# M52723ASP

## Dynamic Focus

REJ03F0191-0201
Rev.2.01
Mar 31, 2008

## Description

The M52723ASP is semiconductor integrated circuit for Multi-Sync display monitors.

It generates horizontal and vertical parabola waves, and it can revise focus of CRT monitors.

## Features

- It can control phase of horizontal wave.
- It contains the horizontal saw wave generator and Auto Gain Control circuit, so that it is able to keep the amplitude constant if frequency change.
- It change the parabola wave inretrace period to constant voltage in order to reduce load at the amplitude after IC.

## Application

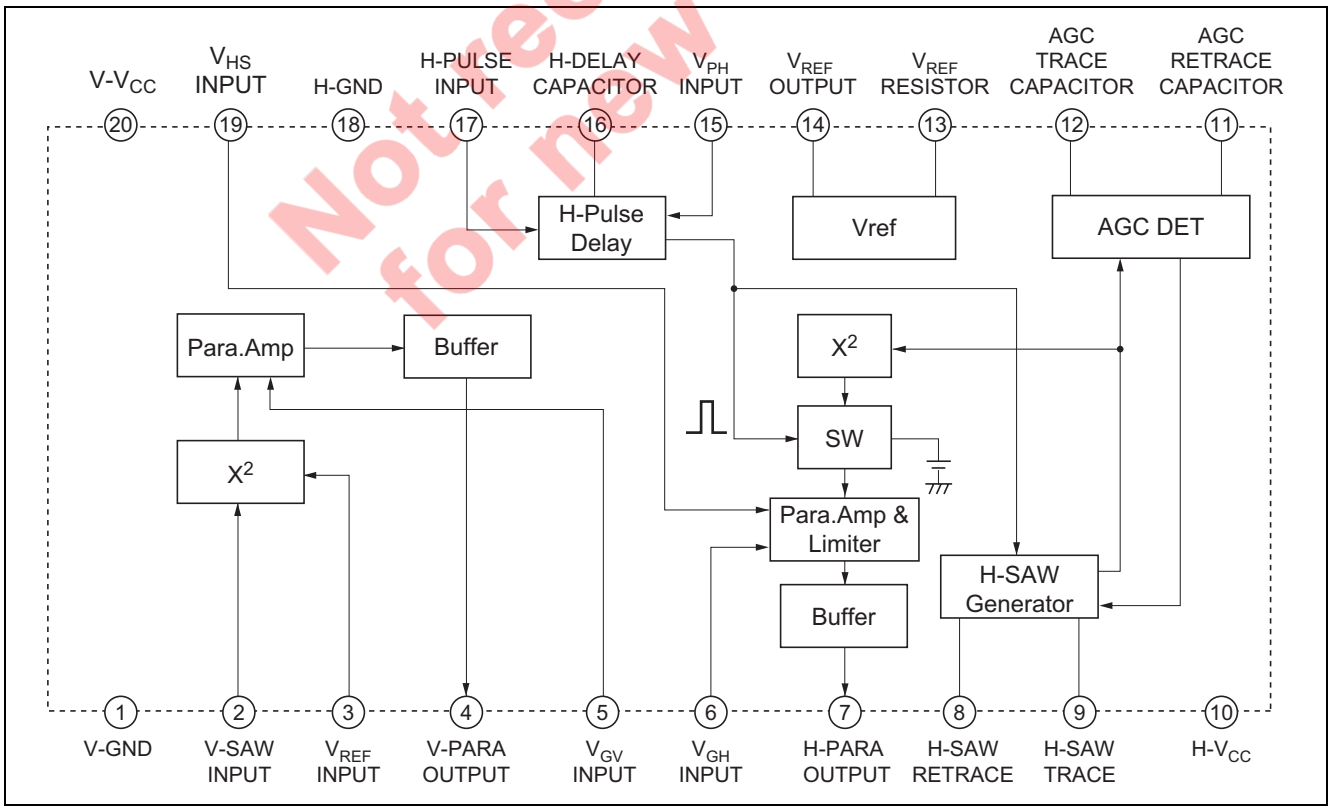
CRT display monitor

## Recommended Operating Condition

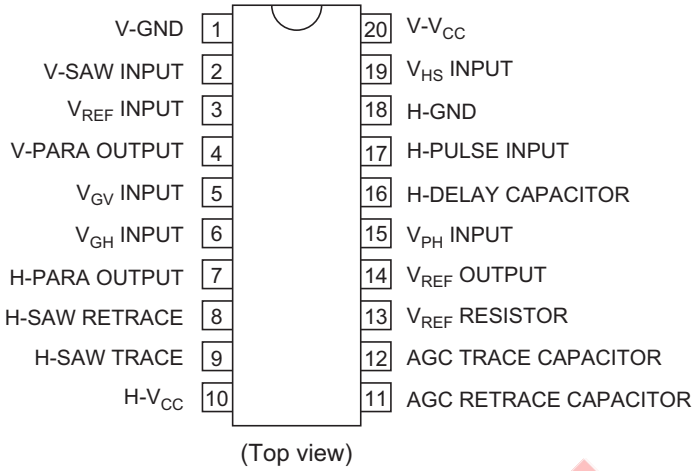
Supply voltage range: 11.5 to 12.5 V

Rated supply voltage: 12 V

## Block Diagram



## Pin Arrangement




Outline: PRDP0020BA-A (20P4B)



## Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| Supply voltage | $V_{CC}$ | — | — | 13.0 | V |
| Power dissipation | Pd | — | — | 1237.6 | mW |
| Operating temperature | Topr | –20 | — | +85 | °C |
| Storage temperature | Tstg | –40 | — | +150 | °C |
| Recommended operating voltage | Vopr | — | 12.0 | — | V |
| Recommended operating voltage range | Vopr | 11.5 | — | 12.5 | V |
| Surge | Vsurge | ±200 | — | — | V |

## Electrical Characteristics

(Ta = 25°C, $V_{CC}$ = 12 V, unless otherwise noted)

| Item | Symbol | Limits | | | Unit | Test Conditions | Pin No. |
|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | | |
| Circuit current 1 | $I_{CCH}$ | 15.1 | 21.5 | 27.9 | mA | (10) Measure | 10 |
| Circuit current 2 | $I_{CCV}$ | 5.2 | 7.4 | 9.6 | mA | (20) Measure | 20 |
| Reference voltage output | $V_{REF}$ | 6.75 | 6.95 | 7.15 | V | (14) Measure | 14 |
| Reference voltage temperature drift | $D_{REF}$ | — | 49 | — | ppm/deg | (14) Measure | 14 |
| Horizontal Block | | | | | | | |
| H-pulse low input range | $V_{IL}$ | 0.0 | — | 2.0 | V | (6) 4.0 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 3.2 V in | 7 |
| H-pulse high input range | $V_{IH}$ | 3.0 | — | $V_{CC}$ –2.0 | V | (6) 4.0 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 3.2 V in | 7 |
| H-pulse low input current | $I_{IL}$ | –5.0 | –0.6 | –0.1 | µA | (17) 0 V in, measure | 17 |
| H-pulse high input current | $I_{IH}$ | –1.0 | 0.0 | 1.0 | µA | (17) 5 V in, measure | 17 |
| H parabola width | $T_W$ | 0.50 | 0.70 | 0.90 | µs | (6) 4.0 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 3.2 V in | 7 |
| H parabola delay 1 | $T_{D1}$ | –0.09 | 0.09 | 0.35 | µs | (6) 4.0 V in<br>(7) Measure<br>(15) 0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 3.2 V in | 7 |
| H parabola delay 2 | $T_{D2}$ | 0.19 | 0.41 | 0.65 | µs | (6) 4.0 V in<br>(7) Measure<br>(15) 1.5 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 3.2 V in | 7 |
| H parabola delay 3 | $T_{D3}$ | 2.65 | 2.95 | 3.20 | µs | (6) 4.0 V in<br>(7) Measure<br>(15) 4.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 3.2 V in | 7 |
| Delay temperature drift | $D_D$ | — | –0.08 | — | ns/deg | (6) 4.0 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 3.2 V in | 7 |
| Pin15 input current | $I_{15}$ | –5.0 | –0.4 | –0.1 | µA | (15) 2.5 V in, measure | 15 |
| H parabola amplitude | $V_{HP}$ | 7.5 | 8.2 | 8.9 | $V_{P-P}$ | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V in | 7 |

