

# RC56D, RC336D, and RC144D

## *Integrated V.90/K56flex™/V.34/V.32bis Modem Device Sets for Desktop Applications*

The Conexant™ RC56D, RC336D, and RC144D Modem Device Set families support data/fax, voice/TAM/telephony extensions, V.80 synchronous access mode, host-DSVD, and optional speakerphone, AudioSpan, and on-board DSVD functions depending upon model (Table 1).

The modem supports the following primary data modulations: ITU-T V.90/K56flex™ (RC56), V.34 (RC56 and RC336) and V.32bis. Otherwise, the modems are identical within like models, e.g., SP models operate the same. Unless otherwise noted, descriptions in this document apply to all modem families and models.

The modem is designed to operate with dial-up telephone lines in the U.S. and world-wide.

Low profile, small PQFP packages make this device set ideal for desktop applications using parallel host or serial DTE interface.

The device set consists of an 8-bit microcontroller (MCU) in an 80-pin PQFP, a modem data pump (MDP) in a 100-pin PQFP, and an optional Plug and Play (PnP) ISA Bus Interface Device in 80-pin PQFP. The SVD model is the same as the SP model with the addition of an RCDSVD Speech Codec Processor (SCP) in a 100-pin PQFP to support DSVD.

Downloadable architecture supports downloading of modem firmware from the host/DTE to the MCU and, transparently to the host/DTE, the downloading of MDP code modules from the MCU.

The modem operates by executing firmware from installed 1Mbit (128k x 8) RAM and 2Mbit (256k x 8) ROM/flash ROM. The RC336 and RC144 can alternatively use 32k x 8 RAM and 1Mbit or 2Mbit ROM/flash ROM.

In V.90/K56flex mode (RC56), the modem can receive data at speeds up to 56 kbps from a digitally connected V.90- or K56flex-compatible central site modem. Taking advantage of the PSTN which is primarily digital except for the client modem to central office local loop, V.90/K56flex modems are ideal for applications such as remote access to an Internet Service Provider (ISP), on-line service, or corporate site. The modem can send data at speeds up to V.34 rates.

In V.34 data mode (RC56 and RC336), the modem operates at line speeds up to 33.6 kbps. 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 230.4 kbps. Non-error-correcting mode is also supported.

In V.32 bis mode, the modem operates at line speeds up to 14.4 kbps.

The modem supports fax Group 3 send and receive rates up to 33.6 kbps and T.30 protocol.

In voice/TAM mode, enhanced 2-bit or 4-bit per sample ADPCM coding and decoding at 7200 Hz sample rate allows efficient digital storage of voice/audio. This mode supports applications such as digital telephone answering machine (TAM), voice annotation, and recording from and playback to the telephone line. Other voice/TAM functions using handset or headset are supported by SP and SVD models. Extension pickup /remote hangup detection and line-in-use detection telephony extensions are also supported.

SP and SVD models support position independent, full-duplex speakerphone (FDSP) operation using microphone and speaker, as well as other voice/TAM applications using handset or headset.

SP and SVD models also support AudioSpan (analog simultaneous audio/voice and data) operation with a data rate of 4.8 kbps with audio.

SVD models, using the optional RCDSVD SCP device, support hardware-based (on-board) V.70 DSVD (digital simultaneous voice and data) with speech coding per ITU-T interoperable G.729 and G.729 Annex A with interoperable G.729 Annex B.

Host-based DSVD is supported in all models, however, the host PC must supply full-duplex sound support, typically to a microphone/speaker, such as provided by Conexant WaveArtist devices or a sound card.

A common PC board design can support data/fax, V.80, voice/TAM/telephony extensions, speakerphone, AudioSpan, and host- or on-board DSVD operation depending on the installed modem and optional PnP and RCDSVD devices.

Accelerator kits and reference designs are available to minimize application design time and costs. PC-based "ConfigurACE™ II for Windows" software allows MCU firmware to be customized.

### Features

- Downloadable MCU firmware from the host/DTE and downloadable MDP code modules from the MCU
- Data modem
  - ITU-T V.90 and K56flex (RC56 models)
  - V.34 (33.6 kbps) (RC56 and RC336 models)
  - V.32 bis, V.32, V.22 bis, V.22, 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

Table 1. Modem Models and Functions

Model/Order/Part Numbers						Supported Functions				
Marketing Model Number	Device Set Order Number	MCU [80-PQFP] Part No.	MDP [100-PQFP] Part No.	PnP [80-PQFP] Part No.	RCDSVD [100-PQFP] Part No.	V.90 and K56flex Data	V.34 Data	V.32 bis Data, V.34 Fax, Fax Cl 1 and 2, Voice/TAM, Host DSVD, W-Class, V.80	FDSP, AudioSpan	On-board DSVD
RC56D/SP	DS56-L138-021	L2800-38	R6764-61	-	-	Y	Y	Y	Y	-
RC56D/SP-PNP	DS56-L138-031	L2800-38	R6764-61	11596-21	-	Y	Y	Y	Y	-
RC56D	DS56-L118-051	L2800-38	R6764-63	-	-	Y	Y	Y	-	-
RC56D-PNP	DS56-L138-051	L2800-38	R6764-63	11596-21	-	Y	Y	Y	-	-
RC56D/SVD	DS56-L460-031	L2800-38	R6764-61	-	R6715-14	Y	Y	Y	Y	Y
RC56D/SVD-PNP	DS56-L460-041	L2800-38	R6764-61	11596-21	R6715-14	Y	Y	Y	Y	Y
RC336D/SP	DS28-L304-021	L2800-38	R6764-65	-	-	-	Y	Y	Y	-
RC336D/SP-PNP	DS28-L304-031	L2800-38	R6764-65	11596-21	-	-	Y	Y	Y	-
RC336D	DS28-L303-041	L2800-38	R6764-67	-	-	-	Y	Y	-	-
RC336D-PNP	DS28-L303-051	L2800-38	R6764-67	11596-21	-	-	Y	Y	-	-
RC144D/SP	DS96-L835-011	L2800-38	R6764-69	-	-	-	-	Y	Y	-
RC144D	DS96-L835-001	L2800-38	R6764-68	-	-	-	-	Y	-	-

Marketing Model Number	Device Set Order Number	MCU [80-PQFP] Part No.	MDP [100-PQFP] Part No.	UCU [68-PLCC] Part No.	RCDSVD [100-PQFP] Part No.	V.90 and K56flex Data	V.34 Data	V.32 bis Data, V.34 Fax, Fax Cl 1 and 2, Voice/TAM, Host DSVD, W-Class, V.80	FDSP, AudioSpan	On-board DSVD
RC56D/SP-USB*	DS56-L122-011	L2800-38	R6764-61	R8292-11	-	Y	Y	Y	Y	-
RC56D-USB*	DS56-L122-021	L2800-38	R6764-63	R8292-11	-	Y	Y	Y	-	-

