Ordering number:ENN4367

CMOS IC

LC73860

DTMF Receiver IC

Overview

The LC73860 is a DTMF signal detector receiver that incorporates all the necessary filters for telephone answering machines.

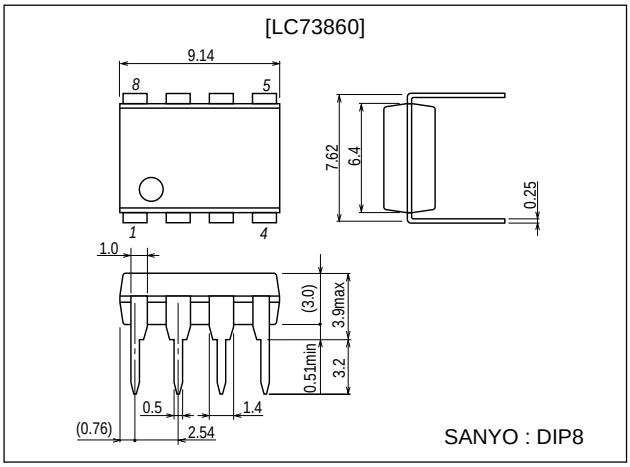
Features

- 16-DTMF tone signal decoder.
- DTMF receiver with all necessary filters built-in.
  - · Dial tone filter.
  - · High-group bandpass filter.
  - · Low-group bandpass filter.
- Extended dynamic range.
- Serial data output.
- Microcontroller guard-time compatible.
- 4.5 to 5.5V operating supply voltage range.
- Available in 8-pin plastic DIPs (300 mil).

Package Dimensions

unit:mm

3001C-DIP8



Specifications

Absolute Maximum Ratings at Ta=25±2˚C, V_{SS}=0V

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{DD} max		–0.3 to +6.0	V
Input voltage	V_{IN} max		–0.3 to V_{DD}+0.3	V
Input current	I_{IN} max		–10 to +10	mA
Output voltage	V_{OUT} max		–0.3 to V_{DD}+0.3	V
Allowable power dissipation	Pd max	Ta≤85°C	500	mW
Operating temperature	Topr		–40 to +85	˚C
Storage temperature	Tstg		–50 to +125	˚C

Recommended Operating Conditions at Ta=–40 to +85˚C, V_{SS}=0V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Operating supply voltage	V_{DD}		4.5		5.5	V
Input HIGH-level voltage	V_{IH}	ACK pin	$0.7V_{DD}$			V
		PD pin	$0.85V_{DD}$			V
Input LOW-level voltage	V_{IL}	ACK pin			$0.3V_{DD}$	V
		PD pin			$0.15V_{DD}$	V

DC Electrical Characteristics at Ta=25±2˚C, V_{DD}=5V, V_{SS}=0V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Operating supply current	I_{DD}(op)			3.0	7.0	mA
Standby supply current	$I_{DD(st)}$	V_{PD}=5V			10	µA
Output HIGH-level current	I_{OH}	V_{OUT}=4.6V, SD and EST pins			–0.4	mA
Output LOW-level current	I_{OL}	V_{OUT}=0.4V, SD and EST pins	1			mA
Input impedance	Z_{in}	INPUT pin	10			kΩ

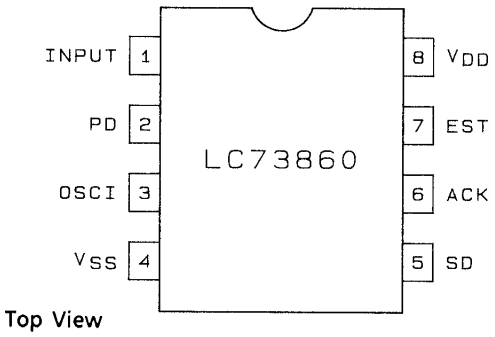
AC Electrical Characteristics at Ta=25±2˚C, V_{DD}=5V, V_{SS}=0V, f_{OSC}=4.194304MHz

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Valid input signal level		See notes 1, 2, 3, 5, 6 and 9.	–49.5		0	dBm
Positive twist accept		See notes 2, 3, 4, 9 and 11.		6		dB
Frequency deviation accept		See notes 2, 3, 5 and 9.	±1.5%±2			Hz
Frequency deviation reject		See notes 2, 3 and 5.	±3.5			%
Third tone tolerance		See notes 2, 3, 4, 5, 9 and 10.		–16		dB
Dial tone tolerance		See notes 2, 3, 4, 5, 8, 9 and 10.		22		dB
Noise tolerance		See notes 2, 3, 4, 5, 8, 9 and 10.		–12		dB
Tone present detect time	t_{DP}	See timing chart.	3		20	ms
Tone absent detect time	t_{DA}	See timing chart.	0.5		20	ms
Data shift rate					1	MHz
Data output delay time	t_{PAD}	See timing chart.		100		ns
Setup time delay	t_{DL}	See timing chart.	0			ns
Data hold time	t_{DH}	See timing chart.	30			ns
Oscillator frequency	f_{OSC}		4.152362	4.194304	4.236247	MHz

