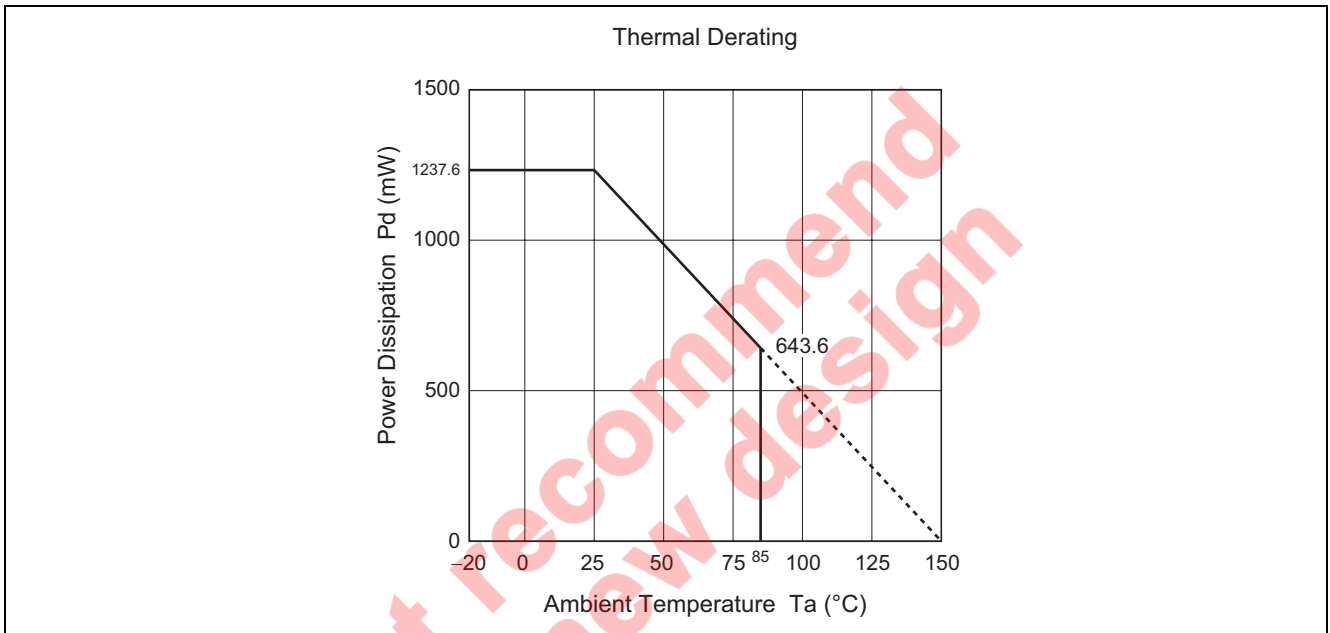


Absolute Maximum Ratings

(Ta = 25°C, Surge capacity = 200 pF)

Item	Symbol	Ratings			Unit
		Min.	Typ.	Max.	
Supply voltage	V _{CC}	—	—	13.0	V
Power dissipation	P _d	—	—	1237.6	mW
Operating temperature	T _{opr}	-20	—	+85	°C
Storage temperature	T _{stg}	-40	—	+150	°C
Recommended operating voltage	V _{opr}	—	12.0	—	V
Recommended operating voltage range	V _{opr'}	11.5	—	12.5	V
Surge	V _{surge}	±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) 2.4 V in (7) Measure (15) 3.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H-pulse high input range	V _{IH}	3.0	—	V _{CC} -2.0	V	(6) 2.4 V in (7) Measure (15) 3.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 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	0.6	0.8	1.0	μs	(6) 2.4 V in (7) Measure (15) 3.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H parabola delay 1	T _{D1}	0.1	0.3	0.5	μs	(6) 2.4 V in (7) Measure (15) 0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H parabola delay 2	T _{D2}	0.4	0.6	0.8	μs	(6) 2.4 V in (7) Measure (15) 1.3 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H parabola delay 3	T _{D3}	2.9	3.1	3.3	μs	(6) 2.4 V in (7) Measure (15) 4.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
Delay temperature drift	D _D	—	0.08	—	ns/deg	(6) 2.4 V in (7) Measure (15) 3.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
Pin 15 input current	I ₁₅	-5.0	-0.3	-0.1	μA	(17) 2.5 V in, measure	15

Electrical Characteristics (cont.)