## Electrical Characteristics (cont.)

| Item | Symbol | Limits | | | Unit | Test Conditions | Pin No. |
|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | | |
| H para. freq. characteristics 1 | $F_{HP1}$ | –0.2 | 0.0 | 0.2 | V | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 24 kHz H-pulse in<br>(19) 4.0 V in | 7 |
| H para. freq. characteristics 2 | $F_{HP2}$ | –0.2 | 0.0 | 0.2 | V | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 110 kHz H-pulse in<br>(19) 4.0 V | 7 |
| H para. $V_{CC}$ characteristics 1 | $V_{VHP1}$ | –0.1 | 0.0 | 0.1 | V | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(10) (20) 11.5 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V in | 7 |
| H para. $V_{CC}$ characteristics 2 | $V_{VHP2}$ | –0.1 | 0.0 | 0.1 | V | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(10) (20) 12.5 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V | 7 |
| H para. size temperature drift | $D_{HP}$ | — | –275 | — | ppm/deg | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V in | 7 |
| H para. size control 1 | $S_{HP1}$ | 7.5 | 8.2 | 8.9 | $V_{P-P}$ | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V in | 7 |
| H para. size control 2 | $S_{HP2}$ | 20 | 25 | 30 | % | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 2.0 V in | 7 |
| H para. size control 3 | $S_{HP3}$ | –5 | 0 | 5 | % | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 0 V in | 7 |

## Electrical Characteristics (cont.)

| Item | Symbol | Limits | | | Unit | Test Conditions | Pin No. |
|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | | |
| H para. gain control 1 | $G_{HP1}$ | 0.7 | 0.9 | 1.1 | $V_{P-P}$ | (6) 1.0 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V in | 7 |
| H para. gain control 2 | $G_{HP2}$ | 4.2 | 4.7 | 5.2 | — | (6) 2.5 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V in | 7 |
| H para. gain control 3 | $G_{HP3}$ | 8.36 | 8.76 | 9.16 | $V_{P-P}$ | (6) 4.0 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V in | 7 |
| H para. limit size temperature drift | $D_{LI}$ | — | 106 | — | ppm/deg | (6) 4.0 V in<br>(7) Measure<br>(15) 3.0 V in<br>(17) fH = 50 kHz H-pulse in<br>(19) 4.0 V in | 7 |
| Pin6 input current | $I_6$ | –5.0 | –0.4 | –0.1 | µA | (16) 2.5 V in, measure | 6 |
| Pin19 input current | $I_{19}$ | –5.0 | –0.4 | –0.1 | µA | (19) 2.0 V in, measure | 19 |
| Vertical Block | | | | | | | |
| V parabola accuracy 1 | $A_{VP1}$ | 9.5 | 10.0 | 10.5 | V | (2) 1.9 V in<br>(3) 3.5 V in<br>(4) Measure<br>(5) 4.0 V in | 4 |
| V parabola accuracy 2 | $A_{VP2}$ | 6.23 | 6.73 | 7.23 | V | (2) 2.7 V in<br>(3) 3.5 V in<br>(4) Measure<br>(5) 4.0 V in | 4 |
| V parabola accuracy 3 | $A_{VP3}$ | 20 | 25 | 30 | % | (2) 3.5 V in<br>(3) 3.5 V in<br>(4) Measure<br>(5) 4.0 V in | 4 |
| V parabola accuracy 4 | $A_{VP4}$ | 20 | 25 | 30 | % | (2) 4.3 V in<br>(3) 3.5 V in<br>(4) Measure<br>(5) 4.0 V in | 4 |
| V parabola accuracy 5 | $A_{VP5}$ | 90 | 100 | 110 | % | (2) 5.1 V in<br>(3) 3.5 V in<br>(4) Measure<br>(5) 4.0 V in | 4 |
| V parabola amplitude 1 | $G_{VP1}$ | 0.0 | 0.0 | 0.1 | $V_{P-P}$ | (2) $f_V$ = 70 Hz, 3.2 $V_{P-P}$ saw wave in<br>(3) 3.5 V in<br>(4) measure<br>(5) 1.0 V in | 4 |

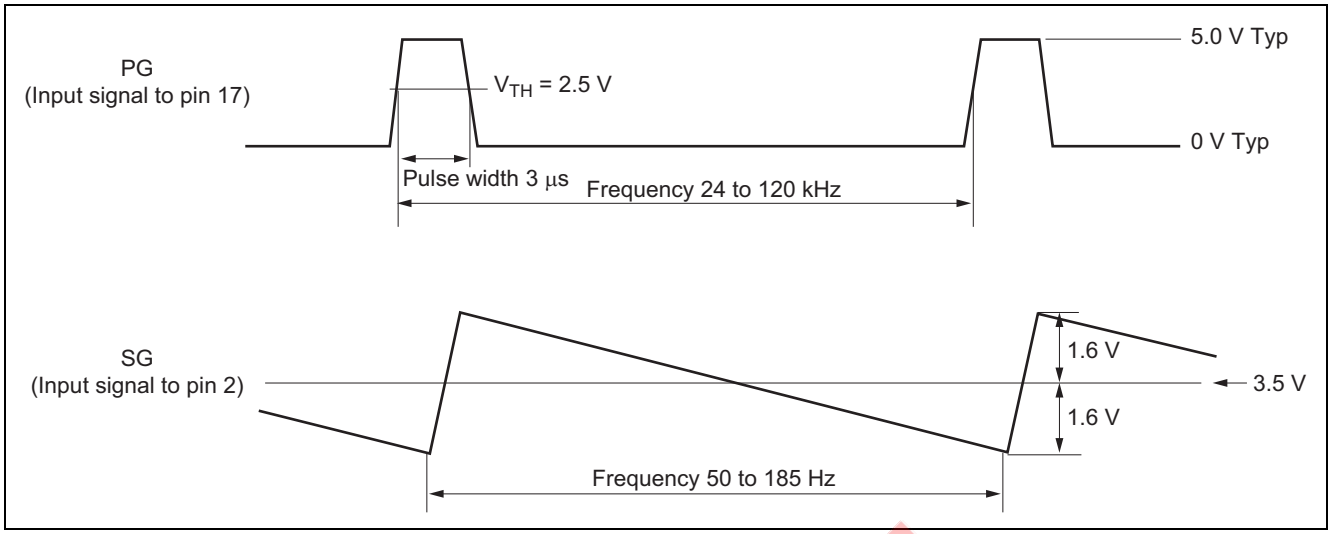
## Electrical Characteristics (cont.)

| Item | Symbol | Limits | | | Unit | Test Conditions | Pin No. |
|---|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | | |
| V parabola amplitude 2 | $G_{VP2}$ | 2.77 | 3.12 | 3.47 | $V_{P-P}$ | (2) $f_V$ = 70 Hz, 3.2 $V_{P-P}$ saw wave in<br>(3) 3.5 V in<br>(4) measure<br>(5) 2.5 V in | 4 |
| V parabola amplitude 3 | $G_{VP3}$ | 6.26 | 6.56 | 6.86 | $V_{P-P}$ | (2) $f_V$ = 70 Hz, 3.2 $V_{P-P}$ saw wave in<br>(3) 3.5 V in<br>(4) measure<br>(5) 4.0 V in | 4 |
| V para. freq. characteristics 1 | $F_{VP1}$ | –0.1 | 0.0 | 0.1 | V | (2) $f_V$ = 50 Hz, 3.2 $V_{P-P}$ saw wave in<br>(3) 3.5 V in<br>(4) measure<br>(5) 4.0 V in | 4 |
| V para. freq. characteristics 2 | $F_{VP2}$ | –0.1 | 0.0 | 0.1 | V | (2) $f_V$ = 185 Hz, 3.2 $V_{P-P}$ saw wave in<br>(3) 3.5 V in<br>(4) measure<br>(5) 4.0 V in | 4 |
| V para. $V_{CC}$. characteristics 1 | $V_{VP1}$ | –0.1 | 0.0 | 0.1 | V | (2) $f_V$ = 70 Hz, 3.2 $V_{P-P}$ saw wave in<br>(3) 3.5 V in<br>(4) measure<br>(5) 4.0 V in | 4 |
| V para. $V_{CC}$. characteristics 2 | $V_{VP2}$ | –0.1 | 0.0 | 0.1 | V | (2) $f_V$ = 70 Hz, 3.2 $V_{P-P}$ saw wave in<br>(3) 3.5 V in<br>(4) measure<br>(5) 4.0 V in | 4 |
| V para. $V_{CC}$. temperature drift | $D_{VP}$ | — | –325 | — | ppm/deg | (2) $f_V$ = 70 Hz, 3.2 $V_{P-P}$ saw wave in<br>(3) 3.5 V in<br>(4) measure<br>(5) 4.0 V in | 4 |
| Pin2 input current | $I_2$ | –5.0 | –0.4 | –0.1 | µA | (2) 3.5 V in, measure | 2 |
| Pin3 input current | $I_3$ | –5.0 | –0.4 | –0.1 | µA | (3) 3.5 V in, measure | 3 |
| Pin5 input current | $I_5$ | –5.0 | –0.4 | –0.1 | µA | (5) 2.5 V in, measure | 5 |

