Features:

- Full Automatic measurement
- 3 3/4 digits display
- Frequency measurement (40M HZ)
- Rotary or push setting mode
- Auto-power-off then hold the final data
- Rotary or push re-power on function
- Data hold, MAX/MIN hold, Relative data when this function is pressed
- Low battery detect (3V & 9V)
- On chip buzzer driver
- 3V DC power supply
- Internal AC to DC conversion OP AMP If non_AC mode , OP will become unit gain buffer.
- Serial Data Output (RS232 format)
- LCD segment check
- 100 Pin flat-package

Description:

The ES51988 is an integrated analog-to-digital converter (ADC)with 3 3/4 digits and 42-segment bargraph LCD display, automatic range, and 3V battery power supply.

Automatic range selection is provided for voltage (AC/DC) measurement, ohm measurement, current(uA and mA) measurement,and frequency counter. The ES51988 also provides serial data output function.

Expensive and bulky mechanical range switches are not required. The other functions are provided for MAX and MIN holding and current value display, data holding, Relative data and reference value display, low battery detection, auto-power-off, diode measurement, continuity checking.

Absolute Maximum Ratings

Characteristics	Ratings
Supply Voltage (V- to AGND)	-4V
Analog Input Voltage	V+ to V-
Digital Input	V- to DGND
Power Dissipation Flat Package	500mW
Operating Temperature	0℃ to 70℃
Storage Temperature	-25℃ to 125℃

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Electrical Characteristics

TA=25℃,V- = -3V

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Count
V-	Power Supply		-3.5	-3.0	-2.2	Volt
Idd	Operating Supply Current	Normal Power On	-	1.0	1.5	mA
Iss		Auto-power-off	-	0.1	5	uA
REV	Rollover Error (Voltage)	10M input Resistor	-	-	± 0.1	% F.S.
REB	Rollover Error (Bargraph)		-	-	± 0.5	% F.S.
NLV	Nonlinearity (Voltage)	Best Case Straight Line	-	-	± 0.1	% F.S.
NLB	Nonlinearity (Bargraph)		-	-	± 0.5	% F.S.
	Input Leakage		-	1	10	pA
	Low Battery Flag Voltage	V- to AGND	-2.5	-2.3	-2.1	V
	Zero Input Reading	10MΩ Input Resistor	-000	000	+000	Count
VREF	Reference Voltage and 400Ω measurement	100KΩ Between VRH and AGND	-1.3	-1.2	-1.1	V
	Peak to Peak Backplane Drive Voltage	-3.2≦V-≦-2.2	2.85	3.0	3.15	V
	Counter Time Base Period	fosc=4MHz	-	1	-	Sec
	Open Circuit Voltage for Ω Measurement(except 400Ω)	Ω and Continuity Function	-0.5	-0.45	-0.4	V
	Pull High to 0V Resistance	FC1,FC2,FC3,FC4 FC5,RANGE,HOLD, MAX/MIN,REL	-	2.5	-	MΩ
	Pull High to 0V Resistance	KEY, SET	-	250	-	KΩ
	AC Frequency Response (4V range)	± 0.5% Error	-	40 to 500	-	HZ
		± 2.5% Error	-	40 to 2000	-	
TCRF	Reference Voltage Temperature Coefficient	100KΩBetween VRH and AGND 0℃＜TA＜70℃	-	50	-	ppm/℃

