



# 15N06

**Power MOSFET**

## 15A, 60V N-CHANNEL POWER MOSFET

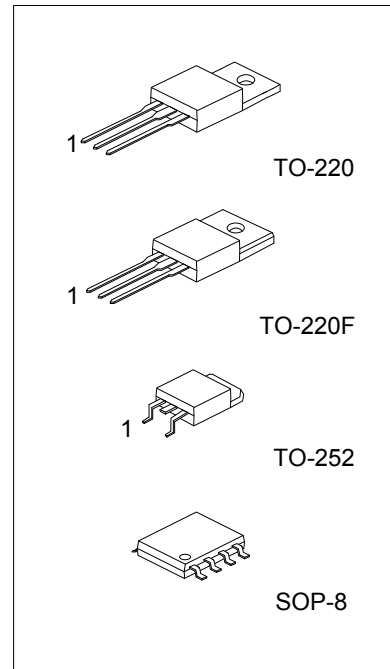
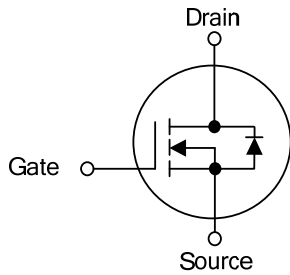
■ DESCRIPTION

The UTC **15N06** uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

■ FEATURES

- \*  $R_{DS(ON)} < 100m\Omega @ V_{GS}=5V, I_D=7.5A$
- \* Low capacitance
- \* Low gate charge
- \* Fast switching capability
- \* Avalanche energy specified

■ SYMBOL

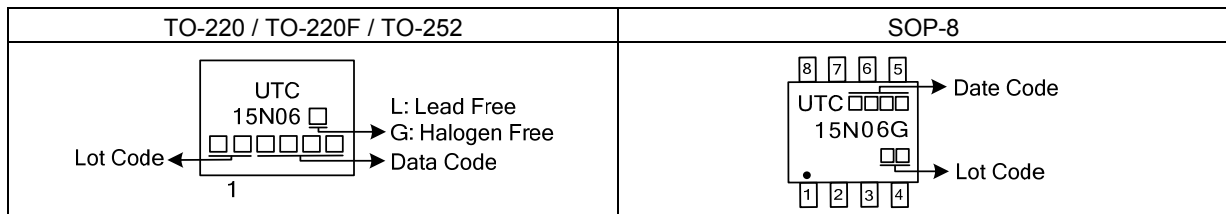


■ ORDERING INFORMATION

| Ordering Number |              | Package | Pin Assignment |   |   |   |   |   |   |   | Packing |           |
|-----------------|--------------|---------|----------------|---|---|---|---|---|---|---|---------|-----------|
| Lead Free       | Halogen Free |         | 1              | 2 | 3 | 4 | 5 | 6 | 7 | 8 |         |           |
| 15N06L-TA3-T    | 15N06G-TA3-T | TO-220  | G              | D | S | - | - | - | - | - | -       | Tube      |
| 15N06L-TF3-T    | 15N06G-TF3-T | TO-220F | G              | D | S | - | - | - | - | - | -       | Tube      |
| 15N06L-TN3-R    | 15N06G-TN3-R | TO-252  | G              | D | S | - | - | - | - | - | -       | Tape Reel |
| -               | 15N06G-S08-R | SOP-8   | S              | S | S | G | D | D | D | D | D       | Tape Reel |

|   |  |
|---|--|
| <p>15N06L-TA3-T</p> <p>(1)Packing Type<br/>(2)Package Type<br/>(3)Green Package</p> | <p>(1) R: Tape Reel, T: Tube<br/>(2) TA3: TO-220, TF3: TO-220F, TN3: TO-252<br/>S08: SOP-8<br/>(3) L: Lead Free, G: Halogen Free and Lead Free</p> |
|---|--|

