IS22C011

8 to 12 SEC INSTANT VOICE ROM

OCTOBER 1998

FEATURES

- Voice length at:
  - 8 KHz sampling is 8 seconds
  - 6 KHz sampling is 10 seconds
  - 5 KHz sampling is 12.8 seconds
- 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 comes out after playback
- BUSY signal for CPU control
- Two LEDs flash at 3 Hz interval
- 2.4V to 6V single power supply operation
- Low standby current (<5 μA at 3V)
- Auto power-down
- Built-in oscillator, D/A converter, EPROM
- ADPCM data compression
- Optional pop noise elimination function
- COUT pin drives speaker with a transistor
- Development tools support
- VOUT1 and VOUT2 drives buzzer directly
- Sampling rate determined by external resistor
- Holdable and unholdable triggering option
- Industrial temperature available

GENERAL DESCRIPTION

The IS22C011 is a high-quality voice synthesizer with capacity from 8 to 12 seconds. A proprietary ADPCM algorithm is used. The audio message is stored in a 256K bit on-chip one-time programmable memory.

The IS22C011 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 instant programming nature of the IS22C011 gives a very short turn around time free of NRE charges usually required with conventional voice ROMs. Users now can add a voice synthesis function as an additional feature to their products even when production volume is small. As a result, initial investment is minimal and the risk in the product development phase is reduced.

The IS22C011 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-down function eliminates undesired noise at the end of playback.

Up to eight sections are available and accessible through the S1 to S4 trigger pins. The SBT trigger pin can be 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 μP or other IS22C011 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 compensation oscillator requires only one external resistor. Different sampling frequencies are determined by the external oscillator resistor value.

Programmable Options

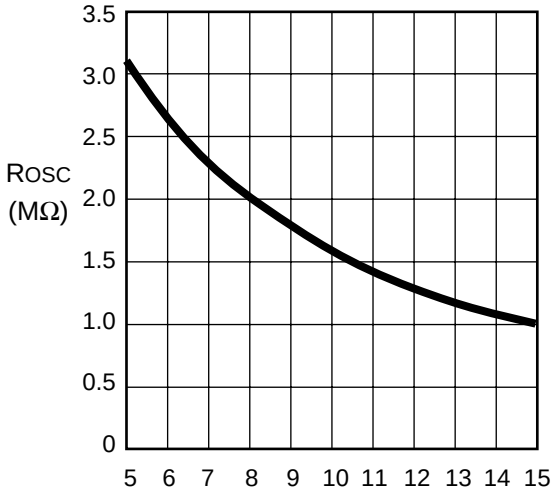
The IS22C011 provides different control functions for user specified applications. They include:

