

Scalable Automotive Audio Solutions Using the PCM6xx0-Q1 Family of Products

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ABSTRACT

The automotive industry is experiencing a major transformation focused on comfortable driving experience without compromising fuel-efficiency and manufacturing cost. Car OEMs are frequently refreshing their audio system architecture to accommodate a user-rich experience and better safety by incorporating several new audio technologies. Active Noise Cancellation (ANC), In-Cabin Communication (ICC), and Hands-free Voice Beam-forming Systems make the cars quieter and enhance the communication experience between passengers. Depending on system requirements, vehicle size and luxury level (low, middle, and high end), OEMs use different numbers of microphones for each of these applications. As these technologies continue to evolve, there is a dire need of scalable audio solutions to speed up the hardware and software development among the designers.

To accommodate the short- and long-term vision of OEMs and Tier1s in most cost-optimized and space-constrained manner, Texas Instruments has developed a highly-integrated, package- and software-compatible, high-performance, multi-channel audio ADC family called [PCM6260-Q1](#). The PCM6260-Q1 family of products provide flexible and scalable solutions for microphone and line input applications, facilitating high levels of hardware and software scalability.

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1 Introduction to the PCM6260-Q1 Family

To accommodate the short- and long-term vision of OEMs and Tier1s in most cost-optimized and space-constrained manner, Texas Instruments developed a highly-integrated, **package- and software-compatible**, high-performance, multi-channel audio ADC family called PCM6260-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, low latency and ultra-low latency filters, multiple programmable biquads per channel, and high-pass filters. The PCM6260-Q1 family supports 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. [Figure 1](#) shows a functional block diagram of the PCM6260-Q1 device.

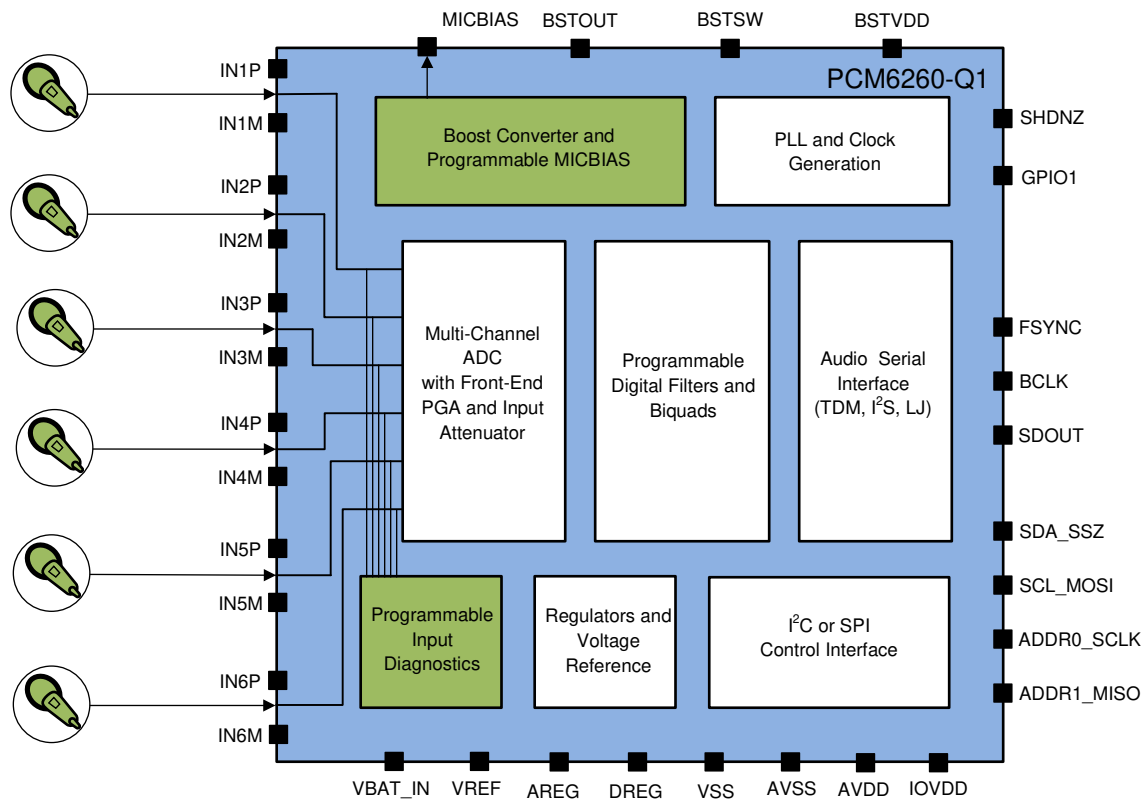


Figure 1. PCM6260-Q1 Functional Block Diagram

The PCM6260-Q1 device is one of the PCM6xx0-Q1 family that are available in two (PCM6020-Q1), four (PCM6240-Q1, PCM6340-Q1), six (PCM6260-Q1, PCM6360-Q1), and eight (PCM6480-Q1) channel package- and software-compatible options. [Table 1](#) shows the different offerings of this audio ADC family.