## Switch and Voltage Condition

| Symbol | Switch | | | | | | | | | Voltage (V) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SW2 | SW3 | SW5 | SW6 | SW10 | SW15 | SW17 | SW19 | SW20 | $V_{CC}$ | V2 | V5 | V6 | V15 | V17 | V19 |
| $I_{CCH}$ | a | a | a | a | b | a | b | a | a | 12.0 | 3.5 | 2.5 | 2.5 | 3.0 | 0 | 2.0 |
| $I_{CCV}$ | | | | | a | | | | b | | | | | | | |
| $V_{REF}$ | | | | | | | | | a | | | | | | | |
| $D_{REF}$ | | | | | | | | | | | | | | | | |
| $V_{IL}$ | | | | | | | a | | | | | | 4.0 | | — | 3.2 |
| $V_{IH}$ | | | | | | | | | | | | | | | | |
| $I_{IL}$ | | | | | | | b | | | | | | 2.5 | | 0 | 2.0 |
| $I_{IH}$ | | | | | | | | | | | | | | | 5.0 | |
| $T_W$ | | | | | | | a | | | | | | 4.0 | | — | 3.2 |
| $T_{D1}$ | | | | | | | | | | | | | | 0 | | |
| $T_{D2}$ | | | | | | | | | | | | | | 1.5 | | |
| $T_{D3}$ | | | | | | | | | | | | | | 4.0 | | |
| $D_D$ | | | | | | | | | | | | | | 3.0 | | |
| $I_{15}$ | | | | | | b | b | | | | | | 2.5 | — | 0 | 2.0 |
| $V_{HP}$ | | | | | | a | a | | | | | | | 3.0 | — | 4.0 |
| $F_{HP1}$ | | | | | | | | | | | | | | | | |
| $F_{HP2}$ | | | | | | | | | | | | | | | | |
| $V_{VHP1}$ | | | | | | | | | | 11.5 | | | | | | |
| $V_{VHP2}$ | | | | | | | | | | 12.5 | | | | | | |
| $D_{HP}$ | | | | | | | | | | 12.0 | | | | | | |
| $S_{HP1}$ | | | | | | | | | | | | | | | | 4.0 |
| $S_{HP2}$ | | | | | | | | | | | | | | | | 2.0 |
| $S_{HP3}$ | | | | | | | | | | | | | | | | 0 |
| $G_{HP1}$ | | | | | | | | | | | | | 1.0 | | | 4.0 |
| $G_{HP2}$ | | | | | | | | | | | | | 2.5 | | | |
| $G_{HP3}$ | | | | | | | | | | | | | 4.0 | | | |
| $D_{LI}$ | | | | | | | | | | | | | | | | 4.0 |
| $I_6$ | | | | b | | | b | | | | | | — | | 0 | 2.0 |
| $I_{19}$ | | | | a | | | | b | | | | | 2.5 | | | — |
| $A_{VP1}$ | | | | | | | | a | | | | 4.0 | | | | 2.0 |
| $A_{VP2}$ | | | | | | | | | | | 1.9 | | | | | |
| $A_{VP3}$ | | | | | | | | | | | 2.7 | | | | | |
| $A_{VP4}$ | | | | | | | | | | | 4.3 | | | | | |
| $A_{VP5}$ | | | | | | | | | | | 5.1 | | | | | |
| $G_{VP1}$ | b | | | | | | | | | | — | 1.0 | | | | |
| $G_{VP2}$ | | | | | | | | | | | | 2.5 | | | | |
| $G_{VP3}$ | | | | | | | | | | | | 4.0 | | | | |
| $F_{VP1}$ | | | | | | | | | | | | | | | | |
| $F_{VP2}$ | | | | | | | | | | | | | | | | |
| $V_{VP1}$ | | | | | | | | | | 11.5 | | | | | | |
| $V_{VP2}$ | | | | | | | | | | 12.5 | | | | | | |
| $D_{VP}$ | | | | | | | | | | 12.0 | | | | | | |
| $I_2$ | c | | | | | | | | | | 3.5 | 2.5 | | | | |
| $I_3$ | a | b | | | | | | | | | | | | | | |
| $I_5$ | | a | b | | | | | | | | | — | | | | |

## Input Signal




## Electrical Characteristics Test Method

### $I_{CCH}$ Circuit Current1

Measure the input current to pin 10.

### $I_{CCV}$ Circuit Current2

Measure the input current to pin 20.

### $V_{REF}$ Reference Voltage Output

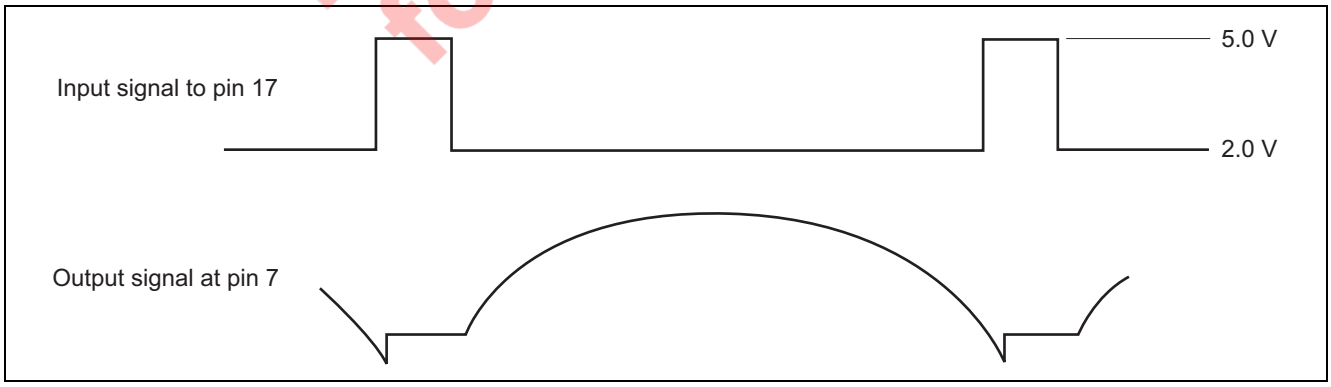
Measure the output voltage at pin 14.

### $D_{REF}$ Reference Voltage Temperature Drift

Measure temperature drift of pin 14. (–20°C to 85°C)

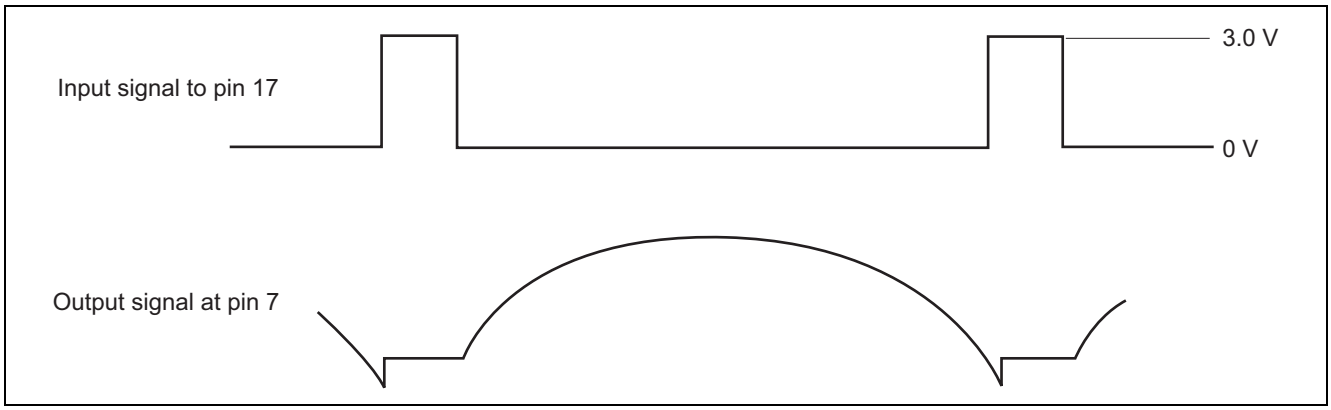
### $V_{IL}$ H-pulse Low Input Range

Input horizontal pulse which low level is 2 V in pin 17 and confirm output horizontal signal at pin 7.



