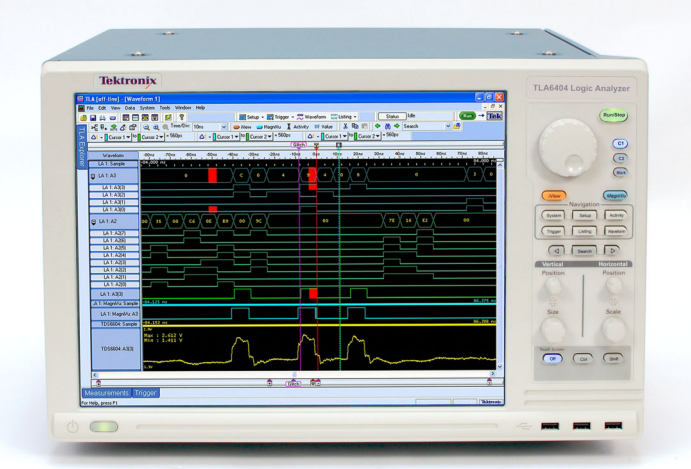
Tektronix Logic Analyzers

TLA6400 Series Preliminary Data Sheet



Features & Benefits

- Comprehensive Set of Signal Integrity Tools that Allow You to Quickly Isolate, Identify, and Debug Complex Signal Integrity Issues
  - Glitch Trigger and Storage – Allows you to trigger on and highlight potential signal integrity problems. Not only can the TLA6400 Series trigger on the problem, but by highlighting suspected problems in red, you will be able to easily determine which signals you need to investigate further
  - iCapture – Route the suspected signal to the analog output of the TLA6400 Series using the exclusive Tektronix iCapture feature. This eliminates the need to double-probe with an oscilloscope probe, reducing time to debug
  - iView – Time-correlated view of both logic analyzer and oscilloscope data to trace the SI problem across the digital and analog domain
- Performance and Ease of Use to Debug, Validate, and Optimize Digital Systems
  - 40 ps Resolution MagniVu™ Acquisition to Accurately See Signal Relationships in Your System
  - State Speed – Sample your fastest synchronous buses with clock rates up to 667 MHz and data rates up to 1333 Mb/s
  - 15 in. Display, with Optional Touch Screen to See More of Your Data and Navigate Efficiently through Your Data
  - 4 Models with 34/68/102/136 Channels and Up to 64 Mb Record Length offer Flexible Solutions to Fit Any Budget
  - Drag-and-Drop Triggering – Simply drag any one of eight different trigger types from a table onto the waveform and the TLA will automatically set up the trigger conditions. Eliminates errors, improves repeatability, and saves time
  - Drag-and-Drop Measurements – Simply drag an icon from the measurement toolbar and drop it on your signal of interest and get a table of results. Saves time, removes complexity, and reduces measurement uncertainty

Applications

- Digital Hardware Validation and Debug
- Monitoring, Measurement, and Optimization of Digital Hardware Performance
- Embedded Software Integration, Debug, and Verification

Tektronix®

Efficiently Debug and Validate Your Digital System at a Price You Will Like!

The affordable TLA6400 Series of logic analyzers offer the performance needed to debug, validate, and optimize the functionality of your digital system. The TLA6400 Series also provides a comprehensive set of signal integrity debug tools that allow you quickly isolate, identify, and characterize elusive and hard-to-find problems. Add a broad range of support for today's applications, and you have the ideal tool to help you meet all of the debug challenges of today's digital designs.

The TLA6400 Series allows you to effectively validate and debug the functionality of your digital designs:

- Use the patented 25 GHz MagniVu technology to accurately measure timing relationships. The single, integrated acquisition architecture of the TLA6400 Series eliminates the timing skew problems inherent in other logic analyzer architectures
- Capture on buses with clock rates up to 667 MHz and data rates up to 1333 Mb/s
- Buy the capability you need now and upgrade as your measurement needs grow
- Quickly isolate events through a simple and intuitive drag-and-drop trigger setup
- Easily summarize your design's performance with sophisticated drag-and-drop measurements such as frequency, period, pulse width, duty cycle, and edge count
- View data in a variety of time-correlated formats including waveform, listing, graph, disassembly, source code, or compare

Find Tough Signal Integrity Problems

Today's logic analyzers not only need to help troubleshoot functional issues in your design, but also need to help find signal integrity problems caused by crosstalk, termination mismatches, ground bounce, and other issues. To help debug these problems, the TLA6400 Series includes a comprehensive suite of signal debug tools.

