M62362P/FP

1280 Resolution 3ch Multiplying D/A Converter

REJ03D0873-0201
Rev.2.01
Dec 27, 2007

Description

The M62362P is an integrated circuit semiconductor of CMOS structured with 3 channels of built-in 1280 step resolution (equivalent 10.3-bit) multiplication type D/A converters.

The 3-wire serial interface method and it is able to cascading serial use with D_O terminal.

The device is suited for use in high accuracy automatic adjustment combination with microcomputer.

Features

- Digital data transfer method: 3-wire serial data transfer method
- High resolution
  Resolution is more over 10-bit and error is less than ±1 LSB
- Capable of 4 quadrant multiplication
- Short setting time
- With reset terminal

Recommended Operating Condition

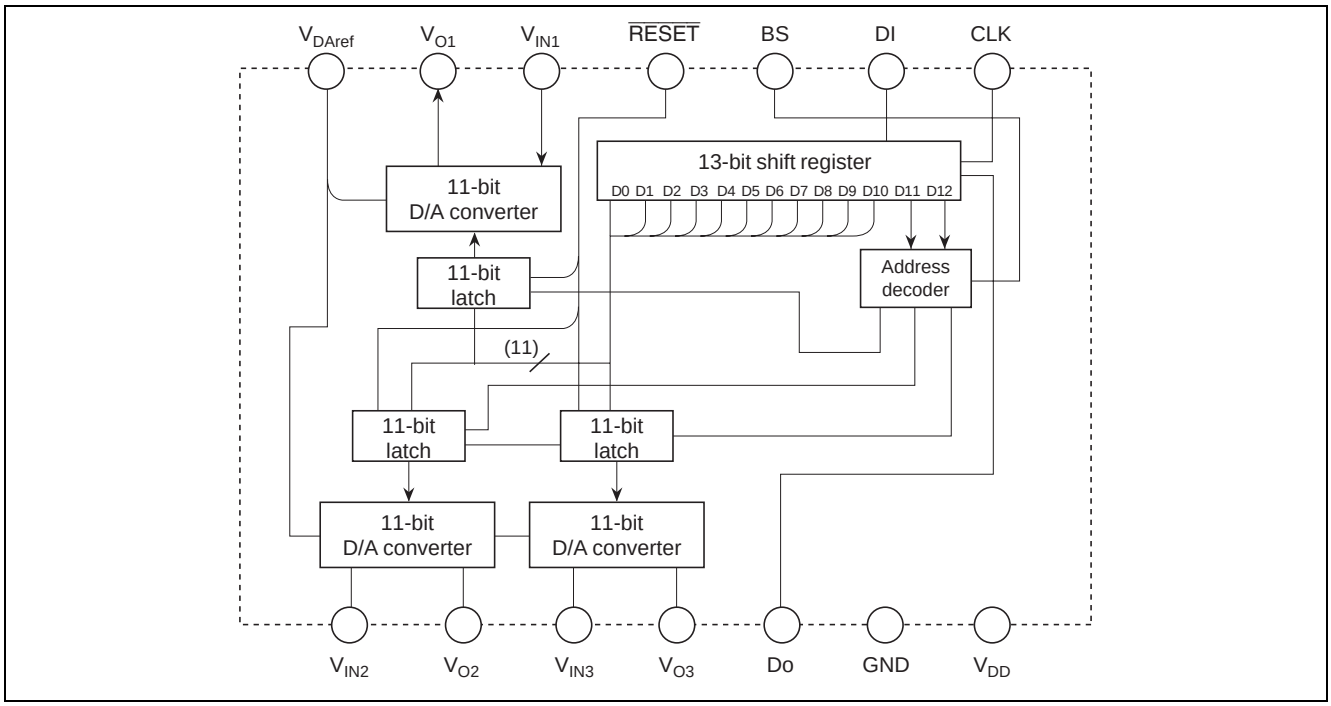
Digital section supply voltage: V_{DD} = 5 V ± 10%

Application

Signal gain control of display-monitor or CTV. Conversion from digital control data to analog control data for home-use and industrial equipment.