■ MARKING



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

| PARAMETER   |                        | SYMBOL    | RATINGS    | UNIT             |
|---|------------------------|-----------|------------|------------------|
| Drain-Source Voltage                                |                        | $V_{DSS}$ | 60         | V                |
| Drain-Gate Voltage ( $R_G=20k\Omega$ )              |                        | $V_{DGR}$ | 60         | V                |
| Gate-Source Voltage                                 |                        | $V_{GSS}$ | $\pm 15$   | V                |
| Continuous Drain Current ( $T_C=25^\circ\text{C}$ ) |                        | $I_D$     | 15         | A                |
| Pulsed Drain Current (Note 2)                       |                        | $I_{DM}$  | 60         | A                |
| Avalanche Current (Note 3)                          |                        | $I_{AR}$  | 15         | A                |
| Avalanche Energy                                    | Single Pulsed (Note 4) | $E_{AS}$  | 50         | mJ               |
|   | Repetitive (Note 3)    | $E_{AR}$  | 12         | mJ               |
| Power Dissipation<br>( $T_A=25^\circ\text{C}$ )     | TO-220                 | $P_D$     | 2.2        | W                |
|   | TO-220F                |           | 2.0        |                  |
|   | TO-252                 |           | 1.5        |                  |
|   | SOP-8                  |           | 2.0        |                  |
| Junction Temperature                                |                        | $T_J$     | +175       | $^\circ\text{C}$ |
| Storage Temperature                                 |                        | $T_{STG}$ | -65 ~ +175 | $^\circ\text{C}$ |

Note: 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. Pulse width limited by safe operating area.

3. Pulse width limited by  $T_{J(MAX)}$ ,  $\delta < 1\%$

4. Starting  $T_J=25^\circ\text{C}$ ,  $I_D=I_{AR}$ ,  $V_{DD}=25\text{V}$

■ THERMAL DATA

| PARAMETER           |              | SYMBOL        | RATINGS | UNIT                      |
|---------------------|--------------|---------------|---------|---------------------------|
| Junction to Ambient | TO-220/SOP-8 | $\theta_{JA}$ | 58      | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F      |               | 62.5    |                           |
|                     | TO-252       |               | 100     |                           |
| Junction to Case    | TO-220       | $\theta_{JC}$ | 4.38    | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F      |               | 5       |                           |
|                     | TO-252       |               | 3       |                           |

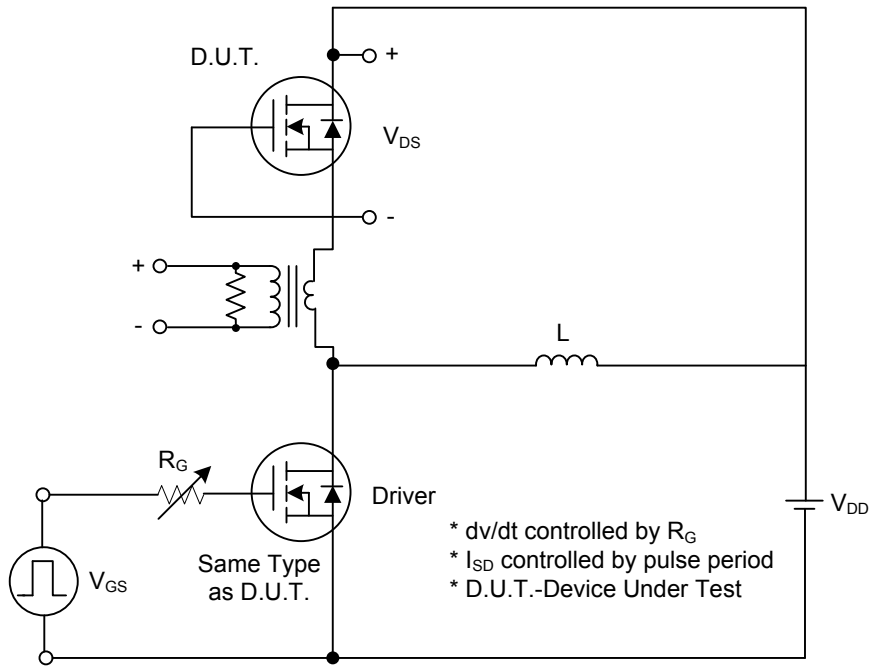
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

