



UT3N06Z

Preliminary

POWER MOSFET

N-CHANNEL ENHANCEMENT MODE POWER MOSFET

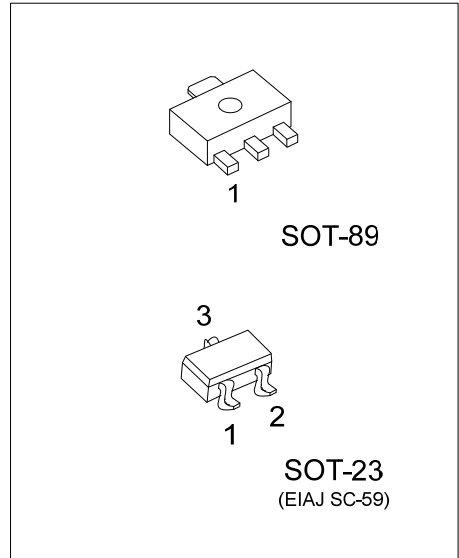
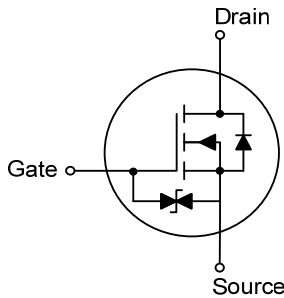
■ DESCRIPTION

This **UT3N06Z** is an N-channel power MOSFET providing very low on-resistance. It has high efficiency and perfect cost-effectiveness. It can be generally applied in the commercial and industrial fields.

■ FEATURES

- * $R_{DS(ON)} \leq 65 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=1.5\text{A}$
- $R_{DS(ON)} \leq 90 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=1.5\text{A}$
- * Fast switching capability
- * Enhanced ESD capability

■ SYMBOL



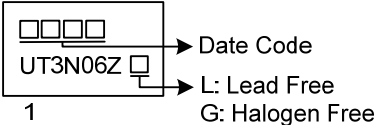
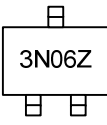
■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-----------------|----------------|---------|----------------|---|---|-----------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| UT3N06ZL-AB3-R | UT3N06ZG-AB3-R | SOT-89 | G | D | S | Tape Reel |
| UT3N06ZL-AE3-R | UT3N06ZG-AE3-R | SOT-23 | G | S | D | Tape Reel |

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

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>UT3N06ZG-AB3-R</p> <ul style="list-style-type: none"> (1)Packing Type (2)Package Type (3)Green Package | <ul style="list-style-type: none"> (1) R: Tape Reel (2) AB3: SOT-89, AE3: SOT-23 (3) G: Halogen Free and Lead Free, L: Lead Free |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|

MARKING

| SOT-89 | SOT-23 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>The diagram shows a rectangular package with three small squares at the top, the text 'UT3N06Z' in the center, and a small square at the bottom. An arrow points from the top squares to the text 'Date Code'. Another arrow points from the bottom square to the text 'L: Lead Free' and 'G: Halogen Free'. The number '1' is located below the package.</p> |  <p>The diagram shows a rectangular package with a small square at the top and two small squares at the bottom. The text '3N06Z' is centered on the package.</p> |

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

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|------------------------------------|------------------------|-----------|------------|------------------|
| Drain-Source Voltage | | V_{DSS} | 60 | V |
| Gate-Source Voltage | | V_{GSS} | ± 20 | V |
| Drain Current | Continuous | I_D | 3 | A |
| | Pulsed (Note 2) | I_{DM} | 6 | A |
| Avalanche Energy (Note 3) | Single Pulsed (Note 3) | E_{AS} | 8.5 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 2 | V/nS |
| Power Dissipation | SOT-89 | P_D | 1.4 | W |
| | SOT-23 | | 1.25 | W |
| Junction Temperature | | T_J | +150 | $^\circ\text{C}$ |
| Storage Temperature Range | | T_{STG} | -20 ~ +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. $L = 0.1\text{mH}$, $I_{AS} = 13\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 3.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---------------------|--------|---------------|---------|---------------------------|
| Junction to Ambient | SOT-89 | θ_{JA} | 104 | $^\circ\text{C}/\text{W}$ |
| | SOT-23 | | 250 | $^\circ\text{C}/\text{W}$ |
| Junction to Case | SOT-89 | θ_{JC} | 89.3 | $^\circ\text{C}/\text{W}$ |
| | SOT-23 | | 100 | $^\circ\text{C}/\text{W}$ |

Note: The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.