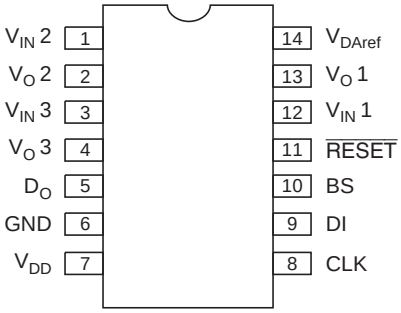
Automatic adjustment by combination with EEPROM and microcomputer. (Replacement of conventional half-fixed)

Block Diagram



Pin Arrangement

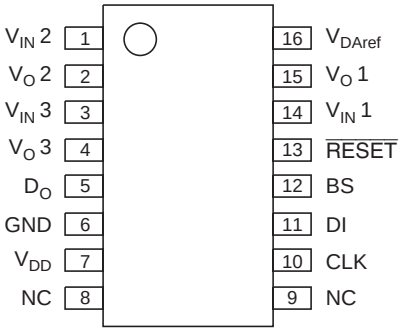
M62362P



(Top view)

Outline: 14P4

M62362FP



NC: No connection

(Top view)

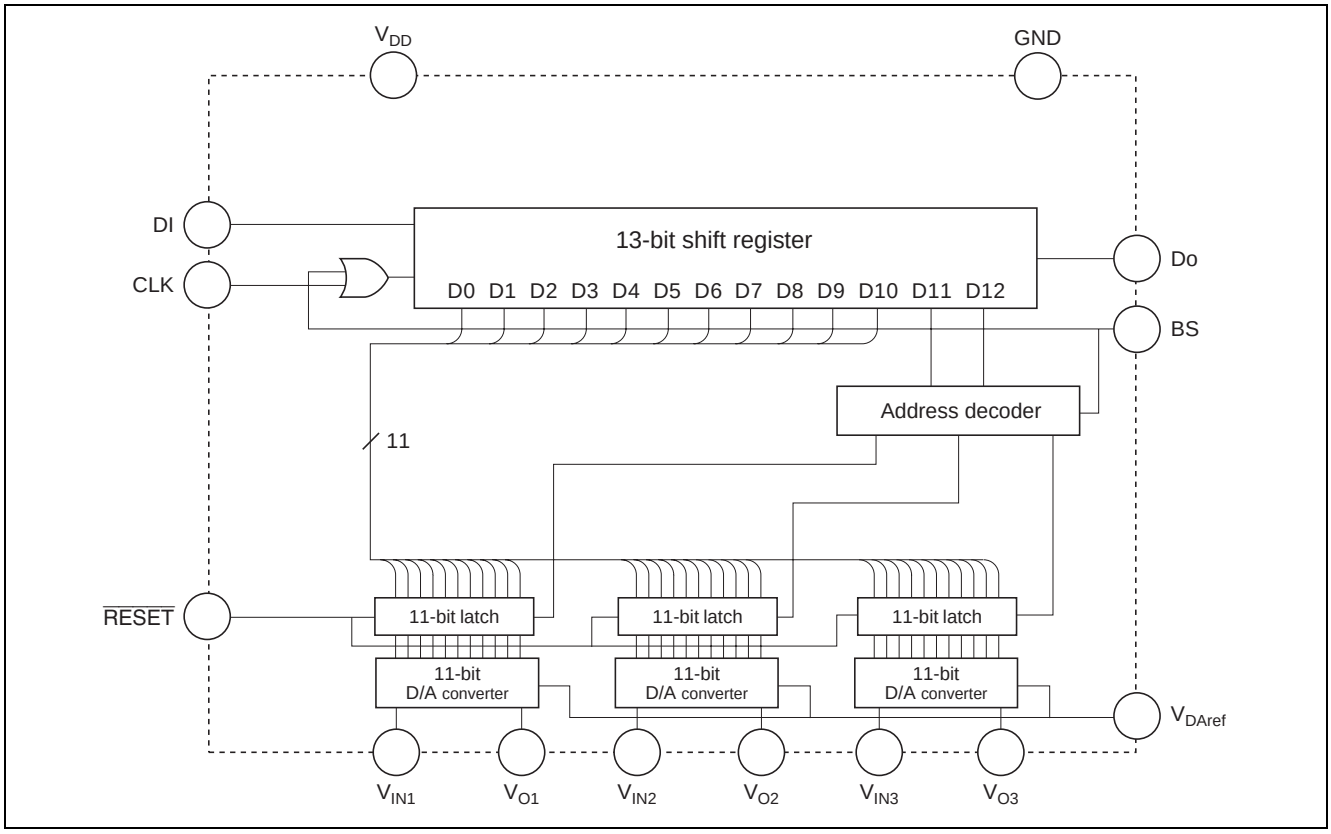
Outline: PRSP0016DE-A (16P2N-A)

