

# M62363FP

## 8-BIT 8CH D-A CONVERTER

### DESCRIPTION

The M62363FP is an integrated circuit semiconductor of CMOS structure with 8 channels of built-in 8-bit multiplication type D-A converters.

The input data is a easy-to-use 3-wire serial method and it is able to cascading serial use with Do terminal.

The device is suited for use in automatic adjustment combination of microcomputer.

### FEATURES

- Digital data transfer method  
3-wire serial data transfer method
- D-A converter system  
Employment of the additional higher-order segment R-2R method doubled precision compared to the conventional R-2R method.
- Short setting time
- 4 Quadrant multiplication

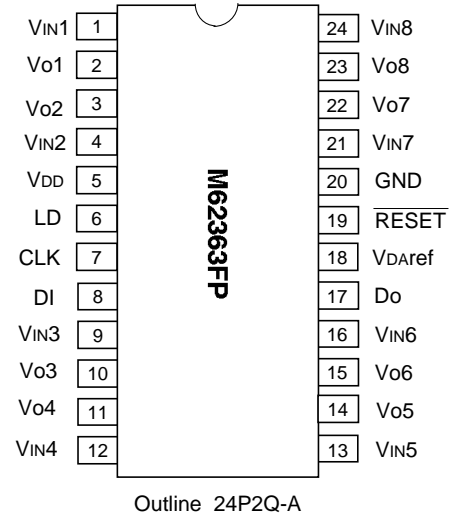
### APPLICATION

Conversion from digital control data to analog control data for home-use and industrial equipment.

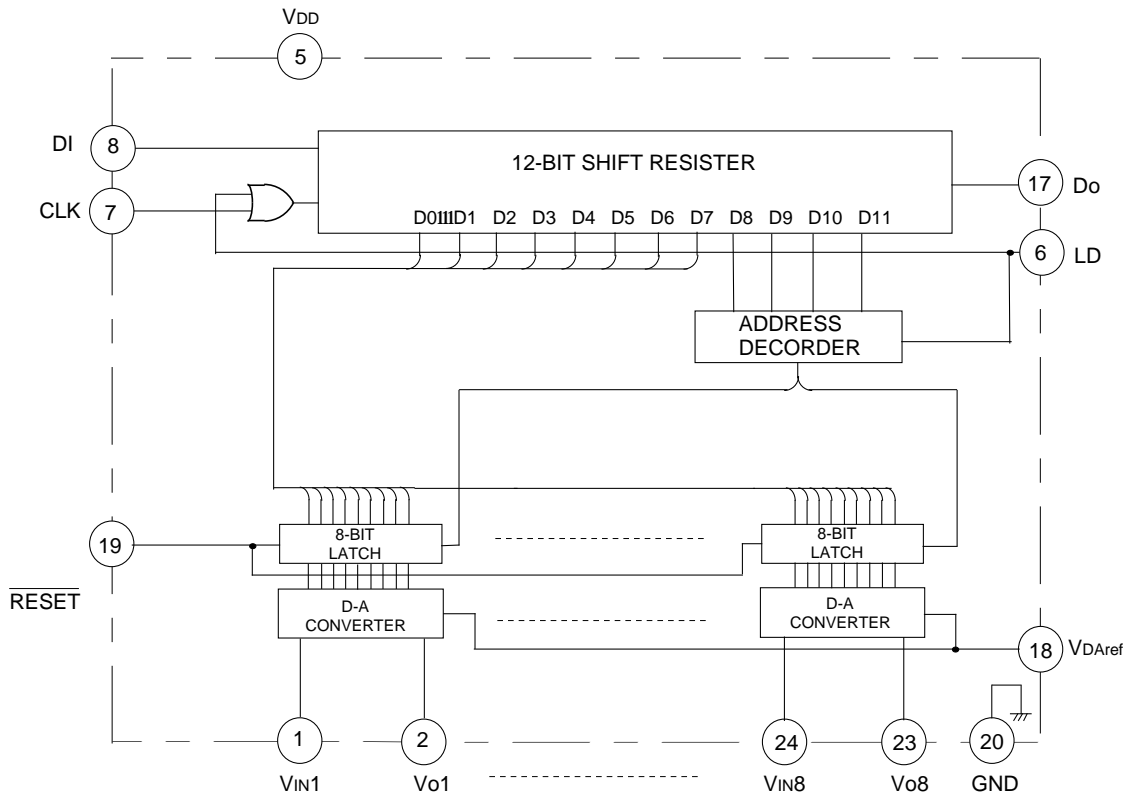
Automatic adjustment by combination with EEPROM and microcomputer.(replacement of conventional half-fixed resistor.)

