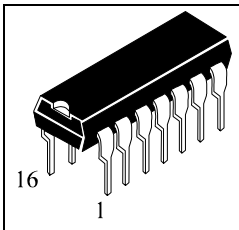
# KK9151-3

# PULSE DIALER

The KK9151-3 pulse dialer is a monolithic CMOS integrated circuit which converts pushbutton inputs to a series of pulses suitable for telephone dialing. It is intended to replace mechanical telephone dialers and can operate directly from telephone lines. CMOS technology is used to produced this device, resulting in very low power requirements and high noise immunity. The KK9151-3 can be easily interfaced with a variety of telephones, requiring only a minimal number of external components.

- Direct telephone line operation
- 4 x 3 matrix keyboard interface
- Supply voltage range of 2.0 to 5.5 volts
- Inexpensive RC oscillator
- Low power standby mode for redialing
- 22-digit redial memory
- Redial with either * or # key
- Dialer reset for line power breaks > 200 ms
- Selectable make/break ratio
- High speed test capacity



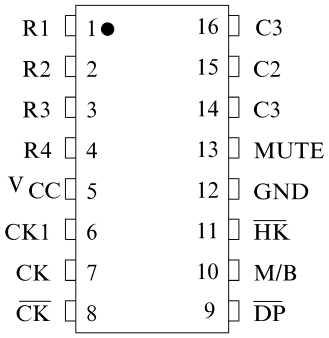

N SUFFIX
PLASTIC

**ORDERING INFORMATION**

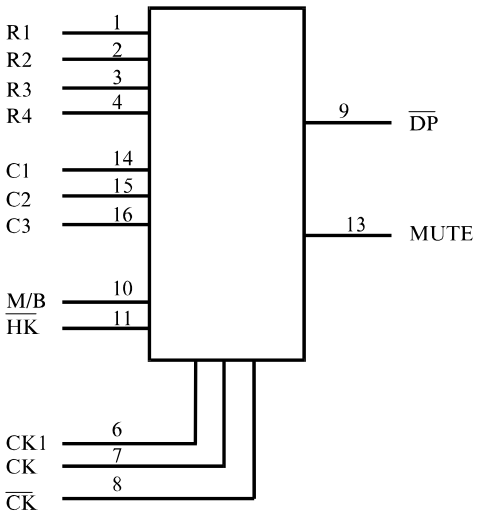
KK9151-3N Plastic

$T_A$ = -20° to 70° C for package

## PIN ASSIGNMENT




## LOGIC DIAGRAM



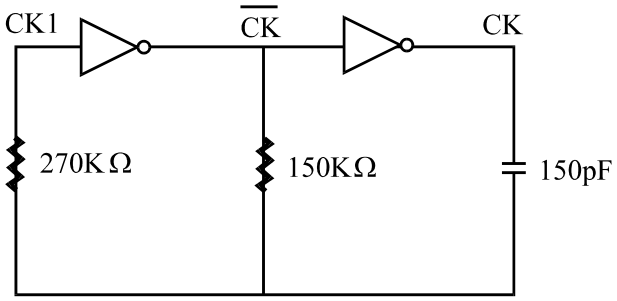

PIN 5 = $V_{CC}$
PIN 12 = GND

## KEYBOARD ASSIGNMENT

| | C1 | C2 | C3 |
|---|---|---|---|
| R1 | 1 | 2 | 3 |
| R2 | 4 | 5 | 6 |
| R3 | 7 | 8 | 9 |
| R4 | * | 0 | # |

(*,# : Redial)

