M8008A Clock Generator Module

32 - 64 GHz

Version 2.1

Overview

The Keysight M8008A is designed as a sample clock source for following Keysight products:

- M8198A 128 GSa/s Arbitrary Waveform Generator
- M8199A 128/256 Gsa/s Arbitrary Waveform Generator
- M8199B 224/256 Gsa/s Arbitrary Waveform Generator

It can also be used as a standalone low-jitter clock source for other applications. It comes as a 1-slot AXIe module, which allows the M8008A plus one M8198A module or up to two M8199A/B Arbitrary Waveform Generator (AWG) modules to be plugged into a single 5-slot AXIe chassis.

Key benefits

- 32 – 64 GHz continuous frequency range
- Output amplitude up to +10 dBm
- Very low intrinsic jitter and wideband phase noise
- 4 clock outputs can drive up to one M8198A and up to four M8199A/B AWG modules

Front panel connections

- **Sync In** – Reserved for future use
- **Sync Out A, B, C, D** – connected to Sync In of M8198A or M8199A/B AWG modules
- **Sample Clk Out 1 / Sample Clk Out 2** – sample clock outputs, connected to “Sample Clk In” of the M8198A or M8199AB AWG modules. Each pair of sample clock outputs can be turned on and off independently

- **Sys Trig In A/B** – Reserved for future use
- **Ref Clk In** – Reference clock input
- **Ref Clk Out** – Reference clock output
- **Ref Clk Out 16G** – auxiliary reference clock output that outputs ¼ of the frequency of Sample clock output. This can be used for example to drive the PTB and Trigger input of a DCA

Specifications

Clock generation modes

Clock mode	Clock generation
Internal	Reference oscillator of M8008A through PLL (25 kHz loop bandwidth)
AXIe	Reference oscillator of the AXIe chassis through PLL (25 kHz loop bandwidth)
External Reference	External Ref Clk In through PLL (25 kHz loop bandwidth)
Direct clock	No PLL. Maximum output frequency is 64 GHz.

Sample Clock Output (Sample Clk Out 1/2)

These outputs provide the sample clock signal to the M8198A and M8199A/B AWG modules. Use an M8199A-810 cable to connect to each Sample Clk In of the M8198A or M8199A/B AWG modules.

Sample Clock Output specifications	
Frequency range	32 – 64 GHz (software allows over-programming up to 65 GHz)
Frequency accuracy and resolution Clock mode: Internal Clock mode: AXIe Clock mode: Ext. Reference	 see Internal Synthesizer section see AXIe chassis data sheet Equal to external reference clock source
Number of Clock Channels	2 x 2. Each pair can be enabled/disabled separately
Amplitude range	0 dBm to +10 dBm, 32 GHz…60 GHz 0 dBm to +9 dBm, 60 GHz…64 GHz
Amplitude accuracy 1	+/- 2 dB (typ.)
Intrinsic random jitter 2	70 fs (typ.)
Duty cycle	50% +/- 5% (typ.) 32 GHz...50 GHz 50% +/- 2% (typ.) 50 GHz...64 GHz
SFDR	30 dB (typ.) 32 GHz…45 GHz 45 dB (typ.) 45 GHz...60 GHz 35 dB (typ.) 60 GHz...64 GHz
SSB phase noise	-100 dBc/Hz (typ.) at 100 kHz offset -130 dBc/Hz (meas.) at 1 MHz offset -140 dBc/Hz (meas.) at 10 MHz offset
Termination	50 Ω. Do not operate into open. Unused outputs must be terminated or turned off.
Coupling	AC
Connector	1.85 mm, female

[1] Measured with U8488A Average Power Sensor
[2] Measured with N1060A; using internal synthesizer as a clock source

Internal synthesizer

Frequency	
Accuracy	+/- 2 ppm (spec.)
Resolution	1 Hz

Reference Clock Input (Ref Clk In)

This input allows locking the clock frequency to an external 10 or 100 MHz reference clock

Ref Clk In Specifications	
Input amplitude	0.2 to 2.0 V_{pp}
Input frequency Clock mode: Ext. Ref Direct mode	 10 MHz or 100 MHz +/- 0.1%, sine or square wave 8 GHz - 16.2 GHz, sinewave or square wave, input amplitude: 4 dBm ± 1 dBm
Termination	50 Ω, AC coupled
Connector	3.5 mm, female

Reference Clock Output (Ref Clk Out)

Ref Clk Out specifications	
Amplitude	900 mV_{pp} square wave (nom.)
Frequency Clock mode: Ext. Ref Clock mode: Internal	 10 MHz or 100 MHz (100 MHz only if Ref Clk In is 100 MHz) 100 MHz from internal oscillator
Termination	50 Ω (nom.)
Connector	3.5 mm, female

Reference Clock Output 16G (Ref Clk Out 16G)

Auxiliary clock output that can be used as a trigger and precision timebase signal for a DCA

Ref Clk Out 16G specifications	
Amplitude	+5 dBm fixed, sinusoidal (typ.)
Frequency	Fixed at ¼ of Sample Clock Out (i.e., 8…16 GHz)
Termination	50 Ω (nom.)
Connector	3.5 mm, female

System Trigger Input A/B (Sys Trig In A/B)

Reserved for future use.

