TELEDYNE TEST TOOLS
Everywhereyoulook™

# T3AWG6K Series Data Sheet

## Arbitrary Waveform Generator
## 2, 4 and 8 Channel Configuration


### Sample Rate up to 12.32 GS/s in RF mode

| | |
|---|---|
| • 16 Bit Vertical Resolution | ✓ Exceptional signal fidelity for developing quality products with a reduced design cycle. |
| • up to 5 $V_{pp}$ Output Voltage and ±2.5 V HW Baseline Offset for a total output voltage window ±5 V or 10 V (50 Ohm) | ✓ Unmatched wide output voltage window enables generating challenging in amplitude large-signal waveforms. |
| • 4 GPts Waveform Memory per Channel | ✓ Unmatched deep memory depth allows to store and reproduce complex pseudo-random waveforms for long play time testing. |
| • Up to 32 Digital Channel in synchronous with Analog Generation | ✓ Mixed Signal Generation for debugging and validating analog and digital design. |
| • Multifunctional solution instrument (AFG/AWG/DPG) | ✓ Arbitrary Function Generator, Arbitrary Waveform Generation and Digital Pattern Generation functionalities into one instrument. |

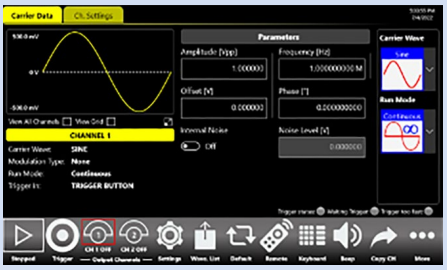
Standard warranty is one year.

### Key Specifications

| Model | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| Number of Analog Channels | 2 | 4 | 8 |
| Vertical Resolution | 16 bits | | |
| Output Voltage | up to 5 $V_{pp}$ and ± 2.5 V Baseline Hardware offset (50 Ohm into 50 Ohm) | | |
| Sampling Rate | up to 6.16 GS/s variable clock (12.32 GS/s in RF mode) for AWG and 6.16 GS/S fixed in AFG | | |
| Waveform Memory | 4 Gpts per channel | | |
| Digital Pattern Generator (DPG) | up to 8 Digital Channels | up to 16 Digital Channels | up to 32 Digital Channels |
| Waveforms Sequencing | up to 16.384 waveforms, length granularity of 1 point (> 384 Pts.) | | |

## AFG Operational Mode

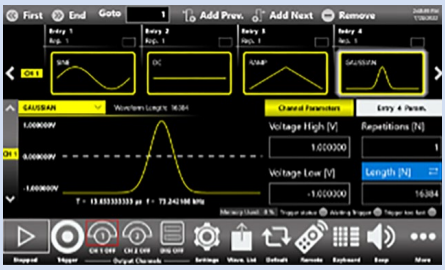
- Improved Direct Digital Synthesis (DDS) based technology
- Fixed Sampling Clock – 6.16 GS/s



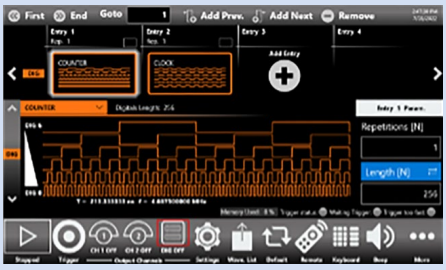
*Arbitrary Function Generation (AFG functionality)*

## AWG Operational Mode

- Variable Clock True-Arbitrary Technology
- Variable Sampling Clock – from 1 S/s to 6.16 GS/s (12.32 GS/s in RF mode)
- Mixed Signal Generation: 2/4/8 Analog Channels and 8/16/32 synchronized Digital Channels[1)]



*Arbitrary Waveform Generation (AWG functionality)*



*Digital Pattern Generation (DPG functionality)*

[1)] See Digital Channel Selection Guide, page 16

# Three different features on the same platform for a multifunctional generator

T3AWG6062, T3AWG6064 and T3AWG6068 are multi-functional generators that combines many functions in one instrument, i. e. Arbitrary Function Generator, Arbitrary Waveform Generator and Digital Pattern Generator.

These three-different functionalities are leveraging on the HW flexibility adopting two different technologies.

An improved Direct Digital Synthesis (DDS) based technology adopted when using the Function Generator (AFG) lets the user to change glitch free on-the-fly all the parameters preserving the waveform shape.

All control and setting are always one touch away: swipe gesture to change the channel, the carrier selection and have access to the modulation parameters, swipe into the waveform gallery to import a signal at a glance and use the touch-friendly virtual numeric keyboard to change parameters values.

The variable clock, true-arbitrary technology adopted when using the Arbitrary Waveform / Digital Pattern Generator lets the user to create complex waveforms of analog and digital pattern, insert them is a sequence, apply loops, jumps and conditional branches. Digital output combined and synchronized with analog output signals represents an ideal tool to troubleshoot and validate digital design.

The waveform memory length of 4 GPts on each channel combined with number of waveforms entries up to 16,384 and the waveform repeat count higher then 4 $10^9$ or infinite make the T3AWG6062, T3AWG6064 and T3AWG6068 the best-in-class waveform generators for the most demanding technical applications.

This innovative and disruptive hardware architecture combined with 16-bit vertical resolution and 4 Gpts waveform memory depth, makes the T3AWG6062, T3AWG6064 and T3AWG6068 the ideal generators for today's and tomorrow's test challenges.

# Applications and Key Industries at a glance

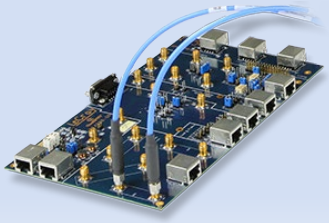
## Multi-channel Stimulus-Response Testing

The T3AWG6K series arbitrary waveform generator delivers exceptional performance for creation of complex wideband waveforms. Up to 8 channels are available in a single instrument with 5 GHz bandwidth in @RF mode with 16-bit resolution and a sampling rate of 12.32 GS/s in @RF mode. Ideal for use in a Stimulus-Response measurement model with Digital Storage Oscilloscopes HD.

