



## UF830K-TC

Power MOSFET

### 4.5A, 500V N-CHANNEL POWER MOSFET

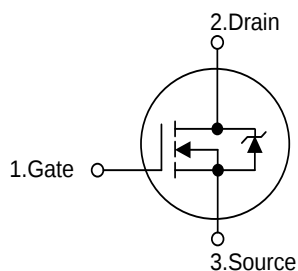
#### DESCRIPTION

The UTC **UF830K-TC** is a N-Channel enhancement mode silicon gate power MOSFET is designed high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.

#### FEATURES

- \*  $R_{DS(ON)} \leq 1.65 \Omega$  @  $V_{GS}=10V$ ,  $I_D=2.5A$
- \* Single Pulse Avalanche Energy Rated
- \* Rugged- SOA is Power Dissipation Limited
- \* Fast Switching Speeds
- \* Linear Transfer Characteristics
- \* High Input Impedance

#### SYMBOL



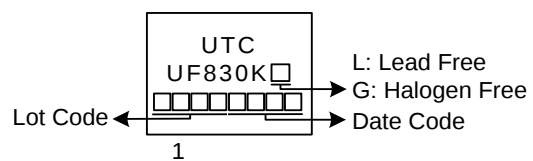
#### ORDERING INFORMATION

| Ordering Number |               | Package  | Pin Assignment |   |   | Packing   |
|-----------------|---------------|----------|----------------|---|---|-----------|
| Lead Free       | Halogen Free  |          | 1              | 2 | 3 |           |
| UF830KL-TA3-T   | UF830KG-TA3-T | TO-220   | G              | D | S | Tube      |
| UF830KL-TF1-T   | UF830KG-TF1-T | TO-220F1 | G              | D | S | Tube      |
| UF830KL-TF2-T   | UF830KG-TF2-T | TO-220F2 | G              | D | S | Tube      |
| UF830KL-TF3-T   | UF830KG-TF3-T | TO-220F  | G              | D | S | Tube      |
| UF830KL-TM3-T   | UF830KG-TM3-T | TO-251   | G              | D | S | Tube      |
| UF830KL-TN3-R   | UF830KG-TN3-R | TO-252   | G              | D | S | Tape Reel |
| UF830KL-TQ2-T   | UF830KG-TQ2-T | TO-263   | G              | D | S | Tube      |
| UF830KL-TQ2-R   | UF830KG-TQ2-R | TO-263   | G              | D | S | Tape Reel |

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

|                                                                                               |  |                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>UF830KG-TA3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p> |  | <p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252 TQ2: TO-263</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|-----------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## ■ MARKING



### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, Unless Otherwise Specified)

| PARAMETER                                                                 |                  | SYMBOL           | RATINGS    | UNIT |
|---------------------------------------------------------------------------|------------------|------------------|------------|------|
| Drain to Source Voltage (T <sub>J</sub> =25°C ~125°C)                     |                  | V <sub>DS</sub>  | 500        | V    |
| Drain to Gate Voltage (R <sub>G</sub> =20kΩ, T <sub>J</sub> =25°C ~125°C) |                  | V <sub>DGR</sub> | 500        | V    |
| Gate to Source Voltage                                                    |                  | V <sub>GS</sub>  | ±30        | V    |
| Drain Current                                                             | Continuous       | I <sub>D</sub>   | 4.5        | A    |
|                                                                           | Pulsed           | I <sub>DM</sub>  | 18         | A    |
| Peak Diode Recovery dv/dt (Note 3)                                        |                  | dv/dt            | 2          | V/ns |
| Power Dissipation                                                         | TO-220/TO-263    | P <sub>D</sub>   | 73         | W    |
|                                                                           | TO-220F/TO-220F1 |                  | 38         | W    |
|                                                                           | TO-220F2         |                  | 40         | W    |
|                                                                           | TO-251/TO-252    |                  | 46         | W    |
| Single Pulse Avalanche Energy Rating (Note 2)                             |                  | E <sub>AS</sub>  | 110        | mJ   |
| Junction Temperature                                                      |                  | T <sub>J</sub>   | +150       | °C   |
| Storage Temperature                                                       |                  | 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. L = 10mH, I<sub>AS</sub> = 4.5A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C

