

# RH56D-PCI

## Host Controlled V.90/K56flex™

### Modem Device Family for Desktop Applications

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#### Introduction

The Conexant™ RH56D-PCI V.90/K56flex™ Host Controlled Modem Device Family supports high speed analog data up to 56 kbps, 14.4 kbps fax, voice/TAM, and speakerphone (optional) operation. The modem operates with PSTN telephone lines in the U.S. and world-wide. The modem is available with or without speakerphone support (see Table 1).

The modem is packaged in a single 144-pin thin quad flat pack (TQFP) that combines PCI Bus Interface (BIF) and Modem Data Pump (MDP) functions. **This modem is pin-compatible with the SoftK56-PCI modem, part number R6793 (see SoftK56-PCI data sheet Order No. MD231).**

Host modem software is also provided.

Operating with +3.3V power, this device set supports 32-bit host applications in such designs as embedded motherboards and PCI half cards. Downloadable architecture allows updating of MDP executable code.

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

In V.34 data mode, the modem operates at line speeds up to 33.6 kbps. When applicable, error correction (V.42/MNP 2-4) and data compression (V.42 bis/MNP 5) maximize data transfer integrity and boost average data throughput. Non-error-correcting mode is also supported.

All models support remote audio recording and remote audio playback over the telephone line interface using A-Law,  $\mu$ -Law, or linear coding at 8000 or 7200 Hz sample rate to support applications such as digital telephone answering machine (TAM).

The SP model supports position independent, full-duplex speakerphone (FDSP) operation.

Fax Group 3 send and receive rates are supported up to 14.4 kbps with T.30 protocol.

V.80 synchronous access mode supports host-controlled communication protocols, e. g., H.324 video conferencing.

Reference design kits are available to minimize application design time and costs.

#### Features

- Data modem
  - ITU-T V.90, K56flex, V.34 (33.6 kbps), V.32 bis, V.32, V.22 bis, V.22, V.23, and V.21; Bell 212A and 103
  - V.42 LAPM and MNP 2-4 error correction
  - V.42 bis and MNP 5 data compression
  - V.250 (ex V.25 ter) and V.251 (ex V.25 ter Annex A) commands
  - Fax modem send and receive rates up to 14.4 kbps ITU-T V.17, V.29, V.27 ter, and V.21 channel 2
  - EIA/TIA 578 Class 1 and T.31 Class 1.0 commands
- Voice, telephony, TAM
  - V.253 commands
  - 8-bit  $\mu$ -Law/A-Law coding (G.711)
  - 8-bit/16-bit linear coding
  - 8000/7200 Hz sample rate
  - Music on hold from host or analog hardware input
  - TAM support with concurrent DTMF detect, ring detect and caller ID
- V.80 synchronous access mode supports host-controlled communication protocols
  - H.324 interface support
- V.8/V.8bis and V.251 (ex V.25 ter Annex A) commands
- Full-duplex Speakerphone (FDSP) Mode (SP model)
  - Telephone handset interface
  - External microphone and speaker interface
  - Microphone gain and muting
  - Speaker volume control and muting
  - Adaptive acoustic, line, and handset echo cancellation
  - Loop gain control, transmit and receive path AGC
- Data/Fax/Voice call discrimination
- Multiple country support
  - Call progress, blacklisting
- Single profile stored in host
- Modem and audio paths concurrent across PCI Bus
- System compatibilities
  - Windows 95, Windows 95 OSR2, Windows 98, Windows NT 4.0, Windows NT 5.0 operating systems
  - Microsoft's PC 98 Design Initiative compliant
  - Unimodem/V compliant
  - Pentium 133 MHz equivalent or greater
  - 16 Mbyte RAM or more
- 32-bit PCI Local Bus interface
  - Conforms to the PCI Local Bus Specification, Production Version, Revision 2.1
  - PCI Bus Mastering interface to the MDP
  - 33 MHz PCI clock support

## Features (Continued)

- Supports PCI Bus Power Management
  - Conforms to PCI Bus Power Management Specification, Rev. 1.1
  - ACPI Power Management Registers
  - APM support
  - PME# support
- Device package
  - R6795 Modem: 144-pin TQFP (1.6 mm max. height)
- +3.3V operation with +5V tolerant digital inputs
- +5V or +3.3V analog operation

