Data Sheet

Dual Channel Function/Arbitrary Waveform Generator

AD8610

The AD8610 Dual Channel Function/Arbitrary Waveform Generator is capable of generating stable and precise sine, square, triangle, pulse, and arbitrary waveforms. With easy-to-read color displays and an intuitive user interface with numeric keypad, these instruments offer plenty of features including linear/logarithmic sweep, built-in counter, extensive modulation and triggering capabilities, a continuously variable DC offset, and a high performance 14-bit, 125 MSa/s arbitrary waveform generator. The main output voltage can be varied from 0 to 10 Vpp into 50 ohms (up to 20 Vpp into open circuit) and the secondary output can be varied from 0 to 3 Vpp into 50 ohms (up to 6 Vpp into open circuit).

Easily create custom arbitrary waveforms using the included waveform editing software or output any of the 48 built-in predefined arbitrary waveforms. Up to 10 user-defined 16 kpt arbitrary waveforms can be saved to the instrument. Additionally, the included LabVIEW™ drivers allow users to conveniently load and save .CSV or text file data directly into the arb memory without having to use waveform editing software.

Extensive modulation capabilities include amplitude and frequency modulation (AM/FM), double sideband amplitude modulation (DSB-AM), amplitude and frequency shift keying (ASK/FSK), phase modulation (PM), and pulse width modulation (PWM).

The standard external 10 MHz reference clock input allows the instrument to be synchronized to an external 10 MHz source or another generator. This feature is typically not found in function generators at this price point. Additionally, the phase of both output channels can be conveniently synchronized with the push of a button.

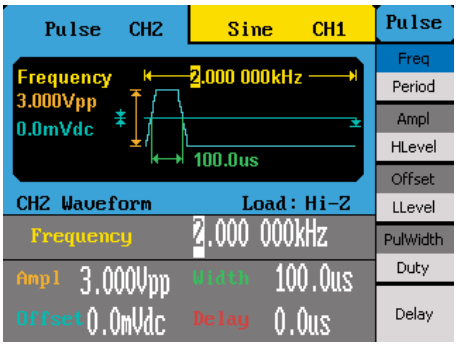
These versatile function/arbitrary waveform generators are suitable for education and other applications that require high signal fidelity, a variety of modulation schemes, or arbitrary waveform generation capabilities.

Features & Benefits

- 14-bit, 125 MSa/s, 16k point arbitrary waveform generator
- Generate sine waves up to 10 MHz
- Large 3.5-inch LCD color display with waveform preview
- Linear and logarithmic sweep
- AM, DSB-AM, ASK, FM, FSK, PM, and PWM modulation functions
- Variable DC offset
- Adjustable duty cycle
- Two independent channels with individual output ON/OFF buttons
- Internal/external triggering
- Gate and burst mode
- 48 built-in predefined arbitrary waveforms
- Store/recall up to 10 instrument settings and 10 arbitrary waveforms
- Built-in counter
- USB device port (USBTMC-compliant) and front panel USB host port
- GPIB connectivity with optional USB-to-GPIB adapter
- SCPI-compliant command set
- Arbitrary waveform editing software provided
- Short circuit protection on output
- LabVIEW™ drivers available

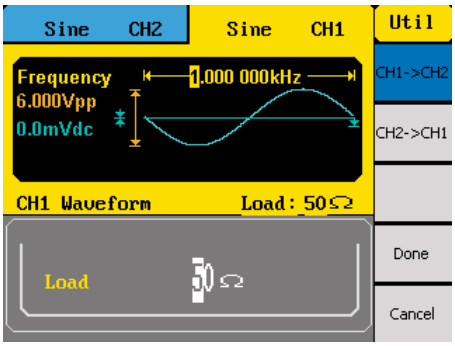
Flexible operation

Color display with waveform preview



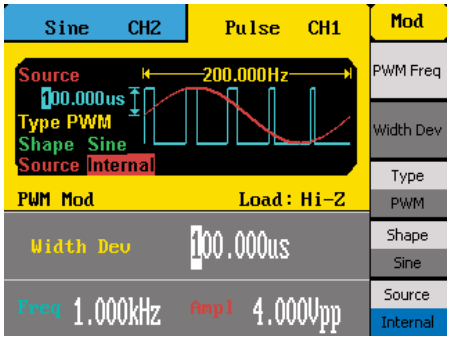
The large 3.5" color display highlights the currently selected channel and shows all relevant parameters with a preview of the waveform being generated.

Duplicate channel parameters



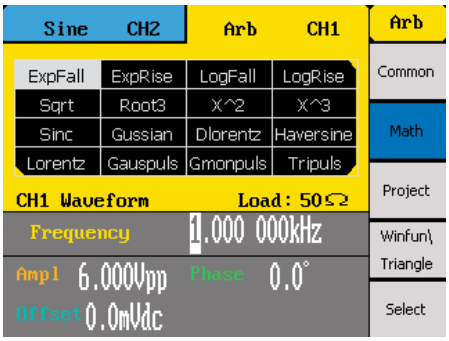
Quickly copy all waveform parameters between channels via the Utility menu. This feature can help you save time when you need to set up two identical output signals.