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

SEGMENT DECODE

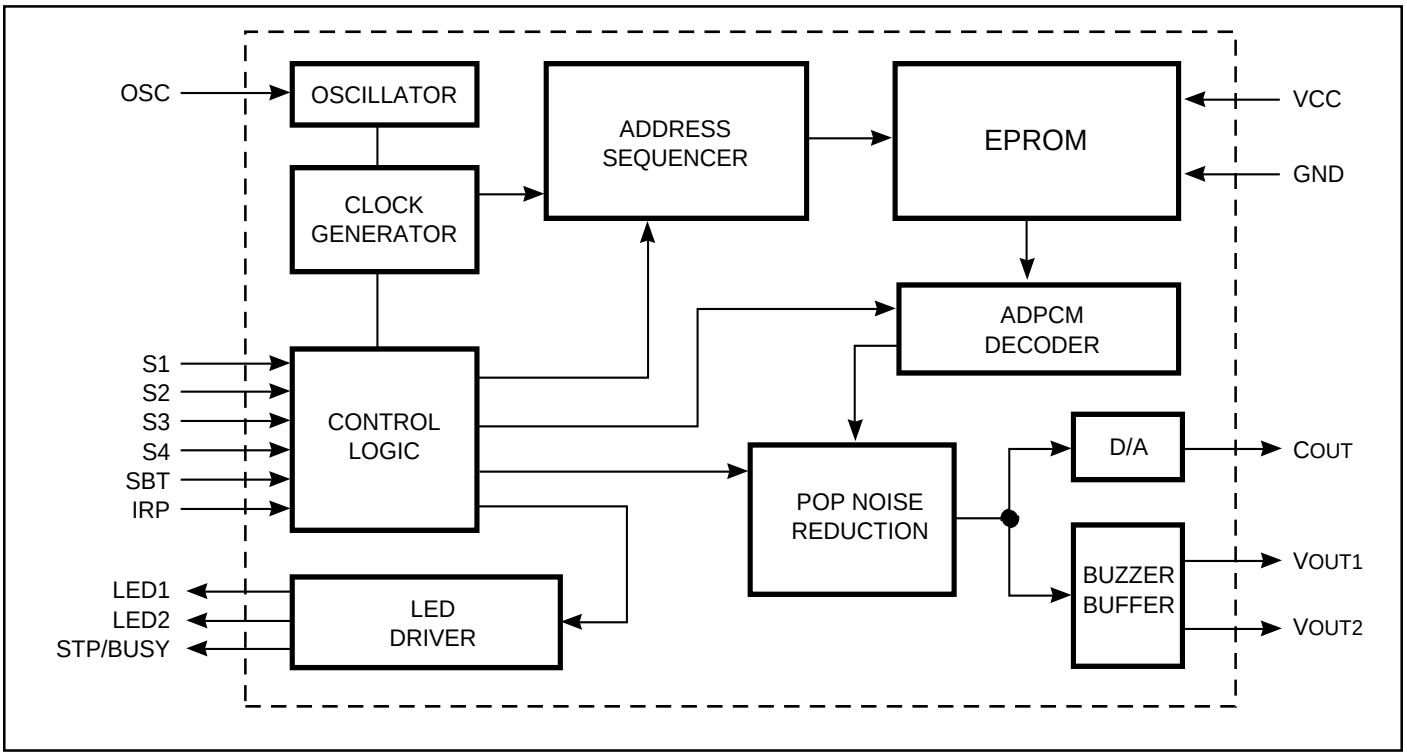
	1	2	3	4	5	6	7	8
S1	H	L	L	L	H	L	L	H
S2	L	H	L	L	H	H	L	L
S3	L	L	H	L	L	H	H	L
S4	L	L	L	H	L	L	H	H

SAMPLE FREQUENCY



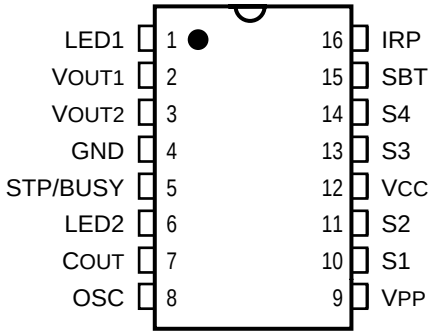
Typical Value, Vcc = 4.5V

BLOCK DIAGRAM



PIN CONFIGURATIONS

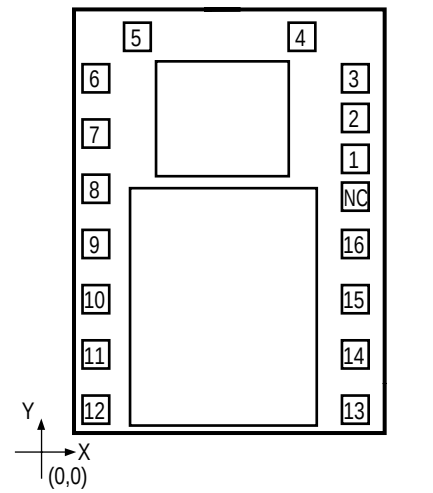
16-Pin DIP and SOP



PIN DESCRIPTIONS

LED1	Drives First LED Flash at 3 Hz
V_{OUT1}	PWM Audio Signal Output for Buzzer
STP/BUSY	Generate Busy Signal or 30 ms Pulse after Voice Playback
GND	Ground
V_{OUT2}	Compliment PWM Audio Signal Output for Buzzer
LED2	Drives Second LED Flash at 3 Hz
C_{OUT}	Current Output from Internal DAC for Speaker Playback
OSC	Oscillator Resistor Pin to Control Sampling Frequency
V_{PP}	Program Power Supply, No Connect When Voice Playback
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

BONDING DIAGRAM



Note: Substrate must be connected to GND

Pad size = 95 µm x 95 µm

Die size = 2100 µm x 2550 µm

Note: Programming requires connection to pins 4, 5, 6, 8, 9, 12, 15, and 16.

