1. GENERAL DESCRIPTION

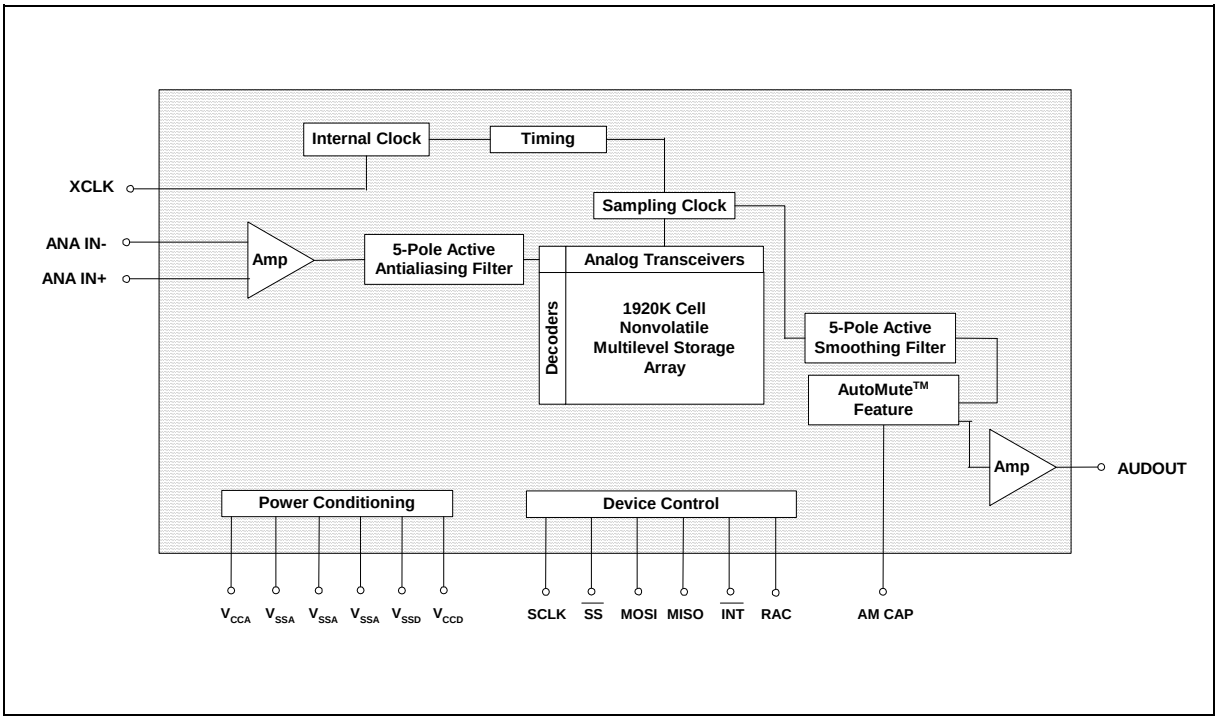
The ISD4003 ChipCorder® series provides high-quality, 3-volt, single-chip record/playback solutions for 4- to 8-minute messaging applications ideally for cellular phones and other portable products. The CMOS-based devices include an on-chip oscillator, anti-aliasing filter, smoothing filter, AutoMute® feature, audio amplifier, and high density multilevel Flash memory array. The ISD4003 series is designed to be used in a microprocessor- or microcontroller-based system. Address and control are accomplished through a Serial Peripheral Interface (SPI) or Microwire Serial Interface to minimize pin count.

Recordings are stored into the on-chip Flash memory cells, providing zero-power message storage. This unique single-chip solution utilizes Nuvoton's patented multilevel storage technology. Voice and audio signals are directly stored onto memory array in their natural form, providing high-quality voice reproduction.

