M52723ASP

DYNAMIC FOCUS

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

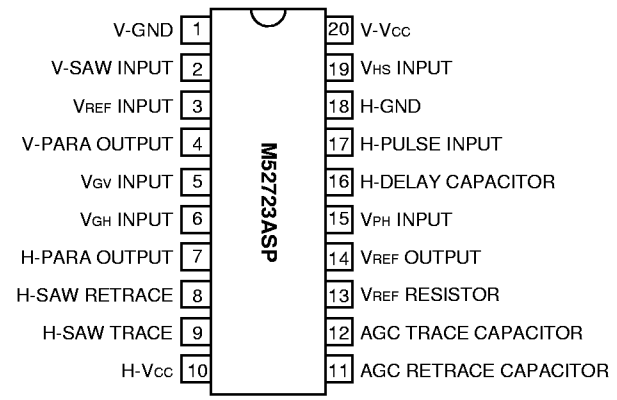
CRT display monitor

RECOMMENDED OPERATING CONDITION

Supply voltage range.....11.5 to 12.5V

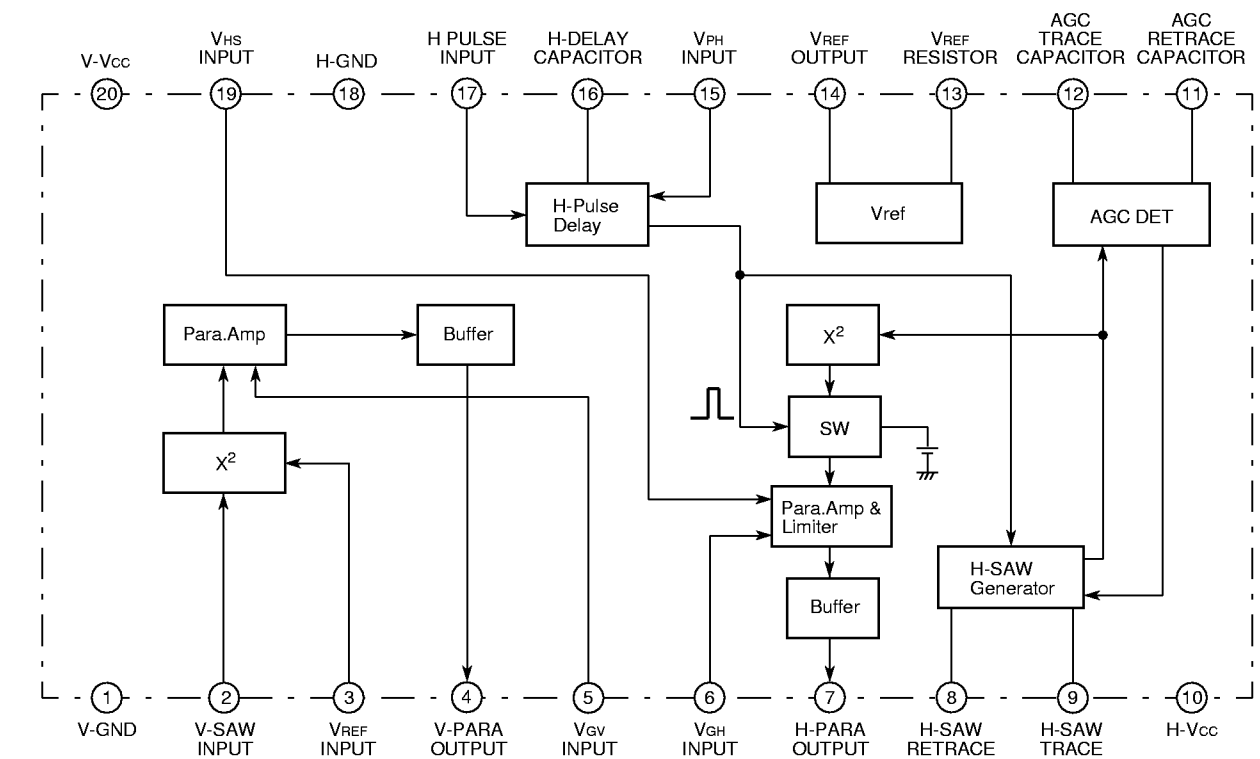
Rated supply voltage.....12V

PIN CONFIGURATION (TOP VIEW)



Outline 20P4B

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Symbol	Parameter	Ratings			Unit
		Min.	Typ.	Max.	
V_{CC}	Supply voltage	–	–	13.0	V
P_d	Power dissipation	–	–	1237.6	mW
T_{opr}	Operating temperature	-20	–	+85	°C
T_{stg}	Storage temperature	-40	–	+150	°C
V_{opr}	Recommended operating voltage	–	12.0	–	V
$V_{opr'}$	Recommended operating voltage range	11.5	–	12.5	V
V_{surge}	Surge	±200	–	–	V

