

LR48081A/LR48082A

Pulse/Tone Dialer LSI

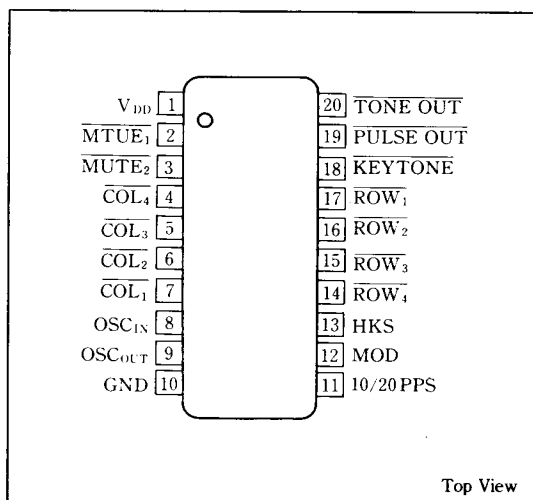
Description

The LR48081A/LR48082A is a pulse/tone dialer LSI incorporating a 32-digit redial memory.

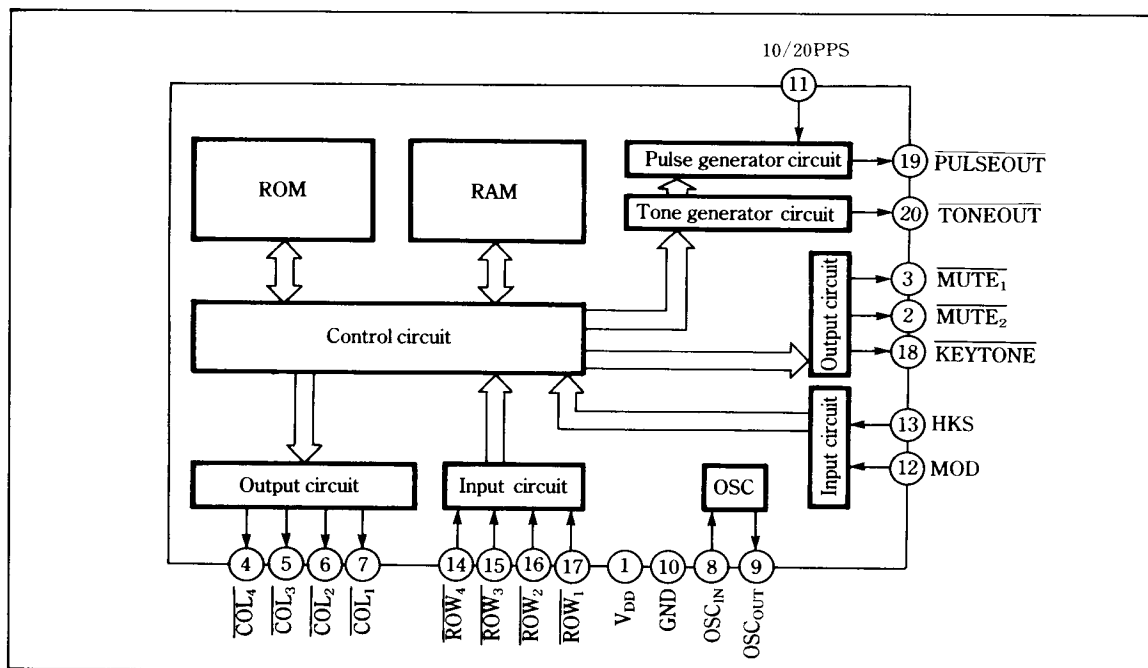
Features

1. 32-digit redial memory
2. Make ratio : 40% (LR48081A)
33% (LR48082A)
3. Pulse rate : 10/20pps pin-selectable
4. Key tone output (1kHz)
5. Key or switch input allows switching from pulse to tone mode to provide mixed dialing capability
6. Uses a 3.579545MHz color-burst crystal/ceramic oscillator as a frequency reference
7. Flash signal output
8. PBX pause storage
9. 20-pin dual-in-line package

