DYMEC

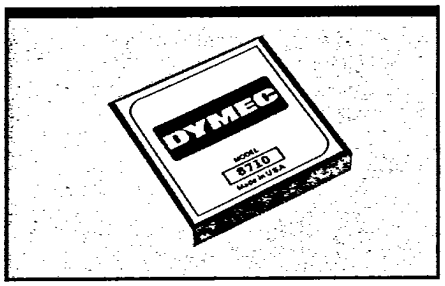
A Subsidiary of
SILICON TRANSISTOR CORP.

MODEL

8710

T-73-13-03

10MHz Voltage-to-Frequency Converter



Description

The **8710** is a high performance, precision 10MHz full scale Voltage-to-Frequency Converter intended for applications which require high resolution and a six decade dynamic range. The differential input of the **8710** accepts both a positive or negative 10µV to 10V full scale analog input signal with a 5% overrange capability. The input signal, with common-mode signals attenuated by 60dB minimum, is converted to an output signal proportional to the full scale frequency, within 0.05% linearity utilizing the long-proven charge balance technique. A buffered TTL compatible frequency output with a 10 TTL load fanout is provided that will drive up to 50pF capacitive loads.

Stability of the **8710** over temperature is excellent, with a 10µV/°C typical, 50µV/°C maximum offset and 60ppm/°C typical, 100ppm/°C maximum gain tempco. Warm-up time to 0.1% accuracy is less than two (2) minutes.

In applications that require slightly different specifications, **custom frequencies** and/or **custom trimming** can be easily accommodated. Other variations such as ratiometric operation, FET input opamp, or extended temperature range can also be accommodated. Please contact the factory to discuss your specific requirements.

The **8710** is packaged in a 2.00"x 2.00"x0.40" modular package. Power dissipation is less than 1.34W maximum, and operation to rated performance is over the 0°C to +70°C temperature range.

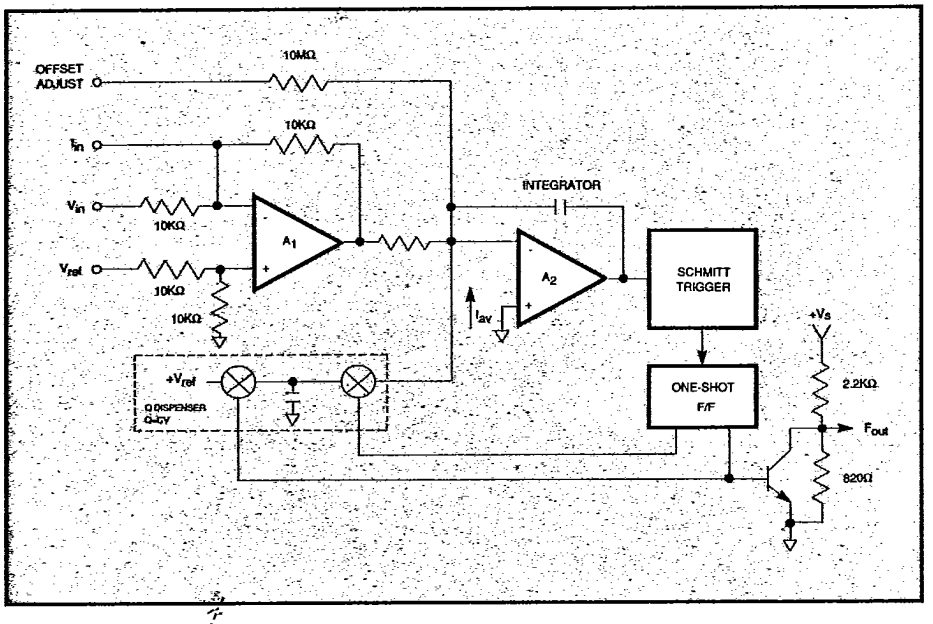


Figure 1. 8710 Block Diagram

FEATURES

- ☐ **Guaranteed minimum/ Maximum specifications**
- ☐ **Wide Dynamic Range**
  >10,000,000:1
  >140dB
- ☐ **Excellent Linearity**
  ±0.05% FS ±0.05% of input
- ☐ **Excellent Stability**
  10µV/°C offset
  60ppm/°C gain
- ☐ **Buffered Frequency Output**
  10 TTL loads
- ☐ **Self-contained**
  2.00" x 2.00" x 0.40" module
- ☐ **Low Power**
  <1.34W

