Agilent 33250A Function/Arbitrary Waveform Generator

Data Sheet

- 80 MHz sine and square wave outputs
- Sine, square, ramp, noise and other waveforms
- 50 MHz pulse waveforms with variable rise/fall times
- 12-bit, 200 MSa/s, 64K-point deep arbitrary waveform

Standard Waveforms

The Agilent Technologies 33250A function/arbitrary waveform generator uses direct digital-synthesis techniques to create a stable, accurate output on all waveforms, down to 1 µHz frequency resolution. The benefits are apparent in every signal you produce, from the sine wave frequency accuracy to the fast rise/fall times of square waves, to the ramp linearity.

Front-panel operation of the 33250A is straightforward and user friendly. The knob or numeric keypad can be used to adjust frequency, amplitude and offset. You can even enter voltage values directly in Vpp, Vrms, dBm, or high/low levels. Timing parameters can be entered in hertz (Hz) or seconds.

Custom Waveform Generation

Why settle for a basic function generator when you can get arbitrary waveforms at no extra cost? With the 33250A, you can generate arbitrary waveforms with 12-bit vertical resolution, 64K memory depth, and a sample rate of 200 MSa/s. You can also store up to four 64K-deep arbitrary waveforms in non-volatile memory with user-defined names to help you find the right waveform when you need it most.

The included Agilent IntuiLink software allows you to easily create, edit, and download complex waveforms using the IntuiLink arbitrary waveform editor. Or you can capture a waveform using IntuiLink oscilloscope or DMM and send it to the 33250A for output. For programmers, ActiveX components can be used to control the instrument using SCPI commands. IntuiLink provides the tools to easily create, download, and manage waveforms for your 33250A. To find out more about IntuiLink, visit www.agilent.com/find/intuilink.

Pulse Generation

The 33250A can generate simple pulses up to 50 MHz. With variable edge time, pulse width and voltage level, the 33250A is ideally suited to a wide variety of pulse applications.

Built-in Versatility

AM, FM and FSK capabilities make it easy to modulate waveforms with or without a separate source. Linear or logarithmic sweeps can be performed with a programmable frequency marker signal. Programmable burst count and gating allow you to further customize your signal.

For system applications, both GPIB and RS-232 interfaces are standard, and support full programmability using SCPI commands.

Color Graphical Display

The unique design of the 33250A combines a low-profile instrument with the benefits of a color graphical display. Now you can display multiple waveform parameters at the same time. The graphical interface also allows you to modify arbitrary waveforms quickly and easily.

Timebase Stability and Clock Reference

The 33250A TCXO timebase gives you frequency accuracy of 2 ppm for your most demanding applications. The external clock reference input/output lets you synchronize to an external 10 MHz clock, to another 33250A, or to another Agilent 332XXA function/arbitrary wafeform generator. Phase adjustments can be made from the front panel or via a computer interface, allowing precise phase calibration and adjustment.

Agilent Technologies

Measurement Characteristics

Waveforms

Standard sine, square, pulse, ramp, noise, sin(x)/x, exponential rise, exponential fall, cardiac, DC volts

Arbitrary

Waveform length	1 to 64K points
Amplitude resolution	12 bits (including sign)
Repetition rate	1 µHz to 25 MHz
Sample rate	200 MSa/s
Filter bandwidth	50 MHz
Non-vol. memory	Four (4) 64K waveforms

Frequency Characteristics

Sine	1 µHz to 80 MHz
Square	1 µHz to 80 MHz
Pulse	500 µHz to 50 MHz
Arb	1 µHz to 25 MHz
Ramp	1 µHz to 1 MHz
White noise	50 MHz bandwidth
Resolution	1 µHz; except pulse, 5 digits
Accuracy (1 year)	2 ppm, 18°C to 28°C 3 ppm, 0°C to 55°C

Sinewave Spectral Purity

Harmonic distortion

	≤ 3 Vpp[1]	> 3 Vpp
DC to 1 MHz	-60 dBc	-55 dBc
1 MHz to 5 MHz	-57 dBc	-45 dBc
5 MHz to 80 MHz	-37 dBc[2]	-30 dBc[2]