## Different signal emulations

| Emulation of | Stimulus-response testing case: |
|---|---|
| @perfect signal | DUT response behavior is not influenced by uncontrolled and unknown distortions |
| @real-world signal | DUT response behavior before any signal source can be available.<br>(Playback of signals acquired using the oscilloscope and imported into the AWG) |
| @extreme condition signal | DUT response behavior in difficult conditions and corner cases (stress and margin tests) |
| @noise and interference signal | DUT response behavior with interference signals and noise added to the expected signal<br>(noise and interference immunity) |

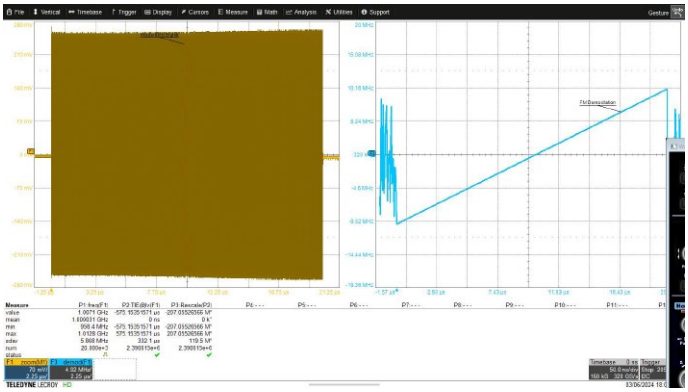
*Function/Arbitrary Waveform Generator (AWG), stimulus*



*Device Under Test (DUT)*

*Digital Storage Oscilloscope HD, Response*

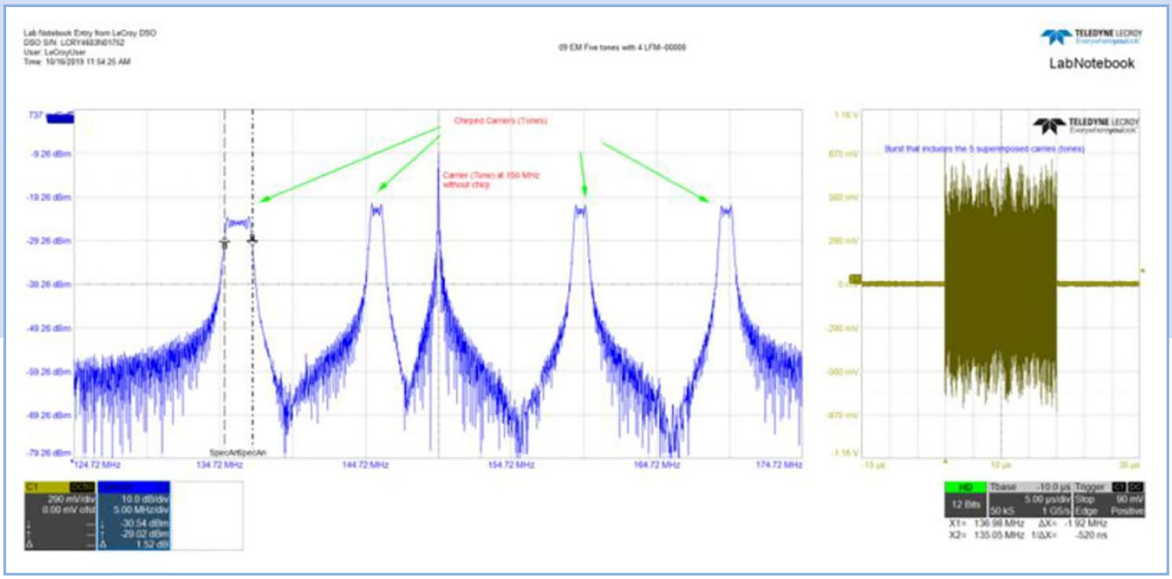
## Phase Coherence Baseband, IF and I/Q signals emulation



The T3AWG6K series can produce a wide range of modulations and signal scenarios. In fact, you can rely on the function generation operating mode (AFG) using improved direct digital synthesis (DDS) technology and a powerful and flexible waveform sequence in the arbitrary waveform generation mode (AWG) using variable-clock true-arb technology. In addition, the ability to generate up to 32 digital channels synchronously with analog signals enables efficient and adaptive testing with complex signal emulation.

## Complex Radio Frequency (RF) signal generation

Nowadays, RF engineers find it difficult to create the signals required for compliance and stress tests, simply because signals are becoming increasingly complex and require very precise phase related components. The T3AWG6K series arbitrary waveform generators can support all the today and tomorrow design and test challenges. This is also thanks to the SW Waveform Editor utility which allow to create new arbitrary and complex waveforms in a simple, flexible, and affordable way and the ability to capture real-life waveforms directly acquired by real-time oscilloscopes.

