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BCM3545
PRODUCT Brief
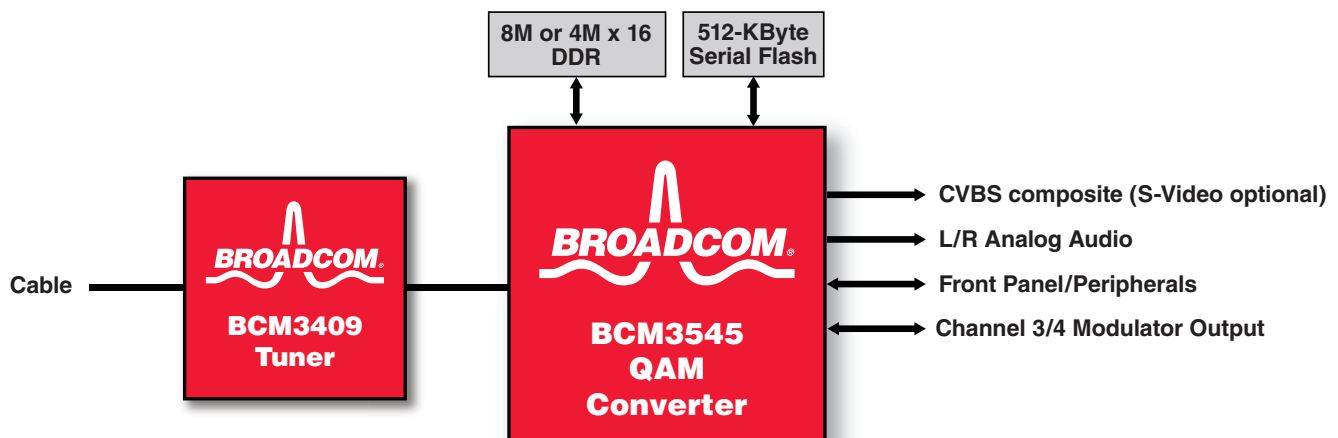
QAM DIGITAL RECEIVER

FEATURES

- **Complete digital-to-analog (DAC) converter System-on-a-Chip solution**
- **SCTE-40-compliant when used with BCM3409 QAM tuner**
- **Integrated receivers:**
  - 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:**
  - MP@ML MPEG-2 SD video decoder
  - Dolby® Digital (AC-3) and MPEG-2 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**
- **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**
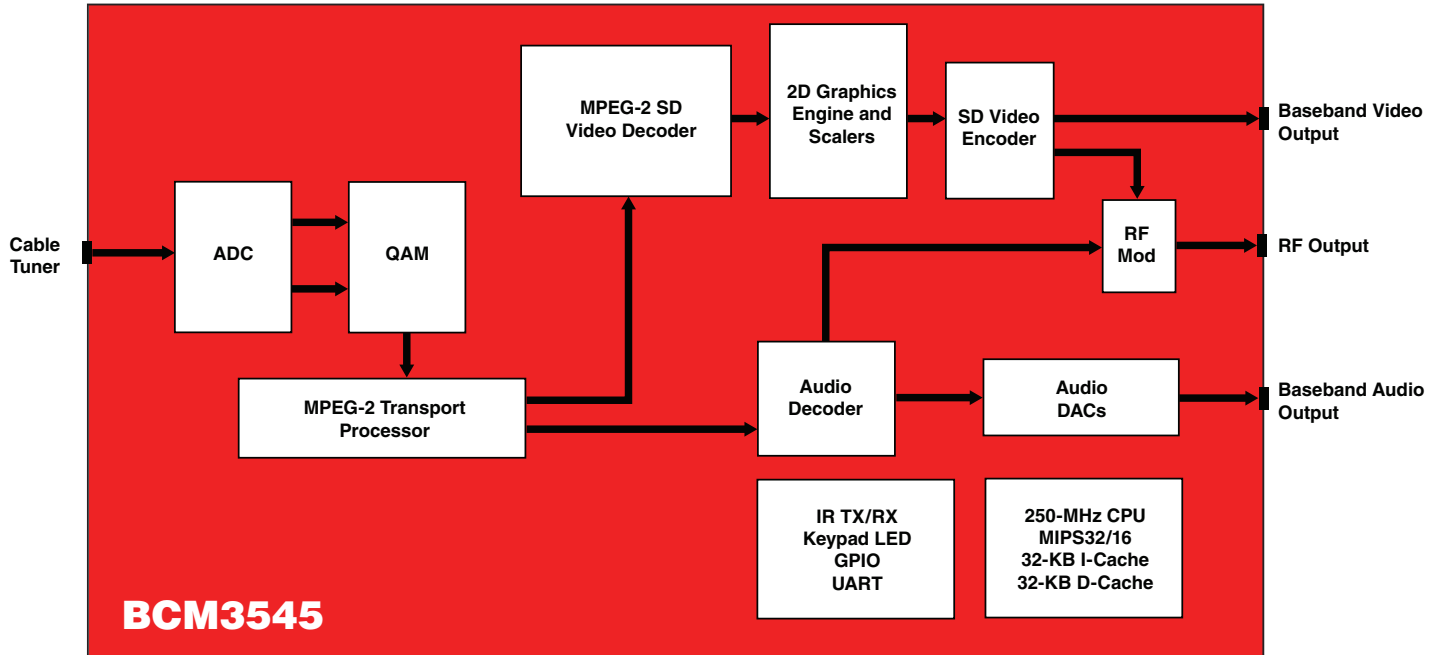- **340-PBGA optimized for two-layer PCB routing**

