CS-279

Floppy Disk Logic Circuit and Stepper Motor Driver

Description

The CS-279 is a floppy disk logic circuit with on chip bipolar stepper motor drivers and clamp diodes. It provides all the logic functions needed for a standard disk drive. The CS-279 is compatible with the CS-570, CS-3471/CS-3470A or other Read/Write circuits. The CS-279 incorporates Schmitt Trigger inputs for clean operation. The CS-279 also has high current open collector outputs capable of connecting directly back to the host computer or interface.

The three comparators on the circuit can be connected to photo sensors or switches to detect INDEX PULSES, TRACK-00 and WRITE PROTECTION. An on chip pull-down resistor provides a current path for the sensors so no additional components are necessary.

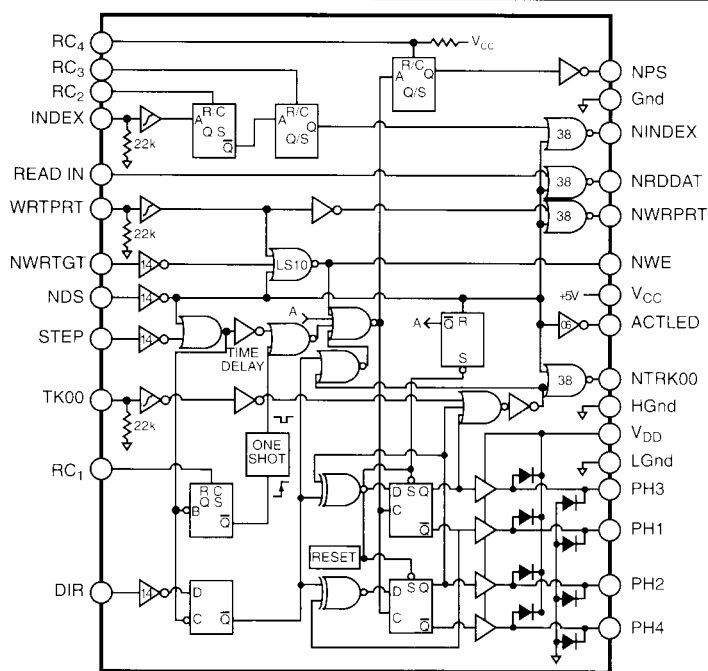The Stepper Logic is capable of full or half stepping. An on chip, externally programmable one shot determines the time delay for the ghost pulse. This can easily be defeated by grounding the one shot pin. The direction input allows the circuit to step the motor in or out. Two high current bridge outputs are provided and can be directly connected to the bipolar stepper motor. On chip diodes provide the protection needed for the IC. This bipolar stepper motor driver is capable of driving up to 275mA per phase. A power saving circuit is provided and may be used to reduce the power consumption when the motor has finished stepping. Three grounds have been used on the chip to eliminate cross-talk between the stepper driver and the rest of the circuit.

The CS-279 also has the necessary logic to inhibit the stepper circuit during the write mode. The write enable output only goes low when all the requirements of writing are met.
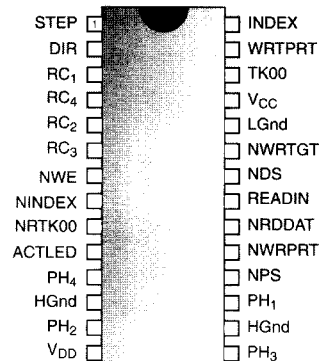
Features

- Stepper Logic, Full or Half Stepping
- On Chip Bipolar Stepper Motor Driver, Up to 275mA
- On Chip Clamp Diodes
- Power Saving Circuitry
- Direct Connection of Sensors: Such as INDEX, TRACK-00 and WRITE PROTECT
- High Current Outputs for Direct Connection to the Host Controller
- LED Output Driver, Active During Drive Select

Package Options

28L PDIP

STEP	INDEX
DIR	WRTPRT
RC$_1$	TK00
RC$_4$	V$_{CC}$
RC$_2$	LGnd
RC$_3$	NWRTGT
NWE	NDS
NINDEX	READIN
NRTK00	NRDDAT
ACTLED	NWRPRT
PH$_4$	NPS
HGnd	PH$_1$
PH$_2$	HGnd
V$_{DD}$	PH$_3$

28L PLCC

Block Diagram
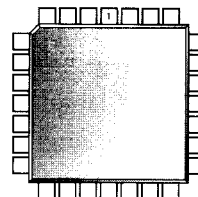
CSC ™ CHERRY SEMICONDUCTOR