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Pin Description

Pin No.	Symbol	Description
1	V+	Positive supply voltage,output of on-chip DC-DC converter.
2	V+	Positive supply voltage,output of on-chip DC-DC converter.
3	CH+	High speed positive connection for reference capacitor.
4	CH-	High speed negative connection for reference capacitor.
5	CIH	High speed integrator output. Connected to integration capacitor.
6	BUFH	Integration resistor connection for high speed buffer output.
7	CAZH	High speed auto-zero capacitor connection
8	CL+	High resolution positive connection for reference capacitor.
9	CL-	High resolution negative connection for reference capacitor.
10	CIL	High resolution integrator output. Connected to integration capacitor.
11	CAZL	High resolution auto-zero capacitor connection.
12	BUFL	Integration resistor connection for high resolution buffer output.
13	IVSH	High level current measurement input.
14	IVSL	Low level current measurement input
15	OVX	Input high voltage for resistance measurement.
16	OVH	Output connection for resistance measurement.
17	OVSG	Sense low voltage for resistance measurement.
18	OR1	Reference resistor connection for 399.9Ω range.
19	VR5	Voltage measurement $\div$ 10000 attenuator (3999V).
20	VR4	Voltage measurement $\div$ 1000 attenuator (399.9V).
21	VR3	Voltage measurement $\div$ 100 attenuator (39.99V).
22	VR2	Voltage measurement $\div$ 10 attenuator (3.999V).
23	TEST5	Test pin 5.
24	ACVL	Negative output of AC to DC converter.
25	ACVH	Positive output of AC to DC converter.
26	ADI	Negative input of internal AC to DC OP AMP.
27	ADO	Output of internal AC to DC OP AMP.
28	NC	
29	NC	
30	NC	
31	SGND	Signal ground.
32	VR1	Unknown voltage input .
33	NC	
34	VR	Reference input voltage connection. Typically -100 mV.
35	VRH	Output of band-gap voltage reference. Typically -1.2 V.
36	ACVR	Optional pin. When connected to -3V,ACV without 400mV range.
37	NC	
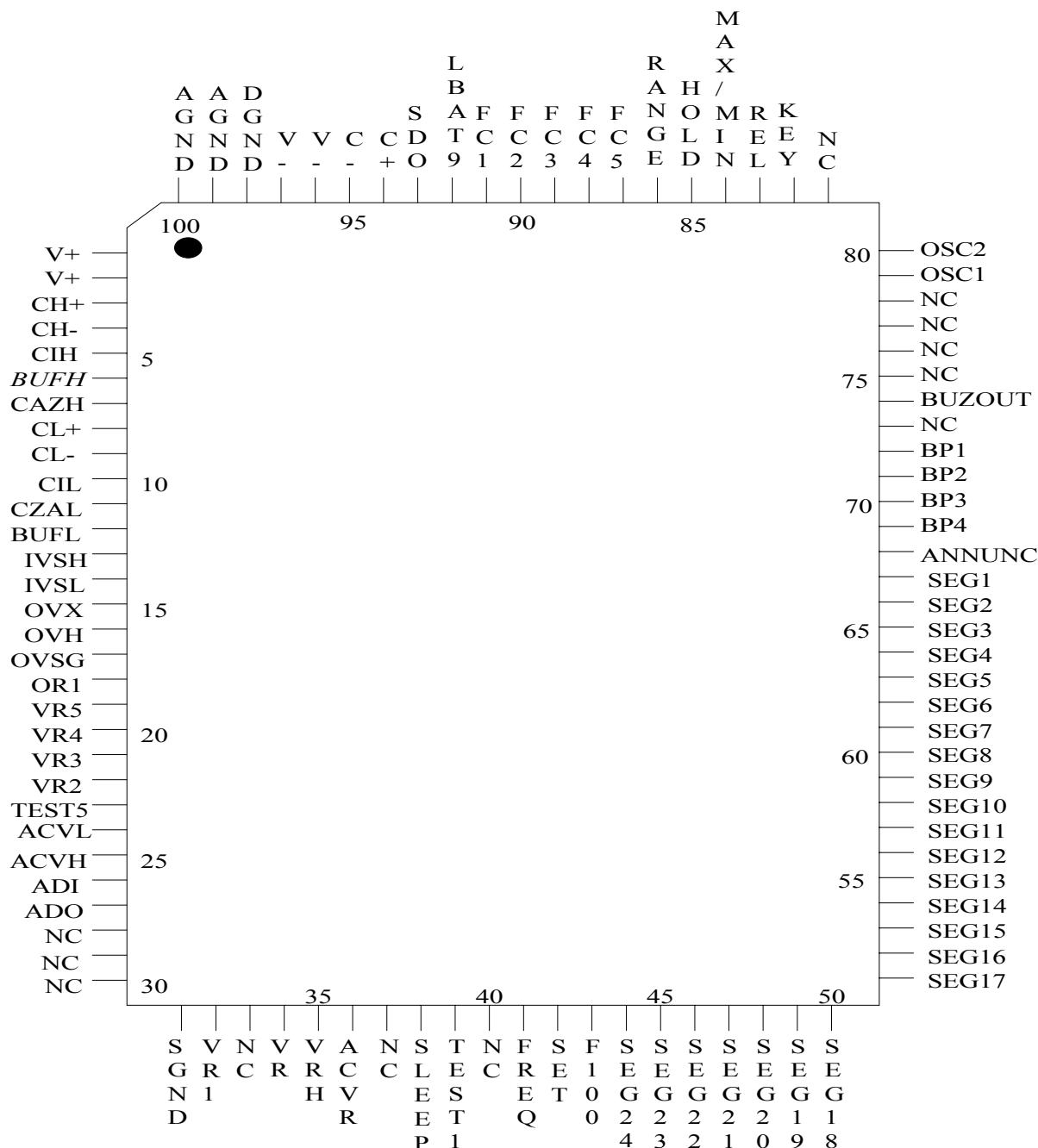
Pin. No	Symbol.	Description
38	SLEEP	When auto-power-off happen, this pin output will change from +3V to –3V. When re-power on happens, this pin output will change back to +3V.
39	TEST1	Test pin 1.
40	NC	
41	FREQ	Frequency counter input, offset to 1/2(V-).
42	SET	Input to set serial data output. Pulse low to make this function active.
43	F100	100 HZ square wave output.
44	SEG24	LCD Segment line 24.
45	SEG23	LCD Segment line 23.
46	SEG22	LCD Segment line 22.
47	SEG21	LCD Segment line 21
48	SEG20	LCD Segment line 20.
49	SEG19	LCD Segment line 19.
50	SEG18	LCD Segment line 18.
51	SEG17	LCD Segment line 17.
52	SEG16	LCD Segment line 16.
53	SEG15	LCD Segment line 15.
54	SEG14	LCD Segment line 14.
55	SEG13	LCD Segment line 13.
56	SEG12	LCD Segment line 12.
57	SEG11	LCD Segment line 11.
58	SEG10	LCD Segment line 10.
59	SEG9	LCD Segment line 9.
60	SEG8	LCD Segment line 8.
61	SEG7	LCD Segment line 7.
62	SEG6	LCD Segment line 6.
63	SEG5	LCD Segment line 5.
64	SEG4	LCD Segment line 4.
65	SEG3	LCD Segment line 3.
66	SEG2	LCD Segment line 2.
67	SEG1	LCD Segment line 1.
68	ANNUNC	Square-wave output at the backplane frequency, synchronized to BP1. ANNUNC can be used to control display annunciator. Connecting an LCD segment to ANNUNC and turns it on; connecting an LCD segment to its backplane and turns it off.
69	BP4	LCD Backplane 4.
70	BP3	LCD Backplane 3.
71	BP2	LCD Backplane 2.
72	BP1	LCD Backplane 1.

Pin. No	Symbol.	Description.
73	NC	
74	BUZOUT	Buzzer output. Audio frequency (2.0KHz) output which drives a piezoelectric buzzer.
75	NC	
76	NC	
77	NC	
78	NC	
79	OSC1	Crystal oscillator (input) connection.
80	OSC2	Crystal oscillator (output) connection.
81	NC	
82	KEY	Mode change pin.
83	REL	Input to get relative display. Pulse low to make this function active.
84	MAX/MIN	Input to set MAX/MIN display. Pulse low to make this function active.
85	HOLD	Input to hold display. Pulse low to make this function active.
86	RANGE	Input to set automatic/manual mode and manual range selection. Pulse low to make this function active.
87	FC5	Switch 5 for function selection.
88	FC4	Switch 4 for function selection.
89	FC3	Switch 3 for function selection.
90	FC2	Switch 2 for function selection.
91	FC1	Switch 1 for function selection.
92	LBAT9	Low battery voltage setting. If used 3V battery, connected this pin to AGND, the default low battery voltage will be –2.3V. If used 9V battery, when the input voltage is small than VRH(-1.2V), the low battery annunciator will be display.
93	SDO	Serial data output.
94	C+	Positive capacitor connection for on-chip DC-DC converter.
95	C-	Negative capacitor connection for on-chip DC-DC converter.
96	V-	Negative supply voltage.Connecting to battery negative terminal.
97	V-	Negative supply voltage.Connecting to battery negative terminal.
98	DGND	Digital ground,connected to battery positive terminal.
99	AGND	Analog ground.
100	AGND	Analog ground.

