

MAXIM

CMOS 8 Bit Multiplying D/A Converter

MX7523

General Description

The MX7523 is high performance multiplying 8 bit digital-to-analog converter (DAC). Low power CMOS technology and low cost make it suitable for a wide range of analog data acquisition and control applications.

Thin-film resistors assure 8 bit resolution with up to 10 bit linearity (L grade) over the full operating temperature range. In addition, all digital inputs are compatible with CMOS logic levels.

Maxim's MX7523 is electrically and pin compatible with the Analog Devices AD7523 and is available in a standard width 16-lead DIP as well as small outline package.

Applications

- Automatic Test Equipment
- Digital Calibration Systems
- Battery Powered Instruments
- Audio Gain Control
- Digitally Controlled Filters
- Programmable Power Supplies
- Motion Control Systems

Features

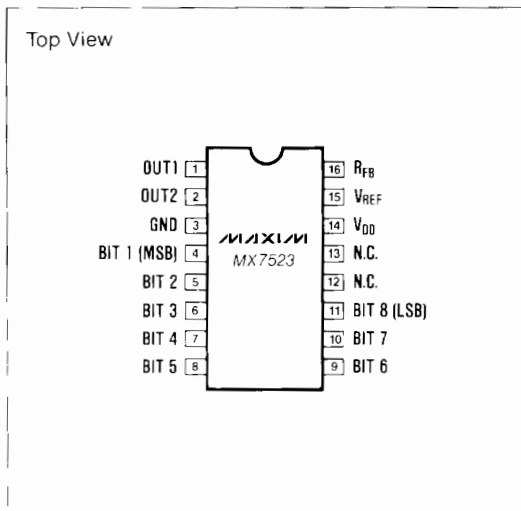
- ◆ 8, 9 and 10 Bit Linearity
- ◆ $\pm 1.5\%$ Untrimmed Gain Accuracy
- ◆ Guaranteed Monotonic
- ◆ Low Feedthrough 1/2LSB at 200kHz
- ◆ Low Power Consumption
- ◆ CMOS Compatible Logic Inputs
- ◆ Widely Second Sourced

Ordering Information

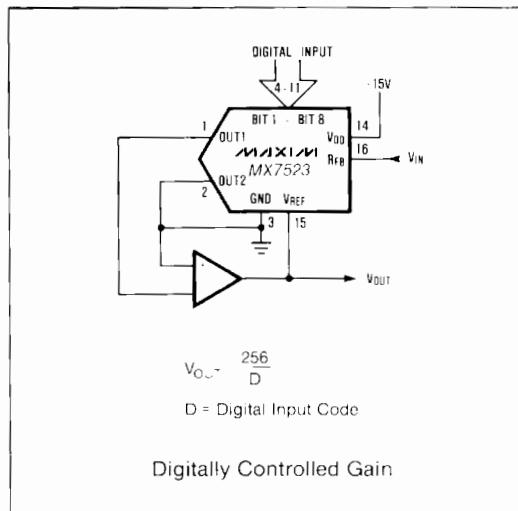
PART	TEMP RANGE	PACKAGE*	ERROR
MX7523JN	0°C to +70°C	Plastic DIP	1/2LSB
MX7523KN	0°C to +70°C	Plastic DIP	1/4LSB
MX7523LN	0°C to +70°C	Plastic DIP	1/8LSB
MX7523JCWE	0°C to +70°C	Small Outline	1/2LSB
MX7523KCWE	0°C to +70°C	Small Outline	1/4LSB
MX7523LCWE	0°C to +70°C	Small Outline	1/8LSB

* All devices — 16 lead packages

Pin Configuration



Typical Operating Circuit



CMOS 8 Bit Multiplying D/A Converter

ABSOLUTE MAXIMUM RATINGS

V_{DD} to GND	-0.3V, +17V	Storage Temperature	-65°C to +150°C
V_{REF} to GND	+25V	Lead Temperature (Soldering 10 secs)	+300°C
R_{FB} to GND	+25V	Power Dissipation to +70°C	
Digital Input Voltage to GND	-0.3V, V_{DD}	Plastic DIP	670mW
Output Voltage (OUT1, OUT2) (Note 1)	-0.3V, V_{DD}	Small Outline	450mW
Operating Temperature	0°C to +70°C		

