



## UFZ44

Power MOSFET

### 50 A, 60 V N-CHANNEL POWER MOSFET

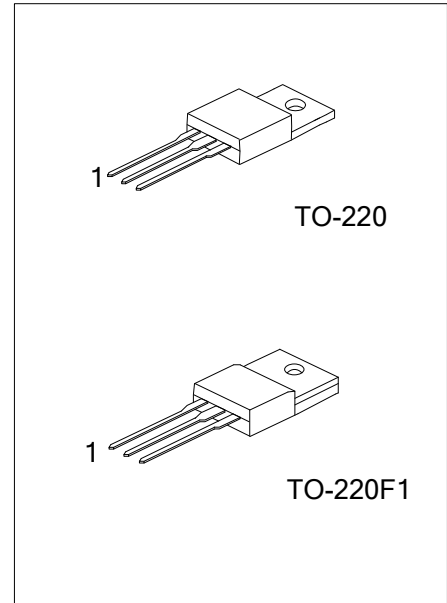
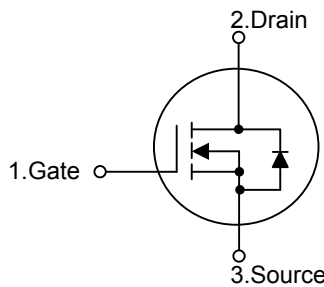
#### DESCRIPTION

The UTC **UFZ44** is an N-channel mode Power MOSFET, using UTC's advanced technology to provide customers with a minimum on-state resistance, superior switching performance, cost-effectiveness and ruggedized device design.

#### FEATURES

- \*  $R_{DS(ON)} < 28m\Omega @ V_{GS}=10V, I_D=31A$
- \* High Switching Speed
- \* Improved dv/dt Capability

#### SYMBOL



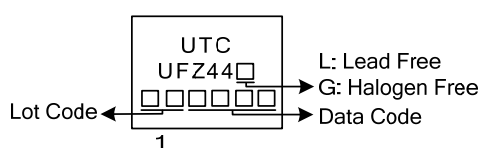
#### ORDERING INFORMATION

| Ordering Number |              | Package  | Pin Assignment |   |   | Packing |
|-----------------|--------------|----------|----------------|---|---|---------|
| Lead Free       | Halogen Free |          | 1              | 2 | 3 |         |
| UFZ44L-TA3-T    | UFZ44G-TA3-T | TO-220   | G              | D | S | Tube    |
| UFZ44L-TF1-T    | UFZ44G-TF1-T | TO-220F1 | G              | D | S | Tube    |

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

|   |   |
|---|---|
| <p>UFZ44L-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p> | <p>(1) T: Tube</p> <p>(2) TA3: TO-220, TF1: TO-220F1</p> <p>(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                    |                             |                                 | $V_{DSS}$ | 60       | V                   |
| Gate-Source Voltage                     |                             |                                 | $V_{GSS}$ | $\pm 20$ | V                   |
| Drain Current                           | Continuous, $V_{GS}$ at 10V | $T_C=25^\circ\text{C}$ (Note 2) | $I_D$     | 50       | A                   |
|   |                             | $T_C=100^\circ\text{C}$         |           | 36       | A                   |
|   | Pulsed (Note 3)             |                                 | $I_{DM}$  | 200      | A                   |
| Single Pulsed Avalanche Energy (Note 4) |                             |                                 | $E_{AS}$  | 100      | mJ                  |
| Peak Diode Recovery $dv/dt$ (Note 5)    |                             |                                 | $dv/dt$   | 4.5      | V/ns                |
| Power Dissipation                       | $T_C=25^\circ\text{C}$      | TO-220                          | $P_D$     | 150      | W                   |
|   |                             | TO-220F1                        |           | 70       | W                   |
| Linear De-rating Factor                 |                             |                                 |           | 1.0      | W/ $^\circ\text{C}$ |
| 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. Current limited by the package, (die current = 51 A).
3. Repetitive rating; pulse width limited by maximum junction temperature.
4.  $V_{DD} = 25\text{ V}$ , starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 44\text{ }\mu\text{H}$ ,  $R_G = 25\text{ }\Omega$ ,  $I_{AS} = 51\text{ A}$ .
5.  $I_{SD} \leq 51\text{ A}$ ,  $di/dt \leq 250\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 175\text{ }^\circ\text{C}$ .

