Features

- Operating voltage: 2.5V~5.5V
- Serial mode for the AX9200A
- Serial/parallel mode for the AX9200B
- Low standby current
- Low total harmonic distortion
- 3.58MHz crystal or ceramic resonator
- AX9200A: 8-pin SOP package
  AX9200B: 14-pin SOP package

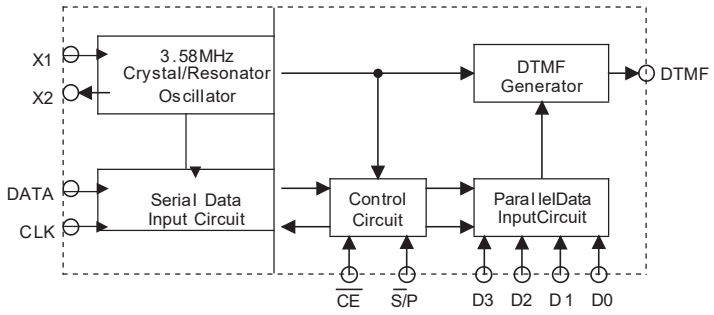
General Description

The AX9200A/B tone generators are designed for MCU interfaces. They can be instructed by a MCU to generate 16 dual tones and 8 single tones from the DTMF pin. The AX9200Aprovides a serial mode whereas the AX9200Bcontains a selectable serial/parallel mode interface for various applications such as security systems, home automation, remote control through telephone lines, communication systems, etc.

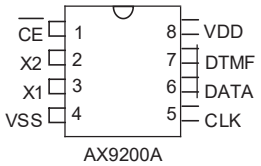
Selection Table

Function / Part No.	Operating Voltage	OSC Frequency	Interface	Package
AX9200A	2.5V~5.5V	3.58MHz	Serial	8SOP
AX9200B	2.5V~5.5V	3.58MHz	Serial/Parallel	14SOP

Block Diagram

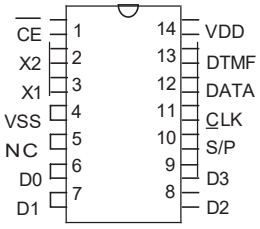


Pin Assignment



AX9200A

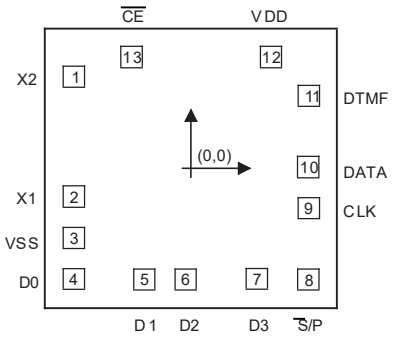
8 SOP-A



AX9200B

14 SOP-A

Pad Assignment



Pad Coordinates

Unit: μm

Pad No.	X	Y	Pad No.	X	Y
1	-553.30	430.40	8	553.30	-523.50
2	-553.30	-133.50	9	553.30	-190.30
3	-553.30	-328.50	10	553.30	4.70
4	-553.30	-523.50	11	553.30	340.30
5	-220.10	-523.50	12	374.90	523.50
6	-25.10	-523.50	13	-279.30	523.50
7	308.10	-523.50			

Chip size: 1460 × 1470 $(\mu m)^2$

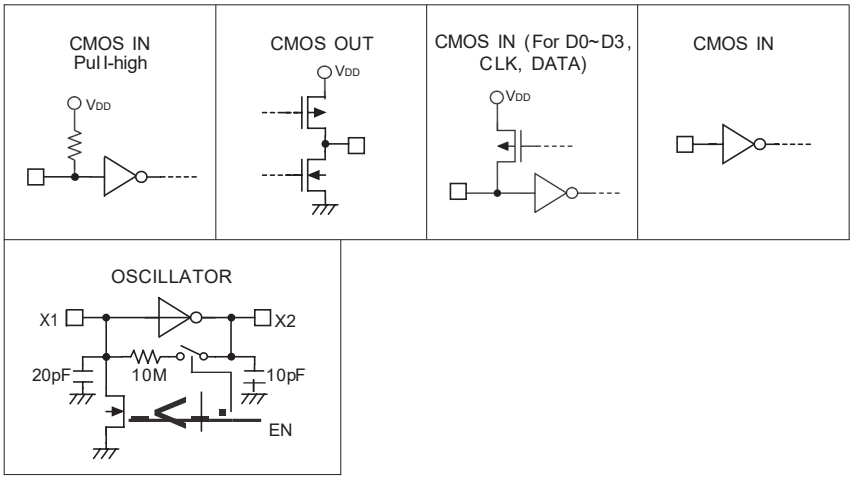
* The IC substrate should be connected to VSS in the PCB layout artwork.

