

# 4-CHANNEL HD AUDIO CODEC WITH QUAD DIGITAL MICROPHONE INTERFACE

**STAC9204/9205**

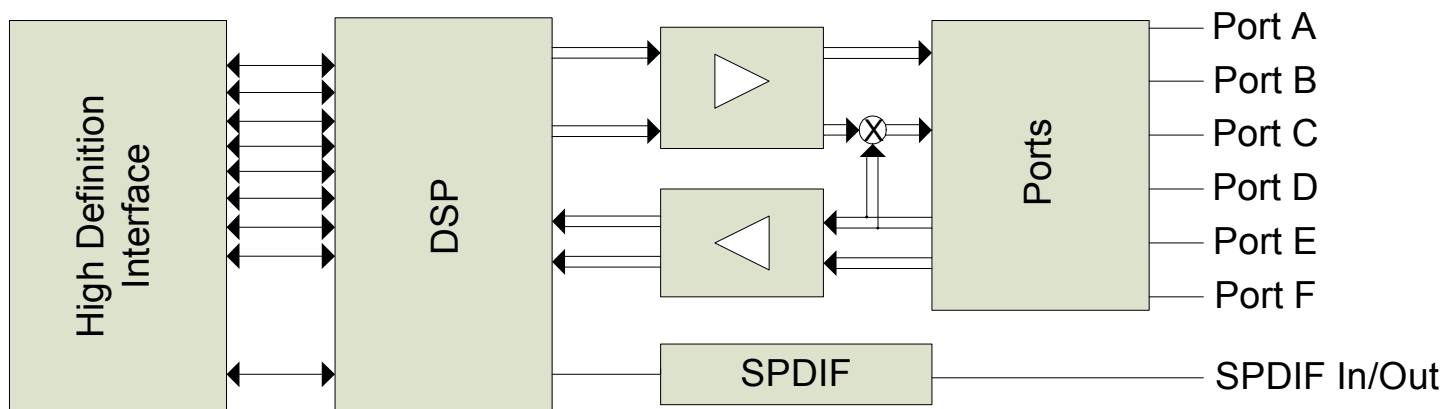
## Description

The STAC9204/9205 are high fidelity, 4-channel HD Audio CODECs that enable 2.0 Audio with simultaneous Real-Time Communication such as VoIP, conferencing, voice command and control, etc. Up to four digital microphones are supported, enabling high quality voice input for increased usability of voice applications.

## Features

- High performance SD technology
  - 103dB DAC SNR
  - 90dB ADC SNR
- Two stereo DACs and two stereo ADCs
  - Supports 2.0 Audio with simultaneous Real-Time Communication (RTC) channel such as VoIP or separate stereo audio stream
  - Provides mono output for laptop sub-woofer
- 24-bit resolution with up to 192 KHz sample rates
- Supports advanced chipsets with flexible 1.5 V to 3.3 V signaling
- Digital microphone interface
  - Direct interface to up to four digital microphones
- Analog stereo microphone
  - Microphone Boost 0, 10, 20, 30, 40dB
  - Five adjustable Vref outputs for microphone bias
- Universal Jacks™ functionality for jack retasking
- S/PDIF In and Out
- Two-pin volume up/down control
- Digital PC Beep to all outputs
- +3.3 V, +4 V, +4.5 V and +5 V analog power supply options

## Block Diagram



- Optimized and flexible power management
- 48-pin LQFP and 48-pad QFN environmental package

## Software Support

- SKPI (Kernel Processing Interface)
  - Enables plug-ins that can operate globally on all audio streams of the system
- 12 band parametric equalizer SKPI plug-in
  - Constant, system-level effects tuned to optimize a particular platform can be combined with user-mode “presets” tailored for specific acoustical environments and applications
  - System-level effects automatically disabled when external audio connections made
- Dynamics Processing SKPI plug-in
  - Enables improved voice articulation
  - Compressor/limiter allows higher average noise level without resonances

## Third Party Partners

- Dolby PC Entertainment Experience Logo Program
  - Dolby Home Theater™ (HT)
  - Dolby Sound Room™ (SR)
- Dolby Technologies
  - Dolby Headphone™, Dolby Virtual Speaker™
  - Dolby ProLogic II™, Dolby ProLogic IIx™
  - Dolby Digital Live™ (DDL)
- Intel Audio Studio™ from Sonic Focus
- Maxx Player™ from Waves
- Microphone Beam Forming, Acoustic Echo Cancellation, and Noise Suppression from Knowles™

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## 1. DESCRIPTION

### 1.1. Overview

The STAC9204/9205 are high fidelity, 4-channel HD Audio CODECs that enable 2.0 Audio with simultaneous real-time communication such as VoIP, conferencing, voice command and control, etc. Up to four digital microphones are supported enabling high quality voice input for increased usability of voice applications.

The STAC9204/9205 incorporate IDT's proprietary SD technology to achieve a DAC SNR in excess of 100dB. The higher performance and quality of IDT's audio solutions brings consumer electronics level performance to the notebook, desktop and media center PC.

The STAC9204/9205 provide stereo, 24-bit, full duplex resolution, supporting sample rates up to 192 KHz by the DAC and ADC. The STAC9204/9205 SPDIF In/Out supports sample rates of 96 KHz, 48 KHz and 44.1 KHz plus SPDIF OUT supports 88.2 KHz and 192 KHz. Additional sample rates are supported by the driver software.

The STAC9204/9205 support all desired four channel configurations, including switchable Headphone (HP) Out and Universal Jacks™ functionality for jack detection and re-tasking. The SPDIF interface provides connectivity to consumer electronic equipment like Dolby Digital decoders, powered speakers and mini-disk drives, or to a home entertainment system. All analog I/O pairs support LINE\_IN, LINE\_OUT and MIC. (Port D only supports fixed-function microphone.)

MIC inputs can be programmed with 0/10/20/30/40dB boost. For more advanced configurations, the STAC9204/9205 have five General Purpose I/O (GPIO) pins. The STAC9204/9205 also provide single ended CD input for compatibility with DRM solutions and to support legacy OS issues.

The STAC9204/9205 integrate two headphone amplifiers which are available on Ports A and D. The headphone amplifiers are dedicated to these two outputs for increased flexibility, enhanced user experience, and reduced implementation costs.

The Universal Jack capabilities allow the CODECs to detect when audio devices are connected, and allow the CODECs to be reconfigured to support these devices regardless of which port they are connected to. SPDIF input sensing is also supported. The fully parametric IDT SoftEQ can be initiated upon headphone jack insertion and removal for protection of notebook speakers.

The STAC9204/9205 operate with a 3.3 V digital supply and either 3.3 V, 4 V, 4.5 V or 5 V analog supply. They also support 1.5 V and 3.3 V HDA signaling; the correct voltage is selected dynamically based on the value of the appropriate pin.

The STAC9204/9205 are available in a 48-pin LQFP or a 48-pad QFN Environmental (ROHS) package.

## 1.2. Block Diagram

Figure 1. STAC9204/9205 / STAC9204D/9205D Block Diagram

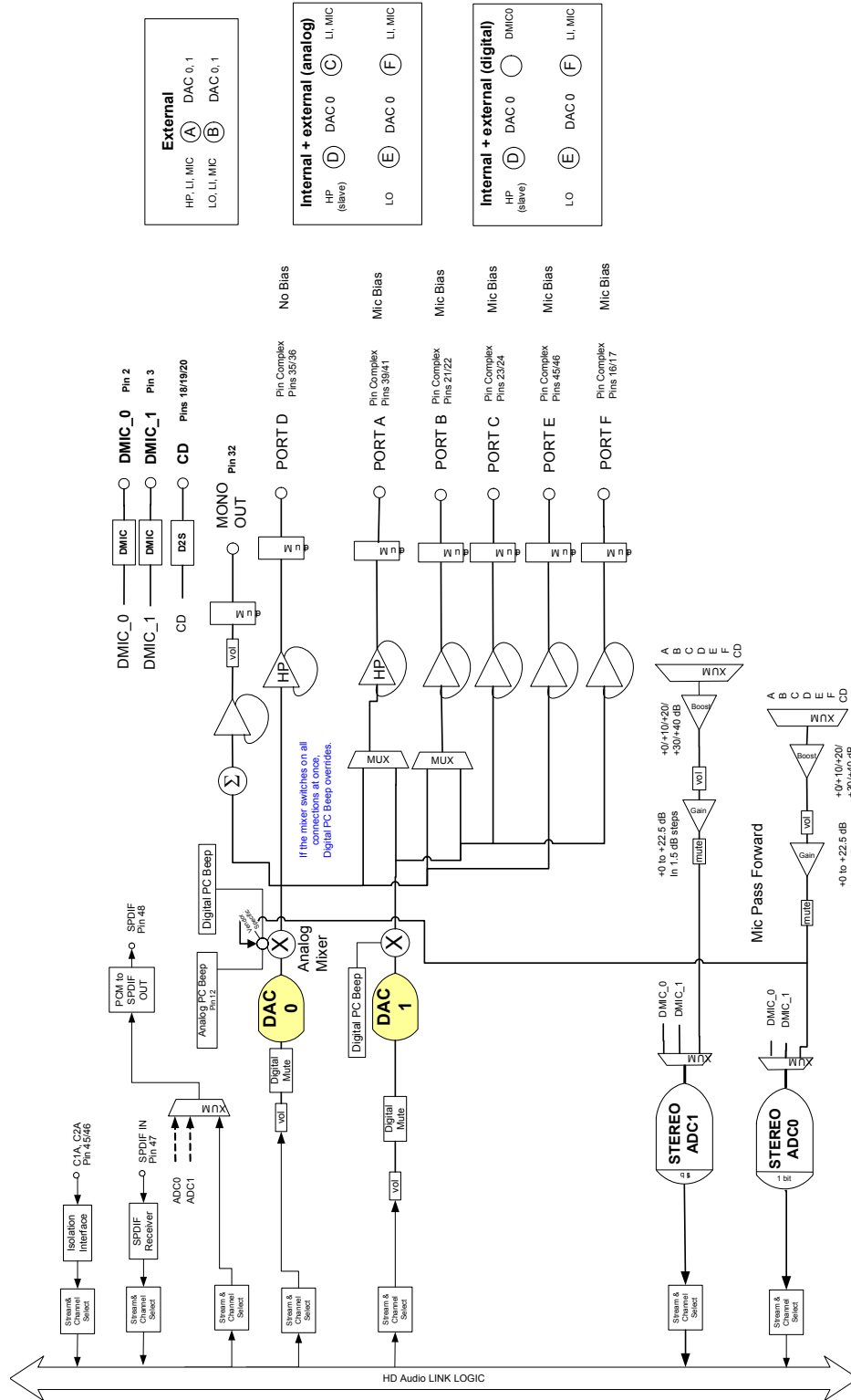
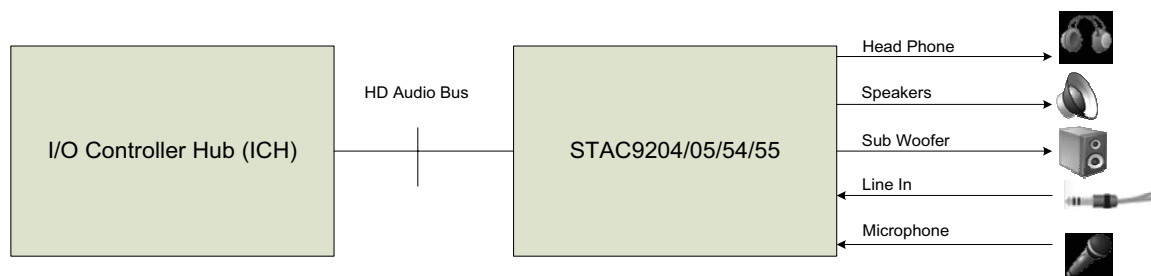


Figure 2. System Diagram



## 1.3. Detailed Description

### 1.3.1. Low-voltage High Definition Audio Link Signaling

The STAC9204/9205 are compatible with either 1.5 V or 3.3 V High Definition Audio Link signaling; the voltage selection is performed dynamically based on the input voltage of DVDD\_IO. Note that DVDD\_IO is not a logic configuration pin but provides the digital power supply to be used for the High Definition Audio Link signals.

When in 1.5 V mode, the STAC9204/9205 can correctly decode BITCLK, SYNC, RESET# and SDO because they operate at 1.5 V. Additionally, it will drive SDI\_CODEC at 1.5 V. None of the GPIOs are affected, as they always function at their nominal voltage (DVDD or AVDD).

### 1.3.2. Digital Microphone Support

The digital microphone interface permits connection of digital microphones to the STAC9205 via the DMIC0, DMIC1, and DMIC\_CLK three-pin interface. The DMIC0 and DMIC1 pins carry either 1 or 2 channels of digital microphone data to the STAC9205. In the event that a single microphone is used, the data is routed to both ADC channels.

The DMIC\_CLK output is programmable from 1.176 MHz to 4.704 MHz in 1.176 MHz increments and is synchronous to the 24 MHz internal clock. The default frequency is 2.352 MHz.

The STAC9205 supports the digital microphone configurations listed in Table 1.

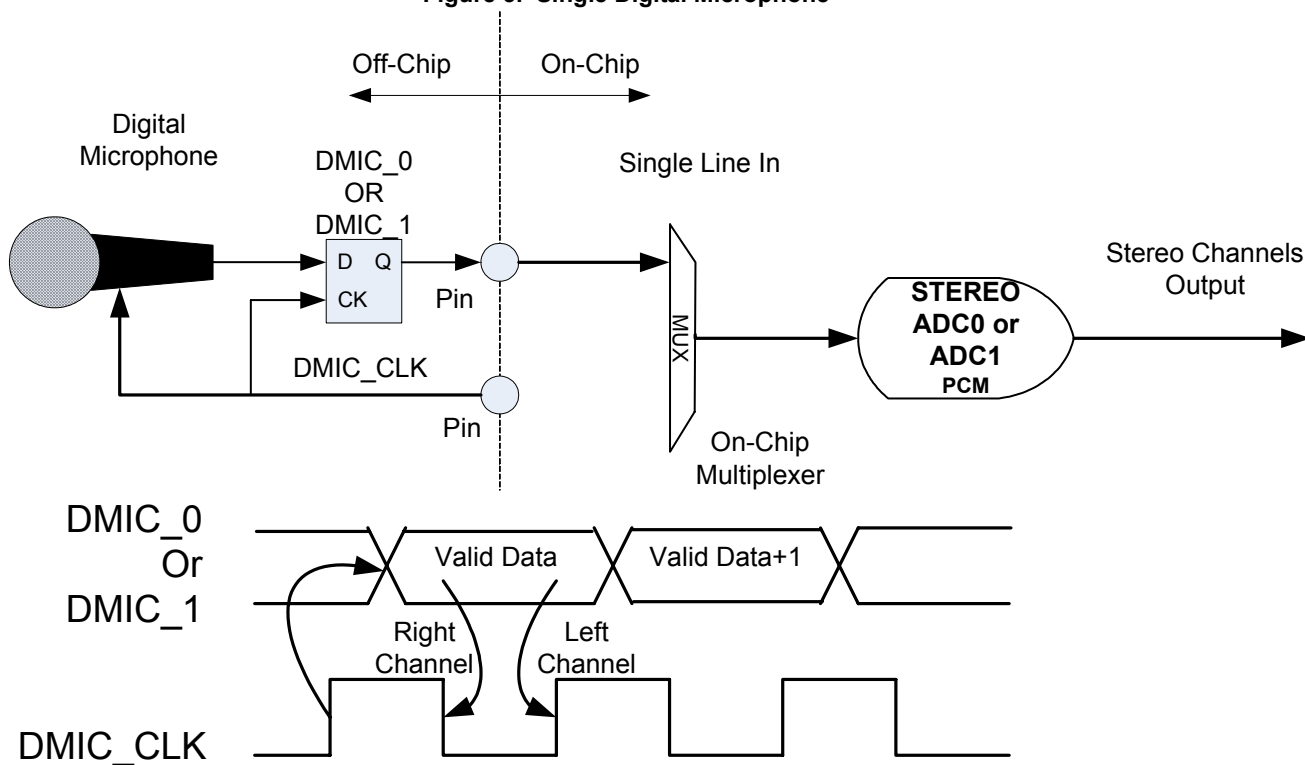
Table 1. STAC9205 Valid Digital Microphone Configurations

| Digital Mics | Data Sample                                                                           | ADC Conn. | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|---------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0            | N/A                                                                                   | N/A       | No Digital Microphones                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1            | Single Edge (see Figure 3)                                                            | 0 or 1    | Available on either DMIC_0 or DMIC_1<br>Both ADC Channels process data, may be in-phase or out-of-phase by 1/2 DMIC_CLK period depending upon external configuration and timing                                                                                                                                                                                                                                                                                                                              |
| 2            | Double Edge on either DMIC_0 or 1 (see Figure 4)<br>OR<br>Single Edge on DMIC_0 and 1 | 0 or 1    | Available on either DMIC_0 or DMIC_1<br>External logic required to support sampling on a single Digital Microphone pin channel on rising edge and second Digital Microphone right channel on falling edge of DMIC_CLK for those digital microphones that don't support alternative clock edge capability. If both DMIC_0 and DMIC_1 are used to support 2 digital microphones, 2 separate ADC units will be used, however, this configuration is not recommended since it consumes two stereo ADC resources. |
| 3            | Double Edge on one DMIC pin and Single Edge on the second DMIC pin.                   | 0 or 1    | Requires both DMIC_0 or DMIC_1<br>External logic required to support sampling on a single Digital Microphone pin channel on rising edge and second Digital Microphone right channel on falling edge of DMIC_CLK for those digital microphones that don't support alternative clock edge capability. Two ADC units are required to support this configuration                                                                                                                                                 |
| 4            | Double Edge (see Figure 5)                                                            | 0 or 1    | Connected to DMIC_0 and DMIC_1<br>External logic required to support sampling on a single Digital Microphone pin channel on rising edge and second Digital Microphone right channel on falling edge of DMIC_CLK for those digital microphones that don't support alternative clock edge capability. Two ADC units are required to support this configuration                                                                                                                                                 |

Table 2. DMIC\_CLK, DMIC\_0 and DMIC\_1 Operation During Power States

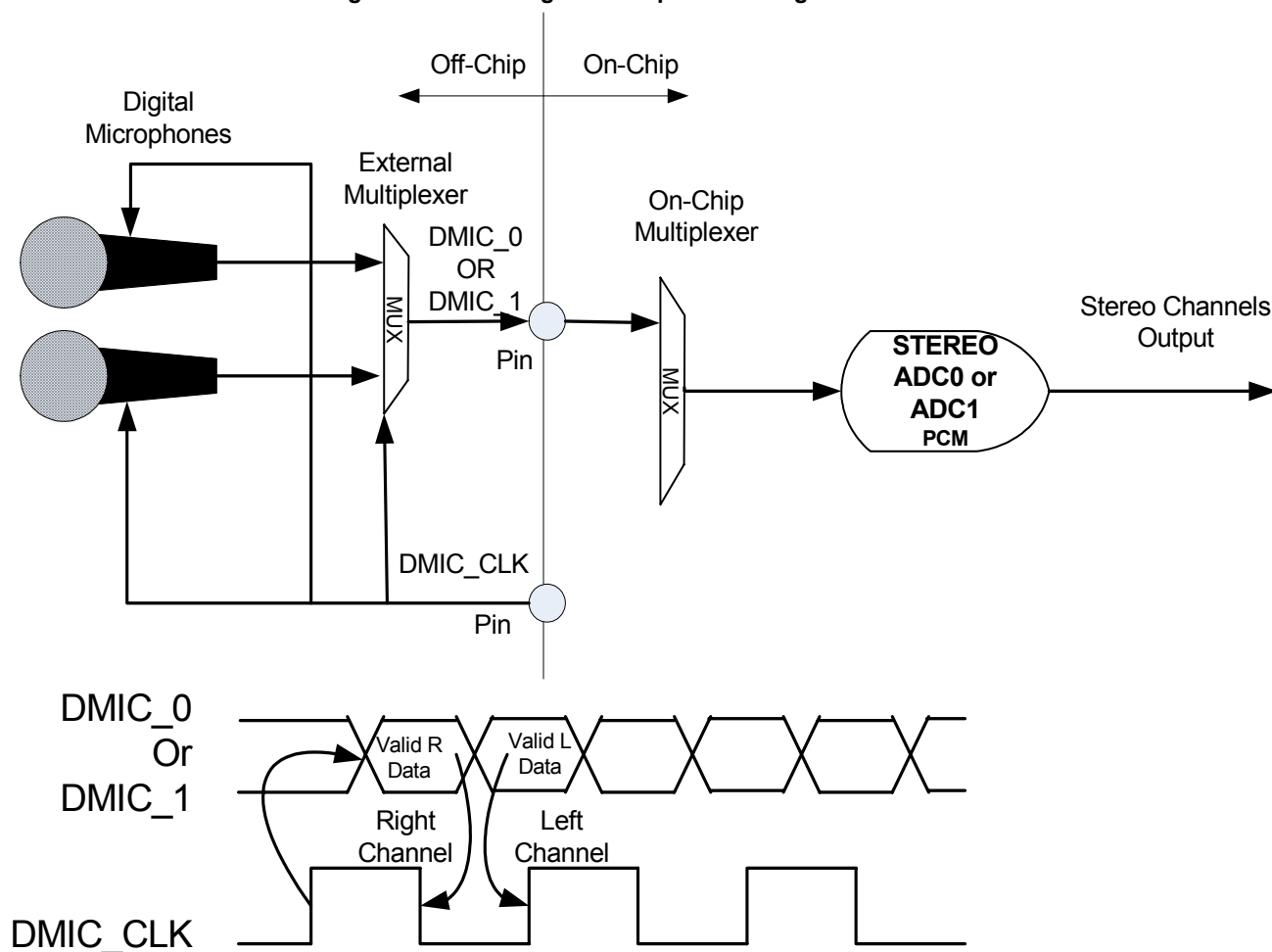
| Power State | DMIC Widget Enabled? | DMIC_CLK Output | DMIC_0,1       | Notes                                                                                                                 |
|-------------|----------------------|-----------------|----------------|-----------------------------------------------------------------------------------------------------------------------|
| D0          | Yes                  | Clock Capable   | Input Capable  | DMIC_CLK Output is Enabled when either DMIC_0 or DMIC_1 input widget is enabled. Otherwise, the DMIC_CLK remains low. |
| D1          | Yes                  | Clock Disabled  | Input Disabled | DMIC_CLK Output is Enabled when either DMIC_0 or DMIC_1 input widget is enabled. Otherwise, the DMIC_CLK remains low. |
| D2          | Yes                  | Clock Disabled  | Input Disabled | DMIC_CLK remains low                                                                                                  |
| D3          | Yes                  | Clock Disabled  | Input Disabled | DMIC_CLK remains low                                                                                                  |
| D0-D3       | No                   | Clock Disabled  | Input Disabled | DMIC_CLK is HIGH-Z with weak pull-down                                                                                |

Figure 3. Single Digital Microphone



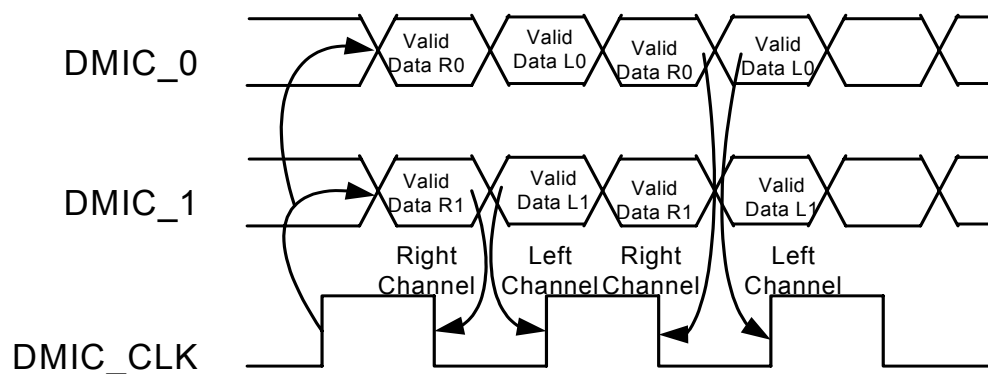
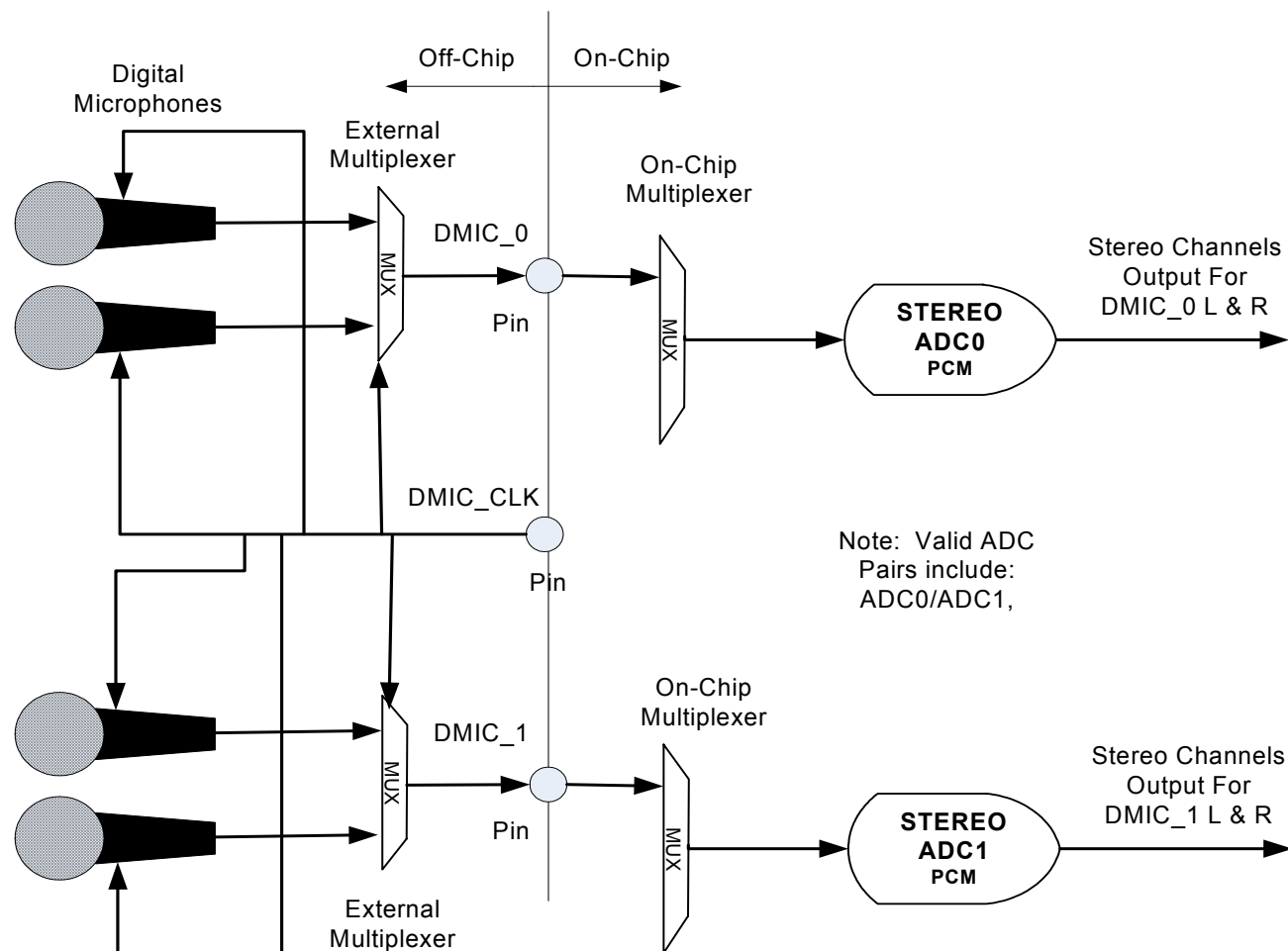
Note: Data is ported to both left and right channels.

Figure 4. Stereo Digital Microphone Configuration



*Note: Some Digital Microphone Implementations support data on either edge, therefore the external mux may not be required.*

Figure 5. Quad Digital Microphone Configuration



*Note: Some Digital Microphone Implementations support data on either edge, therefore the external mux may not be required*

### 1.3.3. *Volume/Digital Microphone/GPIO Selection*

For the STAC9205, three functions are available on pins 2 and 3. To determine which function is actually enabled on these pins, the order of precedence is followed:

1. If the GPIOs are enabled through the Audio Function Group, they override both Volume Control and Digital Microphones.
2. If the GPIOs are not enabled through the Audio Function Group, then, at reset, the Volume control is enabled with a weak pull-up.
3. If BIOS or other software application enables either Digital Microphone input through the Configuration Default Register, the Volume is disconnected and the pull-ups are disconnected, with the weak pull-downs enabled.

For STAC9204, Digital Microphones are not available, but the other two functions operate with the same order of precedence.

### 1.3.4. *VRefOut/GPIO Selection*

Two functions are available on pins 30 and 31. To determine which function is enabled on the two pins, the order of precedence followed is:

1. If the GPIOs are enabled, they override VRefOut-E or VRefOut-F.
2. If the GPIOs are not activated through the Audio Function Group, then, at reset, the VRefOut pins are enabled.

If using the GPIOs as inputs, incorporate 10 KW external pull-ups or the GPI will not function correctly.

### 1.3.5. *SPDIF Input*

SPDIF IN can operate at 44.1 KHz, 48 KHz or 96 KHz, and implements internal Jack Sensing.

A sophisticated digital PLL allows automatic rate detection and accurate data recovery. The ability to directly accept consumer SPDIF voltage levels eliminates the need for costly external receiver ICs. Advanced features such as record-slot-select and SPDIF\_IN routing to the DAC allow for simultaneous record and play.

### 1.3.6. *SPDIF Output*

SPDIF Output supports 44.1 KHz, 48 KHz, 88.2 KHz, 96 KHz and 192 KHz sample rates, as defined in the Intel High Definition Audio Specification, with resolutions up to 24 bits. This insures compatibility with all consumer audio gear and allows for convenient integration into home theater systems and media center PCs.

### 1.3.7. Mono Output

MONO Output is supported on pin 32 and has an independent mute and volume control. The MONO Output derives input from the output of the summing node after DAC0. The following analog signals feed the summing amplifier that feeds the MONO Output summing amplifier:

- DAC0 Output: When enabled, both DAC0 Outputs are summed together.
- Analog PC Beep: Sourced from pin 12.
- ADC Input: Stereo analog feed into the stereo ADC input.
- The combination of the stereo channels from DAC0 are combined into a single analog signal with a -6dB degradation in signal strength.

*Note: MONO Output only works with the IDT Driver.*

### 1.3.8. Universal Jacks™

The Universal Jacks™ technology allows for the greatest flexibility in board design and implementation.

For the STAC9204/9205 the Universal Jacks™ capabilities are as follows<sup>1</sup>:

- Ports A and D<sup>2</sup> support<sup>3</sup>:
  - Headphone Out
  - Line Out
  - Line In
  - Microphone, with 0/10/20/30/40 dB Microphone boost<sup>4</sup>
- Ports B, C, E, and F support<sup>3</sup>:
  - Line Out
  - Line In
  - Microphone, with 0/10/20/30/40 dB Microphone boost<sup>4</sup>
- Mono Output cannot be reconfigured

*Note: 1) On the STAC9204/9205, only one function can be selected on each pin pair at a time. For example, a pin pair cannot be configured as an input and output at the same time. Configuration can be changed at any time.*

*Note: 2) Port D does not provide a microphone bias pin. Therefore only an internal, fixed-function microphone can be supported.*

*Note: 3) Headphone capabilities are provided on Ports A and D, however, audio performance degrades when 2 headphones are enabled.*

*Note: 4) When the 40dB microphone boost feature is enabled, additional gain increases greater than 6dB may result in significant audio quality degradation of the microphone audio input. In particular, when the 40dB microphone boost is active, the SNR, THD+N and DC offset will significantly degrade regardless of the input signal level.*

#### 1.3.8.1. Jack Detect

SENSE\_A pin is used to detect the presence of plugs in ports A, B, C, and D. SENSE\_B pin is used to detect the presence of plugs in ports E and F. Refer to the STAC9204/9205 reference design for port detect circuitry.

