TekExpress USB 3.2 Transmitter Solutions

Datasheet

The Tektronix USBSSP-TX and USB-TX Automated Transmitter solutions provide an easy way to validate and characterize emerging USB 3.2 Type-C host controllers, hubs and devices with Tektronix MSO/DPO/70000DX/SX series oscilloscopes.

Key Offerings

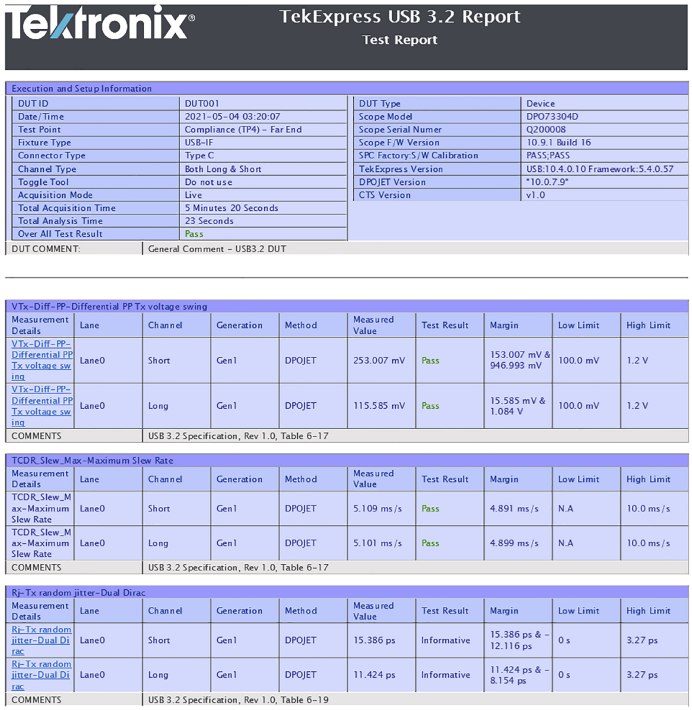
- Transmitter testing
  - Provides a comprehensive automated and manual toolset for USB 3.2 Gen1 (5 Gbps) and Gen2 (10 Gbps) verification, characterization, debug, and compliance test.
  - Supports Type-C, Standard and Micro connectors for USB 3.2 Specification.
  - Provides automatic processing of USB-IF SIGTEST results without manual intervention.
  - Auto selection of sources (channels) based on the probe type selected.
  - Includes support for captive devices and their associated channels as per CTS.
  - Uses pre-recorded mode to run measurements for offline analysis and collaboration with the globally dispersed teams.
  - DPOJET plugin for USB 3.2 Type-C, Standard and Micro connectors which supports USB 3.2 specification and CTS (Gen1 & Gen2) with setup files and MOI.
  - Automatic DUT control and pattern validation to capture all required data patterns (CP0, CP1, CP9, CP10, etc.).
  - Support embedding all Channels and their respective filter files for Type-C, Standard and Micro Connectors using SDLA .
  - Quickly validate test status with comprehensive reporting that details test margins, pass/fail results, and plots in PDF, MHT and CSV formats.
  - Manual Lane Switching – Support for reversible Type-C connector.

Applications

- USB transmitter testing
  - Host and Device silicon validation
  - System, peripheral, and hub validation and integration
  - Manufacturing test

Complete automation for USB testing

The automated solution for USB 3.2 simplifies transmitter testing. No longer is it a requirement that the end user be an expert in USB. The process of defining test parameters, power on/off DUT, capturing the LFPS signal, toggling the compliance patterns, making sure the compliance pattern captured is correct, showing results after each measurement is executed, and saving the test results, is fully automated in the Tektronix USB 3.2 automated test solution.



TekExpress USB 3.2 Report
Test Report

Execution and Setup Information

DUT ID	DUT001	DUT Type	Device
Date/Time	2021-05-04 03:20:07	Scope Model	DPO73304D
Test Point	Compliance (TP4) – Far End	Scope Serial Numer	Q200008
Fixture Type	USB-IF	Scope F/W Version	10.9.1 Build 16
Connector Type	Type C	SPC Factory:S/W Calibration	PASS;PASS
Channel Type	Both Long & Short	TekExpress Version	USB:10.4.0.10 Framework:5.4.0.57
Toggle Tool	Do not use	DPOJET Version	"10.0.7.9"
Acquisition Mode	Live	CTS Version	v1.0
Total Acquisition Time	5 Minutes 20 Seconds		
Total Analysis Time	23 Seconds		
Over All Test Result	Pass		
DUT COMMENT:	General Comment – USB3.2 DUT		