Pin Connections



Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Note
Supply voltage	V_{DD}	6.5	V	1
Operating temperature	T_{opr}	-30 to +60	°C	
Storage temperature	T_{stg}	-55 to +150	°C	
Power dissipation	P_D	500	mW	2
Pin voltage	V_{IN1}	-0.3	V	3
Pin voltage	V_{IN2}	+0.3	V	4

Note 1 : Referenced to GND

Note 2 : $T_a = 25^\circ\text{C}$

Note 3 : The maximum applicable voltage on any pin with respect to GND

Note 4 : The maximum applicable voltage on any pin with respect to V_{DD}

DC Characteristics

($T_a = 25^\circ\text{C}$, GND=0V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Note
Supply voltage	V_{DD}	PULSE	1.5		6.0	V	
		TONE	2.0		6.0	V	
Standby current	I_{SB}	$V_{DD} = 3.0\text{V}$		0.5	1.0	μA	1
Operating current	I_{OPP}	$V_{DD} = 3.0\text{V}$, pulse mode		0.5	1.0	mA	2
	I_{OPT}	$V_{DD} = 3.0\text{V}$, tone mode		0.5	1.5	mA	
Input voltage	V_{IL}		GND		$0.2V_{DD}$	V	3
	V_{IH}		$0.8V_{DD}$		V_{DD}	V	
KEYTONE output current	I_{TL}	$V_{DD} = 2.0\text{V}$, $V_{OL} = 0.5\text{V}$	1.0	2.0		mA	
	I_{TH}	$V_{DD} = 2.0\text{V}$, $V_{OH} = 1.5\text{V}$	1.0	2.0		mA	
Output leakage current	I_{LKG}	$V_{DD} = 6.0\text{V}$, $V_{OH} = 6.0\text{V}$			1.0	μA	4
COLUMN output current	I_{CL}	$V_{DD} = 3.5\text{V}$, $V_{OL} = 0.5\text{V}$	300	650	1000	μA	
	I_{CH}	$V_{DD} = 3.5\text{V}$, $V_{OH} = 3.0\text{V}$	50	70	100	μA	
ROW input current	I_{RP}	$V_{DD} = 3.5\text{V}$, $V_{IL} = 0\text{V}$	10	30	50	μA	
HKS input current	I_{HP}	$V_{DD} = 3.5\text{V}$, $V_{IL} = 0\text{V}$	40	60	80	μA	

Note 1 : Current for memory retention ; no load on all outputs ; On-Hook mode

Note 2 : Current during operation ; no load on all outputs

Note 3 : Applicable to all input pins

Note 4 : Applicable to MUTE₁, MUTE₂, PULSEOUT pins

Tone Output Characteristics

($T_a = 25^\circ\text{C}$, GND=0V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Note
Tone output voltage	ROW V_{OR}	$R_L = 10\text{k}\Omega$, $V_{DD} = 4.0\text{V}$	125	165	200	mV _{rms}	
	COLUMN V_{OC}	$R_L = 10\text{k}\Omega$, $V_{DD} = 4.0\text{V}$	170	220	270	mV _{rms}	
Output distortion	DIS	$R_L = 10\text{k}\Omega$, $V_{DD} \geq 2.5\text{V}$			-20	dB	1
Pre-emphasis	PE _{HB}	$R_L = 10\text{k}\Omega$, $V_{DD} \geq 2.5\text{V}$	1.0	2.0	3.0	dB	
Inter-digital pause time	t_{IDP}			100		ms	2
Tone output time	t_{OD}			100		ms	2
Tone output rate	t_{OR}			200		ms	2

Note 1 : Unwanted frequency components in the 20Hz-80kHz frequency range with respect to fundamental tone signals of ROW and COLUMN.

Note 2 : When crystal oscillation parameters $R_S = 100\Omega$, $L_M = 96\text{mH}$, $C_M = 0.02\text{pF}$, $C_h = 5\text{pF}$, $f = 3.579545\text{MHz}$ are used.

