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DBS9905/ DBS908/908AB

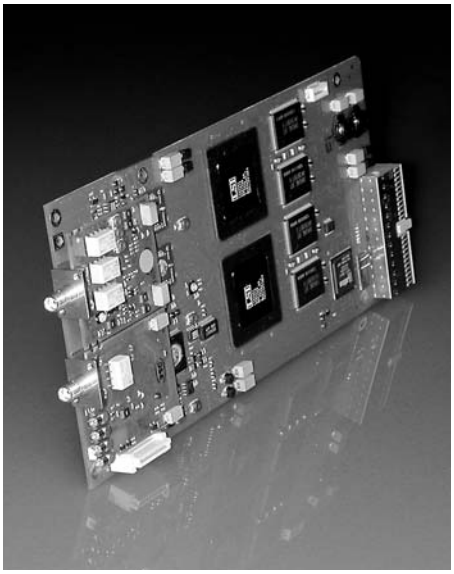
2 GS/s VXI Waveform Digitizer Mezzanine Module

For the Analogic DBS9905 "C" Size VXI Carrier Module

Introduction

The high-performance DBS908 Waveform Digitizer is a modular mezzanine board designed for use with the DBS9905 "C" size VXI carrier module. It features a maximum sampling rate of 2 GigaSamples/second, 8-bit resolution and a 4 MegaSample on-board memory. The DBS908's compact size and mezzanine board concept permits the use of two modules on the single-slot, "C" size DBS9905 carrier card. The use of two instruments in a single slot efficiently maximizes your VXI resources while, at the same time, decreasing the cost per slot. The DBS908 provides a unique combination of speed, resolution and size that maintains the Analogic tradition of implementing innovative ideas that provide state-of-the-art performance at competitive prices.

The DBS908's broad sampling rate range of 100 S/s to 2 GS/s, input bandwidth of DC to 500 MHz (–3 dB), 8-bit resolution and 4 MS (16 MS for DBS908LM) on-board memory position it for use in such applications as Telecommunications, Magnetic Media, Automotive, Time-of-Flight Mass Spectroscopy, Computing, Particle Physics, Military, Explosive-Weapons and Ballistic Testing. The user-programmable front-end further optimizes the digitizer's performance for a variety of applications.



General Description

The DBS908 features an oscilloscope-type front-end that can be programmed for AC or DC coupling and 50Ω or 1 MΩ input impedance, therefore making it easily adaptable for use with either coaxial transmission cable or high impedance probes. The high impedance mode also features very low, 10 pF capacitance that helps minimize the loading effect that can occur when probing high-frequency circuits. A programmable gain amplifier is used to optimize the DBS908's dynamic range by scaling the input to a Full Scale Range (FSR) that is appropriate for the signal of interest. Available ranges are: 50 mV, 100 mV, 200 mV, 500 mV, 1V, 2V and 5V on the DBS908 and LM versions, plus 10V, 20V, 50V on the extended DBS908AB version. A variable offset of ±2V for ranges less than or equal to 500 mV or ±20V for the higher FSR's also can be employed to maintain the digitizer's dynamic range in instances when the signal of interest is not centered around 0V. For the DBS908AB on ranges of 10V, 20V, 50V, an offset of ±200V is available. The front-end employs calibration circuitry to compensate for any internal offset or gain errors. Calibration is implemented, at the user's discretion, by calling a software function.

A crystal-controlled time base that is accurate to ±25 ppm is used to clock the DBS908's ADC subsystem. The module's sampling rate is programmable and has a range of 100 S/s to 2 GS/s in increments of 1, 2, 2.5, 4 or 5. A front panel external clock input is provided for divergent sampling rates or to synchronize the ADC clock with the signal of interest. Signal acquisition can be triggered on the signal of interest (internal trigger), an external trigger input, or VXI TTLTRG lines. Whether the trigger source is internal or external, the trigger condition can be further defined by selecting the trigger slope and level. DC or AC LFReject trigger coupling mode is also provided. Regardless of the trigger source, data is acquired in relation to the specified trigger event and stored as user-defined pre- or post-trigger data. Pre-trigger delay, the storage of data in memory before the desired trigger event, can be adjusted in size from 100% to 0% of acquisition memory. All data samples can be stored before the trigger, immediately after the trigger, or anywhere in between up to the full 4 MS (16 MS for DBS908LM) of memory. Post-trigger delay, the storage of data in memory exclusively after the trigger event can be adjusted from 0 to 200 MS. In post-trig-

