

Specifications

USB-4304



**MEASUREMENT
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Specifications

Typical for 25 °C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

Counter

Refer to the CTS9513-2 data sheet for complete 9513 specifications and operating modes. The CTS9513-2 data sheet is available on our web site at www.mcdaq.com/PDFmanuals/9513A.pdf.

Table 1. Counter specifications

Parameter	Conditions
Counter type	9513
Configuration	Two 9513 devices. Five up/down counters, 16 bits each.
Compatibility	5V/TTL
The 9513 device is programmable for:	
Clock source	Software selectable: External: <ul style="list-style-type: none"> ▪ Counter 1-5 clock inputs ▪ Counter 1-5 gate inputs Internal: <ul style="list-style-type: none"> ▪ Terminal count of previous counter ▪ Internal clock frequency scaler (default; divided by 1)
Gate	Software selectable source: External: <ul style="list-style-type: none"> ▪ Active high or low level or edge, counter 1 – 5 gate input ▪ Active high level previous gate or next gate ▪ All external gate signals (xCTRxGATE) individually pulled up through 47K resistors to +5V. Internal: <ul style="list-style-type: none"> ▪ Active high previous counter terminal count ▪ No gating. (default)
Output	Software selectable: <ul style="list-style-type: none"> ▪ Always low (default) ▪ High pulse on terminal count ▪ Low pulse on terminal count ▪ Toggle on terminal count ▪ Inactive, high impedance at user connector counter # output.
Osc Out	Software selectable source: <ul style="list-style-type: none"> ▪ Counter # input ▪ Gate # input ▪ Prescaled internal clock (default) Software selectable divider: <ul style="list-style-type: none"> ▪ Division by 1-16 (default = 16)
Clock input frequency	20 MHz max (50 nS min period)
Internal clock frequencies (Generated from 12 MHz crystal oscillator.)	Software selectable: <ul style="list-style-type: none"> ▪ 5.0000 MHz (default) ▪ 3.3333 MHz ▪ 1.6667 MHz ▪ 1.0000 MHz
Internal clock frequency prescaler	BCD scaling (Internal clock divided by 1, 10, 100, 1000 or 10000) or Binary scaling (Internal clock divided by 1, 16, 256, 4096 or 65536)
<i>Internal clock generator accuracy</i>	± 2 ppm
12 MHz crystal oscillator accuracy	± 50 ppm
<i>High pulse width (clock input)</i>	25 ns min

Parameter	Conditions
Low pulse width (clock input)	25 ns min
Gate width	70 ns min
Input low voltage	-0.5 V min, 0.8 V max
Input high voltage	2.0 V min, USB +5 V power max
Output low voltage @ $I_{OL} = 4\text{ mA}$	0.4 V max
Output high voltage @ $I_{OH} = 4\text{ mA}$	2.4 V min

Digital input / output

Table 2. Digital I/O specifications

Digital type	Discrete, 5V/TTL compatible
	Output: 74ACT373
	Input: 74ACT373
Number of I/O	8 input, 8 output
Configuration	1 bank of 8 as output, 1 bank of 8 as input
Input high voltage	2.0 V min, 5.5 V absolute max
Input low voltage	0.8 V max, -0.5 V absolute min
Output high voltage	3.3 volts min @ -24 mA ($V_{CC} = 4.5\text{ V}$)
Output low voltage	0.8 volts max @ 10 mA
Data transfer	Programmed I/O
Power-up / reset state	Digital outputs reset to TTL low
Digital I/O transfer rate (system paced)	System dependent, 33 to 1000 port reads/writes or single bit reads/writes per second.
Pull-up/pull-down configuration	User configurable for pull-up/-down through 47 k Ω resistor (Note 1). All pins floating (default)

Note 1: Pull-up and pull-down configurations are available using the DI CTL pin (pin 21 on the P1 connector). The pull down configuration requires the DI CTL pin to be connected to a GND pin (pin 11 on P1 or P2). For a pull up configuration, the DI CTL pin should be connected to a +5V terminal pin (pin 20 on P1 or P2).

Interrupt Input

Table 3. Interrupt specifications

Implementation	Interrupts the microcontroller operation on the device to execute one or more of several firmware routines.
Interrupt characteristics	Rising edge (default) or falling edge triggered, user selectable
Firmware routines	Any or all of the following can be activated by the user: <ul style="list-style-type: none"> ▪ Generate USB event notification ▪ Latch digital inputs (Reading digital inputs returns most recently latched value.) ▪ Latch digital outputs (Most recently written digital output value is latched.) ▪ Save counts on any/all of counters 1-5 on either/both 9513 chips.
Event latency to PC	1-33 ms (4 ms typical)
Maximum event notification rate	33-1000 Hz (system dependent) (Note 2)
Interrupt latency for latch operations	100 μs maximum (80 μs typical)

Note 2: The interrupt rate, when transferring information to the PC (event notification), is limited by the USB to a theoretical limit of 1 kHz. Some systems may not be able to achieve this maximum rate due to differences in USB controller implementation, traffic on the USB, or operating system activity.

Memory

Table 4. Memory specifications

EEPROM	256 bytes EEPROM memory available for external use.
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Microcontroller

Table 5. Microcontroller specifications

Type	High performance 8-bit RISC microcontroller
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USB +5V voltage

Table 6. USB +5V voltage specifications

Parameter	Conditions	Specification
USB +5V (VBUS) input voltage range		4.75 V min. to 5.25 V max.

LEDs

Table 7. USB +5V voltage specifications

Power LED	Indicates that the device's microcontroller has power and is running
Status LED	Indicates that the USB is configured; blinks to indicate USB traffic.