Wide variety of modulation schemes



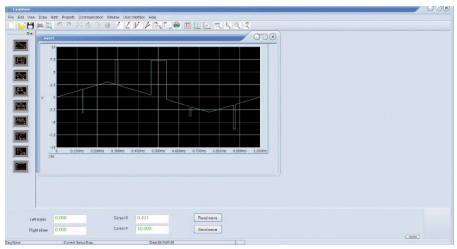
This instrument is capable of many different types of modulation for various applications. Modulate your waveforms with AM, DSB-AM, FM, PM, ASK, FSK, and PWM modulation schemes.

Arbitrary waveform generation



The model AD8610 have non-volatile memory to create, store, and recall up to 10 different arbitrary waveforms of up to 16,000 points each. Users can also output any of the 48 built-in predefined arbitrary waveforms.

Generate waveforms with ease



The provided waveform editing software can be used to create point-by-point arbitrary waveforms via freehand or waveform math functions. A standard USBTMC-compliant USB device port on the rear panel allows users to easily interface with a PC to load these arbitrary waveforms into the instrument.

Synchronization and external triggering

Use the external 10 MHz clock input to synchronize your signals to a master time base. The Sync output generates a TTL pulse for synchronization to a channel's frequency. An external trigger connector is also available for inputting or outputting trigger signals.

Specifications

Model	AD8610
Channels	2
Frequency Characteristics	
Sine	1 µHz – 10 MHz
Square	1 µHz – 10 MHz
Triangle, Ramp	1 µHz – 300 kHz
Pulse	500 µHz – 10 MHz
Gaussian Noise (-3 dB)	> 10 MHz
Arbitrary	1 µHz – 5 MHz
Accuracy	± 50 ppm (90 days) ± 100 ppm (1 year)
Resolution	1 µHz
Arbitrary Characteristics	
Built-in Waveforms	48 built-in waveforms (includes DC)
Waveform Length	16,000 points / Ch
Vertical Resolution	14 bits
Sampling Rate	125 MSa/s
Minimum Rise/Fall Time	7 ns (typical)
Jitter (pk-pk)	8 ns (typical)
Non-volatile Memory Storage	10 waveforms
Output Characteristics	
Amplitude Range	channel 1: 2 mVpp – 10 Vpp into 50 Ω (4 mVpp – 20 Vpp into open circuit), ″ 10 MHz 2 mVpp – 5 Vpp into 50 Ω (4 mVpp – 10 Vpp into open circuit), > 10 MHz
	channel 2: 2 mVpp – 3 Vpp into 50 Ω (4 mVpp – 6 Vpp into open circuit)
Amplitude Resolution	up to 4 digits
Amplitude Accuracy (100 kHz)	± (0.3 dB + 1 mVpp of setting value)
Amplitude Flatness (relative to 100 kHz, 5 Vpp)	± 0.3 dB
Cross Talk	< -70 dBc
Offset Range (DC)	channel 1: ± 5 V into 50 Ω (± 10 V into open circuit)
	channel 2: ± 1.5 V into 50 Ω (± 3 V into open circuit)
Offset Resolution	up to 4 digits
Offset Accuracy	± (|offset setting value| x 1% + 3 mV)
Channel Output Impedance	50 Ω, high impedance
Output Protection	short-circuit protection
Sync Out	TTL compatible, 2 MHz maximum frequency > 50 ns width, not adjustable 50 Ω (typical) output impedance
Waveform Characteristics	
Harmonic Distortion	DC – 1 MHz, < - 60 dBc 1 MHz – 5 MHz, < -53 dBc 5 MHz – 25 MHz, < - 35 dBc 25 MHz – 50 MHz, < -32 dBc
Total Harmonic Distortion	DC – 20 kHz at 1 Vpp, < 0.2 %
Spurious (non-harmonic)	DC – 1 MHz, < -70 dBc 1 MHz – 10 MHz, < -70 dBc + 6 dB/spectrum phase
Phase Noise	10 kHz offset, - 108 dBc/Hz (typical)
Rise/Fall Time (square)	< 12 ns (10 % – 90 %) at full amplitude into 50 Ω
Variable Duty Cycle (square)	20% – 80% to 10 MHz 40% – 60% to 20 MHz 50% > 20 MHz
Asymmetry (50% duty cycle)	1% of period + 20 ns (typical,1 kHz, 1 Vpp))
Jitter (square)	0.1% of period (typical, 1 kHz, 1 Vpp)
Ramp Symmetry	0% – 100%
Linearity (triangle, ramp at 1 kHz, 1 Vpp, 100% symmetry)	< 0.1% of peak output (typical)