For different analog supply voltages, Table 3 summarizes what ports can be detected and the resistor tolerance needed.

**Table 3. Jack Detect**

| AVdd Nominal Voltage<br>(+/- 5%) | Resistor Tolerance<br>Sense A<br>(If port D is used) | Resistor Tolerance<br>Sense A<br>(If port D is not used) | Resistor Tolerance<br>Sense B<br>(For ports E and F) |
|----------------------------------|------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------|
| 5 V                              | 1%                                                   | 1%                                                       | 1%                                                   |
| 4.5 V                            | 1%                                                   | 1%                                                       | 1%                                                   |
| 4 V                              | 0.50%                                                | 1%                                                       | 1%                                                   |
| 3.3 V                            | 0.10%                                                | 1%                                                       | 1%                                                   |

Includes pull-up resistors on Sense A/B and series resistors between jack switch and Sense A/B. See the reference design for more information on Jack Detect implementation.

### 1.3.8.2. Impedance Sense

Impedance Sensing is accomplished by on-chip circuitry that tests the impedance at the pin of the chip and compares it to internal reference impedance. Table 4 describes the bin information and the codes that are returned when the Pin Widget Impedance field in the Port Pin Sense widget is read. Please note that even under the best conditions, there is no method to guarantee 100% impedance sensing due to variations in external circuitry and impedance overlap of devices that can be plugged into a jack. The impedance sense table reflects both standard Line Out and Headphone output drivers.

**Table 4. Impedance Sense**

| Bins | Return Hex Code | Measured Impedance Level                  | General Device Detected            |
|------|-----------------|-------------------------------------------|------------------------------------|
| 000b | 0064h           | Impedance < 300 $\Omega$                  | Passive Speakers, Headset Speakers |
| 001b | 012Ch           | Impedance = 300 $\Omega$ +/- 25%          | Some Headset Speakers              |
| 010b | 028Ah           | 300 $\Omega$ > Impedance < 1275 $\Omega$  | Some Microphones                   |
| 011b | 03E8h           | Impedance = 1275 $\Omega$ +/- 25%         | Microphones                        |
| 100b | 07D0h           | 1275 $\Omega$ > Impedance < 2000 $\Omega$ | Microphones                        |
| 101b | 0BB8h           | Impedance = 2000 $\Omega$ +/- 25%         | Amplified Speakers                 |
| 110b | 2710h           | > 2000 $\Omega$                           | Amplified Speakers, Line In        |
| 111b | 2710h           | > 2000 $\Omega$                           | Amplified Speakers, Line In        |

### 1.3.9. Power Management

Table 5 describes the active functionality in each power state.

**Table 5. Power Management**

| Function                | D0-D1 | D2  | D3-default       | D3-alternate              |
|-------------------------|-------|-----|------------------|---------------------------|
| DAC                     | On    | Off | Off              | Off                       |
| ADC                     | On    | Off | Off              | Off                       |
| Ports                   | On    | On  | Off              | Off                       |
| Headphone (HP) Amps     | On    | On  | Off <sup>1</sup> | Off                       |
| VrefOut                 | On    | On  | Off              | Off                       |
| Port Sense              | On    | On  | On <sup>2</sup>  | Programmable              |
| AZ-Link                 | On    | On  | On <sup>3</sup>  | Programmable <sup>4</sup> |
| VAG                     | On    | On  | On <sup>5</sup>  | Programmable              |
| Differential Amplifiers | On    | On  | Off              | Off                       |

1. VAG is kept active when amplifiers are turned off.
2. If BITCLK is not active, a wake event must be generated. Otherwise an unsolicited response is sent.
3. Not active if BITCLK is not running.
4. This mode can only be exited with a Bus Reset.
5. VAG is always ramped up and down gradually, except in the case of a sudden power removal.

The D3-default state is available for HD Audio compliance. The programmable values exposed via vendor-specific settings are under the IDT Device Driver control for further power reduction.

The default power state for the Audio Function Group after reset is D3-default.

### 1.3.10. Analog PC-Beep

PC Beep may need to be active on power up, in which case the BIOS is responsible for enabling it by setting AnalogBeepEn in the AFG AnaCtrl widget. The PC\_BEEP input is routed directly to the MONO\_OUT, LINE\_OUT and HP\_OUT pins of the CODEC. Because the PC\_BEEP input drive is often a full scale digital signal, some resistive attenuation of the PC\_BEEP input is recommended to keep the beep tone within reasonable volume levels. The user should mute this input before using any other mixer input because the PC Beep input can contribute noise to the lineout during normal operation.

Analog PC-Beep is not supported during Link Reset.

### 1.3.11. Headphone Drivers

Performance degradation will occur when using two headphones simultaneously. See the electrical specifications for details.

**1.3.12. Device IDs****Table 6. Device IDs**

| Part Number | DAC SNR | DAC | ADC | Digital Mics | Dolby     | VID   | DID   |
|-------------|---------|-----|-----|--------------|-----------|-------|-------|
| STAC9205X   | 103dB   | 4   | 4   | Yes          | No        | 8384h | 76A0h |
| STAC9205D   | 103dB   | 4   | 4   | Yes          | Yes-HT/SR | 8384h | 76A1h |
| STAC9204X   | 103dB   | 4   | 4   | No           | No        | 8384h | 76A2h |
| STAC9204D   | 103dB   | 4   | 4   | No           | Yes-HT/SR | 8384h | 76A3h |

*Note: HT/SR refers to Dolby Home Theater (HT) and Sound Room (SR), logos of the Dolby PC Entertainment Experience Logo program.*

## 2. CHARACTERISTICS

### 2.1. Electrical Specifications

#### 2.1.1. Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the STAC9204/9205. These ratings, which are standard values for IDT commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

| Item                                  | Pin  | Maximum Rating                                                                                    |
|---------------------------------------|------|---------------------------------------------------------------------------------------------------|
| Analog maximum supply voltage         | AVdd | 6 Volts                                                                                           |
| Digital maximum supply voltage        | DVdd | 5.5 Volts                                                                                         |
| VREFOUT output current                |      | 5 mA                                                                                              |
| Voltage on any pin relative to ground |      | Vss - 0.3 V to Vdd + 0.3 V                                                                        |
| Operating temperature                 |      | 0 °C to +70 °C                                                                                    |
| Storage temperature                   |      | -55 °C to +125 °C                                                                                 |
| Soldering temperature                 |      | Soldering temperature information for all available packages begins on <a href="#">page 189</a> . |

#### 2.1.2. Recommended Operating Conditions

| Parameter                                                           |                             | Min.  | Typ. | Max.  | Units |
|---------------------------------------------------------------------|-----------------------------|-------|------|-------|-------|
| Power Supply Voltage                                                | Digital - 3.3 V             | 3.135 | 3.3  | 3.465 | V     |
|                                                                     | Analog - 3.3 V              | 3.135 | 3.3  | 3.465 | V     |
| (Note: With Supply Override Enable Bit set to force 5 V operation.) | Analog - 4 V                | 3.8   | 4    | 4.2   | V     |
|                                                                     | Analog - 4.5 V              | 4.275 | 4.5  | 4.725 | V     |
|                                                                     | Analog - 5 V                | 4.75  | 5    | 5.25  | V     |
| Ambient Operating Temperature                                       |                             | 0     |      | +70   | °C    |
| Case Temperature                                                    | T <sub>case</sub> (48-LQFP) |       |      | +90   | °C    |
|                                                                     | T <sub>case</sub> (48-QFN)  |       |      | +95   | °C    |

**ESD:** The STAC9204/9205 is an ESD (electrostatic discharge) sensitive device. The human body and test equipment can accumulate and discharge electrostatic charges up to 4000 Volts without detection. Even though the STAC9204/9205 implements internal ESD protection circuitry, proper ESD precautions should be followed to avoid damaging the functionality or performance.

## 2.2. STAC9204/9205 5.0V, 4.5V, 4.0V, and 3.3V Analog Performance Characteristics

(Tambient = 25 °C, AVdd = Supply ± 5%, DVdd = 3.3V ± 5%, AVss=DVss=0V; 1 kHz input sine wave; Sample Frequency = 48 kHz; 0 dB = 1 VRMS, 10KW//50pF load, Testbench Characterization BW: 20 Hz – 20 kHz, 0 dB settings on all gain stages)

**Table 7. Performance Characteristics**

| Parameter                                                                            | Conditions                                    | AVdd                       | Min | Typ                     | Max | Unit |
|--------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------|-----|-------------------------|-----|------|
| <b>Digital to Analog Converters</b>                                                  |                                               |                            |     |                         |     |      |
| Resolution                                                                           |                                               | All                        |     | 24                      |     | Bits |
| SNR - DAC to All Line-Out Ports<br>(Note 4)                                          | PCM data, (Note 9)                            | 5V<br>4.5V<br>4.0V<br>3.3V |     | 103<br>101<br>100<br>98 |     | dB   |
| THD+N - DAC to All Line-Out Ports                                                    | -3dB Signal, PCM data,<br>(Note 9)            | 5V<br>4.5V<br>4.0V<br>3.3V |     | 87<br>85<br>84<br>82    |     | dB   |
| SNR - DAC to All Headphone Ports<br>(Note 4)                                         | 10KΩ load, PCM data, (Note 9)                 | 5V<br>4.5V<br>4.0V<br>3.3V |     | 103<br>101<br>100<br>98 |     | dB   |
| THD+N - DAC to All Headphone<br>Ports (Note 3)                                       | -3dB Signal, 10KΩ load, PCM<br>data, (Note 9) | 5V<br>4.5V<br>4.0V<br>3.3V |     | 85<br>83<br>82<br>80    |     | dB   |
| SNR - DAC to All Headphone Ports<br>with 2 Headphone Outputs<br>Operating (Note 4)   | 10KΩ load, PCM data, (Note 9)                 | 5V<br>4.5V<br>4.0V<br>3.3V |     | 100<br>98<br>97<br>95   |     | dB   |
| THD+N - DAC to All Headphone<br>Ports with 2 Headphone Outputs<br>Operating (Note 3) | -3dB Signal, 10KΩ load, PCM<br>data, (Note 9) | 5V<br>4.5V<br>4.0V<br>3.3V |     | 82<br>80<br>79<br>77    |     | dB   |
| SNR - DAC to All Headphone Ports<br>(Note 4)                                         | 32Ω load, PCM data, (Note 9)                  | 5V<br>4.5V<br>4.0V<br>3.3V |     | 103<br>101<br>100<br>98 |     | dB   |
| THD+N - DAC to All Headphone<br>Ports (Note 3)                                       | -3dB Signal, 32Ω load, PCM<br>data, (Note 9)  | 5V<br>4.5V<br>4.0V<br>3.3V |     | 80<br>80<br>78<br>76    |     | dB   |
| Any Analog Input to DAC Crosstalk                                                    | 10KHz Signal Frequency                        | All                        | -   | -80                     | -   | dB   |
| Any Analog Input to DAC Crosstalk                                                    | 1KHz Signal Frequency                         | All                        | -   | -85                     | -   | dB   |
| Gain Error                                                                           | (Note 9)                                      | All                        |     |                         | 0.5 | dB   |
| Interchannel Gain Mismatch                                                           | (Note 9)                                      | All                        |     |                         | 0.5 | dB   |

| Parameter                                         | Conditions                      | AVdd                       | Min                              | Typ                      | Max    | Unit   |
|---------------------------------------------------|---------------------------------|----------------------------|----------------------------------|--------------------------|--------|--------|
| Dynamic Range: PCM to All Analog Outputs (Note 1) | -60dB signal level              | 5V<br>4.5V<br>4.0V<br>3.3V | -                                | 95<br>93<br>92<br>90     | -      | dB     |
| D/A Digital Filter Pass Band (Note 5)             |                                 | All                        | 20                               | -                        | 21,000 | Hz     |
| D/A Digital Filter Transition Band                |                                 | All                        | 21,000                           | -                        | 31,000 | Hz     |
| D/A Digital Filter Stop Band                      |                                 | All                        | 31,000                           | -                        | -      | Hz     |
| D/A Digital Filter Stop Band Rejection (Note 6)   |                                 | All                        | -75                              | -                        | -      | dB     |
| D/A Out-of-Band Rejection (Notes 6 and 7)         |                                 | All                        | -55                              | -                        | -      | dB     |
| Group Delay (48KHz sample rate)                   |                                 | All                        | -                                | -                        | 1      | ms     |
| Attenuation, Gain Step Size DIGITAL               |                                 | All                        | -                                | 0.75                     | -      | dB     |
| Gain Drift                                        |                                 | All                        | -                                | 100                      | -      | ppm/°C |
| DAC Offset Voltage                                |                                 | All                        | -                                | 20                       | 100    | mV     |
| Deviation from Linear Phase                       |                                 | All                        | -                                | 1                        | 10     | deg.   |
| <b>Analog Outputs</b>                             |                                 |                            |                                  |                          |        |        |
| Full Scale All Line-Outs                          | DAC PCM Data<br><br>* (Note 11) | 5V<br>4.5V<br>4.0V<br>3.3V | 1.00<br>1.00<br>1.00 (*)<br>0.70 | -                        | -      | Vrms   |
| Full Scale All Line-Outs                          | DAC PCM Data<br><br>* (Note 11) | 5V<br>4.5V<br>4.0V<br>3.3V | 2.83<br>2.83<br>2.83 (*)<br>2.00 | -                        | -      | Vp-p   |
| All Headphone Capable Outputs                     | 32Ω load<br><br>* (Note 11)     | 5V<br>4.5V<br>4.0V<br>3.3V | 31<br>31<br>31 (*)<br>15         | 50<br>50<br>50 (*)<br>25 | -      | mWpeak |
| <b>Analog inputs</b>                              |                                 |                            |                                  |                          |        |        |
| Full Scale Input Voltage                          | 0dB Boost @4.75V                | 5V<br>4.5V<br>4.0V<br>3.3V | 1.00                             | -                        | -      | Vrms   |
| All Analog Inputs with boost                      | 10dB Boost                      | 5V<br>4.5V<br>4.0V<br>3.3V | 0.31                             | -                        | -      | Vrms   |
| All Analog Inputs with boost                      | 20dB Boost                      | 5V<br>4.5V<br>4.0V<br>3.3V | 0.10                             | -                        | -      | Vrms   |

| Parameter                                                         | Conditions                                      | AVdd                       | Min    | Typ                  | Max    | Unit       |
|-------------------------------------------------------------------|-------------------------------------------------|----------------------------|--------|----------------------|--------|------------|
| All Analog Inputs with boost                                      | 30dB Boost                                      | 5V<br>4.5V<br>4.0V<br>3.3V | 0.03   | -                    | -      | Vrms       |
| All Analog Inputs with boost                                      | 40dB Boost<br>(Not recommended)                 | 5V<br>4.5V<br>4.0V<br>3.3V | 0.01   | -                    | -      | Vrms       |
| Input Impedance                                                   |                                                 | All                        | -      | 50                   | -      | K $\Omega$ |
| Input Capacitance                                                 |                                                 | All                        | -      | 15                   | -      | pF         |
| <b>Analog to Digital Converter</b>                                |                                                 |                            |        |                      |        |            |
| Resolution                                                        |                                                 | All                        |        | 24                   |        | Bits       |
| Dynamic Range, All Analog Inputs to A/D (Note 1)                  | High Pass Filter Enabled, 1Vrms Input, No boost | 5V<br>4.5V<br>4.0V<br>3.3V | 88     | 98<br>96<br>94<br>90 |        | dB         |
| <b>SNR</b> All Analog Inputs to A/D (Note 4)                      | High Pass Filter enabled, -3dBV input Level     | 5V<br>4.5V<br>4.0V<br>3.3V | 88     | 98<br>96<br>94<br>90 |        | dB         |
| <b>THD+N</b> All Analog Inputs to A/D (Note 3)                    | High Pass Filter enabled, -3dBV input Level     | 5V<br>4.5V<br>4.0V<br>3.3V |        | 85<br>80<br>74<br>72 |        | dB         |
| Analog Frequency Response (Note 2)                                |                                                 | All                        | 10     | -                    | 30,000 | Hz         |
| A/D Digital Filter Pass Band (Note 5)                             |                                                 | All                        | 20     | -                    | 21,000 | Hz         |
| A/D Digital Filter Transition Band                                |                                                 | All                        | 21,000 | -                    | 31,000 | Hz         |
| A/D Digital Filter Stop Band                                      |                                                 | All                        | 31,000 | -                    | -      | Hz         |
| A/D Digital Filter Stop Band Rejection (Note 6)                   |                                                 | All                        | -90    | -                    | -      | dB         |
| Group Delay (48KHz sample rate)                                   |                                                 | All                        | -      | -                    | 1      | ms         |
| Any Analog Input to ADC Crosstalk                                 | 10KHz Signal Frequency                          | All                        | -      | -80                  | -      | dB         |
| Any Analog Input to ADC Crosstalk                                 | 1KHz Signal Frequency                           | All                        | -      | -85                  | -      | dB         |
| Spurious Tone Rejection                                           |                                                 | All                        | -      | -100                 | -      | dB         |
| Attenuation, Gain Step Size<br>ANALOG                             |                                                 | All                        | -      | 1.5                  | -      | dB         |
| Interchannel Gain Mismatch ADC                                    |                                                 | All                        | -      | -                    | 0.5    | dB         |
| Noise Floor when 40dB Mic Boost Enabled<br>(40dB not recommended) |                                                 | All                        |        |                      | 0.01   | mV         |
| 40dB Mic Boost Enabled SNR<br>(40dB not recommended)              | 5mV Input                                       | All                        |        | 60                   |        | dB         |

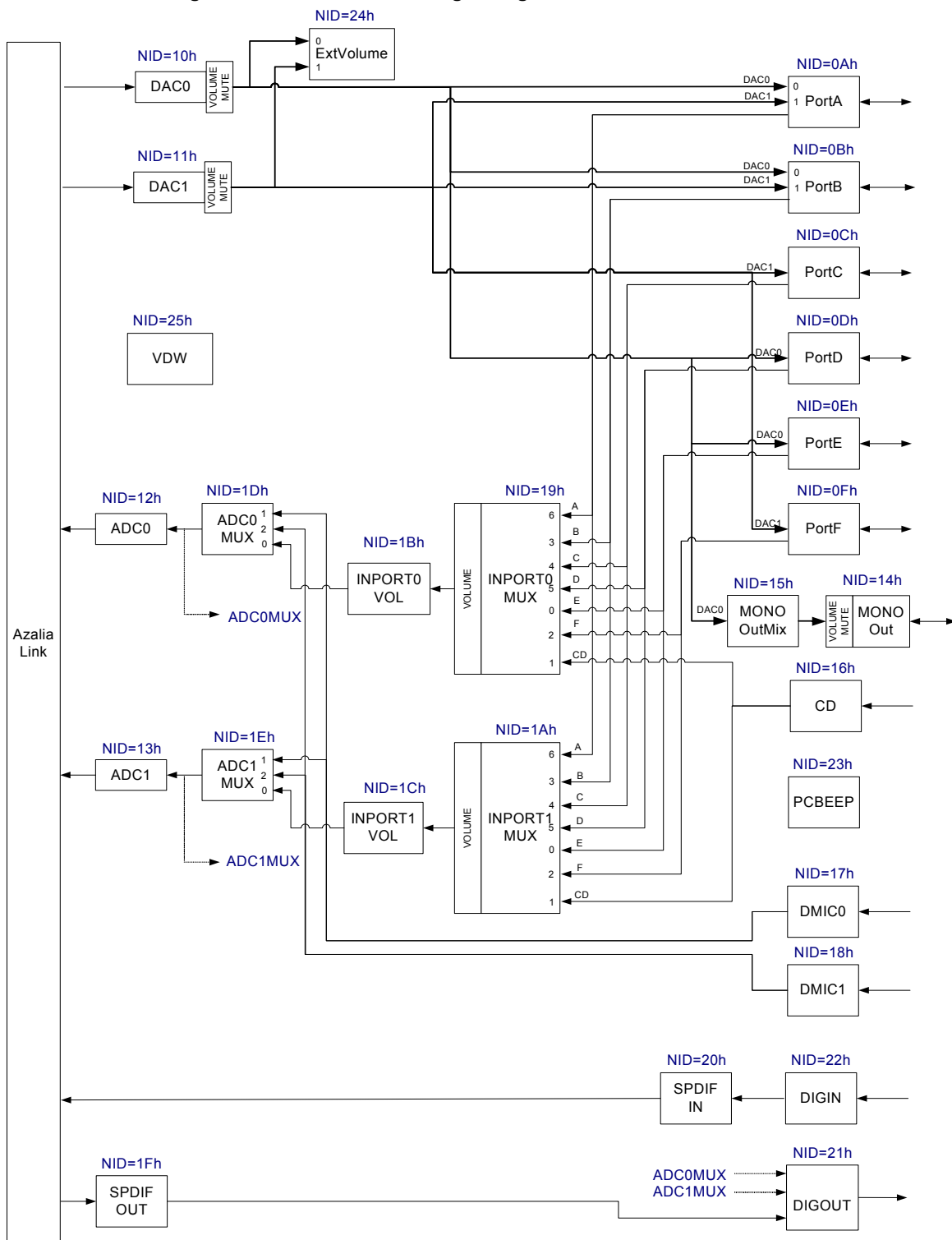
| Parameter                                              | Conditions   | AVdd | Min | Typ           | Max | Unit |
|--------------------------------------------------------|--------------|------|-----|---------------|-----|------|
| 40dB Mic Boost Enabled THD+N<br>(40dB not recommended) | 5mV Input    | All  |     | 55            |     | dB   |
| <b>Power Supply (Note 10)</b>                          |              |      |     |               |     |      |
| Power Supply Rejection Ratio                           | 1kHz         | All  | -   | -80           | -   | dB   |
| Power Supply Rejection Ratio                           | 20kHz        | All  | -   | -70           | -   | dB   |
| D0 Didd                                                | 3.3V         |      |     | 70            | 80  | mA   |
| D0 Aidd                                                | 5.0V<br>3.3V |      |     | 65<br>50      |     | mA   |
| D1 Didd                                                | 3.3V         |      |     | 70            | 80  | mA   |
| D1 Aidd                                                | 5.0V<br>3.3V |      |     | 65<br>50      |     | mA   |
| D2 Didd                                                | 3.3V         |      |     | 25            | 35  | mA   |
| D2 Aidd                                                | 5.0V<br>3.3V |      |     | 43<br>35      |     | mA   |
| D3 Didd                                                | 3.3V         |      |     | 20            | 35  | mA   |
| D3 Aidd                                                | 5.0V<br>3.3V |      |     | 20<br>17      |     | mA   |
| One Stereo ADC Didd                                    | 3.3V         |      |     | 3             | 5   | mA   |
| One Stereo ADC Aidd<br>(note 12)                       | 5.0V<br>3.3V |      |     | 3             | 5   | mA   |
| One Stereo DAC Didd                                    | 3.3V         |      |     | 3             | 5   | mA   |
| One Stereo DAC Aidd<br>(Note 12)                       | 5.0V<br>3.3V |      |     | 10            | 13  | mA   |
| <b>CD Input</b>                                        |              |      |     |               |     |      |
| CD Common Mode Rejection (CMR)                         |              | All  | 50  | 55            |     | dB   |
| <b>Voltage Reference Outputs</b>                       |              |      |     |               |     |      |
| VREFout (Note 8)                                       |              | All  | -   | 0.5 X<br>AVdd | -   | V    |
| VREFILT (VAG)                                          |              | All  |     | 0.45X<br>AVdd |     | V    |
| <b>Phased Locked Loop</b>                              |              |      |     |               |     |      |
| PLL lock time                                          |              | All  |     | 96            | 200 | usec |
| PLL (or HD Audio Bit CLK)<br>24MHz clock jitter        |              | All  |     | 150           | 500 | psec |

1. Ratio of Full Scale signal to noise output with -60dB signal, measured "A weighted" over a 20 Hz to a 20 kHz bandwidth.
2.  $\pm 3$ dB limits for Line Output & 0 dB gain, at -20dBV
3. Amplitude of THD+N, measured with A-weighting filter, over 20 Hz to 20 kHz bandwidth.
4. Ratio of Full Scale signal to idle channel noise output is measured "A weighted" over a 20 Hz to a 20 kHz bandwidth. (AES17-1991 Idle Channel Noise or EIAJ CP-307 Signal-to-noise Ratio).
5. Peak-to-Peak Ripple over Passband meets  $\pm 0.25$ dB limits, 48 kHz Sample Frequency.
6. Stop Band rejection determines filter requirements. Out-of-Band rejection determines audible noise.

7. The integrated Out-of-Band noise generated by the DAC process, during normal PCM audio playback, over a bandwidth 28.8 to 100 kHz, with respect to a 1 Vrms DAC output.
8. Can be set to 0.5 or 0.8 AVdd.
9. Analog mixer disabled. See Figure 2
10.  $Didd = Didd\_Core + Didd\_IO$  (with all converters enabled and no playback)
11. Requires setting the power supply override bit.
12. Current reduction by disabling.

### 3. WIDGET INFORMATION AND SUPPORTED COMMAND VERBS

Figure 6. STAC9204/9205 Widget Diagram



### 3.1. Widget List STAC9204/9205

Table 8. High Definition Audio Widget

| Node ID | Widget Name  | Description                                                                  |
|---------|--------------|------------------------------------------------------------------------------|
| 00h     | Root         | Root Node                                                                    |
| 01h     | AFG          | Audio Function Group                                                         |
| 0Ah     | Port A       | Port A Pin Widget (Configurable as Headphone, Line In, Line Out, Microphone) |
| 0Bh     | Port B       | Port B Pin Widget (Configurable as Line In, Line Out, Microphone)            |
| 0Ch     | Port C       | Port C Pin Widget (Configurable as Line In, Line Out, Microphone)            |
| 0Dh     | Port D       | Port D Pin Widget (Configurable as Headphone, Line In, Line Out, Microphone) |
| 0Eh     | Port E       | Port E Pin Widget (Configurable as Line In, Line Out, Microphone)            |
| 0Fh     | Port F       | Port F Pin Widget (Configurable as Line In, Line Out, Microphone)            |
| 10h     | DAC0         | Stereo Output Converter to DAC                                               |
| 11h     | DAC1         | Stereo Output Converter to DAC                                               |
| 12h     | ADC0         | Stereo Input Converter to ADC                                                |
| 13h     | ADC1         | Stereo Input Converter to ADC                                                |
| 14h     | Port MonoOut | Port MonoOut Pin Widget (output only)                                        |
| 15h     | MonoOutMix   | Port MonoOut Mixer                                                           |
| 16h     | CD           | CD Pin Widget                                                                |
| 17h     | DigMic0      | Digital Microphone 0 Pin Widget                                              |
| 18h     | DigMic1      | Digital Microphone 1 Pin Widget                                              |
| 19h     | InPort0Mux   | ADC0 Input Port Mux                                                          |
| 1Ah     | InPort1Mux   | ADC1 Input Port Mux                                                          |
| 1Bh     | InPort0Vol   | ADC0 Input Port Volume                                                       |
| 1Ch     | InPort1Vol   | ADC1 Input Port Volume                                                       |
| 1Dh     | ADC0Mux      | ADC0 Mux                                                                     |
| 1Eh     | ADC1Mux      | ADC1 Mux                                                                     |
| 1Fh     | SPDIFOUT     | Stereo Output for SPDIF_Out                                                  |
| 20h     | SPDIFIn      | Stereo Input for SPDIF_In                                                    |
| 21h     | DigOut       | Digital Output Pin                                                           |
| 22h     | DigIn        | Digital Input Pin                                                            |
| 23h     | PcBeep       | Digital PC Beep                                                              |
| 24h     | ExtVolume    | External Volume Control                                                      |
| 25h     | Reserved     | Reserved                                                                     |

### 3.2. Pin Configuration Default Register Settings

The configuration default registers are 32-bit registers required for each pin widget. These registers are normally used by the CODEC driver to determine the configuration of jacks and devices attached to the CODEC. When the CODEC is powered on, these registers are loaded with the default values provided by IDT for typical system usage, and are loaded in a way that is compatible with the Microsoft Universal Audio Architecture (UAA) driver. The values can be overridden by IDT customers according to their system configuration. Table 9 shows the Pin Widget Configuration Default settings.

**Table 9. Pin Widget Configuration Default Settings**

| Pin Name   | Port                   | Location                 | Device          | Connection           | Color         | Misc                      | Assoc. | Seq |
|------------|------------------------|--------------------------|-----------------|----------------------|---------------|---------------------------|--------|-----|
| DigInPin   | Not Connected<br>01b   | Mainboard<br>Rear<br>1h  | SPDIF In<br>Ch  | RCA<br>4h            | Unknown<br>0h | Jack Detect<br>Override=0 | Fh     | 0h  |
| DigOutPin  | Connect to Jack<br>00b | Mainboard<br>Rear<br>1h  | SPDIF Out<br>4h | RCA<br>4h            | Gray<br>2h    | Jack Detect<br>Override=0 | 7h     | 0h  |
| PortAPin   | Connect to Jack<br>00b | Mainboard<br>Front<br>2h | HP Out<br>2h    | 1/8 inch Jack<br>1h  | Green<br>4h   | Jack Detect<br>Override=0 | 2h     | 0h  |
| PortBPin   | Connect to Jack<br>00b | Mainboard<br>Front<br>2h | MIC In<br>Ah    | 1/8 inch Jack<br>1h  | Pink<br>9h    | Jack Detect<br>Override=0 | 8h     | 0h  |
| PortCPin   | Connect to Jack<br>00b | Mainboard<br>Rear<br>1h  | Line In<br>8h   | 1/8 inch Jack<br>1h  | Blue<br>3h    | Jack Detect<br>Override=0 | 4h     | Eh  |
| PortDPin   | Connect to Jack<br>00b | Mainboard<br>Rear<br>1h  | HP Out<br>2h    | 1/8 inch Jack<br>1h  | Green<br>4h   | Jack Detect<br>Override=0 | 1h     | Fh  |
| PortEPin   | Connect to Jack<br>00b | Mainboard<br>Rear<br>1h  | Line Out<br>0h  | 1/8 inch Jack<br>1h  | Black<br>1h   | Jack Detect<br>Override=0 | 1h     | 0h  |
| PortFPin   | Connect to Jack<br>00b | Mainboard<br>Rear<br>1h  | MIC In<br>Ah    | 1/8 inch Jack<br>1h  | Pink<br>9h    | Jack Detect<br>Override=0 | 4h     | 0h  |
| MonoOutPin | Not Connected<br>01b   | Internal<br>010000b      | Line Out<br>0h  | Other Analog<br>7h   | Unknown<br>0h | Jack Detect<br>Override=0 | Fh     | 0h  |
| CDPin      | Not Connected<br>01b   | Internal<br>010000b      | CD<br>3h        | ATAPI Internal<br>3h | Unknown<br>0h | Jack Detect<br>Override=0 | Fh     | 0h  |
| DigMic0Pin | Not Connected<br>01b   | Internal<br>010000b      | MIC In<br>Ah    | Unknown<br>0h        | Unknown<br>0h | Jack Detect<br>Override=0 | Fh     | 0h  |
| DigMic1Pin | Not Connected<br>01b   | Internal<br>010000b      | MIC In<br>Ah    | Unknown<br>0h        | Unknown<br>0h | Jack Detect<br>Override=0 | Fh     | 0h  |

### 3.3. Widget Information

**Table 10. Command Format for Verb with 4-bit Identifier**

| Bits [39:32] | Bits [31:28]  | BITS [27:20] | BITS[19:16]     | BITS [15:0]           |
|--------------|---------------|--------------|-----------------|-----------------------|
| Reserved     | CODEC Address | NID          | Verb ID (4-bit) | Payload Data (16-bit) |

**Table 11. Command Format for Verb with 12-bit Identifier**

| Bits [39:32] | Bits [31:28]  | BITS [27:20] | BITS[19:8]       | BITS [7:0]           |
|--------------|---------------|--------------|------------------|----------------------|
| Reserved     | CODEC Address | NID          | Verb ID (12-bit) | Payload Data (8-bit) |

There are two types of responses: Solicited and Unsolicited. Solicited responses are provided as a direct response to an issued command and will be provided in the frame immediately following the command. Unsolicited responses are provided by the CODEC independent of any command. Unsolicited responses are the result of CODEC events such as a jack insertion detection. The formats for Solicited Responses and Unsolicited Responses are shown in Tables 12 and 13 respectively. The “Tag” field in bits [31:28] of the Unsolicited Response identify the event.