Pin Description

Pin No.	Pin Name	Function
9 (11)	DI	Serial data input terminal
5	D_O	Serial data output terminal
8 (10)	CLK	Serial clock input terminal
10 (12)	BS	When BS terminal level is "H" latch circuit data is load
11 (13)	$\overline{\text{RESET}}$	When $\overline{\text{RESET}}$ terminal level is "L", all D/A output terminal became "L"
13 (15)	V_{O1}	1280 resolution D/A output
2	V_{O2}	
4	V_{O3}	
7	V_{DD}	Power supply terminal
6	GND	GND terminal
1	V_{IN2}	D/A converter input terminal
3	V_{IN3}	
12 (14)	V_{IN1}	
14 (16)	V_{DAref}	D/A converter reference voltage input terminal

Note: ( ) : M62362FP

Block Diagram for Explanation of Terminals



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage	V_{DD}	–0.3 to +7.0	V
Digital input voltage (DI, CLK, BS)	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 +85	°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 +85°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 +85°C, unless otherwise noted.)

Item		Symbol	Limits			Unit	Conditions
			Min	Typ	Max		
Input voltage		V_{IN}	0	—	V_{DD}	V	
Output voltage		V_O	0	—	V_{DD}	V	V_{IN} = 0 to V_{DD}
Input current		I_{IN}	—	0.75	1.5	mA	V_{IN} = 5 V, V_{DAref} = 0 V Proportional to (V_{IN} – V_{DAref})
D/A reference source current		I_{DAref}	–4.5	–2.25	—	mA	V_{IN1} = V_{IN2} = V_{IN3} = 5 V, V_{DAref} = 0 V Proportional to (V_{IN} – V_{DAref})
D/A output sink or source current		I_O	–1.0	—	1.0	µA/LSB	
Output impedance		R_O	—	1.8	3.6	kΩ	Constant for all D/A output mode
Resolution		RES	—	1280	—	STEP	
Accuracy	Differential nonlinearity	DNL	–1	—	1	LSB	
	Nonlinearity	NL	–0.6	—	0.6	%FS	
	Nonlinearity for channels	ΔNL	–0.4	—	0.4	%FS	

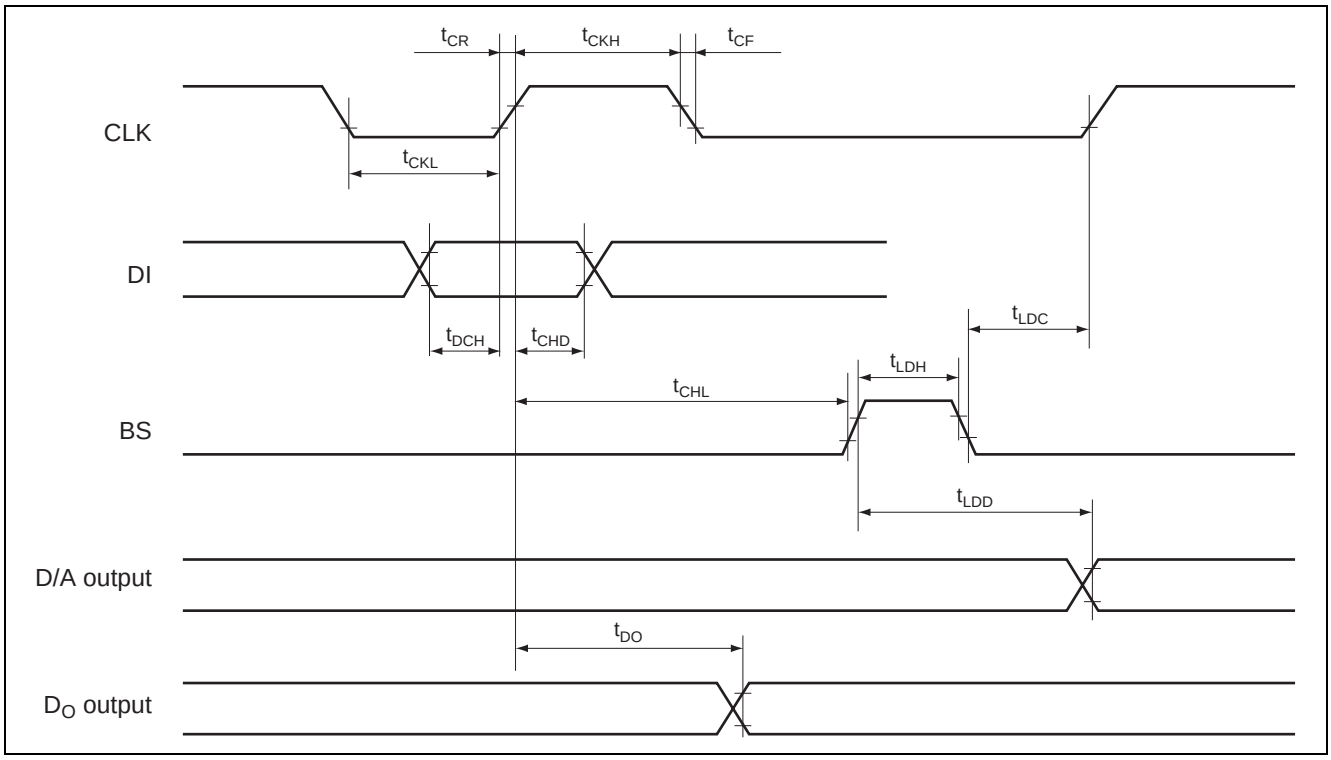
Note: Polarity of current, (+) is sink into IC and (–) is source from IC.

