

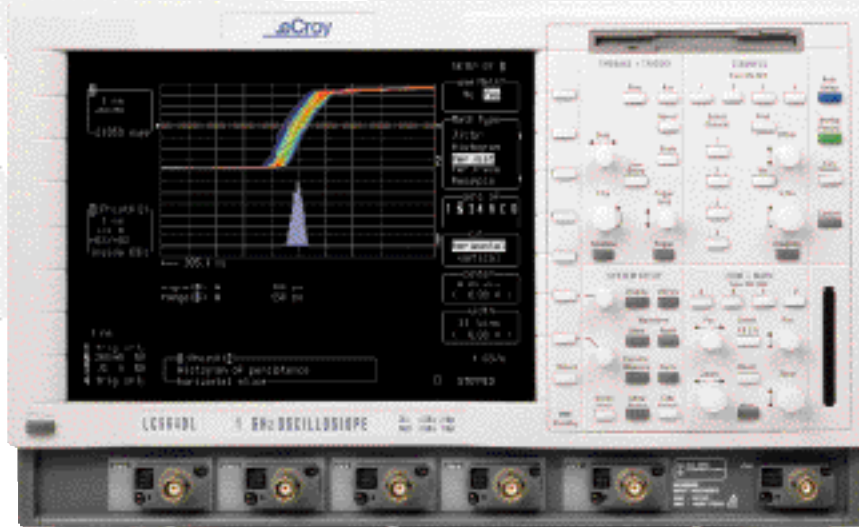
# LeCroy Digital Oscilloscopes

*Get the Complete Picture*

## **LC564DL LC554DL Datasheet**

### **LEADING FEATURES**

- **1 GHz and 500 MHz bandwidth**
- **4 GS/s and 2 GS/s Single-Shot Sampling Rate**
- **2 Million Points of Acquisition Memory**
- **10.4" TFT LCD Color Display**
- **Analog Persistence™**
- **Power Analysis** (optional)
- **Communications Testing** (optional)
- **Digital Filter Package** (optional)



The LC564DL and LC554DL digital oscilloscopes from LeCroy are designed to save engineers valuable time in troubleshooting and problem solving. Each oscilloscope is an integrated and powerful system providing the capability to:

- CAPTURE fast signals with high resolution for longer time intervals.
- VIEW data like never before, giving you more information quickly, with a large flat-panel color display and advanced zooming techniques.
- ANALYZE your signal to get answers quickly and more accurately with a powerful processing system and math packages.

## **Capture**

The LC564DL features 1 GHz bandwidth, while the LC554DL provides 500 MHz. Both instruments provide 4 GS/s maximum sample rate, 10 ppm timebase accuracy, and 5 ps interpolator resolution to deliver the signal detail and stability you need to identify and characterize critical signal transitions.

Both scopes offer high performance signal capture with a 2 GS/s ADC and one million points of data acquisition memory per channel. This

combination allows you to capture long complex signals with excellent accuracy. When two inputs are in use, these scopes will capture two million data points at 4 GS/s.

SMART Triggers® include glitch, runt, slew, pattern, exclusion, and more. If you work with high speed circuits, you have the ability to trigger on fast slew rates, logic patterns and runs as short as 600 ps. Flexibility, high-resolution, accuracy, and low trigger jitter, plus quick setup, make SMART Triggers the key to capturing elusive events.

## **View**

The large 10.4" TFT-LCD color display makes it easy to see signal details. Press the "FULL SCREEN" button on any LC scope and the full display area is devoted to the signal. Display up to eight traces on multiple grids with maximum S/N ratio.

Visually explore the full depth of signal information and get the complete picture of waveform activity. All it takes is a press of the green Analog Persistence button. Choose the intensity-graded or color-graded view and quickly visualize the signal's history.

The most flexible zoom capabilities available enable you to explore signal relationships and inspect or magnify selected regions of waveforms.

**LeCroy**

## Analyze

Simply press the “Custom” button for quick and easy access to Jitter and Timing Analysis (JTA), Communication Test, or other special analysis applications designed to speed your work along!

