X-ES

Fast, Flexible, and Customer-Focused Embedded Solutions

Built-In Test (BIT) Software

Complementing a diverse product lineup, Extreme Engineering Solutions, Inc. (X-ES) provides a comprehensive library of Built-In Test (BIT) software. X-ES BIT software provides exceptional test coverage through Power-On BIT (PBIT), Continuous BIT (CBIT), and Initiated BIT (IBIT) routines. BIT is supported on most processor boards for VxWorks and Linux.

Regardless of the X-ES processor board or operating system, the BIT libraries present the user with the same consistent Application Programming Interface (API). For example, all Intel® and NXP (formerly Freescale) based X-ES processor cards support a common set of BIT tests for common device interfaces such as SDRAM, Ethernet, and non-volatile storage. Example applications in ANSI C source form are included in X-ES BIT.

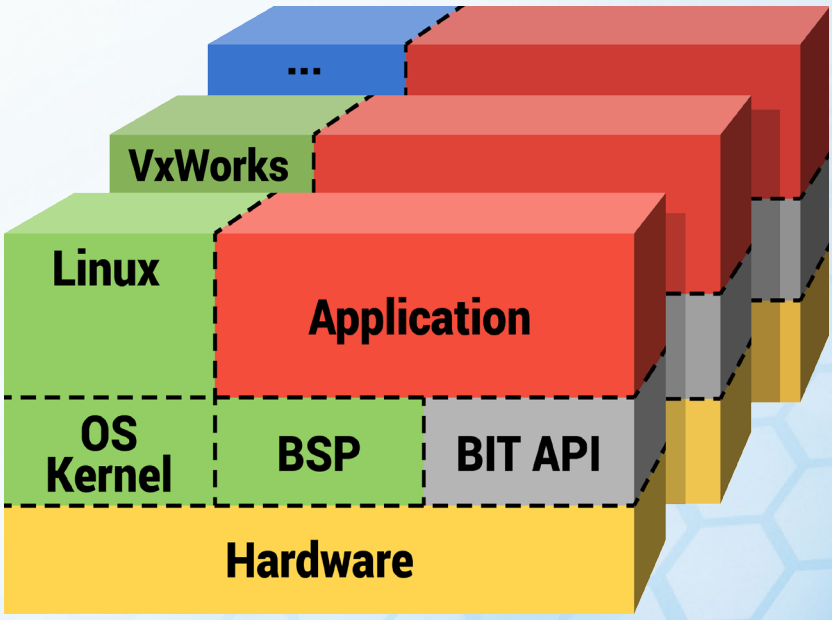
Whether your goals are Fault Detection and Fault Isolation (FDFI) coverage during deployment, qualification testing, or manufacturing reliability, X-ES has the BIT capabilities your project needs.

BIT Features

- PBIT (Power-On Tests)
  - Power-on results available to operating system
  - Fast boot supported
  - Early invasive testing yields high test coverage
  - Field upgradable firmware support
  - Visual and hardware signal failure indicators
- CBIT (Continuous Tests)
  - Full source available
  - Non-invasive testing
  - Dedicated OS task
  - Low CPU utilization
  - Runs out-of-the-box
  - Test result logging
  - Health statistics
  - Modular implementation
  - Extensible
  - IPMI integration
- IBIT (Initiated Tests)
  - Full source available
  - Comprehensive test set
  - Offline device diagnostic testing
  - IPMI integration

BIT API

The X-ES BIT API provides a standardized interface between the low-level BIT routines, operating system, and application. Applications can query PBIT results, poll CBIT status, or execute IBIT procedures. Whether you have requirements for PBIT, CBIT, or IBIT, X-ES provides the standardized application framework necessary to simplify development of fault-detection software.



