GX5960 SERIES

HIGH PERFORMANCE 50 MHZ DYNAMIC DIGITAL I/O PXI SUBSYSTEM

- High voltage pin electronics with per channel programmability & PMU pin
- Analog bus access for each I/O channel
- Dual level drive / sense, and programmable load on a per channel basis
- 256 timing sets with 4 phases and 4 windows
- Supports up to 528 bi-directional I/O channels

DESCRIPTION

The GX5960 digital subsystem represents the highest level of performance available for PXI-based digital instrumentation and features high performance pin electronics and a timing generator / sequencer in a compact, 6U PXI form factor. The GX5960 series consists of the GX5961 clock generator board with 16 driver / sensor channels and the GX5964 driver / sensor board which supports 32 bi-directional I/O channels. Up to 528 digital I/O channels can be supported by the GX5960 digital subsystem. Each digital channel features a wide drive / sense voltage range of -14 V to +26 V (maximum swing of 24 volts) which can be individually programmed for a drive hi, drive lo, sense hi, sense lo, and a load value (with commutation voltage level) – offering the user complete flexibility when creating test programs and fixtures for multiple UUTs. In addition, each channel offers a parametric measurement unit (PMU) for DC measurements.

FEATURES

The GX5960 offers real-time digital stimulus, record, or expect data modes on all I/O channels. Pattern memory depth is 256K words. Each channel can be configured as an input or output on a per cycle basis. Six drive data formats are supported: NR, R1, R0, RZ, RC, and Complement Surround – providing flexibility to create a variety of bus cycles and waveforms to test board and box level products.

The GX5961 provides timing, input / output synchronization signals, and sequencing as well as 16 I/O channels. Additional channels can be added to the system by installing one or more, GX5964 boards which are interconnected via the PXI local and trigger busses. The GX5961 offers a flexible clock system which allows the module to operate as a timing master to the UUT or be slaved to the UUT's time base or some other external clock.

All pin electronic resources are independent on a per channel basis – offering the user complete flexibility when programming drive / sense levels, source / sink currents, slew rate, skew, or PMU functions. The PMU can operate in the force voltage / measure current or force current / measure voltage mode and is useful for measuring a UUT's DC characteristics. In addition, each I/O channel includes an analog bus relay, which allows each channel to support hybrid channel (digital or analog) measurement capabilities. For analog stimulus / response measurements, the analog bus can be connected to external resources via a dedicated analog bus connector located on the front panel of the module.

DATA SEQUENCER

The GX5961's sequencer supports sequences up to 4096 steps and has 16 loop counters that may be nested. The sequencer supports a variety of sequencing functions including jumps, subroutines, looping, and test inputs. All of the sequencer commands may be programmed using a Graphical Vector Editor, Windows® API commands, or via a script language. The sequencer allows the user to generate test vectors indefinitely at maximum test rates. Internal and external trigger and pause commands are available in several modes.

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TIMING GENERATOR

The GX5961's timing generator supports 256 timing sets which can consist of up to 4 drive phases and 4 sense windows for 4K of sequence steps. The T0 cycle or sequencer period range is programmable from 20 ns to 64 us with the phase and window values programmable from 0 ns to 64 us. This flexibility offers the user the ability to address a wide range of applications including the emulation of complex bus cycles and proprietary digital interfaces.

COMPATIBILITY

The GX5960 subsystem can operate in any 6U PXI chassis that supports an air flow rate of 20 cfm/slot. Power for the pin electronics requires the use of external power supplies or the GX5960 can be used with a Marvin Test Solutions GX7005A / GX7015A / GX7017 PXI chassis which are designed specifically for high performance / high power digital applications and includes the necessary pin electronics power supplies.

SOFTWARE

The board is supplied with GtDio6x, a software package that includes vector editing, a virtual instrument panel, and 32/64-bit DLL driver libraries and documentation. The virtual panel can be used to interactively program and control the instrument from a window that displays the instrument's current settings and status. In addition, interface files are provided to support access to programming tools and languages such as ATEasy, LabView, C/C++, Microsoft Visual Basic®, Delphi, and Pascal. On-Line help file and PDF User's Guide provides documentation that includes instructions for installing, using and programming the board.

Other optional software packages are available to support the importing of CASS digital TPS' or IEEE-1445 .tap files.