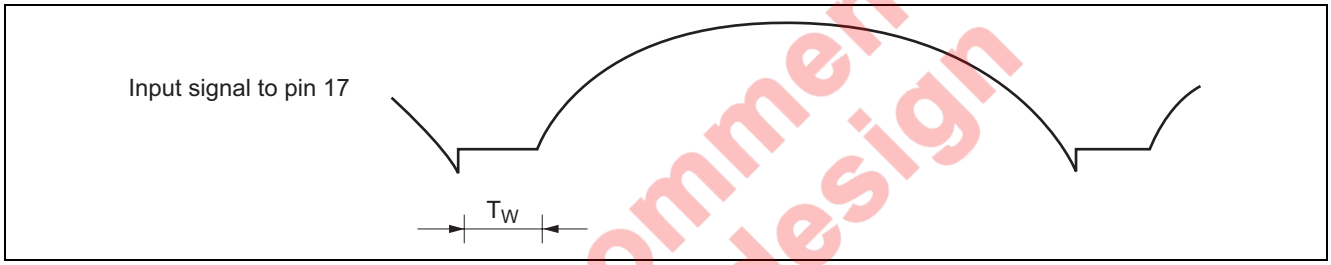
### $V_{IH}$ H-pulse High Input Range

Input horizontal pulse which high level is 3 V in pin 17 and confirm output horizontal signal at pin 7.




### $T_W$ H Parabola Width

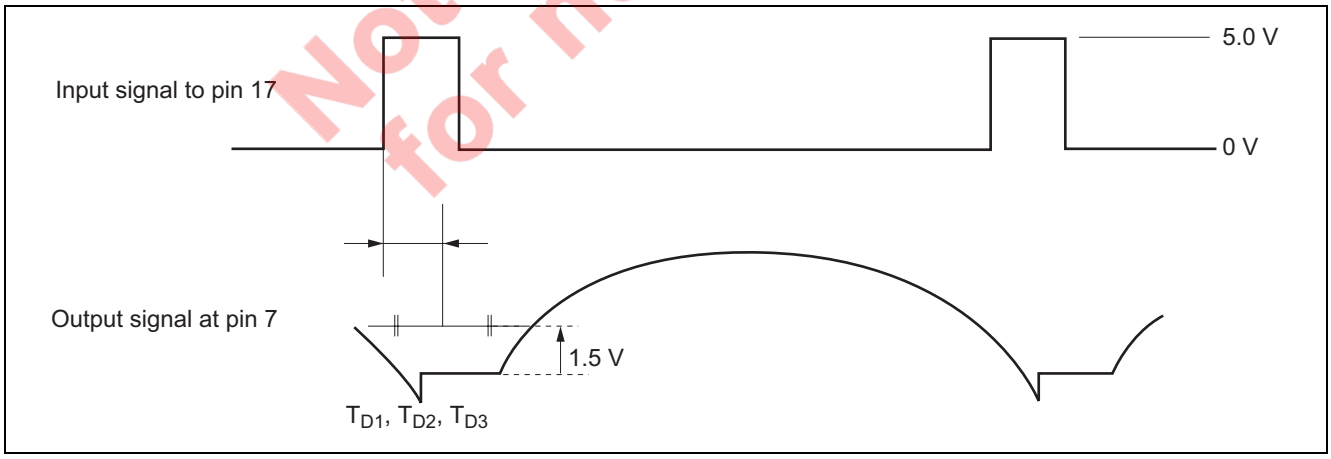
Measure the time width of retrace period at pin 7.






### $T_{D1}$ H Parabola Delay1, $T_{D2}$ H Parabola Delay2, $T_{D3}$ H Parabola Delay3

Measure the delay time from rise time of input signal to middle point of raise waveform point and down waveform point which voltage is retrace voltage +1.5 V when the voltage of pin 15 is 0 V, 1.5 V, and 4 V.



### $D_D$ Delay Temperature Drift

Measure the temperature drift of the delay time. (–20°C to 85°C)

### $I_{15}$ Pin 15 Input Current

Measure the input current to pin15 when the voltage of pin 15 is 2.5 V.

### $V_{HP}$ H Parabola Amplitude

Measure the amplitude of parabola waveform at pin 7 and it is defined $HP_{50\ kHz}$.

### $F_{HP1}$ H Para. Freq. Characteristics1

When the frequency of input signal in pin 17 is 24 kHz, the amplitude of parabola waveform at pin 7 is defined as $HP_{24\ kHz}$.

$$F_{HP1} = HP_{50\ kHz} - HP_{24\ kHz}$$

### $F_{HP2}$ H Para. Freq. Characteristics2

When the frequency of input signal in pin 17 is 120 kHz, the amplitude of parabola waveform at pin 7 is defined as $HP_{120\ kHz.}$

$$F_{HP2} = HP_{50\ kHz} - HP_{120\ kHz}$$

### $V_{VHP1}$ H Para. $V_{CC}$. Characteristics1

When the supply voltage of pin 10, 20 is 11.5 V, the amplitude of parabola waveform at pin 7 is defined as $HP_{11.5\ V}$.

$$V_{VHP1} = HP_{50\ kHz} - HP_{11.5\ V}$$

### $V_{VHP2}$ H Para. $V_{CC}$. Characteristics2

When the supply voltage of pin 10, 20 is 12.5 V, the amplitude of parabola waveform at pin 7 is defined as $HP_{12.5\ V}$.

$$V_{VHP2} = HP_{50\ kHz} - HP_{12.5\ V}$$

### $D_{HP}$ H Para. Size. Temperature Drift

Measure the temperature drift of $HP_{50\ kHz}$. (–20°C to 85°C)

### $S_{HP1}$ H Para. Size. Control1

Measure the amplitude of parabola waveform at pin 7 and it is defined as $HP_{19\ 4.0\ V}$.

### $S_{HP2}$ H Para. Size. Control2

The amplitude of parabola waveform at pin 7 is defined as $HP_{19\ 2.0\ V}$.

$$S_{HP2} = \frac{HP_{19\ 2.0\ V}}{HP_{19\ 4.0\ V}} \times 100\ (\%)$$

### $S_{HP3}$ H Para. Size. Control3

The amplitude of parabola waveform at pin 7 is defined as $HP_{19\ 0\ V}$.

$$S_{HP3} = \frac{HP_{19\ 0\ V}}{HP_{19\ 4.0\ V}} \times 100\ (\%)$$

### $G_{HP1}$ H Para. Gain Control1

Measure the amplitude of parabola waveform at pin 7 and it is defined as $HP_{6\ 1.0\ V}$.

### $G_{HP2}$ H Para. Gain Control2

The amplitude of parabola waveform at pin 7 is defined as $HP_{6\ 2.5\ V}$.

$$G_{HP2} = \frac{HP_{6\ 2.5\ V} - HP_{6\ 1.0\ V}}{1.5}$$

### $G_{HP3}$ H Para. Gain Control3

Measure the amplitude of parabola waveform at pin 7. (Limit level)

### $D_{LI}$ H Para. Limit Size Temperature Drift

Measure temperature drift of $G_{HP3}$. (–20°C to 85°C)

### $I_6$ Pin 6 Input Current

Measure the input current to pin 6 when voltage of pin 6 is 2.5 V.

### $I_{19}$ Pin 19 Input Current

Measure the input current to pin 19 when voltage of pin 19 is 2 V.

### $A_{VP1}$ V Parabola Accuracy1

Measure the output voltage at pin 4 and it is defined as $VP_{2\ 3.5\ V}$.

