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BCM54981
PRODUCT Brief

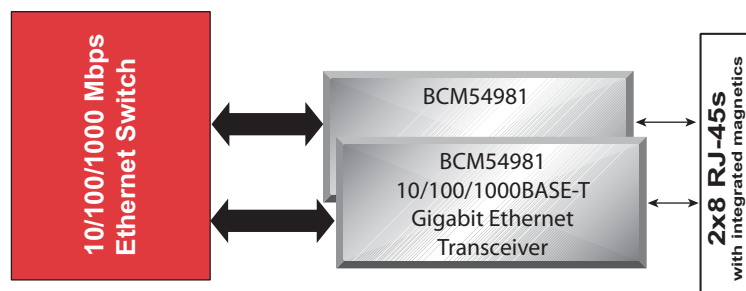# OCTAL-PORT 10/100/1000BASE-T GIGABIT ETHERNET TRANSCEIVER

FEATURES

- Eight 10BASE-T/100BASE-TX/1000BASE-T Gigabit Ethernet transceiver in a fully integrated 90 nm CMOS single chip

- Fully compliant with IEEE 802.3™, IEEE 802.3u, and IEEE 802.3ab standards

- Low power: 500 mW per port

- SGMII and SerDes MAC interface options

- Supports 10/100/1000BASE-T and 100BASE-FX on copper interface

- Internal 100Ω Twisted Pair termination resistors

- Reverse MDI capability

- Enhanced LED driver modes

- Line-side loopback

- Low electromagnetic interference (EMI) emissions

- Hardware-accelerated CableChecker™ diagnostics

- Robust cable-sourced electrostatic discharge (CESD) tolerance

- Support for jumbo packets

- IEEE 1149.1 (JTAG) and 1149.6 (AC-JTAG) boundary scan

- Ethernet@Wirespeed™ and Super-Isolate mode support

- Remote PHY management capability allows PHY register access through SGMII interface without the need of MDIO/MDC.
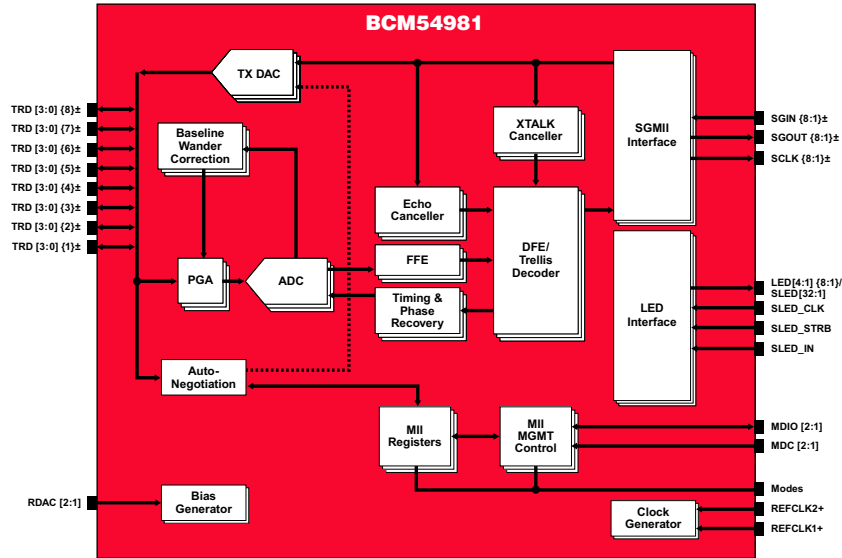
SUMMARY OF BENEFITS

- Energy efficient, low-cost, and low-power octal-port integration enables single-row, high-port density switches

- Provides compatibility with IEEE standard devices operating at 10 Mbps, 100 Mbps, and 1000 Mbps at half-duplex and full-duplex

- Low-cost solution for unmanaged switch applications

- Lowers system bill of materials (BOM) cost and simplifies system design

- Eases system level debug

- Internal 100Ω Twisted Pair termination resistors eliminate the need for external resistors. Saving eight resistors per port.

- Ability to reverse MDI, which results in ease of board design and simplifies the layout in high-port density switch designs.

- Enables use of low-cost magnetics, even in high-density (48+) designs

- CableChecker characterizes cable plant condition and immediately indicates cabling issues
  - CableChecker detection of cable plant impairments
  - Prevents erroneous equipment return due to bad cable plants
  - Prevents manufacturing fallout due to bad cable plants

- 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

BCM54981 System Diagram

10/100/1000 Mbps Ethernet Switch

BCM54981

BCM54981 10/100/1000BASE-T Gigabit Ethernet Transceiver

2x8 RJ-45s with integrated magnetics

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BCM54981 Reference Design

The BCM54981 consists of eight complete 10/100/1000BASE-T Gigabit Ethernet transceivers integrated on a single monolithic CMOS chip. The BCM54981 is optimized for low power and small footprint size to enable high-port density applications. By lowering system cost and reducing power dissipation by nearly 15% compared to previous generation PHY products, the BCM54981 enables a new class of cost-effective Gigabit Ethernet equipment, driving the delivery of Gigabit Ethernet bandwidth to the desktop.

The BCM54981 DSP-based architecture and advanced power management techniques combine with enhanced analog front-end design to achieve robust and low-power operation over existing Category 5 twisted-pair wiring. The BCM54981 architecture not only meets the requirements of IEEE 802.3, IEEE 802.3u, and IEEE 802.3ab but also maintains the industry's highest level of margin over IEEE requirements for echo, near-end crosstalk (NEXT), and far-end crosstalk (FEXT). Low power is the key to implementing high-density Gigabit Ethernet switches, and at less than 500 mW per port the BCM54981 has the smallest footprint and lowest power in the industry. In addition, the BCM54981 has extremely low EMI emissions, which reduces the design constraints required to meet EMI radiation specifications. The BCM54981 provides the highest level of external component integration in the smallest possible package resulting in PBC space saving of 40% for high-density switch applications.

The BCM54981 supports the SGMII and SerDes MAC interfaces. The SGMII and serial SerDes interfaces are reduced pin-count (6 and 4, respectively, versus 25) versions of the GMII. These reduced pin-count interfaces simplify design and lower system cost by reducing the number of layers required to route high-density solutions. In addition, these interfaces allow fewer pins at the MAC/switch, which reduces the MAC/switch cost by enabling smaller die sizes that are possible with full GMII.

This new device is the second member of Broadcom's 90-nm Gigabit Ethernet copper PHY family, joining more than a dozen previous-generation quad and single products. The 90-nm process is the optimal process that offers the best performance, lowest cost, and lowest power for highly integrated Gigabit Ethernet copper solutions. Devices based on the 90-nm process offer an excellent long-term cost curve, enabling better cost reduction over time (compared to older technologies) without having to redesign or requalify a new part.

Each BCM54981 port 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 preferred speed. This includes physical wiring defects that the BCM54981 cannot automatically correct and channel conditions such as excessive cable length and return loss, crosstalk, echo, and noise. Broadcom's CableChecker software can be used with the device to provide remote management of the cable and a first level of diagnostics and fault isolation.

The BCM54981 has the industry's highest tolerance to electrostatic discharge (ESD). This prevents ESD damage not only during manufacturing but also during CESD events in the field. CESD is an ESD event that occurs when an electrically charged network cable is plugged into a network port. This is an issue that has become more prevalent with contemporary cable installations, and the BCM54981 leads the industry in tolerance level.

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