

ULTRA-LOW POWER 12-BIT IC DACs

FEATURES

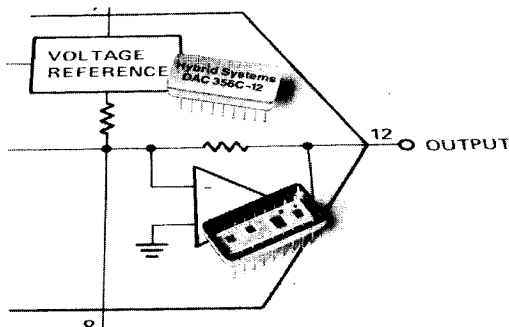
- Low power: 75mW versions
- -55°C to $+125^{\circ}\text{C}$ operation
- MIL-STD-883 or commercial processing
- Internal reference and output amplifier
- Hermetic 18-pin package

DESCRIPTION

Only DAC356 Series 12-bit digital-to-analog converters (DACs) offer minimum power consumption of available low cost DACs with internal references and output amplifiers. DAC356LP-12 operates switches, ladder network, internal reference and output amplifier on just 75mW typical, 90mW maximum. Each DAC is hermetically sealed in a compact 18-pin, single DIP width package.

Low power operation is accomplished using matched CMOS current switches. All models are factory trimmed to $\pm 0.1\%$ of full scale range (FSR) and may be further adjusted to an accuracy of $\pm 0.02\%$ or better (see APPLICATIONS INFORMATION).

The DAC356 Series uses complementary offset binary coding and delivers an output of $\pm 10\text{V}$ @5mA (consult factory for other ranges). Input logic is DTL, TTL, and CMOS compatible. Settling time for 1 LSB change to $\pm 0.02\%$ FSR is $5\mu\text{s}$; a full scale change settles in $50\mu\text{s}$. Gain drift is $\pm 30\text{ppm}/^{\circ}\text{C}$ FSR. Operation is from ± 13 to ± 18 volt power supplies

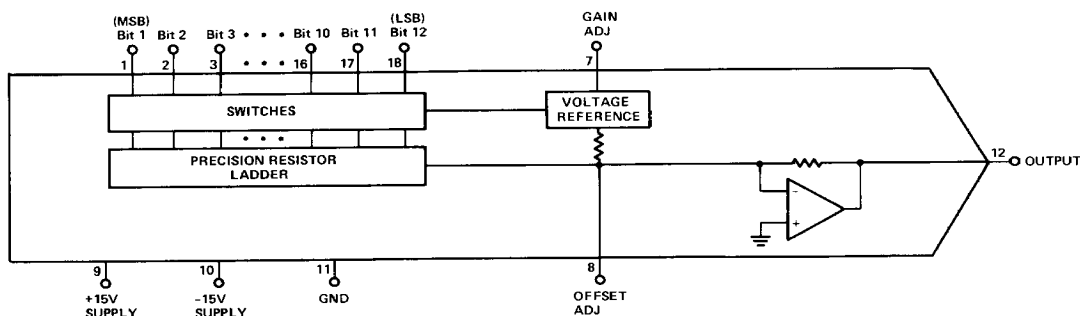


($\pm 15\text{V}$ nominal). The DAC356 is an ultra low power version of the DAC346 and DAC347.

DAC356 Series models are of particular advantage in systems that incorporate large numbers of DACs...where the accumulated power consumption can be significant. DAC356 Series allows minimum power supply size and expense. Related heat removal requirements are also diminished. And DAC356 Series' wide tolerance on power supply voltages (versus $\pm 3\%$ tolerance usual for higher power drain units) further eases supply needs. In systems applications of large or small DAC quantities, DAC356 Series' units offer increased reliability and wider operating temperature range.

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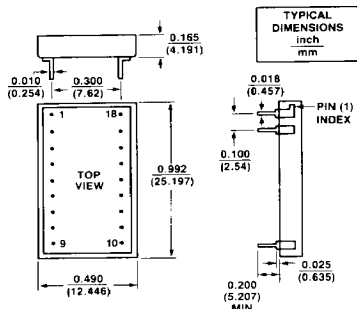
FUNCTIONAL DIAGRAM



SPECIFICATIONS

(Typical @ +25°C and nominal supplies unless otherwise noted)

