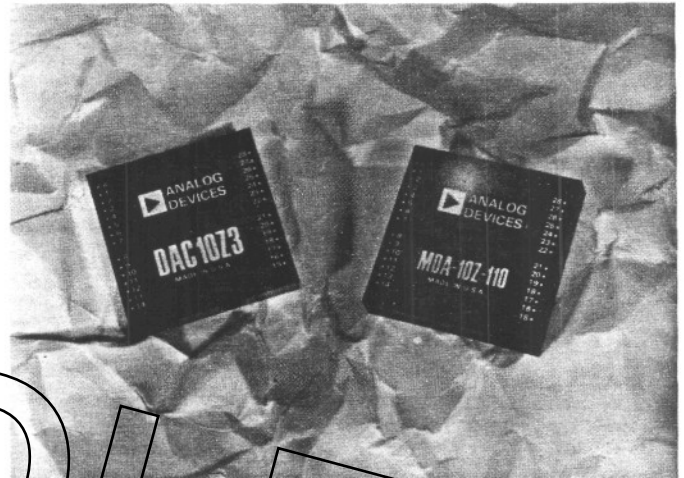


**FEATURES**

- Low Cost:**
- 10 Bit Resolution**
- $\pm 1/2$  LSB Linearity Error**
- Unipolar or Bipolar Outputs**
- Small Size (2" x 2" x 0.4")**



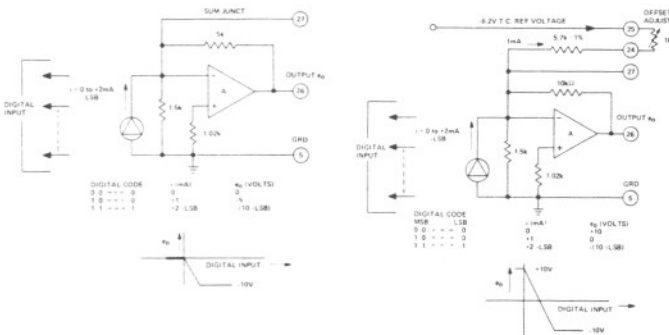
OBSOLETE

**GENERAL DESCRIPTION**

The MDA-10Z and DAC-10Z are low cost, 10-bit digital-to-analog converters packaged in compact 2" x 2" x 0.4" modules. The MDA-10Z is a current output device intended for use with external output amplifiers. It features a settling time to  $\pm 1/2$  LSB of 300ns. The DAC-10Z which comes complete with an IC op amp produces voltage outputs with 5 $\mu$ s settling times. Both the DAC-10Z and MDA-10Z can be ordered with either unipolar or bipolar outputs. Unipolar units utilize Binary coded inputs and bipolar units use Offset Binary code. All digital inputs are fully TTL/DTL compatible.

**DAC-10Z OUTPUT CHARACTERISTICS**

The output circuit configuration as well as the input-output relationships of the DAC-10Z are shown below in Figure 1 for both the unipolar and bipolar output versions.



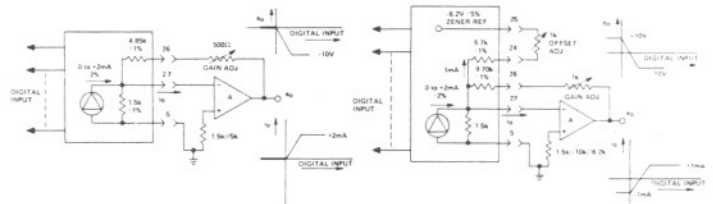
a) Unipolar - DAC-10Z-1      b) Bipolar - DAC-10Z-3

Figure 1. DAC-10Z Output Configuration

Note that the DAC-10Z-1 requires no external gain or zero adjustment. The DAC-10Z-3 requires a 1k $\Omega$  offset adjustment pot, which the user must supply. With a digital input of 0000000000 applied, this pot is adjusted until an output of +10.000V is obtained within  $\pm 2$ mV.

**MDA-10Z WITH EXTERNAL AMPLIFIER**

Figure 2, below, shows unipolar and bipolar versions of the MDA-10Z used with an external inverting op amp and also shows the resulting input-output relationships.



a) Unipolar - MDA-10Z-25      b) Bipolar - MDA-10Z-110  
Figure 2. MDA-10Z With External Amplifier (Inverting Mode)

The gain of the MDA-10Z-25 is adjusted by means of a 500 $\Omega$  trim pot which the user supplies. With a digital input of 1111111111 applied, this pot is adjusted until an output of -9.990V is obtained within  $\pm 1$ mV.

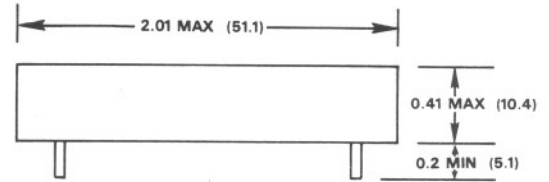
In addition to the gain adjustment, the MDA-10Z-110 requires a zero adjustment. With a digital input of 0000000000 applied, the 1k $\Omega$  offset pot is adjusted until a +10.000V output is obtained within  $\pm 2$ mV. Next, a digital input of 1111111111 is applied and the 1k $\Omega$  gain pot is adjusted until an output of -9.980V results within  $\pm 2$ mV.