SUMMARY OF BENEFITS

- **Highly integrated solution combining the functionality of a complete QAM-to-NTSC converter on a single chip.**
- **Integration of field proven QAM receivers.**
- **Complete solution, including BCM3409 tuner, meets SCTE-40 Receiver Performance Guidelines.**
- **All-silicon solution minimizes parts count and provides ease of manufacturing.**
- **Integrated security, including ISO 7816 SmartCard interface, DVB-CSA, DVS-042, DES-ECB-CTS descramblers, 3DES key management, JTAG lock, and secure bootloader ROM**
- **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 converter manufacturing**

BCM3545 System Block Diagram


```
          ┌──────────────┐  ┌──────────────┐
          │ 8M or 4M x 16│  │  512-KByte   │
          │     DDR      │  │ Serial Flash │
          └──────┬───────┘  └──────┬───────┘
                 │                 │
                 ↕                 ↕
                 ┌─────────────────────────┐  →  CVBS composite (S-Video optional)
  ┌──────────┐   │                         │  →  L/R Analog Audio
  │ BROADCOM │   │       BROADCOM          │  ↔  Front Panel/Peripherals
  │ BCM3409  │ → │       BCM3545           │  ↔  Channel 3/4 Modulator Output
  │  Tuner   │   │    QAM Converter        │
  └──────────┘   └─────────────────────────┘
Cable →
```

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BCM3545 Block Diagram

The BCM3545 is a highly integrated low-power solution combining the functionality of a complete QAM-to-NTSC converter on a single chip. It provides SCTE-40 QAM signal reception, with functionality targeted at DTA specification or similar converter boxes for analog cable switch-off.

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 BCM3545 has all security components to meet the DTA conditional access requirements, including ISO 7816 SmartCard interface, DVB-CSA, DVS-042, DES-ECB-CTS descramblers, 3DES key management, and bootloader ROM. Each BCM3545 will be factory OTP-programmed with its unique private password. JTAG and Broadband Studio ports may be OTP-locked at the stage of product factory test. A high-fidelity fixed 54-MHz crystal clock is used to clock in the 12-bit ADC.

The BCM3545 has an MPEG-2 Digital Video Broadcasting (DVB)-compliant transport processor with advanced section filtering capability, MPEG-2 (MP@ML 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 BCM3545 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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