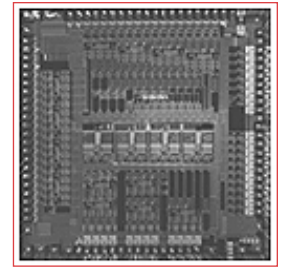**BROADCOM**

BCM5401

PRODUCT
Brief

10/100/1000BASE-T GIGABIT ETHERNET TRANSCEIVER
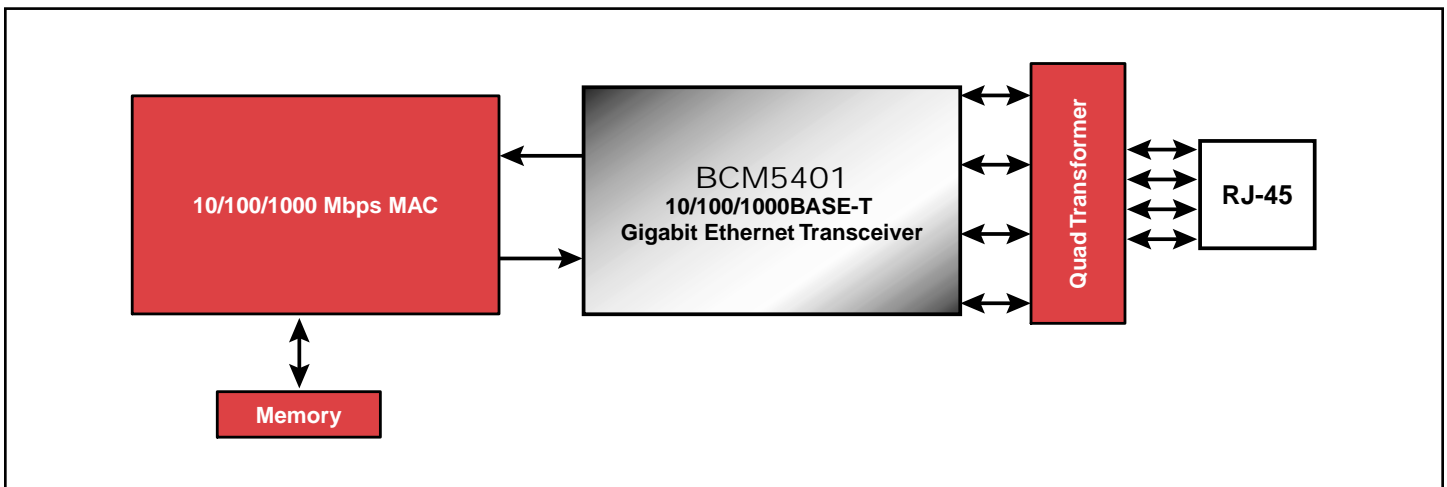
BCM5401 FEATURES
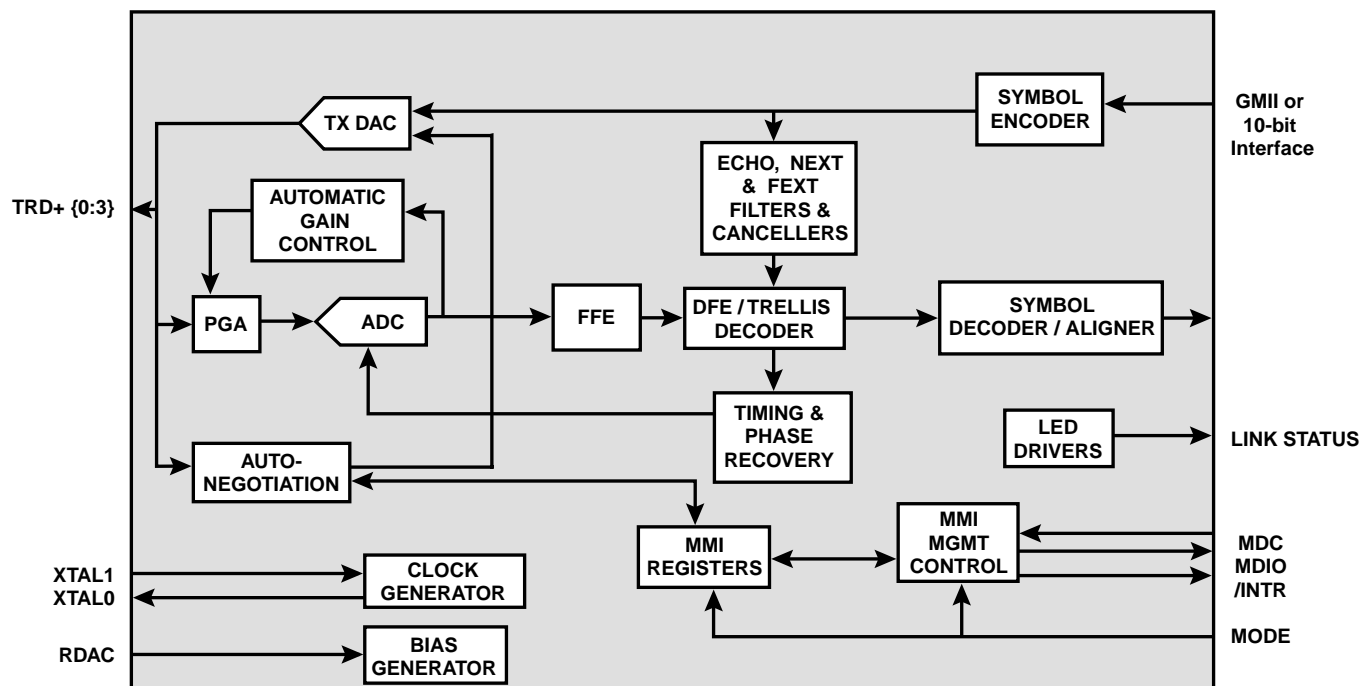
- **Fully integrated 10BASE-T/100BASE-TX/ 1000BASE-T Gigabit Ethernet Transceiver**
  - IEEE 802.3, 802.3u, and 802.3ab Standards
- **Digital Signal Processor (DSP) Based Design-Offering Robust, Fully Adaptive Performance, and Simplified Board Design**
- **Field-Proven Design Based on BCM5400**
- **Register and Software Compatible with BCM5400**
- **Advanced Power Management**
  - Low-Power 1.8V Digital Core
  - Wake On LAN Support
- **Integrated Cable Test Features**
  - Link Quality Indication
  - Automatic Detection and Correction of Wiring Pair Swaps, Pair Skew, and Pair Polarity
  - Automatic MDI Crossover
- **IEEE 802.3ab Standard Auto-Negotiation with Next Page Support to Determine Operating Speed**
- **Internal 125-MHz Low-jitter Clock Generation**
- **GMII Interface and 10-bit Interface (TBI)**
- **Support for Jumbo Packets up to 9 Kb**
- **JTAG Test Interface**
- **256-pin TBGA Package**

