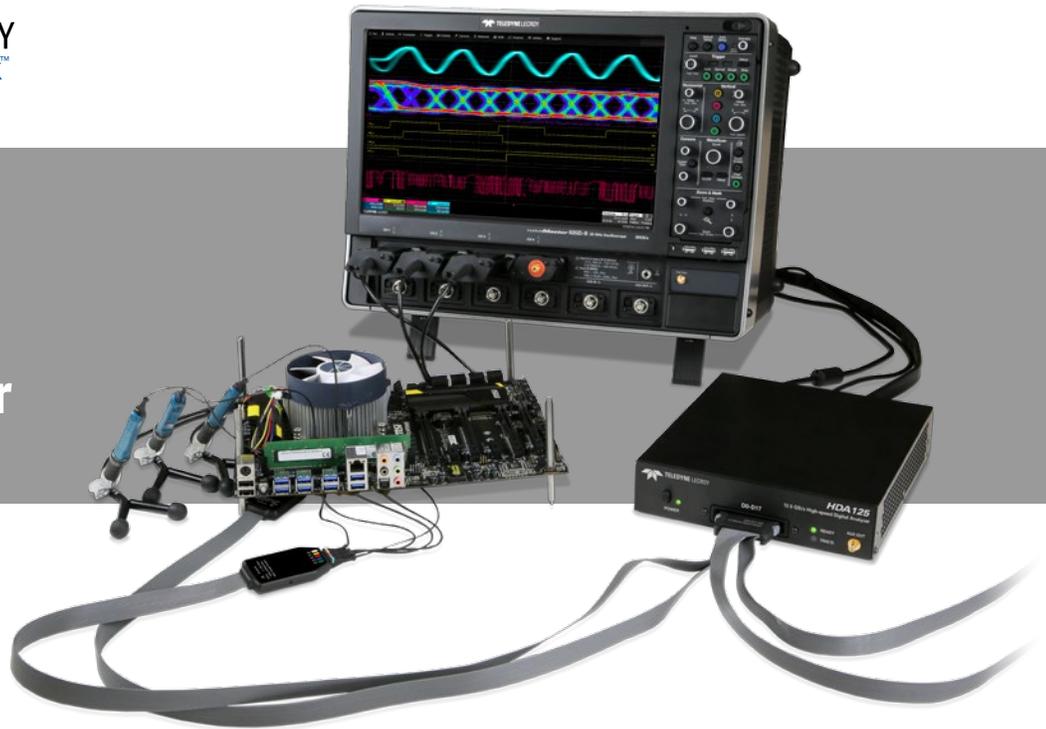


# HDA125 High-speed Digital Analyzer



## Key Features

- 12.5 GS/s sampling rate for 80ps timing accuracy
- 3 GHz leadset for capturing digital signals up to 6 Gb/s
- Add high-speed mixed-signal capability to your Teledyne LeCroy high-bandwidth oscilloscope
  - LBUS connection for precise timing synchronization
  - USB 3.1 for fast data transfer
- Unique QuickLink probing system
  - Differential solder-in tips with 9-inch lead simplify access to difficult test points
  - Ultra low loading for superior performance
  - 6 GHz bandwidth tips are compatible with both HDA digital leadset and Teledyne LeCroy WaveLink differential analog probes for unmatched acquisition flexibility

The HDA125 transforms your Teledyne LeCroy oscilloscope into the highest-performance, most flexible mixed-signal solution for high-speed digital debug and evaluation. With 12.5 GS/s digital sampling rate on 18 input channels, and the revolutionary QuickLink probing solution allowing seamless transitions from digital to high-bandwidth analog acquisitions, validation of challenging interfaces such as DDR4 has never been simpler or more comprehensive.

## Complete Embedded System Debug

Modern embedded systems increasingly utilize high-speed digital buses, posing new and evolving challenges to validation and debug engineers. While analog signal-integrity characterization is a critical part of this process, the ability to decode and trigger on related digital buses is becoming a vital capability. The HDA125 High-speed Digital Analyzer addresses this need with the most flexible solution available.

## Unique probing solution

One of the most challenging aspects of high-speed embedded test is simply getting the signals from the system under test to the instrumentation with

sufficient fidelity. The HDA125 is built around Teledyne LeCroy's revolutionary QuickLink probing concept - enabling high signal quality, easy access to remote test points, and simple transitions from digital to analog probing.