**Notes:**

- Model options:
  - D Downloadable
  - SP Speakerphone
  - PNP Includes PnP Interface Device (11596-21) [80-pin PQFP]
  - SVD On-board DSVD with RCDSVD SCP, and Speakerphone
  - USB Universal Serial Bus interface, with UCU device.
- Supported functions (Y = Supported; - = Not supported):
  - AudioSpan Analog simultaneous voice and data
  - DSVD Digital simultaneous voice and data
  - Fax Cl 1 and 2 Fax Class 1 and Fax Class 2 support
  - FDSP Full-duplex speakerphone
  - Voice/TAM Voice and telephone answering machine support (handset support requires SP or SVD model)
  - W-Class World-class with multiple country support.

\* See RC56D-USB Data Sheet, Order No. MD234.

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## Features (Continued)

- Fax modem send and receive rates up to 33.6 kbps
  - V.34 fax, V.17, V.29, V.27 ter, and V.21 channel 2
- V.80 synchronous access mode supports host-based communication protocols
- World-class operation
  - Call progress
  - Blacklisting
  - Multiple country support
- Voice/TAM/telephony extensions mode
- Handset support (SP and SVD models)
- Full-duplex speakerphone (FDSP) mode (SP and SVD models)
  - Acoustic and line echo cancellation
  - Microphone gain and muting
  - Speaker volume control and muting
- AudioSpan simultaneous audio/voice and data (SP and SVD models)
  - ITU-T V.61 modulation (4.8 kbps data with audio)
  - Handset, headset, or microphone/speaker
- ITU-T V.70 DSVD using the RCDSVD SCP (SVD models)
  - ITU-T interoperable G.729 and G.729 Annex A with interoperable G.729 Annex B
  - Voice/silence detection and handset echo cancellation
  - Robust DSVD timing recovery
  - Handset, headset, or half-duplex speakerphone
- Host-based DSVD support with V.70 software drivers for Windows 95
- Communication software compatible AT command sets
- NVRAM directory and stored profiles
- Flash memory support
- Internal phase-locked loop (PLL)
- Built-in host/DTE interface with speeds up to 230.4 kbps
  - Parallel 16550A UART-compatible interface
  - Serial ITU-T V.24 (EIA/TIA-232-E)
- Supports Conexant 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
- Serial sync/async data; parallel async data
- Caller ID and distinctive ring detect
- Packages:
  - MCU: 80-pin PQFP
  - MDP: 100-Pin PQFP
  - PNP: 80-Pin PQFP
  - RCDSVD SCP: 100-pin PQFP
- +5V operation
- Sleep Mode

## Description

### General

The modem device set, consisting of separate microcontroller (MCU), modem data pump (MDP), optional Plug and Play (PnP) ISA Bus Interface Device, and optional RCDSVD Speech Codec Processor (SCP) devices, provides the processing core for a complete modem design.

For data/fax/V.80/voice/TAM/speakerphone/host-DSVD/AudioSpan operation, only the microcontroller (MCU) and modem data pump (MDP) devices are needed. The OEM adds an MCU crystal, discrete components, and a telephone line/telephone/voice/TAM/telephony extension interface circuit to complete the modem system. Optional on-board DSVD operation is supported with addition of the RCDSVD Speech Codec Processor (SCP) device to an SP model (included in SVD models). Table 1 shows the supported functions by product family.

Dialing, call progress, V.80, telephone line interface, voice/TAM, speakerphone, AudioSpan, and DSVD functions are supported and controlled through the AT command set.

Connection to the host/DTE is supported by serial DTE interface (Figure 1) or parallel host interface (Figure 2) depending on installed modem firmware.

For U.S. operation, the modem can operate with a 1-relay data/fax/TAM DAA interface (Figure 3) or a 2-relay data/fax/TAM/Speakerphone DAA interface (Figure 4).

### Data/Fax Modes

In V.90/K56flex data modem mode (RC56), the modem can receive data from a digital source using a V.90- or K56flex-compatible central site modem at line speeds up to 56 kbps. Asymmetrical data transmission supports sending data at speeds up to V.34 rates. This mode can fallback to full-duplex V.34 mode.

In V.34 data modem mode, the modem can operate in 2-wire, full-duplex, asynchronous modes at line rates up to 33.6 kbps. 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 33.6 kbps to 300 bps with automatic fallback. Automode operation in V.34 is provided in accordance with PN3320 and in V.32 bis in accordance with PN2330. All tone and pattern detection functions required by the applicable ITU or Bell standard are supported.

In fax modem mode, the modem can operate in 2-wire, half-duplex, synchronous mode and can support Group 3 facsimile send and receive speeds of 33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, and 2400 bps. 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 at speeds up to 33.6 kbps with automatic rate adaption. Fax data transmission and reception performed by the modem are controlled and monitored through the EIA/TIA-578 Fax Class 1, T.31 Fax Class 1.0, or Fax Class 2 command interface. Full HDLC formatting, zero insertion/deletion, and CRC generation/checking are 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 and RTS/CTS.

