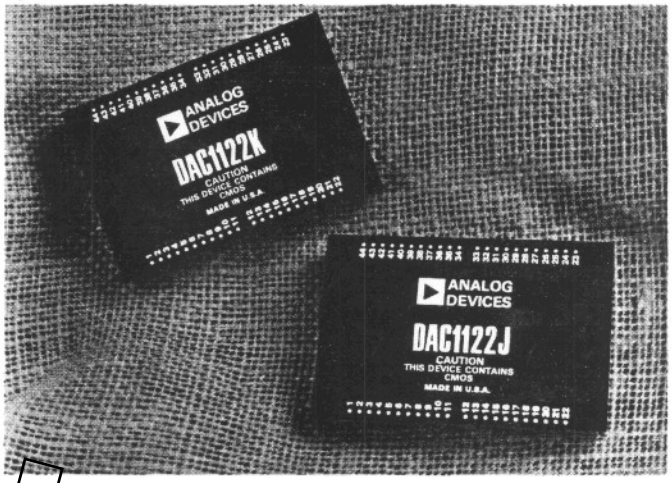
Low Power, High Performance Digital-to-Analog Converter

DAC1122J/K

FEATURES
- Low Power: 8.5mW
- Full Range: +5 to +15V CMOS Compatibility
- TTL/DTL Compatibility
- 12-Bit Resolution and Accuracy
- Monotonic 0 to +70°C
- Fast 10μs Settling (DAC1122K)
- 1 and 2 Quadrant Multiplication
- User Selectable:
  - Internal Reference
  - Voltage or Current Output
  - True or Complementary Inputs
- Small 3" x 2" x 0.42" Package



GENERAL DESCRIPTION

The DAC1122 is a versatile high performance digital-to-analog converter. This 12-bit device is designed to achieve the extremely low power of 8.5mW. In addition, the DAC1122 can operate over a complete range of CMOS inputs (+5VDC to +15VDC) and can be battery operated, i.e. used with non-tracking supplies. The digital inputs can be configured to accept either high true or low true signals with binary or offset binary coding. Both current and voltage mode outputs are available. The DAC1122 can operate from fixed reference or for 2-quadrant multiplication, from external reference. The converter is available in two grades of settling time (10μs and 20μs) and gain tempco (15ppm/°C and 30ppm/°C). The major performance highlights are identified below.

LOW POWER OPERATION

The DAC1122 has a nominal power consumption of 24mW when used with the internal precision reference supply. Power can be reduced to 10mW when an external (6.4V) reference is supplied. Further reduction in power to 8.5mW is achieved by externally providing a voltage ranging from -5V to +5V as a reference. In this mode of operation, 2 quadrant multiplication is achieved. The DAC1122 is designed to operate with non-tracking supplies. This feature is an important consideration in battery powered applications.

INPUT VERSATILITY

The DAC1122 is compatible with a majority of digital signal sources in use today. Positive true and low true inputs can be applied with binary or offset binary coding. The inputs can be driven from TTL and a complete range of CMOS levels (+5V to +15V).

OUTPUT FLEXIBILITY

The output of the DAC1122 is capable of driving a 300pF load with up to 5mA and is fully short circuit protected. When used in the voltage mode, high conversion speeds are achieved with a slew rate of 7V/μs and 0.01% settling in 12μs max. Five voltage output ranges are user selectable; +5V, +10V, ±2.5V, ±5V, and ±10V.

PRINCIPLE OF OPERATION

The DAC1122 is shown in Figure 1 in simplified form. To achieve maximum applications flexibility for the user, many internal points in the converter are brought out. As a result, the user is allowed to configure the converter to achieve optimum performance for each application. Figure 1 is shown with the internal reference connected to the reference amplifier input (jumper A), the reference amplifier output provides the reference to the R-2R network (jumper B), binary weighted current output (I_O or $\overline{I_O}$; see digital inputs below) is connected to the output amplifier's summing junction (jumper C). Finally, the voltage output is determined by the range and bipolar offset connections (jumpers D and F). The reference supply is enabled by connection to $+V_S$ (jumper E). Figure 1 also shows proper external connection for zero and gain adjustments.

The 12 binary weighted current sources which form the basis of the digital-to-analog conversion process are directly controlled by the digital data presented at the input terminals. The combined output of these sources is applied to the internal op amp summing junction to produce a voltage output signal. By connecting jumper D, various values of op amp feedback resistance and thus output voltage ranges can be selected.

