IS22C022

VERSATILE 20 SEC INSTANT VOICE ROM

SEPTEMBER 1999

ISSI®

FEATURES

- Minimum 20 second voice length at 6 KHz

- Versatile features for playback

- Combination of voice building blocks extends the duration of playback

- Voice data re-use saves memory space

- Four trigger pins, S1 to S4 for eight groups

- SBT for sequential play-all or random play

- Holdable and unholdable, edge and level triggering option

- 15 ms debounce time suitable for CDS

- IRP interrupt pin for master reset

- Three programmable output pins for STP Stop Pulse, BUSY Signal, and LED

- Built-in oscillator with variable sample rate

- Single external resistor to determine sample rate

- Built-in D/A converter, EPROM

- ADPCM data compression provides high sound quality

- Optional pop noise elimination function

- C$_{OUT}$ pin drives speaker with a transistor

- V$_{OUT}$1 and V$_{OUT}$2 drives buzzer or speaker directly

- Auto-power down

- 2.4V-6V single power supply operation

- Low standby current (<5 µA at 3V)

- Development tools support

GENERAL DESCRIPTION

IS22C022 is a high quality voice synthesizer capable of varying playback duration. A proprietary ADPCM algorithm is used. The audio message is stored in a 512K bits on-chip EPROM which can store up to 20 seconds of voice data at 6 KHz sample rate.

The IS22C022 eliminates the need of complicated circuitry in voice playback but still achieves high voice quality. Sounds such as human speech, animal sounds, musical sounds and even special sound effects can be synthesized. Versatile combinations in sections achieve longer playback duration. In addition, 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 in which speech can be mixed with background music each from one of two different chips.

The IS22C022 provides wide operating voltage range from 2.4V to 6.0V. PWM digital amplifier output pins, V$_{OUT}$1 and V$_{OUT}$2 provides direct drive to buzzer or speaker.

A current output pin, C$_{OUT}$, 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.

Group of sections

The voice data memory area of the IS22C022 can be subdivided into 126 sections. Any combination of these sections will form an individual group for data playback. A maximum of eight groups are available with activation controlled by S1 to S4 pins. The SBT pin can be used to trigger multiple groups playback in sequence.

Integrated Silicon Solution, Inc. — 1-800-379-4774

Rev. A
11/15/99

1

ISSI®

BLOCK DIAGRAM

PIN CONFIGURATIONS
300-mil PDIP


```
OUT1   [ 1 ●      16 ]  IRP
VOUT1  [ 2         15 ]  SBT
VOUT2  [ 3         14 ]  S4
GND    [ 4         13 ]  S3
OUT2   [ 5         12 ]  VCC
OUT3   [ 6         11 ]  S2
COUT   [ 7         10 ]  S1
OSC    [ 8          9 ]  VPP
```
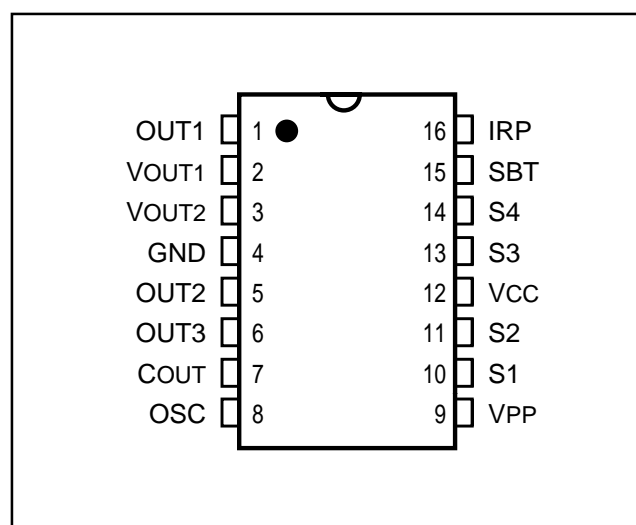
PIN DESCRIPTION