AC Characteristics

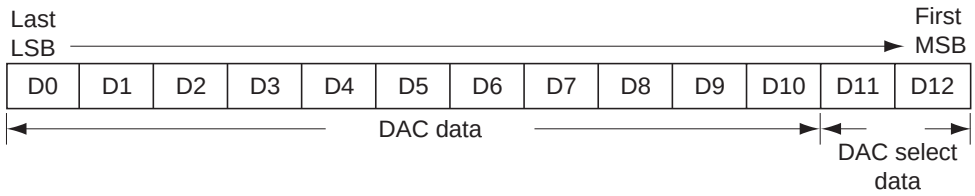
(V_{DD}, V_{IN} = +5 V ± 10%, $V_{DD} \geq V_{IN}$, GND = V_{DAref} = 0 V, Ta = –20 to +85°C)

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	$C_L \leq 100$ pF
Data output setting time	t_{LDD}	—	—	20	µs	No load
Input/output response time		—	—	5		f = 10 kHz

Timing Chart



Digital Data Format



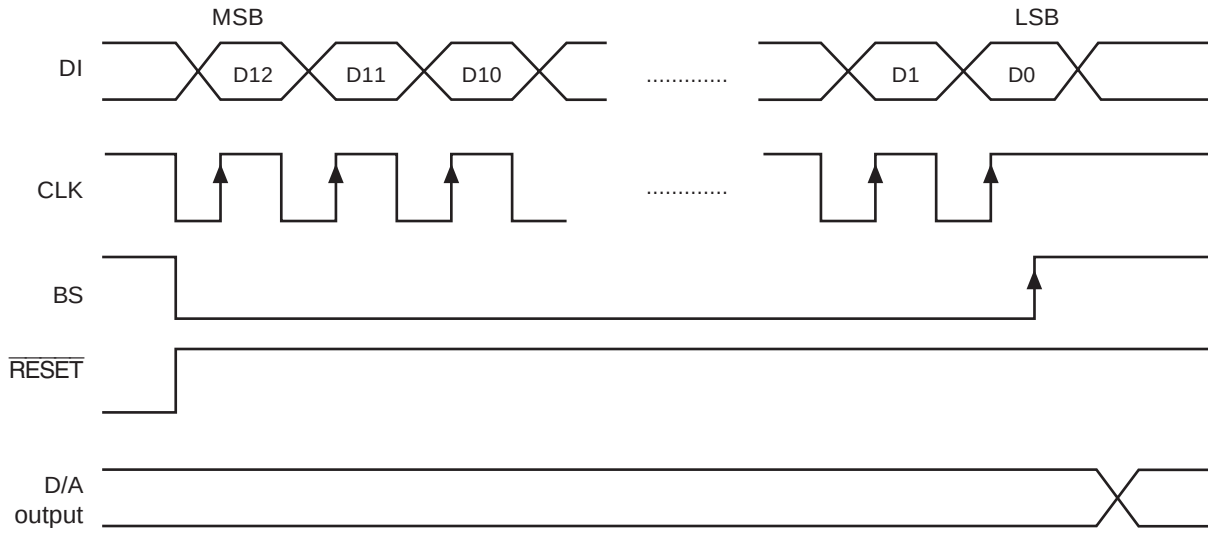
DAC Data

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D/A Output
0	0	0	0	0	0	0	0	0	0	0	V_{DAref}
1	0	0	0	0	0	0	0	0	0	0	$(V_{IN} - V_{DAref}) / 1280 \times 1 + V_{DAref}$