Pin Description

Pin Name	I/O	Internal Connection	Description
$\overline{CE}$	I	CMOS IN Pull-high	Chip enable, active low
X2	O	Oscillator	The system oscillator consists of an inverter,a bias resistor, and the required load capacitor on chip. The oscillator function can be implemented by Connect a standard 3.579545MHz crystal to the X1 and X2 terminals.
X1	I		
VSS	—	—	Negative power suppl, ground
NC	—	—	No connection
D0~D3	I	CMOS IN Pull-high or Floating	Data inputs for the parallel mode. When the IC is operating in the serial mode, the data input terminals (D0~D3) are included with a pull-high resistor. When the IC is operating in the parallel mode, these pins become floating.
$\overline{S}$/P	I	CMOS IN	Operation modeselection input. S/P="H": Parallel mode S/P="L": Serial mode
CLK	I	CMOS IN Pull-high or Floating	Data synchronous clock input for the serial mode. When the IC is operating in the parallel mode, the input terminal (CLK) is included with a pull-high resistor. When the IC is operating in the serial mode, this pin becomes floating.

Pin Name	I/O	Internal Connection	Description
DATA	I	CMOS IN Pull-high or Floating	Data input terminal for the serial mode. When the IC is operating in the parallel mode, the input terminal (DATA) is included with a pull-high resistor. When the IC is operating in the serial mode, this pin becomes floating.
DTMF	O	CMOS OUT	Output terminal of the DTMF signal
VDD	—	—	Positive power supply, 2.5V~5.5V for normal operation

Approximate internal connection circuits



Absolute Maximum Ratings

Supply Voltage .....VSS-0.3V to VSS+6V

Input Voltage.....VSS-0.3V to VDD+0.3V

Storage Temperature .....-50。C to 125。C

Operating Temperature .....-20。C to 75。C

Note: These are stress ratings only. Stresses exceeding the range specified under " Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