### $A_{VP2}$ V Parabola Accuracy2

The output voltage at pin 4 is defined as $VP_{2\ 1.9\ V}$.

$$A_{VP2} = VP_{2\ 3.5\ V} - VP_{2\ 1.9\ V}$$

### $A_{VP3}$ V Parabola Accuracy3

The output voltage at pin 4 is defined as $VP_{2\ 2.7\ V}$.

$$A_{VP3} = \frac{VP_{2\ 3.5\ V} - VP_{2\ 2.7\ V}}{VP_{2\ 3.5\ V} - VP_{2\ 1.9\ V}} \times 100\ (\%)$$

### $A_{VP4}$ V Parabola Accuracy4

The output voltage at pin 4 is defined as $VP_{2\ 4.3\ V}$.

$$A_{VP4} = \frac{VP_{2\ 3.5\ V} - VP_{2\ 4.3\ V}}{VP_{2\ 3.5\ V} - VP_{2\ 1.9\ V}} \times 100\ (\%)$$

### $A_{VP5}$ V Parabola Accuracy5

The output voltage at pin 4 is defined as $VP_{2\ 5.1\ V}$.

$$A_{VP5} = \frac{VP_{2\ 3.5\ V} - VP_{2\ 5.1\ V}}{VP_{2\ 3.5\ V} - VP_{2\ 1.9\ V}} \times 100\ (\%)$$

### $G_{VP1}$ V Parabola Amplitude1, $G_{VP2}$ V Parabola Amplitude2, $G_{VP3}$ V Parabola Amplitude3

Measure the amplitude of parabola waveform at pin 4 when the voltage of pin 5 is 0 V, 2.5 V, and 4 V.

When the voltage of pin 5 is 4 V, the amplitude of parabola waveform is defined as $VP_{70\ Hz}$.

### $F_{VP1}$ V Para. Freq. Characteristics1

When the frequency of input signal in pin 2 is 50 Hz, the amplitude of parabola waveform at pin 4 is defined as $VP_{50\ Hz}$.

$$F_{VP1} = VP_{70\ Hz} - VP_{50\ Hz}$$

### $F_{VP2}$ V Para. Freq. Characteristics2

$$F_{VP2} = VP_{70\ Hz} - VP_{185\ Hz}$$

### $V_{VP1}$ V Para. $V_{CC}$. Characteristics1

When the voltage of pin 10, 20 is 11.5 V, the amplitude of parabola waveform is defined as $VP_{11.5\ V}$.

$$V_{VP1} = VP_{70\ Hz} - VP_{11.5\ V}$$

### $V_{VP2}$ V Para. $V_{CC}$. Characteristics2

When the voltage of pin 10, 20 is 12.5 V, the amplitude of parabola waveform is defined as $VP_{12.5\ V}$.

$$V_{VP2} = VP_{70\ Hz} - VP_{12.5\ V}$$

### $D_{VP}$ V Para. Temperature Drift

Measure temperature drift of $VP_{70\ Hz}$. (−20°C to 85°C)

### $I_2$ Pin 2 Input Current

Measure the input current to pin 2 when the voltage of pin 2 is 3.5 V.

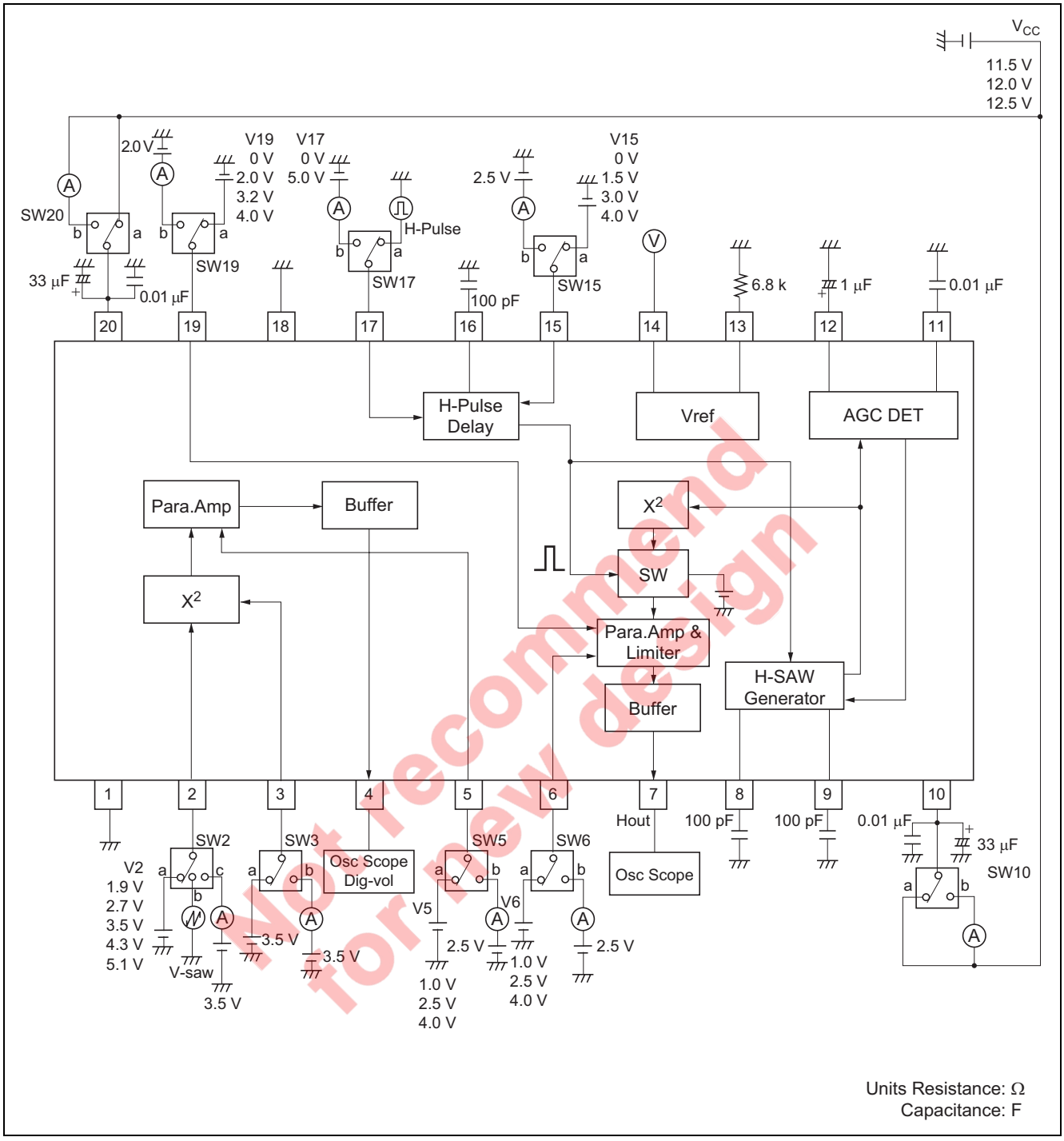
### $I_3$ Pin 3 Input Current

Measure the input current to pin 3 when the voltage of pin 3 is 3.5 V.

### $I_5$ Pin 5 Input Current

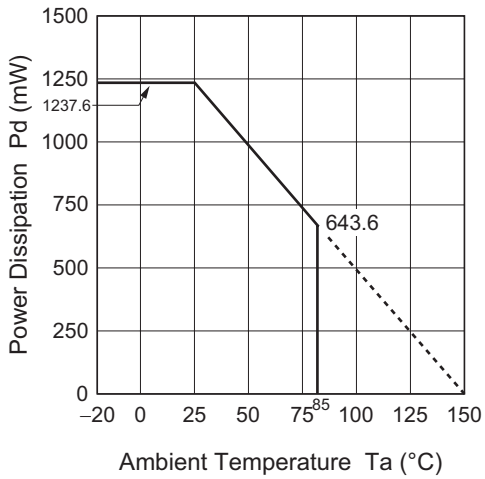
Measure the input current to pin 5 when the voltage of pin 5 is 3.5 V.