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

Symbol	Parameter	Test conditions	Pin No.	Limits			Unit
				Min.	Typ.	Max.	
I_{CCH}	Circuit current 1	(10) Measure	10	15.1	21.5	27.9	mA
I_{CCV}	Circuit current 2	(20) Measure	20	5.2	7.4	9.6	mA
V_{REF}	Reference voltage output	(14) Measure	14	6.75	6.95	7.15	V
D_{REF}	Reference voltage temperature drift	(14) Measure	14	–	49	–	ppm/deg
HORIZONTAL BLOCK							
V_{IL}	H-pulse low input range	(6) 4.0V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 3.2V in	7	0.0	–	2.0	V
V_{IH}	H-pulse high input range	(6) 4.0V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 3.2V in	7	3.0	–	V_{CC} -2.0	V
I_{IL}	H-pulse low input current	(17) 0V in, measure	17	-5.0	-0.6	-0.1	µA
I_{IH}	H-pulse high input current	(17) 5V in, measure	17	-1.0	0.0	1.0	µA
T_W	H parabola width	(6) 4.0V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 3.2V in	7	0.50	0.70	0.90	µsec
T_{D1}	H parabola delay 1	(6) 4.0V in (7) Measure (15) 0V in (17) fH=50kHz H-pulse in (19) 3.2V in	7	-0.09	0.09	0.35	µsec
T_{D2}	H parabola delay 2	(6) 4.0V in (7) Measure (15) 1.5V in (17) fH=50kHz H-pulse in (19) 3.2V in	7	0.19	0.41	0.65	µsec
T_{D3}	H parabola delay 3	(6) 4.0V in (7) Measure (15) 4.0V in (17) fH=50kHz H-pulse in (19) 3.2V in	7	2.65	2.95	3.20	µsec
D_D	Delay temperature drift	(6) 4.0V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 3.2V in	7	–	-0.08	–	ns/deg
I_{15}	Pin15 input current	(15) 2.5V in, measure	15	-5.0	-0.4	-0.1	µA
V_{HP}	H parabola amplitude	(6) 2.5V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 4.0V in	7	7.5	8.2	8.9	V_{P-P}
F_{HP1}	H para. freq. characteristics 1	(6) 2.5V in (7) Measure (15) 3.0V in (17) fH=24kHz H-pulse in (19) 4.0V in	7	-0.2	0.0	0.2	V
F_{HP2}	H para. freq. characteristics 2	(6) 2.5V in (7) Measure (15) 3.0V in (17) fH=110kHz H-pulse in (19) 4.0V	7	-0.2	0.0	0.2	V
V_{VHP1}	H para. V_{CC}. characteristics 1	(6) 2.5V in (7) Measure (15) 3.0V in (10) (20) 11.5V in (17) fH=50kHz H-pulse in (19) 4.0V in	7	-0.1	0.0	0.1	V
V_{VHP2}	H para. V_{CC}. characteristics 2	(6) 2.5V in (7) Measure (15) 3.0V in (10) (20) 12.5V in (17) fH=50kHz H-pulse in (19) 4.0V	7	-0.1	0.0	0.1	V
D_{HP}	H para. size temperature drift	(6) 2.5V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 4.0V in	7	–	-275	–	ppm/deg
S_{HP1}	H para. size control 1	(6) 2.5V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 4.0V in	7	7.5	8.2	8.9	V_{P-P}
S_{HP2}	H para. size control 2	(6) 2.5V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 2.0V in	7	20	25	30	%
S_{HP3}	H para. size control 3	(6) 2.5V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 0V in	7	-5	0	5	%
G_{HP1}	H para. gain control 1	(6) 1.0V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 4.0V in	7	0.7	0.9	1.1	V_{P-P}
G_{HP2}	H para. gain control 2	(6) 2.5V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 4.0V in	7	4.2	4.7	5.2	-
G_{HP3}	H para. gain control 3	(6) 4.0V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 4.0V in	7	8.36	8.76	9.16	V_{P-P}

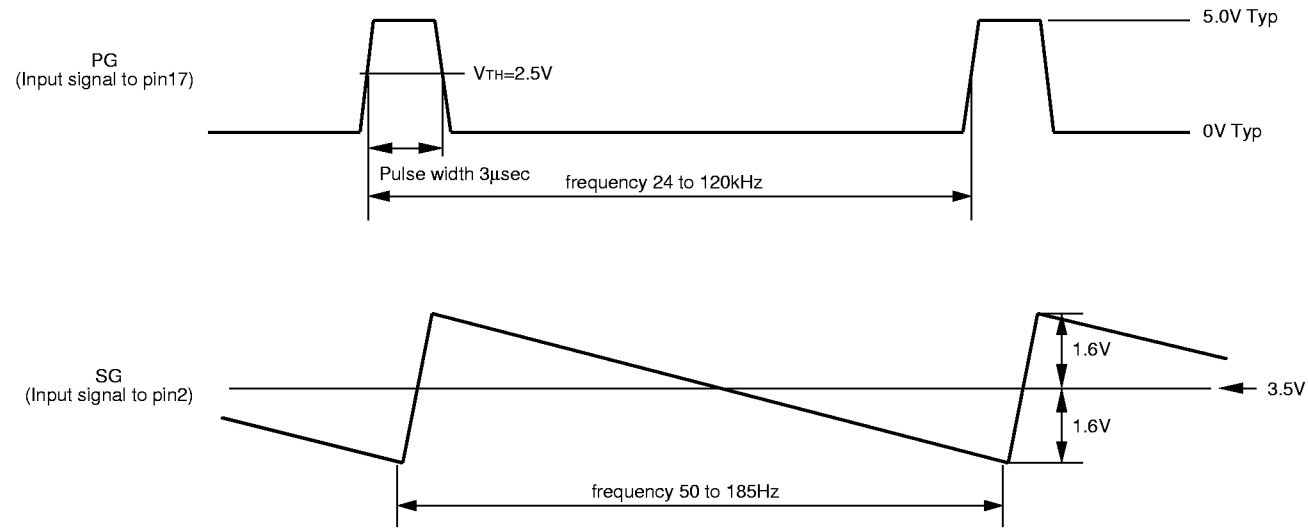
ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test conditions	Pin No.	Limits			Unit
				Min.	Typ.	Max.	
D_{LI}	H para. limit size temperature drift	(6) 4.0V in (7) Measure (15) 3.0V in (17) fH=50kHz H-pulse in (19) 4.0V in	7	–	106	–	ppm/deg
I_6	Pin6 input current	(16) 2.5V in, measure	6	-5.0	-0.4	-0.1	μA
I_{19}	Pin19 input current	(19) 2.0V in, measure	19	-5.0	-0.4	-0.1	μA
VERTICAL BLOCK							
A_{VP1}	V parabola accuracy 1	(2) 1.9V in (3) 3.5V in (4) measure (5) 4.0V in	4	9.5	10.0	10.5	V
A_{VP2}	V parabola accuracy 2	(2) 2.7V in (3) 3.5V in (4) measure (5) 4.0V in	4	6.23	6.73	7.23	V
A_{VP3}	V parabola accuracy 3	(2) 3.5V in (3) 3.5V in (4) measure (5) 4.0V in	4	20	25	30	%
A_{VP4}	V parabola accuracy 4	(2) 4.3V in (3) 3.5V in (4) measure (5) 4.0V in	4	20	25	30	%
A_{VP5}	V parabola accuracy 5	(2) 5.1V in (3) 3.5V in (4) measure (5) 4.0V in	4	90	100	110	%
G_{VP1}	V parabola amplitude 1	(2) fv=70Hz, 3.2V_{P-P} saw wave in (3) 3.5V in (4) measure (5) 1.0V in	4	0.0	0.0	0.1	V_{P-P}
G_{VP2}	V parabola amplitude 2	(2) fv=70Hz, 3.2V_{P-P} saw wave in (3) 3.5V in (4) measure (5) 2.5V in	4	2.77	3.12	3.47	V_{P-P}
G_{VP3}	V parabola amplitude 3	(2) fv=70Hz, 3.2V_{P-P} saw wave in (3) 3.5V in (4) measure (5) 4.0V in	4	6.26	6.56	6.86	V_{P-P}
F_{VP1}	V para. freq. characteristics 1	(2) fv=50Hz, 3.2V_{P-P} saw wave in (3) 3.5V in (4) measure (5) 4.0V in	4	-0.1	0.0	0.1	V
F_{VP2}	V para. freq. characteristics 2	(2) fv=185Hz, 3.2V_{P-P} saw wave in (3) 3.5V in (4) measure (5) 4.0V in	4	-0.1	0.0	0.1	V
V_{VP1}	V para. V_{CC}. characteristics 1	(2) fv=70Hz, 3.2V_{P-P} saw wave in (3) 3.5V in (4) measure (5) 4.0V in	4	-0.1	0.0	0.1	V
V_{VP2}	V para. V_{CC}. characteristics 2	(2) fv=70Hz, 3.2V_{P-P} saw wave in (3) 3.5V in (4) measure (5) 4.0V in	4	-0.1	0.0	0.1	V
D_{VP}	V para. V_{CC}. temperature drift	(2) fv=70Hz, 3.2V_{P-P} saw wave in (3) 3.5V in (4) measure (5) 4.0V in	4	–	-325	–	ppm/deg
I_2	Pin2 input current	(2) 3.5V in, measure	2	-5.0	-0.4	-0.1	μA
I_3	Pin3 input current	(3) 3.5V in, measure	3	-5.0	-0.4	-0.1	μA
I_5	Pin5 input current	(5) 2.5V in, measure	5	-5.0	-0.4	-0.1	μA

