

Bt8954

PCMx Voice Pair Gain (VPG) Framer

Flexible Framer for VPG Market, Increasing PSTN Switch Capacity Utilization

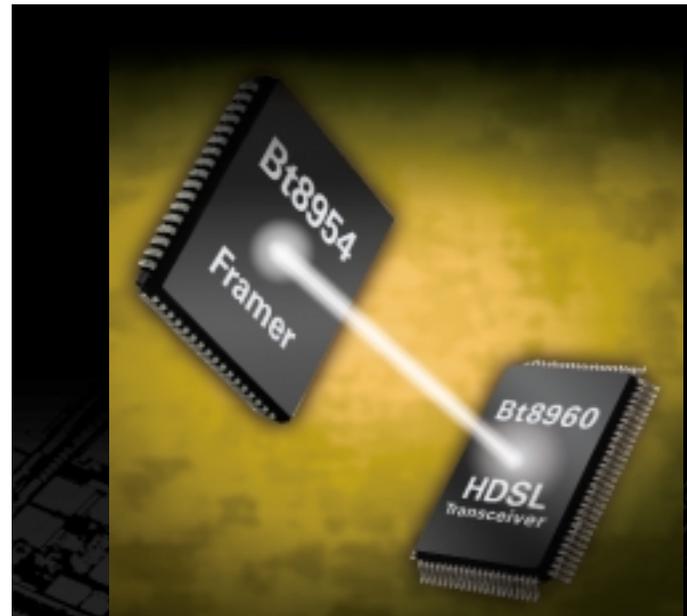
The Bt8954 framer forms the foundation for a complete low-cost voice pair-gain system when combined with the Conexant Bt8960 or RS8973.

Creating a voice PCM interface for Codecs, the Bt8954 combines frame, overhead, and signaling information with the PCM payload for transport over a DSL interface. And the Bt8954 supports from 2-18, 64 Kbps channels or up to 36, 32 Kbps ADPCM compressed channels. When combined with the Bt8960, a 4-voice system is possible with > 5km reach without ADPCM compression. This allows high speed fax and data modems to operate above the 9600 baud limit compared with previous generation which uses 32 Kbps ADPCM systems based on ISDN U-Interface chips. V.34 data and fax modem performance is maximized through the use of single frame strobes, low jitter PLL, and long reach Conexant HDSL technology.

Low Cost, High Performance

The Bt8954 is targeted at systems that support uncompressed voice for high quality fax and data modem applications. Conexant delivers low cost and high performance through a combination of PCM bus interface, PCM clock generation, 18 individual Codec strobes, and an internal slip buffer.

Since the generation of PCM clock and frame strobes is integrated into the Bt8954, direct connection to low cost codecs such as the



Distinguishing Features

- Direct PCM Interface
- Supports popular PCM Codecs
- Payload of 2-18 64 Kbps voice channels
- 32 Kbps ADPCM supported
- 2.048 PCM clock generation
- 6.144, 8.192, and 20.48 MHz ADPCM clock generation
- Slip buffer for single TX/RX frame sync

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3054/3057 family is supported. An internal PLL generates the PCM clock from the clocks provided by the Bt8960 or Bt8970 HDSL transceivers, eliminating the need for extra crystals or PLLs.

PCM4 Reference Design

Conexant offers a complete PCM4 reference design based on the Bt8954. This includes power supply for the COT (central office terminal) and RT (remote terminal), CO subscriber interfaces, and DSL interfaces. The system supports 4 voice channels at 64 Kbps at >5km over .4mm wire. Complete software source code for full functionality including signaling, maintenance interfaces, and start-up is included. A complete set of manufacturing documentation is also available.

Voice and Data Applications Supported

The Bt8954 also supports voice and packet data applications where an HDLC formatter is placed on the PCM bus and the payload is divided between voice channels and HDLC-based packet data traffic. The Bt8954 allows for convenient management of the voice traffic as well as the DSL link while an external HDLC controller handles packet data traffic.

