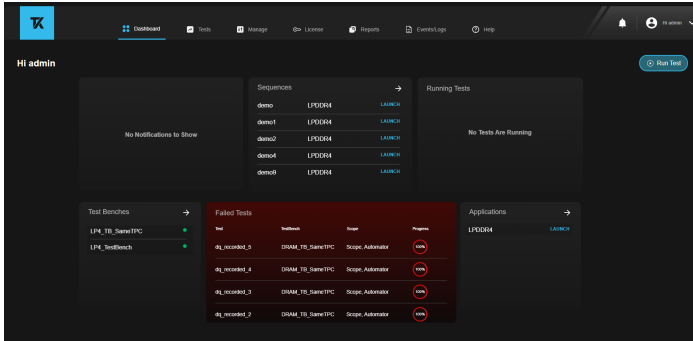


Clarius LPDDR4 Tx Compliance and Debug Solution Datasheet



LPDDR4 has become the engine driving the ever-evolving world of mobile technology. Its ability to deliver high bandwidth for data-intensive applications while maintaining low power consumption makes it the ideal choice for powering smartphones, tablets, laptops, and other portable electronics. However, ensuring flawless performance and reliable operation on these advanced mobile devices requires robust testing and validation tools.

The Tektronix Clarius compliance LPDDR4 application empowers engineers to navigate the complexities of LPDDR4 memory testing with confidence. This comprehensive solution streamlines workflows, automates complex test procedures, and verifies JEDEC compliance—all without requiring specialized LPDDR4 expertise. The Clarius compliance LPDDR4 application empowers you to bring high-performance, reliable LPDDR4 products to market faster, delivering the seamless user experience that today's mobile innovations demand.

The Clarius platform, a next-generation compliance test automation software, simplifies LPDDR4 testing through several key features:

- High asset utilization and faster test times—disaggregated architecture to offload analysis from the oscilloscope.
- Easy workflow integration: leverage REST APIs and SDK for faster automation.
- Unified user-interface for all technology standards across transmitter and receiver test validation.
- Integrated data management for results, reports, and waveforms in the UI, along with a dashboard view.

Key features

- Supports 109 measurements of LPDDR4 System Transmitter Tests as per LPDDR4 JEDEC specification:
 - 18 Clock differential measurements
 - 15 Clock single ended measurements
 - 26 Write burst differential measurements
 - 19 Write burst single ended measurement
 - 19 Read burst differential measurements
 - 12 Address command measurements

- The user-defined acquisition mode enables users to conduct application measurements by adjusting the oscilloscope settings, such as sample rate, record length, bandwidth, and other parameters, according to their preferences and requirements mode for all scenarios.
- Retain Vertical Scale setting supported during acquisition for all scenarios.
- Custom limit support for all tests.
- Supports all the data rate as per JEDEC.
- Custom Data Rate support up to 15000 MT/s.
- De-embedding support for all measurements.
- Supports multi-run feature for all measurements.
- Time to Test : The user can perform multiple JEDEC measurements on multiple edges, multiple Read or Write bursts with a single acquisition.
- Enables to capture long extensive record lengths, identify Read and Write bursts automatically and perform multiple measurements on entire record length and perform statistical analysis.
- Zoom to the worst-case region of the waveform for measurements.
- Easy to use measurement configuration allows the adjustment of test parameters for tests by group to save time over configuring each measurement individually.
- Test report to reflect all the statistics of the measurement
- The user can customize the signal selection in the 'Source and Signal' panel, allowing flexible test bench workflows.
- Multiple Burst Detection Methods are supported: Read and Write, Write only, and Read only.
- Support for tDQ2DQ measurement with multiple DQs.
- Support for simultaneous differential and single-ended Write Burst measurements for up to 32 DQs.
- Support for simultaneous Address Command measurements for up to 8 CAs.
- Auto and manual support for calculating Vcent-DQ and Vcent-CA.

