MODELS SE5082

5GS/s Dual Channels Arbitrary Waveform Generators

Specification

CONFIGURATION

Output Channels	1/2, Synchronized/fully separated

STANDARD WAVEFORMS

Type:	Sine, triangle, square, ramp, pulse, sin(x)/x, exponential rise, exponential decay, gaussian, noise and DC.
Frequency Range:	
Sine	1µHz to 1GHz
Square, Pulse	1µHz to 500MHz
All others	1µHz to 250MHz

SINE

Start Phase:	0 to 360°	
PhaseResolution:	0.01°	

Harmonics Distortion (typ.):

	DC 1Vpp	AC 0dBm
5MHz to 200MHz	<-44dBc(1))	<-40dBc
200MHz to 375MHz	<-40dBc(1))	<-40dBc
375MHz to 500MHz	<-35dBc(1)	<-50dBc
500MHz to 700MHz	<-32dBc(1)	<-55dBc
700MHz to 1GHz	<-70dBc(1))	<-70dBc

(1) Measured with 1GHz lowpass fiter

Non-Harmonics Distortion (typ.):

1MHz to 100MHz	<-80dBc
100MHz to 250MHz	<-75dBc
250MHz to 500MHz	<-70dBc
500MHz to 1GHz	<-65dBc

SSB Phase Noise (10kHz offset):

1MHz Carrier	<-120dBc/Hz
10MHz Carrier	<-118dBc/Hz
100MHz Carrier	<-115dBc/Hz
250MHz Carrier	<-108dBc/Hz
500MHz Carrier	<-100dBc/Hz
1GHz Carrier	<-95dBc/Hz

Flatness (AC Path):

Cross Range	±0.5dB

PULSE

Pulse Mode:	Single or double, programmable
Polarity:	Normal, inverted or complement
Period:	2ns to 1.6s
Resolution:	500ps
Pulse Width:	1ns to 1.6s
Rise/Fall Time:	
DC Path	600ps (typical < 500ps)
Linear	1ns to 1.6s
Delay:	1ns to 1.6s
Double Pulse Delay:	1ns to 1.6s
Amplitude:	
Range	
DC Path	50mVp-p to 2Vp-p into 50Ω
Levels	
Low Level	-1V to +0.95V
High Level	-0.95V to +1V

NOTES:

1. All pulse parameters, except rise and fall times, may be freely programmed within the selected pulse period provided that the ratio between the period and the smallest incremental unit does not exceed the ratio of 16,000,000 to 1.
2. Rise and fall times, may be freely programmed provided that the ratio between the rise/fall time and the smallest incremental unit does not exceed the ratio of 1,000,000 to 1.
3. The sum of all pulse parameters must not exceed the pulse period setting.

PULSE / PATTERN COMPOSER

MULTI-LEVEL / LINEAR-POINTS

Number of Levels:	1 to 1000
Dwell Time:	500ps to 1s
Transition type:	Fast or Linear
Memory:	100k
Amp. Resolution:	4 digits
Time Resolution:	500ps to 100ns (auto or user)

PATTERN

Pattern Source:	PRBS or user-defined
PRBS Type:	PRBS7, PRBS9, PRBS11, PRBS15, PRBS23, PRBS31, USER
Data Rate:	1Bit/s to 500MBit/s
Number of Levels:	2, 3, 4, 5
High/Low Levels:	±2V
Resolution:	4 digits
Loops:	1 to 1e6
Preamble:	1 to 16e6
Length:	2 to 16e6

ARBITRARY WAVEFORMS

Sample Rate:	50MS/s to 5GS/s (6GS/s typical)
Vertical Resolution:	12 bits
Waveform Memory:	32M/64M points optional
Min. Segment Size:	384points
Resolution:	32 points
No. of Segments:	1 to 32k
Waveform Granularity:	1 point
Dynamic control:	Software command or rear panel segment control port
Jump Timing:	Coherent or asynchronous

