

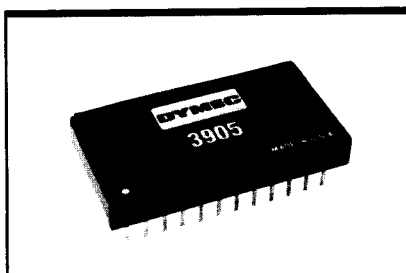


A Subsidiary of
SILICON TRANSISTOR CORP.

MODEL

3905

5MHz Voltage-to-Frequency Converter



Description

The 3905 is a high performance, precision 5 MHz full scale Voltage-to-Frequency Converter, intended for those applications which require maximum performance at the most economical cost. The 3905 features overall performance and stability virtually identical to similar units costing 40% more.

The unit accepts a $-100 \mu\text{V}$ to -10V Full Scale, single-ended, analog input signal with a 5% over-range capability, and a dynamic range of greater than 5,000,000 to 1 ($>134 \text{ dB}$). The input signal is converted to an output signal proportional to the full scale frequency, within 0.02% linearity utilizing the long-proven charge balance technique. Buffered complementary TTL-

compatible frequency outputs are provided that will drive up to 50 pF capacitive loads.

Stability of the 3905 V/F over temperature is excellent for a V/F converter in its price range, with a $10 \mu\text{V}/^\circ\text{C}$ typical, $30 \mu\text{V}/^\circ\text{C}$ maximum offset and $60 \text{ ppm}/^\circ\text{C}$ typical, $100 \text{ ppm}/^\circ\text{C}$ maximum gain tempco. Warm-up time to fully specified accuracy is less than two (2) minutes.

In applications where overall system throughput must be maintained at a specific rate, or where fixed offset or different full scale voltages would be convenient, **custom frequencies** and/or **custom trimming** can be easily accommodated. By increasing the full scale output frequency by 10-20%, for example, additional time would be available for the system micro-processor to access the results of each conversion. Please contact the factory to discuss your specific system timing requirements.

The 3905 is packaged in a 1.31" X 0.69" X 0.22" 24-pin DIL plastic package. Pin spacing is 0.6" (double DIP). Power dissipation is less than 0.8W maximum, and operation is over the 0°C to $+70^\circ\text{C}$ temperature range.

Features

- ☐ Outstanding Price/Performance Ratio
- ☐ Guaranteed minimum/maximum specifications
- ☐ Wide Dynamic Range
 - $>5,000,000:1$
 - $>134 \text{ dB}$
- ☐ Excellent Linearity
 - $0.02\% \text{ FS} \pm 0.02\%$ of input
- ☐ Excellent Stability
 - $10 \mu\text{V}/^\circ\text{C}$ offset
 - $60 \text{ ppm}/^\circ\text{C}$ gain
- ☐ Complementary Frequency Outputs
 - TTL/CMOS Compatible
- ☐ Small Size
 - 24-pin Double-DIP
- ☐ Low Power
 - $<0.8\text{W}$

Applications

- ☐ Analytical Instrumentation
- ☐ Medical Instrumentation
- ☐ Telemetry
- ☐ Data Recording
- ☐ Weighing Systems

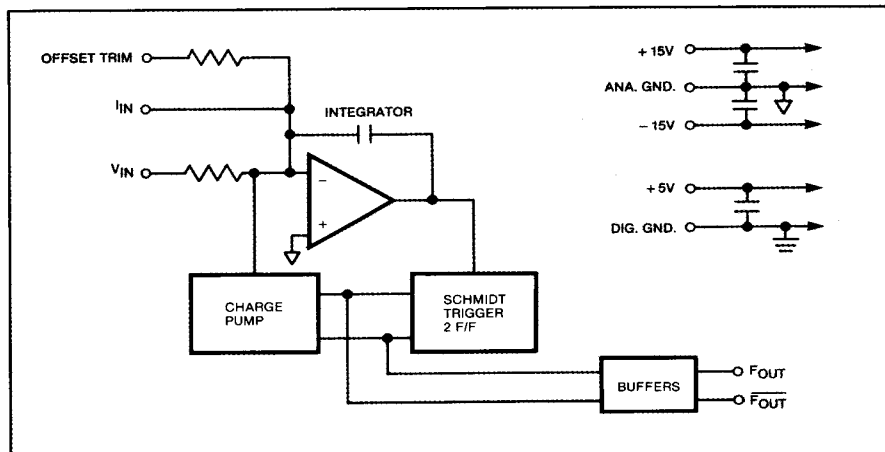


Figure 1. 3905 Block Diagram.

