

IS22C120

16 to 20 SEC VOICE ROM

**ADVANCE INFORMATION
SEPTEMBER 1997**

FEATURES

- Voice length at:
 - 8 KHz sampling is 16 seconds
 - 6 KHz sampling is 20 seconds
- Silence compression saves memory
- Four trigger pins, S1 to S4 for eight sections
- SBT pin play-all or sequential play-all
- 15 ms debounce suitable for CDs
- IRP interrupt pin stops playback at once
- STP stop pulse generated at playback end
- BUSY signal for CPU control
- Two LEDs flash at 3 Hz
- 2.4V to 6V single power supply operation
- Low standby current (<5 μ A at 3V)
- Auto power-down
- Built-in oscillator, D/A converter, ROM
- ADPCM data compression
- Optional pop noise elimination function
- COUT pin drives speaker with a transistor
- Development tool support
- VOUT1 and VOUT2 drives buzzer directly
- Sampling rate determined by an external resistor
- Holdable and unholdable triggering option
- Each section can be programmed to repeat up to eight times

GENERAL DESCRIPTION

The IS22C120 is a high-quality voice synthesizer with capacity from 16 to 20 seconds. A proprietary ADPCM algorithm is used. The audio message is stored in a 512K bit on-chip read-only memory.

The IS22C120 eliminates the need for complicated circuitry in voice playback but still achieves high voice quality. Sounds such as human speech, animal sounds, musical sounds, and even special effects can be synthesized. Devices can be cascaded to achieve longer voice duration. Two devices can be configured in parallel in order to achieve signal mixing without an external mixer so speech can be mixed with background music each from one of two different chips.

The IS22C120 provides wide voltage operating range from 2.4V to 6.0V. A pair of PWM output pins, VOUT1 and VOUT2, provide direct drive to a buzzer. Voice quality is comparable to a speaker output and power consumption is much lower. This facilitates button battery applications such as greeting cards.

A current output pin, COUT, enables the device to drive a speaker through a low cost NPN transistor. No complex filtering or amplifier circuit is needed. An automatic ramp-up and ramp-down function eliminates undesired noise at the beginning and end of playback.

Up to eight sections are available and accessible through the S1 to S4 trigger pins. The SBT trigger pin can be mask programmed to playback all eight sections or sequentially from section 1 to 8. An interrupt pin (IRP), stop pulse (STP) or BUSY signals provide handshaking with μ P or other IS22C120 devices. All trigger pins give 15 ms debounce time and are ideal for CDS applications. Two LED drivers are available, flashing on and off approximately at 3 Hz. The internal voltage compensated oscillator requires only one external resistor. Different sampling frequencies are determined by the external oscillator resistor value.

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Programmable Options

The IS22C120 provides programmable user specified control functions. They include:

- Non-sequence or Sequence play-all
- Unholdable or Holdable trigger
- STOP or BUSY signal selection
- Automatic ramp-up and ramp-down or no ramp-up or ramp-down

Silence Compression

If a particular sound sequence includes periods of silence, the IS22C120 will automatically compress the silence to save memory space. This compression will not affect playback of the sound sequence.

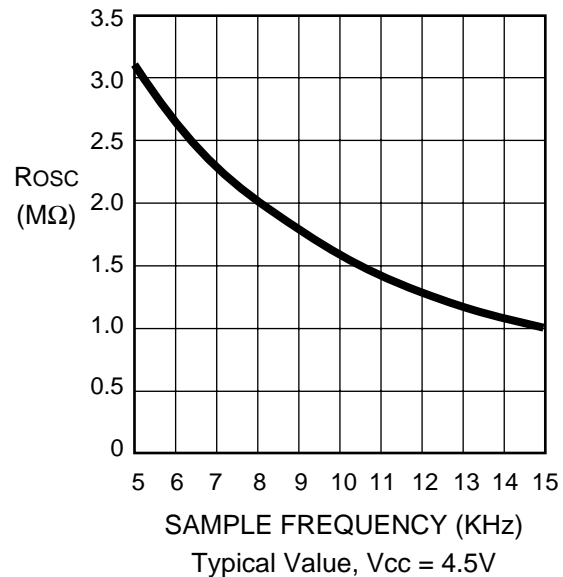
Section Repeat

SBT and S1 to S4 have self repeat functions allowing each section with sound to be programmed to repeat consecutively up to eight times.

