



UM91611

10 Memory Pulse Dialer

Features

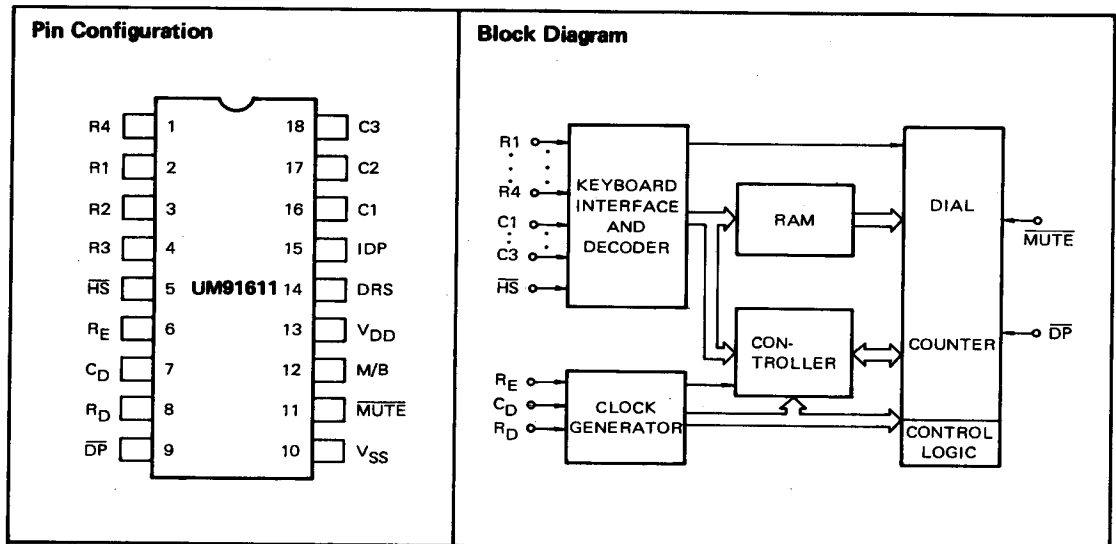
- Ten 18-digit number memories plus last number redial memory (22 digit) memory on chip
- Low voltage CMOS process for direct operation from telephone lines
- Inexpensive RC oscillator design with accuracy better than $\pm 5\%$ over temperature and unit-unit variations
- Independent select inputs for variation of dialing rates (10PPS/20PPS), make/break ratio ($33\frac{1}{3}:66\frac{2}{3}/40:60$), inter-digit pause (400ms/800ms)
- Uses either inexpensive single contact XY matrix keyboard or standard 2 of 7 keyboard with positive common
- Mute and pulse drivers on chip
- Call Disconnect by pushing * and # keys simultaneously

General Description

The UM91611 pulse dialer is a monolithic CMOS integrated circuit which converts pushbutton inputs to a series of pulses suitable for telephone dialing. The UM91611 is pin compatible with T25610 and quite similar to UM91610. The UM91611 is upgraded version of the popular UM9151. In addition to dialer functions performed by the UM9151, UM91611 has ten 18-digit number memories plus last

number redial memory with 22-digit capacity.

CMOS technology is used to produce this device, resulting in very low power requirements, high noise immunity, and easy interface to a variety of telephones requiring few external components.



Absolute Maximum Ratings*

DC Supply Voltage ($V_{DD} - V_{SS}$) -0.3V to +5.0V
 Operating Temperature (T_{OP}) -20°C to +60°C
 Storage Temperature (T_{STG}) -55°C to +125°C
 Applied Voltage on Any Pin
 (V_{IN}) $V_{SS} - 0.3 \leq V_{IN} \leq V_{DD} + 0.3$

