

# RS56L-PCI

## Host-Processed V.90/K56flex™

### Modem Device Family for Mobile Applications

#### Introduction

The Rockwell RS56L-PCI (SoftK56) Host-Processed V.90/K56flex™ Modem Device supports high speed analog data up to 56 kbps, 14.4 kbps fax, voice/TAM, cellular phone, and speakerphone (optional) operation. The modem operates with PSTN telephone lines as well as analog and digital cellular phones in the U.S. and world-wide depending upon model and installed software drivers. The modem models are listed in Table 1.

The modem is packaged in a single 144-pin thin quad flat pack (TQFP) that combines the PCI Bus Interface (BIF) and Line/Voice Codec (LVC) functions. Figure 1 identifies the major hardware signal interfaces supported by each model.

Host modem and cellular phone driver software is provided.

Operating with +3.3V power, this device set supports 32-bit host applications in such cellular-based mobile designs as laptop, notebook, and palmtop computers. The device is easily integrated into PCI Bus-based embedded motherboards, system boards, or plug-in cards.

Modem data pump and controller functions, traditionally enabled using dedicated hardware, are processed in a Pentium MMX-compatible CPU using host-signal processing modem software.

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) and voice annotation.

The SP model also 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.

Cellular phone operation is supported by a generic hardware interface meeting multiple standards and host software specific to a particular cell phone type.

Reference designs 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
- Data/Fax/Voice call discrimination
- Switching to/from data and fax
- Full-duplex Speakerphone (FDSP) Mode (SP model)
  - External microphone and speaker interface
  - Microphone gain and muting
  - Speaker volume control and muting
  - Adaptive acoustic and line echo cancellation
  - Loop gain control, transmit and receive path AGC
- Cellular phone interface
  - Hardware interface supports multiple standards
  - Cell phone specific software supports different types and models
- Multiple country support
  - Call progress, blacklisting
- Single profile stored in host
- Modem and audio paths concurrent across PCI bus

**Features (Continued)**

- 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
- 32-bit PCI Local Bus interface
  - Conforms to the PCI Local Bus Specification, Production Version, Revision 2.1
  - PCI Bus Mastering interface to the LVC
  - 33 MHz PCI clock support
- Supports PCI Bus Power Management
  - Conforms to PCI Bus Power Management Specification, Rev. 1.1
  - ACPI Power Management Registers
  - APM support
  - PME# support
- Thin package supports low profile designs
  - R6794: 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**

Model/Order/Part Numbers		Supported Functions			
Marketing Model Number	Combined Bus Interface (BIF) and Line/Voice Codec (LVC) or Line Codec (LC) in 144 TQFP Part No.	Signal Processing	Host Bus	V.90/K56flex Data, V.17 Fax, Voice/TAM, Cellular	FDSP
RS56L-PCI	R6794-14	Host Processor	PCI	Y	—
RS56L/SP-PCI	R6794-11	Host Processor	PCI	Y	Y