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Absolute Maximum Ratings

Logic Supply Voltage 7.0V
Analog Supply Voltage 15.0V
Input Voltage ....-0.3 to V_{CC} + 0.3V
Storage Temperature...-40 to +150°C
Operating Temperature..0 to 70°C
Power Dissipation (Continuous, T_A = 50°C)..2.0 Watts

Electrical Characteristics: V_{CC} = 5.0V; V_{SS} = 12.0V, T_A = 25°C unless otherwise specified

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
■ DC Characteristics					
Logic Supply		4.5		5.5	V
Stepper Supply		4.0		13.2	V
Logic Current				150	mA
Stepper Supply	No load			75	mA
Rising Edge Schmitt Trip Point		1.4		2.0	V
Falling Edge Schmitt Trip Point		0.5		1.0	V
Schmitt Hysteresis		400		800	mV
High Level Schmitt Input Current	V_{IN} = 2.7V			20	μA
Low Level Schmitt Input Current	V_{IN} = 0.4V			-400	μA
Rising Comparator Trip Point		1.6		2.2	V
Falling Comparator Trip Point		1.1		1.7	V
Comparator Hysteresis (Note 5)		200		400	mV
Comparator Pulldown (Note 5)		13.0		29.7	kΩ
Read in High Trip Point		2			V
Read in Low Trip Point				0.8	V
Read in High Level Input Current	V_{IN} = 2.7V			20	μA
Read in Low Level Input Current	V_{IN} = 0.4V			-1.6	mA
Open Collector Output High Leakage Current	V_{OH} = 5V			250	μA
Open Collector Output Voltage	I_O = 40mA			0.4	V
NWE Output High Voltage	I_O = -400μA	2.7	3.4		V
NWE Output Low Voltage	I_O = 4mA			0.4	V
Total Phase Output Saturation Voltage	I_{OUT} = ±275mA			3.4	V
Positive Phase Clamp	I_{OUT} = 275mA			2.0	V
Negative Phase Clamp	I_{OUT} = -275mA	-2.0			V
■ AC Characteristics					
Power Save Pulse Width (Note 1)	C4 = 0.1μF	30	50	125	ms
Index Pulse Width (Note 2)	R3 = 81k C3 = 0.1μf	2.8		4.3	ms

Electrical Characteristics: continued

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT

■ **AC Characteristics (continued)**

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Index to Data Pulse Width (Note 3)	R2 = 1.25k to 50k; C2 = 0.1μF	50		2000	μs
Step One Shot Pulse Width (Note 4)	R1 = 75kΩ, C1 = 0.1μF	2.4	3.0	3.6	ms
Read in Pulse		1			μs
NRDDAT Propogation Delay	V_{OUT}, Low to High			750	ns
	V_{OUT}, High to Low			100	ns
Input Step Pulse Width		1			μs
V_{SS} & V_{CC} Supply Ripply	1Hz < f < 1MHz			100	mV

NOTES:

1. Minimum Pulse Width is specified over the operating temperature range.

2. Index Pulse Width is specified over the operating temperature range.

3. Index to Data Pulse Width shall remain within ±50 μs of room temperature value over the temperature range of 10°C to 46°C. Also the following equation is true: $0.320\,RC \le PW \le 0.480\,RC$.

4. Step One Shot Pulse Width shall not vary be more than ±20% over the temperature range of 10°C to 46°C. Grounding the RC_1 pin shall inhibit this function.

