DAC-208

9-BIT VOLTAGE-OUTPUT D/A CONVERTER
(8 BITS PLUS SIGN)

Precision Monolithics Inc.

FEATURES

- **Complete** ..... **Reference and Op Amp Included**
- **Sign-Magnitude Coding**
- **Unipolar/Bipolar Selectable** ..... **+5V or ±10V**
- **8-Bit Linearity Maintained over Full Temp Range**
- **Fast** ..... **750ns Settling Time**
- **Multiplying Operation**
- **Guaranteed Monotonicity**
- **MIL-STD-883 Class B Processing Available**

ORDERING INFORMATION†

NL %FS	18-PIN HERMETIC DUAL-IN-LINE	
	MILITARY TEMP	COMMERCIAL TEMP
0.1	DAC208AX*	DAC208EX
0.2	DAC208BX*	DAC208FX

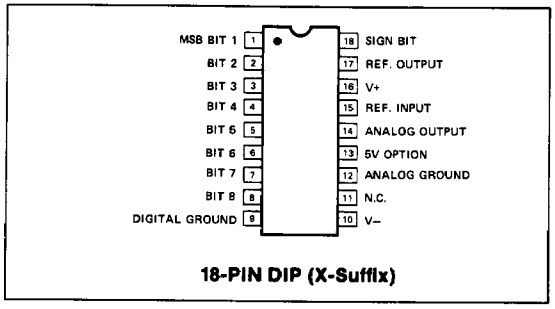
*For devices processed in total compliance to MIL-STD-883, add /883 after part number. Consult factory for 883 data sheet.

†All commercial and industrial temperature range parts are available with burn-in. For ordering information see 1986 Data Book, Section 2.

GENERAL DESCRIPTION

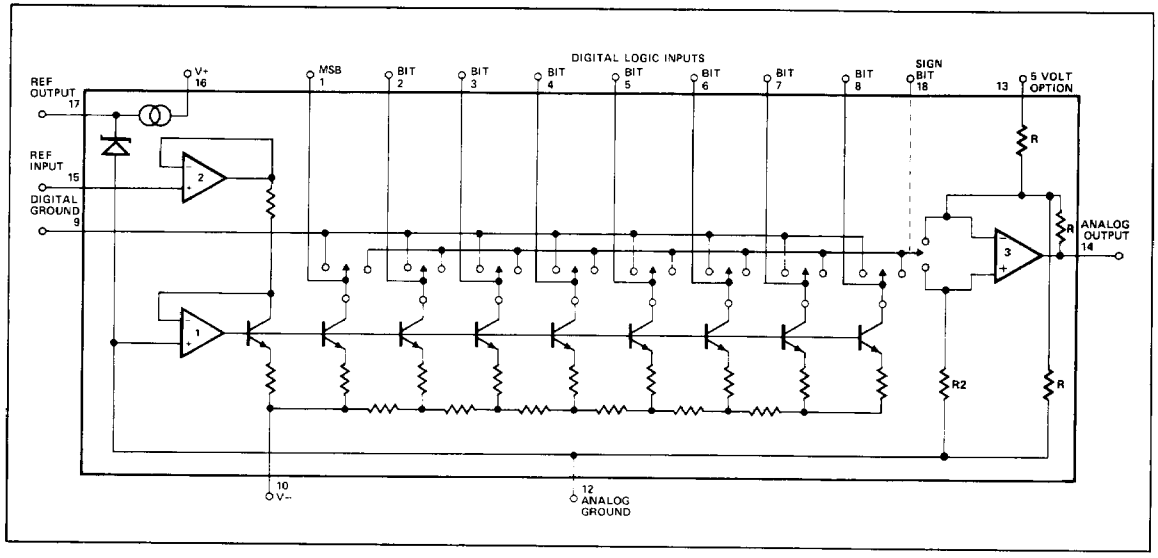
The DAC-208 is a complete, voltage output, 8-bit plus sign D/A converter. A precision voltage reference, logic controlled polarity switch, and high-speed (750 ns settling time) output op amp are included. Nonlinearity, monotonicity, and full-scale temperature coefficient are guaranteed over the full operating range. Enhanced reliability is achieved with monolithic construction and hermetic DIP packaging. Two low-cost 0°C/+70°C and two −55°C/+125°C grades are available in addition to MIL-STD-883 Class B processing. Monotonicity is guaranteed by design.