Features

- ❑ 2 GS/s Sampling Rate
- ❑ 500 MHz Bandwidth
- ❑ 4 MS Acquisition Memory (16 MS Option)
- ❑ Internal Calibration
- ❑ Input Protection
- ❑ Pre- and Post-Triggering
- ❑ High-Resolution Trigger Timer Interpolator
- ❑ Low Power Consumption
- ❑ VXI Plug & Play software

Applications

- ❑ Telecommunications
- ❑ Magnetic Media
- ❑ Ultrasonic
- ❑ ATE
- ❑ Vibration Analysis
- ❑ Time-of-Flight Mass Spectroscopy
- ❑ Beam Instrumentation

VXI bus

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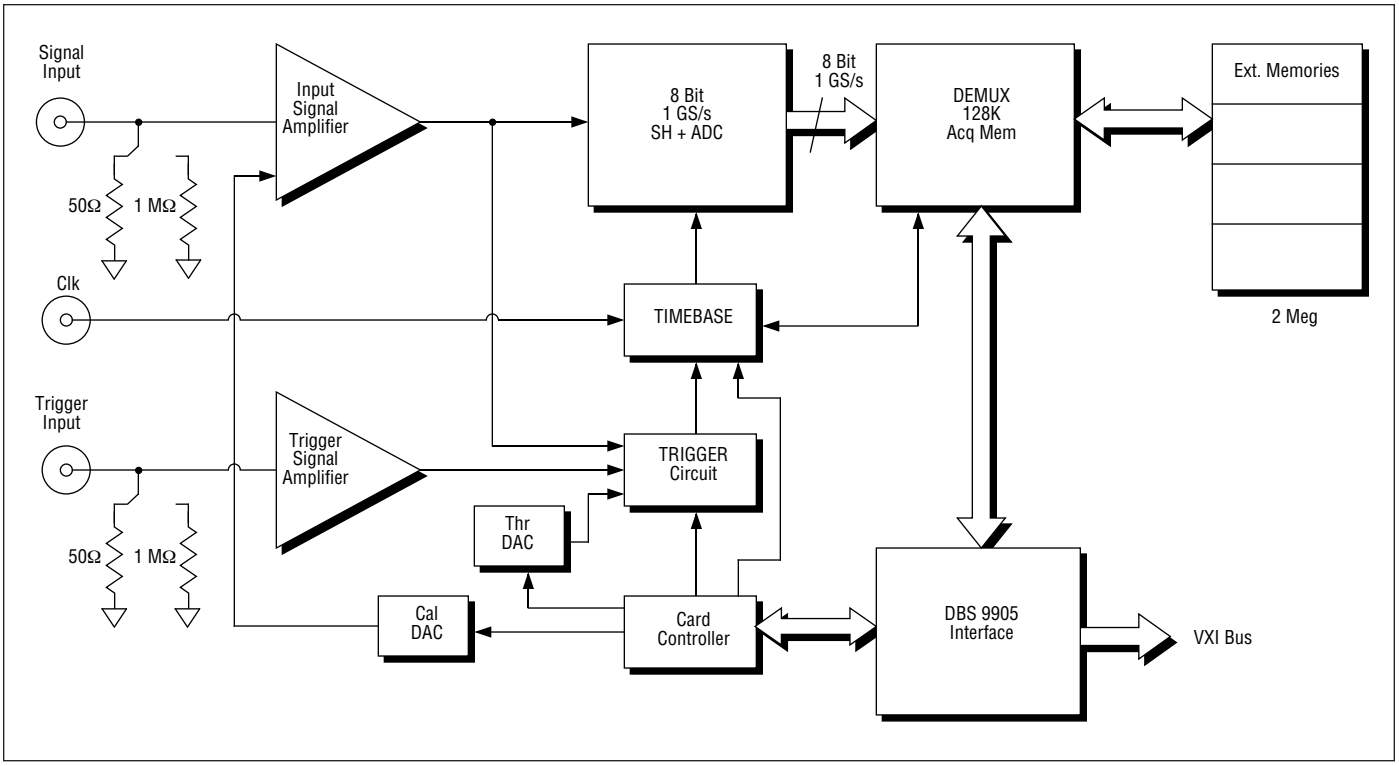