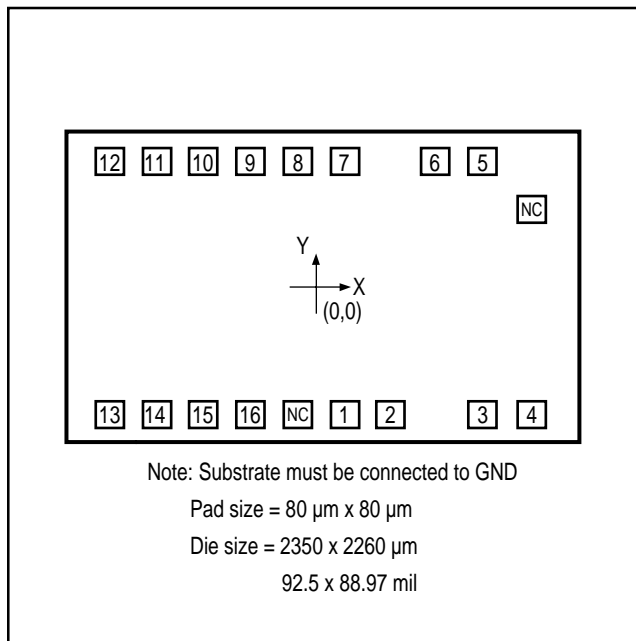|	
OUT1	Programmable output 1
OUT2	Programmable output 2
OUT3	Programmable output 3
$V_{OUT}1$	PWM audio signal output for buzzer and speaker
$V_{OUT}2$	PWM audio signal output for buzzer and speaker
GND	Power ground
C_{OUT}	Current output from internal DAC for speaker playback
OSC	Oscillator resistor pin to control sampling frequency
V_{PP}	Program power supply, no connect when voice playback
S1	Trigger switch 1, internal pull low, active high
S2	Trigger switch 2, internal pull low, active high
V_{CC}	Positive power supply
S3	Trigger switch 3, internal pull low, active high
S4	Trigger switch 4, internal pull low, active high
SBT	Sequential trigger, internal pull low, active high
IRP	Interrupt to stop playback, internal pull low, active high

Note:
1. The following pins are used to program data into the memory: pins 4, 5, 6, 8, 9, 12, 15 and 16.

IS22C022

ISSI®

BONDING DIAGRAM

Note: Substrate must be connected to GND
Pad size = 80 µm x 80 µm
Die size = 2350 x 2260 µm
92.5 x 88.97 mil

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

BONDING PARAMETERS

Pin	Name	X	Y
1	OUT1	-6	−1017
2	V_{OUT1}	297	−1017
3	V_{OUT2}	803	−1017
4	GND	1058	−1017
5	OUT2	927	1017
6	OUT3	697	1017
7	C_{OUT}	199	1017
8	OSC	−103	1017
9	V_{PP}	−358	1017
10	S1	−566	1017
11	S2	−810	1017
12	V_{CC}	−1059	1017
13	S3	−934	−1017
14	S4	−689	−1017
15	SBT	−444	−1017
16	IRP	−200	−1017

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC} - GND	Terminal Voltage with Respect to GND	−0.5 to +7.0	V
V_{IN}		$GND − 0.3 < V_{IN} < V_{CC} + 0.3$	V
V_{OUT}		$GND < V_{OUT} < V_{CC}$	V
T_A	Operating Temperature	−10 to +85	°C
T_{STG}	Storage Temperature	−55 to +125	°C

Integrated Silicon Solution, Inc. — 1-800-379-4774

Rev. A
11/15/99

IS22C022

ISSI®

DC CHARACTERISTICS

Symbol	Parameter Description	Test Conditions	Min.	Typ.	Max.	Unit
V$_{CC}$	Operating Voltage		2.4	3.0	6.0	V
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
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
ÐF/F	Frequency Stability	(F$_{OSC}$ [3V] – F$_{OSC}$ [3.5V]) / F$_{OSC}$ (3.0V)	—	—	5	%

SAMPLING FREQUENCY vs Rosc FOR IS22C022

Common Sampling Rate vs. Oscillator Resistor

Sampling Frequency KHz	Rosc Kohm
5.0	1,920
5.5	1,750
6.0	1,610
6.5	1,490
7.0	1,380
7.5	1,290
8.0	1,200
8.5	1,130
9.0	1,070
9.5	1,010
10.0	961
10.5	915
11.0	874
12.0	835