Table 1. Modem Models and Functions

Marketing Model Number <sup>1</sup>	Combined PCI Bus Interface (BIF) and Modem Data Pump (MDP) Part No. [144-Pin TQFP]	Signal Processing	Host Bus	V.90/K56flex Data, V.17 Fax, Voice/TAM	FDSP
RH56D-PCI	R6795-12	Hardware DSP	PCI	Y	—
RH56D/SP-PCI	R6795-11	Hardware DSP	PCI	Y	Y

**Notes:**

1. Model options:
 

SP	Full-duplex speakerphone (FDSP)
PCI	PCI Bus interface
2. Supported functions (Y = Supported; – = Not supported):
 

Voice/TAM,	Voice playback and record through line
FDSP	Full-duplex speakerphone and voice playback and record through line, handset, and mic/speaker

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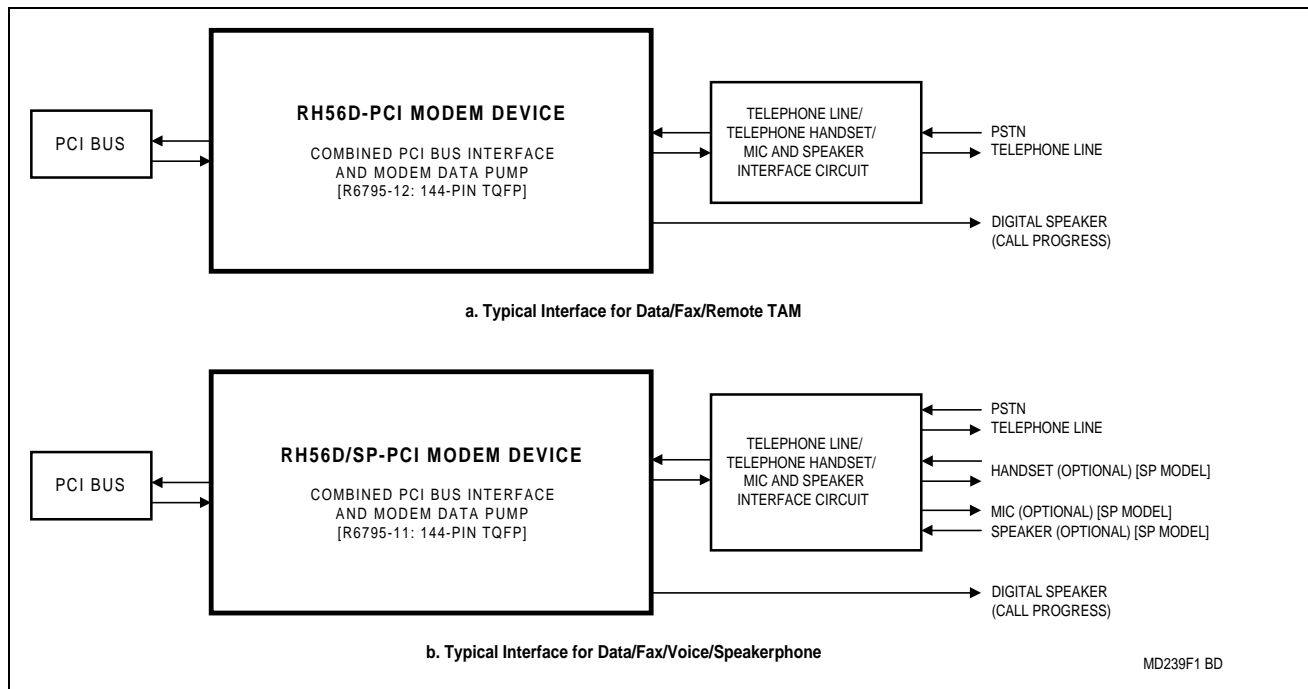


Figure 1. RH56D-PCI Major Interfaces

## Description

### General

The RH56D-PCI modem provides the processing core for a complete system design featuring data/fax modem, voice/TAM, and speakerphone support, depending on specific model (Table 1).

**Note:** The term, "RH56D-PCI Device Set", refers to the family of modem models listed in Table 1.

Modem operation, including dialing, call progress, telephone line interface, telephone handset interface, audio interface, and host interface functions are supported and controlled through the command set.

The modem hardware connects to the host processor via a PCI Bus interface. The OEM adds a crystal circuit, EEPROM, telephone line interface, telephone handset interface (optional), and audio interface (optional) to complete the system.