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

ICCH Circuit current1

Measure the input current to pin10.

ICCV Circuit current2

Measure the input current to pin20.

VREF Reference voltage output

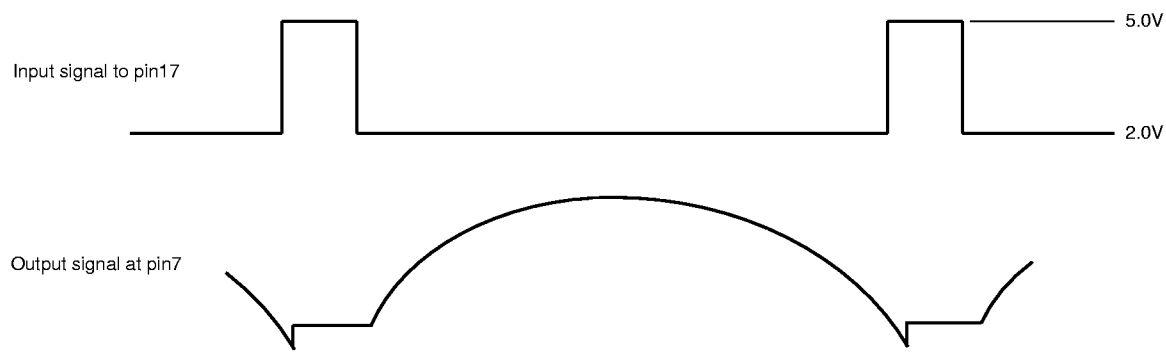
Measure the output voltage at pin14.

DREF Reference voltage temperature drift

Measure temperature drift of pin14. (-20°C to 85°C)

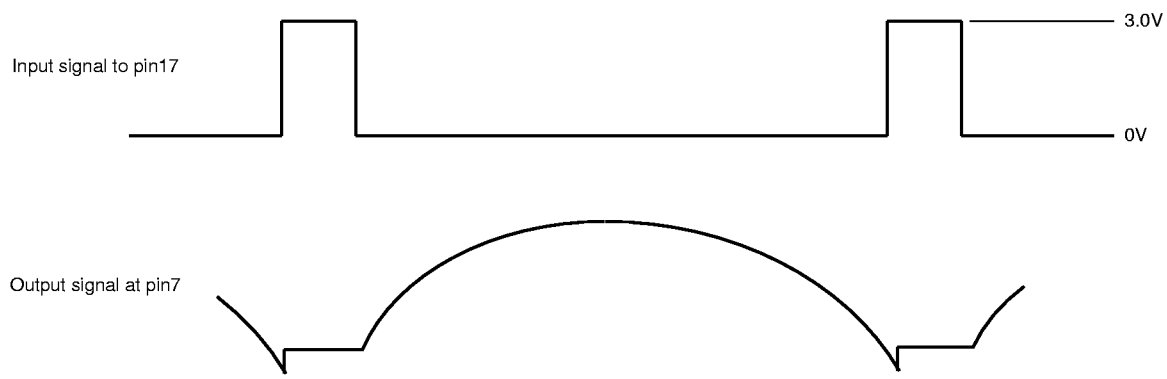
VIL H-pulse low input range

Input horizontal pulse which low level is 2V in pin17 and confirm output horizontal signal at pin7.



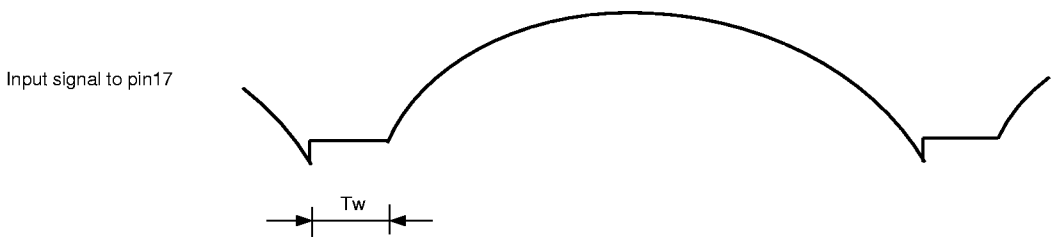
V_{IH} H-pulse high input range

Input horizontal pulse which high level is 3V in pin17 and confirm output horizontal signal at pin7.



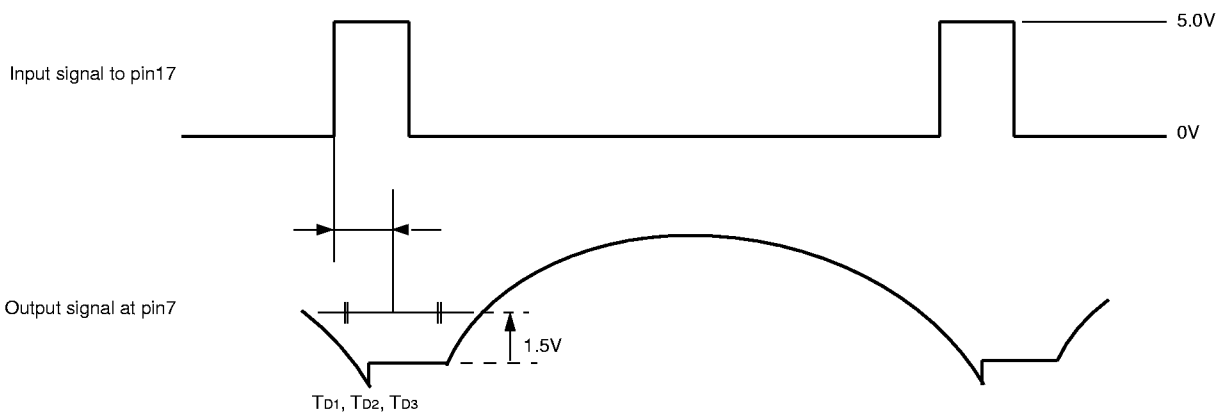
T_W H parabola width

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 +1.5V when the voltage of pin15 is 0V, 1.5V, and 4V.



