

# VOLTCRAFT

## VOLTCRAFT - RELIABLE AND PRECISE. SINCE 1982.

For more than 40 years, our product range has been dynamically adapting to the constant changes in the industry. We commit to offering first-class quality to our customers while delivering an excellent cost-performance ratio. This philosophy remains the cornerstone of Voltcraft's success.

## DOV OSCILLOSCOPE



Item no. 3350781 (DOV702)

Item no. 3350782 (DOV704)

Item no. 3350783 (DOV1002)

Item no. 3350784 (DOV1004)

Item no. 3350785 (DOV1254 LA)

Item no. 3350787 (DOV1254F LA)

Item no. 3350791 (DOV2504 LA)

Item no. 3350792 (DOV2504F LA)

The DOV oscilloscope stands out for its wide range of features. An analogue/digital converter with 12 bit resolution, basic USB, LAN and HDMI ports, Touch-display (1024 x 600 pixels).



Image shows item no 3350792

# TECHNICAL DATA

## Vertical System

### Analog Channel

Characteristics	Description	
Input Coupling	DC, AC, Ground	
Input Impedance	1 MΩ±2%, parallel with 20 pF±5 pF	
Probe attenuation coefficient setting	Common	10.00μX,20.00μX,50.00μX,100.00μX, 200.00μX,500.00μX,1.00mX,2.00mX, 5.00mX,10.00mX,20.00mX,50.00mX, 100.00mX,200.00mX,500.00mX,1.00X, 2.00X,5.00X,10.00X,20.00X,50.00X, 100.00X,200.00X,500.00X,1.00kX,2.00kX, 5.00kX,10.00kX,20.00kX, 50.00kX
	Custom	1.00μX - 1.00MX
Maximum Input Voltage	≤300 Vrms	
Vertical Resolution	12 bits	
Vertical Sensitivity	DOV702 / DOV704 DOV1002 / DOV1004	500 μV/div~ 10 V/div [1]
	DOV1254 LA / DOV1254F LA DOV2504 LA / DOV2504F LA	200 μV/div~ 10 V/div [1]
Displacement	±2 V (500 μV/div – 200 mV/div) ±80 V (500 mV/div – 10 V/div)	
Analog bandwidth	DOV702 / DOV704	70 MHz
	DOV1002 / DOV1004	100 MHz
	DOV1254 LA / DOV1254F LA	125 MHz
	DOV2504 LA / DOV2504F LA	250 MHz
Low Frequency (AC coupling, -3dB)	≥10 Hz (at BNC)	
Rising Time(at BNC, typical)	DOV702 / DOV704	≤ 5 ns
	DOV1002 / DOV1004	≤ 3.5 ns
	DOV1254 LA / DOV1254F LA	≤ 2.8 ns
	DOV2504 LA / DOV2504F LA	≤ 1.4 ns
DC Gain Accuracy	≤1 mV	3%
	≥2 mV	2%
DC accuracy (average)	Delta Volts between any two averages of ≥16 waveforms acquired with the same scope setup and ambient conditions ( $ΔV$ ): $±(2\% \text{ rdg} + 0.05 \text{ div})$	
Channel-channel isolation	50 Hz: 100:1 10 MHz: 40:1	
Time delay between channel (typical)	150 ps	
Waveform inverted	Support	
Bandwidth limit	20 MHz, full bandwidth	

Description:

[1] : 200 μV/div, 500 μV/div is a digital magnification of 1mV/div.

## Horizontal System

### Analog Channel

Characteristics	Description	
Scanning speed (s/div)	1 ns/div - 1000s/div, step by 1-2-5	
Time base accuracy	±25 ppm (typical value, ambient temperature: +25 °C)	
Time interval ( $\Delta T$ ) measurement accuracy(DC~ 100 MHz)	Single: $\pm(1 \text{ interval time} +  \text{time base accuracy}  \times \text{reading} + 0.2 \text{ ns})$ Average>16: $\pm(1 \text{ interval time} +  \text{time base accuracy}  \times \text{reading} + 0.1 \text{ ns})$	
Sampling rate range	0.05 Sa/s ~ 2.5 GSa/s	
Maximum Storage Depth	DOV702 / DOV1002 DOV704 / DOV1004	50M
	DOV1254 LA / DOV1254F LA DOV2504 LA / DOV2504F LA	100M