### Host Modem Software

The host modem software performs two distinct tasks:

1. General modem control which includes command sets, fax Class 1, voice/TAM, speakerphone, error correction, data compression, and operating system interface functions.
2. Modem data pump control. Binary executable code controlling MDP operation is downloaded as required during operation.

Configurations of the modem software are provided to support modem models listed in Table 1.

Binary executable modem software is provided for the OEM.

### Data/Fax Modes

As a V.90/K56flex data modem, the modem can receive data from a digital source using a V.90- or K56flex-compatible central site modem over the digital telephone network portion of the PSTN at line speeds up to 56 kbps. Asymmetrical data transmission supports sending data up to V.34 rates. This mode can fallback to full-duplex V.34 mode, and to lower rates as dictated by line conditions.

As a V.34 data modem, 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 33600 bps down to 2400 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 modes and can support Group 3 facsimile send and receive speeds of 14400, 12000, 9600, 7200, 4800, or 2400 bps. Fax data transmission

and reception performed by the modem are controlled and monitored through the fax EIA/IA-578 Class 1 and T.31 Class 1.0 command interface. Full HDLC formatting, zero insertion/deletion, and CRC generation/checking are provided.

### Synchronous Access Mode (SAM) - Video Conferencing

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

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

### Voice/TAM Mode

Voice/TAM Mode features include 8-bit  $\mu$ -Law, A-Law, and linear coding at 8000 Hz and 7200 Hz sample rates. Tone detection/generation, call discrimination, and concurrent DTMF detection are also supported. ADPCM (4-bit IMA) coding is also supported to meet Microsoft WHQL logo requirements.

Voice/TAM Mode is supported by three submodes:

1. Online Voice Command Mode supports connection to the telephone line or, for the SP model, a handset.
2. Voice Receive Mode supports recording voice or audio data input at the RIN pin, typically from the telephone line or, for the SP model, 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 the SP model, a speaker/handset.

### Speakerphone Mode (SP Model)

The SP model includes additional telephone handset, external microphone, and external speaker interfaces which support voice and full-duplex speakerphone (FDSP) operation.

Hands-free full-duplex telephone operation is supported in Speakerphone Mode under host control. Speakerphone Mode features an advanced proprietary speakerphone algorithm which supports full-duplex voice conversation with acoustic, line, and handset 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 host can separately control volume, muting, and AGC in microphone and speaker channels.

**Hardware Interface**

The major functional interface signals are shown in Figure 2.

The R6795 144-pin TQFP hardware interface signals are shown in Figure 3.

The R6795 144-pin TQFP pin signals are shown in Figure 4.

A schematic showing the R6795 interface for a typical application (data/fax) is shown in Figure 5.

**Package Dimensions**

The package dimensions for the 144-pin TQFP are shown in Figure 6.

**Power Requirements**

The current and power requirements are listed in Table 2.

**Absolute Maximum Ratings**

The absolute maximum ratings are listed in Table 3.

**Additional Information**

Additional information is described in the RH56D-PCI Designer's Guide (Order No. 1213) and in the Command Reference Manual (Order No. 1118).

