

# M52723ASP

## Dynamic Focus

REJ03F0191-0201  
Rev.2.01  
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### 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

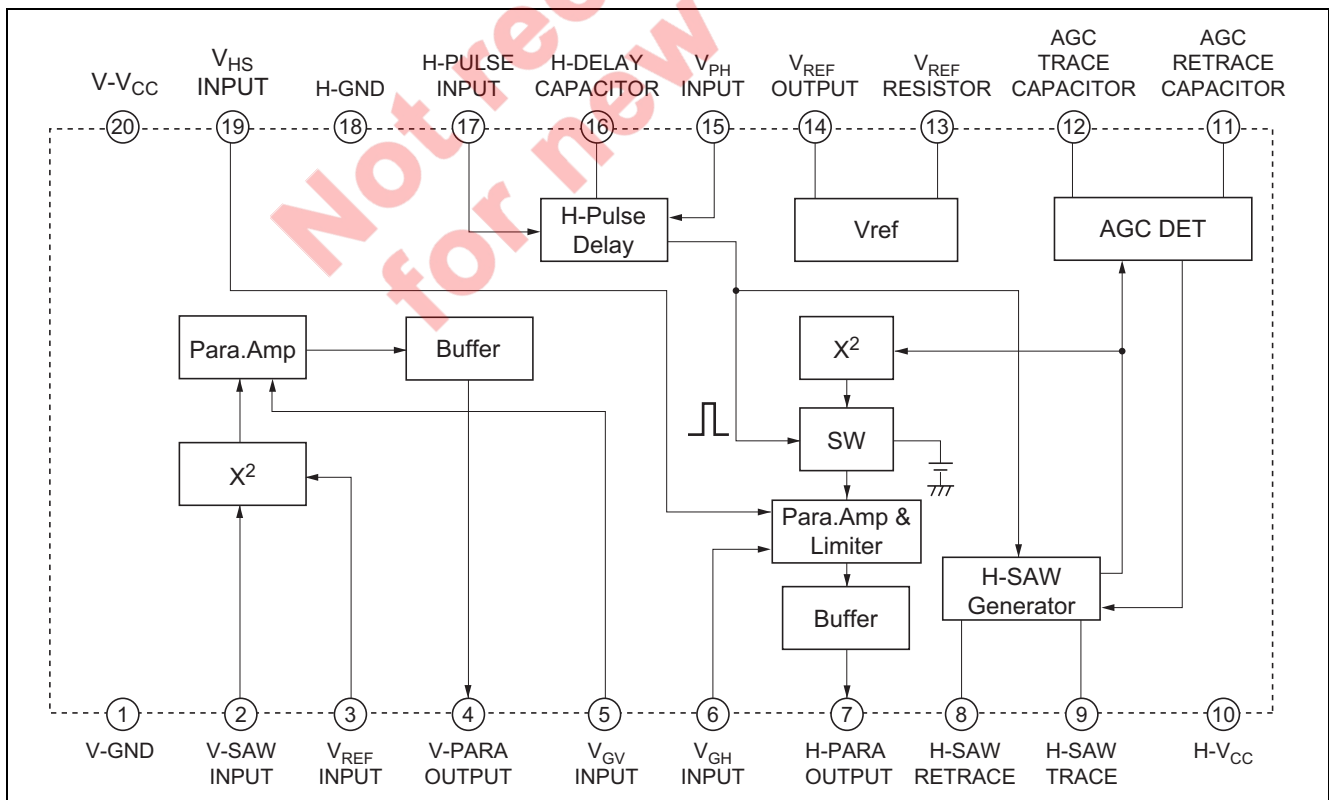
CRT display monitor

### Recommended Operating Condition

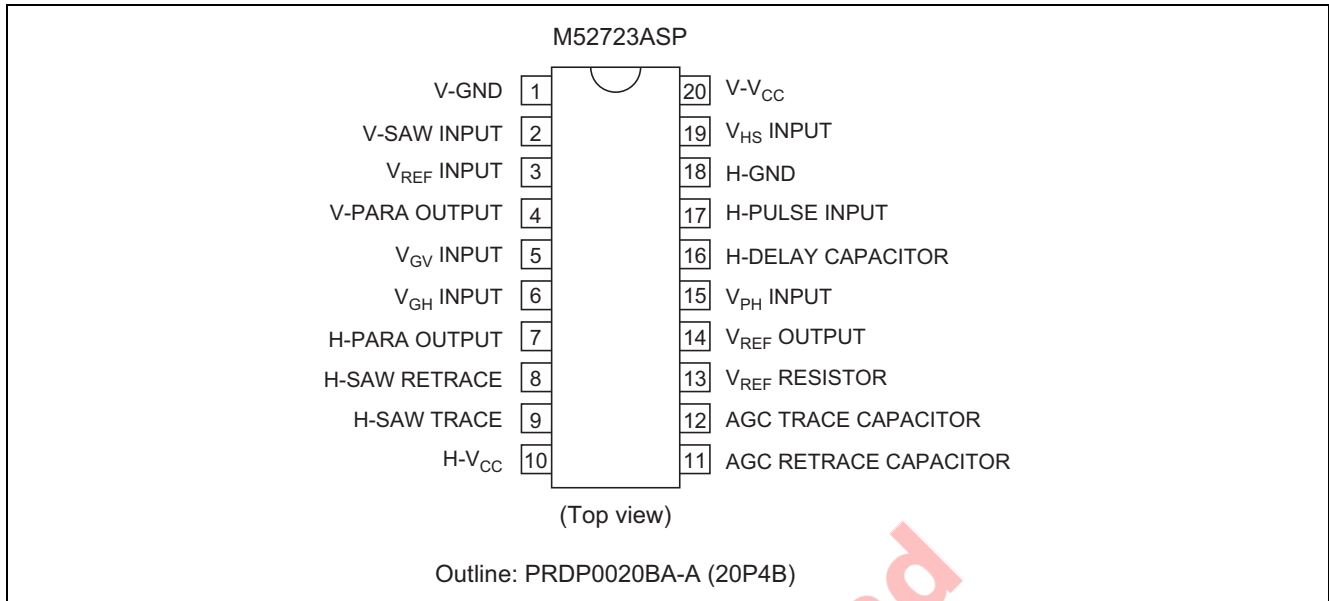
Supply voltage range: 11.5 to 12.5 V

Rated supply voltage: 12 V

### Block Diagram



## Pin Arrangement



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings			Unit
		Min	Typ	Max	
Supply voltage	V <sub>CC</sub>	—	—	13.0	V
Power dissipation	P <sub>d</sub>	—	—	1237.6	mW
Operating temperature	T <sub>opr</sub>	-20	—	+85	°C
Storage temperature	T <sub>stg</sub>	-40	—	+150	°C
Recommended operating voltage	V <sub>opr</sub>	—	12.0	—	V
Recommended operating voltage range	V <sub>opr</sub>	11.5	—	12.5	V
Surge	V <sub>surge</sub>	±200	—	—	V

