# SSS1700B1 Data Specification

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# Product Overview

SSS1700 is 3S highly integrated single chip USB audio controller with on chip oscillator to save the external 12MHz crystal component for headset application. SSS1700 features support 96 KHz 24 bit sampling rate with external audio codec(24bit/96KHz I2S In&Out) and have built-in stereo 16/24 bits ADC, stereo 16/24 bits DAC, earphone driver, five-band hardware EQ, audio PLL, USB clock oscillator, and USB FS controller plus PHY. External 24C02~24C16 EEPROM connection provides flexibility for USB VID/PID/product string, default gain settings, and other customized demands. SSS1700 provides a minimum BOM solution for featured USB audio solutions in Windows / MAC / Android OS.

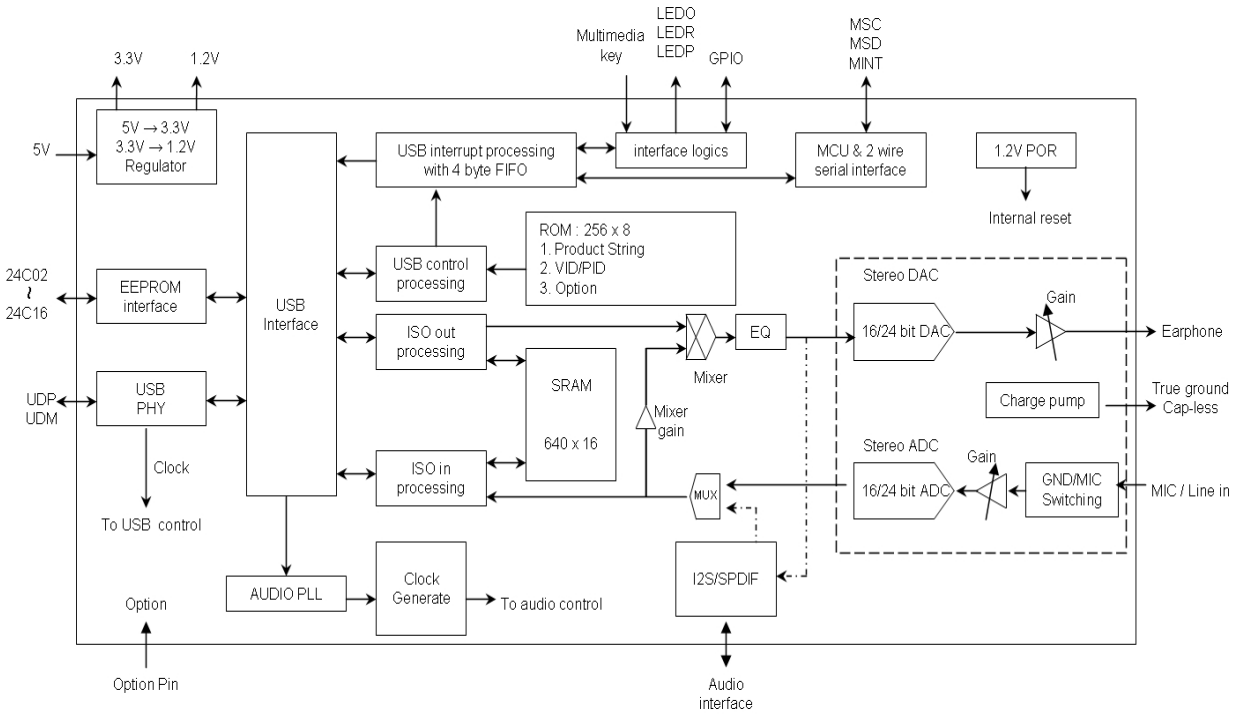
# 1. Product Features

- Compliant with USB specification v2.0 full speed operation
- Compliant with USB audio device class specification v1.0
- Support 44.1KHz/48KHz/96KHz、16bit/24bit sampling rate (EEPROM Option)
- Embedded digital mixer with default mixer mute after power on (control by OS)
  - when mono ADC is set, both DAC channel mixed with this single ADC data
  - when stereo ADC is set, L-ch DAC mixes with L-ch ADC data and R-ch DAC mixes with R-ch ADC data
- ROM option for power mode setting (USB bus power : default 100mA or configuration 500mA)
- Default support 16&24 bit, 48KHz sampling rate for both ADC and DAC
- Embedded I2S interface (master /slave mode) for 16/24 bit CODEC DAC/ADC (EEPROM Option)
- Embedded SPDIF In&Out interface for 16/24 bit CODEC DAC/ADC (EEPROM Option)
- Embedded crystaless on chip oscillator
- Supports USB suspend/resume mode
- Embedded USB transceiver for USB interface
- For headset function, USB audio function topology has 2 input terminals, 2 output terminals, 1 mixer unit, 1 selector unit, and 3 feature units (some units can be enabled by ROM code option)
- Support one control endpoint, one isochronous out endpoint, one isochronous in endpoint, one interrupt in endpoint (HID uses interrupt in and control out)
- Alternate zero bandwidth setting for releasing playback bandwidth on USB bus when this device is inactive
- Volume up, volume down, playback mute, record mute, next track, previous track, stop and play/pause pin for direct user control
- Two wire serial bus for external MCU control
- Whole EEPROM space can be accessed via MCU
- USB HID for host control synchronization
- External serial EEPROM (24C02~24C16) interface for vendor specific USB VID, PID, product string, serial number, default gain, default EQ setting, playback/record enable, and other options
- EEPROM write function via HID for mass production convenience
- Preloaded VID, PID, and product string and design options with setting priority: 1st is external EEPROM and 2nd is embedded ROM
- Vendor specific requests and new dummy register (10XX_10XX; where XX can be set by register write and read back for verify) for software protect
- GPIO and MCU interface register read/write via HID

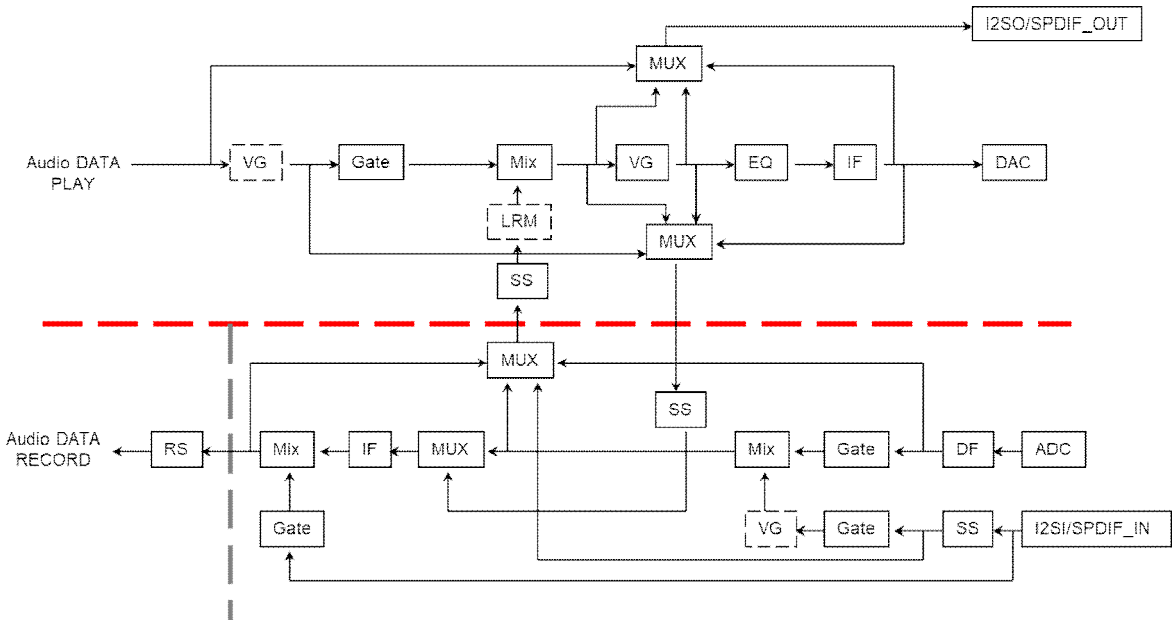
- True Ground Cap-less Headphone Amplifier solution
- Support CTIA/OMTP auto switch for TRRS Audio Jack
- Support AD Key detect
- Support RGB LED (EEPROM Option)
- Support HID Keyboard (EEPROM Option)
- Support IIC initial for external Codec (EEPROM Option)
- Embedded 1.2V POR
- Embedded 5V to 3.3V (with 250mA capability) and 3.3V to 1.2V regulators for single external 5V power supply
- Embedded rotary encoder interface for volume control (EEPROM Option)
- 1.2V digital core and audio PLL operation, 3.3V USB PLL operation and ADC/DAC operation
- Compatible with Win XP, Win 7, Win 10, Mac OS, Linux OS and Android OS without additional driver