### Acquire System

Characteristics	Description		
Acquire mode	Sample, Peak, High Res, Average, Segmentation		
Maximum real-time acquire rate	DOV702	Dual Single	625 MSa/s
	DOV1002	Single	1.25 GSa/s
	DOV704	Four Single,Dual Single[1]	625 MSa/s
	DOV1004	Dual Single[2]	1.25 GSa/s
	DOV1254 LA	Single	1.25 GSa/s
	DOV1254F LA DOV2504 LA DOV2504F LA		
Waveform capture rate	Real-time acquire: 50,000 wfms/s Segment acquire: 700,000 wfms/s		
Record length	DOV702 DOV1002 DOV704 DOV1004	1k, 10k, 100k, 1M, 10M, 25M, 50M	
	DOV1254 LA DOV1254F LA DOV2504 LA DOV2504F LA	1k, 10k, 100k, 1M, 10M, 25M, 50M, 100M	
		Note: The record length is dynamic, changing with the number of channel openings	
Interpolation	Auto, Sinx/x, x		

[1] : Limited to four-channel models, the maximum real-time sampling rate of dual channels must be one of the following conditions: CH1 and CH2 are both on, or CH3 and CH4 are both on.

[2] : Limited to four-channel models, the maximum real-time sampling rate of two channels should meet one of the following conditions: only one channel of CH1 and CH2 can be turned on, and only one channel of CH3 and CH4 can be turned on.

## Trigger

### Trigger System

Characteristics	Description	
Trigger source	CH1, CH2, CH3, CH4, LA	
Trigger mode	Auto, Normal, Single	
Trigger type	Edge trigger, Video trigger, Pulse trigger, Slope trigger, Runt trigger, Windows trigger, Timeout trigger, Nth trigger, Logic trigger, RS232/UART trigger, I2C trigger, SPI trigger, CAN trigger, LIN trigger	
50% level setting (typical)	Input signal frequency $\geq$ 50 Hz	
Trigger displacement	According to Record length and time base	
Holdoff range	100 ns to 10s	
Trigger sensitivity	0.3 div ~ 10 div	
Trigger level range	Internal	$\pm 4$ divs from the center of the screen
Trigger level Accuracy (typical) the source is adapted to rising and falling time $\geq$ 20ns	Internal	$\pm 0.3$ divs

### Trigger Type

Characteristics	Description	
Edge Trigger	Couple	DC, AC, HF
	Slope	Rising, Falling
Video Trigger	Modulation	Support standard NTSC, PAL and SECAM broadcast systems
	Line number range	1-525 (NTSC) and 1-625 (PAL/SECAM)
Pulse Trigger	Trigger condition	Positive pulse: $>$ , $<$ , $=$ Negative pulse: $>$ , $<$ , $=$
	Pulse Width range	30 ns to 10 s
Slope Trigger	Trigger condition	Positive pulse: $>$ , $<$ , $=$ Negative pulse: $>$ , $<$ , $=$
	Time setting	30 ns to 10 s
Runt Trigger	Trigger condition	Positive pulse: $>$ , $<$ , $=$ Negative pulse: $>$ , $<$ , $=$
	Time setting	30 ns to 10 s
Windows Trigger	Trigger condition	Positive pulse: superamplitude entry, superamplitude exit, and superamplitude time Negative pulse: superamplitude entry, superamplitude exit, and superamplitude time
	Time setting	30 ns ~ 10 s
Timeout Trigger	Slope	Rising, Falling
	Idle Time	30 ns ~ 10 s
The Nth Edge Trigger	Slope	Rising, Falling
	Idle Time	30 ns ~ 10 s
	Edge Number	1 ~ 128
Logic trigger	Logic Mode	AND, OR, XOR,XNOR
	Input Mode	H, L, X, Rising, Falling
	Output Mode	Goes True, Goes False, Is True $>$ , Is True $<$ , Is True $=$

RS232/UART Trigger	Polarity	Normal, Inverted
	Trigger Condition	Start, Error, Chk Error, Data
	Baud Rate	Common, Custom
	Data Bits	5 bits, 6 bits, 7 bits, 8 bits
I2C Trigger	Trigger Condition	Start, Restart, Stop, Ack Lost, Addr, Data, Addr/Data
	Address Range / Byte Length	7 bits---->0 to 127 8 bits---->0 to 255 10 bits--->0 to 1023
	ByteLength	1 to 5
SPI Trigger	Trigger Condition	Timeout, CS
	Timeout value	30 ns to 10s
	Data Bits	4 bits to 32 bits
	Edge	Rising, Falling
CAN Trigger	Signal Type	CAN_H, CAN_L, TX, RX, DIFF
	Trigger Condition	Start, Type, Data, ID, ID/Data, End, Lost, Error
	Baud Rate	Common, Custom
	Sample Point	0.5% to 95%
	Frame Type	Data, Remote, Error, Overload
LIN Trigger	Condition	Break, ID, ID/Data, Data Error
	Baud Rate	Common, Custom

