# Invox Technology
# IVS1530
## Data Sheet
### (Preliminary Specifications)

## Single-Chip Voice Recording & Playback Device for Single 20- to 30-Second Message

### Features

- Single-chip, high-quality voice recording & playback solution
  - No external ICs required
  - Minimum external components
- Non-volatile Flash memory technology
  - No battery backup required
  - 100K record cycles (typical)
  - 100-year message retention (typical)
- Single message of 20 to 30 seconds, with external resistor selection
- User-friendly, easy-to-use operation
  - Programming & development systems not required
  - Level-activated recording & edge-activated playback switches
- Low power consumption
  - Operating current: 25 mA (typical, no load)
  - Standby current: 1 µA (typical, no load)
- Automatic power-down feature for longer battery life
- Chip Enable pin for simple message expansion
- Single 5 V power supply

### General Description

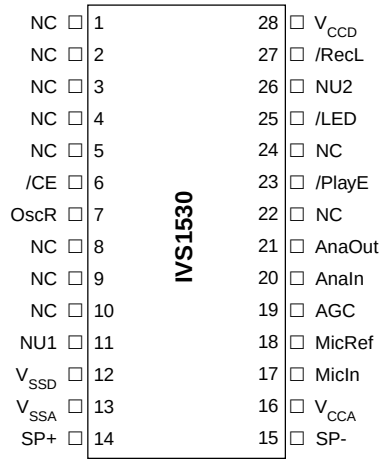
The IVS1530 device offers true single-chip solid-state storage capability and requires no software or micro-controller support. It provides high-quality recording and playback with a single 20- to 30-second message. It is ideal for portable voice recorders, toys, and many other consumer and industrial applications.

Invox proprietary analog/multi-level storage technology is implemented in advanced Flash non-volatile memory cells, each of which can typically store more than 256 voltage levels. The IVS1530 device stores and reproduces voice signals in their natural forms, eliminating the distortion that is often introduced by encoding and compression. The device combines a small size with low power consumption, non-volatility, and ease-of-use for a cost-effective solution to voice recording and playback.

### Pinout Diagram

Figure 1 shows the pinouts for the IVS1530.