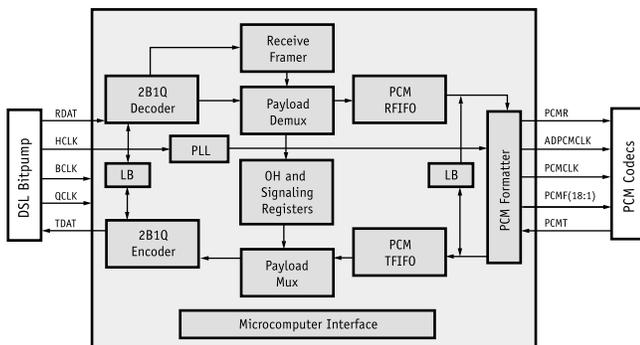


Figure 1. Bt8954 block diagram

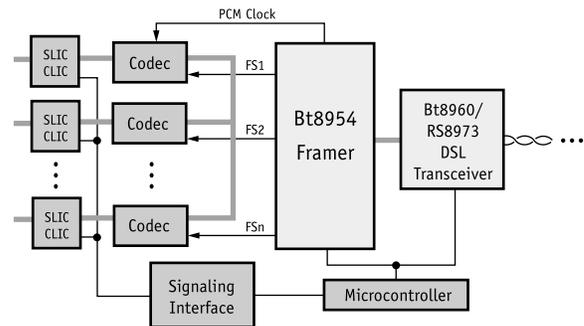
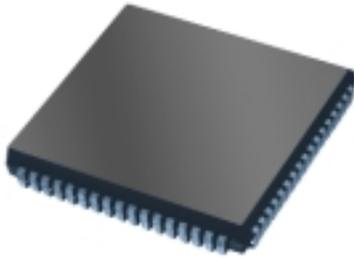


Figure 2. Voice pair-gain systems

Product Description

The Bt8954 has three functions: DSL interface, PCM interface, and framer. The DSL interface conforms to the Conexant standard interface present in all four generations of our HDSL/DSL components. This allows it to connect to either the Bt8960 or RS8973 single chip DSL transceivers. The interfaces provide the bi-directional data and clock signals as well as the high speed recovered clock required for PCM clock synthesis.

The PCM interface consists of a 2.048 MHz PCM clock generated from the DSL clock using an internal low noise PLL. This eliminates the need for additional crystals or PLLs and creates a high quality clock for excellent codec performance. 18 frame strobes are generated on chip for direct connection to codecs. The frame strobes may be programmed for 32 Kbps or 64 Kbps intervals as well as long and short frame strobe operation. This allows operation with almost every codec type available. A receive slip buffer in the PCM receive FIFO allows single transmit and receive frame strobe alignment. An additional



ADPCM clock is generated to create typical clocks for ADPCM codecs. Mixed ADPCM and uncompressed systems are also accommodated.

The Bt8954 frame is based on the HDSL frame. It includes a user-defined 4 Kbps/ EOC (embedded operations channel) for communication between the COT (central office terminal) and RT (remote terminal), indicator bits, frame CRC, user-defined signaling bandwidth, and PCM payload. In the Bt8954 the HDSL Z-bits have been converted to 1-8 Signaling or S-bits for 8-64 Kbps signaling bandwidth and the number of bytes per payload block is programmable from 2-18. (See Figure 2.)

Voice Pair-gain Systems

In a typical system the COT is powered from the CO 48v supply and generates the remote power supply. This supply is coupled to the wire pair and is used to power the remote unit.

The COT analog interface connects directly to the SLICs (Subscriber Line Interface Circuits) from the CO switch or channel bank. This analog interface insures compatibility with existing and new CO equipment. The interface provides the analog voice as well as the ring detection and on/off hook indications.

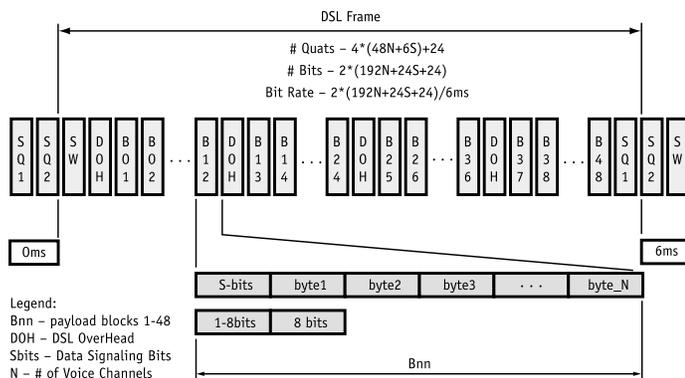


Figure 3. Bt8954 frame

What is Voice Pair Gain (VPG)?

