

BCM5404 QUAD-PORT 10/100/1000BASE-T GIGABIT COPPER TRANSCEIVER

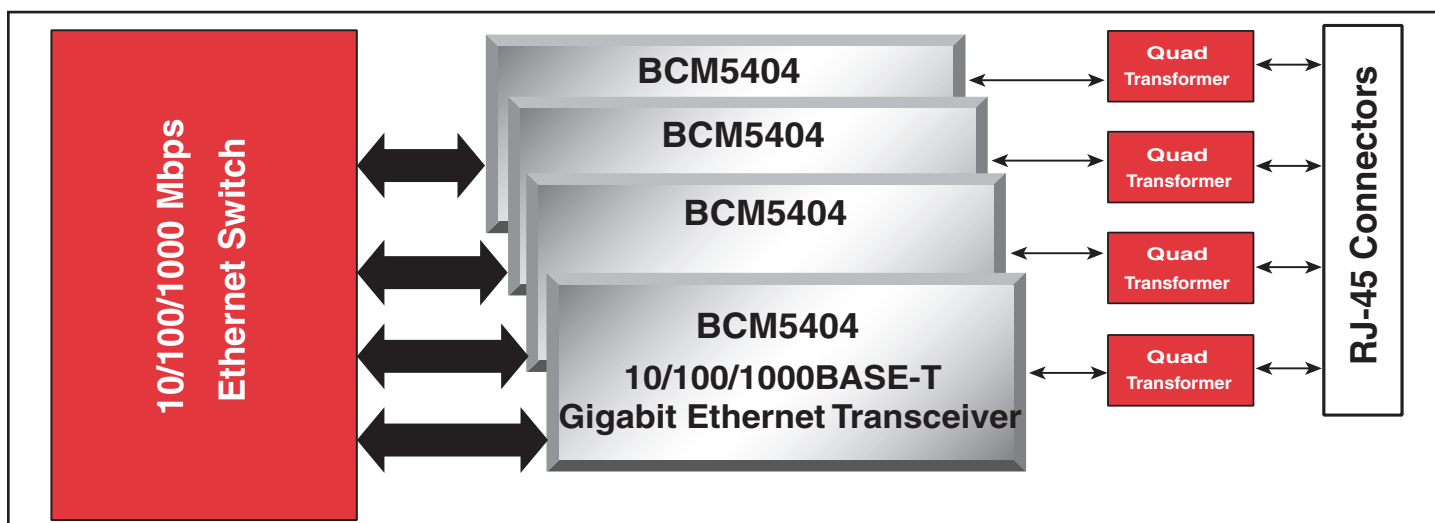
BCM5404 FEATURES

- Four fully integrated 10BASE-T/100BASE-TX/1000BASE-T Gigabit Ethernet transceivers on a single monolithic CMOS chip
- Fully compliant with IEEE 802.3, 802.3u, and 802.3ab standards
- 0.13um CMOS — low power and cost
- Low power
 - 1W per port
 - Advanced power management
- Low EMI emissions
- Ethernet@WireSpeed™ logic automatically selects the maximum speed based on channel conditions
- Cable plant diagnostic
 - Cable plant analyzer function detects cable plant impairments
 - Link quality indication LED
 - Automatic detection and correction of wiring pair swaps, pair skew, and pair polarity
 - Automatic MDI/MDIX crossover at all speeds
- Robust CESD tolerance
- Support for jumbo packets up to 9 KB
- IEEE 1149.1 (JTAG) boundary scan
- MII, GMII, TBI, RGMII, and RTBI interface options