Figure 1. DBS908 Block Diagram.

ger mode, acquisition size is not limited to the size of memory available on the DBS908, since a 28-bit (2^{28}) register is used to set the desired number of samples. Trigger hold off is also provided with a range of 100 µs to 6.5 ms at a resolution of 100 ns. Regardless of the trigger mode, the amount of data acquired and stored in on-board memory is programmable and can range from 100 samples to the full 4 MS (16 MS for DBS908LM). Memory can be configured as a linear buffer or divided into 8K segments for multi-trigger acquisition.

The DBS908 also features a Trigger Time Interpolator (TTI), which can be used in applications that demand precise measurement of the trigger point with respect to the first data point or any trigger to trigger occurrence. The TTI has a resolution of 5 ps max. and is used, by default and dependent on acquisition mode, to time stamp each trigger and the first data point. The user is offered the option of using this timing information to determine when these events occur relative to other events.

The VXI Plug & Play compliant software driver supports all functions of the DBS908 and provides automatic recognition and configuration for all plug-in modules that are installed in the DBS9905 carrier unit. Source code is included as well as .DLL files to allow easy porting to most popular programming environments. These drivers exceed VXI Plug & Play requirements to help ensure that system integration and software development time are reduced to an absolute minimum.

The DBS9905 carrier can take one or two DBS907 or DBS908 modules. It supports all VXI required modes of operation including: MODID slot detection, SYSFAIL, Dynamic Configuration, VXI Backplane Trigger, Interrupts, A16: A24: A32: D16: D32.

MODES OF OPERATION

The DBS908 has two acquisition modes, Single and Sequence. These modes provide an efficient means of utilizing memory while taking advantage of the DBS908's high sampling rate.

Single Acquisition Mode

Acquired waveforms are the result of a series of ADC measurements (sample points) taken at a uniform clock rate. In this mode the user selects the desired sampling rate and acquisition memory size and sets the number of segments to 1. Each waveform is then recorded with a single trigger.

Sequence Acquisition Mode

In this mode the acquisition memory is divided into a preselected number of segments between 2 and 8000. Each segment is then used to store waveforms acquired from successive triggers. In this mode the trigger re-arm time is less than 800 ns, resulting in very low "dead time", when the digitizer cannot acquire data from a new trigger event. Another feature in this mode is the time stamping of each trigger event using the Trigger Time Interpolator. The TTI makes it possible to determine the time, with 5 ps resolution, from one trigger to any other trigger in the sequential acquisition.

DBS9905/ DBS908/908AB

Specifications

SIGNAL INPUT		
Parameter	*Condition*	*Value*
Bandwidth –3 dB	DBS908	250 MHz on 50 mV range 500 MHz on ranges >50 mV
	DBS908AB	250 MHz on 50 mV range 500 MHz on ranges ≤500 mV 300 MHz on ranges >500 mV
Full Scale Range (p - p)	DBS908	50 mV, 100 mV, 200 mV, 500 mV, 1V, 2V, 5V
	DBS908AB	50 mV, 100 mV, 200 mV, 500 mV, 1V, 2V, 5V, 10V, 20V, 50V
Offset Range	≤ 500 mV FSR	±2V range
	1V-5V FSR >5V FSR	±20V range ±200V
Input Impedance	Programmable	1 MΩ/10 pF; 50Ω ±0.5%
Number of Channels		1 single-ended
Input Coupling	Programmable	AC or DC
Max. Input Voltage	@1 MΩ Input Impedance)	908: ±100V (DC+peak AC < 10 kHz) 908AB: ±250V (DC+peak AC < 10 kHz)
	@50Ω Input Impedance	±5V DC (500 mW) or 5V RMS
Overload Recovery Time	@2% FSR with 2 x FSR positive or negative 100 ns pulse returning to 0V	15 ns (typ.)
Overshoot	With 500 ps rise time pulse	< 20% of step FSR</=5V < 30% of step FSR>5V
Long Term Settling Time	To ±3% of step amplitude (80% FSR)	50 ns (typ.)
Connector Type		SMA or BNC

