

LR4807A

Pules/Tone Dialer LSI

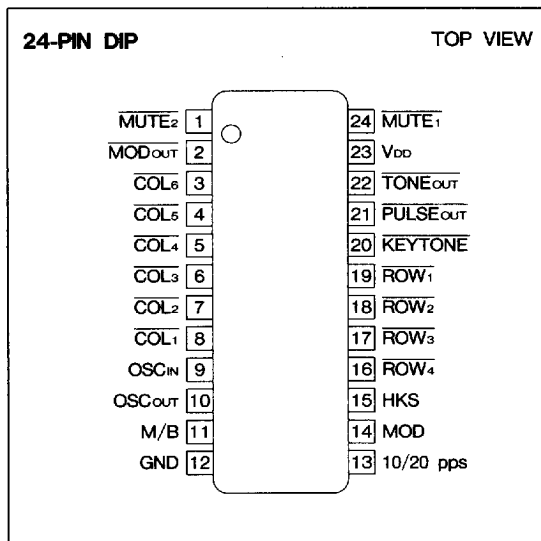
DESCRIPTION

The LR4807A is a CMOS pulse/tone dialer LSI providing 16-digit×3-channel one-touch memory and a 32-digit redial memory.

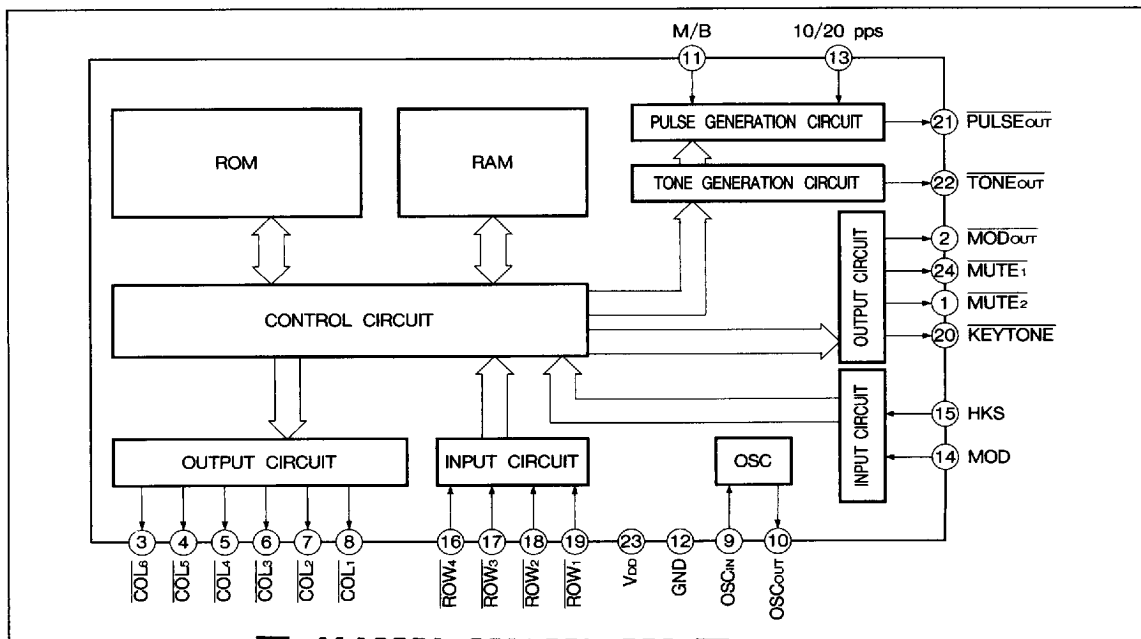
FEATURES

- 32-digit redial memory, 16-digit×3 one-touch memory
- Make ratio : 33/40% pin-selectable
- Pulse rate : 10/20 pps pin-selectable
- Keytone output (1 kHz)
- Key input allows switching from pulse to tone mode to provide mixed-dialing capability
- Pulse/tone dialer operation can be selected by the pin
- Uses a 3.579 545 MHz color-burst crystal/ceramic oscillator as a frequency reference
- Flash signal output
- PBX pause storage
- Package : 24-pin DIP(DIP024-P-0600)

PIN CONNECTIONS



BLOCK DIAGRAM



8180798 0014236 9T5

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ABSOLUTE MAXIMUM RATINGS

SYMBOL	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

NOTES :

1. Referenced to GND.
2. T_a = 25°C
3. The maximum applicable voltage on any pin with respect to GND.
4. The maximum applicable voltage on any pin with respect to V_{DD}.