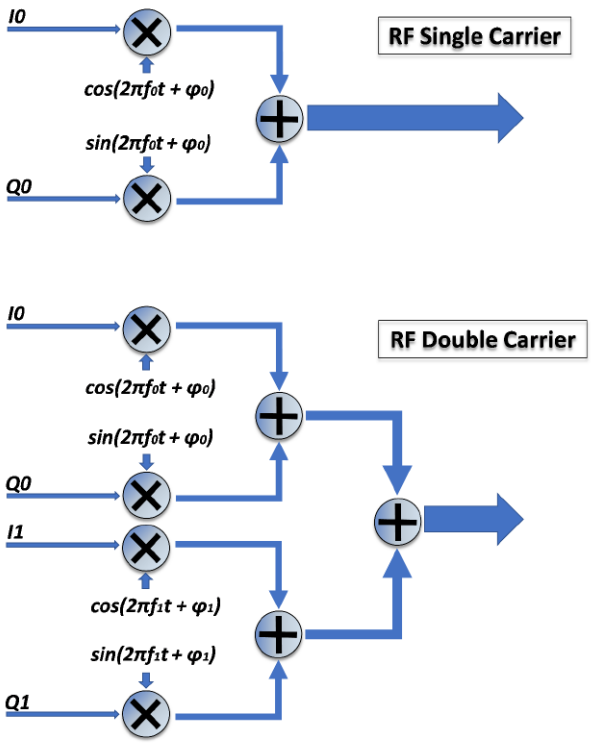


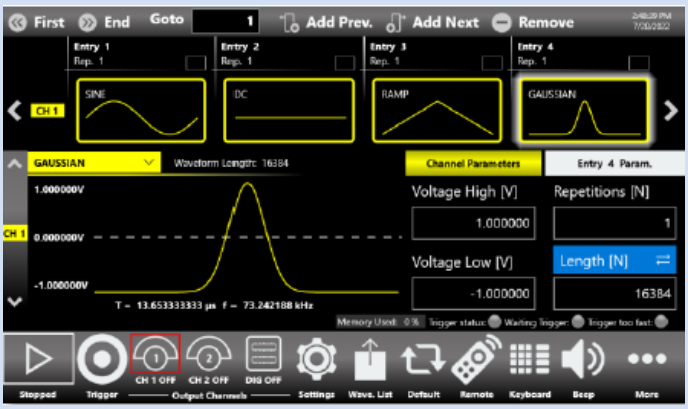

## Digital IQ modulator with a single or double carrier (RF mode)

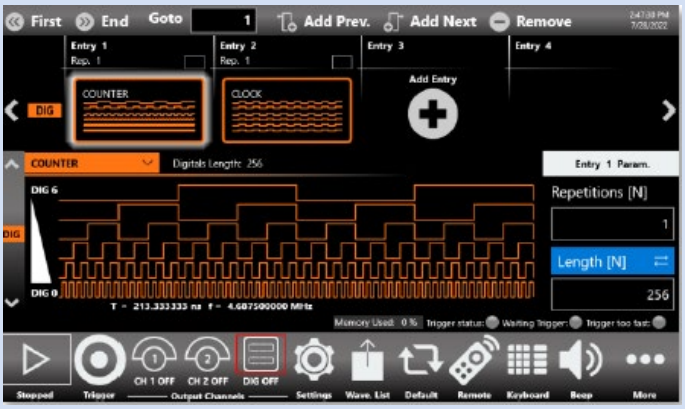
The RF mode gives a more advanced feature for creating and generating IQ modulated RF signals with a single or double carrier. This feature is available with all the T3AWG6K series platforms.

There are many applications where the RF mode is critical, starting from general applications, multi-channel arbitrary waveform generation, to satellite and radar testing, and ending with telecommunication I/Q communication signals.

With this internal IQ modulation feature, you do not need any more external modulators and mixers, so removing the cause of uncertainty for IQ mismatch, increasing the accuracy and the flexibility of the measurements. For every IQ component, it is possible select the shape of the waveform from the drop-down list, i.e waveform list, the amplitude, and the Voltage offset, while the Repetitions number and Length parameters will remain a specific setting of the entry. The sampling rate of the instrument for the RF mode pass from (up to) 6,16 GS/s of the Base Band mode, to (up to) 12,32 GS/s.






## Waveform Sequencing with digital and analog synchronized signals

T3AWG6K can reproduce the signal in any case, whether you know how to define or can acquire the waveform. If you know how to define the waveform you can use the SW Waveform Editor utility that allows you to create the waveform in a simple, flexible, and affordable way.

If, on the other hand, the signal is acquired using a digital storage real-time oscilloscope, the waveform can be imported with simple steps into T3AWG6K arbitrary waveform generator and then played back as is or modified. But there is more. These waveforms can be a simple waveform entry into a more complex and articulated signal using the waveform sequencing.

In fact, the user can have up to 16,384 waveform entries of analog waveforms and digital patterns, define their execution flow by means of loops, jumps and conditional branches. Digital output combined and synchronized with analog output signals represent a must-have tool to troubleshoot and validate the modern mixed signal design including analog and synchronous digital signals. The waveform memory length is 4 GSamples for each channel to fit the most challenging applications.

In conclusion we can say that T3AWG6K arbitrary waveform generator represents an easy way to a seamless transition from simulation to generation for your lab.

# Key Industries


**Today's cars are including highly sophisticated electronic with very sensitive electronic components.**

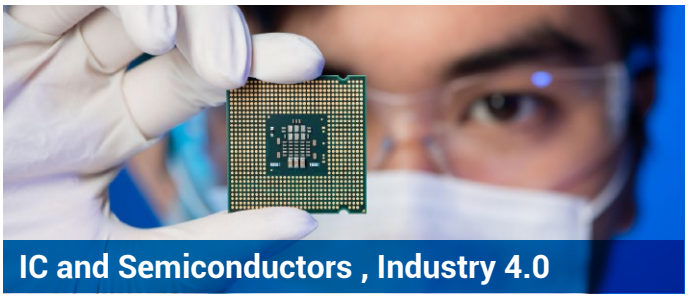
- 16-bit vertical voltage output resolution
- Waveform Sequencing adding noise and interference for EMI testing.
- Wide total output voltage window ±5 V or 10 V (into 50 Ohm)


**Radar test and electronic warfare require to create specific complex true-to-life signals.**

- Output RF signals directly up to 6 GHz (RF mode 12 GS/s)
- Built-in digital I/Q with a single or double carrier
- Wide output voltage ranges up to 5 $V_{pp}$ and ±2.5 V HW Baseline Offset


**Leading edge research in electronics physics, electronics, chemistry, mechanics, and other disciplines**

- 4 GPts @Ch deep waveform memory
- Playback of signals acquired using the oscilloscope and imported into the T3AWG6K.
- Channel coupling for generating seamless phase related analog and digital signals.




**Today's IC, components, and sensors are highly reliable extending the operating range in many variables.**

- Separate or coupled per channel control of channel skew, frequency, gain, and offset.
- Signal BW up to 2.8 GHz BW per channel (6 GHz per channel in RF mode)
- Up to 32 digital channels synchronized with analog channels.

# Automate your test and measurement requirements

## Waveform generation for AFG and AWG operating modes and advanced remote instrument control

T3AWG6K series are easily added to your automated test environment. In addition to the programing manuals, which include the complete list of ASCII SCPI commands, programming examples are available for both the AFG (Function Generator) and AWG (Arbitrary Waveform Generator) operating modes. These programming examples make it easy to connect to a powerful graphical programming environment like LabView™, take full advantage of the visualization and programming capabilities found in MATLAB™, or use the flexibility offered by PYTHON or the .NET programming languages. Load waveforms, create sequences, change waveforms parameters, and enable signal generation directly from the PC.

