RCV144ACF/SP Integrated AudioSpan, Speakerphone, Modem Device for Desktop Applications

Introduction

The Rockwell RCV144ACF/SP Modem Device supports high speed data, high speed fax, AudioSpan, speakerphone, voice/audio, and VoiceView operation. It is intended for use with dial-up telephone lines in the U.S. or world-wide and is offered in six device models (Table 1).

Pin compatible with the RCV336ACF/SP Modem Device Family, this modem family allows design of a common PC board providing data and fax modem, AudioSpan, speakerphone, and audio/voice operation with handset, headset, or speakerphone (microphone and speaker) with maximum data line rates from 14.4 kbps (RCV144ACF/SP) to 33.6 kbps (RCV336ACF/SP).

Analog simultaneous audio/voice and data (AudioSpan) operation supports data rates with audio of 4.8 kbps in V.61 mode or 4.8 to 9.6 kbps in ML144 mode.

SP models support position-independent, full-duplex speakerphone (FDSP).

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.

Error correction and data compression (ECC) is performed in the modem using 32k bytes of external RAM to increase data throughput typically by a factor of four.

The modem supports fax Group 3 send and receive rates up to 14400 bps and supports T.30 protocol.

In voice/audio mode, enhanced ADPCM coding and decoding supports efficient digital storage of voice/audio using 2-bit or 4-bit per sample compression and decompression with a 7200 Hz sample rate. This mode also supports 8-bit monophonic audio encoding at 11.025 kHz or 7200 Hz. This mode supports digital telephone answering machine (DTAM), voice annotation, and audio recording and playback applications.

The modem device is packaged in a 68-pin PLCC.

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

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

Features

- AudioSpan (simultaneous audio/voice and data)
  - ITU-T V.61 modulation (4.8 kbps data plus audio)
  - ML144 modulation (4.8 to 9.6 kbps data plus audio)
  - ML288 modulation (4.8 to 14.4 kbps data plus audio)
  - Audio/silence detection (ML144) and handset echo cancellation
  - Handset, headset, or half-duplex speakerphone
- Full-duplex speakerphone (FDSP) mode (option)
  - Acoustic and line echo cancellation
  - Microphone gain and muting
  - Speaker volume control and muting
  - Room monitor
- 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
  - V.42 LAPM, MNP 2-4, and MNP 10 error correction
  - V.42 bis and MNP 5 data compression
  - MNP 10EC™ enhanced cellular performance
  - Hayes AutoSync (option)
- 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/audio mode (option)
  - Enhanced ADPCM compression/decompression
  - Tone detection/generation and call discrimination
  - Concurrent DTMF detection
  - 8-bit monophonic audio data encoding at 11.025 kHz or 7200 Hz
- VoiceView alternating voice and data (option)
- World-class operation (option)
  - Call progress, blacklisting, multiple country support
- 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 ITU-T 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
- Serial async data; parallel async data
- Caller ID and distinctive ring detect
- Single package: 68-pin PLCC
- +5V operation

Table 1. Modem Models and Functions

Model	Supported Functions			
	V.32 bis Data/ V.17 Fax/ AudioSpan	FDSP	Voice/Audio VoiceView	W-Class
RCV144ACF/SP	S	S	S	-
RCV144ACFW/SP	S	S	S	S
RCV144ACF	S	-	S	-
RCV144ACFW	S	-	S	S
RC144ACF	S	-	-	-
RC144ACFW	S	-	-	S

Notes:

1. Model options:
   - SP — Speakerphone.
   - V — Voice, audio, and VoiceView.
   - W — World-class (W-class).
2. Supported functions (S = Supported; – = Not supported):
   - AudioSpan — Analog simultaneous audio/voice and data.
   - FDSP — Full-duplex speakerphone.
   - Voice/audio — Voice and audio functions.
   - VoiceView — VoiceView alternating voice and data.
   - W-Class — World-class functions supporting multiple country requirements.

Description

General

The RCV144ACF/SP device provides the processing core for a complete system design featuring data/fax modem, AudioSpan, speakerphone, audio, voice, and VoiceView support depending on model (Table 1). The OEM adds a crystal, discrete components, and a telephone line/telephone/audio interface circuit to complete the system.