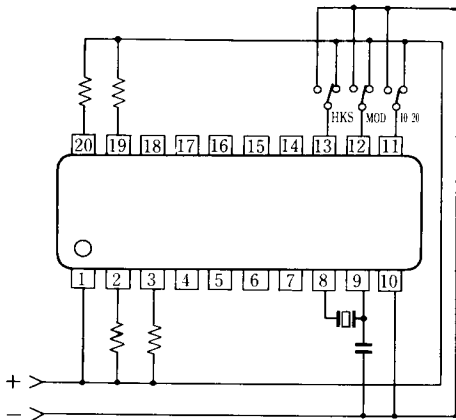
AC Characteristics

(Ta=25℃, GND=0V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Note
Oscillator start time	t _{OS}				8.0	ms	1
Pulse rate	P _R	GND (Pin 1)		10		pps	1
		V _{DD} (Pin 1)		20		pps	
Break time	t _B	LR48081A		60		ms	1,2
		LR48082A		67		ms	
Inter-digital pause time	t _{IDP}	10pps mode		850		ms	1
		20pps mode		500		ms	
Mute overlap time	t _{MOLT}			2		ms	1,2
Pre-digital pause time	t _{PDP}	LR48081A		40		ms	1,2
		LR48082A		33		ms	

Note 1 : When crystal parameters R_S=100Ω, L_M=96mH, C_M=0.02pF, C_h=5pF, f=3.579545MHz are used.
Note 2 : During 10-pps pulse mode (1/2 during 20-pps mode).

Test Circuit



Pin Functions

Name	I/O	Function
COL ₁ -COL ₄	O	Key strobe outputs
OSC _{IN}	I	Crystal oscillation circuit pin
OSC _{OUT}	O	Crystal oscillation circuit pin
10/20pps	I	10/20pps select pins
MOD	I	Pulse/tone mode select pin
MUTE ₁	O	Mute signal output pin
MUTE ₂	O	Pulse mute signal output pin
HKS	I	Hook switch input pin
ROW ₁ -ROW ₄	I	Key input pins
KEY TONE	O	Beep tone output pin
PULSE OUT	O	Pulse output pin
TONE OUT	O	Tone output pin
V _{DD}	I	Power supply pin
GND	I	Power supply pin

Pin Descriptions

10/20pps Select (Pin 11)

In the pulse dialer mode, a pulse rate of 10pps or 20pps may be selected by connecting pin 11 to GND or V_{DD}, respectively.

Pulse/Tone Mode Selection (Pin 12)

The mode immediately after going Off-Hook is selected by the MOD pin. If the MOD key is depressed in pulse mode, the rest of the dialing will be performed in tone mode. Data input through the MOD key will be stored in memory as well as other data.

MOD pin	Initial mode
GND	Tone mode
V _{DD}	Pulse mode

Mute Signal Output (Pin 2)

The MUTE₁ output consists of an N-channel open-drain transistor. It goes low during pulse or tone output.

Pulse Mute Signal Output (Pin 3)

The MUTE₂ output consists of an N-channel open-drain transistor. It goes low during pulse or tone output.

Hook Switch Input (Pin 13)

A pull-up resistor is built-in between the HKS pin and V_{DD}.

The HKS pin must be On-Hook (i.e., not grounded) when power is turned on.

HKS pin	Mode
GND	Off-Hook
Open or V _{DD}	On-Hook

Key Tone Output (Pin 18)

The KEYTONE pin is a CMOS complementary output. It outputs a beep tone signal during key input in the pulse mode.

PULSEOUT (Pin 19)

The PULSEOUT pin consists of an N-channel open-drain transistor that outputs a pulse signal in pulse mode. It also outputs a flash signal.

Tone Output (Pin 20)

The TONEOUT pin outputs a DTMF signal in tone mode. Fig. 1 shows the output circuit diagram.

