

T-75-07-07

LR48221/LR48222 Pulse/Tone Dialer LSI

Description

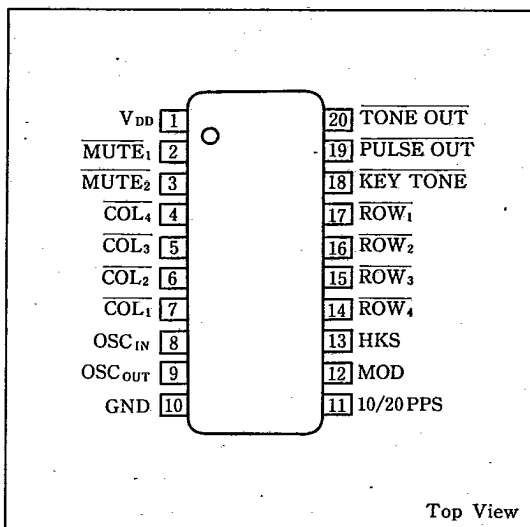
The LR48221/LR48222 is a CMOS pulse/tone dialer with 32-digit redial function and mute function.

Difference between LR48221 and LR48222 is M/B ratio.

Features

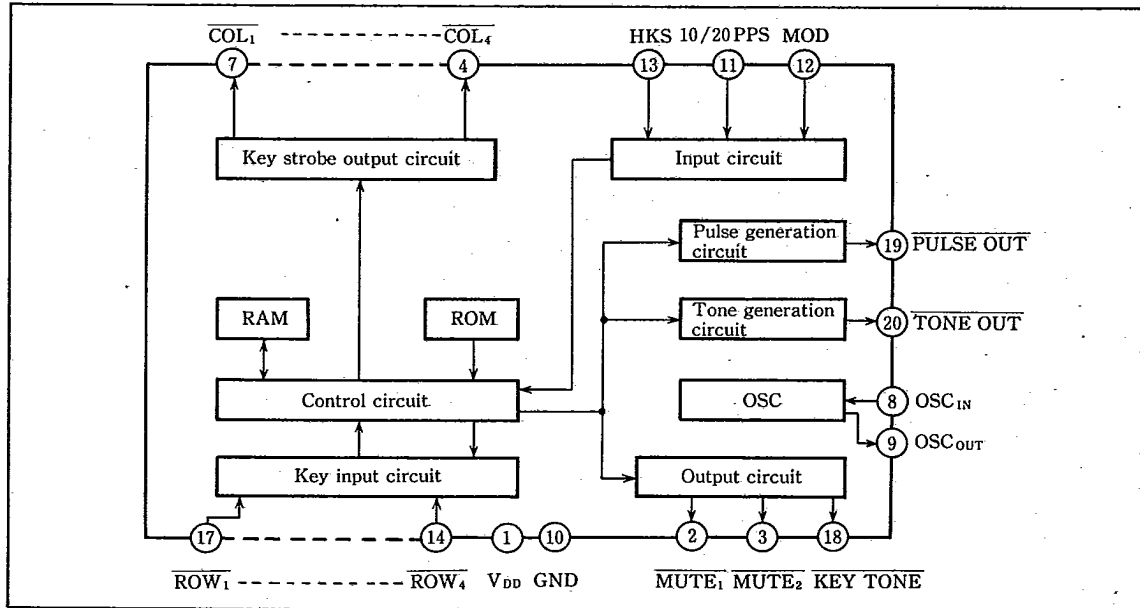
1. Pulse/tone dialer operation pin selectable.
2. Switching from pulse mode to tone mode can be executed by key input and mixed dialing is possible.
3. 32-digit redial memory
4. Flash function
5. Mute function
6. Key tone output (1kHz)
7. PABX pause storage
8. 10 or 20pps is pin selectable
9. M/B ratio : 40/60% (LR48221)
33/67% (LR48222)
10. Uses a 3.579545MHz color burst crystal oscillator as a frequency reference.

