

T3AFG40/T3AFG80/T3AFG120 Data Sheet

Function/Arbitrary Waveform Generators

Debug with Confidence

40 MHz - 120 MHz

Teledyne Test Tools T3AFG40 / T3AFG80 / T3AFG120 range of function/arbitrary generators are a series of dual-channel waveform generators with specifications of up to 120 MHz maximum bandwidth, 1.2 GSa/s maximum sampling rate and 16-bit vertical resolution. The proprietary Arbitrary & Pulse techniques used in the T3AFG40 / T3AFG80 / T3AFG120 models helps to solve the weaknesses inherent in traditional DDS generators when generating arbitrary, square and pulse waveforms. With the above advantages the T3AFG40 / T3AFG80 / T3AFG120 generators can provide users with a variety of high fidelity and low jitter signals, which can meet the growing requirements of a wide range of complex applications.



Tools for Improved Debugging

• Deep Memory – 8 Mpts/Ch.	Generate complex arbitrary waveforms.
 Wide Range of Modulation Types — AM, DSB-AM, FM, PM, FSK, ASK, PWM, Sweep, Burst, and PSK. 	Quickly set up modulated waveforms.
• High Resolution – 16 bit resolution.	Generate waveforms with low noise, low spurious signal content and high dynamic range.
Bandwidth Models up to 120 MHz.	Wide choice of bandwidths.
Built In Arbitrary Waveforms.	Load and replay built in Arbitrary Waveforms.
User Defined Waveforms.	◆ Store and recall user defined waveforms.
Lower cost 5 MHz and 10 MHz single channel models are also available.	Enquire about the T3AFG5 and T3AFG10.

Key Specifications

Bandwidth	40 MHz, 80 MHz, 120 MHz
Channels	2 Independent Channels
Memory	8 Mpts/Ch
Sample Rate	1.2 GS/s
Display	4.3 inch Touch Screen TFT LCD
Connectivity	USB Host, USB Device, LAN

PRODUCT OVERVIEW

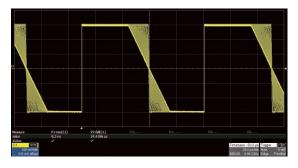
Ordering Information

Model	Bandwidth	Channel	Memory per Ch	Sample Rate per Ch
T3AFG40	40 MHz	2	8 Mpts	1.2 GS/s
T3AFG80	80 MHz	2	8 Mpts	1.2 GS/s
T3AFG120	120 MHz	2	8 Mpts	1.2 GS/s

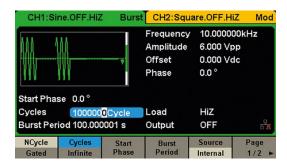
Function	T3AFG40, T3AFG80, T3AFG120
Built-in Waveforms	5 Standard, 196 Arbitrary
Input/Output	2 Waveform Outputs, Counter Input, Aux In/Out, 10 MHz Clock In/Out
Modulation Functions	AM, DSB-AM, FM, PM, FSK, ASK, PSK, PWM, Sweep, Burst, Harmonic
TrueArb and EasyPulse	Yes
Maximum Amplitude Output	< 20 MHz: 10 Vpp at 50 Ohms, 20 Vpp at HiZ > 20 MHz: 5 Vpp at 50 Ohms, 10 Vpp at HiZ
Vertical D/A Resolution	16 Bits
Display Size	4.3" Touch Screen

Excellent Performance

- Bandwidths from 40 MHz to 120 MHz
- All Models have 2 Channels
- 8 Mpts/Channel memory



The rise/fall times can be set independently to a minimum of 8.4 ns at any frequency and to a maximum of 22.4s.



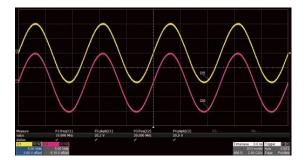
Burst mode supports 'N Cycle' and 'Gated' modes with the Burst source being configured as 'Internal', 'External' or 'Manual'.

Great Connectivity

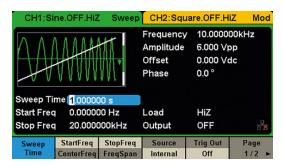
- USB host port for mass storage
- USB device port (USBTMC)
- LAN port on 2 channel models



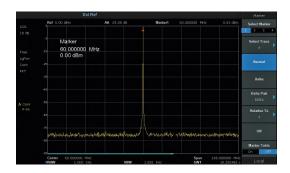
The T3AFG range of Function/Arbitrary Waveform Generators support a wide range of modulation types including AM, FM, PM, FSK, ASK, PSK and DSB-AM.



