Inexpensive pocket oscilloscopes are appearing out of the woodwork lately. While most are merely novelties, there are a few that may actually be handy general-purpose instruments that you might consider keeping in your toolbox. I'll briefly review several current offerings--mostly designed and manufactured in China, but readily available on eBay. In each case, I provide a link to the eBay store, as well as brief specs and features. I don't necessarily recommend any of these, except as conversation starters. But, many of the high-bandwidth oscilloscopes look useful. Interestingly, higher price does not equate to higher performance. Very high (relatively speaking!) bandwidth oscilloscopes are available for around $100.

Several of these are also available from alternate sources. I don't specifically recommend, nor have I dealt with, any of these vendors. As with anything purchased via eBay, it's buyer beware, and take the usual precautions. I might point out one scope that will be available as a Kickstarter project. The oscilloscopes are sorted from lowest to highest price.

**Page 2: AVR DSO150 pocket-sized digital oscilloscope**

AVR DSO150 pocket-sized digital oscilloscope (bandwidth unspecified, sample rate is 250kSa/s. Price $32.99.
Powered from a USB cable, this caseless oscilloscope is rather limited. The bandwidth is unspecified, but I suspect it's in the 25kHz to 50kHz region. The sample rate is 250kSa/s with time base settings from 100µs to 500ms. There are two DC-coupled inputs with trigger level settings up to 5V. The unit comes with a 1X mini probe. Push-button controls are arranged around the edge of the PC board. While the cost is low, I'd recommend spending your money on one of the other models.

Page 3: Key-Scope, a Kickstarter project

Key-Scope I (100kHz, 1 MSa/s). Price $59.

Note that this is a KickStarter project with a closing date of October 28, 2013. The 100kHz bandwidth at 1 MSa/s sample rate Key-Scope performs as a full functioning battery-operated oscilloscope using a single toggle switch for the various functions. The LCD is color and backlit. It uses a probe with ground clip for measurements or you may use an optional 10X probe. The maximum input is 42V. The unit may be connected to a PC to display the waveform. The home page includes a good video on the operation. There are two more models in final development stage that will be introduced later next year, Key-Scope II & III. Both convert analog signals with an 8-bit resolution at 50/250 MSa/s (max bandwidth 5 MHz/25 MHz, respectively. Prices $99 and $149. Use the link to review the video and specifications in more detail.

General Functions

- Real-time Sampling Rate, 1MSa/s
- Analog Bandwidth, 100 kHz
- Timebase Settings, 5us/div - 1h/div
- Single Shot/Normal/Auto Mode
- Also running Scroll & Data Logging Mode
• Input Voltage selection from 10mV/div to 5V/div, 6 steps
• Pre/Post-Trigger positioning
• Trigger Level Adjust
• Zero Line Adjust
• Remote control via USB (data protocol published)
• Simultaneous signal view on PC via USB

Page 4: DSO201 Mini Nano Pocket Digital Oscilloscope

**DSO201 Mini Nano Pocket Digital Oscilloscope** (claimed 1 MHz bandwidth at 1 MSa/s). Price $62.98.

This unit is similar in construction to the “Quad Nano V2”. While the claimed bandwidth is 1 MHz, I suspect it may be much smaller, because of the claimed 1 MSa/s sample rate. Typically, the sample rate ought to be at least 4X the BW. The packaging and controls appear much easier to use than the Quad DSO V2.

Description:

• Display Color 65K
• Display 2.8 Color TFT LCD
• Display Resolution 320×240
• Analog bandwidth 1MHz
• Max sample rate 1Msa/s 12 Bits
• Sample memory depth 4096 Points
• Horizontal sensitivity 1µS/div to 10s/div (in 1-2-5 Step)
• Horizontal position adjustable with indicator
• Vertical sensitivity 10 mV/div to10 V/div (with ×1 probe)[]* 0.5 V/div to 100 V/div (with ×10 probe)
• Vertical position adjustable with indicator
• Input impedance >500kΩ
• Max input voltage $80V_{pp}$ (with ×1 probe)
- Coupling DC
- Trig modes Auto, Normal, Single, None and Scan
- Functionalities: Automatic measurement: frequency, cycle, duty, $V_{pp}$, $V_{RAM}$, $V_{AVG}$, and DC voltage
- Precise vertical measurement with markers
- Precise horizontal measurement with markers
- Rising/falling edge trigger
- Trigger level adjustable with indicator
- Trig sensitivity adjustable with indicator
- Hold/run feature
- Signal generator: Adjustable from 10Hz to 1MHz (1-2-5 Step)
- Power supply 3.7V chargeable Lithium battery via USB port
- Dimension (w/o probe) 105mm X 53mm X 8mm
- Waveform storage SD card PC connection via USB as SD card reader Upgrade by boot loader via USB

