

**UT90N03****Power MOSFET****90A, 30V N-CHANNEL(D-S)  
POWER MOSFET****DESCRIPTION**

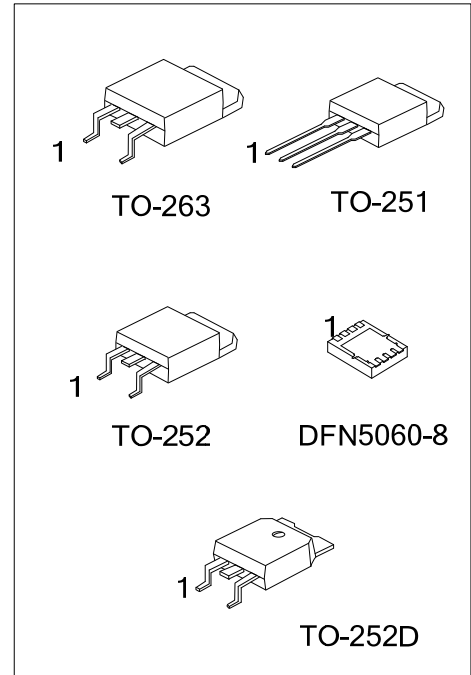
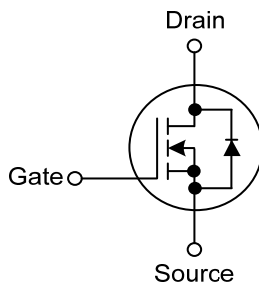
The UTC **UT90N03** is a N-channel enhancement mode Power FET, it uses UTC's advanced technology to provide customers a minimum on-state resistance.

The UTC **UT90N03** is suitable for server and DC-DC converters.

**FEATURES**

\*  $R_{DS(ON)} < 4.5\text{ m}\Omega$  @  $V_{GS}=10\text{V}$ ,  $I_D=28.8\text{A}$

\* Improved dv/dt capability

**SYMBOL****ORDERING INFORMATION**

| Ordering Number     |                     | Package   | Pin Assignment |   |   |   |   |   |   |   | Packing   |
|---------------------|---------------------|-----------|----------------|---|---|---|---|---|---|---|-----------|
| Lead Free           | Halogen Free        |           | 1              | 2 | 3 | 4 | 5 | 6 | 7 | 8 |           |
| UT90N03L-TM3-T      | UT90N03G-TM3-T      | TO-251    | G              | D | S | - | - | - | - | - | Tube      |
| UT90N03L-TN3-R      | UT90N03G-TN3-R      | TO-252    | G              | D | S | - | - | - | - | - | Tape Reel |
| UT90N03L-TND-R      | UT90N03G-TND-R      | TO-252D   | G              | D | S | - | - | - | - | - | Tape Reel |
| UT90N03L-TQ2-T      | UT90N03G-TQ2-T      | TO-263    | G              | D | S | - | - | - | - | - | Tube      |
| UT90N03L-TQ2-R      | UT90N03G-TQ2-R      | TO-263    | G              | D | S | - | - | - | - | - | Tape Reel |
| UT90N03L-K08-5060-R | UT90N03G-K08-5060-R | DFN5060-8 | S              | S | S | G | D | D | D | D | Tape Reel |

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

|                                                                             |  |                                                                                                                                                                |
|-----------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UT90N03G-TM3-T<br>(1) Packing Type<br>(2) Package Type<br>(3) Green Package |  | (1) T: Tube, R: Tape Reel<br>(2) TM3: TO-251, TN3: TO-252, TND: TO-252D<br>TQ2: TO-263, K08-5060: DFN5060-8<br>(3) G: Halogen Free and Lead Free, L: Lead Free |
|-----------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------|

**MARKING**

| TO-251 / TO-252 / TO-252D / TO-263 | DFN5060-8 |
|------------------------------------|-----------|
|                                    |           |

### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C, unless otherwise noted)

