LPC Interface

[0045] Special purpose circuit **40** includes LPC (Low Pin Count) interface **62** to interface with LPC controller **52** in South Bridge **32**.

[0046] The LPC interface **62** is used to by CPU **26** to:

[0047] (1) read the function key input registers in register block **66**;

[0048] (2) set the control register in register block **66** to control the AC**97** Codec **42**;

[0049] (3) get the audio PCM (Pulse Code Modulation) data from the system memory (RAM **30**); and

[0050] (4) perform clock throttling control.

[0051] The setting in the mode register of register block **66** controls the state of switches **60** to switch the special purpose circuit **40** between the normal computer operation mode with switches **60** closed (e.g., running Microsoft Windows® OS) and the mode of a system consistent with the present invention, with switches **60** open (running the mini-OS) to play compressed audio files.

[0052] South Bridge AC**97** Controller **50** Interface (AC_Link_1 from Host)

[0053] During the normal computer operation mode, switches **60** are closed with the South Bridge AC**97** Controller **50** interface connected directly through, closed switches **60**, to AC**97** Codec **42** to generate audio output as if special purpose circuit **40** were not present. To play compressed audio files, switches **60** are open when the mini-OS is running, and state machine **64** controls AC**97** Codec **42**.

AC**97** Codec Interface (AC_Link_2 to AC**97** Codec **42**)

[0054] When the computer is running under control of the mini-OS, switches **60** are open. State machine **64** then controls the AC_link_2 in response to the settings of the register block **66** set by the host (CPU **26**) to generate the controls for AC**97** Codec **42** (e.g., switching the sampling frequency, controlling volume, sending the PCM data to the Codec **42**, setting the Codec **42** to the power saving mode or waking Codec **42** from the power saving mode).

Function Key Input Interface **68**

[0055] Function key interface **68** receives the user selections from function keys **48** and stores the selections in internal registers to be read by CPU **26**.

LCD Interface **72**

[0056] LCD interface **72** is only necessary if LCD **34** is used to provide status information to the user. The purpose, when used, is to show player status on low cost LCD **34** when the system consistent with the present invention is used. Status of the audio track number of the selection playing, status icons (e.g., Play) and other generic status icons may be programmed into the system and displayed for any other purpose.

Operation Modes

[0057] (A) Normal Operation Mode:

[0058] When the PC is fully powered and running under the full system OS, the various functions of special purpose circuit **40** are bypassed and switches **60** are closed, as discussed above. In the normal mode, the computer system uses the South Bridge AC**97** Controller **50** to directly control the AC**97** Codec **42** through the AC_link (in the Normal mode AC_link_1 and AC_link_2 are the same since switches **60** are closed. The special purpose circuit does not intercept of modify the AC_link signals.

[0059] (B) Compressed Audio Performance Mode:

[0060] When switch **54** has been closed, the system runs under the control of mini-OS, and special purpose circuit **40** is empowered and runs in the compressed audio performance mode. The South Bridge AC**97** Controller **50** is isolated from the AC**97** Codec **42** in this mode since switches **60** are open.

[0061] In the compressed audio performance mode, the host (CPU **26**) sets the internal registers of register block **66** to control the data flow to the AC**97** Codec **42**, and to perform the various power management functions.

A Power Saving Control Method in Compressed Audio Performance Mode

[0062] A flexible control method of the special purpose circuit **40** is provided to minimize the system control cycles and power consumption in the performance mode. The system memory (RAM **30**) is used to pass most of the control commands to the special purpose circuit **40**, instead of CPU **26**, which minimizes the time that CPU **26** needs to access high speed external bus other than a standby level. This considerably reduces the power load on the portable computer battery in this mode.

[0063] CPU **26** also sets the system control memory registers in register block **66**. State machine **64** bases operation on those register settings to obtain control words and PCM data automatically through the LPC interface **62**. The control words in the system memory (RAM **30**) are fetched into the internal registers, and the state machine **64** decodes the control words to determine if PCM or audio data is ready. If the audio data is ready, the state machine **64** continues to fetch the audio data and send it to the AC**97** Codec **42**. The control words in the system memory (RAM **30**) can also be used to indicate the sampling frequency of the PCM data. So, the state machine **64** can set AC**97** Codec **42** to the appropriate frequency before the PCM data is sent.

[0064] Those skilled in the art will recognize that a headphone or headset system may comprise further functionality than described hereinabove, e.g., a volume control, or the audio control buttons may be integrated thereto.

[0065] It should also be recognized that a special purpose circuit consistent with the invention may be integrated into a full-time compressed (and/or non-compressed) audio playing system capable of playing music regardless of the operation of the rest of the system. In this configuration, the special purpose circuit and mini-OS are provided, as well as a software driver for handling interrupts from the function buttons under Windows®. In this configuration, when the rest of the system is either fully on (**S0**) or in "sleep"