Package Includes: 1 x ARM Digital Oscilloscope, 1 x Probe, 1 x Mini USB Cable.

Page 5: JYETech oscilloscope kit

[Image of oscilloscope]

JYETech DSO062 Pocket Oscilloscope Kit (bandwidth is unspecified at 1MSa/s). Price $64.95

This is an oscilloscope kit, requiring through-hole component mounting, so assembly should be easy. The bandwidth is not specified, but likely in the low kilohertz range. The claimed sample rate is 1MSa/s. You must provide your own DC adapter. I'd spend your money elsewhere, unless you really prefer building up your own oscilloscope. Controls are limited. The kit comes with an unspecified probe. Not recommended.
Hantek DSO1022 2-channel USB Oscilloscope (20 MHz BW at 40 MSa/s). Price $69.00.

The Hantek DSO1022 is powered from a USB 2.0 interface and requires a PC with Windows operating systems. There are two 1MΩ inputs with an external triggering port.

The unit claims a 20MHz bandwidth at 40MSa/s sample rate. The display includes averaging, intensity, and persistence modes. Math functions include addition, subtraction, multiplication, division, FFT, and X-Y plot. It also includes a built in signal generator with an adjustable 100 Hz to 50 kHz square-wave signal output, fixed at 3.3V_p-p.

Accessories include two oscilloscope probes, a USB cable, and an installation disk.

Hardware Specification

- Channels: 2
- Bandwidth: 20 MHz
- Input impedance: 1 MΩ at 25pF
- Max. sample rate: 40MSa/s
- Vertical resolution: 8-bit
- Vertical gain: 20mV to 5V (8 steps)
- DC accuracy: ±3%
- Timebase range: 1ns to 9000s (39 steps)
- Vertical adjustable: Yes
- Input protection: Diode clamping
- X-Y mode: Yes
- Trigger mode: Auto, Normal, Single
- Trigger slope: +/-
- Trigger level adjust: Yes
- Trigger type: Rising/falling edge
- Trigger source: CH1, CH2
- Cursor measurement: Yes
- Math functions: FFT, Add, Subt, Mult, Div
- Cursor: Frequency, Voltage

**Page 7: Circuit Gear CGM-101, 200kHz**

![Circuit Gear CGM-101](image)


The Circuit Gear Mini model CGM-101 is a two channel, 200kHz bandwidth at 2MSa/s 11-bit oscilloscope with an additional 200kHz DDS arbitrary waveform generator and eight channel digital I/O. There is also a vector network analyzer feature that will measure amplitude and phase from 0.2Hz to 200kHz. It's powered by USB and requires a PC or laptop running Linux, Windows, or Mac operating systems. The software is open-sourced. The CGM-101 has been on the market since 2009. See Martin Rowe's [product tryout](#).

**Specifications:**

Oscilloscope

- Analog bandwidth: 200kHz
- Max sampling rate: 2MSa/s
- Input voltage: 10mV to 5V/div (9 steps)
- Input A/D resolution: 11 bit
- Input impedance: 1MΩ at 20 pF
- Timebase: 500ns/div to 20s/div (24 steps)
- Trigger: Normal, Auto, Single, External
- Trigger polarity: +/-
- Trigger level: Cursor selectable

Waveform Generator

- Frequency range: 0.2Hz to 200kHz
- Frequency resolution: 0.2Hz
Output amplitude: ±2.75V  
Output impedance: 150Ω  
Offset control: Hardware, 12 bit  
Standard waveforms: Sine, Square, Triangle, Ramp, Noise  
Arbitrary waveform: 8 bit resolution, vertical and horizontal

Digital I/O  
Output: 8 bit, 5V, HCMOS  
Input: 8 bit, 3V/5V, HCMOS

Page 8: QDSO Mini Pocket Oscilloscope

QDSO Mini Pocket Oscilloscope (40MHz at 200MSa/s). Price $103.00.

