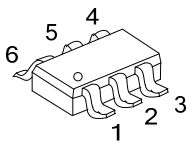
# UM6K31N

**Power MOSFET**

## SILICON N-CHANNEL MOSFET TRANSISTOR

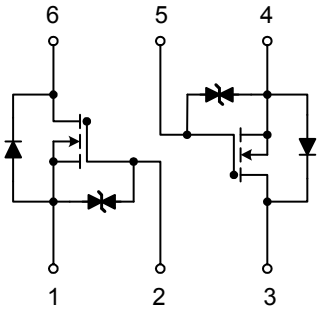



SOT-363

### ■ DESCRIPTION

The UTC **UM6K31N** is a silicon N-channel MOS Field Effect Transistor. It can be used in switching applications.

### ■ SYMBOL



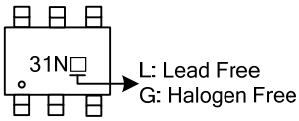

### ■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | | | | Packing |
|---|---|---|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | 4 | 5 | 6 | |
| UM6K31NL-AL6-R | UM6K31NG-AL6-R | SOT-363 | S1 | G1 | D2 | S2 | G2 | D1 | Tape Reel |

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

| | |
|---|---|
| UM6K31NG-AL6-R<br>(1)Packing Type<br>(2)Package Type<br>(3)Green Package | (1) R: Tape Reel<br>(2) AL6: SOT-363<br>(3) G: Halogen Free and Lead Free, L: Lead Free |

### ■ MARKING



## ■ ABSOLUTE MAXIMUM RATINGS ($T_A$=25°C, it is the same rating for the Tr1 AND Tr2)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Drain Current Continuous | Continuous | $I_D$ | ±250 | mA |
| | Pulsed (Note1) | $I_{DP}$ | ±1 | A |
| Source Current Continuous (Body Diode) | Continuous | $I_S$ | 125 | mA |
| | Pulsed (Note1) | $I_{SP}$ | 1 | A |
| Power Dissipation | | $P_D$ | 150 | mW |
| Channel Temperature | | $T_{CH}$ | 150 | °C |
| Strage Temperature | | $T_{STG}$ | -55~150 | °C |

Note 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.

## ■ THERMAL DATA

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Channel to Ambient | $\theta_{JA}$ | 833 | °C/W |

## ■ ELECTRICAL CHARACTERISTICS (Ta =25°C, it is the same rating for the Tr1 And Tr2)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$=1mA, $V_{GS}$=0V | 60 | | | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=60V, $V_{GS}$=0V | | | 1 | μA |
| Gate- Source Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±20 V, $V_{DS}$=0 V | | | ±10 | μA |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}$=10V, $I_D$=1mA | 1.0 | | 2.5 | V |
| Static Drain-Source On-State Resistance (Note1) | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=250mA | | 1.7 | 2.4 | Ω |
| | | $V_{GS}$=4.5V, $I_D$=250mA | | 2.1 | 3.0 | Ω |
| | | $V_{GS}$=4.0V, $I_D$=250mA | | 3.3 | 4.0 | Ω |
| | | $V_{GS}$=2.5V, $I_D$=10mA | | 9.4 | 12 | Ω |
| **DYNAMIC PARAMETERS** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$=0V, $V_{DS}$=25V, f=1MHz | | 26 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 12 | | pF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 5 | | pF |
| **SWITCHING PARAMETERS (Note1)** | | | | | | |
| Total Gate Charge (Note 1) | $Q_G$ | $V_{DS}$=48V, $V_{GS}$=10V, $I_D$=250mA $I_G$= 1mA (Note1, 2) | | 6.6 | | nC |
| Gate to Source Charge | $Q_{GS}$ | | | 2.48 | | nC |
| Gate to Drain Charge | $Q_{GD}$ | | | 0.92 | | nC |
| Turn-ON Delay Time | $t_{D(ON)}$ | $V_{DS}$=30V, $V_{GS}$=10V, $I_D$=250mA, $R_G$=25Ω | | 6 | | ns |
| Rise Time | $t_R$ | | | 9 | | ns |
| Turn-OFF Delay Time | $t_{D(OFF)}$ | | | 14 | | ns |
| Fall-Time | $t_F$ | | | 12 | | ns |
| **SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS (Note1)** | | | | | | |
| Drain-Source Diode Forward Voltage | $V_{SD}$ | $I_S$=250mA, $V_{GS}$=0V | | | 1.2 | V |

Note: $P_W$ ≤ 10μs DUTY CYCLE≤1%.