## Electrical Characteristics

(Ta = 25°C, V<sub>CC</sub> = 12 V, unless otherwise noted)

Item	Symbol	Limits			Unit	Test Conditions	Pin No.
		Min	Typ	Max			
Circuit current 1	I <sub>CCH</sub>	15.1	21.5	27.9	mA	(10) Measure	10
Circuit current 2	I <sub>CCV</sub>	5.2	7.4	9.6	mA	(20) Measure	20
Reference voltage output	V <sub>REF</sub>	6.75	6.95	7.15	V	(14) Measure	14
Reference voltage temperature drift	D <sub>REF</sub>	—	49	—	ppm/ deg	(14) Measure	14
Horizontal Block							
H-pulse low input range	V <sub>IL</sub>	0.0	—	2.0	V	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 3.2 V in	7
H-pulse high input range	V <sub>IH</sub>	3.0	—	V <sub>CC</sub> -2.0	V	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 3.2 V in	7
H-pulse low input current	I <sub>IL</sub>	-5.0	-0.6	-0.1	μA	(17) 0 V in, measure	17
H-pulse high input current	I <sub>IH</sub>	-1.0	0.0	1.0	μA	(17) 5 V in, measure	17
H parabola width	T <sub>W</sub>	0.50	0.70	0.90	μs	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 3.2 V in	7
H parabola delay 1	T <sub>D1</sub>	-0.09	0.09	0.35	μs	(6) 4.0 V in (7) Measure (15) 0 V in (17) fH = 50 kHz H-pulse in (19) 3.2 V in	7
H parabola delay 2	T <sub>D2</sub>	0.19	0.41	0.65	μs	(6) 4.0 V in (7) Measure (15) 1.5 V in (17) fH = 50 kHz H-pulse in (19) 3.2 V in	7
H parabola delay 3	T <sub>D3</sub>	2.65	2.95	3.20	μs	(6) 4.0 V in (7) Measure (15) 4.0 V in (17) fH = 50 kHz H-pulse in (19) 3.2 V in	7
Delay temperature drift	D <sub>D</sub>	—	-0.08	—	ns/ deg	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 3.2 V in	7
Pin15 input current	I <sub>15</sub>	-5.0	-0.4	-0.1	μA	(15) 2.5 V in, measure	15
H parabola amplitude	V <sub>HP</sub>	7.5	8.2	8.9	V <sub>P-P</sub>	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (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 <sub>HP1</sub>	-0.2	0.0	0.2	V	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 24 kHz H-pulse in (19) 4.0 V in	7
H para. freq. characteristics 2	F <sub>HP2</sub>	-0.2	0.0	0.2	V	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 110 kHz H-pulse in (19) 4.0 V	7
H para. V <sub>CC</sub> characteristics 1	V <sub>VHP1</sub>	-0.1	0.0	0.1	V	(6) 2.5 V in (7) Measure (15) 3.0 V in (10) (20) 11.5 V in (17) fH = 50 kHz H-pulse in (19) 4.0 V in	7
H para. V <sub>CC</sub> characteristics 2	V <sub>VHP2</sub>	-0.1	0.0	0.1	V	(6) 2.5 V in (7) Measure (15) 3.0 V in (10) (20) 12.5 V in (17) fH = 50 kHz H-pulse in (19) 4.0 V	7
H para. size temperature drift	D <sub>HP</sub>	—	-275	—	ppm/ deg	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 4.0 V in	7
H para. size control 1	S <sub>HP1</sub>	7.5	8.2	8.9	V <sub>P-P</sub>	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 4.0 V in	7
H para. size control 2	S <sub>HP2</sub>	20	25	30	%	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 2.0 V in	7
H para. size control 3	S <sub>HP3</sub>	-5	0	5	%	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (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 <sub>HP1</sub>	0.7	0.9	1.1	V <sub>P-P</sub>	(6) 1.0 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 4.0 V in	7
H para. gain control 2	G <sub>HP2</sub>	4.2	4.7	5.2	—	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 4.0 V in	7
H para. gain control 3	G <sub>HP3</sub>	8.36	8.76	9.16	V <sub>P-P</sub>	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 4.0 V in	7
H para. limit size temperature drift	D <sub>LI</sub>	—	106	—	ppm/ deg	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 50 kHz H-pulse in (19) 4.0 V in	7
Pin6 input current	I <sub>6</sub>	-5.0	-0.4	-0.1	μA	(16) 2.5 V in, measure	6
Pin19 input current	I <sub>19</sub>	-5.0	-0.4	-0.1	μA	(19) 2.0 V in, measure	19
Vertical Block							
V parabola accuracy 1	A <sub>VP1</sub>	9.5	10.0	10.5	V	(2) 1.9 V in (3) 3.5 V in (4) Measure (5) 4.0 V in	4
V parabola accuracy 2	A <sub>VP2</sub>	6.23	6.73	7.23	V	(2) 2.7 V in (3) 3.5 V in (4) Measure (5) 4.0 V in	4
V parabola accuracy 3	A <sub>VP3</sub>	20	25	30	%	(2) 3.5 V in (3) 3.5 V in (4) Measure (5) 4.0 V in	4
V parabola accuracy 4	A <sub>VP4</sub>	20	25	30	%	(2) 4.3 V in (3) 3.5 V in (4) Measure (5) 4.0 V in	4
V parabola accuracy 5	A <sub>VP5</sub>	90	100	110	%	(2) 5.1 V in (3) 3.5 V in (4) Measure (5) 4.0 V in	4
V parabola amplitude 1	G <sub>VP1</sub>	0.0	0.0	0.1	V <sub>P-P</sub>	(2) f <sub>V</sub> = 70 Hz, 3.2 V <sub>P-P</sub> saw wave in (3) 3.5 V in (4) measure (5) 1.0 V in	4