VTx-Diff-PP-Differential PP Tx voltage swing

Measurement Details	Lane	Channel	Generation	Method	Measured Value	Test Result	Margin	Low Limit	High Limit
VTx-Diff-PP-Differential PP Tx voltage swing	Lane0	Short	Gen1	DPOJET	253.007 mV	Pass	153.007 mV & 946.993 mV	100.0 mV	1.2 V
VTx-Diff-PP-Differential PP Tx voltage swing	Lane0	Long	Gen1	DPOJET	115.585 mV	Pass	15.585 mV & 1.084 V	100.0 mV	1.2 V
COMMENTS	USB 3.2 Specification, Rev 1.0, Table 6-17								

TCDR_Slew_Max-Maximum Slew Rate

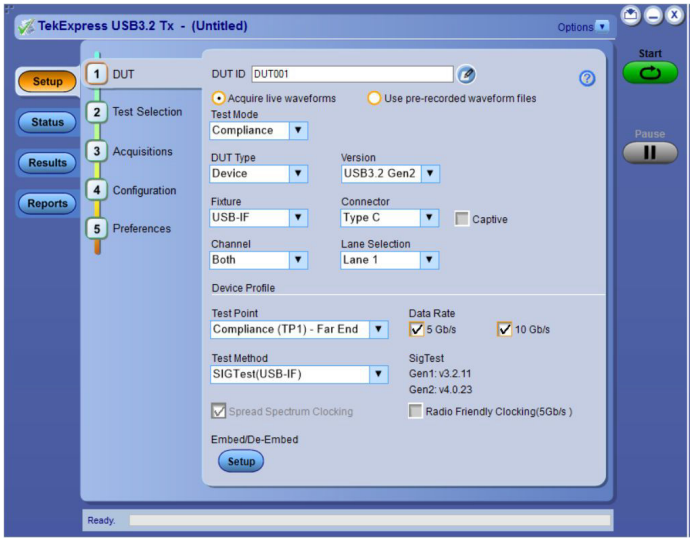
Measurement Details	Lane	Channel	Generation	Method	Measured Value	Test Result	Margin	Low Limit	High Limit
TCDR_Slew_Max-Maximum Slew Rate	Lane0	Short	Gen1	DPOJET	5.109 ms/s	Pass	4.891 ms/s	N.A	10.0 ms/s
TCDR_Slew_Max-Maximum Slew Rate	Lane0	Long	Gen1	DPOJET	5.101 ms/s	Pass	4.899 ms/s	N.A	10.0 ms/s
COMMENTS	USB 3.2 Specification, Rev 1.0, Table 6-17								

Rj-Tx random jitter-Dual Dirac

Measurement Details	Lane	Channel	Generation	Method	Measured Value	Test Result	Margin	Low Limit	High Limit
Rj-Tx random jitter-Dual Dirac	Lane0	Short	Gen1	DPOJET	15.386 ps	Informative	15.386 ps & -12.116 ps	0 s	3.27 ps
Rj-Tx random jitter-Dual Dirac	Lane0	Long	Gen1	DPOJET	11.424 ps	Informative	11.424 ps & -8.154 ps	0 s	3.27 ps
COMMENTS	USB 3.2 Specification, Rev 1.0, Table 6-19								

TekExpress sample report in MHT format

Required test procedures (MOI) can be found at: www.tek.com/usb.



TekExpress automated framework configuration panel

Ordering Information

Automated TekExpress USB 3.2 (5 Gb/s and 10 Gb/s) transmitter measurements

7 Series DPO

Nomenclature	Description
DPO714AX	Tektronix DPO (Digital Phosphor Oscilloscope) 16 GHz and above, 7-SIM (optional)
7-CMUSB3	USB 3.2 (5 Gb/s and 10 Gb/s) Transmitter Normative and Informative Tests for TekExpress Automated Compliance Test Software

