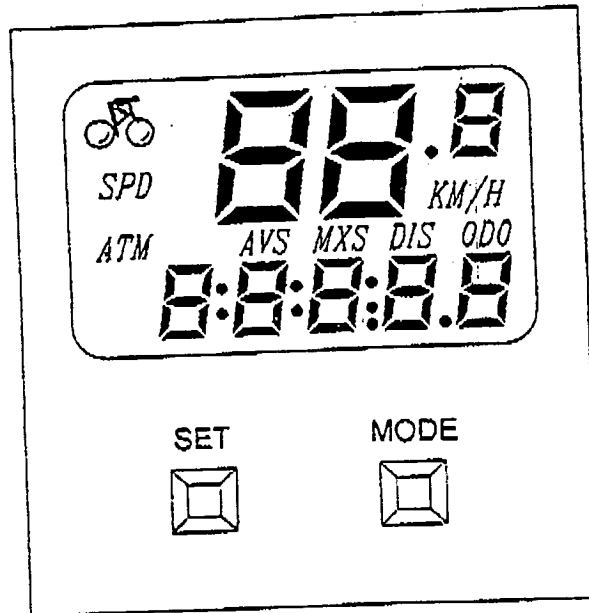


SS0301

CYCLOCOMPUTER 0.0 ~ 99.9 KM/H (MILE/H)



Features:

1. 1.5 Volts operating voltage
3. Dual-line display
4. Current speed in Kilometer per Hour (KM/H) or Mile per Hour (M/H) at system reset
5. Speedometer (0.0 to 99.9 km/h or mile/h) with a resolution of 0.5 km/h or mile/h
6. Tripmeter (0.00 to 999.99 km or mile) measuring elapsed distance
7. Odometer (0.0 to 9999.9 km or mile) measuring cumulated elapsed distance
8. Timer (0:00:00 to 9:59:59) started/stopped automatically by the wheel motion or manually by pressing 'Set' key
10. Average Speed (0.0 to 99.9 km/h or mile/h)
11. Maximum Speed (0.0 to 99.9 km/h or mile/h)
12. Wheel Size Selection (in circumference ranging from 0 to 2999 mm) with a default value of 2124 mm at system reset

SUNSTAR 深圳市商斯达电子有限公司
SHENZHEN SUNSTAR ELECTRONICS CO.,LTD.


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传感器
单片机

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I. General Description

The SS0301 is a low-power CMOS single chip microcontroller specially programmed to be used in a cyclometer, which requires low power operation. There are totally six functions available on this chip, speedometer for measuring the current speed of a bicycle, tripmeter for measuring elapsed distance, odometer for cumulatively measuring the total distance travelled since the last system reset, timer for measuring the elapsed time (Stopwatch) or the riding time when the bicycle being in motion (Auto-timer), average speed for estimating an average speed of a bicycle and maximum speed for recording the peak speed encountered in the whole trip. The speedometer has a range of 0.0 to 99.9 km/h or mile/h with a resolution up to 0.5 km/h or mile/h. Together with a standard LCD, the SS0301 displays two functions simultaneously. One is the real-time speedometer while the other one is selected by the 'mode' toggle input.

II. Key Functions

Key	Terminal	Level	Functions
Mode	S1, S4	Toggle	<ul style="list-style-type: none"> Confirm unit setting Confirm timer operating mode setting Confirm individual digit setting of wheel size and switch to the next higher significant digit Change mode 
Set	S2, S3	Toggle	<ul style="list-style-type: none"> Hold for reset timer in TM mode Hold for reset distance in DIS mode Hold for timer operating mode setting and wheel size setting in ODO mode Alternate display of flashing KM/H or M/H in unit setting Alternate display of AUTO or blank in timer operating mode setting Advance flashing digit in wheel size setting Hold for auto advance flashing digit in wheel size setting Start/Stop timer in manual mode (Stopwatch)

Press both keys together and hold them for two seconds at any time to enter the initial setting mode that prompts inputs of unit setting, timer operating mode setting and wheel size setting, as that occur after initial power supply.