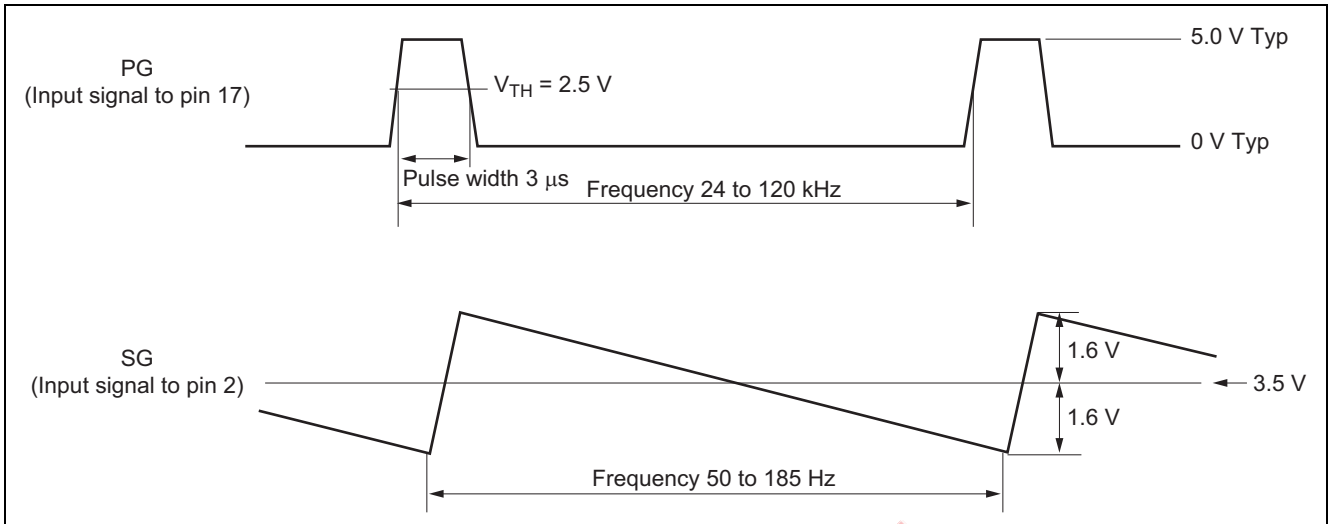
## Electrical Characteristics (cont.)

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 (3) 3.5 V in (4) measure (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 (3) 3.5 V in (4) measure (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 (3) 3.5 V in (4) measure (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 (3) 3.5 V in (4) measure (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 (3) 3.5 V in (4) measure (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 (3) 3.5 V in (4) measure (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 (3) 3.5 V in (4) measure (5) 4.0 V in	4
Pin2 input current	$I_2$	-5.0	-0.4	-0.1	$\mu A$	(2) 3.5 V in, measure	2
Pin3 input current	$I_3$	-5.0	-0.4	-0.1	$\mu A$	(3) 3.5 V in, measure	3
Pin5 input current	$I_5$	-5.0	-0.4	-0.1	$\mu A$	(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 <sub>CC</sub>	V2	V5	V6	V15	V17	V19
I <sub>CCH</sub>	a	a	a	a	b	a	b	a	a	12.0	3.5	2.5	2.5	3.0	0	2.0
I <sub>CCV</sub>					a				b							
V <sub>REF</sub>									a							
D <sub>REF</sub>																
V <sub>IL</sub>							a						4.0		—	3.2
V <sub>IH</sub>																
I <sub>IL</sub>							b						2.5		0	2.0
I <sub>IH</sub>															5.0	
T <sub>W</sub>							a						4.0		—	3.2
T <sub>D1</sub>														0		
T <sub>D2</sub>														1.5		
T <sub>D3</sub>														4.0		
D <sub>D</sub>														3.0		
I <sub>15</sub>						b	b						2.5	—	0	2.0
V <sub>HP</sub>						a	a							3.0	—	4.0
F <sub>HP1</sub>																
F <sub>HP2</sub>																
V <sub>VHP1</sub>										11.5						
V <sub>VHP2</sub>										12.5						
D <sub>HP</sub>										12.0						
S <sub>HP1</sub>																4.0
S <sub>HP2</sub>																2.0
S <sub>HP3</sub>																0
G <sub>HP1</sub>													1.0			4.0
G <sub>HP2</sub>													2.5			
G <sub>HP3</sub>													4.0			
D <sub>LI</sub>																4.0
I <sub>6</sub>				b			b	b					—		0	2.0
I <sub>19</sub>				a				a					2.5			—
A <sub>VP1</sub>													4.0			2.0
A <sub>VP2</sub>											1.9					
A <sub>VP3</sub>											2.7					
A <sub>VP4</sub>											4.3					
A <sub>VP5</sub>											5.1					
G <sub>VP1</sub>	b										—	1.0				
G <sub>VP2</sub>												2.5				
G <sub>VP3</sub>												4.0				
F <sub>VP1</sub>																
F <sub>VP2</sub>																
V <sub>VP1</sub>										11.5						
V <sub>VP2</sub>										12.5						
D <sub>VP</sub>										12.0						
I <sub>2</sub>	c										3.5	2.5				
I <sub>3</sub>	a	b														
I <sub>5</sub>	a	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

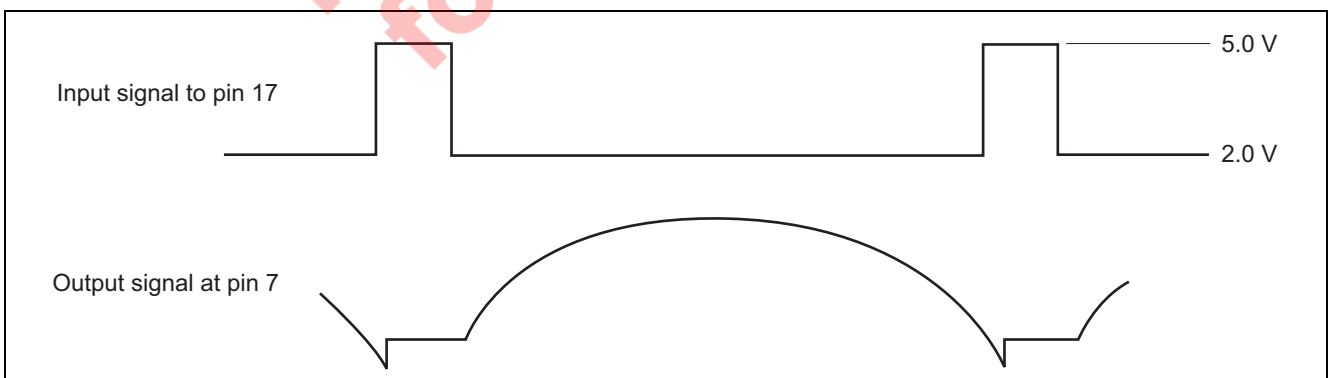
Measure the output voltage at pin 14.

