

FEATURES

Low Cost
12 Bit Resolution
 $\frac{1}{2}$ LSB Linearity
 $\pm 30\text{ppm}/^\circ\text{C}$ TC
20ppm/% Power Supply Rejection
Programmable Output Ranges
Small Size — 2" x 2" x 0.4"



GENERAL DESCRIPTION

The DAC-12QZ is a low-cost/high performance 12-bit digital-to-analog converter designed for general purpose OEM applications. The completely self-contained module includes weighted resistor networks, monolithic μDAC current switches, temperature compensated reference and an externally programmable output amplifier. Performance specifications include $\frac{1}{2}$ LSB linearity error, $5\mu\text{s}$ settling time for full scale conversion, $30\text{ppm}/^\circ\text{C}$ temperature coefficient and 20ppm/% power supply rejection.

μDAC DESIGN

This outstanding cost/performance ratio has been achieved by utilizing the popular AD550 μDAC current switches. The use of monolithic quad current switches offers close inherent matching of switch characteristics and excellent temperature tracking as well as reasonably fast conversion speed. A hybrid resistor assembly of matched precision resistors and a thick film network is used in conjunction with the μDAC switches. Resistors provided include not only the weighting resistors but also the inter-quad attenuators, amplifier feedback resistors, etc. to assure close temperature tracking.

INPUT CODING

The internal μDAC switches of the binary and BCD models are driven directly by complementary input codes without need of a strobe. The complementary codes for each model are:

MODEL	-F.S.	Zero	+F.S.
DAC-12QZ/BIN	1111 1111 1111 0000 0000 0000	1111 1111 1111 0111 1111 1111	0000 0000 0000 0000 0000 0000
DAC-12QZ/BCD	1111 1111 1111 1010 1111 1111	1111 1111 1111 0110 0110 0110	0110 0110 0110 0110 0110 0110

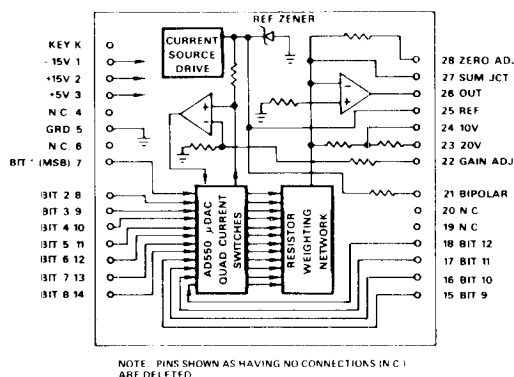
OUTPUT PROGRAMMING

The scale factor is programmed by connecting external jumpers between module pins. With either model, the user can select any one of five output ranges, including bipolar outputs. The choices are:

Unipolar	0 to +5V, 0 to +10V
Bipolar	$\pm 2.5\text{V}$, $\pm 5\text{V}$, $\pm 10\text{V}$

The external jumpers at the module pins determine the output amplifier feedback resistance, allowing use of one 5k resistor, or both, either in series to provide 10k, or parallel to provide 2.5k. Offset of exactly one-half full scale for bipolar applications is provided by connecting another jumper to the summing junction of the output amplifier. To maintain constant load on the reference zener, the bipolar offset output should be grounded when using the module in a unipolar mode.