SAMPLING FREQUENCY vs Rosc FOR IS22C022

Common Resistors vs. Sampling Rate

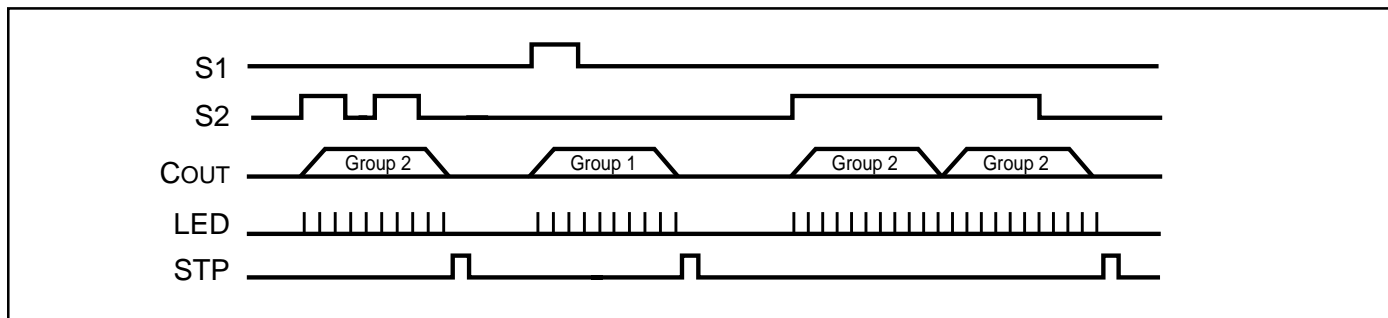| Rosc Kohm	Sampling Frequency KHz
2000	4.8
1500	6.5
1300	7.5
1200	8.0
1000	9.5
910	10.5
820	11.7
750	12.7
680	14.0
560	16.7
510	18.1
470	19.5

ISSI®

TIMING WAVEFORMS

1. Level, Unholdable, Non-retriggerable
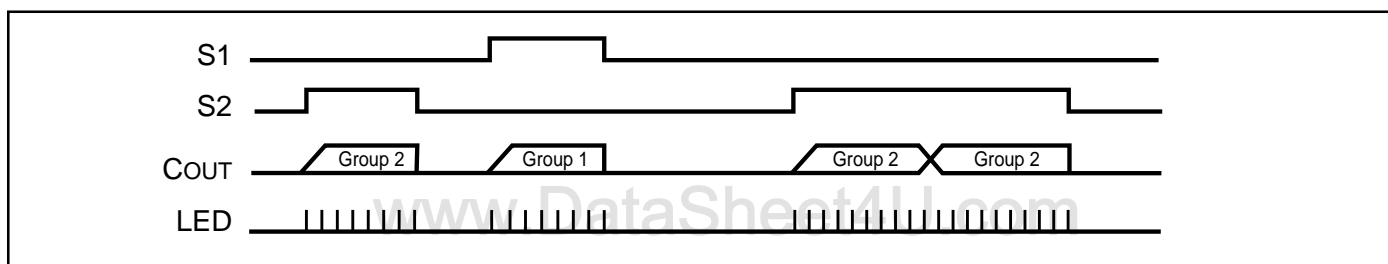   **a. Trigger is shorter than a Group output**   **b. Trigger is longer than a Group output**

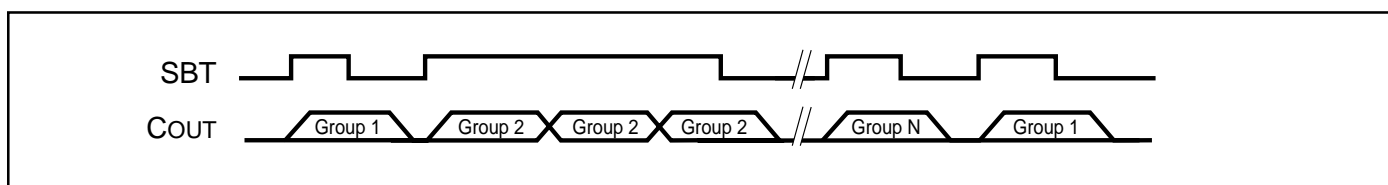**2. Level Holdable**
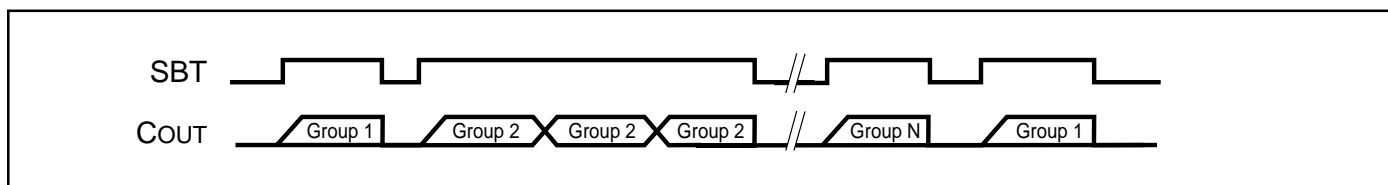   **a. Trigger is shorter than a Group output**   **b. Trigger is longer than a Group output**