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

Measure temperature drift of pin 14. ( $-20^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ )

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

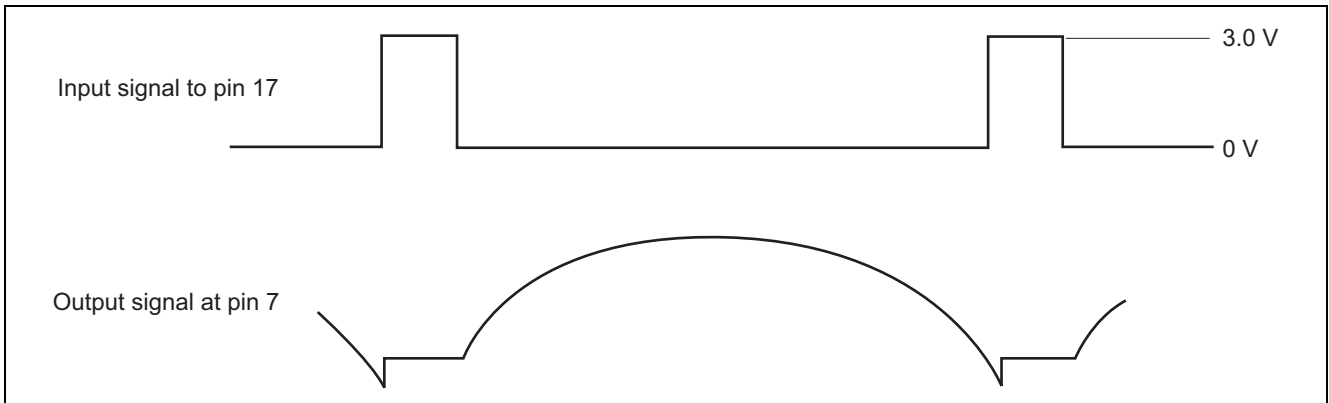
Input horizontal pulse which low level is 2 V in pin 17 and confirm output horizontal signal at pin 7.





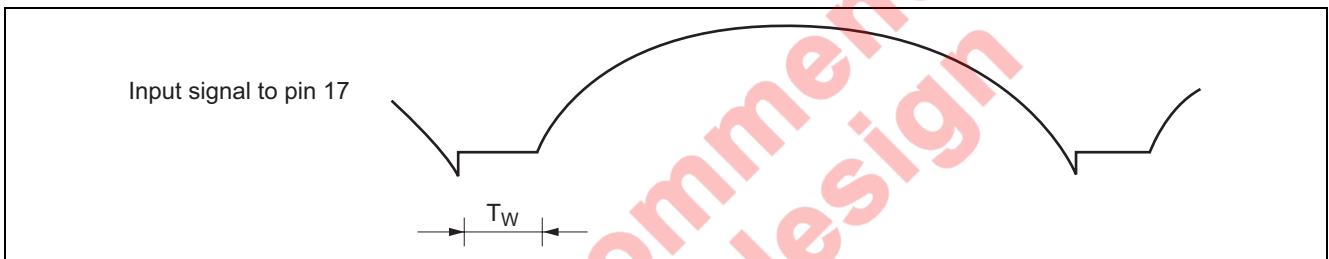
**V<sub>IH</sub> H-pulse High Input Range**

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



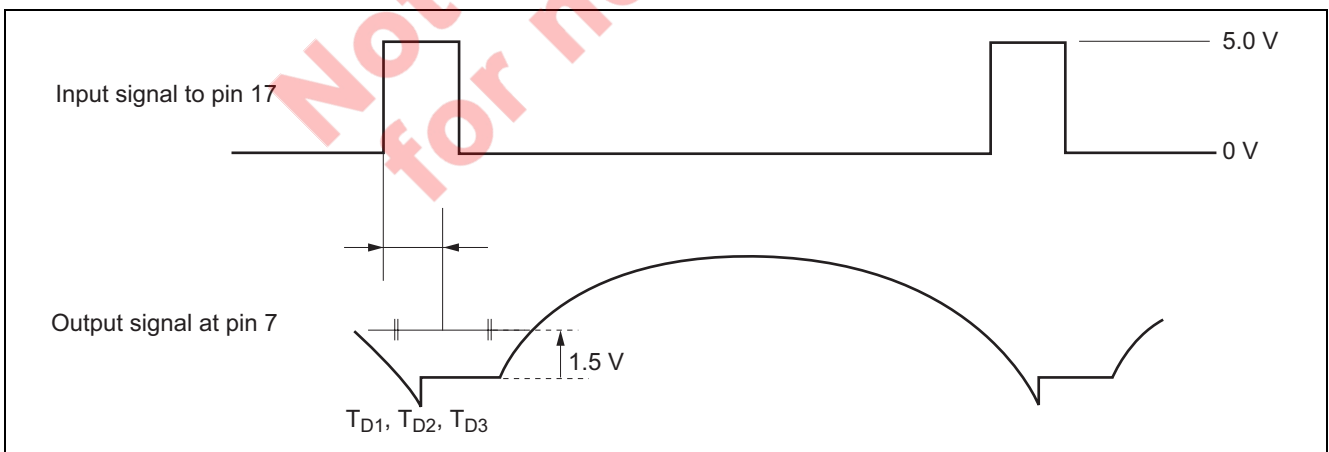
**T<sub>w</sub> H Parabola Width**

Measure the time width of retrace period at pin 7.



**T<sub>D1</sub> H Parabola Delay1, T<sub>D2</sub> H Parabola Delay2, T<sub>D3</sub> 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<sub>D</sub> Delay Temperature Drift**

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

**I<sub>15</sub> Pin 15 Input Current**

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

**V<sub>HP</sub> H Parabola Amplitude**

Measure the amplitude of parabola waveform at pin 7 and it is defined HP<sub>50 kHz</sub>.

**F<sub>HP1</sub> 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<sub>24 kHz</sub>.

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

**F<sub>HP2</sub> 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<sub>120 kHz</sub>.

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

**V<sub>VHP1</sub> H Para. V<sub>CC</sub>. 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<sub>11.5 V</sub>.

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

**V<sub>VHP2</sub> H Para. V<sub>CC</sub>. 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<sub>12.5 V</sub>.

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

**D<sub>HP</sub> H Para. Size. Temperature Drift**

Measure the temperature drift of HP<sub>50 kHz</sub>. (–20°C to 85°C)

**S<sub>HP1</sub> H Para. Size. Control1**

Measure the amplitude of parabola waveform at pin 7 and it is defined as HP<sub>19.4.0 V</sub>.

**S<sub>HP2</sub> H Para. Size. Control2**

The amplitude of parabola waveform at pin 7 is defined as HP<sub>19.2.0 V</sub>.

$$S_{HP2} = \frac{HP_{19.2.0\text{ V}}}{HP_{19.4.0\text{ V}}} \times 100 (\%)$$

**S<sub>HP3</sub> H Para. Size. Control3**

The amplitude of parabola waveform at pin 7 is defined as HP<sub>19.0 V</sub>.

$$S_{HP3} = \frac{HP_{19.0\text{ V}}}{HP_{19.4.0\text{ V}}} \times 100 (\%)$$

**G<sub>HP1</sub> H Para. Gain Control1**

Measure the amplitude of parabola waveform at pin 7 and it is defined as HP<sub>6 1.0 V</sub>.

**G<sub>HP2</sub> H Para. Gain Control2**

The amplitude of parabola waveform at pin 7 is defined as HP<sub>6 2.5 V</sub>.

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

**G<sub>HP3</sub> H Para. Gain Control3**

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

**D<sub>LI</sub> H Para. Limit Size Temperature Drift**

Measure temperature drift of G<sub>HP3</sub>. (−20°C to 85°C)

**I<sub>6</sub> Pin 6 Input Current**

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

**I<sub>19</sub> Pin 19 Input Current**

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

**A<sub>VP1</sub> V Parabola Accuracy1**

Measure the output voltage at pin 4 and it is defined as VP<sub>2 3.5 V</sub>.