BLOCK DIAGRAM DAC-12QZ

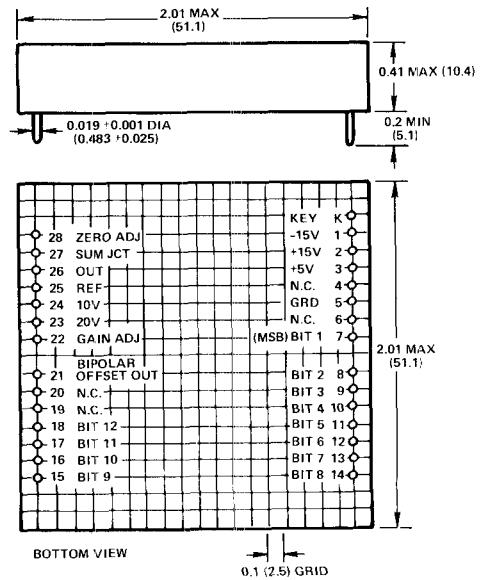


SPECIFICATIONS

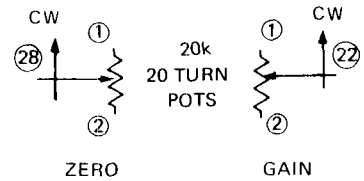
(typical @ +25°C and rated supply voltages, unless otherwise noted)

RESOLUTION	12 Bits
DIGITAL INPUTS	TTL Compatible
'O' $E < +0.8V$	@ -1.6mA
'1' $+2V < E < +6V$	@ +0.1mA (open input equivalent to digital "1")
INPUT CODES	
Unipolar	Complementary Binary
	Complementary BCD
Bipolar	Complementary Offset Binary
	Complementary Offset BCD
OUTPUT RANGES	0 to +5V @ 10mA
	0 to +10V @ 5mA
(User Programmable)	$\pm 2.5V$, $\pm 5V$ @ 10mA
	$\pm 10V$ @ 5mA
OUTPUT IMPEDANCE	0.02 Ω
CONVERSION SPEED	5 μs to 0.01% (for 10V step)
Slewing Rate	20V/ μs
LINEARITY ERROR	$\pm \frac{1}{2}$ LSB
TEMPERATURE COEFFICIENT	
Gain	$\pm 30\text{ppm}/^\circ\text{C}$ of Reading, max
Zero	$\pm 50\mu\text{V}/^\circ\text{C}$ (Unipolar), max
	$\pm 100\mu\text{V}/^\circ\text{C}$ (Bipolar), max
Differential Linearity	$\pm 10\text{ppm}/^\circ\text{C}$ F.S., max
TEMPERATURE RANGE	
Operating	0 to +70 $^\circ\text{C}$
Storage	-55 $^\circ\text{C}$ to +125 $^\circ\text{C}$
POWER REQUIREMENTS ¹	+15V $\pm 5\%$ @ 25mA
	-15V $\pm 5\%$ @ 30mA
	+5V $\pm 10\%$ @ 35mA
POWER SUPPLY SENSITIVITY	
Gain	$\pm 20\text{ppm}/\%$ } $\pm 15V$ only;
Zero	$\pm 5\text{ppm}/\%$ } tracking supplies
ADJUSTMENTS (USER PROVIDED) ²	
Gain (20k, 20 turn pot)	$\pm 0.3\%$ F.S.
Zero (20k, 20 turn pot)	$\pm 30\text{mV}$
OUTLINE DIMENSIONS	2" x 2" x 0.400"

**OUTLINE DIMENSIONS
AND PIN CONNECTIONS**
Dimensions shown in inches and (mm).



POTENTIOMETER CONNECTIONS



OUTPUT PROGRAMMING

Output Range	External Pin Connections		
±2.5V	21, 23, & 27	24 & 26	
±5V	21 & 27	24 & 26	
±10V	21 & 27	23 & 26	
+5V	23 & 27	24 & 26	21 & 5
+10V	24 & 26	21 & 5	

Connect pins as indicated for selected output.

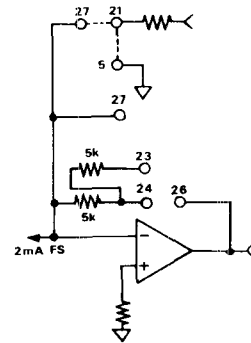


Figure 1. Output Amplifier

¹ Recommended Power Supply: Analog Devices models 904 and 906.

² A mounting board complete with trim pots and supplied with mating connector is available at extra cost. Order Part No. AC4516.
Pin Socket — 2-330808-8, 25 required

Specifications subject to change without notice.

ORDERING GUIDE:

Model DAC-12Q/Z/XXX