M62363FP

8-BIT 8CH D-A CONVERTER

DESCRIPTION

The M62363FP is an integrated circuit semiconductor of CMOS structure with 8 channels of buil-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 convertional R-2R method.
•Short setting time
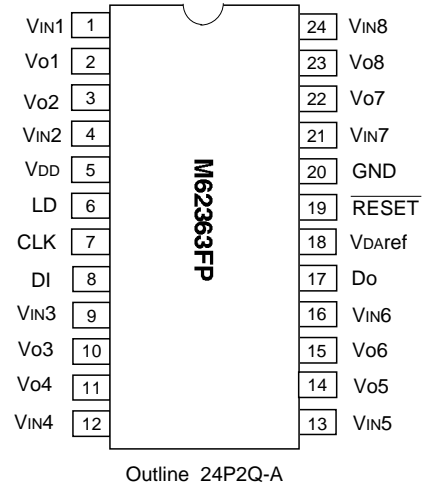•4 Quadrant multiplication

APPLICATION

 Convertion from digital control data to analog control data for home-use and industrial equipment.
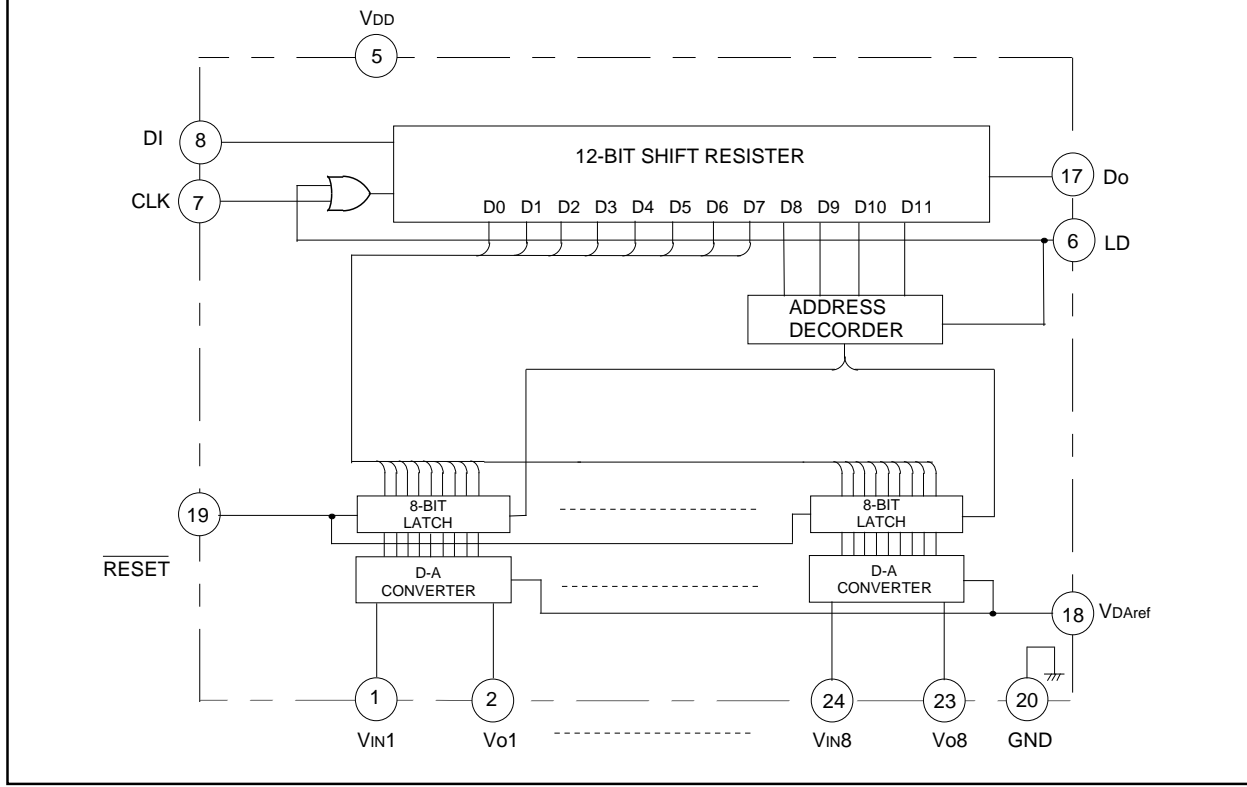 Automatic adjustment by combination with EEPROM and microcomputer.(replacement of conventional half-fixed resistor.)
 Signal gain control of DISPLAY-MONITOR or CTV.

