Rockwell

RCV144ACi/SP and RCV144ATi/SP Integrated High Speed Data/Fax/Voice Modem and Speakerphone Device Set

INTRODUCTION

The Rockwell RCV144ACi/SP and RCV144ATi/SP integrated data/fax/voice/speakerphone modem device families support high speed data, high speed fax, voice/audio, and speakerphone operation in the US or world-wide over a dial-up telephone line. Models supporting error correction and data compression, fax class 1 and class 2, MNP 10/MNP 10EC, AutoSync, voice/audio, VoiceView, and world class (W-class) are available (Table 1).

As a data modem, the modem operates at line speeds to 14400 bps. Error correction (V.42/MNP 2-4) and data compression (V.42 bis/MNP 5) maximize data transfer integrity and boost average data throughput up to 57.6 kbps. Non-error-correcting mode is also supported.

RCV144ACi/SP models perform error correction and data compression (ECC) in the modem using 32k bytes of external RAM. ECC increases data throughput typically by a factor of four.

RCV144ATi/SP models require no external RAM. These models support ECC performed by the host CPU and communications software for Windows using the enhanced Rockwell Windows Protocol Interface (RPI+™) and WinRPI host software module.

As a fax modem, the modem supports Group 3 send and receive rates up to 14400 bps and supports T.30 protocol.

In voice mode, enhanced ADPCM coding and decoding supports efficient digital storage of voice using 2-bit or 4-bit compression and decompression at 7200 bps.

Voice mode also supports business audio and the Integrated Communications System (ICS) program. These features support applications such as digital answering machine, voice annotation, and audio file play/record.

The position independent, full-duplex speakerphone function uses an advanced algorithm that includes both acoustic and line echo cancellation. These functions are supplied with the addition of a speakerphone signal processor (SSP) packaged in a 100-pin PQFP and supportive speakerphone features incorporated in the MCU 100-pin PQFP package.

Reference hardware designs are available with and without interface to sound chips (audio codecs). These designs support functions such as music on hold, telephone/speakerphone conversation recording, and handset recording.

PC-based "ConfigurACE™" software allows MCU firmware to be customized to application and country requirements.

FEATURES

- Data modem throughput up to 57.6 kbps
  - V.32 bis, V.32, V.22 bis, V.22A/B, V.23, and V.21
  - Bell 212A and 103
- RCV144ACi/SP performs ECC in the modem
  - V.42 LAPM and MNP 2-4 error correction
  - V.42 bis and MNP 5 data compression
  - MNP 10 data throughput enhancement
  - MNP 10EC™ enhanced cellular performance
  - Hayes AutoSync (option)
- RCV144ATi/SP supports ECC performed in the host
  - V.42 LAPM and MNP 2-4 error correction
  - V.42 bis and MNP 5 data compression
- Enhanced Rockwell Protocol Interface (RPI+) supported by WinRPI host software module
- Fax modem send and receive rates up to 14400 bps
  - V.33, V.17, V.29, V.27 ter, and V.21 channel 2
- Voice mode
  - Enhanced ADPCM compression/decompression
  - Tone detection/generation and call discrimination
  - Concurrent DTMF detection
- Business audio mode using 8-bit monophonic audio data encoding at 11.025 kHz or 7200 Hz
- VoiceView alternating voice and data (AVD) (ACi option)
- World-class operation (option)
  - Call progress, blacklisting, multiple country support
- Full-duplex speakerphone
  - Acoustic and line echo cancellation
  - Programmable microphone AGC
  - Microphone volume selection and muting
  - Speaker volume control and muting
  - Room monitor
- Communication software compatible AT command sets
- NVRAM directory and stored profiles
- Built-in DTE interfaces with speed up to 57.6 kbps
  - Parallel 16550A UART-compatible interface
  - Serial CCITT V.24 (EIA/TIA-232-E)
- Supports Rockwell PnP ISA Bus Interface Device
- Supports Serial PnP interface per Plug and Play External COM Device Specification, Rev 1.00
- Flow control and speed buffering
- Automatic format/speed sensing to 57.6 kbps
- Serial async data; parallel async data
- Auto dial and auto answer; tone and pulse dialing
- Caller ID and distinctive ring detect
- Packaging: MCU (R6729): 100-pin PQFP
             MDP (R6645): 68-pin PLCC
             SSP (R6674): 100-pin PQFP
- +5V operation
- Power use (typ.): Operating = 1.47 W; Sleep = 32 mW