BONDING PARAMETERS

Pin	Name	X	Y
1	LED1	2005	1584
2	V_{OUT1}	2005	1891
3	V_{OUT2}	2005	2139
4	GND	2005	2422
5	STP	86.25	2383
6	LED2	86.25	2130
7	C_{OUT}	86.25	1854
8	OSC	86.25	1368
9	V_{PP}	86.25	1005
10	S1	86.25	637
11	S2	86.25	355
12	Vcc	86.25	112
13	S3	2005	156
14	S4	2005	468
15	SBT	2005	775
16	IRP	2005	1038

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Parameter	Value	Unit
V_{TERM}	Terminal Voltage with Respect to GND	–0.5 to +7.0	V
T_{BIAS}	Temperature Under Bias	–40 to +85	°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	Vcc = 3.0V	2.5	3.0	3.5	V
V_{IL}	Input LOW Voltage	Vcc = 2.0V	–0.3	0	0.3	V
I_{OH}	V_{OUT} HIGH Operating Current	Vcc = 3.0V, V_{OUT} = 3.0V	—	–12	—	mA
I_{OL}	V_{OUT} LOW Operating Current	Vcc = 3.0V, V_{OUT} = 0V	—	12	—	mA
I_{CO}	C_{OUT} Operating Current	Vcc = 3.0V, V_{COUT} = 0.7V	—	–2	—	mA
I_{STPH}	STP HIGH Operating Current	Vcc = 3.0V, V_{STP} = 3.0V	—	–5	—	mA
I_{STPL}	STP LOW Operating Current	Vcc = 3.0V, V_{STP} = 0V	—	5	—	mA
I_{LED}	LED Output Current	Vcc = 2.2V – 6.0V	6	8	10	mA
I_{SB}	Standby Current	Vcc = 3.0V, I/O Open	—	1	5	µA
I_{OP}	Operating Current	Vcc = 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	Typ.	Unit
t_{DD}	Debounce Delay	15	ms
t_{ST}	Stop Pulse Width	30	ms

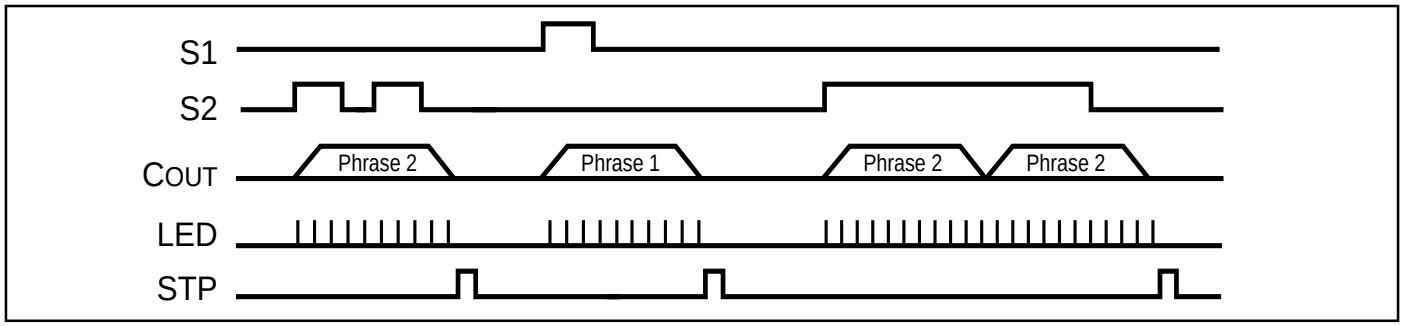
OPERATING RANGE

Range	Ambient Temp.	Vcc
Commercial	0°C to +70°C	2.4V to 6.0V
Industrial	–40°C to +85°C	2.4V to 6.0V