Figure 1. IVS1530 Pinout Diagram*

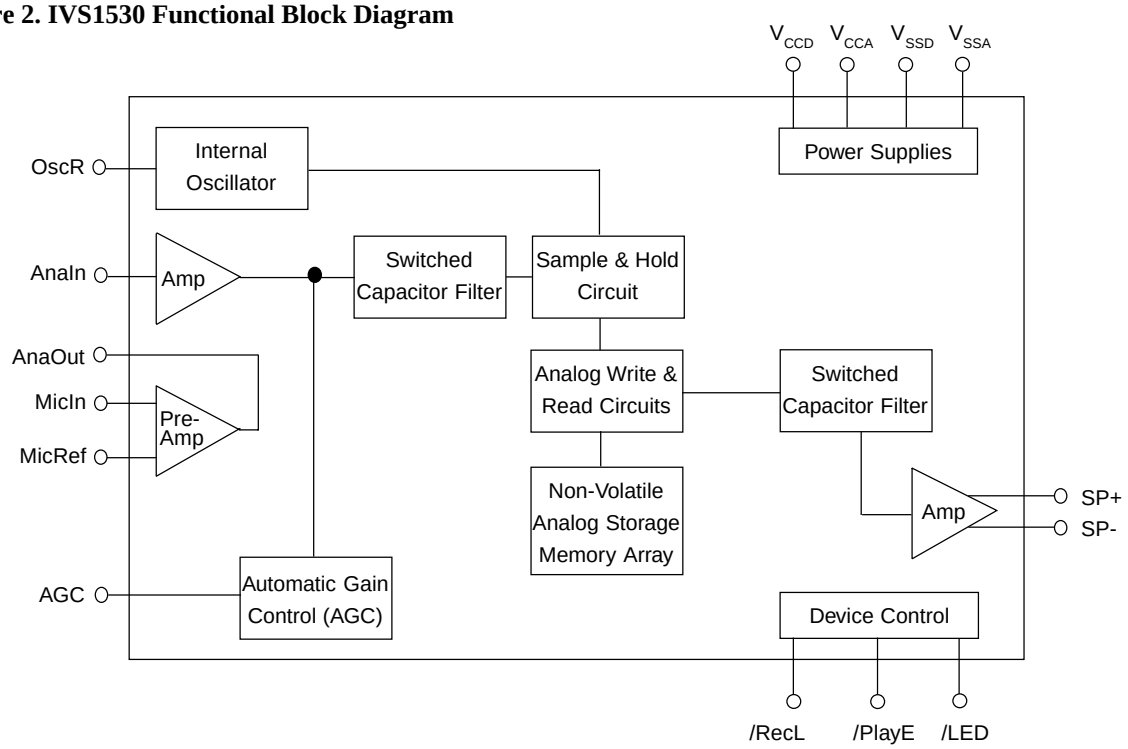



** NC = No Connect (must be floating)*
*NU = Not Used (must be grounded)*

## Functional Block Diagram

Figure 2 shows the functional block diagram of the IVS1530 device.

**Figure 2. IVS1530 Functional Block Diagram**




## Sample Application

Figure 3 shows the diagram for a single, 20-second message recording and playback application using the IVS1530 device. When pins are connected as shown in this example, the operating modes are as follows:

**Record Mode (Level-Activated)**

A single voice message of up to 20 seconds can be recorded. The /LED pin will go low during the actual recording process to provide a visual indication if an LED light is connected to this pin. The chip is in record mode as long as the /RecL pin stays low (level-activated). If the message lasts longer than 20 seconds, recording will terminate automatically after the last available memory cell is written. If the message is shorter than 20 seconds, the recording operation will stop when the /RecL pin goes high. The speaker driver is automatically tristated during the recording operation.

Messages of up to 30 seconds can be recorded by using different OscR resistor values (see Table 1).

**Playback Mode (Edge-Activated)**

Playback always starts from the beginning of the message. The chip is in playback mode after the /PlayE pin pulses low (edge-activated). Playback will stop immediately when the /PlayE pin pulses low a second time. If the newly recorded message is shorter than the previously recorded message, the remaining portion of the previous message will be played after the new message is played back. The input pre-amplifier, AGC, and main amplifier circuits are disabled during playback.