3. I<sub>SD</sub> ≤ 4.5A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C

### ■ THERMAL DATA

| PARAMETER           |                   | SYMBOL          | RATING | UNIT |
|---------------------|-------------------|-----------------|--------|------|
| Junction to Ambient | TO-220/TO-220F    | θ <sub>JA</sub> | 62.5   | °C/W |
|                     | TO-220F1/TO-220F2 |                 |        |      |
|                     | TO-263            |                 | 100.3  |      |
| Junction to Case    | TO-251/TO-252     | θ <sub>JC</sub> | 1.71   | °C/W |
|                     | TO-220/TO-263     |                 | 3.31   |      |
|                     | TO-220F/TO-220F1  |                 | 3.125  |      |
|                     | TO-220F2          |                 | 2.7    |      |

### ■ ELECTRICAL SPECIFICATIONS (T<sub>J</sub>=25°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                                                            | 500 |     |      | V    |
| Drain-Source Leakage Current            | I <sub>DSS</sub>    | V <sub>DS</sub> = Rated BV <sub>DSS</sub> , V <sub>GS</sub> =0V                                       |     |     | 25   | μA   |
| Gate-Source Leakage Current             | I <sub>GSS</sub>    | V <sub>GS</sub> =±30V                                                                                 |     |     | ±100 | nA   |
| ON CHARACTERISTICS                      |                     |                                                                                                       |     |     |      |      |
| Gate Threshold Voltage                  | V <sub>GS(TH)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA                                              | 2.0 |     | 4.0  | V    |
| Static Drain-Source On-State Resistance | R <sub>DS(ON)</sub> | I <sub>D</sub> =2.5A, V <sub>GS</sub> =10V                                                            |     |     | 1.65 | Ω    |
| DYNAMIC PARAMETERS                      |                     |                                                                                                       |     |     |      |      |
| Input Capacitance                       | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz                                                   |     | 267 |      | pF   |
| Output Capacitance                      | C <sub>OSS</sub>    |                                                                                                       |     | 64  |      | pF   |
| Reverse Transfer Capacitance            | C <sub>RSS</sub>    |                                                                                                       |     | 7   |      | pF   |
| SWITCHING PARAMETERS                    |                     |                                                                                                       |     |     |      |      |
| Total Gate Charge (Note 1)              | Q <sub>G</sub>      | V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =1.3A<br>I <sub>G</sub> = 100μA (Note1, 2) |     | 41  |      | nC   |
| Gate-Source Charge                      | Q <sub>GS</sub>     |                                                                                                       |     | 4   |      | nC   |
| Gate-Drain Charge                       | Q <sub>GD</sub>     |                                                                                                       |     | 4   |      | nC   |
| Turn-On Delay Time (Note 1)             | t <sub>D(ON)</sub>  | V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A,<br>R <sub>G</sub> =25Ω (Note1, 2)   |     | 44  |      | ns   |
| Turn-On Rise Time                       | t <sub>R</sub>      |                                                                                                       |     | 49  |      | ns   |
| Turn-Off Delay Time                     | t <sub>D(OFF)</sub> |                                                                                                       |     | 268 |      | ns   |
| Turn-Off Fall Time                      | t <sub>F</sub>      |                                                                                                       |     | 79  |      | ns   |
| SOURCE TO DRAIN DIODE SPECIFICATIONS    |                     |                                                                                                       |     |     |      |      |
| Continuous Source to Drain Current      | I <sub>S</sub>      | (Note 4)                                                                                              |     |     | 4.5  | A    |
| Pulse Source to Drain Current           | I <sub>SD</sub>     |                                                                                                       |     |     | 18   | A    |
| Source to Drain Diode Voltage (Note 1)  | V <sub>SD</sub>     | I <sub>SD</sub> =4.5A, V <sub>GS</sub> =0V                                                            |     |     | 1.6  | V    |
| Reverse Recovery Time (Note 1)          | t <sub>rr</sub>     | I <sub>SD</sub> =4.5A, V <sub>GS</sub> =0V,                                                           |     | 250 |      | nS   |
| Reverse Recovery Charge                 | Q <sub>rr</sub>     | dI <sub>F</sub> / dt =100A/μs                                                                         |     | 1.0 |      | μC   |

