CYRUSTEK ES5107 A/D CONVERTER Datasheet

http://www.manuallib.com/cyrustek/es5107-a-d-converter-datasheet.html

The ES 5107 is a low power monolithic CMOS 3 1/2 digit LCD display A/D converter.The single chip ES 5107 provides all necessaryactive devices which contains the internal clock, voltage reference, sevensegment decoders, LCD display drivers and a back plane driver.The improved internal zener reference voltage circuit gives the analog common a small temperature coefficient of 60 ppm°C typically.

ES5107

3 1/2 DIGIT A/D CONVERTER W/LED

I、GENERL DESCRIPTION

The ES5107 is a low power CMOS 3 1/2 digit A/D converter With LED display drivers. The single chip ES5107 provides all the necessary active devices which contain the internal clock. voltage reference. seven-segment decoders, LED display drivers. The improved internal zener reference voltage circuit gives the analog common a small temperature coefficient of 60 ppm/℃ typically.

The high accuracy characteristics of the ES5107 perform very low linearity error and rollover error. The high input impedance(>$10^{12}\Omega$) and low input leakage current (1pA typical)give the ES5107 a good application in the field of high impedance circuit measurement. The differential input and reference are suitable for measuring bridge transducer or ohms by using ratio-metric method.

The dual slope conversion technique makes the ES5107 a good normal mode and common mode rejection ratio. With a suitable oscillator frequency. the ES5107 has a high rejection of 50Hz, 60Hz and 400Hz line frequency noise.

With a set of LED display and a few resistors and capacitors ES5107 can be built as a high performance panel meter. Existing ICL7107 based systems may be upgraded without changing external passive component values.

II、FEATURES

*Guaranteed zero reading with zero input.

*Low input leakage current (1pA typical)

*Internal Reference with low temperature drift (60ppm/℃ typical)

*Low noise(15μ Vp-p typical)