Sync Out A / B / C / D

Channel to channel synchronization within a M8198A AWG module or M8199A/B AWG single- or multi-module system. Use an M8199A-811 (M8199-61620) cable to connect to each Sync In of the M8198A and M8199A/B AWG modules.

Sync In

Reserved for future use.

AXIe chassis

The M8008A is supported in the M9502A, M9505A, and M9506A chassis.

Software

The M8070B software version 8.0 or later and Windows 10 / 64 bit is required.

General

Environmental and physical characteristics

Power consumption	70 W
Operating temperature	0 °C to 40 °C
Operating humidity	5% to 80% relative humidity, non-condensing
Operating altitude	Up to 2000 m
Storage temperature	-40 °C to +70 °C
Stored states	NA
Interface to controlling PC	PCIe (see AXIe chassis specification) or USB
Form factor	1-slot AXIe
Dimensions (W x H x D)	322.25 mm x 30 mm x 281.5 mm
Weight	3.75 kg
Safety designed to	IEC61010-1, UL61010, CSA22.2 61010.1 tested
EMC tested to	IEC61326-1
Warm-up time	30 min
Calibration interval	2 years recommended
Cooling requirements	When operating the system choose a location that provides at least 80 mm of clearance at rear, and at least 30 mm of clearance at each side

Definitions

Specification (spec.)

The warranted performance of a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature range of 0 °C to 40 °C and a 30-minute warm up period. All specifications include measurement uncertainty and were created in compliance with ISO-17025 methods. Data published in this document are specifications (spec) only where specifically indicated.

Typical (typ.)

The characteristic performance, which 80% or more of manufactured instruments will meet. This data is not warranted, does not include measurement uncertainty, and is valid only at room temperature (approximately 23 °C).

Nominal (nom.)

The mean or average characteristic performance, or the value of an attribute that is determined by design such as a connector type, physical dimension, or operating speed. This data is not warranted and is measured at room temperature (approximately 23 °C).

Measured (meas.)

An attribute measured during development for purposes of communicating the expected performance. This data is not warranted and is measured at room temperature (approximately 23 °C)

Confidently covered by Keysight Services

Prevent delays caused by technical questions, or system downtime due to instrument maintenance and repairs with Keysight Services. Keysight Services are here to support your test needs with expert technical support, instrument repair and calibration, software support, training, alternative acquisition program options, and more.

A KeysightCare agreement provides dedicated, proactive support through a single point of contact for instruments, software, and solutions. KeysightCare covers an extensive group of instruments, application software, and solutions and ensures optimal uptime, faster response, faster access to experts, and faster resolution.

Keysight Services

Offering	Benefits
KeysightCare KEYSIGHTCARE	KeysightCare provides elevated support for Keysight instruments and software, with access to technical support experts that respond within a specified time and ensure committed repair and calibration turnaround times (TAT). KeysightCare offers multiple service agreement tiers, including KeysightCare Assured, Enhanced, and Application Software Support. See the KeysightCare data sheet for details.
KeysightCare Assured	KeysightCare Assured goes beyond basic warranty with repair services that include committed TAT and unlimited access to technical experts.
KeysightCare Enhanced	KeysightCare Enhanced includes all the benefits of KeysightCare Assured plus Keysight's accurate and reliable calibration services, accelerated, and committed TAT, and technical response.
Keysight Support Portal & Knowledge Center	All KeysightCare tiers include access to the Keysight Support Portal where you can manage support and service resources related to your assets such as service requests, and status, or browse the Knowledge Center.
Education Services	Build confidence and gain new skills to make accurate measurements, with flexible Education Services developed by Keysight experts. Including Start-up Assistance.
Alternative acquisition options	
KeysightAccess	Reduce budget challenges with a subscription service enabling you to get the instruments, software, and technical support you want for your test needs.

Recommended services

Maximize your test system up-time by securing technical support, repair, and calibration services with committed response and turnaround times. 1-year KeysightCare Assured is included in every new instrument purchase. Obtain multi-year KeysightCare upfront to eliminate the need for lengthy and tedious paperwork and yearly requests for maintenance budget. Plus, you benefit from secured service for 2, 3, or 5 years.

Service	Function
KeysightCare Enhanced*	**Includes tech support, warranty and calibration**
R-55B-001-1	KeysightCare Enhanced – Upgrade 1 year
R-55B-001-2	KeysightCare Enhanced – Extend to 2 years
R-55B-001-3	KeysightCare Enhanced – Extend to 3 years (Recommended)
R-55B-001-5	KeysightCare Enhanced – Extend to 5 years (Recommended)
KeysightCare Assured	**Includes tech support and warranty**
R-55A-001-2	KeysightCare Assured – Extend to 2 years
R-55A-001-3	KeysightCare Assured – Extend to 3 years
R-55A-001-5	KeysightCare Assured – Extend to 5 years
Start-Up Assistance	
PS-S10	Included – instrument fundamentals and operations starter
PS-S20	Optional, technology & measurement science standard learning

* Available in select countries. For details, please view the datasheet. R-55B-001-2/3/5 must be ordered with R-55B-001-1.