■ THERMAL DATA

| PARAMETER           |                 | SYMBOL        | RATINGS | UNIT                      |
|---------------------|-----------------|---------------|---------|---------------------------|
| Junction to Ambient | TO-220/TO-220F1 | $\theta_{JA}$ | 62      | $^\circ\text{C}/\text{W}$ |
| Junction to Case    | TO-220          | $\theta_{JC}$ | 1.0     | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F1        |               | 1.78    | $^\circ\text{C}/\text{W}$ |

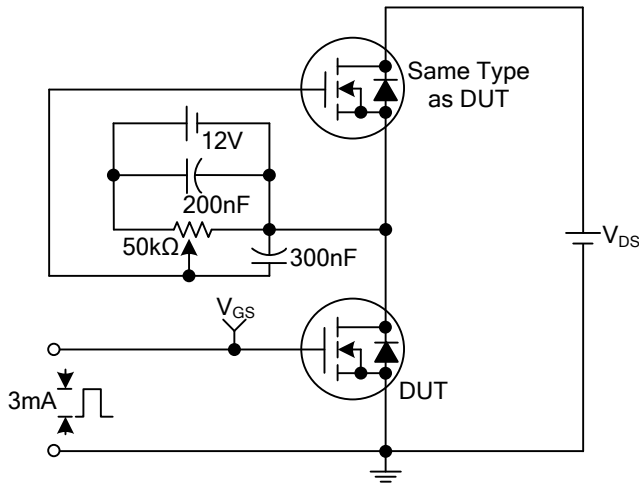
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

| PARAMETER   | SYMBOL                              | TEST CONDITIONS   | MIN | TYP   | MAX  | UNIT |
|---|-------------------------------------|---|-----|-------|------|------|
| <b>OFF CHARACTERISTICS</b>                            |                                     |   |     |       |      |      |
| Drain-Source Breakdown Voltage                        | BV <sub>DSS</sub>                   | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V  | 60  |       |      | V    |
| Breakdown Voltage Temperature Coefficient             | ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | Reference to 25°C, I <sub>D</sub> =1mA  |     | 0.060 |      | V/°C |
| Drain-Source Leakage Current                          | I <sub>DSS</sub>                    | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V   |     |       | 25   | μA   |
|   |                                     | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C                                  |     |       | 250  |      |
| Gate- Source Leakage Current                          | Forward                             | V <sub>GS</sub> =+20V   |     |       | +100 | nA   |
|   | Reverse                             | V <sub>GS</sub> =-20V,  |     |       | -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  | 2.0 |       | 4.0  | V    |
| Static Drain-Source On-State Resistance               | R <sub>DS(ON)</sub>                 | V <sub>GS</sub> =10V, I <sub>D</sub> =31A (Note 2)  |     |       | 28   | mΩ   |
| <b>DYNAMIC PARAMETERS</b>                             |                                     |   |     |       |      |      |
| Input Capacitance                                     | C <sub>ISS</sub>                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz   |     | 1900  |      | pF   |
| Output Capacitance                                    | C <sub>OSS</sub>                    |   |     | 920   |      | pF   |
| Reverse Transfer Capacitance                          | C <sub>RSS</sub>                    |   |     | 170   |      | pF   |
| <b>SWITCHING PARAMETERS</b>                           |                                     |   |     |       |      |      |
| Total Gate Charge                                     | Q <sub>G</sub>                      | V <sub>GS</sub> =10V, V <sub>DS</sub> =48V, I <sub>D</sub> =51A (Note 2)                          |     |       | 67   | nC   |
| Gate to Source Charge                                 | Q <sub>GS</sub>                     |   |     |       | 18   | nC   |
| Gate to Drain Charge                                  | Q <sub>GD</sub>                     |   |     |       | 25   | nC   |
| Turn-ON Delay Time                                    | t <sub>D(ON)</sub>                  | V <sub>DD</sub> =30V, I <sub>D</sub> =51A, R <sub>G</sub> =9.1Ω, R <sub>D</sub> =0.55 Ω (Note 2)  |     | 14    |      | ns   |
| Rise Time   | t <sub>R</sub>                      |   |     | 110   |      | ns   |
| Turn-OFF Delay Time                                   | t <sub>D(OFF)</sub>                 |   |     | 45    |      | ns   |
| Fall-Time   | t <sub>F</sub>                      |   |     | 92    |      | ns   |
| Internal Drain Inductance                             | L <sub>D</sub>                      | Between lead, 6 mm (0.25") from package and center of die contact                                 |     |       | 4.5  | nH   |
| Internal Source Inductance                            | L <sub>S</sub>                      |   |     |       | 7.5  | nH   |
| <b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b> |                                     |   |     |       |      |      |
| Maximum Body-Diode Continuous Current                 | I <sub>S</sub>                      | MOSFET symbol showing the integral reverse p - n junction diode                                   |     |       | 50   | A    |
| Maximum Body-Diode Pulsed Current                     | I <sub>SM</sub>                     |   |     |       | 200  | A    |
| Drain-Source Diode Forward Voltage                    | V <sub>SD</sub>                     | I <sub>S</sub> =51A, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C(Note 2)                            |     |       | 2.5  | V    |
| Body Diode Reverse Recovery Time                      | t <sub>RR</sub>                     | I <sub>F</sub> =51A, dI/dt=100A/μs, T <sub>J</sub> =25°C  |     | 120   | 180  | ns   |
| Body Diode Reverse Recovery Charge                    | Q <sub>RR</sub>                     |   |     | 0.53  | 0.80 | nC   |
| Forward Turn-On Time                                  | t <sub>ON</sub>                     | Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> and L <sub>D</sub> ) |     |       |      |      |

