Tektronix®

6 Series Low Profile Digitizer

LPD64 Datasheet

Highest Performance Digitizer. On ALL Channels!

4 channels with 25 GS/s, 12-bits, 8 GHz, and 250 Mpts in 2U

Performance in numbers

Input Channels

- 4 SMA inputs
- Each SMA input supports Analog, Spectral (using DDC), or both simultaneously

Performance for EVERY Channel

- Sample Rate: 25 GS/s
- Bandwidth: DC to 8 GHz (optional)
- Vertical Resolution: 12-bit ADC
- Real-Time 2 GHz DDC (optional)
- Record Length: 125 Mpts (std), 250 Mpts (optional)
- Lowest-in-class Noise
- Highest-in-class ENOB
- Best-in-class channel-to-channel isolation

Real-Time Digital Down Converter (DDC)

- Patented individual time domain and frequency domain controls
- Up to 2 GHz capture bandwidth (optional)
- IQ data transfers to PC for analysis (optional)
- Frequency vs time, Phase vs time and Magnitude vs time plotting (optional)

Superior low noise, vertical resolution and accuracy

- Low input noise enabled by new TEK061 front-end ASICs
- Noise at 1mV/div: 54.8 uV @ 1 GHz
- Input Range: 10mV to 10 V full scale
- DC Gain Accuracy: +/-1.0% at all gain settings >1 mV/div
- Effective Number of Bits (ENOB):
  - 8.2 bits at 1 GHz
  - 7.6 bits at 2.5 GHz
  - 7.25 bits at 4 GHz
  - 6.8 bits at 6 GHz
  - 6.5 bits at 8 GHz

Remote communication and connectivity

- Ethernet 10/100/1000 port
- USB 3.0 device port (USBTMC) up to 800 Megabits/second
- LXI 1.5 Certified (VXI-11)
- Easy remote access with e*Scope; just enter the instrument IP address into a browser
- Award-winning user interface
- Drivers: IVI-C, IVI-COM, LabVIEW
- Support for VISA, MATLAB, Python, C/C++/C#, Sockets

Measurement Analysis

- 36 standard measurements
- Jitter Measurements (optional)
- DDR Measurements (optional)
- Power Measurements (optional)

Operating Systems

- Closed Linux Embedded OS (standard)
- Microsoft Windows 10 (option 6-WINM2)

Security & Declassification (option 6-SEC)

- Password protect all user-accessible ports
- Locks down the digitizer, prevents on-instrument user data storage
- Meets the needs for top secret and high security environments

Dimensions

- 2U (3.5 in./89 mm) tall & rack ready out of the box (standard configuration)
- 17 in. (432 mm) wide
- Fits into standard 24 - 32 in. (610 - 813 mm) racks
- Air flow is left to right for rack setup

With the lowest input noise and up to 8 GHz analog bandwidth, the 6 Series Low Profile Digitizer LPD64 provides the best signal fidelity for analyzing and debugging signals in a compact 2U rack space. With four SMA inputs each supporting Analog, Spectral (using DDC), or both simultaneously, lowest-in-class noise, and highest-in-class ENOB, the 6 Series Low Profile Digitizer LPD64 is ready for today's toughest challenges and tomorrow's too.

The 6 Series family

The 6 Series Low Profile Digitizer (LPD64) represents the highest performance digitizer on all channels in its class. This high-speed digitizer has the functionality of a digitizer and the power of an oscilloscope, sharing a similar hardware platform as the 6 Series MSO.

The transition from a 6 Series MSO benchtop oscilloscope to a Low Profile Digitizer has never been easier for R&D engineers needing to move their code, test work and platform performance into manufacturing and automation. Both products support the same user interface, remote capability, performance characteristics and programming back-end to make this transition as simple and easy as possible. No need to rewrite test routines and development test cycle code!

For more information on the capabilities of the benchtop 6 Series MSO, including the award-winning user experience and the various analysis software options, please see the 6 Series MSO datasheet at www.tek.com/6SeriesMSO.

The Low Profile family

The 6 Series Low Profile Digitizer expands the performance of the 5 Series MSO Low Profile by adding twice the number of Tektronix TEK049 ASICS in the same 2U footprint. Now with 25 GS/s and up to 8 GHz on all channels. Low Profile users now have the choice of extreme high channel count or extreme performance in the same rack form factor.

For more information on the capabilities of the 5 Series MSO Low Profile (8 channels, 1 GHz), please see the datasheet at https://www.tek.com/MSO58LP/

Two 6 Series Low Profile Digitizers (left) and two 5 Series MSO Low Profile oscilloscopes (right)

Quick Comparison	6 Series Low Profile Digitizer	5 Series MSO Low Profile
Sample Rate	25 GS/s	6.25 GS/s
Analog Bandwidth	Up to 8 GHz	1 GHz
RF (DDC) Span Bandwidth	2 GHz	500 MHz
ENOB @ 1 GHz	8.2 bits	7.6 bits
LXI compliance version	1.5	-
Rack Dimensions	2U	2U

Machine diagnostics for physics

Physics is constantly leading the world to exciting new scientific discoveries in both matter and energy. These experiments require digitizers and oscilloscopes with improvements in precision, accuracy, performance and density when monitoring target test points. The 6 Series Low Profile Digitizer meets these requirements by bringing an industry leading performance, small form factor, Tektronix's class of reliability, easy remote accessibility, and award-winning user interface.

Common physics fields

- High Energy (Particle) Physics
- Nuclear Physics
- Atomic, Molecular and Optical Physics
- Condensed Matter

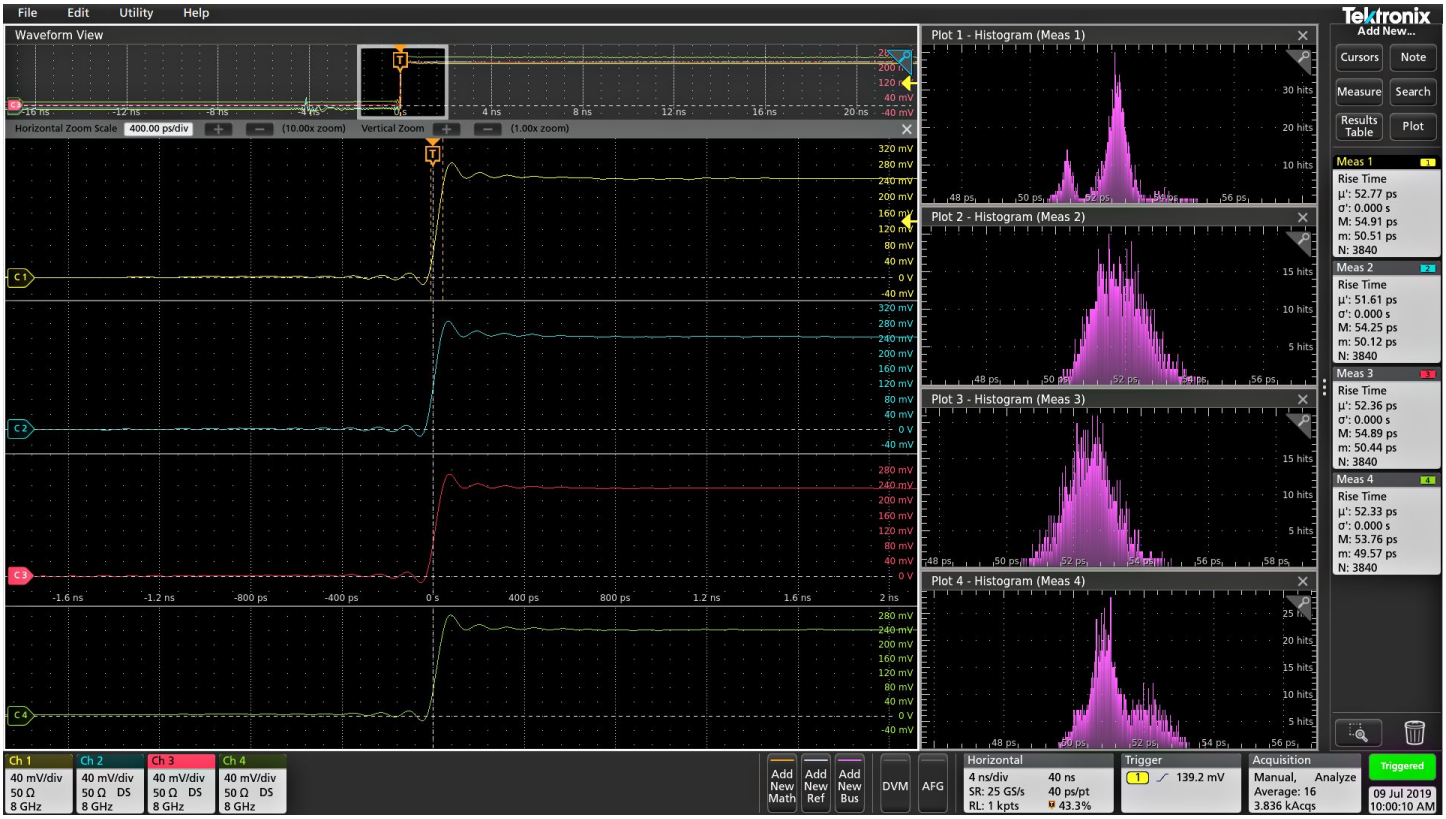
Research fields requiring single shot events or fast repetitive monitoring in their research labs; experiments like Photo Doppler Velocimetry (PDV), VISAR, gas guns, spectroscopy, accelerators and more. Many of these are diagnosing experiments and validating doppler shifts, phase alignments, beat frequencies, beam steering alignment or amplitudes. Doing this with reliable, high performance equipment is key for long term success.