| PARAMETER                                  |                               |                                  | SYMBOL           | RATINGS         | UNIT |
|--------------------------------------------|-------------------------------|----------------------------------|------------------|-----------------|------|
| Drain-Source Voltage                       |                               |                                  | V <sub>DSS</sub> | 30              | V    |
| Gate-Source Voltage                        |                               |                                  | V <sub>GSS</sub> | ±20             | V    |
| Drain Current                              |                               | T <sub>C</sub> =25°C (Note 2, 5) | I <sub>D</sub>   | 90              | A    |
|                                            |                               | T <sub>A</sub> =25°C (Note 3, 4) |                  | 28.8            | A    |
|                                            |                               | Pulsed                           |                  | I <sub>DM</sub> | 90   |
| Avalanche Current Pulse (L=0.074mH)        |                               |                                  | I <sub>AS</sub>  | 90              | A    |
| Single Pulsed Avalanche Energy (L=0.074mH) |                               |                                  | E <sub>AS</sub>  | 300             | mJ   |
| Continuous Source-Drain Diode Current      |                               | T <sub>C</sub> =25°C (Note 2, 5) | I <sub>S</sub>   | 90              | A    |
|                                            |                               | T <sub>A</sub> =25°C (Note 3, 4) |                  | 3.13            | A    |
| Power Dissipation                          | T <sub>C</sub> =25°C (Note 2) | TO-251/TO-252                    | P <sub>D</sub>   | 187             | W    |
|                                            |                               | TO-252D                          |                  |                 |      |
|                                            |                               | TO-263                           |                  | 220             |      |
|                                            |                               | DFN5060-8                        |                  | 21              |      |
|                                            |                               | T <sub>A</sub> =25°C (Note 3, 4) |                  |                 | 3.75 |
| Junction Temperature                       |                               |                                  | T <sub>J</sub>   | -55 ~ +150      | °C   |
| Storage Temperature Range                  |                               |                                  | T <sub>STG</sub> | -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. Based on T<sub>C</sub>=25°C.
3. Surface Mounted on 1"x1" FR4 board.
4. t=10sec.
5. Calculated based on maximum junction temperature. Package limitation current is 90A.

### ■ THERMAL CHARACTERISTICS

| PARAMETER                       |              |                | SYMBOL          | RATINGS | UNIT |
|---------------------------------|--------------|----------------|-----------------|---------|------|
| Junction to Ambient (Note 1, 2) | t≤10sec      | TO-251/TO-252  | θ <sub>JA</sub> | 40      | °C/W |
|                                 |              | TO-252D/TO-263 |                 |         |      |
|                                 |              | DFN5060-8      |                 | 40.3    |      |
| Junction to Case                | Steady State | TO-251/TO-252  | θ <sub>JC</sub> | 0.6     | °C/W |
|                                 |              | TO-252D        |                 |         |      |
|                                 |              | TO-263         |                 | 0.5     |      |
|                                 |              | DFN5060-8      |                 | 6       |      |

Notes: 1. Maximum under Steady State conditions is 90°C/W.  
2. Surface Mounted on 1" x1" FR4 board.