| PARAMETER  | SYMBOL              | TEST CONDITIONS  | MIN | TYP | MAX  | UNIT |
|--|---------------------|--|-----|-----|------|------|
| <b>OFF CHARACTERISTICS</b>                             |                     |  |     |     |      |      |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA   | 60  |     |      | V    |
| Drain-Source Leakage Current                           | I <sub>DSS</sub>    | V <sub>DS</sub> =Max Rating  |     |     | 250  | μA   |
| Gate-Source Leakage Current                            | I <sub>GSS</sub>    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±15V   |     |     | ±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> =250 μA                                | 1   | 1.7 | 2.5  | V    |
| On State Drain Current                                 | I <sub>D(ON)</sub>  | V <sub>DS</sub> >I <sub>D(ON)</sub> ×R <sub>DS(ON)MAX</sub> , V <sub>GS</sub> =10V       | 15  |     |      | A    |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | V <sub>GS</sub> =5V, I <sub>D</sub> =7.5A  |     | 75  | 100  | mΩ   |
| Forward Transconductance (Note 1)                      | g <sub>FS</sub>     | V <sub>DS</sub> >I <sub>D(ON)</sub> ×R <sub>DS(ON)MAX</sub> , I <sub>D</sub> =7.5A       | 3   | 5   |      | S    |
| <b>DYNAMIC PARAMETERS</b>                              |                     |  |     |     |      |      |
| Input Capacitance                                      | C <sub>ISS</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz  |     | 700 | 950  | pF   |
| Output Capacitance                                     | C <sub>OSS</sub>    |  |     | 230 | 310  | pF   |
| Reverse Transfer Capacitance                           | C <sub>RSS</sub>    |  |     | 80  | 110  | pF   |
| <b>SWITCHING PARAMETERS</b>                            |                     |  |     |     |      |      |
| Turn-ON Delay Time                                     | t <sub>D(ON)</sub>  | V <sub>GS</sub> =5V, V <sub>DD</sub> =30V, R <sub>G</sub> =4.7Ω,<br>I <sub>D</sub> =7.5A |     | 15  | 60   | ns   |
| Turn-ON Rise Time                                      | t <sub>r</sub>      |  |     | 160 | 200  |      |
| Turn-OFF Delay Time                                    | t <sub>D(OFF)</sub> | V <sub>GS</sub> =10V, V <sub>DD</sub> =48V, R <sub>G</sub> =47Ω,<br>I <sub>D</sub> =15A  |     | 52  | 80   | ns   |
| Turn-OFF Fall-Time                                     | t <sub>f</sub>      |  |     | 100 | 140  |      |
| Total Gate Charge                                      | Q <sub>G</sub>      | V <sub>DD</sub> =40V, V <sub>GS</sub> =5V, I <sub>D</sub> =15A                           |     | 18  | 30   | nC   |
| Gate Source Charge                                     | Q <sub>GS</sub>     |  |     | 8   |      |      |
| Gate Drain Charge                                      | Q <sub>GD</sub>     |  |     | 9   |      |      |
| <b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b> |                     |  |     |     |      |      |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | I <sub>SD</sub> =15 A, V <sub>GS</sub> =0V(Note 1)                                       |     |     | 1.5  | V    |
| Source-Drain Current                                   | I <sub>SD</sub>     |  |     |     | 15   | A    |
| Source-Drain Current (Pulse)                           | I <sub>SDM</sub>    | (Note 2)   |     |     | 60   | A    |

