

USB-4301

Specifications



**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.mcdda.com/PDFmanuals/9513A.pdf.

Table 1. Counter specifications

Parameter	Conditions
Counter type	9513
Configuration	One 9513 device. 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 (GATx) individually pulled up through 47 K resistors to +5 V. 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, 0.8V max
Input high voltage	2.0 V min, USB +5V power max
Output low voltage @ $I_{OL}=4$ mA	0.4 V max
Output high voltage @ $I_{OH}=4$ 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 ($V_{CC} = 4.5$ 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 terminal block pin 19. The pull-down configuration requires the DI CTL pin (pin 19) to be connected to a GND pin (pin 10, 20, 38, or 48). For a pull-up configuration, the DI CTL pin should be connected to a +5V terminal pin (pin 8 or 18).

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.
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 μ s maximum (80 μ s typical)

Note 2: The interrupt rate, when transferring information to the PC (event notification), is limited by the USB to a theoretical limit of 1kHz. 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 (terminal block pin 8 and 18)	Connected to self-powered hub. (Note 4)	4.75 V min. to 5.25 V max.
User +5V output current (terminal block pin 8 and pin 18)	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-4301 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	127 mm (L) x 88.9 mm (W) x 35.56 (H)
User connection length	3 meters max.

Screw terminal connector type and pin out

Table 12. Screw terminal connector specifications

Connector type	Screw terminal
Wire gauge range	16 AWG to 30 AWG

Screw terminal pin out

Table 13. Screw terminal pin out

Pin	Signal Name	Pin Description	Pin	Signal Name	Pin Description
1	INP1	Counter 1 input	29	INP3	Counter 3 input
2	GAT1	Counter 1 gate	30	GAT3	Counter 3 gate
3	OUT1	Counter 1 output	31	OUT3	Counter 3 output
4	INP2	Counter 2 input	32	INP4	Counter 4 input
5	GAT2	Counter 2 gate	33	GAT4	Counter 4 gate
6	OUT2	Counter 2 output	34	OUT4	Counter 4 output
7	OSC	Oscillator output	35	INP5	Counter 5 input
8	+5V	+5V output	36	GAT5	Counter 5 gate
9	INT	Interrupt input	37	OUT5	Counter 5 output
10	GND	Ground	38	GND	Ground
11	RSVD	Do not connect	39	RSVD	Do not connect
12	RSVD	Do not connect	40	RSVD	Do not connect
13	RSVD	Do not connect	41	RSVD	Do not connect
14	RSVD	Do not connect	42	RSVD	Do not connect
15	RSVD	Do not connect	43	RSVD	Do not connect
16	RSVD	Do not connect	44	RSVD	Do not connect
17	RSVD	Do not connect	45	RSVD	Do not connect
18	+5V	+5V output	46	RSVD	Do not connect
19	DI CTL	Pull-up/down connection	47	RSVD	Do not connect
20	GND	Ground	48	GND	Ground
21	DI0	Digital input	49	DO0	Digital output
22	DI1	Digital input	50	DO1	Digital output
23	DI2	Digital input	51	DO2	Digital output
24	DI3	Digital input	52	DO3	Digital output
25	DI4	Digital input	53	DO4	Digital output
26	DI5	Digital input	54	DO5	Digital output
27	DI6	Digital input	55	DO6	Digital output
28	DI7	Digital input	56	DO7	Digital output

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