## Waveform

### Waveform Measurement

Characteristics	Description	
Cursor Measurement	ΔV, ΔT, ΔT&ΔV between cursors, auto cursor, support XY/FFT/ZOOM window, based on screen percentage	
	Number	2 pairs of XY cursors
	Manual mode	ΔV, ΔT
	Tracing mode	The voltage value and time value of the X waveform point are tracked by fixing the Y axis The fixed X-axis tracks the voltage value and time value of the Y waveform point
	Auto measurement cursor	Allows the cursor to be displayed during automatic measurements
	XY Mode	The voltage parameters of the corresponding channel waveforms were measured in XY timebase mode X= Channel 1, Y= Channel 2
Auto measurement	Number	43 automatic measurements with up to 8 measurements displayed simultaneously
	Measurement source	CH1 - CH4
	Measurement area	Primary time base, extended time base, cursor area
	Horizontal	Period, + Width, Rise Time, +Duty, Frequency, - Width, Fall Time, -Duty and ScrDuty
	Vertical	Vavg, Vpp, Vamp, StdDev, Vmax, Vtop, VRMS, Overshoot, Vmin, Vbase, CycRms and Preshoot
	Blend	+PulseCnt, -PulseCnt, RiseCnt, FallCnt, Area and CycArea
	Channel	Delay(1 $\mu$ -2 $\mu$ ), Delay(1 $\mu$ -2 $\mu$ ), Delay(1 $\mu$ -2 $\mu$ ), Delay(1 $\mu$ -2 $\mu$ ), Phase(1 $\mu$ -2 $\mu$ ), Phase(1 $\mu$ -2 $\mu$ ), Phase(1 $\mu$ -2 $\mu$ ), Phase(1 $\mu$ -2 $\mu$ ), FRR(1 $\mu$ -2 $\mu$ ), FRR(1 $\mu$ -2 $\mu$ ), FRR(1 $\mu$ -2 $\mu$ ), FFF(1 $\mu$ -2 $\mu$ ), LRR(1 $\mu$ -2 $\mu$ ), LRF(1 $\mu$ -2 $\mu$ ), LFR(1 $\mu$ -2 $\mu$ ) and LFF(1 $\mu$ -2 $\mu$ )
Mathematical operation	+, -, *, /, &&,   , ^, !, (, Tan(), Intg(), Diff(), Sqrt(), Lg(), Ln(), Exp(), Abs(), Sine(), CoSin(), User Defined Function, digital filter (low pass, high pass, band pass, band reject), FFT(Vrms, dBVrms, Radians, Degrees)	

### Waveform Analysis

Characteristics	Description	
Pass Fail	The signal under test is compared with a user-defined rule (template), providing the number of passes, failures, and the total number of tests. Pass/fail events can trigger immediate stop, buzzer, and screenshot.	
	Source	CH1 - CH4
	Type	Horizontal, vertical and other measurement items
	Measurement	Data statistics: Pass, Fail and the total number
	Acquire mode	All modes are supported except Zoom, XY, FFT and scroll
Color Grade	Provide three view of waveform intensity, color temperature level >16, 256 color scale display	
	Source	CH1 - CH4
	Waveform brightness	brightness
	Acquire mode	Only basic waveforms are supported

## Decode

Characteristics	Description
Decode Number	2, Both protocol types can be decoded and switched simultaneously
Decode Type	RS232/UART, I2C, SPI, LIN, CAN
RS232/UART	Decode RS232/UART bus TX/RX signals at speeds up to 10 Mb/s (5 to 8 bits), supporting parity bit (odd parity, even parity, or no parity) and stop bit (1 to 2 bits) configuration. Source Channel: CH1~CH4
I2C	Decode the I2C bus addresses (including or excluding the read/write bit), data, and ACK. Source Channel: CH1~CH4
SPI	Decode SPI bus MISO/MOSI data (4 to 32 bits). The mode supports timeout and chip select (CS). Source Channel: CH1~CH4
CAN	Decode remote frames of the CAN bus at speeds up to 1 Mb/s (ID, byte count, CRC), as well as overload frames and data frames (standard/extended ID, control field, data field, CRC, ACK). Supported CAN bus signal types include CAN_H, CAN_L, and differential. Source Channel: CH1~CH4
LIN	Decode LIN bus versions 1.X or 2.X, with speeds up to 10 kb/s. Decode and display synchronization, identifier, data, and checksum. Source Channel: CH1~CH4