**Table 12. Solicited Response Format**

| Bit [35]          | Bit [34]  | BITS [33:32] | BITS[31:0] |
|-------------------|-----------|--------------|------------|
| Valid (Valid = 1) | UnSol = 0 | Reserved     | Response   |

**Table 13. Unsolicited Response Format**

| Bit [35]          | Bit [34]  | BITS [33:32] | BITS[31:28] | BITS [27:0] |
|-------------------|-----------|--------------|-------------|-------------|
| Valid (Valid = 1) | UnSol = 1 | Reserved     | Tag         | Response    |

### 3.4. Supported Command Verbs and Responses

#### 3.4.1. Root Node (NID = 0x00)

##### 3.4.1.1. Root PnPID

Table 14. Root PnPID Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 00      | See bitfield table. |

Table 15. Root PnPID Command Response Format

| Bit     | Bitfield Name | RW | Reset  | Description                                                  |
|---------|---------------|----|--------|--------------------------------------------------------------|
| [31:16] | Vendor        | R  | 0x8384 | Vendor ID.                                                   |
| [15:8]  | DeviceFix     | R  | 0x76   | Fixed portion of Device ID.                                  |
| [7:0]   | DeviceProg    | R  | 0xA5   | Dependant on device - See device ID table in section 1.3.12. |

##### 3.4.1.2. Root RevID

Table 16. Root RevID Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 02      | See bitfield table. |

Table 17. Root RevID Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                  |
|---------|---------------|----|-------|----------------------------------------------|
| [31:24] | Rsvd          | R  | 0x00  | Reserved                                     |
| [23:20] | Major         | R  | 0x1   | Major rev number of compliant HD Audio spec. |
| [19:16] | Minor         | R  | 0x0   | Minor rev number of compliant HD Audio spec. |
| [15:12] | VendorFix     | R  | 0x0   | Vendor's rev number for this device.         |
| [11:8]  | VendorProg    | R  | 0x1   | Vendor's rev number for this device.         |

Table 17. Root RevID Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                     |
|-------|---------------|----|-------|-------------------------------------------------|
| [7:4] | SteppingFix   | R  | 0x0   | Vendor stepping number within the Vendor RevID. |
| [3:0] | SteppingProg  | R  | 0x4   | Vendor stepping number within the Vendor RevID. |

3.4.1.3. *Root NodeInfo*

Table 18. Root NodeInfo Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 04      | See bitfield table. |

Table 19. Root NodeInfo Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                        |
|---------|---------------|----|-------|----------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x00  | Reserved                                           |
| [23:16] | StartNID      | R  | 0x01  | Starting node number (NID) of first function group |
| [15:8]  | Rsvd1         | R  | 0x00  | Reserved                                           |
| [7:0]   | TotalNodes    | R  | 0x01  | Total number of nodes                              |

3.4.2. *AFG Node (NID = 0x01)*3.4.2.1. *AFG NodeInfo*

Table 20. AFG NodeInfo Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 04      | See bitfield table. |

Table 21. AFG NodeInfo Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                |
|---------|---------------|----|-------|------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                   |
| [23:16] | StartNID      | R  | 0x0A  | Starting node number for function group subordinate nodes. |

Table 21. AFG NodeInfo Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description            |
|--------|---------------|----|-------|------------------------|
| [15:8] | Rsvd1         | R  | 0x0   | Reserved               |
| [7:0]  | TotalNodes    | R  | 0x1C  | Total number of nodes. |

## 3.4.2.2. AFG Type

Table 22. AFG Type Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 05      | See bitfield table. |

Table 23. AFG Type Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                   |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------|
| [31:9] | Rsvd          | R  | 0x0   | Reserved                                                                                                                      |
| [8]    | UnsolCap      | R  | 0x1   | This node is capable of generating an unsolicited response, and will respond to the Unsolicited Response verb (Verb ID 708h). |
| [7:0]  | NodeType      | R  | 0x01  | Node type = Audio Function Group                                                                                              |

## 3.4.2.3. AFG GrpCap

Table 24. AFG GrpCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 08      | See bitfield table. |

Table 25. AFG GrpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                        |
|---------|---------------|----|-------|------------------------------------|
| [31:17] | Rsvd3         | R  | 0x0   | Reserved                           |
| [16]    | BeepGen       | R  | 0x1   | Optional Beep Generator is present |
| [15:12] | Rsvd2         | R  | 0x0   | Reserved                           |

Table 25. AFG GrpCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [11:8] | InputDelay    | R  | 0xD   | Typical latency = 13 frames. Number of samples between when the sample is received as an analog signal at the pin and when the digital representation is transmitted on the HD Audio link. |
| [7:4]  | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                   |
| [3:0]  | OutputDelay   | R  | 0xD   | Typical latency = 13 frames. Number of samples between when the signal is received from the HD Audio link and when it appears as an analog signal at the pin.                              |

## 3.4.2.4. AFG FrmtCap

Table 26. AFG FrmtCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0A      | See bitfield table. |

Table 27. AFG FrmtCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                             |
|---------|---------------|----|-------|-----------------------------------------|
| [31:21] | Rsvd2         | R  | 0x0   | Reserved                                |
| [20]    | B32           | R  | 0x0   | 32 bit audio formats are NOT supported  |
| [19]    | B24           | R  | 0x1   | 24 bit audio formats are supported      |
| [18]    | B20           | R  | 0x1   | 20 bit audio formats are supported      |
| [17]    | B16           | R  | 0x1   | 16 bit audio formats are supported      |
| [16]    | B8            | R  | 0x0   | 8 bit audio formats are NOT supported   |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                |
| [11]    | R12           | R  | 0x0   | 384 KHz rate (8/1*48 KHz) NOT supported |
| [10]    | R11           | R  | 0x1   | 192.0 KHz rate (4/1*48 KHz) supported   |
| [9]     | R10           | R  | 0x1   | 176.4 KHz rate (4/1*44.1 KHz) supported |
| [8]     | R9            | R  | 0x1   | 96.0 KHz rate (2/1*48 KHz) supported    |

Table 27. AFG FrmtCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                              |
|-----|---------------|----|-------|------------------------------------------|
| [7] | R8            | R  | 0x1   | 88.2 KHz rate (2/1*44.1 KHz) supported   |
| [6] | R7            | R  | 0x1   | 48.0 KHz rate supported (REQUIRED)       |
| [5] | R6            | R  | 0x1   | 44.1 KHz rate supported                  |
| [4] | R5            | R  | 0x0   | 32.0 KHz rate (2/3*48 KHz) supported     |
| [3] | R4            | R  | 0x0   | 22.05 KHz rate (1/2*44.1 KHz) supported  |
| [2] | R3            | R  | 0x0   | 16.0 KHz rate (1/3*48 KHz) supported     |
| [1] | R2            | R  | 0x0   | 11.025 KHz rate (1/4*44.0 KHz) supported |
| [0] | R1            | R  | 0x0   | 8.0 KHz rate (1/6*48 KHz) supported      |

## 3.4.2.5. AFG StreamCap

Table 28. AFG StreamCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0B      | See bitfield table. |

Table 29. AFG StreamCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                   |
|--------|---------------|----|-------|-------------------------------|
| [31:3] | Rsvd          | R  | 0x0   | Reserved                      |
| [2]    | NonPCM        | R  | 0x0   | No support for non-PCM data.  |
| [1]    | Float32       | R  | 0x0   | No support for Float32 data.  |
| [0]    | PCM           | R  | 0x1   | PCM-formatted data supported. |

## 3.4.2.6. AFG InAmpCap

Table 30. AFG InAmpCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0D      | See bitfield table. |

Table 31. AFG InAmpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                             |
|---------|---------------|----|-------|---------------------------------------------------------|
| [31]    | Mute          | R  | 0x0   | No mute capability                                      |
| [30:23] | Rsvd3         | R  | 0x0   | Reserved                                                |
| [22:16] | StepSize      | R  | 0x5   | Size of each step in the gain range = 1.5dB             |
| [15]    | Rsvd2         | R  | 0x0   | Reserved                                                |
| [14:8]  | NumSteps      | R  | 0x0F  | Number of steps in the gain range = 15 (0dB to 22.5 dB) |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                |
| [6:0]   | Offset        | R  | 0x00  | 0dB-step is programmed with this offset                 |

## 3.4.2.7. AFG PwrCap

Table 32. AFG PwrCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0F      | See bitfield table. |

Table 33. AFG PwrCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                            |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:4] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                               |
| [3]    | D3            | R  | 0x1   | Power State D3 is supported. Allows for lowest possible power consuming state under software control (and still properly respond to a subsequent Power State command). |
| [2]    | D2            | R  | 0x1   | Power State D2 is supported. Allows for lowest possible power consuming state from which it can return to fully on state within 10 ms.                                 |

Table 33. AFG PwrCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                                                                                                                                               |
|-----|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [1] | D1            | R  | 0x1   | Power State D1 is supported. Allows for lowest possible power consuming state from which it can return to fully on state within 10 ms, excepting analog pass-through circuits which must remain fully on. |
| [0] | D0            | R  | 0x1   | Power State D0 is supported. Node power state is fully on.                                                                                                                                                |

## 3.4.2.8. AFG GPIOCap

Table 34. AFG GPIOCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 11      | See bitfield table. |

Table 35. AFG GPIOCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                         |
|---------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31]    | GPIWake       | R  | 0x1   | Wake capability. Assuming the Wake Enable Mask controls are enabled, GPIOs configured as inputs can cause a wake (generate a Status Change event on the link) when there is a change in level on the pin.           |
| [30]    | GPIUnsol      | R  | 0x1   | Unsolicited Response capability. Assuming the Unsolicited Enable Mask controls are enabled, GPIOs configured as inputs can generate an Unsolicited Response on the link when there is a change in level on the pin. |
| [29:24] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                                                                            |
| [23:16] | NumGPIs       | R  | 0x00  | Number of GPI pins supported by function                                                                                                                                                                            |
| [15:8]  | NumGPOs       | R  | 0x00  | Number of GPO pins supported by function                                                                                                                                                                            |
| [7:0]   | NumGPIOs      | R  | 0x05  | Number of GPIO pins supported by function                                                                                                                                                                           |

## 3.4.2.9. AFG OutAmpCap

Table 36. AFG OutAmpCap Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 12      | See bitfield table. |

Table 37. AFG OutAmpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                |
|---------|---------------|----|-------|------------------------------------------------------------|
| [31]    | Mute          | R  | 0x1   | Amplifier is capable of muting                             |
| [30:23] | Rsvd3         | R  | 0x0   | Reserved                                                   |
| [22:16] | StepSize      | R  | 0x02  | Size of each step in the gain range = 0.75dB               |
| [15]    | Rsvd2         | R  | 0x0   | Reserved                                                   |
| [14:8]  | NumSteps      | R  | 0x7F  | Number of steps in the gain range = 128 (-95.25dB to +0dB) |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                   |
| [6:0]   | Offset        | R  | 0x7F  | 0dB-step is programmed with this offset                    |

## 3.4.2.10. AFG PwrState

Table 38. AFG PwrState Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F05     | 00                                | See bitfield table. |
| <b>Set1</b> | 705     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 39. AFG PwrState Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                    |
|--------|---------------|----|-------|------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                       |
| [7:4]  | Act           | R  | 0x3   | PS-Act: Actual power state of referenced node. |

Table 39. AFG PwrState Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                   |
|-------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [3:2] | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                      |
| [1:0] | Set           | RW | 0x3   | PS-Set: Current power setting of referenced node.<br>00: All Powered-On<br>01: D1 = > PR0, PR1<br>10: D2 = > PR0, PR1, PR2, PR6, EAPD<br>11: D3 = > PR6, PR5, PR3, PR2, PR1, PR0, EAPD<br>Note: PR4 is not mapped in HD Audio |

## 3.4.2.11. AFG UnsolicitedResp

Table 40. AFG UnsolicitedResp Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 41. AFG UnsolicitedResp Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                        |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                                                                           |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses.                                                                         |
| [6]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                           |
| [5:0]  | Tag           | RW | 0x0   | Software programmable field returned in top six bits (31:26) of every Unsolicited Response generated by this node. |

## 3.4.2.12. AFG GPIO

Table 42. AFG GPIO Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F15     | 00                                | See bitfield table. |
| <b>Set1</b> | 715     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 43. AFG GPIO Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                              |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:5] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                                                 |
| [4]    | Data4         | RW | 0x0   | Data for GPIO4. If this GPIO bit is configured as Sticky (edge-sensitive) input, it can be cleared by writing zero (one) here when the corresponding Polarity Control bit is zero (one). |
| [3]    | Data3         | RW | 0x0   | Data for GPIO3. If this GPIO bit is configured as Sticky (edge-sensitive) input, it can be cleared by writing zero (one) here when the corresponding Polarity Control bit is zero (one). |
| [2]    | Data2         | RW | 0x0   | Data for GPIO2. If this GPIO bit is configured as Sticky (edge-sensitive) input, it can be cleared by writing zero (one) here when the corresponding Polarity Control bit is zero (one). |
| [1]    | Data1         | RW | 0x0   | Data for GPIO1. If this GPIO bit is configured as Sticky (edge-sensitive) input, it can be cleared by writing zero (one) here when the corresponding Polarity Control bit is zero (one). |
| [0]    | Data0         | RW | 0x0   | Data for GPIO0. If this GPIO bit is configured as Sticky (edge-sensitive) input, it can be cleared by writing zero (one) here when the corresponding Polarity Control bit is zero (one). |

## 3.4.2.13. AFG GPIOEn

Table 44. AFG GPIOEn Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F16     | 00                                | See bitfield table. |
| <b>Set1</b> | 716     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 45. AFG GPIOEn Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                    |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------|
| [31:5] | Rsvd          | R  | 0x0   | Reserved                                                                                                                       |
| [4]    | Mask4         | RW | 0x0   | Enable for GPIO4:<br>0 = pin is disabled (Hi-Z state);<br>1 = pin is enabled; behavior determined by<br>GPIO Direction control |
| [3]    | Mask3         | RW | 0x0   | Enable for GPIO3:<br>0 = pin is disabled (Hi-Z state);<br>1 = pin is enabled; behavior determined by<br>GPIO Direction control |
| [2]    | Mask2         | RW | 0x0   | Enable for GPIO2:<br>0 = pin is disabled (Hi-Z state);<br>1 = pin is enabled; behavior determined by<br>GPIO Direction control |
| [1]    | Mask1         | RW | 0x0   | Enable for GPIO1:<br>0 = pin is disabled (Hi-Z state);<br>1 = pin is enabled; behavior determined by<br>GPIO Direction control |
| [0]    | Mask0         | RW | 0x0   | Enable for GPIO0:<br>0 = pin is disabled (Hi-Z state);<br>1 = pin is enabled; behavior determined by<br>GPIO Direction control |

## 3.4.2.14. AFG GPIODir

Table 46. AFG GPIODir Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F17     | 00                                | See bitfield table. |
| <b>Set1</b> | 717     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 47. AFG GPIODir Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                      |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------|
| [31:5] | Rsvd          | R  | 0x0   | Reserved                                                                                                         |
| [4]    | Control4      | RW | 0x0   | Direction control for GPIO4<br>0 = GPIO signal is configured as input<br>1 = GPIO signal is configured as output |

Table 47. AFG GPIODir Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                                                      |
|-----|---------------|----|-------|------------------------------------------------------------------------------------------------------------------|
| [3] | Control3      | RW | 0x0   | Direction control for GPIO3<br>0 = GPIO signal is configured as input<br>1 = GPIO signal is configured as output |
| [2] | Control2      | RW | 0x0   | Direction control for GPIO2<br>0 = GPIO signal is configured as input<br>1 = GPIO signal is configured as output |
| [1] | Control1      | RW | 0x0   | Direction control for GPIO1<br>0 = GPIO signal is configured as input<br>1 = GPIO signal is configured as output |
| [0] | Control0      | RW | 0x0   | Direction control for GPIO0<br>0 = GPIO signal is configured as input<br>1 = GPIO signal is configured as output |

## 3.4.2.15. AFG GPIOWake

Table 48. AFG GPIOWake Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F18     | 00                                | See bitfield table. |
| <b>Set1</b> | 718     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 49. AFG GPIOWake Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                    |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:5] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                                                       |
| [4]    | En4           | RW | 0x0   | Wake enable for GPIO4:<br>0 = wake-up event is disabled;<br>1 = when HD Audio link is powered down (RST# is asserted), a wake-up event will trigger a Status Change Request event on the link. |
| [3]    | En3           | RW | 0x0   | Wake enable for GPIO3:<br>0 = wake-up event is disabled;<br>1 = when HD Audio link is powered down (RST# is asserted), a wake-up event will trigger a Status Change Request event on the link. |

Table 49. AFG GPIOWake Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                                                                                                                                    |
|-----|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [2] | En2           | RW | 0x0   | Wake enable for GPIO2:<br>0 = wake-up event is disabled;<br>1 = when HD Audio link is powered down (RST# is asserted), a wake-up event will trigger a Status Change Request event on the link. |
| [1] | En1           | RW | 0x0   | Wake enable for GPIO1:<br>0 = wake-up event is disabled;<br>1 = when HD Audio link is powered down (RST# is asserted), a wake-up event will trigger a Status Change Request event on the link. |
| [0] | En0           | RW | 0x0   | Wake enable for GPIO0:<br>0 = wake-up event is disabled;<br>1 = when HD Audio link is powered down (RST# is asserted), a wake-up event will trigger a Status Change Request event on the link. |

## 3.4.2.16. AFG GPIOUnsol

Table 50. AFG GPIOUnsol Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F19     | 00                                | See bitfield table. |
| <b>Set1</b> | 719     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 51. AFG GPIOUnsol Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                 |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:5] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                                                                    |
| [4]    | En4           | RW | 0x0   | Unsolicited enable mask for GPIO4. If set, and the Unsolicited Response control for this widget has been enabled, an unsolicited response will be sent when GPIO0 is configured as input and changes state. |
| [3]    | En3           | RW | 0x0   | Unsolicited enable mask for GPIO3. If set, and the Unsolicited Response control for this widget has been enabled, an unsolicited response will be sent when GPIO0 is configured as input and changes state. |

Table 51. AFG GPIOUnsol Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                 |
|-----|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [2] | En2           | RW | 0x0   | Unsolicited enable mask for GPIO2. If set, and the Unsolicited Response control for this widget has been enabled, an unsolicited response will be sent when GPIO0 is configured as input and changes state. |
| [1] | En1           | RW | 0x0   | Unsolicited enable mask for GPIO1. If set, and the Unsolicited Response control for this widget has been enabled, an unsolicited response will be sent when GPIO0 is configured as input and changes state. |
| [0] | En0           | RW | 0x0   | Unsolicited enable mask for GPIO0. If set, and the Unsolicited Response control for this widget has been enabled, an unsolicited response will be sent when GPIO0 is configured as input and changes state. |

## 3.4.2.17. AFG GPIOSticky

Table 52. AFG GPIOSticky Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1A     | 00                                | See bitfield table. |
| <b>Set1</b> | 71A     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 53. AFG GPIOSticky Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                               |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:5] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                  |
| [4]    | Mask4         | RW | 0x0   | GPIO4 input type (when configured as input):<br>0 = Non-Sticky (level-sensitive);<br>1 = Sticky (edge-sensitive).<br>Sticky inputs are cleared by writing zero to corresponding bit of GPIO Data register.<br>GPIOPolarity determines rising or falling edge sensitivity. |

Table 53. AFG GPIOSticky Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                               |
|-----|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [3] | Mask3         | RW | 0x0   | GPIO3 input type (when configured as input):<br>0 = Non-Sticky (level-sensitive);<br>1 = Sticky (edge-sensitive).<br>Sticky inputs are cleared by writing zero to corresponding bit of GPIO Data register.<br>GPIOPolarity determines rising or falling edge sensitivity. |
| [2] | Mask2         | RW | 0x0   | GPIO2 input type (when configured as input):<br>0 = Non-Sticky (level-sensitive);<br>1 = Sticky (edge-sensitive).<br>Sticky inputs are cleared by writing zero to corresponding bit of GPIO Data register.<br>GPIOPolarity determines rising or falling edge sensitivity. |
| [1] | Mask1         | RW | 0x0   | GPIO1 input type (when configured as input):<br>0 = Non-Sticky (level-sensitive);<br>1 = Sticky (edge-sensitive).<br>Sticky inputs are cleared by writing zero to corresponding bit of GPIO Data register.<br>GPIOPolarity determines rising or falling edge sensitivity. |
| [0] | Mask0         | RW | 0x0   | GPIO0 input type (when configured as input):<br>0 = Non-Sticky (level-sensitive);<br>1 = Sticky (edge-sensitive).<br>Sticky inputs are cleared by writing zero to corresponding bit of GPIO Data register.<br>GPIOPolarity determines rising or falling edge sensitivity. |

## 3.4.2.18. AFG SubID

Table 54. AFG SubID Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F20     | 00                                | See bitfield table. |
| <b>Set1</b> | 720     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 721     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 54. AFG SubID Command Verb Format

|             | Verb ID | Payload                           | Response   |
|-------------|---------|-----------------------------------|------------|
| <b>Set3</b> | 722     | See bits [7:0] of bitfield table. | 0000_0000h |
| <b>Set4</b> | 723     | See bits [7:0] of bitfield table. | 0000_0000h |

Table 55. AFG SubID Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                    |
|---------|---------------|----|-------|------------------------------------------------|
| [31:24] | Subsys3       | RW | 0x00  | Subsystem ID. (Any non-zero value)             |
| [23:16] | Subsys2       | RW | 0x00  | Subsystem ID. (Any non-zero value)             |
| [15:8]  | Subsys1       | RW | 0x01  | Subsystem ID. (Any non-zero value)             |
| [7:0]   | Assembly      | RW | 0x00  | Assembly ID. (Not applicable to CODEC vendors) |

## 3.4.2.19. AFG GPIOInvert

Table 56. AFG GPIOInvert Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | FEE     | 00                                | See bitfield table. |
| <b>Set1</b> | 7EE     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 57. AFG GPIOInvert Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                         |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:5] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                            |
| [4]    | GP4           | RW | 0x1   | GPIO4 Polarity<br>If configured as an output:<br>0 = inverting<br>1 = non-inverting<br>If configured as a non-sticky input:<br>0 = inverting<br>1 = non-inverting<br>If configured as a sticky input:<br>0 = falling events will be detected<br>1 = rising events will be detected. |

Table 57. AFG GPIOInvert Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                    |
|-----|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [3] | GP3           | RW | 0x1   | <p>GPIO3 Polarity</p> <p>If configured as an output:</p> <p>0 = inverting</p> <p>1 = non-inverting</p> <p>If configured as a non-sticky input:</p> <p>0 = inverting</p> <p>1 = non-inverting</p> <p>If configured as a sticky input:</p> <p>0 = falling events will be detected</p> <p>1 = rising events will be detected.</p> |
| [2] | GP2           | RW | 0x1   | <p>GPIO2 Polarity</p> <p>If configured as an output:</p> <p>0 = inverting</p> <p>1 = non-inverting</p> <p>If configured as a non-sticky input:</p> <p>0 = inverting</p> <p>1 = non-inverting</p> <p>If configured as a sticky input:</p> <p>0 = falling events will be detected</p> <p>1 = rising events will be detected.</p> |
| [1] | GP1           | RW | 0x1   | <p>GPIO1 Polarity</p> <p>If configured as an output:</p> <p>0 = inverting</p> <p>1 = non-inverting</p> <p>If configured as a non-sticky input:</p> <p>0 = inverting</p> <p>1 = non-inverting</p> <p>If configured as a sticky input:</p> <p>0 = falling events will be detected</p> <p>1 = rising events will be detected.</p> |
| [0] | GP0           | RW | 0x1   | <p>GPIO0 Polarity</p> <p>If configured as an output:</p> <p>0 = inverting</p> <p>1 = non-inverting</p> <p>If configured as a non-sticky input:</p> <p>0 = inverting</p> <p>1 = non-inverting</p> <p>If configured as a sticky input:</p> <p>0 = falling events will be detected</p> <p>1 = rising events will be detected.</p> |

## 3.4.2.20. AFG GPIODrive

Table 58. AFG GPIODrive Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | FEF     | 00                                | See bitfield table. |
| <b>Set1</b> | 7EF     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 59. AFG GPIODrive Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                   |
|--------|---------------|----|-------|-----------------------------------------------------------------------------------------------|
| [31:5] | Rsvd          | R  | 0x0   | Reserved                                                                                      |
| [4]    | OD4           | RW | 0x0   | GPIO4 Drive Mode;<br>0 = push-pull (drive 0 and 1),<br>1 = open drain (drive 0, float for 1). |
| [3]    | OD3           | RW | 0x0   | GPIO3 Drive Mode;<br>0 = push-pull (drive 0 and 1),<br>1 = open drain (drive 0, float for 1). |
| [2]    | OD2           | RW | 0x0   | GPIO2 Drive Mode;<br>0 = push-pull (drive 0 and 1),<br>1 = open drain (drive 0, float for 1). |
| [1]    | OD1           | RW | 0x0   | GPIO1 Drive Mode;<br>0 = push-pull (drive 0 and 1),<br>1 = open drain (drive 0, float for 1). |
| [0]    | OD0           | RW | 0x0   | GPIO0 Drive Mode;<br>0 = push-pull (drive 0 and 1),<br>1 = open drain (drive 0, float for 1). |

## 3.4.2.21. AFG AnaCtrl

Table 60. AFG AnaCtrl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | FE0     | 00                                | See bitfield table. |
| <b>Set1</b> | 7E0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 61. AFG AnaCtrl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                         |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                                                                            |
| [7]    | AnaD3Enable   | RW | 0x0   | D3 enable signal for analog                                                                                         |
| [6]    | ADCMixDAC     | RW | 0x0   | Enable mixing of ADC with DAC signal (for karaoke)                                                                  |
| [5]    | AnalogBeepEn  | RW | 0x0   | Enable Analog PC-Beep path                                                                                          |
| [4]    | LockLS        | RW | 0x0   | Lock Level Shifters prior to digital power down while analog power still on (DEPENDS Bit)<br>0 = normal<br>1 = lock |
| [3]    | UnlockLS      | RW | 0x0   | Unlock Level Shifters<br>0 = lock<br>1 = Releases lock level shift.                                                 |
| [2]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                            |
| [1:0]  | VAGISel       | RW | 0x0   | VAG amplifier output drive:<br>00 = nominal<br>01 = -50%<br>10 = +100%<br>11 = +50%                                 |

## 3.4.2.22. AFG Supply

Table 62. AFG Supply Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | FE6     | 00                                | See bitfield table. |
| <b>Set1</b> | 7E6     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 63. AFG Supply Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:7] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| [7]    | VAGRamp       | RW | 0x0   | An internal power supply anti-pop circuit prevents audible clicks and pops from being heard when the CODEC is powered on and off. This function is accomplished by delaying the charge/discharge of the VREF capacitor. A value of $C_{VREF} = 1 \mu F$ will cause a turn-on delay of roughly 3 seconds, which will allow the power supplies to stabilize before the CODEC outputs are enabled. The recommended value of $C_{VREF} = 10 \mu F$ will extend the delay to 30 seconds. The CODEC outputs are also kept stable for the same amount of time at power-off to allow the system to be gracefully turned off. Setting the VAGRamp bit speeds up the ramp rate by 10X (degrading the anti-pop performance), for easier production testing. Any external component anti-pop circuit is unaffected by the internal circuit. |
| [6:5]  | IBIAS         | RW | 0x0   | 00 = Normal Current<br>01 = 80% nominal Analog Current<br>10 = 120% nominal Analog Current<br>11 = 140% nominal Analog Current                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| [4]    | SPDIFPinLvl   | RW | 0x1   | 0 = low-level SPDIF Input (special buffer for low level signals)<br>1 = standard SPDIF Input (for high level signals)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| [3:0]  | Override      | RW | 0x0   | Supply Override Control.<br>[0] = invert ADC supply<br>[1] = invert DAC supply<br>[2] = supply value<br>[3] = supply override enable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 3.4.2.23. AFG DMicCtrl

Table 64. AFG DMicCtrl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | FF0     | 00                                | See bitfield table. |
| <b>Set1</b> | 7F0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 65. AFG DMicCtrl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                           |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:4] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                              |
| [3:2]  | Phase         | RW | 0x0   | Selects what phase of the DigMic clock the data should be latched:<br>0 = rising edge<br>1 = center of high<br>2 = falling edge<br>3 = center of low. |
| [1:0]  | Rate          | RW | 0x2   | Selects the DigMic rate:<br>0 = 4.704 MHz<br>1 = 3.528 MHz<br>2 = 2.352 MHz<br>3 = 1.176 MHz.                                                         |

## 3.4.2.24. AFG Reset

Table 66. AFG Reset Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | 7FF     | 00                                | See bitfield table. |
| <b>Set1</b> | 7FF     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 67. AFG Reset Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                                              |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:0] | Response      | R  | 0x0   | Reserved. Overlaps Execute.                                                                                                                                                                                                                                                                                                                                                              |
| [0]    | Execute       | W  | 0x0   | Function Reset.<br>Function Group reset is executed when the Set verb 7FF is written with 8-bit payload of 00h. The CODEC should issue a response to acknowledge receipt of the verb, and then reset the affected Function Group and all associated widgets to their power-on reset values. Some controls such as Configuration Default controls should not be reset. Overlaps Response. |

### 3.4.3. PortA Node (NID = 0x0A)

#### 3.4.3.1. PortA WCap

Table 68. PortA WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 69. PortA WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex              |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                               |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability  |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control     |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream       |
| [8]     | ConnList      | R  | 0x1   | Connection list is present             |
| [7]     | UnsolCap      | R  | 0x1   | Unsolicited Response is supported      |

Table 69. PortA WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                          |
|-----|---------------|----|-------|--------------------------------------------------------------------------------------|
| [6] | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                     |
| [5] | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4] | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                  |
| [3] | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2] | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0] | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.3.2. PortA PinCap

Table 70. PortA PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 71. PortA PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                           |
|---------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                              |
| [16]    | EAPDCap       | R  | 0x0   | This widget does not control EAPD pin                                                                                                                                                                 |
| [15:8]  | VrefCap       | R  | 0x17  | VRef generation is supported by this pin complex, and the following voltages can be produced on the associated VRef pin: 80% AVdd; 50% AVdd; GND; Hi-Z (required since pin complex is output capable) |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                              |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.                                                                                                                                                              |
| [5]     | InCap         | R  | 0x1   | Pin complex is input capable.                                                                                                                                                                         |
| [4]     | OutCap        | R  | 0x1   | Pin complex is output capable.                                                                                                                                                                        |

Table 71. PortA PinCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                   |
|-----|---------------|----|-------|-----------------------------------------------|
| [3] | HdphCap       | R  | 0x1   | Pin complex has headphone amplifier.          |
| [2] | PresDtctCap   | R  | 0x1   | Pin complex can perform Presence Detect.      |
| [1] | TrigRqd       | R  | 0x1   | Trigger is required for impedance measurement |
| [0] | ImpSenseCap   | R  | 0x1   | Pin complex supports impedance sense.         |

