GX5296

DYNAMIC DIGITAL I/O WITH PER CHANNEL TIMING, PROGRAMMABLE LOGIC LEVELS AND PMU PXI CARD

- Timing per pin, multiple time sets and flexible sequencer
- 32 Input / Output channels with PMU per pin
- 125 MHz vector rate
- 64 M Vectors per channel (64 Mb per channel vector memory
- Per channel drive / sense voltage range of -2 V to +7 V
- 4 Additional control / timing channels with programmable levels & PMU

DESCRIPTION

The GX5296 offers advanced dynamic digital I/O performance and capabilities in a single slot, 3U PXI format. The 32-channel, GX5296 features timing per pin, multiple time sets, data formatting, and an advanced sequencer – providing users with the capability to emulate and test complex digital busses for system, board or device test applications. Offering sub-nanosecond edge placement resolution per pin and a PMU per pin, the GX5296 has the ability to perform both DC and AC parametric testing. Each digital channel can be individually programmed for a drive hi, drive lo, sense hi, sense lo, and load value (with commutation voltage level). In addition, each channel offers a parametric measurement unit (PMU) providing users with the capability to perform parallel DC measurements on the DUT (device under test).

The GX5296 supports deep pattern memory by offering 64 Mb per pin of vector memory with dynamic per pin direction control and with test rates up to 125 MHz. The board supports both Stimulus / Response and Real-time Compare modes of operation, allowing the user to maximize test throughput for go / no-go testing of components and UUTs that require deep memory test patterns. The single board design supports both master and slave functionality without the use of add-on modules.

FEATURES

The GX5296's timing generator supports 8 timing phases and 4 windows for drive and sense timing respectively. Each phase and window is comprised of two timing edges - assert / de-assert and an open window / close window respectively. Timing resolution of 250 ps is supported for each of these edges. The 8 phases and 4 windows are available for mapping edge timing to a specific channel.

Up to 64 unique time set values can be defined for each phase / window and are selectable on a per sequence step basis. Additionally, six data formats are supported - NR (no return), R0, R1, RHiZ, and RC (Return to Complement), RSC (Return Surround with Complement). Data formatting is assigned on a per channel basis.

Pin electronic resources are independent on a per channel basis and include a full-featured PMU for DC characterization of DUTs. The PMU can operate in the force voltage / measure current or force current / measure voltage mode. Additionally, 4 additional pin electronics resources are available for use as timing and/or control resources – providing programmable drive and sense levels from -2 to +7 volts.

The GX5296 employs a PLL based, clock system which offers programmable vector clock rates up to 125 MHz. In addition, a clocks per pattern (CPP) divider (1 to 256) is available, providing additional clocking and edge placement flexibility. External input and output synchronization signals are also supported, providing the ability to synchronize the GX5296 to external events or time bases.

The GX5296 offers a full-featured sequencer. Capabilities include conditional jump, unconditional jump, subroutine jump, or looping. Additionally, the sequencer has the ability to handshake with external signals in order to synchronize with a UUT. Handshaking settings can be selected on a per step basis and include Handshake Pause and Resume resources. Total sequencer memory size is 4096 steps with each step capable of accessing 1 to 64 M of vector memory.

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SOFTWARE

The GX5296 is supplied with graphical vector development / waveform display tools (GtDIO6xEasy) as well as a virtual instrument panel, 32 / 64-bit DLL driver libraries, and documentation. The virtual panel can be used to interactively control and monitor the instrument from a window that displays the instrument's current settings and status. In addition, **IC**EAsy Test Suite is available, which provides a comprehensive set of software tools - facilitating the development and debugging of test programs for semiconductor devices. The suite includes I-V curve and Shmoo plot tools for analyzing a device's DC and AC characteristics, a library of device test development tools for creating test programs and characterizing devices, file import tools for importing and converting STIL, WGL, VDC/EVCD, and ATP digital file formats as well as GtDIO6xEasy. The complete suite of tools interfaces seemlessly with Marvin Test Solutions' ATEasy, a test executive and test development evironment.