**A<sub>VP2</sub> V Parabola Accuracy2**

The output voltage at pin 4 is defined as VP<sub>2 1.9 V</sub>.

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

**A<sub>VP3</sub> V Parabola Accuracy3**

The output voltage at pin 4 is defined as VP<sub>2 2.7 V</sub>.

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

**A<sub>VP4</sub> V Parabola Accuracy4**

The output voltage at pin 4 is defined as VP<sub>2 4.3 V</sub>.

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

**A<sub>VP5</sub> V Parabola Accuracy5**

The output voltage at pin 4 is defined as VP<sub>2 5.1 V</sub>.

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

**G<sub>VP1</sub> V Parabola Amplitude1, G<sub>VP2</sub> V Parabola Amplitude2, G<sub>VP3</sub> 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<sub>70 Hz</sub>.

**F<sub>VP1</sub> 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<sub>50 Hz</sub>.

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

**F<sub>VP2</sub> V Para. Freq. Characteristics2**

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

**V<sub>VP1</sub> V Para. V<sub>CC</sub>. Characteristics1**

When the voltage of pin 10, 20 is 11.5 V, the amplitude of parabola waveform is defined as VP<sub>11.5 v</sub>.

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

**V<sub>VP2</sub> V Para. V<sub>CC</sub>. Characteristics2**

When the voltage of pin 10, 20 is 12.5 V, the amplitude of parabola waveform is defined as VP<sub>12.5 v</sub>.

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

**D<sub>VP</sub> V Para. Temperature Drift**

Measure temperature drift of VP<sub>70 Hz</sub>. (-20°C to 85°C)

**I<sub>2</sub> Pin 2 Input Current**

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

**I<sub>3</sub> Pin 3 Input Current**

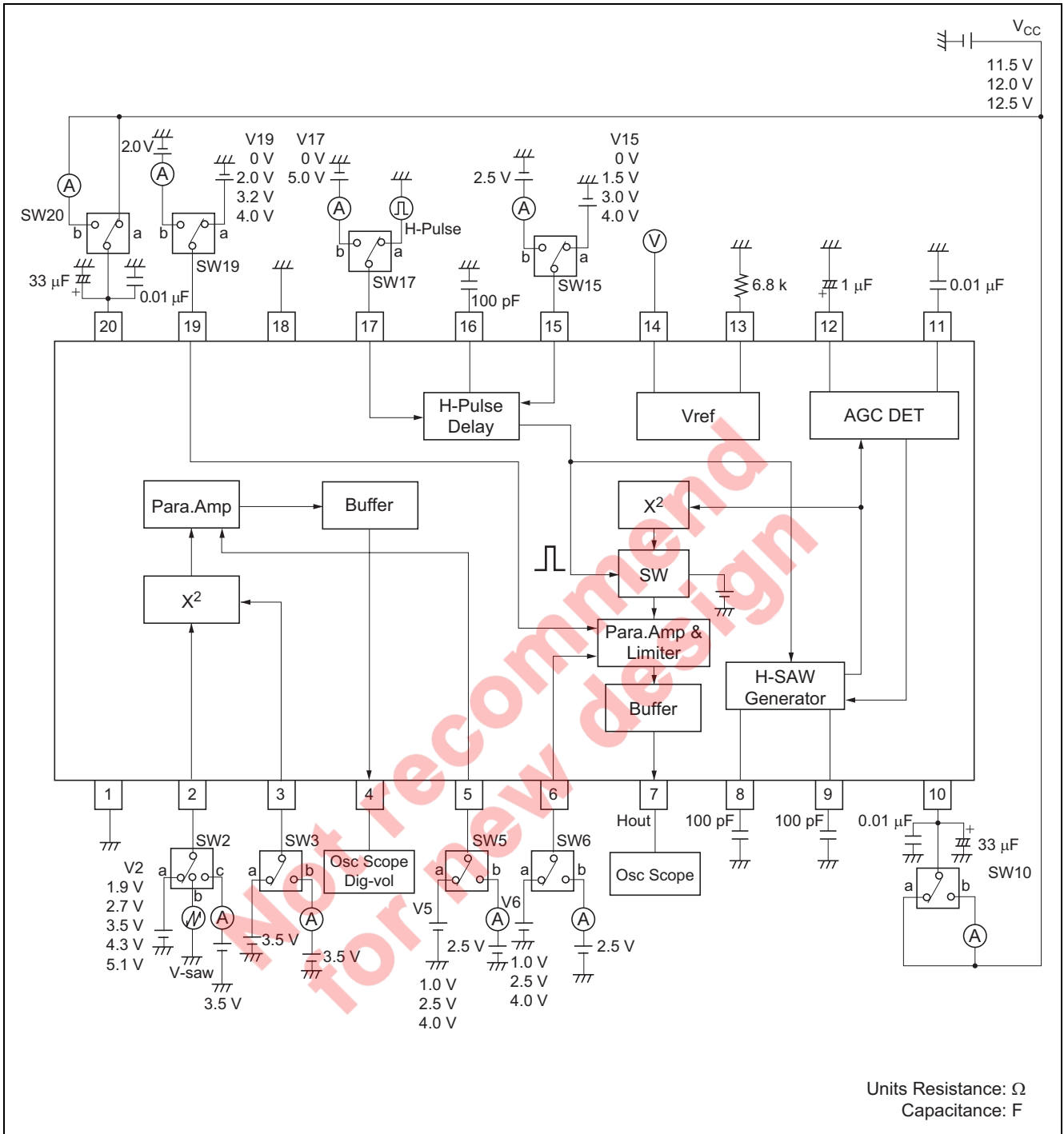
Measure the input current to pin 3 when the voltage of pin 3 is 3.5 V.