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Pin Configuration

Top pins (left to right, 100–81): AGND, AGND, DGND, V−, V−, CC−, CC+, SDO, LBAT9, FC1, FC2, FC3, FC4, FC5, RANGE, HOLD, MAX/MIN, REL, KEY, NC

Left side pins (top to bottom, 1–30):
- 1 V+
- 2 V+
- 3 CH+
- 4 CH−
- 5 CIH
- 6 *BUFH*
- 7 CAZH
- 8 CL+
- 9 CL−
- 10 CIL
- 11 CZAL
- 12 BUFL
- 13 IVSH
- 14 IVSL
- 15 OVX
- 16 OVH
- 17 OVSG
- 18 OR1
- 19 VR5
- 20 VR4
- 21 VR3
- 22 VR2
- 23 TEST5
- 24 ACVL
- 25 ACVH
- 26 ADI
- 27 ADO
- 28 NC
- 29 NC
- 30 NC

Right side pins (top to bottom, 80–51):
- 80 OSC2
- 79 OSC1
- 78 NC
- 77 NC
- 76 NC
- 75 NC
- 74 BUZOUT
- 73 NC
- 72 BP1
- 71 BP2
- 70 BP3
- 69 BP4
- 68 ANNUNC
- 67 SEG1
- 66 SEG2
- 65 SEG3
- 64 SEG4
- 63 SEG5
- 62 SEG6
- 61 SEG7
- 60 SEG8
- 59 SEG9
- 58 SEG10
- 57 SEG11
- 56 SEG12
- 55 SEG13
- 54 SEG14
- 53 SEG15
- 52 SEG16
- 51 SEG17

Bottom pins (left to right, 30–50): SGND, VR1, NC, VR, VRH, ACVR, NC, SLEEP, TEST1, NC, FREQ, SET, F100, SEG24, SEG23, SEG22, SEG21, SEG20, SEG19, SEG18

91年11月28日

Operation Mode

(1) Measurement Description

Voltage Measurement

Resistive divider is automatically changed to provide in range reading for 399.9mV to 3999V full scale reading. The following table shows the various full scale range.

Range	Full scale	Resistive Ratio
VR1	399.9 mV	1 , 1/1
VR2	3.999 V	R2/(R1+R2) , 1/10
VR3	39.99 V	R3/(R1+R3) , 1/100
VR4	399.9 V	R4/(R1+R4) , 1/1000
VR5	3999 V	R5/(R1+R5) , 1/10000

Resistance Measurement

Resistive divider is automatically changed to provide the proper range. The following table shows the various full scale range.

Range	Full Scale	Reference Resistor
OR1	399.9 Ω	R6(100Ω)
OR2	3.999 KΩ	R5(1KΩ)
OR3	39.99 KΩ	R4(10KΩ)
OR4	399.9 KΩ	R1||R3(=100KΩ)
OR5	3.999 MΩ	R1||R2(=1MΩ)
OR6	39.99 MΩ	R1(10MΩ)

Current Measurement

In the current measurement mode , there are three range selections :

Mode	Range Selection	Full Scale
Automatic Mode 1	uA	399.9 uA 3999 uA
Automatic Mode 2	mA	39.99 mA 399.9 mA
Manual Mode	A	39.99 A

When the mode changes among (uA, mA, A), the original AC/DC state will keep.

Continuity Check

The continuity check is the same as the 399.9Ω range of the resistance measurement mode (manual mode). If the bargraph number <=3 ,there will 2.0 KHz signal comes out from BUZOUT pin, if the bargraph number >=4, there will be no beep exist.

Diode Measurement

Use the DCV 3.999V range of voltage measurement mode (manual mode). If the test circuit is open or the device (diode) under test is larger than 2V, the LCD display will show "OL", but the bargraph will show the real detected voltage.
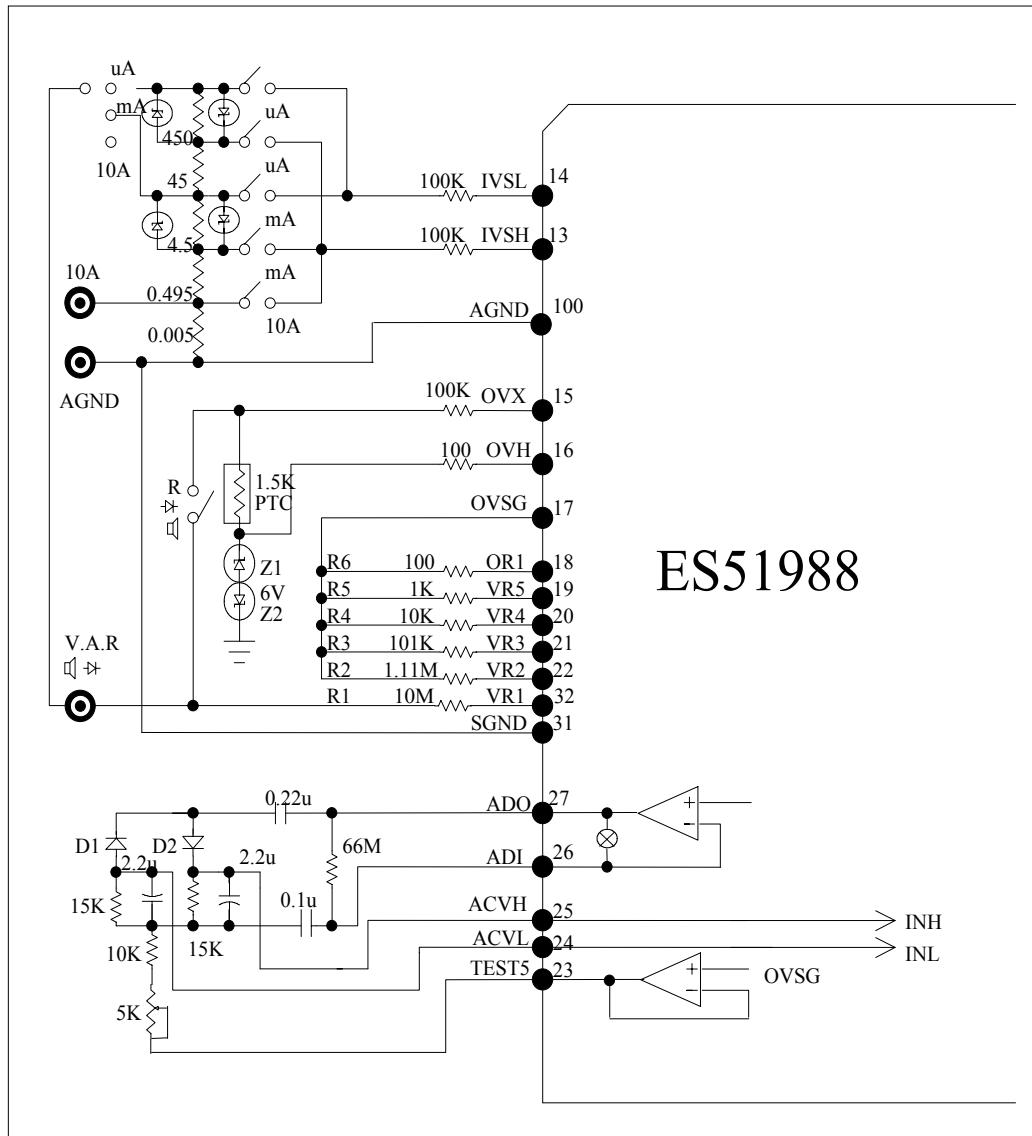
Frequency Counter

The timebase of ES51988 is derived by a clock oscillator.
The timebase of counter is :

$$T_{counter} = \frac{4,000,000}{F_{osc}}$$

Thus , the counter will operate with a 1 second timebase when a 4MHz oscillator is used. For accurate frequency measurement,a crystal oscillator is recommended. The frequency counter can automatically or manually select the proper range. Autorange operation extends over five decades from 1 Hz to 39.99MHz.