DC CHARACTERISTICS

(T_a = 25°C, GND = 0 V)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Supply voltage	V _{DD}	Pulse mode	1.5		6.0	V	
		Tone mode	2.0		6.0	V	
Standby current	I _{SB}	V _{DD} = 3.5 V		0.5	1.0	μA	1
Operating current	I _{OPP}	V _{DD} = 3.5 V, pulse mode		0.5	1.0	mA	2
	I _{OPT}	V _{DD} = 3.5 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	
<u>KEYTONE</u> output current	I _{TL}	V _{DD} = 2.0 V, V _{OL} = 0.5 V	1.0	2.0		mA	
	I _{TH}	V _{DD} = 2.0 V, V _{OH} = 1.5 V	1.0	2.0		mA	
Output leakage current	I _{LKG}	V _{DD} = 6.0 V, V _{OH} = 6.0 V			1.0	μA	4
<u>COLUMN</u> output current	I _{CL}	V _{DD} = 3.5 V, V _{OL} = 0.5 V	300	650	1000	μA	
	I _{CH}	V _{DD} = 3.5 V, V _{OH} = 3.0 V	50	70	100	μA	
ROW input current	I _{RP}	V _{DD} = 3.5 V, V _{IL} = 0 V	10	30	50	μA	
HKS input current	I _{HP}	V _{DD} = 3.5 V, V _{IL} = 0 V	40	60	80	μA	

NOTES :

1. Current for memory retention; no load on all outputs; On-Hook mode.
2. Current during operation; no load on all outputs.
3. Applicable to all input pins.
4. Applicable to MUTE₁, MUTE₂, PULSE_{OUT} pins.

TONE OUTPUT CHARACTERISTICS

(Ta=25°C, GND=0 V)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Tone output voltage	ROW	$R_L = 10\text{ k}\Omega$, $V_{DD} = 4.0\text{ V}$	125	165	200	mV _{rms}	
	COLUMN	$R_L = 10\text{ k}\Omega$, $V_{DD} = 4.0\text{ V}$	170	220	270	mV _{rms}	
Output distortion	DIS	$R_L = 10\text{ k}\Omega$, $V_{DD} \geq 2.0\text{ V}$			-20	dB	1
Pre-emphasis	PE _{HB}	$R_L = 10\text{ k}\Omega$, $V_{DD} \geq 2.0\text{ V}$	1.0	2.0	3.0	dB	
Inter-digital pause	t _{IDP}		100		130	ms	
Tone output time	t _{OD}		100	125	150	ms	
Tone output rate	t _{OR}		200	225	280	ms	

NOTE :

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

AC CHARACTERISTICS

(Ta=25°C, GND=0 V)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Oscillator start-up time	t _{OS}				8.0	ms	1
Pulse rate	Pr	Pin 13=GND	9.8	10	10.2	pps	
		Pin 13=V _{DD}	19.6	20	20.4	pps	
Break time	t _B	Pin 11=GND	65	67	69	ms	1, 2
		Pin 11=V _{DD}	58	60	62		
Inter digital pause	t _{IDP}	10 pps mode	850	900	950	ms	1
		20 pps mode	500	525	550	ms	
Mute overlap time	t _{MOLT}		1.9	2	2.1	ms	1, 2
Pre-digital pause	t _{PDOP}	Pin 11=GND	32	33	34	ms	2
		Pin 11=V _{DD}	39	40	41	ms	

NOTES :

- Crystal resonator parameters : $R_s = 100\text{ }\Omega$, $L_M = 96\text{ mH}$, $C_M = 0.02\text{ pF}$, $C_h = 5\text{ pF}$, $f = 3.579\,545\text{ MHz}$.
- The 10 pps pulse mode value. The values for the 20 pps are half of these values.