D_D Delay temperature drift
Measure the temperature drift of the delay time. (-20°C to 85°C).

I_{15} Pin15 input current
Measure the input current to pin15 when the voltage of pin15 is 2.5V.

V_{HP} H parabola amplitude
Measure the amplitude of parabola waveform at pin7 and it is defined HP_{50kHz}.

F_{HP1} H para. freq. characteristics1
When the frequency of input signal in pin17 is 24kHz, the amplitude of parabola waveform at pin7 is defined as HP_{24kHz}.

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

F_{HP2} H para. freq. characteristics2
When the frequency of input signal in pin17 is 120kHz, the amplitude of parabola waveform at pin7 is defined as HP_{120KHz}.

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

V_{VHP1} H para. V_{CC}. characteristics1
When the supply voltage of pin10, 20 is 11.5V, the amplitude of parabola waveform at pin7 is defined as $HP_{11.5V}$.

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

V_{VHP2} H para. V_{CC}. characteristics2
When the supply voltage of pin10, 20 is 12.5V, the amplitude of parabola waveform at pin7 is defined as $HP_{12.5V}$.

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

D_{HP} H para. size. temperature drift
Measure the temperature drift of HP_{50kHz}. (-20°C to 85°C)

S_{HP1} H para. size. control1
Measure the amplitude of parabola waveform at pin7 and it is defined as $HP_{19\ 4.0V}$.

S_{HP2} H para. size. control2
The amplitude of parabola waveform at pin7 is defined as $HP_{19\ 2.0V}$.

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

S_{HP3} H para. size. control3
The amplitude of parabola waveform at pin7 is defined as $HP_{19\ 0V}$.

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

G_{HP1} H para. gain control1
Measure the amplitude of parabola waveform at pin7 and it is defined as $HP_{6\ 1.0V}$.

G_{HP2} H para. gain control2
The amplitude of parabola waveform at pin7 is defined as $HP_{19\ 2.5V}$.

$$G_{HP2}=\frac{HP_{6\ 2.0V} - HP_{6\ 1.0V}}{1.5}$$

G_{HP3} H para. gain control3
Measure the amplitude of parabola waveform at pin7 (Limit level).

D_{LI} H para. limit size temperature drift
Measure temperature drift of G_{HP3}. (-20°C to 85°C)

I_6 Pin6 input current
Measure the input current to pin6 when voltage of pin6 is 2.5V.

I_{19} Pin19 input current
Measure the input current to pin19 when voltage of pin19 is 2V.

A_{VP1} V parabola accuracy1
Measure the output voltage at pin4 and it is defined as $VP_{2\ 3.5V}$.

A_{VP2} V parabola accuracy2
The output voltage at pin4 is defined as $VP_{2\ 1.9V}$.

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

A_{VP3} V parabola accuracy3
The output voltage at pin4 is defined as $VP_{2\ 2.7V}$.

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

A_{VP4} V parabola accuracy4
The output voltage at pin4 is defined as $VP_{2\ 4.3V}$.

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

A_{VP5} V parabola accuracy5
The output voltage at pin4 is defined as $VP_{2\ 5.1V}$.

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

G_{VP1} V parabola amplitude1, G_{VP2} V parabola amplitude2, G_{VP3} V parabola amplitude3
Measure the amplitude of parabola waveform at pin4 when the voltage of pin5 is 0V, 2.5V, and 4V.
When the voltage of pin5 is 4V, the amplitude of parabola waveform is defined as VP_{70Hz}.

F_{VP1} V para. freq. characteristics1

When the frequency of input signal in pin2 is 50Hz, the amplitude of parabola waveform at pin4 is defined as VP_{50Hz}.

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

F_{VP2} V para. freq. characteristics2

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

V_{VP1} V para. Vcc. characteristics1

When the voltage of pin10, 20 is 11.5V, the amplitude of parabola waveform is defined as $VP_{11.5V}$.

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

V_{VP2} V para. Vcc. characteristics2

When the voltage of pin10, 20 is 12.5V, the amplitude of parabola waveform is defined as $VP_{12.5V}$.

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

D_{VP} V para. temperature drift

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

I_2 Pin2 input current

Measure the input current to pin2 when the voltage of pin2 is 3.5V.