These tools allow you to:

- Use glitch trigger to monitor selected signals in your design and trigger when a signal integrity problem is found on any one of these signals
- Automatically tag any found signal integrity problems, allowing you to quickly identify the signals of interest
- Gain more insight into the problem using the exclusive iCapture functionality to view both digital and analog data through a single probe
- Use iView to see time-correlated digital and analog displays of your data, letting you track the signal integrity problem across both analog and digital domains

Leading Probing Solutions for Real-time Digital Systems Analysis P5900 Series Probes

No test and measurement solution is complete without probing and the consideration of its impact on your system and your measurement time. With the industry's lowest probe loading, the P5900 Series logic analyzer probes protect the integrity of your signal – minimizing the impact on your design. The P5900 Series logic analyzer probes when used with TLA6400 Series logic analyzers make sophisticated logic analysis available at an affordable price. Select from a variety of attachment mechanisms, including the high-density D-Max®, Mictor, and general-purpose.

- For applications where circuit board space is limited, the high-density P5960 offers the smallest available footprint and a quick connection mechanism
- With low loading capacitance, the P5900 Series can accurately acquire signals with faster edges without distorting the signal
- Flexible general-purpose probing, with support for 0.100 in. and 2 mm pin spacing, low input capacitance, and accessories for connecting to many industry-standard connections

TLA6400 Selection Guide

Characteristic	TLA6401	TLA6402	TLA6403	TLA6404
Channels	34	68	102	136
High-speed Timing	25 GHz (40 ps) with 128 Kb record length			
Maximum Timing Sample Rate (Half/Full channel)	3.2 GHz / 1.6 GHz			
Maximum State Clock Rate	333 MHz (standard) 667 MHz (with Option 1T)			
Maximum State Data Rate	667 Mb/s (standard) 1333 Mb/s (with Option 1T)			
Maximum Record Length	2 Mb (standard) 4 Mb (Option 1S) 8 Mb (Option 2S) 16 Mb (Option 3S) 32 Mb (Option 4S) 64 Mb (Option 5S)			
Analog Mux	4 fixed channels (standard) Any signal (user selectable) may be routed to 4 output BNCs with Option AM			
Probing Options (Order separately)	P5910 – 17-channel General-purpose Probe P5934 – 34-channel Mictor Probe P5960 – 34-channel D-MAX Probe			

Characteristics

TLA6400 Series

General

Characteristic	Description
Number of Channels (All channels are acquired including clocks)	
TLA6401	34 channels (2 are clock channels). Clock channels can also be used as qualifiers
TLA6402	68 channels (4 are clock channels). Clock channels can also be used as qualifiers
TLA6403	102 channels (4 are clock and 2 are qualifier channels). Clock channels can also be used as qualifiers
TLA6404	136 channels (4 are clock and 4 are qualifier channels). Clock channels can also be used as qualifiers
Channel grouping	No limit to number of groups or number of channels per group (all channels can be reused in multiple groups)
Time Stamp	54 bits at 20 ps resolution (>4 days duration)
Clocking/Acquisition Modes	Asynchronous/Synchronous 25 GHz MagniVu high-speed timing is available simultaneous with all modes

PC Characteristics

Characteristic	Description
Operating System	Microsoft® Windows® 7 Ultimate, 64-bit
Processor	Intel® Core i3-2120, 3.3 GHz, 3M Cache
Chipset	Intel® Q67 chipset
Memory	2 × 2 GB DIMM, 4 GB Total DDR3, 1066 MHZ, PC3-8500
Sound	Line In, Line Out, and Mic Out connectors
Removable Hard Drive	3.5 in., ≥500 GB Serial ATA, 7200 RPM
Optical Drive	Internal 4.7 GB DVD±R/RW
External Display Port Type	One (1) DVI-I (primary – digital and analog) connector and one (1) VGA connector
External Display Resolution	Up to 1920×1200 noninterlaced at 32-bit color, each for both primary and secondary displays
Network Port	Two (2) 10/100/1000 LAN with RJ-45 connector
USB Port	Five (5) USB 2.0 ports and two (2) USB 3.0 ports. USB ports can be disabled in BIOS

Integral Controls

Characteristic	Description
Front-panel Display	Size: 15 in. (38.1 cm) diagonal Type: Active-matrix color TFT LCD with backlight Resolution: 1024×768
Simultaneous Display Capability	Both the front-panel and one external display can be used simultaneously at 1024×768 resolution
Front Panel	General-purpose knob with dedicated hotkeys and knobs for horizontal and vertical scaling and scrolling
Touch Screen	Available with Option 18. Can be enabled/disabled with a front-panel button

