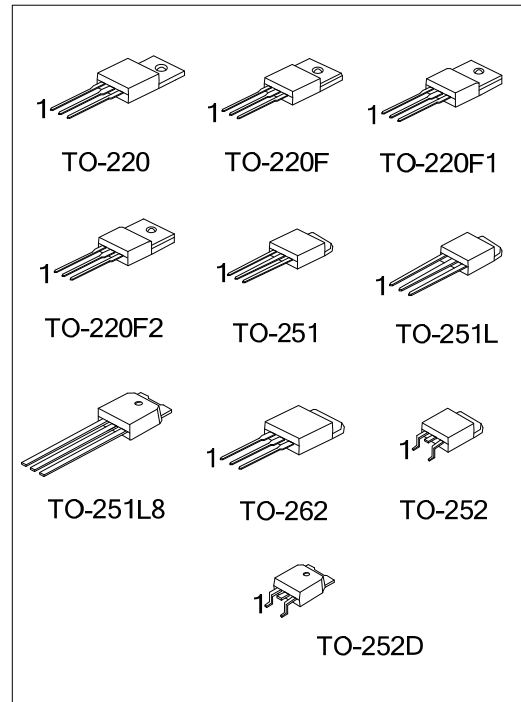
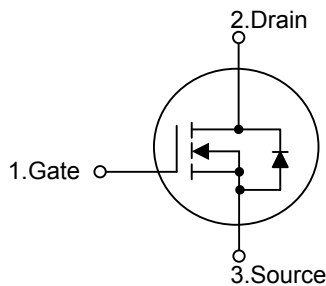
The UTC **4N80** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance, and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **4N80** is universally applied in high efficiency switch mode power supply.

### FEATURES

- \*  $R_{DS(on)} < 3.0\Omega$  @  $V_{GS}=10V, I_D=2.0A$
- \* High switching speed
- \* Improved dv/dt capability
- \* 100% avalanche tested

### SYMBOL



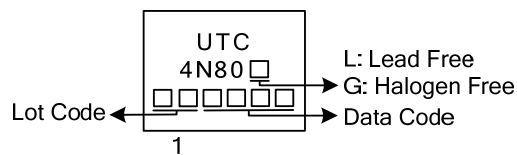
## ORDERING INFORMATION

| Ordering Number |              | Package  | Pin Assignment |   |   | Packing   |
|-----------------|--------------|----------|----------------|---|---|-----------|
| Lead Free       | Halogen Free |          | 1              | 2 | 3 |           |
| 4N80L-TA3-T     | 4N80G-TA3-T  | TO-220   | G              | D | S | Tube      |
| 4N80L-TF1-T     | 4N80G-TF1-T  | TO-220F1 | G              | D | S | Tube      |
| 4N80L-TF2-T     | 4N80G-TF2-T  | TO-220F2 | G              | D | S | Tube      |
| 4N80L-TF3-T     | 4N80G-TF3-T  | TO-220F  | G              | D | S | Tube      |
| 4N80L-TM3-T     | 4N80G-TM3-T  | TO-251   | G              | D | S | Tube      |
| 4N80L-TMA-T     | 4N80G-TMA-T  | TO-251L  | G              | D | S | Tube      |
| 4N80L-TMA8-T    | 4N80G-TMA8-T | TO-251L8 | G              | D | S | Tube      |
| 4N80L-TN3-R     | 4N80G-TN3-R  | TO-252   | G              | D | S | Tape Reel |
| 4N80L-TND-R     | 4N80G-TND-R  | TO-252D  | G              | D | S | Tape Reel |
| 4N80L-T2Q-T     | 4N80G-T2Q-T  | TO-262   | G              | D | S | Tube      |

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

|   |   |
|---|---|
| <p>4N80L-TA3-T</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Green Package</p> | <p>(1) T: Tube, R: Tape Reel<br/>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1<br/>TF2: TO-220F2, TM3: TO-251, TMA: TO-251L<br/>TMA8: TO-251L8, TN3: TO-252,<br/>TND: TO-252D, T2Q: TO-262<br/>(3) L: Lead Free, G: Halogen Free and Lead Free</p> |
|---|---|