PIN FUNCTION

SYMBOL	I/O	FUNCTION
COL ₁ -COL ₆	O	Key strobe output
OSC _{IN}	I	Crystal oscillation circuit pin
OSC _{OUT}	O	Crystal oscillation circuit pin
M/B	I	Make/break ratio select pin
MOD _{OUT}	O	Pulse/tone mode output pin
10/20 pps	I	10/20 pps select pin
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 pin
KEYTONE	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

10/20 pps (Pin 13), M/B (Pin 11)

In pulse mode, the following modes can be selected.

10/20 pps PIN	Pulse RATE
GND	10 pps
V _{DD}	20 pps

M/B PIN	MAKE/BREAK RATIO
GND	33/67
V _{DD}	40/60

Pulse/Tone Mode Selection (Pin 14)

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. The MOD_{OUT} pin (N-channel open-drain).

MOD PIN	INITIAL MODE
GND	Tone mode
V _{DD}	Pulse mode

CONDITION	MODE	MOD _{OUT} OUTPUT
Off-Hook	Pulse mode	High impedance
	Tone mode	"LOW" level
On-Hook	Pulse/tone	High impedance

Mute Signal Output (Pin 24)

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

Pulse Mute Signal Output (Pin 1)

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

Hook Switch Input (Pin 15)

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 20)

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

PULSE_{OUT} (Pin 21)

The PULSE_{OUT} 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 22)

The TONE_{OUT} pin outputs a DTMF signal in tone mode. Fig. 1 shows the output circuit diagram.

Key Function

KEY	FUNCTION
0 - 9	Number key
*	Pulse mode : pause key
	Tone mode : data key
#	Pulse mode : redial key
	Tone mode : data key
REDIAL	Redial key
PAUSE	Pause key
STORE	Memory store key
M1 - M3	Memory recall key
MOD	Pulse→tone switch key
FLASH	Flash function key
A - D	Pulse mode : non operation
	Tone mode : data key

Table 1 DTMF Output Frequencies

		STANDRAD DTMF (Hz)	LR4807A (Hz)	DEVIATION (%)
Lower-group frequency	ROW1	697	701.3	+0.62
	ROW2	770	771.4	+0.19
	ROW3	852	857.2	+0.61
	ROW4	941	935.1	−0.63
Higher-group frequency	COL1	1209	1215.9	+0.57
	COL2	1336	1331.7	−0.57
	COL3	1477	1471.9	−0.35
	COL4	1633	1645.9	+0.73

NOTES :

- These values were obtained with an oscillator frequency of 3.579 545 MHz.
- Any deviations of the oscillation frequency will affect the tone output frequency.

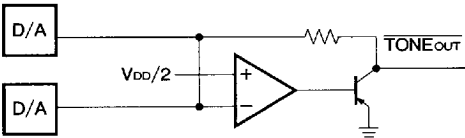


Fig. 1 Tone Output Circuit Diagram

1	2	3	A	FLASH	STORE
4	5	6	B	REDIAL	M1
7	8	9	C	PAUSE	M2
*	0	#	D	MOD	M3

Fig. 2 Key Matrix

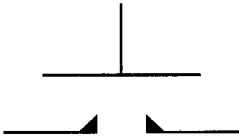


Fig. 3 Single Contact Key

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	22 ms
Key-on time	30 ms (minimum) required
Key cycle time	Max. 130 ms (from data key)

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	MEMORY CONTENTS
Pulse mode Off-Hook 07436 5 1321		(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	123456...012 (32 digits) 3456789	(R)=last number dialed (R)=1234567...012 (R)=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 = VDD Off-Hook 07436 [MOD] 51321		(R)= 07436(Pause)[51321] 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 0 [PAUSE] 51321	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 pause mode or by * key input in pulse mode.