## Enhanced DDR Debug

Teledyne LeCroy already offers the industry's only dedicated DDR Debug Toolkit, designed to simplify challenging memory interface validation. Adding the HDA125 allows the DDR command bus to be directly acquired and integrated into the analysis, enabling advanced command triggering and sophisticated, searchable bus state viewing.

# THE MOST FLEXIBLE MIXED-SIGNAL TEST SOLUTION

The HDA125 High-speed Digital Analyzer is a key building block in the most powerful, flexible mixed-signal test system available. It integrates seamlessly with Teledyne LeCroy oscilloscopes and probing solutions for an unprecedented level of full-system visibility.

## 1. 12.5 GS/s digital acquisition

With 80ps between samples, the HDA125 provides the high sample rate and precise timing accuracy required to capture today's high-speed embedded signals.

## 2. 3 GHz digital leadset

The HDA-DLS leadsets connect the HDA125 to Teledyne LeCroy's unique QuickLink probe tips via low-profile 4- and 5-way comparator "pods". Leadsets are available in 18-channel and 9-channel models.

## 3. QuickLink probe tips

6 GHz differential probe tips with 9-inch lead length provide easy access to challenging test points. Tips are inexpensive, allowing an entire DUT to be equipped cost-effectively.

## 4. LBUS synchronization

The HDA125 synchronizes natively with Teledyne LeCroy oscilloscopes using the LBUS interface, enabling precise timebase synchronization and simple cross-triggering.





### 5. USB 3.1 data transfer

Data transfer from the HDA125 is accomplished via a USB 3.1 interface to maintain oscilloscope responsiveness.

### 6. Digital waveform display

Display digital waveforms acquired by the HDA125 appear directly on the oscilloscope's display, fully time-correlated with the scope's high-bandwidth analog traces.

### 7. Bus decodes

Combine multiple digital traces into a single decoded bus display, for easy readability and more efficient use of screen space.

### 8. Digital triggering

Trigger the oscilloscope on parallel bus states (clocked or un-clocked) from the HDA125.

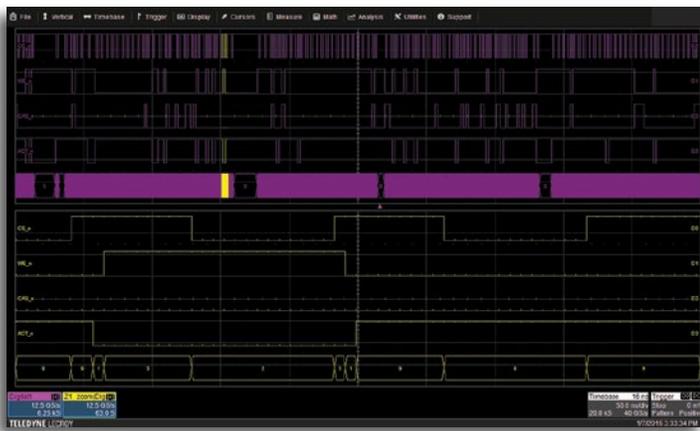
### 9. Simplified analog probing

The included 6 GHz QuickLink probe tips can be connected to Teledyne LeCroy WaveLink probes using adapters. This flexibility allows an entire DUT to be equipped with one kind of tip, making testing quicker and easier.

### 10. Enhanced DDR debug

The HDA125 enables acquisition of DDR command bus signals, adding significant functionality to Teledyne LeCroy's unique DDR Debug Toolkit.

# HIGH-SPEED DIGITAL CAPTURE AND DISPLAY



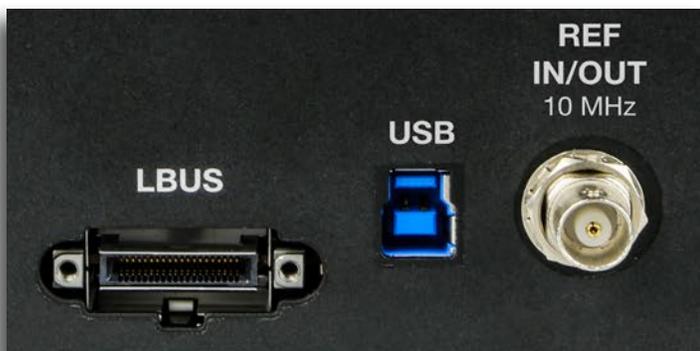
## High-speed Sampling with Superior Sensitivity