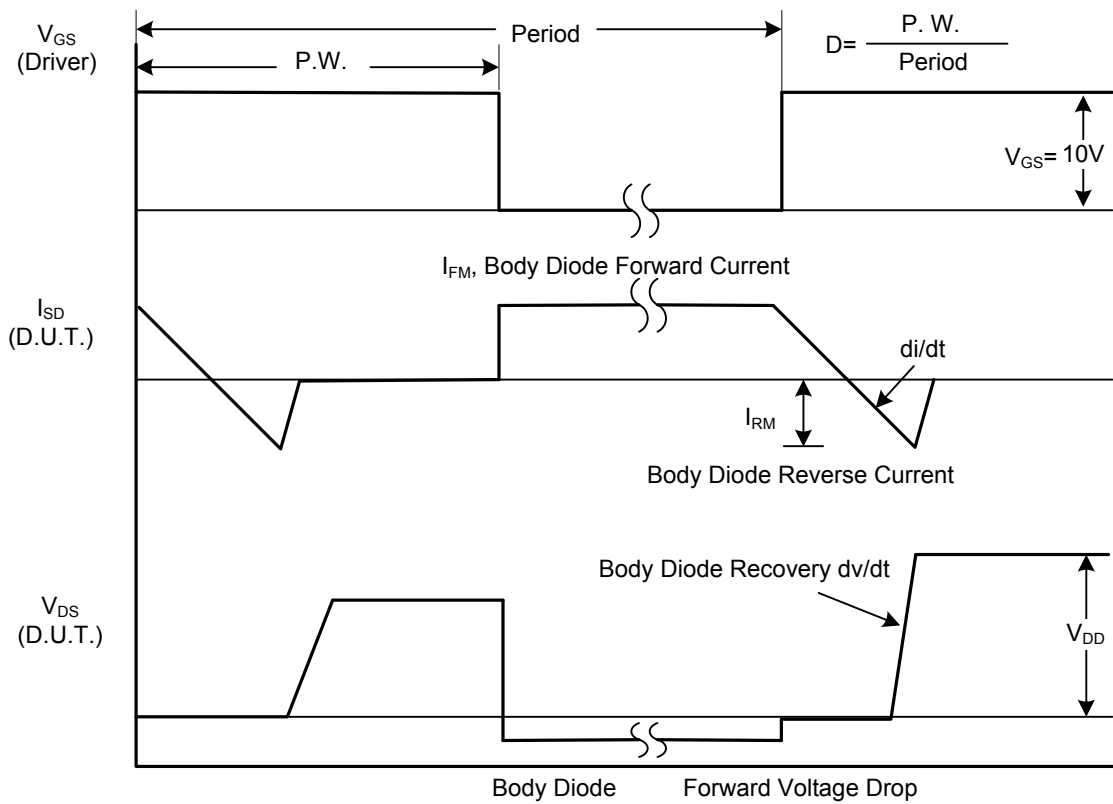
Notes: 1. Pulse width=300μs, duty cycle=1.5%