The modem is packaged in a 68-pin PLCC.

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). Dialing, call progress, telephone line interface, AudioSpan, speakerphone, voice/audio, and VoiceView functions are supported and controlled through the AT command set.

The Telephone Line/Telephone/Audio Signal Interface can support either a 2-relay telephone line interface without Caller ID relay (Figure 3) or a 3-relay telephone line interface using a Caller ID relay (Figure 4). In either case, the Caller ID function is supported.

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.

Data/Fax Modes

In data modem modes, the modem can operate in 2-wire, full-duplex, asynchronous modes at line rates up to 14400 bps. Data modem modes perform complete handshake and data rate negotiations. Using V.34 modulation to optimize modem configuration for line conditions, the modem can connect at the highest data rate that the channel can support from 14400 bps to 300 bps with automatic fallback. Automode operation is provided in accordance with PN2330. All tone and pattern detection functions required by the applicable ITU or Bell standard are supported.

In fax modem modes, 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.

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

AudioSpan Modes

AudioSpan provides full-duplex analog simultaneous audio/voice and data over a single telephone line. AudioSpan can send any type of audio waveform, including music. Data can be sent with or without error correction. The audio/voice interface can be in the form of a headset, handset, or a microphone and speaker (half-duplex speakerphone).

V.61 Modulation. AudioSpan can operate in V.61 modulation at a data rate with audio of 4800 bps.

ML144 Modulation. AudioSpan can operate in ML144 (V.32) modulation at a 4.8 to 9.6 kbps data rate with audio where lower data rates provide higher audio quality.

Speakerphone Mode (SP Models Only)

The speakerphone mode features an advanced proprietary speakerphone algorithm which supports full-duplex voice conversation with both acoustic and line echo cancellation. Parameters are constantly adjusted to maintain stability with automatic fallback from full-duplex to pseudo-duplex operation. The speakerphone algorithm allows position independent placement of microphone and speaker.

The speakerphone mode provides hands-free full-duplex telephone operation under host control. The host can separately control volume, muting, and AGC in microphone and speaker channels.

Modem Firmware

Modem firmware performs processing of general modem control, command sets, fax Class 1, AudioSpan, speakerphone, voice/audio/TAM, error correction, data compression, and DTE/host interface functions (see Table 1).

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

The modem firmware is provided in object code form for the OEM to program into external ROM. The modem firmware may also be provided in source code form under a source code addendum license agreement.

Hardware Interface Signals

The modem (R6746) pin assignments for the 68-pin PLCC with serial interface are shown in Figure 5.

The modem (R6745) pin assignments for the 68-pin PLCC with parallel interface are shown in Figure 6.

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 RCV336ACF/SP and RCV144ACF/SP Designer's Guide (Order No. 1046) and in the AT Command Reference Manual (Order No. 1048).