JTA is designed to get quick, accurate, and precise results when evaluating critical timing parameters of high-speed designs. The LC564DL and LC554DL are optimized to capture a sufficient number of cycles to accurately evaluate cycle-to-cycle jitter.

The innovative Mask Tester software instantly transforms your LC series scope into a dedicated telecommunications tester. You can perform eye pattern tests or, by using external clocking, you can easily display and analyze constellation diagrams.

## Specifications

### ACQUISITION SYSTEM

#### Bandwidth (-3 dB):

LC564DL @ 50 : DC to 1 GHz  
LC554DL @ 50 : DC to 500 MHz  
@ 1 M : Bandwidth dependent on probe used

**Sensitivity:** 2 mV/div to 1 V/div,  
50 , fully variable: 2 mV/div to 2 V/div,  
1 m , fully variable.

**Scale factors:** Choice of over 12 probe attenuation factors selectable via front panel menus.

**Offset Range:** ±20 V across the whole sensitivity range when using the AP020/AP022 active probes.

2.00 – 4.99 mV/div: ±400 mV

5.00 – 99 mV/div (50 only): ±1 V

5.00 – 100 mV/div (1 M only): ±1 V

0.1 – 1.0 V/div (50 only): ±10 V

102 mV – 2.0 V/div (1 M only): ±20 V

**DC Accuracy:** Typically ±(2% full scale + 1% offset setting)

**Vertical Resolution:** 8 bits

**Bandwidth Limiter:** 25 MHz, 200 MHz typical

**Input Coupling:** AC (>10 Hz typ.), DC, GND

**Input Impedance:** 10 M //11 pF typical (using PP005 probe). 50 ±1.25%.

**Max Input Voltage:** 1 M : 100 V  
(DC + peak AC @ 10 kHz)  
50 : ± 5V DC (500 mW) or 5 V<sub>rms</sub>

### ACQUISITION MODES

**Random Interleaved Sampling (RIS):** 25 GS/s.  
For repetitive signals from 200 ps/div to  
1 μs/div.

**Single Shot:** For transient and repetitive signals,  
1 ns/div (2 Ch), 2 ns/div (4 Ch).

### Acquisition System Configuration

Model	Channels	Bandwidth	Sample Rate	Max Record Length
LC564DL	4	1 GHz	2 GS/s on 4ch 4 GS/s on 2ch	1 Mpt on 4ch 2 Mpt on 2ch
LC554DL	4	500 MHz	2 GS/s on 4ch 4 GS/s on 2ch	1 Mpt on 4ch 2 Mpt on 2ch

**Sequence:** Stores multiple events — each of them time stamped (1 ns resolution) — in segmented acquisition memories.

**Sequence Mode Dead Time:** Typically 30 μs

**Number of Segments Available:**  
2 – 2000

### TIMEBASE SYSTEM

**Timebases:** Main and up to four zoom traces

**Time/Div Range:** 1 ns/div (at 4 GS/s), 2 ns/div (at 2 GS/s) to 1,000 s/div

### TRIGGERING SYSTEM

**Modes:** Normal, Auto, Single, and Stop

**Sources:** CH1, CH2, CH3, CH4, Line, Ext, Ext/5, Slope. Level and Coupling are unique for each source.

**Slope:** Positive, Negative, Bi-Slope (Window in & out)

**Coupling:** DC, AC (>10 Hz), HF (175 MHz to >1 GHz), LFREJ (>50 kHz), HFREJ (<100 MHz)

**Pre-Trigger Recording:** 0 to 100% of full scale (adjustable in 1% increments).

**Post-Trigger Delay:** 0 to 10,000 divisions (adjustable in 0.1 div. increments).

**Holdoff by Time:** 2 ns to 20 s

**Holdoff by Events:** 1 to 99,999,999

**Internal Trigger Range:** ±5 div

**Maximum Trigger Frequency:** DC to full bandwidth of scope

**EXT Trigger Max.** Input: 50 ±3%: ±5 V DC (500 mW) or 5 V<sub>rms</sub> 100 V (DC+ peak AC 10 kHz). 10 M // 11 pF at probe tip (PP005)

**EXT Trigger Range:** ±0.5 V (±2.5 V with Ext/5)

**Maximum External Trigger Frequency:**  
750 MHz in 50 when using 50 coupling

**Trigger Output:** Optional ECL rear panel output (option CKTRIG). The calibrator output can provide a trigger status signal or a Pass/Fail test output.