Applications

Tektronix provides the most comprehensive solutions to serve the needs of engineers designing DDR silicon for server, computer, graphics systems, mobile, and embedded systems, as well as those validating the physical layer compliance of the DDR Memory Compliance Test Specification.

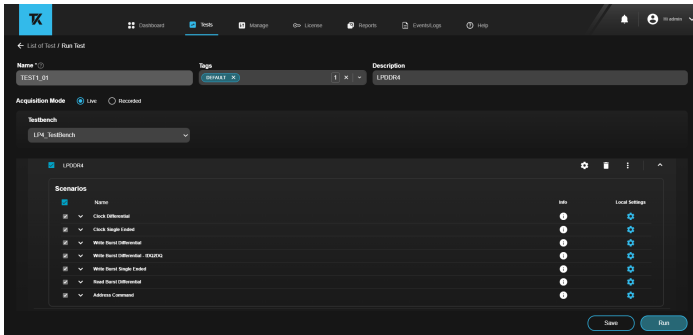
The LPDDR4 applications are compatible with Tektronix DPO/MSO70000 series oscilloscopes that are designed to meet the challenges of the next-generation memory standards. These oscilloscopes provide the industry's leading vertical noise performance with the highest number of effective bits (ENOB) and flattest frequency response for oscilloscopes in their class.

Specifications

LPDDR4 compliance test

The Clarius compliance LPDDR4 application streamlines the compliance testing process for LPDDR4 systems and devices, empowering you to achieve faster time-to-market with several innovative features.

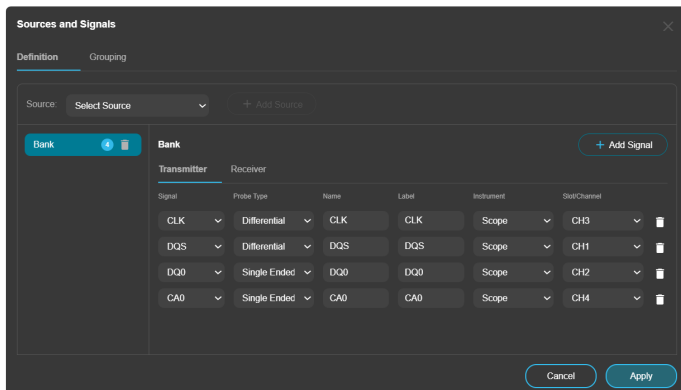
Experience a user-friendly, step-by-step interface that accelerates test setup testing. Effortlessly configure key settings like data rate, acquisition parameters, and test limits within a single intuitive global configuration window. The interface groups tests logically by category (e.g., Clock Differential, Clock Single Ended, Write Burst Differential, Write Burst Differential – tdq2dq, Write Burst Single Ended, Read Burst Differential, Address Command) and allows for individual measurement selection within each group with different methods of Burst Detection.



LPDDR4 test and measurement groups

Sources and Signals

The Clarius compliance LPDDR4 application offers customizable signal selection allowing flexible test bench workflows.

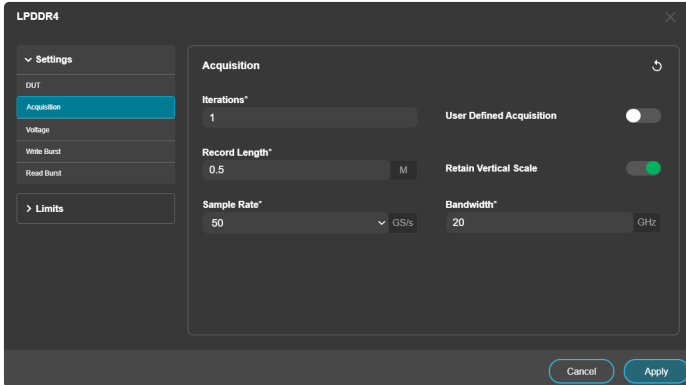


Sources and Signals

User Defined Acquisition Mode

The Clarius compliance LPDDR4 application empowers users with granular control over oscilloscope settings through User Defined Acquisition (UDA) mode. This allows the customization of scope acquisition parameters like sample rate, bandwidth, record length, etc. directly within the automation framework. UDA facilitates tailored test setups for specific JEDEC LPDDR4 needs, streamlining workflows and reducing errors.

