KEITHLEY

Model 3390

50MHz Arbitrary Waveform Generator Specifications

Keithley Instruments, Inc.
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DISPLAY: Graph mode for visual verification of signal settings.

CAPABILITY:

Standard waveforms: Sine, Square, Ramp, Triangle, Pulse, Noise, DC
Built-in arbitrary waveforms: Exponential Rise and Fall, Negative ramp, Sin(x)/x, Cardiac

WAVEFORM CHARACTERISTICS

Sine	Specification
Frequency	1µHz to 50MHz
Amplitude Flatness[1],[2] (Relative to 1KHz)	0.1dB(<100KHz) 0.15dB(<5MHz) 0.3dB(<20MHz) 0.5dB(<50MHz)
Harmonic distortion[2,3] (unit: dBc)	DC to 20kHz: -60(<1Vpp) -60(≥1Vpp) 20 kHz to 100 KHz: -65(<1Vpp) -60(≥1Vpp) 100 kHz to 1 MHz: -50(<1Vpp) -45(≥1Vpp) 1 MHz to 20 MHz: -40(<1Vpp) -35(≥1Vpp) 20 MHz to 50 MHz: -30(<1Vpp) -30(≥1Vpp)
Total harmonic distortion[2,3]	DC to 20kHz, V ≥ 0.5Vpp THD ≤ 0.06% (Typical)
Spurious[2,4] (non-harmonic)	DC to 1MHz -70dBc 1MHz to 50MHz -70dBc + 6dB/octave
Phase Noise (10K Offset)	-115 dBC/Hz, typical when f ≥ 1MHz, V ≥ 0.1Vpp

Square	Specification
Frequency	1µHz to 25MHz
Rise/Fall time	< 10ns
Overshoot	< 2%
Variable Duty Cycle	20% to 80% (to 10MHz) 40% to 60% (to 25MHz)
Asymmetry	1% of period + 5ns (@ 50% duty)
Jitter (RMS)	1ns + 100ppm of period

Ramp, Triangle	Specification
Frequency	1µHz to 200kHz
Linearity	< 0.25% of peak output
Symmetry	0.0% ~ 100.0%

[1] Add 10%/°C of spec for offset and amplitude for operation outside the range of 18°C to 28°C
[2] Autorange enabled
[3] DC offset set to 0V
[4] Spurious output at low amplitude is –75dBm typical

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Pulse	Specification
Frequency	500µHz to 10MHz
Pulse width	20ns minimum 10ns res. (period ≤ 10s)
Variable Edge Time	<10ns to 100ns
Overshoot	<2%
Jitter (RMS)	300ps + 0.1ppm of period

Noise	Specification
Bandwidth	20MHz typical

Arbitrary	Specification
Frequency	1µHz to 10MHz
Length	2 to 256K
Resolution	14 bits (including sign)
Sample Rate	125Msa/s
Min Rise/Fall Time	30ns typical
Linearity	<0.1% of peak output
Settling Time	<250ns to 0.5% of final value
Jitter(RMS)	6ns + 30ppm
Non-volatile Memory	4 waveforms * 256K Points

Common Characteristic	Specification
Frequency Resolution	1µHz
Amplitude Range	10mVpp to 10Vpp in 50Ω 20mVpp to 20Vpp in Hi-Z
Amplitude Accuracy[1,2] (at 1KHz)	±1% of setting ±1mVpp
Amplitude Units	Vpp, Vrms, dBm
Amplitude Resolution	4 digits
DC Offset Range (Peak AC + DC)	±5V in 50Ω ±10V in Hi-Z
DC Offset Accuracy[1,2]	±2% of offset setting ±0.5% of amplitude setting
DC Offset Resolution	4 digits
Main Output Impedance	50Ω typical
Main Output Isolation	42Vpk maximum to earth
Main Output Protection	Short-circuit protected; overload automatically disables main output
Internal Frequency reference Accuracy[5]	±10ppm in 90 days ±20ppm in 1 year
External Frequency reference Standard/Option	Standard