Performance on every channel

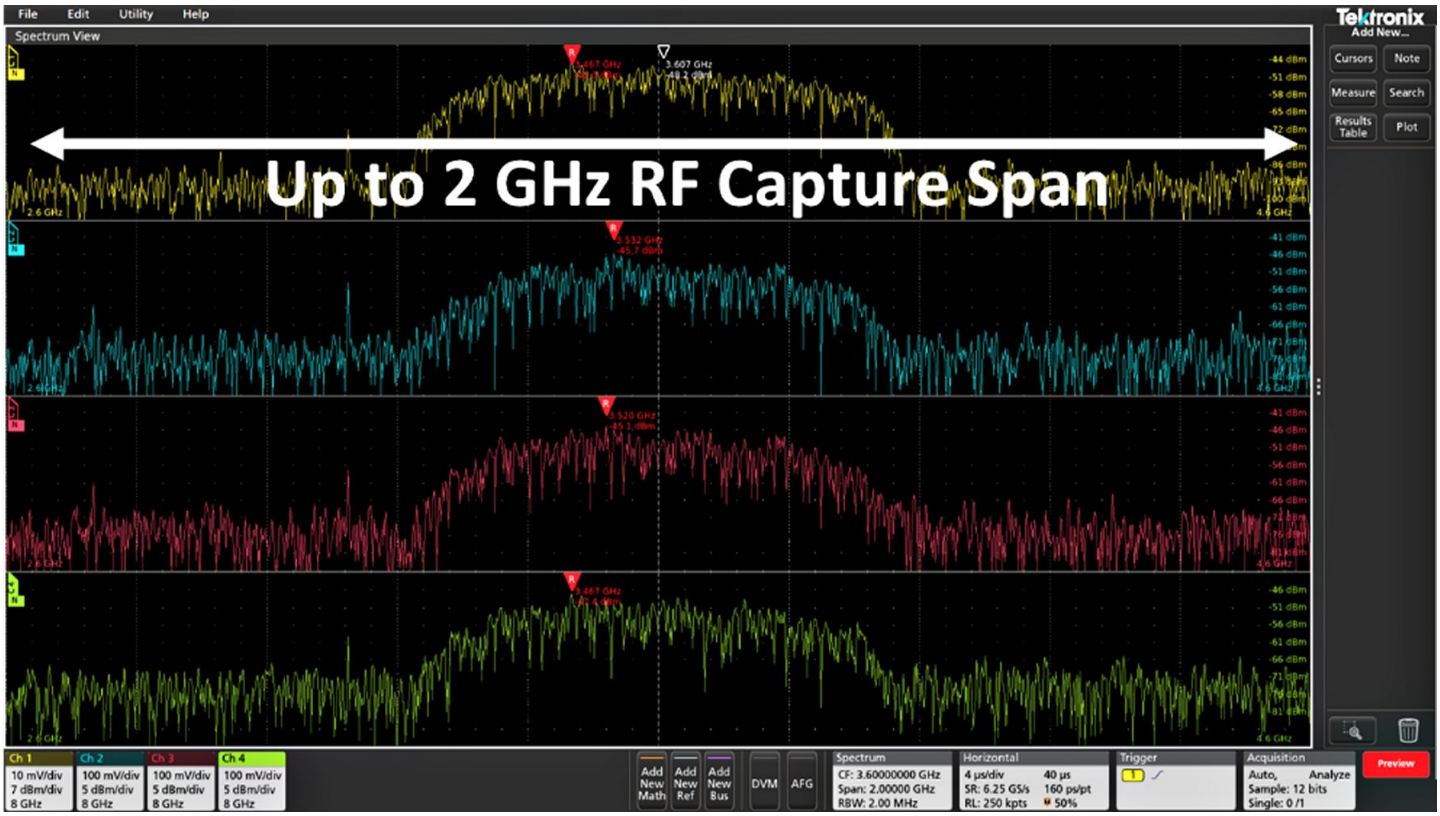
Tired of turning on multiple digitizer channels and wondering what the sample rate, record length or bandwidth settings are? The 6 Series Low Profile Digitizer has industry leading performance on EVERY channel, always. No compromises!

Key performance features:

- 25 GS/s on ALL channels
- DC to 8 GHz on ALL channels
- Up to 250 Million samples on ALL channels
- Up to 2 GHz RF DDC capture bandwidth on ALL channels
- ALL channels fit nicely in a 2U rack-ready digitizer
- 12-bit analog-to-digital converters
- Best-in-class low noise
- Best-in-class Effective Number Of Bits
- Best-in-class channel isolation (crosstalk)



Spectrum View

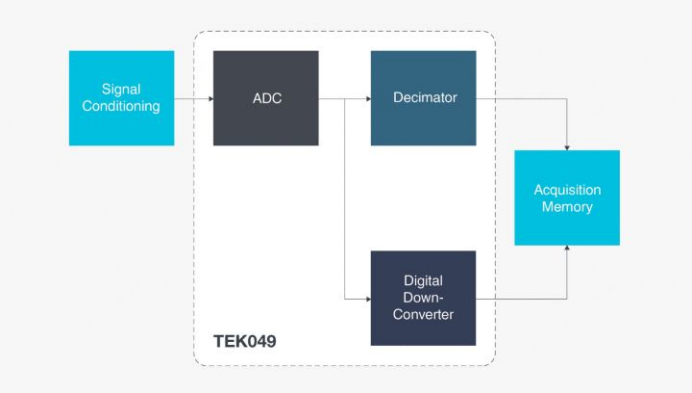


Intuitive spectrum analyzer controls like center frequency, span and resolution bandwidth (RBW), independent from time domain controls, provide easy setup for frequency domain analysis. A spectrum view is available for each analog input, enabling multichannel mixed domain analysis.

It is often easier to debug an issue by viewing one or more signals in the frequency domain. Oscilloscopes and digitizers have included math-based FFTs for decades in an attempt to address this need. However, FFTs are notoriously difficult to use as they are driven by the same acquisition system that's delivering the analog time-domain view. When you optimize acquisition settings for the analog view, your frequency-domain view isn't what you want. When you get the frequency-domain view you want, your analog view is not what you want. With math-based FFTs, it is virtually impossible to get optimized views in both domains.

Spectrum View changes all of this. Tektronix' patented technology provides both a decimator for the time-domain and a digital down-converter for the frequency-domain behind each input. The two different acquisition paths let you simultaneously observe both time- and frequency-domain views of the input signal with independent acquisition settings for each domain. Other manufacturers offer various 'spectral analysis' packages that claim ease-of-use, but they all exhibit the limitations described above. Only Spectrum View provides both exceptional ease-of-use and the ability to achieve optimal views in both domains simultaneously.

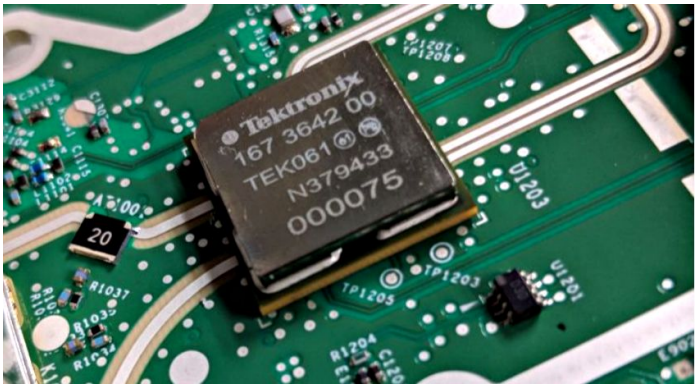
Waveform and IQ data can easily be transferred from the 6 Series Low Profile to a PC using a variety of programming commands and API interfaces that come standard on all Tektronix 5 Series & 6 Series products.



Tektronix's TEK049 ASIC has a patented signal path enabling signals to travel from the ADC to both a traditional decimator (scope) and Digital Down Converter (DDC - RF) for independent control of both the time and frequency domains.

Behind the performance

The Tektronix-designed TEK049 ASIC contains 12-bit analog-to-digital converters (ADCs) that provide 16 times more resolution than traditional 8-bit ADCs. The TEK049 is paired with the new Tektronix TEK061 front-end amplifier with industry leading low noise that enables the best signal fidelity possible to capture small signals with high resolution.



Lowest in class noise enabled by new front-end amplifier

A key attribute to being able to view fine signal details on small, high-speed signals is noise. The higher a measurement systems' intrinsic noise, the less actual signal detail will be visible. This becomes more critical on a digitizer when the vertical settings are set to high sensitivity (like ≤ 10 mV/div) to view small signals that are prevalent in high-speed bus topologies. The 6 Series Low Profile has a new front-end ASIC, the TEK061, that enables breakthrough noise performance at the highest sensitivity settings.

In addition, a new High Res mode applies a hardware-based unique Finite Impulse Response (FIR) filter based on the selected sample rate. The FIR filter maintains the maximum bandwidth possible for that sample rate while preventing aliasing and removing noise from the digitizer amplifiers and ADC above the usable bandwidth for the selected sample rate. High Res mode always provides at least 12 bits of vertical resolution and extends all the way to 16 bits of vertical resolution at ≤ 625 MS/s sample rates and 200 MHz of bandwidth.

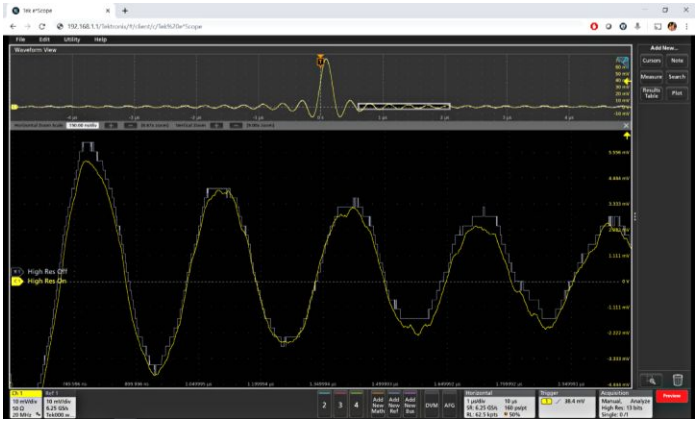
Remote control made easy

Programming the 6 Series Low Profile Digitizer in a test rack for easy remote control has never been easier.