PIN CONFIGURATION (TOP VIEW)

Pin	Name		Pin	Name
1	V_{IN1}		24	V_{IN8}
2	V_{O1}		23	V_{O8}
3	V_{O2}		22	V_{O7}
4	V_{IN2}		21	V_{IN7}
5	V_{DD}		20	GND
6	LD		19	$\overline{RESET}$
7	CLK		18	V_{DAref}
8	DI		17	Do
9	V_{IN3}		16	V_{IN6}
10	V_{O3}		15	V_{O6}
11	V_{O4}		14	V_{O5}
12	V_{IN4}		13	V_{IN5}

M62363FP

Outline 24P2Q-A

BLOCK DIAGRAM

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	$\overline{LD}$	LD terminal input high level then latch circuit data load
⑲	$\overline{RESET}$	Reset terminal
②	Vo1	8-bit resolution D-A output
③	Vo2	
⑩	Vo3	
⑪	Vo4	
⑭	Vo5	
⑮	Vo6	
㉒	Vo7	
㉓	Vo8	
⑤	V_{DD}	Power supply terminal
⑳	GND	GND terminal
①	$V_{IN}1$	D-A converter input terminal
④	$V_{IN}2$	
⑨	$V_{IN}3$	
⑫	$V_{IN}4$	
⑬	$V_{IN}5$	
⑯	$V_{IN}6$	
㉑	$V_{IN}7$	
㉔	$V_{IN}8$	
⑱	$V_{DA}ref$	D-A converter reference voltage input terminal $Vo = (V_{IN} - V_{DA}ref) \times n / 256 + V_{DA}ref$

DIGITAL DATA FORMAT

•12 bit serial data
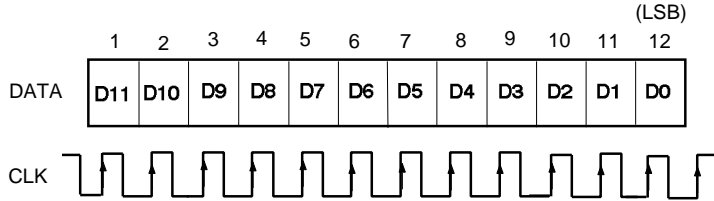
•Data assignment
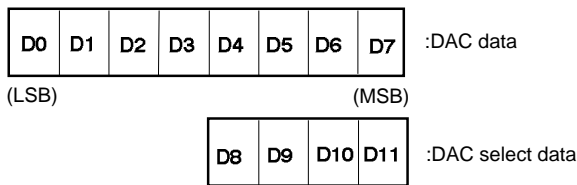
•DAC select data

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)

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

TIMING CHART (MODEL)

$\overline{R}$

DI — MSB: D11, D10, D9 ... LSB: D0

CLK

LD

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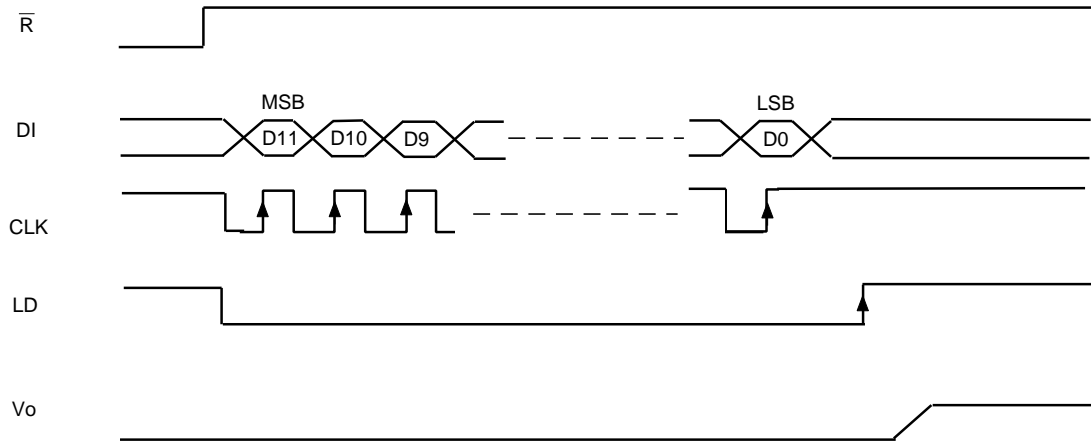
*Input data is carried out LD signal low besides CLK signal positive edge.CLK,LD,is keep generally High level.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
V_{DD}	Supply voltage		-0.3~+7.0	V
V_{IND}	Input voltage		-0.3~+7.0	V
V_{IN}	Input voltage		-0.3~V_{DD}+0.3	V
V_O	Output voltage		-0.3~V_{DD}+0.3	V
V_{DAref}	D-A reference voltage		-0.3~V_{DD}+0.3	V
T_{opr}	Operating temperature		-20~+75	℃
T_{stg}	Storage tempareture		-40~+125	℃