III. Mode Description

3.1 Initial Setting Mode (System Reset)

When the system is first powered or both 'Set' and 'Mode' keys are held for 2 seconds, the initial setting mode is entered. In this mode, all LCD segments will first be turned on for a second and then turned off, leaving only a blinking 'M/H' symbol displayed on the screen. At this moment, press the 'Set' key to toggle blinking of either 'M/H' or 'KM/H', which indicates the unit used in the whole speed measurement. Press the 'Mode' key to confirm the unit setting. After that, the system is switched to the timer operating mode setting (*) and then the wheel size setting (***) with a wheel size input ranging from 0 to 2999 mm. After all settings have been completed, the speed measurement starts and the odometer mode is entered initially.

3.2 Speedometer Mode

This function is displayed at any time after the wheel size setting is completed. The speed of the bicycle is shown on the upper line of the display. The displayed value has a range of 0.0 to 99.9 km/h or mile/h with a resolution of 0.5 km/h or mile/h. The measurable range depends on the wheel size selected. For the default wheel size of 2124 mm, it is ranging from 4 to 80 km/h (or 2.5 to 50 mile/h). The speedometer is activated by the wheel rotation automatically and cannot be disabled or reset manually by the user.

3.3 Odometer Mode (ODO)

Odometer mode is indicated by 'ODO' icon. In this mode, the cyclometer accumulates the distance travelled in each trip since the last system reset. The value is shown on the lower line of the display. It can only be reset at system reset. When 'Set' key is pressed and held for 2 seconds, the timer operating mode setting (*) will be entered, followed by the wheel size setting (**). The maximum cumulated value is limited to 9999.9 km or mile. Once this value is exceeded, the odometer will be reset to zero.

3.4 Timer Mode (TM)

Timer mode is indicated by 'TM' icon. In this mode, there are two operations with the timer mode exclusively selected in the timer operating mode setting. When the timer functions as an auto-timer, it is started/stopped automatically by the wheel rotation. When the timer functions as a stop watch, it can be started/stopped manually by pressing the 'Set' key. The timer value can be reset by holding the 'Set' key for 2 seconds or at system reset. At the same time the tripmeter, the average speed and the maximum speed will also be reset to zero. The range of the timer in either operation is from 0:00:00 to 9:59:59. Once the upper bound is exceeded, the timer will be reset to zero.

3.5 Average Speed Mode (AVS)

Average speed mode is indicated by 'AVS' icon. In this mode, the average speed of the bicycle is calculated. The value is updated every 10 seconds when the bicycle is in motion. It can be reset by resetting the tripmeter or the timer accordingly. At system reset, it is intrinsically reset to zero. The range of displayed value is from 0.0 to 99.9 km/h or mile/h.

3.6 Maximum Speed Mode (MXS)

Maximum speed mode is indicated by 'MXS' icon. In this mode, the peak speed encountered in a trip is recorded. The value will be updated when the current speed exceeds the maximum speed previously kept. It can be reset by resetting the timer accordingly. At system reset, it is intrinsically reset to zero. The displayed value has a range as same as that of the speedometer.

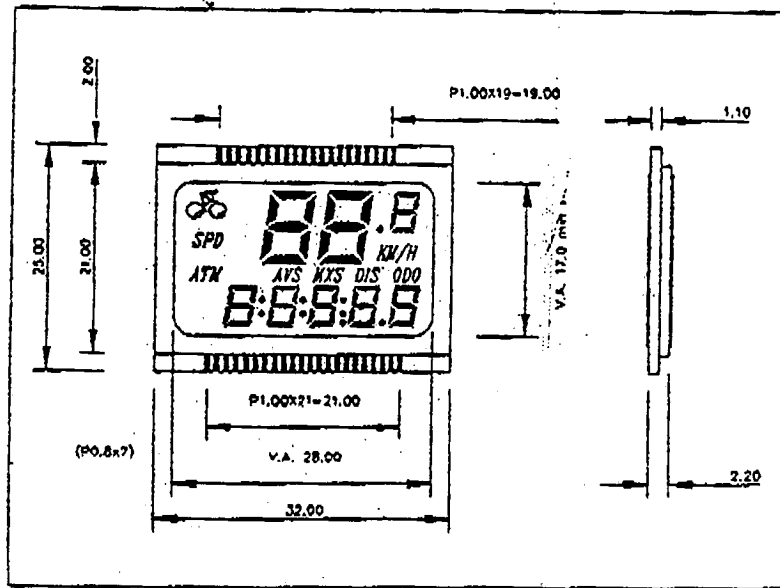
3.7 Tripmeter Mode (DIS)

