Sipex Corporation
SIGNAL PROCESSING EXCELLENCE

HS5210 SERIES

12-BIT ADJUSTMENT FREE ADCs

FEATURES

- 12-bit conversion in 10μS typ; 13μS max
- Adjustment-free, ±0.0125% linearity
- Low power: 670 mW typ
- Wide operating temperature range: −55°C to +125°C
- Small size: 24-pin, metal-to-metal, hermetic package
- Full MIL-STD-883 Rev. C, Levels B or S, or commercial processing

DESCRIPTION

HS5210 Series are extremely fast 12-bit succesive approximation A/D converters providing both parallel and serial output. All models have a maximum conversion time of 13μS which allows full accuracy with a 1 MHz clock.

HS5210 Series hybrid microcircuit converters are housed in hermetically-sealed 24-pin dual-in-line packages. Miniature size, low power consumption and adjustment free operation are product features. The HS5210 Series provides the user with the best possible performance in systems requiring maximum reliability in the smallest space. All converters are completely laser-trimmed, adjustment free, and incorporate highly stable thin-film resistor networks which provide long-term maintenance free operation.

HS5210 Series ADCs are available in four input voltage ranges: 0 to −10 volts (HS5210/13), ±5 volts (HS5211/14), ±10 volts (HS5212/15), and 0 to +10 volts (HS5216). For each of these input ranges, the user has the option of specifying a model complete with an internal reference or for improved absolute accuracy, models which require an external reference.

In all cases ±½ LSB linearity is guaranteed over the entire operating temperature range.

All models of the HS5210 Series may be procured for operation over the −55°C to +125°C military temperature range ("B" models) with the same operating characteristics as the commercial 0°C to +70°C range. In addition, full military temperature range models are available processed to MIL-STD-883 Rev. C, Levels B or S.

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HS 5210 SERIES SUCCESSIVE APPROXIMATION 12-BIT A/D Converters

ABSOLUTE MAXIMUM RATINGS:

Operating Temperature	-55°C to +125°C
Storage Temperature	-65°C to +150°C
Positive Supply	+18 Volts
Negative Supply	-18 Volts
Logic Supply	+7 Volts
Analog Input	±25 Volts
Digital Outputs	0 to Logic Supply
Digital Inputs	-0.5 to +5.5 Volts
Reference Supply (Models HS5213, 14, 15)	-15 Volts

SPECIFICATIONS (T_A=25°C, Voltages ±15, +5 Unless otherwise stated)

PERFORMANCE (NOTE 1):

INPUT RANGE	INPUT IMPEDANCE	HIGH PERFORMANCE (Internal Reference)	HIGH ACCURACY (Ext. Ref.= -10.000V)	
0 to -10V	3.6k	HS5210	HS5213	
+5V to -5V	3.6k	HS5211	HS5214	
+10V to -10V	7.2k	HS5212	HS5215	
0 to +10V	3.3k	HS5216		
		MAX.	MAX.	UNITS
Resolution		12	12	Bits
Linearity (25°C)		±1/2	±1/2	LSB
t_{min} to t_{max}		±3/4	±3/4	LSB
Zero Error		1	1	LSB
Absolute Accuracy (25°C)(Note 2)		2	2	LSB
Absolute Accuracy (-55°C to +125°C)(Note 2)		±.4	±.1	%
Conversion Time		13	13	µSec
Power Supply Requirments				
Current Drain +15 Volt Supply		16	10	mA
Current Drain -15Volt Supply		28	28	mA
Current Drain +5Volt Supply (Note 5)		50	50	mA
Current Drain @ Reference Input			2	mA
Power Supply Rejection				
±15 Volts (Note 3)		±1	±1	LSB/% Supply
±5Volts		±1	±1	LSB/% Supply
Power Consumption		910	825	mW