ELECTRICAL CHARACTERISTICS

Digital part(V_{DD},V_{IN}=+5V±10%, V_{DD}≥V_{IN},GND=V_{DAref}=0V,Ta=20 ~ 75°C,unless otherwise noted)

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

Analog part(V_{DD},V_{IN}=+5V±10%, V_{DD}≥V_{IN},GND=V_{DAref}=0V,Ta=-20 ~ +75°C,unless otherwise noted)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{IN}	Input current	V_{IN}=5V,V_{DAref}=0V •Proportional to max.Input current condition(V_{IN}-V_{DAref})and digital data of each channels		0.30		mA
I_{DAref}	D-A reference input current	V_{IN1}~V_{IN8}=5V,V_{DAref}=0V •Proportional to max.Input current condition(V_{IN}-V_{DAref})and digital data of each channels		-2.40		mA
RO	Output inpedance	Constant for all D-A output mode			50	kΩ
RES	Resolution			8		bit
DNL	Diffrential nonlinearity		-1		1	LSB
NL	Nonlinearity		-1		1	LSB

AC CHARACTERISTICS(V_{DD},V_{IN}=+5V±10%, V_{DD}≥V_{IN},GND=V_{DA}ref=0V,Ta=-20 ~ +75°C,unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{CKL}	Clock "L"pulse width		200			ns
t_{CKH}	Clock "H"pulse width		200			ns
t_{CR}	Clock rise time				200	ns
t_{CF}	Clock fall time				200	ns
t_{DCH}	Data set up time		60			ns
t_{CHD}	Data hold time		100			ns
t_{CHL}	LD set up time		200			ns
t_{LDC}	LD hold time		100			ns
t_{LDH}	LD "H" pulse width		100			ns
t_{Do}	Data output delay time	Less than C_L=100pF	70		350	ns
t_{LDD}	D-A output setting time	Without load			5	μs
	Input•Output replay time	f=10kHz			5	μs