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Table 1. Modem Models and Functions

| Model | ECC | Supported Functions | | | | | | | External |
		Fax Class	MNP 10/ MNP 10EC	Voice	VoiceView	AutoSync	W-Class	Country Support	32k-Byte RAM Required
RCV144ACi/SP	Modem	1 & 2	S	S	S	-	-	US/Canada	Yes
RCV144ACi/A/SP	Modem	1 & 2	S	S	S	S	-	US/Canada	Yes
RCV144ACiW/SP	Modem	1 & 2	S	S	S	S	S	Multiple	Yes
RCV144ATi/SP	Host	1	-	S	-	-	-	US/Canada	No
RCV144ATiW/SP	Host	1	-	S	-	-	S	Multiple	No

Notes:
1. ECC:

   Host   ECC performed by host CPU and commercially available windows software.

   Modem   ECC performed by the modem MCU hardware and firmware.

2. Model options:

   /A   Optional Hayes AutoSync.

   V   Voice (includes Business Audio) and, for ACi/SP and ACFi/SP, VoiceView.

   SP   Speakerphone.

   W   World-class (W-class) support.

3. Supported functions (S = Supported; – = Not supported):

   Fax Class   Fax command functions (1 = Fax Class 1; 2 = Fax Class 2).

   MNP 10   MNP 10 data throughput enhancement.

   MNP 10EC   MNP 10EC enhanced cellular.

   Voice   Voice and business audio command functions.

   VoiceView   VoiceView alternating voice and data (AVD) (ACi/SP and ACiW/SP only).

   AutoSync   Hayes AutoSync using Hayes Synchronous Interface (HSI).

   W-Class   World-class functions supporting multiple country requirements.

MNP 10EC, RPI+, and ConfigurACE are trademarks of Rockwell International.
MNP is a trademark of Microcom Systems, Inc.
VoiceView is a registered trademark of Radish Communications, Inc.
Hayes is a trademark of Hayes Microcomputer Products, Inc.

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TECHNICAL SPECIFICATIONS

GENERAL DESCRIPTION

The modem device set, consisting of separate microcontroller (MCU), modem data pump (MDP), and speakerphone signal processor (SSP) devices, provides the processing core for a complete modem design. The OEM adds three crystals, discrete components, and a telephone line/telephone/audio interface circuit to complete the system.

The modem is the full-featured, self-contained data modem/fax modem/voice/audio/speakerphone solution shown in Figure 1 (serial DTE interface) and Figure 2 (parallel host interface). No external microcontroller for data or fax control functions is required. Dialing, call progress, telephone line interface, voice/audio, and VoiceView functions are supported and controlled through the AT command set. The audio signal interface is illustrated in Figure 3.

The modem connects to the DTE via a V.24 (EIA/TIA-232-E) serial interface or to a host via a parallel microcomputer bus depending on modem model.

Modem

In data modem modes, the modem can operate in 2-wire, full-duplex, synchronous/asynchronous modes at line rates up to 14400 bps. Data modem modes perform complete handshake and data rate negotiations. All tone and pattern detection functions required by the applicable ITU or Bell standard are supported.

In fax modem mode, the modem fully supports Group 3 facsimile send and receive speeds of 14400, 12000, 9600, 7200, 4800, or 2400 bps. Fax modem modes support Group 3 fax requirements. Fax data transmission and reception performed by the modem is controlled and monitored through the fax EIA-578 Class 1 command interface. Full HDLC formatting, zero insertion/deletion, and CRC generation/checking is provided. ACi models also support fax class 2 functions.

Both transmit and receive fax data are buffered within the modem. Data transfer to and from the DTE is flow controlled by XON/XOFF.

Speakerphone

The speakerphone features an advanced proprietary speakerphone algorithm which provides full-duplex, voice conversation with both acoustic and line echo cancellation. During real-time conditions, the speakerphone algorithm constantly adjusts its parameters to deliver the best performance, allowing automatic fallback from full-duplex to pseudo duplex. The speakerphone algorithm includes a superior automatic anti-howling scheme which allows extreme freedom in the placement of microphone and speaker.