LOGIC RATINGS

	MIN.	TYP.	MAX.	UNITS
Input Logic Commands				
Logic "0"			0.7	Volts
Logic "1"	2.0			Volts
Loading		0.5		TTL Load
Clock Input Pulse Width				
Logic "0"	180			nSec
Logic "1"	100			nSec
Output Logic				
Logic "0"		0.15	0.4	Volts
Logic "1"	2.4	3.6		Volts
Serial Output				NRZ
Parallel Output (See Timing Diagram)				
Fanout-High	8			TTL Load
Fanout-Low	2			TTL Load

LOGIC CODING

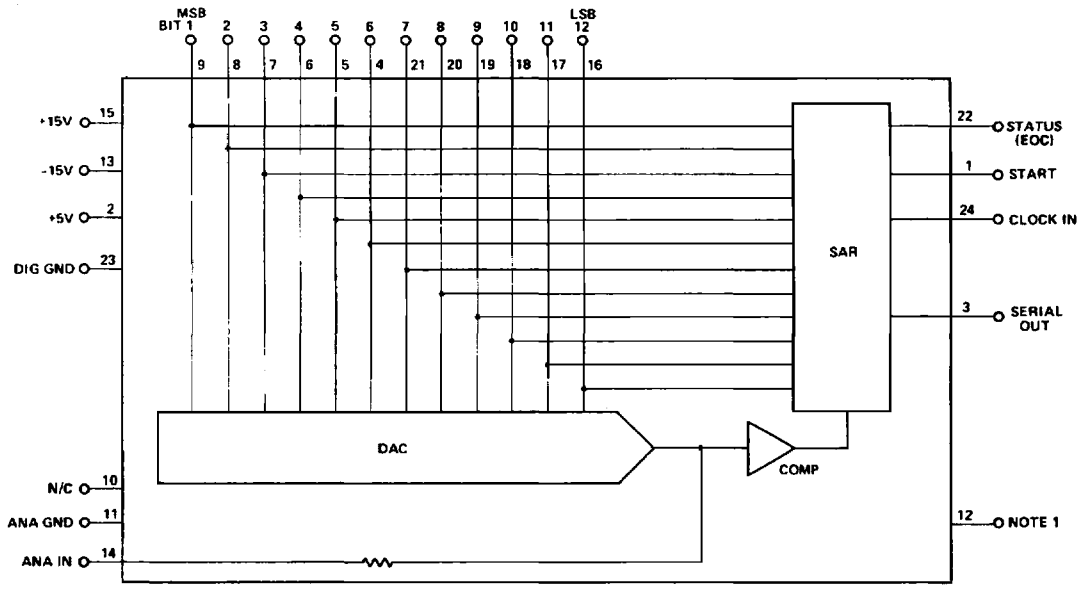
HS5210/5213	HS5211/5214	HS5212/5215	HS5216	MSB LSB
0.0000V	+5.0000V	+10.0000V	+10.0000V	0000 0000 0000
- 0.0024V	+4.9976V	+ 9.9951V	+ 9.9976V	0000 0000 000●
- 4.9976V	+0.0024V	+ 0.0049V	+ 5.0024V	0111 1111 111●
- 5.0000V	0.0000V	0.0000V	+ 5.0000V	●●●● ●●●● ●●●●
- 5.0024V	-0.0024V	- 0.0049V	+ 4.9976V	1000 0000 000●
- 9.9976V	-4.9976V	- 9.9951V	+ 0.0024V	1111 1111 111●
-10.0000V	-5.0000V	-10.0000V	0.0000V	1111 1111 1111

*The voltages given are the theoretical values for the transitions indicated. Ideally, with the converter continuously converting the output bits indicated as ● will change from "1" to "0" or from "0" to "1" as the input voltage passes through the level indicated.

EXAMPLE:
With an HS 5210/13 (0 to - 10V range), the transition from an output 0000 0000 0000 to 0000 0000 0001 will ideally occur at an analog voltage of - 0.0024V and the transition from 1111 1111 1110 to 1111 1111 1111 will occur with an analog voltage of - 9.9976.

