



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

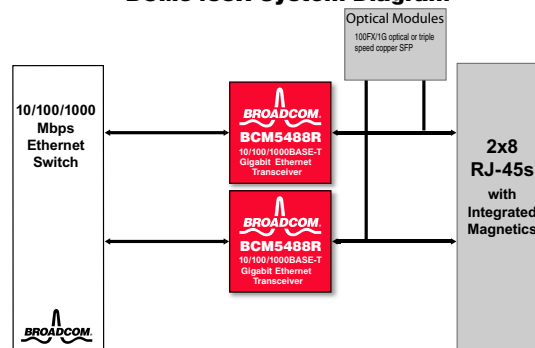
#### FEATURES

- Eight fully-integrated 10BASE-T/100BASE-TX/1000BASE-T Gigabit Ethernet transceivers
- Fully compliant with IEEE 802.3, IEEE 802.3u, and IEEE 802.3ab standards
- 0.13-micron CMOS—low power and cost
- RGMII HSTL MAC interface
- Supports line-side triple-speed SFP with auto-detect capability
- Supports line-side copper or fiber mode
- Supports fiber 100M and 1G operation on the same SerDes pins
- Low power
  - <600 mW per port
  - Advanced power management
- Trace-matched output impedance
- Line-side loopback
- Low EMI emissions
- CableChecker™ diagnostics
  - CableChecker detection of 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 cable-sourced electrostatic discharge (CESD) tolerance
- Support for jumbo packets up to 10 KB
- IEEE 1149.1 (JTAG) and 1149.6 (AC-JTAG) boundary scan
- Package: 676-pin PBGA

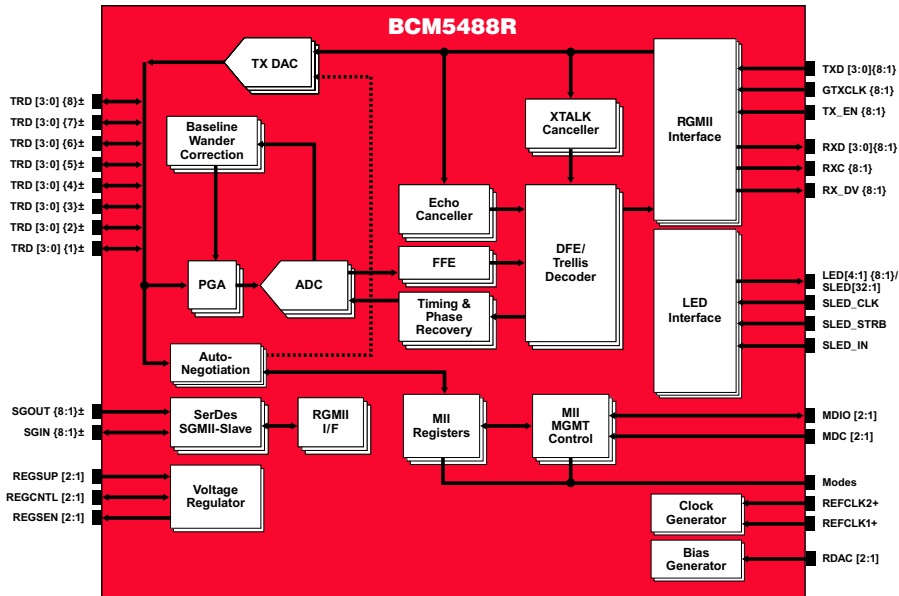
#### SUMMARY OF BENEFITS

- Low-power, octal-port integration enables single-row, high-port density switches.
  - Lowers system costs by eliminating PCB layers required for routing high-density solutions.
  - Reduced I/O pin requirements with RGMII (over 50%).
  - Clock timing can be adjusted to eliminate board trace delays required by the RGMII specification.
  - Lowers MAC/switch costs by reducing the number of pins required to interface with the PHY.
- Provides compatibility with IEEE standard devices operating at 10 Mbps, 100 Mbps, and 1000 Mbps at half-duplex and full-duplex.
- Lowers system BOM cost and simplifies system design.
- Eases system-level debug.
- Enables use of low-cost magnetics, even in high-density (48+) designs.
- CableChecker characterizes cable plant condition and immediately indicates cabling issues.
  - Prevents erroneous equipment return due to bad cable plants.
  - Prevents manufacturing fallout due to bad cable plants.
- Over 3 kV of 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 and simplified power supply.
- Ethernet@WireSpeed™.

**BCM5488R System Diagram**



# OVERVIEW



## BCM5488R Reference Design

The BCM5488R consists of eight complete 10/100/1000BASE-T Gigabit Ethernet transceivers integrated on a single monolithic CMOS chip. The BCM5488R 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 30 percent, the BCM5488R enables a new class of cost-effective Gigabit Ethernet equipment, driving the delivery of Gigabit Ethernet bandwidth to the desktop.

The BCM5488R DSP-based architecture and advanced power management techniques combine to achieve robust and low-power operation over existing Category 5 twisted-pair wiring. The BCM5488R 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 the BCM5488R has the lowest power in the industry at less than 600 mW per port. In addition, the BCM5488R has extremely low EMI emissions, which reduces the design constraints required to meet EMI radiation specifications.

The BCM5488R supports the RGMII MAC interface. The RGMII interface is a reduced pin-count (12 versus 25) version of the GMII. The RGMII clock timing can be adjusted to eliminate the board trace delays required by the RGMII specification. The reduced pin-count interface simplifies design and lowers system cost by reducing the number of layers required to route high-density solutions. In addition, this interface allows fewer pins at the MAC/switch, which reduces the MAC/switch cost by enabling smaller die sizes than would be possible with full GMII.

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This device is another member of Broadcom's 0.13- $\mu$ m Gigabit Ethernet copper PHY family, joining more than a dozen other quad and single products. The 0.13- $\mu$ m process is the optimal process that offers the best performance, lowest cost, and lowest power for Gigabit Ethernet copper solutions. Devices based on the 0.13- $\mu$ m 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 BCM5488R 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 BCM5488R cannot automatically correct for 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 BCM5488R 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 BCM5488R can tolerate well over 3 kV of CESD.



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