*Direct LED display drive-no external components required

*Differential input and voltage reference

*Internal clock circuit

III、APPLICATTONS

*Digital panel meters

*Digital multimeters

*Thermometers

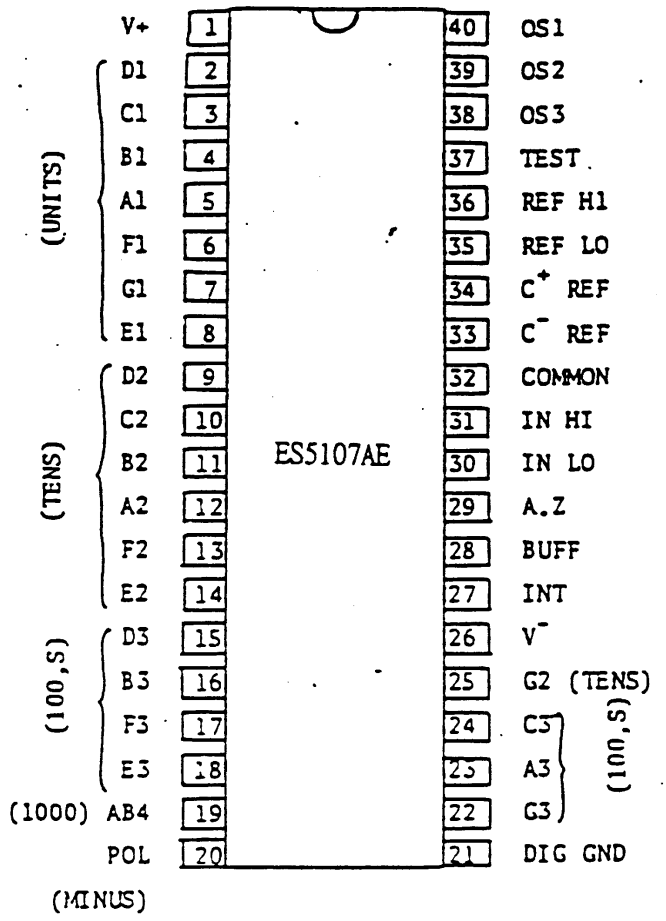
*Capacitance meters

*pH meters

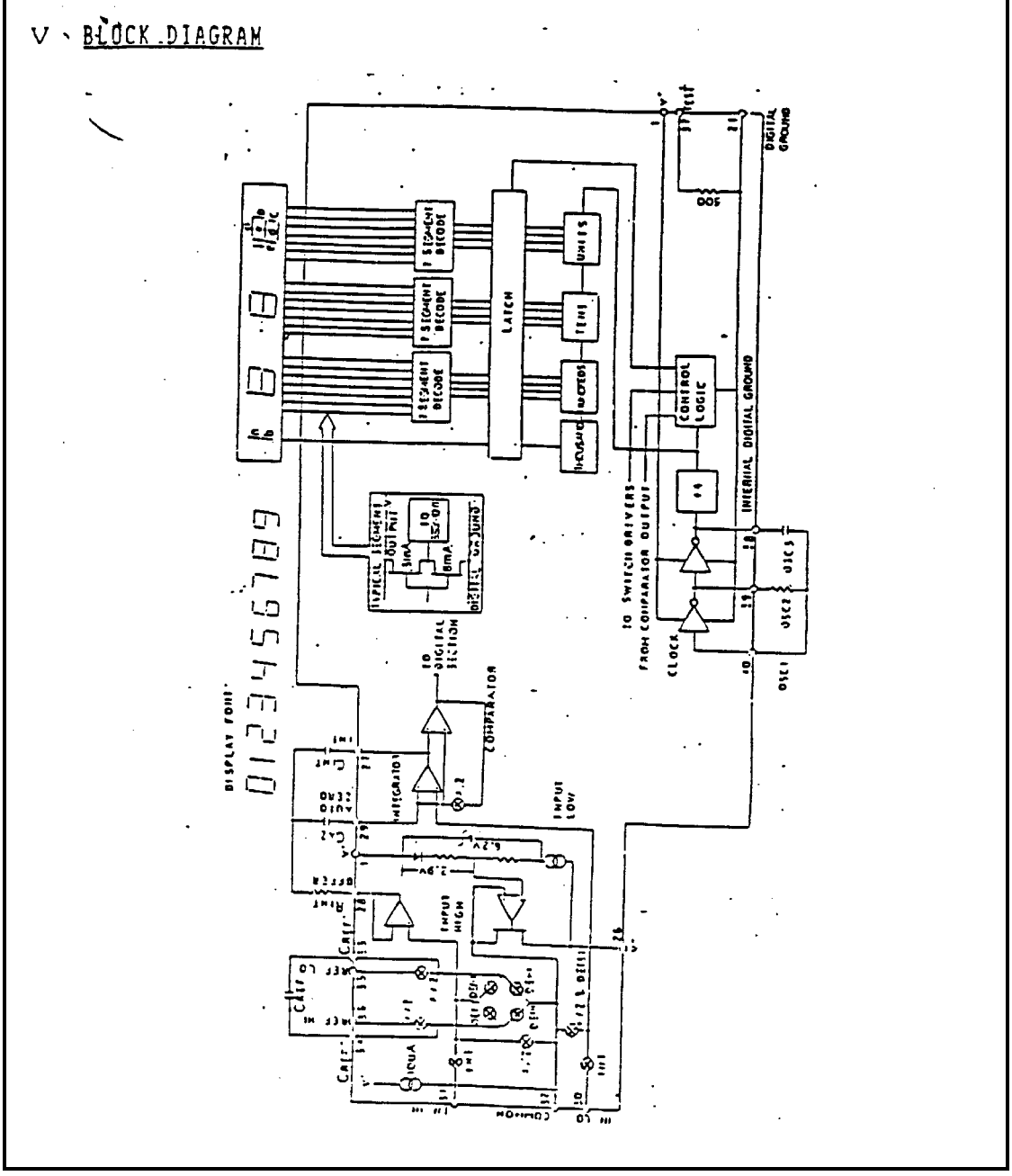
*Photometers

IV、PIN ASSIGNMENT

IV、PIN ASSIGNMENT



V、BLOCK DIAGRAM



VI、ABSOLUTE MAXIMUM RATINGS

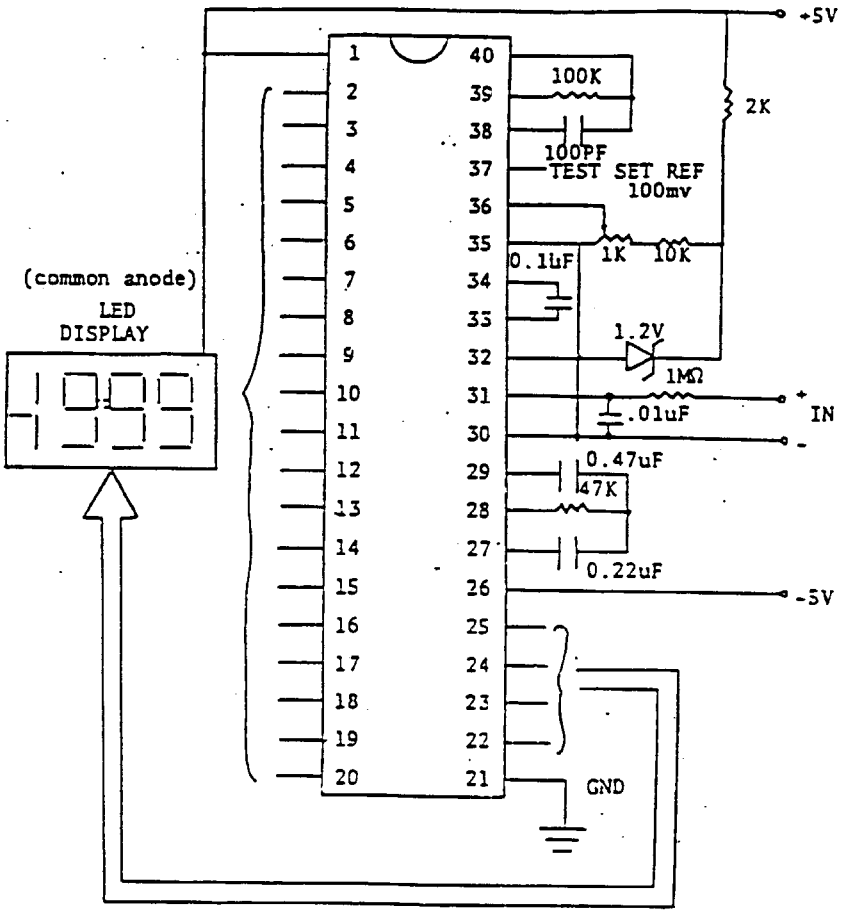
Characteristic	Rating
Supply Voltage V+	+6V
V-	-6V
Analog Input Voltage(either input)	V+ to V-
Reference Input Voltage(either input)	V+ to V-
Clock Input	GND to V+
Power Dissipation(plastic package)	800 mW
Operating Temperatuer	0℃ to +70℃
Storage Temperature	-65℃ to +160℃
Lead Temperature(Soldering, 10 sec)	270℃

