



White Paper

Audio Technologies Give Flat-Panel Television Manufacturers Opportunity to Differentiate Products, Drive Increased Sales and Market Share

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Overview

Since the day that they first appeared in retail stores, flat panel televisions have garnered as much consumer and media fascination as perhaps any product in consumer electronics history. Signaling an end to the days of heavy, boxish CRT and mammoth projection television sets of previous generations, this new era of television sets – with sales spurred by increased availability of high-definition content – have sparked a revolution in home entertainment.

Unfortunately for these flat-panel TV manufacturers, there's a gathering storm on the horizon. The early adopter days of high prices and high margins are quickly fading. Sparked by continued advances in display manufacturing technologies and fierce competition that have driven down prices, flat-panel televisions risk becoming commoditized. No longer novelty products – play toys for those wealthy enough to shell out \$5,000 - \$10,000 or more for a 50-inch and above plasma sets, flat-panel TVs (primarily LCD and plasma displays) are becoming mainstream consumer products, with projected sales in 2006 of 52 million units, growing to 136 million by 2010.¹ With higher volume sales and increased competition, however, consumer retail prices are plummeting. Great news for consumers, flat-panel TV prices are projected to fall up to 88 percent from Q1 of 2006 to Q4 of 2009. For manufacturers, that translates into reduced profits that continue to quickly erode. Additionally, many predict average brand gross margins will fall from around 10 to 12 percent from Q2 of 2006 to Q2 of 2007 due to the commoditization of the small-screen-size LCD TV market.

Given the downward pricing pressures, OEMs must avoid the painful scenario that befell DVD manufacturers earlier this decade when DVD players became commodities with razor-thin margins. For flat-panel TV manufacturers to avoid a similar fate, they must find ways to differentiate their products relative to their competitors. They must convince the consumer that their product offers something extra – something of value – beyond the otherwise similarly-equipped televisions (e.g. similar screen size and video quality).

For most manufacturers, the answer can not be found merely by marketing nuances in incremental video quality enhancements. Television picture quality on most flat-panel TVs is perceived by the consumer as being very good and even excellent, especially compared to their not-so-distant memories of the “old” days of television, dominated by standard lower-quality analog TV transmissions. The opportunity, therefore, lies in improving the second-most important system aspect of any television: the audio. Whereas video improvements moving forward will likely occur incrementally, the opportunity exists today to enhance the flat-panel TV audio experience immeasurably. More importantly, leveraging new audio IC technologies that both improve the audio quality and offer value-added features give consumers a reason to pick their television when it’s sitting next to a long line of other TVs on consumer retail shelves. Audio therefore becomes a key method in which to add differentiation and to drive sales, market share and additional profits. Increasingly, TV manufacturers are turning to audio technologies to provide that competitive edge.

Conflict: Legacy Audio Technologies Fail Flat-Panel TVs

Any discussion of incorporating newer, sophisticated audio technologies into DTVs has to first accept the common understanding that the audio experience within most flat-panel TVs today is quite poor. To most consumers, flat-panel TVs often fail (some miserably) in any attempt to deliver a quality audio experience on par with the quality of the on-screen video. Audio output, as measured in watts per channel, is usually tepid, marred oftentimes by poor overall audio clarity and noise. Moreover, volume control, mute and tone control are typically the extent of audio features – hardly cutting edge in this day of whiz-bang home theaters and sophisticated audio processing.

It's not difficult to offer anecdotal proof of this general consensus on the state of television audio. Consumer opinions, reflected through product reviews on major retailer Websites and other sources, routinely chastise the audio quality of flat-panel televisions:

“The sound quality is like a cheap portable radio,” – consumer review on Circuit City website, commenting on major manufacturer’s current 32-inch LCD.

Importantly, the consumer electronics industry leadership are lamenting the current status of audio and are publicizing the need for the industry to provide the consumer with a better experience.

“Our Industry is failing TV buyers. They are missing the best way to experience their new TV -- with great audio,” – Gary Shapiro, president, Consumer Electronics Association, May/June 2006.

Not surprisingly, the consumer media also often point out the inherent shortcomings of flat-panel TV audio systems:

“..the stereo speaker sounded so tinny they almost demand you buy a separate sound system” – Miami Herald, March 2006 product review.

A common reaction to this situation: *Who cares about the audio experience from the DTV itself? If people want good audio, they're going to connect the TV to a home theater receiver and a set of more adept speakers.* Sounds reasonable, but, statistically, is this really the case? Not according to the Consumer Electronics Association, whose studies found that only about one in four televisions are connected to a home theater system.² Moreover, as flat-panel TVs migrate from primary living room/home theater settings and into bedrooms and secondary rooms in the home, it's more likely that these TVs, smaller than their larger counterparts in the home theater room, will not benefit from the connection to a home theater system. Given this reality, the need for audio quality improvement and feature differentiation becomes even more critical.