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

MODELS	DAC-10Z	MDA-10Z
RESOLUTION	10 Bits Binary	*
<b>DATA INPUTS</b>		
0V ≤ "0" ≤ +0.8V <sup>1</sup>	-1.2mA	*
2.4V ≤ "1" ≤ +5V (For Open Circuit)	+25nA	*
<b>CODING</b>		
Unipolar Output	Natural Binary	*
Bipolar Output	Offset Binary	*
<b>OUTPUT</b>		
<b>UNIPOLAR</b>		
Voltage	0V to -10V	See Terminal Limits
Current	See Terminal Limits	0mA to +2mA
Zero Offset	¼LSB (2.5mV) Max	1/40LSB (50nA) Max
<b>BIPOLAR</b>		
Voltage	±10V	See Terminal Limits
Current	See Terminal Limits	-1mA to +1mA
Zero Offset	¼LSB, Max	*
<b>TERMINAL LIMITS</b>		
IMPEDANCE	±5mA	-10V to +1.5V
FULL-SCALE CALIBRATION	0.3 ohm, Max	1.5k ohm, ±1%
ACCURACY	10V -LSB, ±0.05%	2mA, ±2%
LINEARITY	±½LSB	±½LSB Rel. to F.S.
SETTLING TIME	±½LSB (±0.05% of Full Scale)	*
To 0.05% of F.S.	5µsec for 10V Step	300nsec for 2mA Step
<b>OUTPUT CIRCUIT PROTECTION</b>		
	Can be Opened or Shorted Indefinitely to Ground or ±Supply Voltage Without Damage.	Can be Opened or Shorted Indefinitely to Ground Without Damage.
<b>POWER REQUIREMENT</b>		
	±5VDC, ±2% @ ±15mA	*
<b>POWER SUPPLY SENSITIVITY</b>		
<b>UNIPOLAR</b>		
Zero	3ppm of F.S./%ΔV <sub>S</sub>	
Gain	150ppm of Reading/%ΔV <sub>S</sub>	
<b>BIPOLAR</b>		
Zero	10ppm of F.S./%ΔV <sub>S</sub>	300ppm of F.S./%ΔV <sub>S</sub>
Gain	300ppm of Reading/%ΔV <sub>S</sub>	*
<b>TEMPERATURE RANGE</b>		
OPERATING	0 to +70°C	*
STORAGE	-55°C to +125°C	*
<b>TEMPERATURE COEFFICIENT</b>		
<b>UNIPOLAR</b>		
Zero	10ppm of F.S./°C	5ppm of F.S./°C
Gain	30ppm of Reading/°C	*
<b>BIPOLAR</b>		
Zero	30ppm of F.S./°C	*
Gain	30ppm of Reading Ref. to +F.S./°C	40ppm of Reading Ref. to -F.S./°C

## OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).



### NOTE:

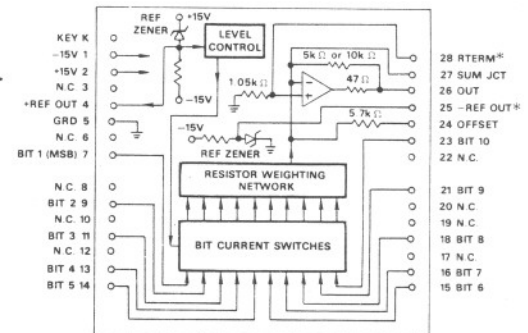
Terminal pins installed only in shaded hole locations. See table below for deleted pins. Module weight: 2 ounces (57 grams). All pins are gold plated half-hard brass (MIL-G-45 204), 0.019" ±0.001" (0.48 ±0.03) dia. For mounting card, order AC4102

<sup>1</sup> Maximum V input +15V allowable.  
\*Specifications same as model DAC-10Z.  
Specifications subject to change without notice.

## ORDERING GUIDE:

- DAC-10Z-1 10-bit binary with amplifier, 0V to -10V output voltage.
- DAC-10Z-3 10-bit binary with amplifier, 10V to -10V output voltage.
- MDA-10Z-25 10-bit binary without amplifier, with 0mA to +2mA output current and 5kΩ nominal (4.85kΩ ±1%) gain resistor.
- MDA-10Z-110 10-bit binary without amplifier, -1mA to +1mA output current and 10kΩ nominal (9.70kΩ ±1%) gain resistor.

## BLOCK DIAGRAM DAC-10Z & MDA-10Z



PINS SHOWN AS HAVING NO CONNECTIONS (N.C.) ARE DELETED. THE OUTPUT OF AMP ONLY APPEARS IN THE DAC-10Z'S.

\*NOTE: NOT ALL OF THE PINS SHOWN WITH CONNECTIONS TO THEM APPEAR ON EACH MODEL. THE PINS DELETED ON EACH MODEL ARE SHOWN BELOW:

MODEL	DELETED PINS
DAC-10Z-1	PINS 25, 28
DAC-10Z-3	PIN 28
MDA-10Z-25	PIN 25
MDA-10Z-110	NONE