TELEDYNE LECROY
Everywhereyoulook™

USB 3.2 Link Layer Protocol Decode

Add USB 3.2 protocol decoding to your oscilloscope to speed debug of complicated issues.

Key Features

- **USB 3.2 (Gen1, Gen2) one-lane and two-lane decode**
- **Includes USB 2.0 and 1.x decode**
- **Link layer protocol decode**
- **Gen1 decoding with or without descrambling**
- **128b/132b (Gen2) and 8b/10b (Gen1) decode**
- **Color-coded decode overlaid on the waveform is intuitive and easy-to-read**
- **Decode information expands as the time base is adjusted or zoomed**
- **Convenient table display with quick "zoom to message" capability**
- **Quick search capability for specific link layer frames**

Protocol Awareness in Your Physical Layer Tool

Oscilloscopes are the preferred tool for the hardware engineer, but have been of limited utility in interpreting serial data protocols. Protocol analyzers are powerful, but don't show physical layer waveforms. The USB 3.2 decode option for Teledyne LeCroy oscilloscopes provides link layer decode information annotated on the USB 3.2 physical layer waveforms. This provides the ability to view protocol traffic on the oscilloscope and verify that the link is alive and transmitting properly. It also aids in debugging problems that are not solely analog or digital in nature, such as interoperability issues, uncertain error causes, and physical layer issues not evident with a protocol analyzer.

Intuitive Decode Annotation

Various sections of the protocol are color-coded to make it easy to understand. Decode annotation information condenses or expands depending on the time base/zoom ratio setting.

Convenient Table Display and Search

Long oscilloscope acquisition memory provides long capture times of USB 3.2 transmissions. Decoded information is conveniently shown in a table format, and specific frame types may be searched for. In addition, table data may be exported as a .csv file.

Support on Multiple Oscilloscope Platforms

The USB3.2 specification defines Gen1 (5Gb/s) and Gen2 (10Gb/s) data rates on one or two lanes. USB3.2 Link Layer Decode supports one and two lane testing and is available on a wide range of oscilloscopes with real-time bandwidths from 6 GHz to 65 GHz.

SPECIFICATIONS AND ORDERING INFORMATION

	USB3.2 or USB3.1 Gen2 (10Gb/s)	USB3.2, USB3.1, or USB3.0 Gen1 (5Gb/s)
	Definition	
Protocol Setup	Selection for source channels. Support Single-ended or differential probing.	
Decode Capability		
Speed and Lane Width	USB3.2 Gen2 x 2 (2 Lanes) USB3.2 Gen2 x 1 (1 Lane) 128b/132b Low-level decode (1 Lane) - Included.	USB3.2 Gen1 x 1 (1 Lane) 8b/10b Low-level decode (1 Lane) - enabled with Opt. 8B10B D.
Decode Input	Any analog Channel, Memory or Math trace.	
# of Decode Waveforms	**Up to 4 buses may be decoded at one time** In addition, zooms can be displayed (with decoded information).	
Location	Overlayed over waveform(s), on Grid. (Note: Use multi-grid if there is more than one decoder ON, or when also using Zoom traces).	
Visual Aid	Color Coding for LMP, TP, DPH, ITP, DPP, Link Command, TS1, TS2, TSEQ, SKIP, SYNC, SDS, Logical Idle, Electrical Idle, LFPS. Decode information is intelligently annotated based on time base setting and USB3.2 item type.	Color Coding for LMP, TP, DPH, ITP, DPP, Link Command, TS1, TS2, TSEQ, SKIP, Idle, E.Idle, LFPS, Protocol Error. Decode information is intelligently annotated based on time base setting.
Search		
Pattern Search	Search by Index, Time, Type, SubType, and (Details) including: **LMP** (Reserved, Set Link Function, U2 Inactivity Timeout, Port Capability, Port Configuration, Port Config Acknowledge, Unknown), **TP** (ACK, NRDY, ERDY, Status, Stall, Device Notification, Ping, Ping Response, Unknown), **DPH, ITP, DPP, Link Command, TS1, TS2, TSEQ, SKIP, Idle, Electrical Idle, SDS, SYNC, and LFPS** (Polling, Ping, U1Exit, U2Exit, U3Exit, Reset, LBPM_Delimeter, LBPM types LBPM0 and LBPM1, SCD types Polling0 Polling1, Unknown).	Search by Index, Time, Type, SubType and (Details) including: **LMP** (Set Link Function, U2 Inactivity Timeout, Port Capability, Port Configuration, Port Config Response, Unknown), **TP** (ACK, NRDY, ERDY, Status, Stall, Device Notification, Ping, Ping Response, Unknown), **DPH, ITP, DPP, Link Command** (LGOOD_0, LGOOD_1, LGOOD_2, LGOOD_3, LGOOD_4, LGOOD_5, LGOOD_6, LGOOD_7, LBAD, LCRD_A, LCRD_B, LCRD_C, LCRD_D, LRTY, LGO_U1, LGO_U2, LGO_U3, LAU, LXU, LMPA, LUP, LDN, Unknown), **TS1, TS2, TSEQ, SKIP, Idle, E. Idle, LFPS** (Polling, Ping, U1Exit, U2Exit, U3Exit, Reset, Unknown), and **Protocol Error** (CRC5 Error, CRC16 Error, CRC32 Error,Mismatched LinkCtrl Words).
Recommended Oscilloscope Performance and Compatibility		
Compatible With…	LabMaster 10 Zi-A (All Models) SDA 8 Zi-B (13 GHz Models and above)	LabMaster 10 Zi-A (All Models) SDA 8 Zi-B (6 GHz Models and above) WavePro HD (6 GHz Models and above)

Ordering Information

Product Description	Product Code
USB3.2 Link Layer Decode *(Includes USB1.x, USB2.0 Decode - see Low-speed Serial Data TDME Datasheet)*	USB32BUS D

Additional Products

QualiPHY Enabled USB 3.2 Software Option	QPHY-USB3.2-Tx-Rx
8b/10b Low-level Decoder	8B10B D
USB Power Delivery Trigger & Decode	USBPD TDME
Protocol Analyzer Software Synchronization Options	ProtoSync ProtoSync-BT

Recommended Probes (1each per lane tested)

For WavePro HD

6 GHz, 2.5 Vpp Differential Probe with ProBus2 Interface	D610-A-PB2
8 GHz Differential Probe with ProBus2 Interface	DH08-PB2

For SDA 8 Zi-B:

8 GHz Differential Probe with ProLink Interface	DH08-PL
13 GHz Differential Probe with ProLink Interface	DH13-PL
16 GHz Differential Probe with ProLink Interface	DH16-PL
20 GHz Differential Probe with 2.92MM Interface	DH20-PL

For LabMaster 10 Zi-A:

25 GHz Differential Probe with 2.92MM Interface	DH25-2.92MM
30 GHz differential probe with 2.92 mm interface	DH30-2.92MM

DH Series Probe Tips:

DH series solder-in tip, 30 GHz BW, 3.5 Vpp range	DH-SI
DH series high-sensitivity solder-in tip, 30 GHz BW, 2.0 Vpp range	DH-SI-HS

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Local sales offices are located throughout the world.
Visit our website to find the most convenient location.