

T3AFG30 / T3AFG60 Data Sheet

Function/Arbitrary Waveform Generators

Debug with Confidence

30 MHz – 60 MHz

Teledyne Test Tools T3AFG30 and T3AFG60 range of function/arbitrary generators are a series of dual-channel waveform generators with specifications of up to 60 MHz maximum bandwidth, 150 MSa/s maximum sampling rate and 14-bit vertical resolution.

The proprietary Arbitrary & Pulse techniques used in the T3AFG30 / T3AFG60 models helps to solve the weaknesses inherent in traditional DDS generators when generating arbitrary, square and pulse waveforms. With the above advantages the T3AFG30 and T3AFG60 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 – 16 kpts/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 – 14 bit resolution. | ✓ Generate waveforms with low noise, low spurious signal content and high dynamic range. |
| ••Bandwidth Models of 30 MHz and 60 MHz. | ✓ Wide choice of bandwidths. Other models available up to 500 MHz. |
| ••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 | 30 MHz, 60 MHz |
| Channels | 2 Independent Channels |
| Memory | 16 kpts/Ch |
| Sample Rate | 150 MS/s |
| Display | 4.3 inch TFT LCD Display |
| Connectivity | USB Host, USB Device, LAN |

PRODUCT OVERVIEW

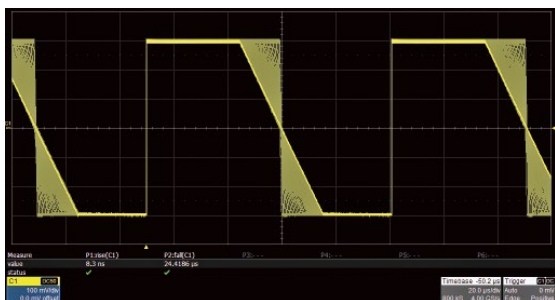
Ordering Information

| Model | Bandwidth | Channel | Memory per Ch | Sample Rate per Ch |
|---------|-----------|---------|---------------|--------------------|
| T3AFG30 | 30 MHz | 2 | 16 kpts | 150 MS/s |
| T3AFG60 | 60 MHz | 2 | 16 kpts | 150 MS/s |

| | |
|--------------------------|---|
| Function | T3AFG30, T3AFG60 |
| 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 | ≤ 10 MHz: 10 Vpp at 50 Ohms, 20 Vpp at HiZ > 10 MHz: 5 Vpp at 50 Ohms, 10 Vpp at HiZ |
| Vertical D/A Resolution | 14 Bits |
| Display Size | 4.3" Color TFT |

Excellent Performance

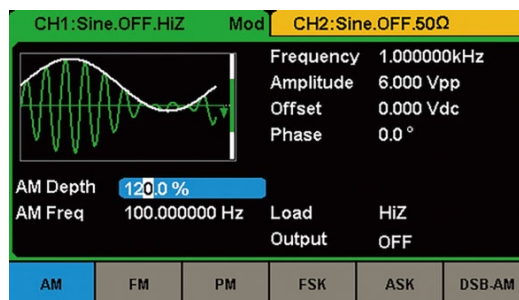
- Model bandwidths from 30 MHz to 60 MHz
- All Models have 2 Channels
- 16 kpts/Channel memory



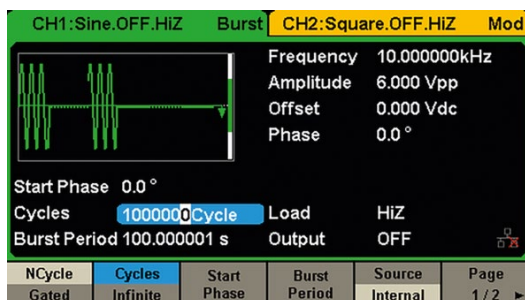
The rise/fall times can be set independently to a minimum of 16.8 ns at any frequency and to a maximum of 22.4s.

Great Connectivity

- USB host port for mass storage
- USB device port (USBTMC)
- LAN port



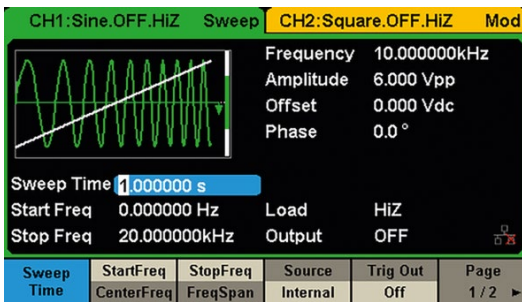
The T3AFG range of Function/Arbitrary Waveform Generators support a wide range of modulation types including AM, FM, PM, FSK, ASK, PSK and DSB-AM.