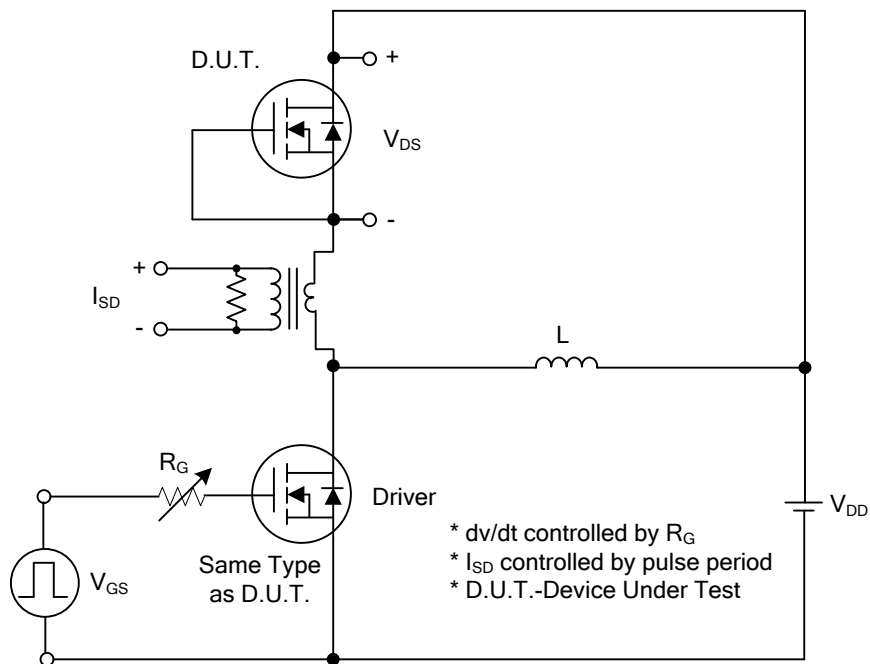
Notes: 1. Pulse Test: Pulse width≤300μs, Duty Cycle≤2%.

2. MOSFET Switching Times are Essentially Independent of Operating Temperature.

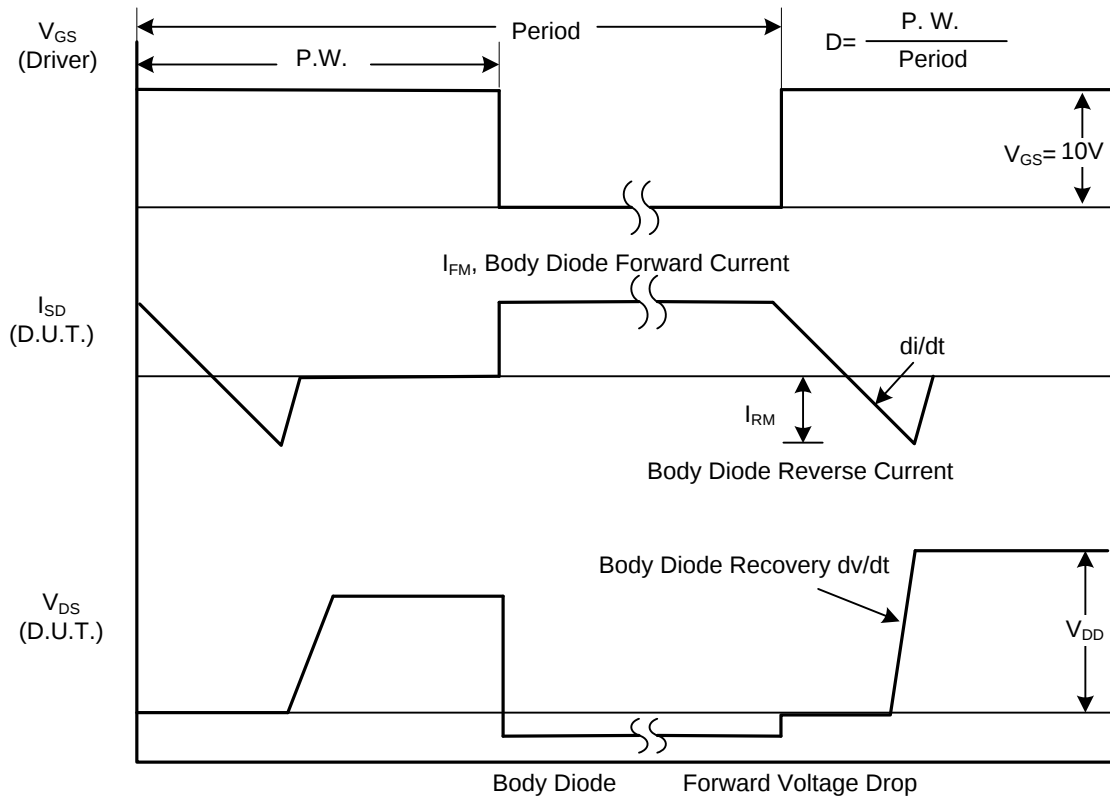
3. Gate Charge is Essentially Independent of Operating Temperature.