5. The input current at the positive threshold shall not vary more than 2000 PPM/°C over the normal operating range.

Package Pin Description

PACKAGE PIN #	PIN SYMBOL	FUNCTION

28L PDIP & 28L PLCC

Input Pins

26	TK00	**TRACK 00** is a comparator input with hysterisis. An internal 22kΩ pull down resistor is provided. A "0" on this input causes NTRK00 output to go low.
27	WRTPRT	**WRITE PROTECT** is a comparator input with hysteresis. An internal 22kΩ pulldown resistor is provided. A "0" on this input causes NWE to go high and NWRPRT to go low.
23	NWRTGT	**NOT WRITE GATE** is a Schmitt trigger input. A "0" on this input disables the stepper circuitry and causes a "0" on the NWE output.
22	NDS	**NOT DRIVE SELECT** is a Schmitt trigger input. A "0" on this input enables the IC.
28	INDEX	**INDEX** is a comparator input with a 22kΩ pulldown resistor provided. A positive transition on this input fires the RC_2 oneshot. After RC_2 times out the RC_3 oneshot fires during which time the NINDEX goes low.
2	DIR	**DIRECTION** is a Schmitt trigger input. The polarity of this input determines the direction which the stepper motor moves. This signal is latched in by the step signal.
1	STEP	**STEP** input is a Schmitt input. The positive going trailing edge clocks the direction flip-flop, steps the stepper motor and triggers the stepper one shot.
21	READIN	**READ INPUT** input is a TTL input. A "1" on this input causes a low condition on the NRDDAT output.

PACKAGE PIN #	PIN SYMBOL	FUNCTION
28L PDIP & 28L PLCC		

Input Pins (continued)

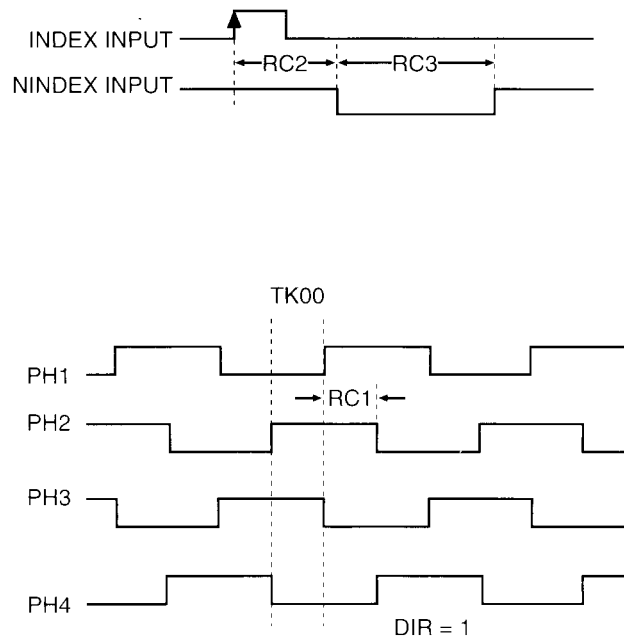|		
3	RC_1	RC_1 is the stepper one shot. This one shot shall trigger on the trailing edge of the step pulse. If RC_1 is grounded the one shot is inhibited.
5	RC_2	RC_2 is the Index to Data one shot. This one shot shall trigger on the leading edge of the Index pulse.
6	RC_3	RC_3 is the Index pulse width one shot. This one shot shall trigger on the trailing edge of the Index to Data one shot.
4	RC_4	RC_4 is the Power Save one shot. This one shot shall trigger on the trailing edge of the Step pulse.
25	V_{CC}	V_{CC} is the +5V supply voltage to the IC.
14	V_{DD}	V_{DD} is the +12V supply voltage to the stepper motor outputs.
12, 16	HGnd	**HIGH GROUND** High current output ground.
24	LGnd	**LOW GROUND** Low current logic ground.

Output Pins

7	NWE	**NOT WRITE ENABLE** is a TTL type output. This output turns on when NWRTGT is a "0" and WRTPRT is a "1".
9	NRTK00	**NOT TRACK 00** is a 40mA open collector output. This output is turned on when TK00 is a "0".
18	NPS	**NOT POWER SAVE** is a 40mA open collector output. This output is turned on when the Power Save one shot triggers during the step Pulse.
8	NINDEX	**NOT INDEX** is a 40mA open collector output. This output turns on when the Index Pulse Width one shot triggers.
10	ACTLED	**THE ACTIVITY LED** is a 30mA open collector output. This output turns on when the NDS input is low.
19	NWRPRT	**NOT WRITE PROTECT** is a 40mA open collector output. This output turns on when WRTPRT is low.
20	NRDDAT	**NOT READ DATA** is a 40mA open collector output. This output turns on when READIN is high.
17	PH_1	**PHASE 1** is a 275mA push pull output. This output reflects the $\overline{Q}$ of one of the stepper motor flip-flops.
13	PH_2	**PHASE 2** is a 275mA push pull output. This output reflects the Q of one of the stepper motor flip-flops.
15	PH_3	**PHASE 3** is a 275mA push pull output. This output reflects the Q of one of the stepper motor flip-flops.
11	PH_4	**PHASE 4** is a 275mA push pull output. This output reflects the $\overline{Q}$ of one of the stepper motor flip-flops.