The HDA125 samples 18 input signals at 12.5 GS/s, for accurate characterization of the fastest signals. But sample rate is only half the story - high-speed embedded systems testing often poses very challenging signal amplitude conditions. The High-speed Digital Analyzer meets these challenges with ultra-low probe loading and industry-leading sensitivity (150 mV minimum signal swing). The most precise threshold settings are ensured with a unique hysteresis adjustment capability, and three times better threshold accuracy than competing mixed-signal instruments.



## Acquisition Synchronization and Cross-triggering

The HDA125 connects to Teledyne LeCroy oscilloscopes using an LBUS connector, enabling the digital channels to be acquired with the same timebase accuracy and triggering synchronization as a built-in mixed-signal solution. A USB 3.1 interface provides high-speed transfer of the acquired digital data to the oscilloscope. And the modular design allows you to better leverage your investment by sharing digital capability between existing instruments.



## Enhance Existing Oscilloscope Capabilities

The HDA125 connects using the LBUS connector and synchronization infrastructure, allowing you to add high-speed digital acquisition and analysis capabilities to your existing laboratory oscilloscopes - no need to update the entire instrument just to add new functionality.

# THE MOST ADVANCED DDR ANALYSIS

## Command Bus Capture for Full Interface Visibility

Basic debugging and validation of embedded DDR interfaces typically involves analysis of the analog properties of the clock, data (DQ) and strobe (DQS) signals - and Teledyne LeCroy's DDR analysis tools are established industry leaders in this application. But when validation tasks become more complex and problems require deeper insight, the ability to trigger on, acquire and visualize the state of the DDR command bus is invaluable. The HDA125 brings command bus acquisition to Teledyne LeCroy's already comprehensive toolset, providing the ultimate in memory bus analysis capability.



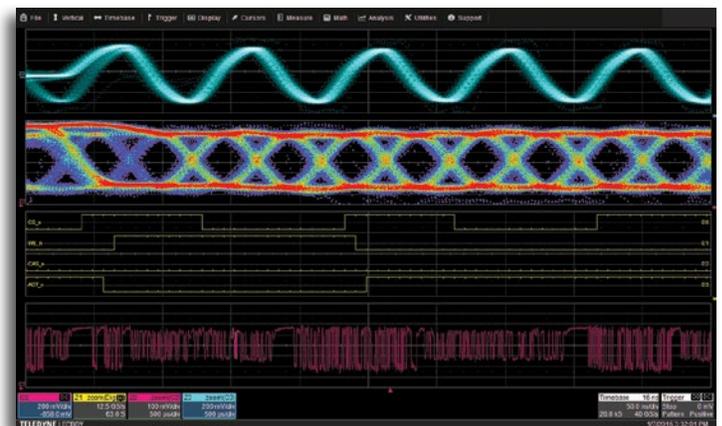
## Analyze Bus Activity

The HDA125 enables the unique “bus view” feature of the DDR Debug Toolkit, which brings Teledyne LeCroy's advanced bus analysis feature set to bear on DDR analysis. View bus activity in tabular form, and move time-correlated views to a desired event with the touch of a button. Search for specific events and bus states within the acquired record. Intuitive color overlays and annotations make it easy to identify areas of interest in the acquired analog waveforms.



