M62363FP

8-bit 8ch D/A Converter

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Rev.3.01
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Description

The M62363FP is an integrated circuit semiconductor of CMOS structured 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 D_O 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

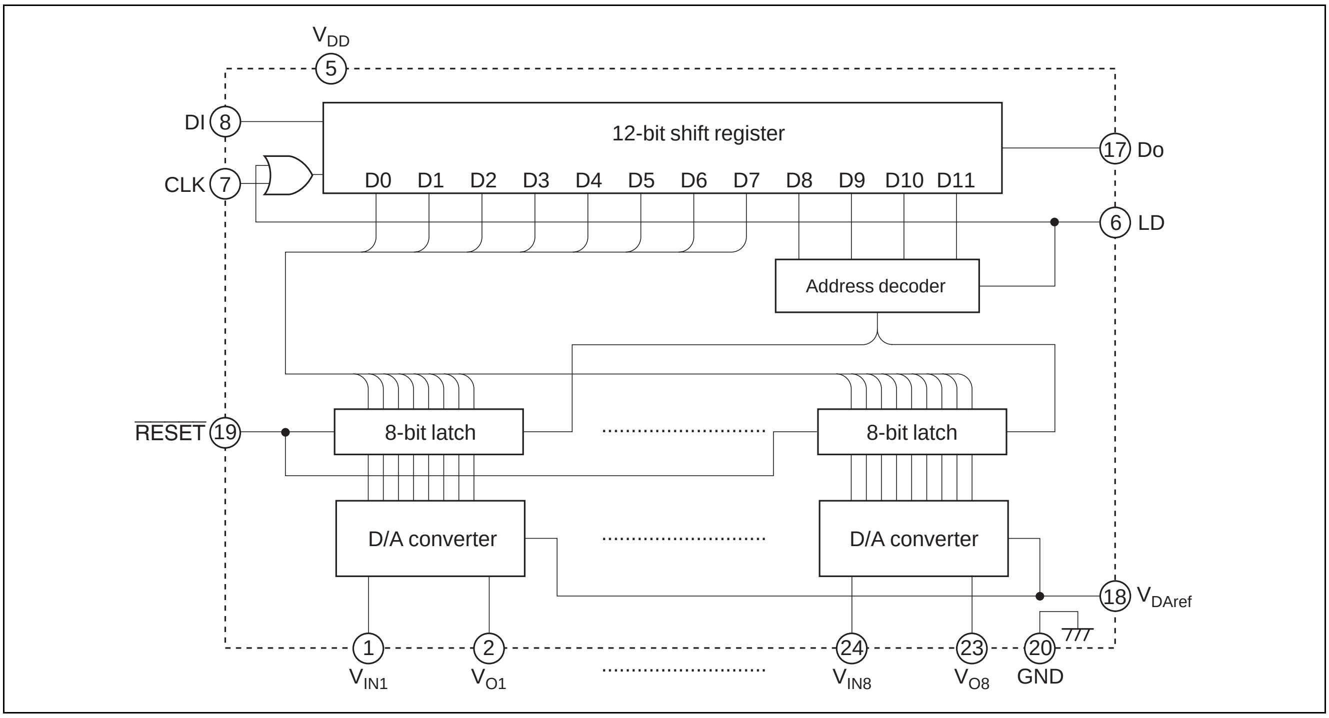
Application

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.)

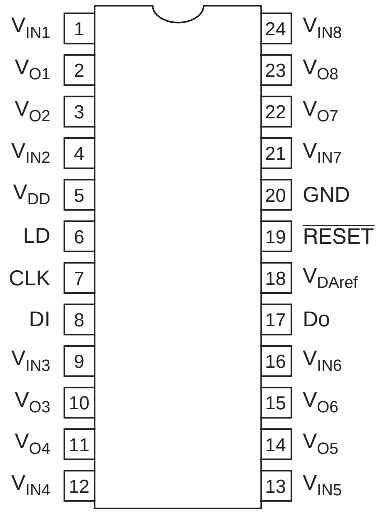
Signal gain control of display-monitor or CTV

Block Diagram



Pin Arrangement

M62363FP



(Top view)

Outline: PRSP0024GA-A (24P2Q-A)