Key Functions

Key	Function
0-9	Number keys
*	Pulse mode : pause key Tone mode : data key
#	Pulse mode : redial key Tone mode : data key
REDIAL	Redial key
PAUSE	Pause key
MOD	Pulse→tone switch key
FLASH	Flash function key

DTMF Output Frequencies

		Standard DTMF (Hz)	Tone frequency (Hz)	Deviation (%)
Low group frequency	ROW ₁	697	701.3	+0.62
	ROW ₂	770	771.4	+0.19
	ROW ₃	852	857.2	+0.61
	ROW ₄	941	935.1	-0.63
High group frequency	COL ₁	1209	1215.9	+0.57
	COL ₂	1336	1331.7	-0.32
	COL ₃	1477	1471.9	-0.35

Note : These values were obtained with an oscillator frequency of 3.579545MHz. Any deviations of the oscillation frequency will affect the tone output frequency.

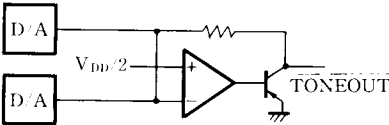


Fig. 1 Tone output circuit diagram

ROW ₁	1	2	3	FLASH
ROW ₂	4	5	6	REDIAL
ROW ₃	7	8	9	PAUSE
ROW ₄	*	0	#	MOD
	COL ₁	COL ₂	COL ₃	COL ₄

Fig. 2 Key matrix

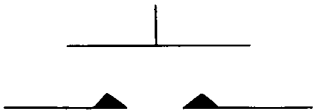


Fig. 3 Single contact key

Key Input Specifications

Parameter	Specification
Double keys depressed	Only one of the two will be recognized as valid input according to a given priority.
Bounce count	22msec
Key-on time	30msec (minimum) required
Key cycle time	Max. 130msec (from data key input)

■ Functional Description

Normal Dialing

Following a transition to Off-Hook, Normal dialing is accomplished by data key input (pulse mode : 0-9, tone mode : 0-9, * and #). 32 digits of input data can be stored in buffer memory. Any further input after the 32nd digit will be accepted after the initial 32 digits in buffer memory have been dialed. When the 33rd digit is received, the buffer memory is cleared.

Input	Dial output	Memory contents
Pulse Mode Off-Hook		last number dialed
07436 5 1321	0743651321	0743651321
Tone Mode Off-Hook		last number dialed
07436 5 1321 # *	[0743651321 # *]	0743651321 # *
Pulse Mode Off-Hook		last number dialed
07436 5 1321	0743651321	0743651321 # *
Pulse Mode Off-Hook		
123456...012 (32 digits)	123456...012 (32 digits)	last number dialed (R)=1234567...012
3456789	3456789	3456789

Note : Digits inside the [] represent the DTMF output.

Redial Function

Following a transition to Off-Hook, redial key input causes the contents of buffer memory to be dialed. In pulse mode, the # key will also act as a redial key.

Input	Dial output	Memory contents
Pulse mode REDIAL or #	0743651321	(R)=0743651321

Mixed Dialing

The MOD key is used to switch from pulse mode to tone mode.

Input	Dial output	Memory contents
MOD pin=V _{DD} Off-Hook		
07436MOD51321	07436 (Pause) [51321]	(R)=07436MOD51321

MOD key input will be stored in memory as a single digit data value as if it were data key input.

It should be noted that switching from pulse to tone mode causes a pause to be automatically inserted. (Refer to the Pause function.)

Pause Function

The pause key is used to suspend dial output for intervals of about 4 seconds. Pause key input is

stored in memory in the same way as data key input.

Input	Dial output	Memory contents
Off-Hook 0PAUSE51321	0 (Pause) 51321	0PAUSE51321

Note : The * key also acts as a pause key in the pulse mode.

The pause will be reset by redial key input in the pause mode or by # key input in the pulse mode.

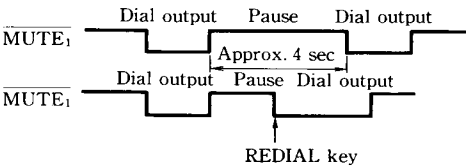


Fig. 4 Pause operation

Redialing+Normal Dialing

Normal dialing is permitted after redialing in Off-Hook mode. After redialing, up to 32 digits of normally dialed data may be stroed in buffer memory. If more than 32 digits are input, the digits stored in the buffer must be dialed first before additional key input can be stored. Then, after the buffer contents have been dialed, the buffer is cleared and data from the 33rd digit on can be newly stored.