SEQUENCED WAVEFORMS

Multi Sequence:	1 to 1,000 unique scenarios
Sequencer Steps:	1 to 48k steps.
Segment Loops:	1 to 16M cycles, each segment
Sequence Loops:	1 to 1M ("Once" mode only)
Step Advance Modes:	Continuous, once (x "N") and stepped

SEQUENCED SEQUENCES

Sequence Scenarios:	1 Scenario
Dynamic Control:	Software command or rear panel sequence control port
Table Length:	1 to 1k steps

Advance Control:	Continuous, once and stepped
Sequence Loops:	1 to 1,000,000 cycles

MODULATION

COMMON CHARACTERISTICS

Carrier Waveform:	Sine, square, triangle
Carrier Frequency:	10kHz to 1GHz
Modulation Source:	Internal

FM

Modulation Shape:	Sine, square, triangle, ramp
Modulation Freq.:	100Hz to 100MHz
Deviation Range:	10mHz to 500MHz

FSK / FREQUENCY HOPPING

FSK Baud Rate:	10mbps to 500Mbps
Hop Table Size:	2 to 256
Hop Type:	Fast or Linear
Dwell Time Mode:	Fixed or programmable per step
Dwell Time:	2ns to 10s
Dwell Time Res.:	2ns

SWEEP / CHIRP

Sweep Type:	Linear or log
Sweep Direction:	Up or down
Sweep Time:	1.4 µs to 10ms
Modulation Shape:	Pulse
Pulse Repetition:	
Range	200ns to 20s
Resolution	3 digits
Accuracy	100ppm

AM

Modulation Shape:	Sine, square, triangle, ramp
Modulation Freq.:	100Hz to 1MHz
Modulation Depth:	0.1 to 200%

ASK / AMPLITUDE HOPPING

ASK Baud Rate:	10mbps to 500Mbps
Hop Table Size:	2 to 256
Hop Type:	Fast or Linear
Dwell Time Mode:	Fixed or programmable per step
Dwell Time:	2ns to 10s
Resolution	2ns

(n)PSK and (n)QAM

Modulation Type:	PSK, BPSK, QPSK, OQPSK, PI/4 DQPSK, 8PSK, 16PSK, 16QAM, 64QAM, 256QAM and User Defined
Symbol Rate Range:	10mbps to 500Mbps
Symbol Accuracy:	1ppm
Table Size:	2 to 256

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COMMON CHARACTERISTICS

FREQUENCY

Resolution:	12 digits
Accuracy/Stability:	Same as reference

ACCURACY REFERENCE CLOCK

Internal	1 ppm from 19°C to 29°C; 1ppm/°C below 19°C or above 29°C; 1 ppm/year aging rate
External	Same as accuracy and stability of the external ref.

OUTPUTS

MAIN OUTPUTS

Coupling:	DC-coupled, or AC-coupled
Connectors:	Front panel SMAs
Impedance:	50Ω nominal, each output
Protection:	Protected against temporary short to case ground

DC-COUPLED

Type:	Single-ended or differential
Resolution:	4 digits
Accuracy:	±(2% +2 mV), offset = 0V
Overshoot:	5%, typical

DC PATH

Rise/Fall Time:	‹600ps (typical ‹500ps)
Amplitude Range:	
Single-ended	50mVp-p to 2Vp-p*
Differential	100mVp-p to 4Vp-p*

OFFSET

Offset Range:	-1.5V to + 1.5V into 50Ω
Offset Resolution:	4 digits
Offset Accuracy:	±2% + 15mV

DIRECT (DAC), AC-COUPLED

Type:	Single-ended
Amplitude Range:	-20dBm to +10dBm into 50Ω,
Resolution:	4 digits
Accuracy:	±(3% +0.5dBm)
Bandwidth:	1GHz