DEVICES

Modem Data Pump (MDP)

The MDP is a Rockwell RC144DPi data/fax/voice modem data pump. The crystal frequency is 35.2512 MHz.

As a data modem, the MDP can operate in full-duplex, synchronous/asynchronous modes at line rates up to 14400 bps.

As a fax modem, the MDP fully supports Group 3 facsimile send and receive speeds of 14400, 12000, 9600, 7200, 4800, and 2400 bps.

ADPCM voice processing is performed in the MDP.

The RC144DPi MDP is packaged in a 68-pin PLCC (R6645).

Microcontroller (MCU)

The MCU is a Rockwell C40 microcomputer with interface pins to support speakerphone. A pin-compatible C40 MCU without speakerphone support is also available.

The MCU performs the command processing and host interface functions. The crystal frequency is 9.8304 MHz.

The MCU connects to the host via a V.24 (EIA/TIA-232-E) serial interface or a parallel microcomputer bus depending on installed MCU firmware.

The MCU connects to the MDP via dedicated lines and the external bus. The MCU external bus also connects to OEM-supplied ROM (128k bytes) and, for ACi models, to OEM-supplied RAM (32k bytes).

For all models, a 256-byte NVRAM can optionally be connected to the MCU over a dedicated serial interface.

The C40 MCU is packaged in a 100-pin PQFP (R6729).

Speakerphone Signal Processor (SSP)

The SSP is a Rockwell speakerphone signal processor.

The speakerphone mode provides hands-free full-duplex telephone operation under MCU control. The host can separately control volume, muting, and AGC in microphone and speaker channels. The speakerphone automatically recalculates loop control parameters to maintain duplexity and stability.

The SSP is packaged in a 100-pin PQFP (R6674).

MCU Firmware

Modem firmware performs processing of general modem control, command sets, fax class 1, voice/audio, and DTE/host interface functions. In addition, ACi/SP and ACiW/SP firmware perform Hayes Autosync, error correction, data compression, fax class 2, and VoiceView functions (see Table 1).

Configurations of the MCU firmware are provided to support parallel host bus interface operation or serial DTE interface operation.