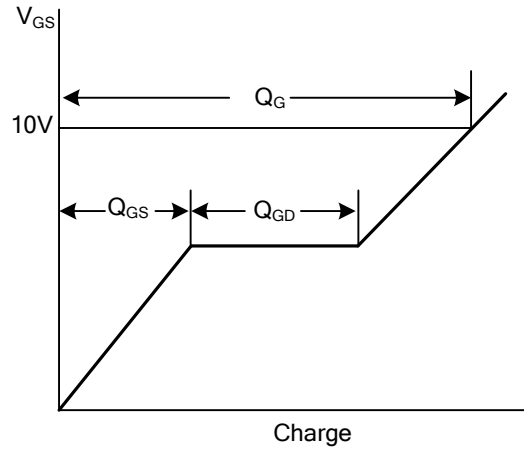
Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature.  
 2. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

## TEST CIRCUITS AND WAVEFORMS

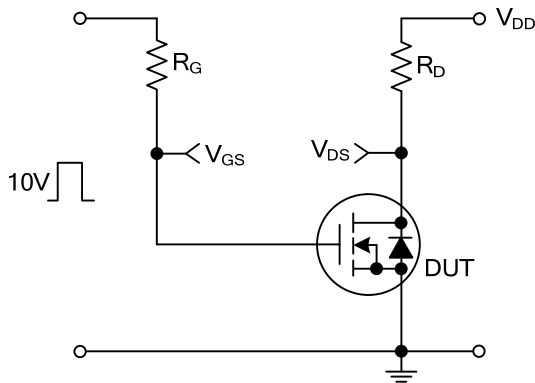
Gate Charge Test Circuit



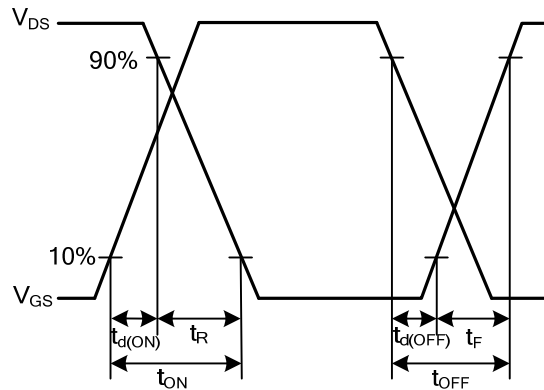
Gate Charge Waveforms



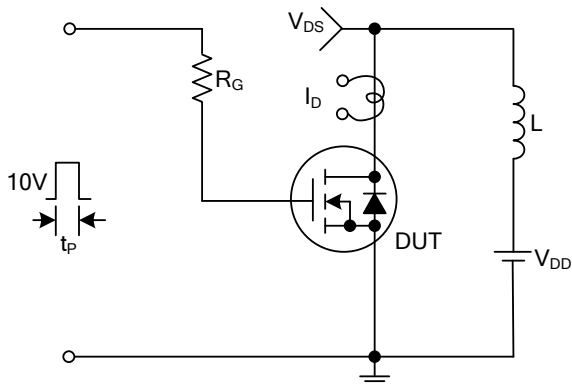
Resistive Switching Test Circuit



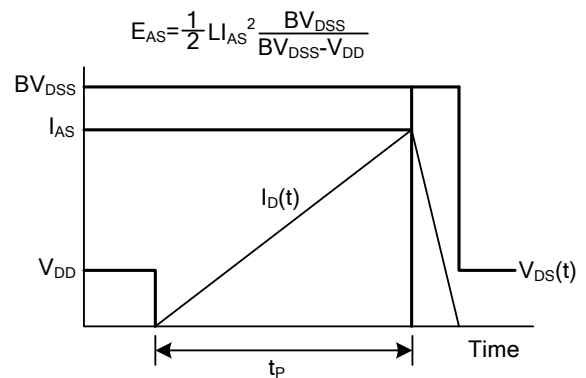
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