Pin Connections



11. CMOS process
12. 20-pin dual-in-line package

Block Diagram



SHARP

Pulse/Tone Dialer LSI

LR48221/LR48222

T-75-07-07

■ Pin Function

Pin name	I/O	Function
COL ₁ -COL ₄	O	Key strobe output
OSC _{IN}	I	Crystal oscillation circuit
OSC _{OUT}	O	Crystal oscillation circuit
10/20pps	I	10/20pps selection
MOD	I	Pulse/tone mode selection
MUTE ₁	O	Mute signal
MUTE ₂	O	Pulse mute signal
HKS	I	Hook switch
ROW ₁ -ROW ₄	I	Key entry
KEY TONE	O	Beep tone
PULSEOUT	O	Pulse output
TONEOUT	O	Tone output
V _{DD}	I	Power supply
GND	I	Power supply

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit	Note
Supply voltage	V _{DD}	6.5	V	1
Power dissipation	P _o	500	mW	2
Pin voltage	V _{IN1}	-0.3	V	3
	V _{IN2}	+0.3	V	3
Operating temperature	T _{opr}	-30 to +60	°C	
Storage temperature	T _{stg}	-55 to +150	°C	

Note 1 : Referenced to GND

Note 2 : Ta=25°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

(Ta=25°C, GND=0V)

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Note
Supply voltage	V _{DD}	Pulse mode	1.5		6.0	V	
		Tone mode	1.5		6.0	V	
Standby current	I _{SB}	V _{DD} =3.0V		0.1	0.2	μA	1
Operating current	I _{OPP}	V _{DD} =2.5V pulse mode		0.3	0.5	mA	2
	I _{OPT}	V _{DD} =2.5V tone mode		0.5	1.0	mA	
Input voltage	V _{IL}		GND		0.2V _{DD}	V	3
	V _{IH}		0.8V _{DD}		V _{DD}	V	
Sink current	I _{PL}	V _{DD} =2.0V, V _{OL} =0.5V	1.0	2.5		mA	4
KEYTONE output current	I _{TL}	V _{DD} =2.0V, V _{OL} =0.5V	1.0	2.0		mA	
	I _{TH}	V _{DD} =2.0V, V _{OH} =1.5V	1.0	2.0		mA	
Output leakage current	I _{LKG}	V _{DD} =6.0V, V _{OH} =6.0V			1.0	μA	4
COLUMN output current	I _{CL}	V _{DD} =3.5V, V _{OL} =0.5V	300	500	1000	μA	
	I _{CH}	V _{DD} =3.5V, V _{OH} =3.0V	10	35	100	μA	
ROW input current	I _{RP}	V _{DD} =3.5V, V _{HL} =0V	10	30	50	μA	
HKS input current	I _{HP}	V _{DD} =3.5V, V _{HL} =0V	30	60	90	μA	

Note 1 : Current necessary for memory retention. All outputs unloaded.
On-hook mode.

Note 2 : Current necessary for circuit operation. All outputs unloaded.

Note 3 : Applied to all input pins.

Note 4 : Applied to MUTE₁, MUTE₂ and PULSEOUT pins.

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LR48221/LR48222

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

Note 1 : Unnecessary frequency component in the frequency range of 20Hz to 80kHz for the basic tone signals relative to ROW and COLUMN.

(Ta=25°C, GND=0V)

Note 1 : Crystal parameters: $R_S=100\Omega$, $L_M=96mH$, $C_M=0.02pF$, $C_h=5pF$, $f=3.579545MHz$
 Note 2 : The 10pps pulse mode value. The values for the 20pps are half of these values.

Pin Function

10/20PPS(Pin 11)

In pulse dialer operation mode, following mode can be selected.

10/20pps pin	Pulse rate
GND	10pps
V _{DD}	20pps

Pulse/Tone Mode Selection

The mode immediately after going Off-Hook is selected by MOD pin (Pin 12). In pulse mode, dialing after depression of * key during the dialing operation are carried out in tone mode. Like other data key inputs, * key input is stored in memory.

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

MUTE₁ (Pin 2)

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

MUTE₂ (Pin 3)

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

HKS (Pin 13)

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

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

KEYTONE (Pin 18)

The KEYTONE pin is a CMOS complementary output. It outputs a tone signal (square wave) during key input in pulse mode and while data input is being made by FLASH, RED/P, PAUSE or MUTE key.

PULSEOUT (Pin 19)

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

TONEOUT (Pin 20)

The TONEOUT pin outputs a DTMF signal in tone mode.

