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BCM5402
## PRODUCT Brief

BCM5402 DUAL-PORT 10/100/1000BASE-T GIGABIT COPPER TRANSCEIVER

BCM5402 FEATURES

- **Two 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**
- **Low power**
  - Less than 2W per port
  - Advanced power management
  - Wake On LAN mode—less than 600 mW per port
- **MII, GMII, TBI, RGMII, and RTBI interface options**
- **Ethernet@WireSpeed™ 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
- **Internal 125-MHz low-jitter clock generation**
- **Support for jumbo packets up to 9 KB**
- **IEEE 1149.1 (JTAG) boundary scan**
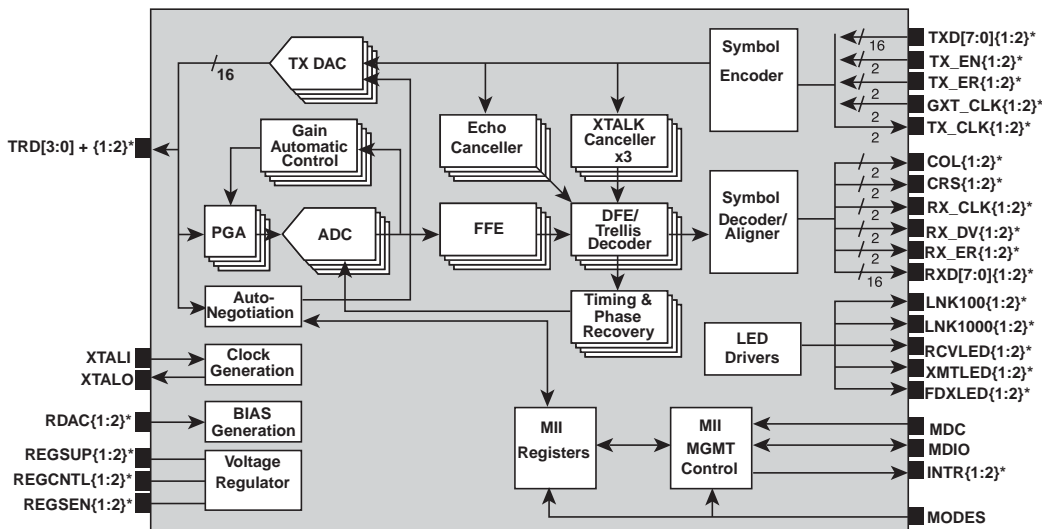- **256-pin TBGA and 260FPBGA**

SUMMARY OF BENEFITS

- **Low power dual-port integration enables high port density switches and dual-port adapter cards.**
- **Compatible with IEEE standard devices operating at 10, 100, and 1000 Mbps at half- and full-duplex.**
- **No airflow or heatsink required.**
- **Wake on LAN mode for low power PC'99 compliant adapters (less than 600 mW per-port).**
- **RGMII/RTBI reduces I/O pin requirement over GMII and TBI by more than 50%.**
- **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.
- **125-MHz clock eliminates costly external clocking circuitry for the MAC/ASIC.**
- **Operates with larger packets for wider range of packet protocol support and improved efficiency.**
- **High density package options without heatsink requirement provides improved testability.**

