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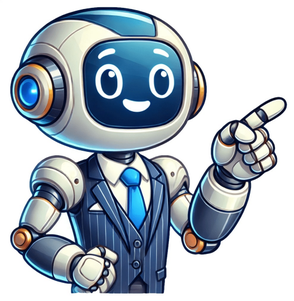

In order to utilize this material further, you have the freedom to do so. You may also build upon it or modify it for any purpose, including commercial use. ========== You are required to give proper credit and link to the license provided. It is also mandatory to mention if you have made any changes. ========== This technology can be used in various devices, even those with small amounts of digital content. Analog Devices has started to incorporate this technology in some of their data converters due to advancements in finer line process geometries. ========== This technology offers several benefits for the chip manufacturer and system level design. For instance, it simplifies the characterization process by providing better visibility into the device and reduces manufacturing test time with autonomous testing capabilities. ========== Incorporating BIST at the system level provides an efficient way to improve system reliability as systems become more complex. This technology enables a hierarchical test strategy that can be implemented to test individual components. ========== Analog Devices provides built-in test solutions for its high-speed DACs, including the AD9736. The signature test is a crucial aspect of BIST, allowing designers to generate an expected signature for an arbitrary test pattern. This feature offers greater flexibility in the patterns that the source can provide. By utilizing BIST models and test patterns, designers can efficiently evaluate the device and its downstream signal chain. The AD9789, for instance, contains an on-chip QAM mapper, interpolation filters, and a digital upconverter followed by a 14-bit DAC. The BIST pattern generator can be configured to send data to the QAM mapper, enabling the transmission of modulated signals. Analog performance can be measured at the output of the DAC and along the rest of the transmit path signal chain without additional digital stimulus. This decoupling of analog evaluation from digital development simplifies the evaluation process and eliminates specialized circuitry required for digital test pattern generation. As systems become increasingly complex, the inclusion of BIST functionality on individual devices becomes more critical. By utilizing BIST on devices like data converters and other "analog" components, designers can improve system-level testability and device evaluation. BITs, or Built-In Tests, are diagnostic mechanisms integrated into systems to ensure proper functioning. BITs detect, isolate, and report faults within a system, enhancing reliability and maintainability. PBITs, or Power-On Built-In Tests, run automatically when a system is powered on, verifying the system's integrity before normal operation begins. CBITs, or Continuous Built-In Tests, run continuously during system operation, monitoring the system's health in real-time. This allows for immediate corrective actions to maintain system integrity. Results from BITs can be harvested using a local API or published over the network using the Zenoh pub/sub protocol, enabling centralized monitoring and analysis. By incorporating BIST functionality into devices and systems, designers can improve testability, reliability, and overall system performance. As digital interface speeds increase, verifying these interfaces becomes more important and challenging. Utilizing BIST solutions is essential for maintaining the reliability and functionality of complex systems. Built-in Self Test (BIST) is a Design-for-Testability technique used to design additional hardware and software features into integrated circuits. This allows them to perform self-testing, reducing dependence on external automated test equipment (ATE). BIST makes electrical testing of a chip easier, faster, more efficient, and less costly. ========== === Built-in Self Test can be applied to various types of circuits, with implementation varying depending on the product diversity. In DRAMs, for example, additional circuits are incorporated onto the chip for pattern generation, timing, mode selection, and go-/no-go diagnostic tests. The main drivers for BIST development are high ATE testing costs and increasing integrated circuit complexity. ========== === BIST offers several advantages, including lower test costs, better fault coverage, shorter test times, easier customer support, and the ability to perform tests outside production environments. However, it also has some disadvantages, such as additional silicon area requirements, reduced access times, and increased pin requirements. ========== ===Built-in self-test (BIST) is a mechanism that allows machines to test themselves, reducing complexity and costs associated with external testing. Engineers design BISTs to meet requirements such as high reliability and lower repair cycle times while considering constraints like limited technician accessibility and cost of testing during manufacture. ==========Various electronic systems use Built-In-Self-Test mechanisms to ensure their