0	1	0	0	0	0	0	0	0	0	0	$(V_{IN} - V_{DAref}) / 1280 \times 2 + V_{DAref}$
1	1	0	0	0	0	0	0	0	0	0	$(V_{IN} - V_{DAref}) / 1280 \times 3 + V_{DAref}$
:	:	:	:	:	:	:	:	:	:	:	:
1	1	1	1	1	1	1	1	0	0	1	$(V_{IN} - V_{DAref}) / 1280 \times 1279 + V_{DAref}$
0	0	0	0	0	0	0	0	1	0	1	V_{IN}
:	:	:	:	:	:	:	:	:	:	:	:
1	1	1	1	1	1	1	1	1	1	1	V_{IN}

DAC Select Data

D11	D12	DAC Selection
0	0	Don't care
0	1	ch1
1	0	ch2
1	1	ch3

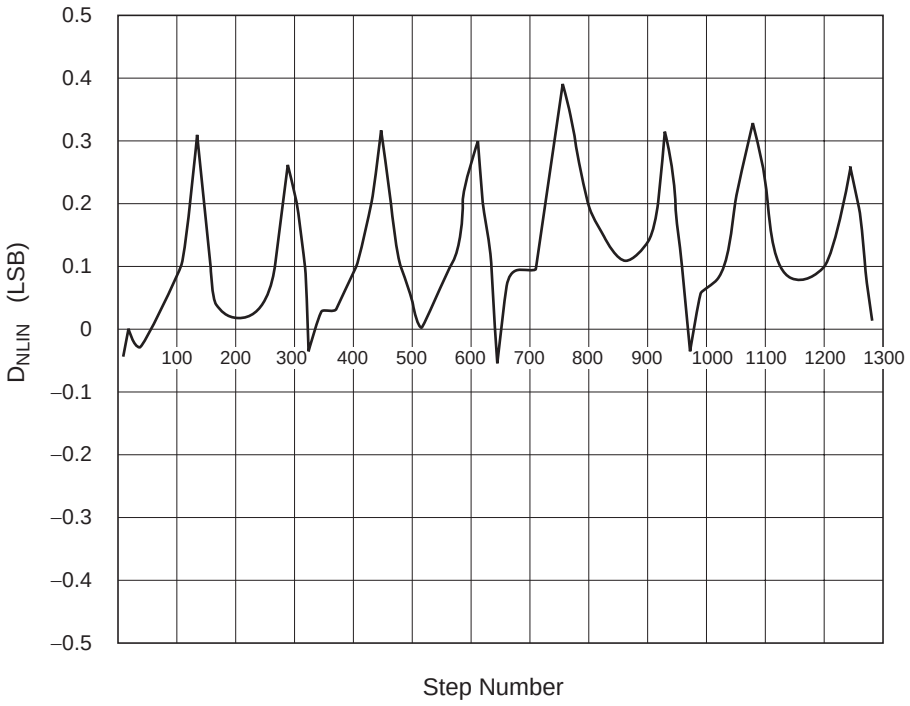
Timing Chart (Model)



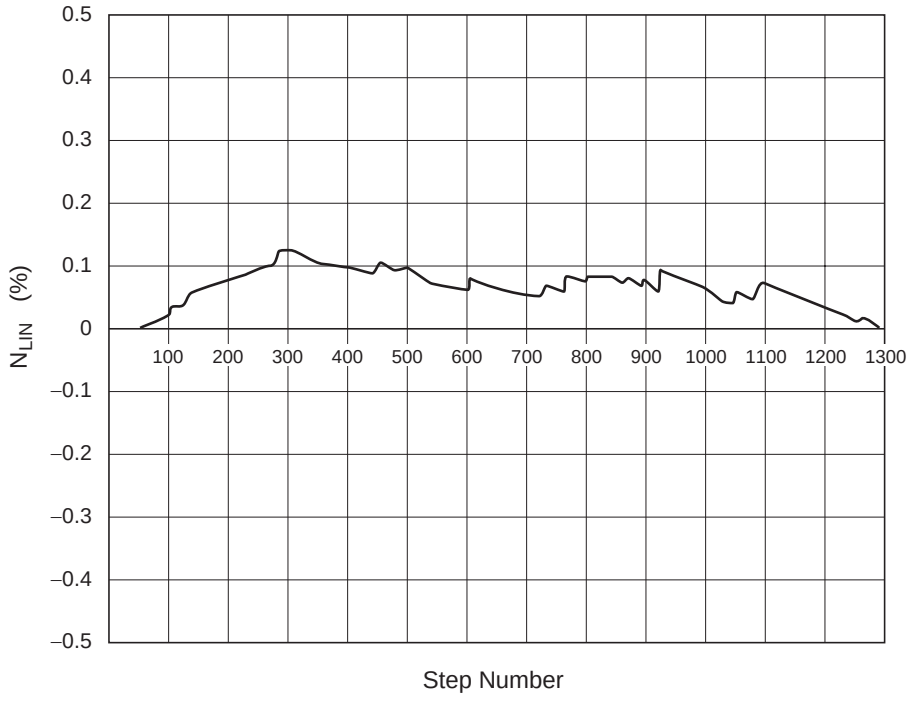
Note: Input data is carried out BS signal "L" besides CLK signal positive edge. CLK, BS, is keep generally "H" level.