VII、ELECTRICAL CHARACTERISTICS

At V+ = +5V，V- = -5V，feocx = 48KHz，T_A = 25℃

Characteristic	Test Conditions	Min	Typ.	Max	Units
Zero Input Reading	V_{IN} = OV Full Scale = 200mV	-000.0	±000.0	+000.0	Digital Reading
Ratio-metric Reading	$V_{IN} = V_{REF}$ V_{REF} = 100mV	999	999/1000	1000	Digital Reading
Linearity	Full Scale = 200mV or 2V	-1	±0.2	+1	Counts
Rollover Error	$-V_{IN} = +V_{IN} \cong$ 200mV	-1	±0.2	+1	Counts
Common Mode Rejection Ratio	V_{CM} = ±1V, V_{IN} = OV Full Scale = 200mV	-	50	-	μV/V
Noise (P_K-P_K Value not exceeded 95% of time)	V_{IN} = OV Full Scale = 200mV	-	15	-	μV_{P-P}
Input Leakage Current	V_{IN} = OV	-	1	10	pA
Analog COMMON Voltage	25KΩ between Common and V+	2.8	3.0	3.2	V
Analog COMMON Temperature Coefficient	25KΩ between Common and V+ O℃≤T_A≤70℃	-	60	75	ppm/℃
Scale Factor Temperature Coefficient	V_{IN} = 199mV O℃≤T_A≤70℃ Ext. Ref. Oppm/℃	-	60	75	ppm/℃
Zero Reading Drift	V_{IN} = OV O℃≤T_A≤70℃	-	0.2	1	μV/℃
Segment Sinking Current (except Pin 19) (include Pin 19)	V+ = 5V Segment Voltage = 3V	5 10	8 16	- -	mA mA
V+ Supply Current (not include LED current)	V_{IN} = OV	-	0.5	0.65	mA
V- Supply Current		-	0.5	0.65	mA

Ⅶ、TEST CIRCUIT

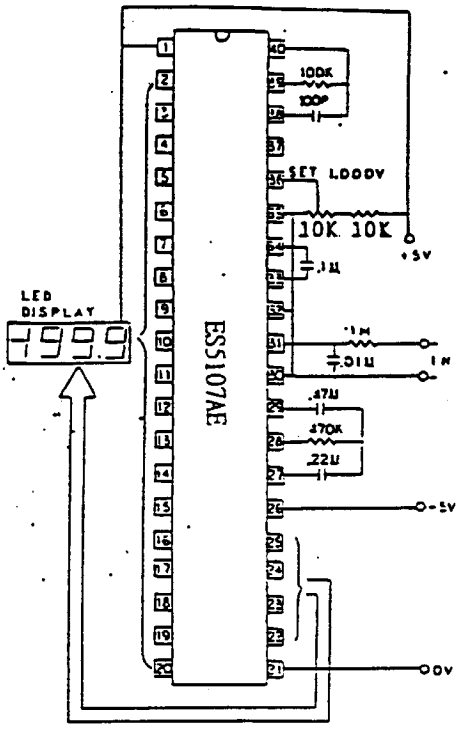


f_{clock} = 48KHz 200mV full-scale 3readings/sec

D、APPLICATION CIRCUITS

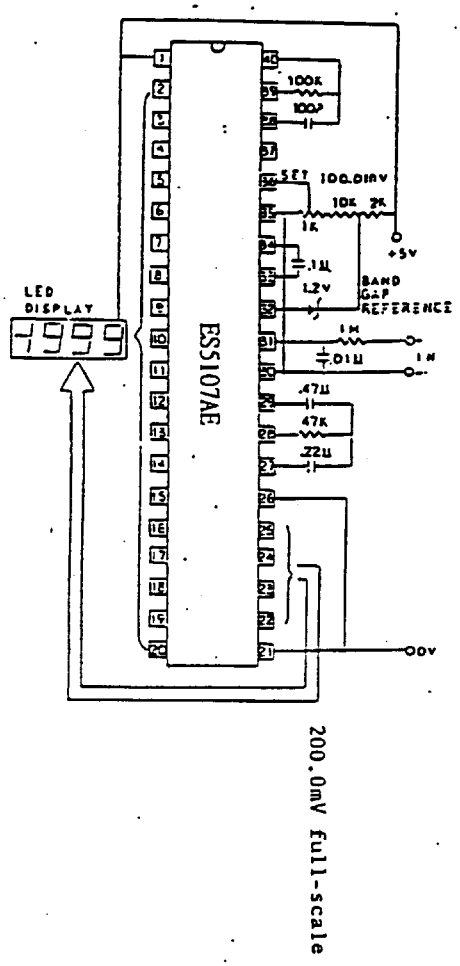
A、Internal Reference:The analog COMMON voltage is used as reference voltage. Values here are for 2.0000V full-scale.

D、APPLICATION CIRCUITS
A、Internal Reference : The analog COMMON voltage is used as reference voltage. Values here are for 2.000V full-scale.