The QDSO is equipped with a 3.5-inch TFT and includes a 1000mA lithium battery (good for a claimed two hours use). The bandwidth is 40 MHz - the highest for any of these handheld DSOs. The sample rate is a claimed 200 MSa/s with a single 1 MOhm input. It comes with a single 1X probe. While larger than others in this review, the unit may actually be useful for many applications, rather than just a conversation piece as many others listed.

Specifications:

- Channels: 1  
- Bandwidth: 40 MHz  
- Max. sample rate: 200MSa/s  
- Vertical resolution: 8 bit  
- Vertical gain: 10mV to 10V
- DC accuracy: ±3%
- Input impedance: 1 MΩ at 25pF
- Coupling: DC
- Input protection: Diode, 50V
- Timebase range: 1ns to 100ms
- Trigger mode: Auto, Normal, Single
- Trigger type: Rising/Falling edge
- Autoset: Yes
- Level adjust: Yes
- Measurement functions: V\text{MIN}, V\text{MAX}, V_{\text{PP}}, V_{\text{RMS}}, Frequency
- Cursors: 2
- Display: 3.5 inch, 24 bit, TFT, 320x240 pixels
- Dimensions: 110mm x 75mm x 13mm

Page 9: JYETech DSO082

JYETech DSO082 (10 MHz BW at 50 MSa/s) - $104.95.

The JYETech model DSO082 is specified as 10MHz analog bandwidth with up to 50 Msa/s real-time sampling rate and 10mV/Div sensitivity with one channel. The push button controls and rotary encoder operations of DSO082 are straightforward and easy. The unit features 1024-point FFT, USB connection, capture save/recall, adjustable memory size, and what appears to be a rugged plastic enclosure. The firmware is field upgradable through a simple USB connection.
The unit comes with a 1X and 10X (switchable 20MHz probe, power adapter, and manual. One year warranty.

Features:

Vertical

- Number of Channels: 1
- Analog Bandwidth: 0 - 10MHz
- Sensitivity: 10mV/div to 5V/div
- Resolution: 8-bit
- Input Impedance: 1MΩ
- Maximum Input voltage: 50VPP (for 1X probe)
- Coupling: DC, AC, GND

Horizontal

- Max Real-time Sampling Rate: 50 MSa/s
- Timebase: 0.2 us/div - 10 s/div
- Record Length: 2000 - 16000 points user selectable
- Zoom-in: Up to 10X in HOLD mode
- Run/Hold Modes: one button switchable

Trigger

- Trigger Modes: Auto, Normal, Single
- Trigger Types: Rising/falling edge
- Trigger Sources: Internal/external
- Trigger Position: Adjustable
- Trig Point Indicator: Yes

Other Features

- Save/Recall up to 4 captures
- Screen image hardcopy
- USB connection for data transfer and firmware upgrade
- FFT with selectable length of 256, 512, or 1024 points and sampling rate from 1K Sa/s to 50 MSa/s
- Rotary encoder for quick parameter setting Display
- 2-inch 128 X 64 black-and-white dot-matrix LCD
- Backlight ON/OFF control
- Contrast adjustable
- Power Supply
- 9V AC/DC power adapter
- Supply voltage range: 8 - 12 V
- Supply Current: 300 mA (LCD backlight ON, typical)
- Reverse polarity and over-voltage protected

Physical

- Dimension: 140mm X 70mm X 30mm
- Weight: 150g (not including probe and power adapter)

Page 10: DSO201 Nano Pocket Oscilloscope
**DSO201** Nano Pocket Oscilloscope (200 kHz BW at 1 MSa/s). Price $104.99.