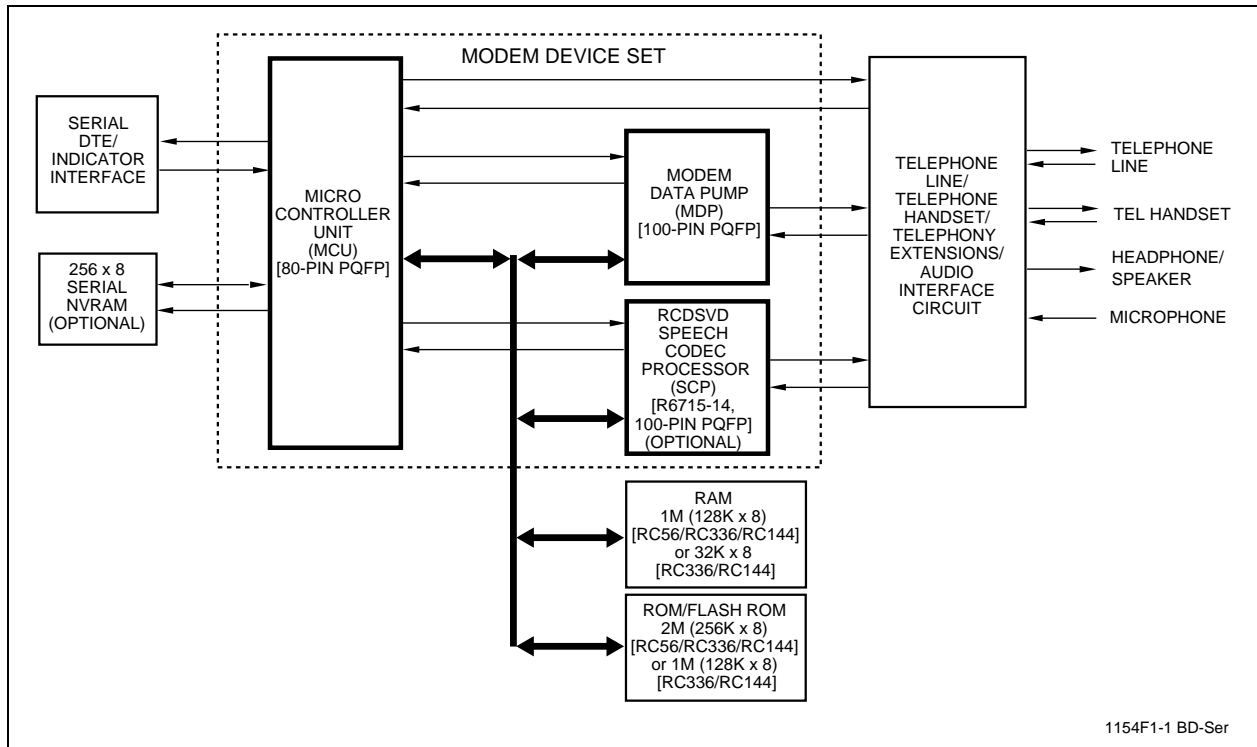


Figure 1. Block Diagram - Serial DTE Interface

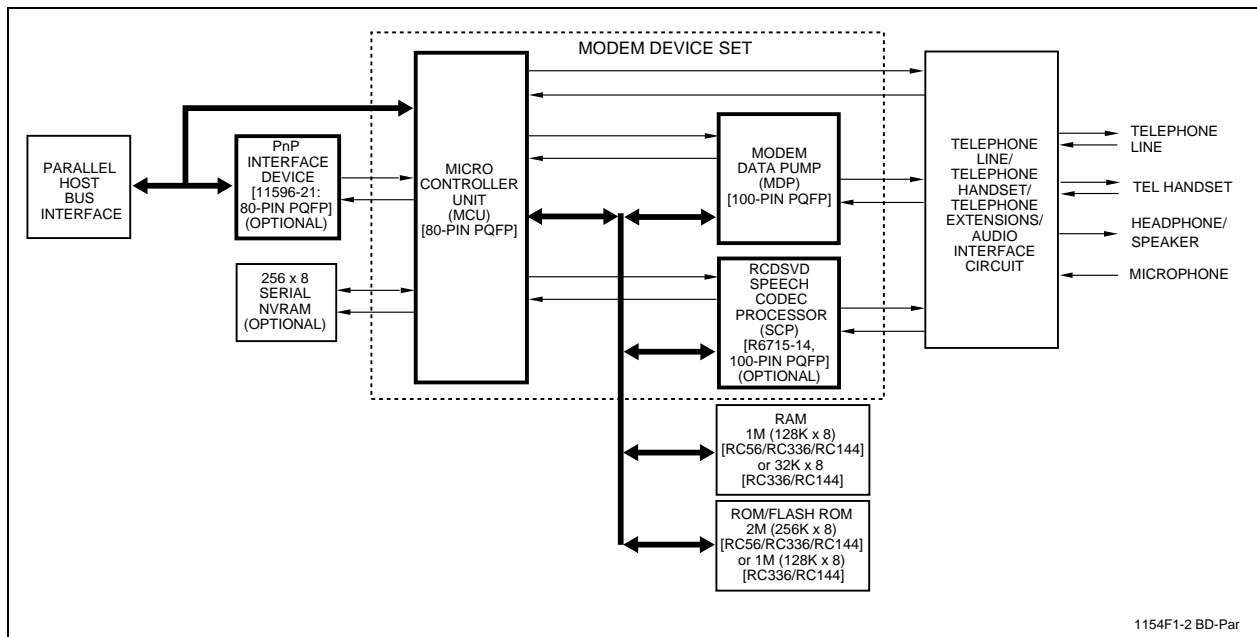


Figure 2. Block Diagram - Parallel Host Interface

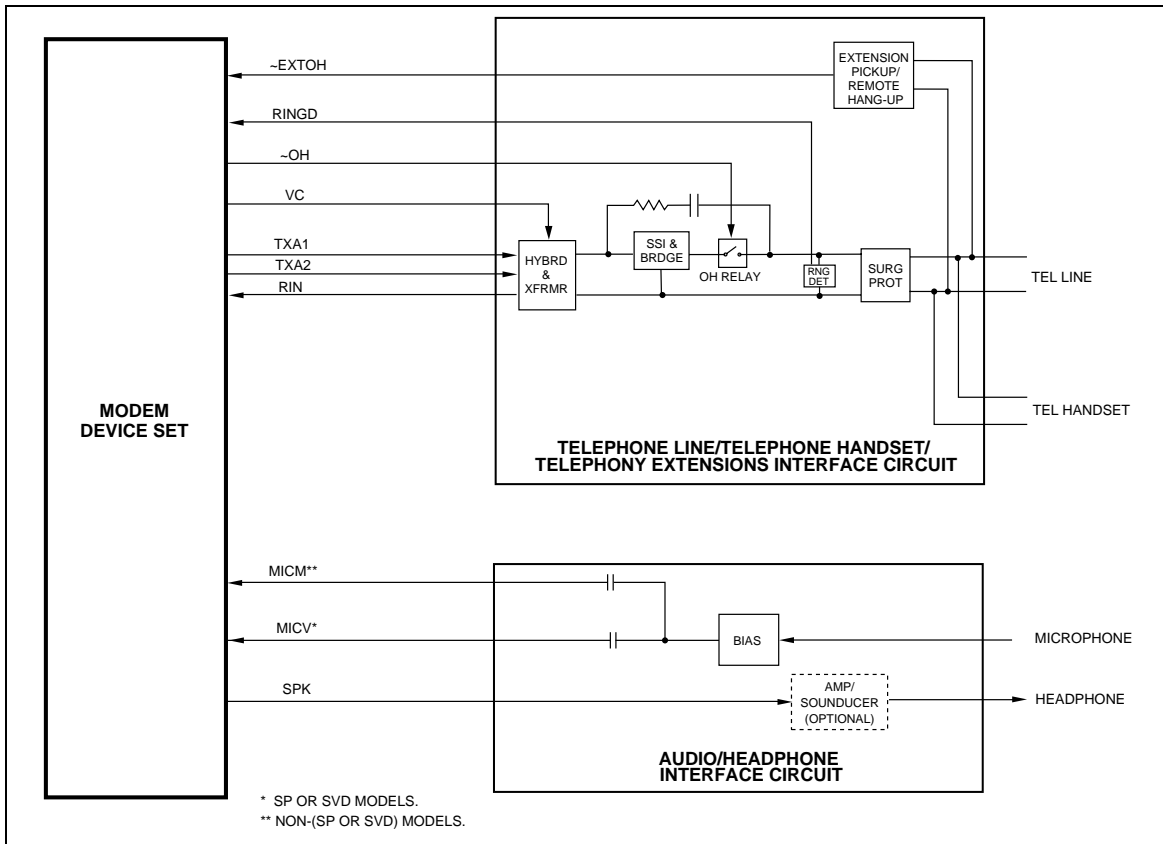


Figure 3. 1-Relay Data/Fax/TAM DAA Interface (U.S.)

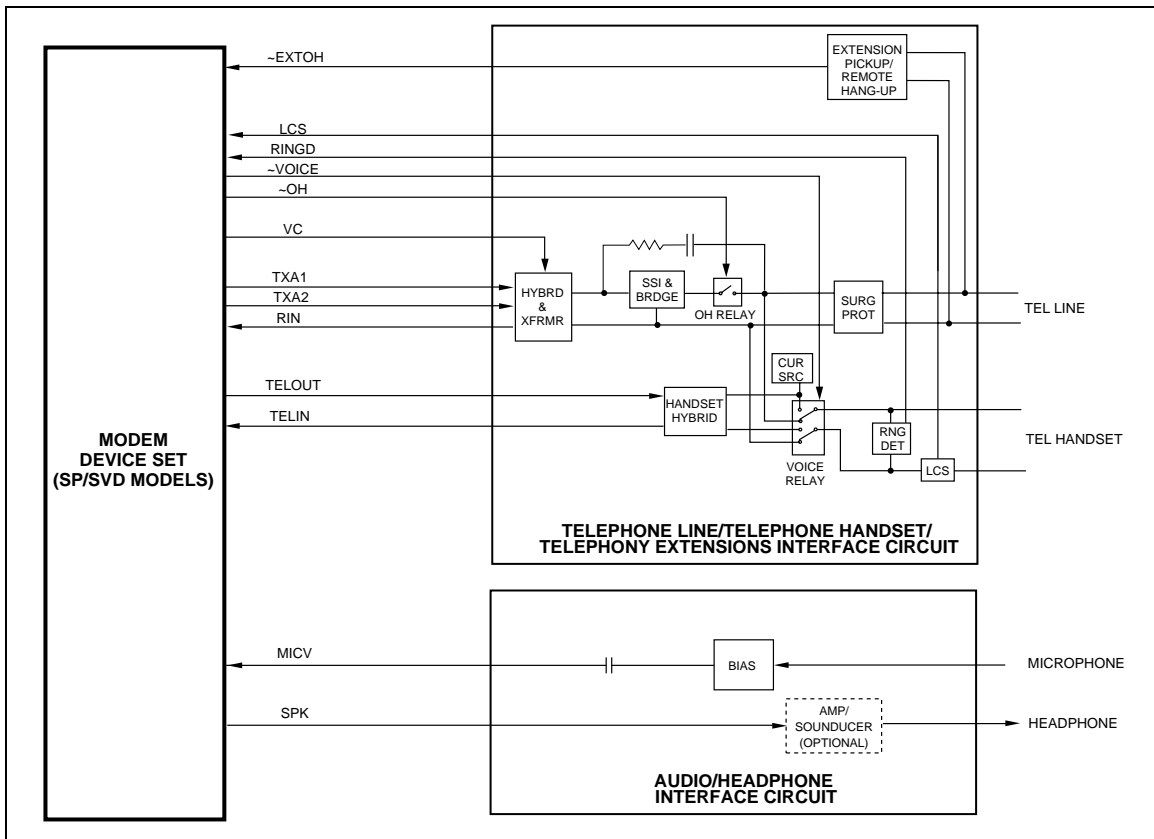


Figure 4. 2-Relay Data/Fax/TAM/Spkerphone/AudioSpan DAA Interface (U.S.)

**Synchronous Access Mode (SAM)**

V.80 synchronous access mode between the modem and the host/DTE is provided for host-based communication protocols, e.g., H.324 video conferencing applications.

Voice-call-first (VCF) before switching to a videophone call is also supported.

**World Class Operation**

W-class functions support modem operation in multiple countries. Additional capabilities are provided in addition to the data modem functions in areas such as for dialing, carrier transmit level, calling tone, call progress tone detection, answer tone detection, blacklisting, relay control. Country dependent parameters are programmable by ConfigurACE II for Windows.

**Voice/TAM Mode**

Voice/TAM Mode features include enhanced ADPCM compression/decompression, tone detection/generation and call discrimination, concurrent DTMF detection, and 8-bit monophonic audio data encoding.

Voice/TAM Mode is supported by three submodes:

1. Online Voice Command Mode supports connection to the telephone line or, for SP and SVD models, a handset.
2. Voice Receive Mode supports recording voice or audio data input at the RIN pin, typically from the telephone line or, for SP and SVD models, a microphone/handset.
3. Voice Transmit Mode supports playback of voice or audio data to the TXA1/TXA2 output, typically to the telephone line or, for SP and SVD models, a speaker/handset.

**Telephony Extension Operation**

Extension pickup/remote hangup detection and line-in-use detection are supported.

**Speakerphone Mode (SP and SVD Models)**

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.

**AudioSpan Mode (SP and SVD Models)**

AudioSpan provides full-duplex analog simultaneous audio/voice and data over a telephone line at a data rate of 4800 bps with audio using V.61 modulation. 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. Handset echo cancellation is provided.

**DSVD Mode using RCDSVD SCP Device (SVD Models)**

On-board DSVD operation requires installation of the optional RCDSVD SCP (R6715-14).

DSVD provides full-duplex digital simultaneous voice and data over a single telephone line. DSVD uses codecs in the RCDSVD SCP to code (compress) analog speech signal on the RCDSVD LINEIN pin or MICIN pin for passing to the modem controller in digitized form, and to decode (decompress) coded speech received from the modem controller for routing to the RCDSVD LINEOUT pin or SPKP/SPKN pins in analog form.