In order to produce bipolar outputs, the output amplifier is offset by ½ of full scale, by an offset current. This offset current is generated by the precision internal reference source and is applied to the op amp summing junction (jumper F).

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HANDLING CONSIDERATIONS

Care must be taken in the handling of the DAC1122 to prevent electrostatic damage to its internal CMOS switches. The unit should be transported on conductive foam or other suitable material and should only be handled by properly grounded personnel. The ground pins must be connected before power is applied. All units are factory repairable in the event that failures such as those described accidentally occur.

POWER SUPPLY AND GROUNDING CONNECTIONS

The power supplies should be connected to the DAC1122 as shown below in Figure 3.

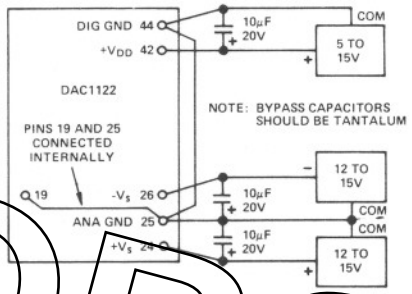
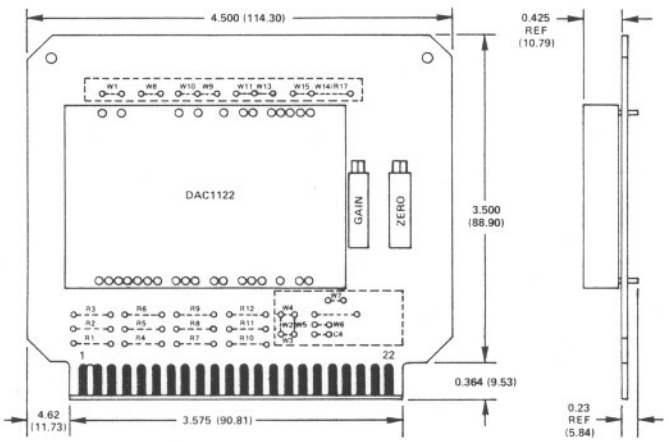


Figure 3. Power Supply and Grounding Connections

THE AC1512 MOUNTING CARD

The AC1512 mounting card is available to assist in the application of the DAC1122. This 4.5" x 3.5" (114 x 89mm) printed circuit card, shown below in Figure 4, has sockets which allow a DAC1122 to be plugged directly onto it. It includes the necessary adjustment potentiometers and bypass capacitors; it mates with a Cinch 251–22–30–160 (or equivalent) dual 22 pin edge connector which is supplied with every card.



MOUNTING CARD CONNECTOR DESIGNATIONS

PIN	FUNCTION	PIN	FUNCTION
A	MSB	M	BIT 11
B	BIT 2	N	LSB
C	BIT 3	S	ANALOG GND.
D	BIT 4	T	6.4V INPUT
E	BIT 5	U	OUTPUT
F	BIT 6	X	V+
H	BIT 7	Y	V-
J	BIT 8	1	V_{DD}
K	BIT 9	2	DIG. GND.
L	BIT 10	15	MULT. INPUT

Figure 4. Mounting Card (AC1512) Assembly

The output voltage range, digital input coding, logic compatibility, and reference configuration can be programmed by means of jumpers and resistors which the user installs as shown in Table 4.

OUTPUT RANGE	INSTALL JUMPERS
+5V	W6, 13
+10V	W13
±2.5V	W6, 9, 13
±5V	W9, 13
±10V	W9, 11

INPUT CODE	INSTALL JUMPERS
Unipolar BIN Bipolar OBN	W2, 5
Unipolar C-B Bipolar COB	W3, 4

INPUT LEVELS	R1-R12
CMOS 5 to 15V	Omit
TTL	Install

+6.4V (MASTER) REF	W7
Internal	Install
External	Omit

-5V (MULTIPLY) REF	W8
Internal	Install
External	Omit

Table 4

NOTES:

1. POWER REDUCTION: (EXTERNAL REFERENCE)
   A. When using +6.4V reference, replace W14 with R17 (1 Meg.).
   B. When using external -5V reference, delete W14, add W15.
2. BANDWIDTH REDUCTION:
   A capacitor may be installed at C4 to increase response time or trade speed against noise.
3. Location of these jumpers is shown in Figure 4.

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