Green Hills Probe V4

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Technology overview

The Green Hills Probe V4 is the fastest and most capable JTAG and trace debug probe ever made by Green Hills Software. Its 4GB of high-speed trace memory and 40 Gbits/second aggregate bandwidth combine with TimeMachine™ to enable software developers to find and fix bugs faster, optimize quickly, and test with confidence.

Key features of the Green Hills Probe include:

- 4GB of high-speed trace memory with 40 Gbits/second of aggregate bandwidth
- Supports the latest high-speed serial trace (HSST) protocols, including multiple 12.5Gb serial lanes
- The fastest download speeds, capable of sustaining a 120MHz JTAG clock rate with nearly 100% data payload utilization
- Supports all leading debug and trace interfaces on thousands of processors
- Tight integration with TimeMachine
- Offers sophisticated analysis tools for quickly locating key execution points in large datasets
- LCD status screen for easy access to configuration settings, diagnostics and factory reset
- USB host and power ports, Ethernet switch and port

Designed to Find Heisenbugs

The Probe V4 was designed to find Heisenbugs, which are bugs that disappear or don't reproduce while debugging. These insidious bugs are responsible for endless software and product delays. Through fast trace capture over industry-standard protocols and with a deep capture buffer, the Green Hills Probe V4 provides all developers on all leading processors the most effective weapon against Heisenbugs: trace capture.

Run control and trace features

Broad Target Support

Green Hills Probe V4 supports an extensive range of target trace ports on thousands of processors.

RTOS awareness

Coupled with the MULTI® IDE, the Green Hills Probe provides RTOS-aware debugging of Green Hills Software's INTEGRITY® RTOS.

Fastest Download Speeds

With its 4GB of high-speed trace memory and 40 Gbits/second of aggregate bandwidth, the Probe V4 enables faster development by minimizing the time spent waiting for downloads to complete. It supports JTAG clocks from 2.5 kHz to 120 MHz with nearly 100% data payload utilization to maximize the download speed to the target processor.

Flexible and Modular

The Green Hills Probe V4 simplifies customer configurations because it replaces both the Green Hills Probe V3 and the SuperTrace™ Probe. A single processor-independent Green Hills Probe V4 is configured with either a pod for JTAG and parallel trace or a pod for high-speed serial trace (HSST). A processor adapter is then added to match the target processor.

Expanded System and Test Automation

The Green Hills Probe V4 provides and instruments the most common power and communications interfaces used by target boards, simplifying not only the physical cabling to a target board, but also providing debugging insight into these interfaces.

- Target boards can be powered with a switchable 12V/2A power port or a 5V/1.5A USB Type A interface.
- Integrated, instrumented Ethernet switch with a second Ethernet port on the front panel for use by the target board.
- USB host support for attached USB serial adapters for communication to target board serial ports.

Supported Target Families

- **Arm Architecture**
  - Arm7, Arm9, Arm11
  - Cortex-M0, Cortex-M3, Cortex-M4, Cortex-M7, Cortex-M23, Cortex-M33
  - Cortex-R4, Cortex-R5, Cortex-R7, Cortex-R8, Cortex-R52
  - Cortex-A5, Cortex-A7, Cortex-A8, Cortex-A9, Cortex-A15, Cortex-A17, Cortex-A35, Cortex-A53, Cortex-A55, Cortex-A57, Cortex-A72, Cortex-A73, Cortex-A75, Cortex-A76
  - XScale PXA250, PXA255

  Processor manufacturers: *Altera, Atmel, Broadcom, Cavium, Cirrus Logic, Cypress, Fujitsu, LSI, Marvell, Microchip, Nextchip, NVIDIA, NXP, Qualcomm, Renesas, Samsung, Sharp, ST, Telechips , Texas Instruments, Xilinx*
- **Power Architecture**
  - PowerPC 4xx, 6xx, 7xx, 74xx, 82xx, 83xx, 86xx
  - RAD series
  - PowerPC e200, e300, e500, e600, e500MC, e5500, e6500
  - NXP MPC55xx, 56xx, 57xx, PX, S32R families
  - ST Micro SPC56xx, 57xx, 58xx
  - NXP QorIQ P-Series and T-Series

  Processor manufacturers: *AMCC, IBM, NXP, ST*
- **RISC-V**
  - RV32, RV64
- **NXP Coldfire**
  - MCF52xx/53xx/54xx
- **Intel Architecture**
  - Atom Apollo Lake
  - Tiger Lake
- **MIPS**
  - MIPS32, MIPS64
- **TriCore**

Supported debug & trace architectures

- Arm CoreSight
- Arm ETM v1, v3, v4
- Arm-14/20
- Arm PRM
- Arm PTM
- Arm SWD
- COP
- CoreSight HSSTP
- EJTAG2.5
- EOnCE
- Intel MIPI
- MIPS PDTrace
- Nexus
- NXP ColdFire
- TI-14
- Infineon TriCore/AURIX
- Xilinx-14

Variable Target Voltage

The Green Hills Probe V4 can select between a range of I/O interface voltages from 1.65V to 5V for connecting to a variety of targets.