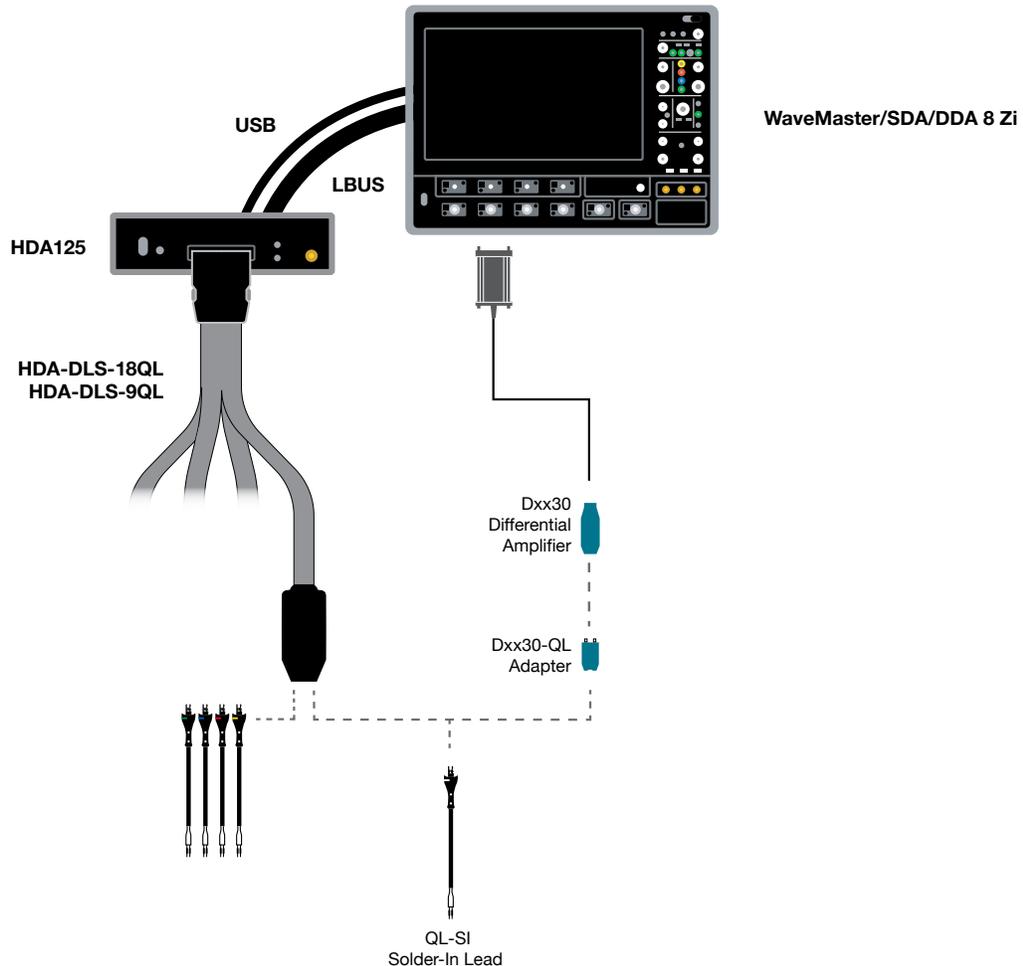
## Trigger on DDR Commands

The ability to trigger on specific states of the command bus becomes an invaluable tool for quick understanding of DDR signal quality. The HDA125's logic triggering combines with the DDR Debug Toolkit's intuitive setup and intelligent software cross-triggering to provide the ultimate DDR triggering system. Persistence maps of read and write bursts provide an easy and fast means of identifying subtle signal-quality problems for further investigation.



# ULTIMATE PROBING FLEXIBILITY

The QuickLink probe tip system was designed from the ground up to be compatible with both the HDA125 High-speed Digital Analyzer system, and with Teledyne LeCroy's WaveLink series of differential analog probes. This cross-connection ability allows you to equip your system under test with QuickLink tips at all desired test points, and swap connections between digital and analog acquisition systems as needed.



## High Signal Fidelity

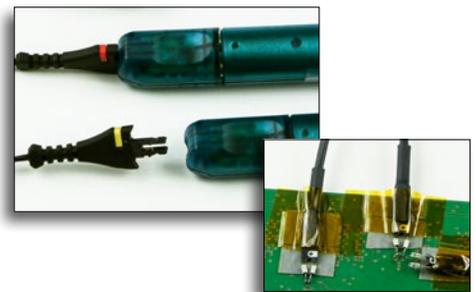
When connected to a WaveLink analog probe, QuickLink tips provide 6 GHz of bandwidth and a flat, well-controlled frequency response. When used for digital acquisitions with the HDA125, they support 3 GHz bandwidth with industry-leading sensitivity. In both cases, high input impedance ensures minimal loading of the system under test.

## Easy to connect

Unlike other "consumable" probe tip solutions which rely on tiny, delicate tips located very close to the device under test, the QuickLink solder-in tip has an integral 9-inch lead. This effectively relocates your test point to a more convenient location, making testing more reliable by eliminating torque and other forces on the solder joints.