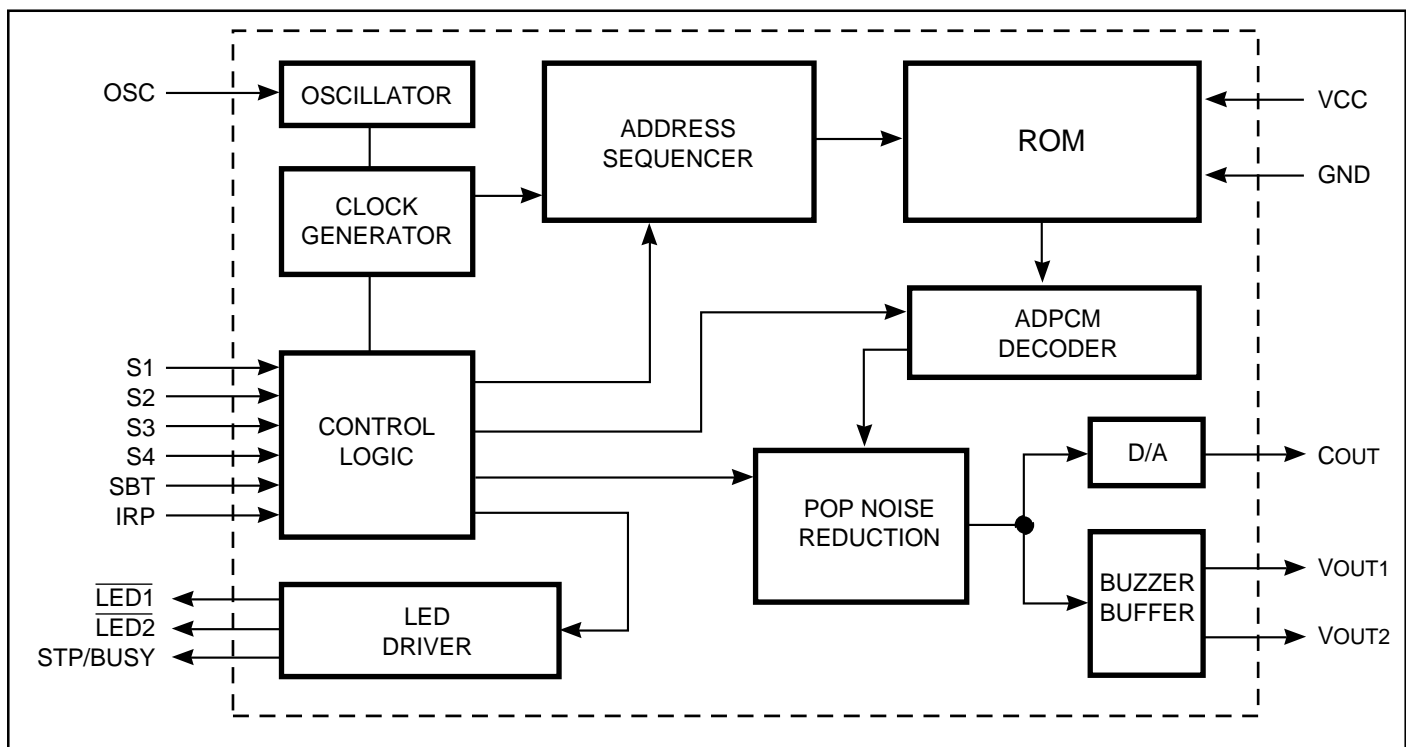
SEGMENT DECODE

	1	2	3	4	5	6	7	8
S1	H	L	L	L	H	L	L	H
S2	L	H	L	L	H	H	L	L
S3	L	L	H	L	L	H	H	L
S4	L	L	L	H	L	L	H	H

SAMPLE FREQUENCY

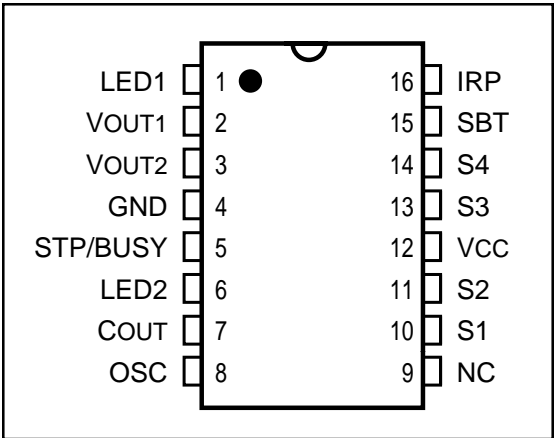


BLOCK DIAGRAM



PIN CONFIGURATIONS

16-Pin DIP



PIN DESCRIPTIONS

$\overline{\text{LED1}}$	Drives First LED Flash at 3 Hz (Active LOW)
VOUT1	PWM Audio Signal Output for Buzzer
STP/BUSY	Generate Busy Signal or 30 ms Pulse after Voice Playback
GND	Ground
VOUT2	Compliment PWM Audio Signal Output for Buzzer
$\overline{\text{LED2}}$	Drives Second LED Flash at 3 Hz (Active LOW)
COUT	Current Output from Internal DAC for Speaker Playback
OSC	Oscillator Resistor Pin to Control Sampling Frequency
NC	No Connect
S1-S4	Input Switches, Internal Pull LOW, Active HIGH
SBT	One Key or Sequential Trigger, Internal Pull LOW, Active HIGH
IRP	Interrupt to Stop Playback, Internal Pull LOW, Active HIGH
Vcc	Power Supply Voltage

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Parameter	Value	Unit
V _{TERM}	Terminal Voltage with Respect to GND	−0.5 to +7.0	V
T _A	Commercial Operating Temperature	0 to +70	°C
