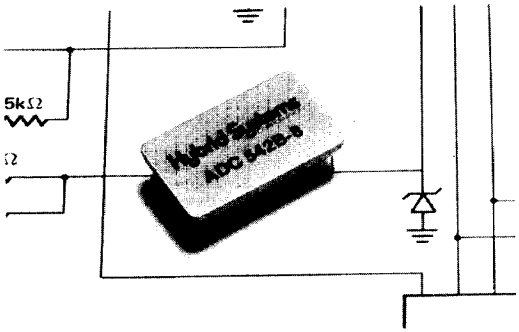
ADC541/542

8-BIT, WIDE TEMPERATURE, 2.5μS ADCs

FEATURES

- 2.5μS conversion time
- Low power: 650mW
- Wide temperature range models: −55°C to +125°C operation
- MIL-STD-883 or commercial/industrial processing
- Plug-in replacements for ADC82



DESCRIPTION

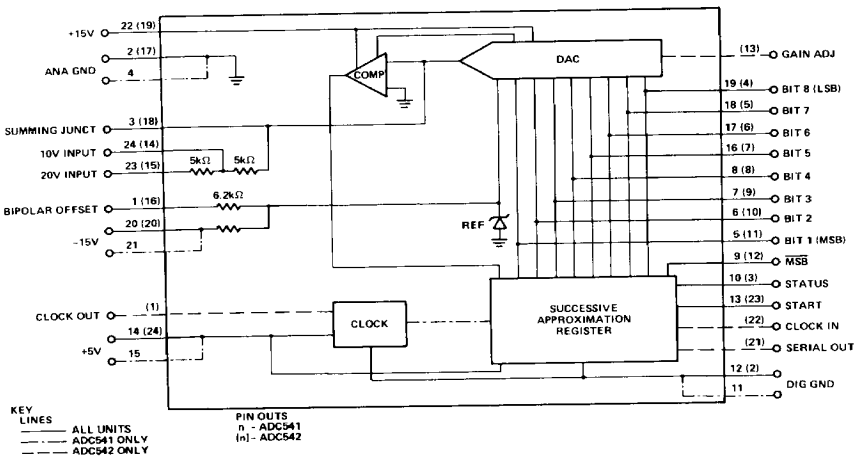
The ADC541/542 Series are fast, low power, hybrid IC analog-to-digital converters (ADCs). The series features 8-bit resolution and accuracy with 2.5μS typical conversion time. The low power drain of 650 mW is from standard ±15 VDC and +5 VDC power supplies. All models are hermetically-sealed in 24-pin DIP style packages and are complete with precision thin-film DAC, clock, comparator, reference and successive approximation register.

The ADC541C-8 and ADC542C-8 are processed to commercial/industrial standards and operate −25°C to +85°C. ADC541B-8 and ADC542B-8 are processed to MIL-STD-883 Rev. C, Level B requirements, and operate −55°C to +125°C. In addition, the ADC542 versions are plug-in replacements for the ADC82.

All models can be externally pin-connected for 3 unipolar and 3 bipolar input ranges. Output coding in the bipolar mode is user selectable as either offset binary or 2's complement. ADC541/542 feature an overall temperature coefficient of ±45 ppm/°C and long-term stability of 0.1%/year.

ADC541/542 models provide systems designers with greater flexibility, savings in space and weight, and the ultimate in reliability. Their compact size, 8-bit resolution, accuracy and extensive self-contained features are particularly well suited to microprocessor applications.

FUNCTIONAL DIAGRAM

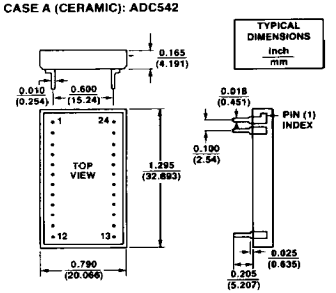


SPECIFICATIONS

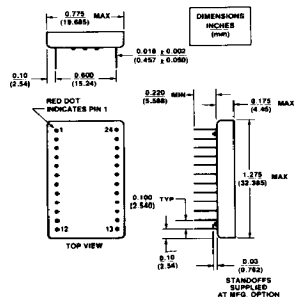
(Typical @ +25°C and nominal power supplies unless otherwise noted)