## Bode Plot

Characteristics	Description
Start frequency	10 Hz ~ 25 MHz
End frequency	10 Hz ~ 25 MHz
Points/Decade	10 ~ 100
Amplitude	2mV ~ 6V

## AFG

Characteristics	Description	
Channel	1	
Sample Rate	160 MSa/s	
Vertical Resolution	14 bits	
Maximum frequency	30 MHz	
Waveform	Standard waveforms	Sine wave, square wave, ramp wave, pulse wave, noise
	Arbitrary waveforms	Butterworth, X^2 and EOG etc 28 built-in waveforms

## Frequency Feature

Sine wave	1 $\mu$ Hz to 30 MHz
Square wave	1 $\mu$ Hz to 15 MHz
Ramp wave	1 $\mu$ Hz to 1 MHz
Pulse wave	1 $\mu$ Hz to 10 MHz
Noise wave(-3 dB)	20 MHz (Gaussian white noise)
Arbitrary wave(except DC)	1 $\mu$ Hz to 10 MHz
Frequency resolution	1 $\mu$ Hz or 9 significant figures
Frequency stability	$\pm 25$ ppm, 0 to +40°C
Frequency aging rate	$\pm 25$ ppm per year

## Amplitude characteristic

Output amplitude	High Z	2 mVpp to 10 Vpp ( $\leq 10$ MHz) 2 mVpp to 5 Vpp ( $\leq 30$ MHz)
	50Ω	1 mVpp to 5 Vpp ( $\leq 10$ MHz) 1 mVpp to 2.5 Vpp ( $\leq 30$ MHz)
Amplitude accuracy	$\pm(1\%$ of setting + 1 mVpp) (typical 1kHz sine, 0V offset)	
Amplitude resolution	1mVpp or 5 bits	
DC offset range (AC+DC)	High Z	$\pm 5$ Vpk - Amplitude Vpp/2 ( $\leq 10$ MHz) $\pm 2.5$ Vpk - Amplitude Vpp/2 ( $\leq 30$ MHz)
	50Ω	$\pm 2.5$ Vpk - Amplitude Vpp/2 ( $\leq 10$ MHz) $\pm 1.25$ Vpk - Amplitude Vpp/2 ( $\leq 30$ MHz)
DC offset accuracy	$\pm(1\%$ of  setting  + 1 mV + amplitude Vpp * 0.5%)	
Offset resolution	1 mVpp	
Output Impedance	50Ω (typical)	

## Waveforms characteristic

### Sine

Bandwidth flatness(1Vpp,relative 1kHz, 50Ω)	$\leq 10$ MHz: $\pm 0.3$ dB $\leq 30$ MHz: $\pm 0.5$ dB
Harmonic distortion	Typical value (0dBm) DC to 1 MHz: <-65 dBc 1 MHz to 30 MHz: <-60 dBc
Total harmonic distortion	<0.2%, 10Hz to 20kHz, 1Vpp
Non-harmonic distortion	Typical value(0dBm) $\leq 10$ MHz: <70 dBc $>10$ MHz: <70 dBc + 6 c/sound interval
Phase noise	Typical value(0dBm,10kHz offset) 10MHz: $\leq -110$ dBc/Hz

### Square

Rising falling time	<20 ns
Jitter	200 ps +25 ppm
Overshoot	<5%

### Ramp

Linearity	<the 1% of maximum output (typical value 1 kHz, 1 Vpp, symmetry50%)
Symmetry	0% to 100%