The MCU firmware is provided in object code form for the OEM to program into external ROM. The MCU firmware may also be provided in source code form under a source code addendum license agreement.
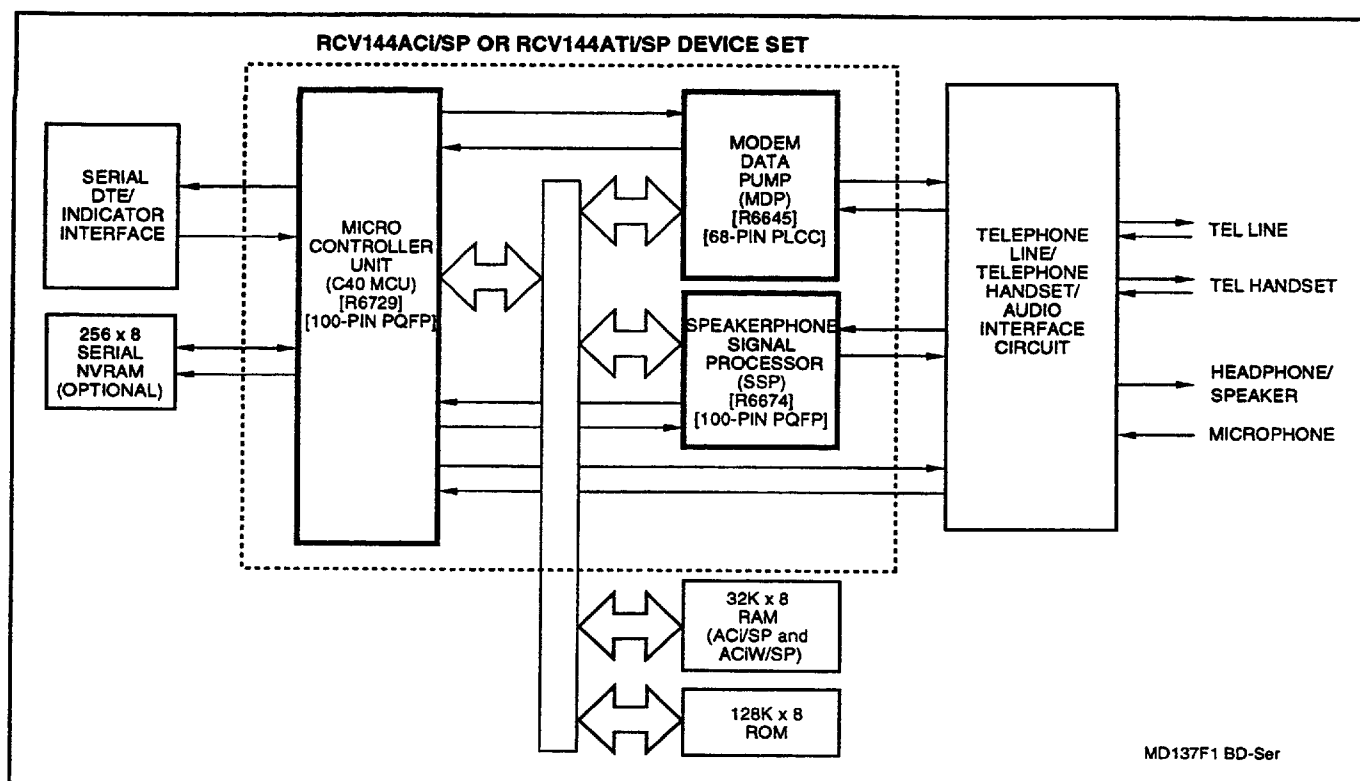
Figure 1. Block Diagram - Serial DTE Interface
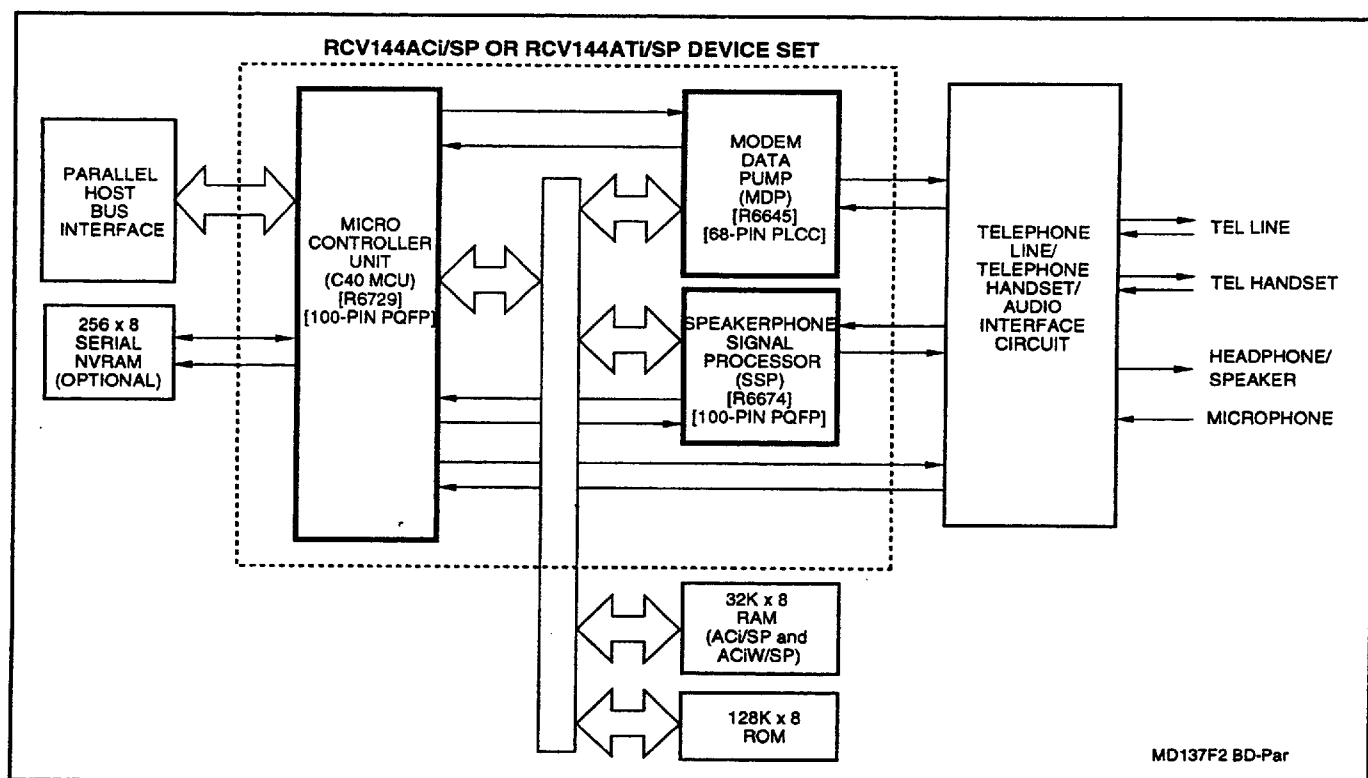
Figure 2. Block Diagram - Parallel Host Interface