Automated test equipment and multichannel systems require robust programming capability and are often subject to rack-space constraints and/or speed restraints. The 6 Series Low Profile Digitizer packs 4 high performance 25 GS/s channels into just 2 rack units and comes ready to mount in a rack. Each input can work as a precision analog channel and/or Spectrum channel with multiple remote interfaces that can be transferred over 1000Base-T Ethernet or Super Speed USB 3.0 ports to your local PC for further analysis. With the wide range of programming language support and GitHub repository, there are many ways to easily integrate your new digitizer into a test rack.

Key remote access features include:

- 2 rack units high (3.5 inches) with rackmount attached
- Easy web browser remote access and control
- LXI 1.5 certified (VXI-11)
- Ethernet and USB 3.0 (USBTMC) device port with up to 800 Mbps transfer rate
- Programmers manual with 1000+ VISA commands
- Programming support: IVI-C, IVI-COM, MATLAB, LabView, Python, VISA, Sockets, and more
- Tektronix GitHub programming examples (https://github.com/tektronix/Programmatic-Control-Examples)



*Easy remote control using e*Scope in a browser like Chrome, Firefox or Edge*

e*Scope is an easy remote viewing method of controlling a 5 Series or 6 Series oscilloscope or digitizer over a network connection through a standard web browser, in the exact same way that you do in-person. Simply type the instrument IP address into a modern browser and the LXI landing page is displayed, then select the Instrument Control to access e*scope. No drivers needed, it's all self-sustained with the browser, just like you were connected using the instrument screen or an attached monitor. Its fast, responsive and perfect for single or multiple instrument situations to visualize the data.

*Easy remote control using e*Scope across multiple instruments by tiling browser tabs on a monitor for viewing*

Synchronizing

Synchronize multiple instrument channels within 200 ps using manual deskew and the Aux Trigger input

When synchronizing multiple instruments its important to have the smallest amount of skew between instrument channels to allow for data timing accuracy. Generally speaking this can be broken down into two types of skew; the part that comes from uncertainty between the aux trigger to analog channel, and the part that comes from trigger jitter. By calibrating out the effects of channel delay to the aux input we can reduce the amount of timing inaccuracy between instrument channels to just the jitter. This process is called deskewing an instrument.

Deskewing can be done to a reference channel that is simultaneously feeding a trigger edge (preferably over 1 Vpp) into the Aux Trigger input of multiple instruments and to the reference channel. When everything is adjusted, instrument to instrument channels can be within a very tight tolerance of only a couple sample points and within our specification of 200 ps. Whether you have 16 channels or 200 channels, all the data can be easily synchronized and analyzed.

Enhanced security option

The optional 6-SEC enhanced security option enables password-protected enabling/disabling of all instrument I/O ports and firmware upgrades. In addition, option 6-SEC provides the highest level of security by ensuring that internal memory never stores user settings or waveform data, in compliance with National Industrial Security Program Operating Manual (NISPOM) DoD 5220.22-M, Chapter 8 requirements and Defense Security Service Manual for the Certification and Accreditation of Classified Systems under the NISPOM. This ensures that you can confidently move the instrument out of a secure area.

Arbitrary/Function Generator (AFG)

The instrument contains an optional integrated arbitrary/function generator, perfect for simulating sensor signals within a design or adding noise to signals to perform margin testing. The integrated function generator provides output of predefined waveforms up to 50 MHz for sine, square, pulse, ramp/triangle, DC, noise, sin(x)/x (Sinc), Gaussian, Lorentz, exponential rise/fall, Haversine and cardiac. The AFG can load waveform records up to 128 k points in size from an internal file location or a USB mass storage device.

The AFG feature is compatible with Tektronix' ArbExpress PC-based waveform creation and editing software, making creation of complex waveforms fast and easy.

Digital Voltmeter (DVM) and Trigger Frequency Counter

The instrument contains an integrated 4-digit digital voltmeter (DVM) and 8-digit trigger frequency counter. Any of the analog inputs can be a source for the voltmeter, using the same probes that are already attached for general oscilloscope usage. The trigger frequency counter provides a very precise readout of the frequency of the trigger event on which you're triggering.

Both the DVM and trigger frequency counter are available for free and are activated when you register your product.

Specifications

All specifications are guaranteed unless noted otherwise. All specifications apply to all models unless noted otherwise.

Model overview

LPD64 Low Profile Digitizer

Characteristic	LPD64
Analog inputs	4
Bandwidth (calculated rise time)	1 GHz (400 ps), 2.5 GHz (160 ps), 4 GHz (100 ps), 6 GHz (66.67 ps), 8 GHz (50 ps)
DC Gain Accuracy	50 Ω: ±2.0% [1], (±2.0% at 2 mV/div, ±4.0% at 1 mV/div, typical) 50 Ω: ±1.0% [2] of full scale, (±1.0% of full scale at 2 mV/div, ±2.0% at 1 mV/div, typical)
ADC Resolution	12 bits
Vertical Resolution (all channels)	8 bits @ 25 GS/s; 8 GHz 12 bits @ 12.5 GS/s; 4 GHz 13 bits @ 6.25 GS/s (High Res); 2 GHz 14 bits @ 3.125 GS/s (High Res); 1 GHz 15 bits @ 1.25 GS/s (High Res); 500 MHz 16 bits @ ≤625 MS/s (High Res); 200 MHz
Sample Rate	25 GS/s on all channels
Record Length	125 Mpoints on all channels (standard) 250 Mpoints on all channels (optional)
Waveform Capture Rate	>500,000 wfms/s (Peak Detect, Envelope acquisition mode), >30,000 wfms/s (all other acquisition modes)
Arbitrary/Function Generator (option)	13 predefined waveform types with up to 50 MHz output
DVM	4-digit DVM (free with product registration)
Trigger Frequency Counter	8-digit frequency counter (free with product registration)

Vertical system

Input coupling	DC
Input impedance 50 Ω, DC coupled	50 Ω ±3%
Input sensitivity range	
50 Ω	1 mV/div to 1 V/div in a 1-2-5 sequence Note: 1 mV/div is a 2X digital zoom of 2 mV/div.
Maximum input voltage	50 Ω: 2.5 V_{RMS} at <100 mV/div, with peaks ≤ ±20 V (DF ≤ 6.25%) 50 Ω: 5 V_{RMS} at ≥100 mV/div, with peaks ≤ ±20 V (DF ≤ 6.25%)

1 Warranted specification, immediately after SPC, add 2% for every 5 °C change in ambient temperature.

2 Warranted specification, immediately after SPC, add 1% for every 5 °C change in ambient temperature. At full scale is sometimes used to compare to other manufactures.

Vertical system

Effective bits (ENOB), typical

2 mV/div, High Res mode, 50 Ω, 10 MHz input with 90% full screen

Bandwidth	ENOB
4 GHz	5.9
3 GHz	6.1
2.5 GHz	6.2
2 GHz	6.35
1 GHz	6.8
500 MHz	7.2
350 MHz	7.4
250 MHz	7.5
200 MHz	7.75
20 MHz	8.8

50 mV/div, High Res mode, 50 Ω, 10 MHz input with 90% full screen

Bandwidth	ENOB
4 GHz	7.25
3 GHz	7.5
2.5 GHz	7.6
2 GHz	7.8
1 GHz	8.2
500 MHz	8.5
350 MHz	8.8
250 MHz	8.9
200 MHz	9
20 MHz	9.8

Vertical system

2 mV/div, Sample mode, 50 Ω, 10 MHz input with 90% full screen

Bandwidth	ENOB
8 GHz	5.1
7 GHz	5.3
6 GHz	5.5
5 GHz	5.65
4 GHz	5.9
3 GHz	6.05
2.5 GHz	6.2
2 GHz	6.35
1 GHz	6.8
500 MHz	7.2
350 MHz	7.3
250 MHz	7.5
200 MHz	7.3
20 MHz	7.6

50 mV/div, Sample mode, 50 Ω, 10 MHz input with 90% full screen

Bandwidth	ENOB
8 GHz	6.5
7 GHz	6.6
6 GHz	6.8
5 GHz	7
4 GHz	7.2
3 GHz	7.4
2.5 GHz	7.6
2 GHz	7.7
1 GHz	8.2
500 MHz	8.4
350 MHz	8.7
250 MHz	8.8
200 MHz	7.8
20 MHz	7.9

DC balance

0.1 div with DC-50 Ω digitizer input impedance (50 Ω terminated)

0.2 div at 1 mV/div with DC-50 Ω digitizer input impedance (50 Ω terminated)

Position range

±5 divisions

Offset ranges, maximum

Input signal cannot exceed maximum input voltage for the 50 Ω input path.