Typical Characteristics

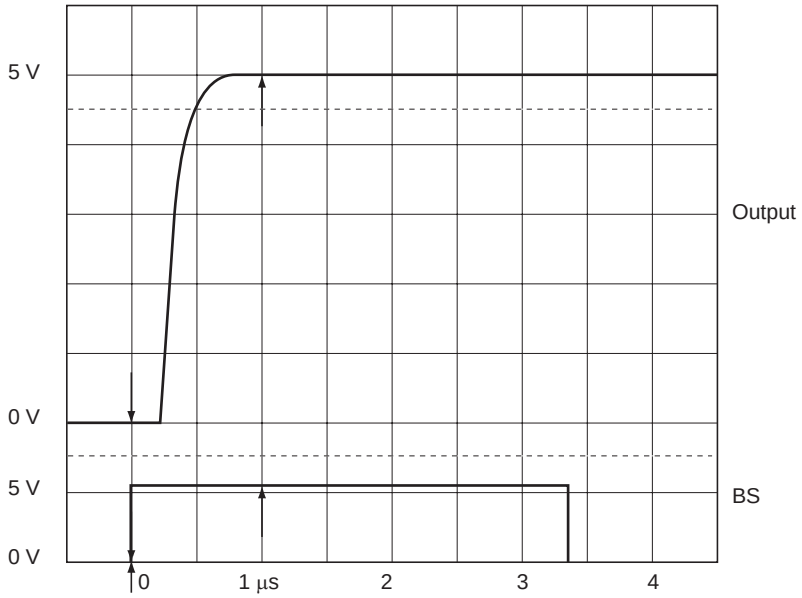
M62362P Differential Nonlinearity



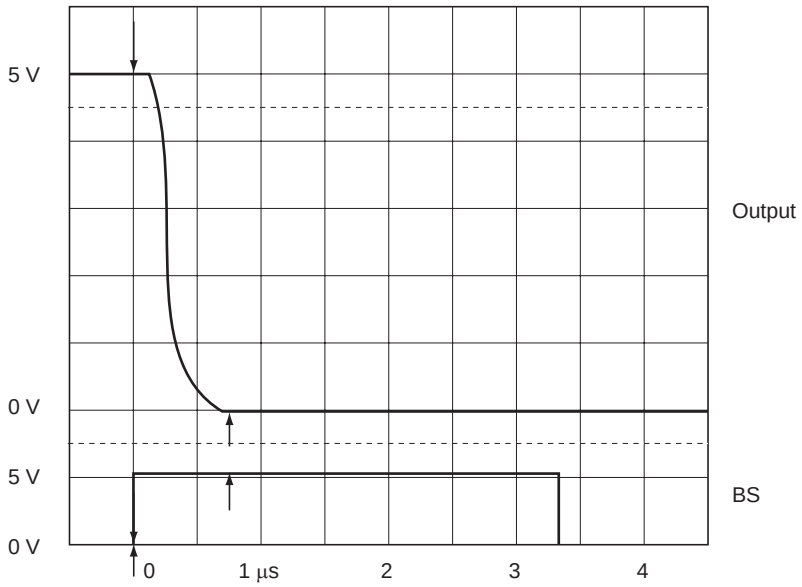
M62362P Nonlinearity



M62362P Output Rise Characteristics (Setting Time)