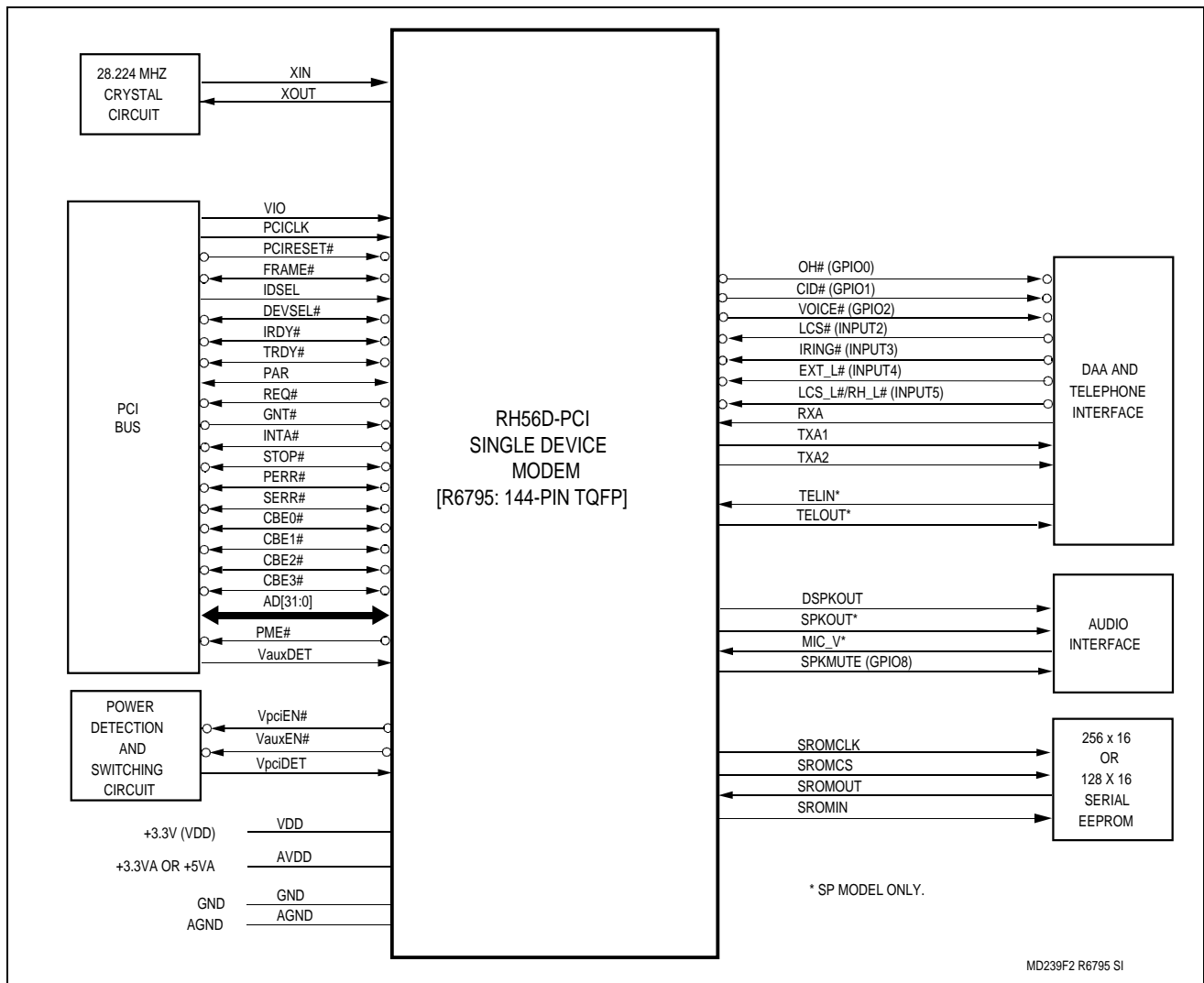


Figure 2. RH56D-PCI Major Hardware Interface Signals

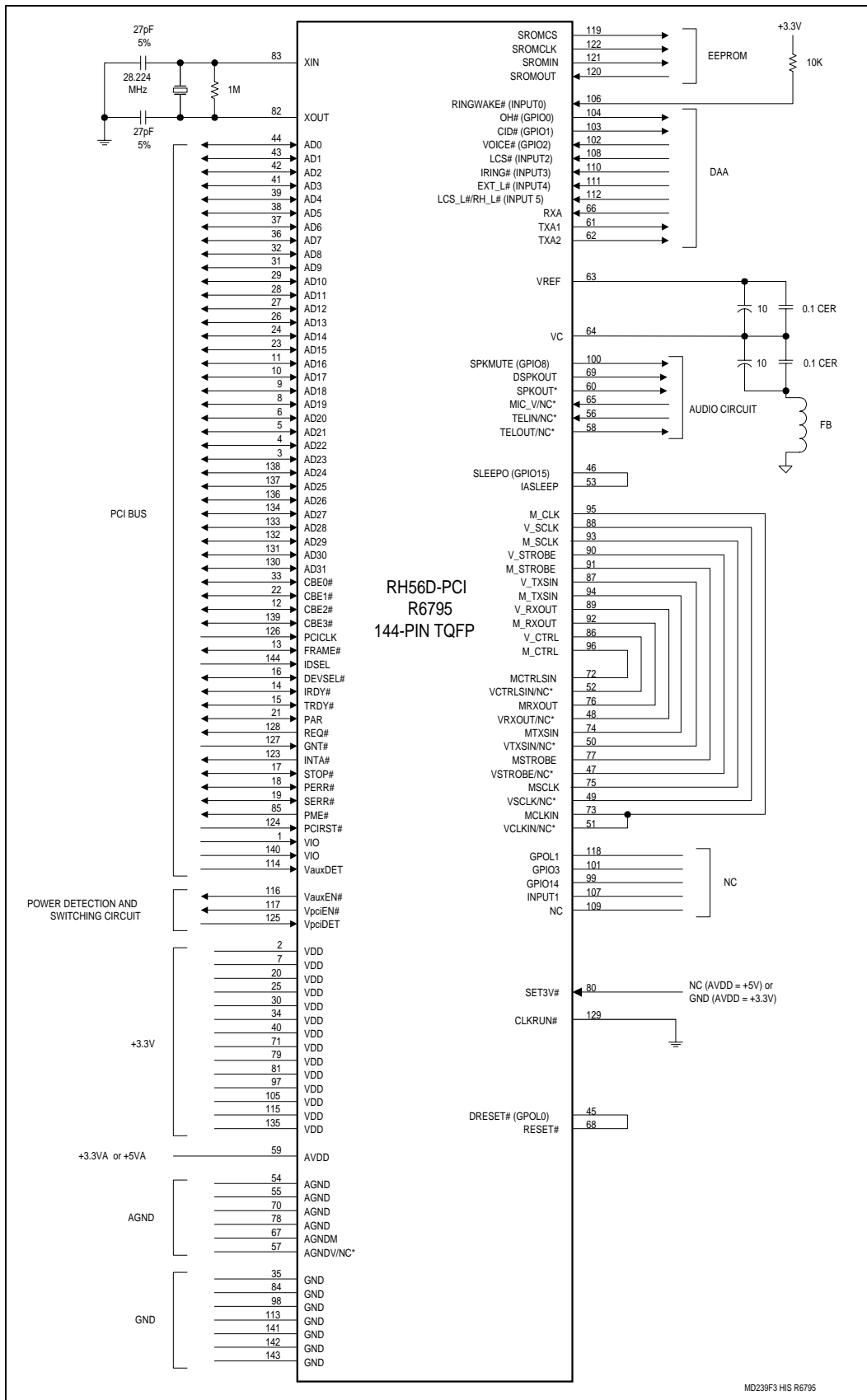


Figure 3. R6795 144-Pin TQFP Hardware Interface Signals

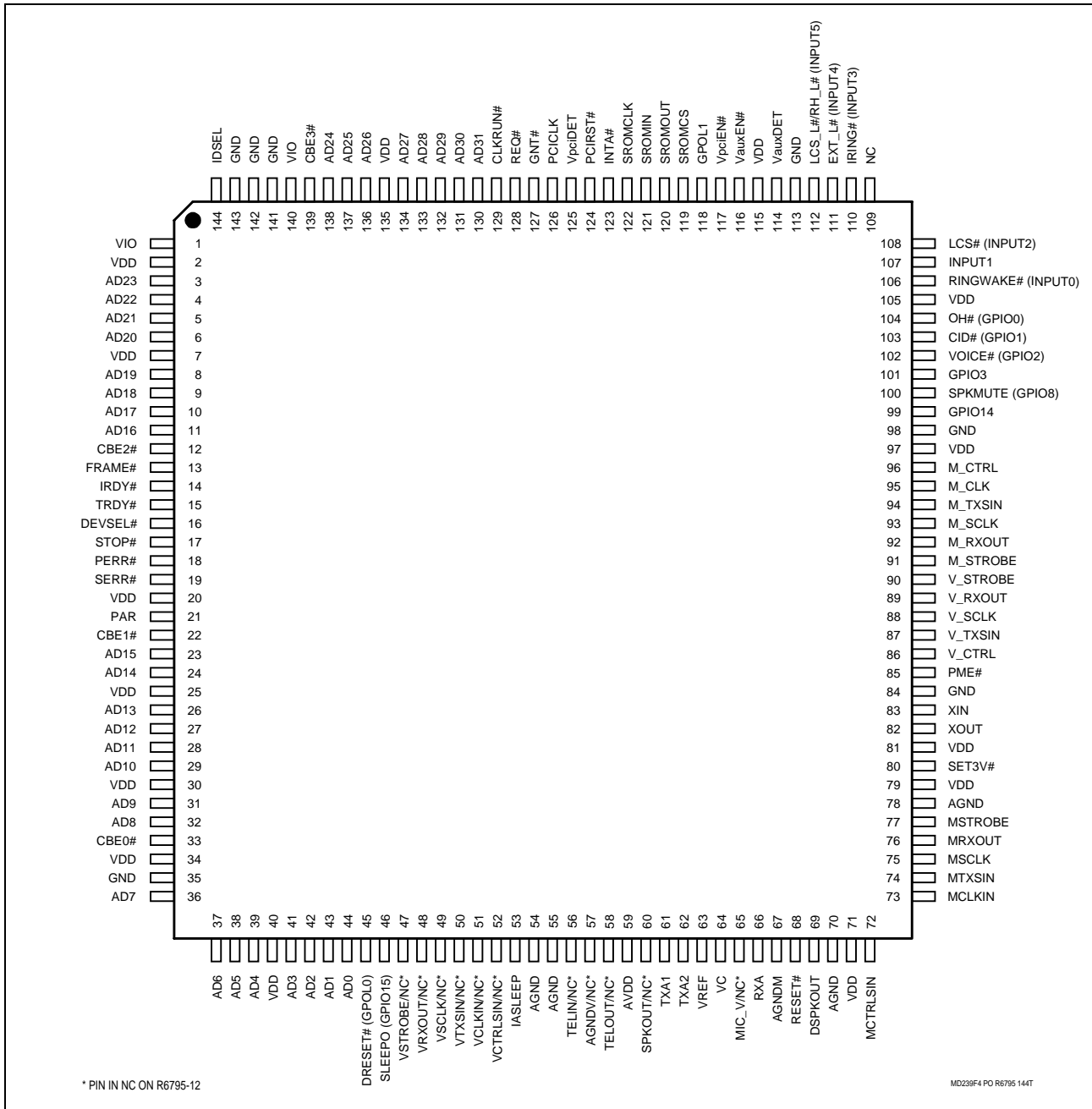


Figure 4. R6795 144-Pin TQFP Pin Signals

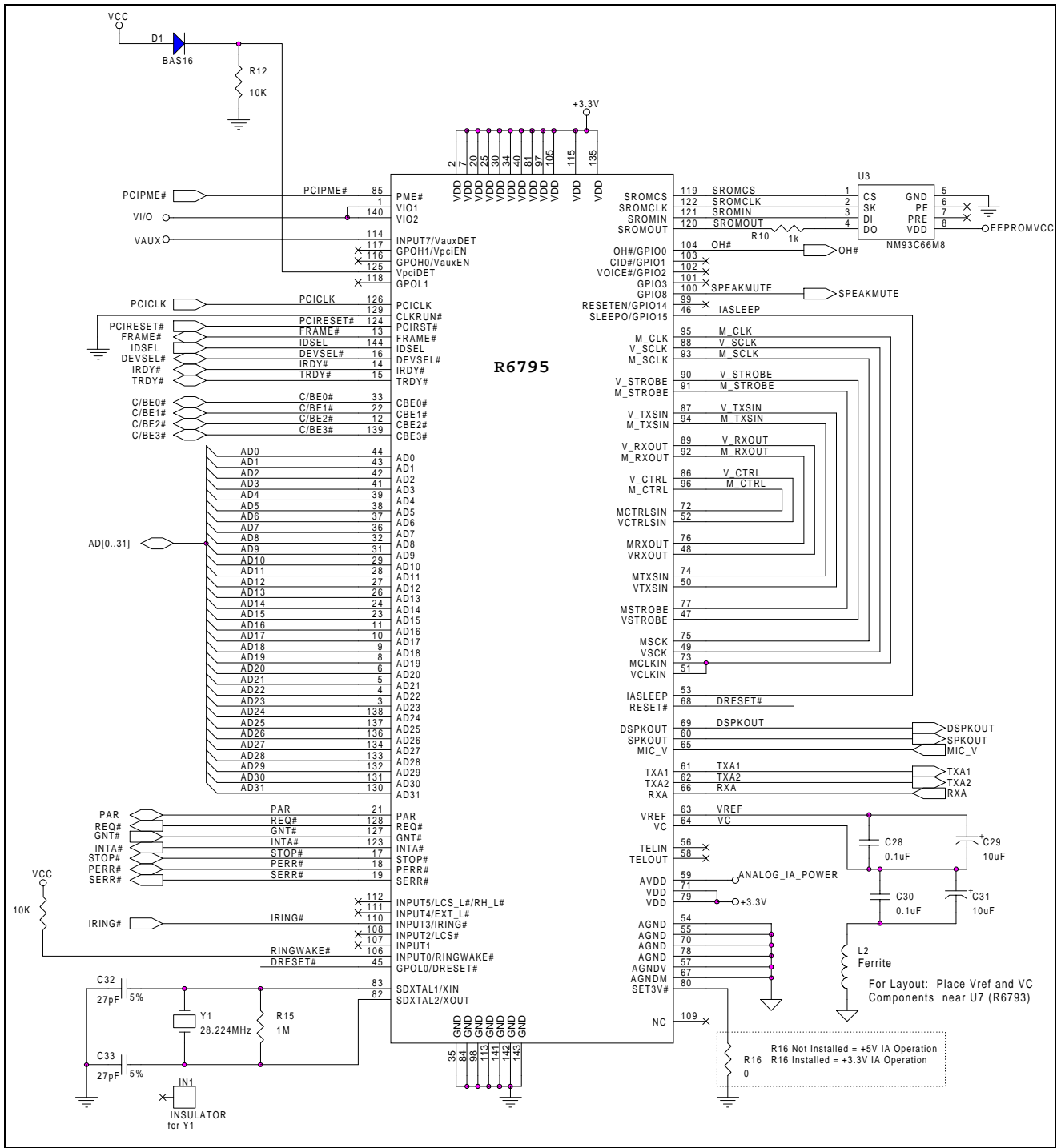


Figure 5. Schematic - R6795 Interface –Speakerphone Application



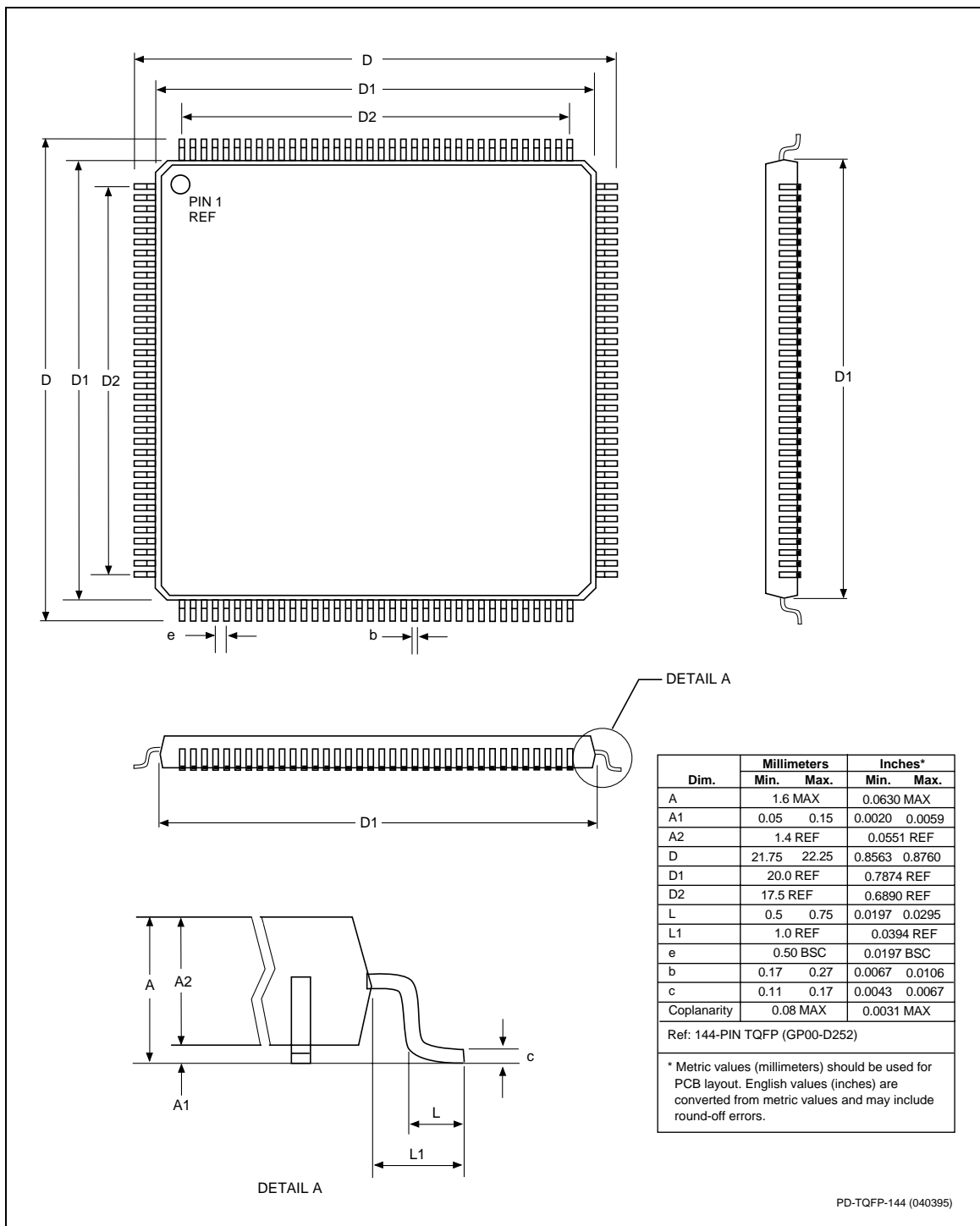


Figure 6. Package Dimensions - 144-Pin TQFP

Table 2. Current and Power Requirements

Device State (Dx) and Bus State (Bx)	Conditions			Current		Power	
	PCI Bus Power	PCI Clock (PCICLK)	Line Connection	Typical Current (mA)	Maximum Current (mA)	Typical Power (mW)	Maximum Power (mW)