Range	Full Scale
FR1	3.999 KHZ
FR2	39.99 KHZ
FR3	399.9 KHZ
FR4	3.999 MHZ
FR5	39.99 MHZ

ES51988

Analog Switch Selection

Note : Light shielding for Z1, Z2, D1, D2.

(2) Switch Description

Rotary mode : FC1,FC2,FC3,FC4,FC5

Measurement mode are depend on the logic levels of FC1,
FC2, FC3,FC4 FC5 and KEY :

When FC5=1

FC1	FC2	FC3	FC4	Mode	Push mode(KEY)
1	1	0	0	DC V	DC V — AC V
1	1	1	0	DC uA	DC uA — AC uA
1	1	0	1	DC mA	DC mA — AC mA
1	1	1	1	DC A	DC A — AC A
0	1	1	1	Ω	Ω — Continuity
0	1	1	0	Continuity	Continuity — Diode
1	0	1	1	Ω	Ω — Continuity — Diode
1	0	1	0	Frequency	

When FC5=0, KEY is disabled.
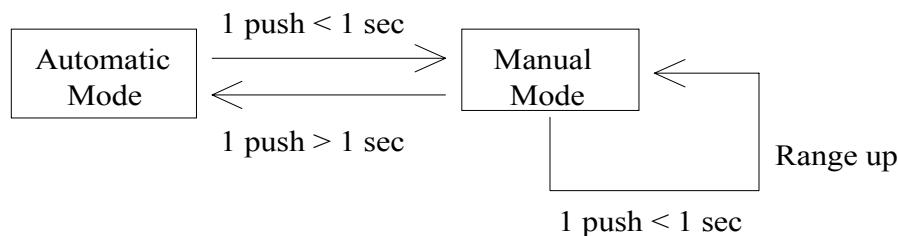
FC1	FC2	FC3	FC4	Mode
1	1	0	0	ACV
1	1	1	0	AC uA
1	1	0	1	AC mA
1	1	1	1	ACA
0	1	1	1	Ω
0	1	1	0	Continuity
1	0	1	1	Diode
1	0	1	0	Frequency

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Push mode

RANGE

The mode selection of Auto-mode and Manual-mode is determined by RANGE pin. The following is the operating flow chart of Auto-mode and Manual-mode.

```
┌─────────┐  1 push < 1 sec   ┌─────────┐
│Automatic│ ─────────────────>│ Manual  │ <───┐
│  Mode   │ <─────────────────│  Mode   │     │
└─────────┘  1 push > 1 sec   └─────────┘     │ Range up
                                   │          │
                                   └──────────┘
                              1 push < 1 sec
```
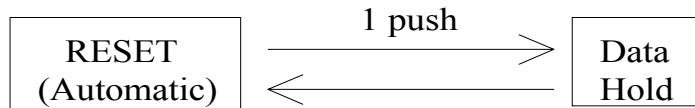
* If HOLD, MAX/MIN, REL function is enabled，when RANGE
   function is pressed，the enabled function will be clear.
* The bargraph is not affected by HOLD, MAX/MIN, REL function.

Function	Auto	Manual	Control Range	Initial Range
Voltage (AC/DC)	R1－R5	Ri → Ri+1 (R5→R1)	399.9mV | 3999V	399.9mV(DC) 3.999V (AC)
uA(AC/DC)	R1－R2	R1 → R2 R2 → R1	399.9uA | 3999uA	399.9uA
mA(AC/DC)	R1－R2	R1 → R2 R2 → R1	39.99mA | 399.9mA	39.99mA
A(AC/DC)	Fix	Fix	39.99A	39.99A
Ω	R1－R6	Ri → Ri+1 (R6→R1)	399.9Ω | 39.99MΩ	"OL" 399.9Ω
Continuity	Fix	Fix	399.9Ω	"OL" 399.9Ω
Diode	Fix	Fix	3.999V	"OL" 3.999V
Frequency	FR1－FR5	FRi→FRi+1 (FR5→FR1)	3.999KHZ | 39.99MHZ	3.999KHZ

HOLD :
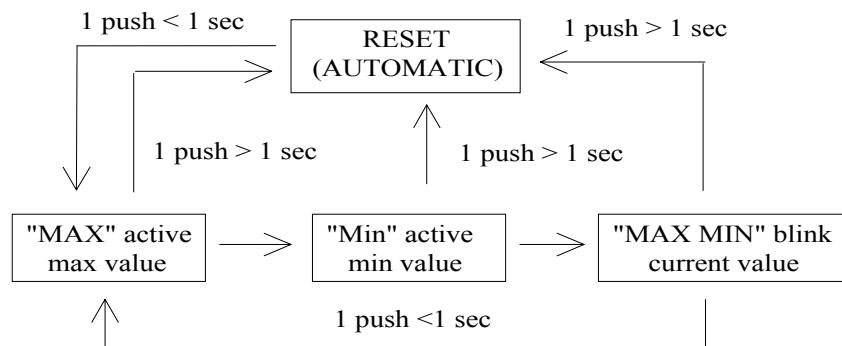
```
┌──────────────┐    1 push     ┌──────────┐
│   RESET      │ ────────────> │  Data    │
│ (Automatic)  │ <──────────── │  Hold    │
└──────────────┘               └──────────┘
```
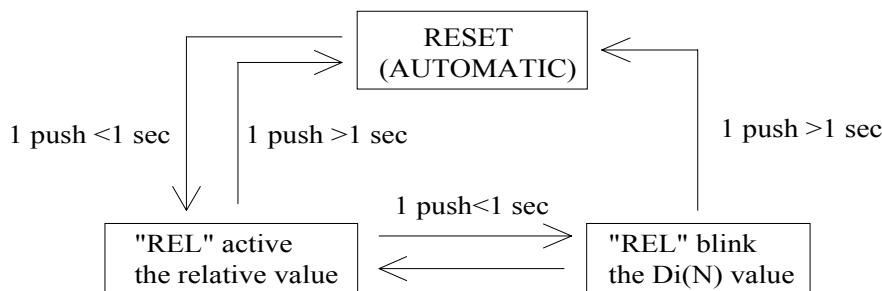
(1) Under auto mode, press the HOLD function, the mode will change to manual mode and stay at the same scale range.

(2) If HOLD function is enabled, MAX/MIN, REL function is disabled. But if MAX/MIN, REL function is pressed first, the HOLD function still can active.

(3) If continue to press the HOLD pin(logic low)then power on the ES51988 , all the segments will blight until release the HOLD pin.

