Low Cost Solutions for Chip and Board Level Testing

Complex mixed signal semiconductors, subassemblies and circuits have traditionally been tested in production by large, expensive ATE systems. Developers and designers used slow, individual bench instruments or had to negotiate for time on production equipment.
A modular system based around a programmable, high-speed real-time controller provides a cost-effective platform for implementing a low-cost, reconfigurable mixed signal tester.
The modular system can contain:
Parallel analogue I/O modules, parallel digital I/O modules, digital input modules with individual thresholds (comparator inputs), I/O modules with waveform storage buffers, multi-function counter-timers; all managed by a deterministic, high-speed control system. FLASH programming functionality can even be added, combining the testing and programming steps into a single stage.

Designing, prototyping, and testing products such as mass market ICs and boards for electronic toys, cheap control units for domestic appliances, electronic tools, and many other applications require strongly integrated digital and analogue acquisition and signal generation hardware. Providing all these functions in a single system gives many advantages in speed and co-ordination of operation and ease of implementation.

- Flexible selection of many different analogue and digital I/O modules
- Scalable number and type of I/Os
- Synchronized functions and precise timing between all I/O modules
- High-speed system with deep onboard memory
- Ethernet based communication interface allows multiple distributed test systems at a single PC or workstation
- Excellent driver support under Windows, Linux, Unix, ...
- Code compatibility across different system configurations and sizes
- FPGA based modules provides nanosecond precision for customized functions in I/O modules, e.g. special hardware triggers, or interfaces like SPI or I2C
- Real-time reaction times of 300ns

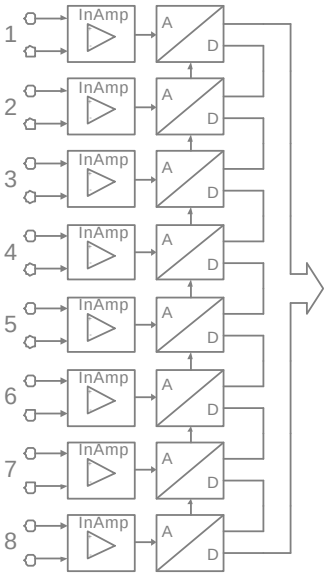
Key Application Characteristics

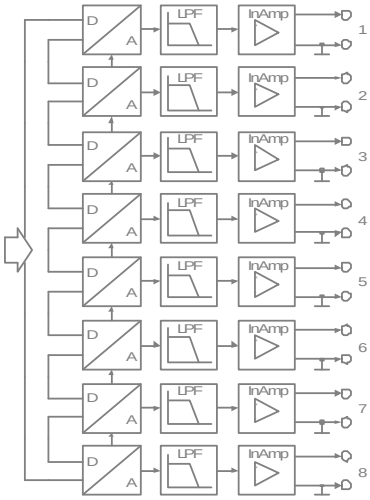
- Multi-channel arbitrary, analogue and digital waveform generator
- Synchronized analogue/digital stimulation of the Device Under Test

- Simultaneous measurement of DUT response with parallel analogue/digital inputs
- High-speed, multi-function testing
- Extremely fast, real-time DSP control
- Adaptive FLASH programming

Synchronized analogue/digital Stimulation of the Device Under Test

For high-speed arbitrary waveform generation and the stimulation of the DUT the ***ADwin***-Pro system is fitted with analogue and digital output modules. The analogue output modules are designed with parallel outputs; thus all channels can be updated synchronously, eliminating phase shift between the channels. Parallel updating allows multiple, correlated waveforms to be output, often essential for determining timing characteristics or device response. Each channel is fitted with an individual DAC and update register, so new values can be written to the registers and then all DACs triggered for simultaneous updating.





Modules are available with 8 or 4 channels. Modules can be paralleled to give higher numbers of simultaneous outputs all triggered from a single command, with update rates into the MHz range.

Waveforms can be stored in a local RAM buffer on the I/O module. This buffer can be arbitrarily allocated across outputs, the entire buffer can be allocated to a single output or each output can use a portion of the memory. Outputs can loop through their buffer at individual update rates.

Using the DSP controller, output waveforms can be generated in real-time or mathematically from the results of analogue or digital inputs. This allows adaptive, real-time control or programming of the test device.

Measuring the DUT Responses

Phase shift between measurement channels is eliminated by using parallel analogue input modules with a synchronous trigger. This is of benefit when measuring multiple, correlated signals or determining signal timings or phase. Modules with 4 or 8 individual ADC’s are

available. Multiple modules can be simultaneously triggered to allow the acquisition of large numbers of synchronized signals

Each module is fitted with internal RAM, which can act as a buffer for extended, high-speed acquisition into MHz sample rates. Alternatively, individual inputs can be read directly by the DSP for adaptive control feedback, pre-processing or intelligent triggering algorithms.

FPGA Provides Nanosecond Precision for Customized Functions

The new digital and analogue I/O modules for the ***ADwin***-Pro system are equipped with programmable FPGAs, that offer the implementation of application-specific functions at a digital gate level.
Digital functions not available on standard I/O modules can be included via VHDL code on these modules. For example: sequence controlling, custom counters, specific serial interfaces - SPI, Manchester-Code, I2C, etc.
An equivalent analogue input module with 4 or 8 ADCs, FPGA and RAM is available. This module forms the base for implementing extremely fast, VHDL programmable, customer-specific functions for pre-processing of the analogue signals at a digital gate level.

Implementation of FPGA based solutions extends the processing speed of the ***ADwin*** system from microsecond cycle times down to nanoseconds. More complex devices can be tested and test times can be reduced which, when combined with the simple programming structure and adaptable, modular hardware; brings great cost benefits to the test and development engineer.