## 3.4.3.3. PortA ConnLen

Table 72. PortA ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 73. PortA ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                   |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries.                                       |
| [6:0]  | N             | R  | 0x02  | Number of NID entries in connection list.<br>N = 02h if DAC1 enabled,<br>N = 01h otherwise |

## 3.4.3.4. PortA ConnLst

Table 74. PortA ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 75. PortA ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description        |
|---------|---------------|----|-------|--------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry. |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry. |

Table 75. PortA ConnLst Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                       |
|--------|---------------|----|-------|-----------------------------------------------------------------------------------|
| [15:8] | Entry1        | R  | 0x11  | DAC1 Converter widget.<br>Entry1 = 11h if DAC1 enabled,<br>Entry1 = 00h otherwise |
| [7:0]  | Entry0        | R  | 0x10  | DAC0 Converter widget                                                             |

## 3.4.3.5. PortA ConnSelect

Table 76. PortA ConnSelect Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F01     | 00                                | See bitfield table. |
| <b>Set1</b> | 701     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 77. PortA ConnSelect Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                      |
|--------|---------------|----|-------|----------------------------------|
| [31:1] | Rsvd          | R  | 0x0   | Reserved                         |
| [0]    | Index         | RW | 0x0   | Connection select control index. |

## 3.4.3.6. PortA PinCtl

Table 78. PortA PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 79. PortA PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                        |
|--------|---------------|----|-------|--------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                           |
| [7]    | HdphEn        | RW | 0x0   | 1 = enable the low impedance amplifier associated with the output. |
| [6]    | OutEn         | RW | 0x0   | 1 = (CODEC) output path of Pin Widget is enabled                   |

Table 79. PortA PinCtl Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                 |
|-------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [5]   | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled                                                                                                                                                                                                                                                                                                             |
| [4:3] | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                                                                                                    |
| [2:0] | VrefSelect    | RW | 0x0   | VRefEn: Selects one of the possible states for the VRef signal associated with the Pin Widget. If the value written to this control does not correspond to a supported value defined in the VRefCntrl field of the Pin Capabilities parameter (0C), then this control will take the value of 000b (Hi-Z). (Hi-Z = 000b, 50% = 001b, GND = 010b, 80% = 100b) |

## 3.4.3.7. PortA Unsolicited Response

Table 80. PortA Unsolicited Response Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 81. PortA Unsolicited Response Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                           |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x00  | Reserved                                                                                                                              |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses. Unsolicited response events occur upon jack-insertion OR completion of a Jack-Sense cycle. |
| [6]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                              |
| [5:0]  | Tag           | RW | 0x00  | Software programmable field returned in top six bits (31:26) of every Unsolicited Response generated by this node.                    |

3.4.3.8. *PortA PinSense*

Table 82. PortA PinSense Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F09     | 00                                | See bitfield table. |
| <b>Set1</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 83. PortA PinSense Command Response Format

| Bit    | Bitfield Name | RW | Reset       | Description                                                                                                                                                                    |
|--------|---------------|----|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31]   | PresDtct      | R  | 0x0         | 1 = something is plugged into jack associated with Pin Complex.                                                                                                                |
| [30:0] | Impedance     | R  | 0x7FFF_FFFF | Measured impedance of the widget. A value of all 1s indicates that a valid sense reading is not available, or the sense measurement is busy if it has been recently triggered. |
| [0]    | RightCh       | W  | 0x0         | Set 1 = perform impedance sensing on right channel or ring of the connector                                                                                                    |
| [0]    | LeftCh        | W  | 0x0         | Set 0 = perform impedance sensing on left channel or tip of the connector                                                                                                      |

3.4.3.9. *PortA PinConfig*

Table 84. PortA PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 85. PortA PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x0   | External Port Connectivity of the Pin Complex.<br>0 = connected to a jack                                                         |
| [29:24] | Location      | RW | 0x02  | Physical location of the jack.<br>02h = Mainboard, Front                                                                          |
| [23:20] | Device        | RW | 0x2   | Default Device, indicating intended use of jack.<br>2 = HP Out                                                                    |
| [19:16] | Connection    | RW | 0x1   | Connection Type. 1 = 1/8 inch jack                                                                                                |
| [15:12] | Color         | RW | 0x4   | Color of physical jack. 4 = Green                                                                                                 |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0x2   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.4. PortB Node (NID = 0x0B)

#### 3.4.4.1. PortB WCap

Table 86. PortB WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 87. PortB WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex              |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                               |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability  |

Table 87. PortB WCap Command Response Format

| Bit  | Bitfield Name | RW | Reset | Description                                                                          |
|------|---------------|----|-------|--------------------------------------------------------------------------------------|
| [10] | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                   |
| [9]  | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                     |
| [8]  | ConnList      | R  | 0x1   | Connection list is present                                                           |
| [7]  | UnsolCap      | R  | 0x1   | Unsolicited Response is supported                                                    |
| [6]  | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                     |
| [5]  | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4]  | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                  |
| [3]  | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2]  | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1]  | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0]  | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.4.2. PortB PinCap

Table 88. PortB PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 89. PortB PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                           |
|---------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                              |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin.                                                                                                                                                                |
| [15:8]  | VrefCap       | R  | 0x17  | VRef generation is supported by this pin complex, and the following voltages can be produced on the associated VRef pin: 80% AVdd; 50% AVdd; GND; Hi-Z (required since pin complex is output capable) |

Table 89. PortB PinCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                    |
|-----|---------------|----|-------|------------------------------------------------|
| [7] | Rsvd1         | R  | 0x0   | Reserved                                       |
| [6] | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.       |
| [5] | InCap         | R  | 0x1   | Pin complex is input capable.                  |
| [4] | OutCap        | R  | 0x1   | Pin complex is output capable.                 |
| [3] | HdphCap       | R  | 0x0   | Pin has a headphone amplifier.                 |
| [2] | PresDtctCap   | R  | 0x1   | Pin complex can perform Presence Detect.       |
| [1] | TrigRqd       | R  | 0x1   | Trigger is required for impedance measurement. |
| [0] | ImpSenseCap   | R  | 0x1   | Pin complex supports impedance sense.          |

## 3.4.4.3. PortB ConnLen

Table 90. PortB ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 91. PortB ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                   |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries.                                       |
| [6:0]  | N             | R  | 0x02  | Number of NID entries in connection list.<br>N = 02h if DAC1 enabled,<br>N = 01h otherwise |

## 3.4.4.4. PortB ConnLst

Table 92. PortB ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 93. PortB ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry.                                                                |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry.                                                                |
| [15:8]  | Entry1        | R  | 0x11  | DAC1 Converter widget.<br>Entry1 = 11h if DAC1 enabled,<br>Entry1 = 00h otherwise |
| [7:0]   | Entry0        | R  | 0x10  | DAC0 Converter widget                                                             |

## 3.4.4.5. PortB ConnSelect

Table 94. PortB ConnSelect Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F01     | 00                                | See bitfield table. |
| <b>Set1</b> | 701     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 95. PortB ConnSelect Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                      |
|--------|---------------|----|-------|----------------------------------|
| [31:1] | Rsvd          | R  | 0x0   | Reserved                         |
| [0]    | Index         | RW | 0x0   | Connection select control index. |

## 3.4.4.6. PortB PinCtl

Table 96. PortB PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 97. PortB PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                 |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:7] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                                                                                                    |
| [6]    | OutEn         | RW | 0x0   | 1 = (CODEC) output path of Pin Widget is enabled                                                                                                                                                                                                                                                                                                            |
| [5]    | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled                                                                                                                                                                                                                                                                                                             |
| [4:3]  | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                                                                                                    |
| [2:0]  | VrefSelect    | RW | 0x0   | VRefEn: Selects one of the possible states for the VRef signal associated with the Pin Widget. If the value written to this control does not correspond to a supported value defined in the VRefCntrl field of the Pin Capabilities parameter (0C), then this control will take the value of 000b (Hi-Z). (Hi-Z = 000b, 50% = 001b, GND = 010b, 80% = 100b) |

## 3.4.4.7. PortB Unsolicited Response

Table 98. PortB Unsolicited Response Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 99. PortB Unsolicited Response Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                           |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x00  | Reserved                                                                                                                              |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses. Unsolicited response events occur upon jack-insertion OR completion of a Jack-Sense cycle. |
| [6]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                              |
| [5:0]  | Tag           | RW | 0x00  | Software programmable field returned in top six bits (31:26) of every Unsolicited Response generated by this node.                    |

3.4.4.8. *PortB PinSense*

Table 100. PortB PinSense Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F09     | 00                                | See bitfield table. |
| <b>Set1</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 101. PortB PinSense Command Response Format

| Bit    | Bitfield Name | RW | Reset       | Description                                                                                                                                                                    |
|--------|---------------|----|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31]   | PresDtct      | R  | 0x0         | 1 = something is plugged into jack associated with Pin Complex.                                                                                                                |
| [30:0] | Impedance     | R  | 0x7FFF_FFFF | Measured impedance of the widget. A value of all 1s indicates that a valid sense reading is not available, or the sense measurement is busy if it has been recently triggered. |
| [0]    | RightCh       | W  | 0x0         | Set 1 = perform impedance sensing on right channel or ring of the connector                                                                                                    |
| [0]    | LeftCh        | W  | 0x0         | Set 0 = perform impedance sensing on left channel or tip of the connector                                                                                                      |

3.4.4.9. *PortB PinConfig*

Table 102. PortB PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 103. PortB PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x0   | External Port Connectivity of the Pin Complex.<br>0 = connected to a jack                                                         |
| [29:24] | Location      | RW | 0x02  | Physical location of the jack.<br>02h = Mainboard, Front                                                                          |
| [23:20] | Device        | RW | 0xA   | Default Device, indicating intended use of jack.<br>A = MIC In                                                                    |
| [19:16] | Connection    | RW | 0x1   | Connection Type. 1 = 1/8 inch jack                                                                                                |
| [15:12] | Color         | RW | 0x9   | Color of physical jack. 9 = Pink                                                                                                  |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0x8   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.5. PortC Node (NID = 0x0C)

#### 3.4.5.1. PortC WCap

Table 104. PortC WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 105. PortC WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex              |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                               |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability  |

Table 105. PortC WCap Command Response Format

| Bit  | Bitfield Name | RW | Reset | Description                                                                                |
|------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [10] | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                         |
| [9]  | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                           |
| [8]  | ConnList      | R  | 0x1   | Connection list is present.<br>ConnList = 1 if DAC1 enabled,<br>ConnList = 0 otherwise     |
| [7]  | UnsolCap      | R  | 0x1   | Unsolicited Response is supported                                                          |
| [6]  | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                           |
| [5]  | Stripe        | R  | 0x0   | No support for striping                                                                    |
| [4]  | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                        |
| [3]  | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier<br>parameters from Audio Function node<br>instead |
| [2]  | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                        |
| [1]  | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                         |
| [0]  | Stereo        | R  | 0x1   | Stereo widget                                                                              |

## 3.4.5.2. PortC PinCap

Table 106. PortC PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 107. PortC PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                           |
|---------|---------------|----|-------|---------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                              |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin |

Table 107. PortC PinCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                           |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [15:8] | VrefCap       | R  | 0x17  | VRef generation is supported by this pin complex, and the following voltages can be produced on the associated VRef pin: 80% AVdd; 50% AVdd; GND; Hi-Z (required since pin complex is output capable) |
| [7]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                              |
| [6]    | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.                                                                                                                                                              |
| [5]    | InCap         | R  | 0x1   | Pin complex is input capable.                                                                                                                                                                         |
| [4]    | OutCap        | R  | 0x1   | Pin complex is output capable.<br>OutCap = 1 if DAC1 enabled,<br>OutCap = 0 otherwise                                                                                                                 |
| [3]    | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.                                                                                                                                                              |
| [2]    | PresDtctCap   | R  | 0x1   | Pin complex can perform Presence Detect.                                                                                                                                                              |
| [1]    | TrigRqd       | R  | 0x1   | Trigger is required for impedance measurement                                                                                                                                                         |
| [0]    | ImpSenseCap   | R  | 0x1   | Pin complex supports impedance sense.                                                                                                                                                                 |

## 3.4.5.3. PortC ConnLen

Table 108. PortC ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 109. PortC ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                   |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries.                                       |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.<br>N = 01h if DAC1 enabled,<br>N = 00h otherwise |

3.4.5.4. *PortC ConnLst*

Table 110. PortC ConnLst Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F02     | 00      | See bitfield table. |

Table 111. PortC ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry.                                                                |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry.                                                                |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry.                                                                |
| [7:0]   | Entry0        | R  | 0x11  | DAC1 Converter widget.<br>Entry1 = 11h if DAC1 enabled,<br>Entry1 = 00h otherwise |

3.4.5.5. *PortC PinCtl*

Table 112. PortC PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 113. PortC PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                      |
|--------|---------------|----|-------|--------------------------------------------------|
| [31:7] | Rsvd2         | R  | 0x0   | Reserved                                         |
| [6]    | OutEn         | RW | 0x0   | 1 = (CODEC) output path of Pin Widget is enabled |
| [5]    | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled  |

Table 113. PortC PinCtl Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                 |
|-------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [4:3] | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                                                                                                    |
| [2:0] | VrefSelect    | RW | 0x0   | VRefEn: Selects one of the possible states for the VRef signal associated with the Pin Widget. If the value written to this control does not correspond to a supported value defined in the VRefCntrl field of the Pin Capabilities parameter (0C), then this control will take the value of 000b (Hi-Z). (Hi-Z = 000b, 50% = 001b, GND = 010b, 80% = 100b) |

## 3.4.5.6. PortC UnsolResp

Table 114. PortC UnsolResp Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 115. PortC UnsolResp Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                           |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x00  | Reserved                                                                                                                              |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses. Unsolicited response events occur upon jack-insertion OR completion of a Jack-Sense cycle. |
| [6]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                              |
| [5:0]  | Tag           | RW | 0x00  | Software programmable field returned in top six bits (31:26) of every Unsolicited Response generated by this node.                    |

3.4.5.7. *PortC PinSense*

Table 116. PortC PinSense Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F09     | 00                                | See bitfield table. |
| <b>Set1</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 117. PortC PinSense Command Response Format

| Bit    | Bitfield Name | RW | Reset       | Description                                                                                                                                                                    |
|--------|---------------|----|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31]   | PresDtct      | R  | 0x0         | 1 = something is plugged into jack associated with Pin Complex.                                                                                                                |
| [30:0] | Impedance     | R  | 0x7FFF_FFFF | Measured impedance of the widget. A value of all 1s indicates that a valid sense reading is not available, or the sense measurement is busy if it has been recently triggered. |
| [0]    | RightCh       | W  | 0x0         | Set 1 = perform impedance sensing on right channel or ring of the connector                                                                                                    |
| [0]    | LeftCh        | W  | 0x0         | Set 0 = perform impedance sensing on left channel or tip of the connector                                                                                                      |

3.4.5.8. *PortC PinConfig*

Table 118. PortC PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 119. PortC PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x0   | External Port Connectivity of the Pin Complex.<br>0 = connected to a jack                                                         |
| [29:24] | Location      | RW | 0x01  | Physical location of the jack.<br>01h = Mainboard, Rear                                                                           |
| [23:20] | Device        | RW | 0x8   | Default Device, indicating intended use of jack.<br>8 = Line In                                                                   |
| [19:16] | Connection    | RW | 0x1   | Connection Type. 1 = 1/8 inch jack                                                                                                |
| [15:12] | Color         | RW | 0x3   | Color of physical jack. 3 = Blue                                                                                                  |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0x4   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0xE   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.6. PortD Node (NID = 0x0D)

#### 3.4.6.1. PortD WCap

Table 120. PortD WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 121. PortD WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex              |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                               |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability  |

Table 121. PortD WCap Command Response Format

| Bit  | Bitfield Name | RW | Reset | Description                                                                          |
|------|---------------|----|-------|--------------------------------------------------------------------------------------|
| [10] | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                   |
| [9]  | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                     |
| [8]  | ConnList      | R  | 0x1   | Connection list is present                                                           |
| [7]  | UnsolCap      | R  | 0x1   | Unsolicited Response is supported                                                    |
| [6]  | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                     |
| [5]  | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4]  | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                  |
| [3]  | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2]  | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1]  | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0]  | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.6.2. PortD PinCap

Table 122. PortD PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 123. PortD PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                        |
|---------|---------------|----|-------|----------------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                           |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin              |
| [15:8]  | VrefCap       | R  | 0x00  | VRef generation not supported by this pin complex. |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                           |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.           |

Table 123. PortD PinCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                   |
|-----|---------------|----|-------|-----------------------------------------------|
| [5] | InCap         | R  | 0x1   | Pin complex is input capable.                 |
| [4] | OutCap        | R  | 0x1   | Pin complex is output capable.                |
| [3] | HdphCap       | R  | 0x1   | Pin complex has headphone amplifier.          |
| [2] | PresDtctCap   | R  | 0x1   | Pin complex can perform Presence Detect.      |
| [1] | TrigRqd       | R  | 0x1   | Trigger is required for impedance measurement |
| [0] | ImpSenseCap   | R  | 0x1   | Pin complex supports impedance sense.         |

## 3.4.6.3. PortD ConnLen

Table 124. PortD ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 125. PortD ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                             |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

## 3.4.6.4. PortD ConnLst

Table 126. PortD ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 127. PortD ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description           |
|---------|---------------|----|-------|-----------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry.    |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry.    |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry.    |
| [7:0]   | Entry0        | R  | 0x10  | DAC0 Converter widget |

3.4.6.5. *PortD PinCtl*

Table 128. PortD PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 129. PortD PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                        |
|--------|---------------|----|-------|--------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                           |
| [7]    | HdphEn        | RW | 0x0   | 1 = enable the low impedance amplifier associated with the output. |
| [6]    | OutEn         | RW | 0x0   | 1 = (CODEC) output path of Pin Widget is enabled                   |
| [5]    | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled                    |
| [4:0]  | Rsvd1         | R  | 0x0   | Reserved                                                           |

3.4.6.6. *PortD UnsolvResp*

Table 130. PortD UnsolvResp Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 131. PortD Unsolicited Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                           |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x00  | Reserved                                                                                                                              |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses. Unsolicited response events occur upon jack-insertion OR completion of a Jack-Sense cycle. |
| [6]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                              |
| [5:0]  | Tag           | RW | 0x00  | Software programmable field returned in top six bits (31:26) of every Unsolicited Response generated by this node.                    |

## 3.4.6.7. PortD PinSense

Table 132. PortD PinSense Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F09     | 00                                | See bitfield table. |
| <b>Set1</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 133. PortD PinSense Command Response Format

| Bit    | Bitfield Name | RW | Reset       | Description                                                                                                                                                                    |
|--------|---------------|----|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31]   | PresDtct      | R  | 0x0         | 1 = something is plugged into jack associated with Pin Complex.                                                                                                                |
| [30:0] | Impedance     | R  | 0x7FFF_FFFF | Measured impedance of the widget. A value of all 1s indicates that a valid sense reading is not available, or the sense measurement is busy if it has been recently triggered. |
| [0]    | RightCh       | W  | 0x0         | Set 1 = perform impedance sensing on right channel or ring of the connector                                                                                                    |
| [0]    | LeftCh        | W  | 0x0         | Set 0 = perform impedance sensing on left channel or tip of the connector                                                                                                      |

3.4.6.8. *PortD PinConfig*

Table 134. PortD PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 135. PortD PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x0   | External Port Connectivity of the Pin Complex.<br>0 = connected to a jack                                                         |
| [29:24] | Location      | RW | 0x01  | Physical location of the jack.<br>01h = Mainboard, Rear                                                                           |
| [23:20] | Device        | RW | 0x2   | Default Device, indicating intended use of jack.<br>2 = HP Out                                                                    |
| [19:16] | Connection    | RW | 0x1   | Connection Type. 1 = 1/8 inch jack                                                                                                |
| [15:12] | Color         | RW | 0x4   | Color of physical jack. 4 = Green                                                                                                 |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0x1   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0xF   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.7. PortE Node (NID = 0x0E)

#### 3.4.7.1. PortE WCap

Table 136. PortE WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 137. PortE WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                          |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                             |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex                                                            |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                               |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                             |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                                |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                   |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                     |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                           |
| [7]     | UnsolCap      | R  | 0x1   | Unsolicited Response is supported                                                    |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                     |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4]     | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                  |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2]     | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                                                                        |

3.4.7.2. *PortE PinCap*

Table 138. PortE PinCap Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 0C      | See bitfield table. |

Table 139. PortE PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                           |
|---------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                              |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin                                                                                                                                                                 |
| [15:8]  | VrefCap       | R  | 0x17  | VRef generation is supported by this pin complex, and the following voltages can be produced on the associated VRef pin: 80% AVdd; 50% AVdd; GND; Hi-Z (required since pin complex is output capable) |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                              |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.                                                                                                                                                              |
| [5]     | InCap         | R  | 0x1   | Pin complex is input capable.                                                                                                                                                                         |
| [4]     | OutCap        | R  | 0x1   | Pin complex is output capable.                                                                                                                                                                        |
| [3]     | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.                                                                                                                                                              |
| [2]     | PresDtctCap   | R  | 0x1   | Pin complex can perform Presence Detect.                                                                                                                                                              |
| [1]     | TrigRqd       | R  | 0x1   | Trigger is required for impedance measurement                                                                                                                                                         |
| [0]     | ImpSenseCap   | R  | 0x1   | Pin complex supports impedance sense.                                                                                                                                                                 |

3.4.7.3. *PortE ConnLen*

Table 140. PortE ConnLen Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 0E      | See bitfield table. |

Table 141. PortE ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                             |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

## 3.4.7.4. PortE ConnLst

Table 142. PortE ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 143. PortE ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description           |
|---------|---------------|----|-------|-----------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry.    |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry.    |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry.    |
| [7:0]   | Entry0        | R  | 0x10  | DAC0 Converter widget |

## 3.4.7.5. PortE PinCtl

Table 144. PortE PinCtl Command Verb Format

|      | Verb ID | Payload                           | Response            |
|------|---------|-----------------------------------|---------------------|
| Get  | F07     | 00                                | See bitfield table. |
| Set1 | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 145. PortE PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                      |
|--------|---------------|----|-------|--------------------------------------------------|
| [31:7] | Rsvd2         | R  | 0x0   | Reserved                                         |
| [6]    | OutEn         | RW | 0x0   | 1 = (CODEC) output path of Pin Widget is enabled |

Table 145. PortE PinCtl Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                 |
|-------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [5]   | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled                                                                                                                                                                                                                                                                                                             |
| [4:3] | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                                                                                                    |
| [2:0] | VrefSelect    | RW | 0x0   | VRefEn: Selects one of the possible states for the VRef signal associated with the Pin Widget. If the value written to this control does not correspond to a supported value defined in the VRefCntrl field of the Pin Capabilities parameter (0C), then this control will take the value of 000b (Hi-Z). (Hi-Z = 000b, 50% = 001b, GND = 010b, 80% = 100b) |

## 3.4.7.6. PortE UnsolicitedResp

Table 146. PortE UnsolicitedResp Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 147. PortE UnsolicitedResp Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                           |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x00  | Reserved                                                                                                                              |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses. Unsolicited response events occur upon jack-insertion OR completion of a Jack-Sense cycle. |
| [6]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                              |
| [5:0]  | Tag           | RW | 0x00  | Software programmable field returned in top six bits (31:26) of every Unsolicited Response generated by this node.                    |

3.4.7.7. *PortE PinSense*

Table 148. PortE PinSense Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F09     | 00                                | See bitfield table. |
| <b>Set1</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 149. PortE PinSense Command Response Format

| Bit    | Bitfield Name | RW | Reset       | Description                                                                                                                                                                    |
|--------|---------------|----|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31]   | PresDtct      | R  | 0x0         | 1 = something is plugged into jack associated with Pin Complex.                                                                                                                |
| [30:0] | Impedance     | R  | 0x7FFF_FFFF | Measured impedance of the widget. A value of all 1s indicates that a valid sense reading is not available, or the sense measurement is busy if it has been recently triggered. |
| [0]    | RightCh       | W  | 0x0         | Set 1 = perform impedance sensing on right channel or ring of the connector                                                                                                    |
| [0]    | LeftCh        | W  | 0x0         | Set 0 = perform impedance sensing on left channel or tip of the connector                                                                                                      |

3.4.7.8. *PortE PinConfig*

Table 150. PortE PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 151. PortE PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x0   | External Port Connectivity of the Pin Complex.<br>0 = connected to a jack                                                         |
| [29:24] | Location      | RW | 0x01  | Physical location of the jack.<br>01h = Mainboard, Rear                                                                           |
| [23:20] | Device        | RW | 0x0   | Default Device, indicating intended use of jack.<br>0 = Line Out                                                                  |
| [19:16] | Connection    | RW | 0x1   | Connection Type. 1 = 1/8 inch jack                                                                                                |
| [15:12] | Color         | RW | 0x1   | Color of physical jack. 1 = Black                                                                                                 |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0x1   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.8. PortF Node (NID = 0x0F)

#### 3.4.8.1. PortF WCap

Table 152. PortF WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 153. PortF WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex              |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                               |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability  |

Table 153. PortF WCap Command Response Format

| Bit  | Bitfield Name | RW | Reset | Description                                                                                |
|------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [10] | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                         |
| [9]  | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                           |
| [8]  | ConnList      | R  | 0x1   | Connection list is present.<br>ConnList = 1 if DAC1 enabled,<br>ConnList = 0 otherwise     |
| [7]  | UnsolCap      | R  | 0x1   | Unsolicited Response is supported                                                          |
| [6]  | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                           |
| [5]  | Stripe        | R  | 0x0   | No support for striping                                                                    |
| [4]  | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                        |
| [3]  | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier<br>parameters from Audio Function node<br>instead |
| [2]  | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                        |
| [1]  | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                         |
| [0]  | Stereo        | R  | 0x1   | Stereo widget                                                                              |

## 3.4.8.2. PortF PinCap

Table 154. PortF PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 155. PortF PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                           |
|---------|---------------|----|-------|---------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                              |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin |

Table 155. PortF PinCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                           |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [15:8] | VrefCap       | R  | 0x17  | VRef generation is supported by this pin complex, and the following voltages can be produced on the associated VRef pin: 80% AVdd; 50% AVdd; GND; Hi-Z (required since pin complex is output capable) |
| [7]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                              |
| [6]    | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.                                                                                                                                                              |
| [5]    | InCap         | R  | 0x1   | Pin complex is input capable.                                                                                                                                                                         |
| [4]    | OutCap        | R  | 0x1   | Pin complex is output capable.<br>OutCap = 1 if DAC1 enabled,<br>OutCap = 0 otherwise                                                                                                                 |
| [3]    | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.                                                                                                                                                              |
| [2]    | PresDtctCap   | R  | 0x1   | Pin complex can perform Presence Detect.                                                                                                                                                              |
| [1]    | TrigRqd       | R  | 0x1   | Trigger is required for impedance measurement                                                                                                                                                         |
| [0]    | ImpSenseCap   | R  | 0x1   | Pin complex supports impedance sense.                                                                                                                                                                 |

## 3.4.8.3. PortF ConnLen

Table 156. PortF ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 157. PortF ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                   |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries.                                       |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.<br>N = 01h if DAC1 enabled,<br>N = 00h otherwise |

3.4.8.4. *PortF ConnLst*

Table 158. PortF ConnLst Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F02     | 00      | See bitfield table. |

Table 159. PortF ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry.                                                                |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry.                                                                |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry.                                                                |
| [7:0]   | Entry0        | R  | 0x11  | DAC1 Converter widget.<br>Entry1 = 11h if DAC1 enabled,<br>Entry1 = 00h otherwise |

3.4.8.5. *PortF PinCtl*

Table 160. PortF PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 161. PortF PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                      |
|--------|---------------|----|-------|--------------------------------------------------|
| [31:7] | Rsvd2         | R  | 0x0   | Reserved                                         |
| [6]    | OutEn         | RW | 0x0   | 1 = (CODEC) output path of Pin Widget is enabled |
| [5]    | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled  |

Table 161. PortF PinCtl Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                 |
|-------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [4:3] | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                                                                                                    |
| [2:0] | VrefSelect    | RW | 0x0   | VRefEn: Selects one of the possible states for the VRef signal associated with the Pin Widget. If the value written to this control does not correspond to a supported value defined in the VRefCntrl field of the Pin Capabilities parameter (0C), then this control will take the value of 000b (Hi-Z). (Hi-Z = 000b, 50% = 001b, GND = 010b, 80% = 100b) |

## 3.4.8.6. PortF UnsolicitedResp

Table 162. PortF UnsolicitedResp Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 163. PortF UnsolicitedResp Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                           |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x00  | Reserved                                                                                                                              |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses. Unsolicited response events occur upon jack-insertion OR completion of a Jack-Sense cycle. |
| [6]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                              |
| [5:0]  | Tag           | RW | 0x00  | Software programmable field returned in top six bits (31:26) of every Unsolicited Response generated by this node.                    |

3.4.8.7. *PortF PinSense*

Table 164. PortF PinSense Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F09     | 00                                | See bitfield table. |
| <b>Set1</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 165. PortF PinSense Command Response Format

| Bit    | Bitfield Name | RW | Reset       | Description                                                                                                                                                                    |
|--------|---------------|----|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31]   | PresDtct      | R  | 0x0         | 1 = something is plugged into jack associated with Pin Complex.                                                                                                                |
| [30:0] | Impedance     | R  | 0x7FFF_FFFF | Measured impedance of the widget. A value of all 1s indicates that a valid sense reading is not available, or the sense measurement is busy if it has been recently triggered. |
| [0]    | RightCh       | W  | 0x0         | Set 1 = perform impedance sensing on right channel or ring of the connector                                                                                                    |
| [0]    | LeftCh        | W  | 0x0         | Set 0 = perform impedance sensing on left channel or tip of the connector                                                                                                      |

3.4.8.8. *PortF PinConfig*

Table 166. PortF PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 167. PortF PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x0   | External Port Connectivity of the Pin Complex.<br>0 = connected to a jack                                                         |
| [29:24] | Location      | RW | 0x01  | Physical location of the jack.<br>01h = Mainboard, Rear                                                                           |
| [23:20] | Device        | RW | 0xA   | Default Device, indicating intended use of jack.<br>A = MIC In                                                                    |
| [19:16] | Connection    | RW | 0x1   | Connection Type. 1 = 1/8 inch jack                                                                                                |
| [15:12] | Color         | RW | 0x9   | Color of physical jack. 9 = Pink                                                                                                  |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0x4   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.9. DAC0 Node (NID = 0x10)

#### 3.4.9.1. DAC0 CnvtrFrmt

Table 168. DAC0 CnvtrFrmt Command Verb Format

|             | Verb ID | Payload                            | Response            |
|-------------|---------|------------------------------------|---------------------|
| <b>Get</b>  | A       | 0000                               | See bitfield table. |
| <b>Set1</b> | 2       | See bits [15:0] of bitfield table. | 0000_0000h          |

Table 169. DAC0 CnvtrFrmt Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                 |
|---------|---------------|----|-------|-------------------------------------------------------------|
| [31:16] | Rsvd2         | R  | 0x0   | Reserved                                                    |
| [15]    | StrmType      | R  | 0x0   | Stream Type: only PCM streams are supported by this widget. |