# MODEL SPECIFIC SPECIFICATIONS

## General Specifications

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **Number of Channels** | | | |
| Analog | 2 | 4 | 8 |
| Digital | 0, 8 | 0, 8, 16 | 0, 8, 16, 32 |
| Markers | 1 | 2 | 4 |
| **Operating Modes** | | | |
| Function Generator | AFG, Improved Direct Digital Synthesizer (DDS) based Technology | | |
| Arbitrary Waveform Generator | AWG, Variable Clock "True Arb" Technology | | |
| **Output Channels** | | | |
| Output type | Single ended DC coupled | | |
| Output impedance | Single ended: 50 Ω | | |
| Connectors | SMA on front panel | | |
| **DC Amplitude** | | | |
| Voltage Range | ± 2.5 V (into 50 Ω) | | |
| Resolution | 100 µV (nom), 5 digits | | |
| Amplitude Accuracy | ± (1 % of \|setting\| + 5 mV) | | |
| **DC Baseline Hardware Offset** | | | |
| Range (50 Ω into 50 Ω) | -2.5 V to +2.5 V | | |
| Range (50 Ω into High Impedance) | -2.5 V to +2.5 V | | |
| DC Baseline Accuracy (50 Ω into 50 Ω) | ± (1 % of \|setting\| + 5 mV) | | |
| AC Accuracy (1 kHz sine wave, 0 V offset, > 5 $mV_{p-p}$ amplitude, 50 Ω load) | ± (1 % of setting [$V_{pp}$] + 5 mV) [1)] | | |

[1)] Specifications is valid in the range 0 % to 90 % of full scale output

## AFG mode Specifications

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **General Specifications** | | | |
| Operating Mode | Direct Digital Synthesizer (DDS) | | |
| Sample Rate (SR) | 6.16 GS/s (fixed) | | |
| Amplitude Range | 0 to 5 $V_{pp}$ (into 50 Ω) | | |
| Amplitude Resolution | 100 µV (nom), 5 digits | | |
| Run Modes | Continuous, modulation, sweep, burst | | |
| Standard Waveforms | Sine, Square, Pulse, Ramp, more (Noise, DC, Sin(x)/x, Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine | | |
| Arbitrary Waveforms | Vertical resolution: 16-bit, Waveform length: 16,384 points | | |
| **Internal Trigger Timer** | | | |
| Range | 10.4 ns to 88 s | | |
| Resolution | 80 ps | | |
| Accuracy | ± (0.1 % setting + 5 ps) | | |

# MODEL SPECIFIC SPECIFICATIONS

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **Sine Waves** | | | |
| Frequency Range Sine (50 Ω into 50 Ω)[1] | 1 µHz to ≤ 1 GHz: 5 $V_{pp}$ | | |
| | 1 GHz to ≤ 2 GHz: 4 $V_{pp}$ | | |
| Flatness | DC to 2 GHz: ± 0.5 dB (1 $V_{pp}$, relative to 1 kHz) | | |
| Harmonic Distortion (1 $V_{p-p}$) | 1 µHz to ≤ 20 kHz < -75 dBc | | |
| | 20 kHz to ≤ 400 MHz < -70 dBc | | |
| | 400 MHz to ≤ 1 GHz < -60 dBc | | |
| | 1 GHz to ≤ 2 GHz < -55 dBc | | |
| Total Harmonic Distortion (1 $V_{p-p}$) | 10 Hz to 20 kHz < 0.05 % | | |
| Spurious (measured across DC to 3.08 Ghz)[2] | 1 µHz to ≤ 500 MHz: < -75 dBc | | |
| | 500 MHz to ≤ 1.5 GHz: < -70 dBc | | |
| | 1.5 GHz to ≤ 2 GHz: < -55 dBc | | |
| Phase Noise (1 $V_{p-p}$, 10 kHz offset) | 20 MHz: < -127 dBc/Hz typ. | | |
| | 100 MHz: < -123 dBc/Hz typ. | | |
| | 1 GHz: < -105 dBc/Hz typ. | | |
| **Square Waves** | | | |
| Frequency Range Sine (50 Ω into 50 Ω)[1] | 1 µHz to ≤ 770 MHz | | |
| Rise/fall time (10 % to 90 %) | 400 ps | | |
| Rise/fall time (20 % to 80 %) | 300 ps | | |
| Overshoot (1 $V_{p-p}$) | < 2 % | | |
| Jitter (rms) | < 2 ps | | |
| **Pulse Waves** | | | |
| Frequency Range | 1 µHz to ≤ 770 MHz | | |
| Pulse width[3] | 500 ps to (Period – 500 ps) | | |
| Pulse width Resolution | 20 ps or 15 digits | | |
| Pulse duty | 0.1 % to 99.9 % (limitations of pulse width apply) | | |
| Leading/trailing edge transition time (10 % to 90 %) | 400 ps to 1,000 s | | |
| Leading/trailing edge transition time (20 % to 80 %) | 300 ps to 1,000 s | | |
| Transition time Resolution | 2 ps or 15 digits | | |
| Overshoot (1 $V_{p-p}$) | < 2 % | | |
| Jitter (rms, with rise and fall time ≥ 400 ps) | < 2 ps | | |
| **Double Pulse Waves** | | | |
| Frequency Range | 1 µHz to ≤ 385 MHz: 10 $V_{pp}$ ($V_{pp}$ = \|$V_{pp}$1\| + \|$V_{pp}$2\|) | | |
| Other Pulse Parameters | See Pulse Waves | | |
| **Ramp Waves** | | | |
| Frequency Range | 1 µHz to 75 MHz | | |
| Linearity (< 10 kHz, 1 $V_{p-p}$, 100 %) | ≤ 0.1 % | | |
| Symmetry | 0 % to 100 % | | |

[1] Amplitude doubles on High Impedance load
[2] Spurious are evaluated @1 $V_{pp}$ single ended nominal output amplitude
[3] Below 500 ps width, the pulse amplitude will have some reduction respect to the set value