Signal gain control of DISPLAY-MONITOR or CTV.

### PIN CONFIGURATION (TOP VIEW)



### BLOCK DIAGRAM



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### EXPLANATION OF TERMINALS

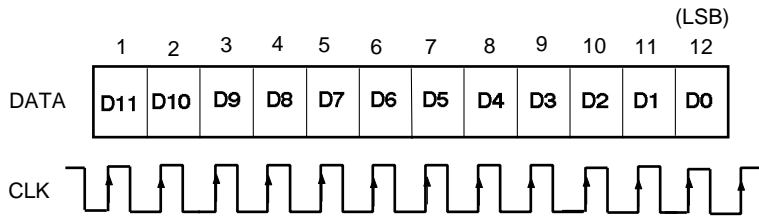
Pin No.	Symbol	Function
⑧	DI	Serial data input terminal
⑰	Do	Serial data output terminal
⑦	CLK	Serial clock input terminal
⑥	LD	LD terminal input high level then latch circuit data load
⑲	RESET	Reset terminal
②	Vo1	8-bit resolution D-A output
③	Vo2	
⑩	Vo3	
⑪	Vo4	
⑭	Vo5	
⑮	Vo6	
⑳	Vo7	
㉓	Vo8	
⑤	VDD	Power supply terminal
㉒	GND	GND terminal
①	VIN1	D-A converter input terminal
④	VIN2	
⑨	VIN3	
⑫	VIN4	
⑬	VIN5	
⑯	VIN6	
㉑	VIN7	
㉔	VIN8	
⑱	VDaref	D-A converter reference voltage input terminal $V_o = (V_{IN} - V_{Daref}) \times n / 256 + V_{Daref}$

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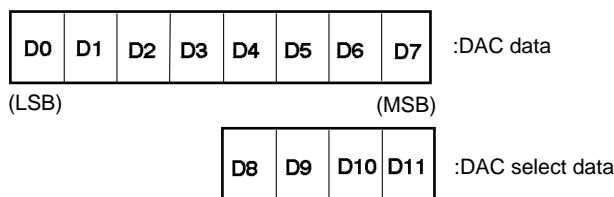
## 8-BIT 8CH D-A CONVERTER

### DIGITAL DATA FORMAT

•12 bit serial data



•Data assignment



•DAC select data

D8	D9	D10	D11	DAC selection
0	0	0	0	Don't care
0	0	0	1	Ao1 selection
0	0	1	0	Ao2 selection
0	0	1	1	Ao3 selection
0	1	0	0	Ao4 selection
0	1	0	1	Ao5 selection
0	1	1	0	Ao6 selection
0	1	1	1	Ao7 selection
1	0	0	0	Ao8 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