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Pulse	
Pulse Width	16 ns minimum, 8 ns resolution
Rise/Fall Time	7 ns (typical) at 1 kHz, 1 Vpp from 10% – 90%
Duty Cycle	0.1% resolution
Overshoot	< 5%
Jitter (pk-pk)	8 ns
Burst	
Waveform	sine, square, ramp, pulse, arbitrary (except DC)
Type	cycle (1 – 50,000 cycles), infinite, gated
Start/Stop Phase	0 ° – 360 °
Internal Period	1 µs – 500 s
Gated Source	external trigger
Trigger Source	internal, external, manual
Phase Offset	
Range	0 ° – 360 °
Resolution	0.1 °
Trigger Characteristics	
Trigger Input	
Max. Input Voltage	± 6 V
Input Level	TTL compatible
Slope	rising or falling, selectable
Pulse Width	> 100 ns
Input Impedance	> 5 kΩ, DC coupling
Maximum Frequency	1 MHz
Input Latency	< 300 ns
Trigger Output	
Voltage Level	TTL compatible
Pulse Width	> 400 ns
Output Impedance	50 Ω
Maximum Frequency	1 MHz
AM, FM & PM Modulation Characteristics	
Carrier	sine, square, ramp, arbitrary (except DC)
Source	internal, external
Modulation Waveform	sine, square, ramp, noise, arbitrary (2 mHz – 20 kHz)
AM Modulation Depth	0% – 120%, 0.1% resolution
FM Frequency Deviation	0 – 0.5*bandwidth, 10 µHz resolution
PM Phase Deviation	0 – 360 °, 0.1 ° resolution
ASK & FSK Modulation Characteristics	
Carrier	sine, square, ramp, arbitrary (except DC)
Source	internal, external
Modulation Waveform	50% duty cycle square waveform (2 mHz – 50 kHz)
DSB-AM Modulation Characteristics	
Carrier	sine, square, ramp, arbitrary (except DC)
Source	internal, external
Modulation Waveform	sine, square, ramp, noise, arbitrary (2 mHz – 1 kHz)
PWM Modulation Characteristics	
Frequency	500 µHz – 20 kHz
Source	internal, external
Modulation Waveform	sine, square, ramp, arbitrary (except DC)
External Modulation	- 6 V – 6 V (max. width deviation)
Duty Cycle Modulating Frequency	2 mHz – 20 kHz

Sweep Characteristics	
Waveforms	sine, square, ramp, arbitrary (except DC)
Sweep Shape	linear or logarithmic, up or down
Sweep Time	1 ms – 500 s
Sweep Trigger	internal, external, manual
Inputs	
Modulation In	± 6 Vpp for 100% modulation > 5 kΩ input impedance maximum voltage input: ± 6 V
Ext Trig/Gate/FSK/Burst	TTL compatible maximum voltage input: ± 6 V
External Clock	10 MHz ± 100 Hz, TTL compatible for synchronization to external 10 MHz clock or another generator
Frequency Counter	
Measurement	frequency, period, duty cycle, positive/negative pulse width
Measurement Range	single channel: 100 mHz – 200 MHz pulse width/duty cycle: 1 Hz – 10 MHz
Frequency Resolution	6 bits
DC Coupling	DC offset range: ± 1.5 VDC 100 mHz – 100 MHz, 50 mVrms – ± 2.5 V 100 MHz – 200 MHz, 100 mVrms – ± 2.5 V
AC Coupling	1 Hz – 100 MHz, 50 mVrms – 5 Vpp 100 MHz – 200 MHz, 100 mVrms – 5 Vpp
Pulse Width/Duty Cycle Voltage Range	50 mVrms – 5 Vpp
Input Impedance	1 MΩ
Coupling	AC, DC
Trigger Level Range	-3 V – 1.8 V
Environmental and Safety	
Temperature	operating: 32 °F – 104 °F (0 °C – 40 °C) storage: -4 °F – 140 °F (-20 °C – 60 °C)
Humidity	< 95° F (35 °C), ″ 90 % RH 95 °F – 104 °F (35 °C – 40 °C), ″ 60 % RH
Altitude	operating: below 9,842 ft (3,000 m) storage: below 49,212 ft (15,000 m)
Electromagnetic Compatibility	EMC Directive 2004/108/EC, EN61326:2006, EN61000-3-2:2006+A2:2009, EN61000-3-3:2008
Safety	Low voltage directive 2006/95/EC, EN61010-1:2001, EN61010-031:2002+A1:2008
General	
Display	3.5” TFT-LCD display, 320 x 240
Interfaces	USBTMC (standard), GPIB (optional), USB host port
Storage Memory	10 instrument settings, 10 arbitrary waveforms
Power	100 – 240 VAC ± 10%, 50 / 60 Hz ± 5% 100 – 120 VAC ± 10%, 45 – 440 Hz
Power Consumption	50 W max.
Dimensions (W x H x D)	8.4” x 3.5” x 11.1” (213 x 89 x 281 mm)
Weight	5.7 lbs (2.6 kg)
General	
Standard Accessories	Getting Started manual, full instruction manual on CD, AC power cord, USB type A-to-type B cable, certificate of calibration
Optional Accessories	USB-to-GPIB adapter