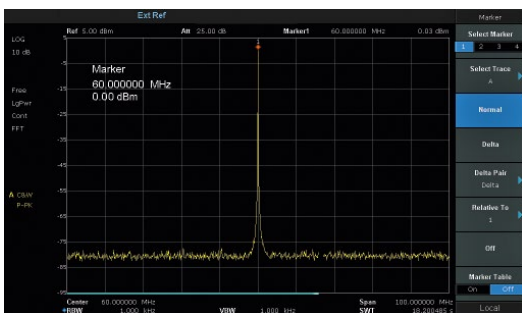
Burst mode supports 'N Cycle' and 'Gated' modes with the Burst source being configured as 'Internal', 'External' or 'Manual'.



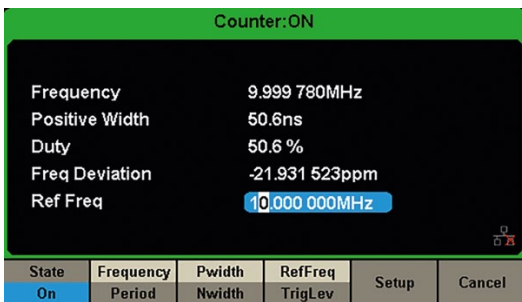
Output amplitude into a high impedance load can be as high 20 Vpp at frequencies up to 10 MHz, and 10 Vpp for frequencies greater than 20 MHz.



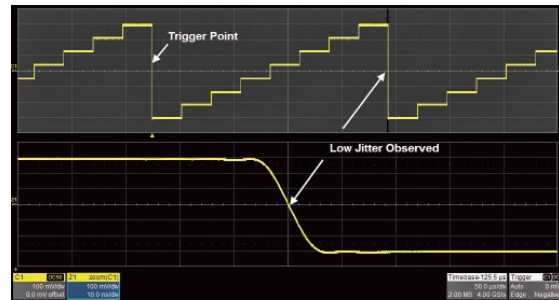
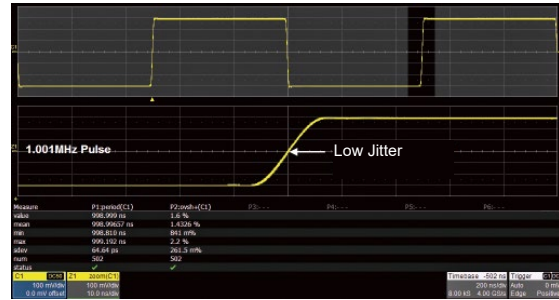
Sweep mode supports 'Linear' and 'Log' sweep, with 'Up' and 'Down' direction, and Sweep source can be configured as 'Internal', 'External' or 'Manual'.



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 T3AFG30 and T3AFG60, 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, Ramp and Arbitrary waveforms
- Burst output under internal or external signal control
- Waveforms types include DC
- Frequency Resolution 1 μ Hz
- DSB-AM: Double Sideband AM modulation Function
- Harmonic Function generating up to 16 harmonics
- Multi-Language User Interface

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 | T3AFG30 | T3AFG60 |
|-----------------|---|---------------------|
| Waveform | Sine, Square, Ramp, Pulse, Noise, Arbitrary | |
| Sine | 1 μ Hz - 30 MHz | 1 μ Hz - 60 MHz |
| Square | 1 μ Hz - 30 MHz | 1 μ Hz - 60 MHz |
| Pulse | 1 μ Hz - 12.5 MHz | |
| Ramp/Triangular | 1 μ Hz - 500 kHz | |
| Noise | 60 MHz (-3 dB) | |
| Arbitrary | 1 μ Hz - 6 MHz | |
| Resolution | 1 μ Hz | |
| Accuracy | 1 st year aging +/- 25 ppm at 0 - 40 Degrees C | |

Sine Wave

| | |
|--------------------------------|---|
| Harmonic Distortion | DC - 10 MHz <- 60 dBc 10 MHz - 30 MHz <- 50 dBc 30 MHz - 60 MHz <- 40 dBc |
| Total harmonic distortion. | 0.075 %, 0 dBm, 10 Hz - 20 kHz |
| Spurious signal (non-harmonic) | DC < 10 MHz <- 65 dBc 10 MHz - 30 MHz <- 55 dBc 30 MHz - 60 MHz <- 40 dBc |

