



M62364

CMOS IC

8-BIT 8-CH MULTIPLYING D-A CONVERTER WITH BUFFER AMPLIFIERS

■ DESCRIPTION

The UTC **M62364** is a CMOS 8-bit, 8-ch D/A converter having a multiplying function and output buffer amplifiers. It has a serial data input and can easily communicate with a microcontroller by the simple three-wiring method (D_{IN} , CLK, LD).

The output buffer amplifiers operating in AB-class has both sinking and driving capabilities of 1.0mA or more and can operate in a whole supply range from V_{DD} to GND.

The IC is suitable for a use in automatic adjustment applications in conjunction with a MCU by utilizing the terminal Do for a cascading connection.

■ FEATURES

- *Three-wiring serial data transmission
- *Doubled precision 8-ch D/A converter employing an R-2R with higher-order segment method
- *8 buffer amplifiers operating in a whole supply voltage range from V_{DD} to GND
- *4-quadrant multiplication

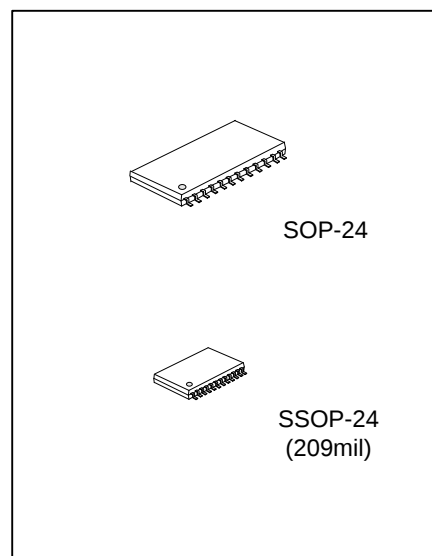
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
M62364L-R24-R	M62364G-R24-R	SSOP-24	Tape Reel
M62364L-S24-R	M62364G-S24-R	SOP-24	Tape Reel

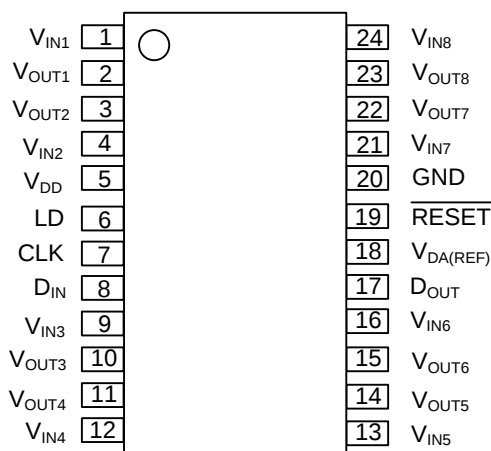
M62364G-R24-R (1) Packing Type (2) Package Type (3) Green Package	(1) R: Tape Reel (2) R24: SSOP-24, S24: SOP-24 (5) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING

SOP-24	SSOP-24
UTC □□□□ → Date Code M62364 □ → L: Lead Free □□ → G: Halogen Free □□ → Lot Code	UTC □□□□ → Date Code M62364 □ → L: Lead Free □□ → G: Halogen Free □□ → Lot Code