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

($T_A = T_{MIN}$ to T_{MAX} , $V_{DD} = +15V$, $V_{REF} = +10V$, $V_{OUT1} = V_{OUT2} = GND$, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	
DC ACCURACY							
Resolution			8			Bits	
Nonlinearity (Note 2)		0.2% FSR = 1/8LSB	J		1.5	LSB	
		0.1% FSR = 1/8LSB	K		1.1		
		0.05% FSR = 1/8LSB	L		1.1		
Monotonicity			Guaranteed				
Gain Error (Note 2, 3)		Digital Inputs = V_{INH}	$T_A = +25^\circ C$ T_{MIN} to T_{MAX}		1.5 1.8	% FSR	
Power Supply Rejection (Note 2)	PSRR	$V_{DD} = +14V$ to +15V	$T_A = +25^\circ C$ T_{MIN} to T_{MAX}		0.02 0.03	%/ V_{DD}	
Output Leakage Current		OUT1, Digital Inputs = V_{INL}	$T_A = +25^\circ C$ T_{MIN} to T_{MAX}		50 200	nA	
		OUT2, Digital Inputs = V_{INH}	$T_A = +25^\circ C$ T_{MIN} to T_{MAX}		50 200		
V_{REF} Input Resistance	R_{REF}	$T_A = +25^\circ C$		5	10	20	k Ω
V_{REF} Resistance Tempco		(Note 4)				-500	ppm/ $^\circ C$
AC PERFORMANCE (Note 4)							
Output Current Settling Time to 0.2% of FSR		$R_L = 100\Omega$, Digital Inputs = V_{INH} to V_{INL} and V_{INL} to V_{INH}	$T_A = +25^\circ C$ T_{MIN} to T_{MAX}		150 200	ns	
Feedthrough Error		Digital Inputs = V_{INL} , $V_{REF} = 20V_{P-P}$, 200 KHz	$T_A = +25^\circ C$ T_{MIN} to T_{MAX}		1.5	LSB	
Output Capacitance	C_{OUT}	Digital Inputs = V_{INH}	OUT1		100	pF	
			OUT2		30		
		Digital Inputs = V_{INL}	OUT1		30		
			OUT2		100		
DIGITAL INPUTS							
Logic HIGH Threshold	V_{INH}			+14.5		V	
Logic LOW Threshold	V_{INL}				-0.5	V	
Input Leakage Current		Digital inputs = 0V or +15V			1	μA	
Input Capacitance, (Note 4)					4	pF	
Input Coding		Unipolar Operation (Table 1) Bipolar Operation (Table 2)		Binary Offset Binary			
POWER REQUIREMENTS							
Power Supply Range	V_{DD}	Accuracy not guaranteed over this range.		+5	+16	V	
Power Supply Current	I_{DD}	Digital inputs = V_{INH} or V_{INL}			100	μA	

Note 1: $V_{OUT1, 2}$ may exceed the Absolute Maximum voltage rating if the current is limited to 30mA or less.

Note 2: Using internal feedback resistor (R_{FB}). Full scale range (FSR) = $-(V_{REF} - 1LSB)$ in unipolar mode.

Note 3: Maximum gain change from +25°C to T_{MIN} or T_{MAX} is $\pm 0.3\%$ FSR.

Note 4: Guaranteed by design but not 100% tested.

CMOS 8 Bit Multiplying D/A Converter

MX7523

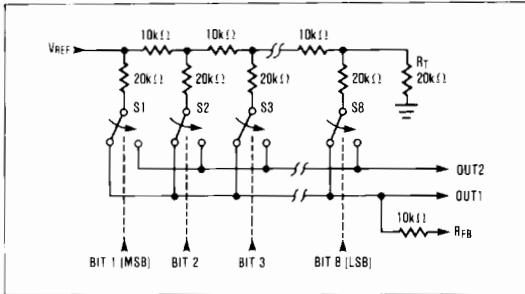
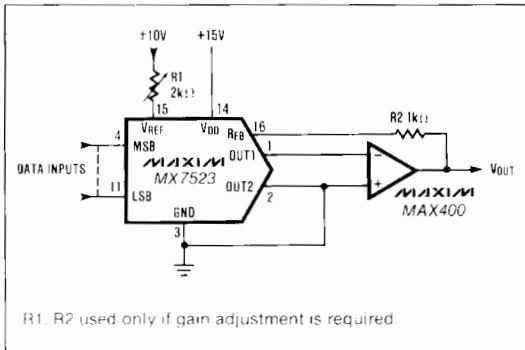
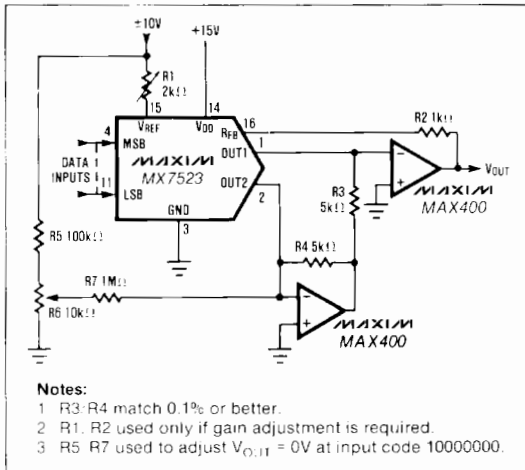


Figure 1. MX7523 Functional Diagram



R1, R2 used only if gain adjustment is required.

Figure 2. Unipolar Binary Operation (2-Quadrant Multiplication)



Notes:

- 1 R3-R4 match 0.1% or better.
- 2 R1, R2 used only if gain adjustment is required.
- 3 R5-R7 used to adjust $V_{O,IT} = 0V$ at input code 10000000.

