Electronic Specifier

design

Contents

06 News
Wireless technologies for the IoT

10 Markets & Trends
Assessing wireless technology in the lighting control market

12 Five in to One Does Go
The simpler solution to home A/V?

14 Free Energy for All!
Providing power for home wireless control systems

18 A sense of haptic touch
Touch and tactile feedback in Human-Machine Interfaces

22 The World of Small Data
The size of the emerging Small Data world

24 Cross-Vendor Support for Home Automation
Can a single platform bring together Smart Home systems?

28 The Case for the Connected Car
Semiconductor integration for connected cars

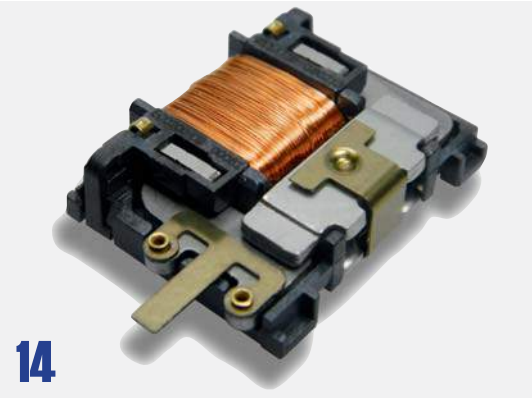
32 Audiomotive
Meeting the growing demand for better quality in-car audio

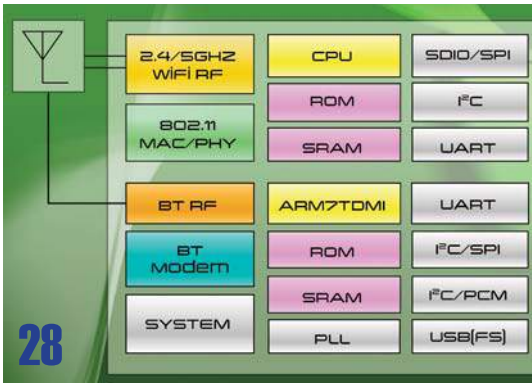
34 Making more of Doherty
Bringing old technology up to date for modern LTE basestations

37 The Time for MEMS Timing Solutions
How MEMS timing solutions are replacing quartz products

40 Will the market adopt MEMS timing?
A closer look at the acceptance of MEMS in the timing market

43 Protected Productivity
Industrialised system components bringing PC-based productivity gains





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Audiomotive

How technology is meeting the growing demand for better quality in-car audio. By Lance Williams, VP of Automotive Strategy, ON Semiconductor

Many of us now enjoy what is very close to studio quality digital audio in the comfort of our homes. It was almost inevitable, then, that before long we would come to expect similar functionality from the systems in our cars, too. There are, of course major technical challenges that need to be addressed before this can happen, but with longer and/or slower commutes the time spent inside cars is considerable. Ensuring that the audio entertainment is of an exceptionally high standard is now an important business dynamic within the automobile business. Increasingly car manufacturers are seeing audio as an area where they can differentiate themselves from their competitors. At the same time improvements to the sound systems used domestically and in public venues have also raised the bar.

Currently the makers of high end automobiles want to impress prospective customers by incorporating systems from the likes of Bose or Bang & Olufsen. This strategy may need to be reassessed though. There are several major deficiencies which are inherent to automotive auditory conditions, which can have a profound and highly detrimental influence on the audio systems deployed within them. Any automobile interior will represent a noisy, acoustically hostile environment. As well as the sound coming from the engine and other external/internal sources, there are various things situated within the cabin that are likely to inhibit peak audio performance (such as glass, plastic, angled surface, seats, etc.). Counteracting all of this clearly has its difficulties.

There is only limited available space in which to accommodate the various elements needed to apply a fully effective audio system capable of delivering the sound quality desired by the driver/passengers. Often other design considerations take precedence which means major concessions have to be made when it comes to speaker positioning within vehicle interiors. Optimal placement is difficult due to the confined space available within the cabin (speakers will frequently end up stuck in the foot wells, simply because there is insufficient room elsewhere to house them). Design engineers are thus forced to sacrifice audio clarity, leading to a poorer overall user experience for the vehicle occupants.

It must also be noted that there can be a broad variation in the interiors of vehicle models – with differing volumes of space to deal with, differing form factors for the seating or the dashboard, differing amounts of head room. As a result it is virtually impossible, using current technology, for manufacturers to follow an all-encompassing ‘one size fits all’ strategy across the entire product line when it comes to automotive audio implementation. This is in direct contrast to the platform approach they are taking with regard to other aspects of their electronics systems development. It means that there is a cost premium associated with the audio element of each new model that a manufacturer looks to bring to market that won’t be there for other electronics systems.