## MARKING



■ 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                                   | $I_D$     | 4.0        | A                |
|                                    | Pulsed (Note 2)                              | $I_{DM}$  | 16         | A                |
| Avalanche Energy                   | Single Pulsed (Note 3)                       | $E_{AS}$  | 460        | mJ               |
|                                    | Repetitive (Note 2)                          | $E_{AR}$  | 13         | mJ               |
| Peak Diode Recovery dv/dt (Note 4) |  | dv/dt     | 4.0        | V/ns             |
| Power Dissipation                  | TO-220/TO-262                                | $P_D$     | 106        | W                |
|                                    | TO-220F/TO-220F1                             |           | 36         | W                |
|                                    | TO-220F2                                     |           | 38         | W                |
|                                    | TO-251/TO-251L<br>TO-251L8/TO-252<br>TO-252D |           | 50         | W                |
|                                    | Junction Temperature                         |           | $T_J$      | +150             |
| 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

3.  $L=57\text{mH}$ ,  $I_{AS}=4\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$

4.  $I_{SD}\leq 4\text{A}$ ,  $di/dt\leq 200\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

■ THERMAL DATA

| PARAMETER           |   | SYMBOL        | RATINGS | UNIT                      |
|---------------------|---|---------------|---------|---------------------------|
| Junction to Ambient | TO-220/TO-220F<br>TO-220F1/TO-220F2<br>TO-262 | $\theta_{JA}$ | 62.5    | $^\circ\text{C}/\text{W}$ |
|                     | TO-251/TO-251L<br>TO-251L8/TO-252<br>TO-252D  |               | 110     | $^\circ\text{C}/\text{W}$ |
| Junction to Case    | TO-220/TO-262                                 | $\theta_{JC}$ | 1.18    | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F/TO-220F1                              |               | 3.47    | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F2                                      |               | 3.28    | $^\circ\text{C}/\text{W}$ |
|                     | TO-251/TO-251L<br>TO-251L8/TO-252<br>TO-252D  |               | 2.5     | $^\circ\text{C}/\text{W}$ |

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

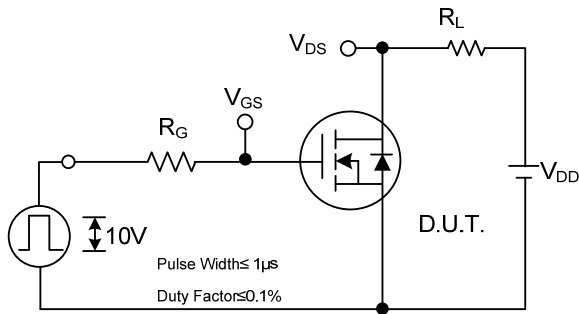
| PARAMETER  | SYMBOL                              | TEST CONDITIONS  | MIN | TYP | MAX  | UNIT  |
|--|-------------------------------------|--|-----|-----|------|-------|
| <b>OFF CHARACTERISTICS</b>                             |                                     |  |     |     |      |       |
| 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  |     | 950 |      | mV/°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>   |     |     |      | nA    |
|  | 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> =2.0A                                       |     | 2.3 | 3.0  | Ω     |
| <b>DYNAMIC PARAMETERS</b>                              |                                     |  |     |     |      |       |
| Input Capacitance                                      | C <sub>ISS</sub>                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =25V,<br>f=1.0MHz                           |     | 680 | 880  | pF    |
| Output Capacitance                                     | C <sub>OSS</sub>                    |  |     | 75  | 100  | pF    |
| Reverse Transfer Capacitance                           | C <sub>RSS</sub>                    |  |     | 8.6 | 12   | pF    |
| <b>SWITCHING PARAMETERS</b>                            |                                     |  |     |     |      |       |
| Total Gate Charge (Note 1)                             | Q <sub>G</sub>                      | V <sub>DS</sub> =640V, V <sub>GS</sub> =10V,<br>I <sub>D</sub> =4A (Note 1,2)    |     | 19  | 25   | nC    |
| Gate-Source Charge                                     | Q <sub>GS</sub>                     |  |     | 4.2 |      | nC    |
| Gate-Drain Charge                                      | Q <sub>GD</sub>                     |  |     | 9.1 |      | nC    |
| Turn-ON Delay Time (Note 1)                            | t <sub>D(ON)</sub>                  | V <sub>DD</sub> =400V, I <sub>D</sub> =4A,<br>R <sub>G</sub> =25Ω (Note 1,2)     |     | 16  | 40   | ns    |
| Turn-ON Rise Time                                      | t <sub>R</sub>                      |  |     | 45  | 100  | ns    |
| Turn-OFF Delay Time                                    | t <sub>D(OFF)</sub>                 |  |     | 35  | 80   | ns    |
| Turn-OFF Fall Time                                     | t <sub>F</sub>                      |  |     | 35  | 80   | ns    |
| <b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b> |                                     |  |     |     |      |       |
| Maximum Body-Diode Continuous Current                  | I <sub>S</sub>                      |  |     |     | 4    | A     |
| Maximum Body-Diode Pulsed Current                      | I <sub>SM</sub>                     |  |     |     | 16   | A     |
| Drain-Source Diode Forward Voltage (Note 1)            | V <sub>SD</sub>                     | I <sub>S</sub> =4A, V <sub>GS</sub> =0V  |     |     | 1.4  | V     |
| Body Diode Reverse Recovery Time (Note 1)              | t <sub>rr</sub>                     | V <sub>GS</sub> =0V, I <sub>S</sub> =4A,<br>dI <sub>F</sub> /dt=100A/μs (Note 1) |     | 575 |      | ns    |
| Body Diode Reverse Recovery Charge                     | Q <sub>rr</sub>                     |  |     |     | 3.65 |       |