Based on the ARM Cortex M3 (32 bit) processor, the DSO201 pocket oscilloscope includes a 320 x 240 color LCD TFT display. The bandwidth is just 200kHz with 1MSa/s sample rate. Sensitivity is 10mV to 10V with timebase 1µs to 2s (in 1-2-5 steps). Input impedance is >500 kΩ with a maximum input of 80Vp-p (1X probe).

The DSO 201 uses DC coupling. Triggering includes Auto, Normal, and Single (rising or falling edge). There is a visible triggering cursor. Auto measurements include frequency, cycle, duty, Vp-p, VAVG and DC voltage. The display has a horizontal and vertical cursor.

The unit also has a built in signal generator that may be set from 10Hz to 1MHz (in 1-2-5 steps). Screen capture may be saved to the 8 MByte flash memory. PCs or a battery charger may be connected via the USB port.

Dimensions are 88mm x 59mm x 11mm. The unit includes a 1X/10X (switchable) probe, USB cable and flannel bag.

**Page 11: Handheld Digital Scopemeter**
Handheld Digital Scopemeter (25 MHz BW at 100 MSa/s). Price $107.90.

The Handheld Digital Scopemeter is a little different that the others listed in the review, in that it may also be used as a DMM. Besides the 25 MHz BW at 100 MSa/s sample rate, it can measure AC/DC volts, resistance, capacitance, diodes and continuity. The display is a 128 x 64 monochrome backlit LCD and will run for a claimed 10 hours of usage on the built in chargeable battery. The scope will read out $V_{\text{RMS}}$, $V_{\text{AVG}}$ and $V_{\text{PP}}$.

The unit includes a 10X 20 MHz probe, test leads, USB charger/adapter, user manual and cary bag. It's larger than all the others reviewed at 174 x 92 x 40 mm. The price seems reasonable.
Hantek DSO-2090 (40 MHz at 100 MSa/s). Price $150.26.

The Hantek DSO-2090 is an upgrade from the model DSO1022. It's also is powered from a USB 2.0 interface and requires a Windows PC. There are two 1 MΩ inputs with an external triggering port.

The unit claims a 40MHz bandwidth at 100MSa/s sample rate. The display includes averaging, intensity and persistence modes. Math functions include addition, subtraction, multiplication, division, FFT, and X-Y plot. It also includes a built-in signal generator with an adjustable 100Hz to 50kHz square-wave signal output, fixed at 3.3Vpp.

Accessories include: two oscilloscope probes, a USB cable, an installation disk.

Characteristics:

- USB2.0 interface, no external power source required, easy to use.
- Be suitable for notebook computer/product line maintenance/be used easily on business.
- Dimensions (mm):190(L) x100(W) x35(H), be carried easily.
- High performance, 100MS/s real-time sampling, 40MHz Bandwidth.
- 23 measurement functions, PASS/FAIL Check.
- Waveform average, persistence, intensity, invert, addition, subtraction, multiplication, division, X-Y plot.
- Save waveform in the following: text file, jpg/bmp graphic file, MS excel/word file.
- FFT
- One computer can connect many DSO, extend channel easily.
- Labview\VB\VC\Delphi\C++Builder Second Design instance.

Specifications:
• Channels: 2
• Bandwidth: 40MHz
• Impedance: 1MΩ at 25pF
• Maximum sample rate: 100MSa/s
• Coupling: AC/DC/GND
• Vertical resolution: 8 bit
• Gain range: 10 mV to 5 V (9 steps)
• DC accuracy: ±3%
• Timebase range: 4 ns to 1 hour (38 steps)
• Vertical adjustable: Yes
• Input protection: diode clamping
• X-Y mode: Yes
• Autoset: Yes (30Hz to 40MHz)
• External input: Yes
• Trigger mode: Auto, Normal, Single
• Trigger slope: +/-
• Trigger level adjustable: Yes
• Trigger type: Rising/Falling edge
• Trigger source: Ch1, CH2, EXT
• Vertical mode: CH1, CH2, Dual, Add
• Cursor measurement: Yes
• Math functions: FFT, Add, Subt, Mult, Div
• Cursor: Frequency, Voltage
• Data samples: 10k to 32k/channel

Contents include a DSO2090 Digital Oscilloscope, software CD, probes, manual, and USB cable.