MAX/MIN :

```
   1 push < 1 sec    ┌──────────────┐   1 push > 1 sec
                     │   RESET      │
                     │ (AUTOMATIC)  │
   1 push > 1 sec    │              │  1 push > 1 sec
                     └──────────────┘

┌──────────────┐    ┌──────────────┐    ┌──────────────┐
│ "MAX" active │──> │ "Min" active │──> │ "MAX MIN" blink│
│  max value   │    │  min value   │    │ current value │
└──────────────┘    └──────────────┘    └──────────────┘
          1 push <1 sec
```

(1) If MAX/MIN function is enaled, REL function is disabled, or if REL function is enabled，MAX/MIN function is disabled.

(2) The sequent order is MAX value, MIN value, Current value.

REL :

```
                  ┌──────────────┐
                  │   RESET      │
                  │ (AUTOMATIC)  │
                  └──────────────┘
  1 push <1 sec    1 push >1 sec       1 push >1 sec

┌──────────────┐  1 push<1 sec   ┌──────────────┐
│ "REL" active │ ──────────────> │ "REL" blink  │
│the relative  │ <────────────── │the Di(N) value│
│   value      │                 │              │
└──────────────┘                 └──────────────┘
```

* When REL function is enabled :

  Display = Di(N+K) - Di(N) , K = 0,1,2,3, ...
  Di(N)   : Input reading when REL function active.
  Di(N+K) : Next K step input reading.

* If the input value Di(N) or Di(N+K) $\geq$ ($\pm$ 4000), the relative value will display "OL".

Auto-Power-off function:

Once power on the ES51988, the auto-power-off function will be enabled
and if the functions are not changed in 30 minutes, the auto-power-off condition
will be happened and SLEEP pin output will change from +3V to –3V. When power-off
happens, the final data is saved. If continue to press anyone of the pushed function
(except HOLD pin)then power on the ES51988, the auto-power -off function will be
disabled , and LCD segment "APO" will be turned off.
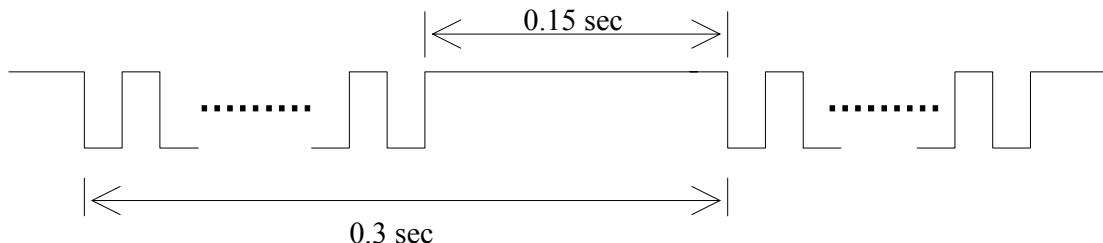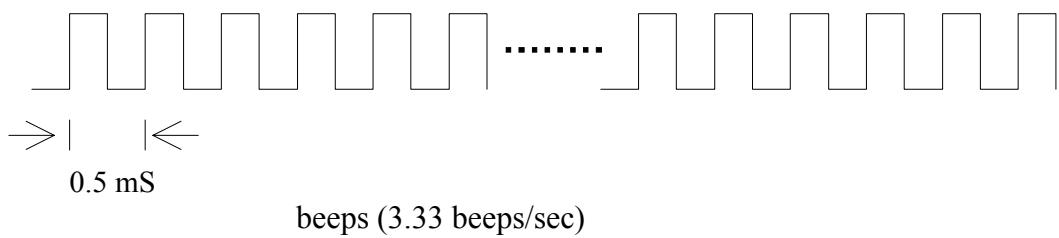
(3) Buzzer

The BUZZER turns on in the following condition :
  ・ 1 beep : Measurement function changed ,power and re-power on ,
        RANGE, HOLD, MAX/MIN, REL, SET or KEY are pushed.
  ・ 3.3 beeps : Input reading overrange. (except diode,ohm,continuity,
        frequency function used)
  ・ 2.0 KHZ continue: Continue check (Bargraph number<=3).
  ・ 2.0 KHZ continue 1.5 sec : Auto-power-off.

    BUZZER output waveform :

2.0 KHz (continued)

0.5 mS

beeps (3.33 beeps/sec)

0.15 sec

0.3 sec

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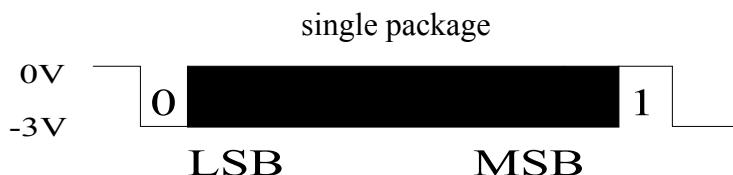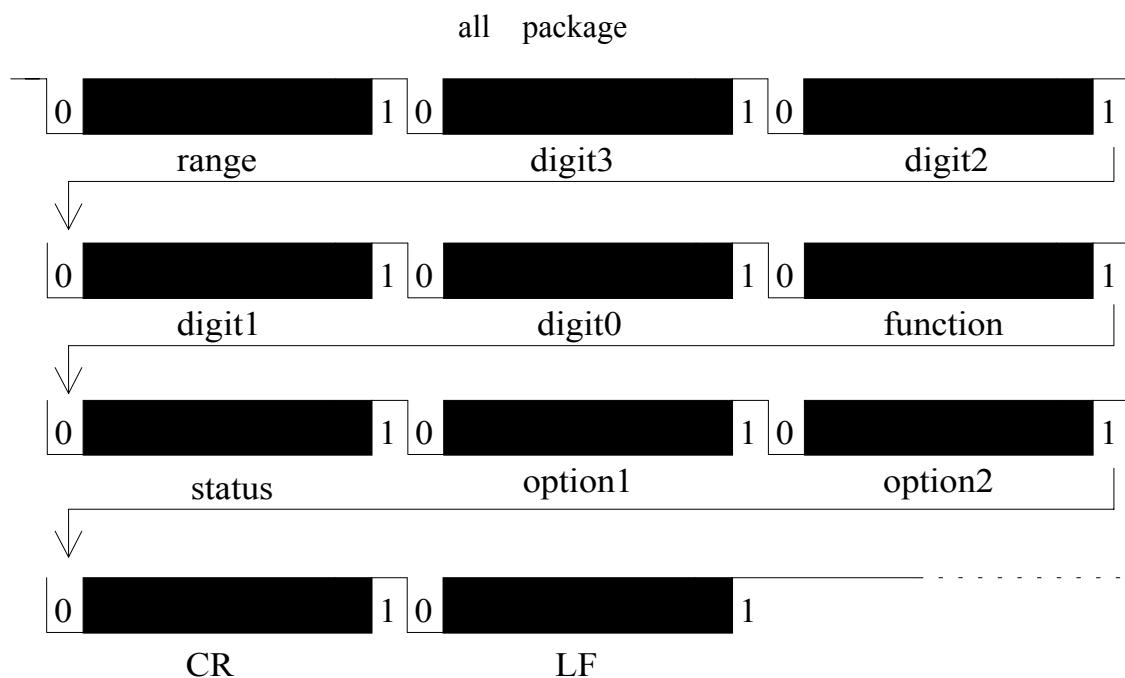
(4) Serial Data Output