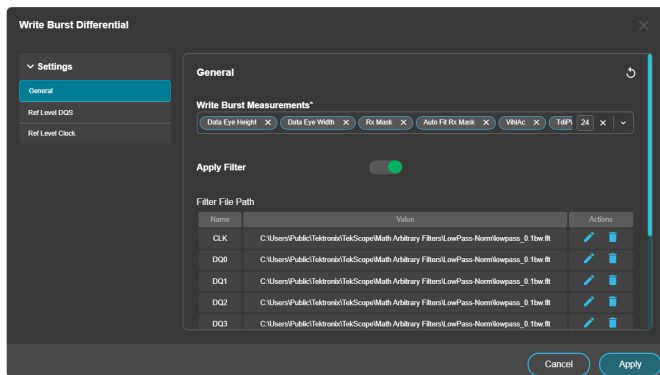
UDA's control extends beyond compliance testing. By adjusting acquisition settings on-the-fly during test execution, engineers can gain deeper insights into signal behavior, enabling faster debug and issue resolution.



User Defined Acquisition Mode

De-embed filters

Easily de-embed the interposer and the probe effects by applying suitable de-embed filters within the automation framework. The Clarius LPDDR4 application also provides an option to apply custom filters.

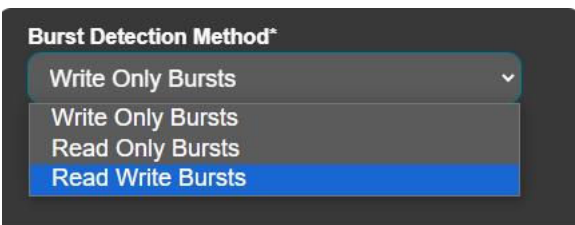


De-embed filters

Automated Read and Write Burst detection

The Clarius compliance LPDDR4 application provides different ways to detect the burst cycles that are used to make measurements

- Read Write Bursts: When the DUT traffic is configured to send both Read and Write Bursts, this method is used for burst detection.
- Write Only: When the DUT traffic is configured to send all Write Bursts, this method is used for burst detection.
- Read Only: When the DUT traffic is configured to send all Read Bursts, this method is used for burst detection.



Burst detection + read/write cycles

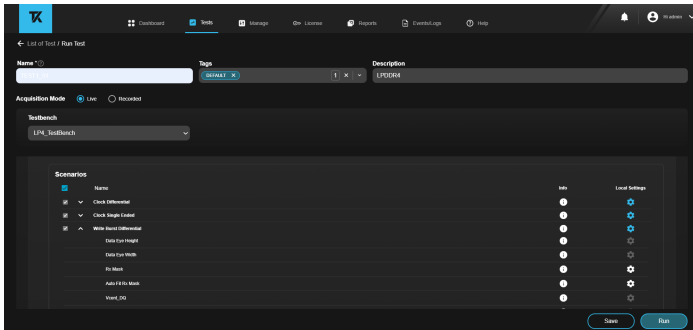
Comprehensive measurements

The Clarius compliance LPDDR4 application adds a long list of JEDEC specific measurements for LPDDR4 memory standards. The LPDDR4 application covers time, voltage, eye, and mask measurements as per the JEDEC standards.