Pin Description

Pin No.	Pin Name	Function
8	DI	Serial data input terminal
17	D_O	Serial data output terminal
7	CLK	Serial clock input terminal
6	LD	LD terminal input high level then latch circuit data load
19	$\overline{RESET}$	Reset terminal
2	V_{O1}	8-bit resolution D/A output
3	V_{O2}	
10	V_{O3}	
11	V_{O4}	
14	V_{O5}	
15	V_{O6}	
22	V_{O7}	
23	V_{O8}	
5	V_{DD}	Power supply terminal
20	GND	GND terminal
1	V_{IN1}	D/A converter input terminal
4	V_{IN2}	
9	V_{IN3}	
12	V_{IN4}	
13	V_{IN5}	
16	V_{IN6}	
21	V_{IN7}	
24	V_{IN8}	
18	V_{DAref}	D/A converter reference voltage input terminal $V_O = (V_{IN} - V_{DAref}) \times n / 256 + V_{DAref}$

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage	V_{DD}	–0.3 to +7.0	V
Input voltage	V_{IND}	–0.3 to +7.0	V
Input voltage	V_{IN}	–0.3 to V_{DD} + 0.3	V
Output voltage	V_O	–0.3 to V_{DD} + 0.3	V
D/A reference voltage	V_{DAref}	–0.3 to V_{DD} + 0.3	V
Operating temperature	Topr	–20 to +75	°C
Storage temperature	Tstg	–40 to +125	°C

Electrical Characteristics

<Digital Part>

(V_{DD}, V_{IN} = +5 V ± 10%, $V_{DD} \geq V_{IN}$, GND = V_{DAref} = 0 V, Ta = –20 to +75°C, unless otherwise noted.)

Item	Symbol	Limits			Unit	Conditions
		Min	Typ	Max		
Supply voltage	V_{DD}	4.5	5.0	5.5	V	
Input leak current	I_{ILK}	–10	—	10	µA	V_{IN} = 0 to V_{DD}
Input low voltage	V_{IL}	—	—	0.2 V_{DD}	V	
Input high voltage	V_{IH}	0.8 V_{DD}	—	—	V	
Output low voltage	V_{OL}	—	—	0.4	V	I_{OL} = 2.5 mA
Output high voltage	V_{OH}	V_{DD} – 0.4	—	—	V	I_{OH} = –400 µA

<Analog Part>

(V_{DD}, V_{IN} = +5 V ± 10%, $V_{DD} \geq V_{IN}$, GND = V_{DAref} = 0 V, Ta = –20 to +75°C, unless otherwise noted.)

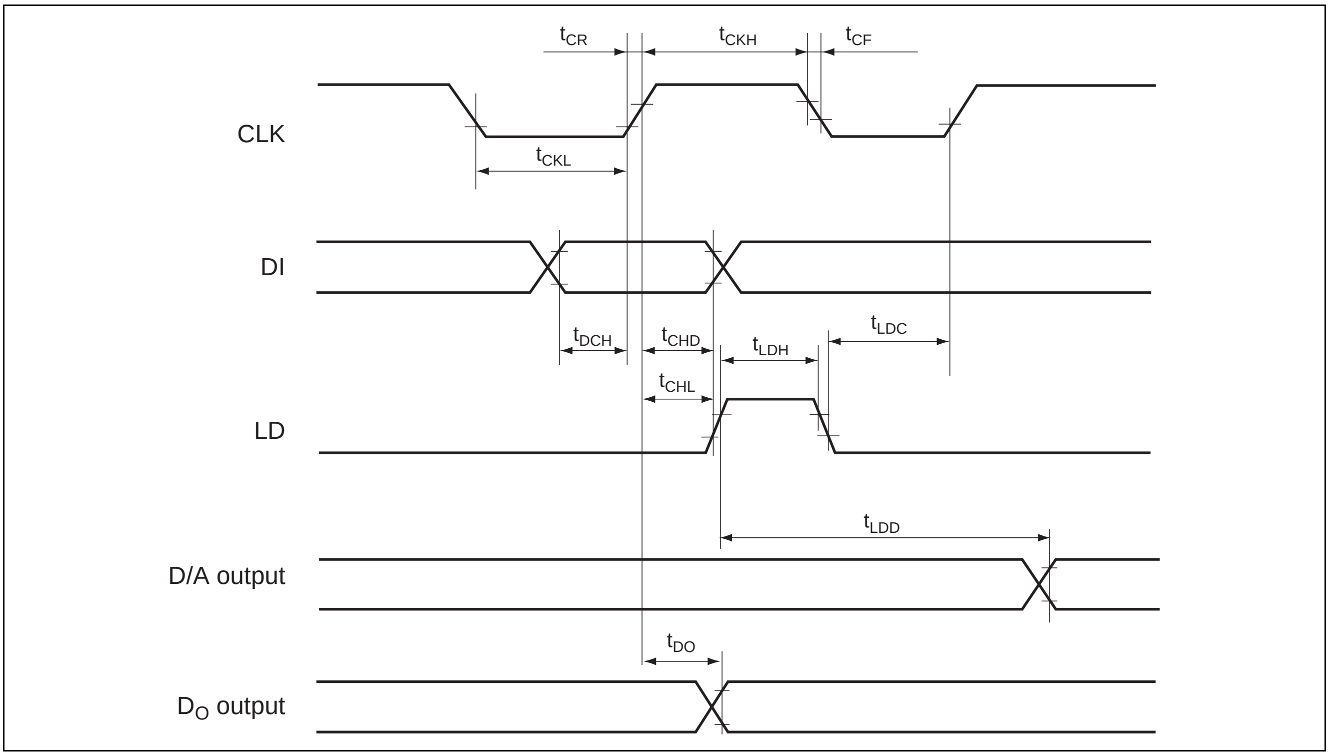
Item	Symbol	Limits			Unit	Conditions
		Min	Typ	Max		
Input current	I_{IN}	—	—	0.30	mA	V_{IN} = 5 V, V_{DAref} = 0 V Proportional to Max. input current condition (V_{IN} – V_{DAref}) and digital data of each cannels
D/A reference input current	I_{DAref}	–2.40	—	—	mA	V_{IN1} to V_{IN8} = 5 V, V_{DAref} = 0 V Proportional to Max. input current condition (V_{IN} – V_{DAref}) and digital data of each channels
Output impedance	R_O	—	—	50	kΩ	Constant for all D/A output mode
Resolution	RES	—	8	—	bit	
Differential nonlinearity	DNL	–1	—	1	LSB	
Nonlinearity	NL	–1	—	1	LSB	