PIN CONNECTIONS



18-PIN DIP (X-Suffix)

SIMPLIFIED SCHEMATIC

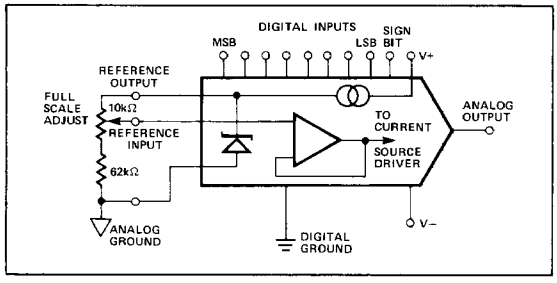


ELECTRICAL CHARACTERISTICS — MILITARY AND COMMERCIAL GRADES at $V_S = \pm 15V$, $T_A = -55°C$ to $+125°C$ for A and B grades, $T_A = 0°C$ to $+70°C$ for E and F grades, unless otherwise noted.(Continued)

PARAMETER	SYMBOL	CONDITIONS	DAC-208A/E MIN	DAC-208A/E TYP	DAC-208A/E MAX	DAC-208B/F MIN	DAC-208B/F TYP	DAC-208B/F MAX	UNITS
Power Supply Sensitivity	P_{SS}	T_A = Full Range	—	0.03	0.15	—	0.03	0.15	% V_{FS}/V
Positive Supply Current	I+		—	7	9	—	7	9	mA
Negative Supply Current	I−		—	10	12	—	10	12	mA

CONNECTION INFORMATION

FULL-SCALE ADJUSTMENT CIRCUIT



Full-Scale output voltage is trimmed using the circuit configuration shown above. Low tempco metal-film resistors are recommended. External components should be mounted near the package to ensure good temperature tracking.

REFERENCE INPUT BYPASS

Low noise and fast settling operation can be obtained by bypassing the Reference Input to Analog Ground with a 0.01μF monolithic capacitor.

GROUNDING

Separate digital and analog grounds have been provided for optimum noise rejection. Best results will be obtained when analog and digital ground are connected together at one point only. This configuration ensures neglible digital currents flowing in analog ground.

APPLICATIONS INFORMATION

LOWER RESOLUTION APPLICATIONS

For applications requiring less than 8-Bit resolution, connect unused logic inputs to ground.

UNIPOLAR OPERATION

Operation as an 8-Bit binary converter may be implemented by connecting the Sign-Bit to +5V for positive Full-Scale output, and 0V for negative Full-Scale.

+5 VOLT OPTION

The output voltage range can be modified by connecting the 5V option pin (pin 13) to the analog output (pin 14). The 5V option is for unipolar operation only. In this configuration the Sign-Bit should be held at logic high (+5V).

POWER SUPPLIES

The DAC-208 will operate within specification for power supplies ranging from ±12V to ±18V for unipolar positive operation; and from ±13V to ±18V for bipolar. Power supplies should be bypassed near the package with 0.1μF monolithic capacitors.

CAPACITIVE LOADING

The output operational amplifier provides stable operation with capacitive loads up to 100pF.

REFERENCE OUTPUT

Reference output current, I_{ref}, should not exceed 100μA.

INTERFACING WITH CMOS LOGIC

The DAC-208 logic input stage requires approximately 1μA, I_{in}, and is capable of operation with inputs between −5V and (V+ −0.7 Volts). The wide input voltage range allows direct CMOS interface with no additional components required.

EXTERNAL REFERENCES

Positive external reference voltages may be applied to the reference input terminal to improve Full-Scale temperature coefficient. External references are used when cascading several converters or when tracking is required between system elements.

MULTIPLYING OPERATION

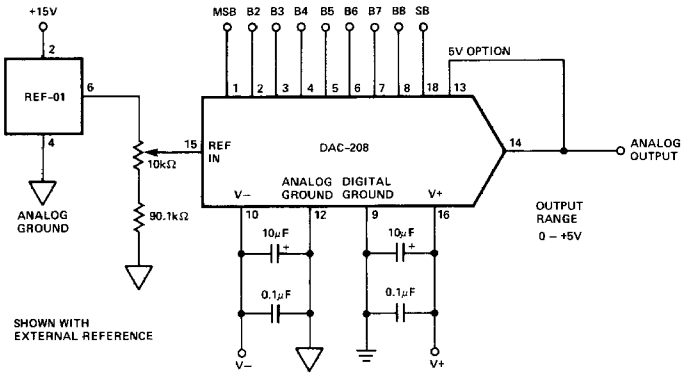
Two-quadrant multiplying operation is achieved by applying an analog input (0 to +10V) to the Reference input terminal. The DAC output is the scaled product of the input voltage and the digital code.

SIGN — MAGNITUDE CODING TABLE

	SIGN BIT	MSB							LSB
+FULL-SCALE −1 LSB	1	1	1	1	1	1	1	1	1
+HALF-SCALE	1	1	0	0	0	0	0	0	0
ZERO-SCALE (+)	1	0	0	0	0	0	0	0	0
ZERO-SCALE (−)	0	0	0	0	0	0	0	0	0
−HALF-SCALE	0	1	0	0	0	0	0	0	0
−FULL-SCALE +1 LSB	0	1	1	1	1	1	1	1	1

UNIPOLAR OPERATION

5V OPTION



APPLICATIONS

AUDIO ATTENUATOR