# Complete Buffered 16-Bit DAC

## FEATURES
• True 16-bit (0.0008%) linearity
• µP compatible
• Complete
• 24-pin package
• Low power — 450mW
• Low cost
• Binary or BCD code

## DESCRIPTION

The DAC9377-16 is a complete, voltage output 16-bit D/A converter with true 16-bit linearity. Complete with storage registers, internal reference and output amplifier, the DAC9377-16 provides the user with exceptional performance and self-contained operation. The input storage register is composed of 16 parallel latches — a system compatible with 16-bit data bus interfaces. A single proprietary monolithic chip contains switches, storage registers and other electronics for high resolution and low linearity error. TTL and CMOS compatibility combined with low power dissipation in a ceramic 24-pin DIP makes the DAC9377-16 unsurpassed in a high resolution data conversion device.

True 16-Bit Linearity — 16-bit (±0.0008%) linearity in a 24-pin DIP is unequaled. No other microcircuit converter does better. Additional versions with 15- and 14-bit linearity are also available.

Low Power — CMOS proprietary monolithic devices in a unique circuit configuration yield the lowest power dissipation (450 mW typ.) of any complete 16-bit converter available.

Complete — No external components are required for 16-bit conversion.
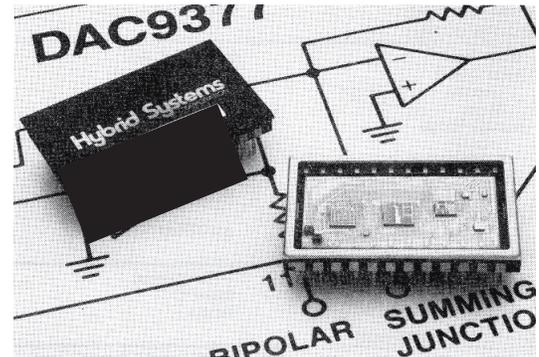
Input Storage Registers — Designed in one 16-bit segment, the input storage register provides data storage when latched, but is "transparent" when unlatched. The latch control is level triggered for either static or dynamic operation.

Reliability — A proven performer, the DAC9377-16 is packaged in a 24-pin ceramic DIP for the utmost in reliability. Combined with our proprietary monolithic device and automatic wirebonding, we've made the DAC9377-16 the most reliable device to date. Reliability is further enhanced by batch-processed, precision laser-trimmed resistor networks fabricated in our own facility.

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
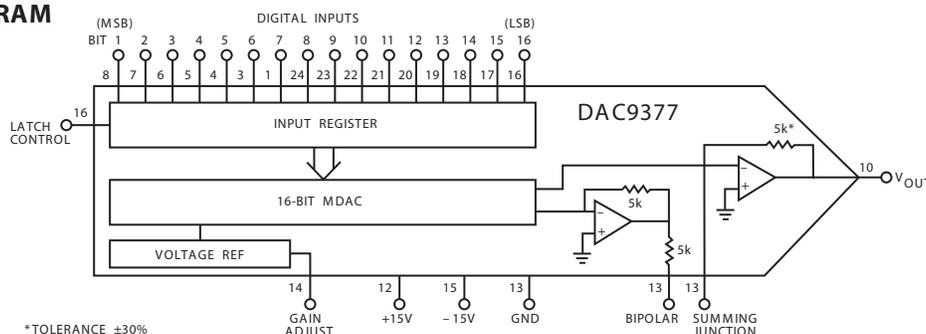
# DAC9377