**Notes:**

1. Model options:
 

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

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

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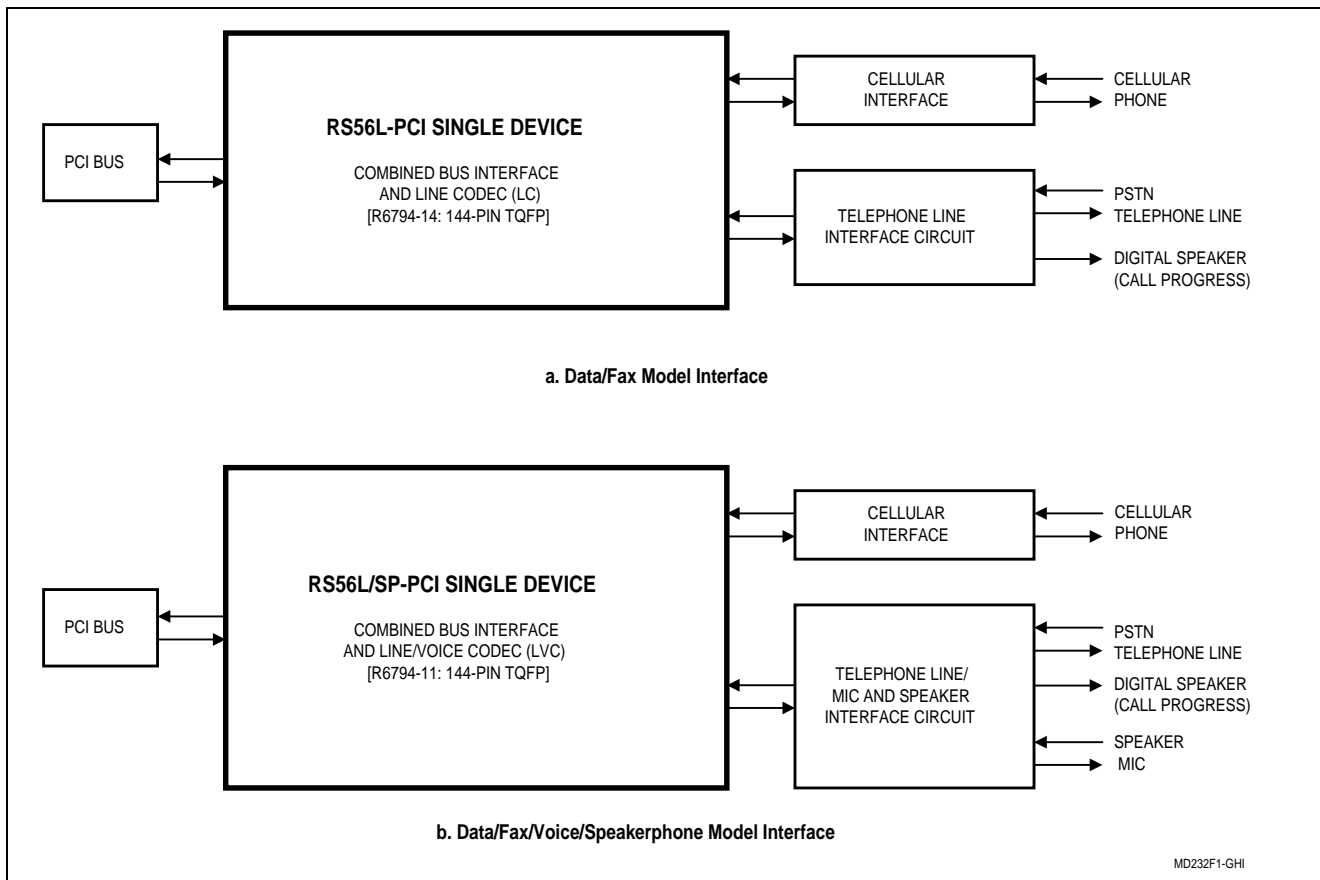


Figure 1. Modem Major Hardware Signal Interfaces

## Description

### General

The RS56L-PCI modem provides the processing core for a complete system design featuring data/fax modem, voice/TAM, cellular phone, and speakerphone support, depending on specific model (Table 1).

**Note:** The term, "SoftK56", refers to the family of RS56 modem models listed in Table 1.

Modem operation, including dialing, call progress, telephone line interface, cell phone 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, cellular phone interface, and audio interface, as required and supported by the modem model 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, VoiceView, cell phone drivers, and operating system interface functions.
2. Modem data pump signal processing, which includes data and facsimile modulation and demodulation, as well as voice sample formatting.

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 microphone/speaker.
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.
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.

### Speakerphone Mode (SP Model)

The SP model includes additional external microphone and 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 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 host can separately control volume, muting, and AGC in microphone and speaker channels.

### Cellular Phone Support

Cellular phone operation is supported by a generic hardware interface meeting multiple standards and host software specific to a particular phone type.

Development of software for specific phones is supported by a software developer's kit. This kit allows for straightforward porting of analog and digital cellular phone drivers to the modem. Consult software release notes for the latest supported types and models.

## Hardware Interface Signals

### Bus Interface and Codec (BIC) Interface

The BIC (R6794) major functional interface signals are shown in Figure 2.

The BIC (R6794) 144-pin TQFP hardware interface signals are shown in Figure 3.

The BIC (R6794) 144-pin TQFP pin signal assignments are shown in Figure 4.

### Cellular Interface Signals

The I/O signals assigned to the cellular phone interface depending upon phone type are listed in Table 2.

### GPIO Pins

The default GPIO signal assignments are listed in Table 3. These assignments are configured by the .INF file.

### Package Dimensions

The package dimensions for the 144-pin TQFP are shown in Figure 5.

### Electrical and Environmental Specifications

The current and power requirements are listed in Table 4.

The absolute maximum ratings are listed in Table 5.

### Additional Information

Additional information is described in the RS56L-PCI Modem Designer's Guide (Order No. 1202) and in the Command Reference Manual (Order No. 1118).