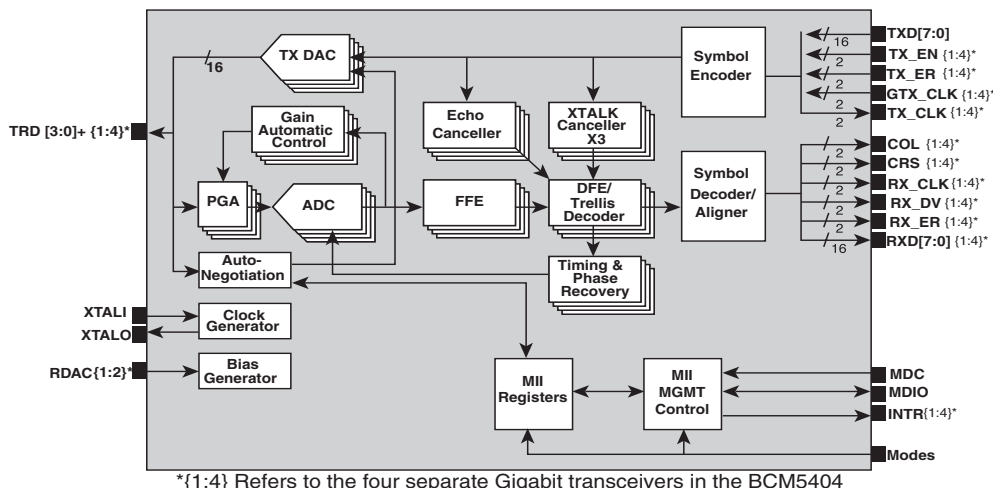
SUMMARY OF BENEFITS

- Low power quad-port integration enables single row, high port density switches.
- Provides compatibility with IEEE standard devices operation at 10, 100, and 1000 Mbps at half- and full-duplex.
- Requires no airflow or heatsink.
- Reduces design constraints in high-density applications that have higher EMI emissions.
- Automatically configures the link to support the highest possible speed based on link partner capability and characteristics of the channel.
- Cable diagnostic function characterizes cable plant condition and immediately indicates cabling issues.
 - Prevents erroneous equipment return due to bad cable plants.
 - Prevents manufacturing fall-out due to bad cable plants.
- High CESD tolerance prevents equipment damage and return.
- Operates with larger packets for wider range of packet protocol support and improved efficiency.
- Ease of manufacturing with JTAG support, simplified power supply, and multiple MAC interfaces.
- High-density package options:
 - Lowers system costs.
 - Simplifies system and board design.
 - RGMII/RTBI reduces I/O pin requirement over GMII and TBI by more than 50%.

BCM5404 System Diagram



BCM5404 Block Diagram



The **BCM5404** consists of four complete 10/100/1000BASE-T Gigabit Ethernet transceivers integrated on a single monolithic CMOS chip. The **BCM5404** is optimized for low power and small footprint size to enable high port density applications. By doubling transceiver port density, lowering system cost, and reducing power dissipation by nearly 50%, the **BCM5404** enables a new class of cost-effective Gigabit Ethernet equipment, driving the delivery of Gigabit bandwidth to the desktop.

The **BCM5404**'s Digital Signal Processor based architecture and advanced power management techniques combine to achieve robust and low power operation over the existing CAT 5 twisted pair wiring. The **BCM5404** architecture not only meets the requirements of 802.3, 802.3u, and 802.3ab, but maintains the industry's highest level of margin over IEEE requirements for Echo, NEXT, and FEXT. Low power is key to implementing high density Gigabit switches, and at 1W per port, the **BCM5404** enables twice the density of previous Gigabit PHY transceivers. With packaging options, high density switches can be easily achieved. In addition, the **BCM5404** has extremely low EMI emissions, which reduces the design constraints required to meet EMI radiation specifications.

This device represents the fourth generation of Gigabit Ethernet transceivers based on the same field-proven architecture as in the BCM5400, BCM5401, BCM5411, and BCM5402 transceivers. Each port of the **BCM5404** is fully independent and has individual interface, control and status registers and incorporates a number of advanced features. A link quality indicator LED gives installers an instant visual indication if there are any problems with the wiring plant supporting operation at the desired speed. This includes

physical wiring defects that the **BCM5404** cannot automatically correct for and channel conditions such as excessive cable length, and return loss, crosstalk, echo, and noise. Broadcom's cable analyzer software can be used with the device to provide remote management of the cable and a first level of diagnostics and fault isolation. The **BCM5404** is fully compatible with the IEEE 802.3 standard for auto-negotiation of speed, but additionally supports Ethernet@WireSpeed™. Ethernet@WireSpeed™ allows the **BCM5404** to force auto-negotiation to be automatically limited by the speed that the channel can reliably support, rather than the performance of the end equipment.

The **BCM5404** also has ESD tolerance well above typical industry standards. This prevents ESD damage not only during manufacturing but during CESD events in the field. Cable-sourced electrostatic discharge (CESD) is an ESD event that occurs when an electrically charged network cable is plugged into a network port, an issue becoming more prevalent with recent cable installations.

In addition to supporting IEEE 802.3 Standard Gigabit Media Independent Interface (GMII), and industry standard Ten Bit Interface (TBI), the **BCM5404** also supports the RGMII and RTBI interfaces. RGMII is a reduced pin-count (12 versus 25) version of the GMII and RTBI is a reduced pin-count version of TBI utilizing standard ASIC technology. The high-density package, multiple MAC interfaces, and streamlined power supply lowers system cost and simplifies the system and board level design.

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5404-PB03-R-6.13.03

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