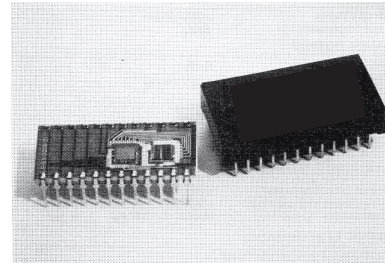# DAC9331-16 Series
Data Converter Line

14, 15, and 16-Bit Linearity, Latched MDACs

FEATURES
- Up to 16-Bit Linearity
- Two Chip Construction
- Input Registers
- Low Power
- Ceramic 24-Pin DIP
- 2 and 4-quadrant Multiplication
- Single-Supply Operation
- Low-Cost

DESCRIPTION

The DAC9331-16 Series are true 16-Bit D/A converters manufactured with advanced proprietary monolithic devices and proven performance packaging technique. A single, unique monolithic chip contains switches, storage registers and other electronics for high resolution and low linearity error. A second, passive chip provides all the needed resistors for these multiplying D/A's. Input storage registers are in two 8-Bit segments with independent latching— compatible with microprocessor data bus interfaces. It's a truly "byte-sized" D/A input system. It combines 2- and 4-quadrant multiplying capability. TTL/DTL and CMOS compatibility; low power consumption (less than 60 mW) and operation from a single supply, the DAC9331-16 Series offers exceptional performance/cost ratio. Outstanding features include:

True 16-Bit Linearity —16-Bit (0.0008%) linearity with 16-Bit resolution is now a reality. No other microcircuit converter does better. 14- and 15-Bit linearity versions available at lower cost.

Low Power — CMOS proprietary monolithic devices in a unique circuit configuration yield the lowest power of any 16-Bit converter available.

Two-Chip Construction — An advanced monolithic device, combined with our own resistor networks are all that's needed in this converter. Automatic wirebonding makes the most consistently superior assembly available.

Input Storage Registers — Designed as two 8-Bit segments, the input registers provide data storage when latched, or "transparent" registers when unlatched. Data conversion can now be performed continuously or from stored data — "byte-sized" input segments provide compatibility with most data bus lines.

Reliability — A proven performer, the DAC9331-16 is packaged in a 24-pin ceramic double DIP for the utmost in reliability. Combined with our proprietary monolithic switches and automatic wirebonding, we've made the DAC9331 -16 Series the most reliable industrial converter to date. Reliability is further enhanced by batch-processed. precision laser-trimmed resistor networks fabricated in our own facility. Networks are functionally trimmed and glass passivated to assure reliability under adverse environmental conditions.

Advanced designs, proven processes and continuous monitoring during all production operations by our quality control organization are combined with rigorous AQL screening to provide the most dependable, low cost D/A converter possible.

FUNCTIONAL DIAGRAM
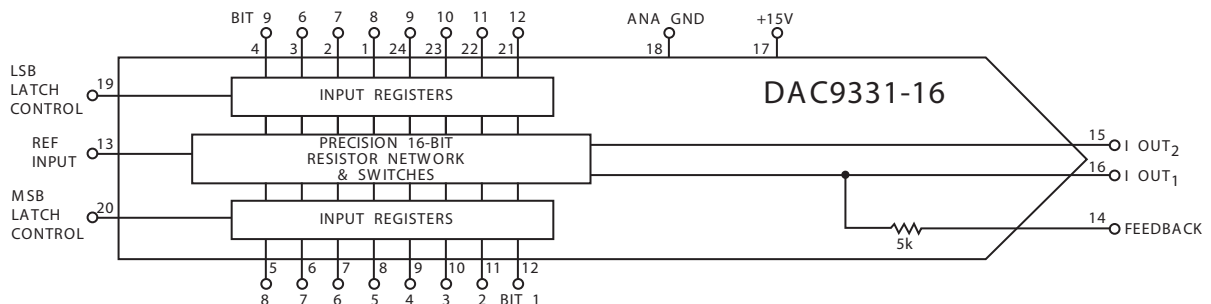
SPECIFICATIONS

(Typical @ +25°C and nominal power supply, V_{REF} =+10V, unipolar unless otherwise noted)