Volts/div Setting	Maximum offset range, 50 Ω Input
1 mV/div - 99 mV/div	±1 V
100 mV/div - 1 V/div	±10 V

Offset accuracy

±(0.005 X | offset - position | + DC balance); Offset, position, and DC Balance in units of Volts

Vertical system

Bandwidth selections

8 GHz model, 50 Ohm	20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, 1 GHz, 2 GHz, 2.5 GHz, 3 GHz, 4 GHz, 5 GHz, 6 GHz, 7 GHz, and 8 GHz
6 GHz model, 50 Ohm	20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, 1 GHz, 2 GHz, 2.5 GHz, 3 GHz, 4 GHz, 5 GHz, and 6 GHz
4 GHz model, 50 Ohm	20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, 1 GHz, 2 GHz, 2.5 GHz, 3 GHz, and 4 GHz
2.5 GHz model, 50 Ohm	20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, 1 GHz, 2 GHz, and 2.5 GHz
1 GHz model, 50 Ohm	20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, and 1 GHz

Bandwidth filtering optimized for Flatness or Step response

Random noise, RMS, typical

50 Ω, typical

25 GS/s, Sample Mode, RMS

V/div	1 mV/div	2 mV/div	5 mV/div	10 mV/div	20 mV/div	50 mV/div	100 mV/div	1 V/div
8 GHz	158 µV	158 µV	208 µV	342 µV	630 µV	1.49 mV	3.46 mV	29.7 mV
7 GHz	141 µV	143 µV	192 µV	311 µV	562 µV	1.31 mV	3.11 mV	26.2 mV
6 GHz	127 µV	127 µV	165 µV	274 µV	489 µV	1.18 mV	2.71 mV	23.6 mV
5 GHz	112 µV	113 µV	149 µV	239 µV	446 µV	1.05 mV	2.42 mV	21.1 mV

12.5 GS/s, HiRes Mode, RMS

V/div	1 mV/div	2 mV/div	5 mV/div	10 mV/div	20 mV/div	50 mV/div	100 mV/div	1 V/div
4 GHz	97.4 µV	98.7 µV	124 µV	192 µV	344 µV	817 µV	1.92 mV	16.3 mV
3 GHz	82.9 µV	84 µV	105 µV	160 µV	282 µV	680 µV	1.62 mV	13.6 mV
2.5 GHz	76.5 µV	77.5 µV	93.8 µV	144 µV	257 µV	606 µV	1.44 mV	12.1 mV
2 GHz	68.1 µV	69.1 µV	83.6 µV	131 µV	226 µV	528 µV	1.28 mV	10.6 mV
1 GHz	54.8 µV	51.2 µV	63.4 µV	90.9 µV	160 µV	378 µV	941 µV	7.65 mV
500 MHz	39.7 µV	39.8 µV	48.1 µV	65.1 µV	115 µV	280 µV	666 µV	5.6 mV
350 MHz	33.8 µV	33.5 µV	40 µV	54.8 µV	94.3 µV	217 µV	560 µV	4.35 mV
250 MHz	30.8 µV	31.2 µV	36.1 µV	49.9 µV	80.3 µV	187 µV	482 µV	3.75 mV
200 MHz	25.3 µV	25.4 µV	29.7 µV	44 µV	70.7 µV	165 µV	445 µV	3.3 mV
20 MHz	8.68 µV	8.9 µV	10.4 µV	15.1 µV	27.5 µV	70.4 µV	158 µV	1.41 mV

Crosstalk (channel isolation), typical

≥ -80 dB up to 2 GHz

≥ -65 dB up to 4 GHz

≥ -55 dB up to 8 GHz

for any two channels set to 200 mV/div.

Horizontal system

Time base range

40 ps/div to 1,000 s/div

Sample rate range

6.25 S/s to 25 GS/s (real time)

50 GS/s to 2.5 TS/s (interpolated)

Record length range

All acquisition modes are 250 M maximum record length, down to 1 k minimum record length, adjustable in 1 sample increments.

Standard: 125 Mpoints

Option 6-RL-2: 250 Mpoints

Seconds/Division range

Record length	1 K	10 K	100 K	1 M	10 M	62.5 M	125 M	250 M
Standard: 125 M	40 ps - 16 s	400 ps - 160 s	4 ns - 1000 s			2.5 µs - 1000 s	5 µs - 1000 s	N/A
Option 6-RL-2: 250 M	40 ps - 16 s	400 ps - 160 s	4 ps - 1000 s			2.5 µs - 1000 s	5 µs - 1000 s	10 µs - 1000 s

Aperture uncertainty

Time duration	Typical jitter
<1 µs	80 fs
<1 ms	130 fs

Timebase accuracy

±1.0 x10^{-7} over any ≥1 ms time interval

Description	Specification
Factory Tolerance	±12 ppb. At calibration, 25 °C ambient, over any ≥1 ms interval
Temperature stability	±20 ppb across the full operating range of 0 °C to 50 °C, after a sufficient soak time at the temperature. Tested at operating temperatures
Crystal aging	±300 ppb. Frequency tolerance change at 25 °C over a period of 1 year

Delta-time measurement accuracy

$$DTA_{pp}(typical) = 10 \times \sqrt{\left(\frac{N}{SR_1}\right)^2 + \left(\frac{N}{SR_2}\right)^2 + \left(0.450\ ps + \left(1 \times 10^{-11} \times t_p\right)\right)^2} + TBA \times t_p$$

$$DTA_{RMS} = \sqrt{\left(\frac{N}{SR_1}\right)^2 + \left(\frac{N}{SR_2}\right)^2 + \left(0.450\ ps + \left(1 \times 10^{-11} \times t_p\right)\right)^2} + TBA \times t_p$$

(assume edge shape that results from Gaussian filter response)

The formula to calculate delta-time measurement accuracy (DTA) for a given instrument setting and input signal assumes insignificant signal content above Nyquist frequency, where:

SR_1 = Slew Rate (1st Edge) around 1st point in measurement

SR_2 = Slew Rate (2nd Edge) around 2nd point in measurement

N = input-referred guaranteed noise limit (V_{RMS})

TBA = timebase accuracy or Reference Frequency Error

t_p = delta-time measurement duration (sec)

Maximum duration at highest sample rate

5 ms (standard) or 10 ms (option 6-RL-2, 250 Mpoints)

Time base delay time range

-10 divisions to 5,000 s

Horizontal system

Deskew range

-125 ns to +125 ns with a resolution of 40 ps (for Peak Detect and Envelope acquisition modes).

-125 ns to +125 ns with a resolution of 1 ps (for all other acquisition modes).

Delay between analog channels, full bandwidth, typical

≤ 10 ps for any two channels with input impedance set to 50 Ω, DC coupling with equal Volts/div or above 10 mV/div

Trigger system

Trigger modes

Auto, Normal, and Single

Trigger coupling

DC, HF Reject (attenuates > 50 kHz), LF Reject (attenuates < 50 kHz), noise reject (reduces sensitivity)

Trigger bandwidth (edge, pulse and logic), typical

Model	Trigger type	Trigger bandwidth
8 GHz	Edge	8 GHz
8 GHz	Pulse, Logic	4 GHz
6 GHz	Edge	6 GHz
6 GHz	Pulse, Logic	4 GHz
4 GHz, 2.5 GHz, 1 GHz:	Edge, Pulse, Logic	Product Bandwidth

Edge-type trigger sensitivity, DC coupled, typical

Path	Range	Specification
50 Ω path	1 mV/div to 9.98 mV/div	3.0 div from DC to instrument bandwidth
	≥ 10 mV/div	< 1.0 division from DC to instrument bandwidth
Line	90 V to 264 V line voltage at 50 - 60 Hz line frequency	103.5 V to 126.5 V
AUX Trigger in		250 mV_{PP}, DC to 400 MHz

Edge-type trigger sensitivity, not DC coupled, typical

Trigger Coupling	Typical Sensitivity
NOISE REJ	2.5 times the DC Coupled limits
HF REJ	1.0 times the DC Coupled limits from DC to 50 kHz. Attenuates signals above 50 kHz.
LF REJ	1.5 times the DC Coupled limits for frequencies above 50 kHz. Attenuates signals below 50 kHz.

Trigger jitter, typical

≤ 1.5 ps_{RMS} for sample mode and edge-type trigger

≤ 7 ps_{RMS} ≤ 2 ps_{RMS} for edge-type trigger and FastAcq mode

≤ 40 ps_{RMS} for non edge-type trigger modes

≤ 40 ps_{RMS} for AUX trigger in, Sample acquisition mode, edge trigger

≤ 40 ps_{RMS} for AUX trigger in, FastAcq acquisition mode, edge trigger

Trigger jitter, AUX input, typical

≤ 200 ps_{RMS} for sample mode and edge-type trigger

≤ 220 ps_{RMS} for edge-type trigger and FastAcq mode

AUX In trigger skew between instruments, typical

±100 ps jitter on each instrument with <450 ps skew; <550 ps total between instruments. Can be manually deskewed so channel-to-channel total skew is <200ps between instruments using AUX In.

Skew improves for pulse input voltages ≥1 V_{pp}

Trigger system

Trigger level ranges

Source	Range
Any Channel	±5 divs from center of screen
Aux In Trigger	±5 V
Line	Fixed at about 50% of line voltage

This specification applies to logic and pulse thresholds.