Test selection

Supports 109 measurements of LPDDR4 System Transmitter Tests as per LPDDR4 JEDEC specification:

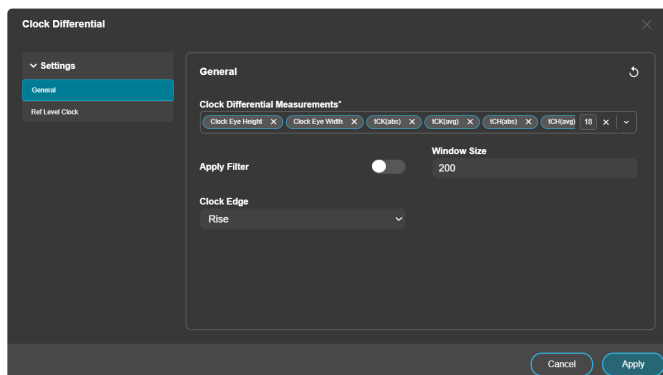
- 18 Clock Differential measurements
- 15 Clock Single Ended measurements
- 26 Write Burst Differential measurements
- 19 Write Burst Single Ended measurement
- 19 Read Burst Differential measurements
- 12 Address Command measurements



Test scenarios

Configurations

Easy to use measurement configuration allows the adjustment of test parameters for tests by group to save time over configuring each measurement individually.



Configurations

Results and reporting

The measurement configurations and JEDEC pass/fail limits are automatically applied for the selected measurements based on the memory specification and the selected speed grade. The results report includes pass/fail based on JEDEC limits.

Clarius LPDDR4 Test Report			
Setup Information			
Test Name	DDRTFL-109	Scope Model Number	DPO733045X
DUT ID	DUT001	Scope Serial Number	8300008
Date and Time	2024-11-30 16:44:53.658	SPC; Factory Calibration	PASS,
Overall Test Result	PASSED	Scope F/W version	CF-91.1CT FV:10.14.1 Build 15
Overall Execution Time	00:00:15	Clarius Version	2.0.0-master.864
Execution Mode	LIVE	App Version	2.0.0-master.484
Data Rate	3200 MT/s	Jedec Specification	JESD209-4D
Iterations	1	Record Length	0.5 M
User Define Acquisition	Disabled	Sample Rate	50 GS/s
Retain Vertical Scale	Disabled	Bandwidth	20 GHz
Additional Comments	None		
Probe and De-Skew Information			
Source	Probe Type	Probe Serial Number	De-Skew Value
CH1	TCA292D	N/A	0.000000 s
CH2	TCA292D	N/A	0.000000 s
CH3	TCA292D	N/A	4.400000E-9 s
CH4	TCA292D	N/A	0.000000 s
CH1_ExtensionScopeB	TCA292D	N/A	0.000000 s
CH2_ExtensionScopeB	N/A	N/A	0.000000 s
CH3_ExtensionScopeB	TCA292D	N/A	0.000000 s
CH4_ExtensionScopeB	N/A	N/A	0.000000 s
Test Summary			
Test Name	Test Group Name	Status	
Clock Eye Height	Clock Differential	PASSED	
Clock Eye Width	Clock Differential	PASSED	
ICH(abs)	Clock Differential	PASSED	
ICH(avg)	Clock Differential	PASSED	
ICK(abs)	Clock Differential	PASSED	

LPDDR4 Test Report

Verification versus debug

The Clarius compliance LPDDR4 application offers a one-stop shop for both ensuring your designs meet LPDDR4 specifications and efficiently debugging any issues that may arise.

Automated Compliance Testing

Run comprehensive compliance tests with complete confidence. The solution automates the entire process, eliminating manual steps and ensuring consistent, reliable results.

Advanced Debug Capabilities

Should an issue surface during testing, the Clarius compliance LPDDR4 application goes beyond simply identifying the failure. It captures and stores worst-case signal waveforms for later in-depth analysis using DPOJET, our powerful advanced jitter and timing analysis software. DPOJET offers both generic jitter and timing analysis measurements to address a wide range of debug needs, as well as LPDDR4-specific measurements to ensure your design adheres to the latest memory standard. With complete control over measurement settings, you can customize each analysis to gain deeper insights into the root cause of failures, accelerating debug cycles.