Table 169. DAC0 CnvtrFrmt Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                      |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [14]    | RateBase      | RW | 0x0   | Sample Base Rate<br>0 = 48 KHz<br>1 = 44.1 KHz                                                                                                                                                   |
| [13:11] | RateMult      | RW | 0x0   | Sample Base Rate Multiple<br>000 = 48 KHz / 44.1 KHz or less<br>001 = x2<br>010 = Reserved (x3)<br>011 = x4<br>100-111 = Reserved                                                                |
| [10:8]  | RateDiv       | RW | 0x0   | Sample Base Rate Divisor<br>000 = Divide by 1<br>001 = Divide by 2<br>010 = Divide by 3<br>011 = Divide by 4<br>100 = Divide by 5<br>101 = Divide by 6<br>110 = Divide by 7<br>111 = Divide by 8 |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                         |
| [6:4]   | NumBits       | RW | 0x3   | Bits per Sample<br>000 = 8 bits<br>001 = 16 bits<br>010 = 20 bits<br>011 = 24 bits<br>100-111 = Reserved                                                                                         |
| [3:0]   | NumChan       | RW | 0x1   | Number of Channels Number of channels in each frame of the stream.<br>0000 = 1 channel<br>0001 = 2 channels<br>...<br>1111 = 16 channels                                                         |

## 3.4.9.2. DAC0 OutAmpRight

Table 170. DAC0 OutAmpRight Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B80     | 00                                | See bitfield table. |
| <b>Set1</b> | 390     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 171. DAC0 OutAmpRight Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                |
|--------|---------------|----|-------|----------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                   |
| [7]    | Mute          | RW | 0x1   | 1 = mute is active         |
| [6:0]  | Gain          | RW | 0x7F  | Amplifier gain step number |

3.4.9.3. *DAC0 OutAmpLeft*

Table 172. DAC0 OutAmpLeft Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | BA0     | 00                                | See bitfield table. |
| <b>Set1</b> | 3A0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 173. DAC0 OutAmpLeft Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                |
|--------|---------------|----|-------|----------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                   |
| [7]    | Mute          | RW | 0x1   | 1 = mute is active         |
| [6:0]  | Gain          | RW | 0x7F  | Amplifier gain step number |

3.4.9.4. *DAC0 WCap*

Table 174. DAC0 WCap Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 09      | See bitfield table. |

Table 175. DAC0 WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x0   | Widget type = Audio Output             |
| [19:16] | Delay         | R  | 0xD   | Number of sample delays through widget |

Table 175. DAC0 WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                          |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------|
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                             |
| [11]    | SwapCap       | R  | 0x1   | Left and right channels can be swapped                                               |
| [10]    | PwrPrsnt      | R  | 0x1   | Power State control is supported                                                     |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                     |
| [8]     | ConnList      | R  | 0x0   | No connection list is present                                                        |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                                  |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                                    |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4]     | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead       |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2]     | OutAmpPrsnt   | R  | 0x1   | Output amplifier                                                                     |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.9.5. DAC0 PwrState

Table 176. DAC0 PwrState Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F05     | 00                                | See bitfield table. |
| <b>Set1</b> | 705     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 177. DAC0 PwrState Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                    |
|--------|---------------|----|-------|------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                       |
| [7:4]  | Act           | R  | 0x3   | PS-Act: Actual power state of referenced node. |

Table 177. DAC0 PwrState Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                   |
|-------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------|
| [3:2] | Rsvd1         | R  | 0x0   | Reserved                                                                                                                      |
| [1:0] | Set           | RW | 0x3   | PS-Set: Current power setting of referenced node.<br>00 - Fully on.<br>01 - Fully on.<br>10 - Fully on.<br>11 - Powered down. |

3.4.9.6. *DAC0 CnvtrID*

Table 178. DAC0 CnvtrID Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F06     | 00                                | See bitfield table. |
| <b>Set1</b> | 706     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 179. DAC0 CnvtrID Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                            |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                                                               |
| [7:4]  | Stream        | RW | 0x0   | Software-programmable integer representing link stream ID used by the converter widget. By convention, stream 0 is reserved as unused. |
| [3:0]  | Channel       | RW | 0x0   | Integer representing lowest channel used by converter.                                                                                 |

3.4.9.7. *DAC0 LR*

Table 180. DAC0 LR Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F0C     | 00                                | See bitfield table. |
| <b>Set1</b> | 70C     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 181. DAC0 LR Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                     |
|--------|---------------|----|-------|-------------------------------------------------|
| [31:3] | Rsvd2         | R  | 0x0   | Reserved                                        |
| [2]    | SwapEn        | RW | 0x0   | 1 = enable swapping of left and right channels. |
| [1:0]  | Rsvd1         | R  | 0x0   | Reserved                                        |

### 3.4.10. DAC1 Node (NID = 0x11)

#### 3.4.10.1. DAC1 CnvtrFrmt

Table 182. DAC1 CnvtrFrmt Command Verb Format

|             | Verb ID | Payload                            | Response            |
|-------------|---------|------------------------------------|---------------------|
| <b>Get</b>  | A       | 0000                               | See bitfield table. |
| <b>Set1</b> | 2       | See bits [15:0] of bitfield table. | 0000_0000h          |

Table 183. DAC1 CnvtrFrmt Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:16] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                          |
| [15]    | StrmType      | R  | 0x0   | Stream Type: only PCM streams are supported by this widget.                                                                       |
| [14]    | RateBase      | RW | 0x0   | Sample Base Rate<br>0 = 48 KHz<br>1 = 44.1 KHz                                                                                    |
| [13:11] | RateMult      | RW | 0x0   | Sample Base Rate Multiple<br>000 = 48 KHz / 44.1 KHz or less<br>001 = x2<br>010 = Reserved (x3)<br>011 = x4<br>100-111 = Reserved |

Table 183. DAC1 CnvtrFmt Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                      |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [10:8] | RateDiv       | RW | 0x0   | Sample Base Rate Divisor<br>000 = Divide by 1<br>001 = Divide by 2<br>010 = Divide by 3<br>011 = Divide by 4<br>100 = Divide by 5<br>101 = Divide by 6<br>110 = Divide by 7<br>111 = Divide by 8 |
| [7]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                         |
| [6:4]  | NumBits       | RW | 0x3   | Bits per Sample<br>000 = 8 bits<br>001 = 16 bits<br>010 = 20 bits<br>011 = 24 bits<br>100-111 = Reserved                                                                                         |
| [3:0]  | NumChan       | RW | 0x1   | Number of Channels Number of channels in each frame of the stream.<br>0000 = 1 channel<br>0001 = 2 channels<br>...<br>1111 = 16 channels                                                         |

## 3.4.10.2. DAC1 OutAmpRight

Table 184. DAC1 OutAmpRight Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B80     | 00                                | See bitfield table. |
| <b>Set1</b> | 390     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 185. DAC1 OutAmpRight Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                |
|--------|---------------|----|-------|----------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                   |
| [7]    | Mute          | RW | 0x1   | 1 = mute is active         |
| [6:0]  | Gain          | RW | 0x7F  | Amplifier gain step number |

3.4.10.3. *DAC1 OutAmpLeft*

Table 186. DAC1 OutAmpLeft Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | BA0     | 00                                | See bitfield table. |
| <b>Set1</b> | 3A0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 187. DAC1 OutAmpLeft Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                |
|--------|---------------|----|-------|----------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                   |
| [7]    | Mute          | RW | 0x1   | 1 = mute is active         |
| [6:0]  | Gain          | RW | 0x7F  | Amplifier gain step number |

3.4.10.4. *DAC1 WCap*

Table 188. DAC1 WCap Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 09      | See bitfield table. |

Table 189. DAC1 WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                   |
|---------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                                                      |
| [23:20] | Type          | R  | 0x0   | Audio Output widget.<br>Type = 0h (Output Converter) if DAC1 enabled,<br>Type = Fh (Vendor Defined) otherwise |
| [19:16] | Delay         | R  | 0xD   | Number of sample delays through widget                                                                        |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                                                      |
| [11]    | SwapCap       | R  | 0x1   | Left and right channels can be swapped                                                                        |
| [10]    | PwrPrsnt      | R  | 0x1   | Power State control is supported                                                                              |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                                              |
| [8]     | ConnList      | R  | 0x0   | No connection list is present                                                                                 |

Table 189. DAC1 WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                          |
|-----|---------------|----|-------|--------------------------------------------------------------------------------------|
| [7] | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                                  |
| [6] | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                                    |
| [5] | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4] | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead       |
| [3] | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2] | OutAmpPrsnt   | R  | 0x1   | Output amplifier                                                                     |
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0] | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.10.5. DAC1 PwrState

Table 190. DAC1 PwrState Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F05     | 00                                | See bitfield table. |
| <b>Set1</b> | 705     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 191. DAC1 PwrState Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                   |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                      |
| [7:4]  | Act           | R  | 0x3   | PS-Act: Actual power state of referenced node.                                                                                |
| [3:2]  | Rsvd1         | R  | 0x0   | Reserved                                                                                                                      |
| [1:0]  | Set           | RW | 0x3   | PS-Set: Current power setting of referenced node.<br>00 - Fully on.<br>01 - Fully on.<br>10 - Fully on.<br>11 - Powered down. |

3.4.10.6. *DAC1 CnvtrID*

Table 192. DAC1 CnvtrID Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F06     | 00                                | See bitfield table. |
| <b>Set1</b> | 706     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 193. DAC1 CnvtrID Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                            |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                                                               |
| [7:4]  | Stream        | RW | 0x0   | Software-programmable integer representing link stream ID used by the converter widget. By convention, stream 0 is reserved as unused. |
| [3:0]  | Channel       | RW | 0x0   | Integer representing lowest channel used by converter.                                                                                 |

3.4.10.7. *DAC1 LR*

Table 194. DAC1 LR Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F0C     | 00                                | See bitfield table. |
| <b>Set1</b> | 70C     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 195. DAC1 LR Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                     |
|--------|---------------|----|-------|-------------------------------------------------|
| [31:3] | Rsvd2         | R  | 0x0   | Reserved                                        |
| [2]    | SwapEn        | RW | 0x0   | 1 = enable swapping of left and right channels. |
| [1:0]  | Rsvd1         | R  | 0x0   | Reserved                                        |

### 3.4.11. ADC0 Node (NID = 0x12)

#### 3.4.11.1. ADC0 CnvtrFrmt

Table 196. ADC0 CnvtrFrmt Command Verb Format

|             | Verb ID | Payload                            | Response            |
|-------------|---------|------------------------------------|---------------------|
| <b>Get</b>  | A       | 0000                               | See bitfield table. |
| <b>Set1</b> | 2       | See bits [15:0] of bitfield table. | 0000_0000h          |

Table 197. ADC0 CnvtrFrmt Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                      |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:16] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                         |
| [15]    | StrmType      | R  | 0x0   | Stream Type: only PCM streams are supported by this widget.                                                                                                                                      |
| [14]    | RateBase      | RW | 0x0   | Sample Base Rate<br>0 = 48 KHz<br>1 = 44.1 KHz                                                                                                                                                   |
| [13:11] | RateMult      | RW | 0x0   | Sample Base Rate Multiple<br>000 = 48 KHz / 44.1 KHz or less<br>001 = x2<br>010 = Reserved (x3)<br>011 = x4<br>100-111 = Reserved                                                                |
| [10:8]  | RateDiv       | RW | 0x0   | Sample Base Rate Divisor<br>000 = Divide by 1<br>001 = Divide by 2<br>010 = Divide by 3<br>011 = Divide by 4<br>100 = Divide by 5<br>101 = Divide by 6<br>110 = Divide by 7<br>111 = Divide by 8 |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                         |

Table 197. ADC0 CnvtrFmt Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                              |
|-------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------|
| [6:4] | NumBits       | RW | 0x3   | Bits per Sample<br>000 = 8 bits<br>001 = 16 bits<br>010 = 20 bits<br>011 = 24 bits<br>100-111 = Reserved                                 |
| [3:0] | NumChan       | RW | 0x1   | Number of Channels Number of channels in each frame of the stream.<br>0000 = 1 channel<br>0001 = 2 channels<br>...<br>1111 = 16 channels |

## 3.4.11.2. ADC0 WCap

Table 198. ADC0 WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 199. ADC0 WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                              |
|---------|---------------|----|-------|--------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                 |
| [23:20] | Type          | R  | 0x1   | Widget type = Audio Input                                                |
| [19:16] | Delay         | R  | 0xD   | Number of sample delays through widget                                   |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                 |
| [11]    | SwapCap       | R  | 0x0   | No left/right swap capability                                            |
| [10]    | PwrPrsnt      | R  | 0x1   | Power State control is supported                                         |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                         |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                               |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                      |
| [6]     | ProcPrsnt     | R  | 0x1   | Software should query the Processing Controls parameter for this widget. |

Table 199. ADC0 WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                          |
|-----|---------------|----|-------|--------------------------------------------------------------------------------------|
| [5] | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4] | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead       |
| [3] | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2] | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0] | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.11.3. ADC0 ConnLen

Table 200. ADC0 ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 201. ADC0 ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved.                                            |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

## 3.4.11.4. ADC0 ConnLst

Table 202. ADC0 ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 203. ADC0 ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description        |
|---------|---------------|----|-------|--------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry. |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry. |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry. |
| [7:0]   | Entry0        | R  | 0x1D  | ADC0Mux widget     |

## 3.4.11.5. ADC0 ProcState

Table 204. ADC0 ProcState Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F03     | 00                                | See bitfield table. |
| <b>Set1</b> | 703     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 205. ADC0 ProcState Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                     |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                        |
| [7]    | HPFOCDIS      | RW | 0x0   | High Pass Filter Offset Calculation Disable<br>0 = Calculation enabled.<br>1 = Calculation disabled.                                            |
| [6:2]  | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                        |
| [1:0]  | ADCHPFByp     | RW | 0x1   | Processing State = 00 (OFF): bypass the ADC high pass filter;<br>Processing State = 01, 10, 11 (ON or BENIGN): ADC high pass filter is enabled. |

## 3.4.11.6. ADC0 PwrState

Table 206. ADC0 PwrState Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F05     | 00                                | See bitfield table. |
| <b>Set1</b> | 705     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 207. ADC0 PwrState Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                            |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                               |
| [7:4]  | Act           | R  | 0x3   | PS-Act: Actual power state of referenced node.                                                                                         |
| [3:2]  | Rsvd1         | R  | 0x0   | Reserved                                                                                                                               |
| [1:0]  | Set           | RW | 0x3   | PS-Set: Current power setting of referenced node.<br>00 - Fully on.<br>01 - Fully on.<br>10 - Fully on.<br>11 - Powered down (default) |

## 3.4.11.7. ADC0 CnvtrID

Table 208. ADC0 CnvtrID Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F06     | 00                                | See bitfield table. |
| <b>Set1</b> | 706     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 209. ADC0 CnvtrID Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                            |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                                                               |
| [7:4]  | Stream        | RW | 0x0   | Software-programmable integer representing link stream ID used by the converter widget. By convention, stream 0 is reserved as unused. |
| [3:0]  | Channel       | RW | 0x0   | Integer representing lowest channel used by converter                                                                                  |

### 3.4.12. ADC1 Node (NID = 0x13)

#### 3.4.12.1. ADC1 CnvtrFmt

Table 210. ADC1 CnvtrFmt Command Verb Format

|             | Verb ID | Payload                            | Response            |
|-------------|---------|------------------------------------|---------------------|
| <b>Get</b>  | A       | 0000                               | See bitfield table. |
| <b>Set1</b> | 2       | See bits [15:0] of bitfield table. | 0000_0000h          |

Table 211. ADC1 CnvtrFmt Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                      |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:16] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                         |
| [15]    | StrmType      | R  | 0x0   | Stream Type: only PCM streams are supported by this widget.                                                                                                                                      |
| [14]    | RateBase      | RW | 0x0   | Sample Base Rate<br>0 = 48 KHz<br>1 = 44.1 KHz                                                                                                                                                   |
| [13:11] | RateMult      | RW | 0x0   | Sample Base Rate Multiple<br>000 = 48 KHz / 44.1 KHz or less<br>001 = x2<br>010 = Reserved (x3)<br>011 = x4<br>100-111 = Reserved                                                                |
| [10:8]  | RateDiv       | RW | 0x0   | Sample Base Rate Divisor<br>000 = Divide by 1<br>001 = Divide by 2<br>010 = Divide by 3<br>011 = Divide by 4<br>100 = Divide by 5<br>101 = Divide by 6<br>110 = Divide by 7<br>111 = Divide by 8 |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                         |

Table 211. ADC1 CnvtrFmt Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                              |
|-------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------|
| [6:4] | NumBits       | RW | 0x3   | Bits per Sample<br>000 = 8 bits<br>001 = 16 bits<br>010 = 20 bits<br>011 = 24 bits<br>100-111 = Reserved                                 |
| [3:0] | NumChan       | RW | 0x1   | Number of Channels Number of channels in each frame of the stream.<br>0000 = 1 channel<br>0001 = 2 channels<br>...<br>1111 = 16 channels |

## 3.4.12.2. ADC1 WCap

Table 212. ADC1 WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 213. ADC1 WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                              |
|---------|---------------|----|-------|--------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                 |
| [23:20] | Type          | R  | 0x1   | Widget type = Audio Input                                                |
| [19:16] | Delay         | R  | 0xD   | Number of sample delays through widget                                   |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                 |
| [11]    | SwapCap       | R  | 0x0   | No left/right swap capability                                            |
| [10]    | PwrPrsnt      | R  | 0x1   | Power State control is supported                                         |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                         |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                               |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                      |
| [6]     | ProcPrsnt     | R  | 0x1   | Software should query the Processing Controls parameter for this widget. |

Table 213. ADC1 WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                          |
|-----|---------------|----|-------|--------------------------------------------------------------------------------------|
| [5] | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4] | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead       |
| [3] | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2] | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0] | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.12.3. ADC1 ConnLen

Table 214. ADC1 ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 215. ADC1 ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved.                                            |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

## 3.4.12.4. ADC1 ConnLst

Table 216. ADC1 ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 217. ADC1 ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description        |
|---------|---------------|----|-------|--------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry. |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry. |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry. |
| [7:0]   | Entry0        | R  | 0x1E  | ADC1Mux widget     |

## 3.4.12.5. ADC1 ProcState

Table 218. ADC1 ProcState Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F03     | 00                                | See bitfield table. |
| <b>Set1</b> | 703     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 219. ADC1 ProcState Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                     |
|--------|---------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                        |
| [7]    | HPFOCDIS      | RW | 0x0   | High Pass Filter Offset Calculation Disable<br>0 = Calculation enabled.<br>1 = Calculation disabled.                                            |
| [6:2]  | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                        |
| [1:0]  | ADCHPFByp     | RW | 0x1   | Processing State = 00 (OFF): bypass the ADC high pass filter;<br>Processing State = 01, 10, 11 (ON or BENIGN): ADC high pass filter is enabled. |

## 3.4.12.6. ADC1 PwrState

Table 220. ADC1 PwrState Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F05     | 00                                | See bitfield table. |
| <b>Set1</b> | 705     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 221. ADC1 PwrState Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                            |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                               |
| [7:4]  | Act           | R  | 0x3   | PS-Act: Actual power state of referenced node.                                                                                         |
| [3:2]  | Rsvd1         | R  | 0x0   | Reserved                                                                                                                               |
| [1:0]  | Set           | RW | 0x3   | PS-Set: Current power setting of referenced node.<br>00 - Fully on.<br>01 - Fully on.<br>10 - Fully on.<br>11 - Powered down (default) |

## 3.4.12.7. ADC1 CnvtrID

Table 222. ADC1 CnvtrID Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F06     | 00                                | See bitfield table. |
| <b>Set1</b> | 706     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 223. ADC1 CnvtrID Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                            |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                                                               |
| [7:4]  | Stream        | RW | 0x0   | Software-programmable integer representing link stream ID used by the converter widget. By convention, stream 0 is reserved as unused. |
| [3:0]  | Channel       | RW | 0x0   | Integer representing lowest channel used by converter                                                                                  |

### 3.4.13. PortMonoOut Node (NID = 0x14)

#### 3.4.13.1. PortMonoOut Vol

**Table 224. PortMonoOut Vol Command Verb Format**

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | BA0     | 00                                | See bitfield table. |
| <b>Set1</b> | 3A0     | See bits [7:0] of bitfield table. | 0000_0000h          |

**Table 225. PortMonoOut Vol Command Response Format**

| Bit    | Bitfield Name | RW | Reset | Description                            |
|--------|---------------|----|-------|----------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                               |
| [7]    | Mute          | RW | 0x1   | 1 = mute is active                     |
| [6:5]  | Rsvd1         | R  | 0x0   | Reserved                               |
| [4:0]  | Gain          | RW | 0x1F  | Mono (left) amplifier gain step number |

#### 3.4.13.2. PortMonoOut WCap

**Table 226. PortMonoOut WCap Command Verb Format**

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 09      | See bitfield table. |

**Table 227. PortMonoOut WCap Command Response Format**

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex              |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                               |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability  |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control     |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream       |

Table 227. PortMonoOut WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                        |
|-----|---------------|----|-------|----------------------------------------------------|
| [8] | ConnList      | R  | 0x1   | Connection list is present                         |
| [7] | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                |
| [6] | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                   |
| [5] | Stripe        | R  | 0x0   | No support for striping                            |
| [4] | FrmtOverride  | R  | 0x0   | N/A for pin complex                                |
| [3] | AmpOverride   | R  | 0x1   | This widget contains its own amplifier parameters. |
| [2] | OutAmpPrsnt   | R  | 0x1   | Output amplifier is present                        |
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier                                 |
| [0] | Stereo        | R  | 0x0   | Mono widget                                        |

## 3.4.13.3. PortMonoOut PinCap

Table 228. PortMonoOut PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 229. PortMonoOut PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                 |
|---------|---------------|----|-------|-------------------------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                                    |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin                       |
| [15:8]  | VrefCap       | R  | 0x00  | VRef generation N/A since pin complex is not input capable. |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                    |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.                    |
| [5]     | InCap         | R  | 0x0   | Pin complex is not input capable.                           |
| [4]     | OutCap        | R  | 0x1   | Pin complex is output capable.                              |

Table 229. PortMonoOut PinCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                   |
|-----|---------------|----|-------|-----------------------------------------------|
| [3] | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.      |
| [2] | PresDtctCap   | R  | 0x0   | Pin complex cannot perform Presence Detect.   |
| [1] | TrigRqd       | R  | 0x0   | N/A                                           |
| [0] | ImpSenseCap   | R  | 0x0   | Pin complex does not support impedance sense. |

## 3.4.13.4. PortMonoOut OutAmpCap

Table 230. PortMonoOut OutAmpCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 12      | See bitfield table. |

Table 231. PortMonoOut OutAmpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                         |
|---------|---------------|----|-------|---------------------------------------------------------------------|
| [31]    | Mute          | R  | 0x1   | Amplifier is capable of muting                                      |
| [30:23] | Rsvd3         | R  | 0x0   | Reserved                                                            |
| [22:16] | StepSize      | R  | 0x05  | Size of each step in the gain range = 1.5dB                         |
| [15]    | Rsvd2         | R  | 0x0   | Reserved                                                            |
| [14:8]  | NumSteps      | R  | 0x1F  | Number of steps in the gain range = 31 (32 values, -46.5dB to +0dB) |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                            |
| [6:0]   | Offset        | R  | 0x1F  | 0dB-step is programmed with this offset                             |

## 3.4.13.5. PortMonoOut ConnLen

Table 232. PortMonoOut ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 233. PortMonoOut ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                             |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

## 3.4.13.6. PortMonoOut ConnLst

Table 234. PortMonoOut ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 235. PortMonoOut ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description         |
|---------|---------------|----|-------|---------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry.  |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry.  |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry.  |
| [7:0]   | Entry0        | R  | 0x15  | MonoOut Mix widget. |

## 3.4.13.7. PortMonoOut PinCtl

Table 236. PortMonoOut PinCtl Command Verb Format

|      | Verb ID | Payload                           | Response            |
|------|---------|-----------------------------------|---------------------|
| Get  | F07     | 00                                | See bitfield table. |
| Set1 | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 237. PortMonoOut PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description |
|--------|---------------|----|-------|-------------|
| [31:7] | Rsvd2         | R  | 0x0   | Reserved    |

Table 237. PortMonoOut PinCtl Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                      |
|-------|---------------|----|-------|--------------------------------------------------|
| [6]   | OutEn         | RW | 0x0   | 1 = (CODEC) output path of Pin Widget is enabled |
| [5:0] | Rsvd1         | R  | 0x0   | Reserved                                         |

## 3.4.13.8. PortMonoOut PinConfig

Table 238. PortMonoOut PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 239. PortMonoOut PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x1   | External Port Connectivity of the Pin Complex.<br>1 = no physical connection                                                      |
| [29:24] | Location      | RW | 0x10  | Physical location of the jack.<br>10h = Internal, N/A                                                                             |
| [23:20] | Device        | RW | 0x0   | Default Device, indicating intended use of jack.<br>0 = Line Out                                                                  |
| [19:16] | Connection    | RW | 0x7   | Connection Type. 7 = Other Analog                                                                                                 |
| [15:12] | Color         | RW | 0x0   | Color of physical jack. 0 = Unknown                                                                                               |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0xF   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.14. MonoOutMix Node (NID = 0x15)

#### 3.4.14.1. MonoOutMix WCap

Table 240. MonoOutMix WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 241. MonoOutMix WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                          |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                             |
| [23:20] | Type          | R  | 0x2   | Widget type = Audio Mixer                                                            |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                               |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                             |
| [11]    | SwapCap       | R  | 0x0   | Swapping of left and right channels not supported                                    |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                   |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                     |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                           |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                                  |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                                    |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4]     | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead       |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2]     | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0]     | Stereo        | R  | 0x0   | Mono widget                                                                          |

3.4.14.2. *MonoOutMix ConnLen*

Table 242. MonoOutMix ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 243. MonoOutMix ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved.                                            |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

3.4.14.3. *MonoOutMix ConnLst*

Table 244. MonoOutMix ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 245. MonoOutMix ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description           |
|---------|---------------|----|-------|-----------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry.    |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry.    |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry.    |
| [7:0]   | Entry0        | R  | 0x10  | DAC0 Converter widget |

3.4.15. *CD Node (NID = 0x16)*3.4.15.1. *CD WCap*

Table 246. CD WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 247. CD WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex              |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                               |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability  |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control     |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream       |
| [8]     | ConnList      | R  | 0x0   | No connection list is present          |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response    |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter       |
| [5]     | Stripe        | R  | 0x0   | No support for striping                |
| [4]     | FrmtOverride  | R  | 0x0   | N/A for pin complex                    |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier                           |
| [2]     | OutAmpPrsnt   | R  | 0x0   | No output amplifier                    |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                     |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                          |

## 3.4.15.2. CD PinCap

Table 248. CD PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 249. CD PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                   |
|---------|---------------|----|-------|-----------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                      |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin         |
| [15:8]  | VrefCap       | R  | 0x00  | Vref generation not supported on this pin     |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                      |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.      |
| [5]     | InCap         | R  | 0x1   | Pin complex is input capable.                 |
| [4]     | OutCap        | R  | 0x0   | Pin complex is not output capable.            |
| [3]     | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.      |
| [2]     | PresDtctCap   | R  | 0x0   | Pin complex cannot perform Presence Detect.   |
| [1]     | TrigRqd       | R  | 0x0   | N/A                                           |
| [0]     | ImpSenseCap   | R  | 0x0   | Pin complex does not support impedance sense. |

## 3.4.15.3. CD PinCtl

Table 250. CD PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 251. CD PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                     |
|--------|---------------|----|-------|-------------------------------------------------|
| [31:6] | Rsvd2         | R  | 0x0   | Reserved                                        |
| [5]    | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled |
| [4:0]  | Rsvd1         | R  | 0x0   | Reserved                                        |

3.4.15.4. *CD PinConfig*

Table 252. CD PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 253. CD PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x1   | External Port Connectivity of the Pin Complex.<br>1 = no physical connection                                                      |
| [29:24] | Location      | RW | 0x10  | Physical location of the jack.<br>10h = Internal, N/A                                                                             |
| [23:20] | Device        | RW | 0x3   | Default Device, indicating intended use of jack.<br>3 = S887CD                                                                    |
| [19:16] | Connection    | RW | 0x3   | Connection Type. 3 = ATAPI internal                                                                                               |
| [15:12] | Color         | RW | 0x0   | Color of physical jack. 0 = Unknown                                                                                               |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0xF   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.16. DigMic0 Node (NID = 0x17)

#### 3.4.16.1. DigMic0 WCap

**Table 254. DigMic0 WCap Command Verb Format**

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 09      | See bitfield table. |

**Table 255. DigMic0 WCap Command Response Format**

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                    |
|---------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                       |
| [23:20] | Type          | R  | 0x4   | Pin Complex widget.<br>Type = 4h (Pin Complex) if DMIC enabled,<br>Type = Fh (Vendor Defined) otherwise                                                                                                                                                        |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                                                                                                                                                                                                         |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                       |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                                                                                                                                                                                                          |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                                                                                                                                                                                             |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream (since the digital microphone input is a SDM signal that needs to be processed by the digital filters, it is not a true bit for bit digital stream like I <sup>2</sup> S or SPDIF where samples are passed through unchanged) |
| [8]     | ConnList      | R  | 0x0   | No connection list is present                                                                                                                                                                                                                                  |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                                                                                                                                                                                                            |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                                                                                                                                                                                               |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                                                                                                                                                                                                        |
| [4]     | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                                                                                                                                                                                            |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead.                                                                                                                                                                          |
| [2]     | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                                                                                                                                                                                            |

Table 255. DigMic0 WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description        |
|-----|---------------|----|-------|--------------------|
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier |
| [0] | Stereo        | R  | 0x1   | Stereo widget      |

## 3.4.16.2. DigMic0 PinCap

Table 256. DigMic0 PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 257. DigMic0 PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                        |
|---------|---------------|----|-------|----------------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                           |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin              |
| [15:8]  | VrefCap       | R  | 0x00  | VRef generation not supported by this pin complex. |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                           |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.           |
| [5]     | InCap         | R  | 0x1   | Pin complex is input capable.                      |
| [4]     | OutCap        | R  | 0x0   | Pin complex is not output capable.                 |
| [3]     | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.           |
| [2]     | PresDtctCap   | R  | 0x0   | Pin complex cannot perform Presence Detect.        |
| [1]     | TrigRqd       | R  | 0x0   | N/A                                                |
| [0]     | ImpSenseCap   | R  | 0x0   | Pin complex does not support impedance sense.      |

3.4.16.3. *DigMic0 PinCtl*

Table 258. DigMic0 PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 259. DigMic0 PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                     |
|--------|---------------|----|-------|-------------------------------------------------|
| [31:6] | Rsvd2         | R  | 0x0   | Reserved                                        |
| [5]    | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled |
| [4:0]  | Rsvd1         | R  | 0x0   | Reserved                                        |

3.4.16.4. *DigMic0 PinConfig*

Table 260. DigMic0 PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 261. DigMic0 PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                  |
|---------|---------------|----|-------|------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x1   | External Port Connectivity of the Pin Complex.<br>1 = no physical connection |
| [29:24] | Location      | RW | 0x10  | Physical location of the jack.<br>10h = Internal, N/A                        |
| [23:20] | Device        | RW | 0xA   | Default Device, indicating intended use of jack.<br>A = MIC In               |
| [19:16] | Connection    | RW | 0x0   | Connection Type. 0 = Unknown                                                 |

Table 261. DigMic0 PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                 |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------|
| [15:12] | Color         | RW | 0x0   | Color of physical jack. 0 = Unknown                                                                                         |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                             |
| [7:4]   | Assoc         | RW | 0xF   | Default Association for Pin Complex groups. Reserved value 0000b should not be used. Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                             |

### 3.4.17. DigMic1 Node (NID = 0x18)

#### 3.4.17.1. DigMic1 WCap

Table 262. DigMic1 WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 263. DigMic1 WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                    |
|---------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                       |
| [23:20] | Type          | R  | 0x4   | Pin Complex widget.<br>Type = 4h (Pin Complex) if DMIC enabled,<br>Type = Fh (Vendor Defined) otherwise                                                                                                                                                        |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                                                                                                                                                                                                         |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                       |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                                                                                                                                                                                                          |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                                                                                                                                                                                             |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream (since the digital microphone input is a SDM signal that needs to be processed by the digital filters, it is not a true bit for bit digital stream like I <sup>2</sup> S or SPDIF where samples are passed through unchanged) |