APPLICATIONS

- Semiconductor test
- ASICs testing
- A/D and D/A testing
- Video acquisition / playback applications
- High speed, bi-directional bus testing / emulation

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SPECIFICATIONS

CHANNEL I/O SPECIFICATIONS	
Number of Data I/O Channels	32 per card
Channel Direction Control	Input or Output per vector, per channel
Drive and Sense Programmable Voltage References	32, Drive Hi / Drive Lo per channel 32, Sense Hi / Sense Lo per channel
Drive Voltage Level	Drive Hi: -2 V to +7 V Drive Lo: -2 V to +7 V Maximum swing: 8 V
Drive Voltage Accuracy	±20 mV (max)
Drive Voltage Resolution	16 bits, 250 uV
Driver Leakage Current	±15 nA (max)
Output Impedance	50 (typ)
Drive Current	±35 mA (max)
Rise / Fall Times	0.5 ns typical for a 2 V pulse
Channel Skew	160 ps, typical between the same card 320 ps max, after calibration, for all channels within a domain (Drive and sense)
Sense Voltage Range	Sense Hi: -1.75 V to +7 V Sense Lo: -1.75 V to +7 V
Sense Voltage Threshold Accuracy	±25 mV
Sense Voltage Resolution	16 bits, 250 uV
Input Leakage Current	±15 nA (max)
Minimum Data Sense Pulse Width	4 ns
Voltage Termination (VTT) Range	-2 V to +7 V
VTT Accuracy	±20 mV
VTT Resolution	16 bits, 250 uV

Pull-Up / Pull-Down Current Source / Sink	+24 to -20 mA, programmable on a per channel basis
Pull-Up / Pull-Down Current Source / Sink Accuracy	±124 uA
Pull-Up / Pull-Down Current Source / Sink Resolution	16 bits
Voltage Commutation (Vcomm) Range	-2V to +7V, programmable on a per channel basis Note: VTT and Vcomm share a common voltage source, only one mode supported per channel
Voltage Commutation Accuracy (typ)	±20mV
Voltage Commutation Resolution	16 bits, 250 uV
Vector Memory	64 M Vectors per channel 64 Mb per channel
Data Output Formats (Assigned per channel)	Drive Hi, Drive Lo, Hi-Z Formatted Data: No return, Return to 1, Return to 0, Return to Hi-Z, Return to complement, Surround by complement
Drive Data Timing (Assigned per channel)	Data assert / de-assert based on Phases 0-7
Capture Mode Timing (Assigned per channel)	Windows 0 - 3 Mask Capture on opening edge of Window Capture on closing edge of Window

TEST MODES	
Drive / Sense Modes	Output: Drive Hi, Drive Lo, Hi-Z Sense: Sense Lo, Sense Hi Drive / Expect: - DriveHi Expect Lo - Drive Lo Expect Hi - DriveHi Expect Hi - Drive Lo Expect Lo Expect valid level Expect invalid level Repeat previous opcode Invert previous opcode

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Revision O   •   Updated Feb 27, 2020

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Record Modes	Real Time Compare: Record errors for inputs with Good 1 & Good 0 Record errors for inputs with only a Good 1 Pass/ fail condition based on expect / actual data compare Record Data: Record raw data based on NOT a Good 0 Record raw data based on a Good 1 Record raw data, Good 1 & Good 0
Error Memory	Record data and address for compare errors 1K deep error memory

TIMING

Master Clock (T0) Frequency Range	1 MHz (min); 125 MHz (max)
T0 Clock Period Programming Resolution	250 ps
Accuracy	±0.02% of programmed value + accuracy of reference clock (PXI 10 MHz or external reference clock)
Jitter	50 ps RMS, typical
Reference	PXI 10 MHz clock or XClk (external clock) input
Clocks per Vector Range	Programmable per sequence step, 1 to 256 T0 clock period must be > 50 ns if programming per seq step
Phase and Window Timing	8 phases, 4 windows; user assigned to DIO channels
Timing Set Sequence Control	64 Timing Sets, supporting 8 Phases, 4 Windows, and 4 K sequence steps
Phase and Window Timing Resolution	250 ps, min.
Minimum Phase / Window Pulse Width; Assert / Return Or Open / Close	4 ns
Phase / Window Reference	Phase: System (T0) or Pattern Clock (selectable per Seq Step) Window: Pattern clock only