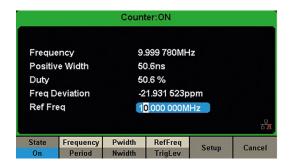
Output amplitude into a high impedance load can be as high 20 Vpp at frequencies up to 20 MHz, and 10 Vpp for frequencies greater than 20 MHz.



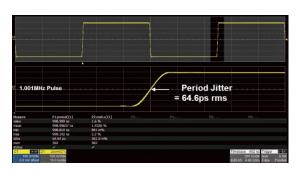
Sweep mode supports 'Linear' and 'Log' sweep, with 'Up' and 'Down' direction, and Sweep source can be configured as 'Internal', 'External' or 'Manual'.

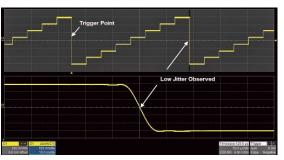


Sine wave output exhibits almost no spurious artefacts at 60 MHz and 0 dBm.



The counter functionality, accessed via the rear panel BNC, gives a DC or AC coupled counter capability from 100 mHz to 200 MHz.





The Teledyne Test Tools T3AFG40 / T3AFG80 and T3AFG120, with its low jitter design, can generate waveforms with exceptional edge stability. With better jitter performance comes better edge stability, and higher confidence in your circuit design.

Smart Capabilities

- Sweep output carrier can be Sine, Square, Triangle and Arbitrary waveforms
- Burst output under internal or external signal control
- Waveforms types include DC
- Frequency Resolution 1 μHz
- DSB-AM: Double Sideband AM modulation Function
- Harmonic Function on 2 channel models
- Multi-Language User Interface



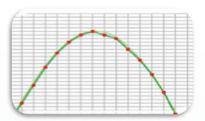
PRODUCT OVERVIEW

14 Bit Resolution



Quantization Level

16 Bit Resolution



14 Bit Resolution

Less accurate waveform generation

16 Bit Resolution

- T3AFG40 / T3AFG80 / T3AFG120 are all 16 bit resolution
- 4 x higher resolution than 14 bit systems
- Lower levels of Harmonic Distortion
- Lower levels of non-harmonic spurious signals
- Improved dynamic range
- Enhanced signal fidelity



I/O Connectivity

- LAN and USB connection
- 10 MHz Reference Input/Output
- Aux Input/Output
- External modulation input
- External burst/sweep trigger input
- External gate input
- The Aux Input/Output will output a trigger pulse when an internal source is used
- External Counter input

SPECIFICATIONS

Frequency Specification

Model	T3AFG40	T3AFG80	T3AFG120
Waveform	Sine, Square, Ramp, Pulse, N		
Sine	1 μHz ~ 40 MHz	1 μHz ~ 80 MHz	1 μHz ~ 120 MHz
Square	1 μHz ~ 25 MHz	, p. 12	· · · · · · · · · · · · · · · · · ·
Pulse	1 μHz ~ 25 MHz		
Ramp/Triangular	1 μHz ~ 1 MHz		
Gaussian white noise	> 40 MHz (-3 dB)	> 80 MHz (-3 dB)	120 MHz (-3 dB)
Arbitrary	1 µHz ~ 20 MHz		
Resolution	1 μHz		
Accuracy	10-year aging +/- 3.5 ppm a	t 25 Degrees C	
Sine Wave			
Harmonic Distortion	DC ~ 10 MHz <- 65 c	JBc	
	10 MHz ~ 20 MHz <- 60 d		
	20 MHz ~ 40 MHz <- 55 c		
	40 MHz ~ 60 MHz <- 50 c		
	60 MHz ~ 80 MHz <- 45 (
	80 MHz ~ 100MHz <- 40 c 100 MHz ~ 120 MHz <- 38 c		
Total harmonic distortion.	0.075 %, 0 dBm, 10 Hz ~ 20		
Spurious signal (non-harmonic)	DC < 50 MHz <- 70 dBc	···-	
	> 50 MHz <- 65 dBc		
Square Wave			
Rise/fall time	9 ns (10 % ~ 90 %)		
Overshoot	3 % (typical, 100 kHz, 1 Vpp,	50 Ohm Load)	
Duty Cycle	0.001 % ~ 99.999 % Limited	<u> </u>	
Jitter	150 ps, 1 Vpp, 50 Ohm Load		
Pulse			
Pulse width	16.3 ns, Min. Accuracy +/- (0	0.01% + 0.3 ns)	
Rise/Fall time (10 % ~ 90 %,typical)	8.4 ns ~ 22.4 s		
Duty Cycle	0.001 % ~ 99.999 %, 0.001 %	Resolution, Limited by Pulse V	Vidth
Overshoot	3 % (typical, 100 kHz, 1 Vpp,	50 Ohm Load)	
Jitter(pk-pk)	150 ps, 1 Vpp, 50 Ohm Load		
Ramp/Triangle Wave			
Linearity	<= 1% of Vpp (typical, 1 kHz,	1 Vpp, 100 % symmetric)	
Symmetry	0%~100%	, ,	
Harmonic Output			
Order	10 Maximum		
Type	Even, Odd, All		
Arbitrary Wave			
Waveform length	8 M points		
Vertical resolution	16 bits		
Sample rate	75 MSa/s Arb Mode, 300 MS	Sa/s DDS Mode	
Min. Rise/Fall time	8 ns (typical)	., 0 00	
Jitter(pk-pk)	150 ps, 1 Vpp, 50 Ohm Load	, TrueArb Mode	
Storage in non-volatile	10 waveforms	,	
RAM memory (10 in total)			
Noise Characteristics			
-3 dB bandwidth	Bandwidth of the waveform	generator	

