National Semiconductor

NSAM265SR/NSAM265SF
CompactSPEECH™ Digital Speech Processors

General Description

The NSAM265SR and the NSAM265SF are members of National Semiconductor's CompactSPEECH, Digital Speech processors family. These processors provide Digital Answering Machine (DAM) functionality to embedded systems. Both processors are based on the NSAM265.

Unless specified otherwise, all references to the CompactSPEECH processor in this document apply to both the NSAM265SR and the NSAM265SF.

The CompactSPEECH processor integrates the functions of a traditional Digital Signal Processing (DSP) chip and a general purpose 16-bit RISC processor. The device contains system support functions such as DRAM Controller, Interrupt Control Unit, Codec Interface, MICROWIRE™ interface, WATCHDOG™ timer and a Clock Generator.

The CompactSPEECH processor operates as a slave peripheral that is controlled by an external microcontroller via a serial MICROWIRE interface. In a typical DAM environment the microcontroller controls the analog circuits, buttons and display, and activates the CompactSPEECH by sending it commands. The CompactSPEECH processor executes the commands and returns status information to the microcontroller.

The CompactSPEECH firmware implements voice compression and decompression, tone detection and generation, message storage management, on-chip speech synthesis for time and day stamp, and support for user-defined voice prompts in various languages.

The NSAM265SR CompactSPEECH supports DRAM/ARAM for message storage while the NSAM265SF supports FLASH/AFLASH. In all other respects, the processors are identical.

The CompactSPEECH implements echo cancellation techniques to support improved DTMF tone detection during message playback.

CompactSPEECH supports speech synthesis: the technology used to create voice prompts from predefined words and phrases stored in a vocabulary.

The CompactSPEECH can synthesize messages in various languages, in addition to the on-chip English vocabulary, via the International Vocabulary Support (IVS) mechanism. Synthesized messages can be stored on an external ROM. One ROM can contain several vocabularies in various languages. The NSAM265SF can also store vocabularies on FLASH memory. DAM manufacturers can thus create machines that "speak" in different languages, simply by using other vocabularies. For more details about IVS, refer to the *IVS User's Manual.*

Features

- Designed around a 16-bit RISC processor
- 16-bit architecture and implementation
- 20.48 MHz operation
- On-chip DSP Module (DSPM) for high speed DSP operations
- On-chip Codec clock generation and interface
- Power-down mode
- MICROWIRE interface to an external microcontroller
- Storage and management of messages
- Programmable message tag for message categorization, e.g., Mailboxes, InComing Messages (ICM), Out-Going Messages (OGM)
- Skip forward or backward during message playback
- Variable speed playback
- Built-in vocabulary for speech synthesis, and support for external vocabularies, using expansion ROM
- Multi-lingual speech synthesis using International Vocabulary Support (IVS)
- DTMF and single tone generation and detection
- DTMF tone detection during OutGoing Message playback
- Telephone line functions, including busy and dial tone detection
- Real-time clock
- Direct access to message memory
- Supports long-frame and short-frame codecs
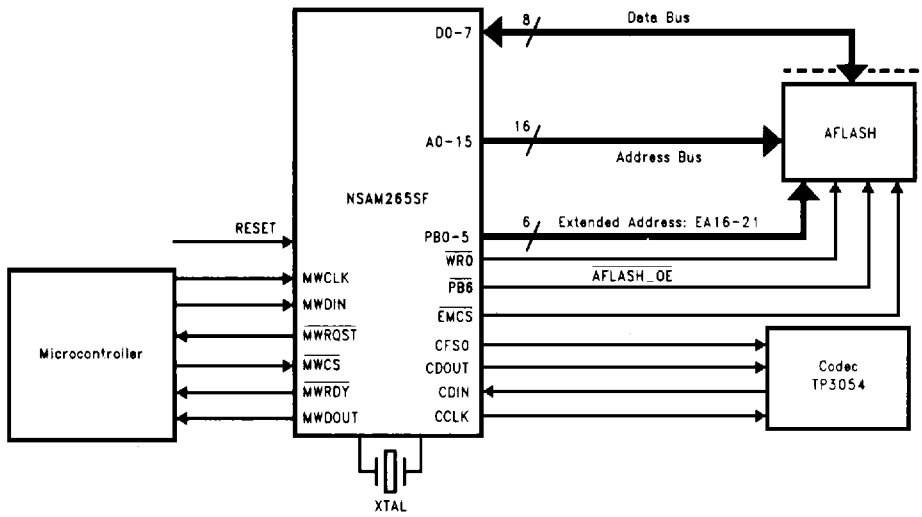- Available in PLCC 68-pin, and PQFP 100-pin packages