## Test Circuit

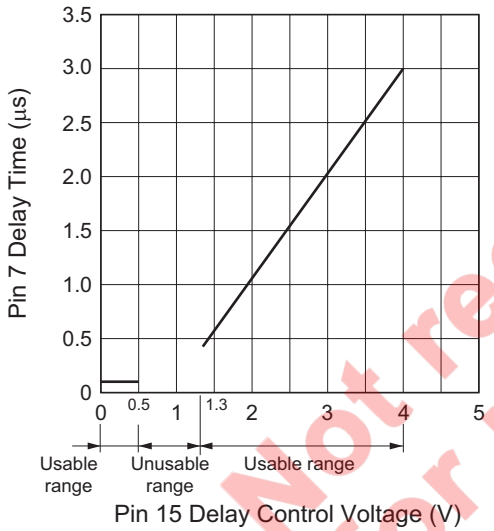


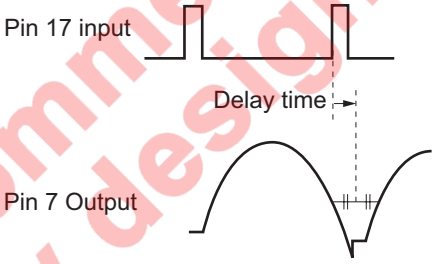
## Typical Characteristics

Thermal Derating (Maximum Rating)

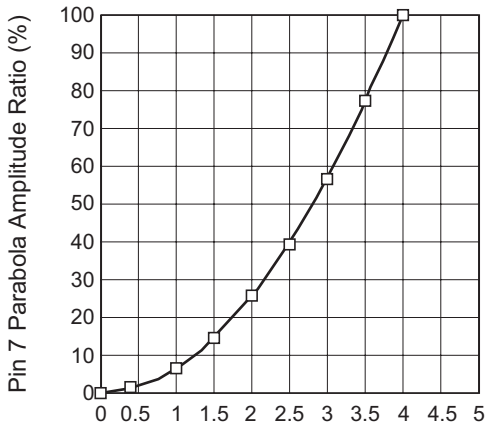



Delay Control Voltage vs. Delay Time



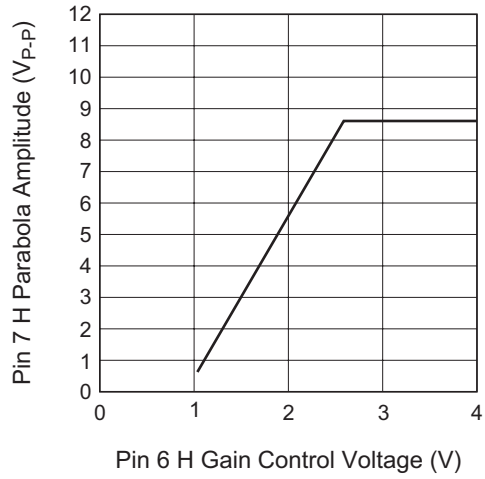

H Size Control Voltage vs.
H Parabola Amplitude Ratio




Pin 6 = 2.5 V const.

$$\text{Amplitude ratio} = \frac{\text{Pin 7 output level}}{\text{Pin 7 output level at pin 19 = 4.0 V}} \times 100\ (\%)$$

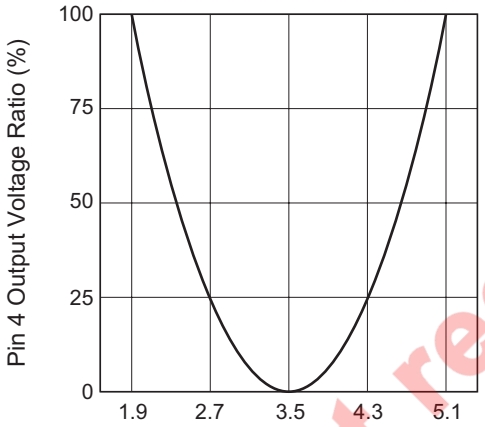
H Gain Control Voltage vs.
H Parabola Amplitude




8.76 $V_{P-P}$ (Limiting level)

Pin 19 = 4.0 V const.

V Para DC Output Voltage Ratio




Pin 3 = 3.5 V const.
Pin 5 = 4.0 V const.

$$\text{Output ratio} = \frac{\text{Pin4out (Pin 2 = 3.5 V)} - \text{Pin4out}}{\text{Pin4out (Pin 2 = 3.5 V)} - \text{Pin4out (Pin 2 = 1.9 V)}} \times 100\ (\%)$$

