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# BCM3543 PRODUCT Brief


# ATSC DIGITAL RECEIVER

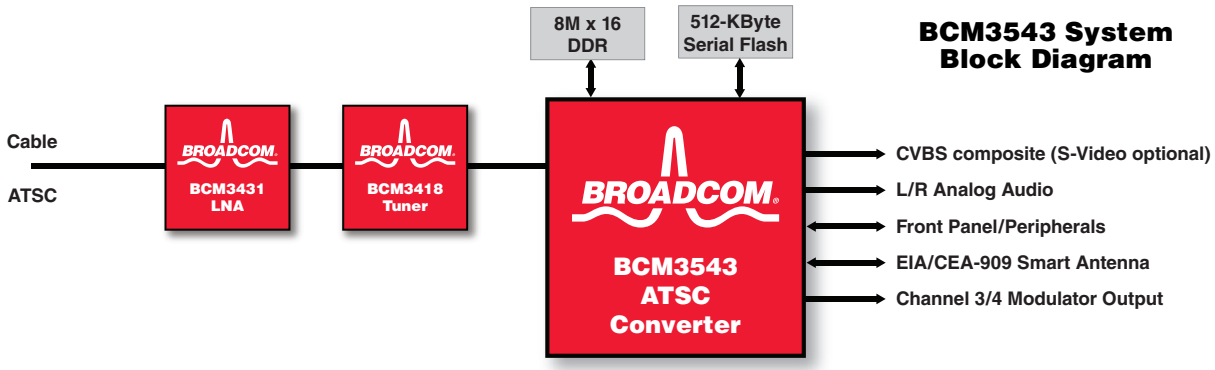
## FEATURES

- **Complete digital-to-analog (DAC) converter System-on-a-Chip solution**
- **Advanced Televisions Systems Committee (ATSC) A/74 and NTIA compliant**
- **Compatibility with high-performance Broadcom® exclusive antenna design**
- **Integrated receivers:**
  - ATSC, 4–1024 QAM receiver
  - 12-bit analog-to-digital converter (ADC) with internal AGC
  - All-digital clock and carrier recovery
- **Digital video and audio capability:**
  - Supports video decode of all ATSC A53E Table A3 formats MP@HL MPEG-2 HD video decoder
  - Dolby® Digital (AC-3) Audio Decode
- **National Television Standards Committee (NTSC) SD Video Encoder**
- **Integrated Analog Circuitry:**
  - On-chip ADCs for IF signals
  - Simultaneous composite video broadcasting signal (CVBS) and S-Video output via triple video DACs
  - Dual-channel audio DACs for L-R audio
  - Dual linear voltage regulator controllers
- **High-quality graphics and video scaling capability**
- **EIA/CEA-909 antenna interface**
- **Support for EAS emergency broadcast, CEA708/608 Closed Captioning, and Parental Control (V-chip)**
- **Channel 3/4 modulator with integrated BTSC encoder**
- **On-chip 250-MHz 32-bit CPU**
- **Extremely low power dissipation (<0.1W) in standby mode**
- **Total DAC box system power less than 8W**
- **340-PBGA optimized for two-layer PCB routing**

## SUMMARY OF BENEFITS

- **Highly integrated solution combining the functionality of a complete ATSC-to-NTSC converter on a single chip.**
- **Exclusive antenna design provides a high-performance single-cable indoor solution, eliminating difficult and costly outdoor installations.**
- **360° smart antenna control is seamlessly integrated into the BCM3543's user interface, eliminating the need for manual antenna adjustments.**
- **Superior ATSC signal reception and demodulation under both static and dynamic multipath conditions.**
- **Integration of field proven QAM receivers.**
- **Complete solution, including BCM3431 LNA and BCM3418 tuner, meets A/74 Receiver Performance Guidelines.**
- **All-silicon solution minimizes parts count and provides ease of manufacturing.**
- **On-chip support to convert all inputs (480i, 480p, 720p, 1080i) to standard definition analog output 480i format.**
- **Advanced graphics engine provides rich user interface environment.**
- **Comprehensive integration of ADCs and DACs simplifies system design and cost.**
- **Full peripheral support eliminates the need for additional components, including LED/Keypad, BSC/SPI master, IR receiver/blaster, PWM, and dual UARTs.**
- **Broadcom-provided embedded software binary and PCB schematics for turnkey ATSC converter manufacturing**