T _{BIAS}	Temperature Under Bias	−10 to +60	°C
T _{STG}	Storage Temperature	−55 to +125	°C

Notes:

1. Stress greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

DC CHARACTERISTICS

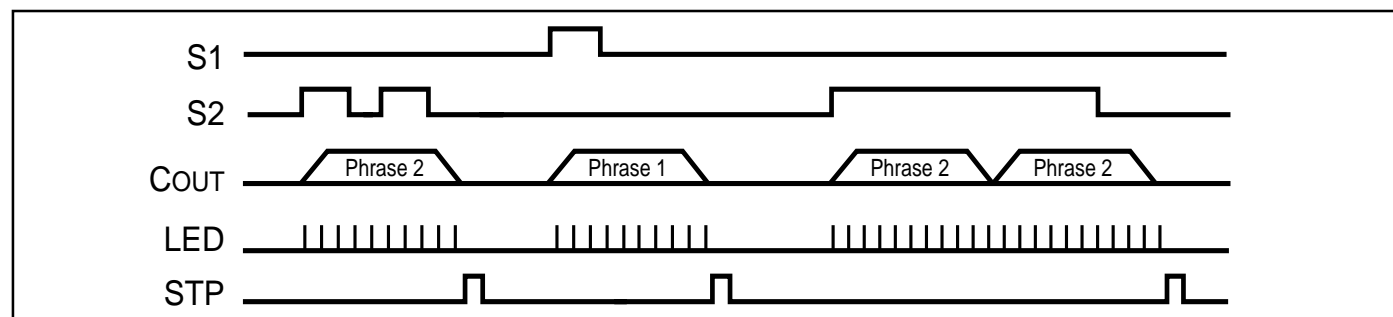
Symbol	Parameter Description	Test Conditions	Min.	Typ.	Max.	Unit
V _{CC}	Operating Voltage		2.4	3.0	6.0	V
V _{IH}	Input HIGH Voltage	V _{CC} = 3.0V	2.5	3.0	3.5	V
V _{IL}	Input LOW Voltage	V _{CC} = 2.0V	−0.3	0	0.3	V
I _{OH}	V _{OUT} HIGH Operating Current	V _{CC} = 3.0V, V _{OUT} = 3.0V	—	−12	—	mA
I _{OL}	V _{OUT} LOW Operating Current	V _{CC} = 3.0V, V _{OUT} = 0V	—	12	—	mA
I _{CO}	C _{OUT} Operating Current	V _{CC} = 3.0V, V _{COUT} = 0.7V	—	−2	—	mA
I _{STPH}	STP HIGH Operating Current	V _{CC} = 3.0V, V _{STP} = 3.0V	—	−5	—	mA
I _{STPL}	STP LOW Operating Current	V _{CC} = 3.0V, V _{STP} = 0V	—	5	—	mA
I _{LED}	LED Output Current	V _{CC} = 2.2V – 6.0V	6	8	10	mA
I _{SB}	Standby Current	V _{CC} = 3.0V, I/O Open	—	1	5	μA
I _{OP}	Operating Current	V _{CC} = 3.0V, I/O Open	—	—	100	μA
ΔF/F	Frequency Stability	1 – F _{osc} (3.5V)/F _{osc} (3.0V)	—	—	5	%