Key Function

1	2	3	FLASH
4	5	6	RED/P
7	8	9	PAUSE
*	0	#	MUTE

Fig. 1 Key matrix

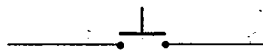


Fig. 2 Single contact keyboard

Table 1 Key function

Key	Function
0-9	Numeric key
*	Pulse mode : mode key Tone mode : data key
#	Pulse mode : redial key Tone mode : data key
RED/P	Redial key : Pause key
PAUSE	Pause key
MUTE	Mute key
FLASH	Flash function key

Table 2 DTMF output frequency

		Standard DTMF (Hz)	Tone output (Hz)	Deviation (%)
Low group frequency	ROW ₁	697	692.6	-0.63
	ROW ₂	770	774.1	+0.54
	ROW ₃	852	849.0	-0.35
	ROW ₄	941	940.0	-0.11
High group frequency	COL ₁	1209	1214.2	+0.43
	COL ₂	1336	1335.7	-0.03
	COL ₃	1477	1484.1	+0.48

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

The DTMF is output when data is input in tone mode through a data key connected with COL₁ - COL₄, ROW₁ - ROW₄. In normal mode, the DTMF signal shown in table 2 is output while a key is depressed.

Table 3 Key input specifications

Parameter	Specification
Double keys depressed	Only one of them will be recognized as valid input according to a given priority: COL ₁ -COL ₄ , ROW ₄ -ROW ₁
Bounce count	24 ms
Key-on time	30 ms at min.
Key cycle time	130 ms at max. (for data keys)

While a keytone or a flash signal is output the next key can not be accepted.

4

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. Immediately after going On-Hook or flash signal is output, the buffer memory is cleared.

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

Note (R) : Buffer memory content
Digits inside the [] represent the DTMF output.
Dialing is not conducted by # or * key input in pulse mode.

Redialing 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	Buffer Contents
Pulse Mode RED/P or #	0743651321	(R)=0743651321

Mixed Dialing

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

Input	Dial Output	Buffer Contents
MOD = V _{DD} Off-Hook 07436 * 51321	07436(Pause)[51321]	(R)=07436MOD51321

The 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 or RED/P key is used to suspend dial output for intervals of about 4 seconds. PAUSE or RED/P key input is stored in memory in the same way as data key input.

Input	Dial Output	Butter Contents
Off-Hook 0PAUSE51321	0(Pause)51321	(R)=0PAUSE51321

The pause will be reset by PAUSE or RED/P key input in pause mode.

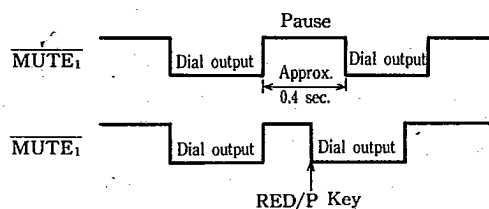


Fig. 3 Pause operation.

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 stored in buffer memory. The digits stored in the buffer must be dialed first before additional key input can be stored. If more than 32 digits are input, the buffer is cleared immediately after going On-Hook or flash signal is output.

Input	Dial Output	Buffer Contents
Pulse Mode Off-Hook RED/P or # 1234 ... 012 32 digits 7890 On-Hook	07436 1234 ... 012 7890	(R)=last number dialed (R)=07436 (R)=1234 ... 012 (R)=7890 (R)=
Pulse Mode Off-Hook RED/P or # 0246	123(Pause)[456] [0246]	(R)=123MOD456 (R)=0246

T-75-07-07

Flash Function

When FLASH key input is made in Off-Hook mode, the signal outputs shown in Fig. 4 will be generated from the PULSEOUT and MUTE₁ pins.

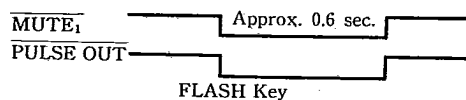
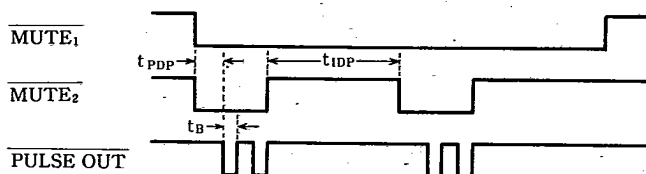


Fig. 4 Flash function

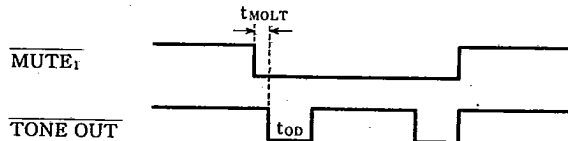
Mute Function

Pressing the MUTE key in Off-Hook mode outputs a Low level signal to the MUTE₁ pin. The MUTE key, FLASH key or On-Hook operation releases the system from the mute state, thus allowing only the MUTE key or FLASH key entries to be accepted in the mute state.

Note : Function and operation are described only for use in the combinations specified in "Functional Description."

■ Timing Diagram

Pulse mode timing



Tone mode timing

4

■ System Configuration Example

S_1, S_2, S_3 : Hook switch