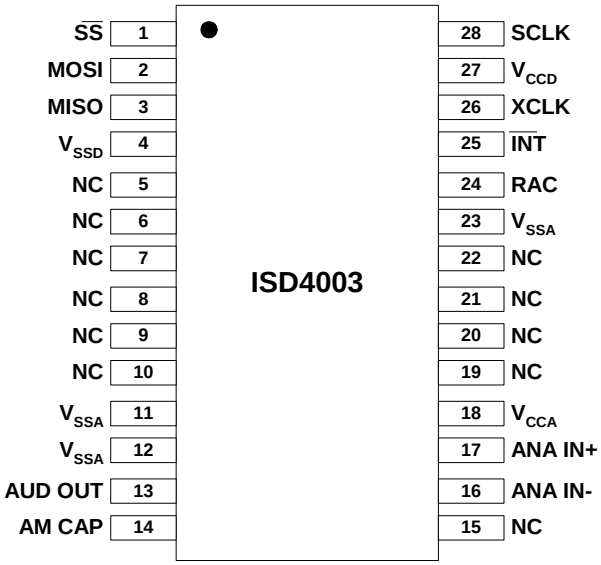
2. FEATURES

- Single-chip voice record/playback solution
- Single 3 volt supply
- Low-power consumption
  - Operating current:
    - I_{CC_Play} = 15 mA (typical)
    - I_{CC_Rec} = 25 mA (typical)
  - Standby current:
    - $I_{CC\_Standby}$ = 1 µA (typical)
- Duration: 4, 5, 6, and 8 minutes
- High-quality, natural voice/audio reproduction
- AutoMute feature provides background noise attenuation
- No algorithm development required
- Microcontroller SPI or Microwire™ Serial Interface
- Fully addressable to handle multiple messages
- Non-volatile message storage
- 100K record cycles (typical)
- 100-year message retention (typical)
- On-chip oscillator
- Power-down feature to reduce power consumption
- Available in die form, PDIP, SOIC, and TSOP
- Packaged type: Lead-Free
- Temperature:
  - Commercial (die): 0°C to +50°C
  - Commercial (packaged units): 0°C to +70°C
  - Industrial (packaged units): -40°C to +85°C

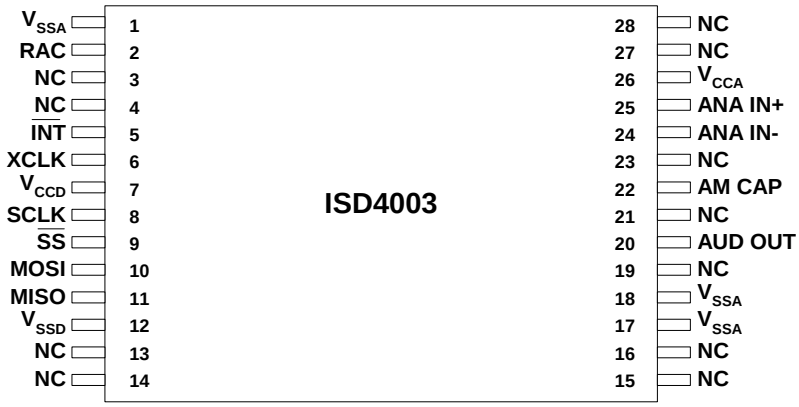
3. BLOCK DIAGRAM



4. PIN CONFIGURATION



SOIC / PDIP



TSOP

5. PIN DESCRIPTION

PIN NAME	PIN NO.		FUNCTION
	SOIC / PDIP	TSOP	
$\overline{SS}$	1	9	**Slave Select**: This input, when LOW, will select the ISD4003 device.
MOSI	2	10	**Master Out Slave IN**: This is the serial input to the ISD4003 device when it is configured as slave. The master microcontroller places data on the MOSI line one half-cycle before the rising edge of SCLK for clocking into the device.
MISO	3	11	**Master In Slave Out**: This is the serial output (open drain) of the ISD4003 device. This output goes into a high-impedance state if the device is not selected.
V_{SSA} / V_{SSD}	11, 12, 23 / 4	1, 17, 18 / 12	**Ground**: The ISD4003 series utilizes separate analog and digital ground busses. The analog ground (V_{SSA}) pins should be tied together as close as possible and connected through a low-impedance path to power supply ground. The digital ground (V_{SSD}) pin should be connected through a separate low-impedance path to power supply ground. These ground paths should be large enough to ensure that the impedance between the V_{SSA} pins and the V_{SSD} pin is less than 3 Ω. The backside of the die is connected to V_{SS} through the substrate. For chip-on-board design, the die attach area must be connected to V_{SS} or left floating.
NC	5-10, 15, 19-22	3, 4, 13-16, 19, 21, 23, 27, 28	Not connected
AUD OUT [1]	13	20	**Audio Output**: This pin provides an audio output of the stored data and is recommended be AC coupled. It is capable of driving a 5 KΩ impedance R_{EXT}.

[1] The AUD OUT pin is always at 1.2 volts when the device is powered up. When in playback, the output buffer connected to this pin can drive a load as small as 5 KΩ. When in record, a built-in resistor connects AUD OUT to the internal 1.2-volt analog ground supply. This resistor is approximately 850 KΩ, but will vary somewhat according to the sample rate of the device. This relatively high impedance allows this pin to be connected to an audio bus without loading it down.