DSVD operates in accordance with ITU-T interoperable G.729 and G.729 Annex A with interoperable G.729 Annex B. Voice activity detection supports speech coding at average bit rate significantly lower than 8.0 kbps.

DSVD decoder timing recovery algorithm compensates for clock skew, asynchronous host-to-decoder data transfer delay, intervening variable length data block transmission delay, and loss of encoded speech data.

The voice interface can be in the form of a headset, handset or a microphone and speaker (half-duplex speakerphone). Handset echo cancellation supports handset use through a hybrid.

In Handset Mode, the RCDSVD SCP interfaces to the telephone interface circuit using the Line Input (LINEIN) and Line Out (LINEOUT) lines. In Headset or Speakerphone Mode, the RCDSVD SCP interfaces to the audio interface circuit using the Microphone Input (MICIN) and Speaker out (SPKR) lines.

**Host-Based DSVD**

All modem models support host-based ITU-T V.70 DSVD. The RCDSVD SCP (R6715) is not required. V.70 software drivers for Windows 95 are provided which support a speech/audio bit rate of significantly less than 8.0 kbps by implementing interoperable G.729 and G.729 Annex A with interoperable G.729 Annex B. The minimum PC performance recommended for host-based DSVD is 150 MHz Pentium or equivalent. The V.70 software drivers require about 10% of the MIPS available in a Pentium 150 MHz class PC. The host PC must supply full-duplex sound support, typically to a microphone/speaker, such as provided by Conexant WaveArtist devices or a sound card. The modem is configured for host-based V.70 via AT commands, and, when using a TAPI-compliant communication application, the V.70 software drivers will automatically run upon a successful V.70 connection.

**Sleep Mode**

Sleep Mode is supported in the modem device set and the RCDSVD SCP device.

**Modem Data Pump (MDP)**

The data/fax/voice/optional speakerphone modem data pump (MDP) is a Conexant R6764 packaged in a 100-pin PQFP. The input clock frequency is 28.224 MHz and can be supplied by the MCU. An internal phase locked loop (PLL) circuit supports 56.448 MHz internal operation. The operating voltage is +3.3V, which can be supplied by the MCU, with +5V tolerant inputs. The MDP supports +5V analog signal interface.

In V.90/K56flex data modem mode (RC56), the MDP can receive data from a digital source using a V.90- or K56flex-compatible central site modem at line speeds up to 56 kbps. Asymmetrical data transmission supports sending data at speeds up to V.34 rates.

In V.34 data modem mode, the MDP can operate in 2-wire, full-duplex, synchronous/asynchronous modes at line rates up to 33.6 kbps. Using V.34 modulation to optimize modem configuration for line conditions, the MDP can connect at the highest data rate that the channel can support from 33.6 kbps to 300 bps with automatic fallback. Automode operation in V.34 is provided in accordance with PN3320 and in V.32 bis in accordance with PN2330.

In fax modem mode, the MDP supports Group 3 facsimile send and receive speeds of speeds of 33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, and 2400 bps.

ADPCM voice processing is supported.

Downloading of MDP code from the MCU is supported.

### Microcontroller (MCU)

The MCU is a Conexant 8-bit microcomputer with pins to support host/ DTE, MDP, voice/audio/speakerphone, and optional RCDSVD SCP interface operation. The operating voltage is +5V. The MCU provides a +3.3V output to power the MDP.

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 performs the command processing and host interface functions. The crystal frequency is 28.224 MHz. The MCU outputs a 28.224 MHz clock to the MDP eliminating need for a separate MDP crystal circuit.

The MCU connects to the MDP via dedicated lines and the external bus. The external bus also connects to OEM-supplied RAM and ROM/flash ROM, and to the optional RCDSVD SCP.

The MCU connects to an optional 256-byte serial EEPROM over a dedicated serial interface.

The MCU is packaged in an 80-pin PQFP.

### RCDSVD Speech Codec Processor (SCP) (Optional)

The RCDSVD SCP (R6715-14), required for on-board DSVD operation, is packaged in a 100-pin PQFP. The 56.448 MHz crystal frequency is supplied by the MDP XCLK output.

### Plug and Play (PnP) ISA Bus Interface Device (PNP Models)

The Conexant Plug and Play (PnP) ISA Bus Interface Device (11596-21) is an 80-pin PQFP VLSI device that supports automatic configuration of an Industry Standard Architecture (ISA) modem card operating on a personal computer (PC) with PnP capability. The PnP Device supports host performance of the following functions when interfacing with the PnP ISA card:

- Isolate the ISA card
- Read the card's resource data
- Identify the card and configure its resources

The PnP Device meets the requirements stated in the Plug and Play ISA Specification Version 1.0a.

See Plug and Play (PnP) ISA Bus Interface Device Data Sheet (Order No. MD144) for additional information.

### MCU Firmware

MCU firmware performs processing of general modem control, command sets, data modem, error correction and data compression (ECC), fax class 1, fax class 2, DSVD, AudioSpan, voice/audio/TAM/speakerphone, W-class, V.80, and serial DTE/parallel host interface functions according to modem models (Table 1).

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

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

### Supported Interfaces

The major hardware signal interfaces of the modem device set are identified in Figure 1 (serial DTE interface) and Figure 2 (parallel host bus interface).

#### Serial DTE Interface and Indicator Outputs

A V.24/EIA/TIA-232-E logic-compatible serial DTE interface is selected by the Parallel/Serial Interface (PARIF) input low. One serial transmit data input line (~TXD), one serial receive data output line (~RXD), three synchronous clocks (~XTCLK, ~RXCLK, and ~TXCLK), four control input lines (~DTR, ~RTS, ~RDL, and ~AL), and six status output lines (~CTS, ~DSR, ~RLSD, ~TM, ~RI, and ~DRSOUT) are supported.

Three dedicated indicator output lines (~DTRIND, ~TMIND, and ~AAIND) are also provided.

#### Parallel Host Bus Interface

A 16550A UART-compatible parallel host bus interface is selected by Parallel/Serial Interface (PARIF) input high. The interface signals are: eight bidirectional data lines (HD0-HD7), three address input lines (HA0-HA2), three control input lines (~HCS, ~HRD, and ~HWT), one status output line (HINT), and a reset input line (~RESET).