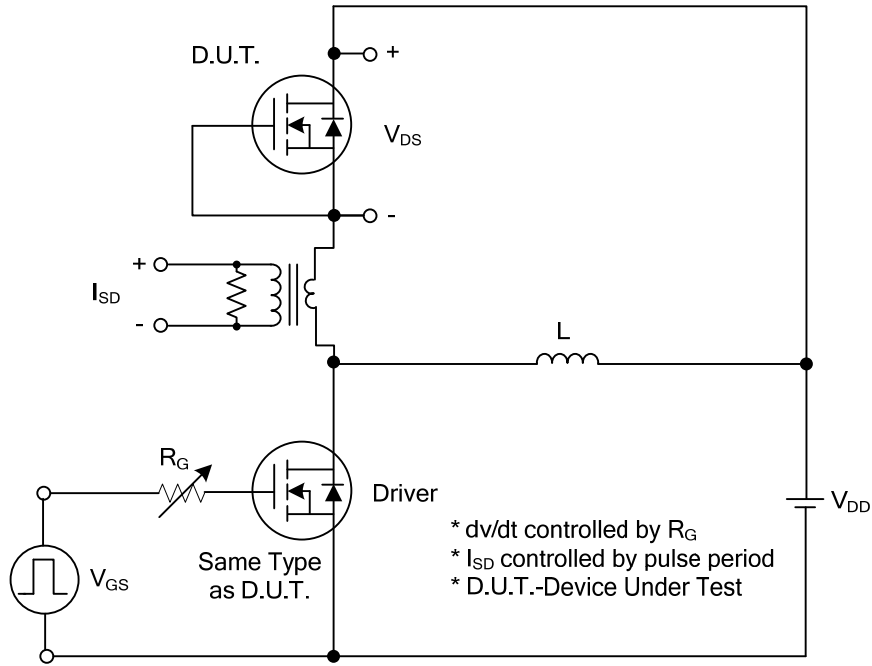
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--------------------------------------------------------|--------------|----------------------------------------------------------------------------------------------|-------------------------------------------|-----|-----|------------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$ | 60 | | | V |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS}=60\text{V}$, $V_{GS}=0\text{V}$ | | | 1 | μA |
| Gate-Source Leakage Current | Forward | $V_{GS}=+20\text{V}$, $V_{DS}=0\text{V}$ | | | +10 | μA |
| | Reverse | | $V_{GS}=-20\text{V}$, $V_{DS}=0\text{V}$ | | | -10 |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$ | 1.0 | | 3.0 | V |
| Static Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10\text{V}$, $I_D=1.5\text{A}$ | | | 65 | $\text{m}\Omega$ |
| | | $V_{GS}=4.5\text{V}$, $I_D=1.5\text{A}$ | | | 90 | $\text{m}\Omega$ |
| DYNAMIC PARAMETERS | | | | | | |
| Input Capacitance | C_{ISS} | $V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$ | | 502 | | pF |
| Output Capacitance | C_{OSS} | | | 53 | | pF |
| Reverse Transfer Capacitance | C_{RSS} | | | 40 | | pF |
| SWITCHING PARAMETERS | | | | | | |
| Total Gate Charge (Note 1) | Q_G | $V_{DS}=48\text{V}$, $V_{GS}=10\text{V}$, $I_D=3.0\text{A}$ (Note 1, 2) | | 18 | | nC |
| Gate to Source Charge | Q_{GS} | | | 4 | | nC |
| Gate to Drain Charge | Q_{GD} | | | 4 | | nC |
| Turn-on Delay Time (Note 1) | $t_{D(ON)}$ | $V_{DS}=30\text{V}$, $V_{GS}=10\text{V}$, $I_D=3.0\text{A}$, $R_G=3\Omega$ (Note 1, 2) | | 3 | | ns |
| Rise Time | t_R | | | 16 | | ns |
| Turn-off Delay Time | $t_{D(OFF)}$ | | | 13 | | ns |
| Fall-Time | t_F | | | 19 | | ns |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | | | | | | |
| Maximum Body-Diode Continuous Current | I_S | | | | 3 | A |
| Maximum Body-Diode Pulsed Current | I_{SM} | | | | 6 | A |
| Drain-Source Diode Forward Voltage (Note 1) | V_{SD} | $I_S=3.0\text{A}$, $V_{GS}=0\text{V}$ | | | 1.4 | V |
| Reverse Recovery Time (Note 1) | t_{rr} | $I_S=3.0\text{A}$, $V_{GS}=0\text{V}$, | | 52 | | nS |
| Reverse Recovery Charge | Q_{rr} | $dI/dt=100\text{A}/\mu\text{s}$ | | 25 | | nC |