AC SWITCHING CHARACTERISTICS

Symbol	Parameter Description	Test Conditions	Min.	Typ.	Max.	Unit
t _{DD}	Debounce Delay		—	15	—	ms
t _{ST}	Stop Pulse Width		—	30	—	ms

SWITCHING WAVEFORMS**S1 to S4 SEGMENT TRIGGERS. PULSE TRIGGERED.**

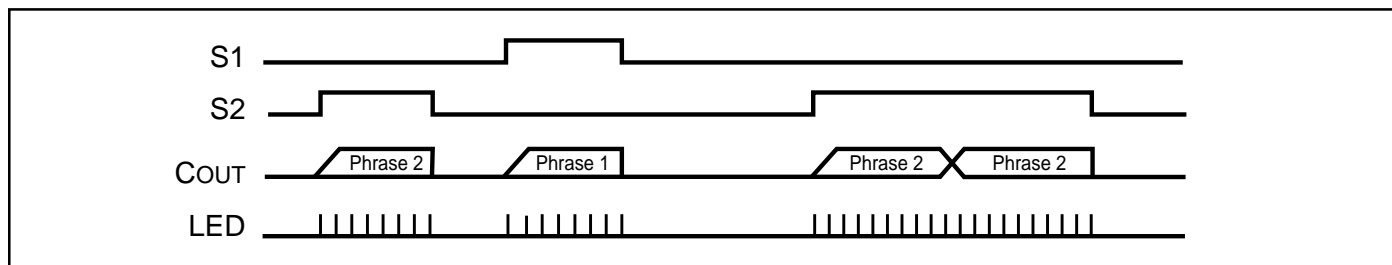
- a. Trigger is shorter than a phrase output b. Trigger is longer than a phrase output



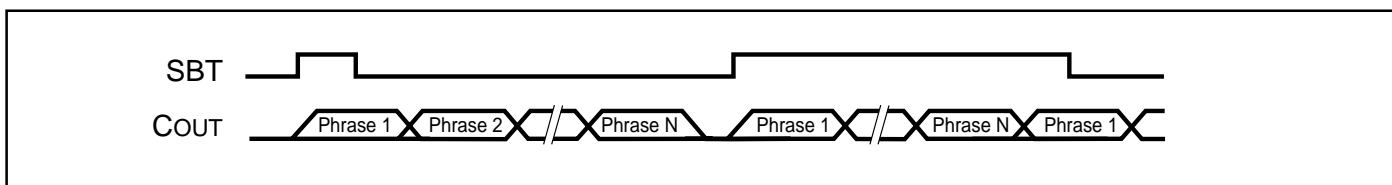
LEVEL TRIGGERED

a. Trigger is shorter than a phrase output

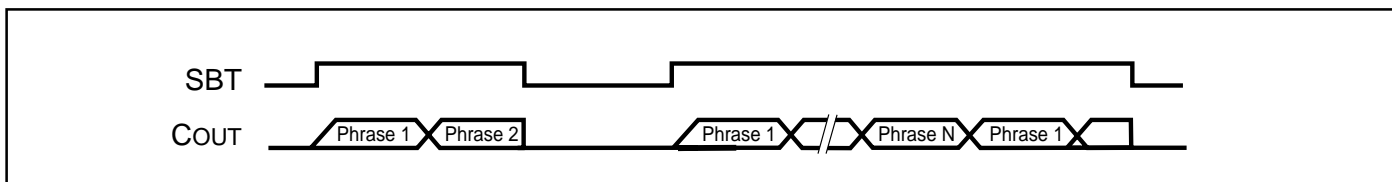
b. Trigger is longer than a phrase output