MARKER OUTPUTS

Number of Markers:	Two markers per channel
Type:	Differential (+) and (-) outputs
Connectors:	SMB
Skew Between Markers:	100ps, typical
Impedance:	50Ω
Amplitude Voltage:	
Window	0V to 1.25V, single-ended; 0V to 2.5V, differential
Low level	0V to 0.8V, single-ended; 0V to 1.6V, differential
High level	0.5V to 1.25V, single-ended; 0V to 2.5V, differential
Resolution:	10mV
Accuracy:	10% of setting
Width control:	2 SCLK to segment length;
Position control:	
Range	0 to segment length
Resolution	2 points
Initial delay:	4ns±½ clock (Output to marker)
Variable delay:	
Control	Separate for each channel
Range	0 to 3ns
Resolution	10ps
Accuracy	±(10% of setting +20ps)
Rise/Fall Time:	‹1ns, typical

DIGITAL OUTPUTS (OPTION D)

Number of Bits:	32 output channels
Type:	Differential (+) and (-) outputs
Connectors:	High speed I/O receptacle, 68-pin VRDPC
Skew Between Bits:	100ps, typical
Level:	LVDS
Impedance:	100Ω
Max. Data Rate:	1.15Gb/s
Pattern Memory:	Up to 16MWord
Source	Dedicated or parallel

SYNC OUTPUT

Connector:	Front panel SMA
Source:	Channel 1 or channel 2
Type:	Single ended
Waveform Type:	
Pulse	16 points width
WCOM	Waveform complete
Impedance:	50Ω
Amplitude:	1V; doubles into high impedance
Variable Position Control:	
Range	0 to segment length
Resolution	16 points
Rise/Fall Time	2ns, typical
Variable Width control:	
Range	16 points to segment length
Resolution	16 points

INPUTS

TRIGGER INPUT

Connector:	Front panel SMA
Input Impedance:	1kΩ or 50Ω, selectable
Polarity:	Positive, negative, or both
Damage Level:	±20Vdc
Frequency Range:	0 to 15MHz
Trigger Level Control:	
Range	-5V to 5V into 50Ω; -10V to 10V into 1kΩ
Resolution	12 bit (2.5mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2Vp-p
Min. Pulse Width:	10 ns

EVENT INPUT

Connector:	Rear panel BNC
Input Impedance:	10kΩ or 2.2kΩ pull up to +5V
Polarity:	Positive, negative or either
Damage Level:	±20Vdc
Frequency Range:	0 to 15MHz
Trigger Level Control:	
Range	-5V to 5V
Resolution	12 bit (2.5mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2 Vp-p minimum
Min. Pulse Width:	10 ns

SEQUENCE/SEGMENT CONTROL INPUT

Connectors:	Rear panel D-sub, 8 bit lines
Input Impedance:	10kΩ
Input Level:	TTL

EXTERNAL REFERENCE INPUT

Connector:	Rear panel BNC
Input Frequency:	10 MHz to 100 MHz, programmable
Input Impedance:	50Ω
Voltage Swing:	-5dBm to 5dBm
Damage Level:	10dBm

EXTERNAL SAMPLE CLOCK INPUT

Connector:	Rear panel SMA
Input Impedance:	50Ω
Voltage Swing:	0dBm to 10dBm
Input Frequency:	10MHz to 2.3GHz
Clock Divider:	1/1, 1/2, 1/4, 1/256, separate for each channel
Damage Level:	15dBm
Input Voltage Range:	
AC	0.25Vp-p to 1Vp-p
DC	±10V max.

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RUN MODES

Continuous:	A selected output function shape is output continuously.
Self Armed:	No start commands are required to generate waveforms.
Armed:	The output dwells on a DC level and waits for an enable command and then the output waveform is output continuously; An abort command turns off the waveform.
Triggered:	A trigger signal activates a single-shot or counted burst of output waveforms and then the instrument waits for the next trigger signal.
Normal Mode	The first trigger signal activates the output; consecutive triggers are ignored for the duration of the output waveform.
Override Mode:	The first trigger signal activates the output; consecutive triggers restart the output waveform regardless if the current waveform has been completed or not.
Gated:	A waveform is output when a gate signal is asserted. The waveform is repeated until the gate signal is de-asserted. Last period is always completed.
Burst:	Upon trigger, outputs a Dual or multiple pre-programmed number of waveform cycles from 1 through 1M.