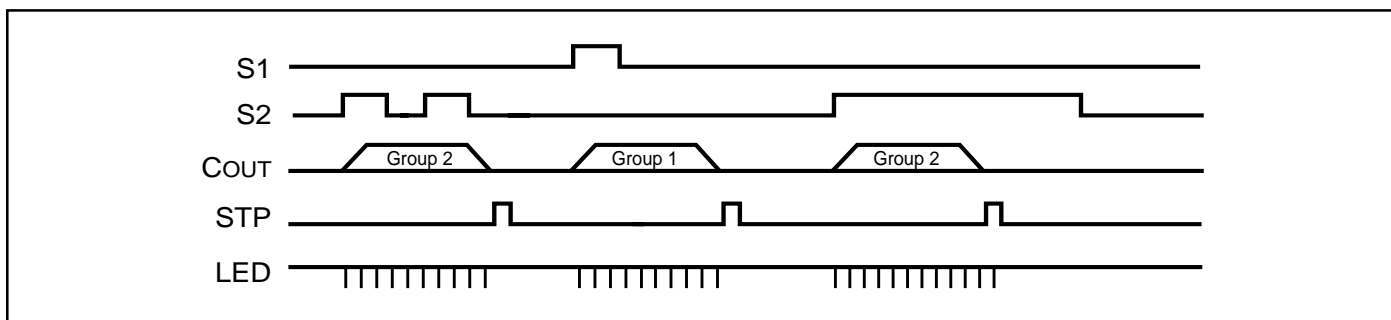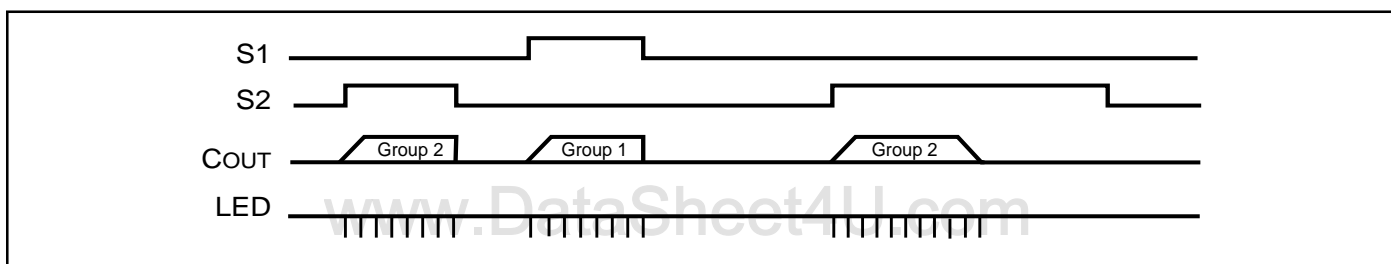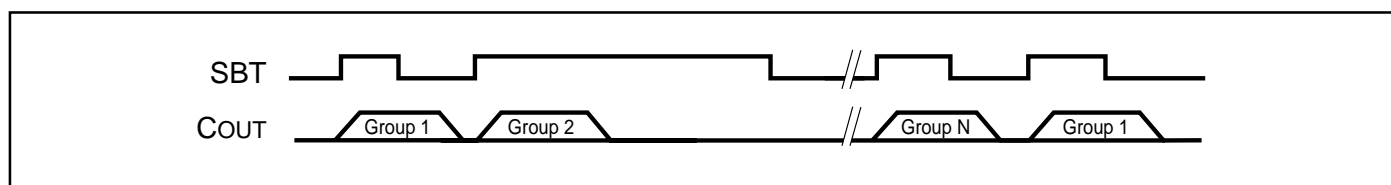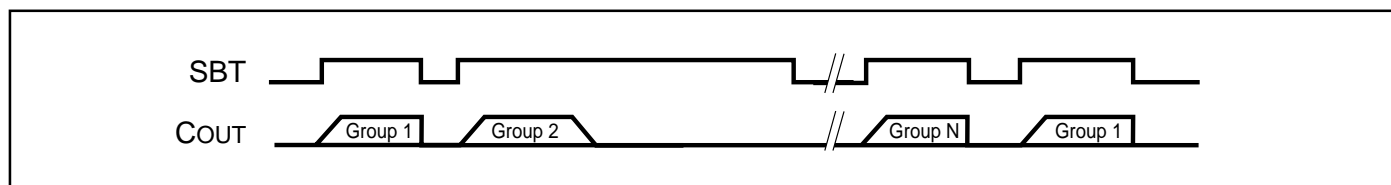