SWITCHING WAVEFORMS

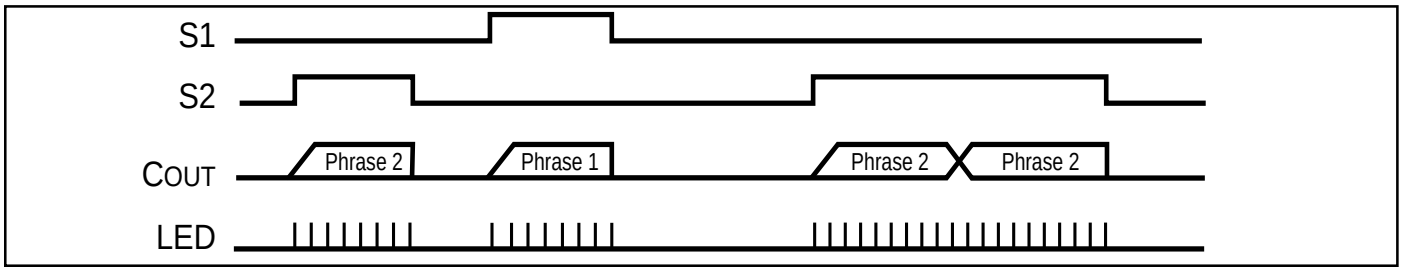
S1 to S4 SEGMENT TRIGGERS. PULSE TRIGGERED.

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



LEVEL TRIGGERED

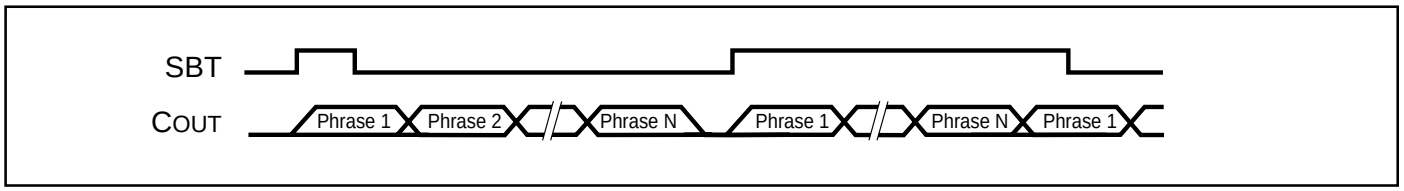
a. Trigger is shorter than a phrase output b. Trigger is longer than a phrase output



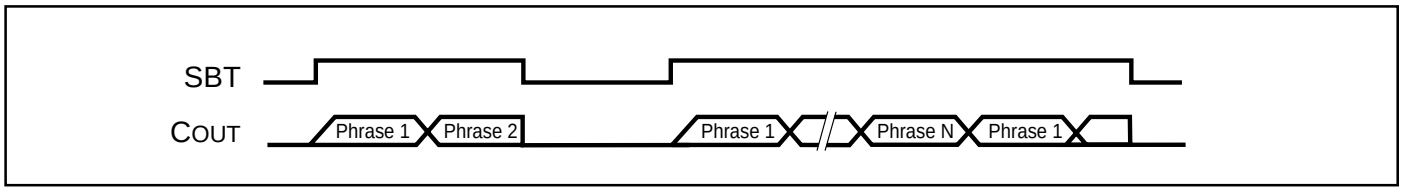
SWITCHING WAVEFORMS

SINGLE BUTTON TRIGGER, NONSEQUENTIAL (SBT)

