AWG474 – 4-GSPS 10-bit Dual-Channel Arbitrary Waveform Generator

PRODUCT DESCRIPTION

The **AWG474** modules generate dual channel arbitrary CW waveforms with sampling rates up to 4 GSPS. The on-board DRAMs provide up to 1G x 10-bit data memory to each channel. The deep memory provides long waveforms required for modern communications such as Orthogonal Frequency Division Multiplexing (OFDM). The high-speed clock input is single-ended 50-Ω terminated and accepts RF clock signals up to 4 GHz with a minimum power of +6 dBm. The RF outputs of the module are comprised of two pairs of differential analog outputs, *AP* and *AN*, and *BP* and *BN*, with 50-Ω back termination. The module accepts a high-speed trigger signal and generates synchronization outputs and three programmable marker signals. The waveform generation can be operated in continuous, gate or burst/pulse mode. The waveform contents can be dynamically changed using the user page selection. The module can be controlled by a PC-based GUI via a high-speed USB 2.0 interface. The companion API provides an interface for software development.

KEY FEATURES

- Two 10-bit DACs
- In-phase or quadrature-phase synchronization of outputs, which can be independently set
- Standard: sampling rate of 4 GSPS with 4 GHz external clock
- Optional: 2 ~ 4 GSPS with 2 ~ 4 GHz external clock
- 2 x 1G x 10-bit memory depth with multi-page configuration
- Up to 2.5 ms waveform at 4 GHz clock rate
- Accepts external trigger and generates marker signal (programmable)
- Programmable cyclic and burst repetitions
- USB 2.0 compliant interface
- 1-lane PCIe PIO interface for alternative data download
- 12V power supply
- User-friendly input data formats and various built-in waveforms
- Companion API and software drivers for easy system development
- Compatible with Matlab (2010a or later) and LabView
- Multi-AWG synchronization
- Aluminum anodized enclosure: 8.25 x 3.5 x 10.7 (W x H x D) inches

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Min	Typical	Max	Unit
Operating Temperature	T_o		25		^oC
Sampling Rate	f_{data}	2	4	4	GSPS
Clock Frequency	f_{CK}	2	4	4	GHz
Clock Input Power	P_{CK}	+6	+9	+12	dBm
Output Level [1] (Default Gain adjust)	V_{out}	-635		0	mV
Output Level, Applying Gain adjust AVCA or AVCB (controlled by software)	V_{out}	-400 to -760		0	mV
Output Power [1](Default Gain adjust)	P_{out}	-4		0	dBm
Output Residue Phase Noise [2]	N_f			-130	dBc/Hz
Output Port Return Loss [4]	RL_{RF}		15		dB
Power Supply [5]	$+12V$		+12		V
	I_{+12}		2.5		A

[1]per port, with 50-ohm load.
If external 50 ohm loads are terminated to ground, the analog outputs will have voltage swings from ground to – 0.6 V with a common mode voltage of –0.3 V. If a positive analog output common mode level is desired, the external 50 ohm loads can be terminated to a positive voltage Vpull with a resultant analog output common mode voltage of (Vpull – 0.6)/2. Vpull should not exceed 5 V.
[2]10 KHz offset
[3]DC-4 GHz
[4]up to Nyquist Frequency
[5]Typically 1.9A at 4 GHz. Current consumption of the power supply varies with clock frequency.

TERMINAL DESCRIPTION

Name	Function	I/O	Signal
GND	Ground		DC
+12V	Power, +12 V		DC
AP	Waveform Output Channel A Positive	O	RF
AN	Waveform Output Channel A Negative	O	RF
BP	Waveform Output Channel B Positive	O	RF
BN	Waveform Output Channel B Negative	O	RF
CK	Input Clock Source	I	RF
TRIG	Trigger	I	
SYNCI	Not Used	N/A	
SYNCO	Divide-by-32 Clock Output	O	
MARKER	Marker #1	O	
MARKER2	Marker #2	O	
MARKER3	Not Used	N/A	

DETAILED SPECIFICATIONS

General	
Output Amplitude Resolution	10 bits per channel
Running Modes	Continuous Gate Triggered Continuous Triggered Burst
User Interface	Windows Graphical User Interface, USB, PCIe x1
Input Clock	
Type	Single-ended, 50-Ω terminated
Connector Type	SMA
Frequency Range	Standard: 4 GHz external clock Optional: 2 GHz ~ 4 GHz external clock
Power Level	+6 dBm to +12 dBm (+9 dBm typical)
Analog Output	
Type	Dual Channel Differential, 50-Ω terminated
Synchronization	In-phase, Quadrature or Arbitrary phase 16-bit Amplitude adjustment
Connector Type	SMA
Data Rate Range	Standard: 4 GSPS per channel Optional: 2 ~ 4 GSPS per channel
Output Level	-635 mV to 0 V
Output Power	-4 dBm to 0 dBm
Output Phase Noise	Max. –130 dBc/Hz at 10 KHz
Output Return Loss	15 dB

DETAILED SPECIFICATIONS, (CONTINUED)