## Trigger Types

Name	Description
<b>Basic Triggers</b>	
Edge/Slope/Window/Line	Triggers when signal meets slope and level condition.
<b>SMART Triggers</b>	
State or Edge Qualified	Triggers on any input source only if a defined state or edge occurred on another input source. Delay between sources is selectable by time or events.
Dropout	Trigger if signal drops out for longer than selected time between 2 ns and 20 s.
Pattern	Logic combination of 5 inputs (4 channels and external trigger input); Each source can be high, low, or don't care. Trigger at start or end of the pattern.
TV-Video	Triggers odd or even fields for NTSC, PAL SECAM, or nonstandard video (up to 1500 lines).
<b>SMART Triggers with Exclusion Technology</b>	
Signal or Pattern Width	Triggers on glitches, selectable pulse widths, or on intermittent faults.
Signal or Pattern Interval	Triggers on intervals selectable between 2 ns and 20 s.
Slew Rate	Trigger on edge rates; select limits for dV, dt, and slope.
Runt	Positive or negative runts defined by two selectable voltage limits and two selectable time limits

### AUTOSETUP

Automatically sets sensitivity, vertical offset and timebase on all display channels.

**Autosetup Time:** Approximately three seconds

**Vertical Find:** Automatically sets sensitivity and offset for selected channel.

### PROBES

**Model:** One PP005 probe supplied per channel.

**Optional Probes:** 1 GHz active probe (AP020); 2.5 GHz active probe (AP022); 1 GHz active differential probe (AP034).

**Probe Calibration:** Max 1 V into 1 M $\Omega$ , 500 mV into 50  $\Omega$ , frequency and amplitude programmable, pulse, or square wave selectable; rise and fall time 1 ns typical. Alternatively, the calibrator output can provide a trigger output or a Pass/Fail test output.

### DISPLAY

**Type:** Color 10.4" TFT-LCD

**Resolution:** VGA (640 x 480 pixels)

**Display Area:** 212 mm x 160 mm

**Controls:** Rear-panel presets for position, brightness and contrast. Menu controls for brightness and color selection.

**Grid Styles:** Single, Dual, Quad, Octal, XY, Single+XY, Dual+XY, and Full Screen — an enlarged view of each grid style.

**Graticules:** Internally generated; separate intensity control for grids and waveforms. Selectable blending of grid with displayed traces.

**Waveform Style:** Dot-join with optional bold sample point highlight or dots-only.

**Persistence Modes:** Color-graded persistence and Analog Persistence, infinite or variable with decay over time. In color-graded persistence, a

color spectrum from red through violet is used to map signal intensity. With Analog Persistence, the brightness level of a single color denotes signal intensity. Each trace's persistence data is stored in 64k levels.

**Trace Display:** Opaque or transparent mode, with overlap management.

**Number of Traces:** Eight (supports a mix of channels, memories or math functions)

**Real-time Clock:** Date, hours, minutes, seconds

**External Monitor:** Rear panel 15-pin socket for external VGA compatible monitor.

**Vertical Zoom:** Up to 5x vertical expansion (50x with averaging, up to 40  $\mu$ V/div sensitivity).

**Horizontal Zoom:** Waveforms can be expanded to 0.4 points/division.

**Auto Scroll:** Use Auto Scroll to automatically "PLAY" the captured signal to identify anomalies quickly and easily. With a selectable zoom expansion and scrolling speed, you can set up Auto Scroll to match your signal viewing needs. The scrolling speed can be adjusted during the scan to focus on the more interesting characteristics of the signal.

"REVERSE" enables you to quickly review any part of the signal.

### RAPID SIGNAL PROCESSING

**Microprocessor:** 96 MHz PowerPC 603e

**System Memory:** 16 Mbytes

**Video Memory:** 1 Mbyte

**Persistence Data Map Memory:** 16 bits per displayed pixel (64k levels).

## WAVEFORM PROCESSING

Up to four processing functions may be performed simultaneously. Functions available are: Add, Subtract, Multiply, Divide, Negate, Identity, Summation Averaging, Sine x/x, Integral, Derivative, Square Root, Ratio, Absolute Value, and the advanced functions listed below.