APPLICATIONS

- Automatic Test Equipment (ATE)
- High-speed functional digital test
- Vector capture
- Hybrid and digital device test
- Memory testing
- LRU and SRU test

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SPECIFICATIONS

TIMING	
Internal Test Clock or System Clock (T0 Clock)	Ext Reference Clock: 1 MHz to 80 MHz Internal reference clock: 20 MHz
T0_CLK Timing Resolution	1 ns (using the internal dual edge 500 MHz master clock)
Master Clock (Phase and Window Timing Source)	500 MHz (internal oscillator), +/- 50 ppm 40 MHz to 500 MHz (PLL), +/- 50 ppm
Master Clock Reference	Internal: 20 MHz PXI Clock 10 MHz Front panel: 5 MHz to 80 MHz
Timing Set	256 Timing Set groups with 4 Phases, 4 Windows, and 4K sequence steps.
Phase Programming Range (Assert / Return)	0 ns to 64 us (using the 500 MHz master clock)
Window Programming Range (Open / Close)	0 ns to 64 us (using the 500 MHz master clock)
Phase and Window Timing Resolution	1 ns, using the internal 500 MHz master clock
Minimum Phase / Window Pulse Width; Assert / Return or Open / Close	8 ns, using the internal 500 MHz master clock
Phase / Window Reference	Phase: System or Vector Clock (selectable per Seq Step) Window: Vector clock only
Phase / Window Dead Time	10 ns at end of the Vector period (using internal 500 MHz master clock)
Clocks per vector	1 to 256 (selectable per Sequencer Step)
Pause / Vector Clutch	Phase and Window are frozen when Pause is asserted Pause on external event Pause based on phase edge Resume after programmed delay Resume on an external signal or CPU resume
Halt / System Clutch	Halt based on an external signal Halt on error Halt on a Sync pulse (used as a breakpoint)
Pause / Pattern and Halt / System Clutch Sources	PXI trigger lines Aux I/O 1-12 Ch. 1-32 (with mask/expect) , (GX5964/GX5964A) Ch. 1-16 (with mask / expect), (GX5961) Phase 1-4 (for Pause)
DRIVE / SENSE MODES AND CHANNEL I/O	
NOTE: ALL SPECIFICATIONS BASED ON PIN ELECTRONIC RAILS (VCC & VEE) OF +18 V AND -14 V) UNLESS NOTED OTHERWISE	
Number of I/O Channels	16 per card (GX5961) 32 per card (GX5964/GX5964A)
Analog bus	32 relay controlled connections to I/O pin (GX5964/GX5964A) 16 relay controlled connections to I/O pin (GX5961) Individual control for each channel
Test Modes	Dynamic or Static
Data Output Formats (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; selectable on a per channel basis
Drive Data Timing (per channel)	Data assert / de-assert based on Phases 1-4
Capture modes (per channel)	Output: Drive High, Drive Low, Hi-Z Expect: 1, 0, OK, between states, or mask Keep last Toggle last Accumulate CRC-16
Recording modes (per sequence step)	Record errors for programmable inputs that have Good 1 & Good 0 Record errors for inputs that have only a Good 1 Record raw data based on NOT a Good 0 Record raw data based on a Good 1
Error address record	Record address for memory errors 1K deep error memory
Number of Drive and Sense Voltage References	GX5961: 16 Drive Hi / Drive Lo 16 Sense Hi / Sense Lo GX5964/GX5964A: 32 Drive High / Drive Low 32 Sense High / Sense Low
Drive Voltage	Level (for specified Vee and Vcc voltages): Drive High: -9 to +15V