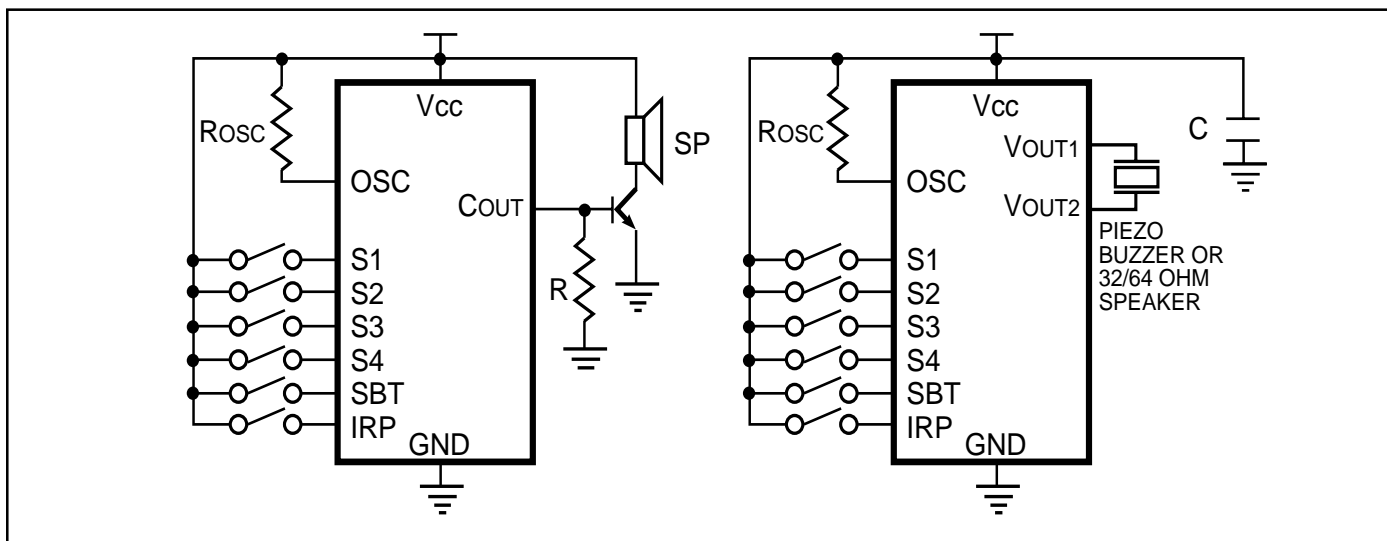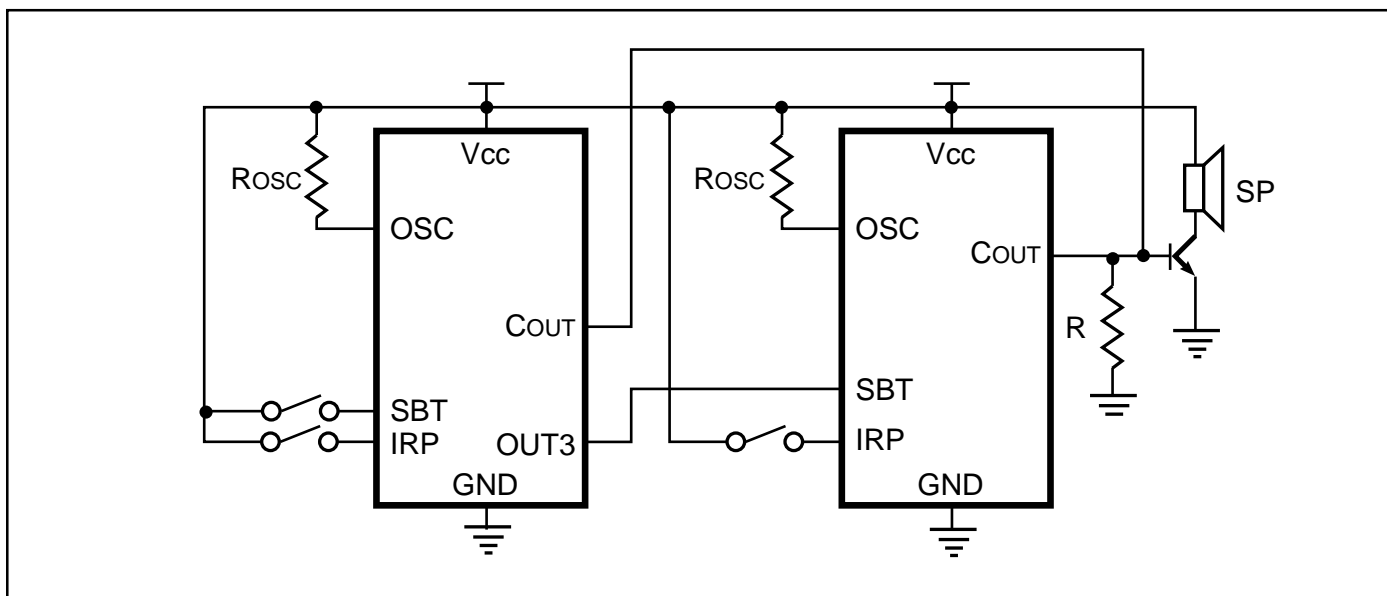**3. Single Button Trigger (SBT), Sequential**
   a. Level Unholdable