Integrated View (iView™) Capability

Characteristic	Description
TLA Mainframe Configuration Requirements	GPIB-iView™ (Opt. 1C) USB-iView™ (Opt. 2C)
Number of Tektronix Oscilloscopes that can be Connected to a TLA System	1
External Oscilloscopes Supported	More than 100. For a complete listing of currently supported oscilloscopes, please visit our website http://www.tektronix.com/iview
TLA Connections	USB, Trigger In, Trigger Out, Clock Out
Oscilloscope Connections	
GPIB-iView™ (Opt. 1C)	GPIB, Trigger In, Trigger Out, Clock In (when available)
USB-iView™ (Opt. 2C)	USB Device Port, Trigger In, Trigger Out
Setup	iView™ external oscilloscope wizard automates setup
Data Correlation	After oscilloscope acquisition is complete, the data is automatically transferred to the TLA and time correlated with the TLA acquisition data
Deskew	The oscilloscope and TLA data is automatically deskewed and time correlated when using the iView™ external oscilloscope cable
GPIB-iView™ (Opt. 2C) External Oscilloscope Cable Length	2 m (6.6 ft.)
USB-iView™ (Opt. 2C) External Oscilloscope Cable Length	2 m (6 ft.)

Symbolic Support

Characteristic	Description
Number of Symbols/Ranges	Unlimited (limited only by amount of virtual memory available on TLA)
Object File Formats Supported	IEEE695, OMF 51, OMF 86, OMF 166, OMF 286, OMF 386, COFF, Elf/Dwarf 1 and 2, Elf/Stabs, TSF (If your software development tools do not generate output in one of the above formats, TSF, or the Tektronix symbol file, a generic ASCII file format is supported. The generic ASCII file format is documented in the TLA User Manual). If a format is not listed, please contact your local Tektronix representative

External Instrumentation Interfaces

Characteristic	Description
System Trigger Output	Asserted whenever a system trigger occurs (TTL-compatible output, back-terminated into 50 Ω)
System Trigger Input	Forces a system trigger (triggers all modules) when asserted (adjustable threshold between 0.5 V and 1.5 V, edge sensitive, falling-edge latched)
External Signal Output	Can be used to drive external circuitry from a module's trigger mechanism (TTL-compatible output, back-terminated into 50 Ω)
External Signal Input	Can be used to provide an external signal to arm or trigger any or all modules (adjustable threshold between 0.5 V and 1.5 V, level sensitive)

Power

Characteristic	Description
Voltage Range/Frequency	90-264 V AC at 47-63 Hz
Input Current	TBD
Power Consumption	400 W maximum

Environmental

Characteristic	Description
Temperature	Operating: +5 °C to +45 °C Nonoperating: –20 °C to +60 °C
Humidity	Operating: 20% to 80% relative humidity noncondensing Nonoperating: 8% to 80% relative humidity noncondensing Max wet bulb temperature: +29 °C
Altitude	–300 meters to 3,000 meters, derate maximum operating temperature by 1 °C per 300 meters above 1500 meters altitude
Safety	UL61010-1:2004, CAN/CSA-C22.2 No. 61010-1:2004, EN61010-1:2001, and IEC61010-1:2001

Physical Characteristics

Dimensions	mm	in.
Height	297	11.7
Width	437	17.2
Depth	387	15.25
Weight	**kg**	**lb.**
Net	TBD	TBD
Shipping (Typical)	TBD	TBD

Input Characteristics

Characteristic	Description
Capacitive Loading	TBD
Threshold Selection Range	From –2.0 V to +4.5 V in 5 mV increments Threshold presets include TTL (1.5 V), CMOS (1.65 V), ECL (–1.3 V), PECL (3.7 V), LVPECL (2.0 V), LVCMOS 1.5 V (0.75 V), LVCMOS 1.8 V (0.9 V), LVCMOS 2.5 V (1.25 V), LVCMOS 3.3 V (1.65 V), LVDS (0 V), and user defined
Threshold Selection Channel Granularity	Separate selection for each channel
Threshold Accuracy (including probe)	±(40 mV + 1%)
Input Voltage Range	
Operating	–2.5 V to 5.0 V
Nondestructive	–4.5 V to +13 V
Minimum Input Signal Swing	300 mV (P5910 and P5960) TBD (P5934)
Input Signal Minimum Slew Rate	TBD

State Acquisition Characteristics

Characteristic	Description
Maximum State Clock Rate	333 MHz (standard) 667 MHz (optional)
State Record Length with Time Stamps	2 Mb, 4 Mb, 8 Mb, 16 Mb, 32 Mb, 64 Mb
Setup-and-Hold Time Selection Range	From 15 ns before, to 7.5 ns after clock edge in 20 ps increments
Setup-and-Hold Window	
All channels	750 ps typical
Minimum Clock Pulse Width	300 ps (P5910 and P5960) 1 ns (P5934)
Demux Channel Selection	Channels can be demultiplexed to other channels through user interface with 8-channel granularity