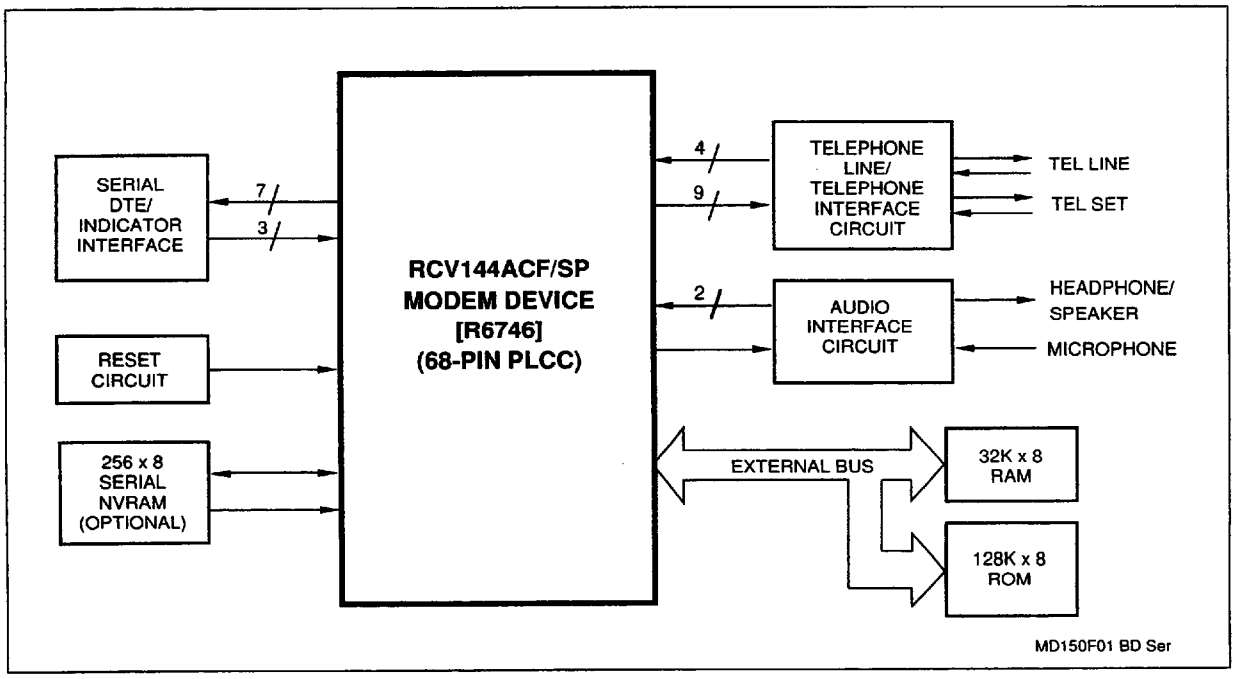

Figure 1. Block Diagram - Serial DTE Interface

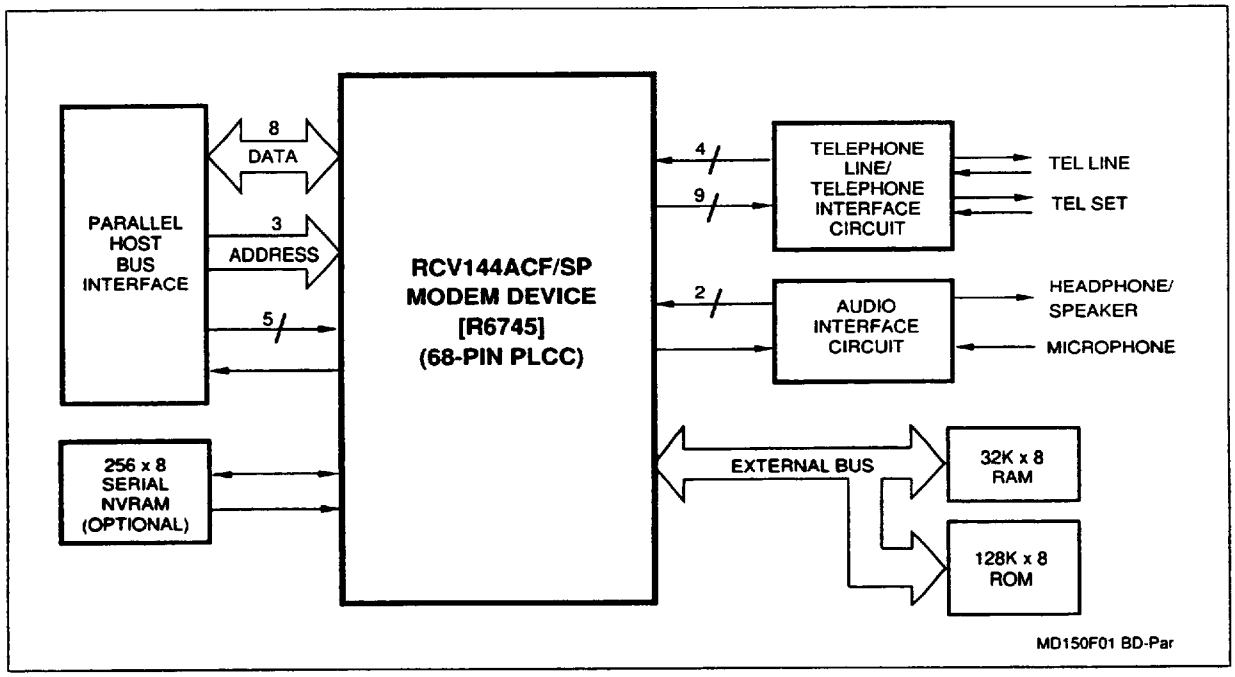