b. Level Holdable

Where N is up to 8.

Integrated Silicon Solution, Inc. — 1-800-379-4774

Rev. A
11/15/99

IS22C022

4. Edge, Unholdable, Non-retriggerable
  a. Trigger is shorter than a Group output   **b. Trigger is longer than a Group output**

S1
S2
COUT   Group 2   Group 1   Group 2
STP
LED

5. Edge Holdable
  a. Trigger is shorter than a Group output   **b. Trigger is longer than a Group output**

S1
S2
COUT   Group 2   Group 1   Group 2
LED

6. Single Button Trigger (SBT), Sequential
  a. Edge Unholdable

SBT
COUT   Group 1   Group 2   Group N   Group 1

  b. Edge Holdable

SBT
COUT   Group 1   Group 2   Group N   Group 1

Where N is up to 8.

Integrated Silicon Solution, Inc. — 1-800-379-4774   7
Rev. A
11/15/99

ISSI®

APPLICATION CIRCUITS

TYPICAL APPLICATION

CASCADE APPLICATION

Notes:

1. To direct dirve a speaker or buzzer, C is needed (C = 0.1 µF).
2. R = 330 Ohm (if using transistor 8050 and Vcc = 4.5V).
3. SP = 8 Ohm speaker.
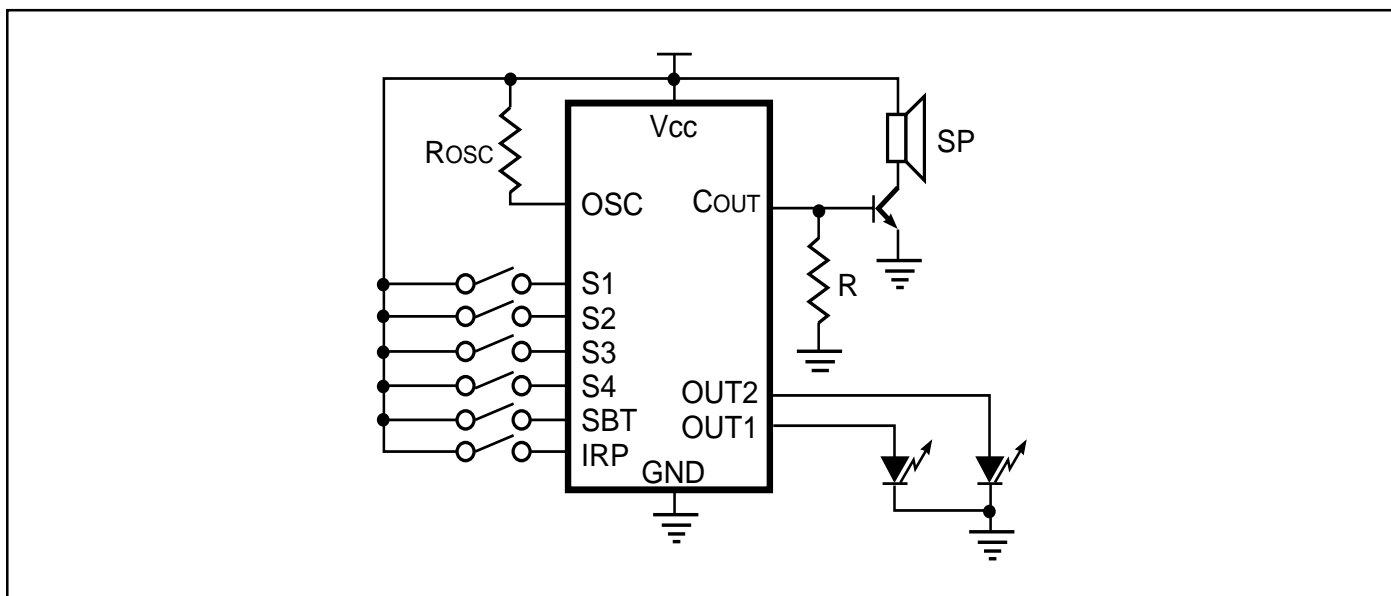4. To determine the value of R_{OSC}, refer to the Sampling Frequency vs. R_{OSC} tables on page 5.

