

Pulse / Arbitrary Waveform Generator SMG4022, SMG4032, SMG4052



Advance Features

- Dual-channel, 500MHz maximum bandwidth, 20Vpp maximum output amplitude, high fidelity output with 80dB dynamic range
- High-performance sampling system with 2.4GSa/s sampling rate and 16-bit vertical resolution.
- Multi Function Signal Generator including noise, IQ signals & PRBS patterns
- Sweep and Burst Function, Harmonic Function
- Wave combining Function, Channel Coupling, Copy and Tracking Function
- 196 built-in Arbitrary Waveforms
- High precision Frequency Counter
- TrueArb & Easy Pulse Technology, capable of generating lower jitter Square, Pulse and Arbitrary waveforms
- Plenty of analog and digital modulation types: AM, FM, PM, FSK, ASK and PWM
- Standard interfaces: USB Host, USB Device, USBTMC), LAN (VXI-11)
- Optional interface: GPIB
- 4.3" touch screen display for easier operation

Technical Specifications	SMG4022	SMG4032	SMG4052
Bandwidth	200MHz	350MHz	500MHz
Resolution	1μHz		
Accuracy	±1ppm		
Sampling Rate	2.4GSa/s (2X Interpolation)		
No. of Channels	2		
Vertical Resolution	16 bit		
Arbitrary Resolution	2 to 20Mpts		
Functions			
Sine			
Frequency	200MHz	350MHz	500MHz
Harmonic Distortion @ 0dBm	- 65dBc (0 to 1MHz)		
	- 60dBc (1 to 60MHz)		
	- 50dBc (60 to 100MHz)		
	- 40dBc (100 to 200MHz)		
	- 30dBc (200 to 300MHz)		
	- 28dBc (>300MHz)		

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Total Harmonic Distortion	0.075% (10Hz to 20kHz)		
Non-Harmonic Spurious	-60dBc (≤ 350MHz)		
	-55dBc (> 350MHz)		
Output	2mV to 20 Vpp (<40MHz), HiZ load		
	2mV to 10 Vpp (40MHz to 120MHz), HiZ load		
	2mV to 5 Vpp (120MHz to 160MHz), HiZ load		
	2mV to 3 Vpp (160MHz to 350MHz), HiZ load		
	2mV to 1.28 Vpp (>350MHz), HiZ load		
Order	10		
Type	Even, Odd, All		
Pulse			
Frequency	1μHz to 80MHz	1μHz to 150MHz	1μHz to 150MHz
Pulse Width	3.3ns		
Pulse Width Resolution	100ps		
Pulse Width Accuracy	±(0.01 + 0.3ns)		
Rise Time (10% to 90%)	2ns	2ns	2ns
Fall Time (90% to 10%)	2ns	2ns	2ns
Rise / Fall Time Resolution	100ps		
Overshoot	3% (100kHz, 1Vpp, 50Ω load, 2ns edge)		
Duty Cycle	0.001% to 99.999%		
Duty Cycle Resolution	0.001%		
Jitter (rms) Cycle to Cycle	100ps (1Vpp, 50Ω load)		
Output Range (HiZ load, 2ns edge, ≥10ns width)	2m to 20Vpp (≤ 20MHz, HiZ load, 2ns edge, ≥10ns width)		
	2m to 10Vpp (20MHz to 120MHz, HiZ load, 2ns edge, ≥10ns width)		
	2m to 5Vpp (>120MHz, HiZ load, 2ns edge, ≥10ns width)		
Square			
Frequency	1μHz to 80MHz	1μHz to 120MHz	1μHz to 120MHz
Rise / Fall Times	2.4ns (10% to 90%, 1Vpp, 50Ω load)		
Overshoot	3% (100kHz, 1Vpp, 50Ω load)		
Duty Cycle	10 to 90% (Limited by frequency setting)		
Jitter (rms) Cycle to Cycle	100ps (1Vpp, 50Ω load)		
Output Range	2mV to 20Vpp (≤ 20MHz, HiZ load)		
	2mV to 10Vpp (> 20MHz, HiZ load)		
Ramp			
Frequency	1μHz to 5MHz		
Symmetry	0% to 100%		
Linearity	1% (Percentage of peak output 1KHz, 1Vpp, 50% symmetry)		
Output Range	2mV to 20Vpp		
Noise			
Bandwidth (-3dBm)	200MHz	350MHz	500MHz
Output Range	2mVrms to 1.084Vrms (Mean = 0, Bandwidth limit = OFF)		
Arbitrary Wave			
Frequency	1μHz to 50MHz		
Waveform Length	2pts to 20Mpts		
Sampling Rate	1μSa/s to 300MSa/s (TrueArb mode)		
	1.2GSa/s (DDS mode)		
Vertical Resolution	16bit		
Rise/Fall Times	2.6ns (10% to 90%, 1Vpp step signal, DDS mode)		
Jitter (rms) Cycle to Cycle	100ps (1Vpp, 50Ω load, TrueArb mode)		
Output Range	2mV to 20Vpp (≤ 20MHz, HiZ load)		
	2mV to 10Vpp (> 20MHz, HiZ load)		