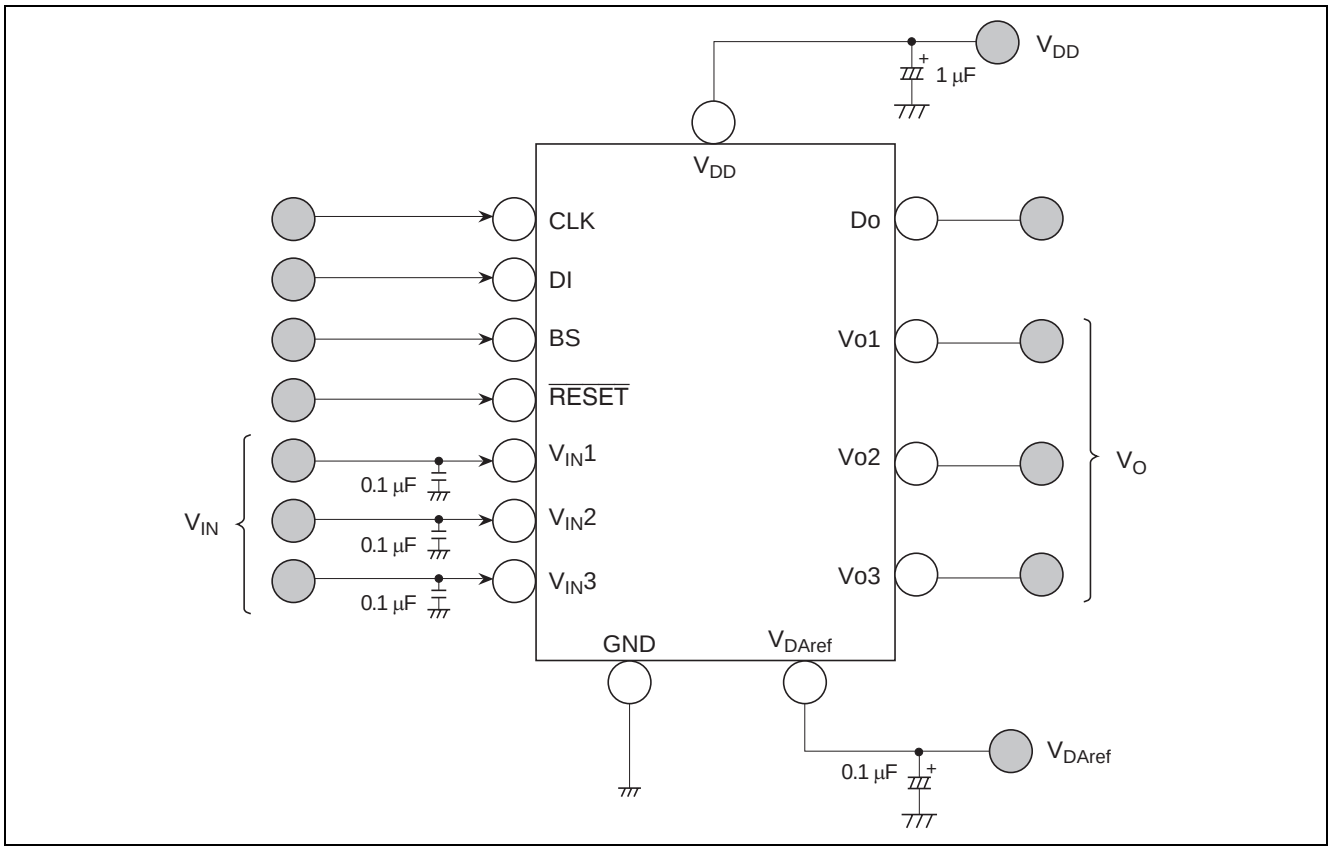
M62362P Output Fall Characteristics (Setting Time)



Precaution for Use

M62362 have 5 terminals these are input free voltage at use. (V_{DD}, V_{IN1}, V_{IN2}, V_{IN3}, V_{DAref}) If ripple and spike is input to these terminals, accuracy of conversion is down. So, when use this device, please connect capacitor among to each terminals and GND for stable operation.