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Functional Block	Test	PBIT	CBIT	IBIT	Component
Thermal Sensors	Die Temperatures	X	X	X	1
	Board Temperatures	X	X	X	2
Software Image Integrity	BIOS Image CRC			X	3
	OS Image CRC			X	4
Bulk Storage	SATA Drive Presence		X	X	5
	USB Device Presence	X	X	X	6
	File System Tests			X	7
RAM Memory	SDRAM Memory	X		X	8
	SDRAM ECC		X	X	9
ROM Memory	BIOS SPI NOR Flash ID Test	X	X	X	10
Ethernet	Ethernet Link		X	X	11
	Networking Statistics		X	X	12
	Ping		X	X	13
	PHY Loopback			X	14
PCI / PCI Express / DMI	PCI Express Root Ports		X	X	15
	PCI Express Devices		X	X	16
	PCI Devices	X	X	X	17
	DMI	X			20
I²C	Device Presence	X	X	X	18
Real Time Clock	RTC Running		X	X	19
Serial Ports	Serial Port Loopback	X		X	21
GPIO	GPIO Pin Read		X	X	22
	GPIO Pin Write			X	23
	Boot Flash Detection	X			
	Non-Volatile Write Protect	X			
System Level	Geographical Address Parity	X	X	X	24
EEPROM	System EEPROM	X	X	X	25

Types of BIT

Power-On BIT

Executed in the boot firmware or in the OS boot process. Examples include PBIT for products supporting UEFI BIOS and U-Boot firmware. The results of PBIT are stored and can be retrieved via API from the operating system.

Continuous BIT

Executed from a task within the operating system. This task periodically runs non-invasive tests such as ECC and device error condition checks.

Initiated BIT

Executed at any time from the user application. Initiated BIT consists of both non-destructive and destructive testing. Destructive tests, such as an internal Ethernet loopback, can be utilized to help diagnose the origin of system failures.

Test Coverage Example

X-ES provides BIT code that covers all the major functional blocks of a design. A BIT device coverage map is available with all X-ES products. Additional FDFI (Fault Detection and Fault Isolation) analysis reports are available upon request.

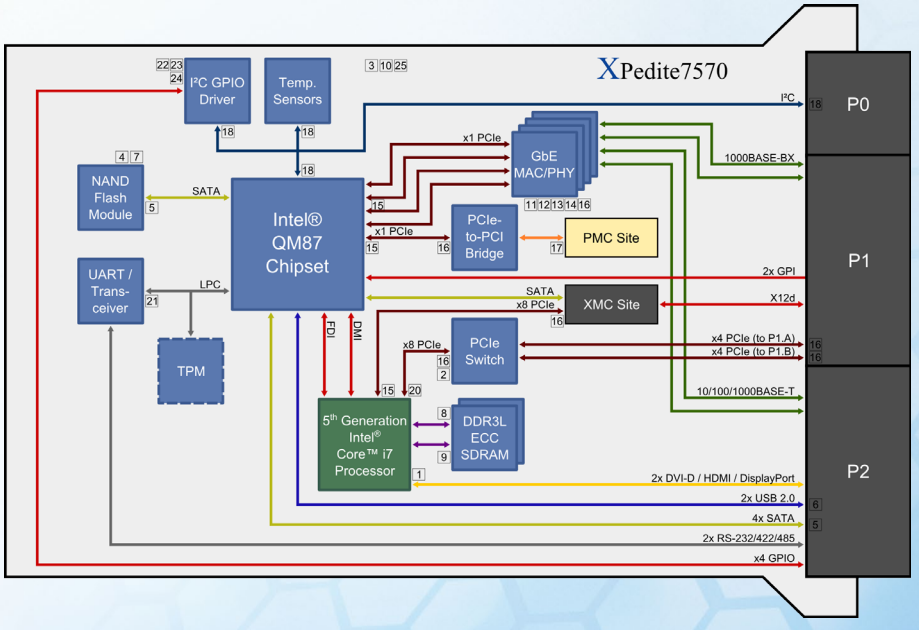
An example of the standard analysis performed by X-ES is provided in the BIT coverage map and associated block diagram. All major functional elements are incorporated into the appropiate PBIT, CBIT, and IBIT routines.

MADE IN THE USA

bsi. ISO 9001 Quality Management

Corporate Overview

Extreme Engineering Solutions, Inc. (X-ES) designs and builds chassis, single-board computers, I/O, power, backplane, and system-level products within the embedded computer industry. X-ES offers cutting-edge performance and flexibility in design plus an unparalleled level of customer support and service. For further information on X-ES products or services, please visit our website: www.xes-inc.com or call (608) 833-1155.



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