Timing Acquisition Characteristics

Characteristic	Description
MagniVu™ Timing	40 ps, adjustments to 80 ps, 160 ps, 320 ps, and 640 ps
MagniVu Timing Record Length	128 Kb per channel, with adjustable trigger position
Deep Timing Resolution (Half/Full channel)	312.5 ps / 625 ps to 50 ms
Deep Timing Resolution with Glitch Storage Enabled	1.25 ns to 50 ms
Deep Timing Record Length (Half/Full channels with time stamps and with or without transitional storage)	4/2 Mb, 8/4 Mb, 16/8 Mb, 32/16 Mb, 64/32 Mb, 128/64 Mb per channel
Deep Timing Record Length with Glitch Storage Enabled	Half of default main memory depth
Channel-to-Channel Skew	300 ps typical
Minimum Recognizable Pulse/Glitch Width (Single channel)	300 ps (P5910 and P5960) 1 ns (P5934)
Minimum Detectable Setup/Hold Violation	80 ps
Minimum Recognizable Multichannel Trigger Event	Sample period + channel-to-channel skew

Analog Acquisition Characteristics (with P6800 or P6900 Series probes)

Characteristic	Description
Bandwidth	1.5 GHz typical
Attenuation	10X or 5X, ±1%
Offset and Gain (Accuracy)	±75 mV, ±2% of signal amplitude
Channels Demultiplexed	4
Run/Stop Requirements	None, analog outputs are always active
iCapture™ Analog Outputs	Compatible with any supported Tektronix oscilloscope
iCapture Analog Output BNC Cable	Low loss, 10X, 36 in. Basic Analog Multiplexer functionality is offered standard on all TLA6400 models. This routes 4 fixed channels to the iCapture Analog Output BNCs. The outputs cannot be switched to other logic analyzer channels. Option AM enables full analog multiplexer control and allows the routing of any 4 logic analyzer channels to the iCapture Analog Output BNCs

Trigger Characteristics

Characteristic	Description
Independent Trigger States	16
Maximum Independent If/Then Clauses per State	16
Maximum Number of Events per If/Then Clause	8
Maximum Number of Actions per If/Then Clause	8
Maximum Number of Trigger Events	26 (2 counters/timers plus any 24 other resources)
Number of Word Recognizers	24
Number of Transition Recognizers	24
Number of Range Recognizers	8
Number of Counters/Timers	2
Trigger Event Types	Word, Group, Channel, Transition, Range, Anything, Counter Value, Timer Value, Signal, Glitch, Setup-and-Hold Violation, Snapshot
Trigger Action Types	Trigger Module, Trigger All Modules, Trigger Main, Trigger MagniVu, Store, Don't Store, Store Sample, Increment Counter, Decrement Counter, Reset Counter, Start Timer, Stop Timer, Reset Timer, Snapshot Current Sample, Goto State, Set/Clear Signal, Do Nothing
Maximum Triggerable Data Rate	1333 Mb/s
Trigger Sequence Rate	DC to 800 MHz (1.25 ns)
Counter/Timer Range	48 bits each (~4 days at 1.25 ns)
Counter Rate	DC to 800 MHz (1.25 ns)
Timer Clock Rate	800 MHz (1.25 ns)
Counter/Timer Test Latency	0 ns
Range Recognizers	Double bounded (136 channel max). Can be as wide as any group, must be grouped according to specified order of significance
Setup-and-Hold Violation Recognizer Setup Time Range	From 7.5 ns before, to 7.5 ns after clock edge in 20 ps increments. This range may be shifted toward the positive region by 0 ns, 2.5 ns, 5 ns, or 7.5 ns
Setup-and-Hold Violation Recognizer Hold Time Range	From 7.5 ns before, to 7.5 ns after clock edge in 20 ps increments. This range may be shifted toward the positive region by 0 ns, 2.5 ns, 5 ns, or 7.5 ns
Trigger Position	Any data sample
MagniVu Trigger Position	MagniVu position can be set from 0% to 60% centered around the MagniVu trigger
Storage Control (Data qualification)	Global (conditional), by state (start/stop), block, by trigger action, or transitional. Also force main prefill selection available