NSAM265SR only

- On-chip ARAM/DRAM Controller for 4-Mbit (1M x 4) and 16-Mbit (4M x 4) devices
- 15 minutes recording on a 4-Mbit ARAM
- Supports various ARAM configurations. No glue logic required
- Storage of up to 1600 messages
- Production diagnostics support

NSAM265SF only

- Supports 4-Mbit and 8-Mbit, byte wide, FLASH/AFLASH devices
- Up to 15 minutes recording on a 4-Mbit FLASH
- Supports various AFLASH configurations. No glue logic required for a single AFLASH configuration
- The number of messages that can be stored is limited only by memory size
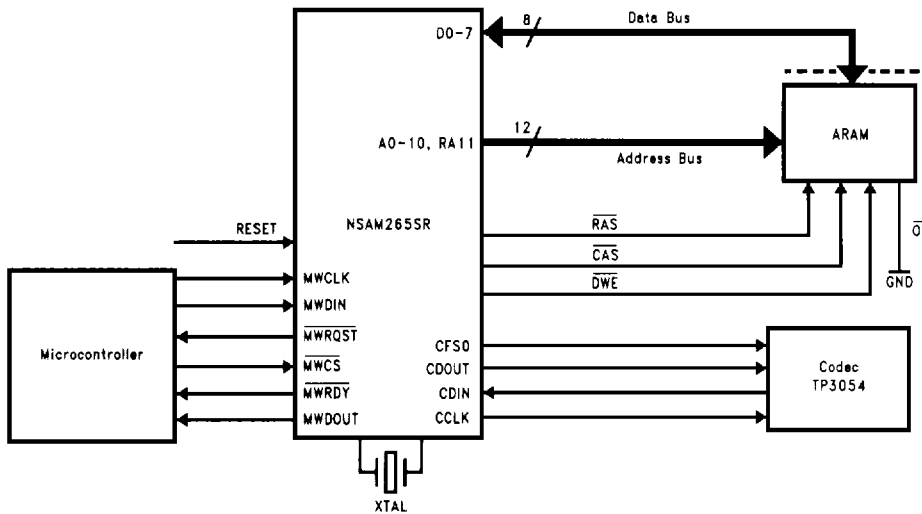- Supports prerecorded IVS and OGM on FLASH
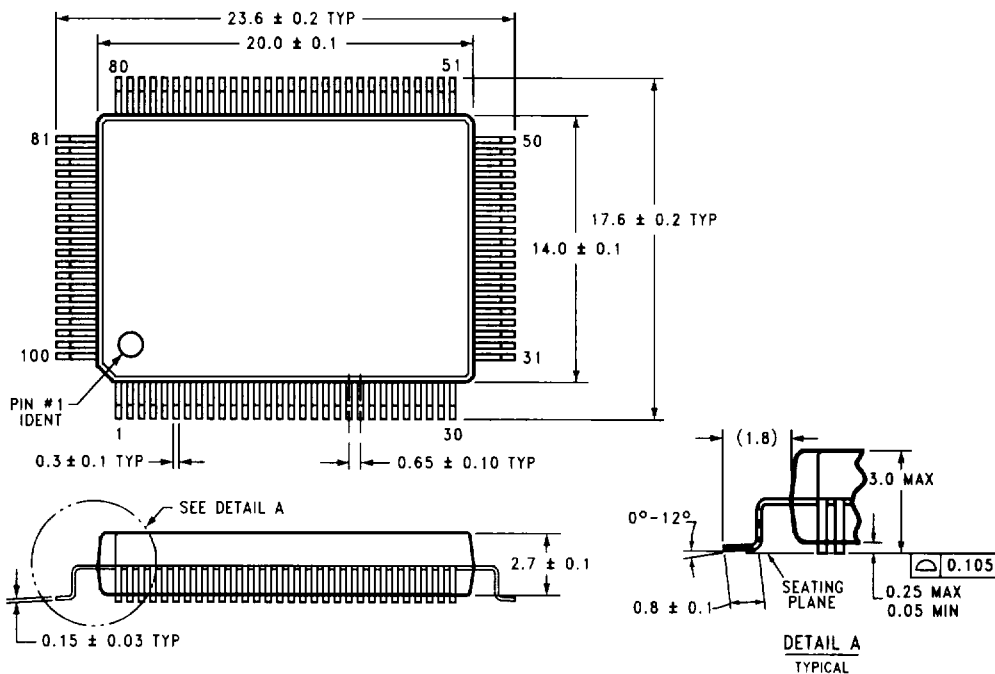
Block Diagrams