Page 13: Velleman HPS1401 Handheld Pocket Oscilloscope
Velleman HPS1401 Handheld Pocket Oscilloscope, 10MHz, 40MSa/s. Price $159.99

Here's another nice-looking handheld oscilloscope with reasonable measurement capability at 10MHz bandwidth and 40MSa/s sample rate. At a claimed 1 hour per division, this might make a good replacement for a chart recorder! The unit has an auto-ranging function for ease of setup. It includes a built in NiMH battery (claimed 6 hour usage) and includes a 10X probe and charger.

Features

- 40Msa/sec in real time
- Bandwidth up to 10MHz
- Full auto range option
- Sensitivity down to 0.1mV
- Signal markers for amplitude and time
- Memory Hold function
- Direct audio power measurement
- USB battery charger included
- X10 measuring probe included
- White LED backlight

Specifications

- Bandwidth: up to 10MHz (-3 dB or -4 dB at selected ranges)
- Input range: 1mV/div to 20V/div in 14 steps
- Input coupling: DC, AC and GND
- Real-time sample rate up to 40 MSa/s
• Resolution: 8 bits
• Time base: 250ns/div to 1hr/div
• Auto set-up function (or manual)
• Probe x10 readout option
• Readouts: DC, AC+DC, True RMS, dBm, $V_{pp}$, Min-Max. (±2.5%)
• Audio power measurement from $2\Omega$ to $32\Omega$
• Hold & store function
• Time and Voltage markers readout
• Max. 100 $V_{pk}$ AC+DC
• Operates on NiMH rechargeable battery pack (included)
• Operates up to 6 hours on one charge
• Charging power supply: 9Vdc/200mA
• For use on CLASS II pollution degree II installations
• Dimensions: 74 x 114 x 29mm / 2.9 x 4.5 x 1.14"
• Weight: 200g, (7oz)

Page 14: Velleman PPS10

Velleman PPS10 (2 MHz BW at 10 MSa/s) - $169.00

The Velleman PPS10 has a limited 2MHz bandwidth at 10MSa/s sample rate, but could be very useful at audio or low frequency applications. The unit is powered by five AA cells (NiCd recommended) and may be charged with the supplied charger/adapter. It also includes DMM measurements (unspecified). Includes a 10X probe and carry case. The 9V adapter is an optional extra. It also includes an RS-232 interface, which is strange in this era of USB ports. I can't think of any current PC that includes this port. For the price, I'd recommend, instead, the Velleman HPS1401.

Features:
- Measurements: dBm, dBV, DC, rms ...
- Trigger mode: run, normal, once, roll, slope +/-
- X and Y position signal shift
- audio power calculation (rms and peak)
- signal markers for Volt and Time
- Frequency readout (through markers)
- Recorder function (roll mode)
- Signal storage (2 memories)
- Full auto set up
- LCD: 128 x 64 pixels / high-contrast
- DVM read-out with x10 option
- Time base: 200ns to 1 hour/div in 32 steps
- 5mV to 20V/div in 12 steps
- 0.1mV sensitivity
- 10Ms/s sampling rate
- Up to 2MHz analog bandwidth
- Joystick operation
- Optical isolated RS232 output for PC
- Optional holster

Specifications:
- Power supply: 5 x 1.5V AAA battery or Nicd/NiMH (not incl.)
- Includes battery charging circuit
- Optional: adapter 9V/300mA (PSU03)
- Dimensions: 155mm x 100mm x 45mm
- Weight: 395g

Page 15: DSO Quad
ARM DSO203 Nano V2 / Quad Pocket Digital Oscilloscope (3 MHz measured BW, 72MSa/s). Price $188.46.

Note, this model (“DSO Quad”) was previously reviewed by the author.

The unit is slightly larger than a standard business card and it comes with two Mueller 10:1, 100-MHz probes with tiny MCX RF coax connectors. The DSO Quad has two analog channels and two digital channels. The sampling rate is 72 MSa/s. Despite the claimed 72MHz bandwidth, I measured a bandwidth of about 3MHz. I suspect the company is confused between bandwidth and sample rate.