P5900 Series

General

Characteristic	P5910	P5934	P5960
Probe Type	Single-ended Data Single-ended Clock (General Purpose)	Single-ended Data Single-ended Clock (Mictor 34-channel)	Single-ended Data Single-ended Clock (D-Max® Probing Technology)
Number of Channels	17	34	34
Recommended Usage	Most general-purpose applications	Applications requiring many channels to be connected quickly in a small footprint	High-performance applications requiring many channels to be connected quickly in a small footprint
Attachment to Target System	Fits both 0.100 in. and 2 mm square pin configuration	Amp Mictor 34-channel connector	D-Max probing technology
Probe Load AC/DC	1.0 pF/20 kΩ to 0 V	1.2 pF/20 kΩ to 0 V	0.7 pF/20 kΩ to 0 V
Input Range		–2.5 V to +5 V	
Maximum Voltage (Nondestruct)		–4.5 V to +13 V	
Cable Length	1.5 m (5 ft.)	1.5 m (5 ft.)	1.2 m (4 ft.)

Ordering Information

TLA6400 Series

TLA6401
34-channel Logic Analyzer module, 25 GHz timing, 333 MHz state, 2 Mb record length. Options for up to 64 Mb record length and/or up to 667 MHz state.

TLA6402
68-channel Logic Analyzer module, 25 GHz timing, 333 MHz state, 2 Mb record length. Options for up to 64 Mb record length and/or up to 667 MHz state.

TLA6403
102-channel Logic Analyzer module, 25 GHz timing, 333 MHz state, 2 Mb record length. Options for up to 64 Mb record length and/or up to 667 MHz state.

TLA6404
136-channel Logic Analyzer module, 25 GHz timing, 333 MHz state, 2 Mb record length. Options for up to 64 Mb record length and/or up to 667 MHz state.

All Include: Mini Keyboard (119-7275-xx), Optical Wheel Mouse (119-7054-xx), Front-panel cover (200-4939-xx), TLA Application Software CD (063-3881-xx), Certificate of Traceable Calibration.

Note: Please specify probe, power, language, and service options when ordering.

Instrument Options

Option	Description
1S	Increase to 4 Mb record length
2S	Increase to 8 Mb record length
3S	Increase to 16 Mb record length
4S	Increase to 32 Mb record length
5S	Increase to 64 Mb record length
1T	Increase state speed to 667 MHz
AM	Add full analog mux control
18	Add touch screen
1C	Add GPIB-iView™ external oscilloscope cable kit
2C	Add USB-iView™ external oscilloscope cable kit
PO	Add accessory pouch

Recommended Accessories

Accessory	Description
Logic Analyzer Cart	
LACART	2-shelf Cart
K4000	3-shelf Cart
016-1522-xx	Wheeled Transport Case
020-2664-xx	Rackmount Kit
650-4815-xx	Additional Removable Hard Drive Assembly; No SW

Power Plug Options

Option	Description
A0	North America power
A1	Universal Euro power
A2	United Kingdom power
A3	Australia power
A4	240 V, North America power
A5	Switzerland power
A6	Japan power
A10	China power
A11	India power
A12	Brazil power
A99	No power cord or AC adapter

Language Options

Option	Description
L0	English Manual
L5	Japanese Manual
L10	Russian Manual
L99	No Manual

Service Options

Option	Description
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
D1	Calibration Data Report
D3	Calibration Data Report 3 Years (with Option C3)
D5	Calibration Data Report 5 Years (with Option C5)
R3	Repair Service 3 Years
R5	Repair Service 5 Years
R3DW	Repair Service Coverage 3 Years (includes product warranty period). 3-year period starts at time of instrument purchase
R5DW	Repair Service Coverage 5 Years (includes product warranty period). 5-year period starts at time of instrument purchase

Upgrades

You can increase the state speed, memory depth, or add full analog multiplexer capability to existing TLA6400 models by ordering the appropriate upgrade kit. Please refer to the TLA Family Upgrade Guide for further details.

P5900 Series

Model	Description
P5910	17-channel General-purpose Probe with Single-ended Data/Clock, Separable Podlets, and Accessories **Includes**: Podlet Holders, IC Grabbers, Ground Leads, Ground Tips, Extension Ground Tips, Probe Labels
P5934	34-channel High-density Mictor Probe with Single-ended Data/Clock and Accessories **Includes**: Latch Housing Assembly (Edge-mount), Latch Housing Assembly (Vertical), Probe Labels
P5960	34-channel High-density D-Max® Probing Technology Probe with Single-ended Data/Clock and Accessories **Includes**: Probe Head Protective Cover, Probe Retention Kit for D-Max® Probing Technology, Probe Labels

CE

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

GPIB IEEE-488

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit **www.tektronix.com**

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