**I<sub>5</sub> Pin 5 Input Current**

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

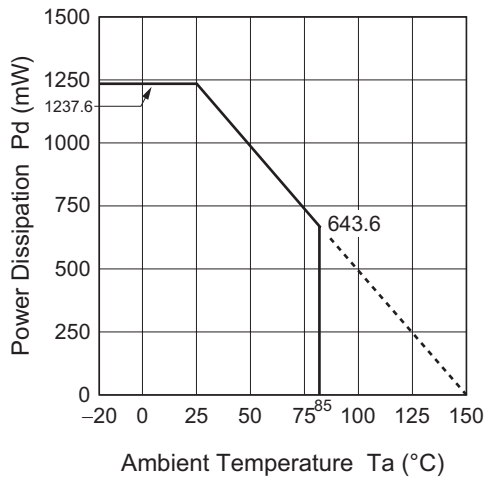
Not recommended  
for new design

Test Circuit

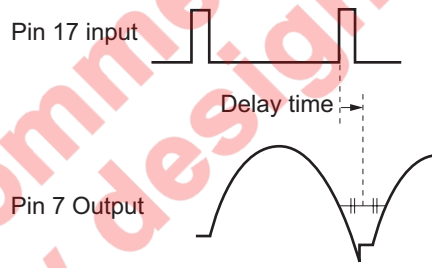
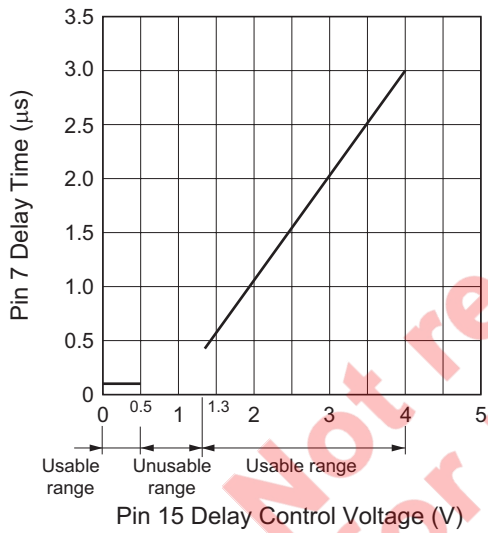


## Typical Characteristics

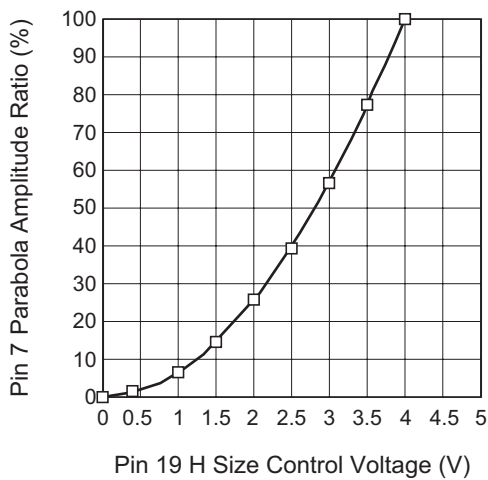
Thermal Derating (Maximum Rating)



Delay Control Voltage vs. Delay Time



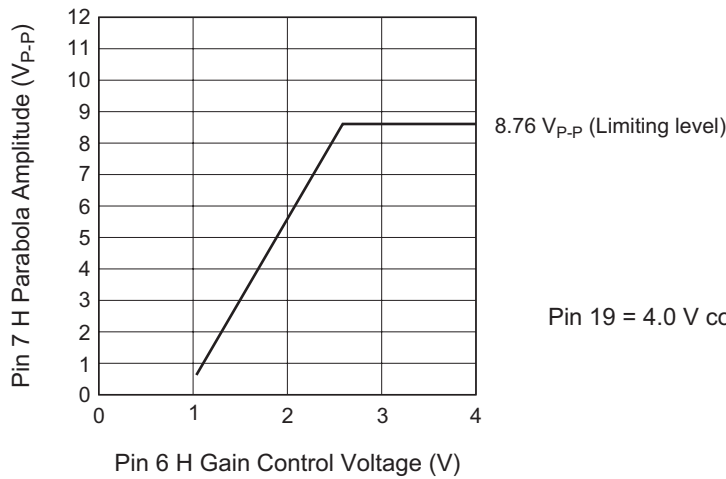
H Size Control Voltage vs. H Parabola Amplitude Ratio



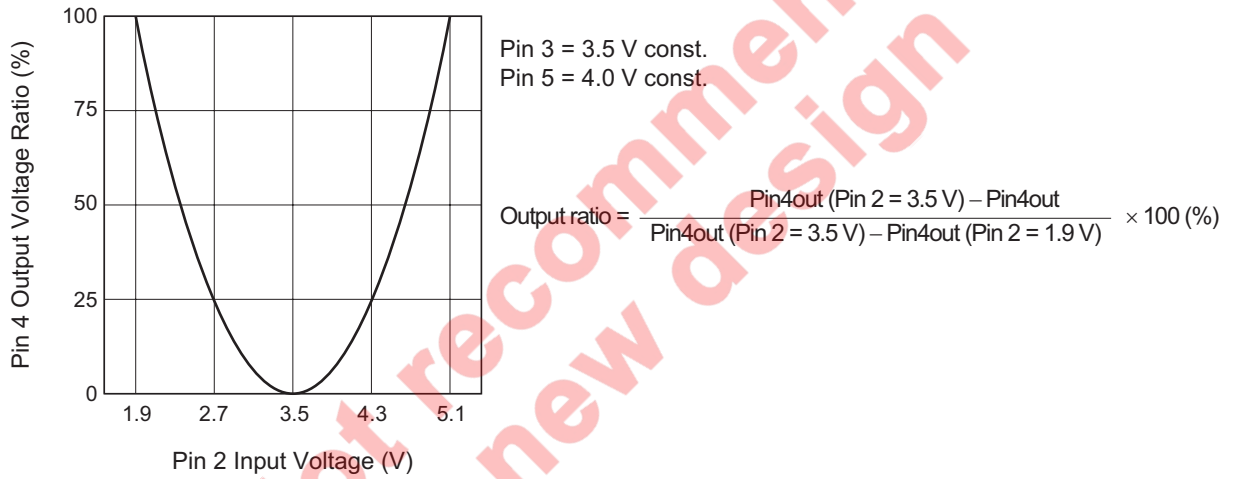
Pin 6 = 2.5 V const.

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

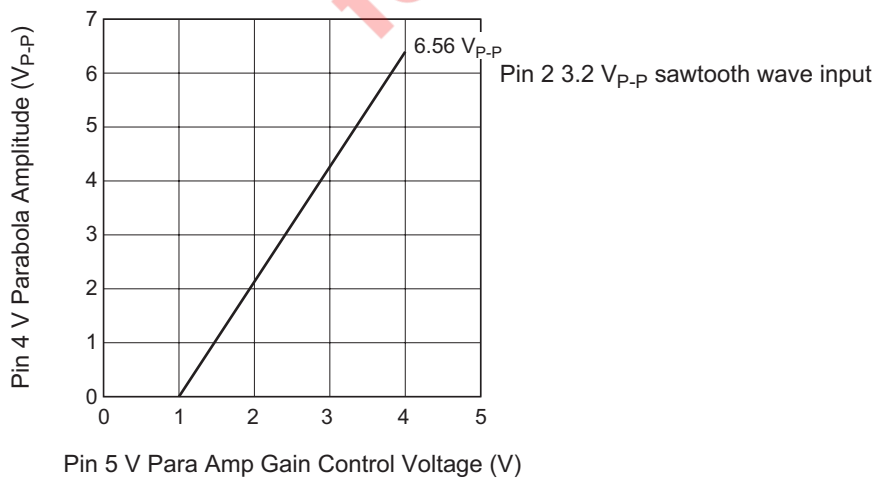
H Gain Control Voltage vs.  
H Parabola Amplitude



