Application Note

PCM6xx0-Q1 Use-Case Scenarios in Automotive Audio Applications

Krunal Maniar

ABSTRACT

1 Abstract

Table of Contents

List of Figures

List of Tables

Trademarks

2 Introduction

The automotive industry is experiencing a major transformation focused on comfortable driving experience without compromising fuel-efficiency and manufacturing cost. Car OEMs are constantly refreshing their audio system architecture to accommodate user-rich experience and better safety by incorporating several new audio technologies. These audio technologies such as active noise cancellation (ANC), in-cabin communication (ICC), and hands-free voice beam-forming use several microphones, amplifiers, and loudspeakers along with advanced digital signal processing techniques to enable background noise reduction, clear voice communication between passengers and hands-free calling. ANC is often incorporated in multiple end-equipments such as head-unit (or digital cockpit processing unit) or external amplifiers or can have it's own standalone module. To make the system implementation simple and cost-effective, the audio inputs from ANC microphones can be combined with hands-free microphones or other auxiliary line inputs. This paper highlights the several use-case of PCM6xx0-Q1 for microphone and line input applications.

3 Overview of PCM6260-Q1 Family

To accommodate the short- and long-term vision of OEMs and TIer1s in most cost-optimized and space-constrained manner, Texas Instrument’s developed a highly-integrated, package- and software- compatible multi-channel audio ADC family called PCM6xx0-Q1. These devices support microphone (analog and digital) and line inputs and integrate a programmable high-voltage microphone bias and input fault diagnostics. These devices provide a very flexible digital filtering scheme with linear-phase and low-latency filters, multiple biquads per channel, and high-pass filters. PCM6xx0-Q1 family support a very flexible data output and control interface, allowing several devices to use the same output data and control interface bus. In addition, these devices have GPIOs, fine phase and gain calibration schemes, and a digital mixer and summer, to optimize the system performance to a whole new level. The different offerings of this audio ADC family are shown in Table 3-1.

Table 3-1. Product Offerings of PCM6xx0-Q1 family

Device	# of Inputs	Boost Converter	Microphone Bias	Microphone Diagnostics
PCM6020-Q1	2 Analog	Yes	Yes	Yes
PCM6240-Q1	4 Analog	Yes	Yes	Yes
PCM6340-Q1	4 Analog	No	Yes	Yes
PCM6260-Q1	6 Analog	Yes	Yes	Yes
PCM6360-Q1	6 Analog	No	Yes	Yes
PCM480-Q1	4 Analog, 4 Digital	Yes	Yes	Yes

4 PCM6xx0-Q1 Use-Case Scenarios

PCM6xx0-Q1 can be used in wide-variety of audio application scenarios in head-unit, external amplifiers, ANC module, or audio hubs. Since PCM6xx0-Q1 support analog and digital microphone inputs and line inputs in both single-ended and differential mode, they cater to almost every conceivable audio signal input scenarios in automotive.