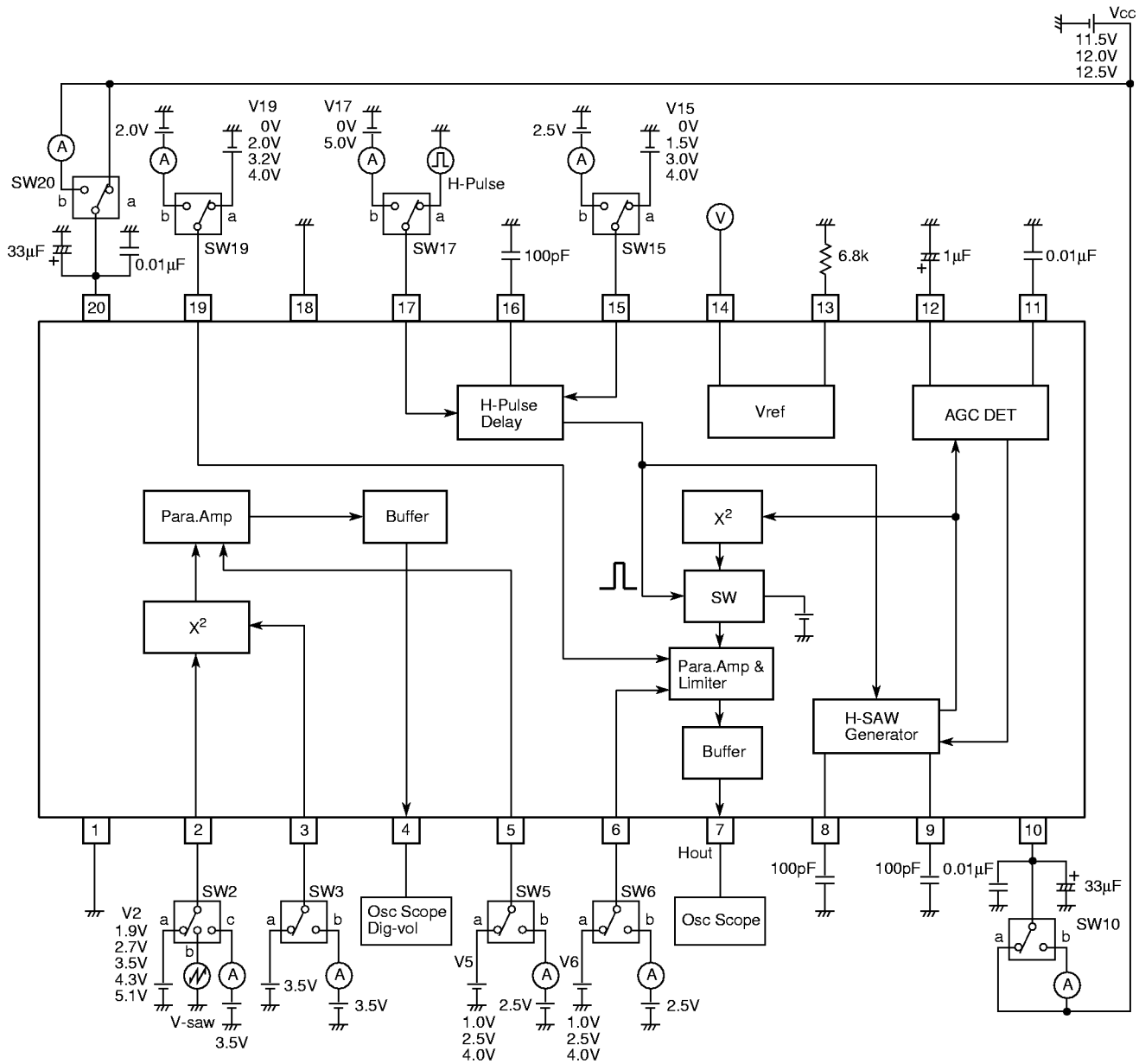
I_3 Pin3 input current

Measure the input current to pin3 when the voltage of pin3 is 3.5V.

I_5 Pin5 input current

Measure the input current to pin5 when the voltage of pin5 is 3.5V.

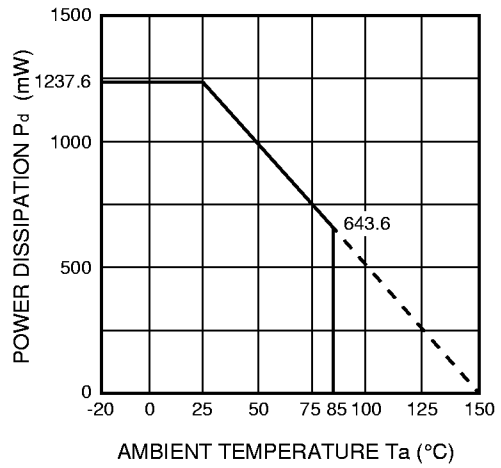
TEST CIRCUIT



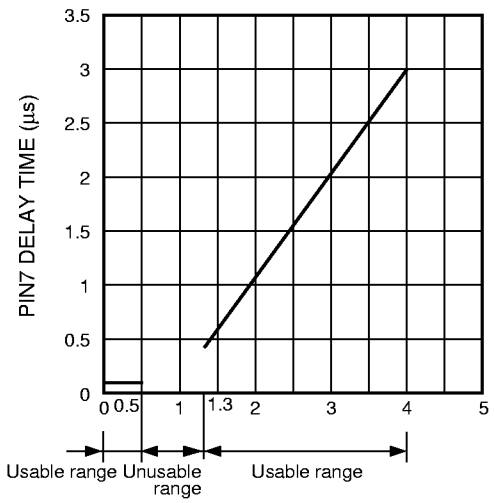
Units Resistance : Ω
Capacitance : F

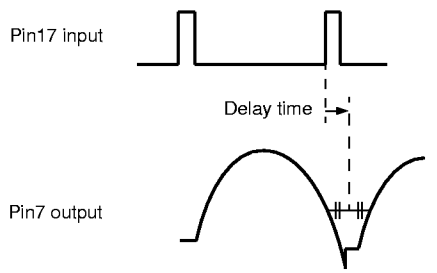
TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)

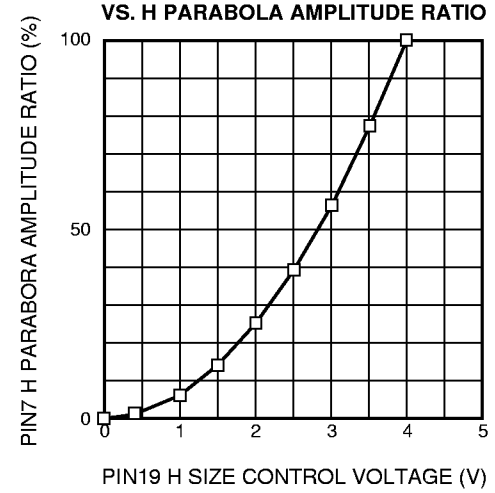


DELAY CONTROL VOLTAGE VS. DELAY TIME





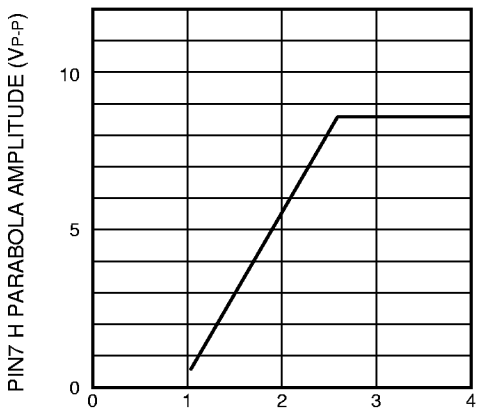
H SIZE CONTROL VOLTAGE VS. H PARABOLA AMPLITUDE RATIO



Pin6=2.5V const.

$$\text{Amplitude ratio} = \frac{\text{Pin7 output level}}{\text{Pin7 output level at pin19=4.0V}} \times 100(\%)$$

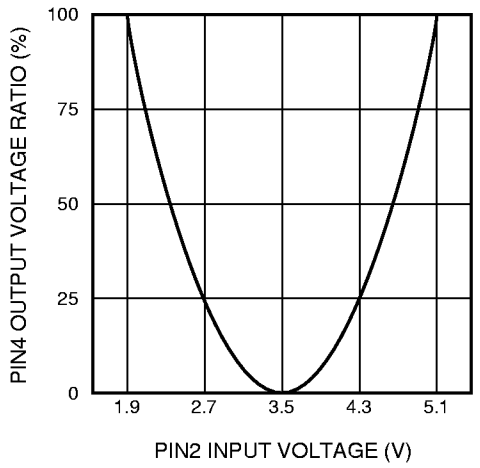
H GAIN CONTROL VOLTAGE VS. H PARABORA AMPLITUDE



8.76VP-P (Limiting level)

Pin19=4.0V const.