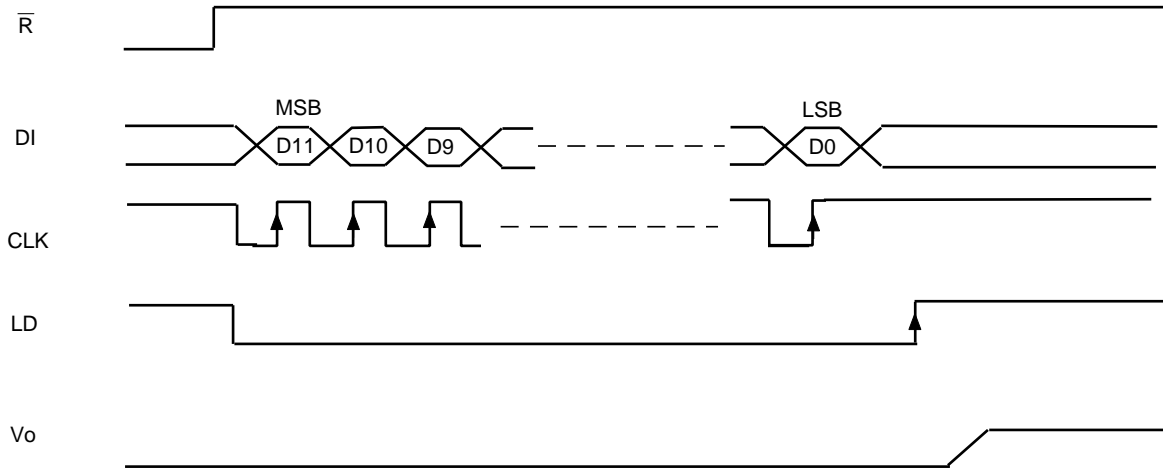
•Digital data format

(LSB)							(MSB)	D-A Output
D0	D2	D3	D4	D5	D6	D7		
0	0	0	0	0	0	0	$V_{Daref}$	
1	0	0	0	0	0	0	$(V_{IN}-V_{Daref}) / 256 \times 1 + V_{Daref}$	
0	1	0	0	0	0	0	$(V_{IN}-V_{Daref}) / 256 \times 2 + V_{Daref}$	
1	1	0	0	0	0	0	$(V_{IN}-V_{Daref}) / 256 \times 3 + V_{Daref}$	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
1	1	1	1	1	1	1	$(V_{IN}-V_{Daref}) / 256 \times 255 + V_{Daref}$	

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### TIMING CHART (MODEL)



\*Input data is carried out LD signal low besides CLK signal positive edge. CLK, LD, is keep generally High level.

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## 8-BIT 8CH D-A CONVERTER

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>DD</sub>	Supply voltage		-0.3~+7.0	V
V <sub>IND</sub>	Input voltage		-0.3~+7.0	V
V <sub>IN</sub>	Input voltage		-0.3-V <sub>DD</sub> +0.3	V
V <sub>o</sub>	Output voltage		-0.3-V <sub>DD</sub> +0.3	V
V <sub>Daref</sub>	D-A reference voltage		-0.3-V <sub>DD</sub> +0.3	V
T <sub>opr</sub>	Operating temperature		-20~+75	°C
T <sub>stg</sub>	Storage temperature		-40~+125	°C

### ELECTRICAL CHARACTERISTICS

**Digital part**(V<sub>DD</sub>,V<sub>IN</sub>=+5V±10%, V<sub>DD</sub> V<sub>IN</sub>,GND=V<sub>Daref</sub>=0V,T<sub>a</sub>=20 ~ 75°C,unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
V <sub>DD</sub>	Supply voltage		4.5	5.0	5.5	V
I <sub>ILK</sub>	Input leak current	V <sub>IN</sub> =0~V <sub>DD</sub>	-10		10	μA
I <sub>IL</sub>	Input low voltage				0.2V <sub>DD</sub>	V
I <sub>IH</sub>	Input high voltage		0.8V <sub>DD</sub>			V
V <sub>OL</sub>	Output low voltage	I <sub>OL</sub> =2.5mA			0.4	V
V <sub>OH</sub>	Output high voltage	I <sub>OH</sub> =-400μA	V <sub>DD</sub> -0.4			V

**Analog part**(V<sub>DD</sub>,V<sub>IN</sub>=+5V±10%, V<sub>DD</sub> V<sub>IN</sub>,GND=V<sub>Daref</sub>=0V,T<sub>a</sub>=-20 ~ +75°C,unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
I <sub>IN</sub>	Input current	V <sub>IN</sub> =5V,V <sub>Daref</sub> =0V •Proportional to max.Input current condition(V <sub>IN</sub> -V <sub>Daref</sub> )and digital data of each channels		0.30		mA
I <sub>Daref</sub>	D-A reference input current	V <sub>IN1</sub> ~V <sub>IN8</sub> =5V,V <sub>Daref</sub> =0V •Proportional to max.Input current condition(V <sub>IN</sub> -V <sub>Daref</sub> )and digital data of each channels		-2.40		mA
R <sub>O</sub>	Output impedance	Constant for all D-A output mode			50	k
RES	Resolution			8		bit
DNL	Differential nonlinearity		-1		1	LSB
NL	Nonlinearity		-1		1	LSB

