

DESIGN AND IMPLEMENTATION OF USB TYPE-C AUDIO ADAPTER ACCESSORY

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ABSTRACT

The main objective of this project is to design a type-C audio adapter which provides the solution for interfacing analog audio through the emerging USB Type-C interface. This design demonstrates how analog audio transmitted to system peripherals using the USB Type-C standard's audio adapter accessory mode. This allows designs to remove the large 3.5 mm jack, and replace it with an 85% tiny USB Type-C adapter. The USB Type-C analog audio multiplexer board controls the switching between analog audio transferred through the USB Type-C connector and data will be transferred through the USB Type-C connector. The USB Type-C to 3.5 mm jack adapter board provides the required pull down resistors for the USB Type-C presence detect logic on CC1 and CC2 that signifies an audio adapter is being used. The adapter also allows users to test audio with existing audio devices that use the 3.5 mm jack interface.

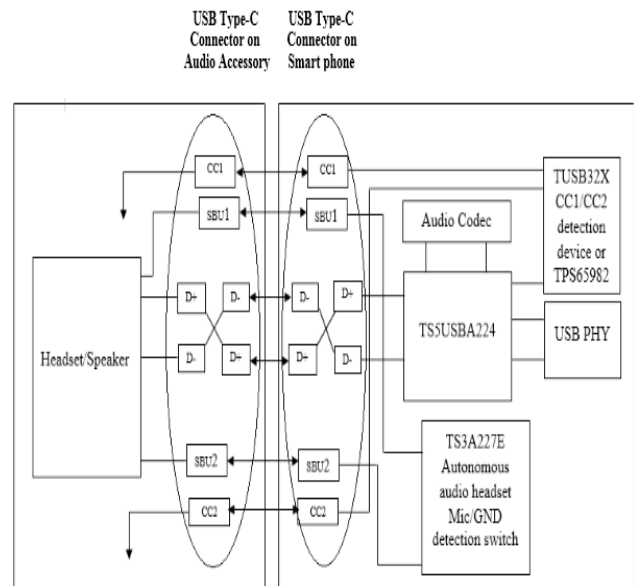
1. INTRODUCTION

The USB Sort C connectors interface with both hosts and gadgets, supplanting different Sort B and Sort A connectors and links with a standard intended to be future-verification. The 24-stick twofold sided connector is comparable in size to the smaller scale B connector, with a USB Sort C port measuring 8.4 millimeters (0.33 in) by 2.6 millimeters (0.10 in). The connector gives four power/ground and two differential sets for non-Super Speed information (however just a single match is populated in a USB Sort C link), four sets of control/ground for rapid

information transport, two "sideband utilize" pins, and two design pins for link introduction identification, committed biphase check code (BMC) arrangement information station, and VCONN +5 V control for dynamic links.

Interfacing a more seasoned gadget to a host with a USB Sort C repository requires a link or connector with a Sort An or Sort B fitting or container toward one side while a USB Sort C plug on the flip side. Legacy connectors with a USB Sort C container are "not characterized or permitted" by the detail, because of their having the capacity to make "many invalid and possibly risky" link mixes.

2. BLOCK DIAGRAM



3.1 WORKING

The USB Type-C audio adapter design is composed of two boards; a USB Type-C analog audio multiplexer board and a USB Type-C connector to a 3.5 mm jack adapter. The USB Type-C analog audio multiplexer board in the type – c audio adapter accessory controls the switching between analog audio both audio and data transferred through the USB Type-C connector. The USB Type-C port to 3.5 mm jack adapter board provides the required pull down resistors for the USB Type-C presence detect logic on CC1 and CC2 that signifies an audio adapter is being used. The type – c adapter also allows users to test audio with existing audio devices that use the 3.5 mm jack interface.

The USB-C Analog Audio TI Design allows for analog audio to be passed over USB Type-C connection while protecting the USB PHY from negative voltage swings from the analog audio. In Figure 2.1, the audio source may be produced through a computer, while the audio sink may be a speaker to listen to the audio. The above block diagram shows the TIDA00565 functional block diagram.