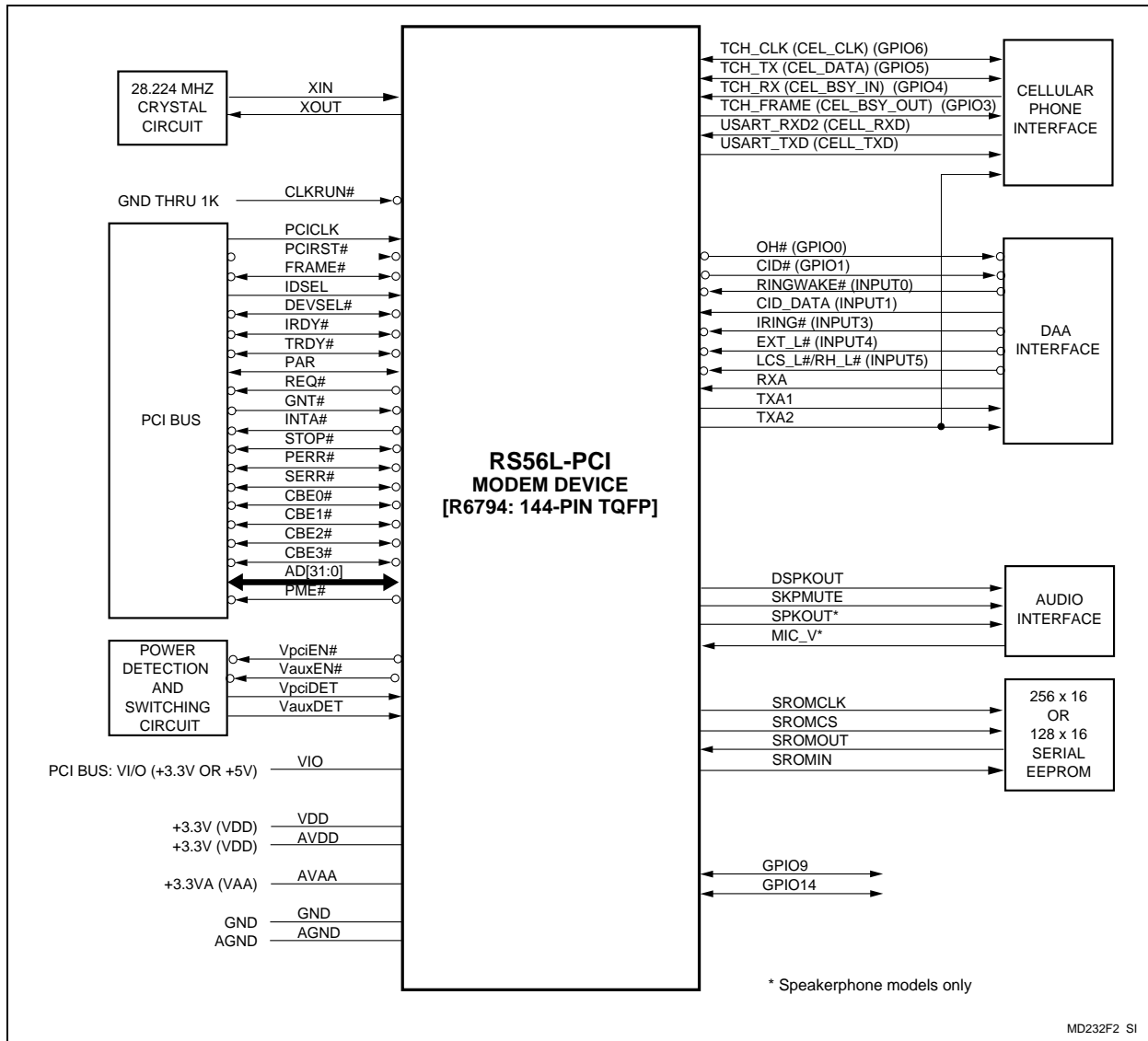


Figure 2. RS56L-PCI (R6794) Major Hardware Interface Signals

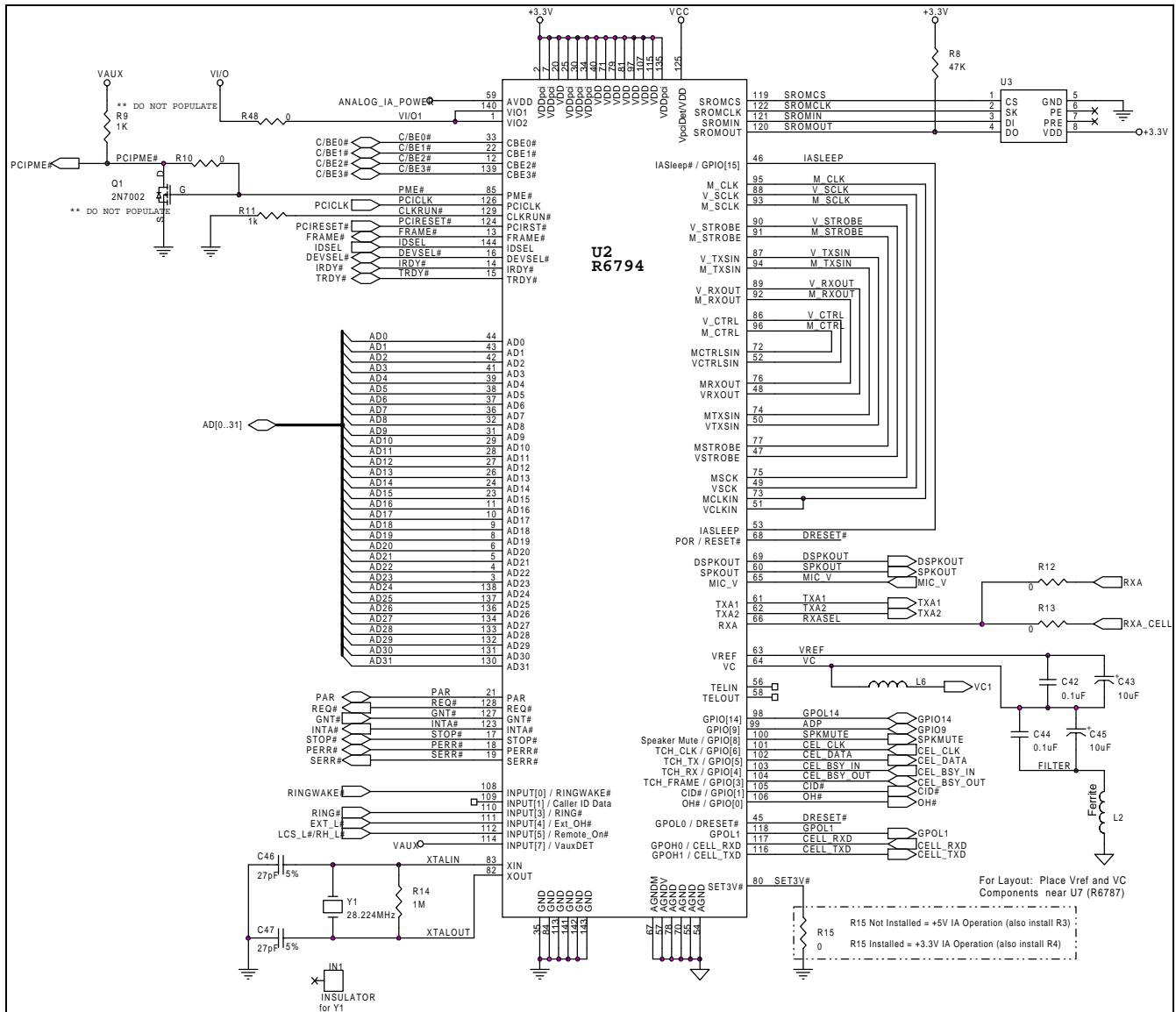


Figure 3. RS56L-PCI (R6794) 144-Pin TQFP Hardware Interface Signals

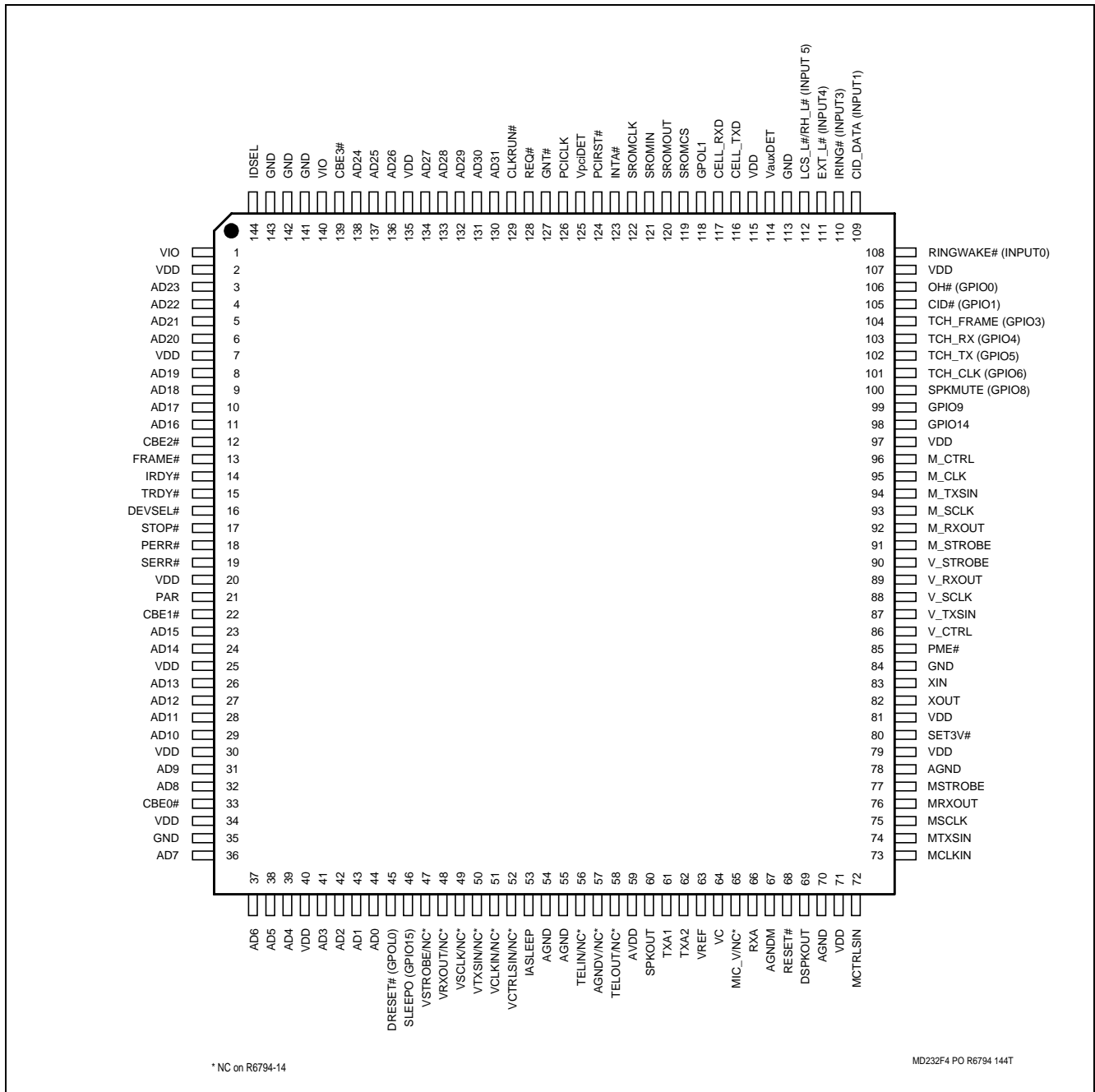


Figure 4. RS56L-PCI (R6794) 144-Pin TQFP Pin Signals



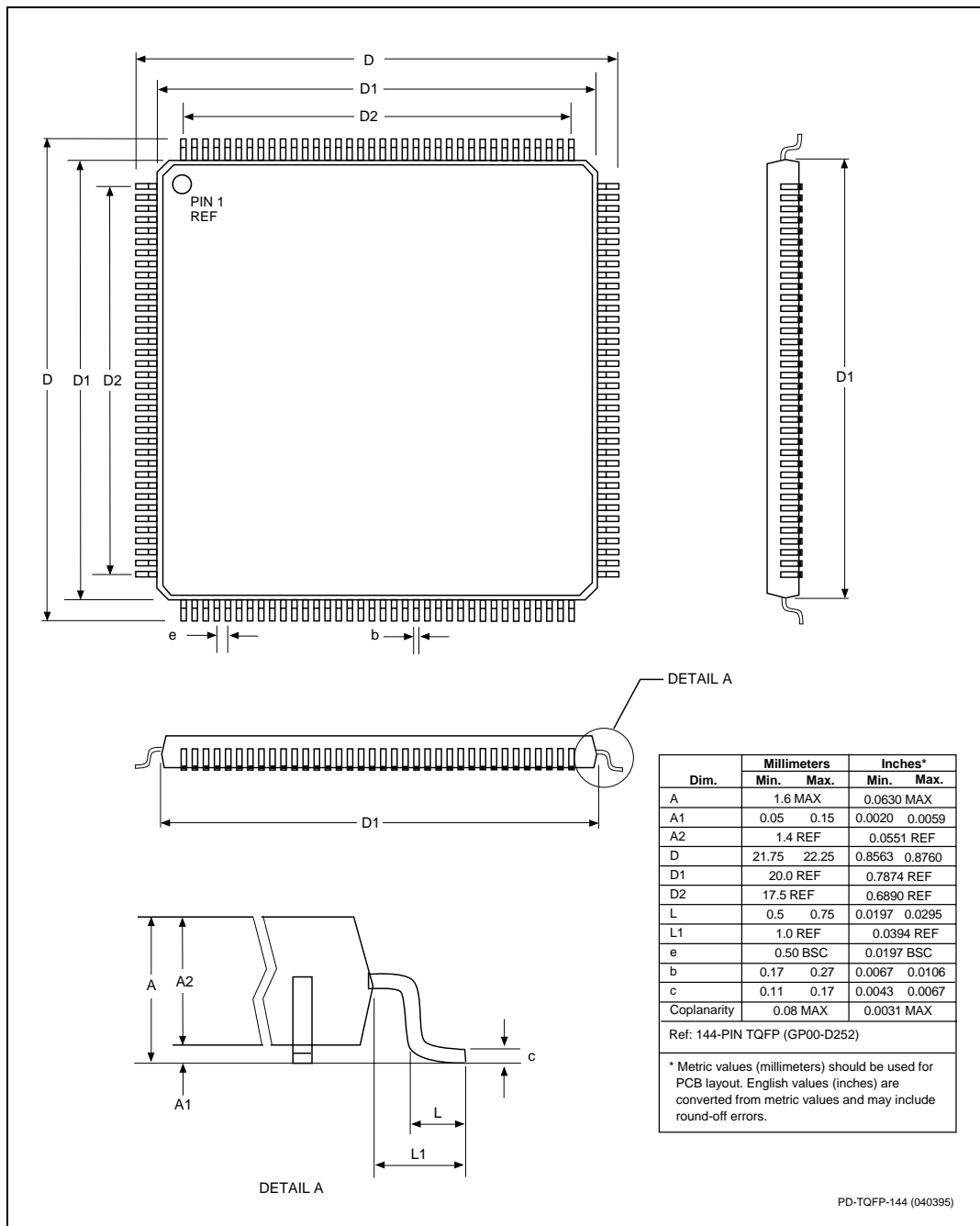


Figure 5. Package Dimensions - 144-Pin TQFP

Table 2. Cellular Phone I/O Signals

I/O Pin Signal Name	PDC Phones