## PIN DESCRIPTION

| PIN No. | NAME | DESCRIPTION |
|---|---|---|
| 1<br>2<br>3<br>4<br><br>14<br>15<br>16 | R1~R4<br><br><br><br><br>C1~C3 | Key inputs.<br><br>These inputs can be interfaced to either an XY matrix keyboard or a 2 of 7 type keyboard. The keypad inputs are normally held at high. When a key is depressed, scanning signals are presented at C1, C2, and C3 inputs; the dialer identifies the key by examining the R1~R4 inputs. Debouncing is provided to avoid false entry. |
| 5<br>12 | $V_{CC}$<br>GND | Positive power supply input.<br>Negative power supply input. |
| 6<br>7<br>8 | CK1,$\overline{CK}$,<br>CK | Oscillator circuit input/output.<br>The oscillator consists of two inverters, with oscillator frequency controlled by external RC components:<br>$R_{CK1}$=270KΩ, $R_{CK}$=150KΩ, $C_{CK}$=150 pF<br>  <br><br>Oscillator Circuit |
| 9 | $\overline{DP}$ | Dialing pulse output.<br>This output consists of an N-channel open drain device. Normally this output will be in off state during make and on during break. Dialing pulse rate = 10pps and inter-digital pause = 800 ms when $F_{OSC}$=18KHz in normal mode. |
| 10 | M/B | Make/Break ratio select input.<br>In normal mode, this input is used to select the Make/Break ratio:<br>when input = $V_{CC}$ , M/B ratio = 1/2.<br>when input = GND, M/B ratio = 2/3.<br>when connected to the clock output (pin 7), this input can trigger the IN9151-3 into test mode, generating high speed dialing. |
| 11 | $\overline{HK}$ | Hook switch input.<br>This input is used to detect whether the telephone is in the On-Hook or Off-Hook state:<br>$V_{CC}$=on-hook<br>GND=off-hook.<br>(Resetting time = 200 ms minimum) |
| 13 | MUTE | Mute output.<br>This output is an inverter normally at low state when there is no key entry. During outdialing it changes to high state and is used to mute the speech network. |

## MAXIMUM RATINGS*

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CC}$ | DC Supply Voltage (Referenced to GND) | -0.3 to +5.5 | V |
| $V_{IN}$ | DC Input Voltage (Referenced to GND) | -0.3 to $V_{CC}$ +0.3 | V |
| $P_D$ | Power Dissipation in Still Air , Plastic DIP** | 600 | mW |
| Tstg | Storage Temperature | -55 to +150 | °C |
| $T_L$ | Lead Temperature, 1mm from case for 10 seconds | 260 | °C |

* Maximum Ratings are those values beyond which damage to the device may occur.
Functional operation should be restricted to the Recommended Operating Conditions.
** Durating: -10 $^{mW}/_{°C}$ from 65°C to 70°C.

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| $V_{CC}$ | DC Supply Voltage (Referenced to GND) | 2.0 | 5.5 | V |
| $V_{IN}$ | DC Input Voltage (Referenced to GND) | 0 | $V_{CC}$ | V |
| $T_A$ | Operating Temperature | -10 | +70 | °C |

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, $V_{IN}$ and $V_{OUT}$ should be constrained to the range GND≤($V_{IN}$ or $V_{OUT}$)≤$V_{CC}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or $V_{CC}$). Unused outputs must be left open.

## DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND, $V_{CC}$ = 2.0 V to5.5 V, $T_A$ = -20 to +70°C)

| Symbol | Parameter | Test Conditions | Guaranteed Limits | | Unit |
|---|---|---|---|---|---|
| | | | Min | Max | |
| $I_{MR}$ | Maximum Memory Retention Current | $V_{CC}$=1.0 V, HK=$V_{CC}$ ,all outputs unloaded | | 1 | µA |
| $I_{CC}$ | Maximum Supply Operating Current | oscillator running, all outputs unloaded | | 200 | µA |
| $I_{SB}$ | Maximum Standby Current | all outputs unload HK=$V_{CC}$ | | 4 | µA |
| $I_{OL}$ | Minimum Output Sink Current (Mute, DP) | $V_{CC}$=2.0V, $V_{OUT}$=0.5V, f=18KHz | 2 | | mA |
| $I_{OH}$ | Minimum Output Drive Current (Mute) | $V_{CC}$=2.0V, $V_{OUT}$=$V_{CC}$-1V, f=18KHz | 1 | | mA |
| $V_{IL}$ | Min High-Level Input Voltage | | 0.8$V_{CC}$ | $V_{CC}$ | $V_{CC}$ |
| $V_{IL}$ | Max Low-Level Input Voltage | | GND | 0.2$V_{CC}$ | |
| $I_{IN}$ | Max. Input Leakage Current | $V_{CC}$=5.5V | | ±1.0 | µA |

