

TriCore™ Architecture and Hitex Solutions



Architecture Overview

TriCore is the first single-core 32-bit MCU-DSP architecture optimized for real-time embedded systems which truly unifies the best of three worlds: real-time capabilities of microcontrollers, computational prowess of DSPs, and the highest performance/price implementations of RISC load-store architectures.

The TriCore architecture is implemented as a family of cores that offer tremendous scalability in terms of both price and performance. In fact, the native MCU-DSP capabilities of the architecture allow system designers to fine-tune the MCU and DSP performance in the software of each TriCore core.

MCU Features

- > Fast context switch & low interrupt latency
- > 16-bit and 32-bit instruction formats
- > Powerful bit manipulation support

TriCore Benefits

- > Integrated MCU-DSP instructions in one core
- > Fast and efficient processing of multiple tasks in one engine
- > Low code size and inherent high-level language support
- > One development toolset for both MCU and DSP tasks
- > Higher flexibility and lower costs

Processor Features

- > 32-bit load-store Harvard architecture
- > Superscalar execution
- > 16 address and 16 data registers



Support Packages & Starter Kits

Easy Evaluation with a Complete Starter Kit

If you are looking for easy evaluation and development using a 32-bit microcontroller, which offers maximum flexibility and high performance for your automotive or industrial applications, we have developed the perfect solution – the TriCore Starter Kits.

The TriCore Starter Kits provide all hardware and software necessary for evaluating Infineon's high-performing 32-bit single-chip microcontroller, and can be used for the development and testing of microcontroller systems. It is perfectly suited to the development and testing of your microcontroller systems.



Hardware

The TriBoard evaluation boards include all components needed to familiarize yourself with TriCore features

- > 4MB external memory
- > Interfaces that connect to external hardware such as extension boards or debugger
- > Wiggler interface for direct connection to PC via parallel cable (included) for software download, flash programming and debug

All starter kits can be obtained directly from Hitex.



TriCore Board Support Package

The TriCore Board Support Package consists of:

- > DAVe Digital Application Virtual Engineer – Automatic Startup Code Generation
- > GNU C / C++ Compiler for TriCore Demo Version
- > DAC – Development Assistant for C – evaluation version
- > Tassy – The Invaluable Test Tool – evaluation version
- > eLinux – real-time operating system
- > HiTOP5 – ultimate and class-leading user interface from Hitex – code size limited version (64k)

The latest release supports all existing and just recently released TriCore derivatives. Besides the automotive derivatives TC17xx, the new TC11xx and the TC19xx are also fully supported. The debugger communicates via the parallel port to the the starter kit's on-board „wiggler“. No additional debug hardware is necessary.

JTAG Debugging & Trace Emulation

The Upgradable Solution for Real-time Debugging

The basic Tanto TriCore system consists of the universal Tanto Base module and a TriCore-specific Port Link module (TantoPL-TriCore) that allows the direct connection of the test and analysis tool to the OCDS port in the target system. Together with our HiTOP high-level language debugger, Tanto provides software breakpoints in addition to the integral hardware breakpoints and complex triggers supported by the OCDS.

It also implements "on-the-fly" access to any internal or external memory location plus internal special function register in real-time. PCP debugging is fully implemented, offering special triggers, disassembly of the PCP code, and high-level language support. The PCP can be controlled independently from the TriCore CPU, allowing PCP execution to be halted while the TriCore program is still running. The synchronous break of the PCP and TriCore is also available.



TantoPT TriCore – The Extension for Program Flow Analysis

The TantoPT module offers enhanced functions for debugging complex systems in real-time. It supports the second OCDS level, and adds a powerful hardware trace module to record 1 M trace frames with timestamps. A special hardware filter eliminates redundant information coming from the OCDS trace port ensuring optimal usage of Tanto's trace memory.