SERIES	**ADC541/542**
RESOLUTION	8-Bits
TYPE	Successive Approximation
ANALOG INPUT	
Unipolar	0 to +5V, 0 to +10V, 0 to +20V
Bipolar	±2.5V, ±5V, ±10V
Impedance	500Ω/Volt
DIGITAL INPUTS	
Start Command Pulse Input	100nS wide, min. Logic "1" > +2.0V; Logic "0" < +0.8V
Logic Loading	2 TTL Loads
Clock In (ADC542 only)	2 TTL Loads
DIGITAL OUTPUTS	
Data Coding, ADC541	Parallel Outputs Only
Unipolar	Binary
Bipolar	2's Complement, Offset Binary
Data Coding, ADC542	Parallel and Serial Outputs
Unipolar	Complementary Binary
Bipolar	Complementary Offset Binary, Complementary 2's Complement
Data Output Drive Capability	3 TTL Loads Logic "1" > +2.4V Logic "0" < 0.4V
Status Output Drive Capability	2 TTL Loads, Logic "1" during conversion
Clock Out (ADC542 only)	
Frequency	2.85 MHz
REFERENCE	Internal
CONVERSION TIME/ THROUGHPUT RATE	2.5μS, typ; 2.8μS max/400 kHz
ACCURACY	
Quantization	±½ LSB max
Linearity	±0.2% of F.S.R. max
Offset, Unipolar and Bipolar[1]	±0.2% of F.S.R. max
Gain[1]	±0.2% of F.S.R. max
STABILITY	
Over Specified Temperature Range	
Linearity	±10ppm/°C
Gain	±40ppm/°C
Offset	±10ppm/°C
Transfer Accuracy[2]	±45ppm/°C
Long Term	±0.1%/year @ +25°C
POWER SUPPLY	
Requirements	
+15V ±3%	20mA max
−15V ±3%	12mA max
+5V ±5%	105mA max
Rejection Ratio	0.05%/% (+15V); 0.01%/% (−15V)
Power Consumption	1W max
TEMPERATURE RANGE	
Specified	
ADC541C/542C	0° to 70°C
ADC541B/542B	−55°C to +125°C
Storage, All Models	−65°C to +150°C
MECHANICAL	
Case Style	Case A (ceramic): ADC542
Case Envelope Dimensions	Case B (metal): ADC541

CASE A (CERAMIC): ADC542



CASE B (METAL): ADC541



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

Pin Assignments

ADC541

PIN	FUNCTION	PIN	FUNCTION
1	BIPOLAR OFFSET	24	+10V INPUT
2	ANALOG GND	23	+20V INPUT
3	SUMMING JCT.	22	+15V
4	ANALOG GND	21	−15V
5	BIT 1 (MSB)	20	−15V
6	BIT 2	19	BIT 8 (LSB)
7	BIT 3	18	BIT 7
8	BIT 4	17	BIT 6
9	BIT 1 (MSB)	16	BIT 5
10	STATUS	15	+5V
11	DIGITAL GND	14	+5V
12	DIGITAL GND	13	START

ADC542

PIN	FUNCTION	PIN	FUNCTION
1	CLOCK OUT	24	+5V
2	DIGITAL GND	23	START
3	STATUS	22	CLOCK IN
4	Bit 8 (LSB)	21	SERIAL OUT
5	Bit 7	20	−15V
6	Bit 6	19	+15V
7	Bit 5	18	SUMMING JCT
8	Bit 4	17	ANALOG GND
9	Bit 3	16	BIPOLAR OFFSET
10	Bit 2	15	20V INPUT
11	Bit 1 (MSB)	14	10V INPUT
12	Bit 1 (MSB)	13	GAIN ADJUST

NOTES

1. Initial offset and gain errors are externally adjustable. See APPLICATIONS INFORMATION.
2. Includes effects of Linearity, offset, and gain errors.