#### NVRAM (Serial EEPROM) Interface

A 2-line serial interface to non-volatile RAM (NVRAM, i.e. serial EEPROM) is supported. The interface signals are a bidirectional data line (NVMDATA) and a clock output line (NVMCLK). Data stored in NVRAM can take precedence over the factory default settings. A 256-byte NVRAM can store up to two user-selectable configurations and up to four 32-digit dial strings.

#### External Bus Interface

The non-multiplexed external bus supports eight bidirectional data lines (D0-D7) and 18 address output lines (A0-A17). Read enable output (~READ), write enable output (~WRITE), and four chip select output (~ROMSEL, ~RAMSEL, ~DPSEL, and ~SCPSEL) lines are also supported.

The external bus connects to the MDP, the optional RCDSVD SCP, and to OEM-supplied memory. The memory is 1Mbit (128k x 8) SRAM and 2Mbit (256k x 8) ROM/flash ROM, or for the RC336 and RC144, can alternatively be 32k x 8 SRAM and 128k x 8 ROM/flash ROM.

### Telephone Line/Telephone Interface

**MCU.** Relay control outputs to the line interface are supported:

- ~RLY1: Off-hook (~OH)
- ~RLY2: Voice (~VOICE), if needed. Pulse (~PULSE) relay function can be enabled by ConfigurACE II.
- ~RLY3: Mute (~MUTE), if needed, can be enabled by ConfigurACE II.
- ~RLY4: Caller ID (~CALLID) if needed. The DAAs shown in Figure 3 and Figure 4 support the Caller ID function without use of a separate relay.

Ring signal (RINGD) and loop current sense (LCS) inputs are supported.

Telephony extensions are supported by the Extension Off-Hook (~EXTOH) input.

**MDP.** A single-ended receive analog input (RIN) and a differential transmit analog output (TXA1/TXA2) are supported. A digitized speaker output (SPKMD) is provided for call progress monitoring.

### Speakerphone Interface (SP and SVD Models)

Microphone input (MICV) and a speaker output (SPKM) lines connect to handset, headset, or a microphone and speaker to support functions such as AudioSpan headset and speakerphone modes, FDSP, telephone emulation, microphone voice record, speaker voice playback, and call progress monitor. The speaker output (SPKM) carries the normal speakerphone audio or reflects the received analog signals in the modem.

An input from the telephone microphone (TELIN) and an output to the telephone speaker (TELOUT) are supported

in AudioSpan modes. These lines connect voice record/playback and AudioSpan audio to the local handset.

### RCDSVD SCP Interface (SVD Models)

The Line In (LINEIN) and Line Out (LINEOUT) lines connect DSVD audio to the local telephone handset.

Microphone input (MICIN) and speaker output (SPKP) lines connect to the microphone and speaker to support DSVD headset and speakerphone modes.

### Hardware Interface Signals

The modem hardware interface signals are shown in Figure 5 (serial DTE interface) and Figure 6 (parallel host interface).

The MCU pin assignments for the 80-pin PQFP with serial DTE interface are shown in Figure 7.

The MCU pin assignments for the 80-pin PQFP with parallel host interface are shown in Figure 8.

The MDP pin assignments for the 100-pin PQFP are shown in Figure 9.

The RCDSVD SCP pin assignments for the 100-pin PQFP are shown in Figure 10.

### 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 RC56D, RC336D, and RC144D Designer's Guide (Order No. 1154), the Plug and Play (PnP) ISA Bus Interface Device Data Sheet (Order No. MD144), the RCDVSD Speech Codec Processor Device Hardware Description (Order No. 1087), and the AT Command Reference Manual (Order No. 1199).



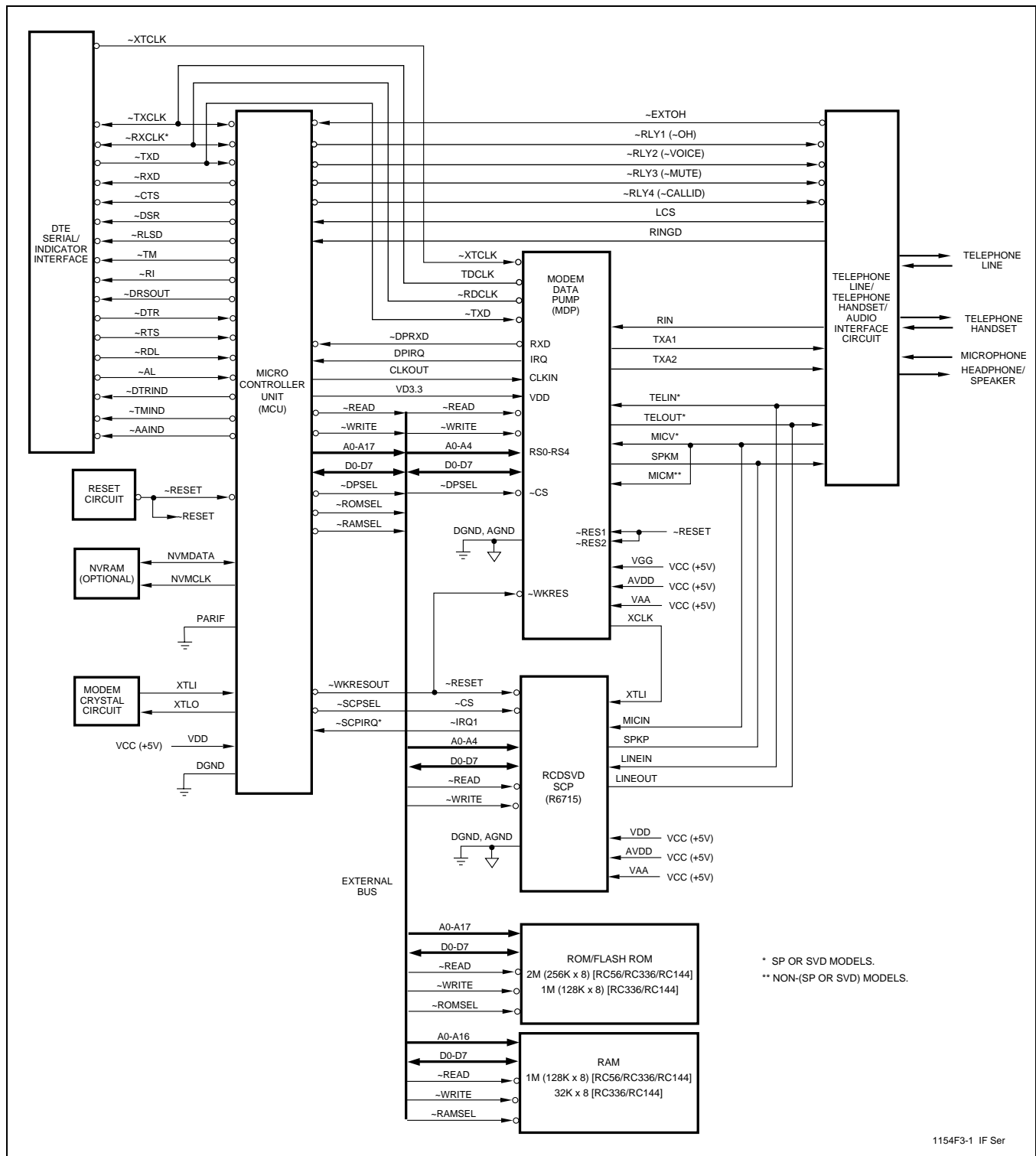


Figure 5. Hardware Interface Signals - Serial DTE Interface

\* SP OR SVD MODELS.  
 \*\* NON-(SP OR SVD) MODELS.