**SWITCHING WAVEFORMS****SINGLE BUTTON TRIGGER, NONSEQUENTIAL (SBT)**

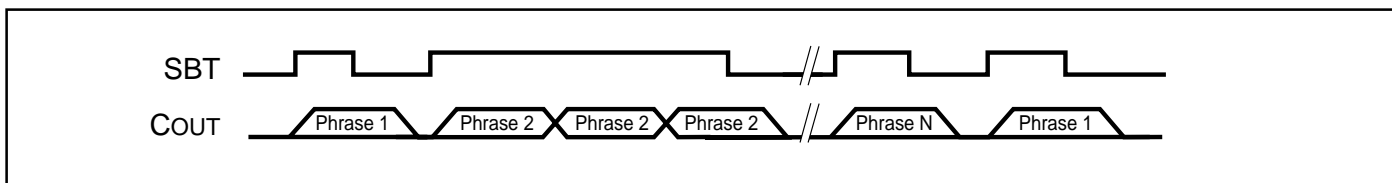
a. Pulse Triggered



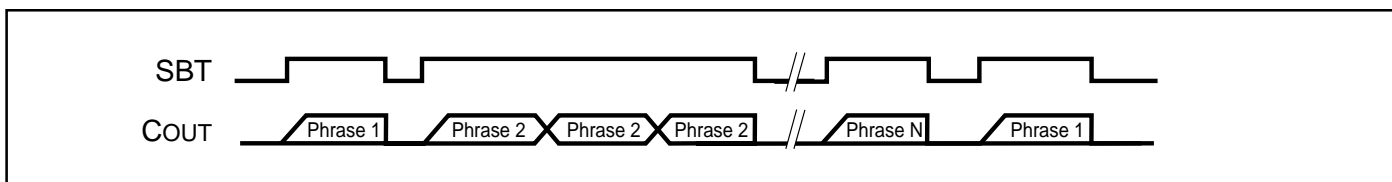
b. Level Triggered

**SINGLE BUTTON TRIGGER, SEQUENTIAL (SBT)**

a. Pulse Triggered

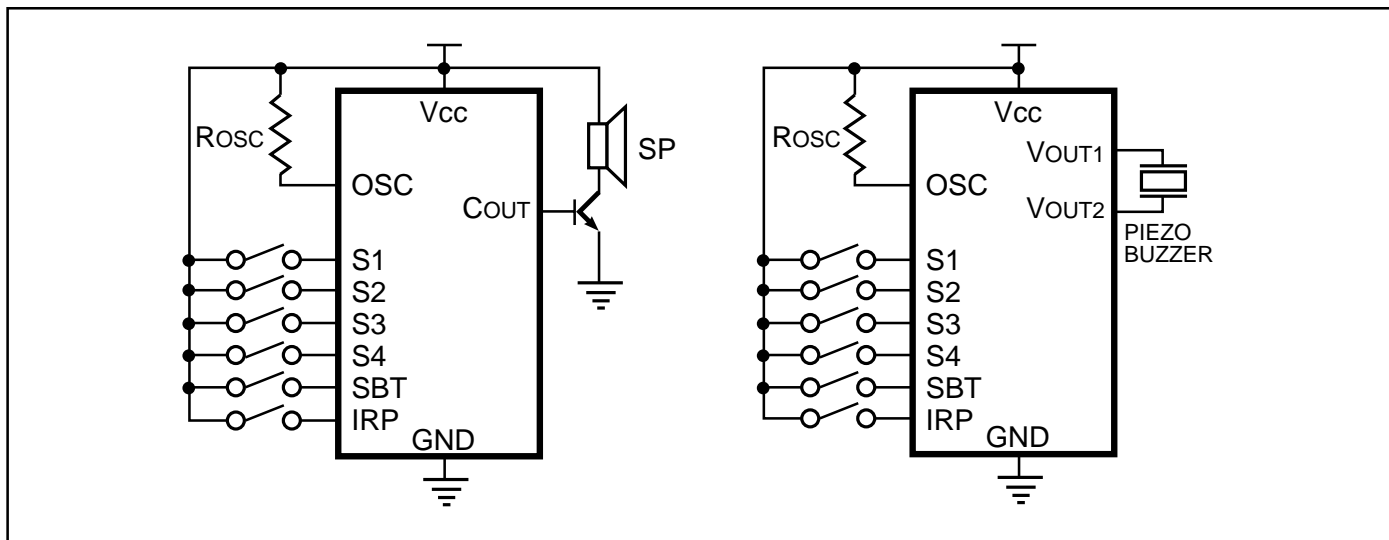


b. Level Triggered