2. Pulse width limited by safe operating area.

■ TEST CIRCUITS AND WAVEFORMS

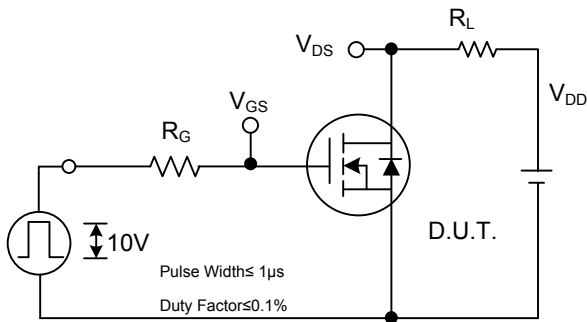


Peak Diode Recovery  $dv/dt$  Test Circuit

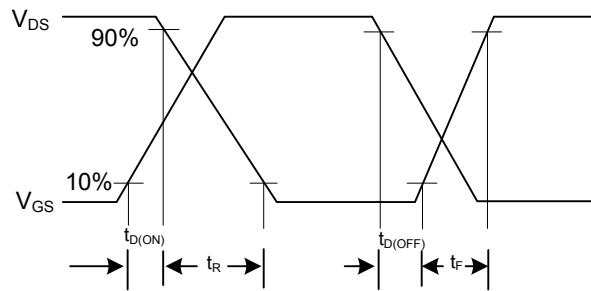


Peak Diode Recovery  $dv/dt$  Waveforms

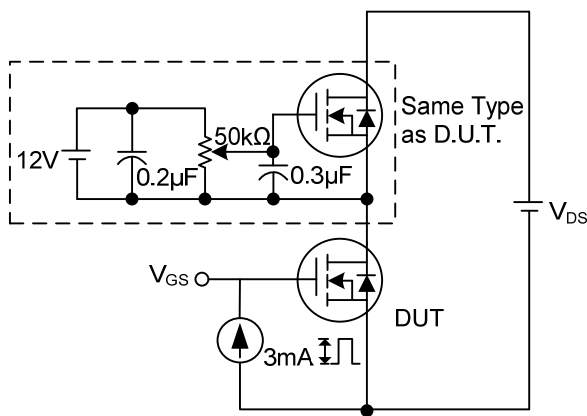
## TEST CIRCUITS AND WAVEFORMS (Cont.)