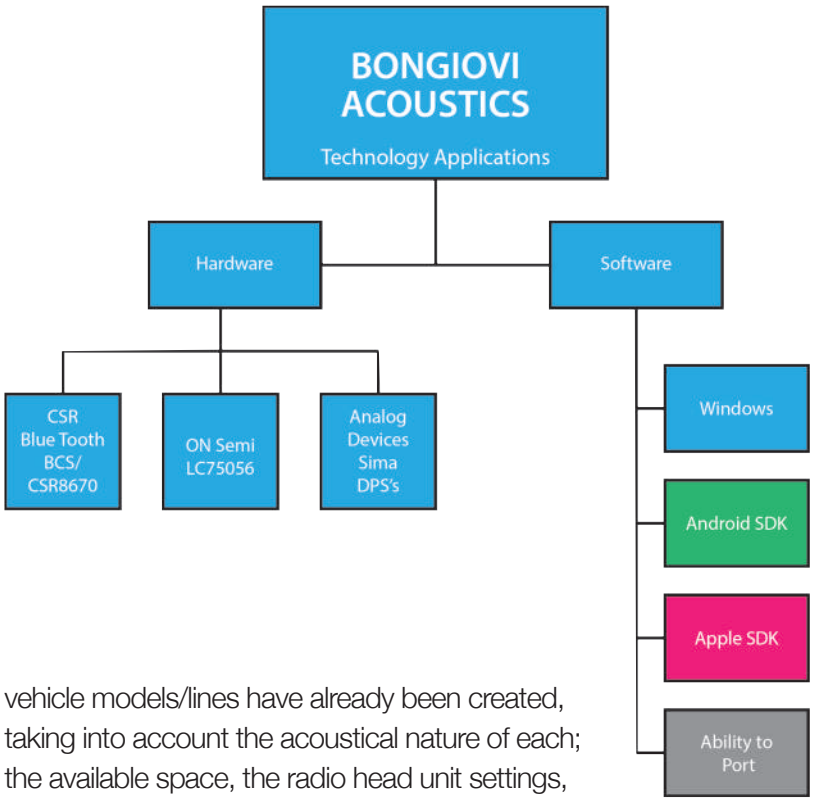
Facing challenges

Though these issues have meant it was not achievable in the past, through the utilisation of sophisticated digital signal processing technology that has just emerged there is now the prospect

of studio quality in-car audio systems becoming a reality. Major improvements can be made to these systems in a number of ways; not only enhancing sound quality characteristics, but also lowering the financial investment. Elimination of certain cumbersome components will be permitted, along with a considerable reduction in the size of the speakers fitted in the vehicle. Bulky magnetic transducers are being replaced by simple, much smaller format piezo devices and the result is that speakers can forthwith be located in more appropriate areas of the car, such as the sides of doors or above the occupants' heads, with obvious acoustic benefits being derived. It also means that car manufacturers may even be able to decrease the weight of the vehicle by several pounds, leading to improved fuel economy.

By partnering with Bongiovi Acoustics, ON Semiconductor is now in a position to implement simpler, lower cost audio systems while simultaneously enhancing the richness of the sound quality emanating from them. Bongiovi's patented Digital Power Station (DPS) technology is designed to facilitate improved clarity in high noise surroundings such as automotive. This patented audio processing algorithm has the ability to re-master audio data in real time. DPS analyses the audio signal and digitally optimises it for playback inside the vehicle. It extends the frequency response of the speakers and maximises the frequency-specific power distribution of the amplifier. This brings about the output of richer, fuller sound even for compressed digital files, as well as compensating for intrinsic volume differences that exist between audio sources or program material.

Working in tandem with DPS, the LC75056 dual-core digital processor IC from ON Semiconductor (which has a 220MIPS processing speed, an integrated 786kbyte memory, plus 6-channel 24-bit ADC and DAC functions) maximises the frequencies that the system can reproduce, boosting performance across all frequencies at any volume setting. Using this combined solution, profiles for a broad spectrum of different specific vehicle models/lines have already been created, taking into account the acoustical nature of each; the available space, the radio head unit settings, the speaker design, speaker positioning, for example. Every individual DPS profile produced contains 120 algorithm calibration points, so that it is precisely tuned to the specific vehicle cabin's characteristics. As medium range and even low end vehicles begin to utilise solutions along the lines of the one just described, they will be able to achieve not just comparable, but superior sound quality to the audio systems currently found in luxury models. Reliance at the higher end of the market on prestige audio system brands will consequently become harder to justify.



The LC75056 maximises the frequencies that the Bongiovi Acoustics system can reproduce

In conclusion, recent innovations in digital signal processing technology mean that, although studio quality audio inside passenger vehicles is not quite a reality yet, this goal is getting ever closer to being in engineers' grasp. The amalgamation of highly sophisticated multi-channel audio processing expertise and advanced proprietary audio conditioning algorithms is extending the performance of speakers and head unit amplifiers deployed in modern automobile designs, while at the same time enabling systems with less hefty power budgets, smaller space requirements within the cabin and better positioned, more efficiently utilised speakers.