Trigger frequency counter 8-digits (free with product registration)

Trigger types

Edge: Positive, negative, or either slope on any channel. Coupling includes DC, AC, noise reject, HF reject, and LF reject

Pulse Width: Trigger on width of positive or negative pulses. Event can be time- or logic-qualified

Timeout: Trigger on an event which remains high, low, or either, for a specified time period. Event can be logic-qualified

Runt: Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Event can be time- or logic-qualified

Window: Trigger on an event that enters, exits, stays inside or stays outside of a window defined by two user-adjustable thresholds. Event can be time- or logic-qualified

Logic: Trigger when logic pattern goes true, goes false, or occurs coincident with a clock edge. Pattern (AND, OR, NAND, NOR) specified for all input channels defined as high, low, or don't care. Logic pattern going true can be time-qualified

Setup & Hold: Trigger on violations of both setup time and hold time between clock and data present on any input channels

Rise / Fall Time: Trigger on pulse edge rates that are faster or slower than specified. Slope may be positive, negative, or either. Event can be logic-qualified

Sequence: Trigger on B event X time or N events after A trigger with a reset on C event. In general, A and B trigger events can be set to any trigger type with a few exceptions: logic qualification is not supported, if A event or B event is set to Setup & Hold, then the other must be set to Edge, and Ethernet and High Speed USB (480 Mbps) are not supported

Visual trigger Qualifies standard triggers by scanning all waveform acquisitions and comparing them to on-screen areas (geometric shapes). An unlimited number of areas can be defined with In, Out, or Don't Care as the qualifier for each area. A boolean expression can be defined using any combination of visual trigger areas to further qualify the events that get stored into acquisition memory. Shapes include rectangle, triangle, trapezoid, hexagon and user-defined

Parallel Bus: Trigger on a parallel bus data value. Parallel bus can be from 1 to 4 bits (from the analog channels) in size. Supports Binary and Hex radices

I^2C Bus (option 6-SREMBD): Trigger on Start, Repeated Start, Stop, Missing ACK, Address (7 or 10 bit), Data, or Address and Data on I^2C buses up to 10 Mb/s

SPI Bus (option 6-SREMBD): Trigger on Slave Select, Idle Time, or Data (1-16 words) on SPI buses up to 20 Mb/s

RS-232/422/485/UART Bus (option 6-SRCOMP): Trigger on Start Bit, End of Packet, Data, and Parity Error up to 15 Mb/s

CAN Bus (option 6-SRAUTO): Trigger on Start of Frame, Type of Frame (Data, Remote, Error, or Overload), Identifier, Data, Identifier and Data, End Of Frame, Missing Ack, and Bit Stuff Error on CAN buses up to 1 Mb/s

CAN FD Bus (option 6-SRAUTO): Trigger on Start of Frame, Type of Frame (Data, Remote, Error, or Overload), Identifier (Standard or Extended), Data (1-8 bytes), Identifier and Data, End Of Frame, Error (Missing Ack, Bit Stuffing Error, FD Form Error, Any Error) on CAN FD buses up to 16 Mb/s

LIN Bus (option 6-SRAUTO): Trigger on Sync, Identifier, Data, Identifier and Data, Wakeup Frame, Sleep Frame, and Error on LIN buses up to 1 Mb/s

FlexRay Bus (option 6-SRAUTO): Trigger on Start of Frame, Indicator Bits (Normal, Payload, Null, Sync, Startup), Frame ID, Cycle Count, Header Fields (Indicator Bits, Identifier, Payload Length, Header CRC, and Cycle Count), Identifier, Data, Identifier and Data, End Of Frame, and Errors on FlexRay buses up to 10 Mb/s

SENT Bus (option 6-SRAUTOSEN) Trigger on Start of Packet, Fast Channel Status and Data, Slow Channel Message ID and Data, and CRC Errors

SPMI Bus (option 6-SRPM): Trigger on Sequence Start Condition, Reset, Sleep, Shutdown, Wakeup, Authenticate, Master Read, Master Write, Register Read, Register Write, Extended Register Read, Extended Register Write, Extended Register Read Long, Extended Register Write Long, Device Descriptor Block Master Read, Device Descriptor Block Slave Read, Register 0 Write, Transfer Bus Ownership, and Parity Error

USB 2.0 LS/FS/HS Bus (option 6-SRUSB2): Trigger on Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error on USB buses up to 480 Mb/s

Trigger system

Ethernet Bus (option 6-SRENET):	Trigger on Start of Frame, MAC Addresses, MAC Q-tag, MAC Length/Type, MAC Data, IP Header, TCP Header, TCP/IPV4 Data, End of Packet, and FCS (CRC) Error on 10BASE-T and 100BASE-TX buses
Audio (I^2S, LJ, RJ, TDM) Bus (option 6-SRAUDIO):	Trigger on Word Select, Frame Sync, or Data. Maximum data rate for I^2S/LJ/RJ is 12.5 Mb/s. Maximum data rate for TDM is 25 Mb/s
MIL-STD-1553 Bus (option 6-SRAERO):	Trigger on Sync, Command (Transmit/Receive Bit, Parity, Subaddress / Mode, Word Count / Mode Count, RT Address), Status (Parity, Message Error, Instrumentation, Service Request, Broadcast Command Received, Busy, Subsystem Flag, Dynamic Bus Control Acceptance, Terminal Flag), Data, Time (RT/IMG), and Error (Parity Error, Sync Error, Manchester Error, Non-contiguous Data) on MIL-STD-1553 buses
ARINC 429 Bus (option 6-SRAERO):	Trigger on Word Start, Label, Data, Label and Data, Word End, and Error (Any Error, Parity Error, Word Error, Gap Error) on ARINC 429 buses up to 1 Mb/s
Trigger holdoff range	0 ns to 10 seconds

Acquisition system

Sample	Acquires sampled values
Peak Detect	Captures glitches as narrow as at all sweep speeds
Averaging	From 2 to 10,240 waveforms
Envelope	Min-max envelope reflecting Peak Detect data over multiple acquisitions
High Res	Applies a unique Finite Impulse Response (FIR) filter for each sample rate that maintains the maximum bandwidth possible for that sample rate while preventing aliasing and removing noise from the oscilloscope amplifiers and ADC above the usable bandwidth for the selected sample rate. High Res mode always provides at least 12 bits of vertical resolution and extends all the way to 16 bits of vertical resolution at ≤ 625 MS/s sample rates.
FastAcq®	FastAcq optimizes the instrument for analysis of dynamic signals and capture of infrequent events. Maximum waveform capture rate: >500,000 wfms/s (Peak Detect or Envelope Acquisition mode) >30,000 wfms/s (All other acquisition modes)
Roll mode	Scrolls sequential waveform points across the display in a right-to-left rolling motion, at timebase speeds of 40 ms/div and slower, when in Auto trigger mode.
FastFrame™	Acquisition memory divided into segments. Maximum trigger rate >5,000,000 waveforms per second Minimum frame size = 50 points Maximum Number of Frames: For frame size ≥ 1,000 points, maximum number of frames = record length / frame size. For 50 point frames, maximum number of frames = 691,000

Waveform measurements

Cursor types

Waveform, V Bars, H Bars, V&H Bars, and Polar (XY/XYZ plots only)

DC voltage measurement accuracy, Average acquisition mode

Measurement Type	DC Accuracy (In Volts)
Average of ≥ 16 waveforms	±((DC Gain Accuracy) * |reading - (offset - position)| + Offset Accuracy + 0.05 * V/div setting)
Delta volts between any two averages of ≥ 16 waveforms acquired with the same oscilloscope setup and ambient conditions	±(DC Gain Accuracy * |reading| + 0.1 div)

Automatic measurements

36, of which an unlimited number can be displayed as either individual measurement badges or collectively in a measurement results table

Amplitude measurements

Amplitude, Maximum, Minimum, Peak-to-Peak, Positive Overshoot, Negative Overshoot, Mean, RMS, AC RMS, Top, Base, and Area

Timing measurements

Period, Frequency, Unit Interval, Data Rate, Positive Pulse Width, Negative Pulse Width, Skew, Delay, Rise Time, Fall Time, Phase, Rising Slew Rate, Falling Slew Rate, Burst Width, Positive Duty Cycle, Negative Duty Cycle, Time Outside Level, Setup Time, Hold Time, Duration N-Periods, High Time, and Low Time

Jitter measurements (standard)

TIE and Phase Noise

Measurement statistics

Mean, Standard Deviation, Maximum, Minimum, and Population. Statistics are available on both the current acquisition and all acquisitions

Reference levels

User-definable reference levels for automatic measurements can be specified in either percent or units. Reference levels can be set to global for all measurements, per source channel or signal, or unique for each measurement

Gating

Screen, Cursors, Logic, Search, or Time. Specifies the region of an acquisition in which to take measurements. Gating can be set to Global (affects all measurements set to Global) or Local (all measurements can have a unique Time gate setting; only one Local gate is available for Screen, Cursors, Logic, and Search actions).

Measurement plots

Time Trend, Histogram, and Spectrum plots are available for all standard measurements

Fast eye rendering: Shows the Unit Intervals (UIs) that define the boundaries of the eye along with a user specified number of surrounding UIs for added visual context

Complete eye rendering: Shows all valid Unit Intervals (UIs)

Measurement limits

Pass/fail testing for user-definable limits on measurement values. Act on event for measurement value failures include Save Screen Capture, Save Waveform, and Stop Acquisitions

Jitter analysis (option 6-DJA) adds the following:

Measurements

Jitter Summary, TJ@BER, RJ- δδ, DJ- δδ, PJ, RJ, DJ, DDJ, DCD, SRJ, J2, J9, NPJ, F/2, F/4, F/8, Eye Height, Eye Height@BER, Eye Width, Eye Width@BER, Eye High, Eye Low, Q-Factor, Bit High, Bit Low, Bit Amplitude, DC Common Mode, AC Common Mode (Pk-Pk), Differential Crossover, T/nT Ratio, SSC Freq Dev, SSC Modulation Rate

Measurement plots

Eye Diagram and Jitter Bathtub

Fast eye rendering: Shows the Unit Intervals (UIs) that define the boundaries of the eye along with a user specified number of surrounding UIs for added visual context

Complete eye rendering: Shows all valid Unit Intervals (UIs)

Eye diagram mask testing

Automated mask pass/fail testing

Waveform measurements

Power analysis adds the following:

Measurements	Input Analysis (Frequency, V_{RMS}, I_{RMS}, voltage and current Crest Factors, True Power, Apparent Power, Reactive Power, Power Factor, Phase Angle, Harmonics, Inrush Current, Input Capacitance)
	Amplitude Analysis (Cycle Amplitude, Cycle Top, Cycle Base, Cycle Maximum, Cycle Minimum, Cycle Peak-to-Peak)
	Timing Analysis (Period, Frequency, Negative Duty Cycle, Positive Duty Cycle, Negative Pulse Width, Positive Pulse Width)
	Switching Analysis (Switching Loss, dv/dt, di/dt, Safe Operating Area, R_{DSon})
	Magnetic Analysis (Inductance, I vs. Intg(V), Magnetic Loss, Magnetic Property)
	Output Analysis (Line Ripple, Switching Ripple, Efficiency, Turn-on Time, Turn-off Time)
	Frequency Response Analysis (Control Loop Response Bode Plot, Power Supply Rejection Ratio, Impedance)
Measurement Plots	Harmonics Bar Graph, Switching Loss Trajectory Plot, and Safe Operating Area

Digital Power Management adds the following:

Measurements	Ripple Analysis (Ripple)
	Transient Analysis (Overshoot, Undershoot, Turn On Overshoot, DC Rail Voltage)
	Power Sequence Analysis (Turn-on, Turn-off)
	Jitter Analysis (TIE, PJ, RJ, DJ, Eye Height, Eye Width, Eye High, Eye Low)

DDR3/LPDDR3 memory debug and analysis option (6-DBDDR3) adds the following:

Measurements	Amplitude Measurements (AOS, AUS, Vix(ac), AOS Per tCK, AUS Per tCK, AOS Per UI, AUS Per UI)
	Time Measurements (tRPRE, tWPRE, tPST, Hold Diff, Setup Diff, tCH(avg), tCK(avg), tCL(avg), tCH(abs), tCL(abs), tJIT(duty), tJIT(per), tJIT(cc), tERR(n), tERR(m-n), tDQSCK, tCMD-CMD, tCKSRE, tCKSRX)

LVDS debug and analysis option (option 6-DBLVDS) adds the following:

Data Lane Measurements	Generic Test (Unit Interval, Rise Time, Fall Time, Data Width, Data Intra Skew (PN), Data Inter Skew (Lane-to-Lane), Data Peak-to-Peak)
	Jitter Test (AC Timing, Clock Data Setup Time, Clock Data Hold Time, Eye Diagram (TIE), TJ@BER, DJ Delta, RJ Delta, DDJ, De-Emphasis Level)
Clock Lane Measurements	Generic Test (Frequency, Period, Duty Cycle, Rise Time, Fall Time, Clock Intra Skew (PN), Clock Peak-to-Peak)
	Jitter Test (TIE, DJ, RJ)
	SSC On (Mod Rate, Frequency Deviation Mean)

Waveform math

Number of math waveforms	Unlimited
Arithmetic	Add, subtract, multiply, and divide waveforms and scalars
Algebraic expressions	Define extensive algebraic expressions including waveforms, scalars, user-adjustable variables, and results of parametric measurements. Perform math on math using complex equations. For example (Integral (CH1 - Mean(CH1)) X 1.414 X VAR1)
Math functions	Invert, Integrate, Differentiate, Square Root, Exponential, Log 10, Log e, Abs, Ceiling, Floor, Min, Max, Degrees, Radians, Sin, Cos, Tan, ASin, ACos, and ATan
Relational	Boolean result of comparison >, <, ≥, ≤, =, and ≠

Waveform math

Logic	AND, OR, NAND, NOR, XOR, and EQV
Filtering function	User-definable filters. Users specify a file containing the coefficients of the filter
FFT functions	Spectral Magnitude and Phase, and Real and Imaginary Spectra
FFT vertical units	Magnitude: Linear and Log (dBm) Phase: Degrees, Radians, and Group Delay
FFT window functions	Hanning, Rectangular, Hamming, Blackman-Harris, Flattop2, Gaussian, Kaiser-Bessel, and TekExp

Spectrum View

Center Frequency	Limited by instrument analog bandwidth
Span	74.5 Hz – 1.25 GHz (standard) 74.5 Hz – 2 GHz (option 6-SV-BW-1) Coarse adjustment in a 1-2-5 sequence
RF vs. Time Traces	Magnitude vs. time, Frequency vs. time, Phase vs. Time
Resolution Bandwidth (RBW)	93 µHz to 62.5 MHz 93 µHz to 100 MHz (option 6-SV-BW-1)
Window types and factors	

Window type	Factor
Blackman-Harris	1.90
Flat-Top 2	3.77
Hamming	1.30
Hanning	1.44
Kaiser-Bessel	2.23
Rectangular	0.89

Spectrum Time	FFT Window Factor / RBW
Reference level	Reference level is automatically set by the analog channel Volts/div setting Setting range: -42 dBm to +44 dBm
Vertical Position	-100 divs to +100 divs
Vertical units	dBm, dBµW, dBmV, dBµV, dBmA, dBµA

Search

Number of searches	Unlimited
Search types	Search through long records to find all occurrences of user specified criteria including edges, pulse widths, timeouts, runt pulses, window violations, logic patterns, setup & hold violations, rise/fall times, and bus protocol events. Search results can be viewed in the Waveform View or in the Results table.

Save

Waveform Type	Tektronix Waveform Data (.wfm), Comma Separated Values (.csv), MATLAB (.mat)
Waveform Gating	Cursors, Screen, Resample (save every nth sample)
Screen Capture Type	Portable Network Graphic (*.png), 24-bit Bitmap (*.bmp), JPEG (*.jpg)
Setup Type	Tektronix Setup (.set)
Report Type	Adobe Portable Documents (.pdf), Single File web Pages (.mht)
Session Type	Tektronix Session Setup (.tss)

Display

Display type	External monitor
	1,920 horizontal × 1,080 vertical pixels (High Definition)
Display modes	Overlay: traditional oscilloscope display where traces overlay each other Stacked: display mode where each waveform is placed in its own slice and can take advantage of the full ADC range while still being visually separated from other waveforms. Groups of channels can also be overlaid within a slice to simplify visual comparison of signals.
Zoom	Horizontal and vertical zooming is supported in all waveform and plot views.
Interpolation	Sin(x)/x and Linear
Waveform styles	Vectors, dots, variable persistence, and infinite persistence
Graticules	Movable and fixed graticules, selectable between Grid, Time, Full, and None
Color palettes	Normal and inverted for screen captures Individual waveform colors are user-selectable
Format	YT, XY, and XYZ
Local Language User Interface	English, Japanese, Simplified Chinese, Traditional Chinese, French, German, Italian, Spanish, Portuguese, Russian, Korean
Local Language Help	English, Japanese, Simplified Chinese

Arbitrary-Function Generator optional

Function types

Arbitrary, sine, square, pulse, ramp, triangle, DC level, Gaussian, Lorentz, exponential rise/fall, sin(x)/x, random noise, Haversine, Cardiac

Amplitude range

Values are peak-to-peak voltages

Waveform	50 Ω	1 MΩ
Arbitrary	10 mV to 2.5 V	20 mV to 5 V
Sine	10 mV to 2.5 V	20 mV to 5 V
Square	10 mV to 2.5 V	20 mV to 5 V
Pulse	10 mV to 2.5 V	20 mV to 5 V
Ramp	10 mV to 2.5 V	20 mV to 5 V
Triangle	10 mV to 2.5 V	20 mV to 5 V
Gaussian	10 mV to 1.25 V	20 mV to 2.5 V
Lorentz	10 mV to 1.2 V	20 mV to 2.4 V
Exponential Rise	10 mV to 1.25 V	20 mV to 2.5 V
Exponential Fall	10 mV to 1.25 V	20 mV to 2.5 V
Sine(x)/x	10 mV to 1.5 V	20 mV to 3.0 V
Random Noise	10 mV to 2.5 V	20 mV to 5 V
Haversine	10 mV to 1.25 V	20 mV to 2.5 V
Cardiac	10 mV to 2.5 V	20 mV to 5 V

Sine waveform

Frequency range
0.1 Hz to 50 MHz

Frequency setting resolution
0.1 Hz

Frequency accuracy
130 ppm (frequency ≤ 10 kHz), 50 ppm (frequency > 10 kHz)

This is for Sine, Ramp, Square and Pulse waveforms only.

Amplitude range
20 mV_{pp} to 5 V_{pp} into Hi-Z; 10 mV_{pp} to 2.5 V_{pp} into 50 Ω

Amplitude flatness, typical
±0.5 dB at 1 kHz

±1.5 dB at 1 kHz for < 20 mV_{pp} amplitudes

Total harmonic distortion, typical
1% for amplitude ≥ 200 mV_{pp} into 50 Ω load

2.5% for amplitude > 50 mV AND < 200 mV_{pp} into 50 Ω load

This is for Sine wave only.

Spurious free dynamic range, typical
40 dB (V_{pp} ≥ 0.1 V); 30 dB (V_{pp} ≥ 0.02 V), 50 Ω load

Square and pulse waveform

Frequency range
0.1 Hz to 25 MHz

Frequency setting resolution
0.1 Hz

Frequency accuracy
130 ppm (frequency ≤ 10 kHz), 50 ppm (frequency > 10 kHz)

Amplitude range
20 mV_{pp} to 5 V_{pp} into Hi-Z; 10 mV_{pp} to 2.5 V_{pp} into 50 Ω

Duty cycle range
10% - 90% or 10 ns minimum pulse, whichever is larger

Minimum pulse time applies to both on and off time, so maximum duty cycle will reduce at higher frequencies to maintain 10 ns off time

Duty cycle resolution
0.1%

Minimum pulse width, typical
10 ns. This is the minimum time for either on or off duration.