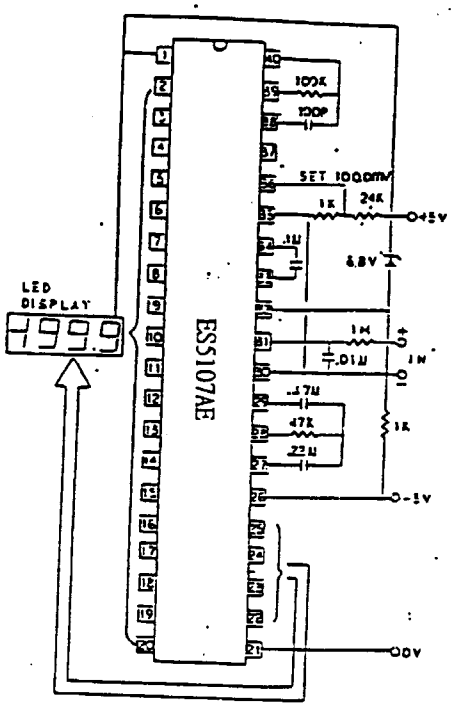
B、External Band-Gap Reference: A band-gap reference of 1.2V type is used to set up a high temperature stability voltage reference.

B、External Band-Gap Reference：A band-gap reference of 1.2V type is used to set up a high temperature stability voltage reference.



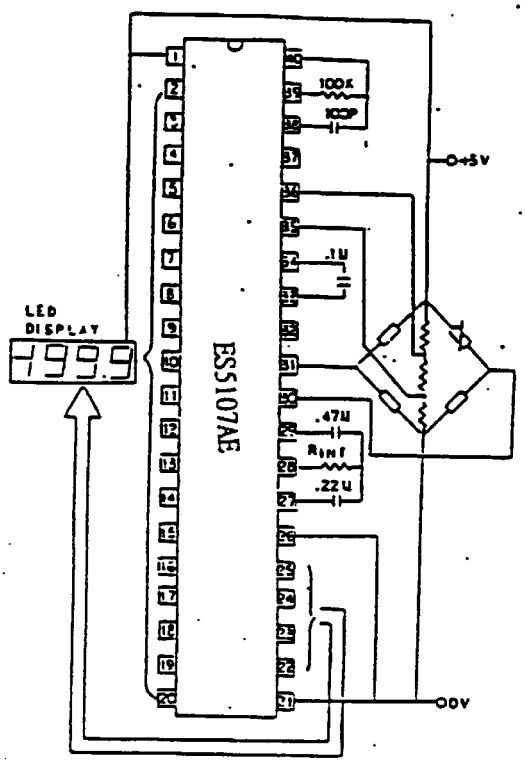
C、Zener Diode Reference: A low TC zener diode is used to set up the low temperature drift reference voltage.

C、Zener Diode Reference：A low TC zener diode is used to set up the low temperature drift reference voltage.



D、Measuring Ratio-metric Values of Quad Load Cell.

D、Measuring Ratiometric Values of Quad Load Cell.