The vertical scale is adjustable from 20 mV/div to 10 V/div (8-bit resolution) and the horizontal sensitivity is 0.1 µs/div to 1s/div. Input coupling is AC or DC and triggering is Auto, Normal, and Single. There are several trigger modes: rising/falling edge, pulse width, and level.

The DSO Quad uses an ARM cortex M3 (32 bit) processor and integrated FPGA with high speed ADC. There’s an internal 2 Mbyte USB-connectable RAM for waveform storage and instrument setups. The 3-in. color display includes channel information/setup along the top and it displays automatic measurements (VMIN, VMAX, VPP, VDC and VRMS and VBATT) along the right side. The unit can also perform channel math functions: A+B, A-B, etc. All these instrument configurations are
controlled by toggle switches and a row of buttons along the unit's top edge.

In addition to being a DSO, the DSO Quad also contains a signal source. It has two built-in signal generators, an 8 MHz variable-duty-cycle square-wave generator and a 20kHz function generator (sine, triangle, and sawtooth). These signals come out through a separate connector.

Specifications:

- Analog channel 2 : [CH_A] [CH_B]
- Digital channel * 2 : [CH_C] [CH_D]
- Vertical Scale: 20 mV-10 V/div (x1 probe)
- Vertical solution: 8 bit
- Input coupling: AC/DC
- Max input voltage: 80 Vpp (x1 probe)
- Storage: 4K per channel
- Software trigger type: edge, pulse, level (to be added)
- Hardware trigger type: edge
- Trigger source: CH1/CH2/EXT/Test
- Signal generator: 10 Hz to 1 MHz
- Storage: Internal 2MB USB disk
- Auto measure: Vmax, Vmin, Vpp, Vavr, Vrms, Freq, Period, Pulse, Duty
- Cursor measurement: Level, Voltage
- Display mode: CH1, CH2, EXT, CH1+CH2, CH1-CH2, CH1*CH2
- Sampling mode: real time
- Sampling rate: 1kSa/s to 72MSa/S
- Power: Lipo battery
- Dimensions: 98mm x 60mm x 14.5mm
- Weight: 80g (without battery)
- Accessories within Pack: 2 Mueller mcx oscilloscope probes

Package Includes a Portable DS203 Oscilloscope, two Probes, and a USB Cable

**Page 16: CircuitGear Mini CGR-101 (2MHz)**
CircuitGear CGR-101 (2MHz at 20 MSa/s). Price $189.

The Circuit Gear Mini model CGR-101 is a two channel 2MHz bandwidth at 20MSa/s 10-bit oscilloscope with an additional 2 MHz DDS arbitrary waveform generator and eight channel digital I/O. There is also a vector network analyzer feature that will measure amplitude and phase from 0.1 Hz to 2 MHz. It's powered by USB and requires a PC or laptop running Linux, Windows or Mac operating systems. The software is open-sourced.

The eBay links included in the article may not work forever, so performing a search for the model number should reveal many vendors selling the same item.

Specifications:

Oscilloscope

• Analog bandwidth: 2MHz
• Max sampling rate: 20MSa/s
• Input voltage: ±0.25Vpk to ±25Vpk (7 steps)
• Input A/D resolution: 10 bit
• Input impedance: 1 MΩ at 20 pF
• Timebase: 50ns/div to 100ms/div (20 steps)
• Trigger: Normal, Auto, Single, External
• Trigger polarity: +/-
• Trigger level: Cursor selectable

Waveform Generator

• Frequency range: 0.1Hz to 2MHz
• Frequency resolution: 0.1Hz
• Output amplitude: ±3V
• Output impedance: 150Ω
• Offset control: Hardware, 8 bit
• Standard waveforms: Sine, Square, Triangle, Ramp, Noise
• Arbitrary waveform: 8 bit resolution, vertical and horizontal

Digital I/O

• Output: 8 bit, 5V, HCMOS
• Input: 8 bit, 3/5 volt, HCMOS
• PWM output