DIGITAL CONVERSION		
Parameter	*Condition*	*Value*
Conversion Rate	Internal Clock	100 S/s to 2 GS/s
Acquisition Memory Size		4 MS (16 MS for DBS908LM)
Resolution		8 bits (1:256)

TRIGGER (INTERNAL & EXTERNAL)		
Parameter	*Condition*	*Value*
Slope	Programmable	Positive or Negative
Coupling	Programmable	DC or AC (50 kHz LFReject)
Trigger Sensitivity	Internal Trigger	From DC to 500 MHz: levels >15% FSR
	External Trigger	From DC to 500 MHz: levels > 2V From DC to 250 MHz: levels > 1V
Internal Trigger Threshold		Adjustable over 60% of FSR
Pre-Trigger Delay		0% to 100% of data set
Post-Trigger Delay		0 to 200 MSamples
Hold Off Resolution		100 ns
Hold Off	Programmable	100 µs to 6.5 ms
Trig. Threshold	Variable	–3V to +3V
Max. Input Voltage	50Ω Input	± 5V DC (500 mW)
	1M input	±100V (DC+peak AC <10 kHz)
Impedance	Programmable	1 MΩ or 50Ω

TIME BASE		
Parameter	*Condition*	*Value*
Clock Accuracy	Internal Clock	< 25 ppm
Acquisition Modes	Single Shot	100 to 4 Msamples
	Sequence	1 to 8k segments
Trigger Re-arm Time	Sequence Mode	< 800 ns
Trigger Time Interpolator	Sequence Mode	5 ps resolution

SYSTEM PERFORMANCE		
Parameter	*Condition*	*Value*
DC Accuracy	All ranges >50 mV	< ±(2% FSR +0.4% x Offset) ±1% FSR typ.
	50 mV range	±(2.5% FSR +0.4% x Offset ±1% FSR typ.
Integral Linearity		< ±1% FSR
ENOB (at 1 GS/s)	DC – 20 MHz	> 6.5 Min.
	20 – 100 MHz	> 6.0
SFDR	100 MHz	44 dB typ.
SNR	All ranges	37 dB Min.
Temperature Drift	Offset	1000 ppm FSR/°C Typ.
	Gain	200 ppm FSR/°C Typ.

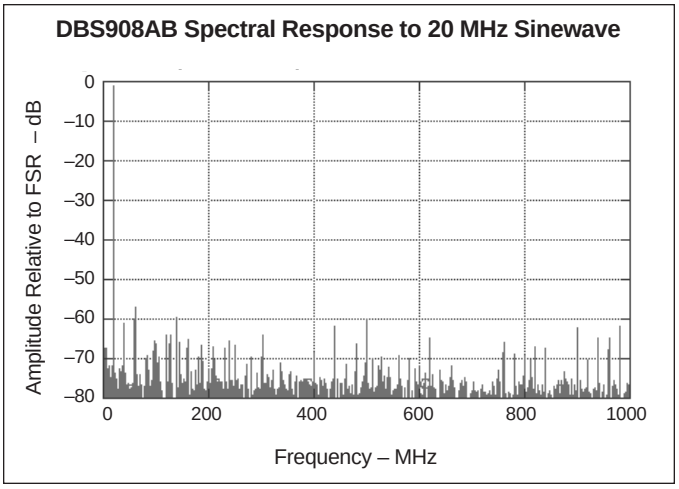
EXTERNAL INPUTS FOR CLOCK & REFERENCE		
Parameter	*Condition*	*Value*
External Clock Frequency		10 MHz to 500 MHz Sine or Square Wave
External Reference Clock Freq.		10 MHz Sine or Square Wave
Clock/Ref. Threshold	Variable	–3V to +3V
Clock/Ref Amplitude	Minimum	1V pk-pk
Connector Type		MMCX