Table 263. DigMic1 WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                           |
|-----|---------------|----|-------|---------------------------------------------------------------------------------------|
| [8] | ConnList      | R  | 0x0   | No connection list is present                                                         |
| [7] | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                                   |
| [6] | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                      |
| [5] | Stripe        | R  | 0x0   | No support for striping                                                               |
| [4] | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                   |
| [3] | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead. |
| [2] | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                   |
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                    |
| [0] | Stereo        | R  | 0x1   | Stereo widget                                                                         |

## 3.4.17.2. DigMic1 PinCap

Table 264. DigMic1 PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 265. DigMic1 PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                        |
|---------|---------------|----|-------|----------------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                           |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin              |
| [15:8]  | VrefCap       | R  | 0x00  | VRef generation not supported by this pin complex. |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                           |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.           |
| [5]     | InCap         | R  | 0x1   | Pin complex is input capable.                      |
| [4]     | OutCap        | R  | 0x0   | Pin complex is not output capable.                 |

Table 265. DigMic1 PinCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                   |
|-----|---------------|----|-------|-----------------------------------------------|
| [3] | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.      |
| [2] | PresDtctCap   | R  | 0x0   | Pin complex cannot perform Presence Detect.   |
| [1] | TrigRqd       | R  | 0x0   | N/A                                           |
| [0] | ImpSenseCap   | R  | 0x0   | Pin complex does not support impedance sense. |

## 3.4.17.3. DigMic1 PinCtl

Table 266. DigMic1 PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 267. DigMic1 PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                     |
|--------|---------------|----|-------|-------------------------------------------------|
| [31:6] | Rsvd2         | R  | 0x0   | Reserved                                        |
| [5]    | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled |
| [4:0]  | Rsvd1         | R  | 0x0   | Reserved                                        |

## 3.4.17.4. DigMic1 PinConfig

Table 268. DigMic1 PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 269. DigMic1 PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x1   | External Port Connectivity of the Pin Complex.<br>1 = no physical connection                                                      |
| [29:24] | Location      | RW | 0x10  | Physical location of the jack.<br>10h = Internal, N/A                                                                             |
| [23:20] | Device        | RW | 0xA   | Default Device, indicating intended use of jack.<br>A = MIC In                                                                    |
| [19:16] | Connection    | RW | 0x0   | Connection Type. 0 = Unknown                                                                                                      |
| [15:12] | Color         | RW | 0x0   | Color of physical jack. 0 = Unknown                                                                                               |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0xF   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.18. InPort0Mux Node (NID = 0x19)

#### 3.4.18.1. InPort0Mux WCap

Table 270. InPort0Mux WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 271. InPort0Mux WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                            |
|---------|---------------|----|-------|----------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                               |
| [23:20] | Type          | R  | 0x3   | Widget type = Audio Selector           |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                               |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability  |

Table 271. InPort0Mux WCap Command Response Format

| Bit  | Bitfield Name | RW | Reset | Description                                                                    |
|------|---------------|----|-------|--------------------------------------------------------------------------------|
| [10] | PwrPrsnt      | R  | 0x0   | No support for Power State control                                             |
| [9]  | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                               |
| [8]  | ConnList      | R  | 0x1   | Connection list is present                                                     |
| [7]  | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                            |
| [6]  | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                              |
| [5]  | Stripe        | R  | 0x0   | No support for striping                                                        |
| [4]  | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead |
| [3]  | AmpOverride   | R  | 0x1   | This widget contains its own amplifier parameters.                             |
| [2]  | OutAmpPrsnt   | R  | 0x1   | Output amplifier is present                                                    |
| [1]  | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                             |
| [0]  | Stereo        | R  | 0x1   | Stereo widget                                                                  |

## 3.4.18.2. InPort0Mux OutAmpCap

Table 272. InPort0Mux OutAmpCap Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 12      | See bitfield table. |

Table 273. InPort0Mux OutAmpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                |
|---------|---------------|----|-------|--------------------------------------------|
| [31]    | Mute          | R  | 0x0   | No mute capability                         |
| [30:23] | Rsvd3         | R  | 0x0   | Reserved                                   |
| [22:16] | StepSize      | R  | 0x27  | Size of each step in the gain range = 10dB |
| [15]    | Rsvd2         | R  | 0x0   | Reserved                                   |

Table 273. InPort0Mux OutAmpCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [14:8] | NumSteps      | R  | 0x04  | Number of steps in the gain range = 5 (0dB to +40dB) |
| [7]    | Rsvd1         | R  | 0x0   | Reserved                                             |
| [6:0]  | Offset        | R  | 0x00  | 0dB-step is programmed with this offset              |

## 3.4.18.3. InPort0Mux OutAmpRight

Table 274. InPort0Mux OutAmpRight Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B80     | 00                                | See bitfield table. |
| <b>Set1</b> | 390     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 275. InPort0Mux OutAmpRight Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                          |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------|
| [31:3] | Rsvd1         | R  | 0x0   | Reserved                                                                                             |
| [2:0]  | Gain          | RW | 0x0   | Amplifier gain step number:<br>000 = 0dB;<br>001 = 10dB;<br>010 = 20dB;<br>011 = 30dB;<br>100 = 40dB |

## 3.4.18.4. InPort0Mux OutAmpLeft

Table 276. InPort0Mux OutAmpLeft Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | BA0     | 00                                | See bitfield table. |
| <b>Set1</b> | 3A0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 277. InPort0Mux OutAmpLeft Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                      |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------------|
| [31:3] | Rsvd1         | R  | 0x0   | Reserved                                                                                         |
| [2:0]  | Gain          | RW | 0x0   | Amplifier gain step number:<br>000 = 0dB<br>001 = 10dB<br>010 = 20dB<br>011 = 30dB<br>100 = 40dB |

## 3.4.18.5. InPort0Mux ConnSelect

Table 278. InPort0Mux ConnSelect Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F01     | 00                                | See bitfield table. |
| <b>Set1</b> | 701     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 279. InPort0Mux ConnSelect Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                         |
|--------|---------------|----|-------|-----------------------------------------------------|
| [31:3] | Rsvd          | R  | 0x0   | Reserved                                            |
| [2:0]  | Index         | RW | 0x0   | Connection select control index. (Default = Port E) |

## 3.4.18.6. InPort0Mux ConnLen

Table 280. InPort0Mux ConnLen Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 0E      | See bitfield table. |

Table 281. InPort0Mux ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                             |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x07  | Number of NID entries in connection list.            |

3.4.18.7. *InPort0Mux ConnLst*

Table 282. InPort0Mux ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 283. InPort0Mux ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description |
|---------|---------------|----|-------|-------------|
| [31:24] | Entry3        | R  | 0x0B  | Port B      |
| [23:16] | Entry2        | R  | 0x0F  | Port F      |
| [15:8]  | Entry1        | R  | 0x16  | CD In       |
| [7:0]   | Entry0        | R  | 0x0E  | Port E      |

3.4.18.8. *InPort0Mux ConnLst4*

Table 284. InPort0Mux ConnLst4 Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 04      | See bitfield table. |

Table 285. InPort0Mux ConnLst4 Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description    |
|---------|---------------|----|-------|----------------|
| [31:24] | Entry7        | R  | 0x0   | No connection. |
| [23:16] | Entry6        | R  | 0x0A  | Port A         |
| [15:8]  | Entry5        | R  | 0x0D  | Port D         |
| [7:0]   | Entry4        | R  | 0x0C  | Port C         |

3.4.19. *InPort1Mux Node (NID = 0x1A)*3.4.19.1. *InPort1Mux WCap*

Table 286. InPort1Mux WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 287. InPort1Mux WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                    |
|---------|---------------|----|-------|--------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                       |
| [23:20] | Type          | R  | 0x3   | Widget type = Audio Selector                                                   |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                         |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                       |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                          |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                             |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                               |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                     |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                            |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                              |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                        |
| [4]     | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead |
| [3]     | AmpOverride   | R  | 0x1   | This widget contains its own amplifier parameters.                             |
| [2]     | OutAmpPrsnt   | R  | 0x1   | Output amplifier is present                                                    |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                             |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                                                                  |

## 3.4.19.2. InPort1Mux OutAmpCap

Table 288. InPort1Mux OutAmpCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 12      | See bitfield table. |

Table 289. InPort1Mux OutAmpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                          |
|---------|---------------|----|-------|------------------------------------------------------|
| [31]    | Mute          | R  | 0x0   | No mute capability                                   |
| [30:23] | Rsvd3         | R  | 0x0   | Reserved                                             |
| [22:16] | StepSize      | R  | 0x27  | Size of each step in the gain range = 10dB           |
| [15]    | Rsvd2         | R  | 0x0   | Reserved                                             |
| [14:8]  | NumSteps      | R  | 0x04  | Number of steps in the gain range = 5 (0dB to +40dB) |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                             |
| [6:0]   | Offset        | R  | 0x00  | 0dB-step is programmed with this offset              |

## 3.4.19.3. InPort1Mux OutAmpRight

Table 290. InPort1Mux OutAmpRight Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B80     | 00                                | See bitfield table. |
| <b>Set1</b> | 390     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 291. InPort1Mux OutAmpRight Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                          |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------|
| [31:3] | Rsvd1         | R  | 0x0   | Reserved                                                                                             |
| [2:0]  | Gain          | RW | 0x0   | Amplifier gain step number:<br>000 = 0dB;<br>001 = 10dB;<br>010 = 20dB;<br>011 = 30dB;<br>100 = 40dB |

3.4.19.4. *InPort1Mux OutAmpLeft*

Table 292. InPort1Mux OutAmpLeft Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | BA0     | 00                                | See bitfield table. |
| <b>Set1</b> | 3A0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 293. InPort1Mux OutAmpLeft Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                          |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------|
| [31:3] | Rsvd1         | R  | 0x0   | Reserved                                                                                             |
| [2:0]  | Gain          | RW | 0x0   | Amplifier gain step number:<br>000 = 0dB;<br>001 = 10dB;<br>010 = 20dB;<br>011 = 30dB;<br>100 = 40dB |

3.4.19.5. *InPort1Mux ConnSelect*

Table 294. InPort1Mux ConnSelect Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F01     | 00                                | See bitfield table. |
| <b>Set1</b> | 701     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 295. InPort1Mux ConnSelect Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                         |
|--------|---------------|----|-------|-----------------------------------------------------|
| [31:3] | Rsvd          | R  | 0x0   | Reserved                                            |
| [2:0]  | Index         | RW | 0x0   | Connection select control index. (Default = Port E) |

3.4.19.6. *InPort1Mux ConnLen*

Table 296. InPort1Mux ConnLen Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 0E      | See bitfield table. |

Table 297. InPort1Mux ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                             |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x07  | Number of NID entries in connection list.            |

## 3.4.19.7. InPort1Mux ConnLst

Table 298. InPort1Mux ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 299. InPort1Mux ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description |
|---------|---------------|----|-------|-------------|
| [31:24] | Entry3        | R  | 0x0B  | Port B      |
| [23:16] | Entry2        | R  | 0x0F  | Port F      |
| [15:8]  | Entry1        | R  | 0x16  | CD In       |
| [7:0]   | Entry0        | R  | 0x0E  | Port E      |

## 3.4.19.8. InPort1Mux ConnLst4

Table 300. InPort1Mux ConnLst4 Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 04      | See bitfield table. |

Table 301. InPort1Mux ConnLst4 Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description    |
|---------|---------------|----|-------|----------------|
| [31:24] | Entry7        | R  | 0x0   | No connection. |
| [23:16] | Entry6        | R  | 0x0A  | Port A         |

Table 301. InPort1Mux ConnLst4 Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description |
|--------|---------------|----|-------|-------------|
| [15:8] | Entry5        | R  | 0x0D  | Port D      |
| [7:0]  | Entry4        | R  | 0x0C  | Port C      |

### 3.4.20. InPort0Vol Node (NID = 0x1B)

#### 3.4.20.1. InPort0Vol WCap

Table 302. InPort0Vol WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 303. InPort0Vol WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                    |
|---------|---------------|----|-------|--------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                       |
| [23:20] | Type          | R  | 0x3   | Widget type = Audio Selector                                                   |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                         |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                       |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                          |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                             |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                               |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                     |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                            |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                              |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                        |
| [4]     | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead |

Table 303. InPort0Vol WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                          |
|-----|---------------|----|-------|--------------------------------------------------------------------------------------|
| [3] | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2] | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1] | InAmpPrsnt    | R  | 0x1   | Input amplifier is present                                                           |
| [0] | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.20.2. InPort0Vol InAmpRight

Table 304. InPort0Vol InAmpRight Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B00     | 00                                | See bitfield table. |
| <b>Set1</b> | 350     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 305. InPort0Vol InAmpRight Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                |
|--------|---------------|----|-------|----------------------------|
| [31:4] | Rsvd1         | R  | 0x0   | Reserved                   |
| [3:0]  | Gain          | RW | 0x0   | Amplifier gain step number |

## 3.4.20.3. InPort0Vol InAmpLeft

Table 306. InPort0Vol InAmpLeft Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B20     | 00                                | See bitfield table. |
| <b>Set1</b> | 360     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 307. InPort0Vol InAmpLeft Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                |
|--------|---------------|----|-------|----------------------------|
| [31:4] | Rsvd1         | R  | 0x0   | Reserved                   |
| [3:0]  | Gain          | RW | 0x0   | Amplifier gain step number |

3.4.20.4. *InPort0Vol ConnLen*

Table 308. InPort0Vol ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 309. InPort0Vol ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                             |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

3.4.20.5. *InPort0Vol ConnLst*

Table 310. InPort0Vol ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

## 3.4.20.6.

Table 311. InPort0Vol ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description        |
|---------|---------------|----|-------|--------------------|
| [31:24] | Entry3        | R  | 0x00  | No Connection      |
| [23:16] | Entry2        | R  | 0x00  | No Connection      |
| [15:8]  | Entry1        | R  | 0x00  | No Connection      |
| [7:0]   | Entry0        | R  | 0x19  | InPort0 Mux widget |

### 3.4.21. InPort1Vol Node (NID = 0x1C)

#### 3.4.21.1. InPort1Vol WCap

**Table 312. InPort1Vol WCap Command Verb Format**

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

**Table 313. InPort1Vol WCap Command Response Format**

| Bit     | Bitfield Name | RW | Reset | Description                                                                          |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                             |
| [23:20] | Type          | R  | 0x3   | Widget type = Audio Selector                                                         |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                               |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                             |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                                |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                   |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                                     |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                           |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                                  |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                                    |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4]     | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead       |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2]     | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1]     | InAmpPrsnt    | R  | 0x1   | Input amplifier is present                                                           |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                                                                        |

3.4.21.2. *InPort1Vol InAmpRight*

Table 314. InPort1Vol InAmpRight Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B00     | 00                                | See bitfield table. |
| <b>Set1</b> | 350     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 315. InPort1Vol InAmpRight Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                |
|--------|---------------|----|-------|----------------------------|
| [31:4] | Rsvd1         | R  | 0x0   | Reserved                   |
| [3:0]  | Gain          | RW | 0x0   | Amplifier gain step number |

3.4.21.3. *InPort1Vol InAmpLeft*

Table 316. InPort1Vol InAmpLeft Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B20     | 00                                | See bitfield table. |
| <b>Set1</b> | 360     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 317. InPort1Vol InAmpLeft Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                |
|--------|---------------|----|-------|----------------------------|
| [31:4] | Rsvd1         | R  | 0x0   | Reserved                   |
| [3:0]  | Gain          | RW | 0x0   | Amplifier gain step number |

3.4.21.4. *InPort1Vol ConnLen*

Table 318. InPort1Vol ConnLen Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 0E      | See bitfield table. |

Table 319. InPort1Vol ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                             |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

## 3.4.21.5. InPort1Vol ConnLst

Table 320. InPort1Vol ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 321. InPort1Vol ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description       |
|---------|---------------|----|-------|-------------------|
| [31:24] | Entry3        | R  | 0x00  | No Connection     |
| [23:16] | Entry2        | R  | 0x00  | No Connection     |
| [15:8]  | Entry1        | R  | 0x00  | No Connection     |
| [7:0]   | Entry0        | R  | 0x1A  | InPort1Mux widget |

## 3.4.22. ADC0Mux Node (NID = 0x1D)

## 3.4.22.1. ADC0Mux WCap

Table 322. ADC0Mux WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 323. ADC0Mux WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                  |
|---------|---------------|----|-------|------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                     |
| [23:20] | Type          | R  | 0x3   | Widget type = Audio Selector |

Table 323. ADC0Mux WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                    |
|---------|---------------|----|-------|--------------------------------------------------------------------------------|
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                         |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                       |
| [11]    | SwapCap       | R  | 0x1   | Left and right channels can be swapped                                         |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                             |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                               |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                     |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                            |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                              |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                        |
| [4]     | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead |
| [3]     | AmpOverride   | R  | 0x1   | This widget contains its own amplifier parameters.                             |
| [2]     | OutAmpPrsnt   | R  | 0x1   | Output amplifier is present                                                    |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                             |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                                                                  |

## 3.4.22.2. ADC0Mux ConnSelect

Table 324. ADC0Mux ConnSelect Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F01     | 00                                | See bitfield table. |
| <b>Set1</b> | 701     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 325. ADC0Mux ConnSelect Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                      |
|--------|---------------|----|-------|----------------------------------|
| [31:2] | Rsvd          | R  | 0x0   | Reserved                         |
| [1:0]  | Index         | RW | 0x0   | Connection select control index. |

## 3.4.22.3. ADC0Mux ConnLen

Table 326. ADC0Mux ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 327. ADC0Mux ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                   |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries.                                       |
| [6:0]  | N             | R  | 0x03  | Number of NID entries in connection list.<br>N = 03h if DMIC enabled,<br>N = 01h otherwise |

## 3.4.22.4. ADC0Mux ConnLst

Table 328. ADC0Mux ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 329. ADC0Mux ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                  |
|---------|---------------|----|-------|------------------------------------------------------------------------------|
| [31:24] | Entry3        | R  | 0x00  | No connection                                                                |
| [23:16] | Entry2        | R  | 0x18  | DMic1 Pin widget.<br>Entry2 = 18h if DMIC enabled,<br>Entry2 = 00h otherwise |

Table 329. ADC0Mux ConnLst Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                  |
|--------|---------------|----|-------|------------------------------------------------------------------------------|
| [15:8] | Entry1        | R  | 0x17  | DMic0 Pin widget.<br>Entry1 = 17h if DMIC enabled,<br>Entry1 = 00h otherwise |
| [7:0]  | Entry0        | R  | 0x1B  | InPort0Vol widget                                                            |

## 3.4.22.5. ADC0Mux LR

Table 330. ADC0Mux LR Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F0C     | 00                                | See bitfield table. |
| <b>Set1</b> | 70C     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 331. ADC0Mux LR Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                      |
|--------|---------------|----|-------|--------------------------------------------------|
| [31:3] | Rsvd2         | R  | 0x0   | Reserved                                         |
| [2]    | SwapEn        | RW | 0x0   | 1 = swap left and right channels of this Widget. |
| [1:0]  | Rsvd1         | R  | 0x0   | Reserved                                         |

## 3.4.22.6. ADC0Mux OutAmpCap

Table 332. ADC0Mux OutAmpCap Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 12      | See bitfield table. |

Table 333. ADC0Mux OutAmpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                       |
|---------|---------------|----|-------|-------------------------------------------------------------------|
| [31]    | Mute          | R  | 0x1   | Amplifier is capable of muting                                    |
| [30:23] | Rsvd3         | R  | 0x0   | Reserved                                                          |
| [22:16] | StepSize      | R  | 0x00  | Size of each step in the gain range, N/A since there are no steps |

Table 333. ADC0Mux OutAmpCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                             |
|--------|---------------|----|-------|-----------------------------------------|
| [15]   | Rsvd2         | R  | 0x0   | Reserved                                |
| [14:8] | NumSteps      | R  | 0x00  | No steps, gain is fixed at 0dB          |
| [7]    | Rsvd1         | R  | 0x0   | Reserved                                |
| [6:0]  | Offset        | R  | 0x00  | 0dB-step is programmed with this offset |

3.4.22.7. *ADC0Mux OutAmpRight*

Table 334. ADC0Mux OutAmpRight Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | B80     | 00                                | See bitfield table. |
| <b>Set1</b> | 390     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 335. ADC0Mux OutAmpRight Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description        |
|--------|---------------|----|-------|--------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved           |
| [7]    | Mute          | RW | 0x1   | 1 = mute is active |
| [6:0]  | Rsvd1         | R  | 0x0   | Reserved           |

3.4.22.8. *ADC0Mux OutAmpLeft*

Table 336. ADC0Mux OutAmpLeft Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | BA0     | 00                                | See bitfield table. |
| <b>Set1</b> | 3A0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 337. ADC0Mux OutAmpLeft Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description |
|--------|---------------|----|-------|-------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved    |

Table 337. ADC0Mux OutAmpLeft Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description        |
|-------|---------------|----|-------|--------------------|
| [7]   | Mute          | RW | 0x1   | 1 = mute is active |
| [6:0] | Rsvd1         | R  | 0x0   | Reserved           |

### 3.4.23. ADC1Mux Node (NID = 0x1E)

#### 3.4.23.1. ADC1Mux WCap

Table 338. ADC1Mux WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 339. ADC1Mux WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                    |
|---------|---------------|----|-------|--------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                       |
| [23:20] | Type          | R  | 0x3   | Widget type = Audio Selector                                                   |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                         |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                       |
| [11]    | SwapCap       | R  | 0x1   | Left and right channels can be swapped                                         |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                             |
| [9]     | DigitalStrm   | R  | 0x0   | Widget supports an Analog stream                                               |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                     |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                            |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter.                                              |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                        |
| [4]     | FrmtOverride  | R  | 0x0   | No format info; use default format parameters from Audio Function node instead |

Table 339. ADC1Mux WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                        |
|-----|---------------|----|-------|----------------------------------------------------|
| [3] | AmpOverride   | R  | 0x1   | This widget contains its own amplifier parameters. |
| [2] | OutAmpPrsnt   | R  | 0x1   | Output amplifier is present                        |
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier                                 |
| [0] | Stereo        | R  | 0x1   | Stereo widget                                      |

## 3.4.23.2. ADC1Mux ConnSelect

Table 340. ADC1Mux ConnSelect Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F01     | 00                                | See bitfield table. |
| <b>Set1</b> | 701     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 341. ADC1Mux ConnSelect Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                      |
|--------|---------------|----|-------|----------------------------------|
| [31:2] | Rsvd          | R  | 0x0   | Reserved                         |
| [1:0]  | Index         | RW | 0x0   | Connection select control index. |

## 3.4.23.3. ADC1Mux ConnLen

Table 342. ADC1Mux ConnLen Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 0E      | See bitfield table. |

Table 343. ADC1Mux ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description |
|--------|---------------|----|-------|-------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved    |

Table 343. ADC1Mux ConnLen Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                |
|-------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [7]   | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries.                                       |
| [6:0] | N             | R  | 0x03  | Number of NID entries in connection list.<br>N = 03h if DMIC enabled,<br>N = 01h otherwise |

## 3.4.23.4. ADC1Mux ConnLst

Table 344. ADC1Mux ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 345. ADC1Mux ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                  |
|---------|---------------|----|-------|------------------------------------------------------------------------------|
| [31:24] | Entry3        | R  | 0x00  | No connection                                                                |
| [23:16] | Entry2        | R  | 0x18  | DMic1 Pin widget.<br>Entry2 = 18h if DMIC enabled,<br>Entry2 = 00h otherwise |
| [15:8]  | Entry1        | R  | 0x17  | DMic0 Pin widget.<br>Entry1 = 17h if DMIC enabled,<br>Entry1 = 00h otherwise |
| [7:0]   | Entry0        | R  | 0x1C  | InPort1Vol widget                                                            |

## 3.4.23.5. ADC1Mux LR

Table 346. ADC1Mux LR Command Verb Format

|      | Verb ID | Payload                           | Response            |
|------|---------|-----------------------------------|---------------------|
| Get  | F0C     | 00                                | See bitfield table. |
| Set1 | 70C     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 347. ADC1Mux LR Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                      |
|--------|---------------|----|-------|--------------------------------------------------|
| [31:3] | Rsvd2         | R  | 0x0   | Reserved                                         |
| [2]    | SwapEn        | RW | 0x0   | 1 = swap left and right channels of this Widget. |
| [1:0]  | Rsvd1         | R  | 0x0   | Reserved                                         |

3.4.23.6. *ADC1Mux OutAmpCap*

Table 348. ADC1Mux OutAmpCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 12      | See bitfield table. |

Table 349. ADC1Mux OutAmpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                       |
|---------|---------------|----|-------|-------------------------------------------------------------------|
| [31]    | Mute          | R  | 0x1   | Amplifier is capable of muting                                    |
| [30:23] | Rsvd3         | R  | 0x0   | Reserved                                                          |
| [22:16] | StepSize      | R  | 0x00  | Size of each step in the gain range, N/A since there are no steps |
| [15]    | Rsvd2         | R  | 0x0   | Reserved                                                          |
| [14:8]  | NumSteps      | R  | 0x00  | No steps, gain is fixed at 0dB                                    |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                          |
| [6:0]   | Offset        | R  | 0x00  | 0dB-step is programmed with this offset                           |

3.4.23.7. *ADC1Mux OutAmpRight*

Table 350. ADC1Mux OutAmpRight Command Verb Format

|      | Verb ID | Payload                           | Response            |
|------|---------|-----------------------------------|---------------------|
| Get  | B80     | 00                                | See bitfield table. |
| Set1 | 390     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 351. ADC1Mux OutAmpRight Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description        |
|--------|---------------|----|-------|--------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved           |
| [7]    | Mute          | RW | 0x1   | 1 = mute is active |
| [6:0]  | Rsvd1         | R  | 0x0   | Reserved           |

3.4.23.8. *ADC1Mux OutAmpLeft*

Table 352. ADC1Mux OutAmpLeft Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | BA0     | 00                                | See bitfield table. |
| <b>Set1</b> | 3A0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 353. ADC1Mux OutAmpLeft Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description        |
|--------|---------------|----|-------|--------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved           |
| [7]    | Mute          | RW | 0x1   | 1 = mute is active |
| [6:0]  | Rsvd1         | R  | 0x0   | Reserved           |

3.4.24. *SPDIFOut Node (NID = 0x1F)*3.4.24.1. *SPDIFOut CnvtrFrmt*

Table 354. SPDIFOut CnvtrFrmt Command Verb Format

|             | Verb ID | Payload                            | Response            |
|-------------|---------|------------------------------------|---------------------|
| <b>Get</b>  | A       | 0000                               | See bitfield table. |
| <b>Set1</b> | 2       | See bits [15:0] of bitfield table. | 0000_0000h          |

Table 355. SPDIFOut CnvtrFrmt Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                      |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:16] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                         |
| [15]    | StrmType      | RW | 0x0   | Stream Type<br>0 = PCM<br>1 = Non-PCM<br>(remaining bits in this verb have other meanings)                                                                                                       |
| [14]    | RateBase      | RW | 0x0   | Sample Base Rate<br>0 = 48 KHz<br>1 = 44.1 KHz                                                                                                                                                   |
| [13:11] | RateMult      | RW | 0x0   | Sample Base Rate Multiple<br>000 = 48 KHz / 44.1 KHz or less<br>001 = x2<br>010 = Reserved (x3)<br>011 = x4<br>100-111 = Reserved                                                                |
| [10:8]  | RateDiv       | RW | 0x0   | Sample Base Rate Divisor<br>000 = Divide by 1<br>001 = Divide by 2<br>010 = Divide by 3<br>011 = Divide by 4<br>100 = Divide by 5<br>101 = Divide by 6<br>110 = Divide by 7<br>111 = Divide by 8 |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                         |
| [6:4]   | NumBits       | RW | 0x3   | Bits per Sample<br>000 = 8 bits<br>001 = 16 bits<br>010 = 20 bits<br>011 = 24 bits<br>100-111 = Reserved                                                                                         |
| [3:0]   | NumChan       | RW | 0x1   | Number of Channels Number of channels in each frame of the stream.<br>0000 = 1 channel<br>0001 = 2 channels<br>...<br>1111 = 16 channels                                                         |

## 3.4.24.2. SPDIFOut WCap

Table 356. SPDIFOut WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 357. SPDIFOut WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                          |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                             |
| [23:20] | Type          | R  | 0x0   | Widget type = Audio Output                                                           |
| [19:16] | Delay         | R  | 0x4   | Number of sample delays through widget                                               |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                             |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                                |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                   |
| [9]     | DigitalStrm   | R  | 0x1   | Widget supports a Digital stream                                                     |
| [8]     | ConnList      | R  | 0x0   | No connection list is present                                                        |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                                  |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                     |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4]     | FrmtOverride  | R  | 0x1   | Widget contains format info; software should query                                   |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2]     | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.24.3. SPDIFOut FrmtCap

Table 358. SPDIFOut FrmtCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0A      | See bitfield table. |

Table 359. SPDIFOut FrmtCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                  |
|---------|---------------|----|-------|----------------------------------------------|
| [31:21] | Rsvd2         | R  | 0x0   | Reserved                                     |
| [20]    | B32           | R  | 0x0   | 32 bit audio formats are NOT supported       |
| [19]    | B24           | R  | 0x1   | 24 bit audio formats are supported           |
| [18]    | B20           | R  | 0x1   | 20 bit audio formats are supported           |
| [17]    | B16           | R  | 0x1   | 16 bit audio formats are supported           |
| [16]    | B8            | R  | 0x0   | 8 bit audio formats are NOT supported        |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                     |
| [11]    | R12           | R  | 0x0   | 384 KHz rate (8/1*48 KHz) NOT supported      |
| [10]    | R11           | R  | 0x1   | 192.0 KHz rate (4/1*48 KHz) supported        |
| [9]     | R10           | R  | 0x0   | 176.4 KHz rate (4/1*44.1 KHz) NOT supported  |
| [8]     | R9            | R  | 0x1   | 96.0 KHz rate (2/1*48 KHz) supported         |
| [7]     | R8            | R  | 0x1   | 88.2 KHz rate (2/1*44.1 KHz) supported       |
| [6]     | R7            | R  | 0x1   | 48.0 KHz rate supported (REQUIRED)           |
| [5]     | R6            | R  | 0x1   | 44.1 KHz rate supported                      |
| [4]     | R5            | R  | 0x0   | 32.0 KHz rate (2/3*48 KHz) NOT supported     |
| [3]     | R4            | R  | 0x0   | 22.05 KHz rate (1/2*44.1 KHz) NOT supported  |
| [2]     | R3            | R  | 0x0   | 16.0 KHz rate (1/3*48 KHz) NOT supported     |
| [1]     | R2            | R  | 0x0   | 11.025 KHz rate (1/4*44.0 KHz) NOT supported |
| [0]     | R1            | R  | 0x0   | 8.0 KHz rate (1/6*48 KHz) NOT supported      |

## 3.4.24.4. SPDIFOut StreamCap

Table 360. SPDIFOut StreamCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0B      | See bitfield table. |

Table 361. SPDIFOut StreamCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                   |
|--------|---------------|----|-------|-------------------------------|
| [31:3] | Rsvd          | R  | 0x0   | Reserved                      |
| [2]    | NonPCM        | R  | 0x1   | Non-PCM data supported.       |
| [1]    | Float32       | R  | 0x0   | No support for Float32 data.  |
| [0]    | PCM           | R  | 0x1   | PCM-formatted data supported. |

## 3.4.24.5. SPDIFOut CnvtrID

Table 362. SPDIFOut CnvtrID Command Verb Format

|      | Verb ID | Payload                           | Response            |
|------|---------|-----------------------------------|---------------------|
| Get  | F06     | 00                                | See bitfield table. |
| Set1 | 706     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 363. SPDIFOut CnvtrID Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                            |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                                                               |
| [7:4]  | Stream        | RW | 0x0   | Software-programmable integer representing link stream ID used by the converter widget. By convention, stream 0 is reserved as unused. |
| [3:0]  | Channel       | RW | 0x0   | Integer representing lowest channel used by converter                                                                                  |