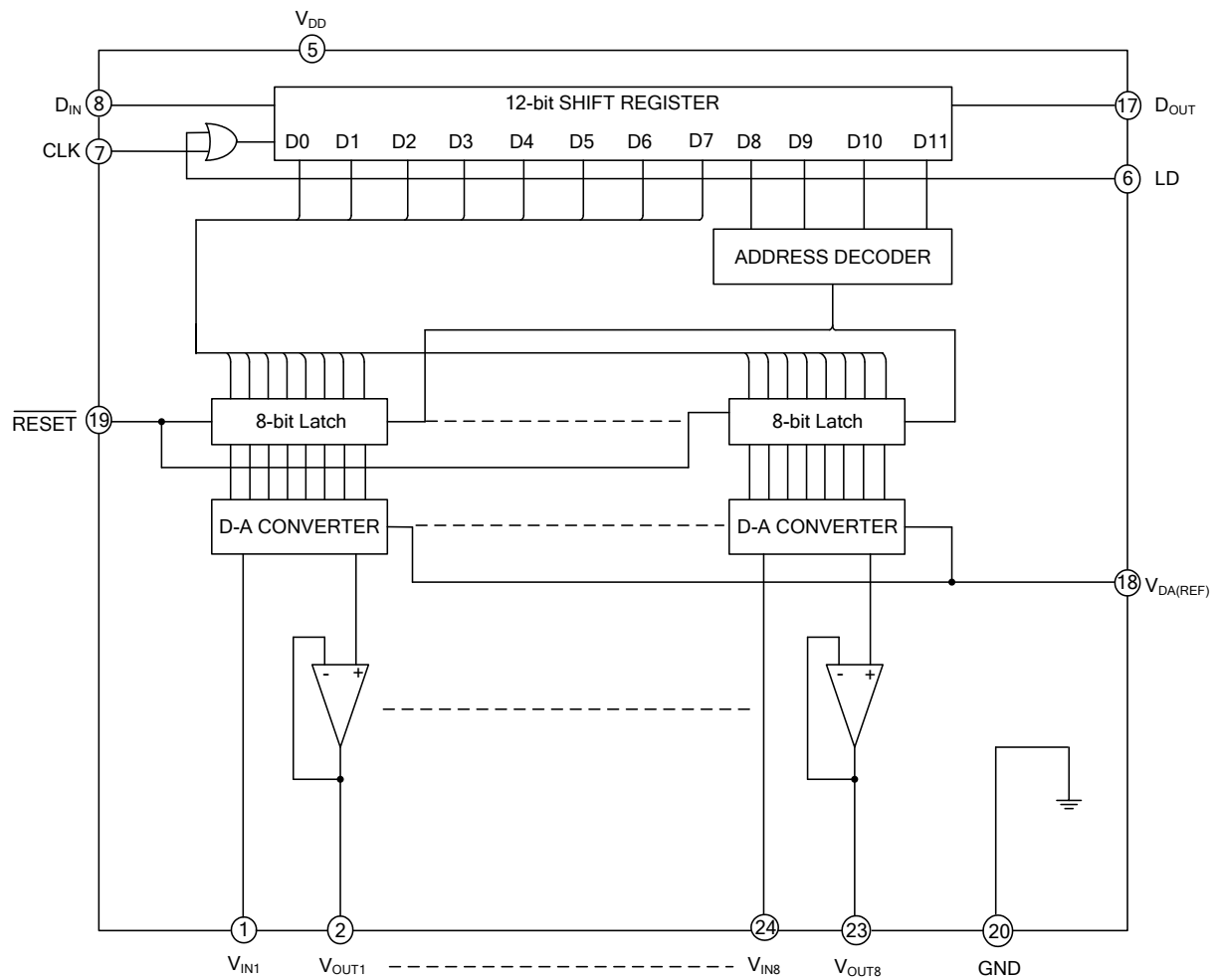
■ PIN CONFIGURATION (TOP VIEW)



■ EXPLANATION OF TERMINALS

PIN NO	SYMBOL	FUNCTION
8	D _{IN}	Serial data input
17	D _{OUT}	Serial data output
7	CLK	Shift clock input. Input data of D _{IN} are taken into the 12-bit shift register on a rising edge of the clock
6	LD	A low state enables data loading to the 12-bit shift register. During a rising edge of LD, the data will be loaded to the output register
19	RESET	Reset 8-bit latches
2	V _{OUT1}	D/A Converter Output with 8-bit resolution
3	V _{OUT2}	
10	V _{OUT3}	
11	V _{OUT4}	
14	V _{OUT5}	
15	V _{OUT6}	
22	V _{OUT7}	
23	V _{OUT8}	
5	V _{DD}	Power Supply
20	GND	Ground
1	V _{IN1}	D/A Converter Input
4	V _{IN2}	
9	V _{IN3}	
12	V _{IN4}	
13	V _{IN5}	
16	V _{IN6}	
21	V _{IN7}	
24	V _{IN8}	
18	V _{DA(REF)}	D/A Converter Reference Voltage Input

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	-0.3 ~ +7.0	V
Digital Input Voltage	V_{IND}	-0.3 ~ +7.0	V
Analog Input Voltage	V_{IN}	-0.3 ~ $V_{DD}+0.3$	V
Analog Output Voltage	V_{OUT}	-0.3 ~ $V_{DD}+0.3$	V
D-A Reference Voltage	$V_{DA(REF)}$	-0.3 ~ $V_{DD}+0.3$	V
Operating Temperature	T_{OPR}	-20 ~ +75	°C
Storage Temperature	T_{STG}	-40 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS