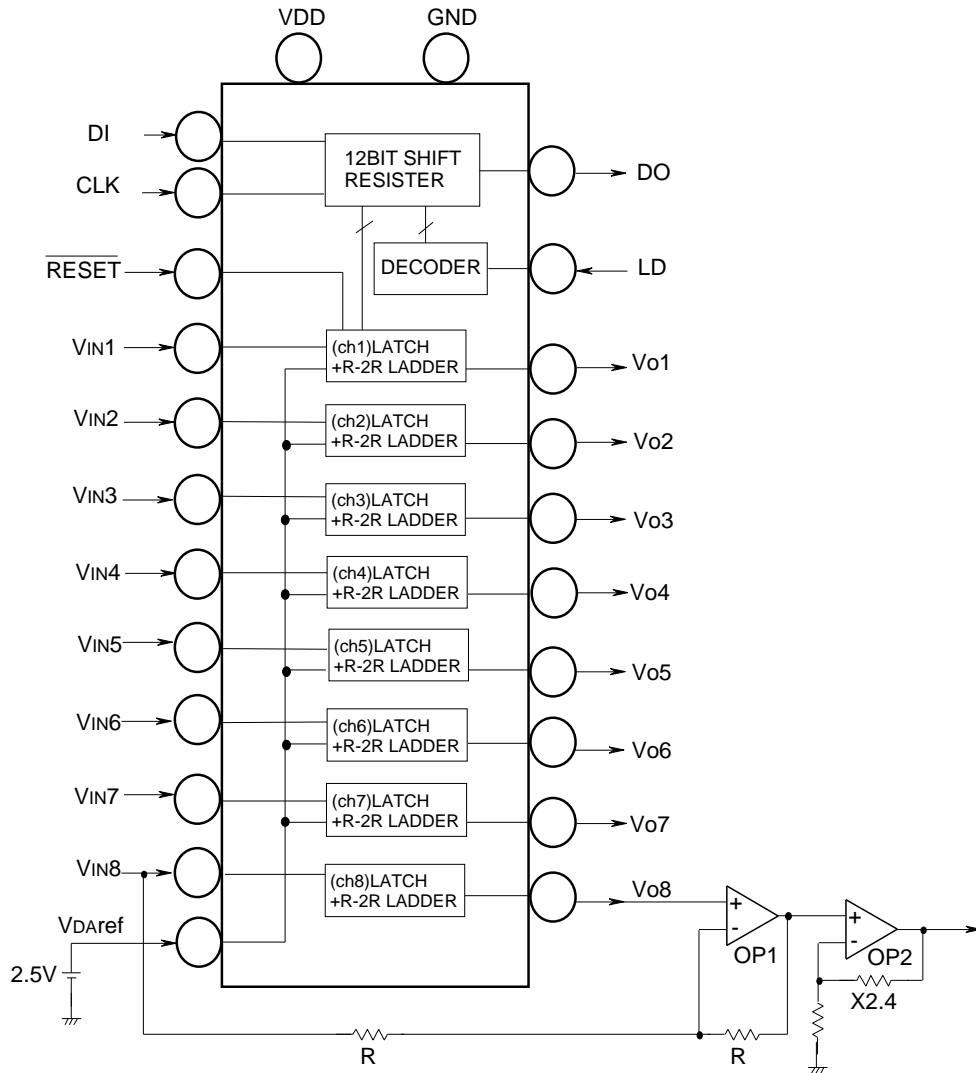**TIMING CHART**
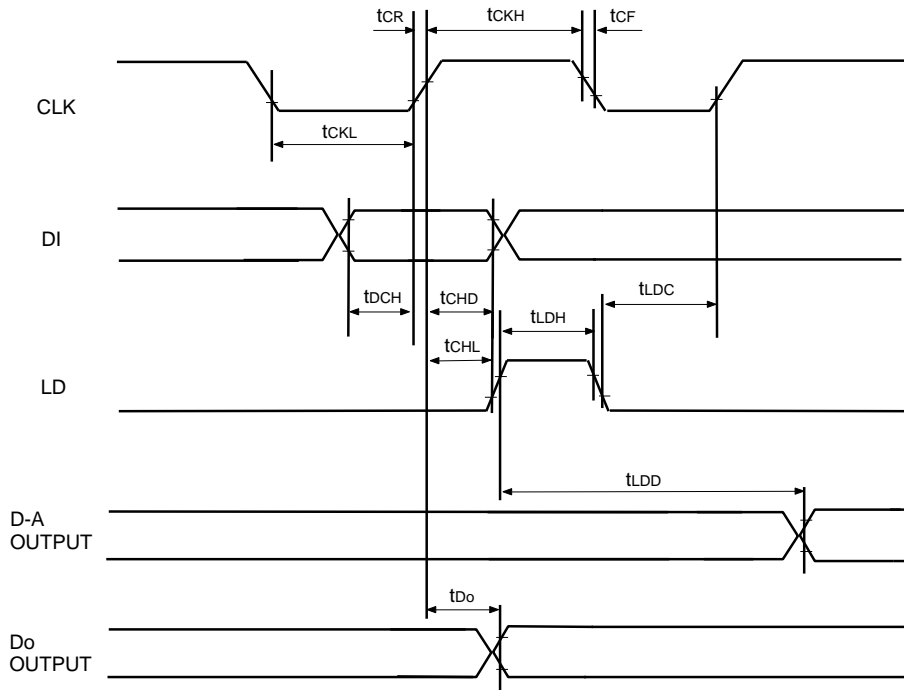
OPERATING DESCRIPTION

*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.