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DC			
Output Range	-10V to 10V (HiZ load)		
	-5V to 5V (50Ω load)		
Accuracy	± (1% + 2mV), HiZ load		
IQ (Optional)			
Symbol Rate	250 to 37.5MSymb/s (Limited by the oversampling factor)		
Vertical Resolution	16bit		
Modulation Type	2ASK, 4ASK, 8ASK, BPSK, QPSK, 8PSK, DBPSK, DQPSK, D8PSK, 8QAM, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 2FSK, 4FSK, 8FSK, 16FSK, MSK, MultiTone, custom (Supported by EasyIQ software)		
Pattern	Pn7, PN9, Pn15, Pn23, User File, Custom (Supported by EasyIQ software)		
Output Range	1mVrms to 0.5Vrms $\sqrt{(I^2 + Q^2)}$, 50Ω load)		
Carrier Frequency	200MHz	350MHz	500MHz
PRBS			
Bit Rate	1u to 160Mbps	1u to 300Mbps	1u to 300Mbps
Sequence length	2 ^{m-1} , m = 3, 4, ..., 32		
Rise / Fall Time (10% to 90%, 1Vpp, 50Ω load)	2ns to 1μs	1ns to 1μs	1ns to 1μs
Output Range	2mVpp to 20Vpp (≤ 40Mbps, HiZ load)		
	2mVpp to 10Vpp (40 to 240Mbps, HiZ load)		
	2mVpp to 5Vpp (>240Mbps, HiZ load)		
Output			
Accuracy	± (1% + 1mVpp), 10kHz sine, 0V offset		
Amplitude flatness	± 0.3dB (50Ω load, 0.5Vpp, 1MHz sine)		
Output Impedance	50Ω (100kHz sine)		
Output current	- 200mA to 200mA		
Crosstalk	- 60dBc (Ch1 = Ch2= 0dBm, Sine, 50Ω load)		
Protection	Current limiting, Over voltage protection		
Current Limit Threshold	± 200mA		
Over Voltage Protection Threshold	± 3.5V to ± 4.5V (Amplitude < 3.2Vpp, DC Offset < 2VDC)		
	± 10.5V to ± 11.5V (Amplitude ≥ 3.2Vpp, DC Offset ≥ 2VDC)		
Modulation			
AM			
Carrier	Sine, Square, Ramp, Arb		
Modulation Source	Internal / External		
Modulation Wave	Sine, Square, Ramp, Noise, Arb,		
Modulation Depth	0 to 120%		
Modulation Frequency	1mHz to 1MHz (Modulation Source Internal)		
FM			
Carrier	Sine, Square, Ramp, Arb		
Modulation Source	Internal / External		
Modulation Wave	Sine, Square, Ramp, Noise, Arb,		
Frequency Deviation	0 to 0.5*BW (BW = Max. Frequency Setting)		
Modulation Frequency	1mHz to 1MHz (Modulation Source Internal)		
PM			
Carrier	Sine, Square, Ramp, Arb		
Modulation Source	Internal / External		
Modulation Wave	Sine, Square, Ramp, Noise, Arb,		
Phase Deviation	0 to 360°		
Modulation Frequency	1mHz to 1MHz (Modulation Source Internal)		
ASK			
Carrier	Sine, Square, Ramp, Arb		
Modulation Source	Internal / External		
Modulation Wave	Square with 50% duty cycle		
Keying frequency	1mHz to 1MHz (Modulation Source Internal)		