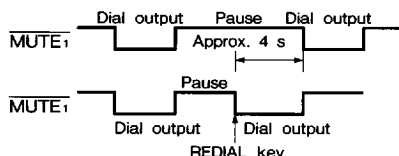


Fig. 4 Pause Operation

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 stored 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	(M)=07436
1234...456	1234...456	(R)=07436
32digits		(R)=1234...456
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 MUTE_i pins.

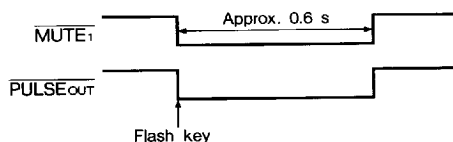


Fig. 5 Flash Function

Memory Dialing

The LR4807A is provided with 3 lines of 16-digit memory. This allows one-touch memory dialing with the M₁ to M₃ keys. It also permits two successive memory key inputs. The memory content dialed will be stored in buffer memory. The third memory key will be accepted after the first and second memory key's data has been dialed. When the contents of the third memory key are received, the buffer memory is cleared, and the contents of the third memory key are stored in buffer memory.

INPUT	DIAL OUTPUT	MEMORY CONTENTS
Tone mode Off-Hook		(M ₁)=07436, (M ₂)=51321, (M ₃)=2116
M ₁	[07436]	(R)=07436
M ₂	[51321]	(R)=07436 5 1321
M ₃	[2116]	(R)=2116

Normal Dialing + Memory Dialing

Memory operations can be done after going Off-Hook. One memory key input is accepted immediately after normal key input of up to 16 digits. Then both input data of normal key and the memory key are stored in buffer memory. After the contents of buffer memory have been dialed new key input will be accepted. In this case, the contents of buffer memory are cleared when new key input is received. Two successive memory key inputs are permitted after normal dialing of 32 digits finishes and the circuit goes Off-Hook. In this case, the contents of buffer memory are cleared, when new key input is received.

INPUT	DIAL OUTPUT	MEMORY CONTENTS
Pulse Mode Off-Hook		(R)=last number dialed, (M)=51321
07436	07436	(R)=07436
[M ₁]	51321	(R)=074651321
2116	2116	(R)=2116
Pulse Mode Off-Hook		(R)=last number dialed, (M ₁)=51321, (M ₂)=2116
12345678901234567	12345678901234567	(R)=12345678901234567
[M ₁]	51321	(R)=51321
[M ₂]	2116	(R)=513212116
Pulse Mode Off-Hook		(R)=last number dialed, (M ₁)=123MOD456
0246	0246	(R)=0246
[M ₁]	123 (Pause) [456]	(R)= 0246123MOD456

Memory Operations

The contents of memory should be set up while Off-Hook.

INPUT	MEMORY CONTENTS
Off-Hook	(R)=last number dialed
STORE M ₁	(M ₁)=(R)=last number dialed
STORE 07436 M ₂	(R)=07436 then (M ₂)=(R)=07436*
STORE 51321	(R)=51321
REDIAL	

* : If the buffer memory contents exceed 16 digits any further input from 17th digit will be ignored.

NOTE :

A, B, C, D and PAUSE key input requires digits of storage in buffer memory.

During store operations FLASH key input is ignored. After a store operation, an On/Off-Hook transition must precede a dial transmission.

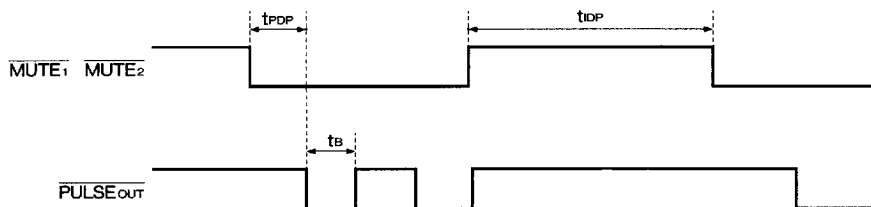
Memory Dialing + Normal Dialing

Memory dialing operations using the memory keys are possible following normal dialing operation, when the circuit is Off-Hook. Both memory dialing data and the data of normal key input, up to 16 digits, may be stored in buffer memory. Normal key input is accepted after the contents of buffer memory have been dialed. In this case, the buffer is cleared, and data from the 17th digit on is newly stored in buffer memory.