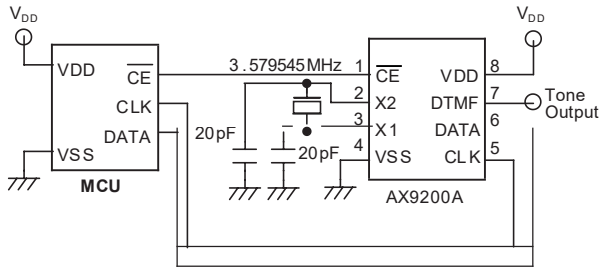
Electrical Characteristics

Ta=25oC

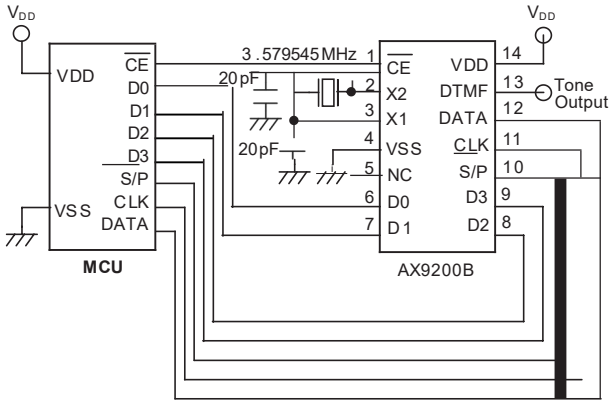
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DD}	Operating Voltage	—	—	2.5	—	5.5	V
I_{DD}	Operating Current	2.5V	$\overline{S/P}$=V_{DD},D0~D3=V_{SS}, CE=V_{SS}, No load	—	240	2500	μA
		5.0V		—	950	3000	
V_{IL}	"Low" Input Voltage	—	—	VSS	—	0.2V_{DD}	V
V_{IH}	"High" Input Voltage	—	—	0.8V_{DD}	—	V_{DD}	V
I_{STB}	Standby Current	2.5V	$\overline{S/P}$=V_{DD},$\overline{CE}$=V_{DD}, no load	—	—	1	μA
		5.0V		—	—	2	
R_P	Pull-high Resistance	2.5V	V_{OL}=0V	120	180	270	kΩ
		5.0V		45	68	100	
t_{DE}	DTMF Output Delay Time (Parallel Mode)	5V	—	—	t_{UP}+6	t_{UP}+8	ms
V_{TDC}	DTMF Output DC Level	2.5V~5.5V	DTMF Output	0.45V_{DD}	—	0.75V_{DD}	V
I_{TOL}	DTMF Sink Current	2.5V	V_{DTMF}=0.5V	-0.1	—	—	mA
V_{TAC}	DTMF Output AC Level	2.5V	Row group, R_L=5kΩ	0.12	0.15	0.18	Vrms
A_{CR}	Column Pre-emphasis	2.5V	Row group=0dB	1	2	3	dB
R_L	DTMF Output Load	2.5V	t_{HD} ≤-23dB	5	—	—	kΩ
t_{HD}	Tone Signal Distortion	2.5V	R_L=5kΩ	—	-30	-23	dB
f_{CLK}	Clock Input Rate (Serial Mode)	—	—	—	100	500	kHz
t_{UP}	Oscillator Starting Time (When $\overline{CE}$ is low)	5.0V	The time from $\overline{CE}$ falling edge to normal oscillator operation	—	—	10	ms
f_{OSC}	System Frequency	—	Crystal=3.5795MHz	3.5759	3.5795	3.5831	MHz

Application Circuits

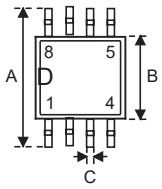
Serial Mode

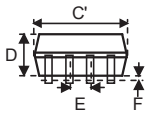


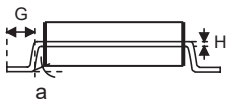
Serial/Parallel Mode



8-pin SOP (150mil) Outline Dimensions



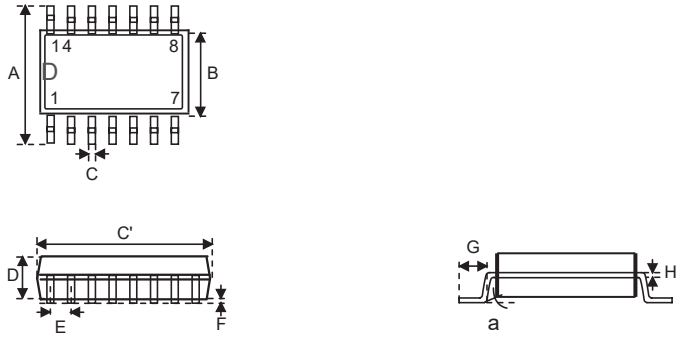




Symbol	Dimensions in inch		
	Min.	Nom.	Max.
A	—	0.236 BSC	—
B	—	0.154 BSC	—
C	0.012	—	0.020
C’	—	0.193 BSC	—
D	—	—	0.069
E	—	0.050 BSC	—
F	0.004	—	0.010
G	0.016	—	0.050
H	0.004	—	0.010
a	0o	—	8o

Symbol	Dimensions in mm		
	Min.	Nom.	Max.
A	—	6.00 BSC	—
B	—	3.90 BSC	—
C	0.31	—	0.51
C’	—	4.90 BSC	—
D	—	—	1.75
E	—	1.27 BSC	—
F	0.10	—	0.25
G	0.40	—	1.27
H	0.10	—	0.25
a	0o	—	8o

14-pin SOP (150mil) Outline Dimensions



Symbol	Dimensions in inch		
	Min.	Nom.	Max.
A	—	0.236 BSC	—
B	—	0.154 BSC	—
C	0.012	—	0.020
C’	—	0.341BSC	—
D	—	—	0.069
E	—	0.050 BSC	—
F	0.004	—	0.010
G	0.016	—	0.050
H	0.004	—	0.010
a	0o	—	8o

Symbol	Dimensions in mm		
	Min.	Nom.	Max.
A	—	6.0	—
B	—	3.9	—
C	0.31	—	0.51
C’	—	8.65	
D	—	—	1.75
E	—	1.27	—
F	0.10	—	0.25
G	0.40	—	1.27
H	0.10	—	0.25
a	0o	—	8o