Waveform	
Max Waveform Length, per channel	1,073,725,440 samples
Minimum Waveform Length	64 samples
Waveform Length Incremental Step	32 samples
Built-In Waveforms	Sine
	Sine A/B
	Ramp
	Pulse
	2 tones
	Multiple tones
	Phase coherent linear chirping
	Phase continuous linear chirping
User-Defined Waveform	User Defined Amplitude, markers, reset
Trigger	
Connector	SMA
Source	External or Software
Recommended External Trigger	LVCMOS 2.5V
Marker	
Number of Markers	2
Marker Length	User defined
Minimum Marker Length	32 samples
Marker #1 Level	LVCMOS 2.5V
Marker #2 Level	LVCMOS 2.5V
API	
CLR (Common Language Runtime) support languages targeting the runtime, such as C++/CLI, C#, Visual Basic, Jscript, and J#	
Compatible with Matlab 2010a or later	
Compatible with LabView	

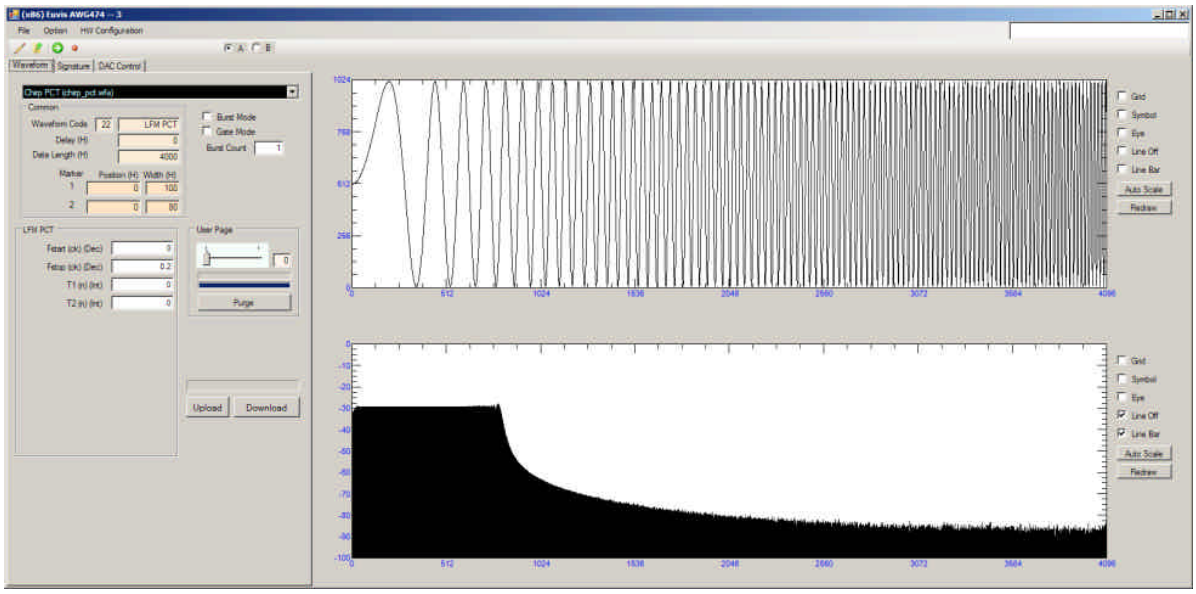
DETAILED SPECIFICATIONS, (CONTINUED)

GUI
Available for Windows XP, Windows Vista and Windows 7
Options
Programmable profiles
Variable clock frequency range for external clock (2 ~ 4 GHz)
Internal 4 GHz clock with pre-selected reference clock frequency (10 ~ 100 MHz)

SWITCHING CHARACTERISTICS

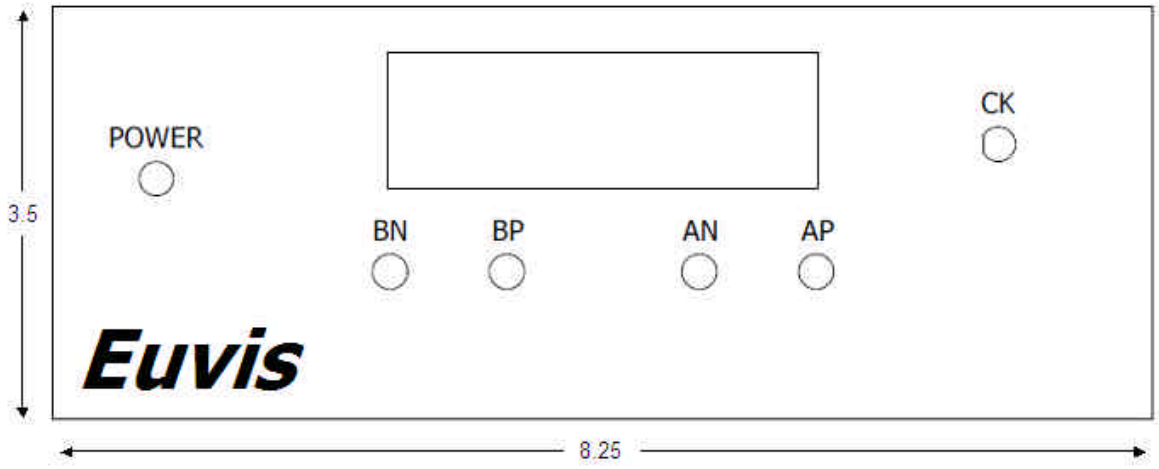
PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
TRIG: LVCMOS 2.5V Logic (Input)					
V_{IH}	Input Voltage High	1.7		2.5	V
V_{IL}	Input Voltage Low	0		0.7	V
I	Input driving current		4		mA
t_a	Active time	64			ns
t_s	Settling time			16	ns
MARKER1, MARKER2, SYNCO: LVCMOS 2.5V Logic (Output)					
V_{OH}	Output Voltage High	2.1		2.5	V
V_{OL}	Output Voltage Low	0		0.4	V
t_s	Settling time			1	ns