Total harmonic distortion

DC to 20 kHz	< 0.2% + 0.1 mVrms

Spurious (non-harmonic)[3]

DC to 1 MHz	-60 dBc
1 MHz to 20 MHz	-50 dBc
20 MHz 80 MHz	-50 dBc + 6 dBc/octave

Phase noise (30 kHz band)

10 MHz	<-65 dBc (typical)
80 MHz	<-47 dBc (typical)

Signal Characteristics

Squarewave

Rise/Fall time	< 8 ns[4]
Overshoot	< 5%
Asymmetry	1% of period + 1 ns
Jitter (rms)	
< 2 MHz	0.01% + 525 ps
≥ 2 MHz	0.1% + 75 ps
Duty cycle	
≤ 25 MHz	20.0% to 80.0%
25 MHz to 50 MHz	40.0% to 60.0%
50 MHz to 80 MHz	50.0% (fixed)

Pulse

Period	20.00 ns to 2000.0 s
Pulse width	8.0 ns to 1999.9 s
Variable edge time	5.00 ns to 1.00 ms
Overshoot	< 5%
Jitter (rms)	100 ppm + 50 ps

Ramp

Linearity	< 0.1% of peak output
Symmetry	0.0% to 100.0%

Arb

Minimum edge time	< 10 ns
Linearity	< 0.1% of peak output
Settling time	< 50 ns to 0.5% of final value
Jitter (rms)	30 ppm + 2.5 ns

Output Characteristics

Amplitude (into 50Ω)	10 mVpp to 10 Vpp[5]
Accuracy (at 1 kHz, >10 mVpp, Autorange on)	± 1% of setting ± 1 mVpp
Flatness (sinewave relative to 1 kHz, Autorange on)	
< 10 MHz	± 1% (0.1 dB)[6]
10 MHz to 50 MHz	± 2% (0.2 dB)
50 MHz to 80 MHz	± 5% (0.4 dB)
Units	Vpp, Vrms, dBm, high and low level
Resolution	0.1 mV or 4 digits
Offset (into 50Ω)	± 5 Vpk ac + dc
Accuracy	1% of setting + 2 mV + 0.5% of amplitude

Waveform Output

Impedance	50Ω typical (fixed) >10 MΩ (output disabled)
Isolation	42 Vpk maximum to earth
Protection	short-circuit protected[7]; overload relay automatically disables main output

Modulation Characteristics

AM

Carrier waveforms	sine, square, ramp, and arb
Mod. waveforms	sine, square, ramp, noise, and arb
Mod. frequency	2 mHz to 20 kHz
Depth	0.0% to 120.0%
Source	internal/external

FM

Carrier waveforms	sine, square, ramp, and arb
Mod. waveforms	sine, square, ramp, noise, and arb
Mod. frequency	2 mHz to 20 kHz
Peak deviation	DC to 80 MHz
Source	internal/external

FSK

Carrier waveforms	sine, square, ramp, and arb
Mod. waveform	50% duty cycle square
Internal rate	2 mHz to 100 kHz
Frequency range	1 µHz to 80 MHz
Source	internal/external

External Modulation Input

Voltage range	± 5 V full scale
Input impedance	10 Ω
Frequency	DC to 20 kHz
Latency	< 70 µs typical

Burst

Waveforms	sine, square, ramp, pulse, arb, and noise
Frequency	1 µHz to 80 MHz[8]
Burst count	1 to 1,000,000 cycles or infinite
Start/Stop phase	-360.0° to +360.0°
Internal period	1 ms to 500 s
Gate source	external trigger
Trigger source	single manual trigger, internal, external trig
Trigger delay	
N-cycle, infinite	0.0 ns to 85.000 sec

Sweep

Waveforms	sine, square, ramp, and arb
Type	linear and logarithmic
Direction	up or down
Start F/Stop F	100 µHz to 80 MHz
Sweep time	1 ms to 500 s
Trigger	single manual trigger, internal, external trig
Marker	falling edge of sync signal (programmable)

System Characteristics

Configuration Times (typical)[9]