($V_{DD}=5V\pm10\%$, $V_{DD}\geq V_{IN}$, GND, $V_{DA(REF)}=0V$, $T_A=-20\sim85^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDUCTION	MIN	TYP	MAX	UNIT
ANA/DIG COMMON PART						
Supply Voltage	V_{DD}		2.7	3.0		V
Supply Current	I_{DD}	CLK=1MHz, $V_{CC}=3V$, $I_{AO}=0\mu A$			3.5	mA
Digital Part						
Digital Input "Low" Voltage	I_{IL}				$0.2 V_{DD}$	V
Digital Input "High" Voltage	I_{IH}		$0.8\times V_{DD}$			V
D _{OUT} Terminal Output "Low" Voltage	V_{OL}	$I_{OL}=2.5\text{mA}$			0.4	V
D _{OUT} Terminal Output "High" Voltage	V_{OH}	$I_{OH}=-400\mu A$	$V_{DD}-0.8$			V
Input Leak Current	I_{ILK}	$V_{IN}=0\sim V_{DD}$	-10		10	μA
ANALOG PART						
Buffer Amplifier Output Voltage Range	V_{AO}	$I_{AO}=\pm100\mu A$	0.1		$V_{CC}-0.1$	V
		$I_{AO}=\pm500\mu A$	0.2		$V_{CC}-0.2$	
Input Current	I_{IN}	$V_{IN}=3V$, $V_{DA(REF)}=0V$, * Proportional to max. input current condition ($V_{IN}-V_{DA(REF)}$) and digital data of each channels.			0.18	mA
D-A Reference Input Current	$I_{DA(REF)}$	$V_{IN}=3V$, $V_{DA(REF)}=0V$, * Proportional to max. input current condition ($V_{IN}-V_{DA(REF)}$) and digital data of each channels	-1.44			mA
Buffer Amplifier Output Current Range	I_{AO}	Upper Saturation Voltage=0.4V Lower Saturation Voltage=0.4V	-1		1	mA
Buffer Amplifier Output Impedance	R_O			5		Ω
Resolution	RES	$V_{DD}=2.61V$, $V_{DA(REF)}=0.050V$		8		bit
Differential Nonlinearity	DNL	(10mV/1LSB)	-1		1	LSB
Nonlinearity	NL	Without Load ($I_{AO}=\pm0$)	-1.5		1.5	LSB
Output Capacitive Load	C_O				0.1	μF

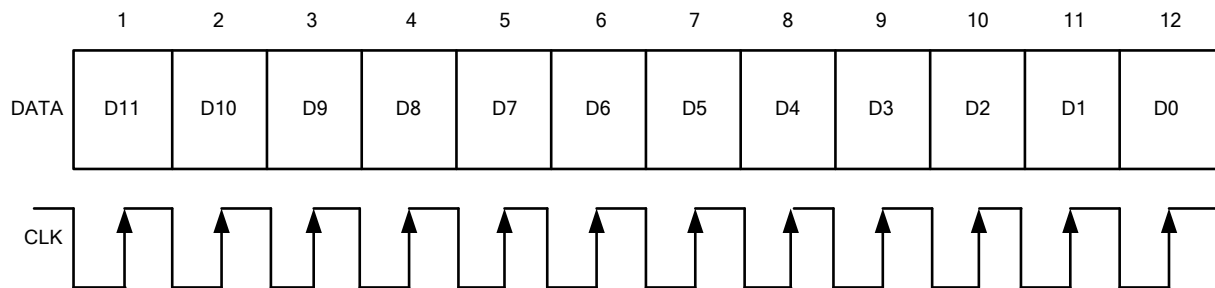
■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDUCTION	MIN	TYP	MAX	UNIT
AC CHARACTERISTICS						
Clock "L" Pulse Width	t_{CKL}		200			ns
Clock "H" Pulse Width	t_{CKH}		200			ns
Clock Rise Time	t_{CR}				200	ns
Clock Fall Time	t_{CF}					
Data Set Up Time	t_{DCH}		60			ns
Data Hold Time	t_{CHD}		100			ns
LD Set Up Time	t_{CHL}		200			ns
LD Hold Time	t_{LDC}		100			ns
LD "H" Pulse Duration Time	t_{LDH}		100			ns
Data Output Delay Time	t_{DOUT}	$C_L=100pF$	70		350	ns
D-A Output Setting Time	t_{LDD}	$C_L \leq 100pF, V_{AO} : 0.1 \leq \Rightarrow 2.6V$ This Time Until The Output Becomes The final Value Of 1/2 LSB			300	μs