Application Example

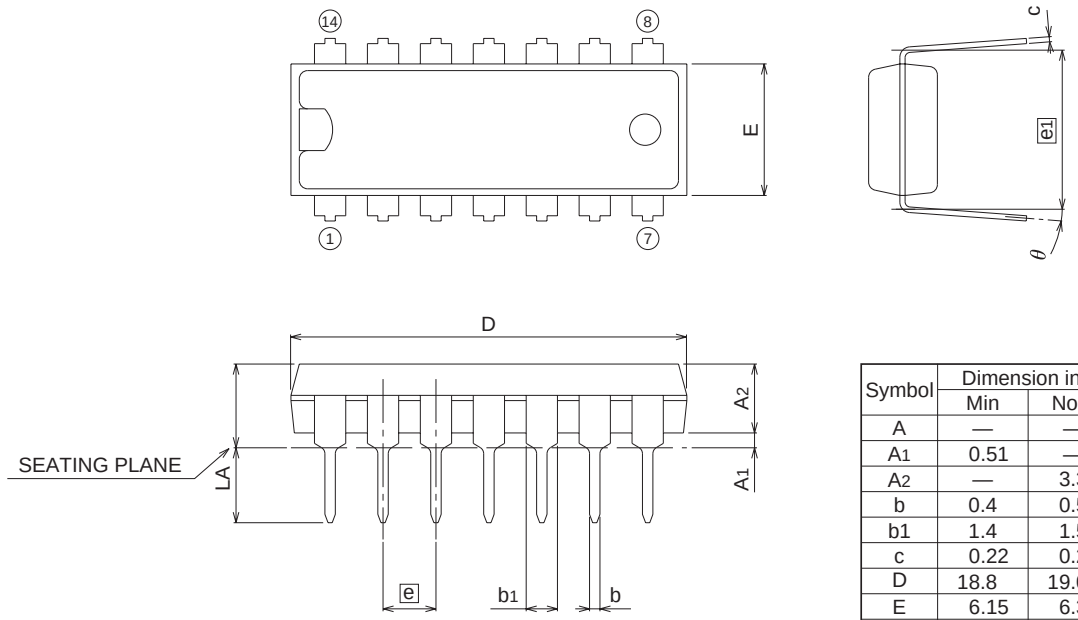


Package Dimensions

14P4

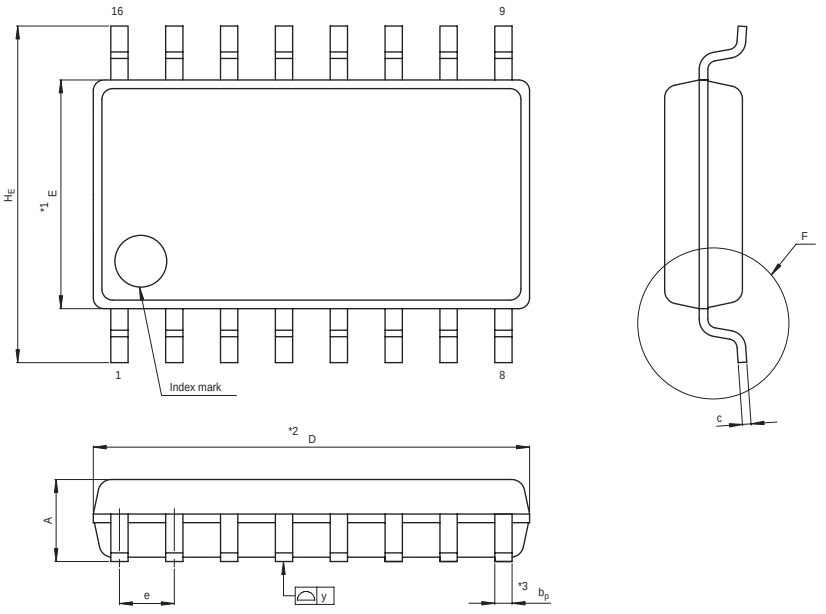
Plastic 14pin 300mil DIP

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
DIP14-P-300-2.54	—	1.0	Alloy 42/Cu Alloy



Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	4.5
A_1	0.51	—	—
A_2	—	3.3	—
b	0.4	0.5	0.6
b1	1.4	1.5	1.8
c	0.22	0.27	0.34
D	18.8	19.0	19.2
E	6.15	6.3	6.45
e	—	2.54	—
e1	—	7.62	—
L	3.0	—	
θ	0°	—	15°

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.3x10.1-1.27	PRSP0016DE-A	16P2N-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_1	0	0.1	0.2
A	—	—	2.1
b_p	0.35	0.4	0.5
c	0.18	0.2	0.25
θ	0°	—	8°
H_E	7.5	7.8	8.1
e	1.12	1.27	1.42
y	—	—	0.1
L	0.4	0.6	0.8

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