Figure 2. Block Diagram - Parallel Host Interface

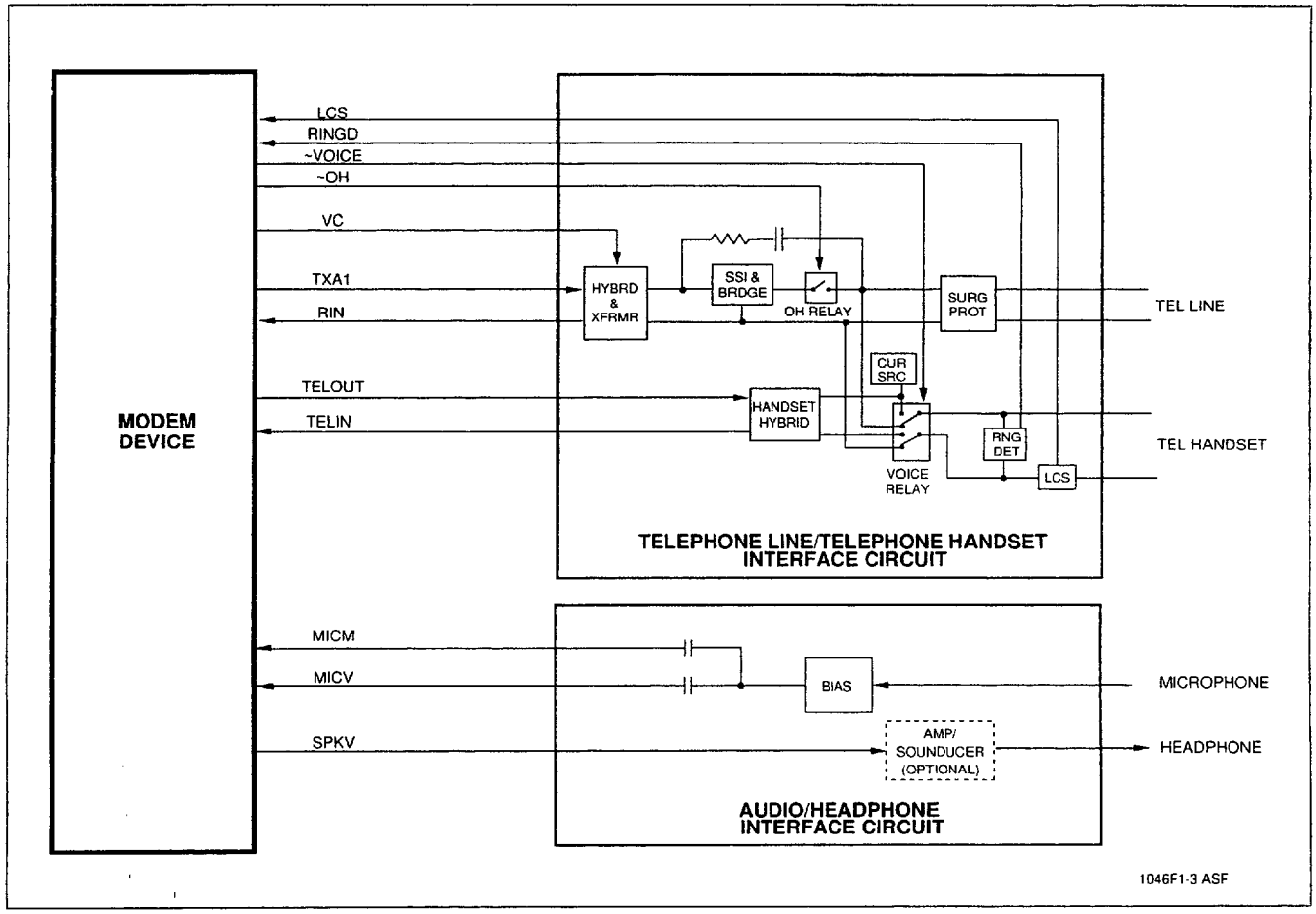

Figure 3. 2-Relay Telephone Line/ Telephone/Audio Signal Interface (U.S.)