Figure 3. Bipolar (4-Quadrant) Operation

Table 1. Unipolar Binary Code Table

DIGITAL INPUT		ANALOG OUTPUT
MSB	LSB	
1	1 1 1 1 1 1 1 1	$-V_{REF} \left(\frac{225}{256} \right)$
1	0 0 0 0 0 0 0 1	$-V_{REF} \left(\frac{129}{256} \right)$
1	0 0 0 0 0 0 0 0	$-V_{REF} \left(\frac{128}{256} \right) = -\frac{V_{REF}}{2}$
0	1 1 1 1 1 1 1 1	$-V_{REF} \left(\frac{127}{256} \right)$
0	0 0 0 0 0 0 0 1	$-V_{REF} \left(\frac{1}{256} \right)$
0	0 0 0 0 0 0 0 0	$-V_{REF} \left(\frac{0}{256} \right) = 0$

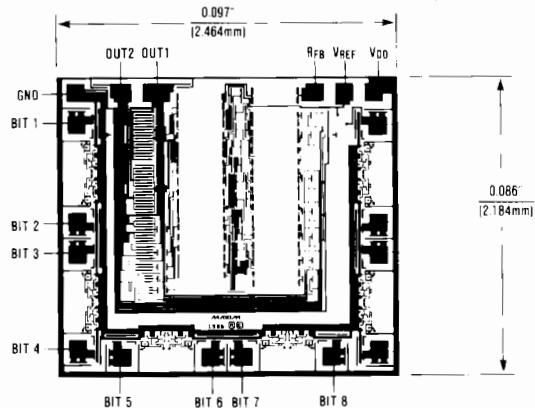
Note: $1\text{LSB} = (2^{-8})(V_{REF}) = \left(\frac{1}{256} \right) (V_{REF})$

Table 2. Bipolar (Offset Binary) Code Table

DIGITAL INPUT		ANALOG OUTPUT
MSB	LSB	
1	1 1 1 1 1 1 1 1	$-V_{REF} \left(\frac{127}{128} \right)$
1	0 0 0 0 0 0 0 1	$-V_{REF} \left(\frac{1}{128} \right)$
1	0 0 0 0 0 0 0 0	0
0	1 1 1 1 1 1 1 1	$+V_{REF} \left(\frac{1}{128} \right)$
0	0 0 0 0 0 0 0 1	$+V_{REF} \left(\frac{127}{128} \right)$
0	0 0 0 0 0 0 0 0	$+V_{REF} \left(\frac{128}{128} \right)$

Note: $1\text{LSB} = (2^{-7})(V_{REF}) = \left(\frac{1}{128} \right) (V_{REF})$

Chip Topography



MX7523

CMOS 8 Bit Multiplying D/A Converter

Package Information

**Plastic DIP
PLASTIC
DUAL-IN-LINE
PACKAGE
(0.300 in.)**

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.200	—	5.08
A1	0.015	—	0.38	—
A2	0.125	0.175	3.18	4.45
A3	0.055	0.080	1.40	2.03
B	0.016	0.022	0.41	0.56
B1	0.045	0.065	1.14	1.65
C	0.008	0.012	0.20	0.30
D1	0.005	0.080	0.13	2.03
E	0.300	0.325	7.62	8.26
E1	0.240	0.310	6.10	7.87
e	0.100	—	2.54	—
eA	0.300	—	7.62	—
eB	—	0.400	—	10.16
L	0.115	0.150	2.92	3.81

PKG.	DIM	PINS	INCHES		MILLIMETERS	
			MIN	MAX	MIN	MAX
P	D	8	0.348	0.390	8.84	9.91
P	D	14	0.735	0.765	18.67	19.43
P	D	16	0.745	0.765	18.92	19.43
P	D	18	0.885	0.915	22.48	23.24
P	D	20	1.015	1.045	25.78	26.54
N	D	24	1.14	1.265	28.96	32.13

21-0043A

**Wide SO
SMALL-OUTLINE
PACKAGE
(0.300 in.)**

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.093	0.104	2.35	2.65
A1	0.004	0.012	0.10	0.30
B	0.014	0.019	0.35	0.49
C	0.009	0.013	0.23	0.32
E	0.291	0.299	7.40	7.60
e	0.050		1.27	
H	0.394	0.419	10.00	10.65
L	0.016	0.050	0.40	1.27

DIM	PINS	INCHES		MILLIMETERS	
		MIN	MAX	MIN	MAX
D	16	0.398	0.413	10.10	10.50
D	18	0.447	0.463	11.35	11.75
D	20	0.496	0.512	12.60	13.00
D	24	0.598	0.614	15.20	15.60
D	28	0.697	0.713	17.70	18.10

21-0042A

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

4 Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 (408) 737-7600

© 1995 Maxim Integrated Products

Printed USA

MAXIM is a registered trademark of Maxim Integrated Products.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.