AC Characteristics

(V_{DD}, V_{IN} = +5 V ± 10%, $V_{DD} \geq V_{IN}$, GND = V_{DAref} = 0 V, Ta = –20 to +75°C, unless otherwise noted.)

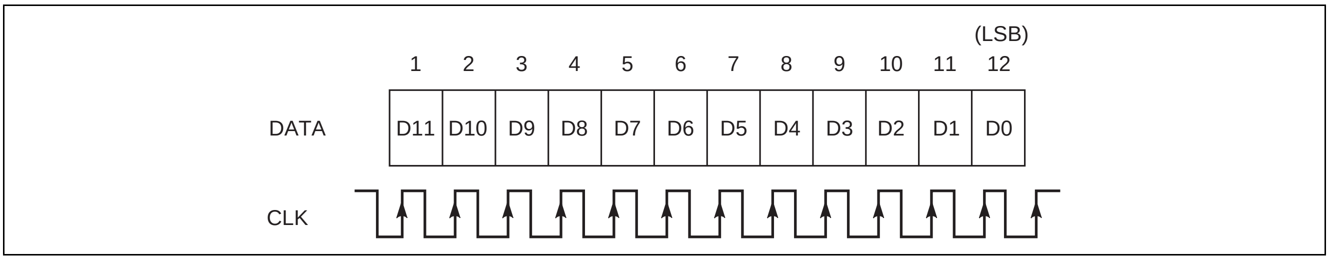
Item	Symbol	Limits			Unit	Conditions
		Min	Typ	Max		
Clock "L" pulse width	t_{CKL}	200	—	—	ns	
Clock "H" pulse width	t_{CKH}	200	—	—	ns	
Clock rise time	t_{CR}	—	—	200	ns	
Clock fall time	t_{CF}	—	—	200	ns	
Data setup time	t_{DCH}	60	—	—	ns	
Data hold time	t_{CHD}	100	—	—	ns	
LD setup time	t_{CHL}	200	—	—	ns	
LD hold time	t_{LDC}	100	—	—	ns	
LD "H" pulse width	t_{LDH}	100	—	—	ns	
Data output delay time	t_{DO}	70	—	350	ns	Less than C_L = 100 pF
D/A output setting time	t_{LDD}	—	—	5	µs	Without load
Input/output replay time	—	—	—	5	µs	f = 10 kHz