SPECIFICATIONS

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DC	Ch	ara	cte	ric	tice

Range

nange	-TO VOLTO VITIZ EORU
	-5 V to +5 V 50 Ohm Load
Accuracy	+/- (1 % + 2 mV) HiZ Load
Harmonic Output Characte	eristics
Order	10
Туре	All, Even, Odd
Output Characteristics	
Range	2 mV − 20 Vpp ≤ 20 MHz HiZ load, 2 mV − 10 Vpp >20 MHz HiZ load. Values are halved into 50 Ω load
Accuracy	+/- (1% + 1 mVpp) 10 kHz sine wave, 0 V offset
Amplitude Flatness	+/- 0.3 dB, 0 – 100 MHz, 50 Ω load, 2.5 Vpp (reference 10 kHz Sine wave) +/- 0.4 dB, 100 MHz – 120 MHz 50 Ω load, 2.5 Vpp (reference 10 kHz Sine wave)
Output impedance	50 Ω +/- 0.5 Ω at 10 kHz sine wave.
Output current	+/- 200 mA
Channel to channel Crosstalk	-60 dBc
Modulation Characteristic	es – AM
Carrier	Sine, Square, Ramp, Arb
Modulation Source	Internal/External
Modulation Wave	Sine, Square, Ramp, Noise, Arb
Modulation Depth	0 – 120 %
Modulation Frequency	1 mHz – 1 MHz, Modulation source "internal"
Modulation Characteristic	es – FM
Carrier	Sine, Square, Ramp, Arb
Modulation Source	Internal/External
Modulation Wave	Sine, Square, Ramp, Noise, Arb
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-10 V to +10 V HiZ Load

Modulation Characteristics - PM

Modulation Depth

Modulation Frequency

Carrier	Sine, Square, Ramp, Arb
Modulation Source	Internal/External
Modulating Waveform	Sine, Square, Ramp, Arb, Noise
Phase Deviation	0 Deg - 360 Deg
Modulation Frequency	1 mHz to 1 MHz with 'internal' modulation source

1 mHz – 1 MHz, Modulation source "internal"

0 - 0.5 * BW BW is the max output frequency limited by the frequency settings

Modulation Characteristics - ASK

Carrier	Sine, Square, Ramp, Arb
Modulation Source	Internal/External
Modulating Waveform	Square with 50 % duty cycle
Keying Frequency	1 mHz to 1 MHz Limited by frequency setting with 'internal' modulation source

Modulation Characteristics - FSK

Carrier	Sine, Square, Ramp, Arb
Modulation Source	Internal/External
Modulating Waveform	Square with 50 % duty cycle
Modulation Frequency	1 mHz to 1 MHz with 'internal' modulation source

Modulation Characteristics - PSK

Carrier	Sine, Square, Ramp, Arb
Modulation Source	Internal/External
Modulating Waveform	Square with 50 % duty cycle
Modulation Frequency	1 mHz to 1 MHz with 'internal' modulation source

Modu	lation	Characteristics -	DWM
wou	17111011	Guaracteristics =	PVVIVI

Carrier	Pulse
Modulation Source	Internal/External
Modulating Waveform	Sine, Square, Ramp, Noise, Arb
Modulation Frequency	1 mHz to 1 MHz with 'internal' modulation source
Pulse Width Deviation Resolution	Minimum 6.67 ns