Compared to an unfiltered trace, this allows up to 5 times more data to be recorded. Traced information is freely accessible during emulation without disturbing program execution. As each trace frame contains a timestamp (10 ns resolution), a statistical performance analysis can be carried out. The full trace functionality is also available for the PCP, allowing qualified trace recording, and various trigger possibilities.

The trace data can be displayed in numerous formats, including execution traces and signal traces, to allow the best possible analysis. The linking of the trace to the source window and to a powerful (hardware integrated) search engine facilitate rapid navigation in the recorded data, and provide a complete overview of the program flow. Tanto's fast analysis algorithms allow an immediate display of the recorded data on the user's screen, even while the CPU is still running. Thus, the trace data can be searched and analyzed without real-time violation.



HiTOP User Interface & Unit Tests with Tessy

HiTOP Debugger

Our universal user interface HiTOP supports very sophisticated HLL-Debugging, and allows an easy transition between different types of tools and CPU platforms. The HiTOP debugger offers software and hardware breakpoints and implements fast-breaks for on-the-fly access to any memory and internal register. The on-chip Flash memory is fully supported by HiTOP and can directly be programmed using user-friendly commands.

HiTOP supports the following compilers:

- > Tasking C/C++/EC++
- > Green Hills C/C++/EC++
- > HighTec GNU C/C++ (on request)

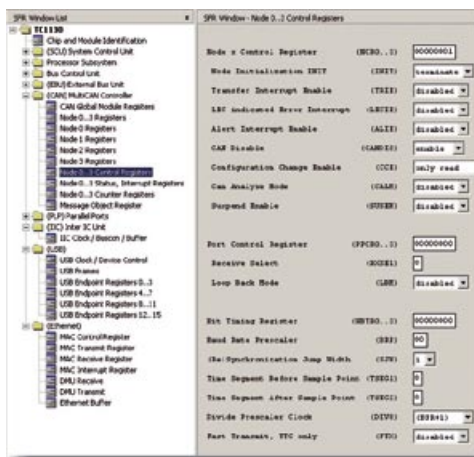
The Operating Environments

HiTOP supports all leading compilers and their object formats. Many third-party tools are well integrated with HiTOP because of the acceptance of HiTOP as standard emulation control software. HiTOP also supports all major embedded real-time operating systems, giving a fully transparent overview of your whole software system at any time by displaying information such as task lists, the status of a specific task, message queues, delays, and memory objects.

Tessy: Automated Unit Test

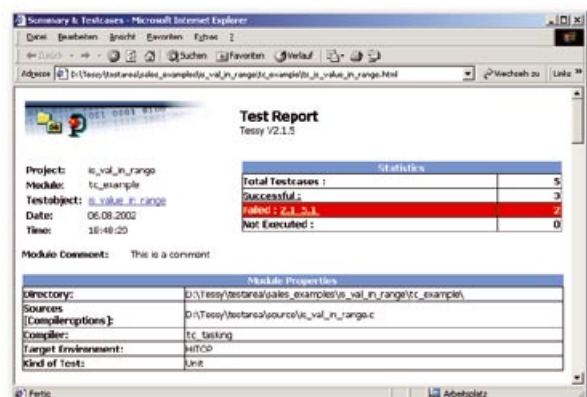
Tessy performs automatic and dynamic unit testing of embedded software and facilitates all other aspects of software testing. It helps increase productivity and save time during an embedded development project, particularly when it comes to regression testing. Regression testing itself is a key feature in achieving software quality:

- > Automated unit testing of embedded software
- > Easy to begin use
- > Saves test data for re-use
- > Ideal for regression testing
- > Unlimited number of test cases
- > C1 code coverage
- > Test documentation in HTML format
- > ASAP2 support
- > Integrates with HiTOP
- > Includes CTE – Classification Tree Editor



HiTOP supports the following RTOS

- > CMX-RTX (CMX)
- > Nucleus Plus (Accelerated Technology)
- > PXROS (HighTec)
- > OSEK (ProOSEK, osCAN, ERCOSEK, VxWorks)