BCM5402 System Diagram
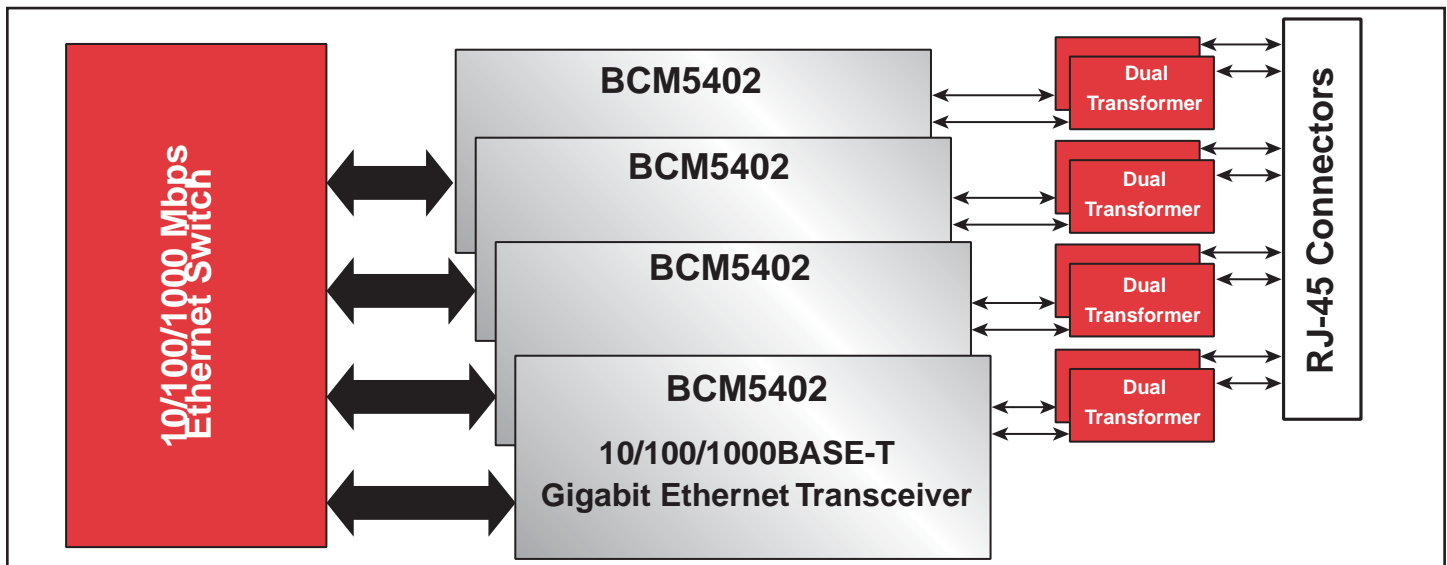
BCM5402 Block Diagram

*{1:2} Refers to the first and second Gigabit transceiver in the BCM5402

The **BCM5402** consists of two complete 10/100/1000BASE-T Gigabit Ethernet transceivers integrated on a single monolithic CMOS chip in a 256-pin TBGA and 260FPBGA package. The **BCM5402** is optimized for low power and small footprint size enabling high port density applications. The package dimension is narrower than the width of two RJ-45 connectors to simplify board layout and component placement.

This device represents the third generation of Gigabit Ethernet transceivers based on the same field-proven architecture as in the BCM5400 and BCM5401 transceivers. These devices have proven robust operation over the installed base of CAT 5 twisted pair wiring. The **BCM5402** is fully software and register compatible with the previous BCM5400 and BCM5401.

The 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. Several special low power modes can be used to further reduce power. Dissipating less than 600 mW per port, the wake-on-LAN mode enables the **BCM5402** to be used for adapters and in LAN-on-motherboard (LOM) solutions for personal computers that meet the stringent standby power requirements for PC'99 compliance.

Each port is fully independent and has individual interface, control and status registers. In addition to supporting IEEE 802.3 Standard Gigabit Media Independent Interface (GMII), and industry-standard Ten Bit Interface (TBI), the **BCM5402** also supports the RGMII interface. RGMII is a reduced pin-count (12 versus 25) version of the GMII utilizing standard ASIC technology.

The **BCM5402** is fully compatible with the IEEE 802.3 standard for auto-negotiation of speed. Additionally, several Plug and Play enhancements are added to make the device even more user-friendly. 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 **BCM5402** 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 Ethernet@WireSpeed™ capability allows the **BCM5402** to auto-negotiate to the maximum data rate allowed by the cable plant. This feature prevents failure to establish link because of cable plant impairment at higher data rates.

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