# MODEL SPECIFIC SPECIFICATIONS

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **Other Waves** | | | |
| Frequency Range | | | |
| Exponential Rise, Exponential Decay | 1 µHz to 75 MHz | | |
| Sin(x)/x, Gaussian, Lorentz, Haversine | 1 µHz to 150 MHz | | |
| Additive Noise | | | |
| Bandwidth (-3 dB) | 2 GHz | | |
| Level | 0 V to 2.5 V – abs (carrier max value [Vpk]) | | |
| Resolution | 1 mV | | |
| Frequency Resolution | | | |
| Sine, square, pulse, arbitrary, Sin(x)/X | 1 µHz or 15 digits | | |
| Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine | 1 µHz or 14 digits | | |
| Frequency Accuracy | | | |
| Non-ARB | ± 2.0 ppm of setting \| ± 500 ppb of setting (Opt.) | | |
| ARB | ± 2.0 ppm of setting ±1 µHz \| ± 500 ppb of setting ±1 µHz (Opt.) | | |
| **Arbitrary** | | | |
| Number of Samples | 2 to 16,384 | | |
| Frequency range | 1 µHz to ≤ 770 MHz | | |
| Analog Bandwidth (-3 dB) | 950 MHz | | |
| Rise/fall time (10 % to 90 %) | 400 ps | | |
| Rise/fall time (20 % to 80 %) | 300 ps | | |
| Jitter (rms) | < 2 ps | | |

## Modulations

| **Amplitude Modulation (AM)** | |
|---|---|
| Carrier waveforms | Standard waveforms (except Pulse, DC and Noise), ARB |
| Modulation source | Internal or external |
| Internal modulating waveforms | Sine, Square, Ramp, Noise, ARB |
| Modulating frequency | Internal: 500 µHz to 61 MHz, External: 10 MHz max. |
| Depth | 0.00 % to 120.00 % |
| **Frequency Modulation (FM)** | |
| Carrier waveforms | Standard waveforms (except Pulse, DC and Noise), ARB |
| Modulation source | Internal or external |
| Internal modulating waveforms | Sine, Square, Ramp, Noise, ARB |
| Modulating frequency | Internal: 500 µHz to 61 MHz, External: 10 MHz max. |
| Peak deviation | DC to 2 GHz |
| **Phase Modulation (PM)** | |
| Carrier waveforms | Standard waveforms (except Pulse, DC and Noise), ARB |
| Modulation source | Internal or external |
| Internal modulating waveforms | Sine, Square, Ramp, Noise, ARB |
| Modulating frequency | Internal: 500 µHz to 61 MHz, External: 10 MHz max. |
| Peak deviation range | 0° to 360° |

# MODEL SPECIFIC SPECIFICATIONS

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **Frequency Shift Keying (FSK)** | | | |
| Carrier waveforms | Standard waveforms (except Pulse, DC and Noise), ARB | | |
| Modulation source | Internal or external | | |
| Internal modulating waveforms | Square | | |
| Key rate | Internal: 500 µHz to 61 MHz, External: 10 MHz max. | | |
| Hop frequency | DC to 2 GHz | | |
| Number of keys | 2 | | |
| **Phase Shift Keying (PSK)** | | | |
| Carrier waveforms | Standard waveforms (except Pulse, DC and Noise), ARB | | |
| Modulation source | Internal or external | | |
| Internal modulating waveforms | Square | | |
| Key rate | Internal: 500 µHz to 61 MHz, External: 10 MHz max. | | |
| Hop frequency | 0° to +360° | | |
| Number of keys | 2 | | |
| **Pulse Width Modulation (PWM)** | | | |
| Carrier waveforms | Pulse | | |
| Modulation source | Internal or external | | |
| Internal modulating waveforms | Sine, Square, Ramp, Noise, ARB | | |
| Modulating frequency | Internal: 500 µHz to 61 MHz, External: 10 MHz max. | | |
| Deviation range | 0 % to 50 % of pulse period | | |
| **Sweep** | | | |
| Type | Linear, Logarithmic, staircase, and user defined | | |
| Carrier waveforms | Standard waveforms (except Pulse, DC and Noise), ARB | | |
| Sweep time | 30 ns to 2,000 s | | |
| Hold/return times | 0 to (2000 s – 30 ns) | | |
| Sweep/hold/return time resolution | 15 ns or 12 digits | | |
| Total sweep time accuracy | ≤ 0.4 % | | |
| Start/stop frequency range | Sine: 1 µHz to 2 GHz, Square: 1 µHz to 770 MHz | | |
| Trigger source | Internal/External/Manual | | |
| **Burst** | | | |
| Waveforms | Standard waveforms (except DC and Noise), ARB | | |
| Type | Trigger or gated | | |
| Burst count | 1 to 4,294,967,295 cycles or Infinite | | |

## True Arb – Baseband mode Specifications

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **General Specifications** | | | |
| Operating Mode | Variable clock (True Arbitrary) – Baseband mode | | |
| Sample Rate (SR) | 1 S/s to 6.16 GS/s | | |
| Sin(x)/x -3 dB bandwidth | 2.72 GHz @ 6.16 GS/S | | |
| Run Modes | Continuous, Triggered Continuous, Single/Burst, Stepped, Advanced | | |
| Vertical Resolution | 16 bit | | |
| Max Waveform Length | 4 G samples @channel | | |
| Waveform Granularity | 1 if the entry length is > 416 samples, | | |
| | 32 if entry length is ≥ 128 and ≤ 416 samples | | |
| Sequence Length | 1 to 16,384 | | |
| Sequence Repeat Counter | 1 to 4,294,967,294 or infinite | | |
| **Timer** | | | |
| Range | 20 ns to 1.39 seconds | | |
| Resolution | ± 1 sampling clock cycle | | |
| Analog Channel to Channels skew | | | |
| Range | 0 to 2.63 µs | | |
| Resolution | 100 fs | | |
| Accuracy | ± (1 % of setting + 20 ps) | | |
| Initial Skew | < 20 ps | | |
| Calculated bandwidth (0.35/rise time) | ≥ 2 GHz | | |
| SFDR @ 100 MHz[4)] | < -80 dBc | | |
| SFDR[4)] | 1 µHz to ≤ 600 MHz: < -80 dBc | | |
| | 600 MHz to ≤ 1.5 GHz: < -75 dBc | | |
| | 1.5 GHz to ≤ 2 GHz: < -65 dBc | | |
| | 2 GHz to ≤ 3 GHz: < -55 dBc | | |
| Rise/fall time (1 $V_{p-p}$ single-ended 10 % to 90 %) | ≤ 175 ps | | |
| Rise/fall time (1 $V_{p-p}$ single-ended 20 % to 80 %) | ≤ 110 ps | | |
| Overshoot (1 $V_{p-p}$ single-ended) | < 5 % | | |
| Random jitter on clock pattern (rms, typical) | < 2 ps | | |
| **Timing and Clock** | | | |
| Sampling Rate | | | |
| Range | 1 S/s up to 6.16 GS/s | | |
| Range in RF mode | 1 S/s to 12.32 GS/S | | |
| Resolution | 32 Hz | | |
| Accuracy | ± 2.0 ppm | | |
| **Digital outputs (Optional)** | | | |
| Output Channels | | | |
| Connectors | Mini-SAS HD connector on rear panel (custom pin-out) | | |
| Number of connectors | 1, 2, 4 | | |
| Number of outputs | 8-bits, 16-bits, 32-bits | | |
| Output impedance | 100 Ω differential | | |
| Output type | LVDS | | |
| Rise/fall time (10 % to 90 %) | < 1 ns | | |
| Jitter (rms) | 20 ps | | |
| Maximum update rate | 1.54 Gbps per channel | | |
| Memory depth | 1 GSamples per digital channel | | |