TCH_CLK/CELL_CLK (GPIO6)	TCH_CLK
TCH_TX/CELL_DATA (GPIO5)	TCH_TX
TCH_RX/CEL_BSY_IN (GPIO4)	TCH_RX
TCH_FRAME/CEL_BSY_OUT (GPIO3)	TCH_FRAME
CELL_RXD	CELL_RXD
CELL_TXD	CELL_TXD
GPIO9	ADP

Table 3. Default GPIO Assignments

GPIO Function	R6794 Pin No.	R6794 Signal
GPIO0	106	OH#
GPIO1	105	CID#
GPIO3	104	TCH_FRAME
GPIO4	103	TCH_RX
GPIO5	102	TCH_TX
GPIO6	101	TCH_CLK
GPIO8	100	SPKMUTE
GPIO9	99	--
GPIO14	98	--
GPIO15	46	SLEEPO
INPUT0	108	RINGWAKE#
INPUT1	109	CID_DATA
INPUT3	110	IRING#
INPUT4	111	EXT_L#
INPUT5	112	LCS_L#/RH_L#

Table 4. 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	33	36	109	130
D0, B0	On	Running	No	22	24	73	86
D3, B0	On	Running	No	22	24	73	86
D3, B1	On	Running	No	22	24	73	86
D3, B2, B3 (D3 hot)	On	Stopped	No	2.1	3.2	6.9	11.5
D3, B3 (D3 cold)	Off	Stopped	No	<1	1	<3.3	3.6

## 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 modem.

## 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 5. 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 (VIO +0.5)*	V
Operating Temperature Range	T <sub>A</sub>	-0 to +70	°C
Storage Temperature Range	TSTG	-55 to +125	°C
Analog Inputs	V <sub>IN</sub>	-0.3 to (VAA + 0.5)	V
Voltage Applied to Outputs in High Impedance (Off) State	V <sub>HZ</sub>	-0.5 to (VIO +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

\* VIO = +3.3V ± 0.3V or +5.0V ± 5%

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