**Average:** Up to 10<sup>6</sup> averages possible.

**Extrema:** Roof, Floor, or Envelope values from 1 to 10<sup>6</sup> sweeps.

**RES:** Low-Pass digital filters provide up to 11-bit vertical resolution. Sampled data is always available, even when a trace is turned off.

**FFT:** Spectral analysis with five windowing functions (Rectangular, Von Hann, Hamming, Flat Top, and Blackman-Harris) and FFT averaging.

**Statistical Diagnostics:** The Parameter Analysis package permits in-depth diagnostics on waveform parameters. Live histogramming and trending of any waveform parameter measurement is possible. The histogram can be autoscaled to display the center and width of the distribution.

*Note: Any of the above processes can be invoked without losing the data.*

## INTERNAL MEMORY

**Waveform Memory:** Up to four 16-bit memories (M1, M2, M3, M4)

**Zoom & Math Memory:** Up to four 16-bit Waveform Processing memories (A,B,C,D) whose length corresponds to the length of the channel acquisition memory.

**Setup Memory:** Four non-volatile memories. The floppy drive and optional cards or disks may also be used for high-capacity waveform and setup storage.

## CURSOR MEASUREMENTS

## AUTOMATED MEASUREMENTS

The following parametric measurements are available, together with their Average, Highest, Lowest values and Standard Deviation:

amplitude	duration	overshoot-
area	duty	period
base	fall	phase
cmean	f 80-20%	peak-to-peak
cmedian	f@level	rise
crms	first	r 20-80%
csdev	frequency	r@level
cycles	last	rms
delay	maximum	std dev
c2d- c2d+	mean	t@level
(setup)(hold)	median	top
delay	minimum	width
t@level	overshoot+	

**PASS/FAIL:** Pass/Fail testing allows any five items (parameters and/or masks) to be tested against selectable thresholds. Waveform Limit Testing is performed using masks that may be defined either inside the instrument or by downloading templates created on a PC. Any failure will cause pre-programmed actions, such as Hardcopy, Save to Internal Memory, Save to mass storage device (card or disk), GPIB SRQ, or Pulse Out.

## INTERFACING

**Remote Control:** All front panel controls as well as all internal functions are possible by GPIB and RS-232-C.

**RS-232-C Port (Standard):** Asynchronous up to 115.2 kBaud for computer/terminal control or printer/plotter connection.

**GPIB Port (Standard):** (IEEE-488.2) Configurable as talker/listener for computer control and fast data transfer.

**Centronics Port (Standard):** Hard copy parallel interface.

**Hard copy:** Screen dumps are activated by a front-panel button or via remote control.

### Supported printers:

B/W: LaserJet, DeskJet, Epson

Color: DeskJet 550C, Epson Stylus, Canon 200/600/800 series.

An optional, internal high-resolution graphics printer is also available for screen dumps; stripchart output formats capable of up to 200 cm/div.

**Hard Copy Formats:** TIFF b/w, TIFF color, HPGL, BMP color and BMP compressed.

**Output Formats:** The ASCII waveform output is compatible with spreadsheets, MATLAB, MathCad. Binary output is also available.

## CURSOR MEASUREMENTS

Type	Symbol	From	To
Relative time	↓ ↑	first point on waveform	any other point on waveform
Relative voltage	==:==:==	select voltage level	any other voltage level
Absolute time	┆ ┆	time and voltage relative to	ground and trigger
Absolute voltage	---:---	voltage	ground