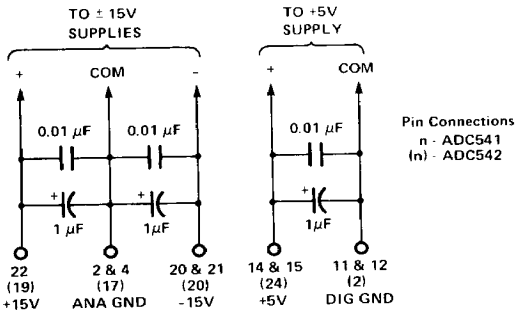
ORDERING INFORMATION

MODEL	DESCRIPTION
ADC541C-8	Commercial/Industrial Process
ADC541B-8	MIL-STD-883 Rev. C, Level B Process
ADC542C-8	Commercial/Industrial Process; ADC82 Pin Out Compat.
ADC542B-8	MIL-STD-883 Rev. C, Level B Process; ADC82 Pin Out Compat.

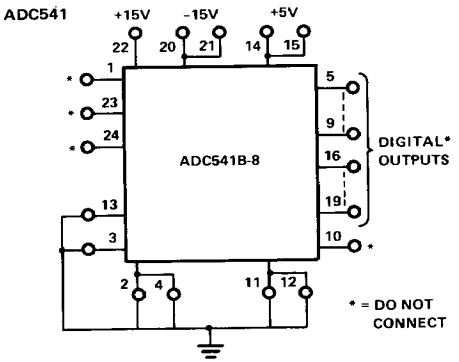
Specifications subject to change without notice.

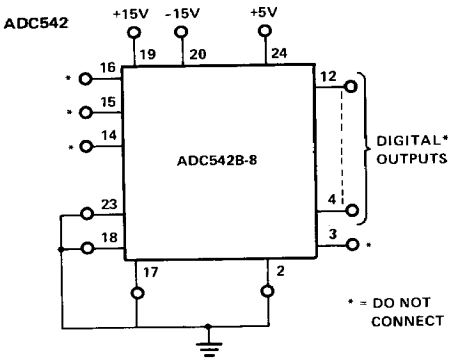
APPLICATIONS INFORMATION

RECOMMENDED POWER SUPPLY BYPASS CIRCUIT

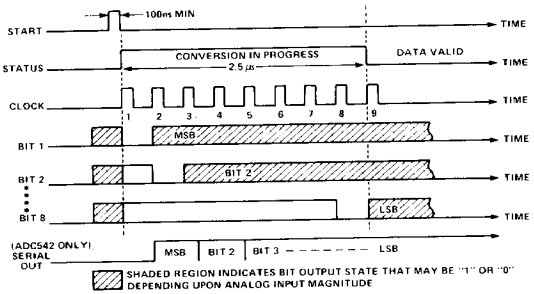


RECOMMENDED BURN-IN CIRCUITS
(Standard for MIL-STD-883 Versions)





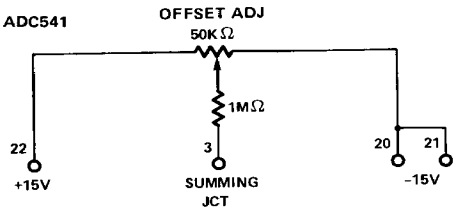
TIMING DIAGRAM



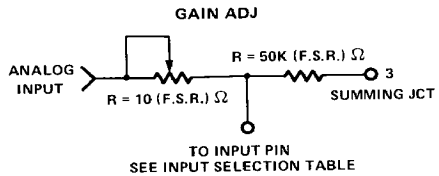
INPUT SELECTION

INPUT VOLT. RANGE	ADC541 PIN CONNECTIONS	ADC541 INPUT PIN	ADC542 PIN CONNECTIONS	ADC542 INPUT PIN
0 to +5V	23 to 3 & 1 to 2	24	16 to 17 & 15 to 18	14
±2.5V	23 to 3 & 1 to 3		16 to 18 & 15 to 18	
0 to +10V	1 to 2	24	16 to 17	14
±5V	1 to 3		16 to 18	
0 to +20V	1 to 2	23	16 to 17	15
±10V	1 to 3		16 to 18	