# 2. Block & Audio Path Diagram

## 2.1 Block Diagram




## 2.2 Audio Path



# 3. Electric Characteristics

## 3.1 Absolute Maximum Rating

| PARAMETER | SYMBOL | VALUE | UNIT |
|---|---|---|---|
| Supply Voltage | VCC5A | -0.3 to +5.5 | V |
| DC Input Voltage | Vin | -0.3 to +3.6 | V |
| Operating Temperature | $T_{opr}$ | 0 to 80 | $^0$C |
| Storage Temperature | $T_{stg}$ | -20 to +120 | $^0$C |
| Human Body Model ESD | HBM | 4000 | V |
| Machine Model ESD | MM | 200 | V |

## 3.2 DC Characteristics

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Regulation Supply Voltage | VCC5A | 4.5 | 5 | 5.5 | V |
| Regulation Output Voltage | VCC33 | 3.0 | 3.3 | 3.6 | V |
| | VCC12 | 1.08 | 1.2 | 1.32 | V |
| Regulation Driving Capability | REGdrv33 | | | 150 | mA |
| | REGdrv12 | | | 100 | mA |
| CODEC Supply Voltage | VDDCP | 3.0 | 3.3 | 3.6 | V |
| | AVDD | 3.0 | 3.3 | 3.6 | V |
| Earphone Driver Supply Voltage | HPVDD | 1.48 | 1.65 | 1.8 | V |
| | HPVSS | -1.48 | -1.65 | -1.8 | V |
| Microphone Bias Voltage | MICBIAS | 2.25 | 2.5 | 2.75 | V |
| IO Supply Voltage | VCCIO | 3.0 | 3.3 | 3.6 | V |
| IO Input Voltage | Vin | -0.3 | 3.3 | 3.6 | V |
| Core Supply Voltage | VCCK | 1.08 | 1.2 | 1.32 | V |

## 3.3 AC Characteristics

### 3.3.1 Headphone Output (A-Weighted)

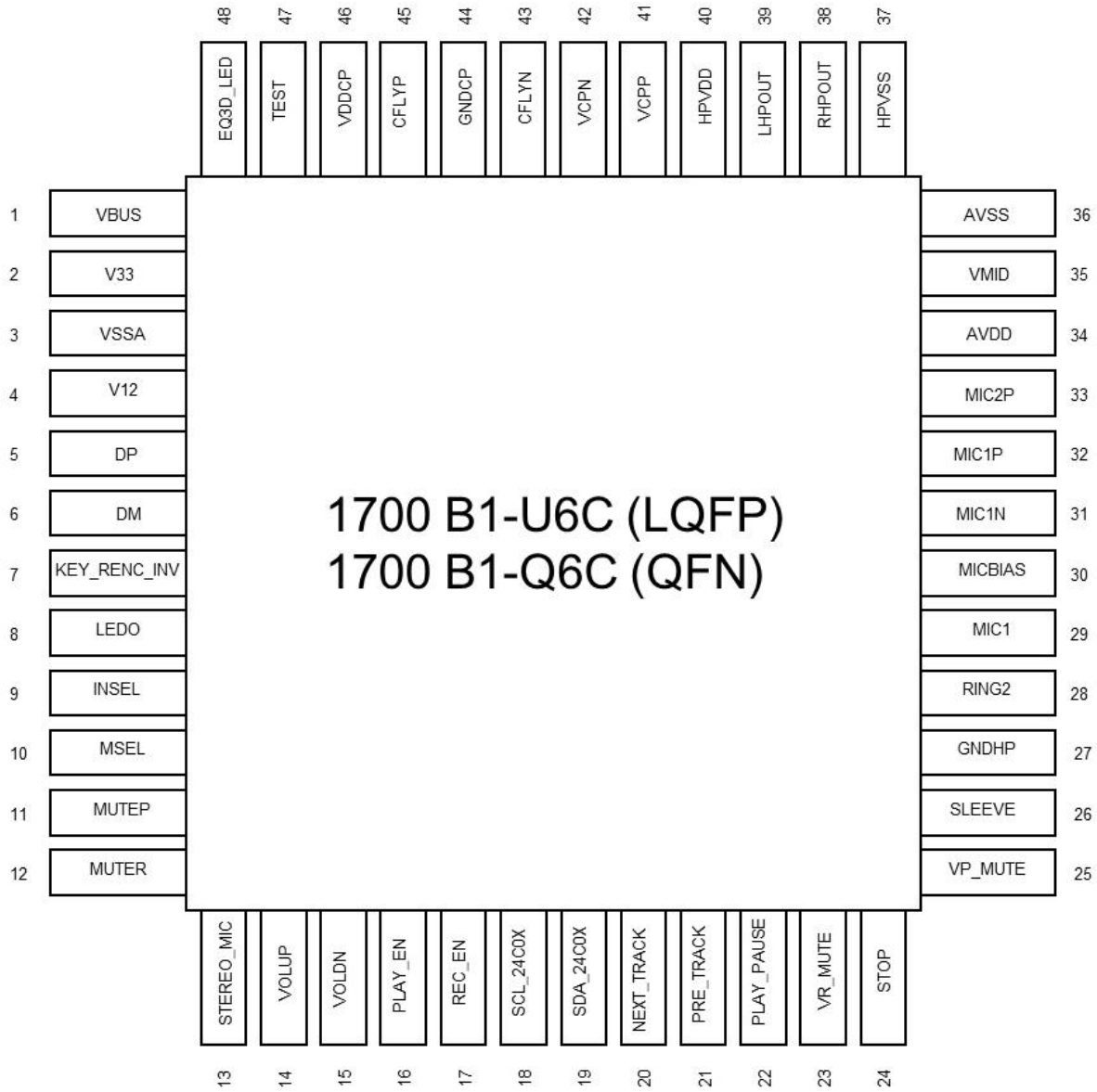
| PARAMETER | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| Pmax Output power @1% THD+N | RL = 32 Ω, VCC33A = 3.3 V | -- | 28 | -- | mW |
| SNR (Signal-to-noise ratio) | Idle channel | -- | 91 | -- | dB |
| THD+N Total harmonic distortion | 1KHz @ -3dB; 32Ω load; 10mW | -- | -75 | -- | dB |