V Para DC Output Voltage Ratio

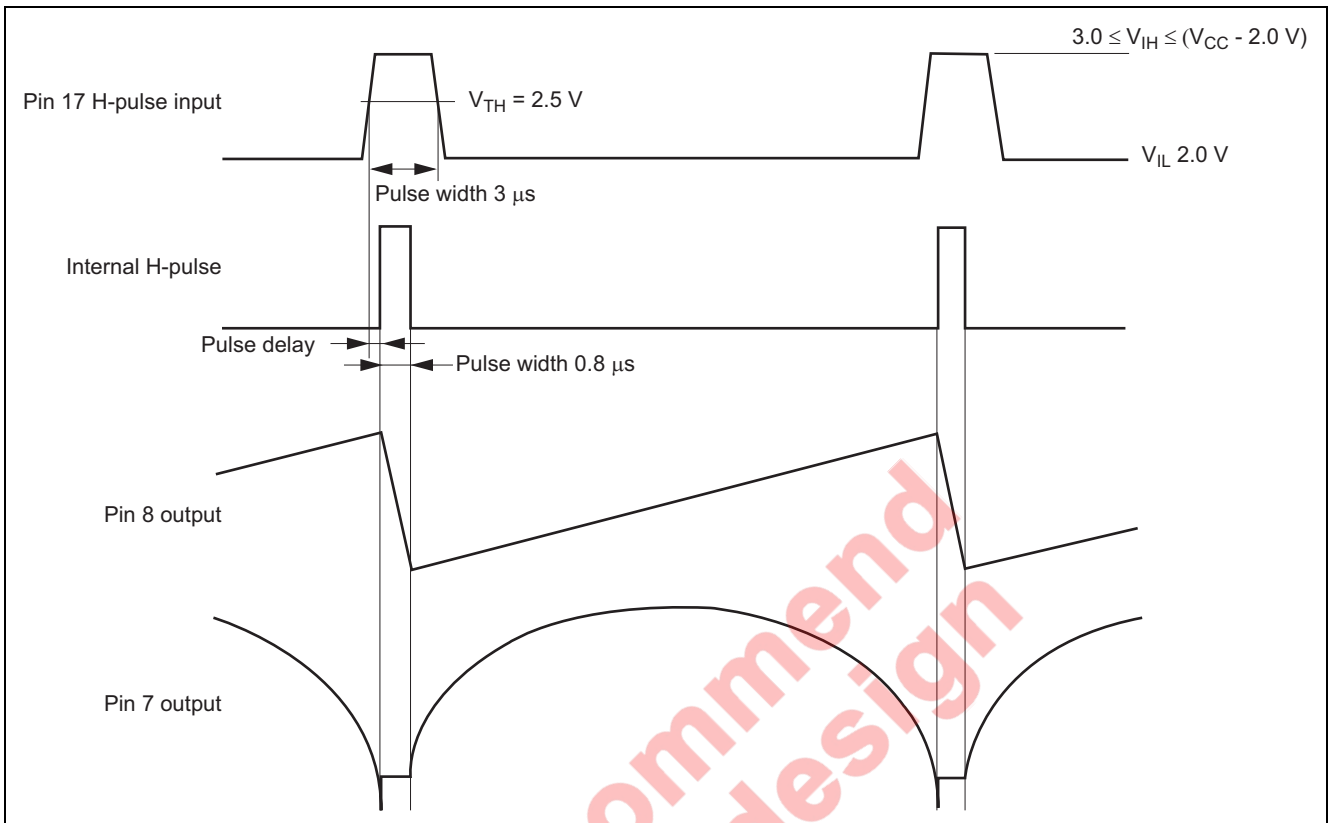


V Para Amp Gain Control Voltage vs.  
Output Amplitude

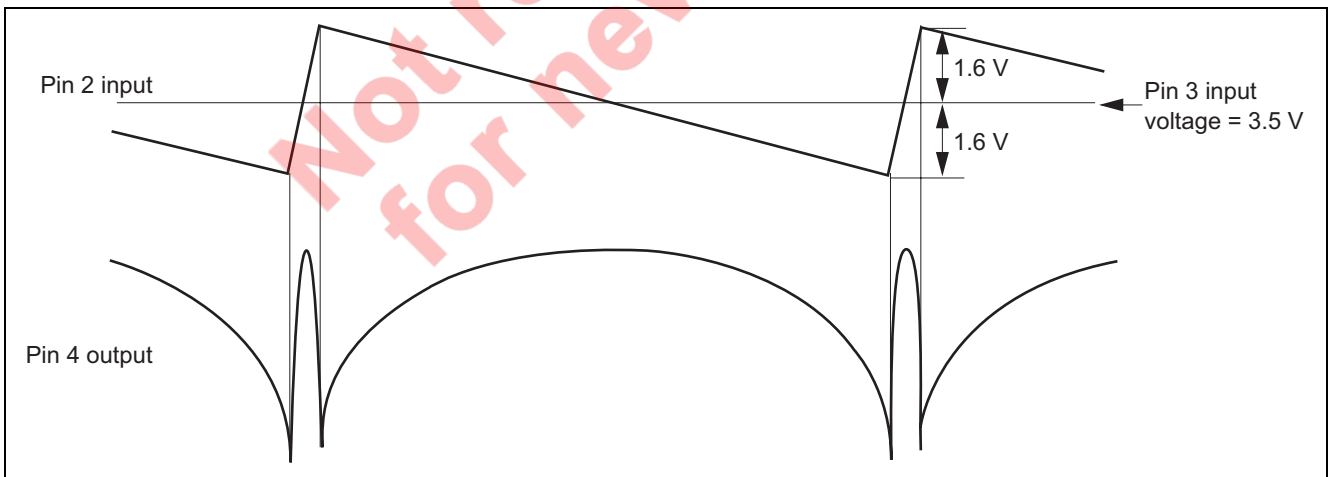


## Timing Chart

### Horizontal Block

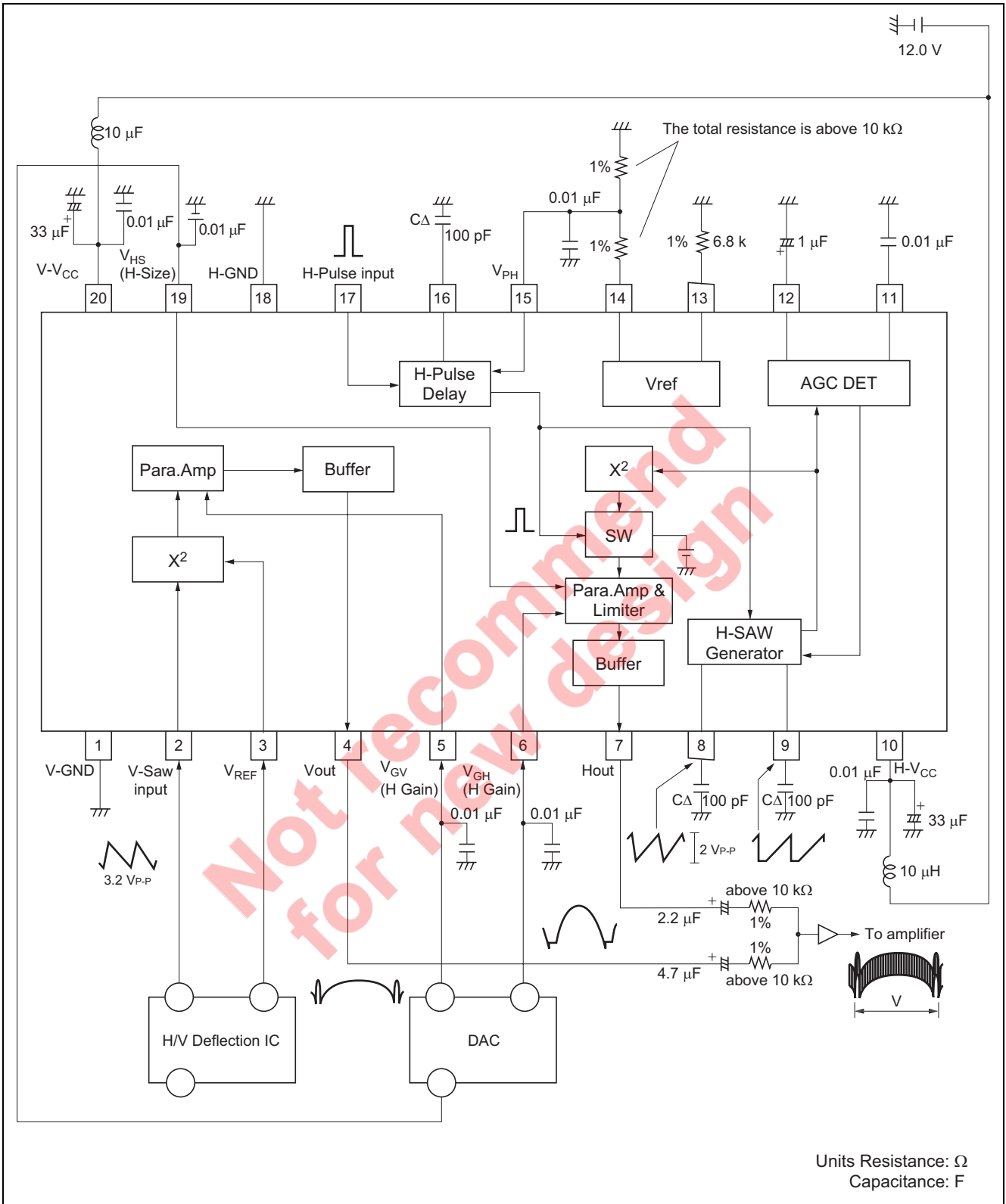


### Vertical Block





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.  $V_{SAWREF} = 3.5 \text{ V}$
3	Vsawref	3.5 V		Vertical reference voltage input pin. (3.5 V)
4	Vout	10 V (Peak)		Vertical parabola wave output pin.  Peak voltage = 10 V (fixed) Amplitude is possible to control by pin 5
5	V <sub>Gv</sub>	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 <sub>GH</sub>	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. 
8	Cret	7.1 V (Top) 4.9 V (Bottom)		Connection pin of horizontal retrace capacitor. Recommended capacitance is 100 pF. 
9	Ctrc	7.1 V (Top) 4.9 V (Bottom)		Connection pin of horizontal trace capacitor. Recommended capacitance is 100 pF. 
10	H-V <sub>CC</sub>	12.0 V	—	V <sub>CC</sub> of horizontal block.
11	C <sub>AGCr</sub>	2.5 V		Connection pin of horizontal sawtooth wave AGC retrace capacitor. Recommended capacitance is 0.01 μF.

