The **Crescendo III SoundBar** is a 3rd-generation SoC that integrates all soundbar audio and microcontroller (MCU) functions in a 176-pin Low Profile Quad Flat Pack (LQFP) package.

For best sound, the **Crescendo III** SoC is built on the ESS SABRE DAC technology normally found only in high-end audiophile and professional audio equipments to deliver spectacular music with an unsurpassed sound stage, utilizing the ESS patented HyperStream™ modulator capable of 100% modulation and unconditional stability to drive analog or digital amplifiers. For digital amplifiers, feedback is provided to drastically reduce distortion and non-linearities encountered by open-loop systems.

For lowest system BOM, the **Crescendo III** SoC adopts a unified memory architecture is adopted for lowest memory cost. It integrates a 32-bit RISC to eliminate multiple microcontrollers needed for system, CEC and HDMI repeater control. Additionally, it includes a 64-bit media processor for audio decoding, post-processing, lip-synchronization and sound effects such as virtual surround and bass enhancement, a hardware parametric equalizer (PEQ) for speaker equalization, an automatic gain limiter (AGL) for anti-clipping control, a user-programmable 32-bit Audio Coprocessor for custom sound algorithms, a 7.1-channel patented HyperStream™ Class D or D/A converter for driving digital or analog power stages, a 3-input HyperStream™ stereo ADC for connection to line input sources, a stereo MIC ADC for microphone input, a 4-input SPDIF/ARC receiver for connection to coaxial, optical, HDMI and ARC input sources, an 8-channel I2S input for connection to HDMI repeater, a flexible remote, VFD and GPIO module for connection to remote control, VFD, buttons and LEDs, and a full-speed USB host controller for firmware upgrade or music playback from thumb drives or iPod.

### FEATURE | BENEFIT
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Highest integration of all audio and system controller functions in TV soundbar | Lowest system BOM cost
Enhanced 32-bit RISC controller with remote and GPIO handler, VFD controller, I2C master and UART | Eliminate multiple MCUs for system, CEC and HDMI control/monitoring
• Main MCU for IR, VFD, Keys and system control
• CEC MCU for HDMI CEC processing
• HDMI MCU/daughter card for HDMI repeater control
Patented HyperStream™ PWM/DAC
• Output in PWM/DAC/I2S modes
• 7.1ch Differential PWM/DAC
• Hardware Parametric Equalizer
• Hardware AGL | Eliminate external DSP
• Drive analog or digital amplifier and wireless subwoofer transmitter
• Realistic audio from tiny speaker/enclosure
• Support amplifier anti-clipping
Comprehensive Sound Bar Processing
• Decode MP3/DD/DTS, etc.
• Sound effects
• Enhanced Audio Coprocessor w/ 128kB SRAM | Eliminate external DSP
• Playback all legacy audio formats
• Virtual Surround Speaker, AV sync etc.
• More memory for custom algorithms and ease of programming
Versatile Audio Input
• 3-input enhanced ADC (50kΩ impedance)
• MIC ADC
• 4-input SPDIF/ARC receiver
• 8-ch I2S input | Eliminate external SPDIF receiver & ADC
• CD quality analog audio input
• Microphone input for Karaoke applications
• Connect to optical/coax/HDMI SPDIF or Audio Return Channel
• Take HDMI audio in PCM format
System
• FS USB Host | Firmware upgrade, playback from iPod or thumbdrives
FUNCTIONAL BLOCK DIAGRAM

Crescendo III SoC

- Memory Controller
- 64-bit Media Processor
- FS USB 2.0 Host
- GPIO / I2C / VFD / IR
- Video Encoder
- Audio Coprocessor
  - Module
  - 128kB RAM
  - Custom Algorithms
  - Enhanced PEQ
  - Speaker Filter
  - Enhanced DRC
- 7.1ch Differential PWM/DAC

- Flash
- System Control
- TV in
  - Line in
  - Aux in
  - MIC in
- SPDIF
- HDMI SPDIF
- HDMI I2S
- 50k R
- 2ch Audio ADC
- MIC ADC
- ARC/SPDIF Rx
- 7.1ch I2S in
- HDMI Repeater
- HDMI out
- HDMI in
- SDRAM
- Firmware Upgrade
- GPIO / I2C / VFD / IR
- CVBS (for debugging or sound tuning)
- Power Stage

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