Timing Chart



Digital Data Format

12-bit serial data



Data assignment

D0	D1	D2	D3	D4	D5	D6	D7	: DAC data
(LSB)							(MSB)	
				D8	D9	D10	D11	: DAC select data

DAC Data

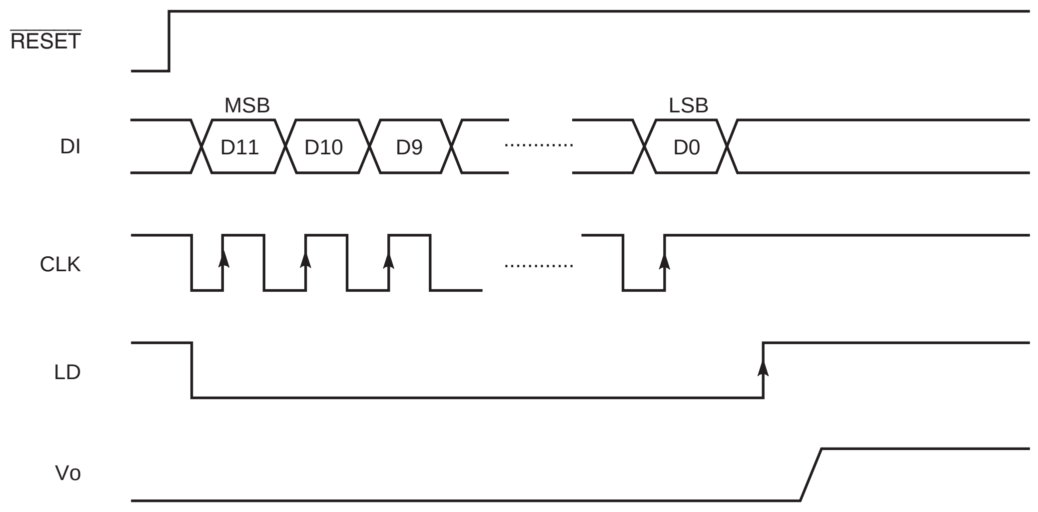
(LSB) (MSB)

D0	D1	D2	D3	D4	D5	D6	D7	D/A Output
0	0	0	0	0	0	0	0	V_{DAref}
1	0	0	0	0	0	0	0	$(V_{IN} - V_{DAref}) / 256 \times 1 + V_{DAref}$
0	1	0	0	0	0	0	0	$(V_{IN} - V_{DAref}) / 256 \times 2 + V_{DAref}$
1	1	0	0	0	0	0	0	$(V_{IN} - V_{DAref}) / 256 \times 3 + V_{DAref}$
:	:	:	:	:	:	:	:	:
1	1	1	1	1	1	1	1	$(V_{IN} - V_{DAref}) / 256 \times 255 + V_{DAref}$