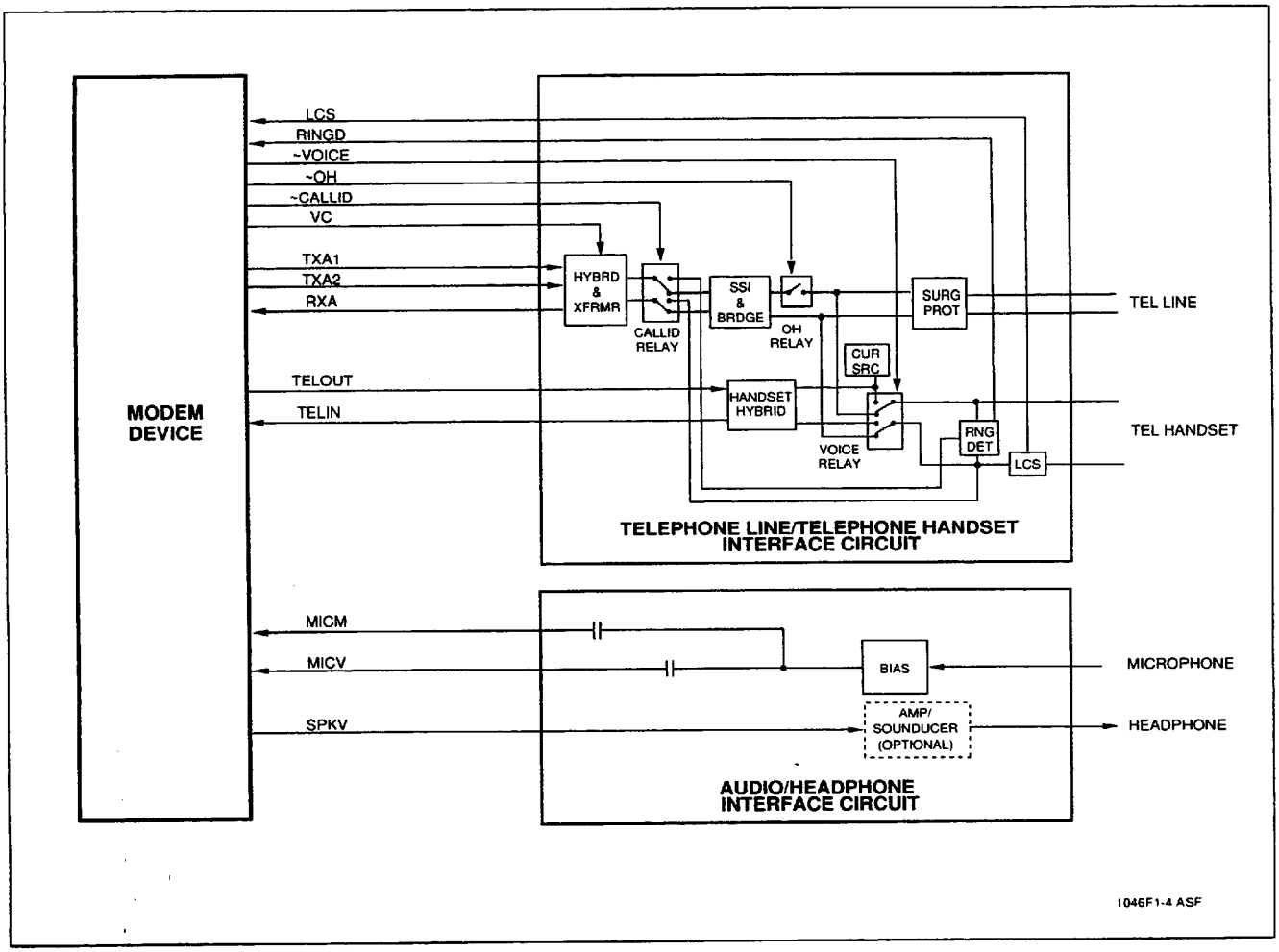

Figure 4. 3-Relay Telephone Line/ Telephone/Audio Signal Interface (U.S.)

