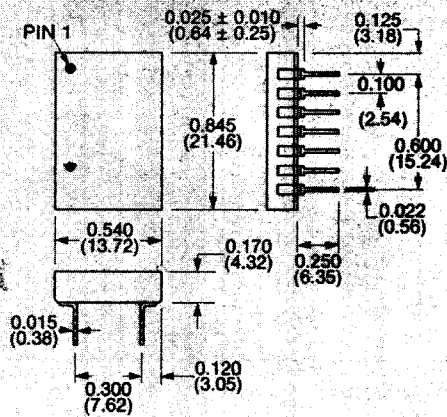


**MN3010**

## FEATURES

- **Complete Internal Reference Internal Output Amplifier**
- **Small 14 Pin DIP**
- **$\pm 1/2$  LSB Linearity Over Temperature**
- **$\pm 1/2$  LSB Absolute Accuracy Over Temperature**
- **Full MIL Operation -55°C to +125°C Available fully screened and processed to MIL-STD-883**

## 14 PIN DIP



Dimensions in inches (millimeters)

## DESCRIPTION

The MN3010 is a complete, 2 decade, voltage output D/A converter with complementary binary coded decimal inputs. It is supplied complete with internal reference and output amplifier in a small, 14 pin Dual-In-Line package.

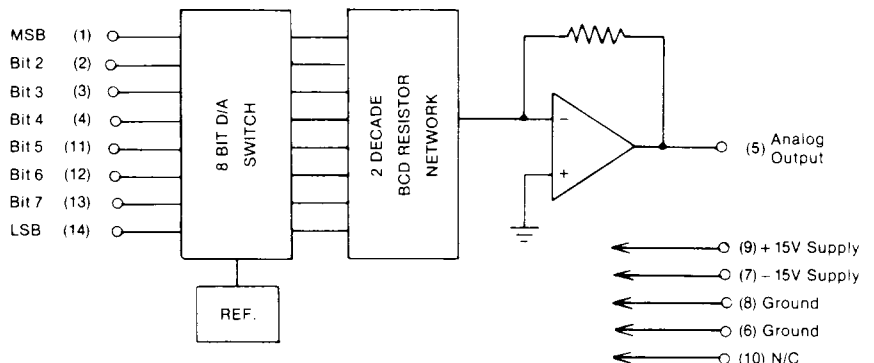
The MN3010 is adjustment-free and guarantees monotonicity,  $\pm 1/2$  LSB linearity, and  $\pm 1/2$  LSB absolute accuracy over its entire operating temperature range; room temperature absolute accuracy is better than  $1/4$  LSB. Settling time is guaranteed to be less than 30  $\mu$ Sec and power consumption less than 585 mW.

Units are available for either 0°C to +70°C or -55°C to +125°C operation and high reliability processing and screening to the requirements of MIL-M-38510 and MIL-STD-883 Method 5008 are available for military and aerospace applications.

## APPLICATIONS

Inherently reliable thin-film hybrid construction, adjustment-free operation, and specifications guaranteed over temperature make the MN3010 an excellent choice for many servo, process control, and thumbwheel interfacing applications demanding high reliability and low maintenance.

## BLOCK DIAGRAM



**Micro Networks Corporation**  
 324 Clark Street, Worcester, Massachusetts 01606 • (617) 852-5400  
 A SUBSIDIARY OF UNITRODE CORPORATION

MN3010

# MN3010 2 DECADE BCD D/A CONVERTER

## ABSOLUTE MAXIMUM RATINGS

Operating Temperature	0°C to +70°C -55°C to +125°C ("H" Models)
Storage Temperature	-65°C to +150°C
+15V Supply (Pin 9)	+18 Volts
-15V Supply (Pin 7)	-18 Volts
Digital Inputs (Pins 1-4, 11-14)	-0.5 to +15 Volts

## ORDERING INFORMATION

PART NUMBER \_\_\_\_\_ MN3010H/B  
 Standard device is specified for 0 to +70°C operation. Add "H" suffix for -55 to +125°C operation.  
 Add "/B" for 100% screening according to Method 5008 of MIL-STD-883.  
 The MN3010 is covered by GSA Contract.