NSAM265SF Basic Configuration

NSAM265SF

D0–7 8 Data Bus → AFLASH

A0–15 16 Address Bus →

PB0–5 6 Extended Address: EA16–21

$\overline{WRO}$

$\overline{PB6}$ AFLASH_OE

$\overline{EMCS}$

RESET

MWCLK
MWDIN
$\overline{MWRQST}$
$\overline{MWCS}$
$\overline{MWRDY}$
MWDOUT

CFSO
CDOUT
CDIN
CCLK

Microcontroller

Codec
TP3054

XTAL

TL/EE/12500–1

NSAM265SR Basic Configuration

NSAM265SR

D0–7 8 Data Bus → ARAM

A0–10, RA11 12 Address Bus →

$\overline{RAS}$ $\overline{OE}$

$\overline{CAS}$

$\overline{DWE}$ $\overline{GND}$

RESET

MWCLK
MWDIN
$\overline{MWRQST}$
$\overline{MWCS}$
$\overline{MWRDY}$
MWDOUT

CFSO
CDOUT
CDIN
CCLK

Microcontroller

Codec
TP3054

XTAL

TL/EE/12500–2

3

Physical Dimensions inches (millimeters)

23.6 ± 0.2 TYP

20.0 ± 0.1

80   51

81   50

17.6 ± 0.2 TYP

14.0 ± 0.1

100   31

PIN #1
IDENT

1   30

0.3 ± 0.1 TYP   0.65 ± 0.10 TYP

SEE DETAIL A

2.7 ± 0.1

0.15 ± 0.03 TYP

(1.8)

3.0 MAX

0°–12°

0.8 ± 0.1

SEATING
PLANE

⌂ 0.105

0.25 MAX
0.05 MIN

DETAIL A
TYPICAL

TL/EE/12500–3

100-Pin Molded Plastic Quad Flat Package (EIAJ)
Order Number NSAM265SRA/SFA
NS Package Number VLJ100A

Physical Dimensions inches (millimeters) (Continued)
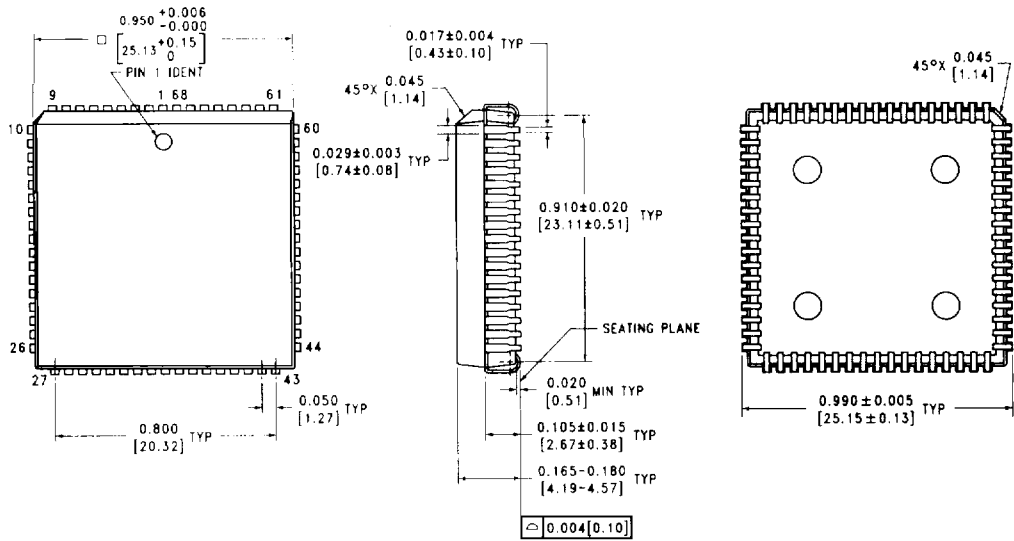
TL/EE/12500-4

68-Pin Plastic Leaded Chip Carrier (V)
Order Number NSAM265SRA/SFA
NS Package Number V68A