Rise/Fall time, typical
5 ns, 10% - 90%

Pulse width resolution
100 ps

Arbitrary-Function Generator optional

Overshoot, typical	< % for signal steps greater than 100 mV_{pp}
	This applies to overshoot of the positive-going transition (+overshoot) and of the negative-going (-overshoot) transition
Asymmetry, typical	±1% ±5 ns, at 50% duty cycle
Jitter, typical	< 60 ps TIE_{RMS}, ≥ 100 mV_{pp} amplitude, 40%-60% duty cycle
Ramp and triangle waveform	
Frequency range	0.1 Hz to 500 kHz
Frequency setting resolution	0.1 Hz
Frequency accuracy	130 ppm (frequency ≤ 10 kHz), 50 ppm (frequency > 10 kHz)
Amplitude range	20 mV_{pp} to 5 V_{pp} into Hi-Z; 10 mV_{pp} to 2.5 V_{pp} into 50 Ω
Variable symmetry	0% - 100%
Symmetry resolution	0.1%
DC level range	±2.5 V into Hi-Z
	±1.25 V into 50 Ω
Random noise amplitude range	20 mV_{pp} to 5 V_{pp} into Hi-Z
	10 mV_{pp} to 2.5 V_{pp} into 50 Ω
Sin(x)/x	
Maximum frequency	2 MHz
Gaussian pulse, Haversine, and Lorentz pulse	
Maximum frequency	5 MHz
Lorentz pulse	
Frequency range	0.1 Hz to 5 MHz
Amplitude range	20 mV_{pp} to 2.4 V_{pp} into Hi-Z
	10 mV_{pp} to 1.2 V_{pp} into 50 Ω
Cardiac	
Frequency range	0.1 Hz to 500 kHz
Amplitude range	20 mV_{pp} to 5 V_{pp} into Hi-Z
	10 mV_{pp} to 2.5 V_{pp} into 50 Ω
Arbitrary	
Memory depth	1 to 128 k
Amplitude range	20 mV_{pp} to 5 V_{pp} into Hi-Z
	10 mV_{pp} to 2.5 V_{pp} into 50 Ω
Repetition rate	0.1 Hz to 25 MHz
Sample rate	250 MS/s
Signal amplitude accuracy	±[(1.5% of peak-to-peak amplitude setting) + (1.5% of absolute DC offset setting) + 1 mV] (frequency = 1 kHz)
Signal amplitude resolution	1 mV (Hi-Z)
	500 µV (50 Ω)

Arbitrary-Function Generator optional

Sine and ramp frequency accuracy	130 ppm (frequency ≤10 kHz) 50 ppm (frequency >10 kHz)
DC offset range	±2.5 V into Hi-Z ±1.25 V into 50 Ω
DC offset resolution	1 mV (Hi-Z) 500 µV (50 Ω)
DC offset accuracy	±[(1.5% of absolute offset voltage setting) + 1 mV] Add 3 mV of uncertainty per 10 °C change from 25 °C ambient

Digital volt meter (DVM)

Measurement types	DC, AC_{RMS}+DC, AC_{RMS}, Trigger frequency count
Voltage resolution	4 digits
Voltage accuracy	
DC:	±((1.5% * |reading - offset - position|) + (0.5% * |(offset - position)|) + (0.1 * Volts/div)) De-rated at 0.100%/°C of |reading - offset - position| above 30 °C Signal ± 5 divisions from screen center
AC:	± 3% (40 Hz to 1 kHz) with no harmonic content outside 40 Hz to 1 kHz AC, typical: ± 2% (20 Hz to 10 kHz) For AC measurements, the input channel vertical settings must allow the V_{PP} input signal to cover between 4 and 10 divisions and must be fully visible on the screen

Trigger frequency counter

Resolution	8-digits
Accuracy	±(1 count + time base accuracy * input frequency) The signal must be at least 8 mV_{pp} or 2 div, whichever is greater.
Maximum input frequency	10 Hz to maximum bandwidth of the analog channel The signal must be at least 8 mV_{pp} or 2 div, whichever is greater.

Processor system

Host processor	Intel i5-4400E, 2.7 GHz, 64-bit, dual core processor
Internal storage	≥ 80 GB. Form factor is an 80 mm m.2 card with a SATA-3 interface 512 GB m.2 drive with a SATA-3 interface (with option 6-WINM2)
Operating system	Closed Embedded OS (std configuration). No access to OS file system. Instrument with option 6-WINM2 installed: Microsoft Windows 10.

Input-Output ports

DisplayPort connector	A 20-pin DisplayPort connector; connect to show the oscilloscope display on an external monitor or projector
DVI connector	A 29-pin DVI-I connector; connect to show the oscilloscope display on an external monitor or projector
VGA	DB-15 female connector; connect to show the oscilloscope display on an external monitor or projector
Probe compensator signal, typical	
Connection:	Connectors are located on the lower front right of the instrument
Amplitude:	0 to 2.5 V
Frequency:	1 kHz
Source impedance:	1 kΩ
External reference input	The time-base system can phase lock to an external 10 MHz reference signal . There are two ranges for the reference clock. The instrument can accept a high-accuracy reference clock of 10 MHz ±2 ppm or a lower-accuracy reference clock of 10 MHz ±1 kppm.
USB interface (Host, Device ports)	Front panel USB Host ports: Two USB 2.0 Hi-Speed ports, one USB 3.0 SuperSpeed port Rear panel USB Host ports: Two USB 2.0 Hi-Speed ports, two USB 3.0 SuperSpeed ports Rear panel USB Device port: One USB 3.0 SuperSpeed Device port providing USBTMC support and up to 800 Mbps transfer speeds
Ethernet interface	10/100/1000 Mb/s
Auxiliary output	Rear-panel BNC connector. Output can be configured to provide a positive or negative pulse out when the oscilloscope triggers, the internal oscilloscope reference clock out, or an AFG sync pulse

Characteristic	Limits
Vout (HI)	≥ 2.5 V open circuit; ≥ 1.0 V into a 50 Ω load to ground
Vout (LO)	≤ 0.7 V into a load of ≤ 4 mA; ≤0.25 V into a 50 Ω load to ground

Kensington-style lock	Rear-panel security slot connects to standard Kensington-style lock
LXI	Class: LXI 2016 Version: 1.5

Power source

Power	
Power consumption	360 Watts maximum
Source voltage	100 - 240 V ±10% at 50 Hz to 60 Hz 115 V ±10% at 400 Hz

Physical characteristics

Dimensions	Height: 3.44 in (87.3 mm) Width: 17.01 in (432 mm) Depth: 23.85 in (605.7 mm) Fits rack depths from 24 inches to 32 inches
Weight	29.4 lbs (13.34 kg)
Cooling	The clearance requirement for adequate cooling is 2.0 in (50.8 mm) on the left and right sides of the instrument. Air flows from left to right through the instrument.
Rackmount configuration	2U rack mount kit is included as standard configuration

Environmental specifications

Temperature	
Operating	+0 °C to +50 °C (32 °F to 122 °F)
Non-operating	-20 °C to +60 °C (-4 °F to 140 °F)
Humidity	
Operating	5% to 90% relative humidity (% RH) at up to +40 °C 5% to RH above +40 °C up to +50 °C, noncondensing
Non-operating	5% to 90% relative humidity (% RH) at up to +60 °C, noncondensing
Altitude	
Operating	Up to 3,000 meters (9,843 feet)
Non-operating	Up to 12,000 meters (39,370 feet)

EMC Environmental and Safety

Regulatory	CE marked for the European Union and CSA approved for the USA and Canada RoHS compliant

Software

Software	
IVI driver	Provides a standard instrument programming interface for common applications such as LabVIEW, LabWindows/CVI, Microsoft .NET, and MATLAB. Compatible with Python, C/C++/C# and many other languages through VISA.
e*Scope®	Enables control of the oscilloscope over a network connection through a standard web browser. Simply enter the IP address or network name of the oscilloscope and a web page will be served to the browser. Transfer and save settings, waveforms, measurements, and screen images or make live control changes to settings on the oscilloscope directly from the web browser.
LXI Web interface	Connect to the oscilloscope through a standard Web browser by simply entering the oscilloscope's IP address or network name in the address bar of the browser. The Web interface enables viewing of instrument status and configuration, status and modification of network settings, and instrument control through the e*Scope web-based remote control. All web interaction conforms to LXI specification, version 1.5.
Programming Examples	Programming with the 5 & 6 Series platforms has never been easier. With a programmers manual and a GitHub site you have many commands and examples to help you get started remotely automating your instrument. See https://github.com/tektronix/Programmatic-Control-Examples.

Ordering Information

Use the following steps to select the appropriate instrument and options for your measurement needs.

Step 1

Start by selecting the model.

Model	Number of channels
LPD64	4

Each model includes
Rackmount attachments installed
Installation and safety manual (translated in English, French, German)
Embedded Help
Power cord
Calibration certificate documenting traceability to National Metrology Institute(s) and ISO9001/ISO17025 quality system registration
One-year warranty covering all parts and labor on the instrument.

Step 2

Configure your Low Profile Digitizer by selecting the analog channel bandwidth you need

Choose the bandwidth you need today by choosing one of these bandwidth options. You can upgrade it later by purchasing an upgrade option.

Bandwidth Option	Bandwidth
6-BW-1000	1 GHz
6-BW-2500	2.5 GHz
6-BW-4000	4 GHz
6-BW-6000	6 GHz
6-BW-8000	8 GHz

Step 3

Add instrument functionality

Instrument functionality can be ordered with the instrument or later as an upgrade kit.

Instrument Option	Built-in Functionality
6-RL-2	Extend record length from 125 Mpoints/channel to 250 Mpoints/channel
6-AFG	Add Arbitrary / Function Generator
6-SEC [3] [4]	Security package adds enhanced security that restricts user data from being saved to the instrument, password-protected enabling for USB ports and firmware updates. Recommended for highly classified data environments.
6-WINM2	Instrument replaces std. embedded linux OS with Windows 10 Operating system on a m.2 512GB drive.

Step 4

Add optional serial bus triggering, decode, and search capabilities

Choose the serial support you need today by choosing from these serial analysis options. You can upgrade later by purchasing an upgrade kit.