SUMMARY OF BENEFITS

- **Provides Robust operation at 1000 Mbps on existing Category-5 cable plants**
- **Supports 10/100/1000BASE-T applications**
- **Dynamically senses and adapts to changes in the channel conditions of the cable plant**
- **Backward software compatibility and similar layout with BCM5400 allows easy migration to the newest technology**
- **Does not require heat sink or airflow**
- **Allows characterization of cable plant and immediate indication of cabling issues for 1000BASE-T**
- **Simplifies installation and diagnostics of cable plants**
- **Automatically configures the link to support the highest possible speed (10/100/1000 Mbps and full-duplex or half-duplex operation)**
- **125-MHz clock eliminates costly external clocking circuitry for the MAC/ASIC**
- **Compatible with any existing MAC/ASIC that supports either an industry-standard 10-bit interface (TBI) or IEEE 802.3z standard GMII**
- **Flexible and programmable LED support**
  - Includes visual link quality indicator

Complete 10/100/1000BASE-T Network Interface Card (NIC) Solution

The Broadcom **BCM5401** is a second-generation 10/100/1000BASE-T Gigabit Ethernet transceiver for Category 5 unshielded twisted-pair (UTP) wiring. Based on the field proven architecture of the BCM5400, it provides lower power, enhanced cable reach, improved bit error rate performance, and advanced testability and diagnostics over first-generation transceivers. The device provides a complete GMII-to-magnetics solution for 10BASE-T, 100BASE-TX, and 1000BASE-T. It also provides a TBI-to-magnetics (10-bit interface) solution for designs using fiber Gigabit Ethernet ASICS. All necessary support circuitry is integrated. including the magnetic hybrid and an on-chip clock generator to provide a low-jitter, 125-MHz system clock.

Low power is achieved through the use of 0.22μ CMOS technology that operates the internal analog circuitry at 2.5V and the digital logic at 1.8V, and through dynamic power management that disables unused portions of the Digital Signal Processor (DSP) architecture when not needed. A special Wake On LAN mode is included to support the low-power requirements for PC adapters and LAN on motherboard (LOM) applications.

Enhanced cable reach and improved bit error rate performance are achieved through advanced DSP and mixed signal design that includes digital adaptive equalizers, encoders, decoders, forward error correction, and cancellation circuitry for echo and crosstalk.

The **BCM5401's** integrated cable management features simplify the installation of networking equipment. The chip automatically detects and corrects most common network wiring problems. The Link Quality LED provides an instant indication of uncorrectable wiring problems or other reasons preventing the wiring plant from supporting 1000BASE-T operation, such as excessive cable length, return loss, crosstalk, echo, and channel noise. Broadcom's remote cable management and diagnostics software can be used with the **BCM5401** to remotely characterize the cable plant (pair length, pair polarity, pair skew, and pair alignment) and offers a first level of fault diagnostics for cable plants that cannot support 1000BASE-T operation.

The performance of the link is automatically determined for either 10/100/1000 Mbps operation at both full- or half-duplex modes using the IEEE 802.3ab Standard auto-negotiation process.

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