a. Pulse Triggered

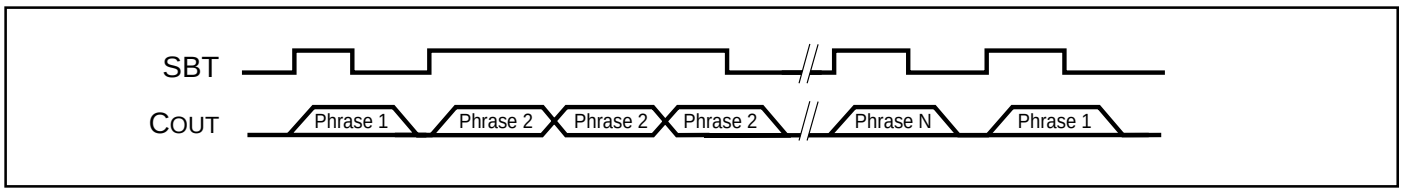


b. Level Triggered

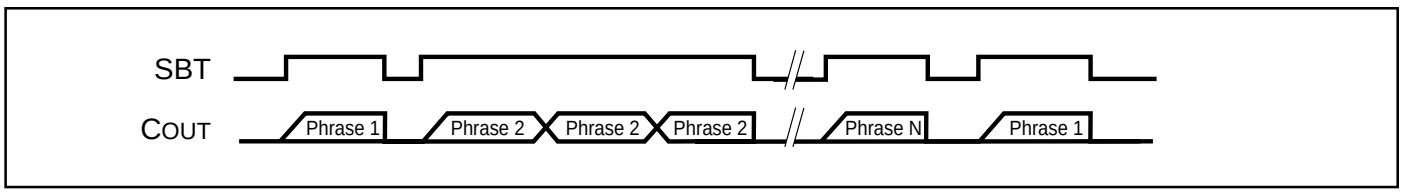


SINGLE BUTTON TRIGGER, SEQUENTIAL (SBT)