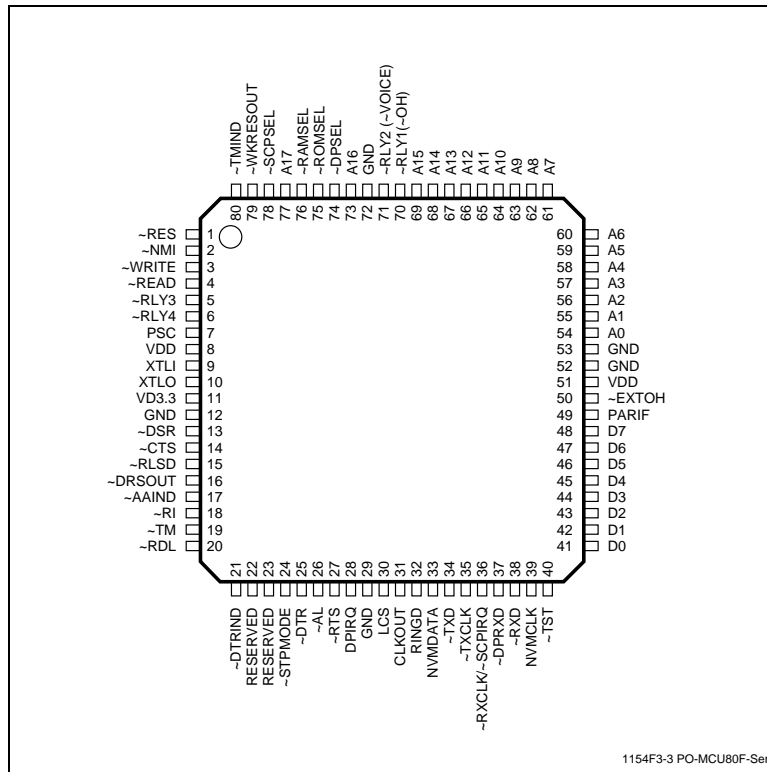


Figure 7. MCU Pin Signals - 80-Pin PQFP - Serial DTE Interface

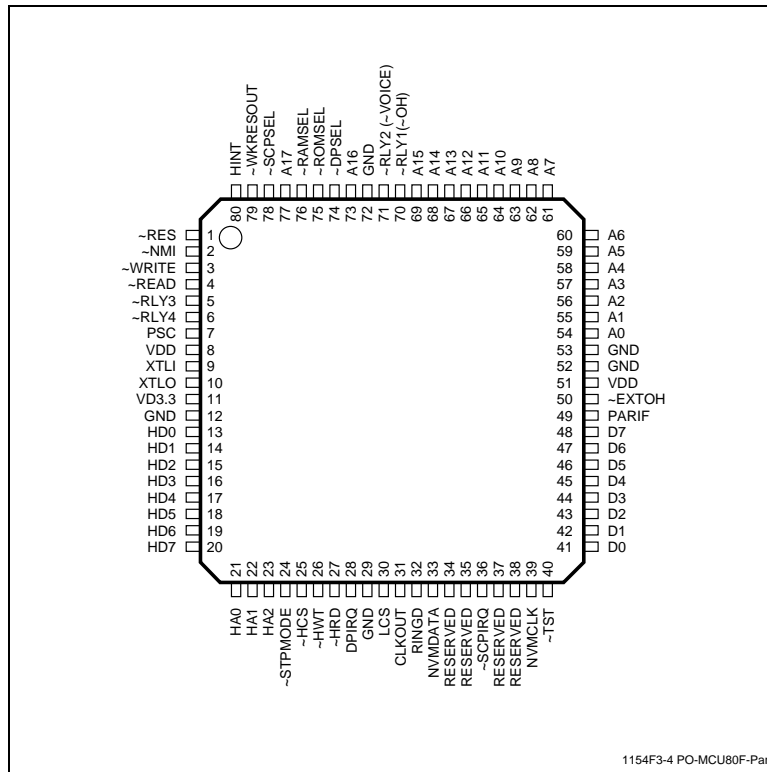


Figure 8. MCU Pin Signals - 80-Pin PQFP - Parallel Host Interface



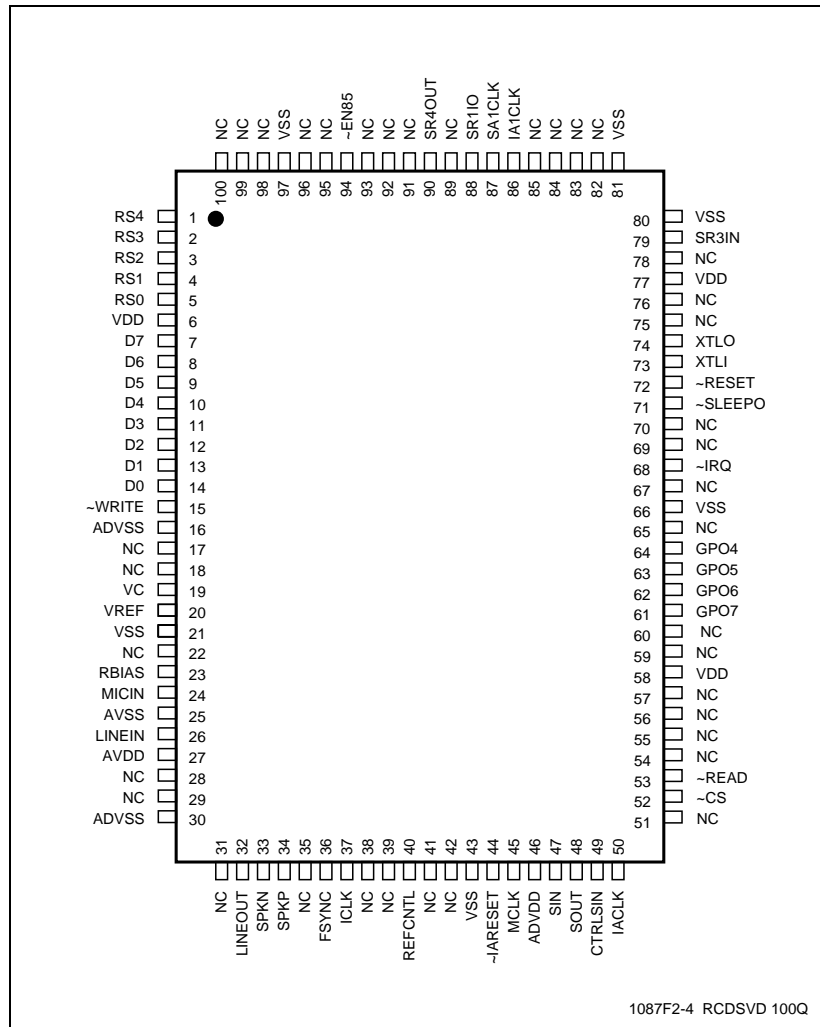


Figure 10. RCDSVD SCP Pin Signals- 100-Pin PQFP

Table 2. Current and Power Requirements

Mode	Current (ID)		Power (PD)		Notes
	Typical Current (mA)	Maximum Current (mA)	Typical Power (mW)	Maximum Power (mW)	
MCU (L28)					$f_{IN} = 28.224$ MHz
Normal mode	68	72	340	380	
Sleep mode	8	8.6	40	45	
MDP (R6764)					$f_{IN} = 28.224$ MHz
Normal mode	85	90	280	325	
Sleep mode	53	—	175	—	
Total Modem (MCU and MDP)					
Normal mode	153	162	620	705	
Sleep	61	—	215	—	
Optional PnP Device (11596-21)					
Normal mode	27	40	135	210	
Optional RCDSVD SCP (R6715)					$f_{IN} = 56.448$ MHz
Normal mode	110	120	550	630	
Sleep	10	—	50	—	
<b>Notes:</b>					
1. Test conditions:           MCU, PnP, and SCP: VDD = +5.0 VDC for typical values; VCC = +5.25 VDC for maximum values. MDP: VDD = +3.3 VDC for typical values; VCC = +3.6 VDC for maximum values.					
2. Normal operating voltage: MCU, PnP, and SCP: VDD = +5.0 V ± 5%. MDP: VDD = +3.3 V ± 0.3 V.					

Table 3. Absolute Maximum Ratings

Parameter	Symbol	Limits	Units
Supply Voltage	$V_{DD}$	MCU: -0.5 to +6.0 MDP: -0.5 to +4.0	V
Input Voltage	$V_{IN}$	-0.5 to (VDD + 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 (VAA + 0.3)	V
Voltage Applied to Outputs in High Impedance (Off) State	$V_{HZ}$	-0.5 to (VDD + 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)	$I_{TRIG}$	±400	mA

**NOTES**

**Further Information**

literature@conexant.com  
1-800-854-8099 (North America)  
33-14-906-3980 (International)

**Web Site**

www.conexant.com

**World Headquarters**

Conexant Systems, Inc.  
4311 Jamboree Road  
P. O. Box C  
Newport Beach, CA  
92658-8902  
Phone: (949) 483-4600  
Fax: (949) 483-6375

**U.S. Florida/South America**

Phone: (813) 799-8406  
Fax: (813) 799-8306

**U.S. Los Angeles**

Phone: (805) 376-0559  