[4)] Measured across DC to Fs/2, excluding fsa – 2*fout and fsa – 3*fout and excluding harmonic where Fsa = 6.16 Gsa/s.

## True Arb – RF mode Specifications

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **General Specifications** | | | |
| Operating Mode | Variable clock (True Arbitrary) – RF mode | | |
| Output Sample Rate (SR) | 8.5 GS/s to 12.32 GS/s | | |
| Sin(x)/x -3 dB bandwidth | 5.04 Ghz @ 12.32 GS/S | | |
| RF Modulation | I/Q quadrature | | |
| RF Carrier count per output channel | Single Carrier (2 components I0, Q0 for channel) | | |
| | Double Carrier (4 components, I0, Q0 and I1, Q1 for channel) | | |
| RF Carrier Frequency range | 0 up to 6 GHz | | |
| RF Carrier Frequency resolution | 1 mHz | | |
| RF Carrier Phase | Programmable | | |
| I/Q Component Data Rate | 1/8 of the Output Sample rate | | |
| I/Q Component Prescaler | 0 to 2^32 | | |
| Run Modes | Continuous, Triggered Continuous, Single/Burst, Stepped, Advanced | | |
| I/Q Component Vertical Resolution | 16 bit | | |
| I/Q Component Waveform Length | 32 M to 500 M samples for component (up to 1 G samples) | | |
| I/Q Component Waveform Granularity | 1 if the entry length is > 104 samples | | |
| | 8 if entry length is ≥ 32 and ≤ 104 samples | | |
| Sequence Length | 1 to 16,384 | | |
| Sequence Repeat Counter | 1 to 4,294,967,294 or infinite | | |
| **Timer** | | | |
| Range | 20 ns to 1.39 seconds | | |
| Resolution | ± 1 Component sampling clock cycle | | |
| **I/Q Component to Component skew** | | | |
| Range | 0 to [16,200 * 8/Output Sampling Clock] s | | |
| Resolution | [8/Output Sampling Clock] s | | |
| Accuracy | ± (1 % of setting + 20 ps) | | |
| Initial Skew | < 20 ps | | |

## Auxiliary input and output characteristics

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **Sync in/out** | | | |
| Connector type | Infiniband 4X connector on rear panel (custom pinout) | | |
| Master to Slave delay (typ.) | TBD | | |
| **Marker Output** | | | |
| Connector type | SMA on front panel | | |
| Number of connectors | 1/2/4 | | |
| Output impedance | 50 Ω | | |
| Output level (into 50 Ω) | | | |
| Voltage Window Amplitude | -0.5 V to 1.65 V | | |
| Voltage Resolution | 100 $mV_{pp}$ to 2.15 $V_{pp}$ | | |
| Voltage Accuracy | 1 mV ± (5 % setting + 25 mV) | | |
| Switching characteristics | | | |
| Max Update Rate (True Arb Mode) | 6.16 Gbps | | |
| Max Frequency (AFG Mode) | 96.5 MHz (continuous mode) | | |
| Rise/Fall Time (10 % to 90 %, 2 $V_{pp}$) | < 150 ps | | |
| Jitter (rms) | < 10 ps | | |
| Marker out to analog channel skew | | | |
| Range | True Arb Mode: 0 to 2.3 µs | | |
| | AFG Mode: 0 to 11 sec. in Contin. Mode, 0 to 2.3 µs in Trig. Mode | | |
| Resolution | True Arb Mode: 1/64 of DAC sampling period | | |
| | AFG Mode: 5 ps | | |
| Accuracy | ± (1 % of setting + 5 ps) | | |
| Initial skew | < 20 ps | | |
| **Trigger/Event Inputs** | | | |
| Connector | SMA on the Front Panel | | |
| Number of Trigger Inputs | 2 (Trig.in 1, Trig.in 2) | | |
| Input impedance | 50 Ω / 1 kΩ | | |
| Slope/Polarity | Positive or negative or both | | |
| Input damage level | < -15 V or > +15 V | | |
| Threshold control level | -10 V to 10 V | | |
| Resolution | 50 mV | | |
| Threshold control accuracy | ± (10 % of \|setting\| + 0.2 V) | | |
| Input voltage swing | 0.5 $V_{p-p}$ minimum | | |
| Minimum pulse width (1 $V_{p-p}$) | 3 ns | | |
| Trigger/gate input to Analog Output delay | | | |
| Slow (synchronous) trigger | AFG mode: < 355 ns (< 405 ns in triggered sweep mode) | | |
| | True Arb mode: < 1550 * DAC clock period(ns) + 10 ns | | |
| Fast (asynchronous) trigger | AFG mode: < 335 ns (< 385 ns in triggered sweep mode) | | |
| | True Arb mode: < 1,360 * DAC clock period(ns) + 27 ns | | |
| Trigger In to output jitter (rms) | AFG mode: < 20 ps | | |
| | True Arb mode: 0.29 * DAC clock period | | |
| Trigger In programmable delay range | 0 ps to 2,418 ps | | |
| Trigger In programmable delay resolution | 78 ps | | |
| Maximum Frequency | AFG: 65 MTps on Rising/Falling Edge, 80 MTps on Both Edges | | |
| | True Arb mode: 1 / (Period of the Analog Waveform + 48 DAC clock period) | | |
| | MTps = Mega Transitions per second | | |