Square Wave

| | |
|----------------|--|
| Rise/fall time | 4.2 ns, 10 % - 90 %, 50 Ohm load at 1 Vpp, 3.8 ns, 10 % - 90 %, 50 Ohm load at 2.5 Vpp |
| Overshoot | 3 % (typical, 100 kHz, 1 Vpp, 50 Ohm Load) |
| Duty Cycle | 0.001 % - 99.999 % Limited By Frequency |
| Jitter | 300 ps + 0.05 ppm of period, 1 Vpp, 50 Ohm Load |

Pulse

| | |
|---------------------------------------|--|
| Pulse width | 32.6 ns, Min. Accuracy +/- (0.01% + 1 ns) |
| Rise/Fall time (10 % - 90 %, typical) | 16.8 ns - 22.4 ns |
| Duty Cycle | 0.001 % - 99.999 %, 0.001 % Resolution, Limited by Pulse Width |
| Overshoot | 3 % (typical, 100 kHz, 1 Vpp, 50 Ohm Load) |
| Jitter(pk-pk) | 300 ps + 0.05 ppm of period, 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 | 16 k points |
| Vertical resolution | 14 bits |
| Sample rate | 30 MSa/s Arb Mode, 150 MSa/s DDS Mode |
| Min. Rise/Fall time | 8 ns (typical) |
| Jitter(pk-pk) | 300 ps, TrueArb Mode, 67 ns DDS mode, pk-pk |
| Number of built in Arb waveforms | 196 waveforms |

Noise Characteristics

| | |
|-----------------|--------|
| -3 dB bandwidth | 60 MHz |
|-----------------|--------|

SPECIFICATIONS

DC Characteristics

| | |
|----------|---|
| Range | -10 V to +10 V HiZ Load -5 V to +5 V 50 Ohm Load |
| Accuracy | +/- (1% + 3 mV) HiZ Load |

Harmonic Output Characteristics

| | |
|-------|----------------|
| Order | 16 |
| Type | All, Even, Odd |

Output Characteristics

| | |
|------------------------------|---|
| Range | 2 mV – 20 Vpp \leq 10 MHz HiZ load, 2 mV – 10 Vpp $>$ 10 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, 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, 0 dBm, sine wave, 50 Ω load |

Modulation Characteristics – 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 – 20 kHz, Modulation source “internal” |

Modulation Characteristics – FM

| | |
|----------------------|--|
| Carrier | Sine, Square, Ramp, Arb |
| Modulation Source | Internal/External |
| Modulation Wave | Sine, Square, Ramp, Noise, Arb |
| Modulation Depth | 0 – 0.5 * BW, BW is the max output frequency limited by the frequency settings |
| Modulation Frequency | 1 mHz – 20 kHz, Modulation source “internal” |

Modulation Characteristics – PM

| | |
|----------------------|---|
| 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 20 kHz with ‘internal’ modulation source |

Modulation Characteristics – ASK

| | |
|---------------------|--|
| Carrier | Sine, Square, Ramp, Arb |
| Modulation Source | Internal / External |
| Modulating Waveform | Square with 50 % duty cycle |
| Keying Frequency | 1 mHz to 50 kHz 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 50 kHz 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 50 kHz with ‘internal’ modulation source |

Modulation Characteristics – PWM

| | |
|----------------------------------|--|
| 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 | 0 Deg to 360 Deg |
| Internal Period | 1 μ s – 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 μ Hz – 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 | Minimum 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 | Minimum 3.8 V at -8 mA |
| Output Impedance | 100 Ohms |
| Maximum Frequency | 10 MHz |
| Pulse Width | 500 ns |

Modulation Input

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

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 21 W, Maximum 50 W |
| Display | |
| Color Depth | 24 bit |
| Contrast Ratio | 350:1 |
| Luminance | 300 cd/m ² |
| 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 | 4.35 kg |
| Compliance | |
| LVD | IEC61010-2:2010 |
| EMC | EN61326-1:2013 |

Ordering information

| | |
|----------------------|-------------------------|
| Models | T3AFG30 30 MHz |
| | T3AFG60 60 MHz |
| | |
| Standard Accessories | Quick Start Guide |
| | USB 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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