Power

Table 8. Power specifications

Parameter	Conditions	Specification
Supply current (Note 3)	USB enumeration	100 mA max
Supply current	Maximum load	302 mA max.
User +5V output voltage range (pin 20 on P1 or P2)	Connected to self-powered hub. (Note 4)	4.75 V min. to 5.25 V max.
User +5V output current (pin 20 on P1 or P2)	Bus-powered and connected to a self-powered hub. (Note 4)	10 mA max.

Note 3: This is the total current requirement for the USB-4304, which includes up to 14 mA for the Power and Status LEDs, but does not include current sourced from the User +5V output or from the digital output pins.

Note 4: Self-Powered Hub refers to a USB hub with an external power supply. Self-powered hubs allow a connected USB device to draw up to 500 mA.

Root Port Hubs reside in the PC's USB Host Controller. The USB port(s) on your PC are root port hubs. All externally powered root port hubs (desktop PC's) provide up to 500 mA of current for a USB device. Battery-powered root port hubs provide 100 mA or 500 mA, depending upon the manufacturer. A laptop PC that is not connected to an external power adapter is an example of a battery-powered root port hub.

USB specifications

Table 9. USB specifications

USB device type	USB 2.0 (full-speed)
Device compatibility	USB 1.1, USB 2.0
Power requirements	Self-powered, 500 mA consumption max
USB cable type	<i>A-B cable, UL type AWM 2725 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D-)</i>
USB cable length	3 meters max.

Environmental

Table 10. Environmental specifications

Operating temperature range	0 to 60 ° C
Storage temperature range	-40 to 85 ° C
Humidity	0 to 90% non-condensing

Mechanical

Table 11. Mechanical specifications

Dimensions	157.6 mm (L) x 92.7 mm (W) x 15.2 mm (H)
User connection length	3 meters max.

Main connectors and pin out

Main connectors P1 and P2 are compatible with the PCI-CTR10 and the CIO-CTR10, with the exception of the lack of DIO and a second interrupt pin on P2.

Table 12. Main connector specifications

Connector type	37 pin shielded D-type, right angle
Compatible cables	<ul style="list-style-type: none"> ▪ C37FF-x, unshielded ribbon cable ▪ C37FFS-x, shielded round cable
Compatible accessory products	CIO-MINI37 CIO-MINI37-VERT CIO-TERMINAL SCB-37

P1 and P2 pin out

Table 13. Connector P1 pin out

Pin	Signal Name	Pin Description
1	INT	Interrupt Input
2	NC	Not Connected
3	DO7	Digital Output
4	DO6	Digital Output
5	DO5	Digital Output
6	DO4	Digital Output
7	DO3	Digital Output
8	DO2	Digital Output
9	DO1	Digital Output
10	DO0	Digital Output
11	GND	Ground
12	1CTR5GATE	Chip 1 Counter 5 Gate
13	1CTR5IN	Chip 1 Counter 5 input
14	1CTR4GATE	Chip 1 Counter 4 Gate
15	1CTR4IN	Chip 1 Counter 4 input
16	1CTR3GATE	Chip 1 Counter 3 Gate
17	1CTR3IN	Chip 1 Counter 3 input
18	1CTR2GATE	Chip 1 Counter 2 Gate
19	1CTR2IN	Chip 1 Counter 2 input
20	+5V	+5V Output
21	DI CTL	Pull-up/down connection
22	DI7	Digital Input
23	DI6	Digital Input
24	DI5	Digital Input
25	DI4	Digital Input
26	DI3	Digital Input
27	DI2	Digital Input
28	DI1	Digital Input
29	DI0	Digital Input
30	1OSC OUT	Chip 1 Oscillator Output
31	1CTR5OUT	Chip 1 Counter 5 output
32	1CTR4OUT	Chip 1 Counter 4 output
33	1CTR3OUT	Chip 1 Counter 3 output
34	1CTR2OUT	Chip 1 Counter 2 output
35	1CTR1OUT	Chip 1 Counter 1 output
36	1CTR1IN	Chip 1 Counter 1 input
37	1CTR1GATE	Chip 1 Counter 1 Gate

Table 14. Connector P2 pin out

Pin	Signal Name	Pin Description
1	NC	Not Connected
2	NC	Not Connected
3	NC	Not Connected
4	NC	Not Connected
5	NC	Not Connected
6	NC	Not Connected
7	NC	Not Connected
8	NC	Not Connected
9	NC	Not Connected
10	NC	Not Connected
11	GND	Ground
12	2CTR5GATE	Chip 2 Counter 5 Gate
13	2CTR5IN	Chip 2 Counter 5 input
14	2CTR4GATE	Chip 2 Counter 4 Gate
15	2CTR4IN	Chip 2 Counter 4 input
16	2CTR3GATE	Chip 2 Counter 3 Gate
17	2CTR3IN	Chip 2 Counter 3 input
18	2CTR2GATE	Chip 2 Counter 2 Gate
19	2CTR2IN	Chip 2 Counter 2 input
20	+5V	+5V Output
21	NC	Not Connected
22	NC	Not Connected
23	NC	Not Connected
24	NC	Not Connected
25	NC	Not Connected
26	NC	Not Connected
27	NC	Not Connected
28	NC	Not Connected
29	NC	Not Connected
30	2OSC OUT	Chip 2 Oscillator Output
31	2CTR5OUT	Chip 2 Counter 5 output
32	2CTR4OUT	Chip 2 Counter 4 output
33	2CTR3OUT	Chip 2 Counter 3 output
34	2CTR2OUT	Chip 2 Counter 2 output
35	2CTR1OUT	Chip 2 Counter 1 output
36	2CTR1IN	Chip 2 Counter 1 input
37	2CTR1GATE	Chip 2 Counter 1 Gate

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