## 3.4.24.6. SPDIFOut DigCtl

Table 364. SPDIFOut DigCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F0D     | 00                                | See bitfield table. |
| <b>Set1</b> | 70D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 70E     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 365. SPDIFOut DigCtl Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description             |
|---------|---------------|----|-------|-------------------------|
| [31:16] | Rsvd2         | R  | 0x0   | Reserved                |
| [15]    | Rsvd1         | R  | 0x0   | Rsvd                    |
| [14:8]  | CC            | RW | 0x00  | CC[6:0] - Category Code |
| [7]     | L             | RW | 0x0   | L - Generation Level    |
| [6]     | PRO           | RW | 0x0   | PRO - Professional      |
| [5]     | AUDIO         | RW | 0x0   | /AUDIO - Non-Audio      |
| [4]     | COPY          | RW | 0x0   | COPY - Copyright        |
| [3]     | PRE           | RW | 0x0   | PRE - Pre-emphasis      |
| [2]     | VCFG          | RW | 0x0   | VCFG - Validity Config  |
| [1]     | V             | RW | 0x0   | V - Validity            |
| [0]     | DigEn         | RW | 0x0   | DigEn - Digital Enable  |

## 3.4.25. SPDIFIn Node (NID = 0x20)

## 3.4.25.1. SPDIFIn CnvtrFrmt

Table 366. SPDIFIn CnvtrFrmt Command Verb Format

|             | Verb ID | Payload                            | Response            |
|-------------|---------|------------------------------------|---------------------|
| <b>Get</b>  | A       | 0000                               | See bitfield table. |
| <b>Set1</b> | 2       | See bits [15:0] of bitfield table. | 0000_0000h          |

Table 367. SPDIFIn CnvtrFrmt Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                      |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:16] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                         |
| [15]    | StrmType      | RW | 0x0   | Stream Type<br>0 = PCM<br>1 = Non-PCM<br>(remaining bits in this verb have other meanings)                                                                                                       |
| [14]    | RateBase      | RW | 0x0   | Sample Base Rate<br>0 = 48 KHz<br>1 = 44.1 KHz                                                                                                                                                   |
| [13:11] | RateMult      | RW | 0x0   | Sample Base Rate Multiple<br>000 = 48 KHz / 44.1 KHz or less<br>001 = x2<br>010 = Reserved (x3)<br>011 = x4<br>100-111 = Reserved                                                                |
| [10:8]  | RateDiv       | RW | 0x0   | Sample Base Rate Divisor<br>000 = Divide by 1<br>001 = Divide by 2<br>010 = Divide by 3<br>011 = Divide by 4<br>100 = Divide by 5<br>101 = Divide by 6<br>110 = Divide by 7<br>111 = Divide by 8 |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                         |
| [6:4]   | NumBits       | RW | 0x3   | Bits per Sample<br>000 = 8 bits<br>001 = 16 bits<br>010 = 20 bits<br>011 = 24 bits<br>100-111 = Reserved                                                                                         |
| [3:0]   | NumChan       | RW | 0x1   | Number of Channels Number of channels in each frame of the stream.<br>0000 = 1 channel<br>0001 = 2 channels<br>...<br>1111 = 16 channels                                                         |

## 3.4.25.2. SPDIFIn WCap

Table 368. SPDIFIn WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 369. SPDIFIn WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                             |
|---------|---------------|----|-------|---------------------------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                                                |
| [23:20] | Type          | R  | 0x1   | Widget type = Audio Input.<br>Input Converter (1h) if SPDIFIn enabled,<br>Vendor Defined (Fh) otherwise |
| [19:16] | Delay         | R  | 0x4   | Number of sample delays through widget                                                                  |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                                                |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                                                   |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                                      |
| [9]     | DigitalStrm   | R  | 0x1   | Widget supports a Digital stream                                                                        |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                                              |
| [7]     | UnsolCap      | R  | 0x0   | Unsolicited Response is not supported                                                                   |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                                        |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                                                 |
| [4]     | FrmtOverride  | R  | 0x1   | Widget contains format info; software<br>should query                                                   |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier<br>parameters from Audio Function node<br>instead              |
| [2]     | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                                     |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                                      |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                                                                                           |

## 3.4.25.3. SPDIFIn FrmtCap

Table 370. SPDIFIn FrmtCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0A      | See bitfield table. |

Table 371. SPDIFIn FrmtCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                  |
|---------|---------------|----|-------|----------------------------------------------|
| [31:21] | Rsvd2         | R  | 0x0   | Reserved                                     |
| [20]    | B32           | R  | 0x0   | 32 bit audio formats are NOT supported       |
| [19]    | B24           | R  | 0x1   | 24 bit audio formats are supported           |
| [18]    | B20           | R  | 0x1   | 20 bit audio formats are supported           |
| [17]    | B16           | R  | 0x1   | 16 bit audio formats are supported           |
| [16]    | B8            | R  | 0x0   | 8 bit audio formats are NOT supported        |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                     |
| [11]    | R12           | R  | 0x0   | 384 KHz rate (8/1*48 KHz) NOT supported      |
| [10]    | R11           | R  | 0x0   | 192.0 KHz rate (4/1*48 KHz) NOT supported    |
| [9]     | R10           | R  | 0x0   | 176.4 KHz rate (4/1*44.1 KHz) NOT supported  |
| [8]     | R9            | R  | 0x1   | 96.0 KHz rate (2/1*48 KHz) supported         |
| [7]     | R8            | R  | 0x0   | 88.2 KHz rate (2/1*44.1 KHz) NOT supported   |
| [6]     | R7            | R  | 0x1   | 48.0 KHz rate supported (REQUIRED)           |
| [5]     | R6            | R  | 0x1   | 44.1 KHz rate supported                      |
| [4]     | R5            | R  | 0x0   | 32.0 KHz rate (2/3*48 KHz) NOT supported     |
| [3]     | R4            | R  | 0x0   | 22.05 KHz rate (1/2*44.1 KHz) NOT supported  |
| [2]     | R3            | R  | 0x0   | 16.0 KHz rate (1/3*48 KHz) NOT supported     |
| [1]     | R2            | R  | 0x0   | 11.025 KHz rate (1/4*44.0 KHz) NOT supported |
| [0]     | R1            | R  | 0x0   | 8.0 KHz rate (1/6*48 KHz) NOT supported      |

## 3.4.25.4. SPDIFIn StreamCap

Table 372. SPDIFIn StreamCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0B      | See bitfield table. |

Table 373. SPDIFIn StreamCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                   |
|--------|---------------|----|-------|-------------------------------|
| [31:3] | Rsvd          | R  | 0x0   | Reserved                      |
| [2]    | NonPCM        | R  | 0x1   | Non-PCM data supported.       |
| [1]    | Float32       | R  | 0x0   | No support for Float32 data.  |
| [0]    | PCM           | R  | 0x1   | PCM-formatted data supported. |

## 3.4.25.5. SPDIFIn ConnLen

Table 374. SPDIFIn ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 375. SPDIFIn ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved.                                            |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x01  | Number of NID entries in connection list.            |

## 3.4.25.6. SPDIFIn ConnLst

Table 376. SPDIFIn ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 377. SPDIFIn ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description        |
|---------|---------------|----|-------|--------------------|
| [31:24] | Entry3        | R  | 0x00  | Unused list entry. |
| [23:16] | Entry2        | R  | 0x00  | Unused list entry. |
| [15:8]  | Entry1        | R  | 0x00  | Unused list entry. |
| [7:0]   | Entry0        | R  | 0x22  | DigIn pin widget   |

## 3.4.25.7. SPDIFIn CnvtrID

Table 378. SPDIFIn CnvtrID Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F06     | 00                                | See bitfield table. |
| <b>Set1</b> | 706     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 379. SPDIFIn CnvtrID Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                            |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                                                               |
| [7:4]  | Stream        | RW | 0x0   | Software-programmable integer representing link stream ID used by the converter widget. By convention, stream 0 is reserved as unused. |
| [3:0]  | Channel       | RW | 0x0   | Integer representing lowest channel used by converter                                                                                  |

## 3.4.25.8. SPDIFIn DigCtl

Table 380. SPDIFIn DigCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F0D     | 00                                | See bitfield table. |
| <b>Set1</b> | 70D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 70E     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 381. SPDIFIn DigCtl Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                        |
|---------|---------------|----|-------|----------------------------------------------------|
| [31:15] | Rsvd2         | R  | 0x0   | Reserved                                           |
| [14:8]  | CC            | R  | 0x00  | CC[6:0] - Category Code                            |
| [7]     | L             | R  | 0x0   | L - Generation Level                               |
| [6]     | PRO           | R  | 0x0   | PRO - Professional                                 |
| [5]     | AUDIO         | R  | 0x0   | /AUDIO - Non-Audio                                 |
| [4]     | COPY          | R  | 0x0   | COPY - Copyright                                   |
| [3]     | PRE           | R  | 0x0   | PRE - Pre-emphasis                                 |
| [2]     | Rsvd1         | R  | 0x0   | Reserved (VCFG bit applies only to output streams) |
| [1]     | V             | R  | 0x0   | V - Validity                                       |
| [0]     | DigEn         | RW | 0x0   | DigEn - Digital Enable                             |

## 3.4.25.9. SPDIFIn VSR

Table 382. SPDIFIn VSR Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | FE0     | 00                                | See bitfield table. |
| <b>Set1</b> | 7E0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 383. SPDIFIn VSR Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                     |
|---------|---------------|----|-------|---------------------------------------------------------------------------------|
| [31]    | RcvRateBase   | R  | 0x0   | Recovered sample rate base<br>0 = 48 KHz<br>1 = 44.1 KHz                        |
| [30:28] | RcvRateMult   | R  | 0x0   | Recovered sample rate multiplier<br>000 = 1X<br>001 = 2X<br>all others reserved |
| [27:26] | Rsvd          | R  | 0x0   | Reserved                                                                        |

Table 383. SPDIFIn VSR Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                                    |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [25:22] | OrigFS        | R  | 0x0   | Original sample rate (IEC spec).                                                                                                                                                                                                                                                                                                                                               |
| [21:20] | CA            | R  | 0x0   | Clock accuracy<br>00 = Level II<br>01 = Level I<br>10 = Level III<br>11 = Reserved                                                                                                                                                                                                                                                                                             |
| [19:16] | FS            | R  | 0x0   | Sample Rate<br>0000 = 44.1 KHz<br>0010 = 48 KHz<br>0011 = 32 KHz<br>All other combinations are reserved and shall not be used until further defined (IEC spec).                                                                                                                                                                                                                |
| [15:12] | CN            | R  | 0x0   | Channel Number (audio channel)<br>0000 = do not take into account<br>0001 = A (left channel for stereo channel format)<br>0010 = B (right channel for stereo channel format)<br>0011 = C<br>...<br>1111 = O                                                                                                                                                                    |
| [11:9]  | WordLen       | R  | 0x0   | Sample Word Length [2:0]<br><i>If MaxWordLen = 1:</i><br>000 = unspecified<br>001 = 20 bits<br>010 = 22 bits<br>011 = reserved<br>100 = 23 bits<br>101 = 24 bits<br>110 = 21 bits<br>111 = reserved<br><i>If MaxWordLen = 0:</i><br>000 = unspecified<br>001 = 16 bits<br>010 = 18 bits<br>011 = reserved<br>100 = 19 bits<br>101 = 20 bits<br>110 = 17 bits<br>111 = reserved |

Table 383. SPDIFIn VSR Command Response Format

| Bit   | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                    |
|-------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [8]   | MaxWordLen    | R  | 0x0   | Max Word Length<br>0 = maximum audio sample word length is 20 bits<br>1 = maximum audio sample word length is 24 bits                                                                                                                          |
| [7]   | IgnoreBlkSz   | RW | 0x0   | 0 = normal behavior<br>1 = disable block size checking for SPDIF_IN.                                                                                                                                                                           |
| [6]   | IgnoreV       | RW | 0x0   | 0 = Respond to SPDIF_IN Valid tag<br>1 = Ignore SPDIF_IN valid tag                                                                                                                                                                             |
| [5]   | AutoMuteDis   | RW | 0x0   | 0 = Auto mute when SPDIF stream marked non PCM<br>1 = Auto Mute disabled.                                                                                                                                                                      |
| [4:3] | ParityLimit   | RW | 0x0   | SPDIF_IN Parity Limit: Loss of DPLL Lock after<br>00 = 4 parity errors<br>01 = 3 parity errors<br>10 = 2 parity errors<br>11 = 1 parity errors<br>NEW LOCATION -- was at Register 72h, Page 0, D13:12, moved as part of SPDIF In consolidation |
| [2]   | Running       | R  | 0x0   | SPDIF IN Running<br>0 = no signal on pin 47<br>1 = signal on pin 47<br>NEW LOCATION -- was at Register 72h, Page 0, D2, moved as part of SPDIF In consolidation                                                                                |
| [1]   | ParityErr     | RW | 0x0   | SPDIF_IN PARITY ERROR. Set to clear. Overlaps SIPERSTAT.                                                                                                                                                                                       |
| [0]   | InvertCOPY    | RW | 0x0   | Copyright invert bit.                                                                                                                                                                                                                          |

### 3.4.26. DigOut Node (NID = 0x21)

#### 3.4.26.1. DigOut WCap

Table 384. DigOut WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 385. DigOut WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                          |
|---------|---------------|----|-------|--------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                             |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex                                                            |
| [19:16] | Delay         | R  | 0x0   | Number of sample delays through widget                                               |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                             |
| [11]    | SwapCap       | R  | 0x0   | No support for swapping left and right channels                                      |
| [10]    | PwrPrsnt      | R  | 0x0   | No support for Power State control                                                   |
| [9]     | DigitalStrm   | R  | 0x1   | Widget supports a Digital stream                                                     |
| [8]     | ConnList      | R  | 0x1   | Connection list is present                                                           |
| [7]     | UnsolCap      | R  | 0x0   | No support for Unsolicited Response                                                  |
| [6]     | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                     |
| [5]     | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4]     | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                  |
| [3]     | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2]     | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1]     | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0]     | Stereo        | R  | 0x1   | Stereo widget                                                                        |

3.4.26.2. *DigOut PinCap*

Table 386. DigOut PinCap Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 0C      | See bitfield table. |

Table 387. DigOut PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                   |
|---------|---------------|----|-------|-----------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                      |
| [16]    | EapdCap       | R  | 0x0   | This widget does not control EAPD pin         |
| [15:8]  | VrefCap       | R  | 0x00  | Vref generation not supported on this pin     |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                      |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.      |
| [5]     | InCap         | R  | 0x0   | Pin complex is not input capable.             |
| [4]     | OutCap        | R  | 0x1   | Pin complex is output capable.                |
| [3]     | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.      |
| [2]     | PresDtctCap   | R  | 0x0   | Pin complex cannot perform Presence Detect.   |
| [1]     | TrigRqd       | R  | 0x0   | N/A                                           |
| [0]     | ImpSenseCap   | R  | 0x0   | Pin complex does not support impedance sense. |

3.4.26.3. *DigOut ConnSelect*

Table 388. DigOut ConnSelect Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F01     | 00                                | See bitfield table. |
| <b>Set1</b> | 701     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 389. DigOut ConnSelect Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                      |
|--------|---------------|----|-------|----------------------------------|
| [31:2] | Rsvd          | R  | 0x0   | Reserved                         |
| [1:0]  | Index         | RW | 0x0   | Connection select control index. |

## 3.4.26.4. DigOut ConnLen

Table 390. DigOut ConnLen Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0E      | See bitfield table. |

Table 391. DigOut ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved.                                            |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries. |
| [6:0]  | N             | R  | 0x03  | Number of NID entries in connection list.            |

## 3.4.26.5. DigOut ConnLst

Table 392. DigOut ConnLst Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F02     | 00      | See bitfield table. |

Table 393. DigOut ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                |
|---------|---------------|----|-------|----------------------------|
| [31:24] | Entry3        | R  | 0x00  | No connection              |
| [23:16] | Entry2        | R  | 0x1E  | ADC1Mux widget             |
| [15:8]  | Entry1        | R  | 0x1D  | ADC0Mux widget             |
| [7:0]   | Entry0        | R  | 0x1F  | SPDIF Out Converter widget |

3.4.26.6. *DigOut PinCtl*

Table 394. DigOut PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 395. DigOut PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                      |
|--------|---------------|----|-------|--------------------------------------------------|
| [31:7] | Rsvd2         | R  | 0x0   | Reserved                                         |
| [6]    | OutEn         | RW | 0x0   | 1 = (CODEC) output path of Pin Widget is enabled |
| [5:0]  | Rsvd1         | R  | 0x0   | Reserved                                         |

3.4.26.7. *DigOut PinConfig*

Table 396. DigOut PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 397. DigOut PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                               |
|---------|---------------|----|-------|---------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x0   | External Port Connectivity of the Pin Complex.<br>0 = connected to a jack |
| [29:24] | Location      | RW | 0x01  | Physical location of the jack.<br>01h = Mainboard, Rear                   |
| [23:20] | Device        | RW | 0x4   | Default Device, indicating intended use of jack.<br>4 = SPDIF Out         |

Table 397. DigOut PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                 |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------|
| [19:16] | Connection    | RW | 0x4   | Connection Type. 4 = RCA                                                                                                    |
| [15:12] | Color         | RW | 0x2   | Color of physical jack. 2 = Grey                                                                                            |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                             |
| [7:4]   | Assoc         | RW | 0x7   | Default Association for Pin Complex groups. Reserved value 0000b should not be used. Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                             |

### 3.4.27. DigIn Node (NID = 0x22)

#### 3.4.27.1. DigIn WCap

Table 398. DigIn WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 399. DigIn WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                   |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                                      |
| [23:20] | Type          | R  | 0x4   | Widget type = Pin Complex. Pin Complex (4h) if SPDIFIn enabled, Vendor Defined (Fh) otherwise |
| [19:16] | Delay         | R  | 0x3   | Number of sample delays through widget                                                        |
| [15:12] | Rsvd1         | R  | 0x0   | Reserved                                                                                      |
| [11]    | SwapCap       | R  | 0x0   | No left/right channel swap capability                                                         |
| [10]    | PwrPrsnt      | R  | 0x1   | Power State control capability for support of EAPD                                            |
| [9]     | DigitalStrm   | R  | 0x1   | Widget supports a Digital stream                                                              |
| [8]     | ConnList      | R  | 0x0   | No connection list is present                                                                 |

Table 399. DigIn WCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                                                          |
|-----|---------------|----|-------|--------------------------------------------------------------------------------------|
| [7] | UnsolCap      | R  | 0x1   | Unsolicited Response is supported                                                    |
| [6] | ProcPrsnt     | R  | 0x0   | No Processing Controls parameter                                                     |
| [5] | Stripe        | R  | 0x0   | No support for striping                                                              |
| [4] | FrmtOverride  | R  | 0x0   | N/A for pin complex                                                                  |
| [3] | AmpOverride   | R  | 0x0   | No amplifier info; use default amplifier parameters from Audio Function node instead |
| [2] | OutAmpPrsnt   | R  | 0x0   | No output amplifier                                                                  |
| [1] | InAmpPrsnt    | R  | 0x0   | No input amplifier                                                                   |
| [0] | Stereo        | R  | 0x1   | Stereo widget                                                                        |

## 3.4.27.2. DigIn PinCap

Table 400. DigIn PinCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 0C      | See bitfield table. |

Table 401. DigIn PinCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                               |
|---------|---------------|----|-------|-----------------------------------------------------------|
| [31:17] | Rsvd2         | R  | 0x0   | Reserved                                                  |
| [16]    | EapdCap       | R  | 0x1   | This widget controls EAPD pin                             |
| [15:8]  | VrefCap       | R  | 0x00  | Vref generation not supported on input pins.              |
| [7]     | Rsvd1         | R  | 0x0   | Reserved                                                  |
| [6]     | BalancedIO    | R  | 0x0   | Pin complex does not have balanced pins.                  |
| [5]     | InCap         | R  | 0x1   | Pin complex is input capable.                             |
| [4]     | OutCap        | R  | 0x0   | Pin complex is not output capable. (EAPD = output stream) |
| [3]     | HdphCap       | R  | 0x0   | Pin does not have a headphone amplifier.                  |

Table 401. DigIn PinCap Command Response Format

| Bit | Bitfield Name | RW | Reset | Description                                   |
|-----|---------------|----|-------|-----------------------------------------------|
| [2] | PresDtctCap   | R  | 0x1   | Pin complex can perform Presence Detect.      |
| [1] | TrigRqd       | R  | 0x0   | N/A                                           |
| [0] | ImpSenseCap   | R  | 0x0   | Pin complex does not support impedance sense. |

## 3.4.27.3. DigIn PwrState

Table 402. DigIn PwrState Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F05     | 00                                | See bitfield table. |
| <b>Set1</b> | 705     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 403. DigIn PwrState Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                            |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                               |
| [7:4]  | Act           | R  | 0x3   | PS-Act: Actual power state of referenced node.                                                                                                         |
| [3:2]  | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                               |
| [1:0]  | Set           | RW | 0x3   | PS-Set: Current power setting of referenced node.<br>00 - Fully on.<br>01 - Fully on.<br>10 - EAPD powered down (Hi-Z).<br>11 - Powered down (default) |

## 3.4.27.4. DigIn PinCtl

Table 404. DigIn PinCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F07     | 00                                | See bitfield table. |
| <b>Set1</b> | 707     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 405. DigIn PinCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                     |
|--------|---------------|----|-------|-------------------------------------------------|
| [31:6] | Rsvd2         | R  | 0x0   | Reserved                                        |
| [5]    | InEn          | RW | 0x0   | 1 = (CODEC) input path of Pin Widget is enabled |
| [4:0]  | Rsvd1         | R  | 0x0   | Reserved                                        |

3.4.27.5. *DigIn UnsolicitedResponse*

Table 406. DigIn UnsolicitedResponse Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 407. DigIn UnsolicitedResponse Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                       |
|--------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x00  | Reserved                                                                                                                                                                                                                          |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses. Unsolicited response events occur upon lock or loss-of-lock of SPDIF_IN clock recovery circuit. Note that the DigEn field of SPDIFIn DigCtl must be set for the functionality to work. |
| [6]    | Rsvd1         | R  | 0x0   | Reserved.                                                                                                                                                                                                                         |
| [5:0]  | Tag           | RW | 0x00  | Software programmable field returned in top six bits (31:26) of every Unsolicited Response generated by this node.                                                                                                                |

3.4.27.6. *DigIn PinSense*

Table 408. DigIn PinSense Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F09     | 00                                | See bitfield table. |
| <b>Set1</b> | 709     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 409. DigIn PinSense Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                               |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31]   | PresDtct      | R  | 0x0   | For this widget, Presence Detect indicates that the SPDIF_IN clock recovery circuit has locked onto a valid SPDIF_IN sampling frequency. Any change in status will generate an Unsolicited Response, if enabled with verb 708. The SPDIF_IN clock recovery circuit must also be enabled (by setting SPDIFInDigCtl:DigEn). |
| [30:0] | Rsvd          | R  | 0x0   | Reserved. Impedance sense not supported for this Pin Complex.                                                                                                                                                                                                                                                             |

## 3.4.27.7. DigIn EAPD

Table 410. DigIn EAPD Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F0C     | 00                                | See bitfield table. |
| <b>Set1</b> | 70C     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 411. DigIn EAPD Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                     |
|--------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:2] | Rsvd2         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                        |
| [1]    | Data          | RW | 0x0   | EAPD value reflected on the EAPD pin.<br>0 = power down external amplifier;<br>1 = power up external amplifier if PwrState < 0x2. If PwrState > = 0x2, Pin47 is Hi-Z.<br>An external pull-down is required if EAPD must be low when Pin Widget is powered down. |
| [0]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                                                                                                                                        |

3.4.27.8. *DigIn PinConfig*

Table 412. DigIn PinConfig Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F1C     | 00                                | See bitfield table. |
| <b>Set1</b> | 71C     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set2</b> | 71D     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set3</b> | 71E     | See bits [7:0] of bitfield table. | 0000_0000h          |
| <b>Set4</b> | 71F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 413. DigIn PinConfig Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                                       |
|---------|---------------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| [31:30] | Port          | RW | 0x1   | External Port Connectivity of the Pin Complex.<br>1 = no physical connection                                                      |
| [29:24] | Location      | RW | 0x01  | Physical location of the jack.<br>01h = Mainboard, Rear                                                                           |
| [23:20] | Device        | RW | 0xC   | Default Device, indicating intended use of jack.<br>C = SPDIF In                                                                  |
| [19:16] | Connection    | RW | 0x4   | Connection Type. 4 = RCA                                                                                                          |
| [15:12] | Color         | RW | 0x0   | Color of physical jack. 0 = Unknown                                                                                               |
| [11:8]  | Misc          | RW | 0x0   | Misc[0] = Jack Detect override.                                                                                                   |
| [7:4]   | Assoc         | RW | 0xF   | Default Association for Pin Complex groups.<br>Reserved value 0000b should not be used.<br>Value 1111b indicates lowest priority. |
| [3:0]   | Sequence      | RW | 0x0   | All Widgets in an association must have unique sequence number.                                                                   |

### 3.4.28. PCBeep Node (NID = 0x23)

#### 3.4.28.1. PCBeep WCap

Table 414. PCBeep WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 415. PCBeep WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                        |
|---------|---------------|----|-------|----------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                           |
| [23:20] | Type          | R  | 0x7   | Widget type = Beep Generator                       |
| [19:4]  | Rsvd1         | R  | 0x0   | Reserved                                           |
| [3]     | AmpOverride   | R  | 0x1   | This widget contains its own amplifier parameters. |
| [2]     | OutAmpPrsnt   | R  | 0x1   | Output amplifier is present                        |
| [1]     | InAmpPrsnt    | R  | 0x0   | N/A                                                |
| [0]     | Stereo        | R  | 0x0   | Mono widget                                        |

#### 3.4.28.2. PCBeep OutAmpCap

Table 416. PCBeep OutAmpCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 12      | See bitfield table. |

Table 417. PCBeep OutAmpCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                |
|---------|---------------|----|-------|--------------------------------------------|
| [31]    | Mute          | R  | 0x0   | Amplifier is capable of muting             |
| [30:23] | Rsvd3         | R  | 0x0   | Reserved                                   |
| [22:16] | StepSize      | R  | 0x17  | Size of each step in the gain range = 6 dB |
| [15]    | Rsvd2         | R  | 0x0   | Reserved                                   |

Table 417. PCBeep OutAmpCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                          |
|--------|---------------|----|-------|------------------------------------------------------|
| [14:8] | NumSteps      | R  | 0x03  | Number of steps in the gain range = 4 (-18dB to 0dB) |
| [7]    | Rsvd1         | R  | 0x0   | Reserved                                             |
| [6:0]  | Offset        | R  | 0x03  | 0dB-step is programmed with this offset              |

## 3.4.28.3. PCBeep Vol

Table 418. PCBeep Vol Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | BA0     | 00                                | See bitfield table. |
| <b>Set1</b> | 3A0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 419. PCBeep Vol Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                            |
|--------|---------------|----|-------|----------------------------------------|
| [31:8] | Rsvd2         | R  | 0x0   | Reserved                               |
| [7]    | Mute          | RW | 0x0   | 1 = disable Digital PC Beep            |
| [6:2]  | Rsvd1         | R  | 0x0   | Reserved                               |
| [1:0]  | Gain          | RW | 0x0   | Mono (left) amplifier gain step number |

## 3.4.28.4. PCBeep Gen

Table 420. PCBeep Gen Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F0A     | 00                                | See bitfield table. |
| <b>Set1</b> | 70A     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 421. PCBeep Gen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| [7:0]  | Divider       | RW | 0x0   | <p>Enable internal PC-Beep generation.<br/>           Divider = 00h - disables internal PC Beep generation and enables normal operation of the CODEC.<br/>           Divider not equal to 00h - generates the beep tone on all Pin Complexes that are currently configured as outputs.<br/>           The HD Audio spec states that:<br/>           beep tone frequency = (48 KHz HD Audio SYNC rate) / (4*Divider),<br/>           producing tones from 47 Hz to 12 KHz (logarithmic scale).<br/>           Instead, this part generates tones with frequency = <math>48000 * (257 - \text{Divider}) / 1024</math>, yielding a linear range from 12 KHz to 93.75 Hz in steps of 46.875 Hz. If JackSenseVSR[Rate2x], then the beep tones generated have frequency = <math>48000 * (513 - \text{Divider}) / 1024</math>, yielding a range of 24 KHz to 12093.75 Hz in steps of 46.875 Hz.</p> |

### 3.4.29. ExtVolume Node (NID = 0x24)

#### 3.4.29.1. ExtVolume WCap

Table 422. ExtVolume WCap Command Verb Format

|     | Verb ID | Payload | Response            |
|-----|---------|---------|---------------------|
| Get | F00     | 09      | See bitfield table. |

Table 423. ExtVolume WCap Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                                                                |
|---------|---------------|----|-------|------------------------------------------------------------------------------------------------------------|
| [31:24] | Rsvd2         | R  | 0x0   | Reserved                                                                                                   |
| [23:20] | Type          | R  | 0x6   | Widget type = Volume Knob Widget.<br>Volume Knob (6h) if VOLUME enabled,<br>Vendor Defined (Fh) otherwise  |
| [19:0]  | Rsvd1         | R  | 0x0   | Reserved. Software assumes capability of unsolicited responses and a connection list for this widget type. |

3.4.29.2. *ExtVolume KnobCap*

Table 424. ExtVolume KnobCap Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 13      | See bitfield table. |

Table 425. ExtVolume KnobCap Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                               |
|--------|---------------|----|-------|---------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                  |
| [7]    | Delta         | R  | 0x1   | Indicates if software can write a base volume to the Volume Control Knob. |
| [6:0]  | NumSteps      | R  | 0x7F  | Total number of steps in the range of the volume knob = 128               |

3.4.29.3. *ExtVolume ConnLen*

Table 426. ExtVolume ConnLen Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F00     | 0E      | See bitfield table. |

Table 427. ExtVolume ConnLen Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                |
|--------|---------------|----|-------|--------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved.                                                                                  |
| [7]    | LongForm      | R  | 0x0   | Connection list uses short-form (7-bit) NID entries.                                       |
| [6:0]  | N             | R  | 0x02  | Number of NID entries in connection list.<br>N = 02h if DAC1 enabled,<br>N = 01h otherwise |

3.4.29.4. *ExtVolume ConnLst*

Table 428. ExtVolume ConnLst Command Verb Format

|            | Verb ID | Payload | Response            |
|------------|---------|---------|---------------------|
| <b>Get</b> | F02     | 00      | See bitfield table. |

Table 429. ExtVolume ConnLst Command Response Format

| Bit     | Bitfield Name | RW | Reset | Description                                                      |
|---------|---------------|----|-------|------------------------------------------------------------------|
| [31:24] | Entry3        | R  | 0x0   | No connection.                                                   |
| [23:16] | Entry2        | R  | 0x0   | No connection.                                                   |
| [15:8]  | Entry1        | R  | 0x11  | DAC1.<br>Entry1 = 11h if DAC1 enabled,<br>Entry1 = 00h otherwise |
| [7:0]   | Entry0        | R  | 0x10  | DAC0                                                             |

## 3.4.29.5. ExtVolume Unsolicited Response

Table 430. ExtVolume Unsolicited Response Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F08     | 00                                | See bitfield table. |
| <b>Set1</b> | 708     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 431. ExtVolume Unsolicited Response Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                    |
|--------|---------------|----|-------|------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd2         | R  | 0x00  | Reserved                                                                                                                                       |
| [7]    | En            | RW | 0x0   | Allow generation of Unsolicited Responses.<br>Unsolicited response events occur upon<br>jack-insertion OR completion of a<br>Jack-Sense cycle. |
| [6]    | Rsvd1         | R  | 0x0   | Reserved                                                                                                                                       |
| [5:0]  | Tag           | RW | 0x00  | Software programmable field returned in top<br>six bits (31:26) of every Unsolicited<br>Response generated by this node.                       |

3.4.29.6. *ExtVolume KnobCtl*

Table 432. ExtVolume KnobCtl Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | F0F     | 00                                | See bitfield table. |
| <b>Set1</b> | 70F     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 433. ExtVolume KnobCtl Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                                                                              |
|--------|---------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| [31:8] | Rsvd          | R  | 0x0   | Reserved                                                                                                                                                 |
| [7]    | Direct        | RW | 0x0   | Direct = 1 causes the volume control to directly control the hardware volume of the slave amps. Direct = 0 causes unsolicited responses to be generated. |
| [6:0]  | Volume        | RW | 0x7F  | Volume, specified in steps of amplifier gain                                                                                                             |

3.4.29.7. *ExtVolume KnobVSR*

Table 434. ExtVolume KnobVSR Command Verb Format

|             | Verb ID | Payload                           | Response            |
|-------------|---------|-----------------------------------|---------------------|
| <b>Get</b>  | FE0     | 00                                | See bitfield table. |
| <b>Set1</b> | 7E0     | See bits [7:0] of bitfield table. | 0000_0000h          |

Table 435. ExtVolume KnobVSR Command Response Format

| Bit    | Bitfield Name | RW | Reset | Description                                                                                             |
|--------|---------------|----|-------|---------------------------------------------------------------------------------------------------------|
| [31:4] | Rsvd          | R  | 0x0   | Reserved                                                                                                |
| [3]    | Continuous    | RW | 0x1   | Allow continuous incrementing/decrementing of the volume knob value.                                    |
| [2:0]  | Rate          | RW | 0x0   | Volume knob update rate, for continuous mode and de-bouncing (2.5 Hz to 20 Hz, in increments of 2.5 Hz) |

## 4. ORDERING INFORMATION

Dolby Home Theater (HT) and Dolby Sound Room (SR) require the 5 V version of this part. Dolby Digital Live (DDL) characteristics are available in the 3.3 V version. Dolby also requires a separate license from Dolby to use their parts. IDT will only provide Dolby parts to Dolby approved customers.