Specifications

All Specifications Guaranteed at 25°C Unless Otherwise Noted

Analog Input

Input Range

– 100 μ V to – 10V

Overrange

5% minimum

Configuration

Single-ended

Impedance

6 K Ω

Offset Voltage

± 7 mV typical, ± 10 mV maximum; Adjustable to zero

Overvoltage Protection

$\pm V_s$ without damage

Transfer Characteristics

Full Scale Frequency Output (Fout)

5 MHz $\pm 5\%$

Transfer Characteristic

5 MHz (Ein/10V)

Gain Error

$\pm 1\%$, trimmable to zero

Non-Linearity

$\pm 0.02\%$ FS, $\pm 0.02\%$ of input, maximum

Full Scale Step Response

2 cycles of new frequency, plus 10 μ S

Overload Recovery

10 cycles of new frequency

Stability

Gain — Tempco

60 ppm FS/ $^{\circ}$ C typical,
100 ppm FS/ $^{\circ}$ C maximum

Gain — PS Sensitivity

200 ppm/1% change in supply voltage

Offset — Tempco

10 μ V/ $^{\circ}$ C typical,
30 μ V/ $^{\circ}$ C maximum

Offset — PS Sensitivity

10 μ V/1% change in supply voltage

Warmup Time

≤ 2 minutes to specified accuracy

Output

Pulse Polarity

Positive and negative

Pulse Width

100 ± 20 ns

Logic Levels (Vcc = +5V)**Logic "1" (High)**

+ 4.0V ± 0.5 V

Logic "0" (Low)

< 0.4V @ 3 mA sink

Load

≤ 50 pF for rated performance

Power Requirements

(+ Vs) + 15V, $\pm 3\%$

30 mA maximum

(– Vs) – 15V, $\pm 3\%$

10 mA maximum

(Vcc) + 5V, $\pm 5\%$

40 mA maximum

Power Dissipation

0.8W maximum

Environmental and Mechanical

Operating Temperature

0 $^{\circ}$ C to + 70 $^{\circ}$ C

Storage Temperature

– 65 $^{\circ}$ C to + 150 $^{\circ}$ C

Humidity

0-85%, non-condensing up to 40 $^{\circ}$ C

Dimensions

1.31" X 0.69" X 0.22"
(33.2 X 17.5 X 5.5 mm)

General Considerations

Figure 2 depicts a typical circuit configuration for the 3905. The layout should be clean, with output pulses routed as far away from the input analog signals as possible. For maximum performance, bypass capacitors, as shown in Figure 2, should be mounted right at the appropriate pins of the 3905.

Offset and Gain Trimming

The OFFSET adjustment potentiometer should be a 20 k Ω , 10-turn unit. To insure that the temperature coefficient of the potentiometer is not significant relative to the overall offset drift specification, a potentiometer with a temperature coefficient of 100 ppm or better is recommended. With this pot in the circuit, initial offsets of up to ± 10 mV may be trimmed to zero.

The GAIN adjustment potentiometer should be a 200 Ω , 10-turn unit with a

recommended temperature coefficient of 100 ppm or better. With this pot in the circuit, initial gain errors of up to $\pm 2\%$ may be trimmed to zero.

Grounding

The Analog and Digital grounds are internally separate in the 3905. The use of ground plane is not necessary for proper operation of the 3905; however, a ground plane is recommended with any analog signal conditioning circuitry that may be used in front of the V/F, especially if this circuitry involves high gains. Any amplifiers used in front of the 3905 should be decoupled to eliminate potential problems with the high frequency output of the V/F.

Offset and Gain Calibration

Offset Calibration

Offset calibration should be performed prior to gain calibration. With a

-10 mV analog input signal at pin 11 of the 3905, adjust the OFFSET potentiometer until a frequency of 5.000 KHz is observed on output pins 21, 23 or 24.

