



## 10/100/1000BASE-T GIGABIT COPPER TRANSCEIVER WITH SERDES

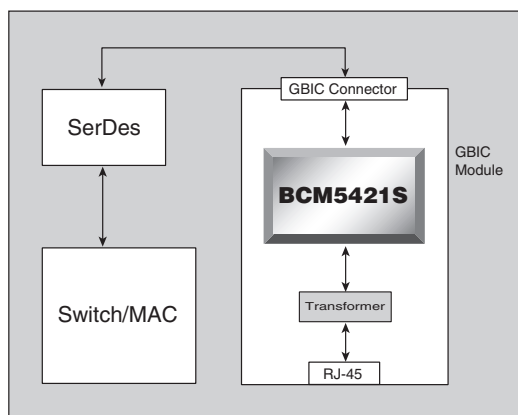
### FEATURES

- Fully integrated 10BASE-T/100BASE-TX/1000BASE-T Gigabit Ethernet transceiver with SerDes
- MII, GMII, TBI, RGMII, RTBI, SGMII, and MAC SerDes interface options
- Line-side copper and fiber interface options
- On-chip low voltage regulators
- Fully compliant with IEEE 802.3, 802.3u, and 802.3ab standards
- 0.13- $\mu$ m CMOS — low power and cost
- Low power
  - 1W per port
  - Wake on LAN support
  - 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, pairskew, 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
- 117-pin BGA and 128-pin MQFP packages

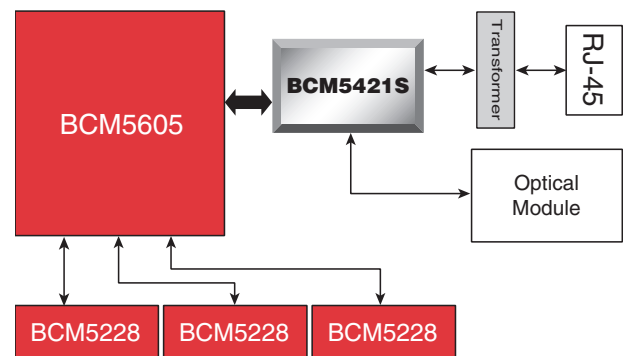
### SUMMARY OF BENEFITS

- Provides triple-speed operation for compatibility with legacy networks.
- Simplifies system and board design.
  - RGMII/RTBI reduces I/O pin requirement over GMII and TBI by more than 50%.
  - SGMII further reduces the interface to six pins, while the serial MAC SerDes interface requires only four pins.
- Lowers system cost and reduces solution footprint.
- Provides interoperability with IEEE standard device operation at 10, 100 and 1000 Mbps at half- and full-duplex.
- Requires no airflow or heatsink.
- Provides compliance with PCI 2.2 and PC99/PC2000.
- Reduces system design constraints to meet EMI emissions standards.
- 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.

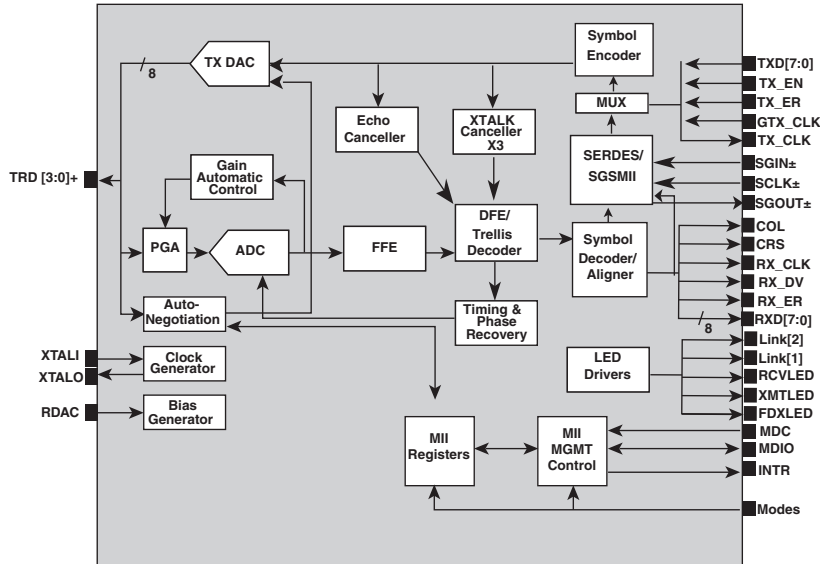
### 10/100/1000BASE-T GBIC Module



### 1000BASE-T Gigabit Copper or Fiber Uplink



# OVERVIEW



The BCM5421S is a fully integrated 10/100/1000BASE-T Gigabit Ethernet transceiver. The BCM5421S is optimized for low power and small footprint size to enable GBIC, copper, and fiber applications. By lowering system cost and reducing power dissipation by nearly 50%, the BCM5421S enables a new class of cost-effective Gigabit Ethernet equipment.

The BCM5421S'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 BCM5421S 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 a key factor in implementing Gigabit small form factor GBICs and uplinks and, at 1W per port, the BCM5421S dissipates nearly half the power of previous Gigabit PHY transceivers. In addition, the BCM5421S has extremely low EMI emissions, which reduces the design constraints required to meet EMI emissions specifications.

In addition to supporting IEEE 802.3 Standard Gigabit Media Independent Interface (GMII), and industry standard Ten Bit Interface (TBI), the BCM5421S also supports the RGMII and RTBI, serial SerDes, and SGMII interfaces. The serial SerDes and SGMII are reduced pin-count (4 and 6 respectively, versus 25) Switch/MAC interfaces. In addition, the serial SerDes interface can be used to route from SerDes to copper as in GBIC applications. 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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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. The fourth generation Gigabit PHY core has already been deployed in the BCM5404, a quad port 10/100/1000BASE-T device of which the BCM5421S is a single port slice.

The BCM5421S 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 BCM5421S 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 BCM5421S is fully compatible with the IEEE 802.3 standard for auto-negotiation of speed, but additionally supports Ethernet@WireSpeed<sup>™</sup>. Ethernet@WireSpeed allows the BCM5421S to force auto-negotiation to automatically establish link at speeds that the channel can reliably support, preventing failure to link due to standard IEEE auto-negotiation.

The BCM5421S 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.



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