STATUS AND CONTROL SIGNALS

Input Trigger Functions	Pause - Resume (2), Halt, Run

Trigger Source	PXI Triggers 0-7 Trigger is edge or level programmable
Sync / Clock Output Functions	Sync (2), Sequence Active, Seq Flag, T0 Clk, Vector Clock, Seq Clock, PXI 10 MHz Clock, Record Active, Counter Active GoSub Active, Subroutine Rtn, Return Flag, Last Vector, Channel Compare
Sync / Clock Outputs	Timing / Sync / Trigger Connector (J3) - (4) Aux pin electronic channels (bidirectional); supported functions: Sequence Active, T0 Clk, Vector Clock, Seq Clock, PXI 10 MHz, Failed Vector, Sequence Active, Counter Active, Last Vector, GoSub Active - PXI Triggers 0-7; supported functions: Seq Flag, Sync (2), Channel Compare, Sequence Active, Failed Vector, Valid Pass Signals are edge or level programmable

SEQUENCER

Commands	Jump, Conditional Jump, Loop, Call Subroutine, Return, Pause, Halt
Sequencer Memory	4096 Steps
Phase Trigger	T0_CLK or PAT_CLK
Window Trigger	PAT_CLK
Patterns per Sequence Step	1 to 64M
Loop Counter	Single loop counter Loop count range: 1 – 64K or continuous
Jump	Conditional / Unconditional
Jump Conditions	Error True, Sequence Timeout True, Signal Level (High / Low), Signal Edge (Rising / Falling)

AUXILIARY I/O CHANNELS

Number Channels	4, can be used for timing / control functions or for static I/O
Drive Voltage Level	Drive Hi: -2 V to +7 V Drive Lo: -2 V to +7 V Maximum swing: 8 V
Drive Voltage Accuracy	±20 mV (max)
Drive Voltage Resolution	16 bits, 250 uV
Driver Leakage Current	±15 nA (max)
Output Impedance	50 (typ)

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Drive Current	±35 mA (max)
Rise / Fall Times	0.5 ns typical for a 2 V pulse
Sense Voltage Range	Sense Hi: -1.75 V to +7 V Sense Lo: -1.75 V to +7 V
Sense Voltage Threshold Accuracy	±25 mV
Sense Voltage Resolution	16 bits, 250 uV
Input Leakage Current	±15 nA (max)
Voltage Termination (VTT) Range	-2 V to +7 V
VTT Accuracy	±20 mV
VTT Resolution	16 bits, 250 uV
Pull-Up / Pull-Down Current Source / Sink	+24 to -20 mA, programmable on a per channel basis
Pull-Up / Pull-Down Current Source / Sink Accuracy	±124 uA
Pull-Up / Pull-Down Current Source / Sink Resolution	16 bits
Voltage Commutation (Vcomm) Range	-2V to +7V, programmable on a per channel basis Note: VTT and Vcomm share a common voltage source, only one mode supported per channel
Voltage Commutation Accuracy (typ)	±20mV
Voltage Commutation Resolution	16 bits, 250 uV
DIGITAL I/O PARAMETRIC MEASUREMENT UNIT (PMU)	
Number of Parametric Measurement Units	32, one per channel
Configurations	Force Voltage/Measure Current (FVMI) Force Current/Measure Voltage (FIMV) Force Voltage/Measure Voltage (FVMV) Force Current/Measure Current (FIMI)