**BCM3543 System Block Diagram**

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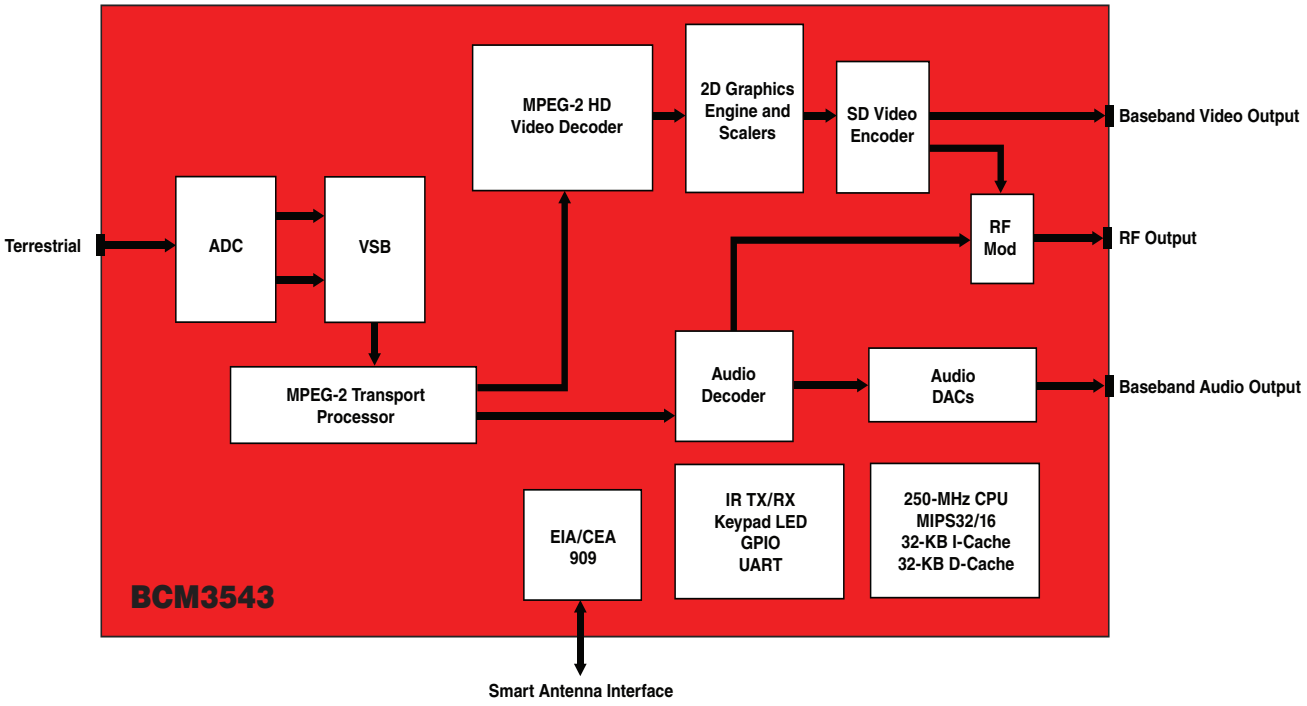
## OVERVIEW




**BCM3543 Block Diagram**

The BCM3543 is a highly integrated low-power solution combining the functionality of a complete ATSC-to-NTSC converter on a single chip. It provides superior ATSC signal reception and demodulation under both static and dynamic multipath conditions, with functionality targeted at National Telecommunications and Information Administration (NTIA) coupon-eligible converter box programs for analog switch off. The BCM3543 is compatible with an ATSC antenna design available exclusively from Broadcom. The BCM3543 exclusive antenna provides a high-performance indoor solution that only requires a single cable interface, eliminating difficult and costly outdoor installations. The antenna control is seamlessly integrated into the BCM3543 user interface, eliminating the need for consumers to manually adjust the antenna position in order to receive optimal signal reception.

The BCM3543 has on-chip support to convert all ATSC A/53e standard- and high-definition inputs (including 60-Hz 720p, 1080i) to 480i output format, including 4:3 center cut-out letterbox of 16:9 transmitted images. The programmable graphics engine enables display of ATSC A/65C Program and System Information (PSIP).

This all-silicon solution minimizes part count and provides ease of manufacturing. The comprehensive integration of ADCs and DACs simplifies system design and cost and has direct interfaces to all other system components including serial Flash (SPI), tuner ($I^2C$), push buttons, and an Infrared (IR) demodulator.

The terrestrial receiver directly samples 44-MHz centred tuner output with an ADC. It digitally resamples and demodulates the signal with recovered clock and carrier timing, filters and equalizes the data, and passes soft decisions to an ATSC A/53 and ITU-T J.83 Annexes A/B/C compatible decoder. A CEA/EIA-909 smart antenna interface is included on chip. A high-fidelity fixed 54-MHz crystal clock is used to clock in the 12-bit ADC.

The BCM3543 has an MPEG-2 Digital Video Broadcasting (DVB)-compliant transport processor with advanced section filtering capability, MPEG-2 (MP@HL profile) video decoder, a Broadcast Television Systems Committee (BTSC) audio encoder, a Dolby AC3/MPEG-2 audio decoder, a pair of analog audio outputs (L-R), and a single NTSC video encoder with analog output.

The BCM3543 incorporates a complete MIPS32®-based microprocessor subsystem, including caches with bridging-to-memory and a local bus, where external peripherals can be attached. Integrated peripherals include a universal asynchronous receiver/transmitter (UART), counter/timers, general-purpose input/output (GPIO), Infrared (IR) transmit (TX)/receive (RX), Broadcom Serial Control (BSC), and Serial Peripheral Interface (SPI) controllers.



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