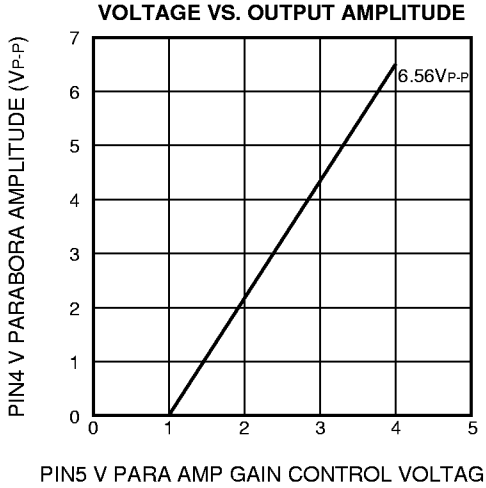
V PARA DC OUTPUT VOLTAGE RATIO



Pin3=3.5V const.
Pin5=4.0V const.

$$\text{Output ratio} = \frac{\text{Pin4out (Pin2=3.5V)-Pin4out}}{\text{Pin4out (Pin2=3.5V)-Pin4out (Pin2=1.9V)}} \times 100\ (\%)$$

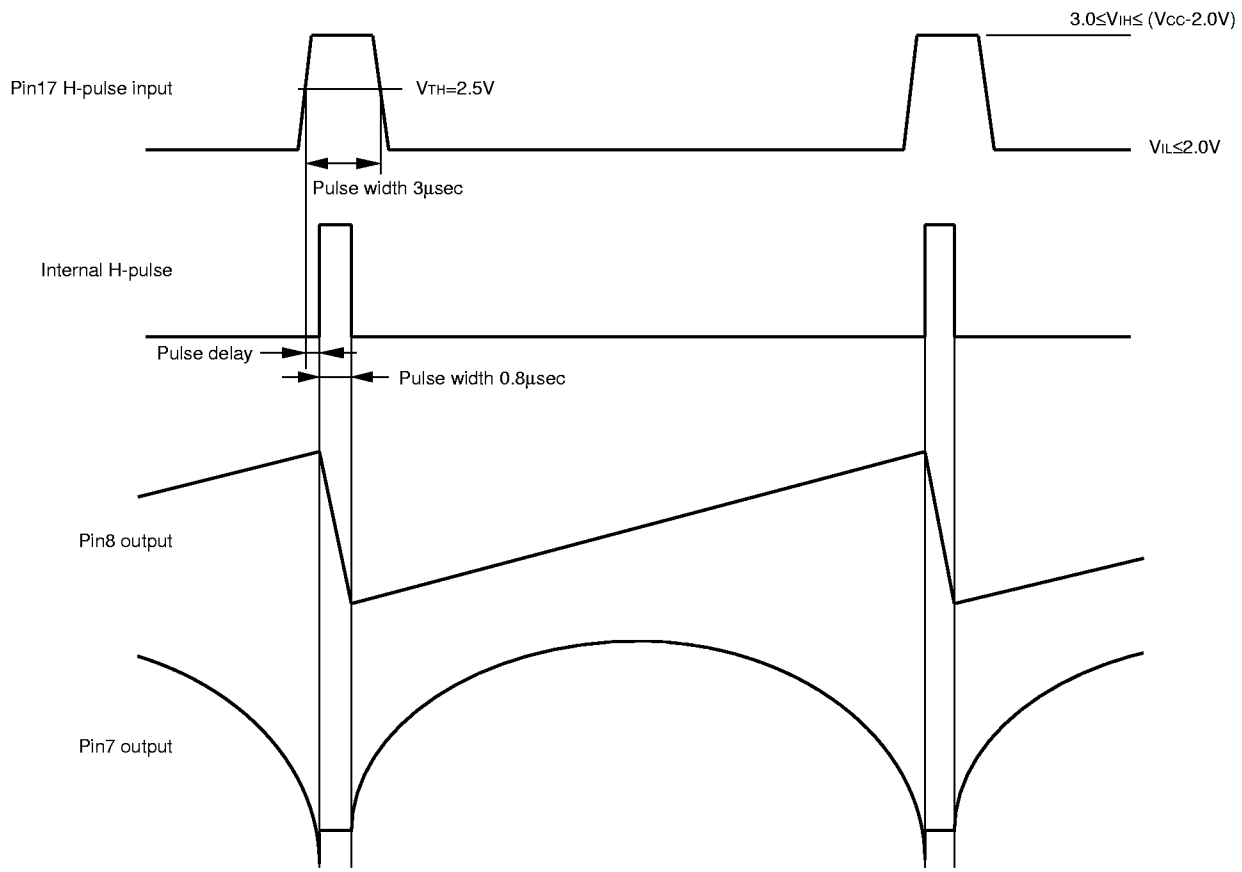
V PARA AMP GAIN CONTROL VOLTAGE VS. OUTPUT AMPLITUDE



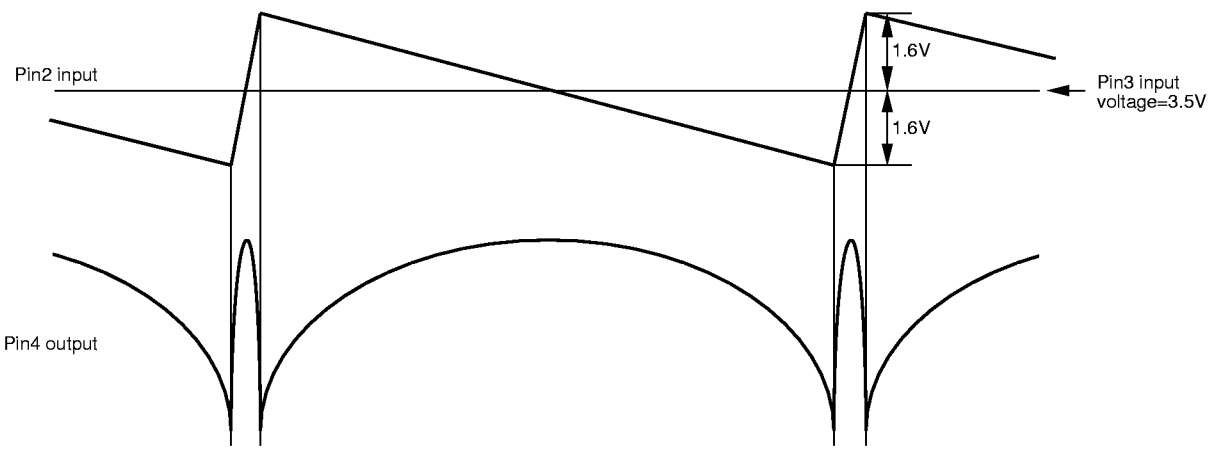