OPTIONAL ADJUSTMENTS



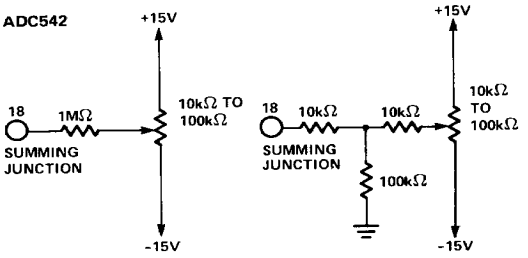
Unipolar: Apply a +½LSB analog input and set the potentiometer for a digital output that alternates between 000...0 and 000...1. Bipolar: The bipolar offset is factory calibrated and requires no external adjustment.



Unipolar & Bipolar: Apply a +(F.S. -3/2LSB) analog input and set the potentiometer for a digital output that alternates between 111...0 and 111...1.

OPTIONAL ADJUSTMENTS (continued)

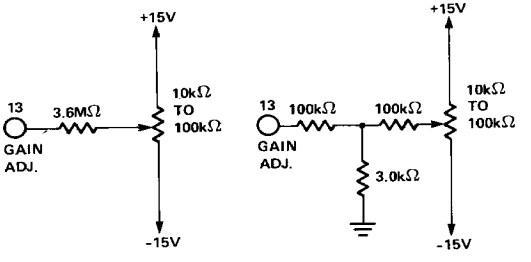
OFFSET ADJ



Two Methods Offering A ±1% Swing.

Unipolar: Apply a +½LSB analog input and set the potentiometer for a digital output that alternates between 111...1 and 111...0.
Bipolar: No adjustments necessary.

GAIN A



Two Methods Offering A ±1% Swing.

Unipolar & Bipolar: Apply a +(F.S. -3/2LSB) analog input and set the potentiometer for a digital output that alternates between 000...0 and 000...1.

INPUT VOLTAGES, TRANSITION VALUES, LSB VALUES AND CODE DEFINITIONS

BINARY (BIN) OUTPUT	INPUT VOLTAGE RANGE						
ANALOG INPUT VOLTAGE RANGES	DEFINED AS	±10V	±5V	±2.5V	0 to +10V	0 to +5V	0 to +20V
CODE DEISGNATION		COB or CTC	COB or CTC	COB or CTC	CSB	CSB	CSB
ONE LEAST SIGNIFICANT BIT (LSB)	$\frac{FSR}{2^n}$ n=8	$\frac{20V}{2^n}$ 78.13 mV	$\frac{10V}{2^n}$ 39.06 mV	$\frac{5V}{2^n}$ 19.53 mV	$\frac{10V}{2^n}$ 39.06 mV	$\frac{5V}{2^n}$ 19.53 mV	$\frac{20V}{2^n}$ 78.13 mV
TRANSITION VALUES 541 542 MSB LSB MSB LSB							
111...11Ø 000...000	+FULL SCALE	+10V – 1½LSB	+5V – 1½LSB	+2.5V – 1½LSB	+10V – 1½LSB	+5V – 1½LSB	+20V – 1½LSB
ØØØ...ØØØ ØØØ...ØØØ	MID SCALE	– ½LSB	– ½LSB	– ½LSB	+5V – ½LSB	+2.5V – ½LSB	+10V – ½LSB
000...000 111...11Ø	– FULL SCALE	– 10V + ½LSB	– 5V + ½LSB	– 2.5V + ½LSB	0 + ½LSB	0 + ½LSB	0 + ½LSB

NOTES:
1. Codings shown for ADC541 are Binary and Offset Binary. Use MSB for 2's Complement Coding.
2. Codings shwon for ADC542 are Complementary Binary and Complementary Offset Binary. Use MSB for Complementary 2's Complement Coding.
3. One LSB = FSR/256.
4. The voltages given are the theoretical values for the transitions indicated. Ideally, with the converter continuously converting the output bits indicated as Ø will change from "1" to "0" or from "0" to "1" as the input voltage passes through the level indicated.