## Cost-effective

QuickLink solder-in tips are low-cost, making it easy to equip multiple test points and DUTs, and eliminating time-consuming re-soldering of connectors.



# SPECIFICATIONS

## HDA125

Input Channels	18 (with HDA-DLS-18QL), 9 (with HDA-DLS-09QL)
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### Vertical System (when using HDA-DLS-xxQL)

Threshold Setting	±5V, settable per channel
Threshold Selections	TTL, ECL, CMOS (2.5 V, 3.3 V, 5 V), PECL, LVDS or User Defined
User-defined Threshold Resolution	5mV
Maximum Input Voltage (non-destruct)	±15V on any single ended input ±15V max differential
Threshold Accuracy	±(25mV + 3% of threshold setting)
Input Dynamic Range	±10V on any single ended input ±7.5V max differential
Minimum Input Voltage Swing	150 mV p-p
Input Impedance	QL-SI tips: 110 kΩ, 0.12pF differential
Digital Bandwidth	3 GHz
User Defined Hysteresis Range	30mV - 600mV
User Defined Hysteresis Resolution	5mV

### Acquisition System

Maximum Sample Rate	12.5 GS/s
Maximum Input Bit Rate	6 Gb/s
Maximum Acquisition Memory	256 MS (depending on configuration and acquisition settings of connected oscilloscope)
Minimum Detectable Pulse Width	167ps
Channel-to-Channel Skew	±160ps

### Trigger System

Trigger Types	Edge, digital pattern, digital state (clocked pattern)
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### Interface

Acquisition/trigger Synchronization	Teledyne LeCroy LBUS
Data Transfer	USB 3.1 Gen1 (compatible with USB 2 hosts)
Reference Clock	10 MHz reference clock in/out (not required to synchronize with oscilloscope when using LBUS)

### Power Requirements

Voltage	12 VDC
Max Power Consumption	60 W

### Environmental

Temperature	Operating: 5°C to 40°C; Non-Operating: -40°C to 70°C
Humidity	Operating: 5% to 90% RH (non-condensing), 75% RH Max above 30°C, 45% RH Max above 40°C Non-Operating: 5% to 95% relative humidity (non-condensing) as tested per MIL-PRF-28800F

### Physical

Dimensions (HWD)	57 mm H x 215 mm W x 272 mm D (including connectors and feet) 53 mm H x 215 mm W x 244 mm D (box only)
Weight (HDA125 only)	1.4 kg (3.0 lbs)
Shipping Weight	5.5 kg (12.0 lbs)
HDA-DLS-xxQL Leadset Length	1023 mm (40.27")

### Certifications

CE (LVD Directive 2006/95/EC)	IEC/EN 61010-1:2010, IEC/EN 61010-031:2015
CE (EMC Directive 2004/108/EC)	IEC/EN 61326-1:2013

# ORDERING INFORMATION

## Product Description

## Product Code

### High-speed Digital Analyzer Systems

12.5 GS/s High-speed Digital Analyzer with 18-channel QuickLink leadset and LBUS connection	HDA125-18-LBUS
12.5 GS/s High-speed Digital Analyzer with 9-channel QuickLink leadset and LBUS connection	HDA125-09-LBUS

### Additional High-speed Digital Leadsets

18 channel QuickLink leadset for HDA125 - includes 18 QuickLink Solder-In tips and carrying case	HDA-DLS-18QL
9 channel QuickLink leadset for HDA125 - includes 9 QuickLink Solder-In tips and carrying case	HDA-DLS-09QL

### Replacement QuickLink Probe Tips

9-pack of replacement QuickLink Solder-In tips	QL-SI-9PACK
Single replacement QuickLink Solder-In tip	QL-SI-1PACK

### QuickLink Analog Probe Adapters

QuickLink Adapter for use with Dxx30 amplifiers	Dxx30-QL
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## Customer Service

Teledyne LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years and our probes are warranted for one year. This warranty includes:

- No charge for return shipping
- Long-term 7-year support
- Upgrade to latest software at no charge



1-800-5-LeCroy  
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Local sales offices are located throughout the world.  
Visit our website to find the most convenient location.