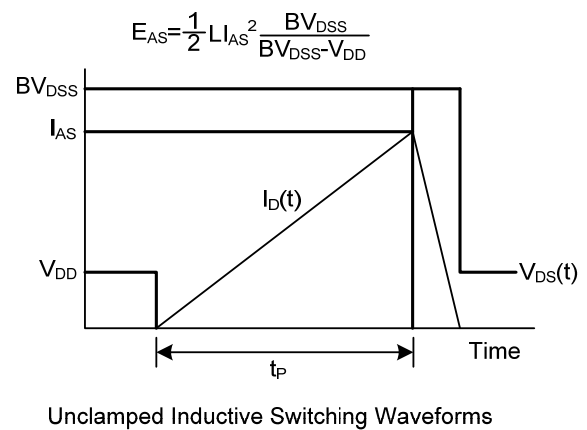
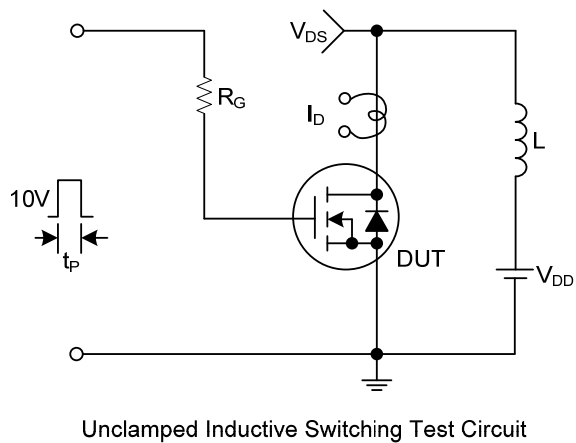
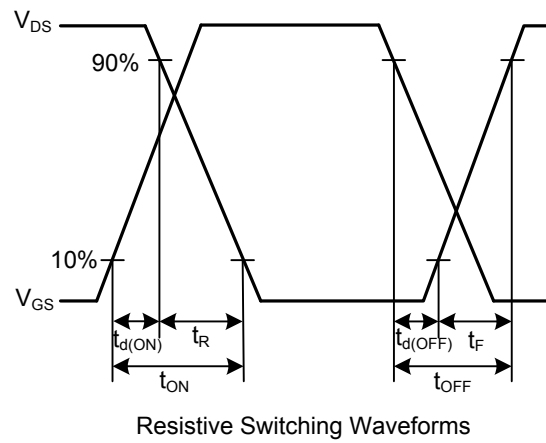
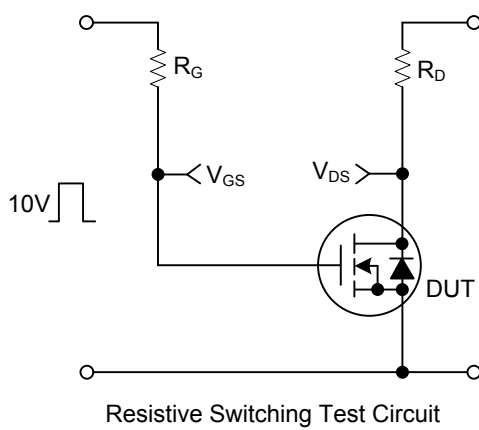
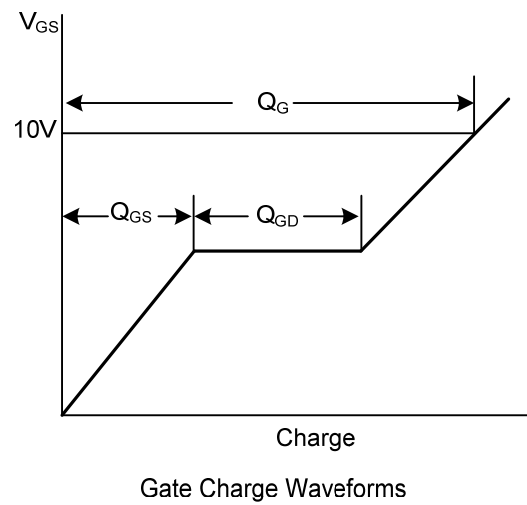
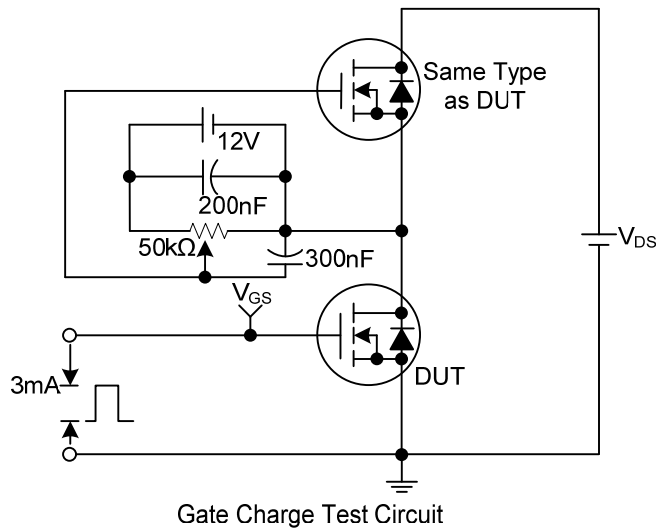
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise noted)