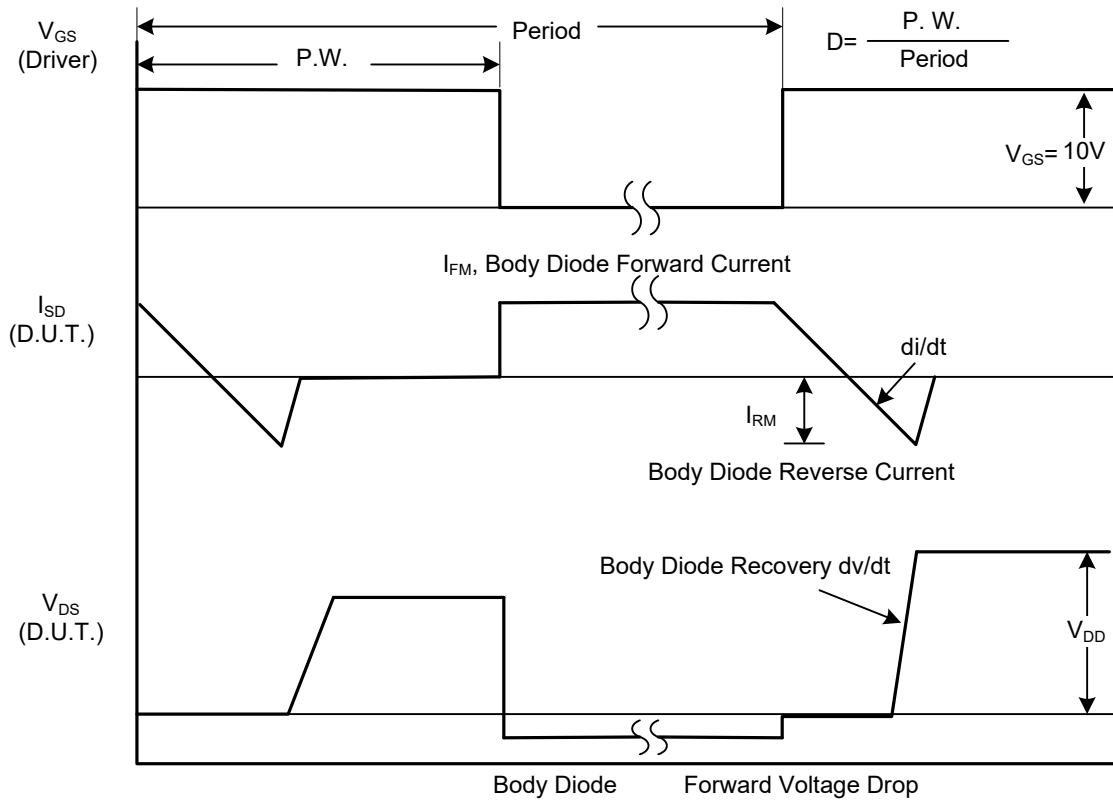
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

