

AT-AWG-1104 performance specifications

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Unless otherwise noted the following conditions are used:

- Ambient temperature between 0°C and 50°C
- Warm up time > 20 minutes
- Humidity: 5% to 80% RH (non-condensating) at ≤ 30 (0°C to 40°C), 50% max RH (non-condensing) at 40degree C

Typical values cover the expected performance over ambient temperature ranges of 23°C \pm 5°C with a 95% confidence level and humidity < 50%.

Specifications	Limits	
	Arbitrary	DDS
Channel operating mode		
Number of Channels	4	
Waveforms	Sine, Cosine, Triangle, Rectangle, Sawtooth, Ramp, Pulse, Sinc, Exponential, Sweep, DC, Noise, From File, Arbitrary	
Sine Waves		
Frequency Range	2 μ Hz to 125 MHz	3.7 MHz to 110 MHz (@ Max sample rate)
Amplitude Flatness (1 Vp-p), typical		
DC to 125 MHz	< \pm 0.1 dB	
DC to 110 MHz		< \pm 0.1 dB
Harmonics Distortion (1 Vp-p), typical		
\leq 1 MHz	< -66dBc	< -66dBc
1 MHz to 5 MHz to	< -63dBc	< -63dBc
5 MHz to 10 MHz	< -59dBc	< -59dBc
10 MHz to 25 MHz	< -53dBc	< -53dBc
25 MHz to 75 MHz	< -38dBc	< -38dBc
75 MHz to 125 MHz	< -28dBc	
75 MHz to 110 MHz		< -31dBc
Non Harmonic Distortion (1 Vp-p, Frequency range DC to 200 MHz), typical		
\leq 1 MHz	< -71dBc	< -63dBc
1 MHz to 5 MHz to	< -71dBc	< -63dBc
5 MHz to 10 MHz	< -71dBc	< -63dBc
10 MHz to 25 MHz	< -66dBc	< -63dBc
25 MHz to 75 MHz	< -53dBc	< -61dBc
75 MHz to 125 MHz	< -47dBc	
75 MHz to 100 MHz		< -61dBc
100 MHz to 110MHz		< -30dBc
THD (100 KHz, 1 Vp-p), typical	< 0.15%	
Phase noise (20 MHz, 1 Vp-p), typical		
10 KHz offset	-130 dBc/Hz	
100 KHz offset	-132 dBc/Hz	
1 MHz offset	-133 dBc/Hz	
Analog Bandwith	125 MHz	110 MHz

Arbitrary Mode Specifications	
Square Wave, Pulse (1 V _{p-p})	
Frequency Range	2 µHz to 62.5 MHz
Duty Cycle Range	1% to 99%
Rise/Fall Time, typical	< 3.5 ns
Overshoot, typical	< 5.5%
Random jitter (rms), typical	< 20 ps
Triangle	
Frequency Range	2 µHz to 31.25 MHz
Start Phase Range	0 to 360°
Ramp	
Frequency Range	2 µHz to 31.25 MHz
Sinc (Sine(x)/x)	
Frequency Range	2 µHz to 15.5 MHz
Minimum Lobe Width	8 ns
Amplitude Modulation	
Modulation type	Arbitrary AM, ASK
Carrier waveform	All, From File, Arbitrary
Modulating waveforms	All, From File, Arbitrary
Modulating source	Internal
Modulating waveform sample clock (@ Max. sampling rate)	0.46 S/s to 125 MS/s
Memory size	2047 entries
Waveform sequencing	
Waveforms	All, From File, Arbitrary
Waveform repetitions	1 to (2 ³³ - 1)
Start source	Software, Internal, External
No. of waveforms	1 to 511
General	
Sample rate real time	4 S/s to 250 MS/s
Vertical res.	16 Bit
Waveform memory	2 MSamples / Ch.
Min. waveform length	8 points
Waveform resolution	2 points
Noise bandwidth (-3 dB gaussian noise), typical	100 MHz
Run Modes	Single, Continuous, Stepped, Burst
DDS Mode Specifications	
Phase/Frequency Modulation	
Modulation type	Arbitrary FM/PM, FSK, PSK
Carrier waveform	All, From File, Arbitrary
Modulating waveforms	All, From File, Arbitrary
Modulating source	Internal
Carrier frequency (@ Max. sample rate)	
Sine wave	3.7mHz to 110 MHz
Square	3.7mHz to 62.5 MHz
Triangle	3.7mHz to 31.25 MHz
Ramp	3.7mHz to 31.25 MHz
Modulating waveform sample clock (@ Max. sample rate)	From 119.2S/s to 125 MS/s (per sample programmable)
Memory size	511 entries
Frequency resolution	0.0019 Hz (FSK), 2.15E-5° (PSK) @ 125 MS/s sample rate 0.0037 Hz (FSK), 4.30E-5° (PSK) @ 250 MS/s sample rate
Frequency sweep	
Carrier waveform	All, From File, Arbitrary
Sweep type	All waveforms
Sweep direction	Up or Down

