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.

FUNCTIONAL DIAGRAM

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.
SPECIFICATIONS

(Typical @ +25°C and nominal power supply, VREF = ±10V, unipolar unless otherwise noted)

**MODEL**
DAC9331-16 -6 -5 -4

**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 \(\pm 1\mu A\) (max):
\(0.4V>Vi>3.2V\)

**REFERENCE INPUT**
Voltage Range \(\pm25V\) (max)
Input Impedance 5K

**ANALOG OUTPUT**
Gain Accuracy \(^3\) 0.1%
Offset (unipolar) \(^4\) 50\(\mu V\) (max)
Small Signal 3dB Bandwidth 1 MHz
Output Capacitance \(C_{out1}\) 90\(pF\)
\(C_{out2}\) 70\(pF\)

**STATIC PERFORMANCE**
Integral Linearity (max) \(\pm0.001\%\) \(\pm0.002\%\) \(\pm0.003\%\)
Differential Linearity (max) \(\pm0.015\%\) \(\pm0.003\%\) \(\pm0.006\%\)
Monotonicity Guaranteed 16 bits 15 bits 14 bits

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

**STABILITY** \(^3\) (Over Specified Temp. Range)
Scale Factor \(^3\) 2ppm/\(^\circ\)C F.S.R. (typ), 6ppm/\(^\circ\)C (max)
Linearity 0.5ppm/\(^\circ\)C F.S.R. (max)
Differential Linearity 0.5ppm/\(^\circ\)C F.S.R. (max)
Linearity Over Time 3ppm F.S.R./1000 hrs.

**POWER SUPPLY (VDP)**
Voltage Range @ Current +15V (nom), +11.5V to +15.5V @ 1.5mA
Rejection Ratio (14V-16V) \(\pm0.002\%\) (max)
Power Dissipation (inputs at GND, Vref=0) 60mW (max)

**TEMPERATURE RANGE**
Operating 0\(^\circ\)C to +70\(^\circ\)C
Storage -55\(^\circ\)C to +85\(^\circ\)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 +VDD
2. Time data must be stable before strobe goes to “0”
3. Using internal feedback resistor.
4. Using the internal feedback 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.
6. See APPLICATIONS INFORMATION for recommended circuit configurations.

**ORDERING INFORMATION**
Consult factory for application information.

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<td>DAC9331-16-6</td>
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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.