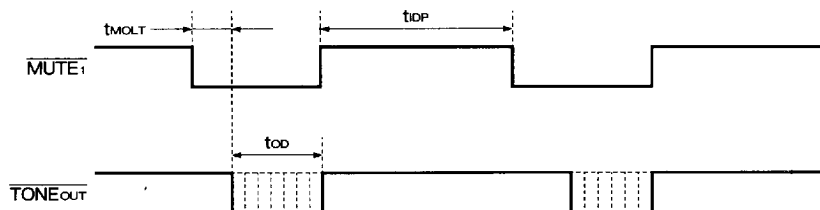
INPUT	DIAL OUTPUT	MEMORY CONTENTS
Pulse mode		(R)=last number dialed,
Off-Hook		(M)=07436
M ₁	07436	(R)=07436
1234...456	1234...456	(R)=07436 1234...456
7890	7890	(R)=7890
Pulse mode		(R)=last number dialed,
Off-Hook		(M)=123MOD456
M ₁	123 (Pause) [456]	
0246	[0246]	(R)=123MOD4560246

TIMING DIAGRAMS

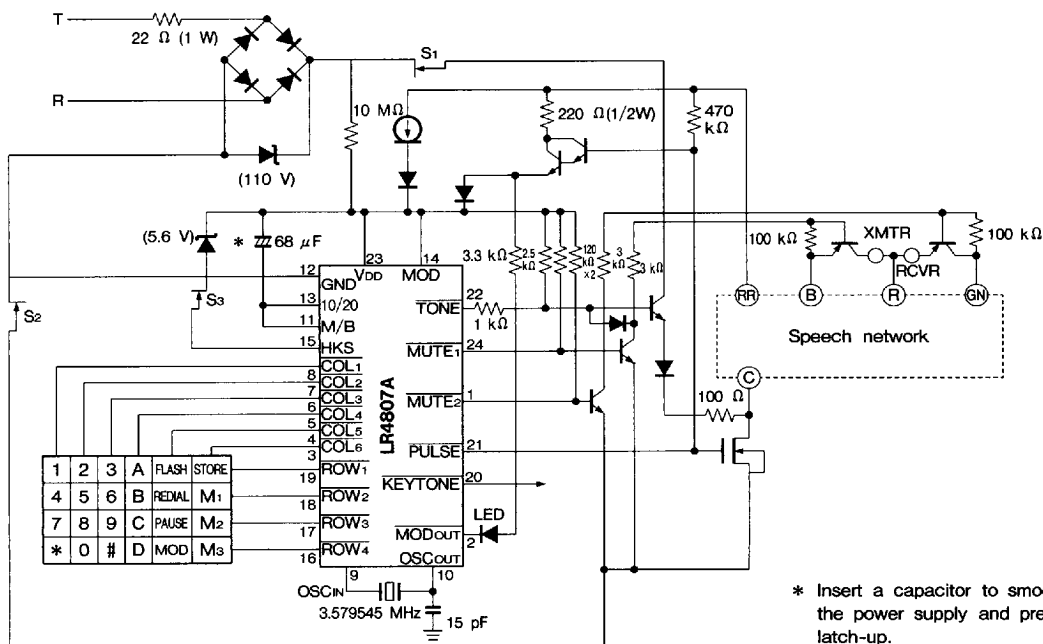
(Pulse mode)



(Tone mode)

* $\overline{\text{MUTE}}_2$ inoperative

SYSTEM CONFIGURATION EXAMPLE



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