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

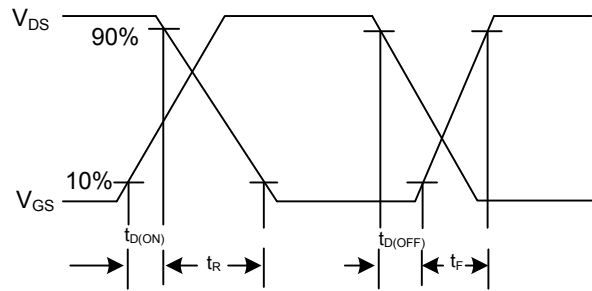
2. Essentially independent of operating temperature.



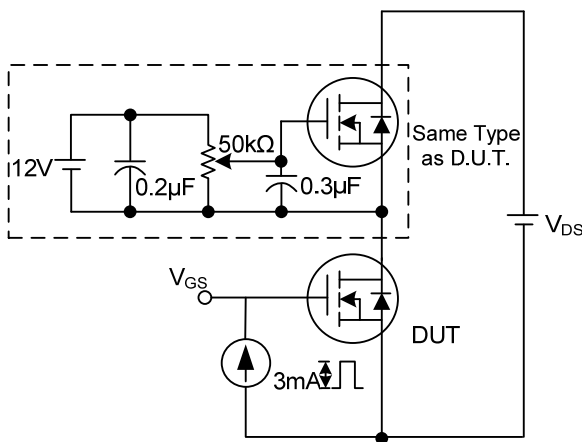
■ TEST CIRCUITS AND WAVEFORMS(Cont.)