Pin2 3.2VP-P sawtooth wave input

TIMING DIAGRAM

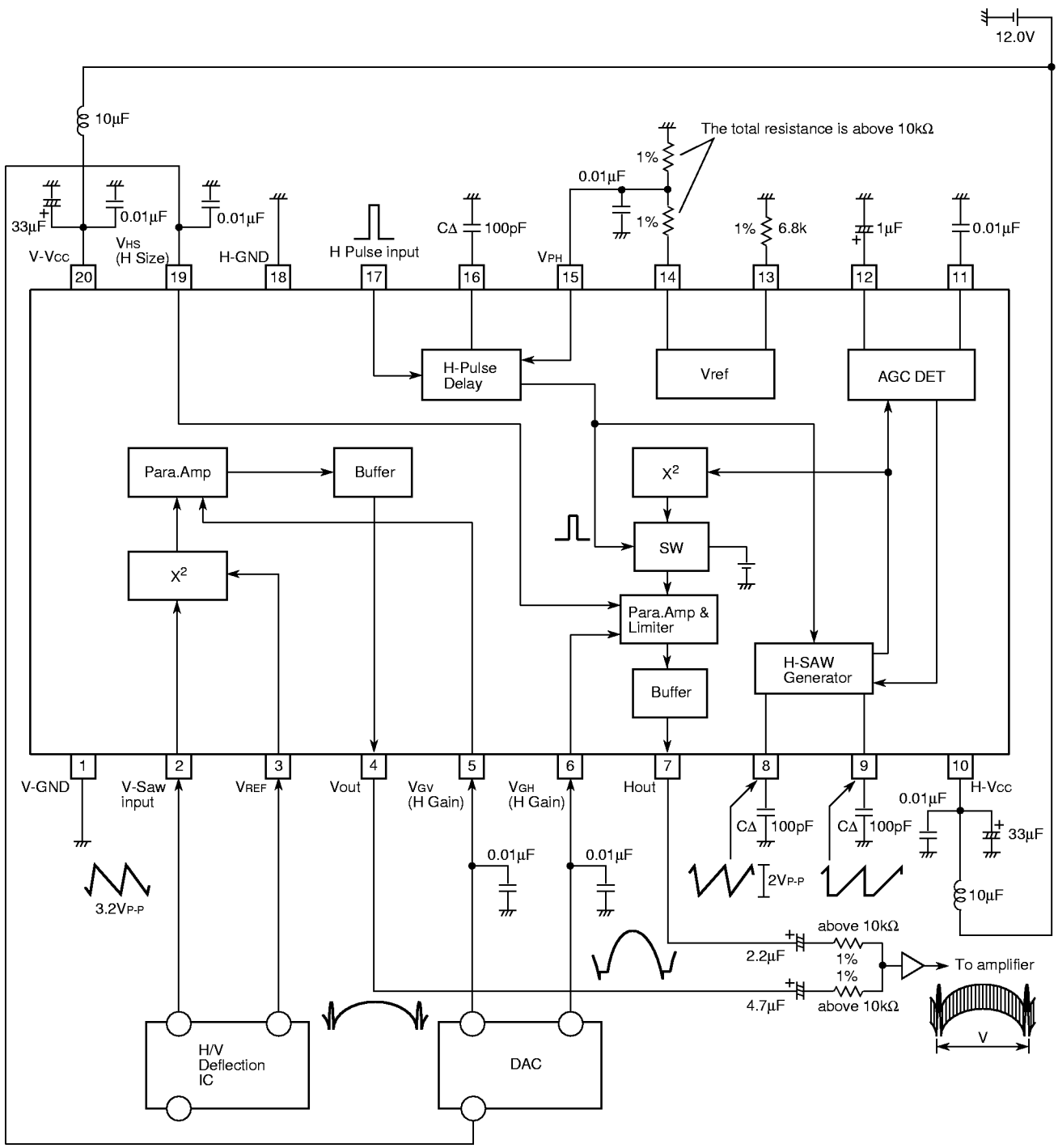
HORIZONTAL BLOCK



VERTICAL BLOCK

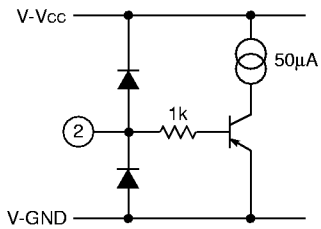
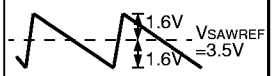
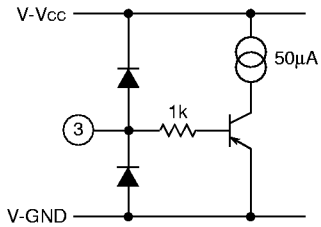
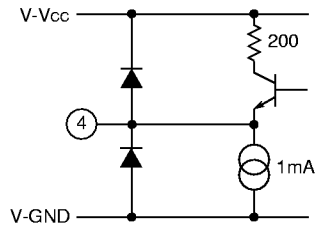
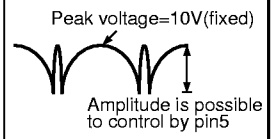
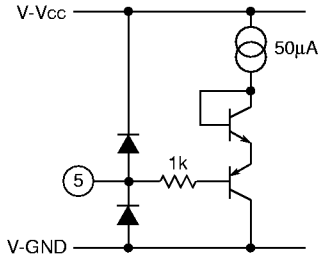
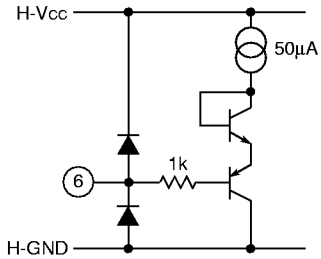