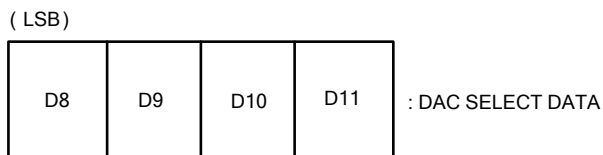
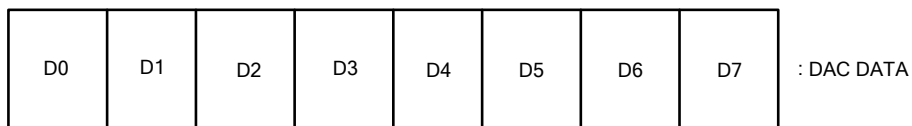
■ DIGITAL FORMAT

12 BIT SERIAL DATA

(LSB)



DATA ASSIGNMENT



Dac Select Data

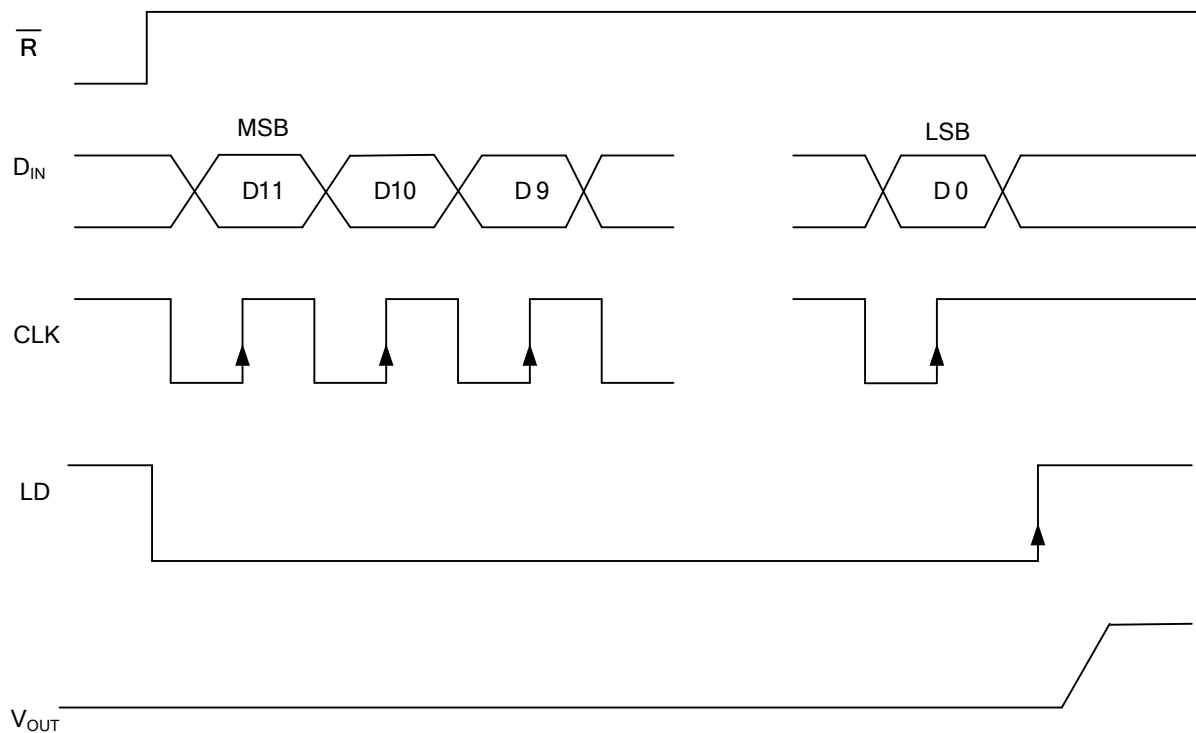
D8	D9	D10	D11	Dac Selection
0	0	0	0	Don't Care
0	0	0	1	V _{OUT1} Selection
0	0	1	0	V _{OUT2} Selection
0	0	1	1	V _{OUT3} Selection
0	1	0	0	V _{OUT4} Selection
0	1	0	1	V _{OUT5} Selection
0	1	1	0	V _{OUT6} Selection
0	1	1	1	V _{OUT7} Selection
1	0	0	0	V _{OUT8} Selection
1	0	0	1	Don't Care
1	0	1	0	Don't Care
1	0	1	1	Don't Care
1	1	0	0	Don't Care
1	1	0	1	Don't Care
1	1	1	0	Don't Care
1	1	1	1	Don't Care

■ DIGITAL FORMAT(Cont.)