So why don't most flat-panel TVs offer even a marginal-quality sound experience? There are several reasons. For starters, the early development of flat-panel TVs thus far has, rightly, been guided by the video experience, as video quality improves with each generation of plasma and LCD display technology. Relatedly, OEMs were

primarily challenged with adapting display technologies into ever-growing screen widths, all the while focusing on improving manufacturability and lowering costs.

In this environment, audio has understandably taken the back seat. Crack open many flat-panel TVs today, and you'll largely find that the audio technology inside is a remnant from rapidly fading days of CRT televisions. One key problem area is in audio amplification. Traditional analog amplifiers (A/B amplification), while fine solutions for CRT systems, are poor design choices for flat-panel TVs. This is because designers must make such severe concessions for the slim product form factors that they greatly limit the audio output power and resulting quality. Class A/B amplification generates tremendous heat, causing unique design challenges, and requiring bulky heat sinks that further introduce severe design problems. Most flat-panel TVs are challenged enough with power and heat issues just from the video system alone. As a result, it's common to encounter many flat-panel televisions that offer only about 10 watts-per-channel – hardly enough power to offer a decent experience!

Audio ICs: Emancipating Flat-Panel TVs to Improve Quality, Offer Feature Differentiation

To be sure, there are many audio technologies that exist today to help OEMs improve audio quality and offer feature differentiation. For example, class D digital amplification technology has made tremendous progress in recent years and now provides solutions to flat-panel TV's primary challenges: obtaining high-quality audio in slim form factors while minimizing heat dissipation. Modern class D technologies, including ICs that combine the power stage and controller onto a single chip, achieve greater than 85 percent efficiency than traditional analog amplifiers, produce minimal electromagnetic interference (EMI) and don't require the use of heat sinks. By implementing newer Class D ICs into system designs, flat-panel TVs can deliver increased audio power – around 20 watts per channel – at overall very high levels of audio quality (eg. less noise, lower distortion, crisp sound). In doing so, OEMs can now deliver increased audio power and quality to better match the visual experience. Clearly, the trend toward class D audio in flat-panel TVs is becoming increasingly mainstream,

and consumers and OEMs alike stand to benefit from its inherent benefits of small size, low heat and strong output and quality.

Having addressed the design challenges of limited space, heat dissipation and audio quality, OEMs are now able to provide consumers with additional audio features – enabled through both semiconductor hardware and specialized software – that will give consumers not only a better audio experience but also greater control over their preferred audio settings. For example, one of the newer and promising features is intelligent volume control, which allows users to set their preferred audio listening levels no matter the audio source. With this feature alone, consumers no longer need to adjust their TV's volume because of volume discrepancies between TV shows and commercials, or from channel-to-channel while surfing. In addition, this feature, made possible through specialized audio algorithms, can be employed to offer a “midnight mode” setting, which effectively serves to minimize bass frequency output. This feature is especially valued by people in the house who are trying to sleep in an adjacent room of the house while another person is watching, for example, an explosion-laden action-adventure movie.

Intelligent volume is just one example of many features OEMs can utilize to differentiate and add value to their flat-panel TVs. Some of the other features available include, but are not limited to, bass enhancement, virtual surround sound, speaker calibration, audio pre-sets for various viewing experiences (eg. live sports) and many standard audio post-processing algorithms (eg. Dolby, DTS, SRS, BBE).

Marketing the Value of Better Audio Quality, Features

The good news for OEMs is that most audio features can be adopted into board designs with only negligible associated costs. When considered against the additional margin improvement and market share gains they can provide, any associated costs seem inconsequential. In short, OEMs stand to reap the benefit of many years of semiconductor IC technologies first implemented into home theater receiver markets. A flat-panel TV surely won't mimic the audio performance of quality home theater systems, but through the adoption of audio ICs designed to improve current audio quality while providing

value-added features, they can certainly better live up to consumer expectations for an improved audio experience.

Above all, new generations of audio IC hardware and software technologies are giving OEMs a fresh marketing opportunity to help fend off the current state of margin erosion through perceived commoditization. Through improvements in both audio quality and features, manufacturers have the opportunity to improve the total flat-panel TV entertainment experience. Fortunately, both improved flat-panel TV audio quality (relative to its current state) and these additional new features are extremely marketable. Consumer research proves that consumers understand the value of good quality audio, and they understand the benefits of being able to have greater control over the TV's audio settings – *no need train retail sales staff!*

To be sure, incremental video quality enhancements alone are not enough to prevent the current state of price and margin erosion. As OEMs look for ways to add additional value and product differentiation, these new generations of audio ICs provide them with a proven marketing solution to drive sales while increasing market share and profits.

Audio technologies provide a competitive edge.

¹: Source: Display Search Q2 2006 Quarterly DTV Market Report.

²: Source: Consumer Electronics Association