APPLICATIONS

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

Specifications

All Specifications Guaranteed at 25°C Unless Otherwise Noted

T-73-13-03

Analog Input

Input Range
±10μV to ±10V
Current Range
+1nA to +1mA
Overrange
5% minimum
Configuration
Differential
Common-Mode Voltage Range
±10V minimum
Common-Mode Rejection Ratio
60dB minimum, 66dB typical; See Note 1
Offset Voltage
±3mV typical; ±10mV maximum; adjustable to zero
Impedance ($+V_{in}$)
10KΩ, ±1%
Impedance (Differential)
40KΩ, ±1%
Overvoltage Protection (I_{in} Terminal)
$\pm V_S$ without damage
Overvoltage Protection (V_{ref} Terminal)
$\pm 2V_S$ without damage

Transfer Characteristics

Full Scale Frequency Output (F_{out})
10MHz +5% overrange
Transfer Characteristic
10MHz (V_{in}/10V)
Full Scale Factor
1mA ±1%, or 10V trimmable to 10MHz
Non-Linearity
±0.05% FS ±0.05% of input; not specified under overrange conditions
Full Scale Step Response (to 0.01%)
2 cycles of new frequency plus 2μs
Overload Recovery
12 cycles of new frequency

Stability

Gain - Tempco
60ppm FS/°C typical
100ppm FS/°C maximum
Gain - PS Sensitivity
200ppm/1% change in supply voltage
Gain - Drift Per Day
±150ppm FS, maximum
Gain - Drift Per Month
±300ppm FS, maximum
Offset - Tempco
±10μV typical; ±50μV maximum
Offset - PS Sensitivity
20μV/1% change in supply voltage
Offset - Drift Per Day
±10μV typical
Offset - Drift Per Month
±20μV typical
Warmup Time
≤2 minutes to 0.1% accuracy

Output

Pulse Polarity
Positive
Pulse Width
60ns±20ns
Logic Levels (V_{CC}=+5V)
Logic "1" (High)
+4.0V ±0.5V
Logic "0" (Low)
<0.4V @ 16mA sink
Load
≤50pF for rated performance
Fanout
10 TTL loads

Power Requirements

($+V_S$) +15V, ±5% 60mA maximum
($-V_S$) -15V, ±5% 25mA maximum
Power Dissipation
1.34W maximum

Environmental and Mechanical

Operating Temperature (to Rated Performance)
0°C to +70°C
Operating Temperature (to 50% derated TC, linearity & fanout)
-25°C to +85°C
Storage Temperature
-55°C to +125°C
Humidity
0-85%, non-condensing up to 40°C
Dimensions
2.00" x 2.00" x 0.40"
(50.8 x 50.8 x 10.16mm)

Note 1: CMRR specification given assumes GAIN ADJUST potentiometer is zero (0) ohms. With GAIN ADJUST potentiometer at 200Ω, CMRR is 34dB.

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Using the 8710 V/F Converter

General Considerations

Figure 2 depicts a typical circuit configuration for the **8710.** 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 **8710.** For positive input signals, use the connections as shown. For negative input voltages, V_{in} should be grounded and the negative going voltage should be connected to the V_{ref} input.

Grounding

The Analog and Digital grounds are internally separate in the **8710.** The use of ground plane is not necessary for proper operation; 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 **8710** should be decoupled to eliminate potential problems with the high frequency output of the V/F.

Input Considerations

Single-ended Inputs

The V_{in} pin accepts a 0V to +10V analog input, and has an impedance of 10KΩ. Figure 3 provides a recommended configuration for expanded or contracted input ranges.