Tripmeter mode is indicated by 'DIS' icon. In this mode, the distance elapsed by the bicycle is recorded. Unlike the 'ODO' function, the distance recorded in this mode can be reset by pressing the 'Set' key for 2 seconds, by resetting the timer or at system reset. The distance measurement starts only when the timer is running in either operation. When the timer is stopped, the distance measurement will also be stopped with the measured distance retained. The range of displayed value is from 0.00 to 999.99 km or mile. Once the upper bound is exceeded, the tripmeter will be reset to zero.

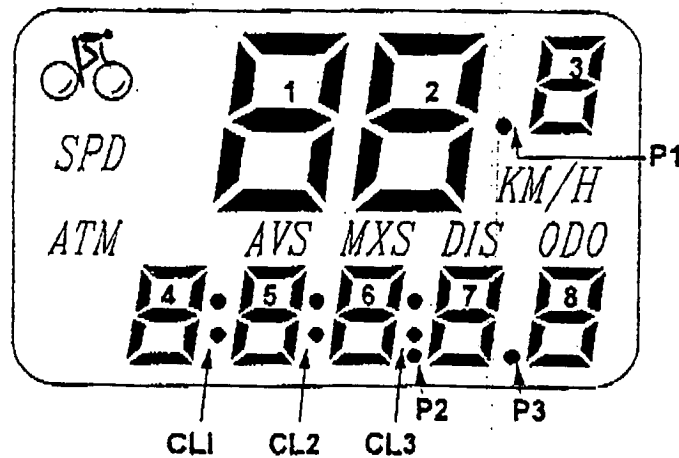
- * An 'AUTO' message is displayed on the screen, which indicates the timer will be operated as Auto-Timer. Press the 'Set' key to turn off this message or vice versa. A blank means the timer will be operated as Stop Watch. Press the 'Mode' key to confirm the selection of timer operation and exit the setting. An 'A' preceding the 'TM' will be indicated in normal run when 'AUTO' is selected.
- ** A default value of '2124' will be displayed upon initialization, otherwise the pre-set value will be retrieved instead. The least significant digit is blinking at first. Press the 'Set' key to advance the digit and hold for advancing it automatically. The ranges for the lower three digits are from 0 to 9 while that for the upper one is from 0 to 2. Press the 'Mode' key to confirm the digit setting and switch to the setting of the next higher significant digit. The setting will be exited once after all the four digits have been confirmed.