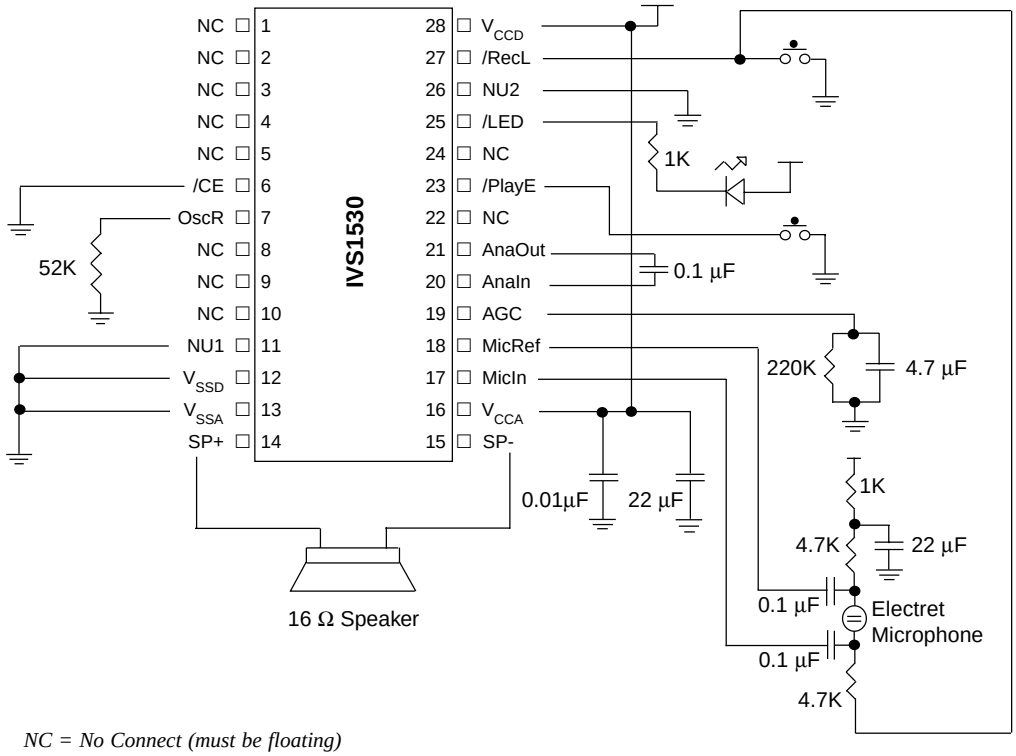
**Standby Mode (/CE = "0")**

The chip will automatically return to the standby state after recording or playback operation is completed.

**Power Down Mode (/CE = "1")**

The chip is always in standby state. No recording or playback is allowed. Current consumption is typically less than 1 µA.

**Figure 3. Sample Application for the IVS1530**




*Notes:* *NC = No Connect (must be floating)*
*NU = Not Used (must be grounded)*
*Pins 23 and 27 have internal pull-up resistors.*
*The typical sampling frequency is 6.4 kHz with OscR = 52 kΩ.*

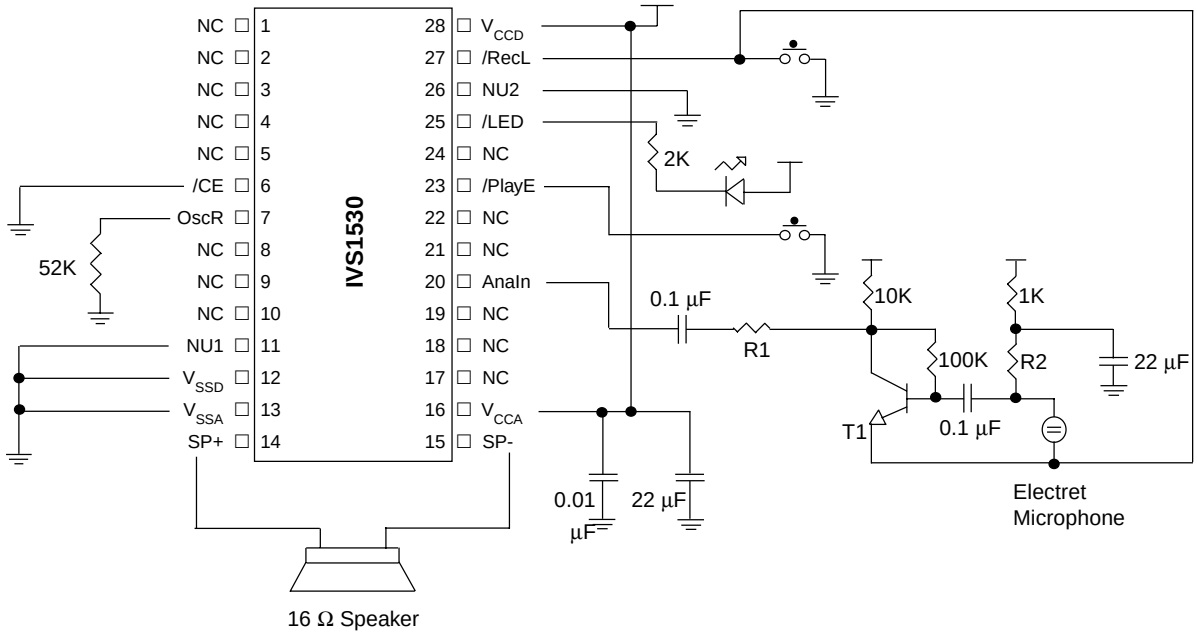
Table 1 shows the typical dependence of the sampling frequency and the total voice duration on the OscR resistor value.