### Pulse

Period	100 ns to 1Ms
Pulsewidth	$\geq 64$ ns
Overshoot	<5%
Jitter	200 ps +25 ppm

### Noise

Type	Gaussian white noise
Bandwidth (-3dB)	20 MHz

### Arbitrary

Bandwidth	10 MHz
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Waveforms length	2 to 8192 points
Sample rate	160 MSa/s
Amplitude accuracy	14 bits
<b>Modulation characteristic</b>	
Modulate type	AM, FM, PM, FSK
<b>AM</b>	
Carrier	Sine, Square, Ramp, Arb(Except DC)
Internal modulation waveform	Sine, Square, Ramp, Noise
Internal amplitude modulation frequency	2 mHz to 20 kHz
Depth	0% to 100%
<b>FM</b>	
Carrier	Sine, Square, Ramp, Arb(Except DC)
Internal modulation waveform	Sine, Square, Ramp, Noise
Internal modulation frequency	2 mHz to 20 kHz
Frequency offset	2 mHz to Carrier frequent
<b>PM</b>	
Carrier	Sine, Square, Ramp, Arb(Except DC)
Internal modulation waveform	Sine, Square, Ramp, Noise
Internal phase modulation frequency	2 mHz to 20 kHz
Phase deviation range	0° to 180°
<b>FSK</b>	
Carrier	Sine, Square, Ramp, Arb(Except DC)
FSK rate	2 mHz to 100kHz
FSK hopfreq	1 µHz to Maximum frequency of corresponding carrier
<b>Voltage range and sensitivity (No modulation source)</b>	
Input resistance	1M Ω

## Counter

Characteristics	Description
Source	CH1, CH2, CH3, CH4, Follow trigger
Measurement type	Frequency, period
Statistic parameter	Type, Max, Min, Avg
Maximum frequency	Maximum analog bandwidth
Resolution	6 bits

## DVM

Characteristics	Description
Source	CH1, CH2, CH3, CH4
Function	AC RMS, DC, AC+DC RMS
Resolution	4 bits
Limit warnings	Support upper and lower limit setting, over-limit condition setting, over-limit prompt

## LA

Characteristics	Description
<b>Vertical</b>	
Input channel	16 [D0:D15] , One group is D0 to D7, and one group is D8 to D15
Threshold range	$\pm 20.0$ V, step by 10 mV
Threshold accuracy	$\pm (100 \text{ mV} + 3\% \text{ threshold setting})$
Threshold selection	TTL, CMOS, ECL, PECL, custom
Maximum input voltage	$\pm 40$ V peak CAT I; The instantaneous overvoltage is 800 Vpk
Maximum input dynamic range	$\pm 10$ V + threshold
Minimum input signal swing	500 mVpp
Input impedance	$100 \text{ k}\Omega \parallel 8 \text{ pF}$
Vertical resolution	1 bit
<b>Horizontal</b>	
Minimum detectable pulse width	5 ns
Maximum input frequency	200 MHz
Time delay between channels	$\pm 5$ ns

## Command

Characteristics	Description
Common support	Supports the standard SCPI command set
Error message Definition	Error Message
Support status reporting mechanism	Status Reporting
Support for synchronization mechanisms	Synchronization

## General Technical Specification

### Display

Characteristics	Description
Display Type	7 inch Colored LCD (Liquid Crystal Display)
Display Resolution	1024 (Horizontal) $\times$ 600 (Vertical) Pixels
Display Colors	24 colors, TFT
Grid	18 horizontal cells * 8 vertical cells
Afterglow	Off, infinity, adjustable time (1 second, 2 seconds, 5 seconds)
Brightness level	256 levels

### Processor system

Characteristics	Description
System memory	2GB RAM
Operating system	Android
Internal non-volatile memory	8GB

## Output of the Probe Compensator

Characteristics	Description
Output voltage(typical)	About 3.3 V, with the Peak-to-Peak voltage $\geq 1$
Frequency(typical)	1 kHz Square

## Others

Characteristics	Description
Communication Interface	HDMI; USB device *1, USB Host *1 ; Trig Out(P/F); LAN interface
Power Supply	Type-C power supply interface[1]; DC:12V 4A
Power Consumption	$\leq 48W$
Touch Screen	Multi-touch Capacitive screen

[1] Without generator:the adapter is required to support a handshake protocol of 12V/ $\geq 3A$ ;With generator: the adapter is required to support a handshake protocol of 12V/ $\geq 4A$ .

## Environment

Characteristics	Description
Temperature	Working temperature: 0 to +40°C Storage temperature: -20 to +60°C
Relative humidity	$\leq 90\%$
Height	Operating: 3,000 m Non-operating: 15,000 m
Cooling Method	Fan cooling

## Mechanical Specifications

Characteristics	Description
Dimension	260 mm (L) x 160 mm (H) x 78 mm (W)
Weight	Approx. 1.5 kg

## Interval Period of Adjustment

One year is recommended for the calibration interval period.

## DELIVERY CONTENTS

Oscilloscope // USB-C® power adapter // USB cable //  
4x probes // 2x Probe adjustment set // BNC cable //  
Software + English manual on CD //  
Quick guide // Safety hintsheet