Wolfson Microelectronics

WM8024

Preliminary Datasheet

January 1993

MINIATURE DUAL 8 BIT DAC

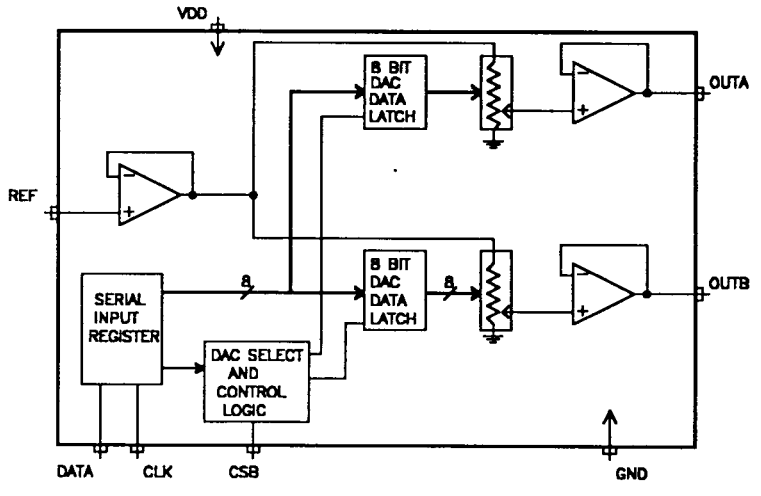
Features

- Two 8 bit D to A converters
- Guaranteed monotonicity
- 5V operation
- Voltage output 0V to 2.5V
- Microprocessor, TTL, CMOS compatible
- High impedance reference voltage input
- Buffered voltage outputs
- Fast settling time (3μs to 0.5 LSB)
- Low power consumption (2.5mA max)
- Very small 8 pin SO package

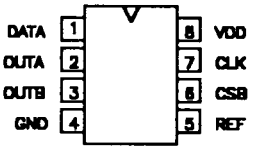
Applications

- Programmable voltage source
- Telecommunications
- Automatic test equipment
- Industrial control
- Signal synthesis

Block Diagram



Pin Configuration



Ordering Information

Part	Package
WM8024D	8 pin Plastic DIP
WM8024S	8 pin SO

Description

WM8024 is a dual 8 bit voltage output digital to analogue converter (DAC) with buffered reference input (high impedance). WM8024 has guaranteed monotonicity and is simple to use, running from a standard 5V supply.

Digital interfacing to the WM8024 is via a simple 3 pin serial interface, and is CMOS/TTL and microprocessor compatible. The digital inputs feature Schmitt triggers for high noise immunity.

The 8 pin small outline (SO) package allows digital control of analogue functions in space critical applications. The WM8024 is characterised over commercial and industrial temperature ranges and does not require external trimming.

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Electrical Characteristics (VDD = 5V ±10%, GND = 0V)

Parameter		Min	Typ	Max	Units
Supply Current					
VDD supply current (outputs unloaded)				2.5	mA
DAC Static Performance					
Resolution		8			bits
Monotonicity - Guaranteed					
Total Error (Integral non-linearity)				1	LSB
Relative Error (differential non-linearity)				±0.5	LSB
Full Scale Error				±2.5	LSB
Full Scale Error Temperature Coefficient			30.0		ppm/°C
Zero Code Error				±1.5	LSB
Zero Code Error Temperature Coefficient			60.0		dB
Reference Input					
Reference Input Range		GND		VDD-2.5	V
Reference Input Capacitance			15		pF
Digital Inputs					
Input Low (VIL)				GND+1	V
Input High (VIH)		VDD - 1			V
Input Leakage Current				±1	μA
Input Capacitance				15	pF
Dynamic Performance					
Output Slew Rate			1.5		V/μs
Output Settling Time (to 0.5LSB, zero to full scale)				3.0	μs
Large Signal Bandwidth (-3dB)			100		kHz
Digital cross talk (CLK 1MHz square wave to VOUT)			-50.0		dB
PSRR			-50.0		dB
Output THD (code = all 1's, Vref = 100kHz, 1Vp-p)			-50.0		dB
Load Capacitance				100	pF
Load Resistance		10			kΩ
Switching Characteristics (see timing diagram)					
Clock Frequency				5	MHz
Data valid to CLK set-up time	(t1)	50			ns
Data valid after CLK hold time	(t2)	50			ns
CSB to CLK set-up time	(t3, t5)	50			ns
CSB to CLK hold time	(t4)	50			ns

Absolute Maximum Ratings

Supply Voltage (VDD - GND) ..... +7V
Digital Inputs..... GND - 0.3V, VDD + 0.3V
Reference Input ..... GND - 0.3V, VDD + 0.3V
Operating Temperature..... -25°C to +85°C
Storage Temperature..... -50°C to +150°C
Lead Temperature (Soldering, 10 sec) ..... +230°C