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HARDWARE INTERFACE SIGNALS

The MCU pin assignments with serial DTE interface for the 100-pin PQFP are shown in Figure 4.

The MCU pin assignments with parallel host interface for the 100-pin PQFP are shown in Figure 5.

The MDP pin assignments for the 68-pin PLCC are shown in Figure 6.

The SSP pin assignments for the 100-pin PQFP are shown in Figure 7.

ELECTRICAL AND ENVIRONMENTAL SPECIFICATIONS

The current and power requirements are listed in Table 2.

The absolute maximum ratings are listed in Table 3.

ADDITIONAL INFORMATION

Additional information is described in the RCV144ACi/SP and RC144ATi/SP Designer's Guide (Order No. 1059) and in the AT Command Reference Manual (Order No. 833).
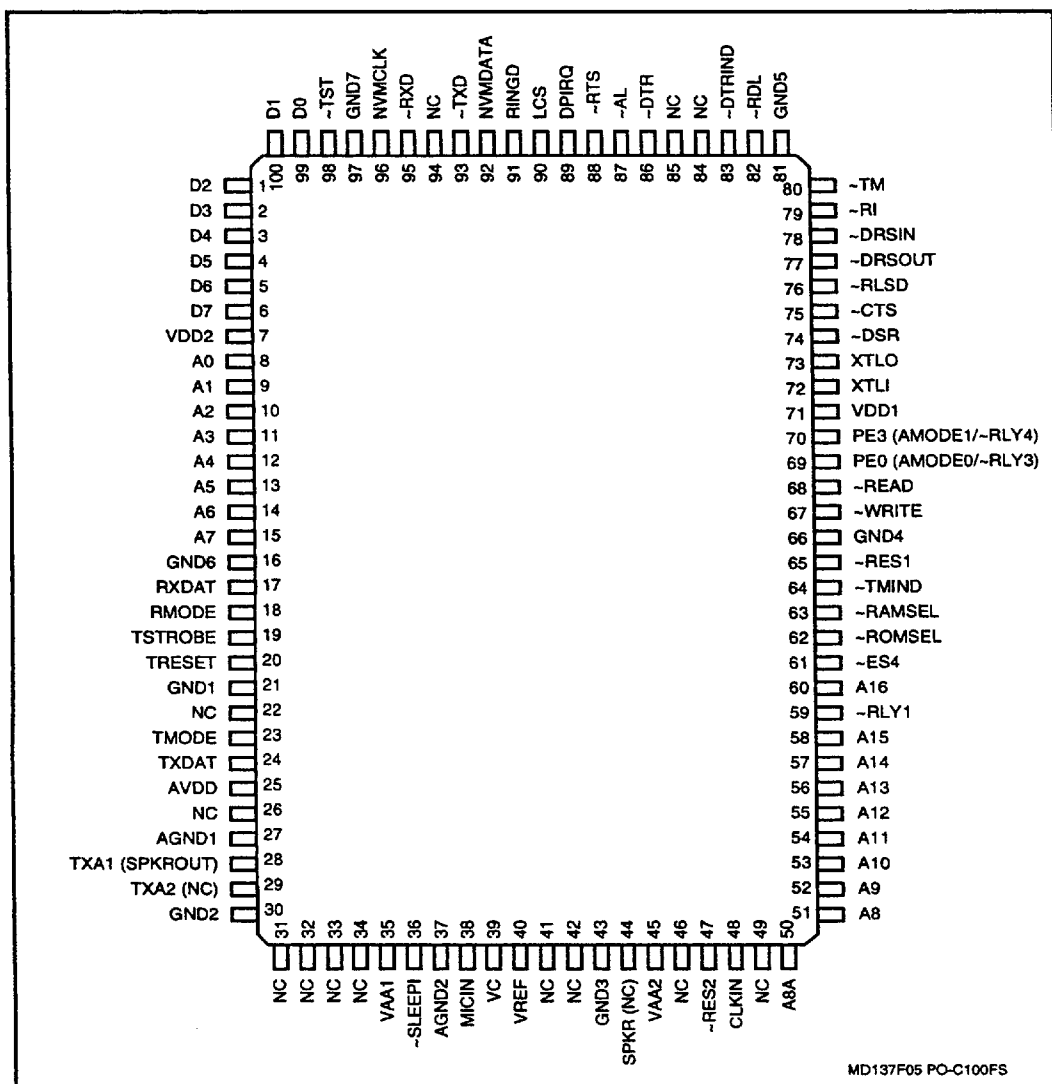
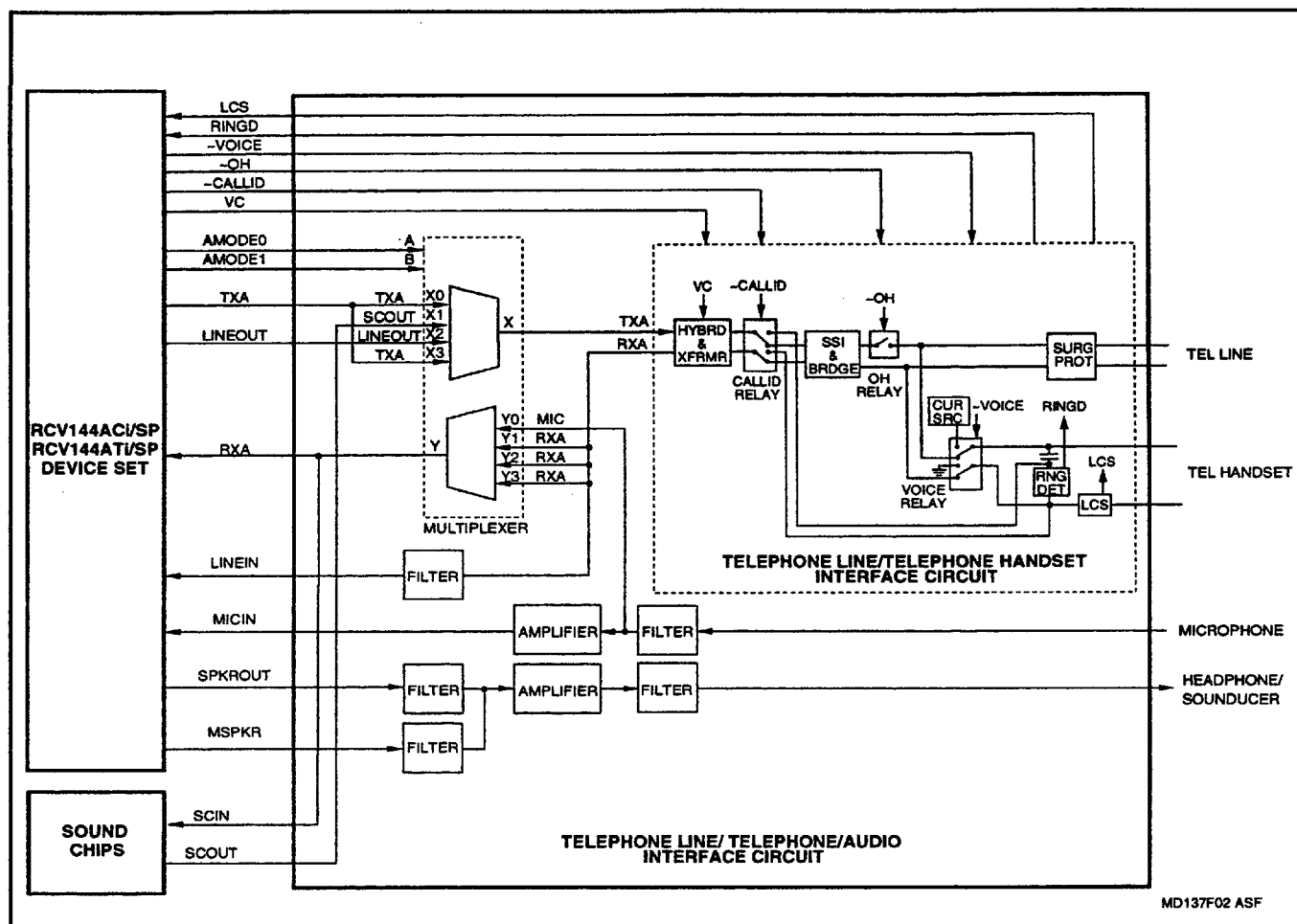**Figure 4. MCU Pin Signals - 100-Pin PQFP - Serial DTE Interface**
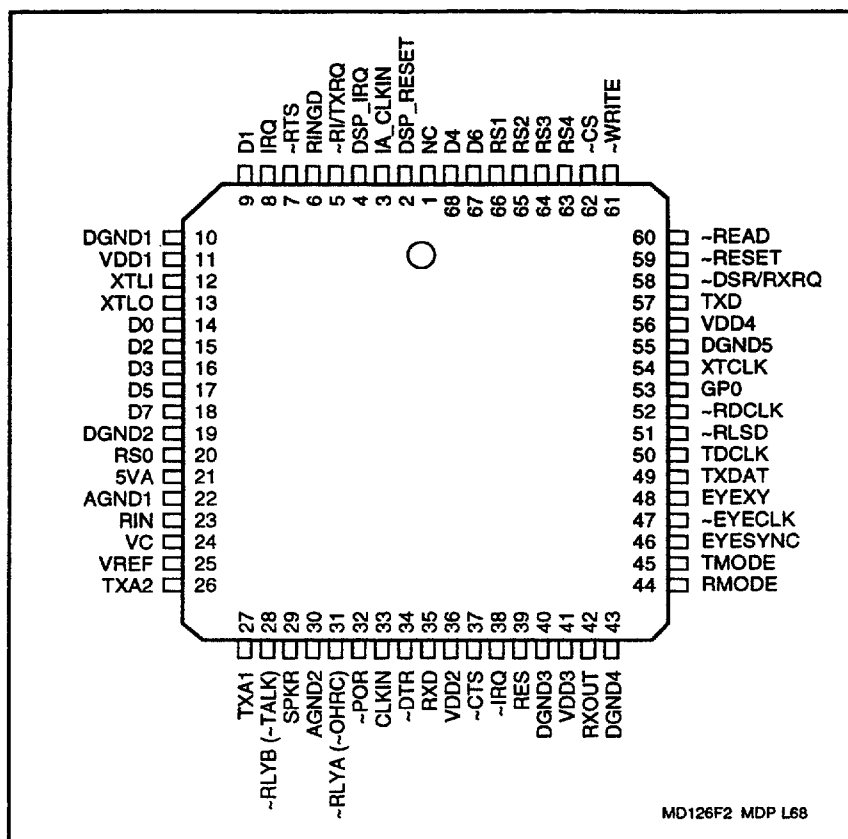
Figure 3. Audio Signal Interface