DBS9905/DBS908 POWER REQUIREMENTS TYP.		
Supply Voltage	***Single Channel***	***Dual Channel***
+12 VDC	0.03A	0.04A
–12 VDC	0.03A	0.06A
+5 VDC	3.0A	5.5A
–5.2 VDC	1.9A	2.6A
–2 VDC	0.05A	0.05A
Total Watts	25.7W	42.3W

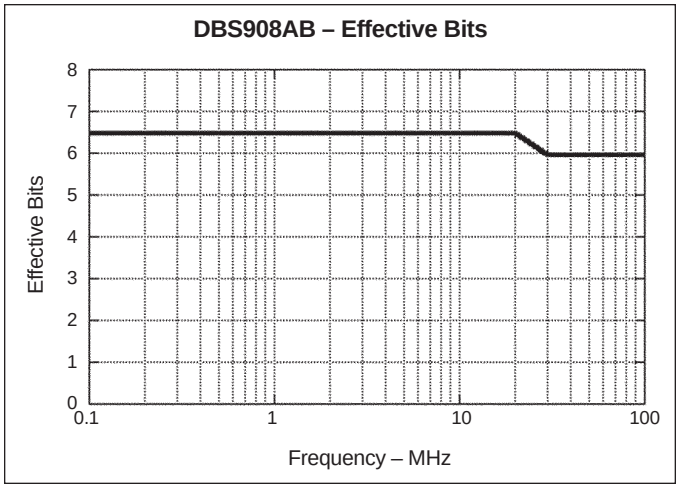
RELIABILITY		
Parameter	*Condition*	*Value*
MTBF Combined DBS9905 and DBS908	Determined by the Generic Parts Count method of MIL-HDBK-217F for a ground benign environment at a temperature of 25°C	>25,000 Hrs

GENERAL		
Parameter	*Condition*	*Value*
Operating Temperature	5% to 90% humidity (non-Condensing)	0°C to 40°C
Storage Temperature		–25°C to +75°C
Required Airflow	0.15 mm H_2O	4 liters/sec Min.
Size		VXI C Size, Single Slot

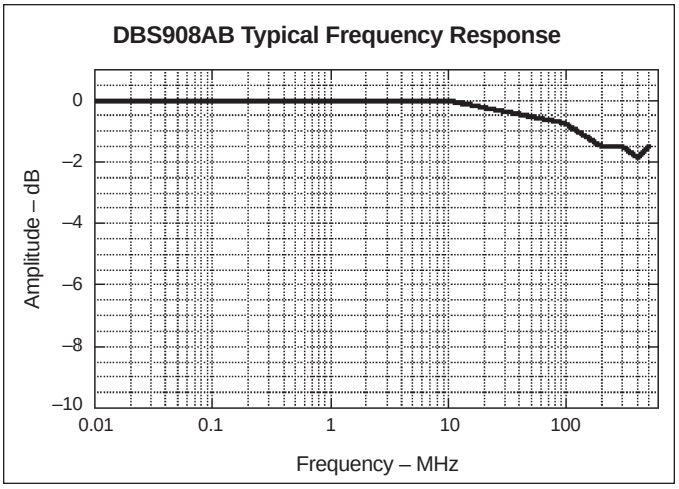
Specifications subject to change without notice



DBS908AB FFT analysis of a pure 20 MHz sinewave, measured at 5V full scale, showing very low noise floor and little harmonic distortion.



DBS908AB on the 1 Volt range with 80% FSR sine waves of 20 MHz and 100 MHz sampled at 1 GS/s.



DBS908AB on the 200 mV Scale with 160 mV pk-pk sine wave input at 1 GS/s.

Ordering Guide

Carrier Module

DBS9905- **XX** **X** **AA** **BB**

- XX: SP = Standard with manuals and black plastic carring case
- X: S* = SMA connector, B* = BNC connector
- AA: Module A code
- BB: Module B code

Plug-in Modules

Model Number	Output* Connector	Memory Size	Module Code
DBS908	SMA	4 MS	03
DBS908AB	BNC	4 MS	53
DBS908LM	SMA	16 MS	04
DBS908ALMB	BNC	16 MS	54

*Connector type must match on carrier and both modules A and B

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