The serial data is output two times from SDO pin on each A/D conversion cycle.The data format satisfy JIS 7BIT transmission code and the baud rate is 2400,it means the receiver terminal can use RS-232 interface to read data .

single package

0V

-3V

0   1

LSB   MSB

A single package include a start bit(0),D0~D6(7 bit), a parity check bit(odd) and a stop bit(1).All the data stream is consist of 110×2 bits. The high and low voltage levels correspond to DGND and V- respectively. SDO remains at 1 (high) when it is inacetive. Hence the start bit(0) could be used as the triggering signal to begin the reading process.

all package

0	1	0	1	0	1
range		digit3		digit2	

0	1	0	1	0	1
digit1		digit0		function	

0	1	0	1	0	1
status		option1		option2	

0	1	0	1
CR		LF	

Digit0 ~ 3 data is exactly the receiver display number,but the status, function,range, option1,option2 data all need written program to judge what the data mean.
Note : LSB bit is sent first,then MSB bit.

The meter always outputs the current input value to the serial port in spite of HOLD mode. Each block is repeated twice in one conversion cycle. The detailed data format of each packet is listed below.

RANGE :

Range	V	mA	UA	Ohm	Frequency
0110000	400mV	40mA	400uA	400 Ohm	4K HZ
0110001	4V	400mA	4000uA	4K Ohm	40K HZ
0110010	40V			40K Ohm	400K HZ
0110011	400V			400K Ohm	4M HZ
0110100	4000V			4M Ohm	40M HZ
0110101				40M Ohm	

Because Continuity,Diode, and Current(A) measurement range are all fixed,so they are all the first code 0110000.

DIGIT0 ~ 3 :

Digit	Display data
0110000	0
0110001	1
0110010	2
0110011	3
0110100	4
0110101	5
0110110	6
0110111	7
0111000	8
0111001	9

If the input value is over-range(OL),the reading data DIGIT3=4,DIGIT2=0, DIGIT1=0,DIGIT0=0,but under the frequency mode,DIGIT0~3 output the measured value.

FUNCTION : The definition code is not the same as FC1 ~ FC4.

Function	Measurement mode
0111111	A
0111110	uA
0111101	mA
0111100	Voltage
0110111	Ω
0110110	Continuity
0111011	Diode
0111010	Frequency

STATUS :

0	1	1	-	BATT	0	OL
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1

     — : "1" is for the negative(-).

  BATT : "1" is for the battery voltage is less than 2.3V± 0.2V.

    OL : "1" is for the input voltage over-range.

OPTION1 :

0	1	1	0	0	0	0
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1

OPTION2 :

0	1	1	DC/AC	AUTO	MAN	APO
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1

  DC/AC : "1" is for the DC mode and Ω, Diode, Continuity, ADP, Frequency
             Function, "0" is for the AC mode.

   AUTO : "1" is for auto range.

    MAN : "1" is for the manual range.

     APO : "1" is for the auto-power-off function enabled.
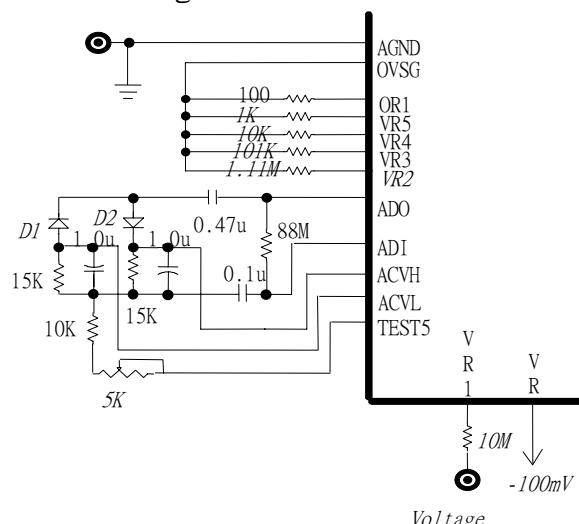
  CR(BACK) : Transmission code "0001101".

LF(LINE FEED) : Transmission code "0001010".
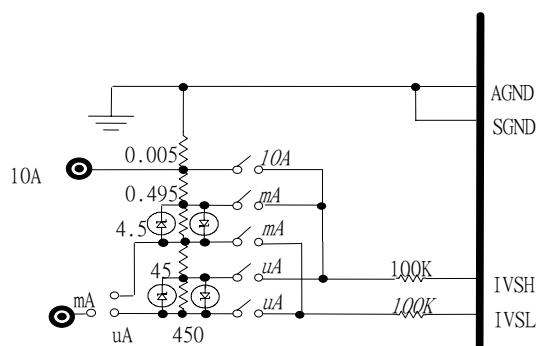
TEST CIRCUIT
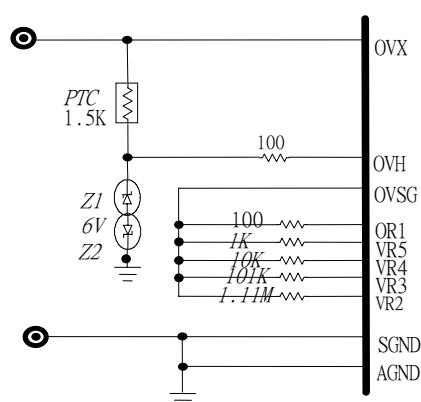
1 Voltage

Voltage
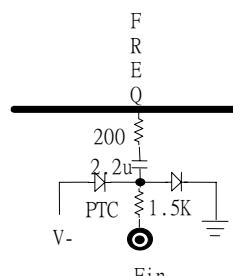
4 Current
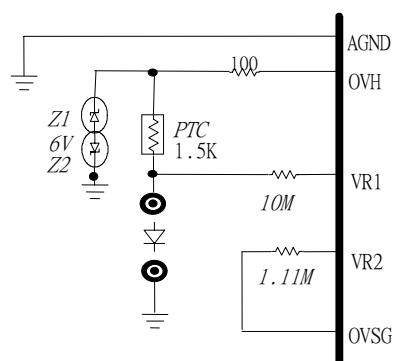

