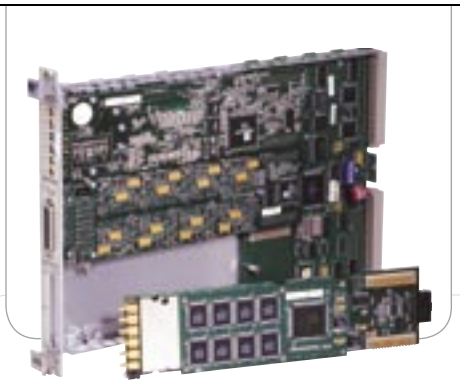
VXI Technology™

VM2601 80 MSa/s 14-bit Digitizer/IF Receiver (VMIP™)
VM2602 40 MSa/s 14-bit Digitizer (VMIP™)
VM2603 20 MSa/s 14-bit Digitizer (VMIP™)



Overview

The model VM2601 is the industry's first high-resolution, high-speed digitizer. Designed as a waveform digitizer (DSO), it has a true differential or single-ended 14-bit input (channel A), and a frequency domain digitizer (IF receiver) with a dedicated RF input channel (channel B). The VM2601/2/3 all have built-in automatic test functions, making them ideal for applications in medical, automotive, semiconductor, avionics, and communications test. These are message-based devices, with SCPI command sets, allowing for ease of programming, but also providing direct register access for fast data throughput. A robust VXI*plug&play* driver is provided to further simplify programming tasks.

This module is part of the VMIP™ family of instruments and can be combined with up to two other modules (i.e., 6.5 digit DMM, 50 MSa/s AWG, 1 ns counter/timer) to form a high-density VXIbus instrument. Three VM2601/2/3s can be installed in a single-wide C-size module giving 3 independent 80 MSa/s digitizer channels.

Superior Analog Performance

Each VM2601/2/3 has two A/D converters and a programmable gain differential amplifier with up to 32 MSa memory. One of the A/D converters is an 80 MSa/s converter used for the high speed DSO input ranges as well as the IF input. The second A/D converter is a 10 MSa/s converter used for DSO sample rates at or below 10 MSa/s which provides for even greater accuracy performance across the range of interest. The IF input is integrated into the VM2601 to provide outstanding distortion-free data with a wide spurious-free dynamic range (SFDR).

The analog front end of the DSO channel features a differential input with software selectable impedances of 50 Ω, 75 Ω, 150 Ω or 1 MΩ. The device can also be operated in a single-ended mode. The VM2601/2/3 have wide programmable input ranges, spanning from 1 Vp to 40 Vp, allowing the user to maximize all 14-bits of vertical range. Switchable analog filters also provide added versatility ensuring that signals above the range of interest do not affect the measurement integrity. The IF input of the VM2601 operates strictly in the single-ended mode and is restricted to 1 Vp input. This reduces the circuitry between the A/D and the module input, providing superior dynamic measurement characteristics.

Features

- The Industry's First Differential 14-bit DSO and Frequency Domain Digitizer
- 40 MHz Bandwidth – Ideal for IF and HF Frequencies
- Up to 80 MSa/s Sample Rate with Pre-and Post-Trigger Capability
- 16 MSa Memory Standard/ 32 MSa Memory Optional
- ±0.5 V, ±1 V, ±2 V, ±5 V, ±10 V, and ±20 V input ranges
- 50 Ω, 75 Ω, 150 Ω, or 1 MΩ Input Impedance, with ac or dc Coupling
- Software Selectable Low Pass Filter
- Automatic Pulse Parameter Measurements
- Up to Three Independent Channels per C-size Card
- Auto Re-arm Capability for Storing Multiple Waveforms w/Pre-trigger Data
- Sleep Mode Reduces Power Consumption When Not in Use
- Dual Channel Synchronization for Precise I/Q Sampling

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Flexible Triggering

The input data is acquired when a conversion trigger event occurs from one of the four following methods:

1. Trigger source from the front panel input: This input has a ±4 V input range, and may be programmed to trigger on either the rising or falling edge of this signal, and at a specified voltage level with a 12-bit resolution and 1% accuracy.

2. Trigger source from the VXI TTL trigger bus: Any one of the eight TTL backplane trigger bus lines may be selected as the trigger source. The unit may be programmed to trigger on either the rising or falling edge of this signal. This allows multiple channels in a mainframe to simultaneously start an acquisition.

3. Trigger upon receipt of a word serial command: When this mode is selected, the ADC will convert when a word-serial command is received by the instrument.

4. Trigger from the input channel: The input channel can be selected to trigger the board. It can be programmed to trigger during a rising or falling edge, and also at a specified voltage with 12 bits of resolution and 1% of range accuracy.

Pre- and post-triggering is available for added flexibility. Pre-trigger data is only limited by the amount of memory installed on the board. Memory can be segmented such that sequential trigger events can be stored without having to force the device to re-arm via software. Since three VM2601s can be accommodated on a single C-size VXIbus card, three differential channels can all be operating and triggering independently. For example, one can be acquiring data while another is waiting for a trigger. In addition, a trigger delay feature means that an acquisition can be delayed up to 1 hour after the receipt of a trigger for efficient use of memory.

Programming, Data Access, and Memory

As with most of our complex instruments, the VM2601 gives the user the ability to access the device using the VXI message-based interface, as well as direct register access for fast data throughput. In addition, a powerful VXI*plug&play* driver API provides high-level access to reduce programming complexity. An on-board processor and expansive library of built-in measurement routines returns measurement data such as rise/fall times, duty cycles, frequency, V rms and many more. Commands can be sent to query the converted values as well as to initiate functions, such as triggering a conversion or querying each channel's calibration constants. This considerably reduces test program development and improves overall test times. Raw sample data is available through A32 shared memory for post-processing analysis. Deep on-board memory (up to 32 MSamples) allows for lengthy transient captures.