Input	Dial output	Memory contents
Pulse mode Off-Hook		(R)=last number dialed,
REDIAL or #	07436	(R)=07436
1234...456	1234...456	(R)=1234...456
32digits		
7890	7890	(R)=7890
Pulse mode Off-Hook		
REDIAL or #	123 (Pause) [456]	(R)=123MOD456
0246	[0246]	(R)=0246

Flash Function

When FLASH key input is made in Off-Hook mode, the signal outputs shown in Fig. 5 will be generated from the PULSEOUT and MUTE₁ pins.

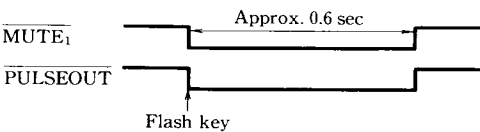
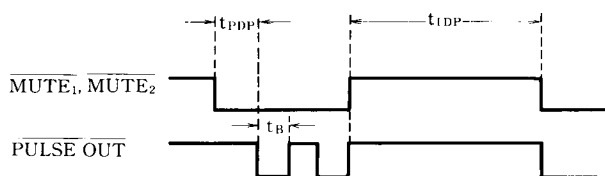


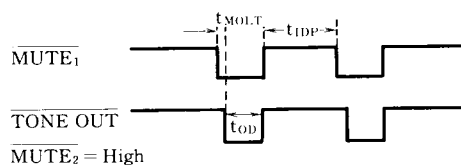
Fig. 5 Flash function

■ Timing Diagram

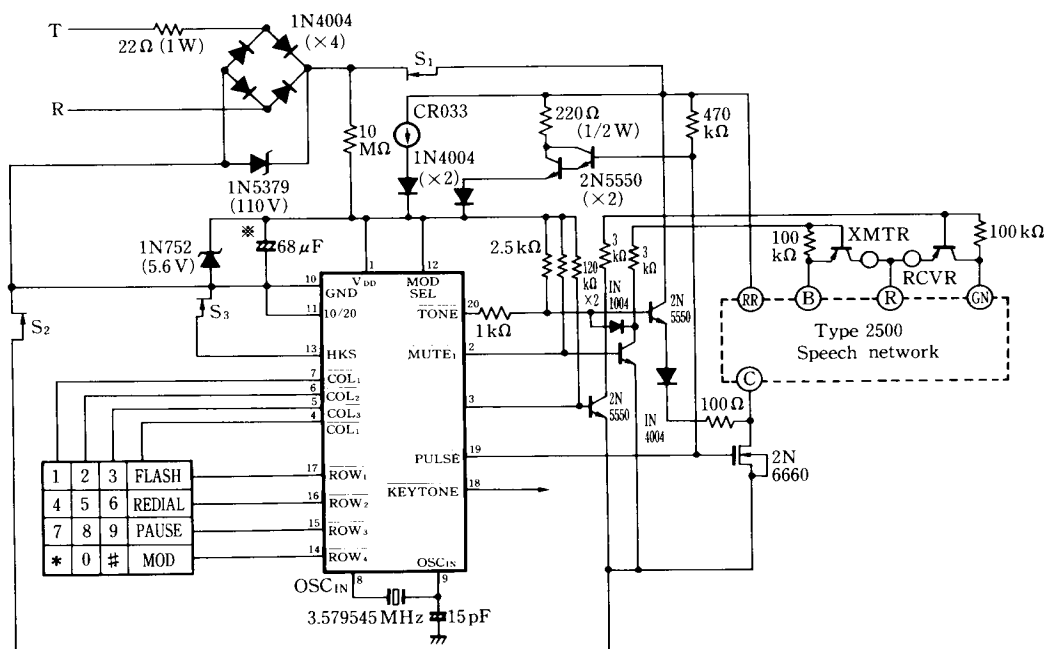
Tone mode



Pulse mode



■ System Configuration Example



※ Insert a capacitor to smooth the power supply and prevent latch-up.