Table 1. PCM6xx0-Q1 Family Offerings

Device	# of inputs	Boost Converter	Microphone Bias	Microphone Diagnostics
PCM6480-Q1	4 Analog, 4 Digital	✓	✓	✓
PCM6260-Q1	6 Analog	✓	✓	✓
PCM6360-Q1	6 Analog	x	✓	✓
PCM6240-Q1	4 Analog	✓	✓	✓
PCM6340-Q1	4 Analog	x	✓	✓
PCM6020-Q1	2 Analog	✓	✓	✓

2 Understanding PCM6xx0-Q1 Hardware and Software Compatibility

Hardware Compatibility: The PCM6xx0-Q1 family is offered in the same ultra-small 5 mm x 5 mm QFN package. The pinout for PCM6xx0-Q1 devices are similar except that for the input pins to accommodate different channel and boost options. This allows easy and quick migration of hardware schematics and layout as the systems requirements change across projects and end-applications or evolve over time. The pin-compatibility diagram, as Figure 2 shows, highlights the minor re-definition in pinout between PCM6xx0-Q1 products to enable additional features.

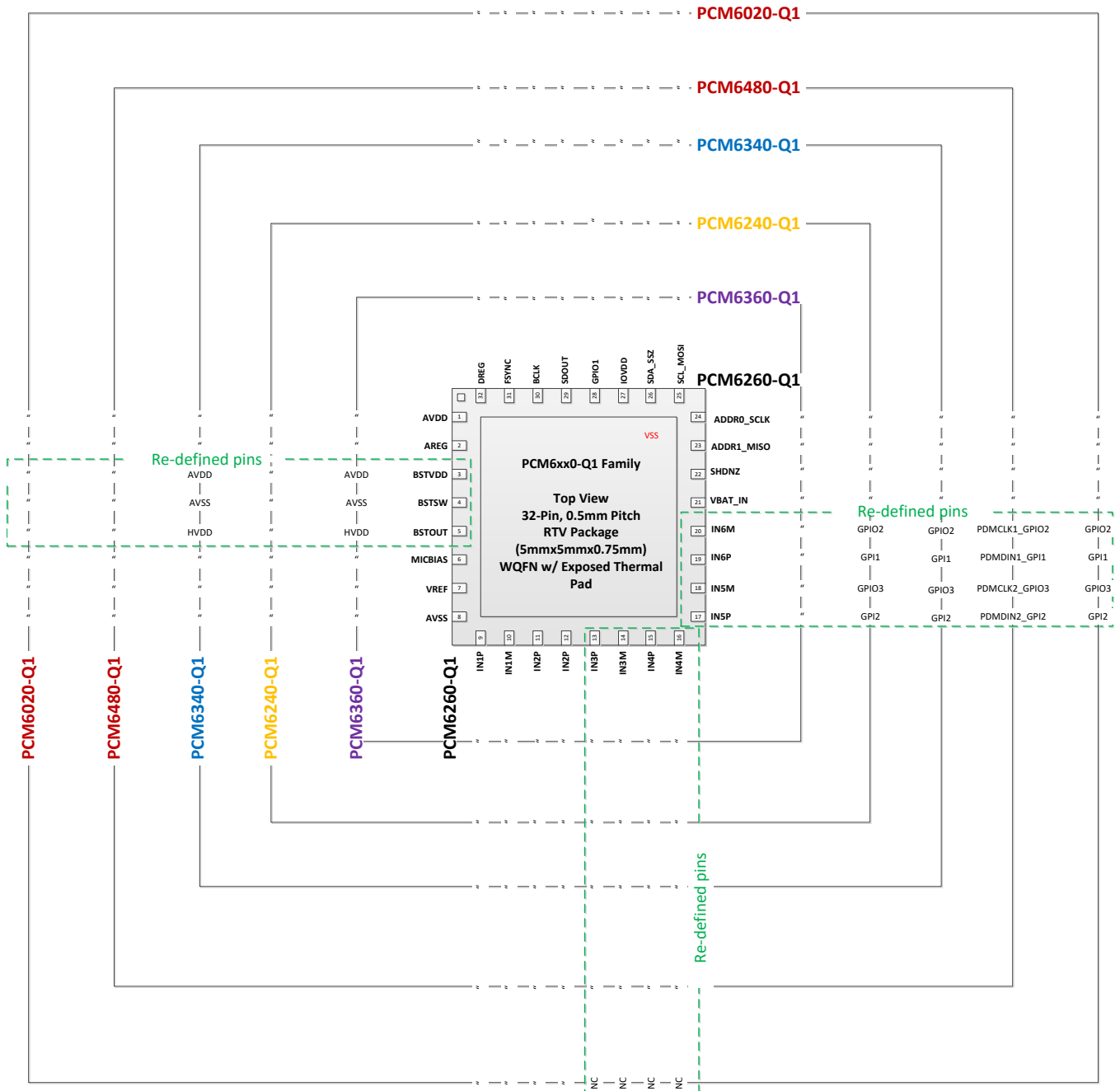


Figure 2. PCM6xx0-Q1 Pin-Compatibility Diagram

For example, the only hardware change in migrating from the PCM6240-Q1 to the PCM6340-Q1 is on pins 3, 4, and 5 as highlighted in Figure 3.

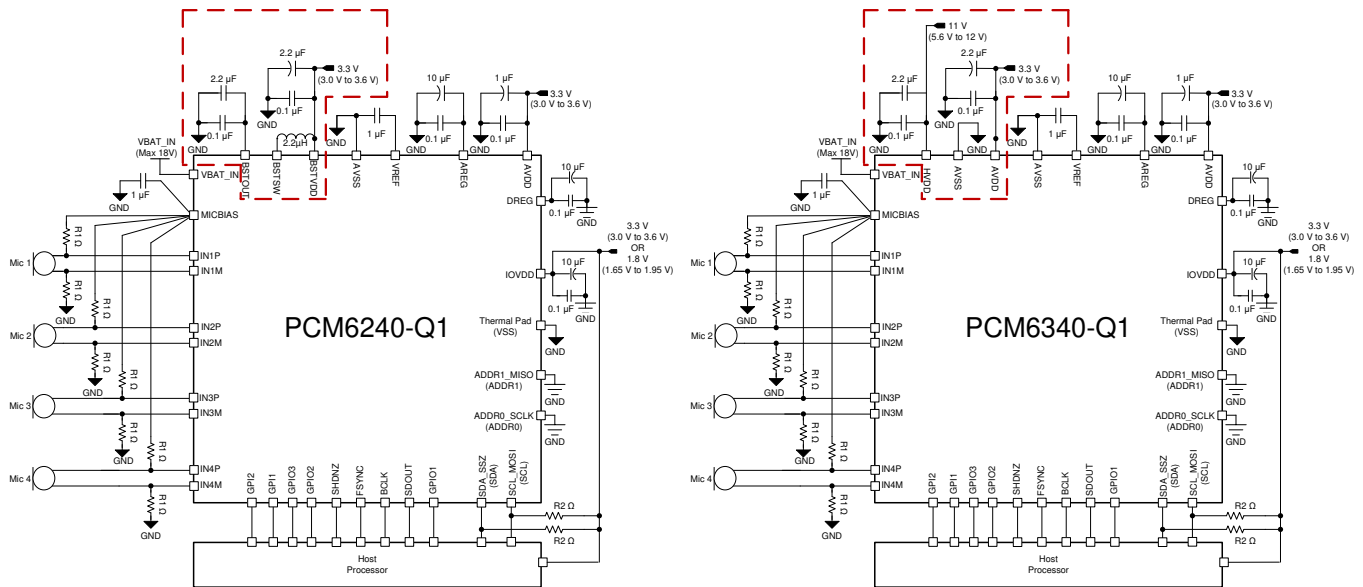


Figure 3. Schematic Differences Between PCM6240-Q1 and PCM6340-Q1

Software Compatibility: The PCM6xx0-Q1 family uses exactly the same data and control interfaces, similar register map definitions, and have the same digital timing requirements. This high level of software compatibility allows the designer to re-use the application software or driver with ease across platforms and thereby save time and development cost.

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