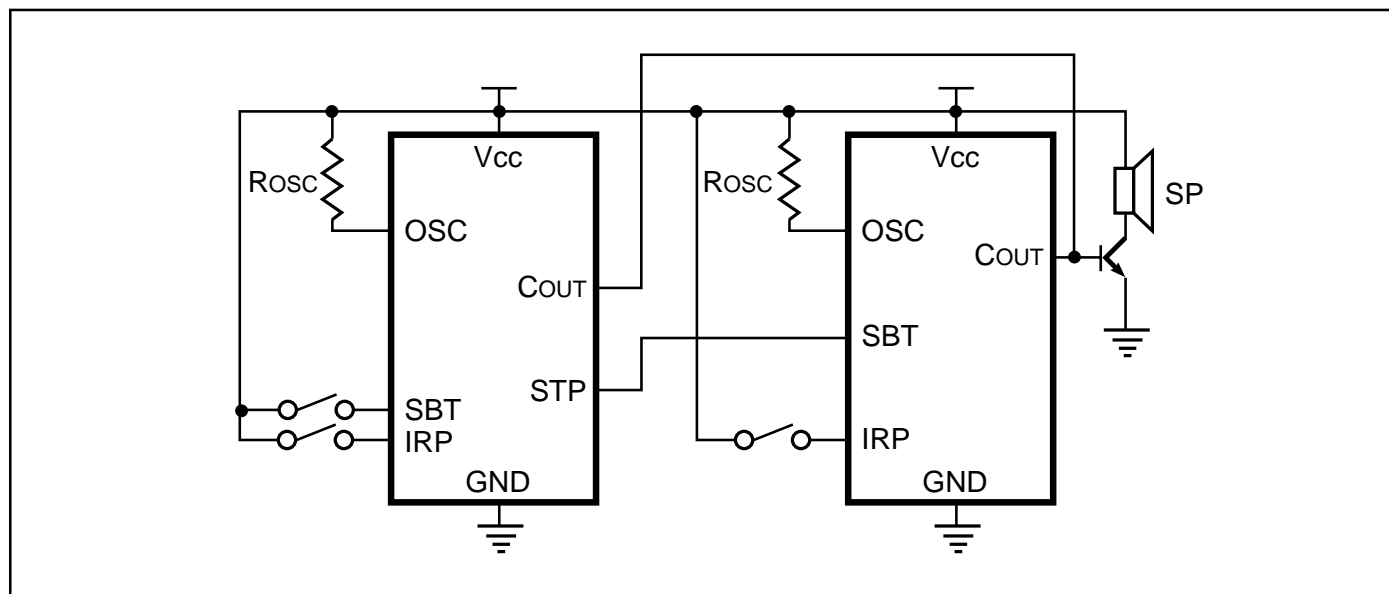


APPLICATION CIRCUITS

TYPICAL APPLICATION

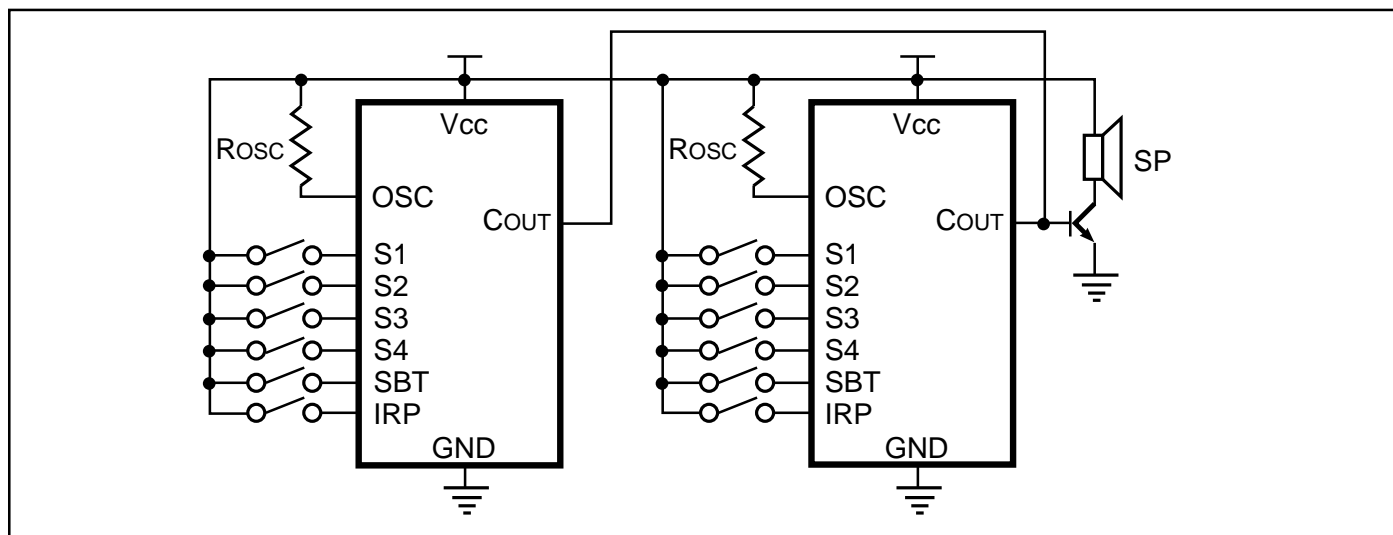


CASCADE APPLICATION

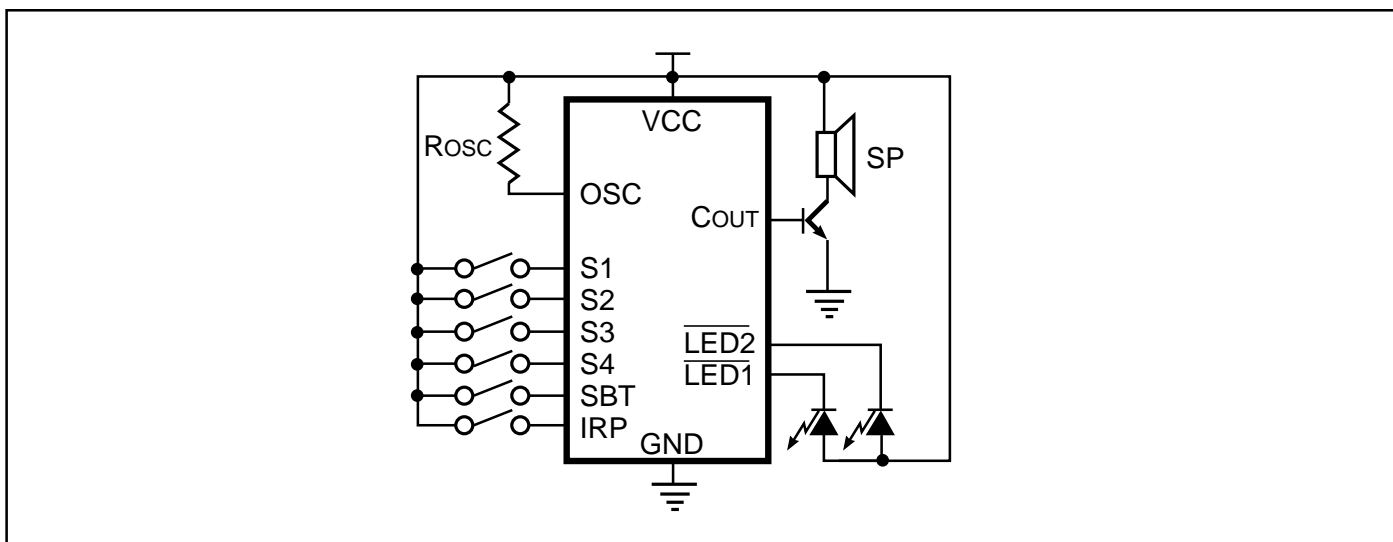


APPLICATION CIRCUITS

PARALLEL APPLICATION

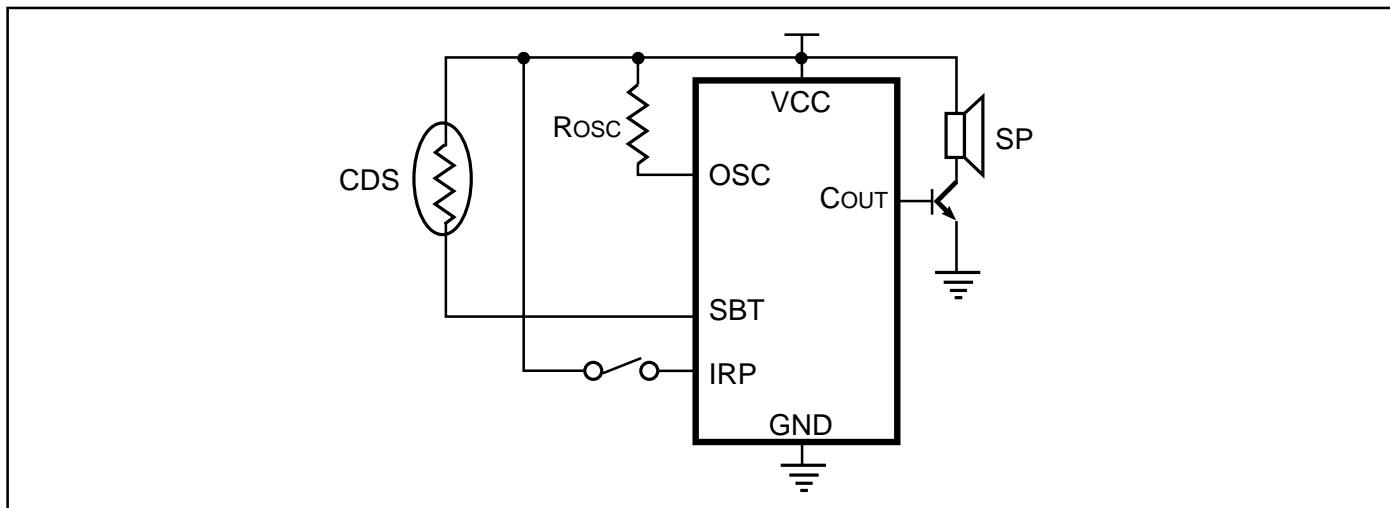


LED APPLICATION