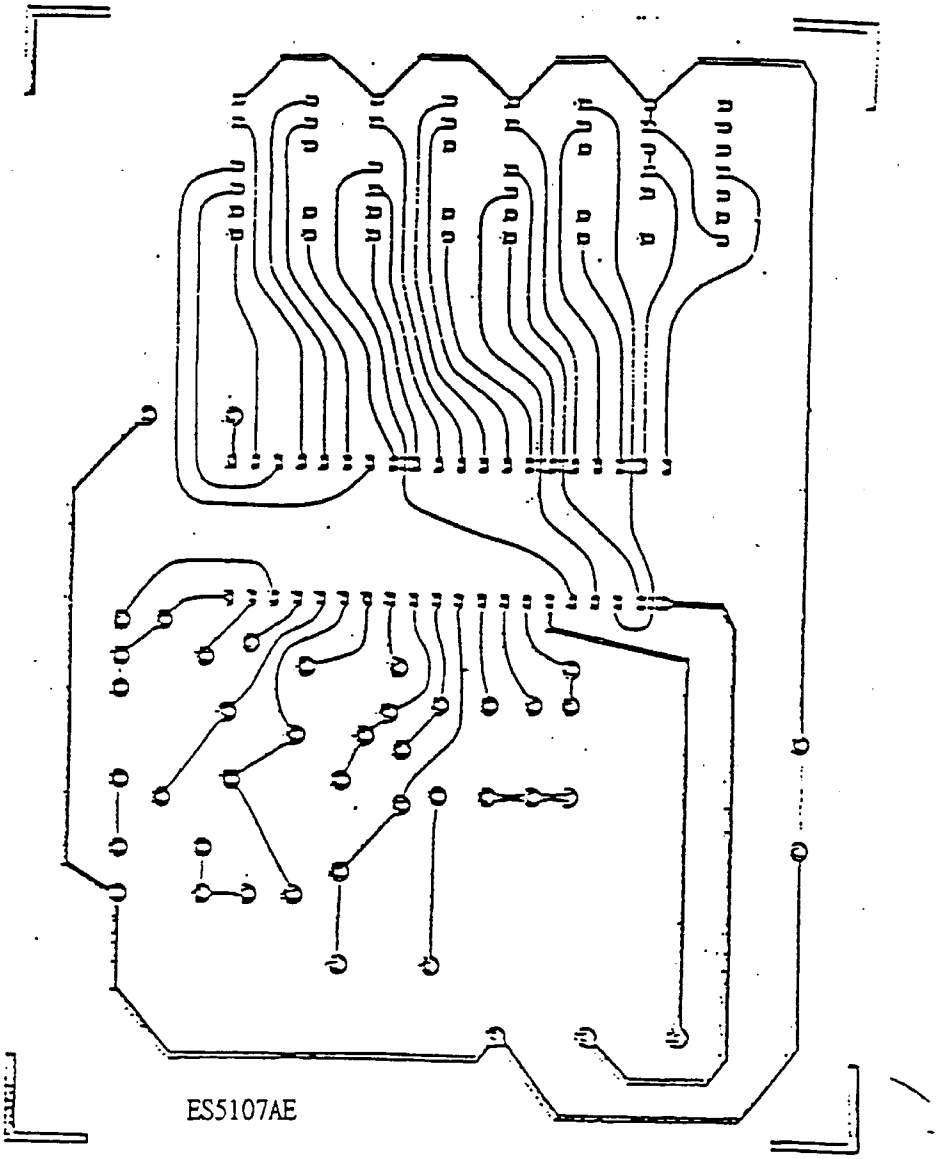


X、PCB LAYOUT

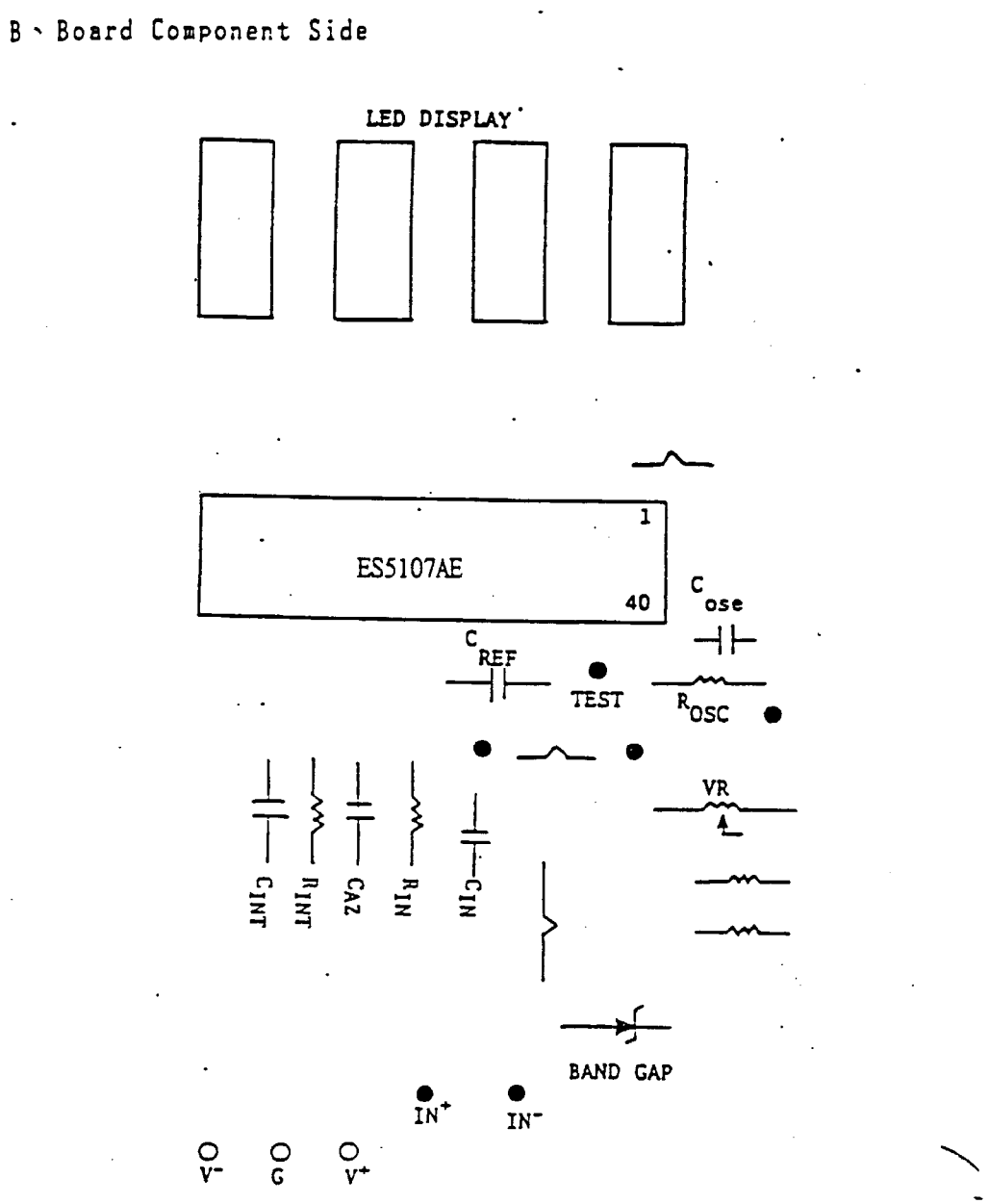
A、Board Back

X、PCB LAYOUT

A、Board Back



B、Board Component Side.