TnR indicates availability on Tape and Reel. The minimum order quantity for TnR is 2,000 units.

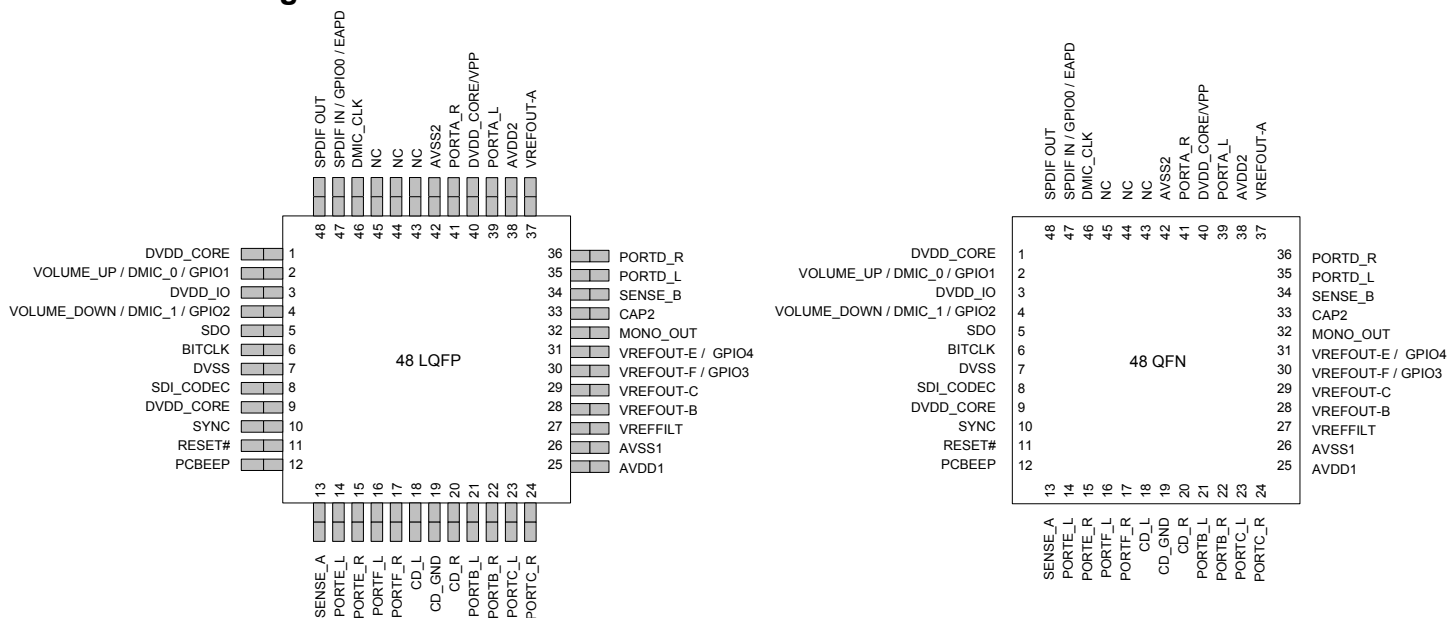
| Part Number       | Voltage | Package     | DAC       | ADC       | Modem | Digital Mics | Dolby         | TnR |
|-------------------|---------|-------------|-----------|-----------|-------|--------------|---------------|-----|
| STAC9204D3TAEyyX  | 3.3 V   | 48 pin LQFP | 4 channel | 4 channel | No    | No           | Yes - DDL     | No  |
| STAC9204D3TAEyyXR | 3.3 V   | 48 pin LQFP | 4 channel | 4 channel | No    | No           | Yes - DDL     | Yes |
| STAC9204D5TAEyyX  | 5 V     | 48 pin LQFP | 4 channel | 4 channel | No    | No           | Yes - HT / SR | No  |
| STAC9204D5TAEyyXR | 5 V     | 48 pin LQFP | 4 channel | 4 channel | No    | No           | Yes - HT / SR | Yes |
| STAC9204X3TAEyyX  | 3.3 V   | 48 pin LQFP | 4 channel | 4 channel | No    | No           | No            | No  |
| STAC9204X3TAEyyXR | 3.3 V   | 48 pin LQFP | 4 channel | 4 channel | No    | No           | No            | Yes |
| STAC9204X5TAEyyX  | 5 V     | 48 pin LQFP | 4 channel | 4 channel | No    | No           | No            | No  |
| STAC9204X5TAEyyXR | 5 V     | 48 pin LQFP | 4 channel | 4 channel | No    | No           | No            | Yes |
| STAC9205D3TAEyyX  | 3.3 V   | 48 pin LQFP | 4 channel | 4 channel | No    | Yes          | Yes - DDL     | No  |
| STAC9205D3TAEyyXR | 3.3 V   | 48 pin LQFP | 4 channel | 4 channel | No    | Yes          | Yes - DDL     | Yes |
| STAC9205D5TAEyyX  | 5 V     | 48 pin LQFP | 4 channel | 4 channel | No    | Yes          | Yes - HT / SR | No  |
| STAC9205D5TAEyyXR | 5 V     | 48 pin LQFP | 4 channel | 4 channel | No    | Yes          | Yes - HT / SR | Yes |
| STAC9205X3TAEyyX  | 3.3 V   | 48 pin LQFP | 4 channel | 4 channel | No    | Yes          | No            | No  |
| STAC9205X3TAEyyXR | 3.3 V   | 48 pin LQFP | 4 channel | 4 channel | No    | Yes          | No            | Yes |
| STAC9205X5TAEyyX  | 5 V     | 48 pin LQFP | 4 channel | 4 channel | No    | Yes          | No            | No  |
| STAC9205X5TAEyyXR | 5 V     | 48 pin LQFP | 4 channel | 4 channel | No    | Yes          | No            | Yes |
| STAC9204D3NBEyyX  | 3.3 V   | 48 pad QFN  | 4 channel | 4 channel | No    | No           | Yes - DDL     | No  |
| STAC9204D3NBEyyXR | 3.3 V   | 48 pad QFN  | 4 channel | 4 channel | No    | No           | Yes - DDL     | Yes |
| STAC9204D5NBEyyX  | 5 V     | 48 pad QFN  | 4 channel | 4 channel | No    | No           | Yes - HT / SR | No  |
| STAC9204D5NBEyyXR | 5 V     | 48 pad QFN  | 4 channel | 4 channel | No    | No           | Yes - HT / SR | Yes |
| STAC9204X3NBEyyX  | 3.3 V   | 48 pad QFN  | 4 channel | 4 channel | No    | No           | No            | No  |
| STAC9204X3NBEyyXR | 3.3 V   | 48 pad QFN  | 4 channel | 4 channel | No    | No           | No            | Yes |
| STAC9204X5NBEyyX  | 5 V     | 48 pad QFN  | 4 channel | 4 channel | No    | No           | No            | No  |
| STAC9204X5NBEyyXR | 5 V     | 48 pad QFN  | 4 channel | 4 channel | No    | No           | No            | Yes |
| STAC9205D3NBEyyX  | 3.3 V   | 48 pad QFN  | 4 channel | 4 channel | No    | Yes          | Yes - DDL     | No  |
| STAC9205D3NBEyyXR | 3.3 V   | 48 pad QFN  | 4 channel | 4 channel | No    | Yes          | Yes - DDL     | Yes |
| STAC9205D5NBEyyX  | 5 V     | 48 pad QFN  | 4 channel | 4 channel | No    | Yes          | Yes - HT / SR | No  |
| STAC9205D5NBEyyXR | 5 V     | 48 pad QFN  | 4 channel | 4 channel | No    | Yes          | Yes - HT / SR | Yes |
| STAC9205X3NBEyyX  | 3.3 V   | 48 pad QFN  | 4 channel | 4 channel | No    | Yes          | No            | No  |
| STAC9205X3NBEyyXR | 3.3 V   | 48 pad QFN  | 4 channel | 4 channel | No    | Yes          | No            | Yes |
| STAC9205X5NBEyyX  | 5 V     | 48 pad QFN  | 4 channel | 4 channel | No    | Yes          | No            | No  |
| STAC9205X5NBEyyXR | 5 V     | 48 pad QFN  | 4 channel | 4 channel | No    | Yes          | No            | Yes |

yy = CODEC revision number

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## 5. PINOUTS

### 5.1. Pin Assignment



### 5.2. Pin Descriptions

| Pin No. | Pin Name                    | Pin Type     | Internal Pull-up/ Pull-down                                                                  | Pin Description                                                     |
|---------|-----------------------------|--------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1       | DVDD_CORE                   | I(Digital)   | None                                                                                         | Digital Vdd = 3.3 V                                                 |
| 2       | Volume Up / DMIC0 / GPIO1   | I/O(Digital) | 50 K $\Omega$ pull-up with Volume or GPIO<br>50 K $\Omega$ pull-down with Digital Microphone | Volume Control or Digital Microphone 0 Input or General Purpose I/O |
| 3       | DVDD_IO                     | I(Digital)   | None                                                                                         | Reference Voltage (1.5 V or 3.3 V)                                  |
| 4       | Volume Down / DMIC1 / GPIO2 | I/O(Digital) | 50 K $\Omega$ pull-up with Volume or GPIO<br>50 K $\Omega$ pull-down with Digital Microphone | Volume Control or Digital Microphone 1 Input or General Purpose I/O |
| 5       | SDO                         | I/O(Digital) | None                                                                                         | HD Audio Serial Data output (inbound stream)                        |
| 6       | BITCLK                      | I(Digital)   | None                                                                                         | HD Audio Bit Clock                                                  |
| 7       | DVSS                        | I(Digital)   | None                                                                                         | Digital Ground                                                      |
| 8       | SDI_CODEC                   | O(Digital)   | None                                                                                         | HD Audio Serial Data (outbound stream), audio module                |
| 9       | DVDD_CORE                   | I(Digital)   | None                                                                                         | Digital Vdd = 3.3 V                                                 |

| Pin No. | Pin Name             | Pin Type    | Internal Pull-up/<br>Pull-down | Pin Description                                                                       |
|---------|----------------------|-------------|--------------------------------|---------------------------------------------------------------------------------------|
| 10      | SYNC                 | I(Digital)  | None                           | HD Audio Frame Sync                                                                   |
| 11      | RESET#               | I(Digital)  | None                           | HD Audio Reset                                                                        |
| 12      | PCBEEP               | I(Analog)   | None                           | PC BEEP                                                                               |
| 13      | SENSE_A              | I(Analog)   | None                           | Jack insertion detection Ports A, B, C, D                                             |
| 14      | PORTE_L              | I/O(Analog) | None                           | Input/Output of Left DAC0                                                             |
| 15      | PORTE_R              | I/O(Analog) | None                           | Input/Output of Right DAC0                                                            |
| 16      | PORTF_L              | I/O(Analog) | None                           | Input/Output of Left DAC1                                                             |
| 17      | PORTF_R              | I/O(Analog) | None                           | Input/Output of Right DAC1                                                            |
| 18      | CD-L                 | I(Analog)   | None                           | CD Audio Left Channel                                                                 |
| 19      | CD-GND               | I(Analog)   | None                           | CD Audio Analog Ground                                                                |
| 20      | CD-R                 | I(Analog)   | None                           | CD Audio Right Channel                                                                |
| 21      | PORTB_L              | I/O(Analog) | None                           | Input/Output of Left DAC0 & DAC1                                                      |
| 22      | PORTB_R              | I/O(Analog) | None                           | Input/Output of Right DAC0 & DAC1                                                     |
| 23      | PORTC_L              | I/O(Analog) | None                           | Input/Output of Left DAC1                                                             |
| 24      | PORTC_R              | I/O(Analog) | None                           | Input/Output of Right DAC1                                                            |
| 25      | AVDD1                | I(Analog)   | None                           | Analog Vdd = 5.0 V or 3.3 V                                                           |
| 26      | AVSS1                | I(Analog)   | None                           | Analog Ground                                                                         |
| 27      | VREFFILT             | O(Analog)   | None                           | Analog Virtual Ground                                                                 |
| 28      | VREFOUT-B            | O(Analog)   | None                           | Reference Voltage out drive (intended for microphone bias) for Port B                 |
| 29      | VREFOUT-C            | O(Analog)   | None                           | Reference Voltage out drive (intended for microphone bias) for Port C                 |
| 30      | VREFOUT-F /<br>GPIO3 | IO(Analog)  | None                           | Reference Voltage out drive (intended for microphone bias) for Port F or analog GPIO3 |
| 31      | VREFOUT-E /<br>GPIO4 | IO(Analog)  | None                           | Reference Voltage out drive (intended for microphone bias) for Port E or analog GPIO4 |
| 32      | MONO_OUT             | O(Analog)   | None                           | Mono output of DAC0                                                                   |
| 33      | CAP2                 | O(Analog)   | None                           | ADC reference Capacitor                                                               |
| 34      | SENSE_B              | I(Analog)   | None                           | Jack insertion detection Ports E, F                                                   |
| 35      | PORT-D_L (HP)        | I/O(Analog) | None                           | Input/Output of Left DAC0                                                             |
| 36      | PORT-D_R (HP)        | I/O(Analog) | None                           | Input/Output of Right DAC0                                                            |

| Pin No. | Pin Name               | Pin Type     | Internal Pull-up/<br>Pull-down   | Pin Description                                                       |
|---------|------------------------|--------------|----------------------------------|-----------------------------------------------------------------------|
| 37      | VREFOUT-A              | O(Analog)    | None                             | Reference Voltage out drive (intended for microphone bias) for Port A |
| 38      | AVDD2                  | I(Analog)    | None                             | Analog Vdd = 5.0 V or 3.3 V                                           |
| 39      | PORTA_L (HP)           | I/O(Analog)  | None                             | Input/Output of Left DAC0 & 1                                         |
| 40      | DVDD_CORE              | I(Analog)    | None                             | DVDD                                                                  |
| 41      | PORTA_R (HP)           | I/O(Analog)  | None                             | Input/Output of Right DAC0 & 1                                        |
| 42      | AVSS2                  | I(Analog)    | None                             | Analog Ground                                                         |
| 43      | NC                     | None         | None                             | No Connect                                                            |
| 44      | NC                     | None         | None                             | No Connect                                                            |
| 45      | NC                     | None         | None                             | No Connect                                                            |
| 46      | DMIC_CLK               | O(Digital)   | 50 K $\Omega$ pull-down          | Digital Microphone Output Clock                                       |
| 47      | SPDIFIN / GPIO0 / EAPD | I/O(Digital) | 50 K $\Omega$ pull-up            | SPDIF Input, General Purpose I/O, EAPD                                |
| 48      | SPDIF-OUT              | O(Digital)   | Internal 50 K $\Omega$ pull-down | SPDIF digital output                                                  |

## 6. DESIGN CONSIDERATIONS

### 6.1. External Components

The STAC9204/9205 requires a minimum number of external components for proper operation.

#### 6.1.1. Decoupling Capacitor

Decoupling capacitors must be connected between AVDD and AVSS and between DVDD and DVSS, as close to these pins as possible.

- Between AVDD (pin 38) and AVSS (pins 26 and 42), use a 1.0 mF capacitor in parallel with a 10 mF capacitor.
- Between AVDD (pin 25) and AVSS (pins 26 and 42), use a 0.1 mF capacitor in parallel with a 10 mF capacitor.
- Between DVDD (pin 1) and DVSS (pins 4 and 7), use a 1.0 mF capacitor in parallel with a 10 mF capacitor.
- Between DVDD (pin 9) and DVSS (pins 4 and 7), use a 0.1 mF capacitor in parallel with a 10 mF capacitor.

For optimum device performance, the decoupling capacitors should be mounted on the CODEC side of the PCB. Avoid the use of vias in the decoupling circuit.

#### 6.1.2. Other Required Components

The following components are required:

- Between VREFFILT (pin 27) and AVSS (pins 26 and 42), use a 1.0 mF capacitor in parallel with a 10 mF capacitor.
- Each of these pins needs to have an 820 pF capacitor connected to AVSS (pins 26 and 42). (Recommend using NP0 type capacitor.)
  - ADC0\_AFILT\_L (pin 28).
  - ADC1\_AFILT\_L (pin 29).
  - ADC0\_AFILT\_R (pin 30).
  - ADC1\_AFILT\_R (pin 31).
- ADC\_VREF (pin 33) must have a 1.0 mF capacitor connected to AVSS (pins 26 and 42). Optionally, a 10 mF capacitor may also be connected in parallel, to improve performance.
- SENSE\_A (pin 13) and SENSE\_B (pin 34) must each be connected to AVSS (pins 26 and 42) with a 1000 pF capacitor located as close to the pins as possible.
- SENSE\_A (pin 13) and SENSE\_B (pin 34) must each be connected to AVDD (pins 25 and 38) with a 5.11 KW resistor. This resistor MUST be 1% tolerance and should be located as close to the pins as possible.
- Either SENSE\_A or SENSE\_B is connected to each Port through a resistor. This resistor MUST be 1% or better tolerance. (For resistor details, see [Table 3](#). For details about these connections, see the latest IDT reference designs.)

For optimum device performance, these components should be mounted on the CODEC side of the PCB. Minimize the use of vias.

## 6.2. PCB Layout Recommendations

An optimum layout is one with all components on the same side of the board, minimizing vias through other signal layers. Other signal traces should be routed away from the STAC9204/9205. This includes signal traces just underneath the device, or on layers adjacent to the ground plane layer used by the device.

Separate analog and digital grounding is recommended. The analog grounds (AVSS (pins 26 and 42)) and the digital grounds (DVSS (pins 4 and 7)) should be tied together at only one place. This tie should be under the CODEC.

Capacitive coupling is allowed for EMI considerations. Generally, use 0.1 mF capacitors. Make sure these are spread out in the layout.

Analog ground (AVSS) should be located on all grounding layers. AVSS should be the same shape on these layers.

Analog audio signals should not escape the AVSS cut.

Analog non-audio signals should not enter the AVSS cut.

Only audio voltage planes (such as AVDD) should be located on the VCC layer.

Analog voltage should be provided from a filtered source. LDO's are preferred. Ferrite beads are acceptable. Whichever is used must support current requirements.

### 6.2.1. Vista WLP Compliance Requirements

The following external components are REQUIRED for Vista WLP compliance.

Required series coupling capacitors on analog I/O signal lines:

- Minimum Premium Desktop Implementations:
  - Line Output = 10 mF, 1206, 10 V, X5R (ceramic) or 3.3 mF aluminum electrolytic (or similar).
  - Headphone Output = 220 mF aluminum electrolytic (or similar).
  - Microphone or Line Input = 1 mF, 0603, X5R (ceramic) or better.
- Minimum Premium Mobile Implementations:
  - Line Output = 2.2 mF, 1206, 16 V, X5R (ceramic).
  - Headphone Output = 100 mF D-Case size (or similar). Larger is better, we usually recommend 220 mF.
  - Microphone or Line Input = 1 mF, 0603, X5R (ceramic) or better.

## EMI Components:

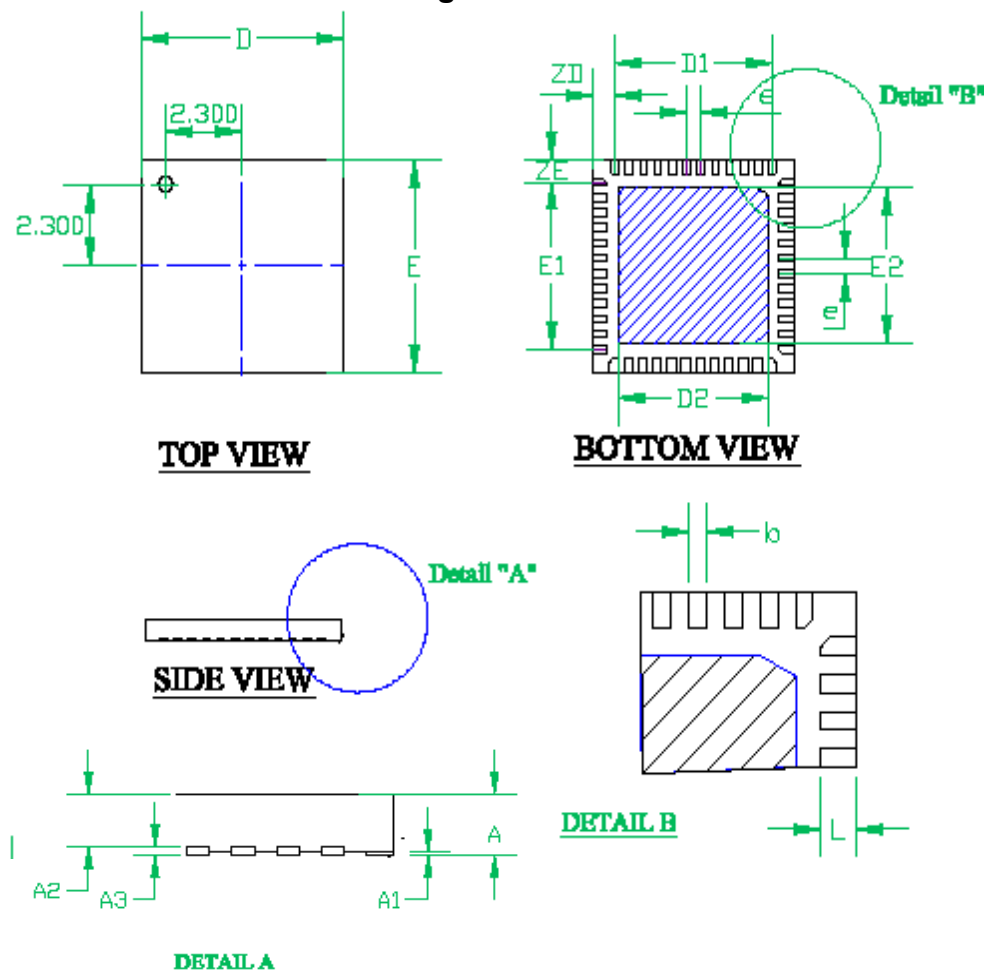
- Recommended Ferrite Beads are 600 ohm. Use these manufacturers only:
  - TDK - MMZ1608Y601BTA
  - MURATA - BLM18BD601SN1
  - TAIYO YUDEN - LF BK 1608HM601-T
- EMI shunt capacitor:
  - For Headphone ports, 0.01 mF.
  - For all other ports, 100 pF.
  - EMI components should be placed as close to the jack as possible.

*Note: See the latest STAC9204/9205/9204D/9205D Reference Designs for further details on schematic recommendations.*

## 7. PACKAGE OUTLINE AND PACKAGE DIMENSIONS

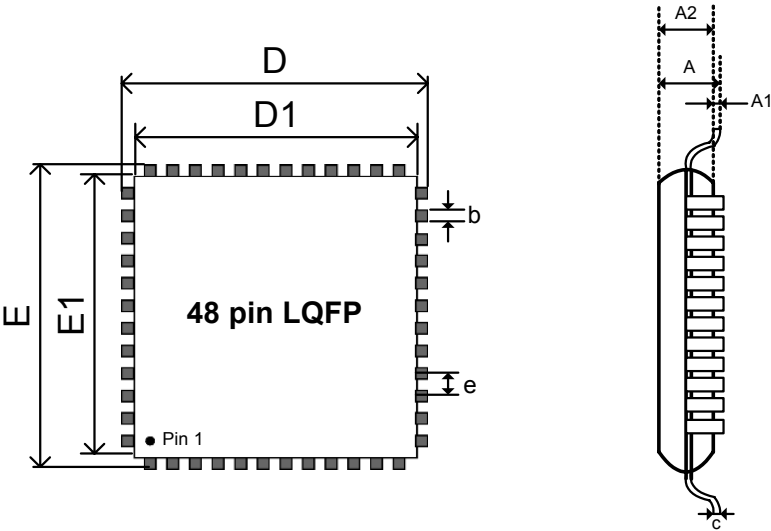
Package dimensions are kept current with JEDEC Publication No. 95

### 7.1. 48-Pad QFN Package



| Key | QFN Dimensions in mm |      |      |
|-----|----------------------|------|------|
|     | Min                  | Nom  | Max  |
| A   | 0.80                 | 0.90 | 1.0  |
| A1  | 0.00                 | 0.02 | 0.05 |
| A3  | 0.20 REF             |      |      |
| D   | 7.00 BSC             |      |      |
| D1  | 5.50 BSC             |      |      |
| E   | 7.00 BSC             |      |      |
| E1  | 5.50 BSC             |      |      |
| L   | 0.35                 | 0.40 | 0.45 |
| e   | 0.50 BSC             |      |      |
| R   | 0.20-0.25            |      |      |
| b   | 0.18                 | 0.25 | 0.30 |
| D2  | 5.50                 | 5.65 | 5.80 |
| E2  | 5.50                 | 5.65 | 5.80 |
| ZD  | 0.75 BSC             |      |      |
| ZE  | 0.75 BSC             |      |      |

7.2. 48-Pin LQFP Package



| Key | LQFP Dimensions in mm |      |      |
|-----|-----------------------|------|------|
|     | Min                   | Nom  | Max  |
| A   | 1.40                  | 1.50 | 1.60 |
| A1  | 0.05                  | 0.10 | 0.15 |
| A2  | 1.35                  | 1.40 | 1.45 |
| D   | 8.80                  | 9.00 | 9.20 |
| D1  | 6.90                  | 7.00 | 7.10 |
| E   | 8.80                  | 9.00 | 9.20 |
| E1  | 6.90                  | 7.00 | 7.10 |
| L   | 0.45                  | 0.60 | 0.75 |
| e   |                       | 0.50 |      |
| c   | 0.09                  | -    | 0.20 |
| b   | 0.17                  | 0.22 | 0.27 |

## 8. SOLDER REFLOW PROFILE

### 8.1. Standard Reflow Profile Data

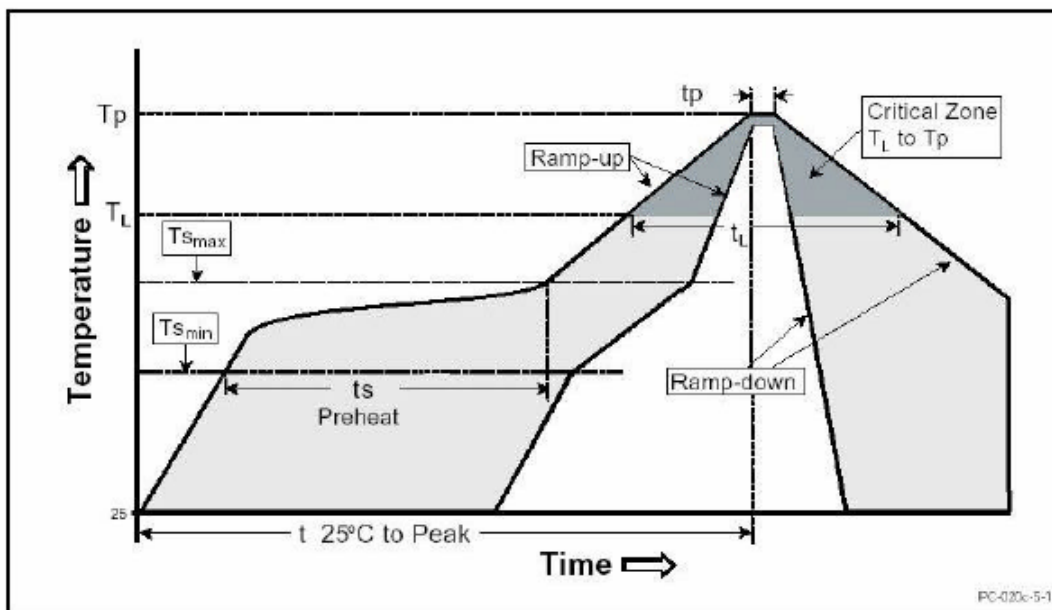
Note: These devices can be hand soldered at 360 °C for 3 to 5 seconds.

**FROM:** IPC / JEDEC J-STD-020C "Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices" ([www.jedec.org/download](http://www.jedec.org/download)).

| Profile Feature                                                                                                         | Pb Free Assembly                                                               |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Average Ramp-Up Rate ( $T_{s_{max}} - T_p$ )                                                                            | 3 °C / second max                                                              |
| Preheat: Temperature Min ( $T_{s_{min}}$ )<br>Temperature Max ( $T_{s_{max}}$ )<br>Time ( $t_{s_{min}} - t_{s_{max}}$ ) | 150 °C<br>200 °C<br>60 - 180 seconds                                           |
| Time maintained above: Temperature ( $T_L$ )<br>Time ( $t_L$ )                                                          | 217 °C<br>60 - 150 seconds                                                     |
| Peak / Classification Temperature ( $T_p$ )                                                                             | See "Package Classification Reflow Temperatures" on <a href="#">page 190</a> . |
| Time within 5 °C of actual Peak Temperature ( $t_p$ )                                                                   | 20 - 40 seconds                                                                |
| Ramp-Down rate                                                                                                          | 6 °C / second max                                                              |
| Time 25 °C to Peak Temperature                                                                                          | 8 minutes max                                                                  |

Note: All temperatures refer to topside of the package, measured on the package body surface.

Figure 7. Solder Reflow Profile



## 8.2. Pb Free Process - Package Classification Reflow Temperatures

| Package Type | MSL | Reflow Temperature |
|--------------|-----|--------------------|
| LQFP 48-pin  | 3   | 260 °C             |
| QFN 48-pad   | 3   | 260 °C             |

## 9. REVISION HISTORY

| Revision | Date              | Description of Change                                                                                                  |
|----------|-------------------|------------------------------------------------------------------------------------------------------------------------|
| 0.8      | 22 September 2006 | Initial release in IDT format.                                                                                         |
| 0.81     | 9 November 2006   | Updated to match IDT standard documents.                                                                               |
| 0.82     | 17 November 2006  | Incorporated Widget list into section 3.                                                                               |
| 1.0      | December 2006     | Updated electrical characteristics based on validation data. Removed use of colored line in block and widget diagrams. |































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