## AC ELECTRICAL CHARACTERISTICS ($F_{OSC}$ = 18 KHz, $V_{CC}$=2.0 to 5.5 V, $T_A$=-20 to +70°C )

| Symbol | Parameter | Test Conditions | Guaranteed Limit | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max | |
| M/B | Make/Break Ratio | M/B=$V_{CC}$ | | 1/2 | | |
| | | M/B=GND | | 2/3 | | |
| DR | Dial Pulse Rate | $F_{OSC}$=18KHz | | 10 | | pps |
| | | $F_{OSC}$=36KHz | | 20 | | |
| $T_M$ | Maximum Make Time (Figure 3) | 10pps | 1/2 | | 33 | ms |
| | | 10pps | 2/3 | | 40 | |
| | | 20pps | 1/2 | | 16.6 | |
| | | 20pps | 2/3 | | 20 | |
| $T_B$ | Maximum Break Time (Figure 3) | 10pps | 1/2 | | 66 | |
| | | 10pps | 2/3 | | 60 | |
| | | 20pps | 1/2 | | 33 | |
| | | 20pps | 2/3 | | 30 | |
| $T_{IDP}$ | Maximum Inter-digital Pause Time (Figure 3) | 10pps | 1/2 | | 800 | |
| | | 10pps | 2/3 | | 800 | |
| | | 20pps | 1/2 | | 400 | |
| | | 20pps | 2/3 | | 400 | |
| $T_{PDP}$ | Maximum Pre-digital Pause (Figure 3) | 10pps | 1/2 | | 800 | |
| | | 10pps | 2/3 | | 800 | |
| | | 20pps | 1/2 | | 400 | |
| | | 20pps | 2/3 | | 400 | |
| $T_{MDP}$ | Maximum Mute Delay Time (Figure 3) | 10pps | 1/2 | | 33 | |
| | | 10pps | 2/3 | | 40 | |
| | | 20pps | 1/2 | | 16.6 | |
| | | 20pps | 2/3 | | 20 | |
| $T_{KD}$ | Minimum Key Debounce Time | $V_{IN}$=GND or $V_{CC}$ | 30 | | | |

## Operation Procedures

**Symbol Definitions:**

$D_P$: pulse digit (0 through 9)
ZiZiZi: conversation
0-0↑: off-hook.
0-0↓: on-hook.
* or # : Redial

**Recommended Operations:**

Normal Dialing:
0-0↑; $D_P$ ... $D_P$; ZiZiZi; 0-0↓
Dial pulse begins as soon as first key is entered.
Debounced and detected on chip.
Redialing:
0-0↑; * or # key
(* or # key can be accepted as first key entry after Off-Hook.)

## Functional Description

1) N-channel open drain output - DP (Figure 1).
2) Clock oscillator
The clock oscillator consists of two inverters, with the frequency of oscillation controlled by external components connected to pins 6,7, and 8. The circuit is sufficiently versatile to allow the use of a variety of external component configurations. The oscillator circuit is shown in figure 2.