IV. LCD Information

4.1 LCD Dimensions



4.2 LCD Segment Layout

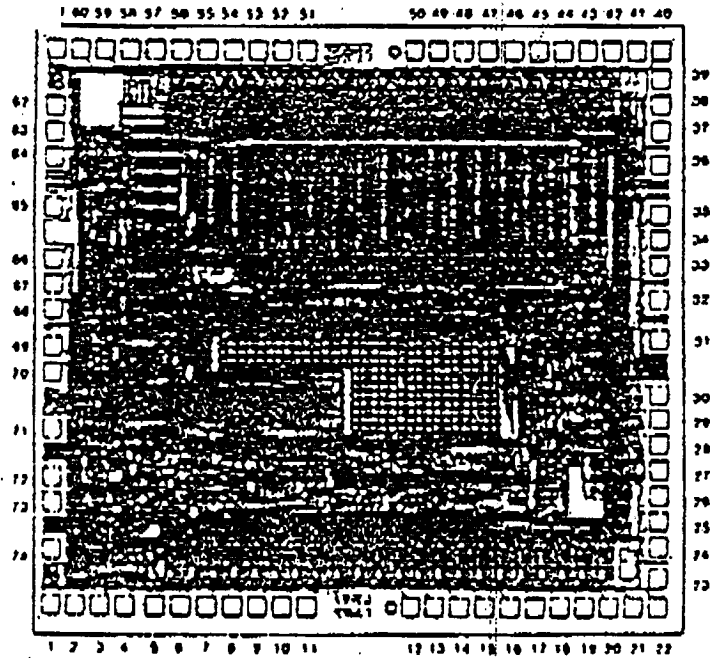


4.3 LCD Segment Assignment Table

LCD Pin No.	Chip Pin Name	COM1 Group	COM2 Group
1	COM2	---	COM2
2	SEG2	4E	4F
3	SEG3	4D	4G
4	SEG4	4C	4B
5	SEG5	CL1	4A
6	SEG6	5E	5F
7	SEG7	5D	5G
8	SEG8	5C	5B
9	SEG9	---	5A
10	SEG10	ODO	6A
11	SEG11	6E	6F
12	SEG12	6D	6G
13	SEG13	6C	6B
14	SEG14	P2	CL3
15	SEG15	7E	7F
16	SEG16	7D	7G
17	SEG17	7C	7B
18	SEG18	P3	7A
19	SEG19	8E	8F
20	SEG20	8D	8G
21	SEG21	8C	8B
22	SEG22	DIS	8A
23	SEG23	MXS	---
24	SEG23	---	AVS
25	---	---	---
26	SEG24	M/H	K
27	SEG27	3B	3C
28	SEG28	3A	3G
29	SEG29	3F	3E
30	SEG30	P1	3D
31	SEG31	2B	2C
32	SEG32	2A	2G
33	SEG33	2F	2E
34	SEG34	---	2D
35	SEG35	1B	1C
36	SEG36	1A	1G
37	SEG37	1F	1E
38	SEG38	---	1D
39	SEG39	A	TM
40	SEG40	SPD	CL2
41	SEG41	AM	PM
42	COM1	COM1	---

V. Chip Pad Information

5.1 Pad Layout



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5.2 Pad Coordinates

PAD	SIGNAL	X-POS.	Y-POS.
1	COM2	-2190	-1965
2	SEG1	-2010	-1965
3	SEG2	-1830	-1965
4	SEG3	-1650	-1965
5	SEG4	-1436	-1965
6	SEG5	-1256	-1965
7	SEG6	-1075	-1965
8	SEG7	-896	-1965
9	SEG8	-716	-1965
10	SEG9	-536	-1965
11	SEG10	-356	-1965
12	SEG11	390	-1965
13	SEG12	570	-1965
14	SEG13	750	-1965
15	SEG14	930	-1965
16	SEG15	1110	-1965
17	SEG16	1290	-1965
18	SEG17	1470	-1965
19	SEG18	1650	-1965
20	SEG19	1830	-1965
21	SEG20	2010	-1965
22	SEG21	2190	-1965
23	SEG22	2190	-1763
24	N.C.	2190	-1535
25	N.C.	2190	-1335
26	N.C.	2190	-1175
27	N.C.	2190	-995
28	N.C.	2190	-815
29	N.C.	2190	-635
30	AC	2190	-455
31	N.C.	2190	-67
32	N.C.	2190	209
33	VSS1	2190	457
34	S4	2190	637
35	S1	2190	817
36	VCM	2190	1169
37	VCP	2190	1407

PAD	SIGNAL	X-POS.	Y-POS.
38	VSS2	2190	1587
39	SEG23	2190	1767
40	SEG24	2190	1965
41	SEG25	2010	1965
42	SEG26	1830	1965
43	SEG27	1650	1965
44	SEG28	1470	1965
45	SEG29	1290	1965
46	SEG30	1110	1965
47	SEG31	930	1965
48	SEG32	750	1965
49	SEG33	570	1965
50	SEG34	390	1965
51	SEG35	-390	1965
52	SEG36	-570	1965
53	SEG37	-750	1965
54	SEG38	-930	1965
55	SEG39	-1110	1965
56	SEG40	-1290	1965
57	SEG41	-1470	1965
58	N.C.	-1650	1965
59	N.C.	-1830	1965
60	N.C.	-2010	1965
61	COM1	-2190	1965
62	N.C.	-2190	1565
63	VDD	-2190	1385
64	XT	-2190	1205
65	XT	-2190	857
66	S2	-2190	489
67	S3	-2190	309
68	VEE	-2190	129
69	K1	-2190	-131
70	K2	-2190	-311
71	M1	-2190	-721
72	N.C.	-2190	-1057
73	M3	-2190	-1237
74	N.C.	-2190	-1537