Ordering information

Hardware Requirements

Item	Description	Quantity	Type		
<ul style="list-style-type: none"> DPO71304SX, MSO71254DX, DPO71254DX DPO71604SX, DPO72004SX, DPO72304SX, DPO72504SX, and DPO73304SX Non-ATlchannels of DPO75002SX, DPO75902SX, DPO77002SX, DPS75004SX, DPS75904SX, and DPS77004SX. 	≥ 12.5 GHz Oscilloscope, Windows 10 OS	1	Equipment	Tektronix	Required
Host PC/Laptop	Refer to System requirements	-	Laptop/PC	-	Required

Test Fixtures and Accessories

Item	Description	Quantity	Type	Vendor	Requirement	Notes
P7713	P7700 Probe recommended. ≥ 13 GHz TriMode Probe	4	TriMode Probe	Tektronix	Required	P7500 possible. Check the interposer configuration.
P77STFLXA / P77STCABL	Active, Solder-in Tip; probe signal directly on motherboard	4	Probe Tip	Tektronix	Required	4 Tips total - based on connection type. New flexible FLRB tips are available in two versions: Standard Temperature and High Temperature (125 C).
P77STFLXB / P77STLRCB / P77STFLRB / P77HTFLRB	Active, Solder-in Tip; probe signals with Nexus XH Series SI Interposer	4	Probe Tip	Tektronix	Required	
Nexus Interposer	Order memory interposers from Nexus.	1	Fixture	Nexus	Required	<p>EdgeProbe™ and Direct Attach Interposers are available from Nexus. Order directly from Nexus. Request the s-par files for all individual signals on the interposer instead of getting a generic nominal s-par model.</p> <p>Refer to the Nexus's page for more information: www.nexustechnology.com/products/memory-interposers/lpddr4-mobile-memory-interposers/</p>

Software Requirements

Compliance

Item	Description	Quantity	Type	Vendor	Requirement
AT-LPDDR4-Tx- XXX	Clarius LPDDR4 Tx Automation Test Software. Refer to License options for more details.	1	Option	Tektronix	Required

Debug

Item	Description	Quantity	Type	Vendor	Requirement
DJA	DPOJET Jitter Analysis.	1	Option	Tektronix	Required
VET	Visual Trigger. Allows visual burst detection method.	1	Option	Tektronix	Recommended
SDLA64	Serial Data Link Analysis for Win 64-bit Scopes.	-	Option	Tektronix	Recommended

System requirements

Prerequisites	Recommended requirements
Operating system	Windows 10 Enterprise and Pro (version 21H1 and above) or Windows 11 Enterprise and Pro (version 21H2 and above) Language: English (United States) only
CPU cores	16
RAM	64 GB
Disk space	300 GB HDD/SSD of free disk space
Internet speed	1 Gbps
Browser	Microsoft Edge (default) or Google Chrome
Additional software	Python 3.12.x ¹

License options

Clarius LPDDR4 Tx Software Options

License terms	License option	Description
Subscription	AT-LPDDR4-Tx-NS1	Clarius LPDDR4 Tx Automation Test Software; Node-Locked, Subscription, 1 Year
	AT-LPDDR4-Tx-NS3	Clarius LPDDR4 Tx Automation Test Software; Node-Locked, Subscription, 3 Years
	AT-LPDDR4-Tx-FS1	Clarius LPDDR4 Tx Automation Test Software; Floating, Subscription, 1 Year
	AT-LPDDR4-Tx-FS3	Clarius LPDDR4 Tx Automation Test Software; Floating, Subscription, 3 Years



Tektronix is ISO 14001:2015 and ISO 9001:2015 certified by DEKRA.



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

Bluetooth®

Bluetooth is a registered trademark of Bluetooth SIG, Inc.

¹ Python installation is required for SDK and DUT control automator.



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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.tek.com.

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