MODEL	DAC9331-16 -6 -5 -4
TYPE	Multiplying, Latched Inputs

DIGITAL INPUT

Resolution	16-Bits
2-Quad. Unipolar Coding	Binary
4-Quad. Bipolar Coding	Offset Binary
Logic Compatibility[1]	DTL, TTL, CMOS
Input Leakage Current	±1µA (max):
	0.4V>V_{LOGIC}>3.2V
Strobe Width	250nS (min)
Data Set-up Time[2]	500nS (min)

REFERENCE INPUT

Voltage Range	±25V (max)
Input Impedance	5K

ANALOG OUTPUT

Gain Accuracy[3]	0.1%
Offset (unipolar)[4]	50µV (max)
Small Signal	
3dB Bandwidth	1 MHz
Output Capacitance	
C_{out1}	90pF
C_{out2}	70pF

STATIC PERFORMANCE

Integral Linearity (max)	±0.001% ±0.002% ±0.003%
Differential Linearity (max)	±0.0015% ±0.003% ±0.006%
Monotonicity Guaranteed	16 bits 15 bits 14 bits

DYNAMIC PERFORMANCE

Major Code Transition Settling	
to 0.01 % F.S.R. (strobed)	2µS
Reference Feedthrough Error	
(Vref=20Vpp @ 10kHz)	2mVp-p

STABILITY[3] (Over Specified Temp. Range)

Scale Factor[5]	2ppm/°C F.S.R. (typ),
	6ppm/°C (max)
Linearity	0.5ppm/°C F.S.R. (max)
Differential Linearity	0.5ppm/°C F.S.R. (max)
Linearity Over Time	3ppm F.S.R./1000 hrs.

POWER SUPPLY(V_{DD})

Voltage Range @ Current	+15V (nom); +11.5V to
	+15.5V@ 1.5mA
Rejection Ratio (14V-16V)	±0.002%/% (max)
Power Dissipation	
(inputs at GND, V_{ref}=0)	60mW (max)

TEMPERATURE RANGE

Operating	0°C to +70°C
Storage	−55°C to +85°C

MECHANICAL

Case Style	24-pin double-DIP
Case Dimensions	

NOTES:
1. V_{IH}=2.4V (min); V_{IL}_0.8V (max)
   Inputs not to exceed -0.5V to +V_{DD}.
2. Time data must be stable before Strobe goes to "0"
3. Using internal feedback resistor.
4. Using the internal Rfeedback with nulled external amplifier in a constant 25°C ambient. (Offset doubles every 10°C).
5. The DAC9331-16 Series is designed to be used only in those applications where the current output is virtual ground; i.e., the summing junction of an op amp in the inverting mode. The internal feedback resistor (R Feedback) must be used to achieve temperature tracking.
   See APPLICATIONS INFORMATION for recommended circuit configurations.
6. For further information on long term drift refer to HS 9377 Application. Notes

PIN	FUNCTION	PIN	FUNCTION
1	Bit 12	24	Bit 13
2	Bit 11	23	Bit 14
3	Bit 10	22	Bit 15
4	Bit 9	21	Bit 16
5	Bit 8	20	MSB LATCH
6	Bit 7	19	LSB LATCH
7	Bit 6	18	ANA GND
8	Bit 5	17	+15V
9	Bit 4	16	1 OUT 1
10	Bit 3	15	1 OUT 2
11	Bit 2	14	$R_{FEEDBACK}$
12	Bit 1	13	REF IN

ORDERING INFORMATION

Consult factory for application information.

MODEL NUMBER	DESCRIPTION
DAC9331-16-4	14-BIT Linearity MDAC
DAC9331-16-5	15-BIT Linearity MDAC
DAC9331-16-6	16-BIT Linearity MDAC

CAUTION: ESD (Electro-Static Discharge) sensitive device. Permanent damage may occur when unconnected devices are subjected to high energy electro-static fields. Unless otherwise noted, the voltage at any digital input should never exceed the supply voltage by more than 0.5 volts or go below –0.5 volts.

Specifications subject to change without notice.

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