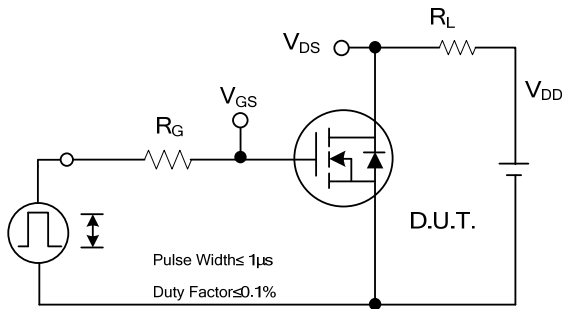


Peak Diode Recovery dv/dt Test Circuit

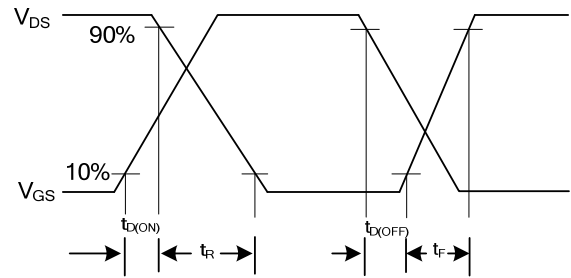


Peak Diode Recovery dv/dt Waveforms

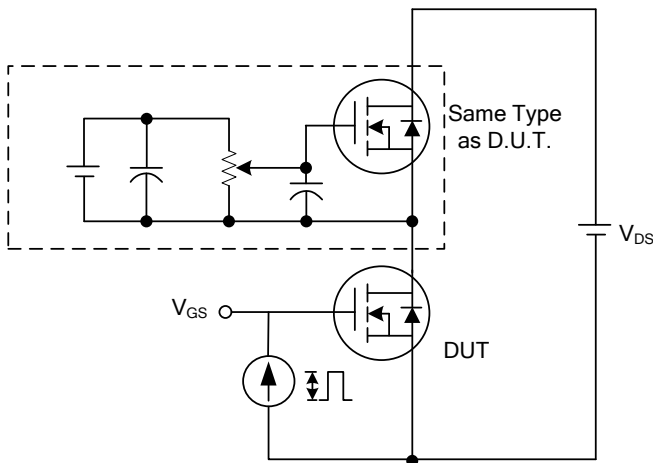
■ TEST CIRCUITS AND WAVEFORMS



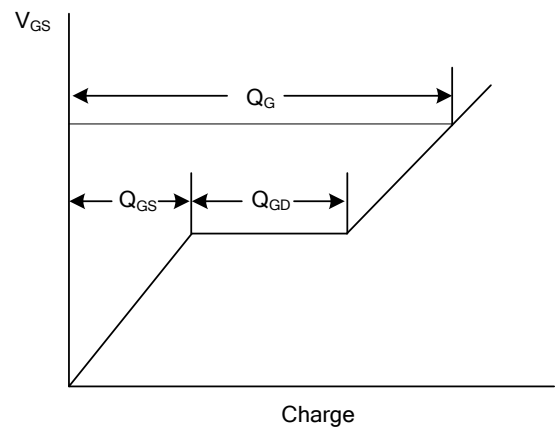
Switching Test Circuit



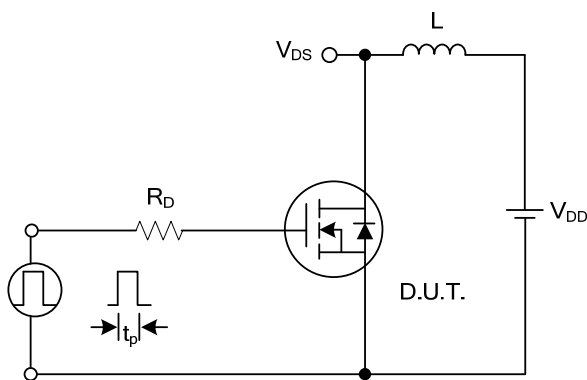
Switching Waveforms



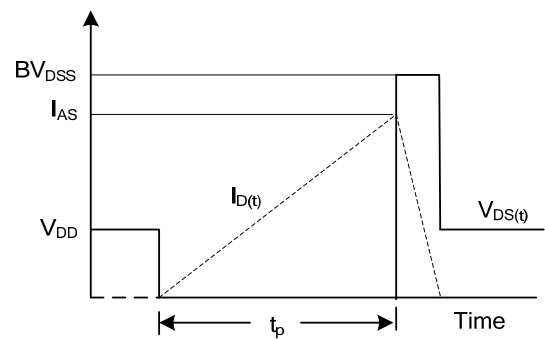
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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