Gain Calibration

With a full scale analog input voltage of -10.00 V on pin 11, adjust the GAIN potentiometer until a full scale frequency of 5.000 MHz is observed on output pins 21, 23 or 24.

N/C Pins

Pins marked as N/C (no connection) have no electrical connection to the internal circuitry of the 3905.

Output Pins

Pins 23 and 24 are tied together internally. Either or both may be used as the source of the frequency output of the 3905 as long as the load specifications are not exceeded. Pin 21 provides an inverted signal relative to pins 23 and 24 with the same loading limits.

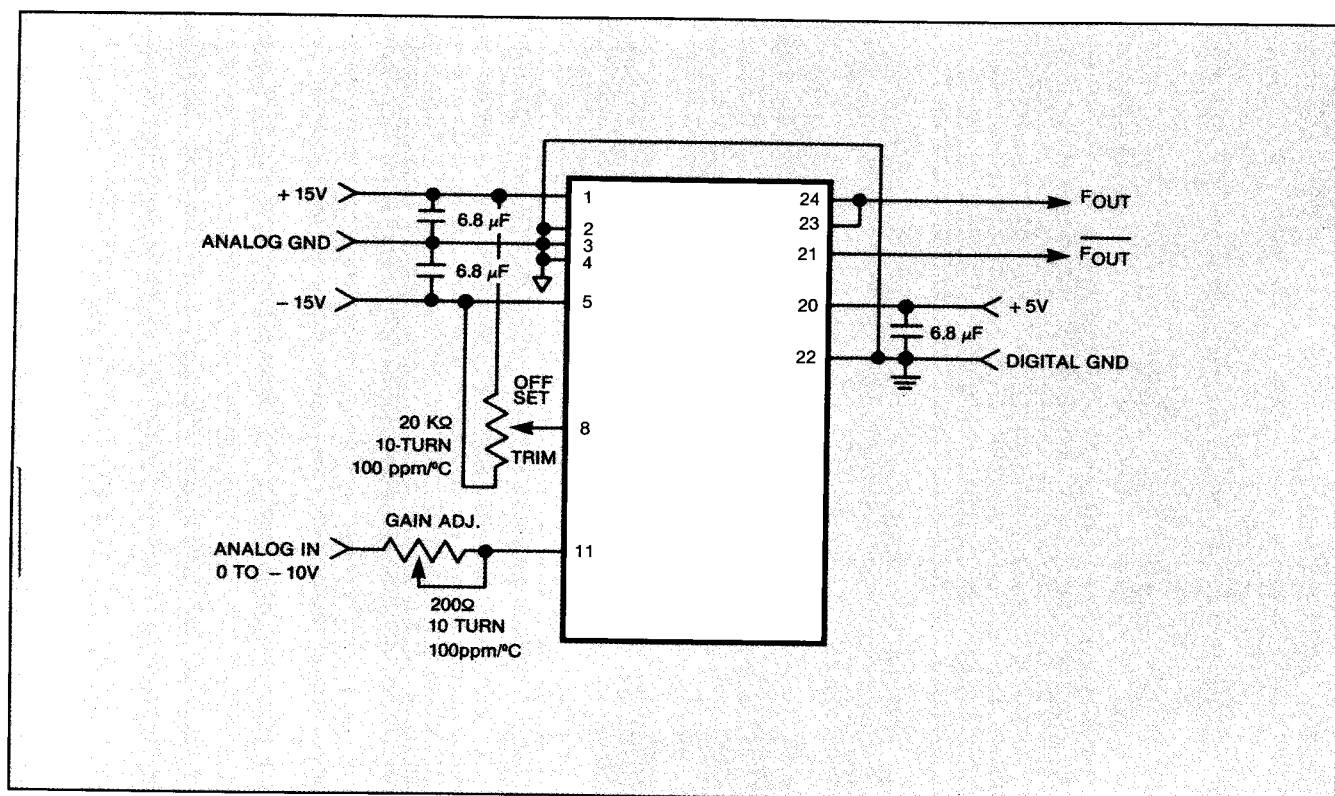


Figure 2. 3905 Typical Circuit Configuration.