Function change	
Standard	100 ms
Pulse	660 ms
Built-in arb	220 ms
Frequency change	20 ms
Amplitude change	50 ms
Offset change	50 ms
Select user arb	< 900 ms for < 16K pts.
Modulation change	< 200 ms

Arb Download Times GPIB/RS-232 (115Kbps)

Arb Length	*Binary*	*ASCII Integer*	*ASCII Real*
64K points	48 sec	112 sec	186 sec
16K points	12 sec	28 sec	44 sec
8K points	6 sec	14 sec	22 sec
4K points	3 sec	7 sec	11 sec
2K points	1.5 sec	3.5 sec	5.5 sec

Trigger Characteristics

Trigger input

Input level	TTL compatible
Slope	rising or falling, (selectable)
Pulse width	> 100 ns
Input impedance	10 kΩ, DC coupled
Latency	
Burst	< 100 ns (typical)
Sweep	< 10 µs (typical)
Jitter (rms)	
Burst	1 ns; except pulse, 300 ps
Sweep	2.5 µs

Trigger output

Level	TTL compatible into 50Ω
Pulse width	> 450 ns
Maximum rate	1 MHz
Fanout	≤ 4 Agilent 33250A's (or equivalent)

Clock Reference

Phase Offset

Range	-360° to +360°
Resolution	0.001°

External Reference Input

Lock range	10 MHz ± 35 kHz
Level	100 mVpp to 5 Vpp
Impedance	1 kΩ nominal, ac coupled
Lock time	< 2 s

Internal Reference Output

Frequency	10 MHz
Level	632 mVpp (0 dbm), nominal
Impedance	50Ω nominal, ac coupled

Sync Output

Level	TTL compatible into > 1 kΩ
Impedance	50 Ω nominal

General

Power supply	100-240 V, 50-60 Hz 100-127 V, 50-400 Hz
Power consumption	140 VA
Operating temp.	0°C to 55°C
Storage temp.	-30°C to 70°C
Stored states	4 named user configurations
Power on state	default or last
Interface	IEEE-488 and RS-232 std.
Language	SCPI-1997, IEEE-488.2
Dimensions (WxHxD)	
Bench top	254 x 104 x 374 mm
Rackmount	213 x 89 x 348 mm
Weight	4.6 kg
Safety designed to	EN61010-1, CSA1010.1, UL-311-1
EMC tested to	IEC-61326-1 IEC-61000-4-3 criteria B IEC-61000-4-6 criteria B
Vibration and shock	MIL-T-28800E, Type III, Class 5
Acoustic noise	40 dBA
Warm-up time	1 hour
Calibration interval	1 year
Warranty	1 year

[1] Harmonic distortion at low amplitudes is limited by a -70 dBm floor
[2] Harmonic distortion at 40 MHz only is -33 dBc
[3] Spurious noise at low amplitudes is limited by a -75 dBm floor
[4] Edge time decreased at higher frequency, 3.5 nS (typical)
[5] 20 mVpp to 20 Vpp into open-circuit load
[6] dB rounded to 1 digit, instrument adheres to "%" specification
[7] Short-circuit protected to ground at all times
[8] Sine and square waveforms above 25 MHz only with infinite burst count
[9] Time to change parameter and output new signal

www.agilent.com
www.agilent.com/find/33250A

Ordering Information

Agilent 33250A
80 MHz function/arbitrary wavefrom generator

Accessories included

Operating manual, service manual, quick reference guide, IntuiLink waveform editor software, test data, RS-232 cable, and power cord (see language option).

Options

Opt. A6J	ANSI Z540 calibration
Opt. AB0	Taiwan: Chinese manual
Opt. AB1	Korea: Korean manual
Opt. AB2	China: Chinese manual
Opt. ABA	English: English manual
Opt. ABD	Germany: German manual
Opt. ABF	France: French manual
Opt. ABJ	Japan: Japanese manual

Other Accessories

34131A	Carrying case
34161A	Accessory pouch
34190A	Rackmount kit*

*For racking two 33250As side-by-side, order the following items: Lock-link kit (34194A), Flange kit (34191A)

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