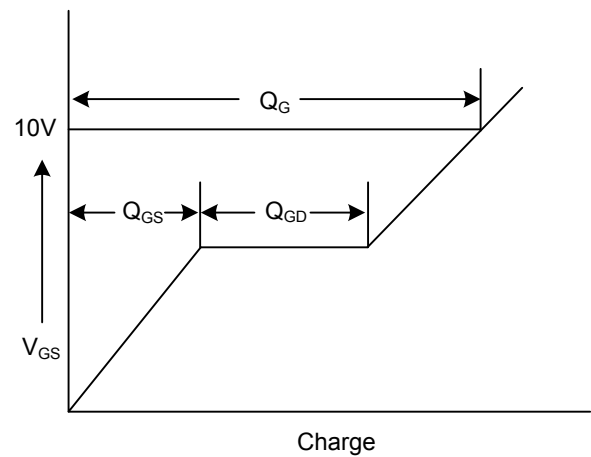
**Switching Test Circuit**



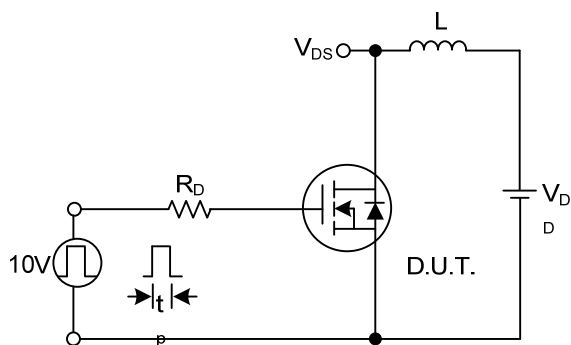
**Switching Waveforms**



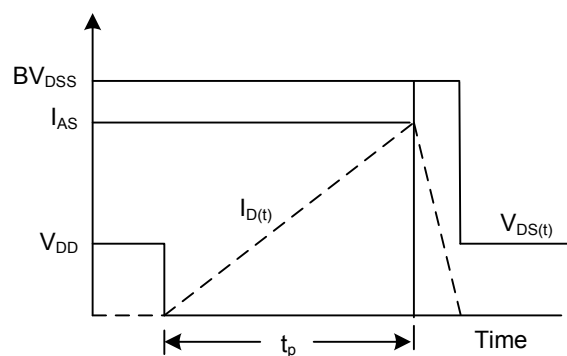
**Gate Charge Test Circuit**



**Gate Charge Waveform**

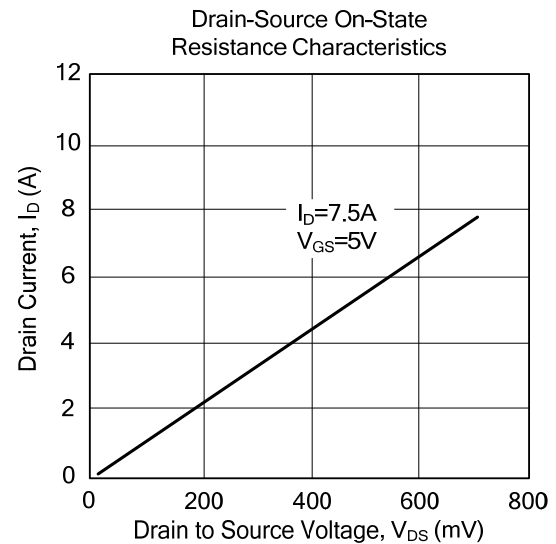
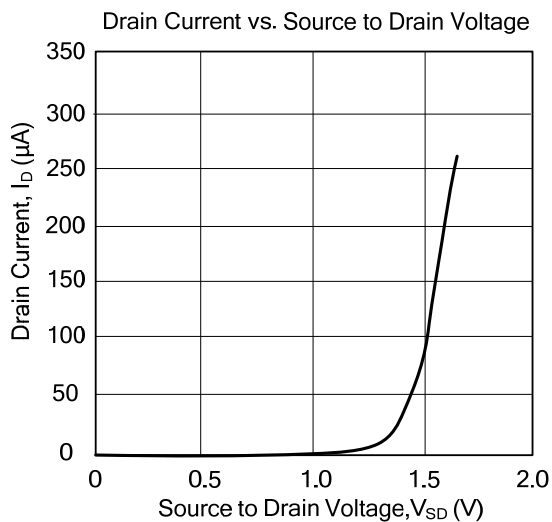
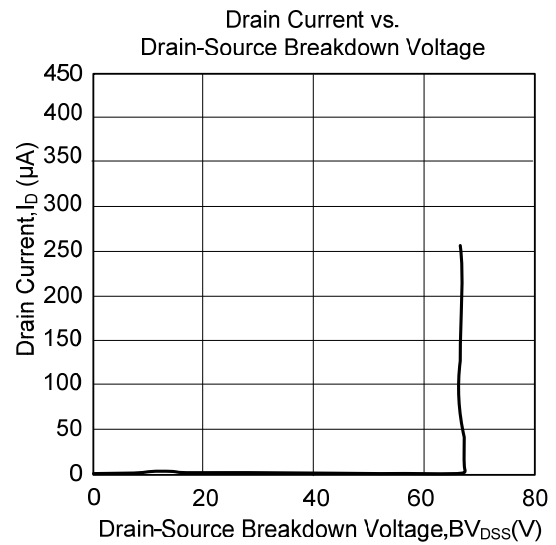
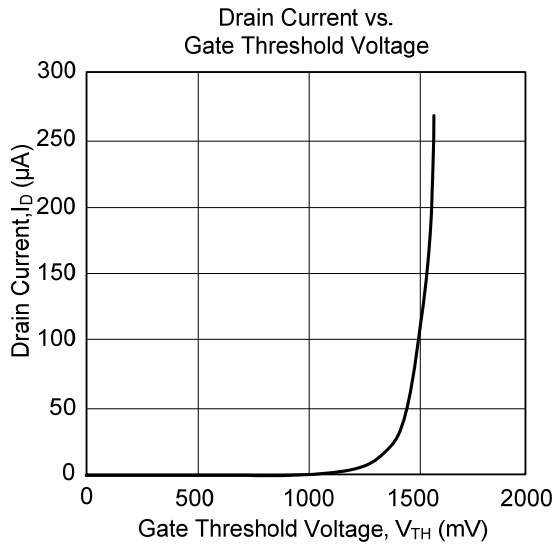


**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

## ■ TYPICAL CHARACTERISTICS



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