4. Modified MOSFET symbol showing the integral reverse P-N junction diode as below.

### ■ TEST CIRCUITS AND WAVEFORMS

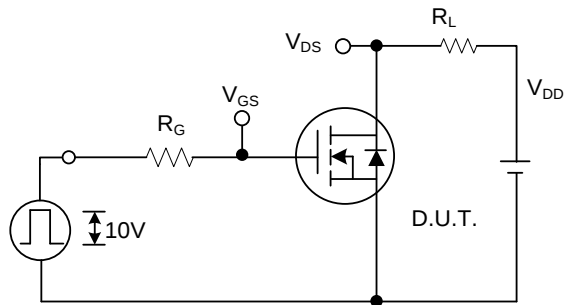


Peak Diode Recovery dv/dt Test Circuit

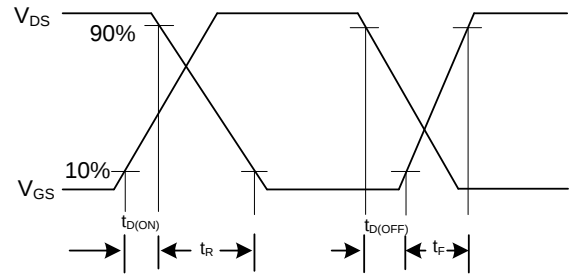


Peak Diode Recovery dv/dt Waveforms

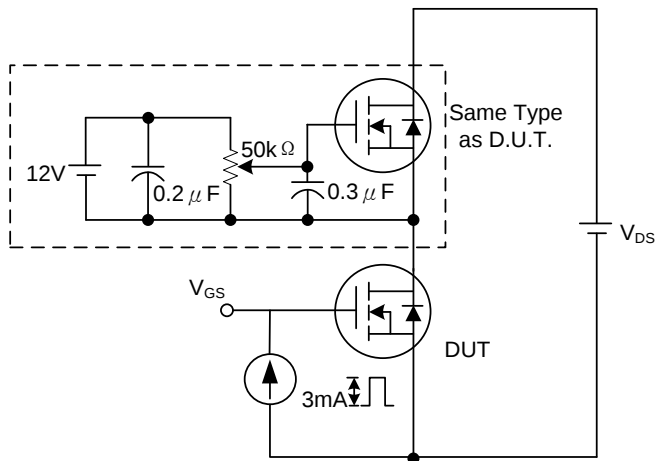
### ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



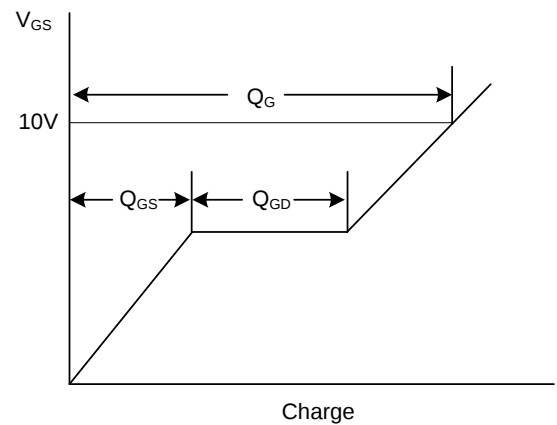
Switching Test Circuit



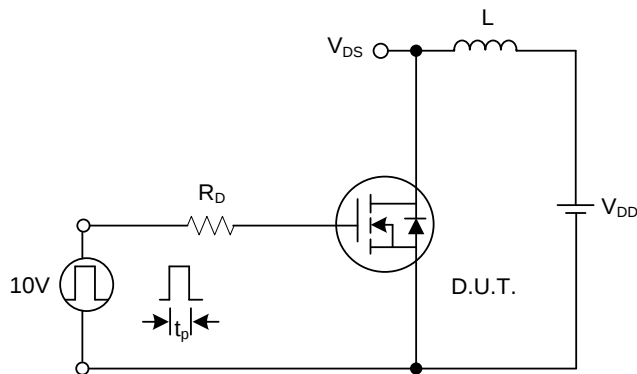
Switching Waveforms



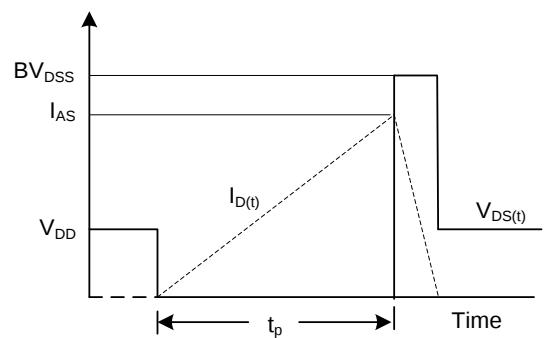
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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