Worldwide Post, Telephone & Telegraph administrations (PTTs) use VPG systems as a cost-effective method of offering clear 64 Kbps lines to fast growing urban and rural areas. This method of deployment is best suited to areas where there is significant unused switching capacity in Central Offices (CO) and a shortage of installed outside plant subscriber loops. In essence, a VPG system acts as a concentration access point, backhauling the traffic to the CO digitally over Single-line Digital Subscriber Line (SDSL) channels. The digitized voice and signaling information is converted to analog form prior to being fed to the CO front-end equipment. This way, it appears as though the subscriber terminal (phone or modem) is connected to the CO by a point-to-point dedicated local loop.

Similar to Digital Loop Carriers, VPG systems include two main network elements; COT (Central Office Terminal) and RT (Remote Terminal). The RT supports POTS termination and voice digitization. COT connects to RT via single copper pair supporting SDSL. VPG systems are also known as PCMX systems where x refers to the number of 64 Kbps clear channels supported per RT unit (PCM4/6/8/11 are most popular). PCM4 offers longer reach, requires a lower voltage feed for remote-powering, and supports 4x64 Kbps channels.

Today's cost-sensitive VPG/PCMX systems use a 2B1Q HDSL transceiver and the companion custom VPG framer. Conexant offers the Bt8960/Bt8954 for PCM4/6 and RS8973/Bt8954 for PCM8/11. In addition, a complete VPG4 reference design is available to take our customers to production quickly and cost-effectively.

Four codecs then digitize the speech for each of the subscriber interfaces. The digital PCM data is then placed on a PCM bus connected to the Bt8954 framer chip. The Bt8954 has an on chip analog PLL for low jitter PCM clock generation and a slip buffer to align TX and RX frame sync signals to the codecs. These two features ensure the best voice quality possible by reducing sampling noise in the codecs.

The Bt8954 then adds HDSL-like overhead for framing, performance monitoring, signaling, and operations and maintenance monitoring to the PCM data before passing it to the Bt8960/RS8973 bit-pump that converts the data to a 2B1Q signal and drives it onto the wire pair. The Bt8960/RS8973 also performs all clock and data recovery, echo cancellation, and equalization to achieve maximum performance on the wire pair.

On the RT, line voltage from the COT is converted to the local supplies for the RT system. The Bt8960/RS8973 interfaces to the wire pair for clock and data recovery and transmission. The Bt8954 frames the DSL recovered data and strips out PCM payload and overhead. The PCM data is routed to/from the codecs. The overhead is read and monitored by the microprocessor.

The analog interface to the phone lines supply telephone power, ringing signals, detect on/off hook, and generate billing tones.

On both the COT and RT an OAM (operations and maintenance) port is present. This port provides diagnostic and configuration capability. It utilizes the EOC function on the Bt8954 to communicate with the RT as well as the block CRC and loopback functions to implement diagnostics.

Product Features

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- Supports popular PCM Codecs
- Payload of 2-18 64 Kbps voice channels
- 32 Kbps ADPCM supported
- 2.048 PCM clock generation
- 6.144, 8.192, and 20.48 MHz ADPCM clock generation
- Slip buffer for single TX/RX frame sync
- 18 frame strobes on-chip
- High performance Codec interface
- Low jitter PCM clock
- Single TX/RX strobe
- 64 Kbps Codec support
- DSL Interface
- Direct connection to Bt8960 or RS8973 DSL transceivers
- 160-1168 Kbps data rates
- HDSL-based frame format
- 4 Kbps EOC for maintenance channel

- Block CRC
- User-defined indicators/status flags
- 8-64 Kbps signaling payload
- 2-18 timeslot voice payload
- Repeater operation supported
- PCM and DSL loopbacks
- Supports high speed fax modems
- Supports V.34 data modems
- Conexant HDSL transmission technology
- 68 PLCC
- JTAG/IEEE Std 1149.1-1990
- -40°C to +85°C operation

Applications

- Clear channel voice pair-gain PCM2, PCM4(1+3), PCM10/11
- Compressed voice systems
- Voice + packet data: Internet access for small office/home office
- Voice pair-gain repeaters

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