TRIGGER CHARACTERISTICS

EXTERNAL

Source:	Channel 1, channel 2, or both
Connector:	SMA
Input Impedance:	1kΩ or 50Ω, selectable
Polarity:	Positive, negative, or both
Damage Level:	±20Vdc
Frequency Range:	0 to 15MHz
Trigger Level Control:	
Range	-5V to 5V into 50Ω; -10V to 10V into 1kΩ
Resolution	12 bit (2.5mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2Vp-p
Pulse Width:	10 ns, minimum
System Delay:	200 SCLK periods + 50ns
Trigger Delay:	Separate for each channel
Range	0 to 8,000,000 SCLK periods
Resolution	4 points
Accuracy	Same as SCLK accuracy

Smart Trigger:	Detects a unique pulse width
Conditioned Trigger:	‹ pulse width, › pulse width or ‹›pulse width
Pulse Width Range	50ns to 2s
Resolution	2ns
Accuracy	±(5% of setting +20ns)
Trigger Hold-off:	Ignores triggers for a hold-off
Hold-off range	100ns to 2s
Resolution	2ns
Accuracy	±(5% of setting +20ns)
Trigger jitter:	4 SCLK periods

INTERNAL

Source:	Common or separate
Modes:	
Timer	Waveform start to waveform start
Delayed	Waveform stop to waveform start
Timer:	
Range	200ns to 10s
Resolution	3 digits
Accuracy	100ppm
Delay	
Range	152 to 8,000,000 SCLK periods
Resolution	Even numbers, divisible by 4

MANUAL

Source:	Soft trigger command from the front panel or remote

INTER-CHANNEL SKEW CONTROL

COURSE TUNING

Initial skew:	200ps
Control:	
Range	0 to waveform-length points
Resolution	4 points
Accuracy:	Same as SCLK accuracy

FINE TUNING

Initial skew:	200ps
Control:	
Range	-3ns to +3ns
Resolution	10ps
Accuracy:	(10% of setting + 20ps)

TWO INSTRUMENTS SYNCHRONIZATION

Initial Skew:	20ns + 0 to 8 SCLK
Offset Control:	0 to Waveform length
Offset Resolution:	4 SCLK increments
Skew Control:	-5ns to 5ns
Skew Resolution:	10ps

GENERAL

Voltage Range:	100VAC to 240VAC
Frequency Range:	50Hz to 60Hz
Power Consumption:	150VA
Display Type:	TFT LCD, 4 ", 320 x 240 pixels

Interfaces:	
USB	1 x front, USB host, (A type); 1 x rear, USB device, (B type)
LAN	1000/100/10 BASE-T
GPIB	IEEE 488.2 standard interface
Segment control	2 x D-sub, 9 pin
Dimensions:	
With Feet	315 x 102 x 395 mm (WxHxD)
Without Feet	315 x 88 x 395 mm (WxHxD)
Weight:	
Without Package	4.5kg
Shipping Weight	6kg
Temperature:	
Operating	0°C to 40°C
Storage	-40°C to 70°C
Humidity:	85% RH, non condensing
Safety:	CE Marked, IEC61010-1
EMC:	IEC 61326-1:2006
Calibration:	2 years
Warranty [1]:	5 years standard

ORDERING INFORMATION

MODEL	DESCRIPTION
SE5082	5GS/s Dual Channel Arbitrary Waveform Generator

OPTIONS

DAC	DAC output
DC	DC coupled output module

ACCESSORIES

S-Sync Cable:	For multi-instrument synchronization
W-Rack Mount:	19" Single Rack Mounting Kit
Case Kit:	Professional Carrying Bag

Note:	Options and Accessories must be specified at the time of your purchase.

[1] Standard warranty in India is 1 year.