### 3.3.2 Microphone Input Characteristics

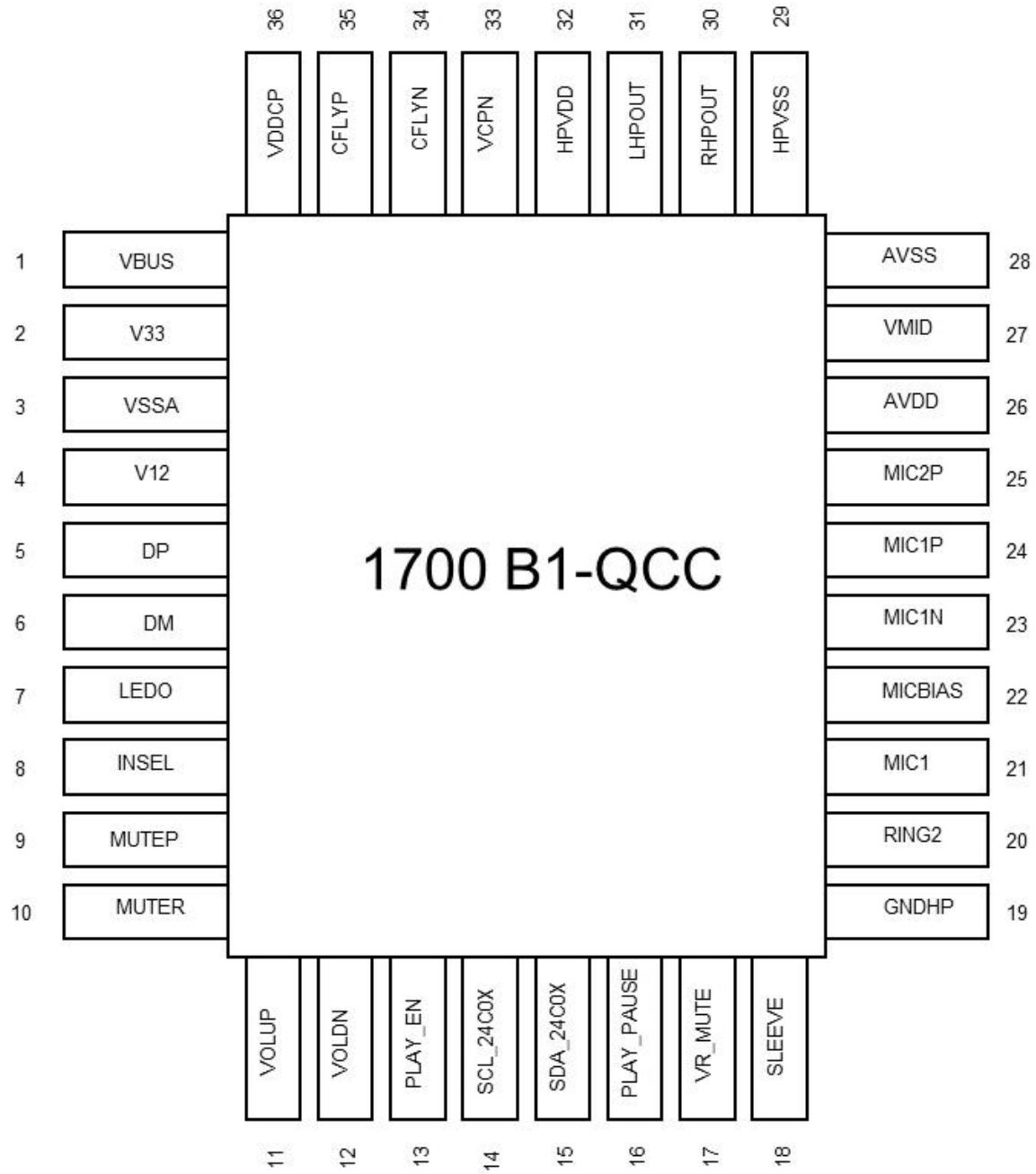
| SYMBOL | PARAMETER | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| AMP | Microphone gain amplification | -4.5 | | +21 | dB |
| | Microphone gain Boost | | +21 | | dB |
| GSTEP | ADC gain step | | 0.75 | | dB |
| DR | Dynamic range @ 997Hz -60dB FS gain = 0dB | | 91 | | dB |
| SNR | SNR @ idle channel gain = 0dB | | 91 | | dB |
| THD+N | THD+N @ 997Hz -3dB FS gain = 0dB | | -85 | | dB |
| FS | Signal full scale input gain = 0dB | | 0.75*VCC33A | | V |

# 4. Pin Description

## 4.1 Pin Out Chart for 48 Pin LQFP/QFN



## 4.2 Pin Out Chart for 36 Pin QFN



## 4.3 Pin List Table

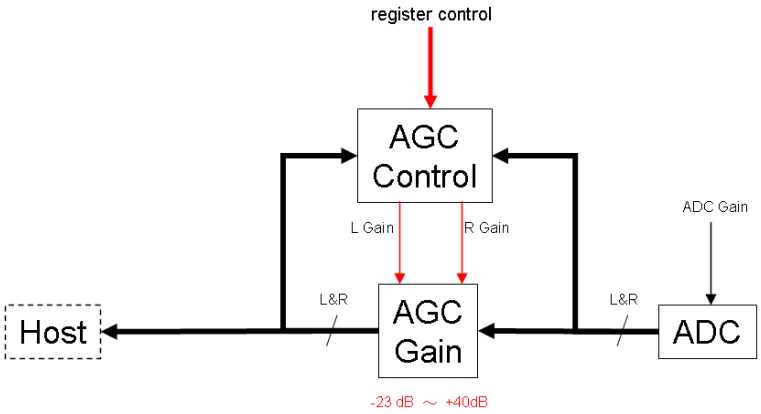
| U6C/ Q6C Pin | QCC Pin | Symbol | IO Type | Normal status | Description | Mark |
|---|---|---|---|---|---|---|
| 1 | 1 | VBUS | P | P | 5V Power input | |
| 2 | 2 | V33 | P | P | 3.3V Power output | |
| 3 | 3 | VSSA | P | P | Ground | |
| 4 | 4 | V12 | P | P | 1.2V Power output | |
| 5 | 5 | DP | AIO | AIO | USB data D+ | |
| 6 | 6 | DM | AIO | AIO | USB data D- | |
| 7 | | KEY_RENC_INV | IO,PU | I | Button & rotary encoder function change<br>1 : normal (HID/hardware Gain control function define in rom)<br>0 : function change (HID/hardware Gain control function swap) | |
| 8 | 7 | LEDO | IO,PD | O | LED Out (toggling for data transmit) | |
| 9 | 8 | INSEL | IO,PU | I | Line in mode select | |
| 10 | | MSEL | IO,PU | I | Mixer enable<br>1: enable mixer 0: disable mixer | |
| 11 | 9 | MUTEP | IO,PU | I | Playback Mute | |
| 12 | 10 | MUTER | IO,PU | I | Record Mute | |
| 13 | | STEREO_MIC | IO,PU | I | MIC Select<br>1: STEREO (for EEPROM option)<br>0: MONO (normal setting) | |
| 14 | 11 | VOLUP | IO,PU | I | Volume up | |
| 15 | 12 | VOLDN | IO,PU | I | Volume down | |
| 16 | 13 | PLAY_EN | IO,PU | I | PLAY Enable option<br>0: disable 1: enable | |
| 17 | | REC_EN | IO,PU | I | REC Enable option<br>0: disable 1: enable | |
| 18 | 14 | SCL_24C0X | IO,PU | O | External ROM(24C0X) serial bus clock pin | |
| 19 | 15 | SDA_24C0X | IO,PU | IO | External ROM(24C0X) serial bus data pin | |
| 20 | | NEXT_TRACK | IO,PU | I | Next Track | |
| 21 | | PRE_TRACK | IO,PU | I | Previous Track | |
| 22 | 16 | PLAY_PAUSE | IO,PU | I | PLAY/PAUSE | |
| 23 | 17 | VR_MUTE | IO,PD | O | Record mute indicator | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 24 | | STOP | IO,PU | I | stop | |
| 25 | | VP_MUTE | IO,PD | O | Play mute indicator | |
| 26 | 18 | SLEEVE | Ground/Analog Input | Analog Input | Microphone or ground, connect to SLEEVE of headset jack | |
| 27 | 19 | GNDHP | Ground | Ground | Headphone ground connect to PCB analog ground | |
| 28 | 20 | RING2 | Ground/Analog Input | Ground | Microphone or ground, connect to RING2 of headset jack | |
| 29 | 21 | MIC1 | Analog Input | Analog Input | The DC input for the analog accessory detect, connect to MICBIAS with 2.2k Ohm resistance. | |
| 30 | 22 | MICBIAS | Analog O | Analog O | Microphone bias voltage output | |
| 31 | 23 | MIC1N | Analog I | Analog I | Microphone input(AC coupled) | |
| 32 | 24 | MIC1P | Analog I | Analog I | Microphone input(AC coupled) | |
| 33 | 25 | MIC2P | Analog I | Analog I | Microphone input(AC coupled) | |
| 34 | 26 | AVDD | P | P | Analog power supply 3.3V typ. | |
| 35 | 27 | VMID | Analog IO | Analog IO | Mid-rail reference decoupling point | |
| 36 | 28 | AVSS | P | P | Analog ground | |
| 37 | 29 | HPVSS | Negative Power | Negative Power | Headphone driver negative power supply -1.65V, connect to VCPN on PCB | |
| 38 | 30 | RHPOUT | Analog O | Analog O | Right channel headphone driver output | |
| 39 | 31 | LHPOUT | Analog O | Analog O | Left channel headphone driver output | |
| 40 | 32 | HPVDD | Power | Power | Headphone driver power supply 1.65V, connect to VCPP on PCB | |
| 41 | | VCPP | Analog O | Analog O | Charge pump positive output, for headphone driver power supply. | |
| 42 | 33 | VCPN | Analog O | Analog O | Charge pump negative output, for headphone driver power supply. | |
| 43 | 34 | CFLYN | Analog O | Analog O | Charge pump flying capacitor pin | |
| 44 | | GNDCP | P | P | Charge pump ground | |
| 45 | 35 | CFLYP | Analog O | Analog O | Charge pump flying capacitor pin | |
| 46 | 36 | VDDCP | P | P | Charge pump power supply | |
| 47 | | TEST | I,PD | I | Test mode<br>0: normal 1: test mode | |
| 48 | | EQ3D_LED | IO,PU | I | EQ&3D LED Out | |