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	Drive Low: -10 to + 11V
	Drive High Range: Vee +5V to Vcc – 3
	Drive Low Range: Vee +4V to Vcc – 7V
	Maximum Drive High and Low Level Range : -14V to +26V
	Drive High and Low Voltage Level Range: Min: 0.5 V p-p Max: 24 V p-p
	Accuracy: +/- 50 mv, < 26 V p-p drive voltage
	Resolution: 16 bits
Output Impedance	12 or 50 ohms, typical
Drive Current	200 mA max per channel 1.6 A per board, max (GX5964/GX5964A) 0.8 A per board, max (GX5961)
Short Circuit Protection	Programmable current level with automatic disable, per channel basis
Slew Rate	0.1 to 1 V/ns, adjustable, programmable on a per channel basis
Channel Skew	320 ps, typical 500 ps max., after calibration, for all channels (Drive and sense)
Channel De-Skew	Range: +/- 5 ns Resolution: 312.5 ps -Programmable on a per channel basis. -Separate deskew control for drive and sense.
Sense Voltage	Range : Sense High: -10 to +11 V Sense Low: -10 to +11 V
	Range Relative to Voltage Rails: Vee +2V to Vcc – 7V
	Maximum Range: -16V to +22V
	Accuracy: +/- 50 mv, < 24 V p-p sense voltage
	Resolution: 16 bits
Input Leakage Current	50 nA, max
Pull-Up / Pull-Down Current Source/ Sink	Current Source: 24 ma, programmable on a per channel basis
	Current Sink: -24 ma, programmable on a per channel basis V commutate: -10 to +11 V., programmable on a per channel basis
	Accuracy: +/-240 uA
	Resolution: 16 bits
Voltage Commutation	Range: Vee +2V to Vcc – 7V
	Accuracy: +/- 50 mv, < 25 V range
	Resolution: 16 bits
Resistive Load	Range: Hi-Z, 250 ohm, 1 K ohm, programmable on a per channel basis
Memory	256K words
EXTERNAL TIMING / CONTROL / SYNC SIGNALS (GX5961 ONLY)	
Sync outputs	2, Start of Sequence; Start of Sequence Step
General purpose aux I/O	12 channels Multiple output selections for internal sequencer / clock signals. Multiple input signal selections
Input aux I/O selections	Synthesizer reference clock, System clock, Break (System Clutch), Halt (Vector Clutch), Sequence Jump signals
Output auxiliary I/O selections	Phase, Window, Syncs, Seq flag, Seq Active, Seq Idle, Burst Active, T0_Clock, Record Active, PXI 10MHz Clk, misc sequencer status signals.
HIGH VOLTAGE I/O (GX5961 ONLY)	
Channels	32 I/O channels
Output Configuration	Open collector
Maximum Voltage	28 VDC
Maximum Current	500 mA per output, 1 A max per byte
Driver Off-State Input Current	65 uA, typical
Measurement Threshold Voltage Range	0 to +28 VDC , threshold level common to all channels
Threshold Resolution	5 mV
Threshold Accuracy	+/- 35mV + 1% of programmed value

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I/O CONNECTIONS	
Analog Bus (For Connections to Analog Instrumentation)	GX5961: 68 position SCSI III Type GX5964: 68 position SCSI III Type GX5964A: 68 position SCSI III Type
I/O	GX5961: 68 position SCSI III Type GX5964: 68 position SCSI III Type GX5964A: (2) 34 pin, dual row IDC connectors
External Control , Timing (GX5961 only)	68 position SCSI III Type
High Voltage I/O (GX5961 only)	68 position SCSI III Type
Diagnostic Probe (GX5961 only)	Probe signal: BNC Probe button / LED: RJ45
Vcc range	+10V to +29V
Vee range	-18V to -3V
Vcc - Vee range	+13V (min) to +32 V (max)
External Vcc / Vee	15 position D-sub, male +18 volts @ 6 A (GX5964/GX5964A) @3 A (GX5961) -14 volts @ 6 A (GX5964/GX5964A) @ 3 A (GX5961)
ANALOG MEASUREMENT BUS	
Number Of Analog I/O Channels	16 per card (GX5961) 32 per card (GX5964/GX5964A)
Control	Independent connect / disconnect to each I/O channel, Independent disconnect relay to each digital channel
Switched Current	Maximum current: 0.5 A per channel
Operating Voltage	30 volts, max
PARAMETRIC MEASUREMENT UNIT (PMU)	
Number Of Parametric Measurement Units	32, one per channel (GX5964/GX5964A) 16, one per channel (GX5961)
Modes	Force voltage, measure current Force current, measure voltage
Force Voltage	Range (for specified Vcc and Vee operating voltages): -10 volts to + 15 volts
	Maximum Range: Vee -4V to Vcc – 3V
	Accuracy : +/- 50 mV, 25 volt range
Force Current	Range : +/- 25 mA FS +/- 200 mA FS
	Resolution: 16 bits
	Accuracy: +/- 50 uA, 25 mA range +/- 2 mA, 200 mA range
Measure Voltage	Voltage Range: I/O: -13 to +15 volts, Vee +1V to Vcc – 3V
	Resolution: 16 bits
	Accuracy: +/- 50 mV, -9 to +13 volt range
	Reading per sec 1 (Aperture 1000 mSec)-500 (Aperture 2 mSec)
Measure Current	Range: +/- 25 ma FS, +/- 200 ma FS
	Accuracy: +/- 50 uA, (25 mA range), +/- 2 mA (200 mA range)
	Reading per sec 1 (Aperture 1000 mSec)-500 (Aperture 2 mSec)
ENVIRONMENTAL	
Operating Temperature	0 to 50° C
Storage Temperature	-20° C to 70° C
Vibration	5 g at 500 Hz
Shock	10 g for 6 ms ½ sine
PHYSICAL CHARACTERISTICS	
Size	6U PXI , single slot
Weight	1.2 lbs (544 g)
CALIBRATION	
Calibration Interval	1 year