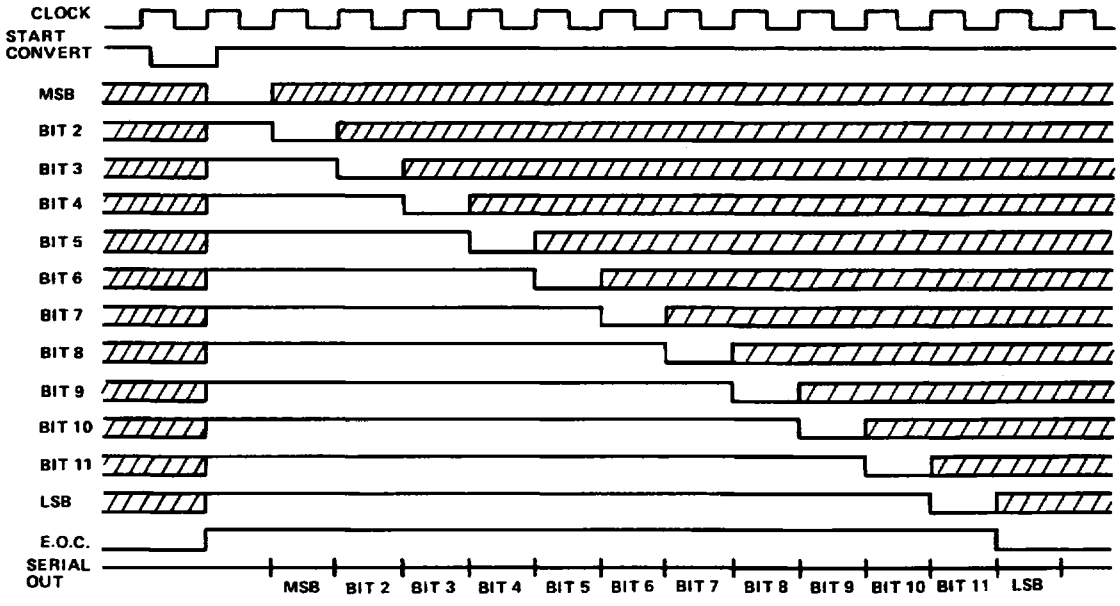
NOTE 1 Parts can be tested to meet MIL-38510/120. Consult factory.
NOTE 2 Absolute accuracy includes all errors, gain, zero, and linearity. No missing codes guaranteed over temperature.
NOTE 3 For proper operation ± 15V power supplies tolerance should not be greater than ± 5%.
NOTE 4 FSR is the abbreviation for "Full Scale Range" and is equal to the peak-to-peak output voltage, i.e., 10V for ± 5V range.
NOTE 5 Model HS 5216 + 5V current is 57 mA max.
NOTE 6 In case of discrepancy between package shown in photograph and package outline dimension, the mechanical outline is correct.

FUNCTIONAL DIAGRAM



NOTE 1. N/C for internal reference models. -10V ref input for external reference models.

TIMING DIAGRAM



NOTES:

1. Shaded areas shown for parallel data outputs denote bit states determined by successive approximation of analog input.
2. For continuous operation connect start convert (Pin 1) to end of conversion (Pin 22).
3. Reset the converter by holding the start 'low' during a low to high transition of the clock. The start must be low for a minimum of 25 nSec prior to the clock transition. After the start is again set high the conversion will begin on the next low to high transition of the clock. The start may be set low at any time during a conversion to reset and begin again.
4. At the end of conversion the E.O.C. will remain low until the converter is reset. The parallel data is valid for the entire time the E.O.C. is low.
5. The serial output is non-return to zero.
6. For the user's design flexibility, digital and analog grounds are brought out separately and must be externally connected. For optimum results, this external connection should be made as close to the converter as is possible.