***Comments**

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics

(Specifications apply over the operating temperature and $1.0V \leq V_{DD}$ to $V_{SS} \leq 3.5V$ unless otherwise specified.)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
V_{DR}	Data Retention Voltage	1.0			V	ON HOOK ($\overline{HS} = V_{DD}$)
I_{DR}	Data Retention Current		0.05	0.15	μA	$V_{DD} = 1.0V, \overline{HS} = V_{DD}$
V_{DD}	Operating Voltage	1.0	2.0	3.5	V	
I_{DD}	Operating Current			100	μA	$V_{DD} = 1.5V$, All outputs pins not loaded
				500	μA	$V_{DD} = 3.5V$, All outputs pins not loaded
I_{OLDP}	\overline{DP} Sink Current	120			μA	$V_{DD} = 3.5V, V_{OUT} = 0.4V$
I_{OHDP}	\overline{DP} Source Current	20			μA	$V_{DD} = 1.5V, V_{OUT} = 1.0V$
		120			μA	$V_{DD} = 3.5V, V_{OUT} = 2.5V$
I_{OLM}	\overline{MUTE} Sink Current	120			μA	$V_{DD} = 3.5V, V_{OUT} = 0.4V$
I_{OHM}	\overline{MUTE} Source Current	20			μA	$V_{DD} = 1.5V, V_{OUT} = 1.0V$
		120			μA	$V_{DD} = 3.5V, V_{OUT} = 2.5V$
I_{OLCK}	Clock Sink Current (R_D Pin)	20			μA	$V_{DD} = 1.5V, V_{OUT} = 0.4V$
I_{OHCK}	Clock Source Current (R_D Pin)	20			μA	$V_{DD} = 1.5V, V_{OUT} = 1.0V$
I_{IH}	Input Current High (M/B, DRS, IDP, \overline{HS} , R_E)			0.5	μA	$V_{DD} = 3.5V, V_{IN} = 3.5V$
I_{IL}	Input Current Low (M/B, DRS, IDP, \overline{HS} , R_E)			0.5	μA	$V_{DD} = 3.5V, V_{IN} = 0.0V$
I_{AVE}	Keyboard Input Current			60	μA	$V_{DD} = 3.5V$, One row and one column
V_{IH}	Input Voltage High	$0.8 V_{DD}$			V	
V_{IL}	Input Voltage Low			$0.2 V_{DD}$	V	
$\Delta f_0 / f_0$	Oscillator Frequency F_0 Stability vs Supply Voltage	-10		+10	%	$V_{DD} = 1.5 \sim 3.5V, R_E = R_D = 750K\Omega \pm 5\%$ $C_D = 270pF \pm 1\%$
F_0	Oscillator Frequency	1.5		10	KHz	
C_{IN}	Input Capacitance Any Pin			10	pF	

Pin Description

Pin	Designation	Description
2, 3, 4, 1, 16, 17, 18	R1, R2, R3, R4, C1, C2, C3	These are 4 row and 3 column inputs from the keyboard contacts. Active pull up and pull down networks are present on these inputs when the device begins keyboard and starts the oscillator. Debouncing circuitry is provided (min. 9ms) to prevent false entry.
15	IDP	One programmable line allows selection of two different inter-digit pause (800ms/400ms when IDP connect to V_{SS}/V_{DD})
14	DRS	A programmable line allows selection of two different output rates (10pps/20pps when DRS connect to V_{SS}/V_{DD})
12	M/B	This input allows selection of the Make/Break ratios ($33\frac{1}{3}:66\frac{2}{3}/40:60$ when M/B connect to V_{SS}/V_{DD})
11	\overline{MUTE}	This output stage consists of a CMOS inverter to drive an external bipolar transistor and is held low during out dialing or on recognition of a key depression and held high otherwise.
9	\overline{DP}	This output stage consists of a CMOS inverter. A Sequence of negative going low pulses are available to disconnect the telephone lines.
6, 7, 8	R_E, C_D, R_D	These pins are provided to connect external resistors R_E, R_D and capacitor C_D to form an RC oscillator that generate the system's clock for this chip. The oscillator is only enabled during the dialing state (PAUSE state included). It is disabled at all other times including the "ON HOOK" state. (the recommended value of RC component are $R_E = R_D = 750K\Omega, C_D = 270pF, f_0 = 2.4KHz$)
5	\overline{HS}	This input detects the state of the hook switch contact. "OFF HOOK" corresponds to V_{SS} condition.
13, 10	V_{DD}, V_{SS}	These are the power supply inputs.

Functional Description
Normal Dialing

OFF HOOK, $\boxed{D1}$ \boxed{Dn}

Dial pulsing to start as soon as first digit is entered (debounced and detected on chip). Pauses may be entered in the dialing sequence by pressing the " $\#$ " key, and have no effect to outdialing. Total number of digits (including " $\#$ " key) entered not to exceed 22. Numbers exceeding 22 digits can be dialed but only after the

first 22 digits have been completely dialed out. In this case redialing function is inhibited.

Inhibit Redialing

OFF HOOK, $\boxed{D1}$ \boxed{Dn} $\boxed{*}$, $\boxed{*}$

In the dialing sequence, wait for dialing to complete before pressing star key. And the redialing function is inhibited.

Redialing

OFF HOOK, **#**, **#**

Last number dialed can be redialed as above. Last number for this purpose is defined as the last number remaining in the buffer. Access pause is terminated by pushing the "**#**" key.

Storing of A Telephone Number

OFF HOOK, *****, **D1**,, **Dn**, *****, **LOCN**
***** **D1**,, **Dm**, *****, **LOCN**,

One can easily store the telephone numbers (including "**#**" key) into the memory locations he chooses by follows the storing sequency properly. This device will not send any output signal when storing of telephone numbers.