2 Resistor
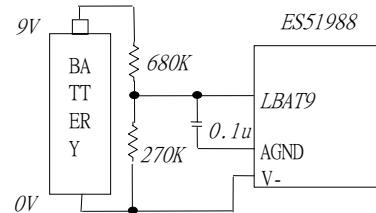
5 Frequency

3 Diode
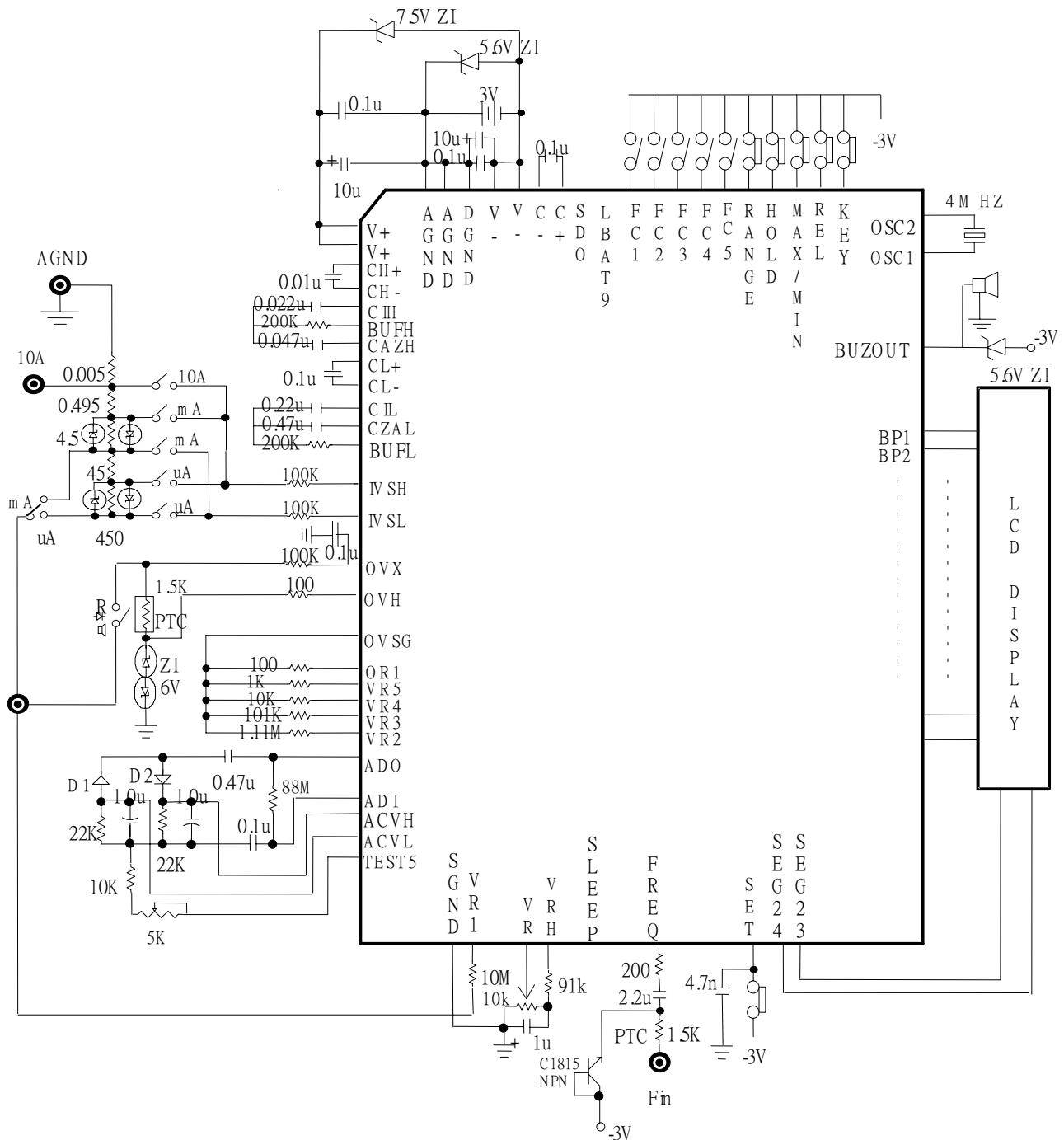
6 Low battery

APPLICATION CIRCUIT

The Other

(1) LCD pin assignment
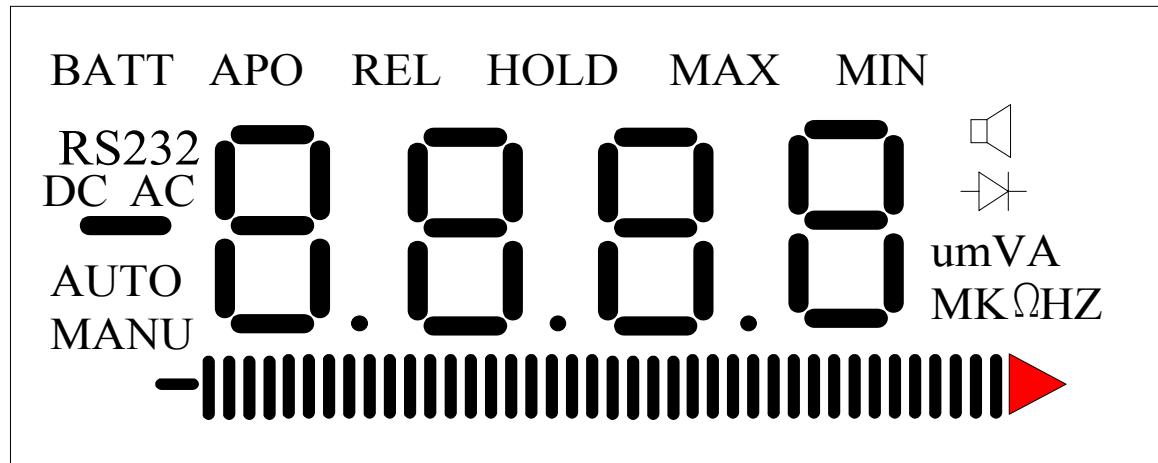
	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7
BP1	RS232	bar2	bar4	bar6	bar8	bar9	bar11
BP2	bar0	bar1	bar3	bar5	bar7	d3	bar10
BP3	bar-	—	AUTO	MANU	e3	g3	c3
BP4	DC	BATT	f3	AC	AP0	a3	b3

	SEG8	SEG9	SEG10	SEG11	SEG12	SEG13	SEG14
BP1	bar13	bar15	bar16	bar18	bar20	bar22	bar24
BP2	bar12	bar14	d2	bar17	bar19	bar21	bar23
BP3	p3	e2	g2	c2	px	p2	e1
BP4	REL	f2	a2	b2	HOLD	MAX	f1