D0, B0	On	Running	Yes	TBD	TBD	TBD	TBD
D0, B0	On	Running	No	TBD	TBD	TBD	TBD
D3, B0	On	Running	No	TBD	TBD	TBD	TBD
D3, B1	On	Running	No	TBD	TBD	TBD	TBD
D3, B2, B3 (D3 hot)	On	Stopped	No	TBD	TBD	TBD	TBD
D3, B3 (D3 cold)	Off	Stopped	No	TBD	TBD	TBD	TBD

**Notes:**  
 Operating voltage: VDD = +3.3V ± 0.3V.  
 Test conditions: VDD = +3.3 VDC for typical values; VDD = +3.6 VDC for maximum values.  
 For all modes, +3.3V is supplied to BIF and MDP.  
 Definitions:  
 PCI Bus Power            On: PCI Bus +5V and +3.3V on (modem normally powered by +3.3V from PCI Bus +3.3V or regulated down from PCI Bus +5V); PCIRST# not asserted.  
                                  Off: PCI Bus +5V and +3.3V off (modem normally powered by +3.3V from Vaux or Vpci); PCIRST# asserted.  
 PCI Clock (PCICLK)    Running: PCI Bus signal PCICLK running;  
                                  Stopped: PCI Bus signal PCICLK stopped (off).  
 Line connection:        Yes: Off-hook, IA powered.  
                                  No: On-hook, IA powered down.  
 Device States:            D3: Low power state. Suspend state can change the system power state; the resulting power state depends on the system architecture (OS, BIOS, hardware) and system configuration (i.e., other PCI installed cards).  