# MODEL SPECIFIC SPECIFICATIONS

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **Reference clock input** | | | |
| Connector type | SMA on rear panel | | |
| Input impedance | 50 Ω, AC coupled | | |
| Input voltage range | 0.2 $V_{pp}$ to 2 $V_{pp}$ | | |
| Damage level | Maximum Input voltage: -0.3 V to 3.6 V | | |
| | Maximum input power: 30 dBm (50 Ω) | | |
| Frequency range | 5 MHz to 200 MHz | | |
| Frequency Resolution | 1 Hz | | |
| **Reference clock output** | | | |
| Connector type | SMA on rear panel | | |
| Output impedance | 50 Ω, AC coupled | | |
| Frequency | 10 MHz TCXO \| 100 MHz VCOCXO (Optional) | | |
| Initial accuracy @ 25 °C | ± 1.0 ppm | | |
| Aging | ± 1.0 ppm/year | | |
| Stability vs. temperature | ± 1 ppm | | |
| Amplitude | 1.65 $V_{pp}$ | | |
| Phase Noise @ 20 MHz carrier | -120 dBc/Hz at 100 Hz; -140 dBc/Hz at 1 KHz; -150 dBc/Hz at 10 KHz | | |
| Phase Noise @ 100 MHz carrier | -120 dBc/Hz at 100 Hz; -145 dBc/Hz at 1 KHz; -150 dBc/Hz at 10 KHz | | |
| **External Clock Input** | | | |
| Connector type | SMA on rear panel | | |
| Input impedance | 50 Ω, AC coupled | | |
| Frequency[5)] | True Arb: SampleRate / N where:<br>N = 4, 8, 16, 32 and SampleRate = 3.08 ÷ 6.16 GSps<br>N = 2, 4, 8, 16, 32 and SampleRate = 3.08 ÷ 5.0 GSps | | |
| | N = 2, 4, 8, 16 and SampleRate = 1.54 ÷ 3.08 GSps<br>N = 1, 2, 4, 8, 16 and SampleRate = 1.54 ÷ 2.5 GSps | | |
| | AFG: 192.5 MHz, 385 MHz, 770 MHz or 1,540 MHz (selectable) | | |
| Input Power Range | +0 dBm to +10 dBm | | |
| Damage Level | 15 dBm | | |
| **Sync Clk Out** | | | |
| Connector type | SMA on rear panel | | |
| Output impedance | 50 Ω, AC coupled | | |
| Frequency | AFG Mode: 6.16 Ghz / N where N = 16, 32, 64, ..., 2,048 | | |
| | True Arb Mode: Sampling Rate / N, N = 16, 32, ..., 2,048 | | |
| Amplitude | 1$V_{pp}$ into 50 Ω | | |
| **External Modulation input** | | | |
| Connector type | SMA on rear panel | | |
| Input impedance | 10 KΩ | | |
| Number of inputs | 1 | | |
| Bandwidth | 10 MHz with 50 MS/s sampling rate | | |
| Input voltage range | -1 V to +1 V (except FSK, PSK) | | |
| | FSK, PSK: 0 V ÷ 3.3 V with 1.65 V fixed threshold | | |
| Vertical resolution | 12-bit | | |
| **Pattern Jump In (optional)** | | | |
| Connector type | DSUB15 | | |
| Input signals | DATA [0..7] + Data_Select + Load | | |
| Internal Data Width | 14 bit, multiplexed using Data_Select | | |
| Number of addressable entries | 16,384 | | |
| Data Rate | DC to 1 MHz | | |
| Input Range | VIL = 0 V to 0.8 V / VIH= 2 V to 3.3 V | | |
| Impedance | Internal 1 kΩ pull-up resistor to Vcc (3.3 V) | | |

[5)] When using the External Clock Input the SampleRate must be in the range 3.08 ÷ 6.16 GHz

## Power / Environmental characteristics / EMC and safety

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| **Power** | | | |
| Source Voltage and Frequency | 100 to 240 VAC ±10 % @ 45–66 Hz | | |
| Max. power consumption | Max. 100 W (T3AWG6062) | | |
| | Max. 200 W (T3AWG6064) | | |
| | Max. 300 W (T3AWG6068) | | |
| **Environmental characteristics** | | | |
| Temperature (operating) | +5 °C to +40 °C (+41 °F to 104 °F) | | |
| Temperature (non-operating) | -20 °C to +60 °C (-4 °F to 140 °F) | | |
| Humidity (operating) | 5 % to 80 % relative humidity with a maximum wet bulb temperature of 29 °C at or below +40 °C, (upper limit de-rates to 20.6 % relative humidity at +40 °C). | | |
| Humidity (non-operating) | 5 % to 95 % relative humidity with a maximum wet bulb temperature of 40 °C at or below +60 °C, upper limit de-rates to 29.8 % relative humidity at +60 °C. Non-condensing. | | |
| Altitude (operating) | 3,000 meters (9,842 feet) maximum at or below 25 °C | | |
| Altitude (non-operating) | 12,000 meters (39,370 feet) maximum | | |
| **EMC and safety** | | | |
| Safety | EN61010-1 | | |
| Main Standards | EN 61326-1:2013 – Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements | | |
| Immunity | EN 61326-1:2013 | | |

## System specifications

| | T3AWG6062 | T3AWG6064 | T3AWG6068 |
|---|---|---|---|
| Display | 7 inch, 1024 x 600, capacitive touch LCD | | |
| Operative System | Windows 10 | | |
| External Dimensions | W 445 mm – H 135 mm – D 320 mm (3U 19" rackmount) | | |
| Weight | Max. 26.45 lbs (12 Kg) | | |
| Front panel connectors | CH N OUTPUT (SMA) where N = 2, 4,8 depending on the model | | |
| | MARKER N OUT (SMA) where N = 1, 2,4 depending on the model | | |
| | TRIGGER IN N (SMA) where N = 1,2 | | |
| | 2 USB 3.0 ports | | |
| Rear panel connectors | Ref. Clk. IN (SMA) | | |
| | Ref. Clk. Out (SMA) | | |
| | Ext. Mod. IN (SMA) | | |
| | Sync Clk Out (SMA) | | |
| | Ext Clk IN (SMA) | | |
| | Sync IN (Infiniband 4X) | | |
| | Sync OUT (Infiniband 4X) | | |
| | POD X [7..0] where X = A, B, C, D depending on the model (Customized Mini SAS HD) | | |
| | External Monitor ports (one or more) | | |
| | 2 USB 2.0 ports or more | | |
| | 4 USB 3.0 ports | | |
| | Ethernet port (10/100/1000BaseT Ethernet, RJ45 port) | | |
| | 2 PS/2 keyboard and mouse ports | | |
| | 2 DPI ports | | |
| | 1 DVI port | | |
| Hard Disk | 1 TB SSD or better | | |
| Processor | Intel® Pentium 3.7 GHz (or better) | | |
| Processor Memory | 32 GB or better | | |