# 5. Function Descriptions

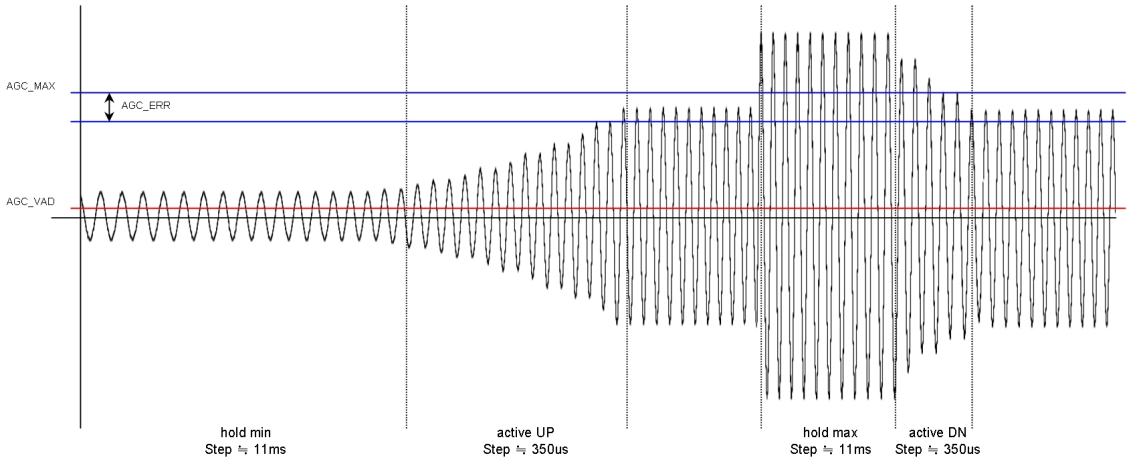
## 5.1 Automatic Gain Control (AGC)

SSS1700 has AGC (Automatic Gain Control) function. It can be used to automatically adjust the output range of ADC, which can let ADC outputs remain in a stable range. AGC control schematic diagram as below, the gain adjustable range is -23dB ~ + 40dB, with each step 1dB adjusted.




AGC parameter setting can be set in EEPROM. The control features include stability of time, error range, active manner, hold time, speed adjusting and son on, these parameters need for individual settings. Its operational diagram refers as below:

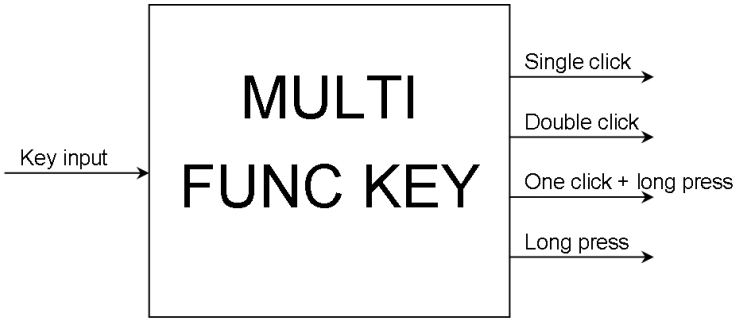
AGC tuning is targeted at within two blue lines. Shown in front of diagram, signal is below the blue line interval, then AGC amplifier the signal to the blue range. Similarly in the illustration, the signal is over the blue interval, and then AGC will down the signal to the blue range.




* AGC function is only valid for built-in ADC of SSS1700

## 5.2 MULTI FUNCTION KEY (4 Key)

SSS1700 support maximum 4 multifunction keys. By EEPROM settings, each multifunction key can have up to four different button operation manners. Four kinds of different button operation are "a short press", "consecutive two short press", "a short and a long press" and "a long press". Each multifunction key corresponds to different control manner for different function demand, so that can achieve the purpose of streamlining the key number of requirements. Setting diagram is as follows:




**Key input can be set from :**

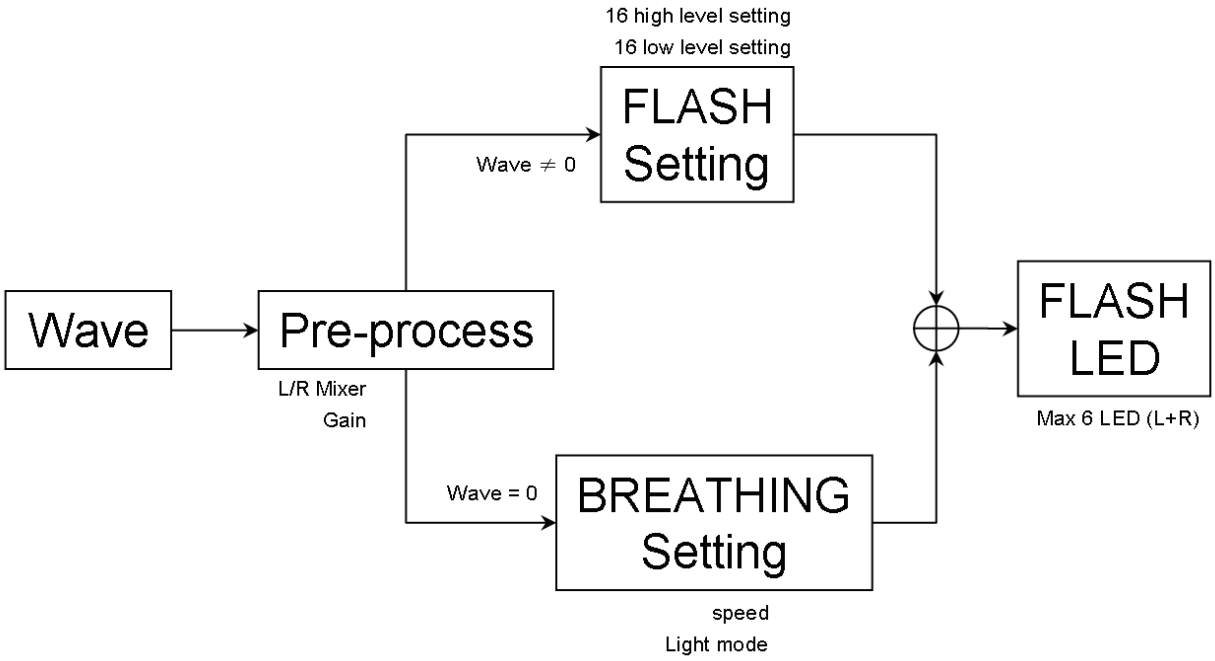
| ON. | Key input |
|---|---|
| 1 | VOLUP_IN |
| 2 | VOLDN_IN |
| 3 | MUTEP_IN |
| 4 | MUTER_IN |
| 5 | NEXT_TRACK_IN |
| 6 | PRE_TRACK_IN |
| 7 | STOP_IN |
| 8 | PLAY_PAUSE_IN |
| 9 | EQ_NEXT_IN |
| 10 | USER_KEY_IN |
| 11 | GPI5 |
| 12 | GPI6 |
| 13 | GPI7 |
| 14 | GPI8 |
| 15 | GPI9 |