Integrated Silicon Solution, Inc. — 1-800-379-4774

Rev. A
11/15/99

ISSI®

PRALLEL APPLICATION
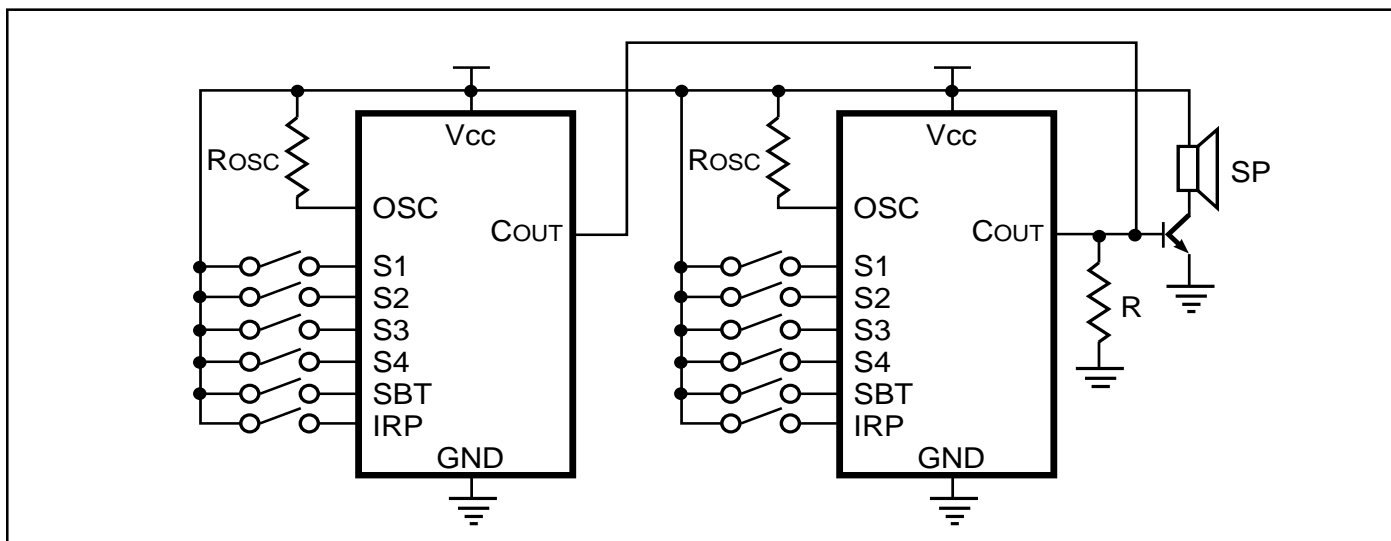
LED APPLICATION

Notes:

The following are typical values:

1. ß of NPN transistor > 130.
2. SP = 8Ω. 1/4W.
3. Piezo buzzer resonant frequency = 1 KHz.