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FSK			
Carrier	Sine, Square, Ramp, Arb		
Modulation Source	Internal / External		
Modulation Wave	Square with 50% duty cycle		
Keying frequency	1mHz to 1MHz (While modulation source is Internal)		
PSK			
Carrier	Sine, Square, Ramp, Arb		
Modulation Source	Internal / External		
Modulation Wave	Square with 50% duty cycle		
Keying frequency	1mHz to 1MHz (While modulation source is Internal)		
PWM			
Carrier	Pulse		
Modulation Source	Internal / External		
Modulation Wave	Sine, Square, Ramp, Noise, Arb		
Modulation Frequency	1mHz to 1MHz (While moudlation source is”Internal”)		
Pulse width deviation	3.3ns		
Burst			
Carrier	Sine, Square, Ramp, Pulse, Noise, Arb		
Type	Count (1-1000000 periods), Infinite, Gated		
Carrier Frequency	2mHz to max. output frequency		
Star/Stop phase	0 to 360°		
Internal Period	1μs to1000s		
Trigger Source	Internal, External, Manual		
Gated Source	Internal/ External		
Trigger delay	100s		
Sweep			
Carrier	Sine, Square, Ramp, Arb.		
Type	Linear, Logarithmic		
Direction	Linear : Up, Down, Up & Down		
	Logarithmic : Up, Down		
Carrier Frequency	1μHz to maximum output frequency		
Sweep Time	1ms to 500s		
Trigger Source	Internal, External, Manual		
Frequency Counter			
Function	Frequency, Period, Positive / Negative Pulse Width, Duty Cycle		
Coupling Mode	AC, DC, HF REJ		
Frequency Range	100mHz to 400MHz (DC coupling)		
	1Hz to 400MHz (AC coupling)		
Input Amplitude	100mVrms to ±2.5V (DC coupling, <100MHz)		
	200mVrms to ±2.5V (DC coupling, 100MHz to 200MHz)		
	500mVrms to ±2.5V (DC coupling, >200MHz)		
	100mVrms to 5Vpp (AC coupling, <100MHz)		
	200mVrms to 5Vpp (AC coupling, 100MHz to 200MHz)		
	500mVrms to 5Vpp (AC coupling, >200MHz)		
Input Impedance	1MΩ		
Reference Clock			
Input			
Frequency	10MHz		
Amplitude	1.4Vpp (min.)		
Input Impedance	5kΩ (AC Coupling)		
Output			
Frequency	10MHz (Synchronized to internal reference clock)		
Amplitude	3.3Vpp approx. (HiZ load)		
Output Impedance	50Ω		

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Auxiliary In / Out			
Trigger Input			
V _{IH}	2 to 5.5V		
V _{IL}	-0.5 to 0.8V		
Input Impedance	100kΩ		
Pulse Width	100ns		
Response Time	100ns Sweep, 600ns Brust		
Trigger Output			
V _{OH}	3.8V (I _{OH} = -8mA)		
V _{OL}	0.44V (I _{OL} = 8mA)		
Output Impedance	100Ω		
Frequency	1MHz		
Sync Output			
V _{OH}	3.8V (I _{OH} = -8mA)		
V _{OL}	0.44V (I _{OL} = 8mA)		
Output Impedance	100Ω		
Pulse Width	26.7ns		
Jitter	3.3ns (Peak to Peak)		
Frequency	10MHz		
Modulation Input			
Frequency	0 to 50kHz		
Input Impedance	10kΩ		
Amplitude @100% modulation depth	12Vpp (Approx)		
General Specifications			
Input Voltage	100 to 240Vrms (±10%), 50 / 60Hz		
Power Consumption	50V (max.)		
PC Interface	Standard : USB Host, USB Device (USBTMC), LAN (VXI-11, Socket, Talnet) Optional : GPIB		
Display	4.3" Touch Screen		
Operating Condition	0 to 40°C, 5 to 90% RH (≤30°C)		
Storage Condition	-20 to 60°C, 5 to 95% RH		
Calibration Interval	1 Year		
Dimensions	W : 260.3mm, H : 107.2mm, D : 295.7mm		
Net Weight	3.5kg		
Gross Weight	4.6kg		
Compliance			
LVD	IEC 61010-1:2010		
EMC	EN61326-1:2013		
Accessories			
Standard	Power Cord, USB Cable, CD, BNC Coaxial Cable		
Optional	USB to GPIB Adapter, IQ Signal Generation Function		

Subject to change

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