**Table 1. Typical Dependence of Sampling Frequency and Total Voice Duration on OscR Resistor Value ($V_{CCA}$ = $V_{CCD}$ = 5 V; $V_{SSA}$ = $V_{SSD}$ = 0 V; $T_A$ = 25° C)**

| Pin 7 - OscR | Typical Sampling Frequency | Typical Total Voice Duration |
|---|---|---|
| 52 kΩ | 6.4 kHz | 20 s |
| 67 kΩ | 5.3 kHz | 24 s |
| 89 kΩ | 4.0 kHz | 30 s |

Figure 4 shows the same application using external microphone biasing instead of the microphone amplifier on the IVS1530 device, thus bypassing that portion of the chip function.

**Figure 4. Sample Application Using External Microphone Biasing**




*Notes:* *NC = No Connect (must be floating)*
*NU = Not Used (must be grounded)*
*Pins 23 and 27 have internal pull-up resistors.*
*The typical sampling frequency is 6.4 kHz with OscR = 52 kΩ.*
*NPN bipolar transistor, T1 model #MPS3904 or equivalent*
*R1 and R2 are recommended to be 30 kΩ. and 10 kΩ, respectively, for typical applications.*

## Electrical Characteristics

The following tables list Absolute Maximum Ratings, DC Characteristics, and Analog Characteristics for the IVS1530 device.

### Absolute Maximum Ratings

| Item | Symbol | Condition | Min | Max | Unit |
|---|---|---|---|---|---|
| Power supply voltage | $V_{CC}$ | $T_A$ = 25° C | –0.3 | 7.0 | V |
| Input voltage | $V_{IN1}$ | $T_A$ = 25° C | –0.3 | $V_{CC}$ + 0.3 | V |
| Input voltage | $V_{IN2}$ | $\mid I_{IN} \mid$ < 20 mA | –1.0 | $V_{CC}$ + 1.0 | V |
| Storage temperature | $T_{STG}$ | - | –65 | 150 | ° C |
| Temperature under bias | $T_{BS}$ | - | –65 | 125 | ° C |
| Lead temperature | $T_{LD}$ | < 10 s | | 300 | ° C |

### DC Characteristics*

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input high voltage | $V_{IH}$ | - | $0.8 \times V_{CC}$ | - | - | V |
| Input low voltage | $V_{IL}$ | - | - | - | 0.8 | V |
| Output high voltage | $V_{OH}$ | $I_{OH}$ = –1.6 mA | 2.4 | - | - | V |
| Output low voltage | $V_{OL}$ | $I_{OL}$ = 4.0 mA | - | - | 0.45 | V |
| Input leakage current | $I_{IH}$ | $V_{IH} = V_{CC}$ | - | - | 1.0 | µA |
| Input leakage current | $I_{IL}$ | $V_{IL} = V_{SS}$ | –1.0 | - | - | µA |
| Output tristate leakage current | $I_{OZ}$ | $V_{OUT} = V_{CC}$ *or* $V_{OUT} = V_{SS}$ | –1.0 | - | 1.0 | µA |
| Operating current consumption | $I_{CC}$ | Internal Clock, no load | - | 25 | - | mA |
| Standby current consumption | $I_{CCS}$ | No load | - | 1.0 | | µA |