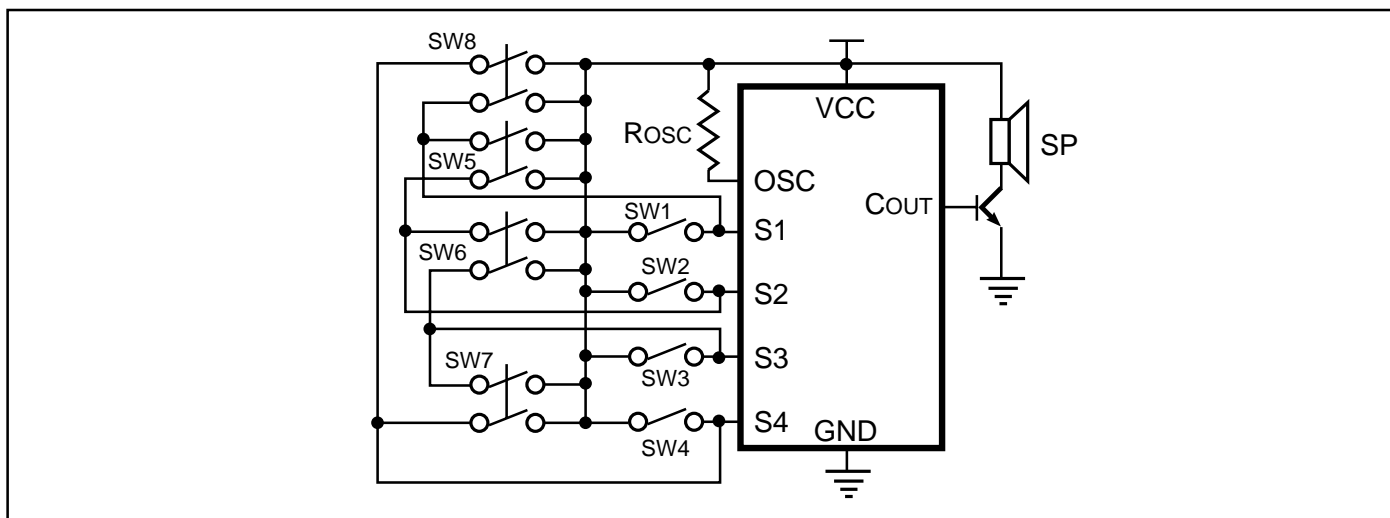


APPLICATION CIRCUITS

CDS APPLICATION



8-SEGMENT TRIGGER APPLICATION



Notes:

The following are typical values:

1. R_{OSC} = 2 MΩ.
2. β of N (NPN transistor) > 130.
3. SP = 8Ω. 1/4W.
4. Piezo buzzer resonant frequency = 1 KHz.

ORDERING INFORMATION

Commerical Range: 0°C to +70°C

Order Part No.	Package
IS22C120X	Unpackaged
IS22C120P	300-mil Plastic DIP
IS22C120S	300-mil Plastic SOP

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ISSI®

Integrated Silicon Solution, Inc.

2231 Lawson Lane
Santa Clara, CA 95054
Fax: (408) 588-0806
Toll Free: 1-800-379-4774
<http://www.issiusa.com>