CHIP SIZE - 4.68 X 4.23 [mm]

PAD SIZE - 110 X 110 [μ m]

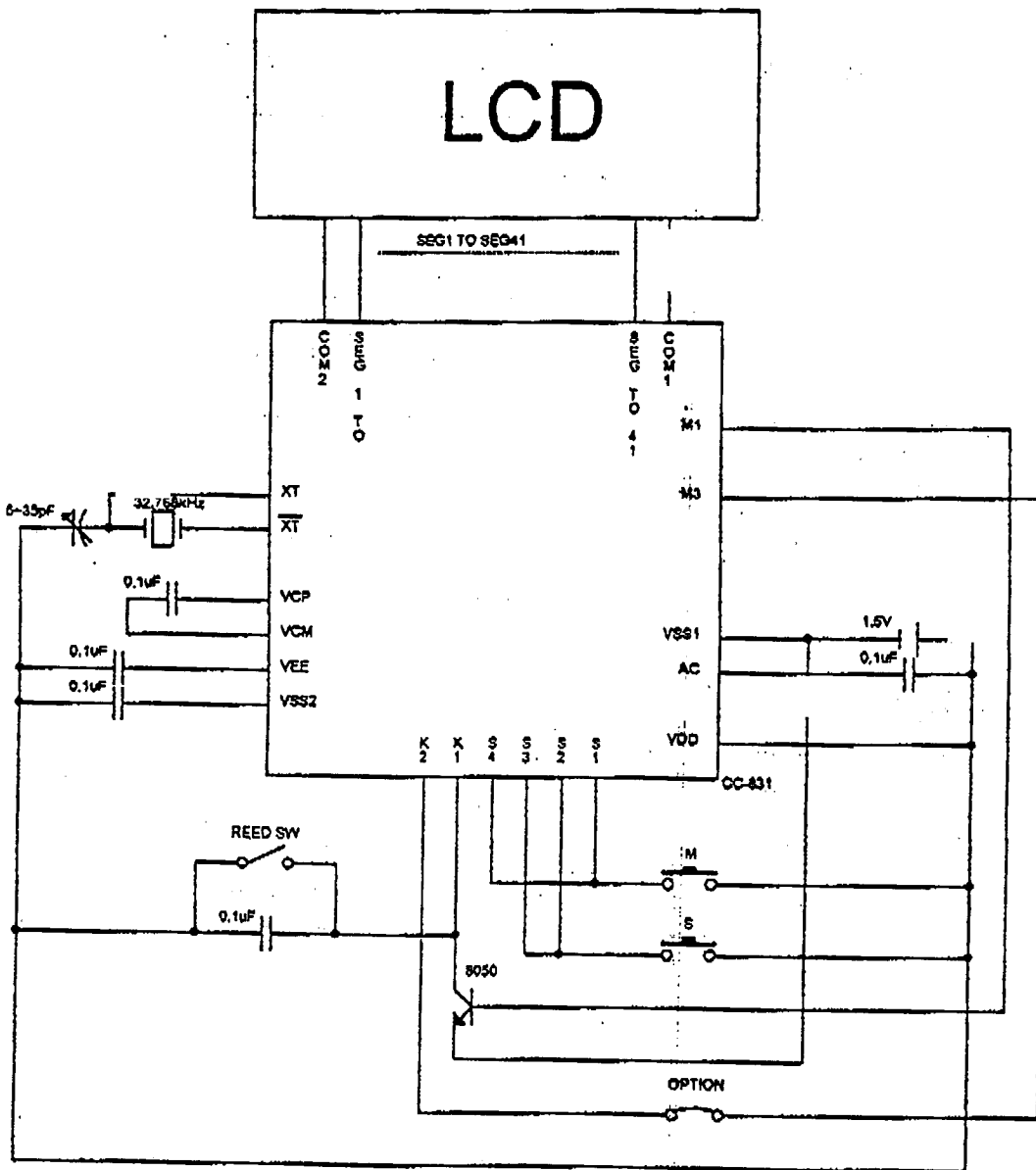
ORG. - X = 0, Y = 0

UNIT - μ m

VI. Pin Description

Designation	Function
V_{DD}	Circuit ground potential
V_{SS1}	Power source (-1.5V)
V_{SS2}	Power source for LCD driver (-3.0V) This terminal is connected to V_{DD} terminal through a 0.1 μ F capacitor.
V_{EE}	Power source for internal logic (-1.5 to -3.0V) This terminal is connected to V_{DD} terminal through a 0.1 μ F capacitor.
V_{CP}, V_{CM}	Booster capacitor connection terminals V_{CP} terminal is connected to V_{CM} terminal through a 0.1 μ F capacitor.
XT, \overline{XT}	Input and output terminals of oscillator inverter, 32.768kHz crystal is connected to these terminals.
AC	Terminal to clear internal logic pulled down to V_{SS1} . After power is turned on, the SS0301 must be reset by this terminal.

VII. Reference Circuit Diagram



VIII. Electrical Characteristics

8.1 Absolute Maximum Ratings

Parameter	Symbol	Conditions	Limits	Unit
Supply Voltage 1	$V_{DD} - V_{SS_1}$	$T_a = 25^\circ\text{C}$	-0.3 to +2.0	V
Supply Voltage 2	$V_{DD} - V_{SS_2}$	$T_a = 25^\circ\text{C}$	-0.3 to +4.0	V
Supply Voltage 3	$V_{DD} - V_{EE}$	$T_a = 25^\circ\text{C}$	-0.3 to +4.0	V
Input Voltage	V_{IN_1}	$T_a = 25^\circ\text{C}$	V_{SS_1} -0.3 to +0.3	V
