



# UM91611

## 10 Memory Pulse Dialer

### Features

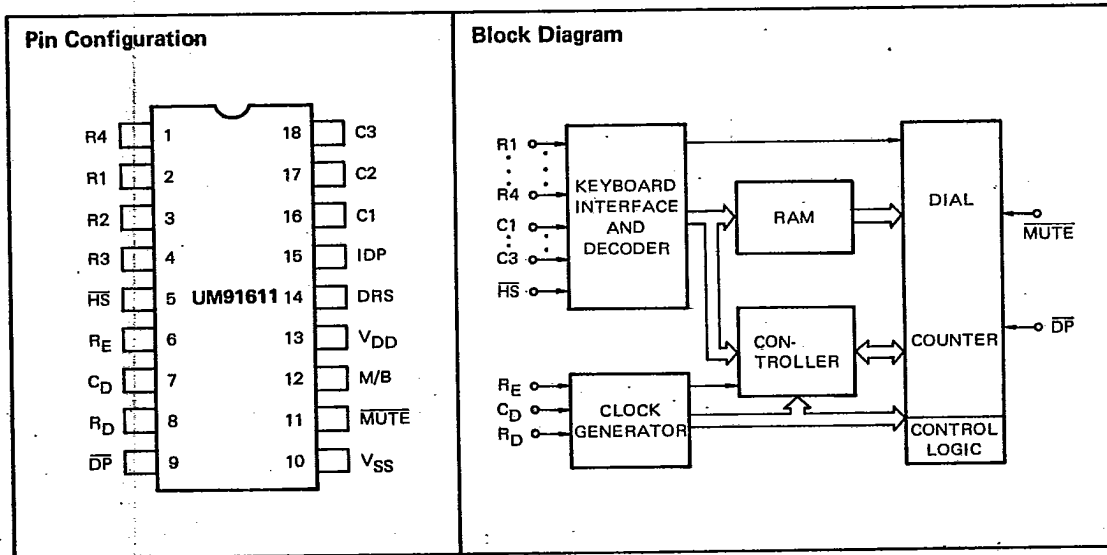
- Ten 18-digit number memories plus last number radial memory (22 digit) memory on chip
- Low voltage CMOS process for direct operation from telephone lines
- Inexpensive RC oscillator design with accuracy better than  $\pm 5\%$  over temperature and unit-unit variations
- Independent select inputs for variation of dialing rates (10PPS/20PPS), make/break ratio ( $33\frac{1}{3}/66\frac{2}{3}$  or 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 monolithic CMOS integrated circuit which convert 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 radial 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.



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**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 ( $HS = V_{DD}$ )
$I_{DR}$	Data Retention Current		0.05	0.15	$\mu A$	$V_{DD} = 1.0V, HS = V_{DD}$
$I_{DD}$	Operating Current			100	$\mu A$	$V_{DD} = 1.5V$ , All outputs pins not loaded
				500	$\mu A$	$V_{DD} = 3.5V$ , All outputs pins not loaded
$I_{OLDP}$	$\overline{DP}$ Sink Current	120			$\mu A$	$V_{DD} = 3.5V, V_{OUT} = 0.4V$
$I_{OHDP}$	$\overline{DP}$ Source Current	20			$\mu A$	$V_{DD} = 1.5V, V_{OUT} = 1.0V$
		120			$\mu A$	$V_{DD} = 3.5V, V_{OUT} = 2.5V$
$I_{OLM}$	MUTE Sink Current	120			$\mu A$	$V_{DD} = 3.5V, V_{OUT} = 0.4V$
$I_{OHM}$	MUTE Source Current	20			$\mu A$	$V_{DD} = 1.5V, V_{OUT} = 1.0V$
		120			$\mu A$	$V_{DD} = 3.5V, V_{OUT} = 2.5V$
$I_{OLCK}$	Clock Sink Current ( $R_D$ Pin)	20			$\mu A$	$V_{DD} = 1.5V, V_{OUT} = 0.4V$
$I_{OHCK}$	Clock Source Current ( $R_D$ Pin)	20			$\mu A$	$V_{DD} = 1.5V, V_{OUT} = 1.0V$
$I_{IH}$	Input Current High (M/B, DRS, IDP, HS, $R_E$ )			0.5	$\mu A$	$V_{DD} = 3.5V, V_{IN} = 3.5V$
$I_{IL}$	Input Current Low (M/B, DRS, IDP, HS, $R_E$ )			0.5	$\mu A$	$V_{DD} = 3.5V, V_{IN} = 0.0V$
$I_{AVE}$	Keyboard Input Current			60	$\mu A$	$V_{DD} = 3.5V$ , 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	

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**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	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. This device is designed to operate from 1.5V to 3.5V.

**Functional Description**

**Normal Dialing**

OFF HOOK,  $[D1]$  .....  $[Dn]$

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,  $[D1]$  .....  $[Dn]$  .....  $[*]$  ,  $[*]$

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



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**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 choosed as he 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 complete, we can store this number into the memory location as we follow 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 complete, we can access the keyboard as normal dialing to dial out telephone number continuously.

**Clear Memory Location**

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

One can easily clear the location N memory as he follows 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 is essentially force the  $\overline{DP}$  output low as long as these two keys 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 memories location when 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 a outdialing pause is met, press once **#** key functions as depause. Also when press the **#** key with the **\*** key simultaneously, it functions as 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**

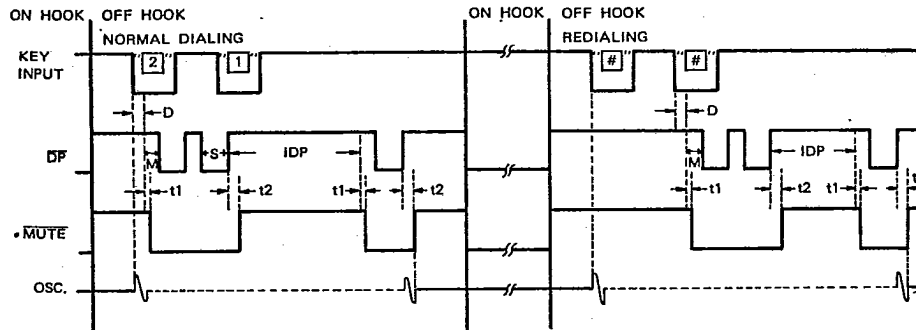
The UM91611 is Make first and Break next structure. When the first digit in RAM is dialed, a logic circuit check immediately if a next digit should dial out. And an interdigit pause will be wait if a next digit is waiting to send out or the oscillator will be disable immediately. Essentially the UM91611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

Pulse Dialer

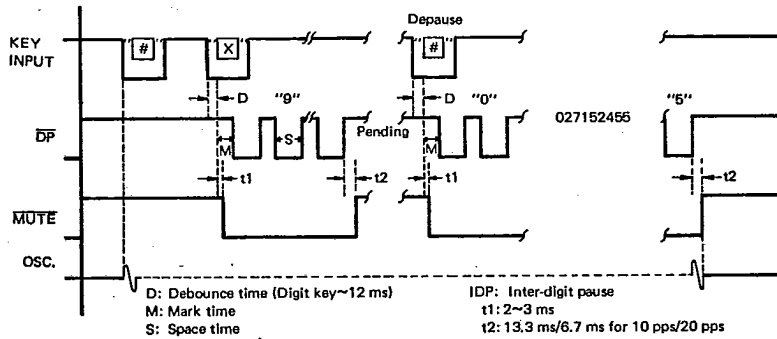


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Timing Diagram



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