70K SX/DX Series oscilloscope

Nomenclature	Description
DPO/MSO70000*	Tektronix DPO or MSO (Mixed Signal Oscilloscope) Oscilloscopes – 16 GHz and above with DPOJET and SDLA64 installed
DPO/MSO70000 Opt. USBSSP-TX**	USB 3.2 (5 Gb/s and 10 Gb/s) Transmitter Normative and Informative Tests for TekExpress Automated Compliance Test Software
USBSSP-UP	Upgrade USB-TX (Supports 5G only) software to USBSSP-TX software package (Supports 5G & 10G)
DPOFL-USBSSP-TX**	Floating license upgrade for USB 3.2 (5 Gb/s and 10 Gb/s) Transmitter Normative and Informative Tests for TekExpress Automated Compliance Test Software
DPO-UP USBSSP-TX	Upgrade for USB 3.2 (5 Gb/s and 10 Gb/s) Transmitter Normative and Informative Tests for TekExpress Automated Compliance Test Software
DPOFL-USBSSP-UP	Upgrade from Floating USB TX to Floating USB SSP TX

* Requires oscilloscope with bandwidth ≥ 16 GHz for USB 3.2 Gen2 (10Gbps) and ≥ 12.5 GHz for USB 3.2 Gen1 (5Gbps).

** Requires DPOJET Jitter and Eye Analysis Tools (Opt. DJA) and ≥16 GHz oscilloscope and SDLA Visualizer (SDLA64).

Recommended test fixtures, cables, and tools

Item	Vendor	Quantity
USB3ET Type A and Micro B Gen1 test fixtures	USB-IF	1
USB31AET Type A & Micro B Gen2 test fixture kit	USB-IF	1
USB31CET Type C Gen1 and Gen2 test fixture	USB-IF	1
PMCABLE1M Phase Matched SMA cable set	Tektronix	2
AFG3k or AFG31k 50MHz or higher, DPO714AX internal AFG, AWG5000C, AWG5200, AWG7000C or AWG70000 (DUT State Control)	Tektronix	1

015-0572-00 BNC to SMA adapter	Tektronix	2
PWS4000 Tektronix Power Supply (optional for automatic power cycling)	Tektronix	1

Key differences between USB-TX and USBSSP-TX

Feature	USB-TX	USBSSP-TX*
Automatic measurement selections based on device type, test type, test points, and selected probes	X	X
Automatic selection of receiver CTLE filter	CTLE only	CTLE/DFE
Automatic selection of Tx channel modeling for software channel emulation	X	X
Complete coverage of USB 3.2 Normative and Informative tests	Gen1 (5 Gb/s)	Gen1 (5 Gb/s) and Gen2 (10 Gb/s)
Automatically save test reports and waveforms	X	X
Re-analyze prerecorded waveforms	X	X
Single test report for all measurements	Gen1 (5 Gb/s)	Gen1 (5 Gb/s) and Gen2 (10 Gb/s)
Automated LFPS measurements (setup files only)	X	X
Automated DUT toggle	X	X
Automated SIGTEST measurements	X	X

* USB-TX option is not a prerequisite

Automated TekExpress USB 3.2 (5 Gb/s) transmitter measurements

Nomenclature	Description
DPO/MSO70000*	Tektronix DPO (Digital Phosphor Oscilloscope) or MSO (Mixed Signal Oscilloscope) Oscilloscopes – 12.5 GHz and above with DPOJET and SDLA64 installed
DPO/MSO70000 Opt. USB-TX**	USB 3.2 (5 Gb/s) Transmitter Normative and Informative Tests for TekExpress Automated Compliance Test Software
DPOFL-USB-TX**	Floating license upgrade for USB 3.2 (5 Gb/s) Transmitter Normative and Informative Tests for TekExpress Automated Compliance Test Software
DPO-UP USB-TX**	Upgrade for USB 3.2 (5 Gb/s) Transmitter Normative and Informative Tests for TekExpress Automated Compliance Test Software
USB-TX-UP	Upgrade USB TX solution from dongle based license to software node locked license.

***** Requires oscilloscope with bandwidth ≥ 16 GHz for USB 3.2 Gen2 (10Gbps) and ≥ 12.5 GHz for USB 3.2 Gen1 (5Gbps).

****** Requires oscilloscope with bandwidth ≥ 12.5 GHz and DPOJET Jitter and Eye Analysis Tools (Opt. DJA).

Recommended test fixtures, cables, and tools

Item	Vendor	Quantity
USB3ET Type A & Micro B Gen1 test fixture kit	USB-IF	1
USB31CET Type C test fixture kit	USB-IF	1
PMCABLE1M Phase Matched SMA cable set	Tektronix	2
AFG3k or AFG31k 50MHz or higher, AWG5000C, AWG7000C or AWG70000 (DUT State Control)	Tektronix	1
015-0572-00 BNC to SMA adapter	Tektronix	2

Tektronix is registered to ISO 9001:2015 and ISO 14001:2015.

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