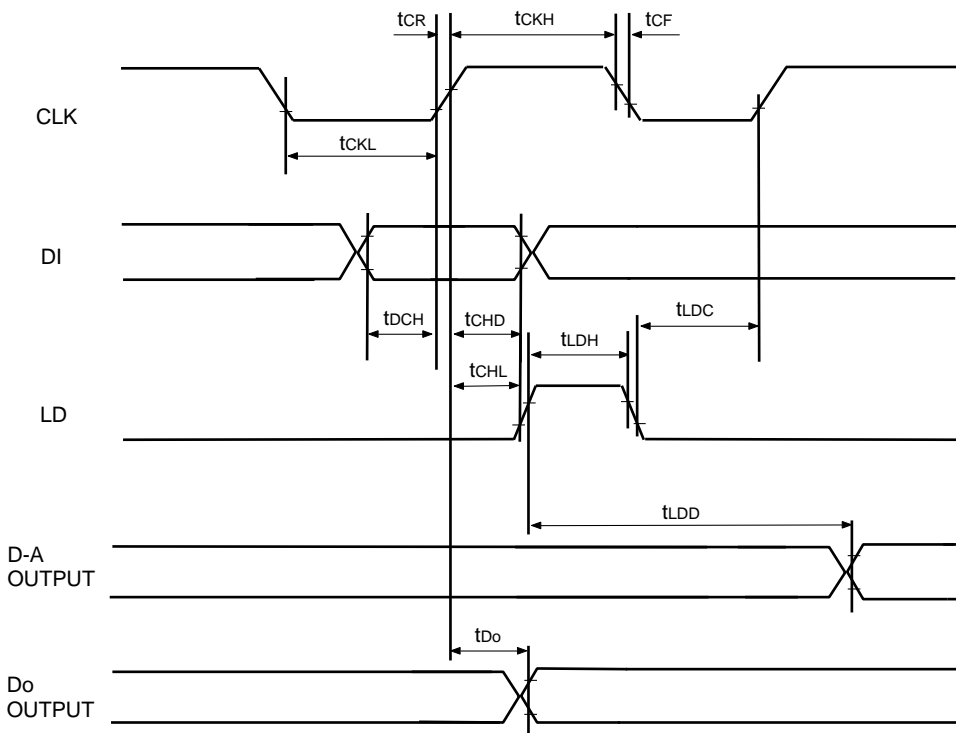
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## 8-BIT 8CH D-A CONVERTER

**AC CHARACTERISTICS**( $V_{DD}, V_{IN}=+5V\pm 10\%$ ,  $V_{DD}, V_{IN}, GND=V_{DAREF}=0V$ ,  $T_a=-20 \sim +75^\circ C$ , unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
tCKL	Clock "L" pulse width		200			ns
tCKH	Clock "H" pulse width		200			ns
tCR	Clock rise time				200	ns
tCF	Clock fall time				200	ns
tDCH	Data set up time		60			ns
tCHD	Data hold time		100			ns
tCHL	LD set up time		200			ns
tLDC	LD hold time		100			ns
tLDH	LD "H" pulse width		100			ns
tDo	Data output delay time	Less than $C_L=100pF$	70		350	ns
tLDD	D-A output setting time	Without load			5	$\mu s$
	Input•Output replay time	$f=10kHz$			5	$\mu s$