Output Voltage 1	V_{OUT_1}	$T_a = 25^\circ\text{C}$	V_{SS_1} -0.3 to +0.3	V
Output Voltage 2	V_{OUT_2}	$T_a = 25^\circ\text{C}$	V_{SS_2} -0.3 to +0.3	V
Storage Temperature	T_{stg}	---	-55 to 125	$^\circ\text{C}$

8.2 Operating Conditions

Parameter	Symbol	Limits	Unit
Operating Voltage	$V_{DD} - V_{SS_1}$	1.25 to 1.65	V
Operating Temperature	T_{opr}	-20 to 75	$^\circ\text{C}$

8.3 DC Characteristics

($V_{DD} = 0V$, V_{SS1} , $V_{SE} = -1.55V$, $V_{SS2} = -3.0V$, $C_1 = 30k\Omega$, $T_a = 25^\circ C$ are assumed)

Parameter	Symbol	Condition	Limits			Unit
			Min.	Typ.	Max.	
Power supply current	I_{DD}	---	-	3.0	-	μA
Oscillation start voltage	$-V_{OSC}$	Within 5 sec. V_{SS1} terminal	1.45	-	-	V
Output current 1. (COM)	I_{OH1}	$V_{OH1} = -0.2V$	-4	-	-	μA
	I_{OM1}	$V_{OM1} = V_{SS1} \pm 0.2V$	4/-4	-	-	
	I_{OL1}	$V_{OL1} = -2.8V$	4	-	-	
Output current 2 (SEGMENT)	I_{OH2}	$V_{OH2} = -0.2V$	-0.4	-	-	μA
	I_{OL2}	$V_{OL2} = -2.8V$	0.4	-	-	
Output current 3 (M_1 , M_3)	I_{OH3}	$V_{OH3} = -0.5V$	-100	-	-	μA
	I_{OL3}	$V_{OL3} = -1.0V$	1.5	-	7.5	
Input current 1 ($S_1 \sim S_4$)	I_{IH1}	$V_{IH1} = 0V$	1	10	50	μA
	I_{IL1}	$V_{IL1} = -1.55V$	-	-	-0.2	
Input current 2 (K_1 , K_2)	I_{IH2}	$V_{IH2} = 0V$	2.5	6	12	μA
	I_{IL2}	$V_{IL2} = -1.55V$	-	-	-0.2	
Oscillator built-in capacitor	CD	---	-	20	-	pF

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