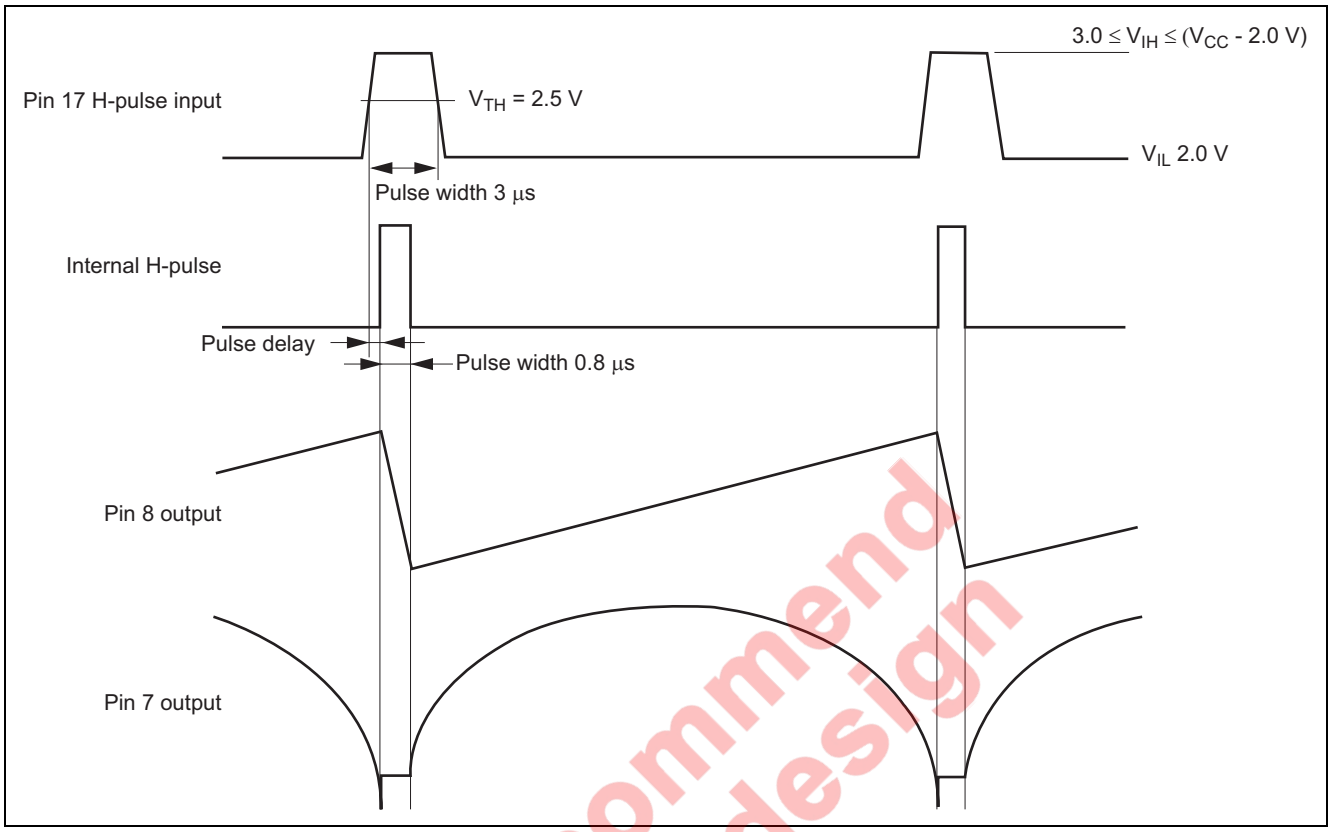


V Para Amp Gain Control Voltage vs.
Output Amplitude

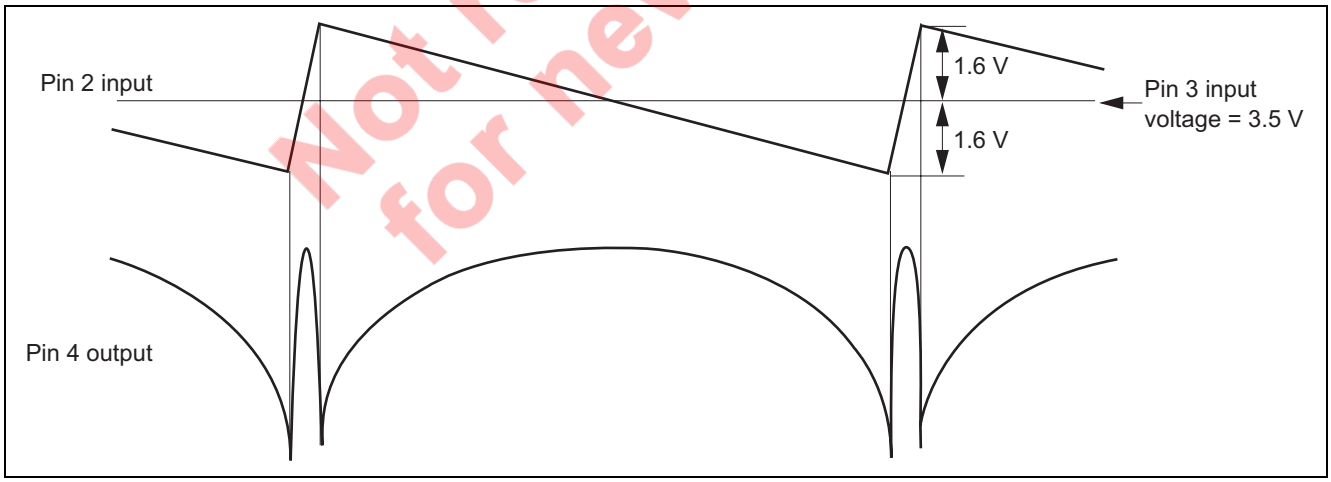

Pin 2 3.2 $V_{P-P}$ sawtooth wave input

# Timing Chart

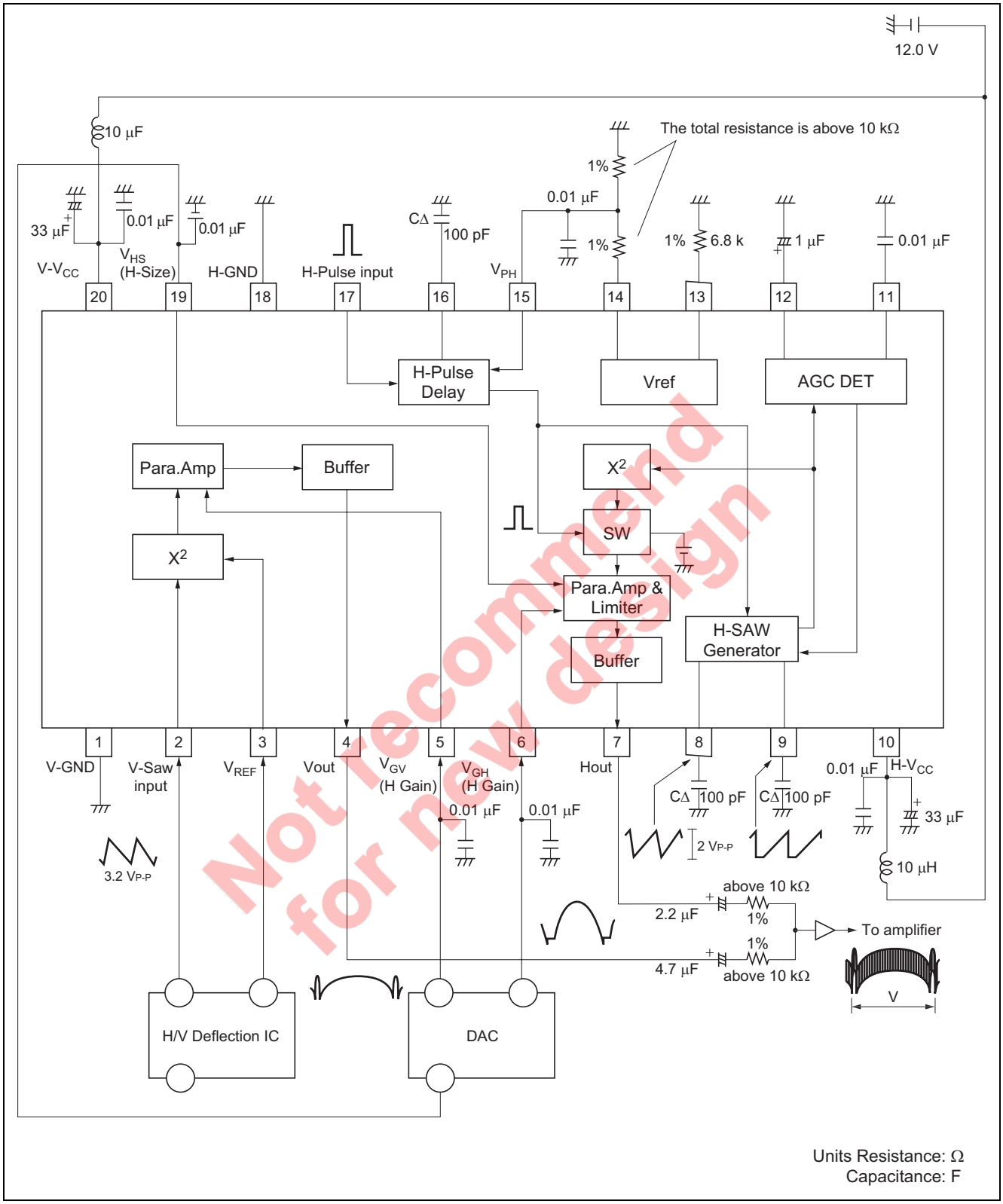
## Horizontal Block



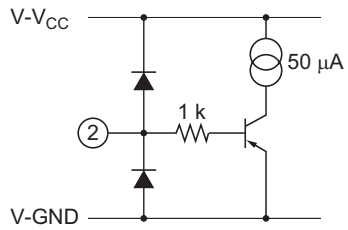
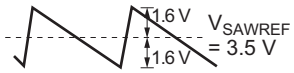
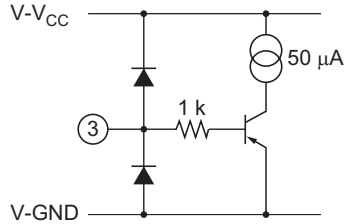
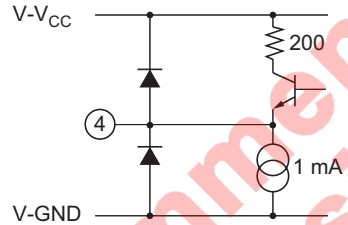
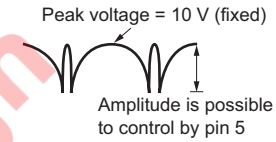
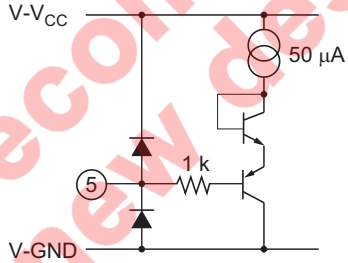
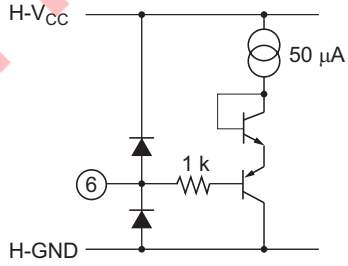

## Vertical Block



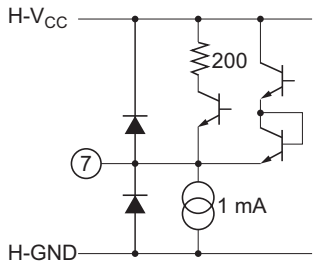
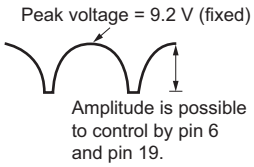
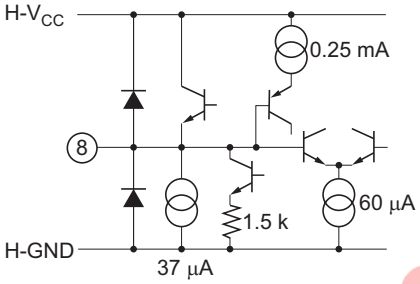
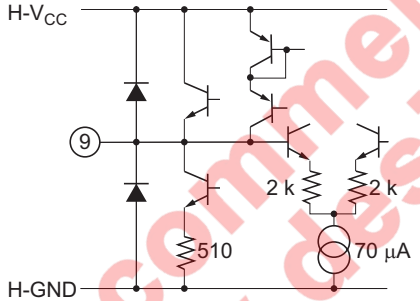
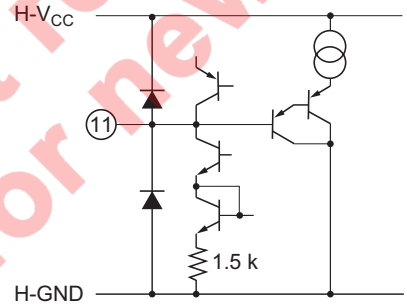
## Application Example