Sweep range (@ Max. sample rate)	
Sine wave	3.7mHz to 110 MHz
Square	3.7mHz to 62.5 MHz
Triangle	3.7mHz to 31.25 MHz
Ramp	3.7mHz to 31.25 MHz
Sweep time (@ Max. sample rate)	100ns to 4.2s
General	
Sample Rate Real Time	125 MS/s to 250 MS/s
Run Modes	Single, Continuous, Burst
Carrier Waveform Memory	2048 Samples / Ch.
Pulse Width Modulation	
Carrier waveform	Pulse
Carrier frequency	100 mHz to 20 MHz
Duty cycle modulating waveform	Sine, Triangle, Ramp, Noise, Manual
Duty cycle modulating frequency	10 μ Hz to 6.67 MHz
Source	Internal
Duty cycle deviation	0 % to 100 % of pulse period
Frequency accuracy	
Stability	< \pm 5 ppm
Aging	< \pm 2 ppm / year
Max Interpolated Sample Rate	1 GS/s (4x interpolation)
Interpolation Factors	1x, 2x, 4x
Sampling Frequency Resolution	15 digits limited by 1 nHz
Amplitude, 50 Ω Load (1 KHz)	0V to +12 Vpp
Amplitude, Open Circuit	0V to +24Vpp
Amplitude Resolution	< 1mV
DC Accuracy, Open circuit (\pm 12 V range)	\pm 0.25% of amplitude range (<i>within \pm10 $^{\circ}$C of calibration temperature $T=25^{\circ}$C, Humidity \leq 80%</i>) \pm 0.3% of amplitude range (0 to 50 $^{\circ}$ C)
DC Accuracy, 50 Ω Load (\pm 6 V range)	\pm 0.25% of amplitude range (<i>within \pm10 $^{\circ}$C of calibration temperature $T=25^{\circ}$C, Humidity \leq 80%</i>) \pm 0.3% of amplitude range (0 to 50 $^{\circ}$ C)
AC Accuracy, Open circuit (0 Vpp to +24 Vpp range, 1 KHz sine wave)	\pm 0.25% of amplitude range (<i>within \pm10 $^{\circ}$C of calibration temperature $T=25^{\circ}$C, Humidity \leq 80%</i>) \pm 0.3% of amplitude range (0 to 50 $^{\circ}$ C)
AC Accuracy, 50 Ω Load (0 Vpp to +12 Vpp range, 1 KHz sine wave)	\pm 0.25% of amplitude range (<i>within \pm10 $^{\circ}$C of calibration temperature $T=25^{\circ}$C, Humidity \leq 80%</i>) \pm 0.3% of amplitude range (0 to 50 $^{\circ}$ C)
Output Impedance	Selectable: 50 Ohm, Low or High Impedance
Short Circuit Protection	Signal outputs are robust against permanent shorts against floating ground
CH1, CH2, CH3, CH4	
Output connector	Front panel BNC
Voltage range (open circuit)	V _{Omin} = -12V V _{Omax} = +12V
Output impedance	50 Ohm, Low or High Impedance
I _o max (only 1 channel loaded)	\pm 200mA max
I _o max (1 or 2 channels loaded)	\pm 120mA max per channel
I _o max (all channels loaded)	\pm 60mA max per channel
External Clock	
Input connector	Front panel BNC
Frequency range	5 MHz to 125 MHz
Min. input voltage swing	Δ V _{INmin} > 2V
Damage level	V _{INmax} < 5V V _{INmin} > -5V
External Trigger Input	
Input connector	Front panel BNC
Frequency range	DC to 125Mhz

Threshold level	VILmax = 0.8V, VIHmin=2V			
Voltage range	-0.5V to 4V			
Damage level	VINmax < 6V VINmin > -2V			
Slope	Rising Edge or Falling			
Trigger IN to Output Delay	<400 ns			
Trigger IN to Output Jitter	±2ns			
External Trigger Output				
Output connector	Front panel BNC			
Output level	TTL compatible into > 1 KOhm			
Output impedance	50 Ohm nominal			
Digital I/O				
Connector	50 pin high density (1.27mm) SCSI connector			
Connector count	1			
Multi Channel Specifications				
Sampling rate tuning	Programmable per channel couple (Ch1-2)			
Skew between channels (all channels at the same sampling rate)				
Average, typical	< 300 ps			
Standard deviation, typical	< 35 ps			
Math	Sum, Difference, Multiply between the two channels (Ch1-2)			
Digital Pattern Generator Model	AWG1102	AWG1102D	AWG1104	AWG1104D
Number of Channels	N/A	18	N/A	18/36
Vector Memory Depth	N/A	1 Mpts/ch	N/A	1 Mpts/ch
Acquisition Memory Depth	N/A	2 Mpts/ch	N/A	2 Mpts/ch
Generation Sample Rate (S/s)	N/A	125 MS/s (direction programmable per channel)	N/A	125 MS/s (direction programmable per channel)
Acquisition Sample Rate (S/s)	N/A	250 MS/s	N/A	250 MS/s
Direction Control	N/A	Programmable per channel	N/A	Programmable per channel
Output Voltage Level	N/A	1.2V to 3.6V	N/A	1.2V to 3.6V
Trigger Levels	N/A	31	N/A	31
Mode	N/A	18 Digital Channels or 2 Analog Channels	N/A	36 Digital Channels or 4 Analog Channels 18 Digital Channels or 2 Analog Channels
General				
Power supply voltage range	100 +/- 10% to 240 +/- 10% VAC			
Power consumption	35 W max.			
Power Frequency range	50/60 Hz +/- 5%			
PC interface	USB 2.0			
External dimensions	335 x 175 x 43 mm			
Weight	1.8 Kg			

Front panel connectors	<ul style="list-style-type: none"> - CH1 BNC - CH2 BNC - Trigger Input BNC - Trigger Output BNC - External clock input BNC - Digital I/O Pod A, 50 pin high density (1.27mm)
Rear panel connectors	<ul style="list-style-type: none"> - DC power jack - USB
Minimum PC Requirements	
Operative system	Microsoft Windows 2000/XP SP2/ Vista / 7 / 10 – 32 & 64Bit Editions
Processor	Pentium III processor, or equivalent
Memory	512Mbytes RAM
Hard Disk	150Mbytes available free space
Display Resolution	800x600
Ports	USB 2.0 or 1.1