**Function output can be assign to :**

| ON. | Function output |
|---|---|
| 1 | VOLUP |
| 2 | VOLDN |
| 3 | MUTEP |
| 4 | MUTER |
| 5 | NEXT_TRACK |
| 6 | PRE_TRACK |
| 7 | STOP |
| 8 | PLAY_PAUSE |
| 9 | EQ_NEXT |
| 10 | USER_KEY |
| 11 | S3D_NEXT |
| 12 | GPO9 |
| 13 | GPO8 |
| 14 | GPO7 |
| 15 | GPO6 |
| 16 | GPO5 |

## 5.3 LED FLASH

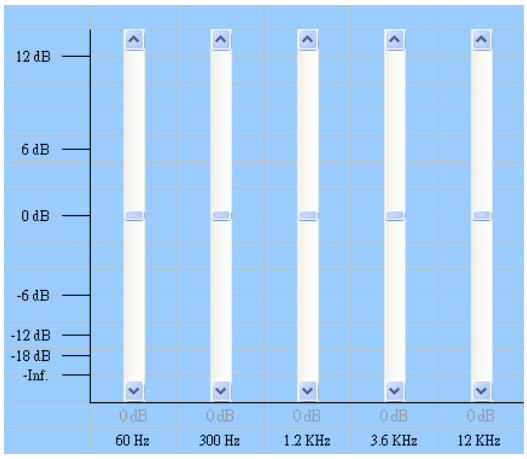
SSS1700 has the function of stereo audio wave gradient indicator. By EEPROM settings, can provide up to six indication signals (the difference between L/R, for each channel share three indication signals). Indication signal can be connected to LED to be audio output gradient indicator. When the audio signal is zero, the LEDs can be set for as breathing lights to increase product diversity.
The following is a functional diagram:



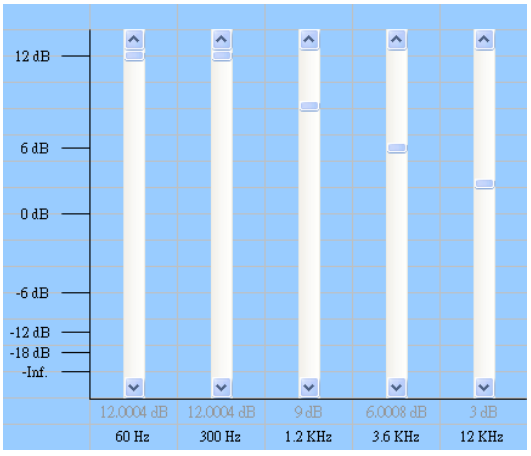

When setting for audio output indicator, it can be adjusted in accordance with the desired output range; each indicator signals can have 16 levels to do proposed audio settings.

## 5.4 Five-band Equalizer

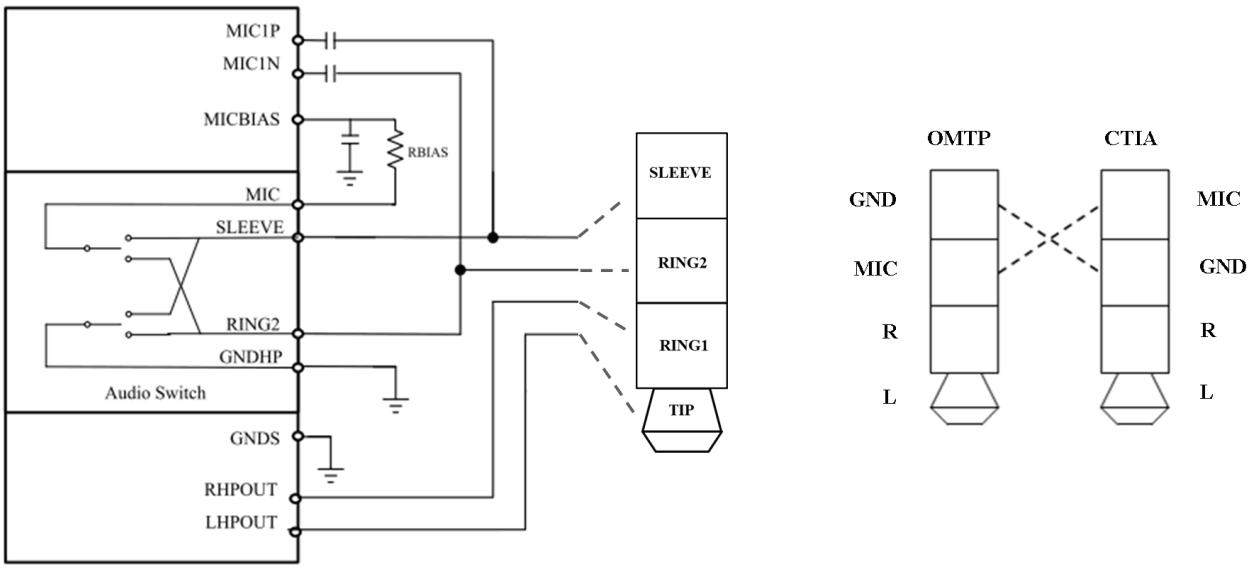
SSS1700 on playback path built 5 Band EQ functions to provide user to make sound effect adjustment. These frequencies of five-band EQ are fixed at 60Hz, 300Hz, 1.2KHz, 3.6KHz and 12KHz, respectively. Gain can be set for each band is + 12dB ~ -∞dB, as follows:




User can adjust a variety of sound effects according to requirement; the results will be stored in EEPROM after adjustment, and it can use single button to change different sound effect in cycle approach, simultaneously, also provide a single LED for indication of ON/OFF sound effect. By default, SSS1700 built-in a subwoofer sound settings, therefore, under no external EEPROM case, there is still an EQ sound transformation for user. Preset bass (SUBWOOFER) sound settings are as follows:



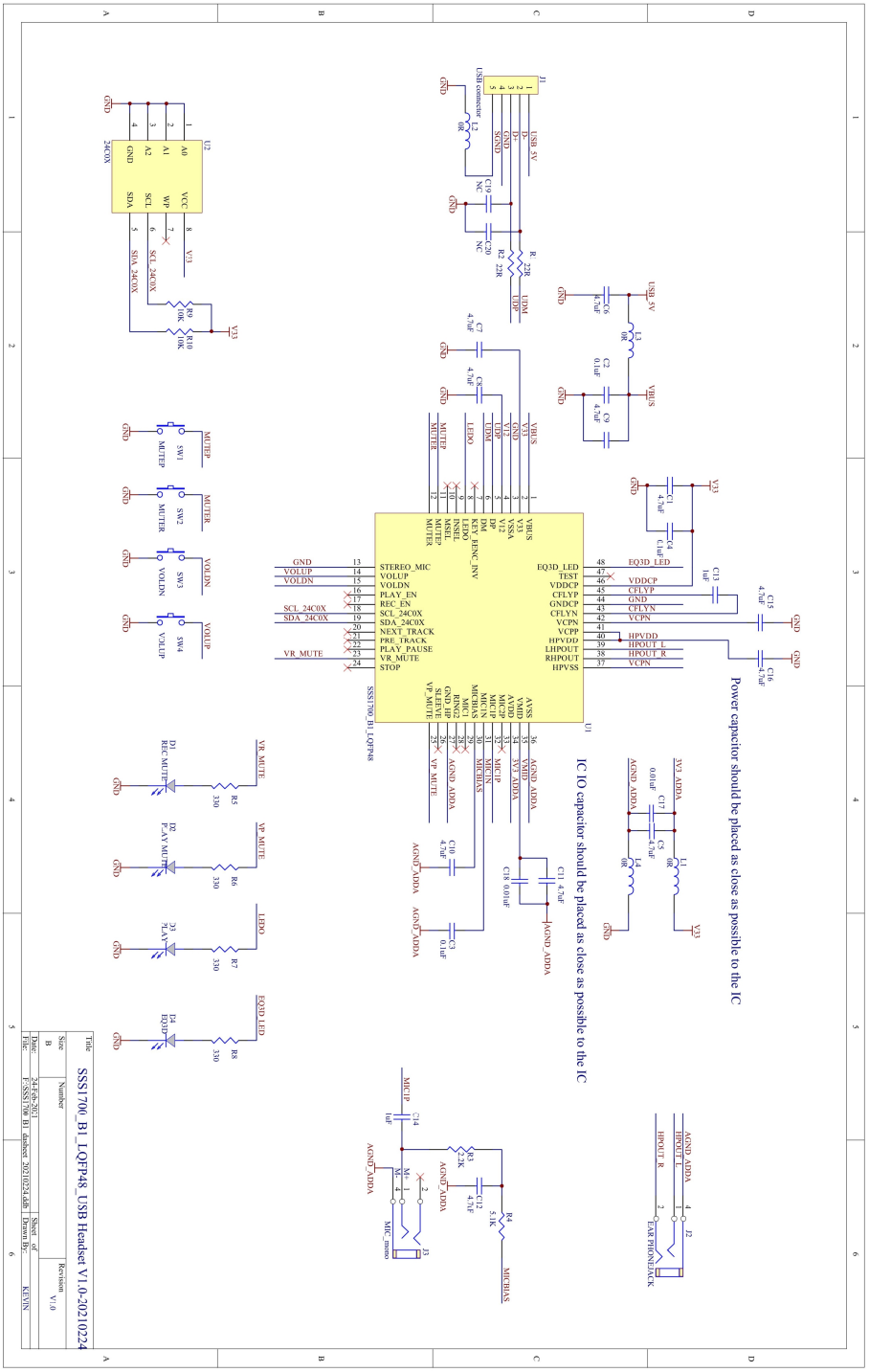
## 5.5 CTIA/OMTP auto switch for TRRS Headset Jack



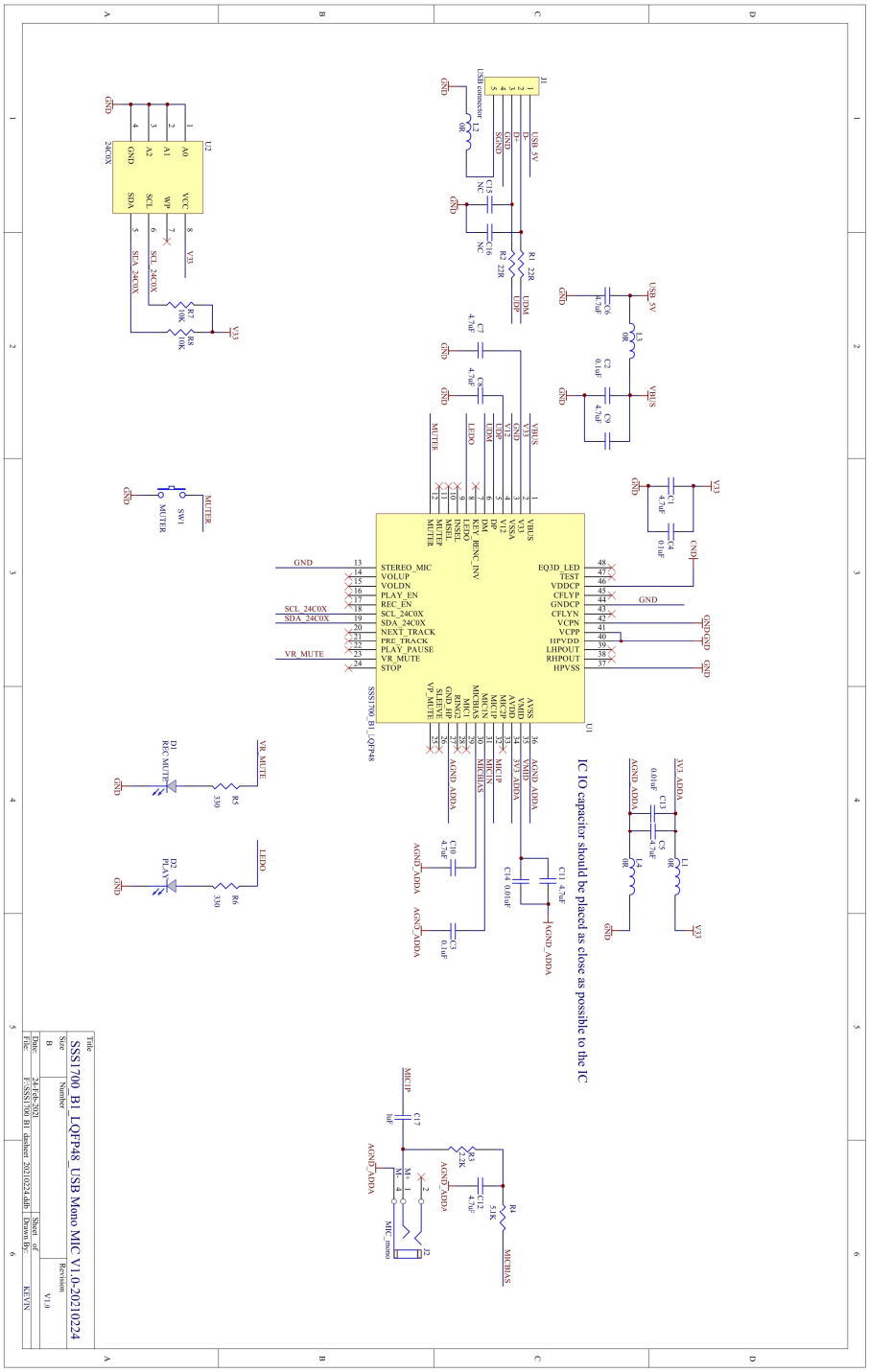

The CODEC detects the locations of ground (GND) and microphone (MIC) poles on the audio plug and routes them to the appropriate connections. This allows the end user to plug headsets with different audio pole configurations into the mobile device and have them operate correctly.