	SEG15	SEG16	SEG17	SEG18	SEG19	SEG20	SEG21
BP1	bar25	bar27	bar29	bar31	bar32	bar34	bar36
BP2	d1	bar26	bar28	bar30	d0	bar33	bar35
BP3	g1	c1	p1	e0	g0	c0	M
BP4	a1	b1	MIN	f0	a0	b0	u
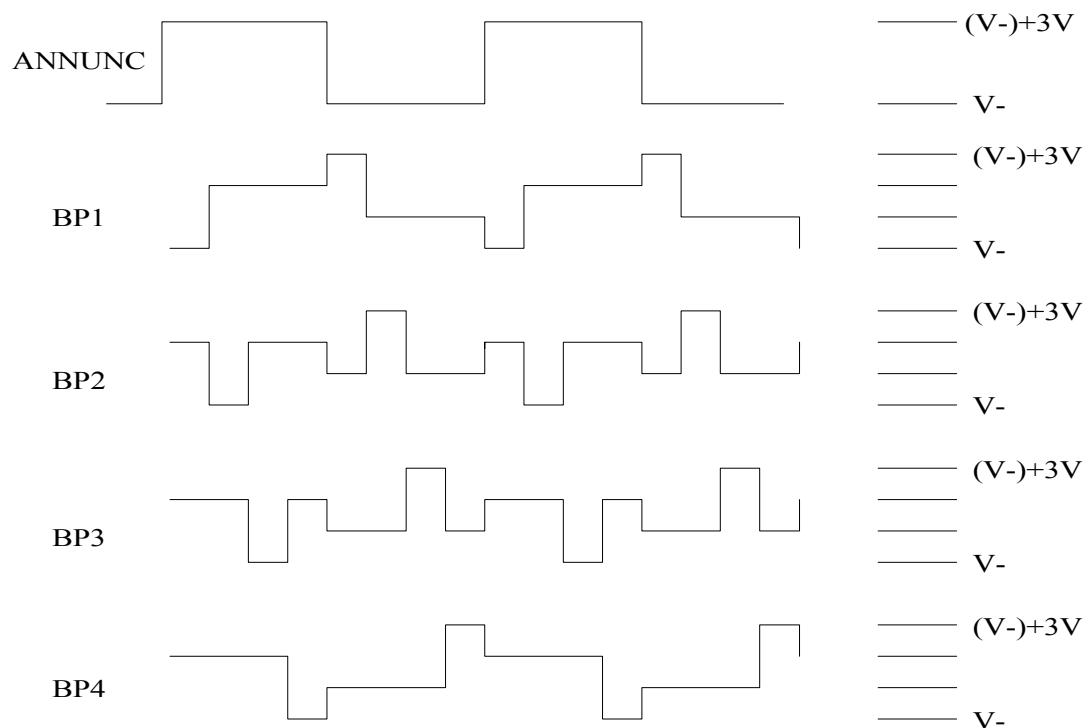
	SEG22	SEG23	SEG24
BP1	bar38	bar40	HZ
BP2	bar37	bar39	Ω
BP3	K	V	A
BP4	m	◁	⊣▷⊢

NOTE : 1 : "bar0" is normally ON.
2 : "px" is always OFF(not used).

LCD Display Panel

Backplane Waveform (Frequency = 62.5 HZ)

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(2) LCD Display ON Condition

LCD Annunciator	
"BATT"	Low battery is detected.
"DC"	DC voltage and DC current functions are used.
"AC"	AC voltage and AC current functions are used.
"-"	DC voltage and current function.
"AUTO"	Automatic mode is used.
"MANU"	Manual mode is used.
"REL"	REL function is used.
"HOLD"	HOLD function is used.
"MAX"	MAX function is used.
"MIN"	MIN function is used.
"◁))" & "Ω"	Continuity-check is used.
"▶⊢" & "V"	Diode measurement is used.
"mV"	AC/DC voltage function is used.
"umA"	AC/DC current function is used.
"MKΩ"	Ω measurement function is used.
"MKHZ"	Frequency counter is used.
"APO"	Auto-power-off function is used.
"RS232"	Serial data output is used.
Bargraph	Bargraph annunciator is only depend on input reading .
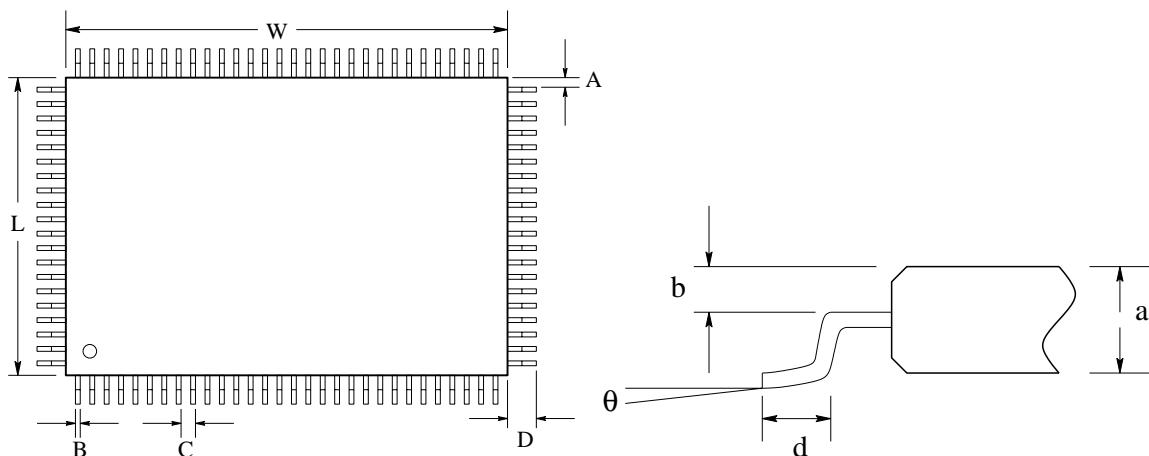
(3) .High Resolution and High Speed(Bargraph) time

Mode	High Resolution		High Speed	
	Current(I) Measurement	Other Measurement (V,R)	Current(I) Measurement	Other Measurement (V,R)
ZI	100m sec	100m sec	10m sec	10m sec
AZ	150m sec	150m sec	15m sec	15m sec
INT	100m sec	100m sec	10m sec	10m sec
DEINT	200m sec	400m sec	20m sec	40m sec

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Package

1   100 Pin QFP Package

2   Dimension Paramenters

Symbol	Milimeter			Mill		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	19.90	20.00	20.10	783.5	787.4	791.3
L	13.90	14.00	14.10	547.2	551.2	551.2
A		0.425			16.7	
B	0.20	0.30	0.40	7.9	11.8	11.8
C		0.65			25.6	
d	1.05	1.20	1.35	41.3	47.2	47.2
a	2.57	2.72	2.87	101.2	107.1	107.1
D		2.50			98.4	
θ	0º		10º			