SERIES	DAC356
TYPE	Fixed Ref, Volt Output
DIGITAL INPUT	
Resolution	12-Bits
Coding	Complementary Offset Binary
Logic Compatibility ¹	$V_{IH} = 2.4V$ min, $V_{IL} = 0.8V$ max
Input Current	$\pm 1\mu A$ max
ANALOG OUTPUT²	
Voltage @ Current	± 10 Volts @ $\pm 5mA$
Impedance	0.1Ω
Initial Accuracy ³	$\pm 0.1\%$ F.S.R.
Output Protection	Short Circuit to GND (Continuous)
REFERENCE	Internal
STATIC PERFORMANCE	
Integral Linearity	$\pm 0.012\%$ F.S.R. max
Differential Linearity	$\pm \frac{1}{2}LSB$ typ, $\pm 1LSB$ max
End Point Accuracy	$\pm 0.1\%$ max
DYNAMIC PERFORMANCE	
Settling Time for 1 LSB	
Change to $\pm 0.02\%$ F.S.R.	$5\mu S$
Settling Time for Full Scale	
Change to $\pm 0.02\%$ F.S.R.	$50\mu S$
STABILITY	
Gain	$\pm 30ppm/^{\circ}C$ F.S.R. (max)
Offset	$\pm 10ppm/^{\circ}C$ F.S.R. (max)
Differential Linearity	$\pm 5ppm/^{\circ}C$ F.S.R. (max)
POWER REQUIREMENTS	
+15V Supply Voltage	+13 to +18 Volts
+15V Supply Current	2.5mA, typ; 3.0mA, max
-15V Supply Voltage	-13 to -18 Volts
-15V Supply Current	2.5mA, typ; 3.0mA, max
Rejection Ratio	0.002%/ % max
TEMPERATURE RANGE	
Operating	-55°C to +125°C B Version 0°C to 70°C C Version
MECHANICAL	
Case Style	Metal



Pin 1 is marked by a dot on the top of the package.

Pin Assignments

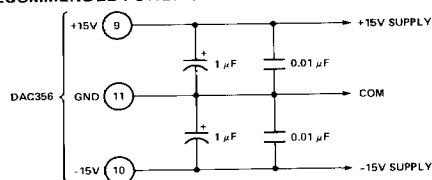
PIN	FUNCTION	PIN	FUNCTION
1	BIT 1 (MSB)	18	BIT 12 (LSB)
2	BIT 2	17	BIT 11
3	BIT 3	16	BIT 10
4	BIT 4	15	BIT 9
5	BIT 5	14	BIT 8
6	BIT 6	13	BIT 7
7	GAIN ADJ	12	OUTPUT
8	OFFSET ADJ	11	GND
9	+15V	10	-15V

NOTES:

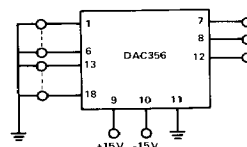
- Logic input should not exceed +15.0V or be below -0.3V.
- Full scale range and offset voltage are externally adjustable. See APPLICATIONS INFORMATION.
- Can be adjusted to $\pm 0.02\%$ F.S.R. or better. See OPTIONAL OFFSET AND GAIN ADJUSTMENTS in APPLICATIONS INFORMATION.

APPLICATIONS INFORMATION

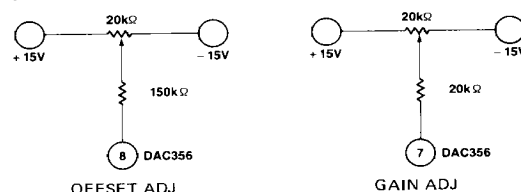
RECOMMENDED POWER SUPPLY BYPASS CIRCUIT



RECOMMENDED BURN-IN CIRCUIT (Standard for MIL-STD-883 models)



OPTIONAL OFFSET AND GAIN ADJUSTMENT CIRCUITS



Quick Calibration Procedure

- Apply a 0 1 1 . . . 1 1 1 input code and set the OFFSET ADJ pot for zero output.
- Apply a 1 1 1 . . . 1 1 1 input code and set the GAIN ADJ pot for -F.S. output.

TRANSFER CHARACTERISTICS

Complementary Offset Binary Input Code												Analog Output	
MSB	2	3	4	5	6	7	8	9	10	11	LSB	Weighting	Voltage
1	1	1	1	1	1	1	1	1	1	1	1	-F.S.	-10.000V
1	0	0	0	0	0	0	0	0	0	0	0	-1 LSB	-0.0048V
0	1	1	1	1	1	1	1	1	1	1	1	ZERO	+0.000V
0	0	0	0	0	0	0	0	0	0	0	0	+F.S. -1LSB	+9.9952V

CAUTION: ESD (Electro-Static Discharge) sensitive device. Permanent damage may occur when unconnected devices are subjected to high energy electrostatic fields. Unused devices must be stored in conductive foam or shunts. Protective foam should be discharged to the destination socket before devices are removed. Devices should be handled at static safe workstations only. Unused digital inputs must be grounded or tied to the logic supply voltage. Unless otherwise noted, the supply voltage at any digital input should never exceed the supply voltage by more than 0.5 volts or go below -0.5 volts. If this condition cannot be maintained, limit input current on digital inputs by using series resistors or contact Hybrid Systems for technical assistance.

ORDERING INFORMATION

MODEL	DESCRIPTION
DAC356LPC-12	Comm, Ultra-Low Power, 12-Bits
DAC356LPB-12	MIL, Ultra-Low Power, 12-Bits

C models are commercially processed
B models are processed to MIL-STD-883 Rev. C, Level B.

Specifications subject to change without notice.