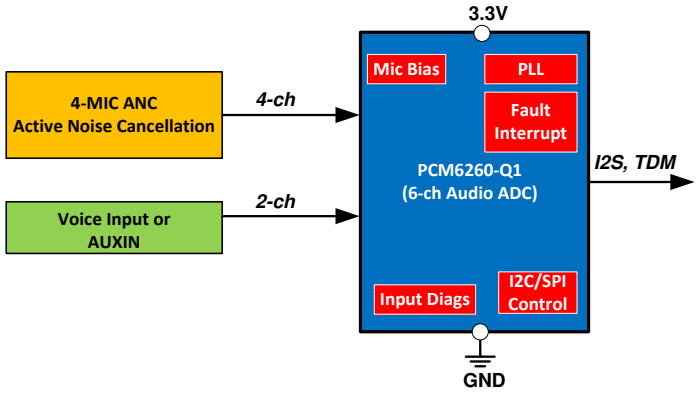

Figure 4-1. ANC with Voice or Auxiliary Audio Input in Head-unit

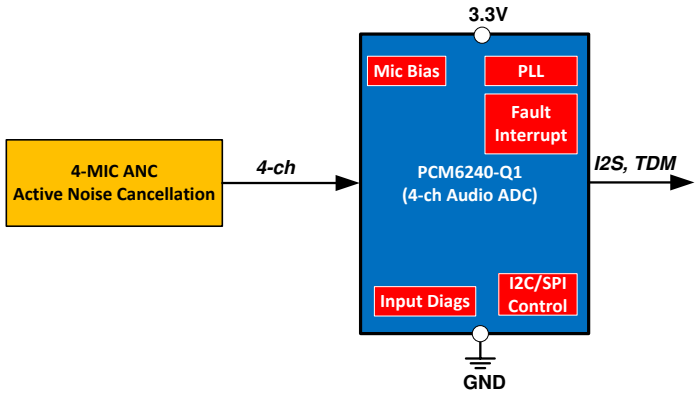

Figure 4-2. ANC in Head-unit

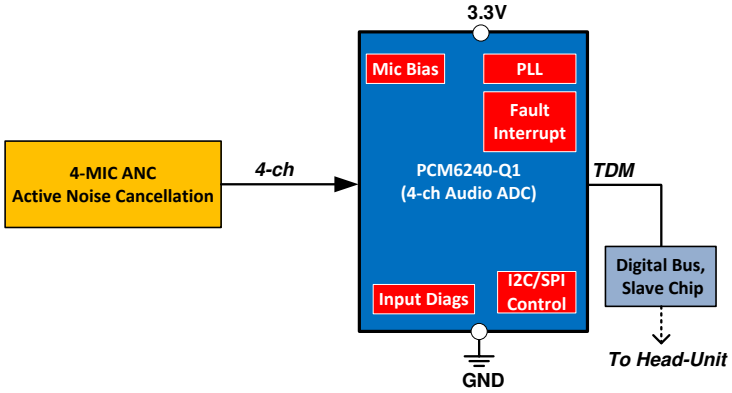

Figure 4-3. ANC in Standalone ANC module

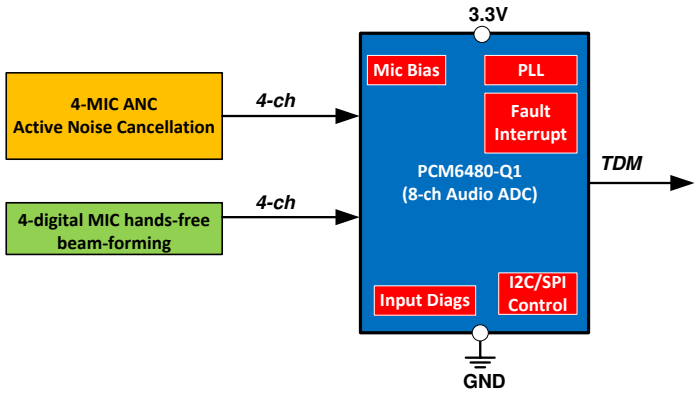

Figure 4-4. ANC and 4-digital MIC Hands-free Beamforming in Head-unit

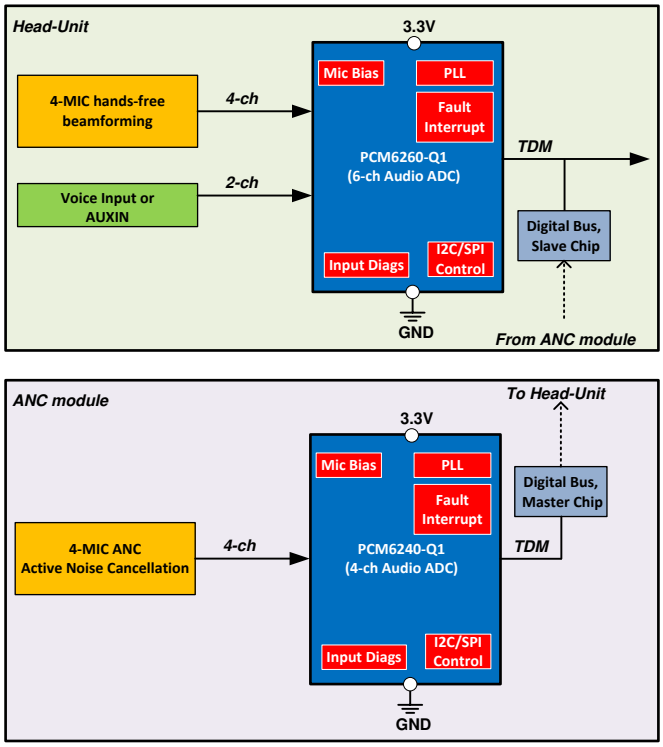

Figure 4-5. ANC in Standalone Module, Hands-free Beamforming and AUXIN or Voice input in Head-unit

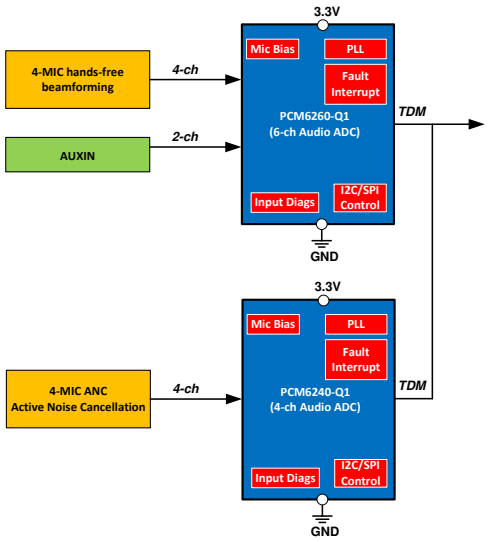

Figure 4-6. ANC, Hands-free Beamforming and Auxiliary Input in Head-unit

For more details about the product features, refer to the product folder PCM6260-Q1.

5 Revision History

Changes from Revision * (April 2020) to Revision A (May 2022)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document	3

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265