| 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                                                                           | 30  |      |      | V    |
| Drain-Source Leakage Current                     |         | I <sub>DSS</sub>    | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V                                                                            |     |      | 1    | μA   |
|                                                  |         |                     | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                                                      |     |      | 10   | μA   |
| Gate-Source Leakage Current                      | Forward | I <sub>GSS</sub>    | V <sub>GS</sub> =+20V, V <sub>DS</sub> =0V                                                                           |     |      | +100 | nA   |
|                                                  | Reverse |                     | V <sub>GS</sub> =-20V, 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                                                             | 1.5 |      | 2.5  | V    |
| Static Drain-Source On-State Resistance (Note 1) |         | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =28.8A                                                                          |     | 2.4  | 4.5  | mΩ   |
|                                                  |         |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =27A                                                                           |     | 2.7  | 5.5  | mΩ   |
| Forward Transconductance (Note 1)                |         | g <sub>FS</sub>     | V <sub>DS</sub> =15V, I <sub>D</sub> =28.8A                                                                          |     | 160  |      | S    |
| On State Drain Current (Note 1)                  |         | I <sub>D(ON)</sub>  | V <sub>GS</sub> =10V, V <sub>DS</sub> ≥5V                                                                            | 90  |      |      | A    |
| DYNAMIC PARAMETERS (Note 2)                      |         |                     |                                                                                                                      |     |      |      |      |
| Input Capacitance                                |         | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V,<br>f=1.0MHz                                                               |     | 4500 |      | pF   |
| Output Capacitance                               |         | C <sub>OSS</sub>    |                                                                                                                      |     | 1400 |      | pF   |
| Reverse Transfer Capacitance                     |         | C <sub>RSS</sub>    |                                                                                                                      |     | 700  |      | pF   |
| SWITCHING PARAMETERS                             |         |                     |                                                                                                                      |     |      |      |      |
| Total Gate Charge                                |         | Q <sub>G</sub>      | V <sub>DS</sub> =15V, V <sub>GS</sub> =10V,<br>I <sub>D</sub> =28.8A                                                 |     | 171  | 257  | nC   |
| Total Gate Charge                                |         | Q <sub>G</sub>      | V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V,<br>I <sub>D</sub> =28.8A                                                |     | 81.5 | 123  | nC   |
| Gate to Source Charge                            |         | Q <sub>GS</sub>     |                                                                                                                      |     | 34   |      | nC   |
| Gate to Drain Charge                             |         | Q <sub>GD</sub>     |                                                                                                                      |     | 29   |      | nC   |
| Gate Resistance                                  |         | R <sub>G</sub>      | f=1MHz                                                                                                               |     | 1.4  | 2.1  | Ω    |
| Turn-ON Delay Time                               |         | t <sub>D(ON)</sub>  | V <sub>DD</sub> =15V, R <sub>L</sub> =0.625Ω,<br>I <sub>D</sub> =24A, V <sub>GEN</sub> =10V, R <sub>G</sub> =1Ω      |     | 18   | 27   | ns   |
| Rise Time                                        |         | t <sub>R</sub>      |                                                                                                                      |     | 11   | 17   | ns   |
| Turn-OFF Delay Time                              |         | t <sub>D(OFF)</sub> |                                                                                                                      |     | 70   | 105  | ns   |
| Fall-Time                                        |         | t <sub>F</sub>      |                                                                                                                      |     | 10   | 15   | ns   |
| Turn-ON Delay Time                               |         | t <sub>D(ON)</sub>  | V <sub>DD</sub> =15V, R <sub>L</sub> =0.67Ω,<br>I <sub>D</sub> =22.5A, V <sub>GEN</sub> =4.5V,<br>R <sub>G</sub> =1Ω |     | 55   | 83   | ns   |
| Rise Time                                        |         | t <sub>R</sub>      |                                                                                                                      |     | 180  | 270  | ns   |
| Turn-OFF Delay Time                              |         | t <sub>D(OFF)</sub> |                                                                                                                      |     | 55   | 83   | ns   |
| Fall-Time                                        |         | t <sub>F</sub>      |                                                                                                                      |     | 12   | 18   | ns   |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS  |         |                     |                                                                                                                      |     |      |      |      |
| Maximum Body-Diode Continuous Current            |         | I <sub>S</sub>      | T <sub>C</sub> =25°C                                                                                                 |     |      | 90   | A    |
| Maximum Body-Diode Pulsed Current (Note 1)       |         | I <sub>SM</sub>     |                                                                                                                      |     |      | 90   | A    |
| Drain-Source Diode Forward Voltage               |         | V <sub>SD</sub>     | I <sub>S</sub> =22A                                                                                                  |     | 0.8  | 1.2  | V    |
| Body Diode Reverse Recovery Time                 |         | t <sub>rr</sub>     | I <sub>F</sub> =20A, di/dt=100A/μs,<br>T <sub>J</sub> =25°C                                                          |     | 52   | 78   | ns   |