Multicore Debugging

The Green Hills Probe V4 supports debugging of multiple cores in a single JTAG scan chain as well as multicore trace. The Green Hills Probe V4 can be used in the most complex debug situations.

Cycle Accurate

When provided for by trace targets, the Green Hills Probe V4 captures trace data in cycle accurate mode so developers can determine how many cycles each instruction takes. This allows analysis of the effects of cache and other memory systems. Besides providing insight into memory systems, cycle accurate mode accurately determines system performance and measures the effects of optimization efforts.

Flexible Trace Clock

With its flexible trace clock interface, Green Hills Probe V4 can automatically adjust for timing skew between trace data and clock lines for more reliable trace collection.

TimeMachine

To realize the full benefit from trace data collected with Green Hills Probe V4, the TimeMachine extends Green Hills Software's MULTI Integrated Development Environment:

- Identify and fix race conditions and timing issues
- Visualize and quickly understand code in order to debug and tune for performance
- Accelerate the debugging cycle by capturing and replaying hard to reproduce problems
- Run and set breakpoints and view data backwards in time in program execution

TimeMachine enables the MULTI Debugger to run, step and analyze your program forward and backward in time to find the root cause of problems.

Specifications

- 4GB of trace memory
- High Speed Serial Trace (HSST) support
  - 4x 12.5Gb serial trace lanes (8b10b encoding)
  - 5x 10Gb serial trace lanes (8b10b encoding)
  - 6x 6Gb serial trace lanes (8b10b encoding)
- Parallel trace support
  - 250MHz x 32 bits single-data rate
  - 250MHz x 16 bits double-data rate
- JTAG debug support
  - 2.5 kHz - 120 MHz JTAG clock with high data payload utilization
  - 1.65 V - 5 V target voltage
- Target interface ports
  - Debug/Trace connector with 40 Gbps aggregate bandwidth and reversible connector and screw retention
  - USB 2.0 Type A port with 5V/2.4A power output
    Supports select USB serial port adapters for monitoring target serial ports
  - Molex 43045-1001 10-position connector for target power and control
    12V/2.6A power supply, with a maximum of 2A per pin
    Four programmable general purpose input/output (GPIO) pins
    GPIO pins may be bridged to emulate a button push
  - Trigger input and output
    SMB in: > 1M Ohm, 0-5.5 Volts, 150 ns delay
    SMB out: 110 Ohm, 0-3.3 Volts, ‹1 sec delay
  - Front-facing switched gigabit Ethernet port for switching and tracing target network traffic
- Host connectivity
  - USB 3.0 SuperSpeed Type B port
    Console concurrently presented to host, along with the MULTI debug interface, as a serial port for direct probe command-line access using a standard terminal program
  - Rear-facing gigabit Ethernet
- User interface
  - Configurable multi-line monochrome LCD panel with probe information
  - Two buttons to control LCD panel display
  - Loudspeaker
- Physical
  - 5.75 x 5.56 x 1.68 inches (width x length x height)
  - Molded plastic case with painted steel endplates
  - 1.25lbs
  - 4x 6-32 inserts in base for mounting
    0.25 inches minimum depth
  - Debug/Trace connector cable length: 23 inches
  - Debug/Trace connector cable minimum bend radius: 0.125 inches

- Power
  - 12VDC, 5A center positive
  - 2.0mm ID x 5.5mm OD male jack on probe
- Environmental
  - 0-50 degrees C
  - up to 85% non-condensing humidity
- Regulatory Compliance
  - FCC Class A
  - EN 61326-1
  - RoHS-compliant
  - Assembled in USA

Debug pods

The Green Hills Probe V4 can be configured to support parallel trace and JTAG target connections via the TE trace pod or serial trace targets via the High-Speed Serial Trace (HSST) pod.

It supports a broad range of target adapters including:

- Arm CoreSight-10
- Arm CoreSight-20
- Arm ETM/CoreSight MICTOR
- Arm-14
- Arm-20
- COP
- CoreSight HSSTP
- EJTAG2.5
- EOnCE
- Intel MIPI60
- MIPI-60
- MIPS PDTrace
- Nexus HP50
- Nexus HS22 (Aurora-11)
- Nexus HS34 (Aurora-17)
- Nexus HS70 (Aurora-35)
- Nexus MICTOR
- TI-14
- Tricore
- Xilinx-14

TE trace pod
(for parallel trace and JTAG target connections)

HSST pod
(for serial trace targets)

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