Last Number Dialed Transfer

OFF HOOK, **D1**,, **Dn**, *****, **#**, **LOCN**

After normal dialing completes, we can store this number into the memory location by following, the operating sequence above.

Repertory Dialing

OFF HOOK, **#**, **LOCN**,, **#**, **LOCM**

At repertory dialing, wait for the first location number dialing to complete before pressing the next "**#**" key if more than one memory location number to be linked. And manual depause (press the "**#**" key) is necessary to terminate the output pause state when a pause is recognized in outdialing.

Normal Dialing After Repertory Dialing or Redialing

OFF HOOK, (**#**, **#**) or (**#**, **LOCN**),, wait for dialing complete **D1**,, **Dn**

After repertory dialing completes, we can access the keyboard with normal dialing to dial out telephone numbers.

Clear Memory Location

OFF HOOK, *****, **#**, *****, **LOCN**

One can easily clear the location N memory by following the clearing sequence properly. This operation is equivalent to storing a pause in the first digit of this memory location.

Call Disconnect

OFF HOOK,, ***#**

One can disconnect the dialing sequence by pressing the ***** and **#** keys simultaneously, and it essentially forces the **DP** output low as long as these two keys are depressed.

Keyboard Definition

Row 1	1	2	3
Row 2	4	5	6
Row 3	7	8	9
Row 4	*	0	#
	Coln 1	Coln 2	Coln 3

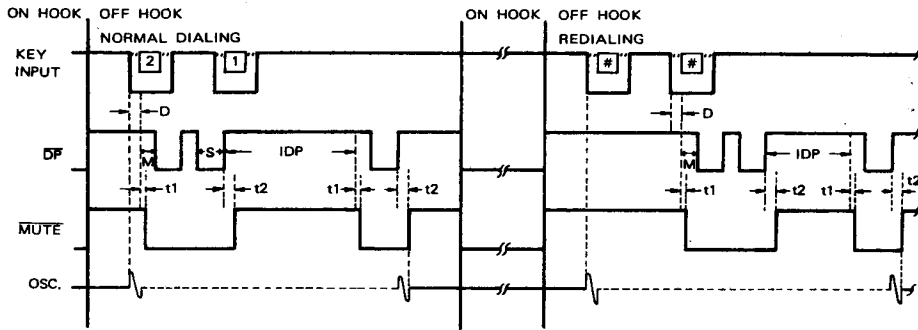
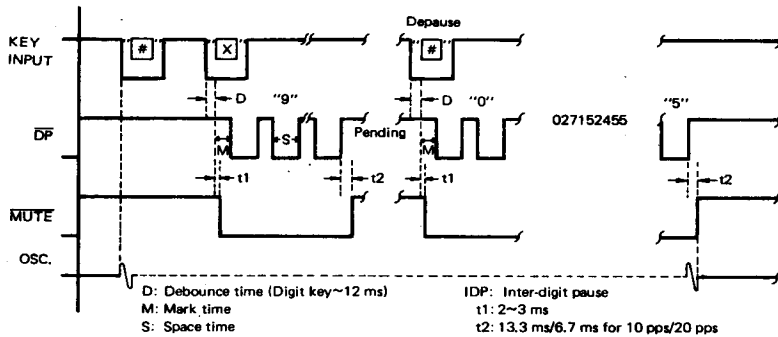
Digits 0 through 9 function as dial numbers in normal dialing and storing number modes, and represent memory locations which operate after a **#** (for redial) or a ***** (2nd and also last in storing mode) key.

***** key functions as the initial and final operation in storing mode, and also stands for a state change in inhibit redialing, last number dialed transfer and call disconnect modes.

key functions as the initial of redialing or repertory dialing in repertory dialing and redialing modes, and stands for the redialing buffer memory when 2nd pressed in redialing mode. In the normal dialing and storing number sequence, **#** stands for a pause for outdialing. And when an outdialing pause is met, pressing **#** key functions as depause. Also when press the **#** key with the ***** key simultaneously, it functions for disconnecting the call. The 6th function is that at last number dialed transfer, press the **#** key after ***** key, it stands for storing the last dialed number into location N.

Dialing pulse Output Structure

The UM91611 is Make first and Break next structure. When the first digit in RAM is dialed, a logic circuit checks immediately if to see the next digit should dial out. And an interdigit pause will be wait if a next digit is waiting to send out otherwise the oscillator will disable immediately. Essentially the UM91611 uses a post-digit pause to meet the EIA RS-470 Inter-Digit Pause requirement.

Timing Diagram

REDIALING OR REPERTORY DIALING FOR A MEMORY LOCATION WHICH WAS STORED: 9 # 027152455


D: Debounce time (Digit key~12 ms)
M: Mark time
S: Space time

IDP: Inter-digit pause
t1: 2~3 ms
t2: 13.3 ms/6.7 ms for 10 pps/20 pps

Typical Application