## ■ TEST CIRCUIT

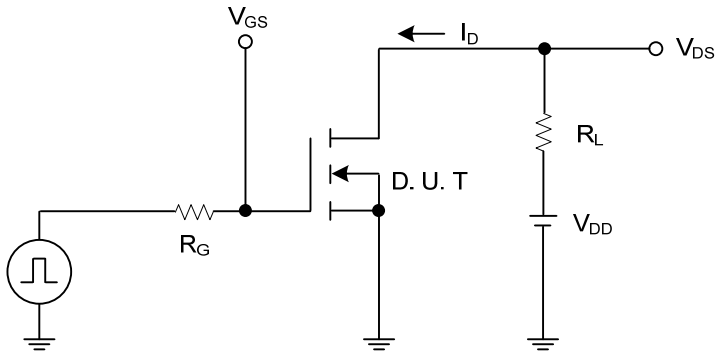



Fig.1-1 Switching Time Measurement Circuit

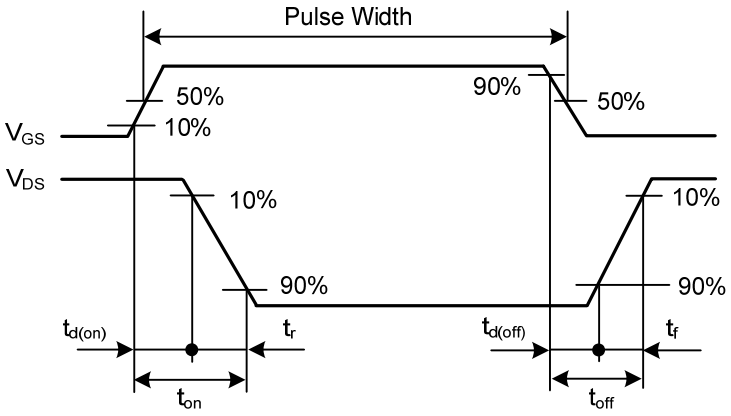
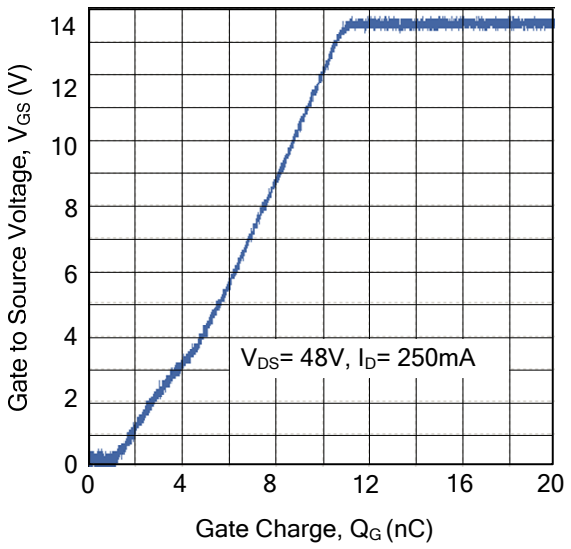


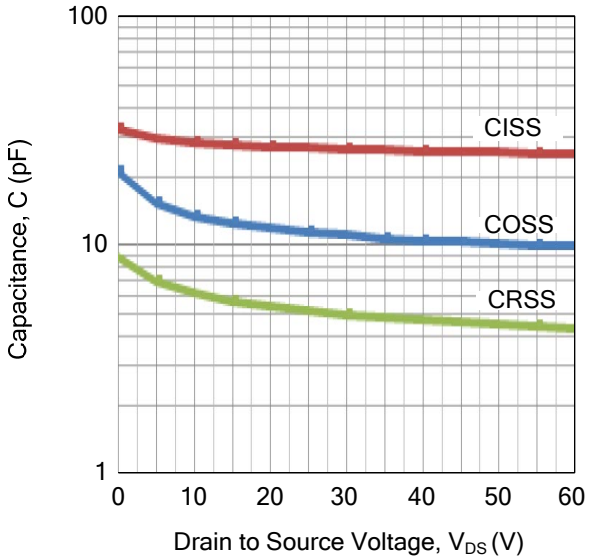

Fig.1-2 Switching Waveforms

## ■ TYPICAL CHARACTERISTICS

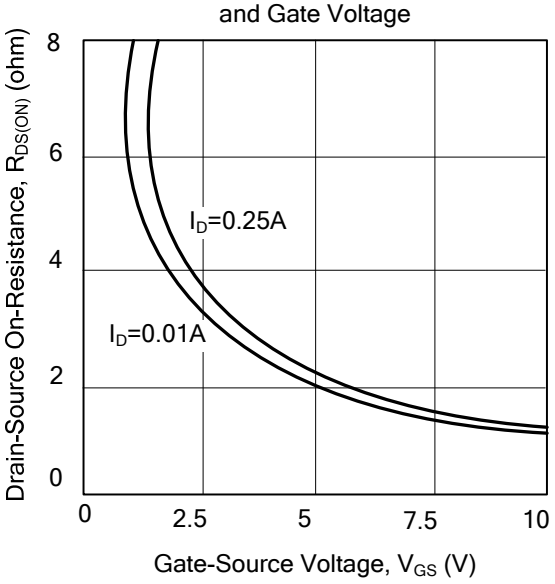
Gate Charge vs. Gate to Source Voltage




Capacitance Characteristics




On-Resistance Variation vs. Drain Current and Gate Voltage




On-Region Characteristics