HiTOP Board Support Package for TriCore Starter Kit

Host Connections	LPT
Operating Software	HiTOP5
Run Control Functions	Run, Halt, Single Step, Line Step, 20 Software Breakpoints, 4 Hardware Breakpoints
Target Adaptation	Internally connected to OCDS Level 1

Tanto Base

Host Connections	USB (V1.1), Serial (115 kBaud), Ethernet (10BaseT)
Operating Software	HiTOP5
Run Control Functions	Run, Halt, Single Step, Line Step, 20 Software Breakpoints, 4 Hardware Breakpoints
External Signals	Trigger out, Trigger in
Operating Voltage	Supports Debug Port voltages between 1.8 and 5.0 Volts
Dimensions	100 x 36 x 80 mm (W x H x D)
Target Adaptation	Directly to OCDS Level 1 connector, or via combined footprint adapter*

Tanto Port Trace (PT)

Trace Depth / Trace Width	1M frames / 32 channels
Trigger Functions	4 triggers (each with an associated counter), 4 level sequencer, qualified trace recording (depending on the functionality of supported chip)
Time Measurements	Time stamps with 10 ns resolution
Supported Frequencies	Up to 133 MHz (200 MHz in preparation)
External Signals	8 I/O signals (configurable: 4 in plus 4 out, or alternatively 8 in)
Operating Voltage	Supports Debug Port voltages between 1.8 and 5.0 Volts
Dimensions	100 x 17 x 125 mm (W x H x D, Tanto PT module), 100 x 36 x 179 mm (with Tanto Base)
Optional Expansion Module	Tanto Data Probe (8 I/O signals)
Target Adaptation	Directly to OCDS Level 1 connector, or via combined footprint adapter *

* merges OCDS Level 1 and OCDS Level 2 signals to one interface

Supported Derivatives

Derivative	Package	f _{max}	Proposed Port Trace Connector	Related Applications
TC1130	P-LBGA208	150MHz	HS, HS-C	Industrial / General Purpose
TC11B	P-BGA338	100MHz	HS, HS-C	Industrial / General Purpose
TC1765	P-BGA260	40MHz	LS, HS, HS-C	Automotive
TC1775	P-BGA329	40MHz	LS, HS, HS-C	Automotive
TC1796	P-LBGA416	150MHz	HS, HS-C	Automotive
TC1910	P-BGA256	100MHz	HS, HS-C	Infotainment
TC1912	P-BGA256	100MHz	HS, HS-C	Infotainment
TC1920	P-BGA256	100MHz	HS, HS-C	Infotainment
IWORX (PXB/PXF 4225)	P-BGA388	120MHz	HS, HS-C	Communication Network
Harrier-XT	P-BGA272	50MHz	LS, HS, HS-C	ATM/HDLC Access Networks

If you don't find your derivative in this list, please contact your local Hitex representative!

Type LS: Standard (low speed) connector
 Type HS: High speed connector
 Type HS-C: High speed combined connector.



Main Office Germany
 Greschbachstraße 12 Tel. +49-721-9628-0
 D-76229 Karlsruhe Fax +49-721-9628-149
 E-mail sales@hitex.de

Visit us on the internet! www.hitex.com or www.hitex.de

Hitex USA
 2062 Business Center Drive, Suite 230 Irvine, CA 92612
 Tel. 800-45-HITEX
 Tel. +1-949-863-0320
 Fax +1-949-863-0331
 E-mail info@hitex.com

Hitex UK
 Warwick University Science Park GB-Coventry CV4 7EZ
 Tel. +44-24-7669-2066
 Fax +44-24-7669-2131
 E-mail info@hitex.co.uk

Hitex Asia
 25 International Business Park, #04-62A German Centre Singapore 609916
 Tel. +65-6566-7919
 Fax +65-6563-7539
 E-mail sales@hitexasia.com.sg

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