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Figure 5. MCU Pin Signals - 100-Pin PQFP - Parallel DTE Interface

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Figure 6. MDP Pin Signals - 68-Pin PLCC

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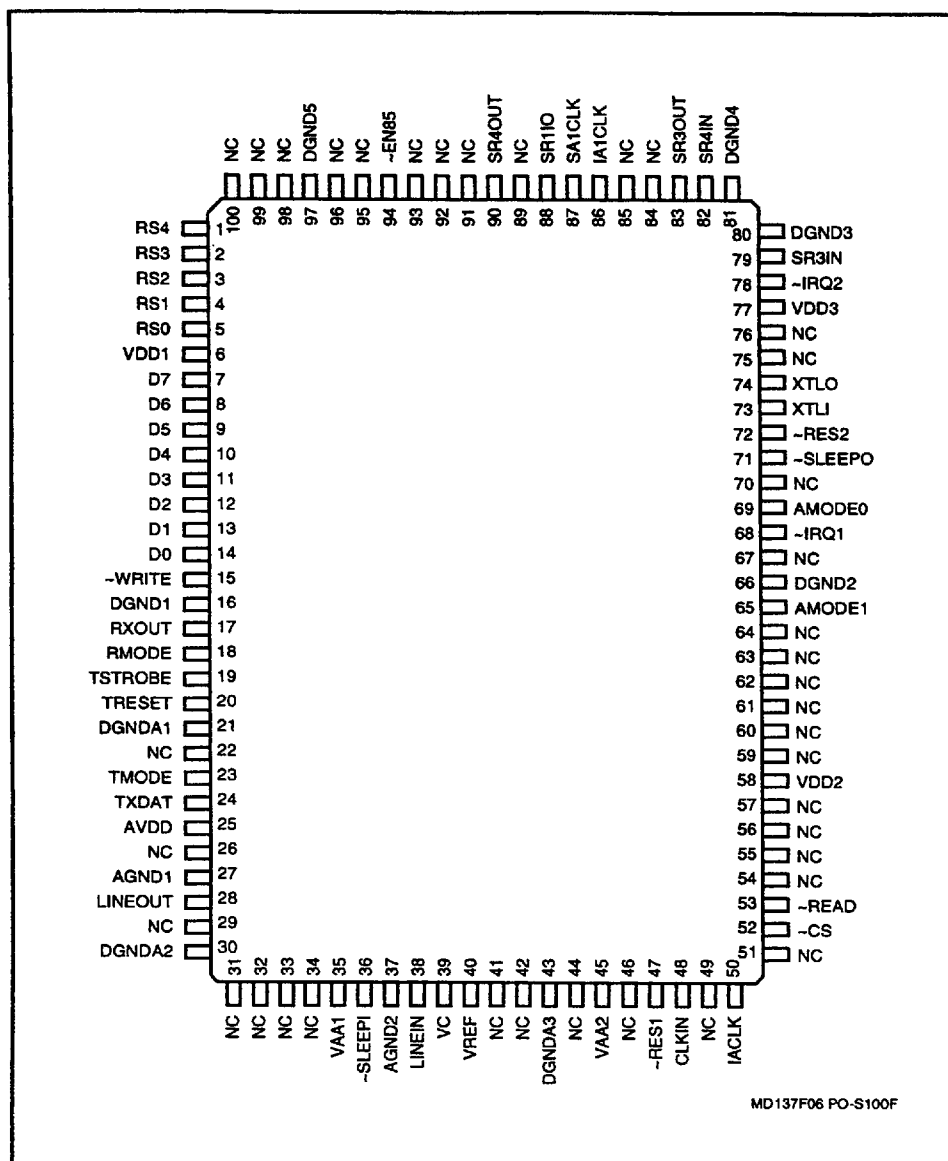
Figure 7. SSP Pin Signals - 100-Pin PQFP

Table 2. Current and Power Requirements

Mode	Current (ID)		Power (PD)		Notes
	Typical Current @ 25°C (mA)	Maximum Current @ 0°C (mA)	Typical Power @ 25°C (mW)	Maximum Power @ 0°C (mW)	
MCU					f_{IN} = 9.8304 MHz
Normal mode	40	47	200	248	
Sleep mode	2.35	3.0	11.8	15.8	
MDP					f_{IN} = 35.2512MHz
Normal mode	140	176	700	925	
Sleep mode	2.0	2.4	10.0	12.6	
SSP					
Normal mode	114	136	570	713	
Sleep mode	2.0	2.5	10.0	13.1	
Total					
Normal mode	294	359	1470	1886	
Sleep mode	6.35	7.9	31.8	41.5	

Notes:
1. Maximum power @ -40°C specified only for extended temperature range parts.
2. Test conditions: VCC = 5.0 VDC for typical values; VCC = 5.25 VDC for maximum values.

Table 3. Absolute Maximum Ratings

Parameter	Symbol	Limits	Units
Supply Voltage	V_{DD}	-0.5 to +7.0	V
Input Voltage	V_{IN}	-0.5 to (+5VD +0.5)	V
Operating Temperature Range	T_A	-0 to +70	°C
Storage Temperature Range	T_{STG}	-55 to +125	°C
Analog Inputs	V_{IN}	-0.3 to (+5VA + 0.3)	V
Voltage Applied to Outputs in High Impedance (Off) State	V_{HZ}	-0.5 to (+5VD + 0.5)	V
DC Input Clamp Current	I_{IK}	±20	mA
DC Output Clamp Current	I_{OK}	±20	mA
Static Discharge Voltage (25°C)	V_{ESD}	±2500	V
Latch-up Current (25°C)	I_{TRIG}	±200	

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