Burst Characteristics

Carrier	Sine, Square, Ramp, Noise, Pulse, Arb
Type	Count (1–1 M cycles), Infinite, Gated
Carrier Frequency	2 mHz – Maximum output frequency
Stop/Start phase	O Deg to 360 Deg
Internal Period	1 μs – 1000 seconds
Trigger Source	Internal, External, Manual
Gated Source	Internal, External
Trigger Delay	Maximum of 100 seconds

Sweep Characteristics

Carrier	Sine, Square, Ramp, Arb
Type	Linear, Log
Direction	Up, Down
Carrier Frequency	1 µHz – Maximum output frequency
Sweep Time	1 ms – 500 seconds
Trigger Source	Internal, External, Manual

Frequency Counter Characteristics

Function	Frequency, Period, Positive / Negative Pulse Width, Duty Cycle
Coupling	DC, AC, HF REJ
Frequency Range	DC: 100 mHz - 200 MHz, AC: 10 Hz - 200 MHz
DC Input Amplitude	100 mV rms - +/- 2.5 V < 100 MHz 200 mV rms - +/- 2.5 V 100 MHz - 200 MHz
AC Input Amplitude	100 mV rms - 5Vp-p < 100 MHz 200 mV rms - 5Vp-p 100 MHz - 200 MHz
Input Impedance	1 M Ohm

Reference Clock Input

Frequency	10 MHz
Amplitude	Minimum 1.4 Vp-p
Input Impedance	5 kOhm AC coupled

Reference Clock Output

Frequency	10 MHz Synchronised to the internal reference clock
Amplitude	Minimum 2 Vp-p into high impedance load
Output Impedance	50 Ohms

External Trigger Input

V in Low	-0.5 V to +0.8 V
V in High	2 V to 5.5 V
Direction	Up, Down
Input Impedance	100 kOhms
Minimum Pulse Width	100 ns
Maximum Response Time	100 ns - Sweep, 600 ns - Burst

Trigger Output

V out Low	Maximum 0.44 V at 8 mA
V out High	Mimimum 3.8 V at -8 mA
Output Impedance	100 Ohms
Maximum Frequency	1 MHz

SPECIFICATIONS

Sync Output

V out Low	Maximum 0.44 V at 8 mA
V out High	Mimimum 3.8 V at -8 mA
Output Impedance	100 Ohms
Maximum Frequency	10 MHz
Pulse Width	50 ns

Modulation Input

Frequency	0 Hz to 50 kHz
Input Impedance	10 kOhm
Amplitude at 100 %	Min 11 Vp-p, Typ 12 Vp-p, Max 13 Vp-p
Modulation Depth	

General Characteristics

Power	
Voltage	100 V to 240 V (+/-10 %) at 50 Hz / 60Hz 100 V to 120 V (+/-10 %) at 400 Hz
Power Consumption	Typical 25.5 W, Maximum 50 W
Display	
Color Depth	24 bit
Contrast Ratio	350:1
Luminance	300 cd/m ²
Touch panel type	Resistive
Environment	
Operating Temperature	0 Deg C to 40 Deg C
Storage Temperature	-20 Deg C to 60 Deg C
Operating Humidity	5 % to 90 % < 30 Deg C 5 % to 50 % > 30 Deg C
Non-Operating Humidity	5 % to 95 %
Maximum Operating Altitude	3048 m < 30 Deg C
Maximum Non-Operating Altitude	15000m
Calibration	
Calibration Interval	Annually
Mechanical	
Dimensions	W x D x H = 260.3 mm x 107.2 mm x 295.7 mm
Net Weight	3.43 kg
Gross Weight	4.42 kg
Compliance	
LVD	IEC 61010-2:2010
EMC	EN61326-1:2013

Ordering information

Models	T3AFG40 40 MHz
	T3AFG80 80 MHz
	T3AFG120 120 MHz
Standard Accessories	Quick Start Guide
	USB Cable
	BNC Cable
	Calibration Certificate
	Power Cord

ABOUT TELEDYNE TEST TOOLS



Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand extends the Teledyne LeCroy product portfolio with a comprehensive range of test equipment solutions. This new range of products delivers a broad range of quality test solutions that enable engineers to rapidly validate product and design and reduce time-to-market. Designers, engineers and educators rely on Teledyne Test Tools solutions to meet their most challenging needs for testing, education and electronics validation.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy has sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

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