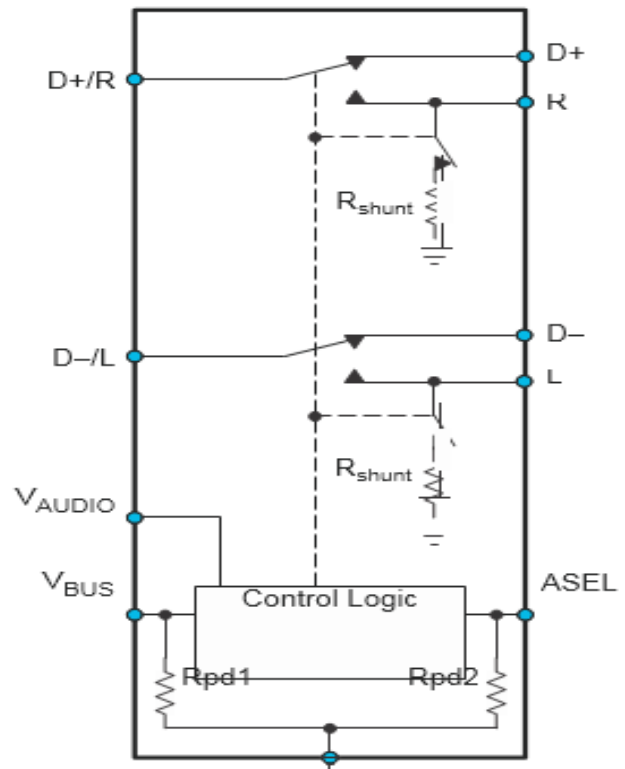
3.2 TS5USBA224

Description

The TS5USBA224 is a double pole, double throw (DPDT) multiplexer. It incorporates a low-twisting sound switch and a USB 2.0 Fast (480Mbps) switch in a similar bundle. This sort of setup permits the framework fashioner to utilize a typical connector for sound and USB information. The sound change is intended to permit sound signs to swing subterranean which makes this normal connector arrangement conceivable.

Purpose

The TS5USBA224 is used to multiplex between the USB 2.0 data and analog audio in order to protect the USB PHY from the negative voltage swings in the analog audio. The analog audio and USB data travel over the D+ and D- lines in the USB Type-C audio connector. When an analog audio signal is on the USB D+ and D- lines, the signal may swing up to -2 to 2 Vpp. This negative swing in voltage can cause damage to components in the signal chain that may not be able to handle a negative swinging signal.



The TS3A227E is used particularly to automatically detect and orient the MIC and GND signals of the 3.5 mm jack to support the function described in the USB Type-C standard above. The USB Type-C to 3.5 mm dongle is on the sink side of the system, therefore, the system user may connect speakers or a headphone set to listen to the audio. Headphones often come with a 4-pole

jack, which means the MIC and GND of the jack must be routed properly.

Features

- ✓ Acts as a High-Speed USB Switch as well as audio switch.

Applications

- ✓ Smart Phones
- ✓ Transportable Instruments
- ✓ Transportable Navigation Devices

3.3 TS3A227E

Description

The TS3A227E is an automatic audio accessory detection and configuration switch that detects 3-pole or 4-pole audio accessories and configures internal switches to route the signals accordingly.

The internal ground FETS of the TS3A227E have an ultra-low RON of 60 mho to minimize crosstalk impact. The ground FETs are also designed to pass FM signals, making it possible to use the ground line of the audio accessory as an FM antenna in mobile applications.

Internal isolation switches allow the TS3A227E to remove the click/pop noise that can be generated during and insertion or removal of an audio accessory. In addition to that depletion FETs prevent a floating ground while the device is unpowered, removing the humming noise present when leaving accessories plugged into an unpowered system.

The major features of this TS3A227E is integrated key press detection for detecting up to 4 keys with press and release support.

Manual I2C control allows the TS3A227E to adapt to application needs by providing control over de-bounce settings and switch states.

Purpose

The USB Sort C standard expresses, "The framework should interface A6/B6, A7/B7, A8 and B8 to a proper sound codec upon section into the sort – c sound connector extra mode. The associations for A8 (SBU1) and B8 (SBU2) pins are reliant on the connector's introduction. Contingent upon the introduction, the receiver and simple ground pins can be swapped. These pins are as of now turned around between the two noteworthy norms for headset jacks and support for this is incorporated with the headset association of numerous codecs, or might be actualized by utilizing a self-ruling sound headset switch. The framework works accurately with either design.

Features

- ✓ Supply Range of 2.5 V to 4.5 V
- ✓ Accessory Insertion/Removal Detection with Adjustable De-bounce Timings
- ✓ Key Press Detection for Up to 4 Keys
- ✓ Ultra Low Ground FET RON of 60 mO
- ✓ Power Off Noise Removal

Applications

- ✓ Mobile Phones
- ✓ Tablets
- ✓ Notebooks and Ultrabooks
- ✓ Anywhere a 3.5 mm Audio Jack is Used

and CC2 pins. These resistors on the CC lines are directed by the USB Sort C determination. The four simple sound signs are a similar which are being utilized by a customary 3.5 mm headset jack. This connector makes it conceivable to interface existing simple headsets with a 3.5 mm to Sort C connector for this show. The connector likewise gives a couple of 1k ohm (Ra) pull down resistors. The accompanying chart demonstrates the case schematics of an aloof 3.5 mm jack to the Sort C connector.

5. CONCLUSION

This project describes the design and implementation of USB Type-c audio adapter accessory which allows smart phones to be small in size and reduces the thickness of the smart phones. We have implemented Xpedition Enterprise tool in an innovative way to exhibit the working of the type – c audio adapter accessory mode in a PCB layout. If this proposed system gets implemented then it will hold the future vision of supporting various services like Replaces Large 3.5 mm Audio Jack with Smaller Type-C Connector, Supports Analog Audio through USB Type-C Connector, Supports USB Power Delivery at instance.

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