Force Voltage Range	-1.25 V to +7 V
Force Voltage Accuracy	±20 mV
Force Voltage Resolution	16 bits
Force Current Ranges	±32 mA, ±8 mA, ±2 mA, ±512 uA, ±128 uA, ±32 uA, ±8 uA, ±2 uA FS
Force Current Accuracy; Test condictions: Vcomm @ 0 volts	±120 uA, -16 mA to +32 mA, 32 mA range ±40 uA, -6 mA to +8 mA range, 8 mA range ±5uA, 2 mA range ±2.4 uA, 512 uA range ±600 nA, 128 uA range ±160 nA, 32 uA range ±80 nA, 8 uA range ±20 nA, 2 uA range
Force Current Accuracy (typ) Vcomm: +1.75 V to +7 V	±120 uA, -16 mA to -32 mA ±40 uA,-6 mA to -8 mA
Force Current Resolution	16 bits
Current Measurement Accuracy (60 Measurements / Sec); Test conditions: Vcomm @ 0 volts	±120 uA, -16 mA to +32 mA, 32 mA range ±40 uA, -6 mA to +8 mA range, 8 mA range ±5uA, 2 mA range ±2.4 uA, 512 uA range ±600 nA, 128 uA range ±160 nA, 32 uA range ±80 nA, 8 uA range ±20 nA, 2 uA range
Current Measurement Accuracy (typ) Vcomm: +1.75 V to +7 V	±120 uA, -16 mA to -32 mA ±40 uA,-6 mA to -8 mA
Current Measurement Resolution	16 bits
Measure Voltage Range	-1.25 V to +7 V
Measure Voltage Accuracy	±2.5 mV (measurement rate < 50 measurements / sec)
High and Low PMU Commutation Voltage Range	VCLo: -2 V to +5 V VCHi: 0 V to +7 V
PMU Vcomm Accuracy	±50 mV

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PMU Vcomm Resolution	16 bits
Pass / Fail PMU Voltage Comparators	Hi and Lo Voltage Threshold Range: -1.75 V to +7 V Accuracy: ±25 mV
Pass / Fail PMU Current Comparators	Hi and Lo Current Threshold Range: -32 mA to +32 mA Accuracy @ Vcomm+ 0V: ±200 uA, -16 mA to +32 mA range ±120 uA, -6 mA to +8 mA range ±12 uA, 2 mA range ±4.8 uA, 512 uA range ±2.4 uA, 128 uA range ±200 nA, 32 uA range ±120 nA, 8 uA range ±80 nA, 2 uA range Accuracy (typ),Vcomm: +1.75 V to +7 V ±200 uA, -16 mA to -32 mA ±120 uA,-6 mA to -8 mA

AUXILIARY I/O PARAMETRIC MEASUREMENT UNIT (PMU)

Number of Parametric Measurement Units	4, one per auxiliary channel
Configurations	Force Voltage/Measure Current (FVMI) Force Current/Measure Voltage (FIMV) Force Voltage/Measure Voltage (FVMV) Force Current/Measure Current (FIMI)
Force Voltage Range	-1.25 V to +7 V
Force Voltage Accuracy	±20 mV
Force Voltage Resolution	16 bits
Force Current Ranges	±32 mA, ±8 mA, ±2 mA FS
Force Current Accuracy; Test conditions: Vcomm @ 0 volts	±120 uA, -16 mA to +32 mA, 32 mA range ±40 uA, -6 mA to +8 mA range, 8 mA range ±5uA, 2 mA range
Force Current Accuracy (typ) Vcomm: +1.75 V to +7 V	±120 uA, -16 mA to -32 mA ±40 uA,-6 mA to -8 mA
Force Current Resolution	16 bits