Application Diagram

5V

150Ω 150Ω

FROM HOST

FROM SENSORS

STEP INDEX

DIR WRTPRT

75k

5V RC₁ TK00

0.1μF

RC₄ V_CC 5V

CS-279

0.1μF

RC₂ LLGnd 150Ω 150Ω

0.1μF

RC₃ NWRTGT FROM HOST

81k 0.1μF

TO R/W CIRCUIT NWE NDS

NINDEX READ IN FROM R/W CIRCUIT

TO HOST NTRK00 NRDDAT

5V ACTLED NWRTPRT TO HOST

150Ω

IN USE PH4 NPS

1/2 STEPPER MOTOR

HLGnd PH1

PH2 HLGnd 1/2 STEPPER MOTOR

V_DD PH3

12V

4.7kΩ

820Ω

5V

47μF

Timing Diagram

INDEX INPUT

←RC2→ ←RC3→

NINDEX INPUT

TK00

PH1

→RC1←

PH2

PH3

PH4

DIR = 1

5
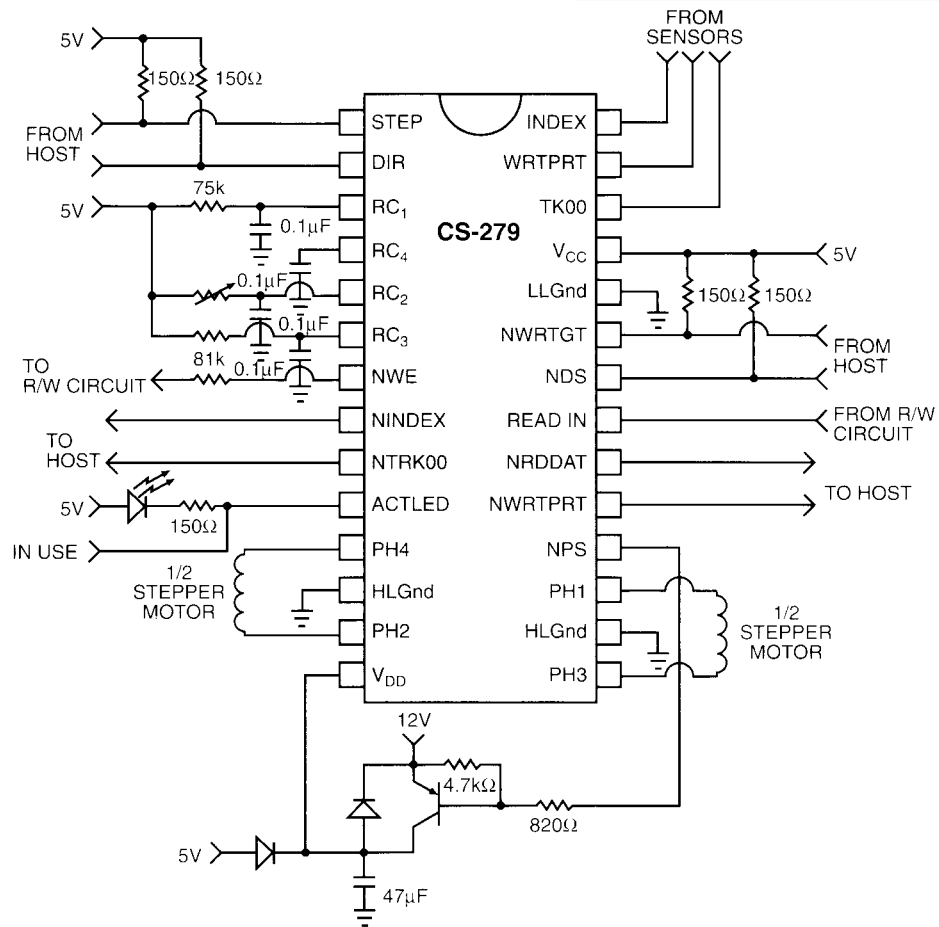
PACKAGE DIMENSIONS IN mm (INCHES)

			D	
Lead Count	Metric		English	
	Max	Min	Max	Min
28 Lead PDIP	36.96	36.70	1.455	1.445
28 Lead PLCC (A)	12.57	12.32	.495	.485
28 Lead PLCC (B)	11.53	11.43	.454	.450

PACKAGE THERMAL DATA

Thermal Data		28L PDIP	28L PLCC	
$R\Theta_{JC}$	typ	23	18	°C/W
$R\Theta_{JA}$	typ	55	70	°C/W

28L PDIP

13.97 (.550)
13.46 (.530)

15.88 (.625)
15.11 (.595)

1.65 (.065)
1.40 (.055)

2.54 (.100)

4.83 (.190) MAX

0.38 (.015) MIN.