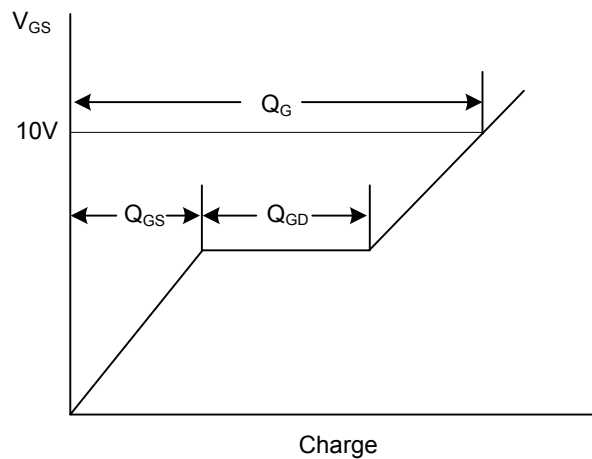
Switching Test Circuit



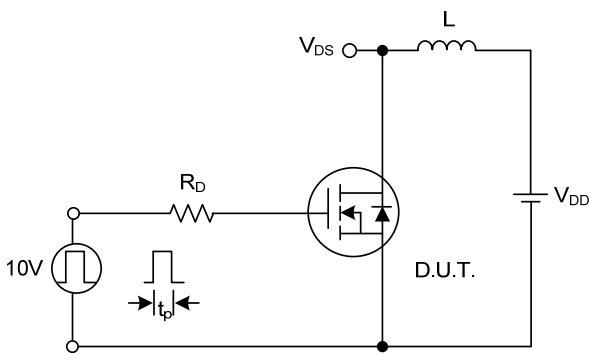
Switching Waveforms



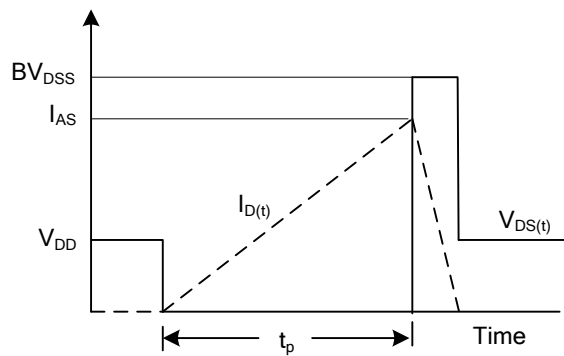
Gate Charge Test Circuit



Gate Charge Waveform

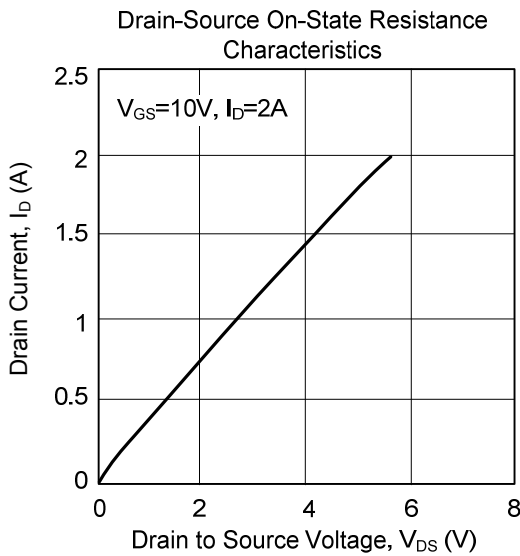
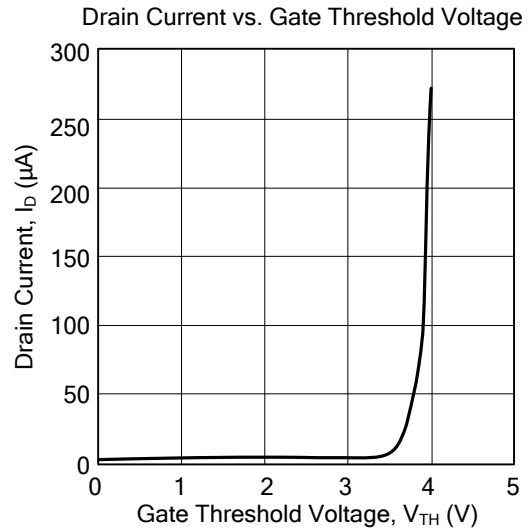
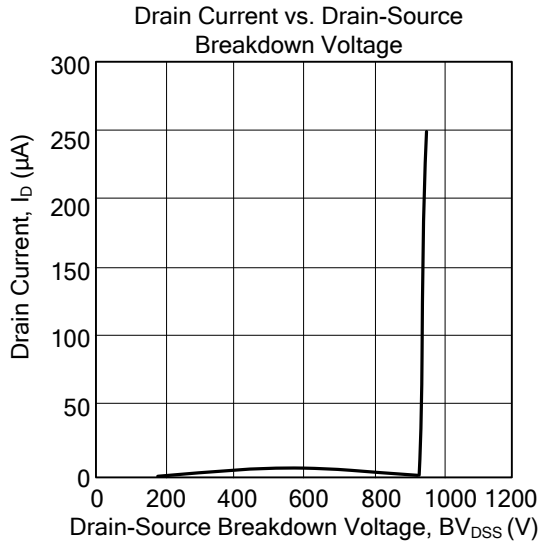


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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