## SPECIFICATIONS

(Typical @+25ºC unipolar operation and nominal power supply, no load)

| MODEL | DAC9377-16-6 | DAC9377-16-5 | DAC9377-16-4 | DAC9377-4D |
|---|---|---|---|---|
| TYPE | Latched Inputs | | | |
| **DIGITAL INPUT** | | | | |
| Resolution | 16-Bits | | | |
| Unipolar Coding | Binary | | | BCD |
| Bipolar Coding | Offset Binary | | | N.A. |
| Logic Compatibility[1] | TTL. CMOS | | | |
| Input Leakage Current | ± 1µA (max): 0.4V>$V_{LOGIC}$>3.2V | | | |
| Latch Control Width | 250nS (min) | | | |
| Data Set-up Time[2] | 500nS(min) | | | |
| Data Hold Time[3] | OnS (min) | | | |
| **ANALOG OUTPUT** | | | | |
| Scale Factor[4] | 0.1% F.S.R. (typ) | | | |
| Initial Offset[4] | 0.15% P.S.R. (max) | | | |
| Unipolar | ±0.05% F.S.R. (max) | | | |
| Bipolar | ±0.10% F.S.R. (max) | | | N.A. |
| Voltage Range | | | | |
| Unipolar | 0 to +10V | | | |
| Bipolar | ±10V | | | N.A. |
| Current Compliance | ±5mA | | | |
| Output Impedance | <0.1 | | | |
| Noise | | | | |
| PP-noise (wideband) | ±0.0005% F.S.R. | | | |
| **REFERENCE** | | | | |
| Voltage | −10V (internal) | | | |
| Drift | 5ppm/ºC | | | |
| Stability | 1mV/yr | | | |
| **STATIC PERFORMANCE** | | | | |
| Integral Linearity[6] | ±0.0008% F.S.R. (typ) | ±0.0015% F.S.R. (typ) | ±0.0015% F.S.R. (typ) | ±0.002% FS.R. (typ) |
| | ±0.0015% F.S.R. (max) | ±0.002% F.S.R. (max) | ±0.003% F.S.R. (max) | ±0.005% F.S.R. (max) |
| Differential Lineanty[7] | ±0.0004% F.S.R. (typ) | ±0.0008% F.S.R. (typ) | ±0.0015% F.S.R. (typ) | ±0.005% F.S.R. (typ) |
| | ±0.0015% F.S.R. (max) | ±0.003% F.S.R. (max) | ±0.006% F.S.R. (max) | ±0.01% F.S.R. (max) |
| Monotonicity | Guaranteed to16-bits | Guaranteed to 15-bits | Guaranteed to 14-bits | |
| **DYNAMIC PERFORMANCE** | | | | |
| Major Carry Transition Settling to 0.006% F.S.R. (strobed) | 20µS | | | |
| Slew Rate | 0.20V/µS | | | |
| **STABILITY[5]** | | | | |
| (Over Specified Temp. Range) | | | | |
| Gain | 8ppm/ºC F.S.R. (max) | | | |
| Linearity | 1ppm/ºC F.S.R. (max) | | | 5ppm/ºC |
| Differential Linearity | 1ppm/ºC F.S.R. (max) | | | 5ppm/ºC |
| Offset Drift | | | | |
| Unipolar | 3ppm/ºC F.S.R. | | | |
| Bipolar | 5ppm/ºC F.S.R. | | | |
| **POWER SUPPLY** | | | | |
| Requirements | +15V ±5% @ 15mA (max) | | | |
| | −15V ±5% @ 20mA (max) | | | |
| Rejection Ratio | 0.003% /% (max) | | | |
| Power Dissipation | 450mW, 600mW max | | | |