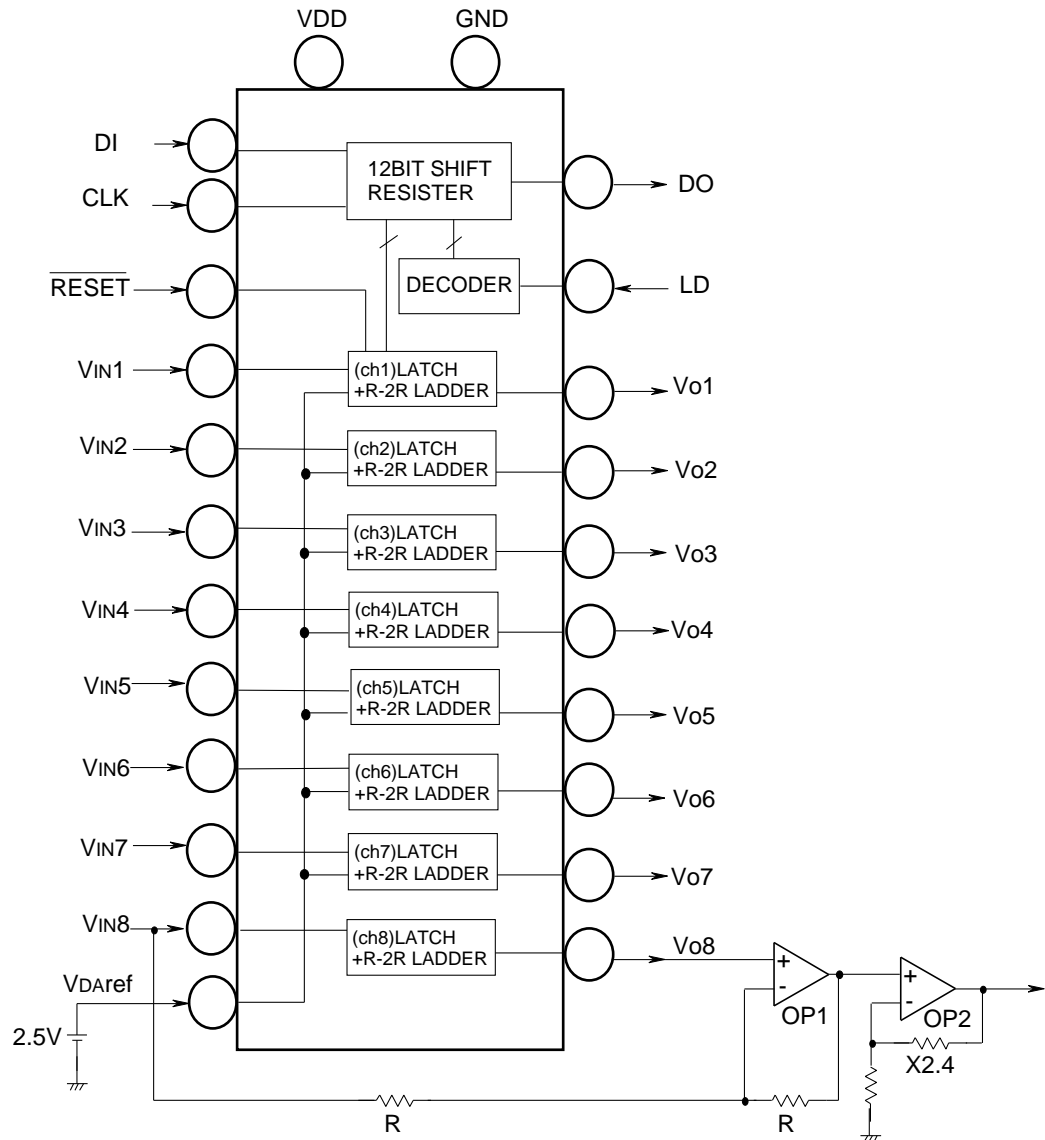
### TIMING CHART



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## 8-BIT 8CH D-A CONVERTER

### OPERATING DESCRIPTION



\*Ch1-Ch7 becomes multiplication type D-A converter action of 0~5V range by each output adds OP1.

\*Ch8 become 4 quadrant multiplication of 0~12V range at 6V center by add OP1 and OP2 to this channel.

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1.The value of Vo depend on output direct buffer.

$$V_o = (V_{IN} - V_{DAREF}) \cdot \frac{n}{256} + V_{DAREF} \dots \dots \dots (1)$$

(n=0~255)

<VIN=5V>		<VIN=0V>	
n	Vo	n	Vo
0	2.5	0	2.5
128	3.75	128	1.25
255	4.99	255	0.01

2.The value of Vo depend on application of ch8.

$$VOP1 = (V_{IN} - V_{DAREF}) \cdot \left( \frac{n}{128} - 1 \right) + V_{DAREF} \dots \dots \dots (2)$$