continued operation. This is particularly crucial in safety-critical devices like medical equipment and military aircraft, where a fault could have severe consequences. These systems employ duplicate or redundant components for critical functions, ensuring that even if one component fails, the system can still function in a "limp mode" or with alternative equipment. For instance, entertainment systems on planes may have a "limp mode" to provide some functionality. Built-In-Self-Test is also used to speed up and reduce the cost of manufacturing integrated circuits by automatically testing their internal functionality during production. This feature can be valuable to customers as well, especially in advanced fieldbus systems where it helps verify system functionality. The concept of BIST is similar to a personal computer's power-on self-test (POST), which checks the RAM and buses upon startup. Unattended machinery, including remote systems like telephone concentrator boxes, continuously test for communications by verifying the presence of periodic data patterns called frames. In cases where electronic loop-backs are absent, software usually provides this facility. Many such systems have automatic reset features to restart their computers in case of lack of communications or improper software operation. In safety-critical devices, there are two types of tests - a comprehensive POST followed by a periodic test that ensures the device has not become unsafe since the last POST. These devices often define a "safety interval" during which critical functions are self-tested at least once. Various specialized versions of BIST exist, including programmable, memory-based, logic-based, and continuous built-in self-test. Engineers specify the requirements for BIST mechanisms in a BIT (or BIST) specification, defining modes required, objectives, performance requirements, availability, trigger mechanisms, architecture, and design details. This ensures that BIST systems are designed and implemented correctly to meet specific needs.built-in self-test (BIST) is a mechanism that permits a machine to test itself engineers design BISTs to meet requirements such as high reliability lower repair cycle times or constraints such as limited technician accessibility cost of testing during manufacture ========== The main purpose of BIST is to reduce the complexity and decrease the cost and reliance upon external pattern-programmed test equipment BIST reduces cost in two ways: reduces test-cycle duration reduces the complexity of the test/probe setup, by reducing the number of I/O signals that must be driven/examined under tester control ========== BIST is commonly placed in weapons avionics medical devices automotive electronics complex machinery unattended machinery and integrated circuits Main article On-board diagnostics Automotive tests itself to enhance safety and reliability for example most vehicles with antilock brakes test them once per safety interval ========== Most automotive engine controllers incorporate a "limp mode" for each sensor so that the engine will continue to operate if the sensor or its wiring fails another example of a limp mode is that some cars test door switches and automatically turn lights on using seat-belt occupancy sensors if the door switches fail almost all avionics now incorporate BIST ========== In avionics the purpose is to isolate failing line-replaceable units which are then removed and repaired elsewhere usually in depots or at the manufacturer commercial aircraft only make money when they fly so they use BIST to minimize the time on the ground needed for repair and to increase the level of safety of the system which contains BIST similar arguments apply to military aircraft ========== When BIST is used in flight a fault causes the system to switch to an alternative mode or equipment that still operates critical flight equipment is normally duplicated or redundant less critical flight equipment such as entertainment systems might have a "limp mode" that provides some functions BIST is used to make faster less-expensive integrated circuit manufacturing tests ========== ========== Self-tests in computers, including embedded systems, ensure their hardware and software are functioning correctly. Unattended machinery performs regular self-tests to detect issues that require maintenance or repair. These tests typically include checks for temperature, humidity, communication errors, power supply issues, and more. For example, power systems and batteries are often tested due to their susceptibility to overheating or failure. In remote systems, continuous communication testing is crucial. The telephone concentrator box, which accumulates and routes telephone lines or data, performs this test regularly. Frames, which repeat about 8,000 times per second, help verify the presence of data patterns. Remote systems often have features to loop back communications locally or remotely, allowing for transmitter and receiver testing without using the computer or software at the remote unit. Many remote systems have automatic