XI、NOTES FOR APPLICATION

A、Analog COMMON

The COMMON pin is used to set the common-mode voltage for the system in which the input signals are floating with respect to the power supply of the ES5107. In all most of the applications, IN LO, REF LO and COMMON Pins are tied to the same point, so that the common mode voltage can be removed from the reference system and the converter. In some applications, IN LO may not at the same point with COMMON and thus a common mode voltage exists in the system the high CMRR(86dB typical)of the ES5107 can take care of this common mode voltage. Nevertheless, it should be care to prevent the output of the integrator from saturation.

The COMMON pin is also used as a voltage reference. It sets a voltage, which is around 2.9 volts more negative than the positive supply. The COMMON voltage of ES5107 has a 0.001%/% voltage coefficient and a low output impedance of 15Ω typical.

The analog COMMON is tied internally to an N channel FET capable of sinking 30mA. This FET will hold the COMMON voltage at 2.9 volts when an external load attempt to pull the COMMON voltage toward the positive supply.

The source current of COMMON is only 10μA, so it is easy to pull COMMON voltage to a more negative voltage with respect to the positive supply.

When the total supply voltage is large enough to cause the zener to regulate(>7V), the COMMON voltage will have a low temperature coefficient typically less than 60 ppm/℃

This voltage can be used to generate the ES5107 reference voltage and an external voltage reference will be unnecessary in most cases.

B、Reference Voltage

For a 1000 counts reading. the input signal must be equal to the reference voltage. So for a 2000 counts full scale reading, it requires the input signal be twice the reference voltage. Thus for the 200.0mV and 2.000V full scale, the reference voltage should equal 100.0mV and 1.000V

In some applications the full-scale input voltage may be other than 200mV or 2V but 600mV, for example. The reference voltage should be set to 300mV and the input signal can be used directly without being divided.

The differential reference can be used during the measurement of resistor by the ratio-metric method and when a digital reading of zero is desired for VIN≠0.A compensating offset voltage can be applied between COMMON and IN LO and the voltage of being measured is connected bet ween COMMON and IN HI.

C、System Timing

The oscillator frequency is divided by four prior to clocking the internal decade counters. The signal integrate takes a fixed 1000 counts time period which is equal to 4000 clock pulses.

To make a maximum rejection of line frequency (60 HZ or 50HZ) noise pickcup, the signal integrate period should be a multiple of the line frequency period. For 60Hz noise rejection, oscillator frequencies of 120KHz, 80Khz, 60KHz, 48KHz, 40KHz etc. should be selected. For 50Hz rejection, oscillator frequencies of 100KKz , 40KHz, etc. would be suitable.

For all ranges of frequency Rosc should be 100KΩ Cosc is selected from the approximate equation f=0.45/RC For 48KHz clock (3 readings/second), Cosc = 100pF.

D、Integrating Resistor

The input buffer amplifier and integrator both have a class A output stage with 100μA of quiescent current and can supply 20μA drive currents with negligible linearity errors. The integrating resistor should be chosen to remain in the output stage linear drive region. It should be noticed that the integrating resistor should not be so large such that the leakage currents of printed circuit board will induce errors. For a 200mV full-scale the recommended integrating resistor value is 47KΩ and for 2V full scale is 470KΩ.

E、Integrating Capacitor

The integrating capacitor should be selected to maximize integrator output voltage swing without causing output saturation. If the analog COMMON is used as voltage reference a ±2V full-scale integrator output swing is satisfactory For 3 readings/second)48Khz clock)a 0.22μF value of C_{INT} is suggested. When different oscillator frequencies are used

C_{INT} must be changed in inverse proportion to maintain the nominal ±2V integrator swing.

The integrating capacitor should have low dielectric absorption to minimize roll-over error. An inexpensive polypropylene capacitor will work well.

F、Auto-Zero Capacitor

The auto-zero capacitor size has some influence on system noise. A 0.47μF capacitor is recommended for 200mV full scale where noise is very important. A 0.047μF capacitor is adequate for 2V full scale applications. A mylar type dielectric capacitor is adequate.