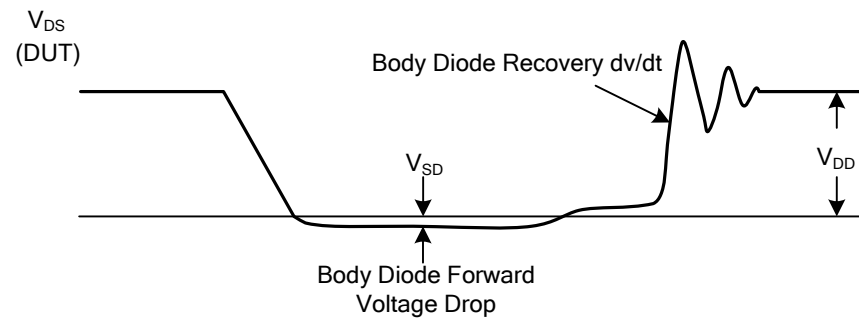
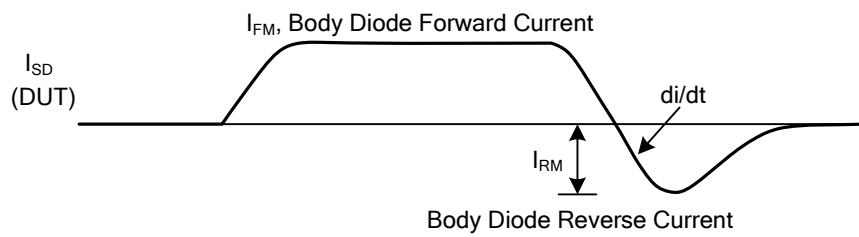
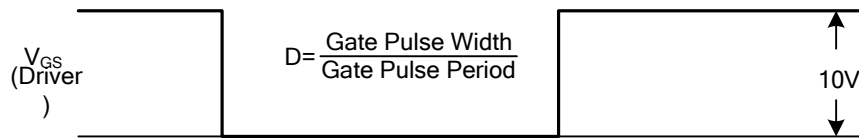
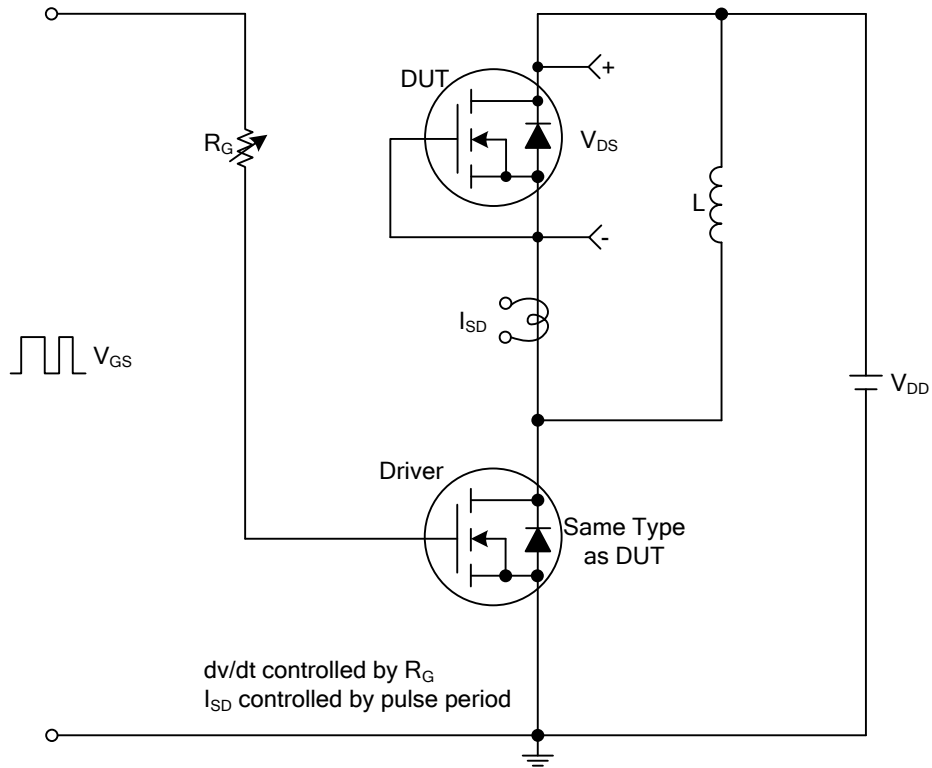