reset features that restart their remote computers when communication issues arise or if improper software operation occurs. Satellites also employ automatic resets and restart systems for power and attitude control. Medical devices perform self-tests to ensure their continued safety, typically with two types of tests: a comprehensive POST test followed by periodic tests. Safety-critical devices define a "safety interval" – a period too short for injury to occur – and complete critical function self-tests at least once per safety interval. The periodic test is usually a subset of the POST. The Minuteman Missile, one of the first computer-controlled BIST systems, used an internal computer to control testing, reducing cables and connectors needed. Various types of built-in self-test (BIST) systems exist, including programmable, memory-based, logic-based, analog, mixed-signal, continuous, event-driven, periodic, interrupt-driven, user/operator-initiated, power-up, and automatic BIST. Engineers specify BIST requirements, design, implementation, and verification in a BIT specification, defining modes, objectives, performance requirements, trigger mechanisms, architecture, interfaces, test point allocation, and execution procedures. ==========A built-in self-test (BIST) is a mechanism that allows machines to test themselves, designed to meet requirements such as high reliability, lower repair cycle times, and cost constraints. ========== Built-in Self-Test (BIST): Mechanism for Machines to Test Themselves ========== BIST mechanism allows machines to test themselves, reducing complexity and increasing reliability. Engineers design BISTs to meet specific requirements, such as high reliability and lower repair cycle times. Satellites have automatic reset features, including power and attitude control systems, which can be triggered by critical events or lack of communications. Medical devices also perform self-tests to ensure continued safety, with a focus on periodic testing and safety intervals.Built-In-Self-Test (BIST) is used to reduce costs by simplifying testing procedures and minimizing equipment downtime. It's commonly applied in various industries, including automotive, avionics, medical devices, and complex machinery. BIST allows vehicles to self-diagnose issues, such as faulty antilock brake systems or engine controllers, and automatically switch to a backup mode to ensure safe operation. Similarly, avionics systems use BIST to identify failing components, reducing repair time and increasing safety. In integrated circuit manufacturing, BIST verifies the internal functionality of ICs, making it easier to detect defects and reduce production costs. This technology is also used in advanced fieldbus systems to ensure correct data transmission. Unattended machinery, such as power systems or batteries, perform self-tests to prevent overheating or failure. Remote systems often include communication tests, loop-back features, and automatic reset mechanisms to ensure reliable operation. Medical devices use BIST to guarantee continued safety by performing comprehensive and periodic tests. These tests help identify potential issues before they become critical, reducing the risk of injury or harm. The first computer-controlled BIST system was implemented in the U.S.'s Minuteman Missile, showcasing its potential for complex systems.Built-in Self-Test (BIST): Enhancing Test Efficiency and Reliability in Electronic Systems ========== The development of built-in self-test (BIST) mechanisms has significantly reduced the weight of cables and connectors required for testing electronic systems, such as the Minuteman weapons system. BIST enables permanent installation of self-testing capabilities, enhancing test efficiency and reliability. Types of BIST Mechanisms Various specialized versions of BIST have been developed, each differing in its functionality or implementation: * Programmable built-in self-test (pBIST) * Memory built-in self-test (mBIST) * Logic built-in self-test (LBIST) * Analog and mixed-signal built-in self-test (AMBIST) * Continuous built-in self-test (CBIST, C-BIT) * Event-driven built-in self-test * Periodic built-in self-test (C-BIT/P-BIT) * Interrupt-driven built-in self-test (IBIST) * User/operator-initiated built-in self-test (I-BIT or O-BIT) * Power-up built-in self-test (PupBIST, P-BIT) * Automatic built-in self-test (ABIST) Requirements and Objectives of BIST Engineers specify the requirements, design, implementation, and verification of BIST mechanisms in BIT specifications. These specifications define: * BIT modes * Required objectives * Performance requirements * Detection time * Isolation capability * Availability * Trigger mechanismsJohn Locke hailed from England. ========== Satyen Bose has shown his excellence in engineering field. ========== === Machiavelli political inquiry was but the reflection of intellectual changes associated with the A. Renaissance ========== = Thomas Hobbes hailed from B. England ========== == The first step towards liberal democracy in Great Britain is A. Enlightenment