### Analog Characteristics*

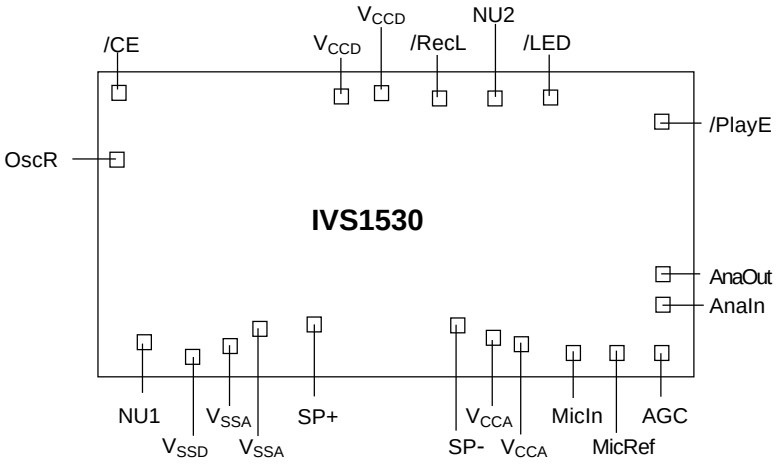
| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| MicIn input voltage | $V_{MI}$ | - | - | - | 20 | $mV_{P-P}$ |
| MicIn input resistance | $R_{MI}$ | - | - | 10 | - | kΩ |
| MicIn amp gain (1) | $G_{MI1}$ | AGC ≤ 2.2 V | - | 24 | - | dB |
| MicIn amp gain (2) | $G_{MI2}$ | AGC ≥ 3.0 V | - | –45 | –15 | dB |
| AnaIn input voltage | $V_{ANI}$ | - | - | - | 50 | $mV_{P-P}$ |
| AnaIn input resistance | $R_{ANI}$ | - | - | 10 | - | kΩ |
| AnaIn amp gain | $G_{ANI}$ | AnaIn to SP+/– | - | 22 | - | dB |
| AGC output resistance | $R_{AGC}$ | - | - | 1 | - | kΩ |
| SP +/- output power | $P_{SP}$ | $R_{SP+/-}$ = 16 Ω | - | 12.2 | - | mW |
| Voltage amplitude across SP +/– | $V_{SP}$ | $R_{SP+/-}$ ≥ 16 Ω | - | 1.25 | - | $V_{P-P}$ |

**Typical Values:* $V_{CCD} = V_{CCA} = 5$ V  $V_{SSD} = V_{SSA} = 0$ V  $T_A = 25°C$

## Bonding Pad Diagram & Description of Bonding Pad Coordinates

Figure 5 shows the bonding pad diagram for the IVS1530 device die.

**Figure 5. IVS1530 Die Bonding Pad Diagram***




*Notes:*
*Die Dimensions:*
*x = 214 ± 1 mils*
*y = 144 ± 1 mils*
*Die Thickness:*
*13.8 ± 1.0 mils*
*(350 ± 25 µm)*
*Pad Opening:*
*110 µm*
*4.3 mils*

Table 2 lists the bonding pad coordinates for the IVS1530 device.

**Table 2. IVS1530 Bonding Pad Coordinates**

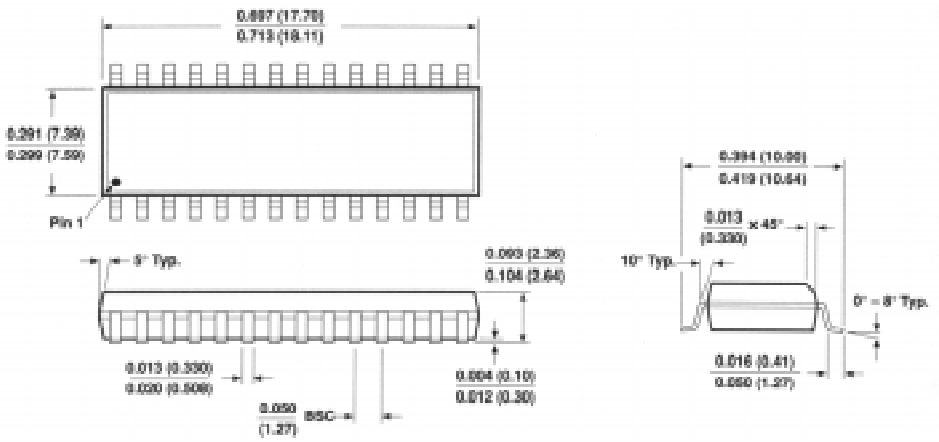
| Pin | Pin Name | X Axis* | Y Axis* |
|---|---|---|---|
| /CE | Chip enable | –2496.20 | 1565.80 |
| OscR | Oscillator frequency-setting resistor | –2459.55 | 729.80 |
| NU1 | Connect to ground | –1808.45 | –1496.10 |
| $V_{SSD}$ | Digital ground supply | –1564.05 | –1572.00 |
| $V_{SSA}$ | Analog ground supply | –1384.05 | –1548.70 |
| $V_{SSA}$ | Analog ground supply | –1204.35 | –1477.10 |
| SP+ | Non-inverting speaker output | –707.15 | –1390.00 |
| SP- | Inverting speaker output | 479.15 | –1389.90 |
| $V_{CCA}$ | Analog power supply | 976.45 | –1492.00 |
| $V_{CCA}$ | Analog power supply | 1190.40 | –1523.70 |
| MicIn | Microphone input | 1619.45 | –1551.40 |
| MicRef | Microphone reference input | 2035.45 | –1551.40 |
| AGC | Automatic gain control | 2487.45 | –1551.40 |
| AnaIn | Analog signal input | 2487.45 | –1049.90 |
| AnaOut | Analog signal output | 2487.45 | –648.90 |
| /PlayE | Edge-activated playback | 2493.65 | 1371.10 |
| /LED | LED output | 1430.70 | 1565.80 |
| NU2 | Connect to ground | 865.75 | 1565.80 |
| /RecL | Level-activated record | 258.15 | 1565.80 |
| $V_{CCD}$ | Digital power supply | –229.40 | 1579.05 |
| $V_{CCD}$ | Digital power supply | –510.80 | 1541.60 |

