

# Technical Data for System Navigator for AMD Geode™ GX and LX Processors

The System Navigator is designed to support the special features and integrated peripherals of the highly integrated AMD Geode™ GX and LX processors. Special “silicon hooks” for software debug and system testing have been jointly developed with AMD and are integrated into the processor. These On-Chip Instrumentation (OCI™) extensions allow FS2 to provide a powerful debug tool with advanced features at a competitive price.

The System Navigator is contained in a compact chassis that connects to the target system using a 14-pin debug connector. The system runs on a Windows® 2000/XP PC over an USB 2.0 port or optional 10/100 Ethernet connection. A graphical, source debugger program, GDB/Insight, provides the user with an intuitive, easy-to-use interface.

## Software Breakpoints

An unlimited number of software breakpoints can be set anywhere in the physical address space of the processor. The software breakpoints use the INT 1 instruction (0xF1 opcode). The debugger uses a software breakpoint when the breakpoint address area is in RAM or other memory space that is writable.

## Hardware Event Recognizers

The Geode GX and LX processors have 10 event recognizers that can generate triggers to control breakpoints. The most basic use of recognizers is for hardware execution breakpoints. Unlike software breakpoints, hardware execution breakpoints allow the user to step through code and set breakpoints in ROM or flash memory. Like their software counterparts, they stop the program just prior to an instruction being executed. For more sophisticated debugging, the event recognizers can monitor bus activity for data cycles or I/O transactions.

(Cont. on page 2)

## Features Overview

- Utilizes On-Chip Instrumentation (OCI™) debug extensions in the Geode GX and LX processors
- Read-write all CPU registers, machine-specific registers (MSRs), memory, and I/O
- Go, halt processor run control
- Single step by assembly instruction
- Unlimited software breakpoints
- Real-time on-chip trace collection
- On-chip trace depth 128 x 64-bit frames
- Flash programming support
- Load binary and Intel Hex file formats
- Hardware execution breakpoints using debug registers
- Complex triggers can monitor address and cycle type
- Low-level access to JTAG functions for silicon verification
- Single line assembler and disassembler
- Trace window with full trace decode into instruction mnemonics
- Includes GNU-based GDB source level debugger
- Source window provides execution control: go; halt; goto cursor; step over/into call
- Source window can set or clear software or hardware breakpoints
- Trigger window for setting complex triggers
- Command-line interface with Tcl/tk scripting language standard



Four of the event recognizers can be combined in a 1-2 or 3-4 arrangement to produce two “super events” that specify an address range. Two of the events are opcode recognizers that trigger when a specific opcode or class of opcodes is about to execute.

**Real Time Trace**

The System Navigator collects trace information that is decoded and displayed as executed instructions. Trace is captured in on-chip memory with trace depth of 128 x 64-bit frames. The trace window displays disassembled instructions interspersed with special messages such as occurrence of interrupts.

**Graphical User Interface**

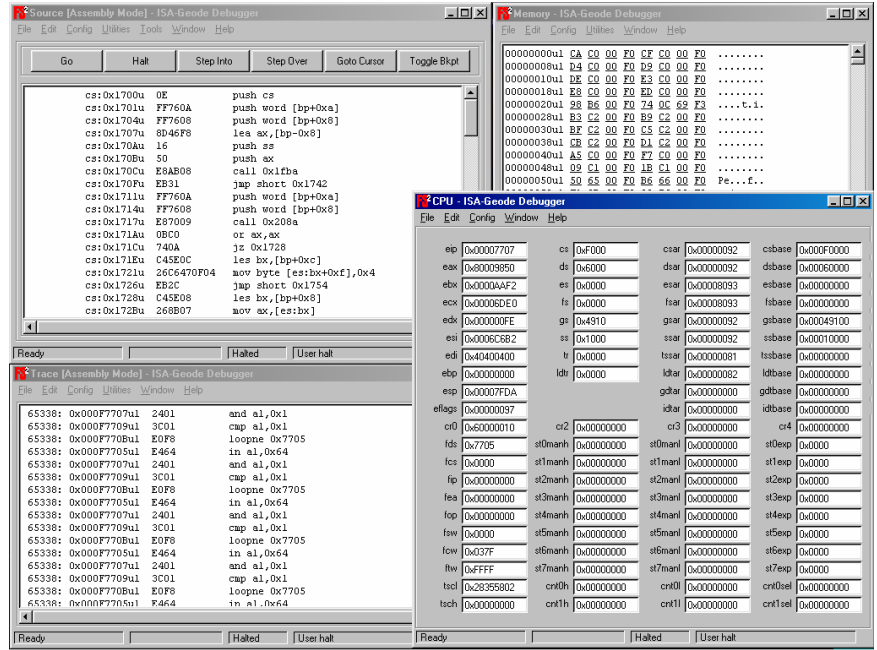
The System Navigator has an easy-to-use graphical debugger interface. The multiple windows of the interface are tightly integrated to the trigger and trace features. The source window displays assembly code and buttons for commonly used features such as go, halt, step-into, step-over, and execute to cursor. Additional windows include the CPU window to display and edit registers, Memory window to display a range of memory or I/O space, Trigger window to set up the 10 available event recognizers, and a Trace window to display execution history. The software includes GNU-based GDB source level debugger and optional eXDI driver for Windows CE debugging.

**FS2 Command line interface**

The System Navigator also includes a command line interface (CLI). The CLI can be used as both an interface and also for writing sophisticated automated sequences of tasks such as regression tests. The CLI is based on the widely used Tcl/tk command language.

**Testing**

A comprehensive self-test capability is included with the System Navigator. For system verification, a loop-back board is provided which is plugged onto the end of the



**FS2 Graphical User Interface**

target interface cable. The self-test process exercises internal nodes and tests to insure the cable signal integrity.

**Host Requirements**

Windows based PC with minimum 32M bytes of memory, USB 2.0 port or 10/100 Ethernet (optional) and Windows® 2000/XP operating system are required.

**Product Codes**

- SNAV-GX-USB System Navigator USB 2.0
- SNAV-GX-ETH As above, with 10/100 Ethernet



MIPS Technologies Inc.  
 First Silicon Solutions  
 1260 NW Waterhouse Ave., #100  
 Beaverton, OR 97006-5794

Ph. (503) 597-5091  
 Fax (503) 597-5098  
 http://www.fs2.com  
 fs2info@mips.com

FS2 is a division of MIPS Technologies, Inc. © 2007 MIPS Technologies, Inc. MIPS, MIPS32, MIPS-Based, 4K, 24K, 34K, PDtrace, FS2, First Silicon Solutions, Bus Navigator, System Navigator, OCI and System Navigator Pro are trademarks or registered trademarks of MIPS Technologies, Inc. in the United States and other countries. All other trademarks are the property of their respective owners.