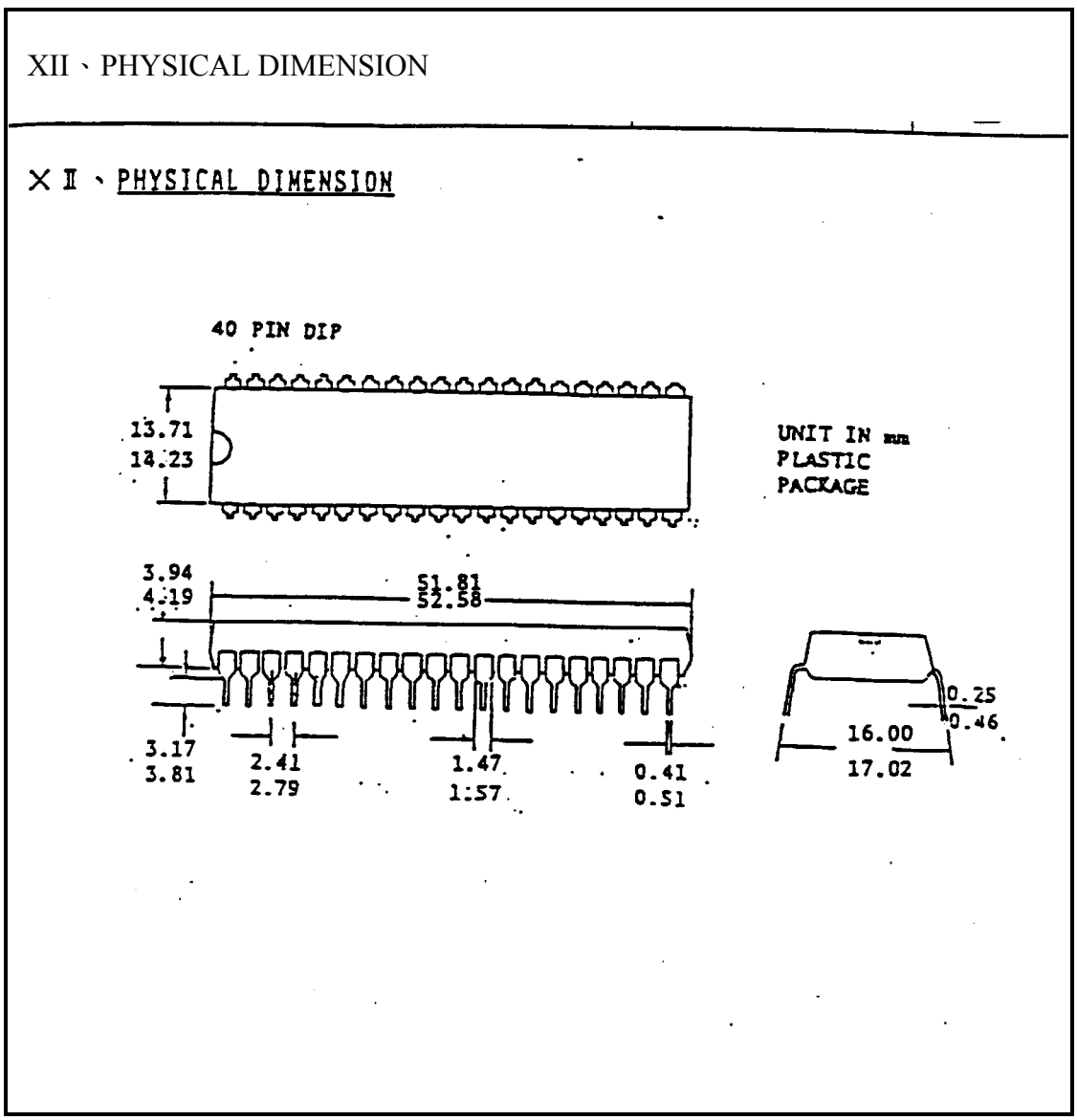
G、Reference Voltage Capacitor

When IN LO is tied to analog COMMON, a 0.1μF capacitor is adequate to be the reference capacitor. If a large common mode voltage exists and the application require a 200mV full scale a larger value is required to prevent roll over error A1.0μF capacitor will hold the roll-over error to 0.5 count.

H、Test

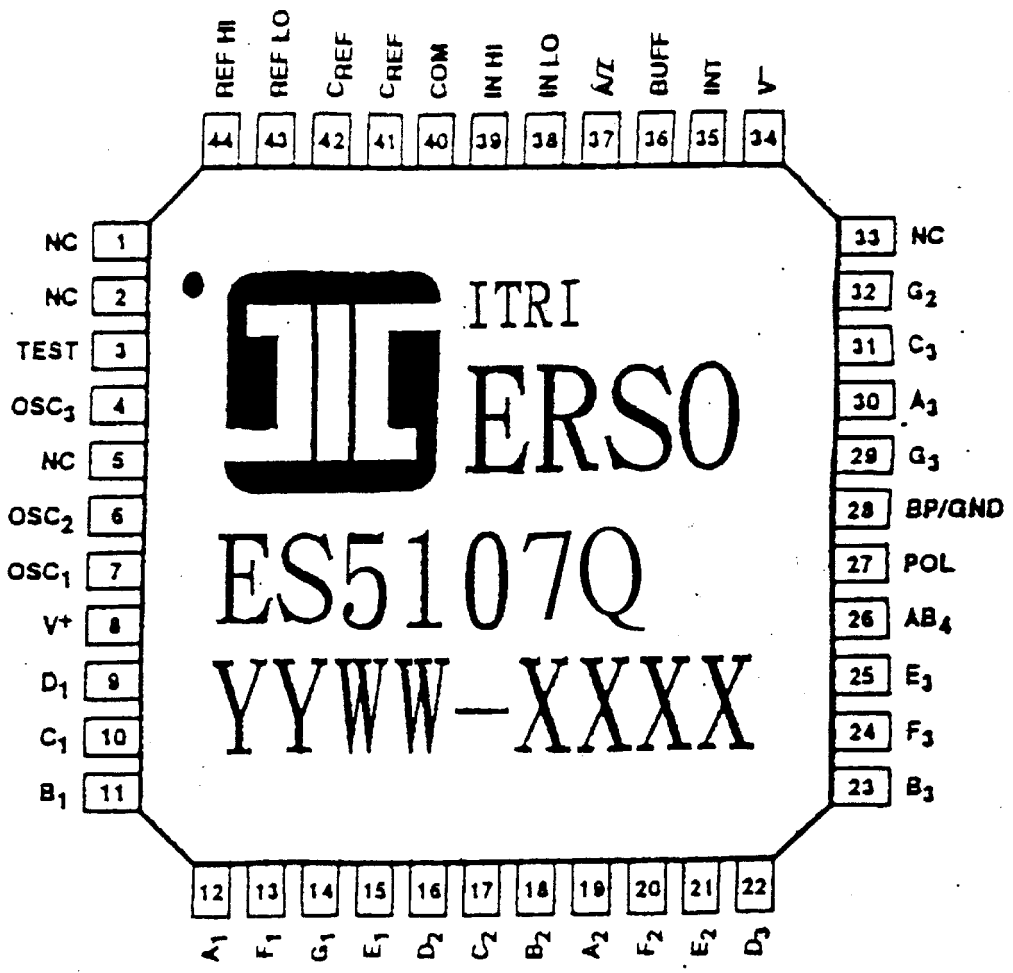
The TEST pin is tied to the internal negative logic supply through a 500Ω resistor. When TEST is pulled high all segments will be turned on and the display should read -1888.