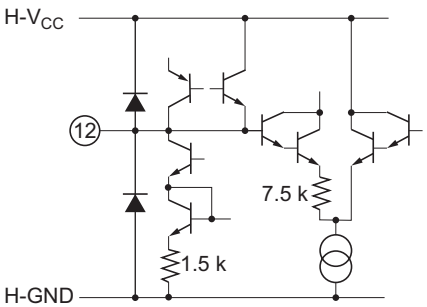
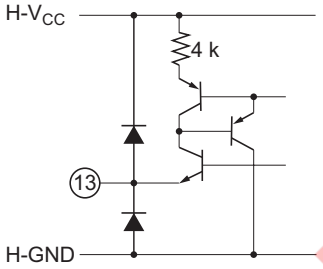
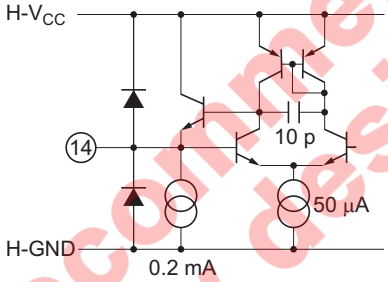
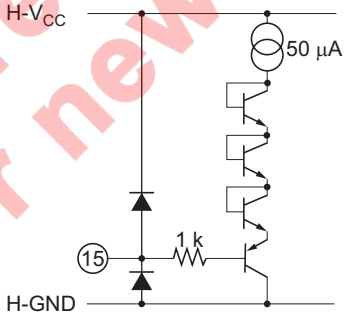
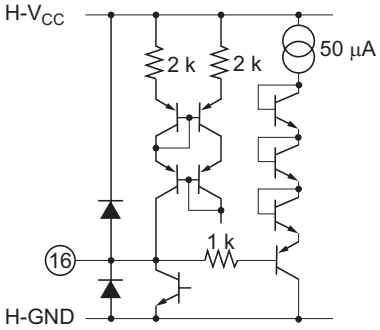
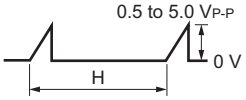
## Pin Description

| Pin No. | Name | DC Voltage (V) | Peripheral Circuit | Function |
|---|---|---|---|---|
| 1 | V-GND | — | — | GND of vertical block |
| 2 | Vsawi | 3.5 V |  | Vertical sawtooth wave input pin.<br>  |
| 3 | Vsawref | 3.5 V |  | Vertical reference voltage input pin. (3.5 V) |
| 4 | Vout | 10 V (Peak) |  | Vertical parabola wave output pin.<br>  |
| 5 | $V_{GV}$ | 1.0 to 4.0 V |  | Vertical parabola wave gain control voltage input pin. Input voltage range is 1.0 to 4.0 V. |
| 6 | $V_{GH}$ | 1.0 to 4.0 V |  | Horizontal parabola wave gain control voltage input pin. Input voltage range is 1.0 to 4.0 V. |

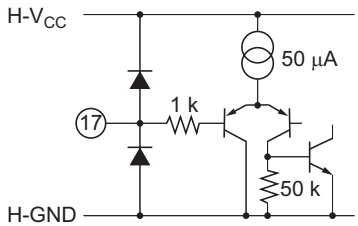
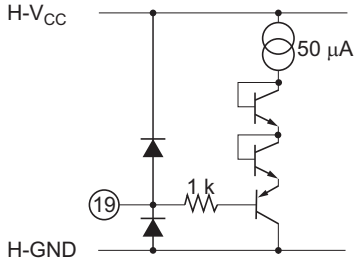
## Pin Description (cont.)

| Pin No. | Name | DC Voltage (V) | Peripheral Circuit | Function |
|---|---|---|---|---|
| 7 | Hout | 9.2 V (Peak) |  | Horizontal parabola wave output pin.<br>  |
| 8 | Cret | 7.1 V (Top)<br>4.9 V (Bottom) |  | Connection pin of horizontal retrace capacitor.<br>Recommended capacitance is 100 pF.<br>  |
| 9 | Ctrc | 7.1 V (Top)<br>4.9 V (Bottom) |  | Connection pin of horizontal trace capacitor.<br>Recommended capacitance is 100 pF.<br>  |
| 10 | H-$V_{CC}$ | 12.0 V | | $V_{CC}$ of horizontal block. |
| 11 | $C_{AGCr}$ | 2.5 V |  | Connection pin of horizontal sawtooth wave AGC retrace capacitor.<br>Recommended capacitance is 0.01 µF. |

## Pin Description (cont.)

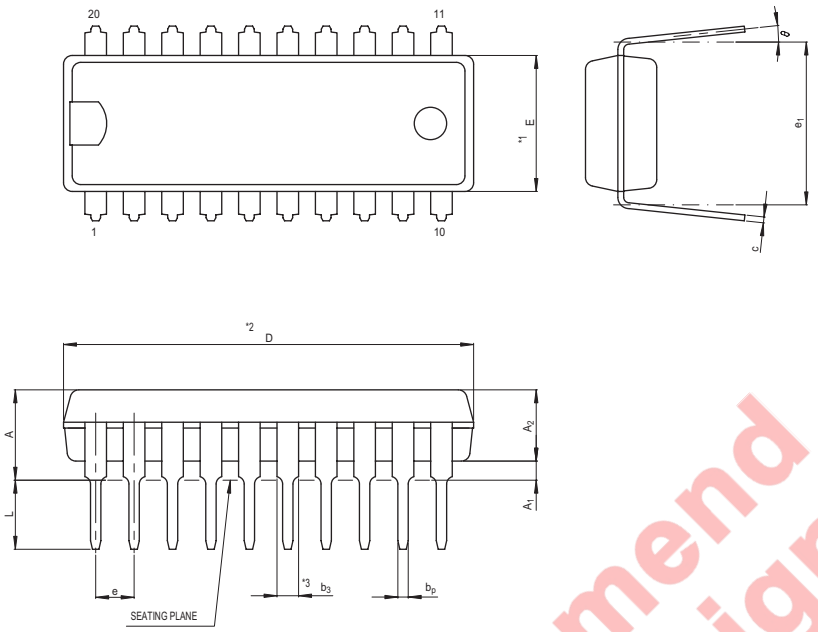
| Pin No. | Name | DC Voltage (V) | Peripheral Circuit | Function |
|---|---|---|---|---|
| 12 | $C_{AGC}$ | 4.0 V |  | Connection pin of horizontal AGC capacitor.<br>Recommended capacitance is 1 μF. |
| 13 | $V_{REFR}$ | 1.28 V |  | Connection pin of reference current source resister.<br>Recommended resistance is 6.8 kΩ. |
| 14 | $V_{REFO}$ | 7.0 V |  | Reference voltage output for horizontal pulse delay circuit.<br>Should be connect more than 10 kΩ external resister. |
| 15 | $V_{PH}$ | 0 to 0.5 V<br>1.3 to 4.0 V |  | Delay adjustment voltage input pin of horizontal pulse. Input voltage range is 1.3 to 4.0 V.<br>At 0 to 0.5 V, delay is minimized.<br>(0.5 to 1.3 V is unusable range.) |
| 16 | Chpd | 0 V<br>(Bottom) |  | Connection pin of horizontal pulse delay timing capacitor.<br>Recommended capacitance is 100 pF.<br>  |

## Pin Description (cont.)

| Pin No. | Name | DC Voltage (V) | Peripheral Circuit | Function |
|---|---|---|---|---|
| 17 | HPin | — |  | Horizontal pulse input pin.<br>Low input level is less than 2.0 V, and high is 3.0 to 10 V. (at $V_{CC}$ = 12 V) |
| 18 | H-GND | — | — | GND of horizontal block |
| 19 | $V_{HS}$ | 0 to 4 V |  | Horizontal size control voltage input pin.<br>Input voltage range is 0 to 4 V. |
| 20 | V-$V_{CC}$ | 12.0 V | — | $V_{CC}$ of vertical block |

## Package Dimensions

| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SDIP20-6.3x19-1.78 | PRDP0020BA-A | 20P4B | 1.0g |




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 |
| $e_1$ | 7.32 | 7.62 | 7.92 |
| D | 18.8 | 19.0 | 19.2 |
| E | 6.15 | 6.3 | 6.45 |
| A | — | — | 4.5 |
| $A_1$ | 0.51 | — | — |
| $A_2$ | — | 3.3 | — |
| $b_p$ | 0.38 | 0.48 | 0.58 |
| $b_3$ | 0.9 | 1.0 | 1.3 |
| c | 0.22 | 0.27 | 0.34 |
| $\theta$ | 0° | — | 15° |
| e | 1.528 | 1.778 | 2.028 |
| L | 3.0 | — | — |

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Colophon .7.2