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

$$Vo=(V_{IN}-V_{DA}ref) \cdot \frac{n}{256} + V_{DA}ref ....(1)$$

$$(n=0\sim255)$$

<V_{IN}=5V>

n	Vo
0	2.5
128	3.75
255	4.99

<V_{IN}=0V>

n	Vo
0	2.5
128	1.25
255	0.01

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

$$V_{OP1}=(V_{IN}-V_{DA}ref) \cdot (\frac{n}{128} -1) + V_{DA}ref ....(2)$$

$$(n=0\sim255)$$

$$V_{OP2}=V_{OP1} \times 2.4 ....(3)$$

<V_{IN}=5V>

n	V_{OP1}
0	0
128	2.50
255	4.98

<V_{IN}=0V>

n	V_{OP1}
0	5.00
128	2.50
255	0.02

n	V_{OP1}
0	0
128	6.00
255	11.95

n	V_{OP1}
0	12.00
128	6.00
255	0.05

APPLICATION EXAMPLE OF CASCADE CONNECTION
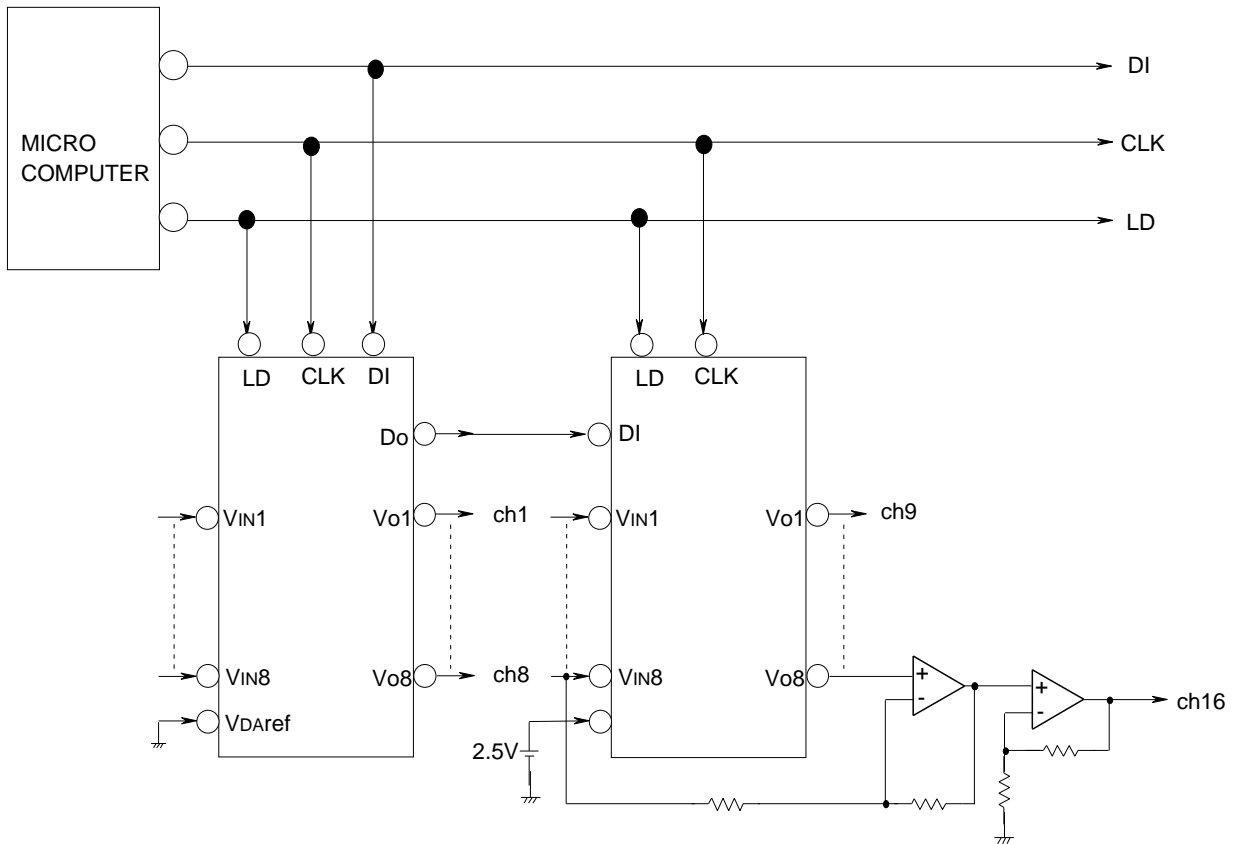
*In this example,M62363X2 are connected in cascode.
*A 24-bit input data can be used to automatically control up to 16 channels.

MITSUBISHI ELECTRIC