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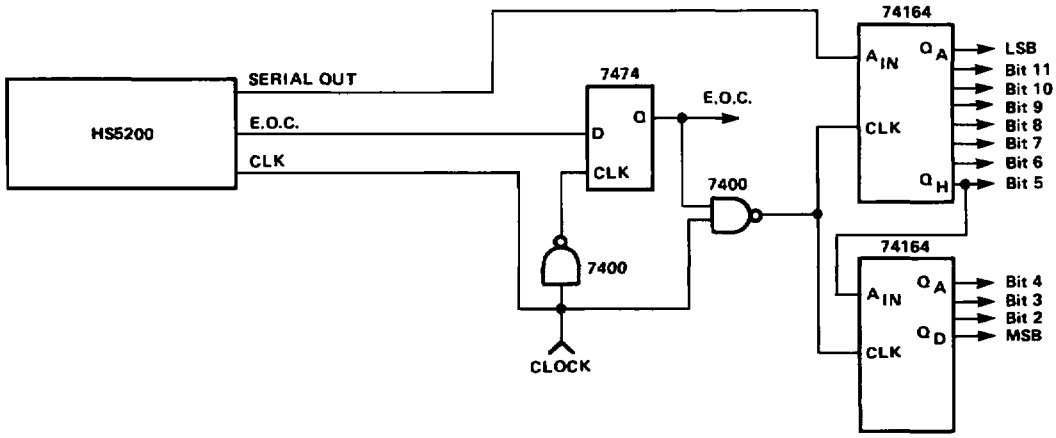
APPLICATIONS INFORMATION

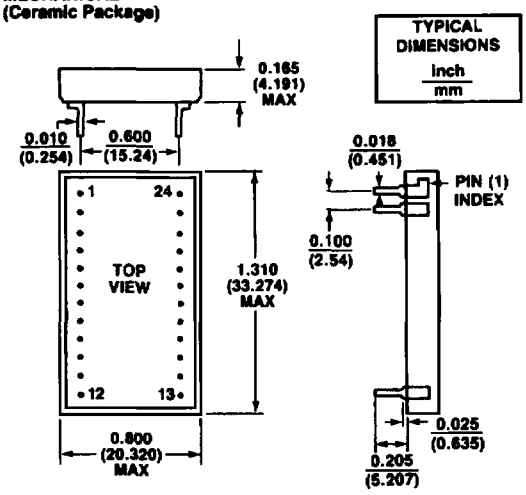
SERIAL TO PARALLEL CONVERSION



PIN DESIGNATIONS

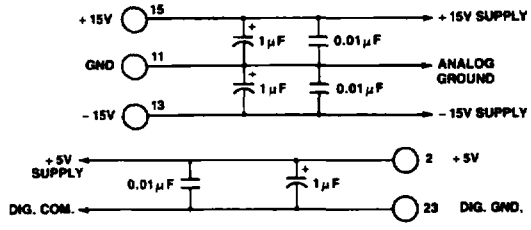
PIN NO.	FUNCTION	PIN NO.	FUNCTION
Pin 1	Start	Pin 24	Clock Input
Pin 2	+5V	Pin 23	DIG GND
Pin 3	Serial Out	Pin 22	E.O.C. (end of conversion)
Pin 4	Bit 6	Pin 21	Bit 7
Pin 5	Bit 5	Pin 20	Bit 8
Pin 6	Bit 4	Pin 19	Bit 9
Pin 7	Bit 3	Pin 18	Bit 10
Pin 8	Bit 2	Pin 17	Bit 11
Pin 9	MSB	Pin 16	LSB
Pin 10	No connection	Pin 15	+15V
Pin 11	Analog Ground	Pin 14	Analog in
Pin 12	N/C (int.ref.models) -V ref in (ext.ref.models)	Pin 13	-15V

MECHANICAL
(Ceramic Package)



Pin 1 is marked by a dot on the top of the package.

RECOMMENDED POWER SUPPLY BYPASS CIRCUITS



ORDERING INFORMATION

Model	Description
HS52XXC	Comm., 12-Bits, 13μS
HS52XXB	MIL, 12-Bits, 13μS

└ Model Selection Number

Specifications subject to change without notice.