## SPECIFICATIONS (T<sub>A</sub> = 25°C, Supply Voltages ±15V, unless otherwise specified).

	MIN.	TYP.	MAX.	UNITS
<b>DIGITAL INPUTS</b>				
Logic Levels: Logic "1" Logic "0"	2.0		0.8	Volts Volts
Input Currents: Logic "1" Logic "0"			40 -1	μA mA
<b>ANALOG OUTPUTS</b>				
Output Voltage Range		0 to -9.9		Volts
Output Impedance	±4	0.5		Ohms mA
Output Load Current				
<b>TRANSFER CHARACTERISTICS</b>				
Linearity Error (Note 1): 0°C to +70°C -55°C to +125°C		±1/4	±1/2	LSB LSB
Full Scale Absolute Accuracy Error (Notes 2,3)				
+25°C		±1/8	±1/4	LSB
0°C to +70°C		±1/4	±1/2	LSB
-55°C to +125°C		±1/2	±1	LSB
Zero Error (Notes 2,3): +25°C		±1/8	±1/4	LSB
0°C to +70°C		±1/4	±1/2	LSB
-55°C to +125°C		±1/2	±1	LSB
<b>DYNAMIC CHARACTERISTICS</b>				
Settling Time (10V Change to ±1/2 LSB)		23	30	μSec
Output Slew Rate		0.5		V/μSec
<b>POWER SUPPLY REQUIREMENTS</b>				
Power Supply Range: +15V Supply -15V Supply	+14.55 -14.55	+15.00 -15.00	+15.45 -15.45	Volts Volts
Power Supply Rejection: +15V Supply -15V Supply		±0.005 ±0.01	±0.015 ±0.03	% FSR /% Vs % FSR /% Vs
Current Drain, Output Unloaded: +15V Supply -15V Supply		+13 -17	+17 -22	mA mA
Power Consumption		450	585	mW

### SPECIFICATION NOTES:

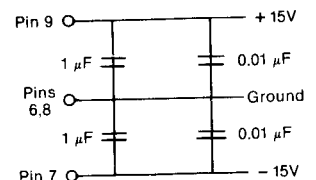
- Micro Networks tests and guarantees maximum linearity error at room temperature and at both extremes of the specified operating temperature range.
- The Absolute Accuracy Error of a voltage output D/A is the difference between the actual output voltage that appears following the application of a given digital input code and the ideal or expected output voltage for that code. Absolute Accuracy Error includes gain, offset, linearity, and noise errors and encompasses the drifts of these errors when specified over temperature. For the MN3010, we measure Absolute Accuracy Error at the endpoints of the output voltage range. The error

measured when the digital input is 0110 0110 (ideal output = -9.9V) is the Full Scale Absolute Accuracy Error. The error measured when the digital input is 1111 1111 (ideal output = 0.0V) is the Zero Error. We perform these tests at 25°C and at the high and low extremes of the specified operating temperature range.

3. For a 2 decade BCD converter, 1 LSB corresponds to 1.0% FSR. FSR stands for Full Scale Range and is equal to the peak to peak voltage of the converters output range. For the MN3010, FSR equals 10V, and 1 LSE = 0.1V.

## LAYOUT CONSIDERATIONS

Proper attention to layout and decoupling is necessary to obtain specified accuracies. The units' two ground pins (Pins 6 and 8) should be tied together as close to the package as possible and both connected to system analog ground, preferably through a large ground plane beneath the package. Power supplies should be decoupled with tantalum or electrolytic capacitors located close to the MN3010. For optimum noise rejection, 1 μF ceramic capacitors parallel with 0.01 μF ceramic capacitors should be used as shown in the adjacent diagram.



DIGITAL INPUT		ANALOG OUTPUT (DC VOLTS)
MSB	LSB	
1111	1111	0.00
1111	1110	-0.10
1111	1101	-0.20
1111	1011	-0.40
1111	0111	-0.80
1110	1111	-1.00
1101	1111	-2.00
1011	1111	-4.00
0111	1111	-8.00
0110	0110	-9.90