Fax: (805) 376-8180

**U.S. Mid-Atlantic**

Phone: (215) 244-6784  
Fax: (215) 244-9292

**U.S. North Central**

Phone: (630) 773-3454  
Fax: (630) 773-3907

**U.S. Northeast**

Phone: (978) 692-7660  
Fax: (978) 692-8185

**U.S. Northwest/Pacific West**

Phone: (408) 249-9696  
Fax: (408) 249-7113

**U.S. South Central**

Phone: (972) 733-0723  
Fax: (972) 407-0639

**U.S. Southeast**

Phone: (770) 246-8283  
Fax: (770) 246-0018

**U.S. Southwest**

Phone: (949) 483-9119  
Fax: (949) 483-9090

**APAC Headquarters**

Conexant Systems Singapore,  
Pte. Ltd.  
1 Kim Seng Promenade  
Great World City  
#09-01 East Tower  
Singapore 237994  
Phone: (65) 737 7355  
Fax: (65) 737 9077

**Australia**

Phone: (61 2) 9869 4088  
Fax: (61 2) 9869 4077

**China**

Phone: (86 2) 6361 2515  
Fax: (86 2) 6361 2516

**Hong Kong**

Phone: (852) 2827 0181  
Fax: (852) 2827 6488

**India**

Phone: (91 11) 692 4780  
Fax: (91 11) 692 4712

**Korea**

Phone: (82 2) 565 2880  
Fax: (82 2) 565 1440

**Europe Headquarters**

Conexant Systems France  
Les Taissounieres B1  
1680 Route des Dolines  
BP 283  
06905 Sophia Antipolis Cedex  
France  
Phone: (33 4) 93 00 33 35  
Fax: (33 4) 93 00 33 03

**Europe Central**

Phone: (49 89) 829 1320  
Fax: (49 89) 834 2734

**Europe Mediterranean**

Phone: (39 02) 9317 9911  
Fax: (39 02) 9317 9913

**Europe North**

Phone: (44 1344) 486 444  
Fax: (44 1344) 486 555

**Europe South**

Phone: (33 1) 41 44 36 50  
Fax: (33 1) 41 44 36 90

**Middle East Headquarters**

Conexant Systems Commercial  
(Israel) Ltd.  
P. O. Box 12660  
Herzlia 46733, Israel  
Phone: (972 9) 952 4064  
Fax: (972 9) 951 3924

**Japan Headquarters**

Conexant Systems Japan Co., Ltd.  
Shimomoto Building  
1-46-3 Hatsudai,  
Shibuya-ku, Tokyo  
151-0061 Japan  
Phone: (81 3) 5371-1567  
Fax: (81 3) 5371-1501

**Taiwan Headquarters**

Conexant Systems, Taiwan Co.,  
Ltd.  
Room 2808, 333  
International Trade Building  
Keelung Road, Section 1  
Taipei 110, Taiwan, ROC  
Phone: (886 2) 2720 0282  
Fax: (886 2) 2757 6760