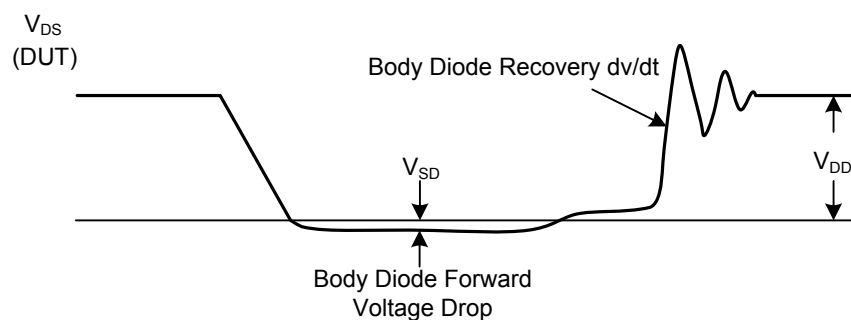
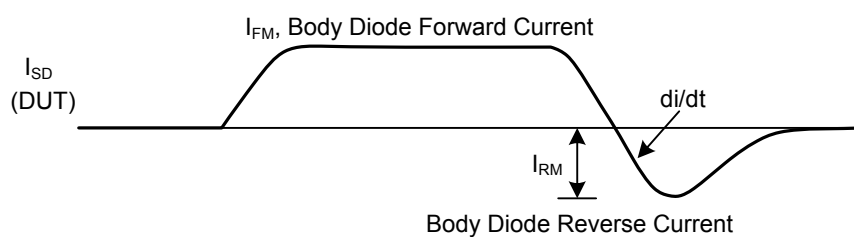
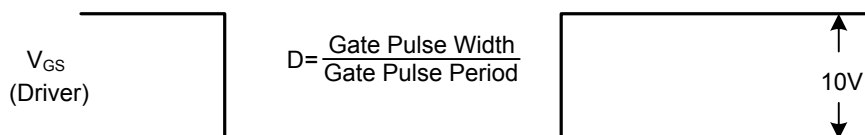
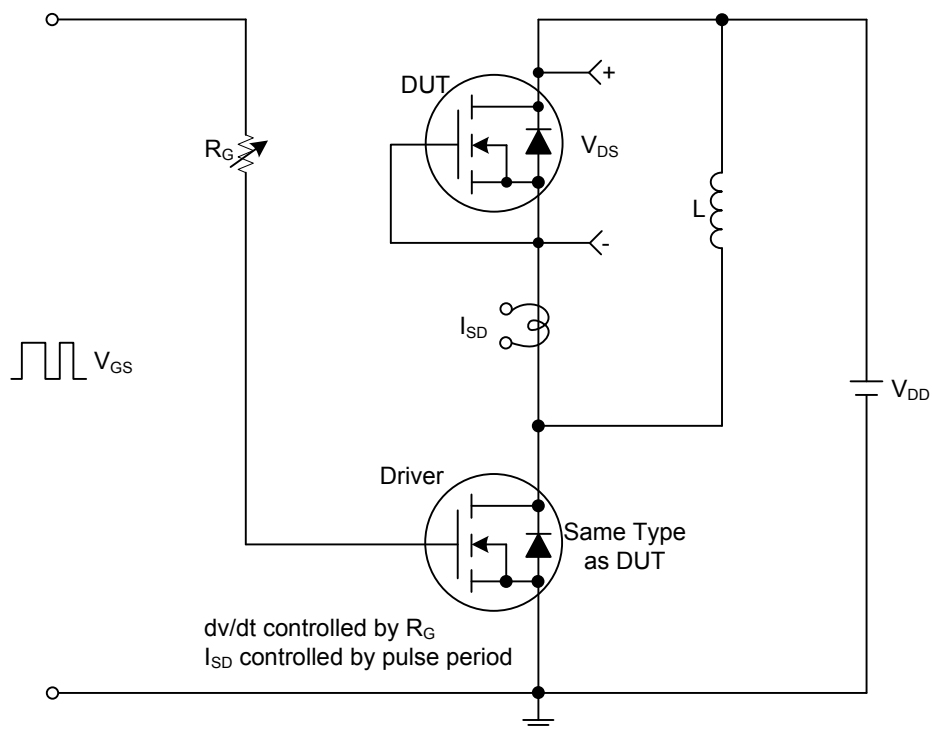
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$ , Duty cycles $\leq 2\%$ .

2. Guaranteed by design, not subject to production testing.

## ■ TEST CIRCUITS AND WAVEFORMS

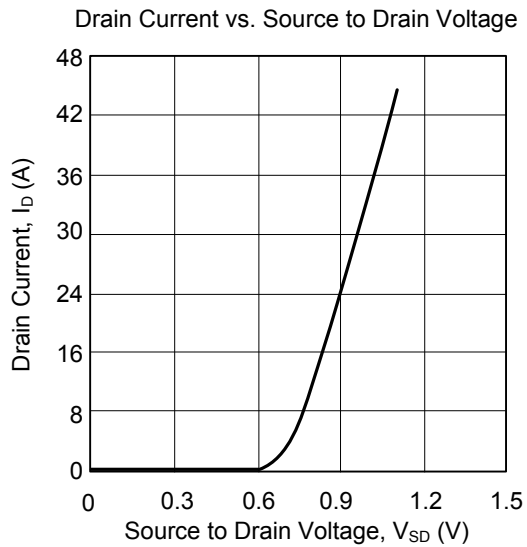


## ■ TEST CIRCUITS AND WAVEFORMS(Cont.)



Peak Diode Recovery dv/dt Test Circuit and Waveforms

## ■ TYPICAL CHARACTERISTICS



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