## T3AWG3-8DIG-TTL
## LVDS to LVTTL adapter

**Require T3AWG6-8DIG or T3AWG6-16DIG or T3AWG6K-32DIG and T3AWG3-8DIG-MSCAB (1x for -8DIG, 2x for -16DIG, 4x for -32DIG)**

| | |
|---|---|
| Output Connector | 20 position 2.54 mm 2 Row IDC Header |
| Output Type | LVTTL |
| Output Impedance | 50 Ω nominal |
| Output voltage | 0.8 V to 3.8 V programmable in group og 8 bits |
| Maximum update rate | 125 Mbps@0.8 V and 400 Mbps@3.6 V |
| Dimension | W 52 mm – H 22 mm – D 76 mm |
| Input connectors | proprietary standard |
| Cable length | 1 meter |
| Cable type | proprietary standard |

## T3AWG3-8DIG-SMA
## Mini-SAS HD to 16x SMA cable (8 LVDS outputs)

**Require T3AWG6-8DIG or T3AWG6-16DIG or T3AWG6K-32DIG**

| | |
|---|---|
| Output Connector | SMA |
| Output Type | LVDS |
| Number of SMA | 16 (8 bits) |
| Cable length | 1 meter |
| Cable type | proprietary standard |

## Digital Channels Selection Guide

| | 8 Digital Channels | 16 Digital Channels | 32 Digital Channels |
|---|---|---|---|
| **Digital Options** | **T3AWG6-8DIG** | **T3AWG6-16DIG** | **T3AWG6-32DIG** |
| **Product Mainframe** | | | |
| T3AWG6062 | Yes | No | No |
| T3AWG6064 | Yes | Yes | No |
| T3AWG6068 | Yes | Yes | Yes |
| **Accessories required:** | | | |
| Cable mini SAS HD 1 m | 1 x T3AWG3-8DIG-MSCAB | 2 x T3AWG3-8DIG-MSCAB | 4 x T3AWG3-8DIG-MSCAB |
| LVTTL digital output [1)] | 1 x T3AWG3-8DIG-TTL | 2 x T3AWG3-8DIG-TTL | 4 x T3AWG3-8DIG-TTL |
| mini SAS HD to x16 SMA Cable | 1 x T3AWG3-8DIG-SMA | 2 x T3AWG3-8DIG-SMA | 4 x T3AWG3-8DIG-SMA |

[1)] LVTTL digital output requires Cable mini SAS

## Ordering information

| T3AWG6062 Product Description (2 Channel platform) | Product Code |
|---|---|
| Arbitrary Waveform Generator, 2 CH, 6 GS/s, 4,096 Mpts/Ch, 5 $V_{pp}$, RF mode (12 GS/s), Wave Sequencing | **T3AWG6062** |
| 8 Digital Output Channels for 2 CH, 4 CH and 8 CH T3AWG6K models (require 1 x Mini-SAS cable) | **T3AWG6-8DIG** |
| **T3AWG6064 Product Description (4 Channel platform)** | **Product Code** |
| Arbitrary Waveform Generator, 4 CH, 6 GS/s, 4,096 Mpts/Ch, 5 $V_{pp}$, RF mode (12 GS/s), Wave Sequencing | **T3AWG6064** |
| 8 Digital Output Channels for 2 CH, 4 CH and 8 CH T3AWG6K models (require 1 x Mini-SAS cable) | **T3AWG6-8DIG** |
| 16 Digital Output Channels for 4 CH and 8 CH T3AWG6K models (require 2 x Mini-SAS cable) | **T3AWG6-16DIG** |
| **T3AWG6068 Product Description (8 Channel platform)** | **Product Code** |
| Arbitrary Waveform Generator, 8 CH, 6 GS/s, 4,096 Mpts/Ch, 5 $V_{pp}$, RF mode (12 GS/s), Wave Sequencing | **T3AWG6068** |
| 8 Digital Output Channels for 2 CH, 4 CH and 8 CH T3AWG6K models (require 1 x Mini-SAS cable) | **T3AWG6-8DIG** |
| 16 Digital Output Channels for 4 CH and 8 CH T3AWG6K models (require 2 x Mini-SAS cable) | **T3AWG6-16DIG** |
| 32 Digital Output Channels for 8 CH T3AWG6K models (require 4 x Mini-SAS cable) | **T3AWG6-32DIG** |
| **Accessories for all platforms (2, 4 and 8 Channels)** | **Product Code** |
| Cable Mini SAS HD 1 m for DIG options (1x for -8DIG, 2x for -16DIG, 4x for -32DIG) | **T3AWG3-8DIG-MSCAB** |
| LVDS to LVTTL adapter[1)] | **T3AWG3-8DIG-TTL** |
| Mini-SAS HD to 16 x SMA cable (8 LVDS output)[2)] | **T3AWG3-8DIG-SMA** |
| Additional SSD – 500 GB | **T3AWG3-SSD** |
| 3U – 19" RACKMOUNT KIT for T3AWG6K | **T3AWG-RACKMOUNT-X** |

[1)] require T3AWG6-8DIG or T3AWG6-16DIG or T3AWG6K-32DIG and T3AWG3-8DIG-MSCAB (1x for -8DIG, 2x for -16DIG, 4x for -32DIG)
[2)] require T3AWG6-8DIG or T3AWG6-16DIG or T3AWG6K-32DIG

Standard warranty is one year.

# ABOUT TELEDYNE TEST TOOLS

TELEDYNE TEST TOOLS
Everywhereyoulook™

## 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.

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T3 stands for Teledyne Test Tools.


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