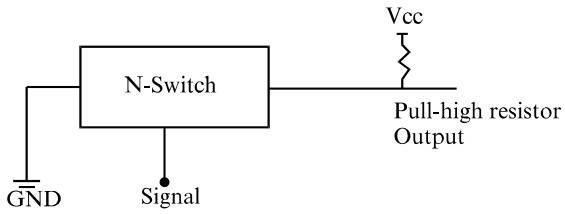



**Figure 1**

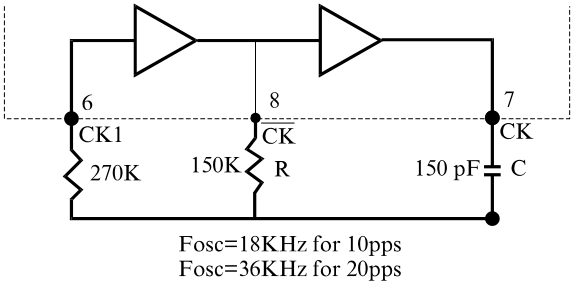
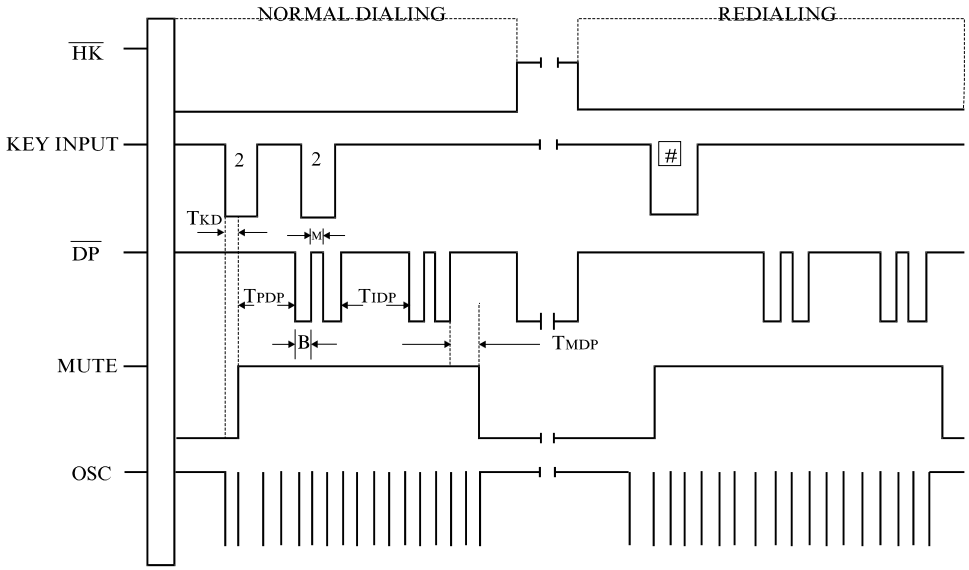
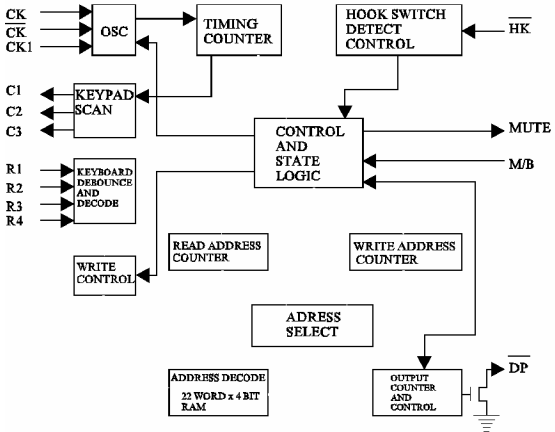



**Figure 2**

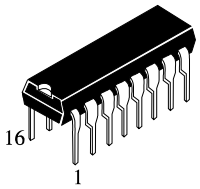
## SWITCHING WAVEFORMS

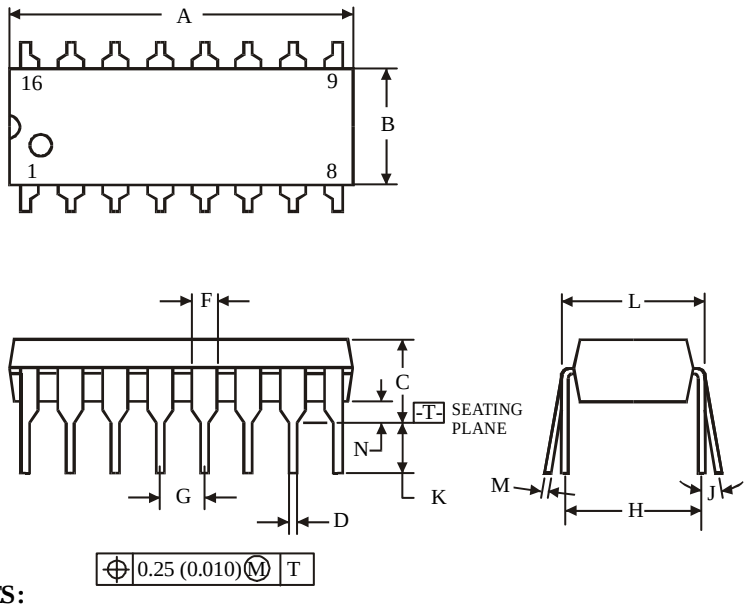



## EXPANDED LOGIC DIAGRAM



**N SUFFIX PLASTIC DIP**
**(MS - 001BB)**




| | Dimension, mm | |
|---|---|---|
| **Symbol** | **MIN** | **MAX** |
| **A** | 18.67 | 19.69 |
| **B** | 6.1 | 7.11 |
| **C** | | 5.33 |
| **D** | 0.36 | 0.56 |
| **F** | 1.14 | 1.78 |
| **G** | 2.54 | |
| **H** | 7.62 | |
| **J** | 0° | 10° |
| **K** | 2.92 | 3.81 |
| **L** | 7.62 | 8.26 |
| **M** | 0.2 | 0.36 |
| **N** | 0.38 | |

**NOTES:**

1. Dimensions “A”, “B” do not include mold flash or protrusions.
   Maximum mold flash or protrusions 0.25 mm (0.010) per side.