APPLICATION EXAMPLE

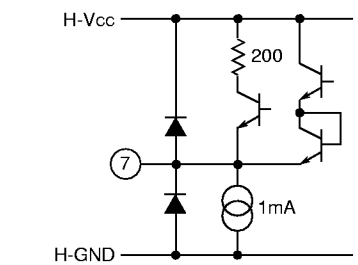
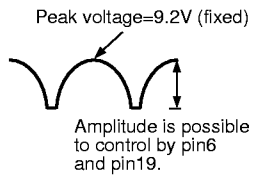
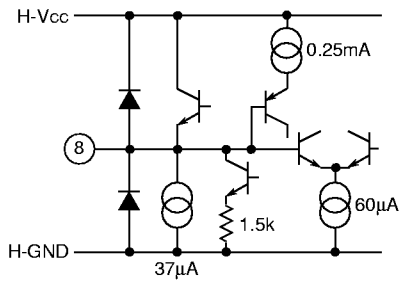
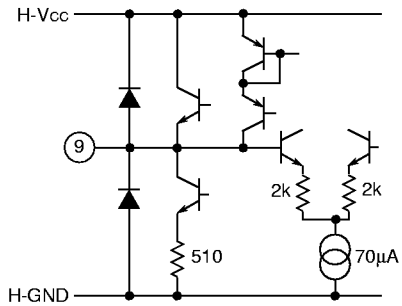
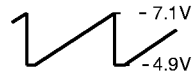
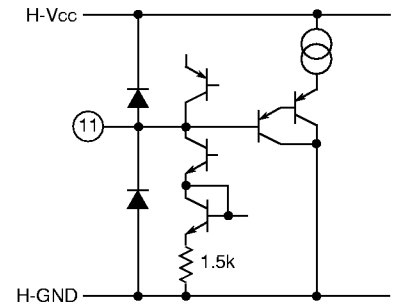


Units Resistance : Ω
Capacitance : F

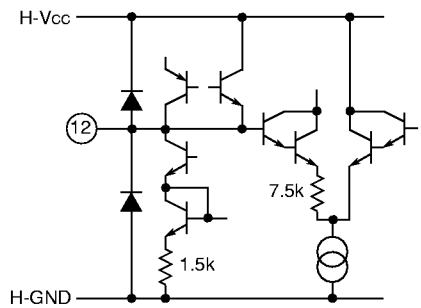
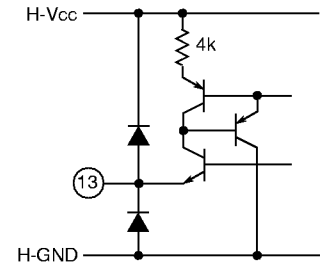
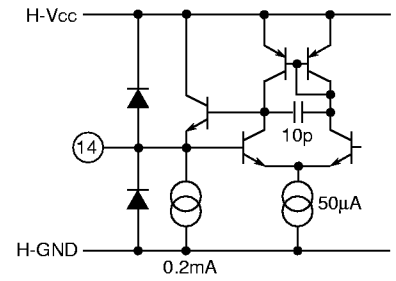
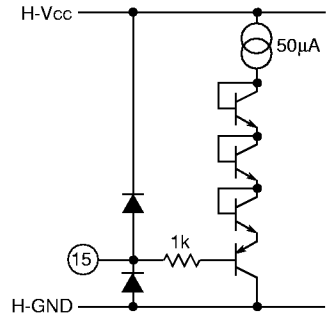
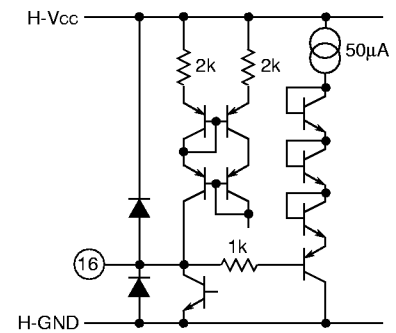
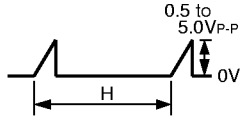
DESCRIPTION OF PIN

Pin No.	Name	DC voltage (V)	Peripheral circuit of pins	Description of function
1	V-GND	–		GND of vertical block
2	Vsawi	3.5V		Vertical sawtooth wave input pin. 
3	Vsawref	3.5V		Vertical reference voltage input pin. (3.5V)
4	Vout	10V (Peak)		Vertical parabola wave output pin. 
5	VGV	1.0 to 4.0V		Vertical parabola wave gain control voltage input pin. Input voltage range is 1.0 to 4.0V.
6	VGH	1.0 to 4.0V		Horizontal parabola wave gain control voltage input pin. Input voltage range is 1.0 to 4.0V.

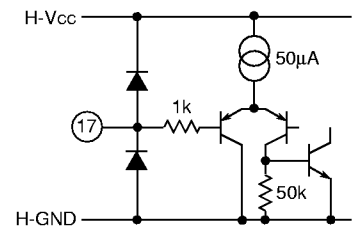
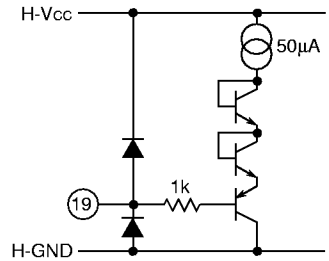
DESCRIPTION OF PIN (cont.)

Pin No.	Name	DC voltage (V)	Peripheral circuit of pins	Description of function
7	Hout	9.2V (Peak)		horizontal parabola wave output pin. 
8	Cret	7.1V (Top) 4.9V (Bottom)		Connection pin of horizontal retrace capacitor. Recommended capacitance is 100pF. 
9	Ctrc	7.1V (Top) 4.9V (Bottom)		Connection pin of horizontal trace capacitor. Recommended capacitance is 100pF. 
10	H-Vcc	12.0V		Vcc of horizontal block.
11	CAGCr	2.5V		Connection pin of horizontal sawtooth wave AGC retrace capacitor. Recommended capacitance is 0.01µF.

DESCRIPTION OF PIN (cont.)

Pin No.	Name	DC voltage (V)	Peripheral circuit of pins	Description of function
12	CAGC	4.0V		Connection pin of horizontal AGC capacitor. Recommended capacitance is 1µF.
13	VREFR	1.28V		Connection pin of reference current source resister. Recommended resistance is 6.8kΩ.
14	VREFO	7.0V		Reference voltage output for horizontal pulse delay circuit. Should be connect more than 10kΩ external resister.
15	VPH	0 to 0.5V 1.3 to 4.0V		Delay adjustment voltage input pin of horizontal pulse. Input voltage range is 1.3 to 4.0V. At 0 to 0.5V, delay is minimized. (0.5 to 1.3V is unusable range.)
16	Chpd	0V (Bottom)		Connection pin of horizontal pulse delay timing capacitor. Recommended capacitance is 100pF. 

DESCRIPTION OF PIN (cont.)

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

Fast Page Mode Write Cycle (Delayed Write)