# 6. Reference Application Circuit for LQFP48 (U6C) / QFN (Q6C)

## 6.1 USB Headset Application Circuit

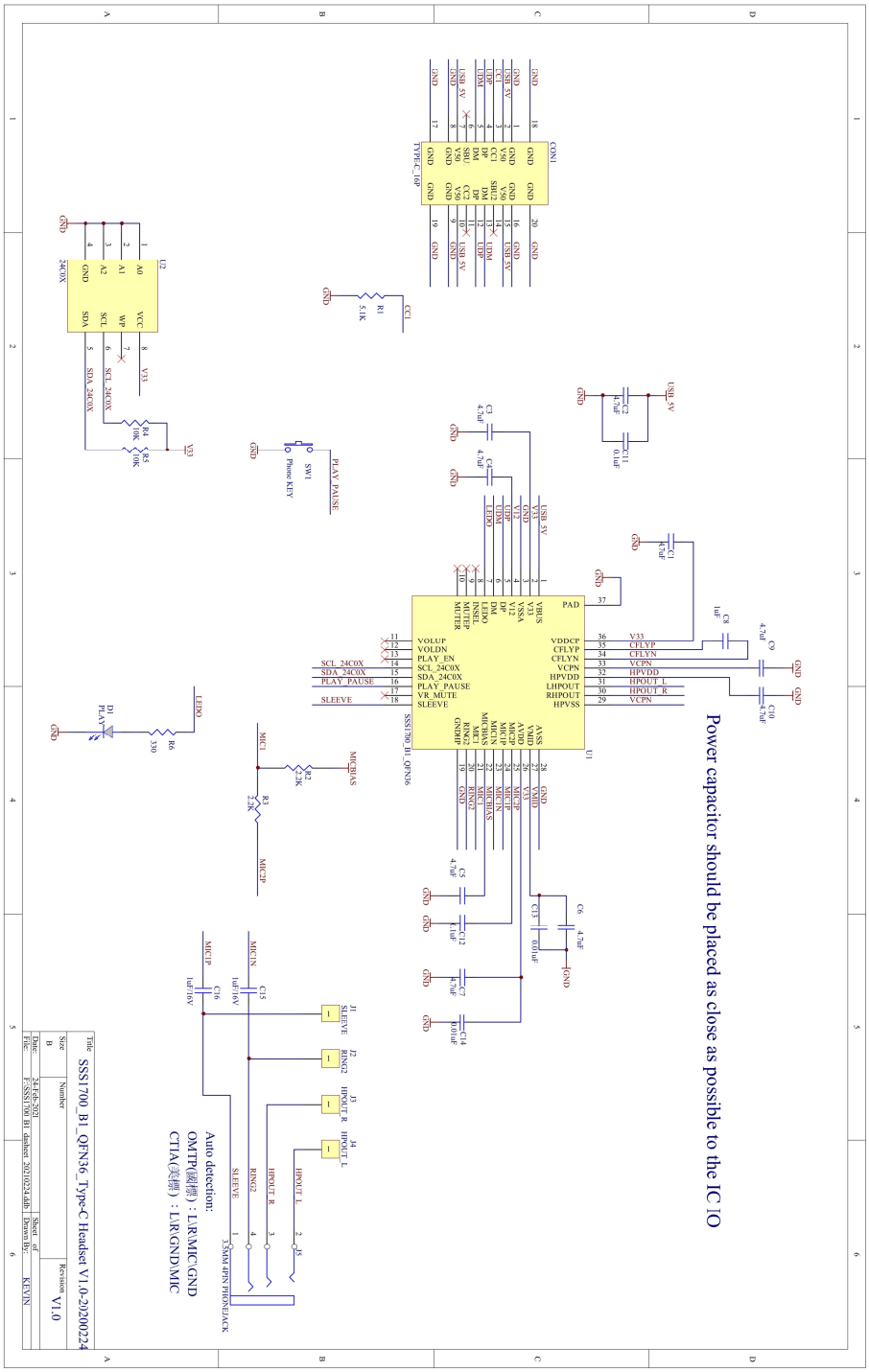


## 6.2 USB Mono MIC Application Circuit



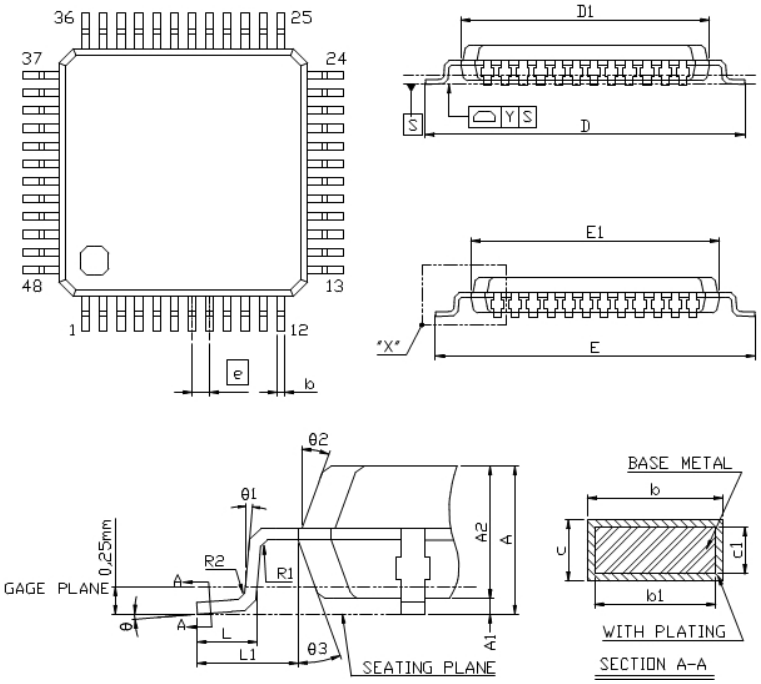
# 7. Reference Application Circuit for QFN36 (QCC)