XII、PHYSICAL DIMENSION

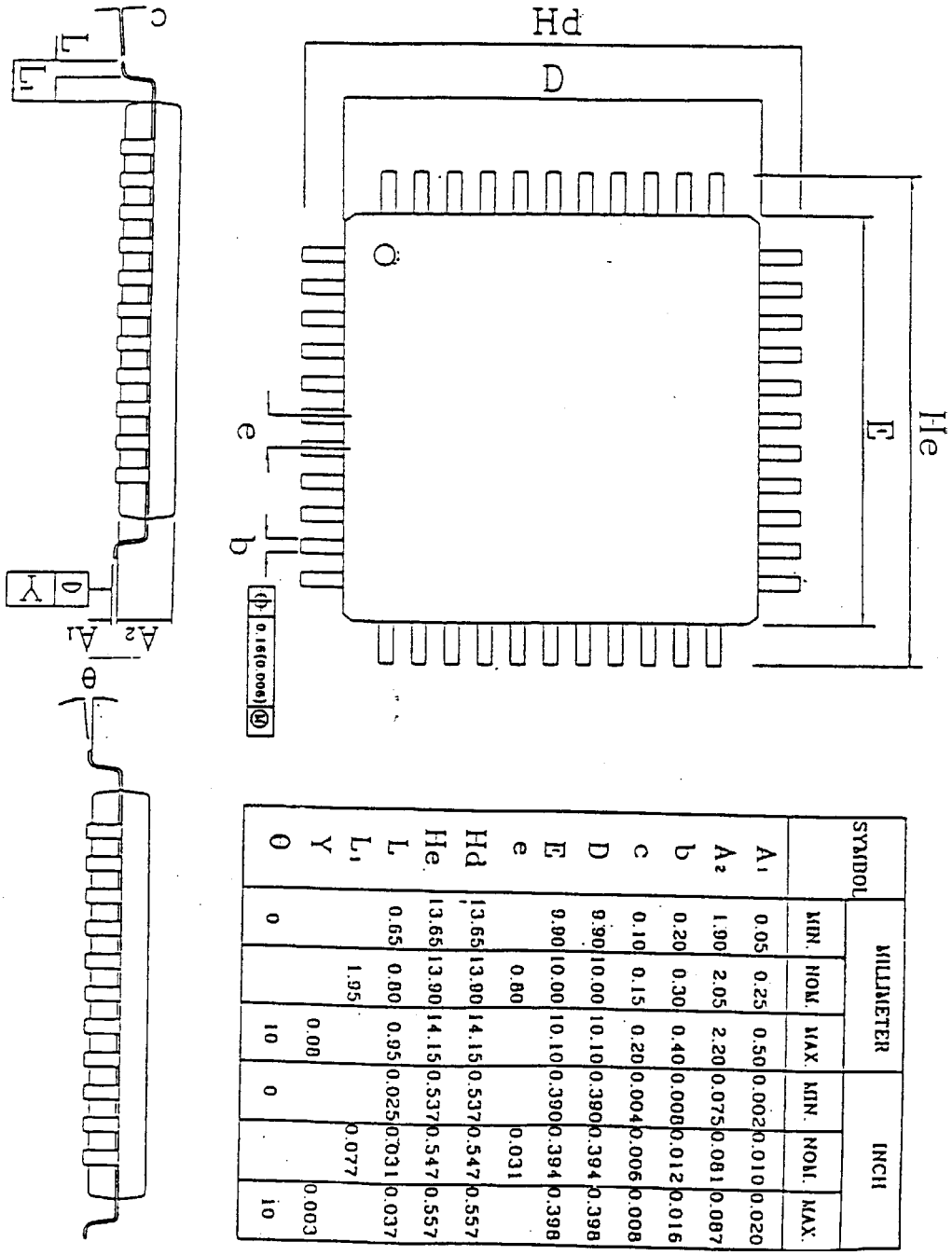


一、ES5170Q PIN CONFIGURATION

一、ES5107Q PIN CONFIGURATION



二、ES5107Q-PACKAGE



SYMBOL		MILLIMETER			INCH		
		MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A_1		0.05	0.25	0.50	0.002	0.010	0.020
A_2		1.90	2.05	2.20	0.075	0.081	0.087
b		0.20	0.30	0.40	0.008	0.012	0.016
c		0.10	0.15	0.20	0.004	0.006	0.008
D		9.90	10.00	10.10	0.390	0.394	0.398
E		9.90	10.00	10.10	0.390	0.394	0.398
e			0.80			0.031	
Hd		13.65	13.90	14.15	0.537	0.547	0.557
He		13.65	13.90	14.15	0.537	0.547	0.557
L		0.65	0.80	0.95	0.025	0.031	0.037
L_1			1.95			0.077	
Y				0.08			0.003
θ		0		10	0		10