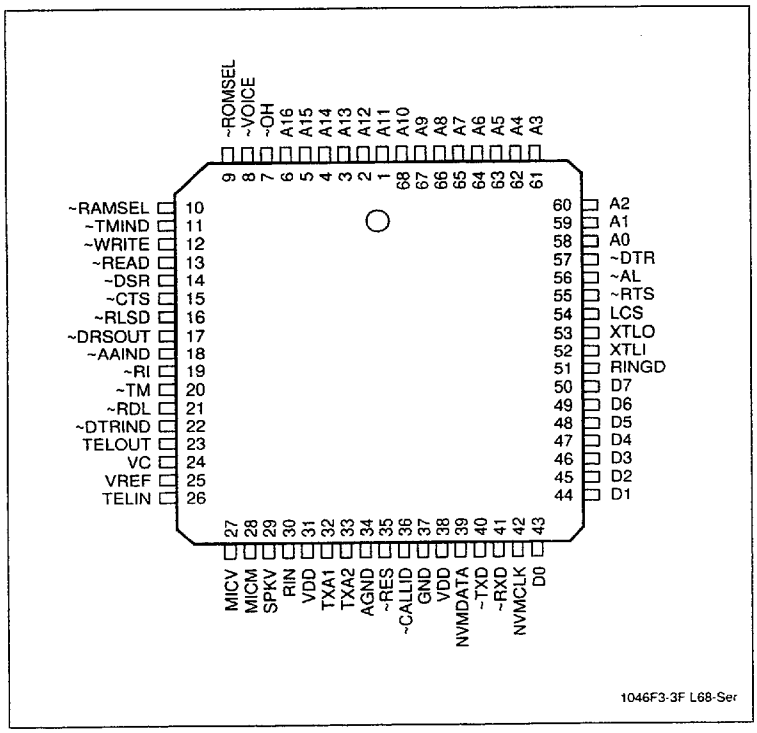

Figure 5. Modem Pin Signals - 68-Pin PLCC - Serial DTE Interface

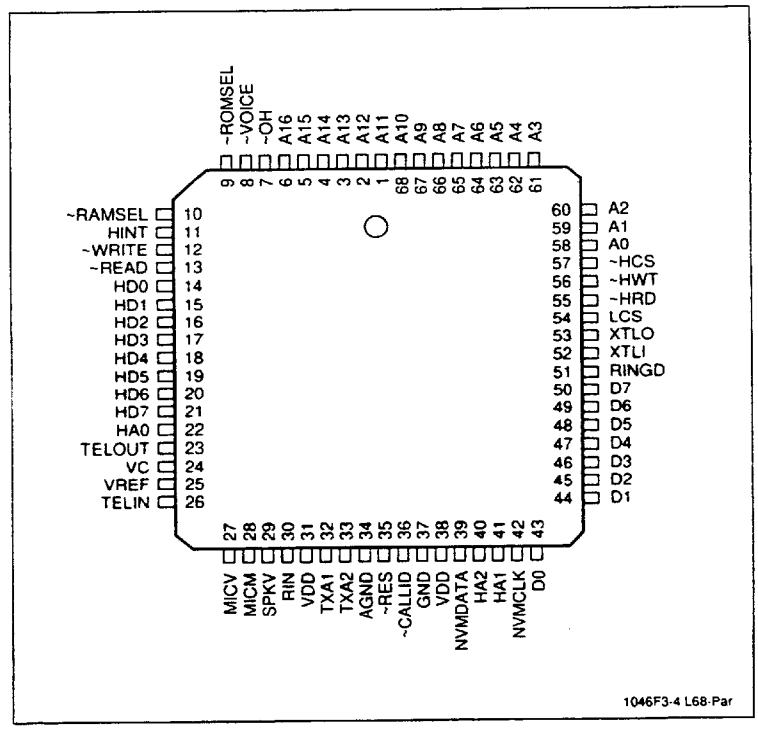

Figure 6. Modem Pin Signals- 68-Pin PLCC - Parallel Host Interface

Table 2. Current and Power Requirements

Mode	Current (ID)		Power (PD)		Notes
	Typical Current (mA)	Maximum Current (mA)	Typical Power (mW)	Maximum Power (mW)	
Normal mode	170	205	850	1075	

Notes:
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	mA