Instrument Option	Serial Buses Supported
6-SRAERO	Aerospace (MIL-STD-1553, ARINC 429)
6-SRAUDIO	Audio (I^2S, LJ, RJ, TDM)
6-SRAUTO	Automotive (CAN, CAN FD, LIN, FlexRay, and CAN symbolic decoding)
6-SRAUTOEN1	100BASE-T1 Automotive Ethernet serial analysis
6-SRAUTOSEN	Automotive sensor (SENT)
6-SRCOMP	Computer (RS-232/422/485/UART)
6-SREMBD	Embedded (I^2C, SPI)
6-SRENET	Ethernet (10BASE-T, 100BASE-TX)
6-SR8B10B	8B/10B
6-SRI3C	MIPI I3C (I3C decode and search only)
6-SRNRZ	NRZ
6-SRPM	Power Management (SPMI)
6-SRSPACEWIRE	Spacewire serial analysis
6-SRUSB2	USB (USB2.0 LS, FS, HS)

3 This option is not compatible with option 6-WINM2.

4 This option must be purchased at the same time as the instrument. Not available as an upgrade.

Step 5

Add optional serial bus compliance testing

Choose the serial compliance testing packages you need today by choosing from these options. You can upgrade later by purchasing an upgrade kit. All options in the table below require option 6-WIN (SSD with Microsoft Windows 10 operating system).

Instrument Option	Serial Buses Supported
6-CMNBASET	2.5 and 5 GBASE-T Ethernet automated compliance test solution. 2.5 GHz is recommended

Step 6

Add optional memory analysis

Instrument Option	Advanced Analysis
6-DBDDR3	DDR3 and LPDDR3 Debug and Analysis

Step 7

Add optional analysis capabilities

Instrument Option	Advanced Analysis
6-DBLVDS	TekExpress automated LVDS test solution (requires option 6-DJA)
6-DJA	Advanced Jitter and Eye Analysis
6-DPM	Digital Power Management
6-MTM	Mask testing
6-PAM3	PAM3 analysis (requires options 6-DJA and 6-WIN)
6-PWR	Power Measurement and Analysis
6-SV-BW-1	Increase Spectrum View Capture Bandwidth to 2 GHz
6-SV-RFVT	Spectrum View RF versus Time Analysis and remote IQ data transferring

Step 8

Add accessories

Optional Accessory	Description
020-3180-xx	Benchtop conversion kit including four (4) instrument feet and a strap handle
016-2139-xx	Hard transit case with handles and wheels for easy transportation
003-1929-xx	SMA 8-lb Torque Wrench for connecting SMA cables
174-6211-xx	2x Matched SMA cables (within 1 pS)
174-6212-xx	4x Matched SMA cables (within 1 pS)
174-6215-00	Power Divider, 2-way, 50 Ohm, DC-18 GHz
174-6214-00	Power Divider, 4-way, 50 Ohm, DC-18 GHz
GPIB to Ethernet adapter	Order model 4865B (GPIB to Ethernet to Instrument Interface) directly from ICS Electronics www.icselect.com/gpib_instrument_intfc.html

Step 9

Select power cord option

Power Cord Option	Description
A0	North America power plug (115 V, 60 Hz) Includes mechanism that retains power cord to instrument
A1	Universal Euro power plug (220 V, 50 Hz)
A2	United Kingdom power plug (240 V, 50 Hz)
A3	Australia power plug (240 V, 50 Hz)
A5	Switzerland power plug (220 V, 50 Hz)
A6	Japan power plug (100 V, 50/60 Hz)
A10	China power plug (50 Hz)
A11	India power plug (50 Hz)
A12	Brazil power plug (60 Hz)
A99	No power cord

Step 10

Add extended service and calibration options

Service Option	Description
G3	Three Year Gold Care Plan. Includes expedited repair of all product failures including ESD and EOS, access to a loaner product during repair or advanced exchange to reduce downtime, priority access to Customer Support among others.
G5	Five Year Gold Care Plan. Includes expedited repair of all product failures including ESD and EOS, access to a loaner product during repair or advanced exchange to reduce downtime, priority access to Customer Support among others.
R3	Standard Warranty Extended to 3 Years. Covers parts, labor and 2-day shipping within country. Guarantees faster repair time than without coverage. All repairs include calibration and updates. Hassle free - a single call starts the process.
R5	Standard Warranty Extended to 5 Years. Covers parts, labor and 2-day shipping within country. Guarantees faster repair time than without coverage. All repairs include calibration and updates. Hassle free - a single call starts the process.
C3	Calibration service 3 Years. Includes traceable calibration or functional verification where applicable, for recommended calibrations. Coverage includes the initial calibration plus 2 years calibration coverage.
C5	Calibration service 5 Years. Includes traceable calibration or functional verification where applicable, for recommended calibrations. Coverage includes the initial calibration plus 4 years calibration coverage.
D1	Calibration Data Report
D3	Calibration Data Report 3 Years (with Option C3)
D5	Calibration Data Report 5 Years (with Option C5)

Feature upgrades after purchase

Add feature upgrades in the future

The 6 Series products offer many ways to easily add functionality after the initial purchase. Node-locked licenses permanently enable optional features on a single product. Floating licenses allow license-enabled options to be easily moved between compatible instruments.

Upgrade feature	Node-locked license upgrade	Floating license upgrade	Description
Add instrument functions	SUP6-AFG	SUP6-AFG-FL	Add arbitrary function generator
	SUP6-RL-2	SUP6-RL-2-FL	Extend record length to 250 Mpts / channel
Add protocol analysis	SUP6-SRAERO	SUP6-SRAERO-FL	Aerospace serial triggering and analysis (MIL-STD-1553, ARINC 429)
	SUP6-SRAUDIO	SUP6-SRAUDIO-FL	Audio serial triggering and analysis (I^2S, LJ, RJ, TDM)
	SUP6-SRAUTO	SUP6-SRAUTO-FL	Automotive serial triggering and analysis (CAN, CAN FD, LIN, FlexRay, and CAN symbolic decoding)
	SUP6-SRAUTOEN1	SUP6-SRAUTOEN1-FL	100Base-T1 Automotive Ethernet serial analysis
	SUP6-SRAUTOSEN	SUP6-SRAUTOSEN-FL	Automotive sensor serial triggering and analysis (SENT)
	SUP6-SRCOMP	SUP6-SRCOMP-FL	Computer serial triggering and analysis (RS-232/422/485/UART)
	SUP6-SREMBD	SUP6-SREMBD-FL	Embedded serial triggering and analysis (I^2C, SPI)
	SUP6-SRENET	SUP6-SRENET-FL	Ethernet serial triggering and analysis (10Base-T, 100Base-TX)
	SUP6-SRI3C	SUP6-SRI3C-FL	MIPI I3C serial decoding and analysis
	SUP6-SR8B10B	SUP6-SR8B10B-FL	8b/10b serial decoding and analysis
	SUP6-SRNRZ	SUP6-SRNRZ-FL	NRZ serial decoding and analysis
	SUP6-SRPM	SUP6-SRPM-FL	Power Management serial triggering and analysis (SPMI)
	SUP6-SRSPACEWIRE	SUP6-SRSPACEWIRE-FL	Spacewire serial analysis
	SUP6-SRUSB2	SUP6-SRUSB2-FL	USB 2.0 serial bus triggering and analysis (LS, FS, HS)
Add serial compliance All serial compliance products require option 6-WINM2 (Microsoft Windows 10 operating system)	SUP6-CMNBASET	SUP6-CMNBASET-FL	Ethernet automated compliance test solution.
Add advanced analysis	SUP6-DBLVDS	SUP6-DBLVDS-FL	LVDS debug and analysis (requires option 6-DJA and 6-WINM2)
	SUP6-DJA	SUP6-DJA-FL	Advanced jitter and eye analysis
	SUP6-PWR	SUP6-PWR-FL	Advanced power measurements and analysis
	SUP6-DPM	SUP6-DPM-FL	Digital power management
	SUP6-SV-RFVT	SUP6-SV-RFVT-FL	Spectrum View RF versus time analysis
	SUP6-SV-BW-1	SUP6-SV-BW-1-FL	Increase Spectrum View capture bandwidth to 2 GHz
	SUP6-PAM3	SUP6-PAM3-FL	PAM3 analysis (requires option 6-DJA)
Add memory analysis	SUP6-DBDDR3	SUP6-DBDDR3-FL	DDR3 and LPDDR3 debug and analysis
Add digital voltmeter	SUP6-DVM	N/A	Add digital voltmeter / trigger frequency counter (Free with product registration at www.tek.com/register6mso)

Bandwidth upgrades after purchase

Add bandwidth upgrades in the future

The analog bandwidth of 6 Series Low Profile Digitizer products can be upgraded after initial purchase. Bandwidth upgrades are purchased based on the current bandwidth and the desired bandwidth. All bandwidth upgrades can be performed in the field by installing a software license and a new front panel label.

Model to be upgraded	Bandwidth before upgrade	Bandwidth after upgrade	Order this bandwidth upgrade
LPD64	1 GHz	2.5 GHz	SUP6LP-BW10T254
	1 GHz	4 GHz	SUP6LP-BW10T404
	1 GHz	6 GHz	SUP6LP-BW10T604
	1 GHz	8 GHz	SUP6LP-BW10T804
	2.5 GHz	4 GHz	SUP6LP-BW25T404
	2.5 GHz	6 GHz	SUP6LP-BW25T604
	2.5 GHz	8 GHz	SUP6LP-BW25T804
	4 GHz	6 GHz	SUP6LP-BW40T604
	4 GHz	8 GHz	SUP6LP-BW40T804
	6 GHz	8 GHz	SUP6LP-BW60T804

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

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

Product Area Assessed: The planning, design/development and manufacture of electronic Test and Measurement instruments.

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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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