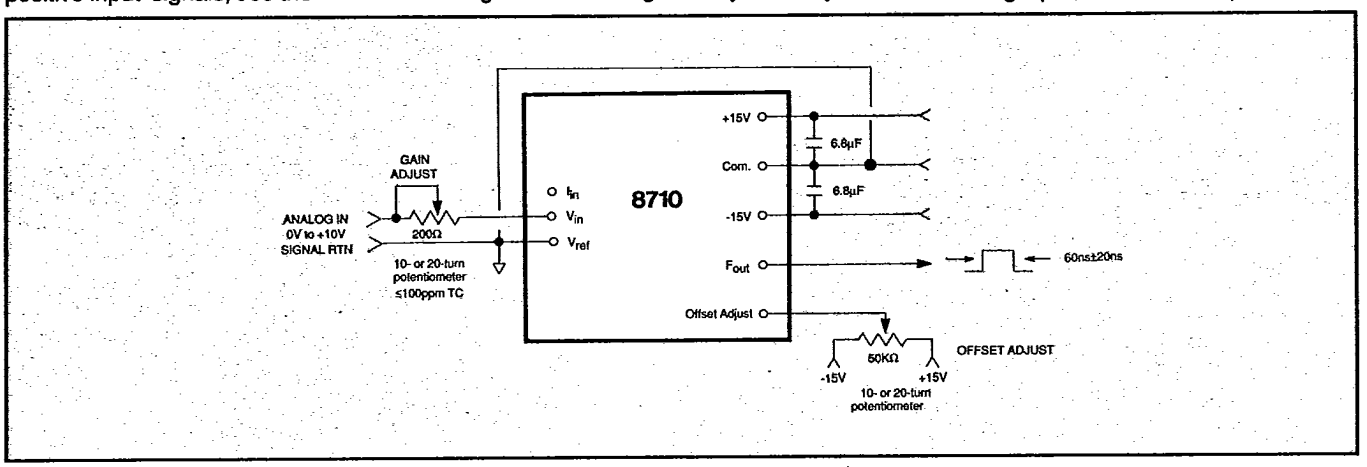


Figure 2. 8710 Normal Input Configuration

Differential Inputs

The input can be configured as a differential input as shown in Figure 4. Differential input impedance is 40KΩ. Maximum common-mode voltage is ±10V.

Offset and Gain Calibration

Offset Calibration

Offset calibration should be performed prior to gain calibration. With a +1mV analog signal at the input of the **8710** , adjust the OFFSET potentiometer until a frequency of 1.000KHz is observed on the output pin .

Gain Calibration

With a full scale analog input voltage of +10.00V, adjust the GAIN potentiometer until a full scale frequency of 10.000MHz is observed on the output pin .

Offset and Gain Trimming

The OFFSET adjustment potentiometer should be a 50KΩ, 10-turn unit. With this pot in the circuit, initial offsets of up to ±10mV may be trimmed to zero.

The GAIN adjustment potentiometer should be a 200Ω, 10-turn unit. To insure that the temperature coefficient of the potentiometer does not become significant relative to the overall gain tempco specification, a 100ppm or better potentiometer is recommended. With this pot in the circuit, initial gain errors of up to ±2% may be trimmed to zero.