Calibration

The calibration constants used to correct the data values are stored in non-volatile memory. These constants are determined when the instrument is calibrated and can be changed as necessary (such as during routine calibration cycles). These constants may also be queried at any time via a word serial query and altered via a word serial command. The constants are password protected and a security code is required to modify the values.

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Specifications:

Analog Input

Parameters	Conditions	Values
Channels		1 DSO Input (Differential/SE) 1 IF input (VM2601 only, SE)
Connectors/Type		Six/SMB
Resolution		14 bits
Full Scale Input Ranges	DSO Input IF Input	±0.5 V, ±1.0 V, and ±2.0 V ±5.0 V, ±10 V and ±20 V ±0.5 V
Max. Sample Rate		VM2601: 80 MSa/s VM2602: 40 MSa/s VM2603: 20 MSa/s
Bandwidth, VM2601	40 MHz Low Pass Filter On 20 MHz Low Pass Filter On	DSO: 40 MHz DSO: 20 MHz IF: 80 MHz
Bandwidth, VM2602	20 MHz Low Pass Filter On 10 MHz Low Pass Filter On	DSO: 20 MHz DSO: 10 MHz
Bandwidth, VM2603	10 MHz Low Pass Filter On 5 MHz Low Pass Filter On	DSO: 10 MHz DSO: 5 MHz
Memory	Standard (VM2601/2/3) Option (VM2601/2/3)	16 MSamples 32 MSamples
Memory Segments	No Pre-Trigger Data w/Pre-trigger Data	64 k segments 8 k segments
Shared Memory Space		A32/A24
Impedance	DSO Input IF Input	50 Ω, 75 Ω, 150 Ω, or 1 MΩ 50 Ω
Input Coupling	DSO Input IF Input	AC/DC DC
Capacitance		40 pF max
CMMR	DC to 20 kHz @ ±0.5 V input range All other input ranges up to 40 MHz	≥60 dB ≥30 dB
Over-voltage Protection	Low ranges High ranges	±5 V dc max. ±50 V dc max.
Offset		±50% of full scale
DC Accuracy	DSO FAST DSO SLOW IF	±1% of range ±0.5% of input, ±0.1% of range ±1% of range

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Analog Input

Parameters	Conditions	Values
AC Amplitude Accuracy	< 1 MHz 1 MHz to 20 MHz 20 MHz to 40 MHz	±0.1 dB ±0.5 dB ±2.5 dB
Frequency Flatness No filter, -1 dBfs @ 50 Ω; Low input ranges (all):	DC to 1 MHz 1 MHz to 20 MHz	±0.1 dB ±0.5 dB
High input ranges:	DC to 1 MHz 1 MHz to 30 MHz	±0.5 dB ±2 dB
Lowpass Filter (3-pole Bessel)	VM2601 VM2602 VM2603	None, 20 MHz or 40 MHz None, 10 MHz or 20 MHz None, 5 MHz or 10 MHz
Integral Non-linearity		±0.5 LSB typ
Missing Codes		Guaranteed no missing codes

Dynamic Characteristics

Parameters	Conditions	Values
(S/[N+D]) 20 Hz to 30 MHz, 80 MHz low jitter clock	0.5 V, 1 V, 2 V input ranges 5 V, 10 V, 20 V input ranges	69 dB typ, 63 dB min. 65 dB typ, 60 dB min.
SFDR DSO Input 20 Hz to 1 MHz, 10 MSa/s 20 MHz LPF ON FFT Size=16384	0.5 V, 5 V input ranges 1 V, 10 V input ranges 2 V, 20 V input ranges	>77 dB typ, >75 dB min >80 dB typ, >77 dB min >80 dB typ, >75 dB min
1 MHz to 10 MHz 80 MSa/s 20 MHz LPF ON FFT Size=16384	0.5 V, 5 V input ranges 1 V, 10 V input ranges 2 V, 20 V input ranges	>75 dB typ, >70 min >75 dB typ, >70 min >75 dB typ, >70 min
IF Input (Excluding Harmonics)		>80 dB typ, >75 dB min
RMS Noise	40 MHz bandwidth @ 50 Ω source impedance, 0.5 V range	250 µV rms max.
SNR	All inputs; all ranges	>62 dB

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Arming, Triggering and Clocking

Parameters		Values
Trigger Source		Ch. Input, EXT input, s/w, VXI TTL Trigger bus, Sync
External Trigger:	**Impedance**	10 kΩ
	Amplitude	±10 V
	Level Accuracy	5 mV
Max. Pre-trigger Samples		Available memory - 1
Trigger Delay		0 – 3600 seconds
Internal Clock Source		CLK10
Internal Clock Accuracy		CLK10
External Clock Max. Frequency		80 MHz
External Clock Impedance		50 Ω
Arm Source		EXT, IMM, Sync, TTLT<0-7>
External Arm:	**Impedance**	10 kΩ
	Amplitude	±10 V
	Resolution	5 mV

Built in Measurement Functions

Period	Vrms
Frequency	Vp
Rise/Fall Time	Vmean
Negative/Positive Duty Cycle	Vampl
Negative/Positive Pulse Width	Vhigh
Negative/Positive Pre-shoot	Vlow
Negative/Positive Overshoot	Vmin
FFT (Driver support only)	

Ordering Information

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Option 18	Upgrade to 32 Msample Memory (must be configured with a VM9000 host module)

VM2601/02/03