                                  D0: Full power state.  
 Device and Bus States: D0, B0:    Any PCI transaction, PCICLK running, VCC present.  
                                  D3, B1:    No PCI Bus transactions, PCICLK running, VCC present.  
                                  D3, B2, B3: No PCI transactions, PCICLK stopped, VCC may be present.  
                                  D3, B3:    No PCI transactions, PCICLK stopped, no VCC.  
 Refer to the PCI Bus Power Management Interface Specification for additional information.

Table 3. Absolute Maximum Ratings

Parameter	Symbol	Limits	Units
Supply Voltage	V <sub>DD</sub>	-0.5 to +4.0	V
Input Voltage	V <sub>IN</sub>	-0.5 to (V <sub>IO</sub> + 0.5)*	V
Operating Temperature Range	T <sub>A</sub>	-0 to +70	°C
Storage Temperature Range	T <sub>STG</sub>	-55 to +125	°C
Analog Inputs	V <sub>IN</sub>	-0.3 to (V <sub>AA</sub> + 0.5)	V
Voltage Applied to Outputs in High Impedance (Off) State	V <sub>HZ</sub>	-0.5 to (V <sub>IO</sub> + 0.5)*	V
DC Input Clamp Current	I <sub>IK</sub>	±20	mA
DC Output Clamp Current	I <sub>OK</sub>	±20	mA
Static Discharge Voltage (25°C)	V <sub>ESD</sub>	±2500	V
Latch-up Current (25°C)	I <sub>TRIG</sub>	±400	mA

\* V<sub>IO</sub> = +3.3V ± 0.3V or +5V ± 5%.

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