## GENERAL

**Auto-calibration:** Ensures specified DC and timing accuracy.

**Auto-Calibration Time:** <500 ms

**Recommended Factory Calibration Interval:** One year

**Temperature:** 5° to 40° C rated accuracy (41° to 104° F). 0° to 45° C operating (32° to 113° F)

**Humidity:** <80% non-condensing.

**Altitude:** Up to 4600 m (operating), 40° C (104° F) max

**Shock and Vibration:** Conforms to selected sections of MIL-PRF-28800F, Class 3

**Power:** 90 – 250 V AC, 45 – 66 Hz, 350 W

**Battery Backup:** Front-panel settings maintained for two years.

**Dimensions:** (HWD) 10.4" x 15.65" x 17.85", 264 mm x 397 mm x 453 mm

**Weight:** Typ. 16 kg (35 lbs) net, typ. 24 kg (53 lbs) shipping.

**Warranty:** Three years

## CE APPROVAL

**EMC:** Conforms to EN50081-1 (Emissions) and EN50082-1 (Immunity)

**Safety:** The oscilloscope has been designed to comply with EN61010-1 Installation Category (Over-voltage category) II, 300V, Pollution degree 2.

**UL and cUL approval:** UL Standard: UL 3111-1; cUL Canadian Standard CSA-C22.2 No. 1010.1-92.

## SERVICE

LeCroy service products include unique upgrades for LeCroy oscilloscopes, metrology modules customized for your company, and more.

Whether you own one LeCroy instrument or hundreds, whether you need prompt attention from our service offices or an on-site service contract, LeCroy is committed to your success. Call your LeCroy service representative to discuss your company's specific requirements. We offer:

- Annual calibration maintenance
- Extended warranty packages
- On-site service contracts
- Metrology training module for on-site calibration maintenance
- Prompt, personalized warranty and nonwarranty repair at service offices
- Retrofit/upgrade service for LeCroy scopes



## Ordering Information

### Digital Oscilloscopes

1 GHz, 2 GS/s, 1 Mpts./ch, 4 Channel Color DSO  
500 MHz, 2 GS/s, 1 Mpts./ch, 4 Channel Color DSO

### Included with Standard Configuration:

10:1 10 M Passive Probe (1 per channel)  
Operator's Manual  
Remote Control Manual  
Hands-On Guide  
Advanced Waveform Math Package  
Spectrum Analysis Package  
Floppy Disk Drive  
Protective Front Cover  
Performance Certificate  
Three-Year Warranty

### Selected Probes & Accessories:

1 GHz 10:1 FET Probe  
2.5 GHz Active Probe  
1 GHz Active Differential Probe  
1 GHz, 10:1, 500 Passive Probe  
ProBus® 75 to 50 Adapter  
SMD Kit for PP005 Probe  
SMD Kit for AP020 Probe  
Graphic Printer Paper/10 Rolls  
Oscilloscope Cart with Drawer and Printer Shelf

### Hardware Options:

Memory Card Reader and 512k SRAM Card  
PC Card Slot for Hard Drives and ATA Flash Cards  
(supports maximum 520 MB hard disk cards)  
PC Card Hard Disk 520 MB (requires HD01 option)  
4 MB ATA Flash Card (requires HD01 option)  
PC Card External Desktop Adaptor for PC (110 V)  
PC Card External Desktop Adaptor for PC (220 V)  
500 MHz Ext Clock, 10 MHz Ref Input, Trigger Comparator Output  
64 Mbyte System Memory  
Internal Graphics Printer

### Software Options:

Parameter Analysis Package (Includes Histogramming and Trending)  
ITU G.703 Fully Automated Mask Tester  
ANSI T1.102 Fully Automated Mask Tester  
O/E and reference receiver for ITUG.957 STM-1  
and STM-4 Fully Automatic Mask Tester (LC564DL only)  
Jitter and Timing Analysis Package  
Disk Drive Measurements  
Supplementary Disk Drive Measurements  
Advanced Optical Recording Measurements  
Power Measure Analysis Software  
Polymask Software  
Digital Filter Package

### Product Code

LC564DL  
LC554DL

PP005  
LCXXX-AD-E  
LCXXX-RCM  
LCXXX-HG  
WP01  
WP02

AP020  
AP022  
AP034  
PP062  
PP090  
PK106  
PK006  
GPR10  
OC9003A

MC01/04  
HD01

HD02  
4MBFC  
DA01-110  
DA01-220  
CKTRIG  
64MBSM  
GP01

WP03  
MT01  
MT02  
MT03

JTA  
DDM  
PRML  
AORM  
PMA1  
PMSK  
DFP

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DSL5XX  
0600 Rev1  
10M MTECH



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