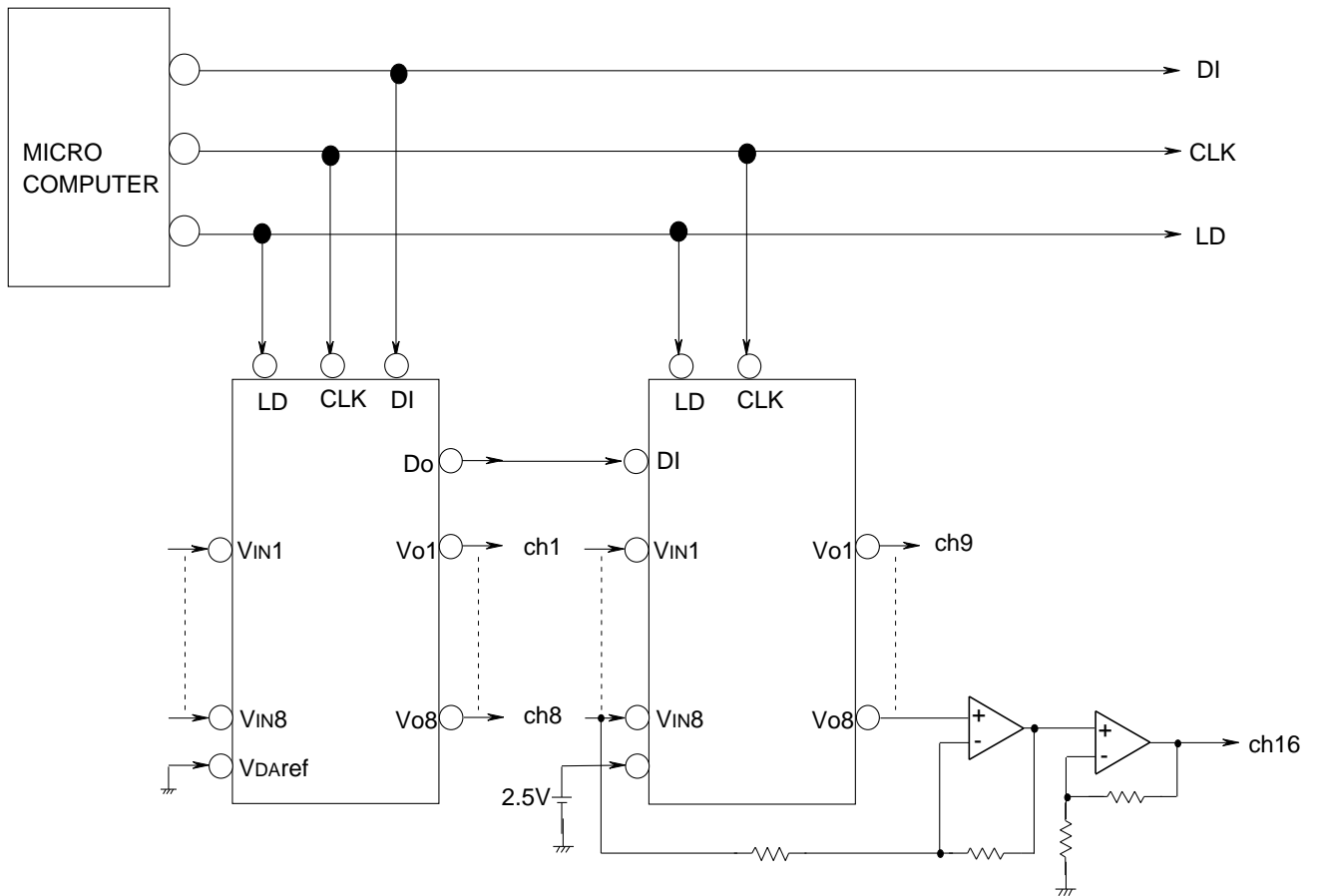
(n=0~255)

$$VOP2 = VOP1 \times 2.4 \dots \dots \dots (3)$$

<VIN=5V>		<VIN=0V>	
n	VOP1	n	VOP1
0	0	0	5.00
128	2.50	128	2.50
255	4.98	255	0.02

n	VOP1	n	VOP1
0	0	0	12.00
128	6.00	128	6.00
255	11.95	255	0.05

### APPLICATION EXAMPLE OF CASCADE CONNECTION



- \*In this example, M62363X2 are connected in cascade.
- \*A 24-bit input data can be used to automatically control up to 16 channels.