0.51 (.020)
0.41 (.016)

D

28L PLCC

A

B

A B

3.96 (.156)
3.71 (.146)

1.42 (.056)
1.07 (.042)

.813 (.032)
.660 (.026)

1.27 (.050)

4.57 (.180)
4.19 (.165)
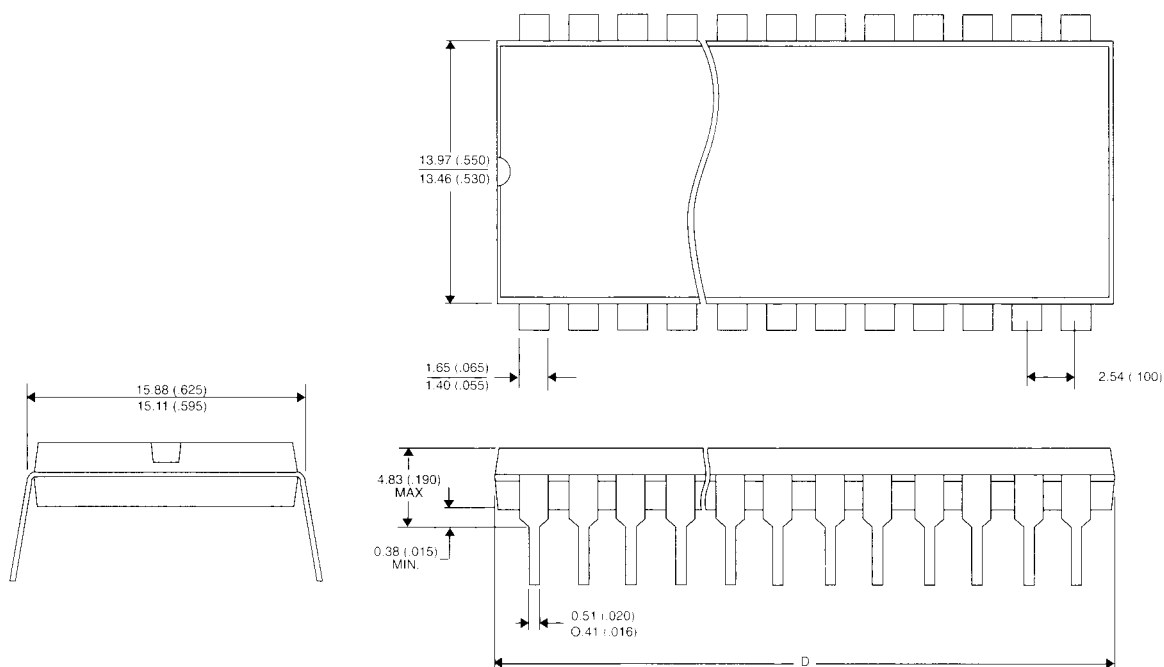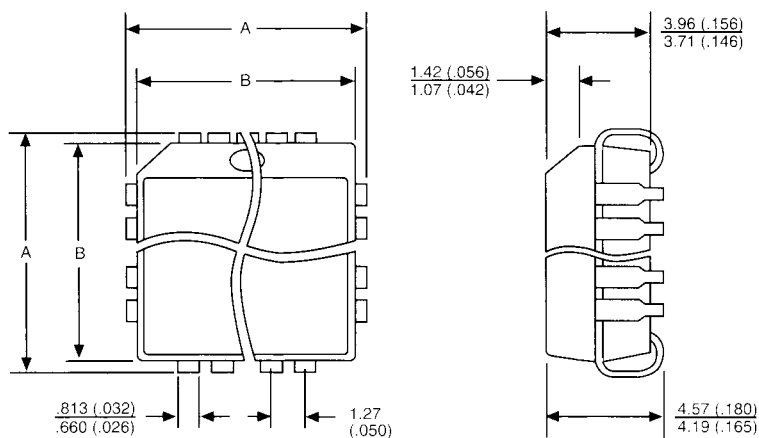
Ordering Information

Part Number	Description
CS-279N28	28 Lead PDIP
CS279FN28	28 Lead PLCC