# DAC9377

## TEMPERATURE RANGE

| | |
|---|---|
| Operating | 0ºCto+70ºC |
| Storage | –25ºCto +85ºC |

## MECHANICAL

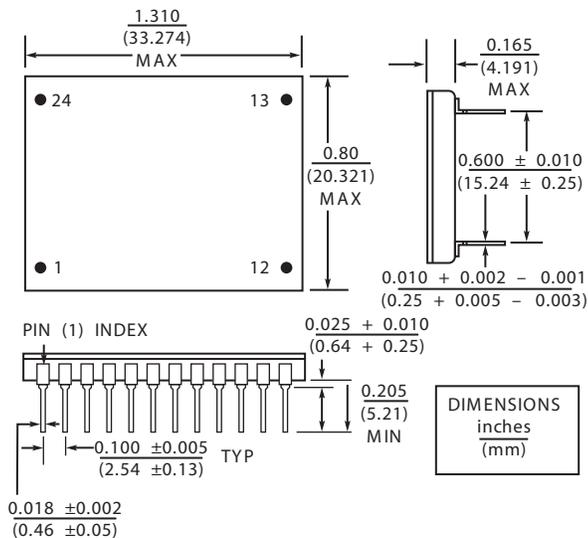| | |
|---|---|
| Case Style | 24 pin. double-DIP |
| Case Dimensions | |

NOTES:

*  Same as DAC9377-16-6

1. Digital input voltage must not exceed supply voltage or go below –0.5V;
2. Time. data must be stable before latch control goes to "0".
3. Time, data must be stable after latch control goes to "0".
4. See APPLICATIONS INFORMATION for calibration procedure.
5. See APPLICATIONS NOTES.
6. Integral Linearity, for this product, is measured as the arithmetic mean value of the magnitudes of the greatest positive deviation and the greatest negative deviation from the theoretical value for any given input combination.
7. Differential Linearity is the deviation of an output step from the theoretical value of 1 LSB for any two adjacent digital input codes.



$$\frac{1.310}{(33.274)} \text{ MAX}$$

$$\frac{0.165}{(4.191)} \text{ MAX}$$

$$\frac{0.80}{(20.321)} \text{ MAX}$$

$$0.600 \pm 0.010$$
$$(15.24 \pm 0.25)$$

$$0.010 + 0.002 - 0.001$$
$$(0.25 + 0.005 - 0.003)$$

$$0.025 + 0.010$$
$$(0.64 + 0.25)$$

PIN (1) INDEX

$$\frac{0.205}{(5.21)} \text{ MIN}$$

DIMENSIONS
$$\frac{inches}{(mm)}$$

$$0.100 \pm 0.005$$
$$(2.54 \pm 0.13)$$ TYP

$$0.018 \pm 0.002$$
$$(0.46 \pm 0.05)$$

Consult factory for application information.

Pin Connections
Unipolar Output: Ground pin 11 (No Connection for BCD)
Bipolar OutPut: Connect pin 11 to pin 9 (Binary Only)

PIN DESIGNATIONS

| PIN | FUNCTION Binary | BCD | PIN | FUNCTION Binary | BCD |
|---|---|---|---|---|---|
| 1 | $2^{-8}$ | (100) | 24 | $2^{-9}$ | (80) |
| 2 | $2^{-7}$ | (200) | 23 | $2^{-10}$ | (40) |
| 3 | $2^{-6}$ | (400) | 22 | $2^{-11}$ | (20) |
| 4 | $2^{-5}$ | (800) | 21 | $2^{-12}$ | (10) |
| 5 | $2^{-4}$ | (1000) | 20 | $2^{-13}$ | (8) |
| 6 | $2^{-3}$ | (2000) | 19 | $2^{-14}$ | (4) |
| 7 | $2^{-2}$ | (4000) | 18 | $2^{-15}$ | (2) |
| 8 | $2^{-1}$ | (8000) | 17 | $2^{-16}$ | (1) |
| 9 | SUMMING JUNCTION | | 16 | LATCH CONTROL | |
| 10 | OUT | | 15 | -15V | |
| 11 | BIPOLAR | N/C | 14 | GAIN ADJUST | |
| 12 | +15V | | 13 | GND | |

Note on BCD pin 11 must have no connection

## ORDERING INFORMATION

| MODEL | DESCRIPTION |
|---|---|
| DAC9377-16-6 | 16-Bit DAC with 16-bit linearity |
| DAC9377-16-5 | 16-Bit DAC with 15-bit linearity |
| DAC9377.16-4 | 16-Bit DAC with 14-bit linearity |
| DAC9377-4D | 16-Bit 4 Decade BCD |

Specifications subject to change without notice.

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