## 7.1 Type-C Headset Application Circuit



# 8. Package Information

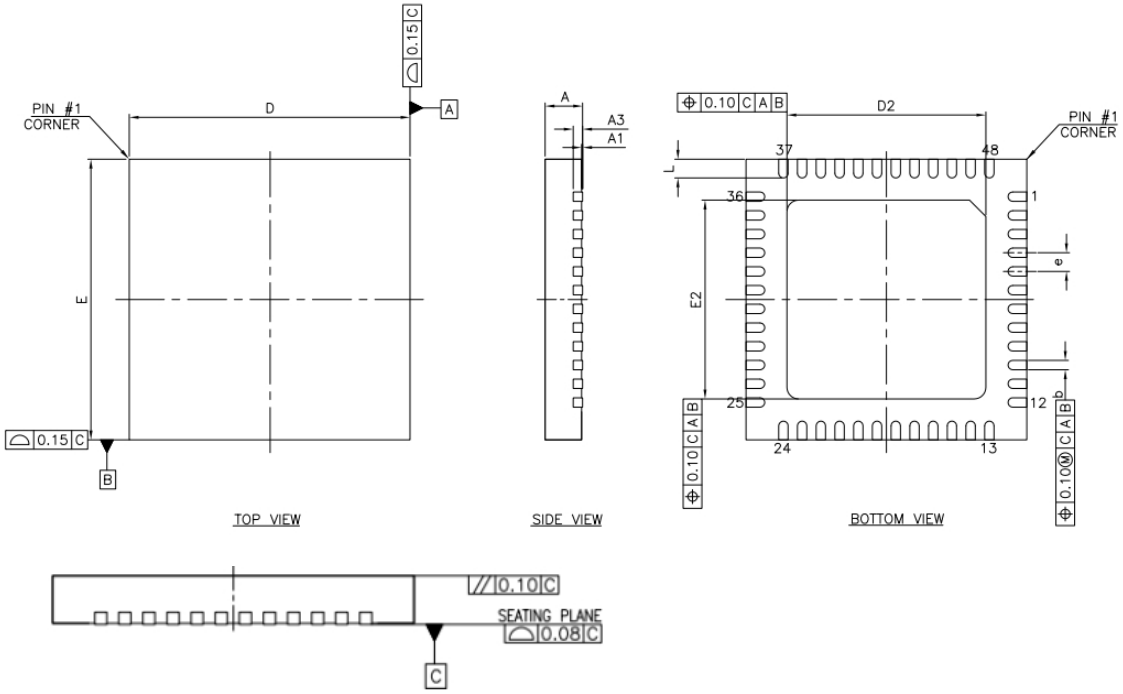
## 8.1 LQFP 48




| SYMBOL | DIMENSION (MM) | | | DIMENSION (MIL) | | |
|---|---|---|---|---|---|---|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | | | 1.60 | | | 63.0 |
| A1 | 0.05 | 0.10 | 0.15 | 2.0 | 3.9 | 5.9 |
| A2 | 1.35 | 1.40 | 1.45 | 53.1 | 55.1 | 57.1 |
| b | 0.17 | 0.22 | 0.27 | 6.7 | 8.7 | 10.6 |
| b1 | 0.17 | 0.20 | 0.23 | 6.7 | 7.9 | 9.1 |
| c | 0.09 | | 0.20 | 3.5 | | 7.9 |
| c1 | 0.09 | | 0.16 | 3.5 | | 6.3 |
| D | 8.90 | 9.00 | 9.10 | 350.4 | 354.3 | 358.3 |
| D1 | 6.90 | 7.00 | 7.10 | 271.7 | 275.6 | 279.5 |
| E | 8.90 | 9.00 | 9.10 | 350.4 | 354.3 | 358.3 |
| E1 | 6.90 | 7.00 | 7.10 | 271.7 | 275.6 | 279.5 |
| e | 0.45 | 0.50 | 0.55 | 17.7 | 19.7 | 21.7 |
| L | 0.50 | 0.60 | 0.70 | 19.7 | 23.6 | 27.6 |
| L1 | 0.85 | 1.00 | 1.15 | 33.5 | 39.4 | 45.3 |
| R1 | 0.08 | | | 3.1 | | |
| R2 | 0.08 | | 0.20 | 3.1 | | 7.9 |
| Y | | | 0.08 | | | 3.1 |
| θ | 0° | 3.5° | 7° | 0° | 3.5° | 7° |
| θ1 | 0° | | | 0° | | |
| θ2 | 11° | 12° | 13° | 11° | 12° | 13° |
| θ3 | 11° | 12° | 13° | 11° | 12° | 13° |

NOTE:
1.REFER TO JEDEC MS-026 (ISSUE D) / BBC
2.DIMENSION D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION.
ALLOWABLE PROTRUSION IS 0.25mm PER SIDE D1 AND E1 ARE
MAXIMUM PLASTIC BODY SIZE DIMENSION INCLUDING MOLD MISMATCH.
3.DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE
DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED
THE MAXIMUM b DIMENSION BY MORE THAN 0.08mm.
4.ALL DIMENSIONS ARE IN MILLIMETERS.
5.DIMENSION CONVERSION FACTOR : 1mm=39.37mil

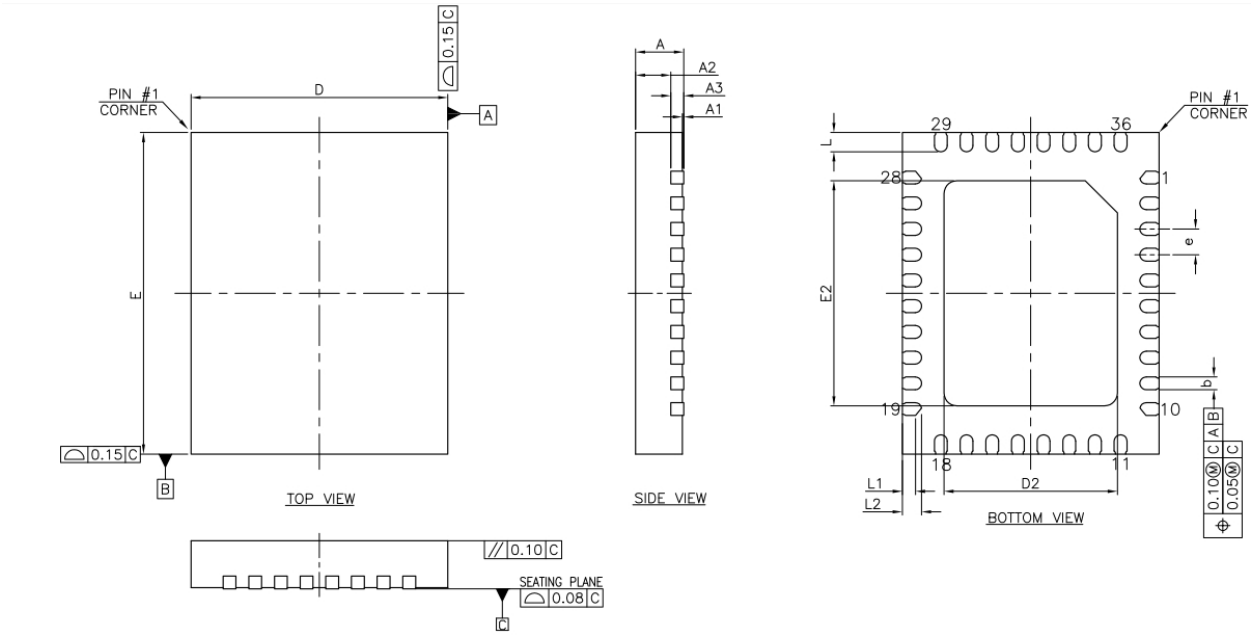
## 8.2 QFN 48




| | SYMBOL | MIN. | NOM | MAX. | MIN. | NOM | MAX. |
|---|---|---|---|---|---|---|---|
| Total thickness | A | 0.70 | 0.75 | 0.80 | 0.60 | 0.65 | 0.70 |
| Standoff | A1 | 0.00 | 0.02 | 0.05 | 0.00 | 0.02 | 0.05 |
| Lead thickness | A3 | 0.20 REF. | | | 0.20 REF. | | |
| Body size | D | 5.90 | 6.00 | 6.10 | 5.90 | 6.00 | 6.10 |
| | E | 5.90 | 6.00 | 6.10 | 5.90 | 6.00 | 6.10 |

| Pad size | Lead width b | | | Exposed pad width D2 | | | Exposed pad length E2 | | | Lead pitch e | Lead length L | | | LEAD FINISH | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN. | NOM | MAX. | MIN. | NOM | MAX. | MIN. | NOM | MAX. | | MIN. | NOM | MAX. | Pure Tin | PPF |
| 189x189MIL | 0.15 | 0.20 | 0.25 | 4.15 | 4.25 | 4.35 | 4.15 | 4.25 | 4.35 | 0.40 BSC | 0.30 | 0.40 | 0.50 | V | X |

## 8.3 QFN36




| | SYMBOL | MIN. | NOM | MAX. |
|---|---|---|---|---|
| Total thickness | A | 0.70 | 0.75 | 0.80 |
| Standoff | A1 | 0.00 | 0.02 | 0.05 |
| Mold thickness | A2 | 0.50 | 0.55 | 0.60 |
| Lead thickness | A3 | | 0.20 REF. | |
| Body size | D | 3.95 | 4.00 | 4.05 |
| | E | 4.95 | 5.00 | 5.05 |
| Lead width | b | 0.15 | 0.20 | 0.25 |
| Exposed pad width | D2 | 2.65 | 2.70 | 2.75 |
| Exposed pad length | E2 | 3.45 | 3.50 | 3.55 |
| Lead pitch | e | | 0.40 BSC | |
| Lead length | L | 0.25 | 0.30 | 0.35 |
| | L1 | – | 0.20 | – |
| | L2 | – | 0.29 | – |
| Lead count | N | | 36L | |

# 9. Ordering Information

| Part Number | Package Type |
|---|---|
| SSS1700B1-U6C | LQFP-48pin |
| SSS1700B1-Q6C | QFN-48pin |
| SSS1700B1-QCC | QFN-36pin |

# 10. Revision History

| Revision | Date | Description |
|---|---|---|
| 1.0 | 2021/03/03 | First Release |
| | | |
| | | |
| | | |