**With respect to die center (µm)*

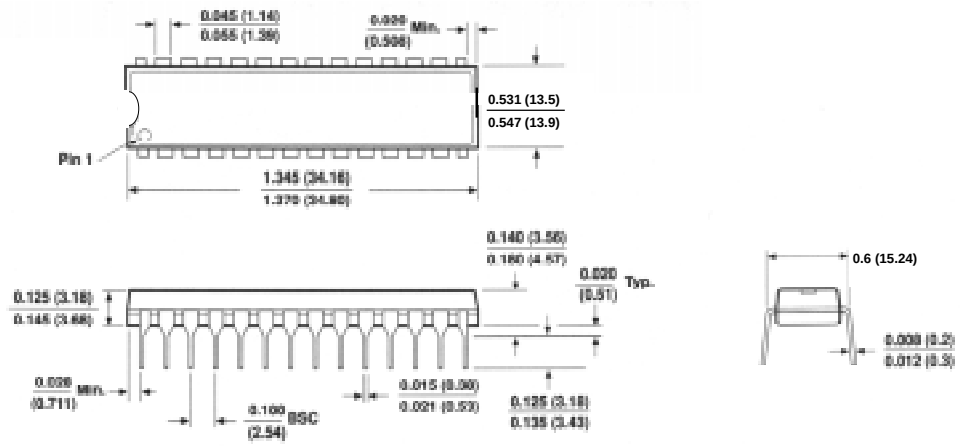
## Package Outlines

The IVS1530 device is available in the following packages. Packages conform to JEDEC and EIAJ standards.

### 28-Pin Plastic Small-Outline Integrated Circuit (SOIC)



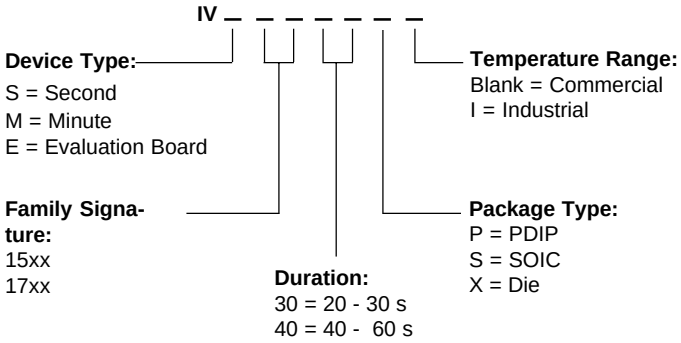

### 28-Pin Plastic Dual In-Line Package (P-600)



## Ordering Information

| Package | Pin | Grade | Part Number |
|---|---|---|---|
| SOIC | 28 | Commercial | IVS1530S |
| P-600 | 28 | Commercial | IVS1530P |
| Die | | Commercial | IVS1530X |

Ordering codes for Invox devices are as follows:






**Invox Technology 2605A Winchester Blvd. Campbell, CA 95008 U.S.A.**
**Tel: 408.871.1900 Fax: 408.871.1971 E-mail: info@invoxtech.com http://www.invoxtech.com**