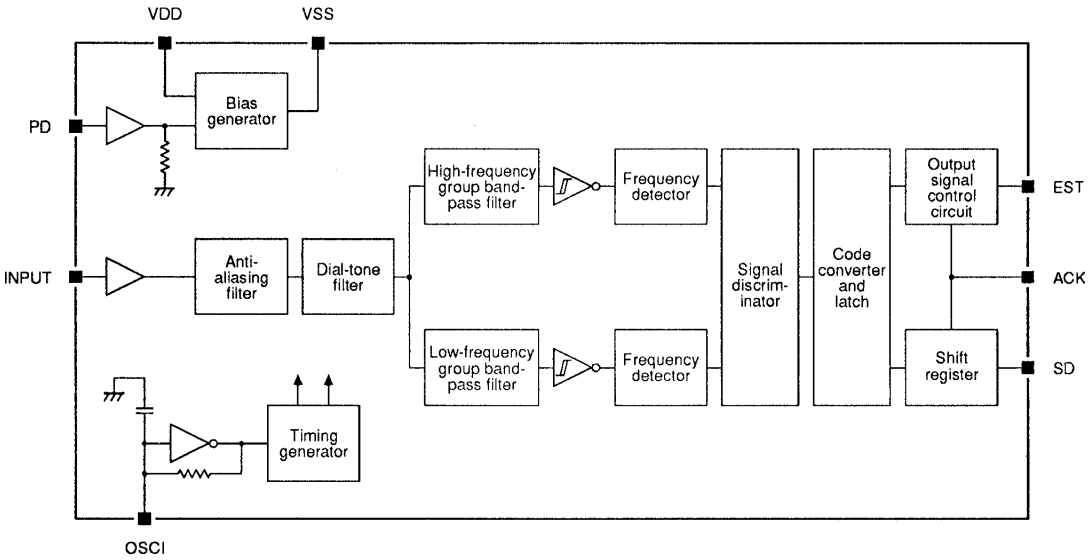
Notes

1. 0dBm=1mW power when driving a 600Ω load.
2. All 16 DTMF signal frequencies.
3. 40ms DTMF signal period and 40ms pause period.
4. Nominal DTMF frequency.
5. Low-frequency group and High-frequency group signal levels are the same.
6. DTMF signal frequency deviation is within ±1.5% ±2Hz.
7. Bandwidth limited (0 to 3kHz) Gaussian noise.
8. 350Hz and 440Hz dial tone frequencies.
9. Error rate of less than 1 in 10,000.
10. Referenced to the lowest frequency component of the DTMF signal.
11. Twist=High-frequency group tone level ÷ Low-frequency group tone level.

Pin Assignment



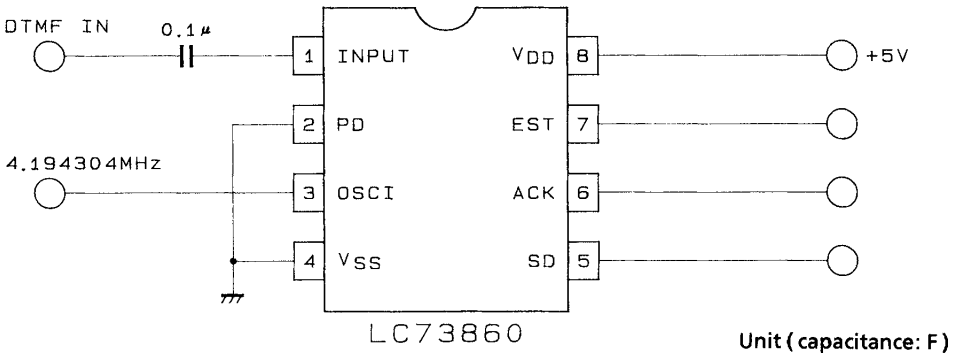
Block Diagram



Pin Functions

Number	Name	I/O	Description
1	INPUT	I	Input coupling capacitor connection. Biased internally to $V_{DD}/2$.
2	PD	I	Power-down mode is selected when HIGH.
3	OSCI	I	4.194304MHz external clock input.
4	V_{SS}		Ground (0V).
5	SD	O	Outputs the 4-bit serial, decoded DTMF output, least significant bit first.
6	ACK	I	Shift data to SD control. Four pulses are used to output the 4-bit DTMF code. Before the first rising edge, the data is latched into the shift register.
7	EST	O	Indicates the presence of a DTMF signal when HIGH. This pin can be monitored and after a short delay, data can be accessed by applying 4 pulses to ACK.
8	V_{DD}	O	4.5 to 5.5V supply voltage.

Test/Application Circuit



Output Code Table

F_L	F_H	KEY	b3	b2	b1	b0
697	1209	1	L	L	L	H
697	1336	2	L	L	H	L
697	1477	3	L	L	H	H
770	1209	4	L	H	L	L
770	1336	5	L	H	L	H
770	1477	6	L	H	H	L
852	1209	7	L	H	H	H
852	1336	8	H	L	L	L
852	1477	9	H	L	L	H
941	1336	0	H	L	H	L
941	1209	✳	H	L	H	H
941	1477	#	H	H	L	L
697	1633	A	H	H	L	H
770	1633	B	H	H	H	L
852	1633	C	H	H	H	H
941	1633	D	L	L	L	L

DTMF Dialing Matrix

	C1	C2	C3	C4
R1	1	2	3	A
R2	4	5	6	B
R3	7	8	9	C
R4	✳	0	#	D

Timing Chart