Mechanical Dimensions & Pinout

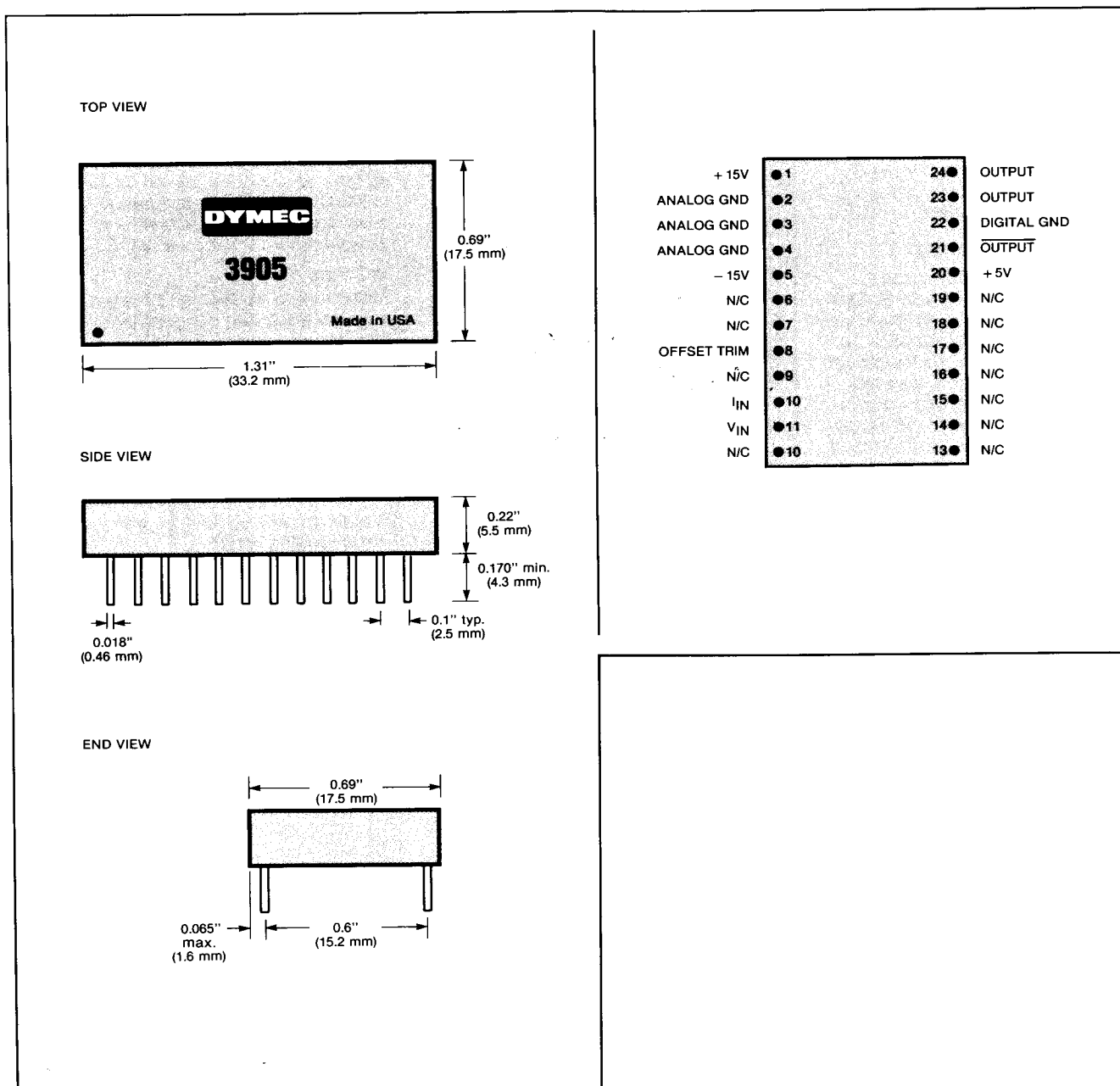


Figure 3. 3905 Mechanical & Pinout



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