Digital Data Format

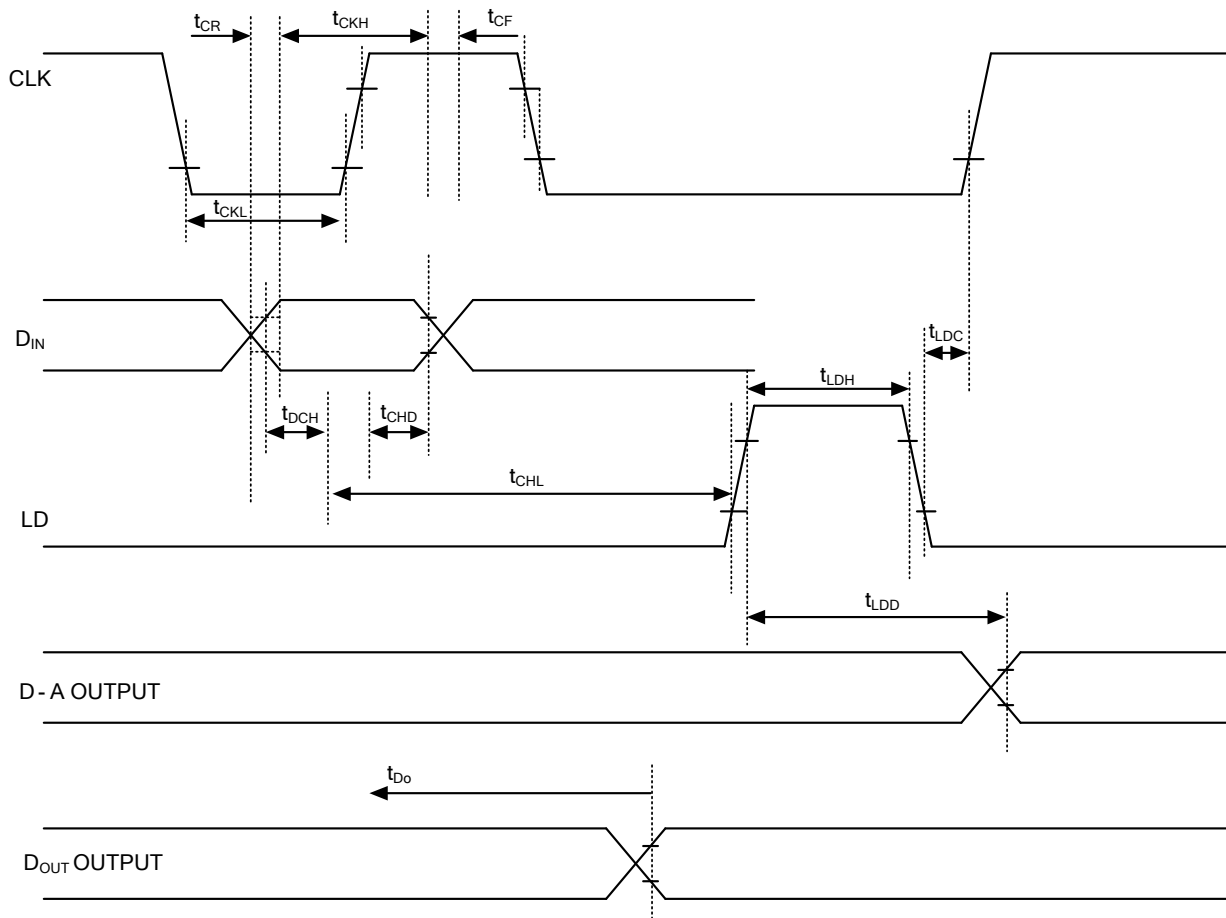
D0	D1	D2	D3	D4	D5	D6	D7	DAC OUTPUT
0	0	0	0	0	0	0	0	$V_{DA(REF)}$
1	0	0	0	0	0	0	0	$(V_{IN}-V_{DA(REF)})/256 \times 1 + V_{DA(REF)}$
0	1	0	0	0	0	0	0	$(V_{IN}-V_{DA(REF)})/256 \times 2 + V_{DA(REF)}$
1	1	0	0	0	0	0	0	$(V_{IN}-V_{DA(REF)})/256 \times 3 + V_{DA(REF)}$
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
1	1	1	1	1	1	1	1	$(V_{IN}-V_{DA(REF)})/256 \times 255 + V_{DA(REF)}$

■ TIMING CHART



* Input data carried out LD signal Low besides CLK signal positive edge.
CLK, LD is keep generally HIGH level.

■ TIMING CHART (Cont.)



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