[5] Add 1ppm/°C average for operation outside the range of 18°C to 28°C

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External Frequency Input:	
Lock Range	10MHz ± 500Hz
Level	100mVpp ~ 5Vpp
Impedance	1KΩ typical, AC coupled
Lock Time	<2 Sec
External Lock Range	10MHz
Frequency Output:	
Level	632mVpp (0dBm), typical
Impedance	50Ω typical, AC coupled
Phase Offset:	
Range	-360° to +360°
Resolution	0.001°
Accuracy	8ns

Modulation	**Specification**
Modulation Type	AM, FM, PM, FSK, PWM, Sweep and Burst
AM:	
Carrier	Sine, Square, Ramp, Arb
Source	Internal/External
Internal Modulation	Sine, Square, Ramp, Triangle, Noise, Arb
Frequency (Internal)	2mHz to 20KHz
Depth	0.0% ~ 120.0%
FM:	
Carrier	Sine, Square, Ramp, Arb
Source	Internal/External
Internal Modulation	Sine, Square, Ramp, Triangle, Noise, Arb
Frequency (Internal)	2mHz to 20KHz
Deviation	DC ~ 25MHz
PM:	
Carrier	Sine, Square, Ramp, Arb
Source	Internal/External
Internal Modulation	Sine, Square, Ramp, Triangle, Noise, Arb
Frequency (Internal)	2mHz to 20KHz
Deviation	0.0° to 360°
PWM:	
Carrier	Pulse
Source	Internal/External
Internal Modulation	Sine, Square, Ramp, Triangle, Noise, Arb
Frequency (Internal)	2mHz to 20KHz
Deviation	0% ~ 100% of pulse width
FSK:	
Carrier	Sine, Square, Ramp, Arb
Source	Internal/External
Internal Modulation	50% duty cycle Square
Frequency (Internal)	2mHz to 100KHz

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External Modulation Input[6]:	
Voltage Range	±5V full scale
Input Resistance	8.7KΩ typical
Bandwidth	DC to 20KHz
SWEEP:	
Waveforms	Sine, Square, Ramp, Arb
Type	Linear or logarithmic
Direction	Up or down
Sweep Time	1ms ~ 500Sec
Trigger	Internal, External or Manual
Marker	Falling edge of sync signal (programmable frequency)
BURST[7]	
Waveforms	Sine, Square, Ramp, Triangle, Noise, Arb
Type	Internal/External
Start/Stop Phase	-360° to +360°
Internal Period	1µs ~ 500Sec
Gated Source	External trigger
Trigger Source	Internal, External or Manual
Trigger Input:	
Level	TTL compatible
Slope	Rising or Falling (Selectable)
Pulse width	>100ns
Impedance	>10KΩ, DC coupled
Latency	<500ns
Trigger Output:	
Level	TTL compatible into ≥1KΩ
Pulse width	>400ns
Output Impedance	50Ω typical
Maximum rate	1MHz
Fan-out	≤4 Keithley 3390s

Pattern Mode CHARACTERISTIC	**Specification**
Clock Maximum Rate	50MHz
Output:	
Level	TTL compatible into ≥2KΩ
Output Impedance	110Ω typical
Pattern Length	2 to 256K

[6] FSK uses trigger input (1MHz maximum)
[7] Sine and square waveforms above 10MHz are allowed only with an "infinite" burst count

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50MHz Arbitrary Waveform Generator Specifications

General	Specification
Power Supply	110-240VAC ±10%
Power Cord Freq.	50Hz to 60Hz
Power Consumption	50VA max
Operating Environment	0°C to 50°C
Storage Temperature	-30°C to 70°C
Interface	USB, LAN, LXI-C, GPIB
Language	SCPI-1993, IEEE-488.2
Dimensions	107(H) x 224(W) x 380(D)mm
Weight	4.08Kg
Safety	Conforms with European Union Directive 2006/95/EC, EN 61010-1
EMC	Conforms with European Union Directive 2004/108/EC, EN 61326-1
Warm-up Time	1 hour
Warranty	1 Year