DAC Select Data

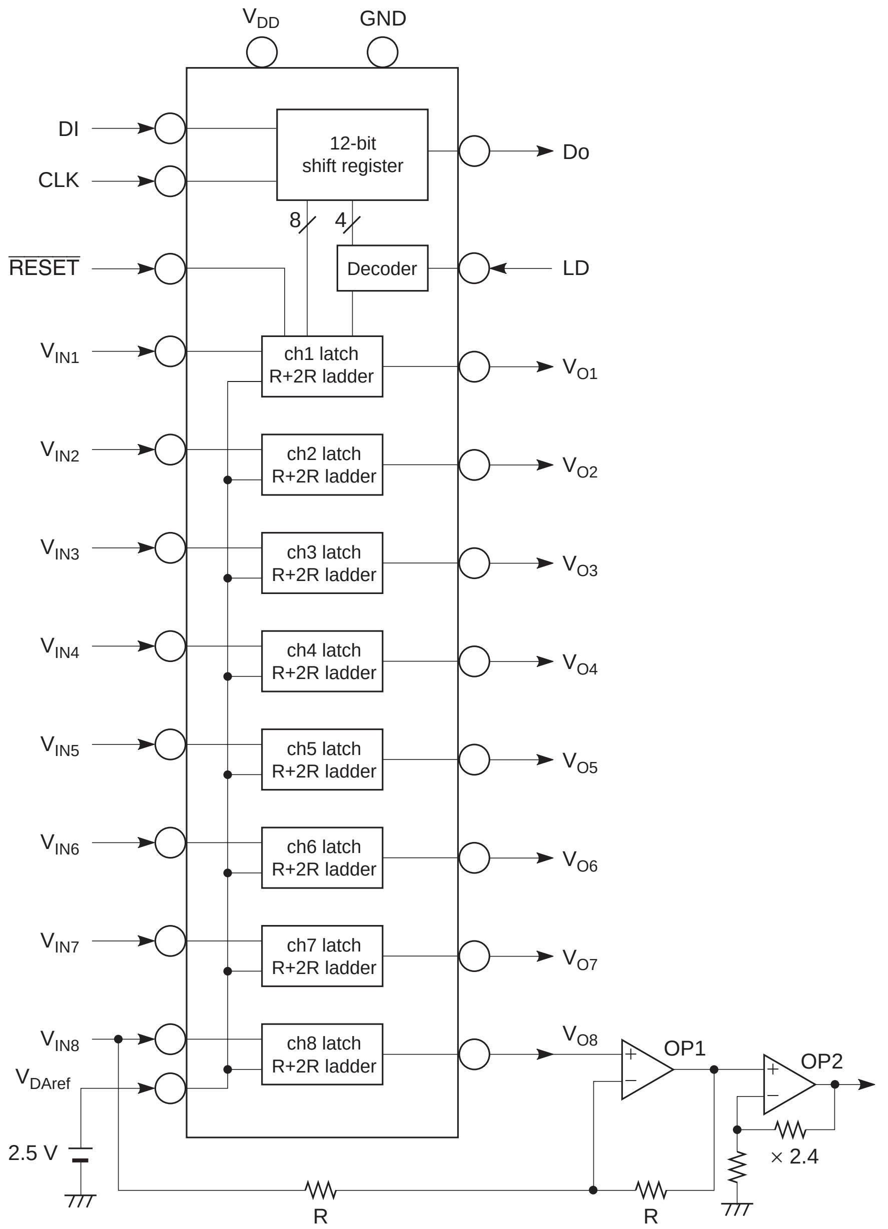
D8	D9	D10	D11	DAC Selection
0	0	0	0	Don't care
0	0	0	1	V_{O1} selection
0	0	1	0	V_{O2} selection
0	0	1	1	V_{O3} selection
0	1	0	0	V_{O4} selection
0	1	0	1	V_{O5} selection
0	1	1	0	V_{O6} selection
0	1	1	1	V_{O7} selection
1	0	0	0	V_{O8} selection
1	0	0	1	Don't care
1	0	1	0	Don't care
1	0	1	1	Don't care
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

Timing Chart (Model)



Note: Input data is carried out LD signal low besides CLK signal positive edge. CLK, LD, is keep generally high level.

Operating Description



Note: ch1 to ch7 becomes multiplication type D/A converter action of 0 to 5 V range by each output adds OP1.
ch8 become 4 quadrant multiplication of 0 to 12 V range at 6 V center by add OP1 and OP2 to this channel.

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

$$V_O = (V_{IN} - V_{DAref}) \bullet \frac{n}{256} + V_{DAref} \ldots \text{ (n = 0 to 255) } \ldots(1)$$

<V_{IN} = 5 V>

n	V_O
0	0
128	3.75
255	4.99

<V_{IN} = 0 V>

n	V_O
0	2.5
128	1.25
255	0.01

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

$$V_{OP1} = (V_{IN} - V_{DAref}) \bullet (\frac{n}{128} - 1) + V_{DAref} \ldots \text{ (n = 0 to 255) } \ldots(2)$$