GRAPHICAL USER INTERFACE:

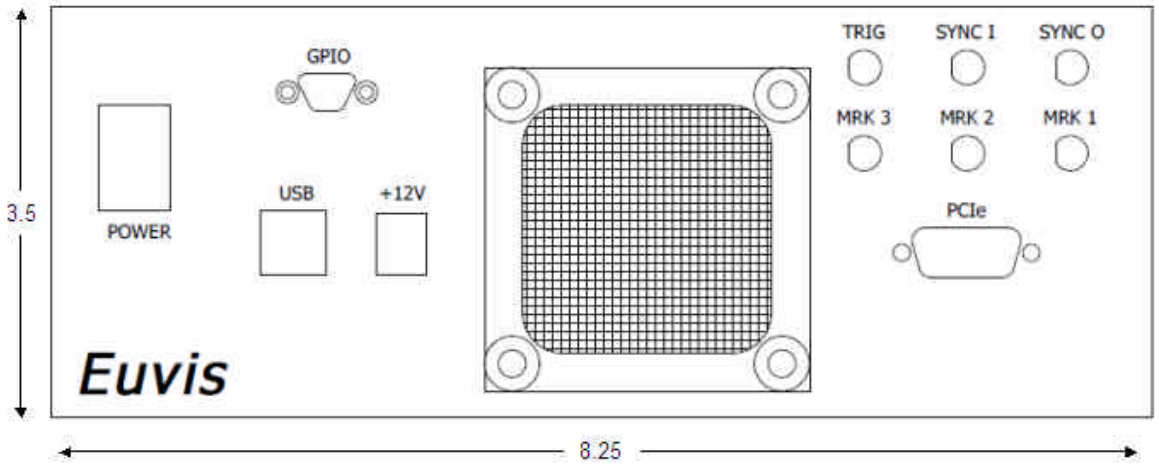


ENCLOSURE DIAGRAM:

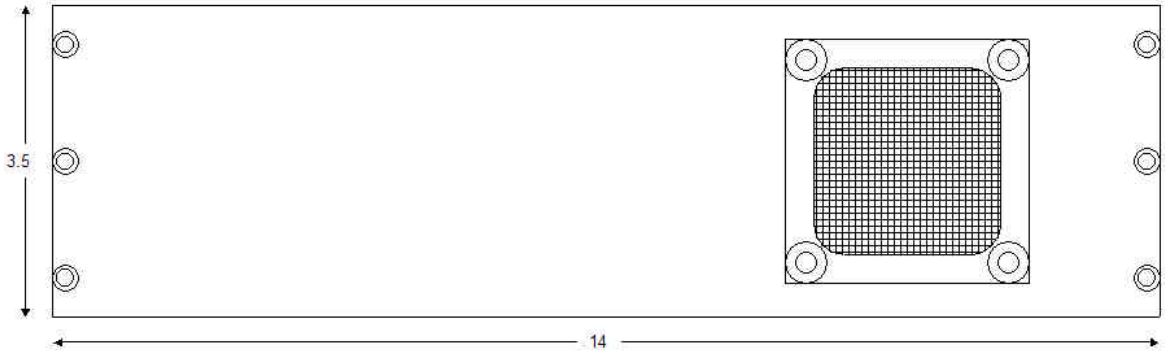
FRONT PANEL



BACK PANEL



SIDE PANEL



DIMENSIONS

Length	10.7 inches
Width	8.25 inches
Height	3.5 inches
Weight	11 lb

I/O LOCATIONS (ORIGIN IS LOWER LEFT CORNER, UNITS ARE MIL)

Front Panel	
AP	5550, 1075
AN	4700, 1075
BP	3300, 1075
BN	2450, 1075
CK	6875, 2000
Back Panel	
TRIG	5900, 2480
SYNCIN	6650, 2480
SYNCOUT	7400, 2480
MARKER1	7400, 1730
MARKER2	6650, 1730
MARKER3	5900, 1730
+12V Power Plug	2545, 1268
USB type “B” Receptacle	1755, 1278

Ordering Information:

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