## Pin Description (cont.)

Pin No.	Name	DC Voltage (V)	Peripheral Circuit	Function
12	C <sub>AGC</sub>	4.0 V		<p>Connection pin of horizontal AGC capacitor.</p> <p>Recommended capacitance is 1 <math>\mu</math>F.</p>
13	V <sub>REFR</sub>	1.28 V		<p>Connection pin of reference current source resistor.</p> <p>Recommended resistance is 6.8 k<math>\Omega</math>.</p>
14	V <sub>REFO</sub>	7.0 V		<p>Reference voltage output for horizontal pulse delay circuit.</p> <p>Should be connect more than 10 k<math>\Omega</math> external resistor.</p>
15	V <sub>PH</sub>	0 to 0.5 V 1.3 to 4.0 V		<p>Delay adjustment voltage input pin of horizontal pulse. Input voltage range is 1.3 to 4.0 V.</p> <p>At 0 to 0.5 V, delay is minimized. (0.5 to 1.3 V is unusable range.)</p>
16	Chpd	0 V (Bottom)		<p>Connection pin of horizontal pulse delay timing capacitor.</p> <p>Recommended capacitance is 100 pF.</p>

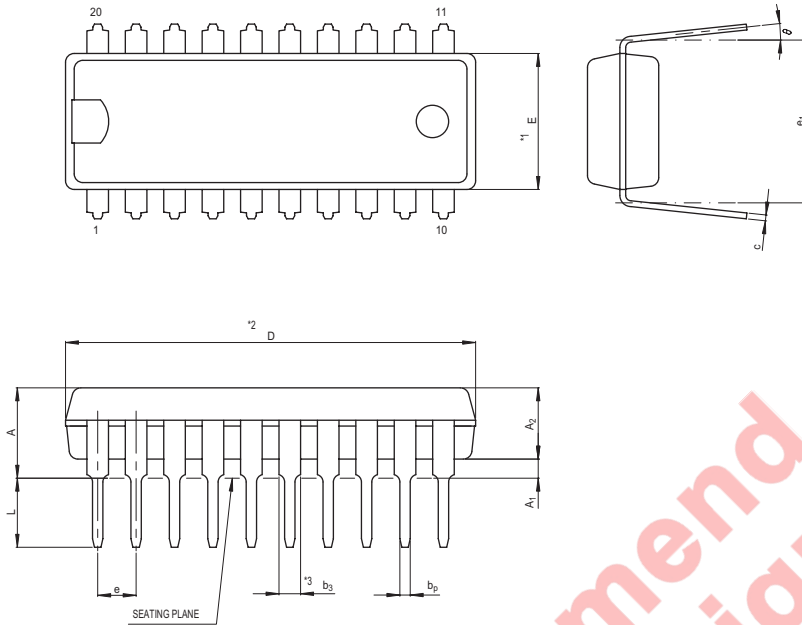
## Pin Description (cont.)

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

Not recommended  
for new design

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	—	—

Not recommend for new design

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