a. Pulse Triggered

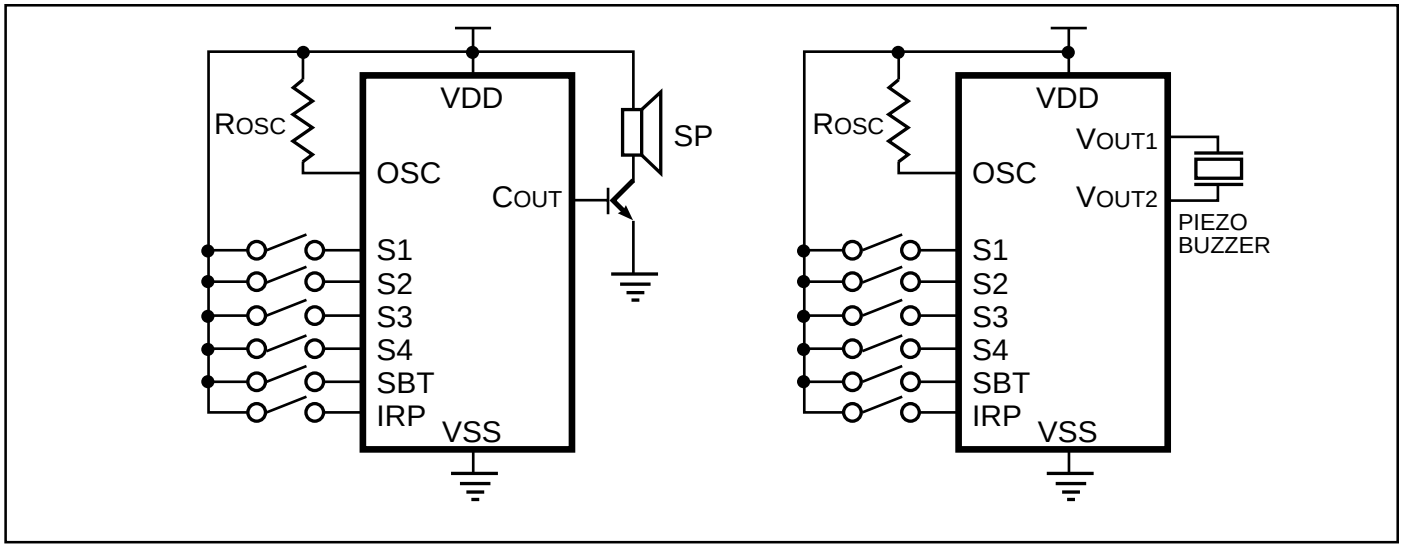


b. Level Triggered

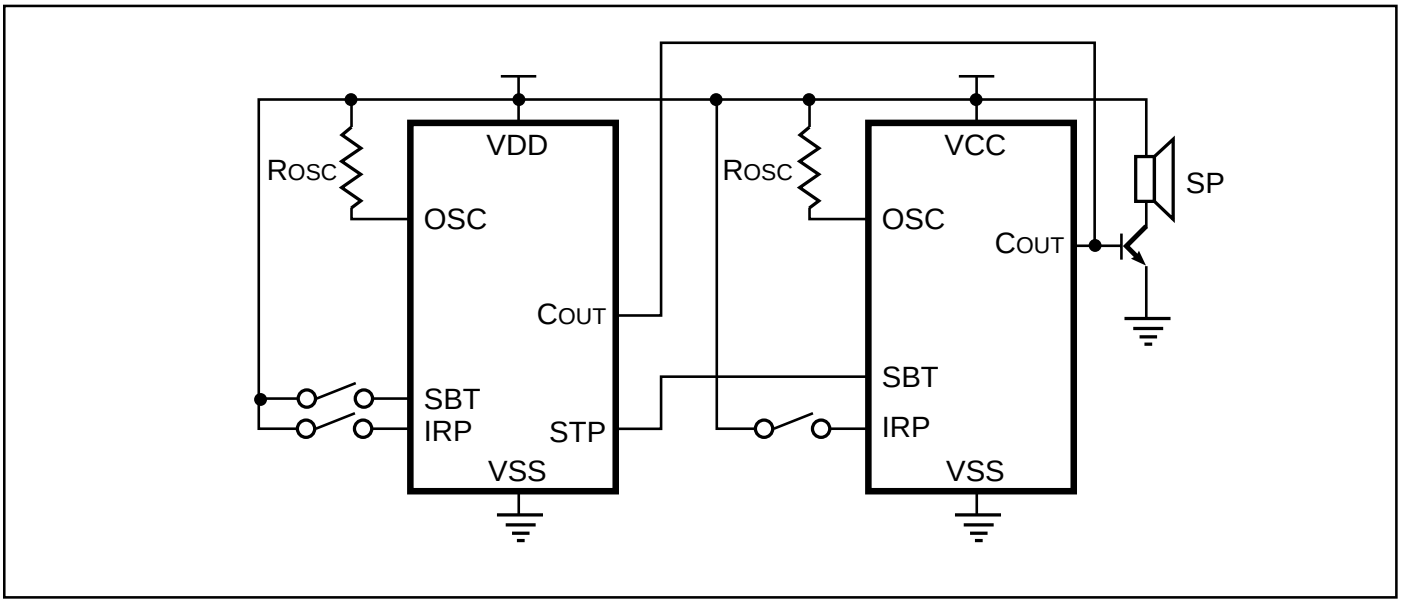


APPLICATION CIRCUITS

TYPICAL APPLICATION

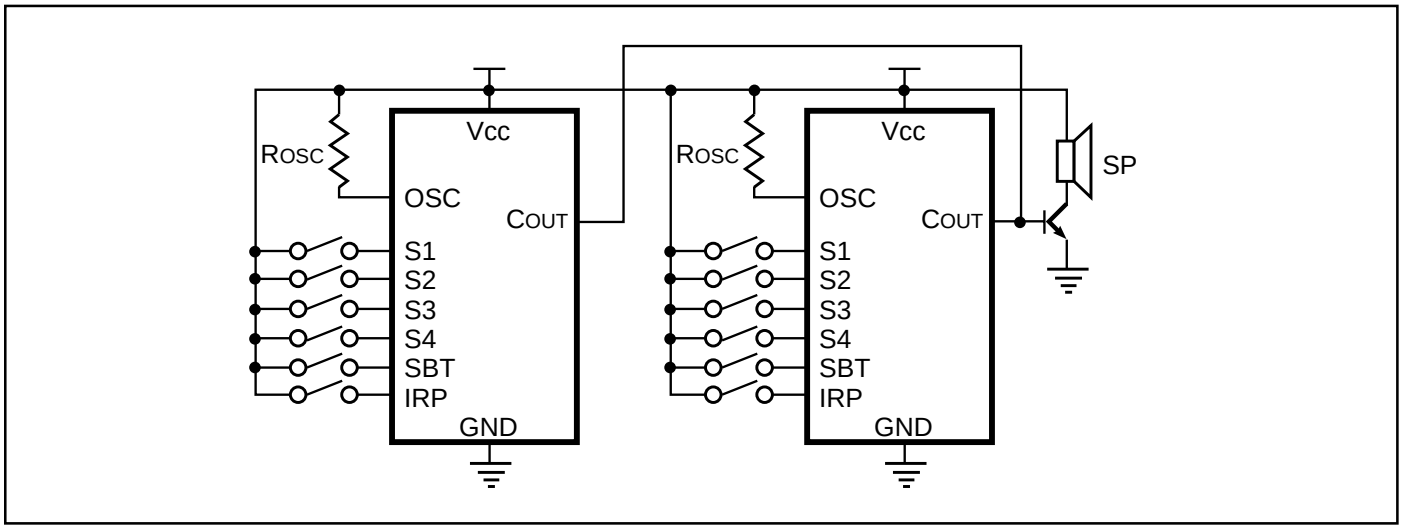


CASCADE APPLICATION

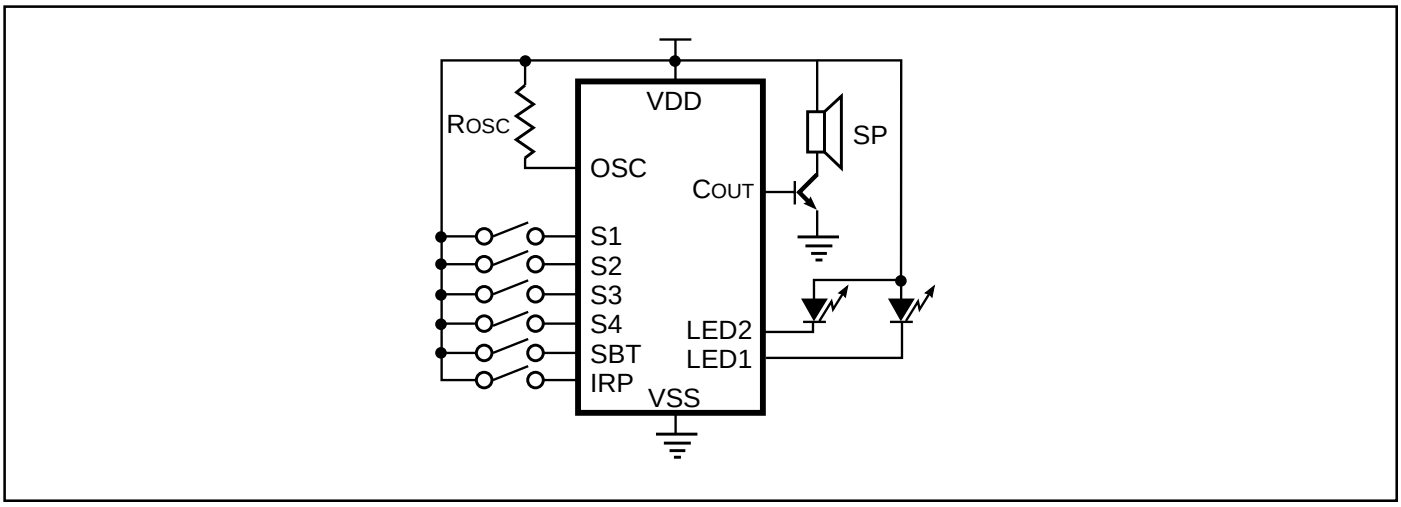


APPLICATION CIRCUITS

PARALLEL APPLICATION



LED APPLICATION



Notes:
The following are typical values:
1. ROSC = 2.0 MΩ.
2. ß 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
IS22C011X	Unpackaged
IS22C011P	300-mil Plastic DIP
IS22C011S	300-mil Plastic SOP

Industrial Range: –40°C to +85°C

Order Part No.	Package
IS22C011XI	Unpackaged
IS22C011PI	300-mil Plastic DIP
IS22C011SI	300-mil Plastic SOP

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