Unclamped Inductive Switching Waveforms

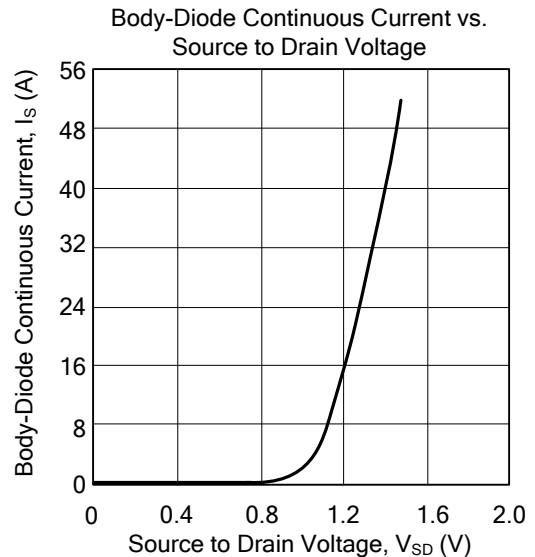
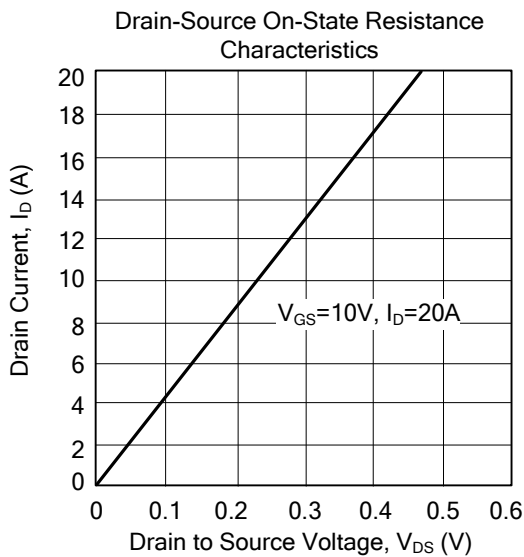
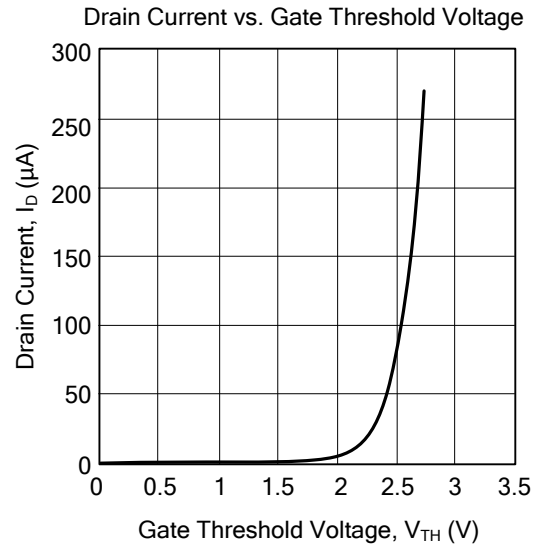
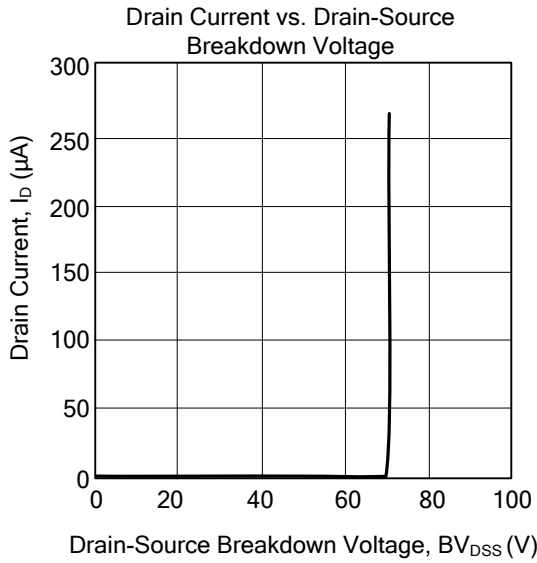


■ TEST CIRCUITS AND WAVEFORMS(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms



## TYPICAL CHARACTERISTICS



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