Rev. A
11/15/99

ISSI®
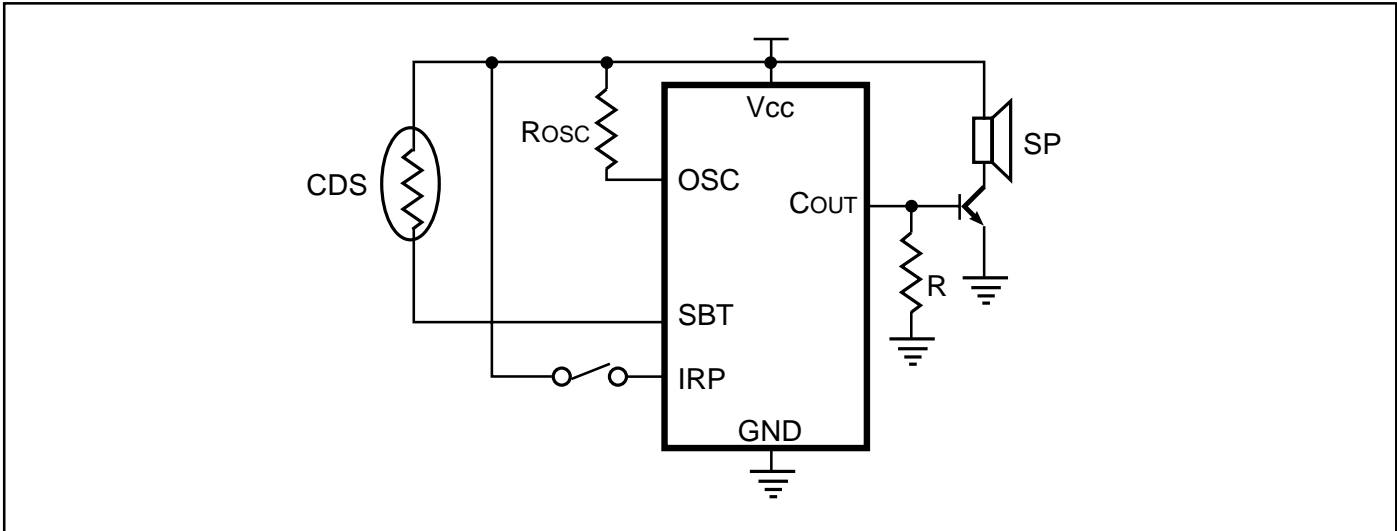
CDS APPLICATION

8-SEGMENT TRIGGER APPLICATION

Integrated Silicon Solution, Inc. — 1-800-379-4774

Rev. A
11/15/99

ISSI®
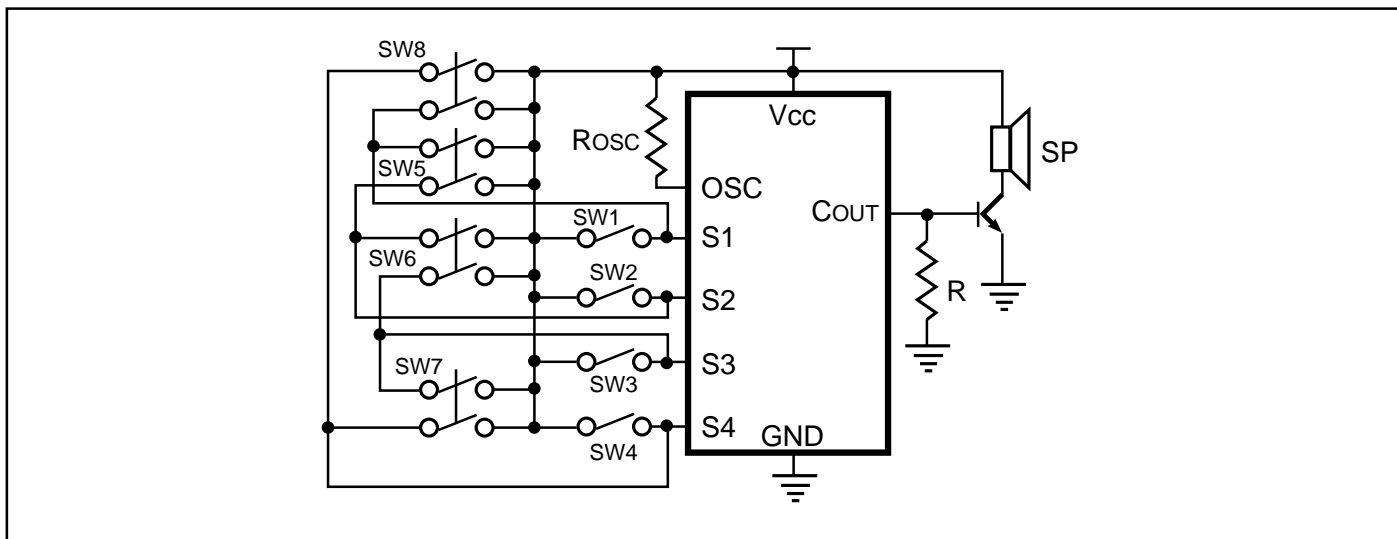
ORDERING INFORMATION

Commerical Range: 0°C to +70°C

Order Part No.	Package
IS22C022X	Unpackaged
IS22C022P	300-mil Plastic DIP

ISSI®

Rev. A
11/15/99