Pin Table

Pin Number	Name	Type	Function
1	DATA	Digital Input	Serial Interface Data
2	OUTA	Analogue Output	Buffered Output of DACA
3	OUTB	Analogue Output	Buffered Output of DACB
4	GND	Supply	Ground Pin
5	REF	Analogue Input	Reference Output of DACB
6	CSB	Digital Input	Chip Select
7	CLK	Digital Input	Serial Interface Clock
8	VDD	Supply	Positive Supply Voltage

Detailed Description

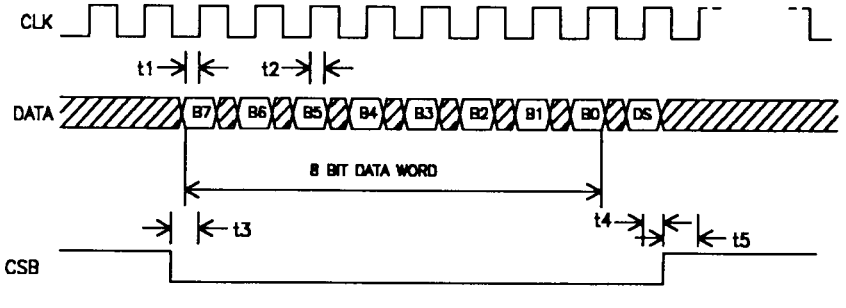
The WM8024 is implemented using two resistor string digital to analogue converters (DAC). The core of each DAC is a single resistor with 256 taps, corresponding to the 256 possible codes. One end of each resistor string is connected to the GND pin and the other end is fed from the output of the input buffer amplifier. Monotonicity is guaranteed by use of the resistor strings. Linearity depends upon the matching of the resistor elements, and upon the performance of the output buffer. Because it is buffered, the reference input always presents a high impedance load to the reference source.

The output voltage is given by:

$$VREF \times \frac{CODE}{256}$$ where "CODE" is the digital input code and is in the range 0 to 255.

3 Pin Data Interface

With CSB low, data is clocked into the DATA pin on each rising edge of CLK. Once all data bits have been clocked in, CSB is returned high to transfer the data from the serial input register to the selected DAC.



DS	Selected DAC
0	A
1	B

Timing Diagram for WM8024

Applications Information

Programmable DC Voltage Source

Figure 1(a) shows the application of WM8024 as a pair of programmable DC voltage sources. The primary voltage source, supplying the REF input of the WM8024 determines the stability of the WM8024 outputs. The circuit of Figure 2 may be used to provide bipolar programmable references.

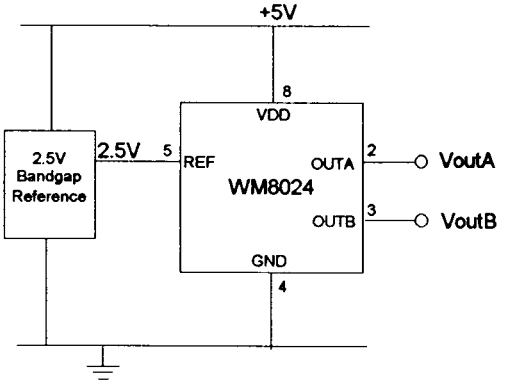


Figure 1: Programmable Voltage Source

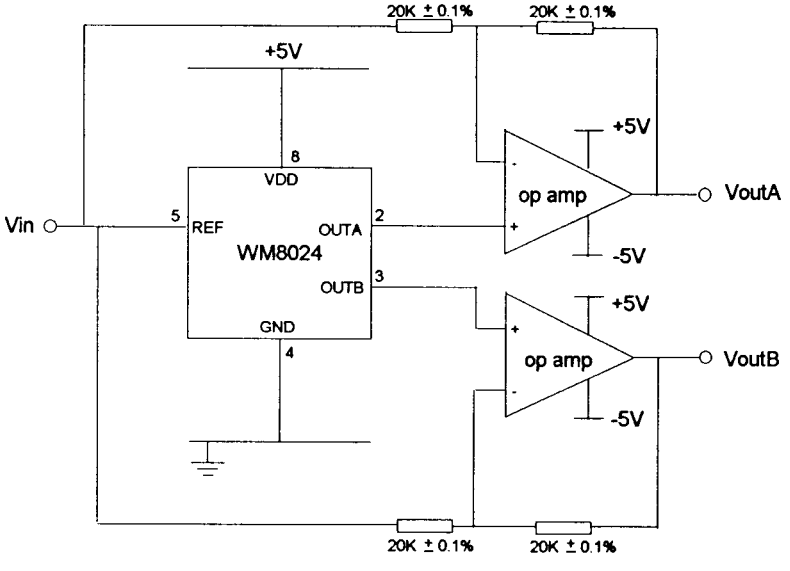


Figure 2: Bipolar Programmable Voltage Source

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