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

<V_{IN} = 5 V>

n	V_{OP1}
0	0
128	2.50
255	4.98

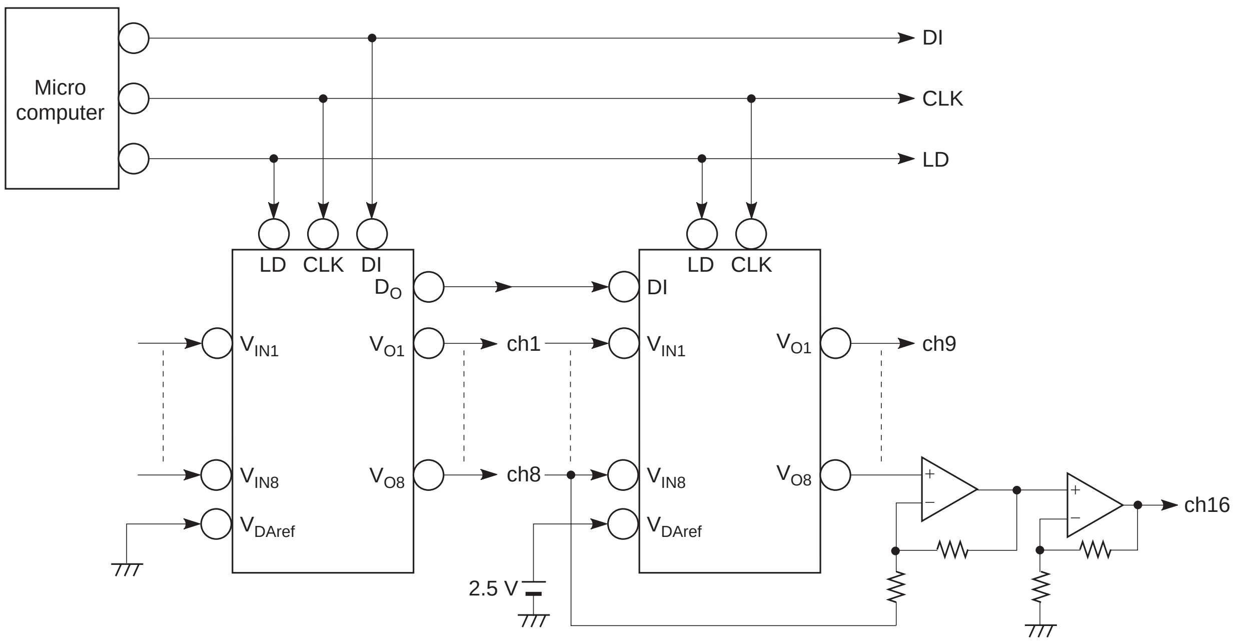
<V_{IN} = 0 V>

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

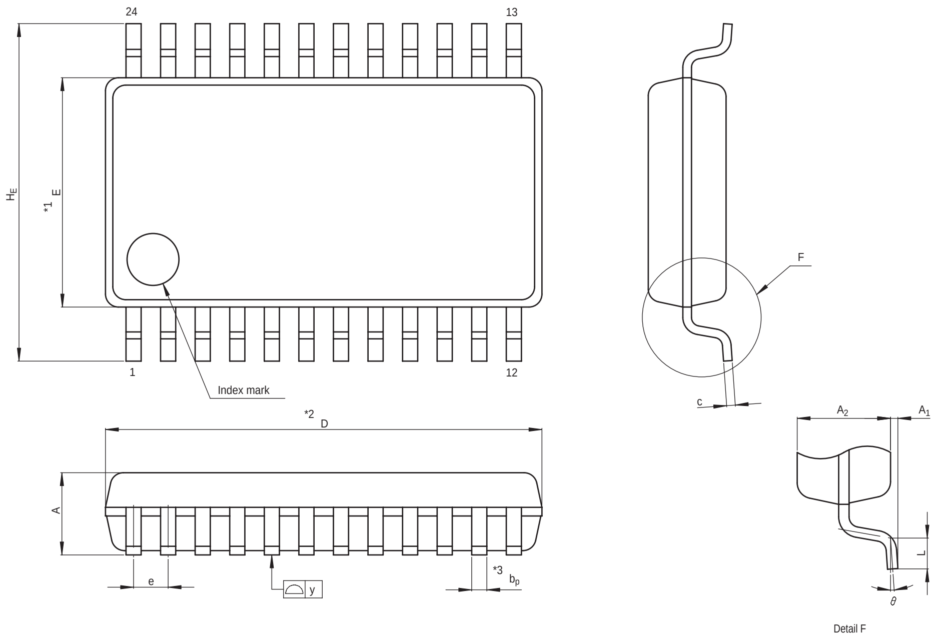
Application Example of Cascade Connection



Note: In this example, M62363 × 2 are connected in cascade.
A 24-bit input data can be used to automatically control up to 16 channels.

Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SSOP24-5.3x10.1-0.80	PRSP0024GA-A	24P2Q-A	0.2g



NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	10.0	10.1	10.2
E	5.2	5.3	5.4
A_2	—	1.8	—
A	—	—	2.1
A_1	0	0.1	0.2
b_p	0.3	0.35	0.45
c	0.18	0.2	0.25
θ	0°	—	8°
H_E	7.5	7.8	8.1
e	0.65	0.8	0.95
y	—	—	0.10
L	0.4	0.6	0.8

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