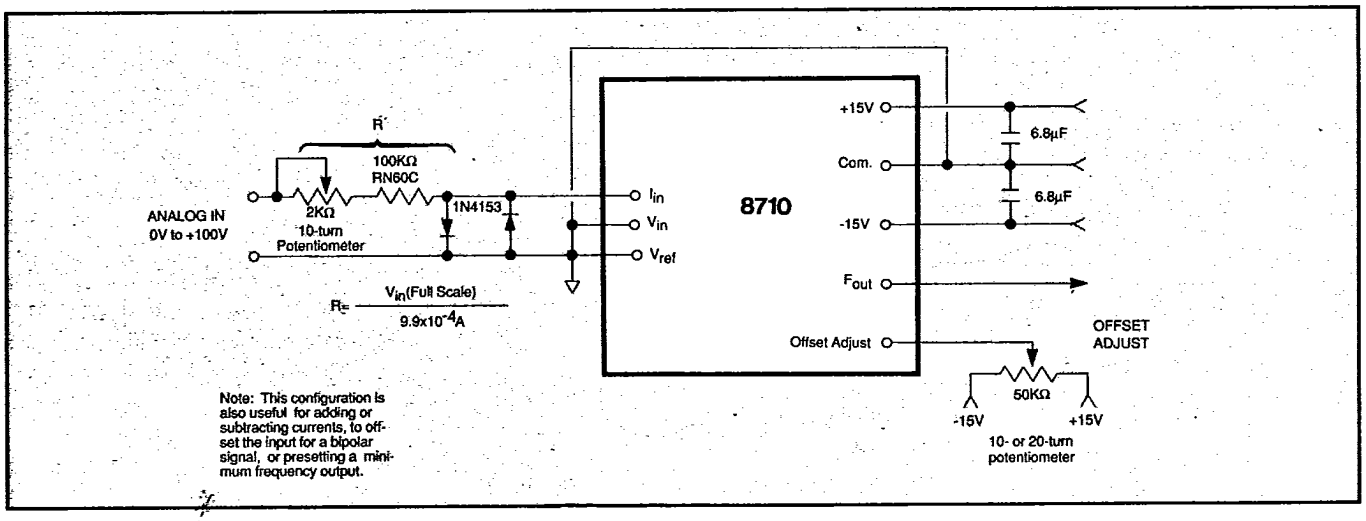


Figure 3. Expanded or Contracted Input Range

Mechanical Dimensions & Pinout

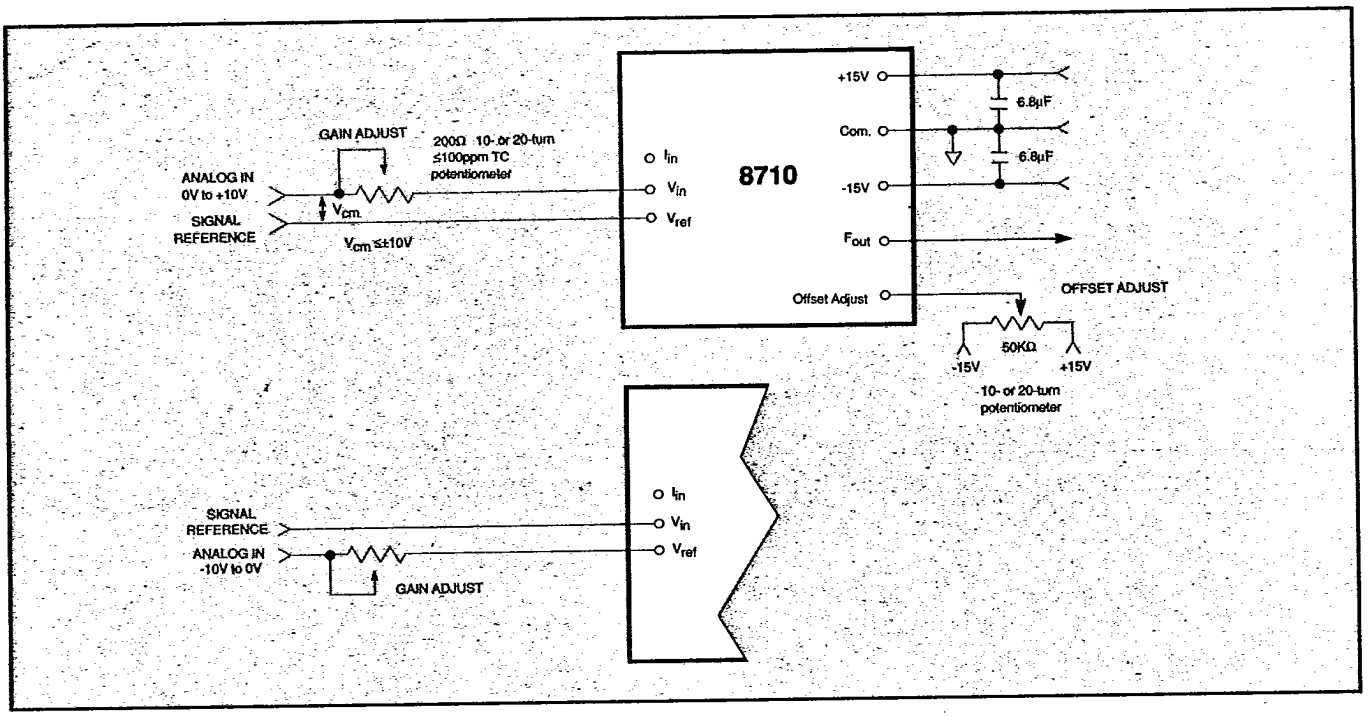
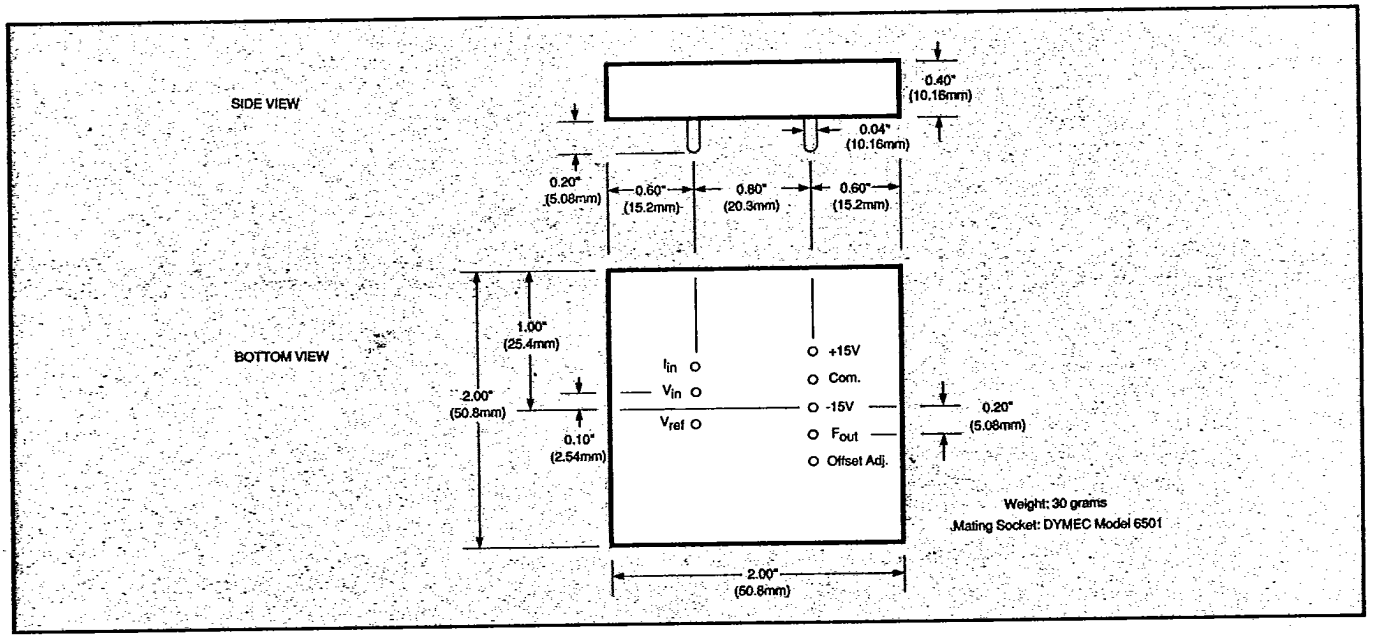


Figure 4. 8710 Differential Inputs



Mechanical Dimensions & Pinout

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Printed in U.S.A.

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Bulletin No. 86078710 REV.0