NOTE: SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

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ORDERING INFORMATION

GX5961	Timing / Sync Board. Includes 16, 50MHz Digital I/O Channels
GX5964A	50MHz High Performance Dynamic Digital I/O Card. 32 Channels with 256K of Memory per Channel w/ (2) 34 pin IDC connectors
SOFTWARE	
GtDio6x-FIT	Digital File Import Tool Option for GX5296 DIO
GtDio6x-FIT-S1Y	Renew GtDio6x-FIT Subscription and Support (1 Year)
GtDio6x-FIT-S2Y	Renew GtDio6x-FIT Subscription and Support (2 Years)
GtDio6x-FIT-S3Y	Renew GtDio6x-FIT Subscription and Support (3 Years)
GtDio6x-FIT-EXP6	1-year Renewal Expired GtDio6x-FIT Subscription and Support (expired 1 day to 6 months)
GtDio6x-FIT-EXP24	1-year Renewal Expired GtDio6x-FIT Subscription and Support (expired 7 to 24 months)
GtDio6x-FIT-SUP	1-year Support only for GtDiox-FIT (no upgrades)
ACCESSORY	
TS-900e-5G-BMC	Blind mate connectors (one pair), DC - 40 GHz, 2.92mm
GT95021	2 ft. Shielded Cable for all 5xxx/35xx (68 Pin)
GT95021E	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	Shielded Flying Lead Cable for all 5xxx/35xx (68 Pin), 48".
GX98605	6U "Wireless" Scout Adapter for GX5055 (200-Pin Scout Signal Connectors)
GT97110	3' Cable with Female DB-9 Connector for GX5055 / GX5960
GX95963	Power Cable for use with the GX5055 and GX5960
GX95971	Loopback Verification Module for GX596x and GX5055
GX95961	Diagnostic probe for use with the GX5961
CALIBRATION	
GX5961-CAL	GX5961 Calibration/Verification Service. Includes pre-verification data (post calibration data provided if applicable)
GX5961-CAL-3	GX5961 Calibration/Verification Service - 3 Years. Includes pre-verification data (post calibration data provided if applicable)
GX5961-CAL-5	GX5961 Calibration/Verification Service - 5 Years. Includes pre-verification data (post calibration data provided if applicable)
GX5964-CAL	GX5964/GX5964A Calibration/Verification Service. Includes pre-verification data (post calibration data provided if applicable)
GX5964-CAL-3	GX5964/GX5964A Calibration/Verification Service - 3 Years. Includes pre-verification data (post calibration data provided if applicable)
GX5964-CAL-5	GX5964/GX5964A Calibration/Verification Service - 5 Years. Includes pre-verification data (post calibration data provided if applicable)
GX5960-CAL	GX5960 Calibration/Verification Service. Includes pre-verification data (post calibration data provided if applicable)
GX5960-CAL-3	GX5960 Calibration/Verification Service - 3 Years. Includes pre-verification data (post calibration data provided if applicable)
GX5960-CAL-5	GX5960 Calibration/Verification Service - 5 Years. Includes pre-verification data (post calibration data provided if applicable)
GX95962	Calibration Harness Assembly
GX95964	GX5960 Calibration Software (requires additional hardware)
GX5055-5960-CALKIT	Calibration cable kit for use with the GX5055 / GX5960 DIO modules & CalEasy
GX5960A-CALKIT	Calibration cable kit for use with the GX5960A DIO modules & CalEasy
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
CalEasy-GX5960 Series	CalEasy for the GX5961 / GX5964 (Single User License) with One Year Support and Subscription

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