Current Measurement Accuracy (60 Measurements / Sec); Test conditions: Vcomm @ 0 volts	±120 uA, -16 mA to +32 mA, 32 mA range ±40 uA, -6 mA to +8 mA range, 8 mA range ±5uA, 2 mA range
Current Measurement Accuracy (typ) Vcomm: +1.75 V to +7 V	±120 uA, -16 mA to -32 mA ±40 uA,-6 mA to -8 mA
Current Measurement Resolution	16 bits
Measure Voltage Range	-1.25 V to +7 V
Measure Voltage Accuracy	±3.0 mV (measurement rate < 50 measurements / sec)
High and Low PMU Commutation Voltage Range	VCLo: -2 V to +5 V VCHi: 0 V to +7 V
PMU Vcomm Accuracy	±50 mV
Vcomm Resolution	16 bits
Pass / Fail PMU Voltage Comparators	Hi and Lo Voltage Threshold Range: -1.75 V to +7 V Accuracy: ±25 mV
Pass / Fail PMU Current Comparators	Hi and Lo Current Threshold Range: -32 mA V to +32 mA Accuracy @ Vcomm= 0V: ±200 uA, -16 mA to +32 mA range ±120 uA, -6 mA to +8 mA range ±12 uA, 2 mA range Accuracy (typ), @Vcomm= +1.75 V to +7 V: ±200 uA, -16 mA to -32 mA ±120 uA,-6 mA to -8 mA

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POWER (IDLE AND INITIALIZED)	
+3.3 V$_{DC}$	4.8 A
+5 V$_{DC}$	1.48 A
+12 V$_{DC}$	0.25 A

Note: The GX5296 is a high performance digital instrument and must be used with a PXI chassis that offers adequate cooling and electrical power. To determine the appropriate PXI chassis for your configuration, please contact the factory to discuss your specific application

ENVIRONMENTAL	
Operating Temperature	0 °C to +50 °C
Storage Temperature	-20 °C to +70 °C
Size	3U PXI
Weight	200 g

FRONT PANEL CONNECTORS	
J1	Digital I/O Signals, 68-pin VHD connector
J3	Timing & Control Signals, 68-pin VHD connector

Note: Specifications are subject to change without notice

ORDERING INFORMATION

GX5296	Dynamic Digital I/O (3U), 32 ch., per pin voltage & direction control; 125 MHz w/64 M Vectors per channel; per pin timing & PMU

SOFTWARE	
GtDio6x-FIT	File import tool for importing and converting STIL, WGL, VCD/EVCD, ATP vectors

ACCESSORY	
GT95014	Connector Interface for GT5xxx/GX5xxx/GC5xxx, SCSI to 100 Mil Grid, Single Ended
GT95021	2 ft. Shielded Cable for all 5xxx/35xx (68 Pin)
GT95022	3 ft Shielded Cable for all 5xxx/35xx (68 Pin)
GT95022E	3 ft Shielded Cable for all 5xxx/35xx (68 Pin) Not Terminated One End
GT95025	Connector Interface, 68-Pin SCSI to TTI Testron 170-Pin Signal Block
GT95028	10 ft shielded cable for 5xxx/35xx products (68 Pin)
GT95031	6 ft Shielded Cable for all 5xxx/35xx (68 Pin)
GT95035E-48	48 in. Shielded Cable for all 5xxx/35xx (68 Pin), not terminated on one end
GT95015	Connector Interface for all 5xxx/35xx, SCSI to 100 Mil Grid, Differential

CALIBRATION	
GX5295-96-CALKIT	Calibration cable kit for use with the GX5295 / GX5296 DIO modules & CalEasy

CalEasy-GX5296	CalEasy for the GX5296 (Single User License) with One Year Support and Subscription
CalEasy	CalEasy License for all Supported Marvin Test Solutions Products (Single User License) with One Year Support and Subscription
CalEasy-2Y	CalEasy License for all Supported Marvin Test Solutions Products (Single User License) with Two Year Support and Subscription
CalEasy-3Y	CalEasy License for all Supported Marvin Test Solutions Products (Single User License) with Three Year Support and Subscription
GT95015-CAL	Connector Interface board with capacitors, for calibrating GX5295/ GX5295
GX5296-CAL	GX5296 Calibration/Verification Service. Includes pre-verification data (post calibration data provided if applicable)
GX5296-CAL-3	GX5296 Calibration/Verification Service - 3 Years. Includes pre-verification data (post calibration data provided if applicable)
GX5296-CAL-5	GX5296 Calibration/Verification Service - 5 Years. Includes pre-verification data (post calibration data provided if applicable)

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