Item	Symbol	Limits			Unit	Test Conditions	Pin No.
		Min.	Typ.	Max.			
H para. unbalance control 1	U _{HP1}	-2.6	-2.2	-1.8	V	(6) 1.8 V in (7) Measure (15) 0 V in (17) fH = 96 kHz H-pulse in (19) 5.7 V in	7
H para. unbalance control 2	U _{HP2}	0.1	0.5	0.9	V	(6) 2.4 V in (7) Measure (15) 0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H para. unbalance control 3	U _{HP3}	1.7	2.1	2.5	V	(6) 1.8 V in (7) Measure (15) 0 V in (17) fH = 96 kHz H-pulse in (19) 6.4 V in	7
H para. unbalance V _{CC} . character 1	V _{UHP1}	-0.2	0.0	0.2	V	(6) 2.4 V in (7) Measure (15) 0 V in (10) (20) 11.5 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H para. unbalance V _{CC} . character 2	V _{UHP2}	-0.2	0.0	0.2	V	(6) 2.4 V in (7) Measure (15) 0 V in (10) (20) 12.5 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H para. unbalance temperature drift	D _{UHP}	—	-2.2	—	mV/ deg	(6) 2.4 V in (7) Measure (15) 0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H para. gain control 1	G _{HP1}	0.2	0.4	0.6	V _{P-P}	(6) 1.0 V in (7) Measure (15) 3.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H para. gain control 2	G _{HP2}	2.9	3.3	3.7	V _{P-P}	(6) 2.5 V in (7) Measure (15) 3.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H para. gain control 3	G _{HP3}	5.3	6.0	6.7	V _{P-P}	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 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) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 24 kHz H-pulse in (19) 6.1 V in	7
H para. freq. characteristics 2	F _{HP2}	-0.2	0.0	0.2	V	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 120 kHz H-pulse in (19) 6.1 V in	7
H para. V _{CC} characteristics 1	V _{VHP1}	-0.2	0.0	0.2	V	(6) 4.0 V in (7) Measure (15) 3.0 V in (10) (20) 11.5 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H para. V _{CC} characteristics 2	V _{VHP2}	-0.2	0.0	0.2	V	(6) 4.0 V in (7) Measure (15) 3.0 V in (10) (20) 12.5 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
H para. size temperature drift	D _{HP}	—	-1.3	—	mV/ deg	(6) 4.0 V in (7) Measure (15) 3.0 V in (17) fH = 96 kHz H-pulse in (19) 6.1 V in	7
Pin 6 input current	I ₆	-5.0	-0.3	-0.1	μA	(6) 2.4 V in, measure	6
Pin 19 input current	I ₁₉	0.1	0.3	5.0	μA	(19) 6.1 V in, measure	19
Vertical Block							
V parabola accuracy 1	A _{VP1}	4.5	5.0	5.5	V	(2) 3.5 V in (3) 3.5 V in (4) Measure (5) 2.3 V in	4
V parabola accuracy 2	A _{VP2}	2.5	3.0	3.5	V	(2) 1.9 V in (3) 3.5 V in (4) Measure (5) 2.3 V in	4
V parabola accuracy 3	A _{VP3}	20	25	30	%	(2) 2.7 V in (3) 3.5 V in (4) Measure (5) 2.3 V in	4
V parabola accuracy 4	A _{VP4}	20	25	30	%	(2) 4.3 V in (3) 3.5 V in (4) Measure (5) 2.3 V in	4
V parabola accuracy 5	A _{VP5}	90	100	110	%	(2) 5.1 V in (3) 3.5V in (4) Measure (5) 2.3 V in	4

Electrical Characteristics (cont.)

Item	Symbol	Limits			Unit	Test Conditions	Pin No.
		Min.	Typ.	Max.			
V para. unbalance control 1	U_{VP1}	-2.8	-2.5	-2.2	V	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 2.8 V in (4) Measure (5) 1.6 V in	4
V para. unbalance control 2	U_{VP2}	-0.3	0	0.3	V	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 3.5 V in (4) Measure (5) 2.3 V in	4
V para. unbalance control 3	U_{VP3}	2.2	2.5	2.8	V	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 4.2 V in (4) Measure (5) 1.6 V in	4
V unbalance. V_{CC} . characteristics 1	V_{UVP1}	-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) 2.3 V in (10) (20) 11.5 V in	4
V unbalance. V_{CC} . characteristics 2	V_{UVP2}	-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) 2.3 V in (10) (20) 12.5 V in	4
V unbalance. temperature drift	D_{UVP}	—	0.5	—	mV/deg	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 3.5 V in (4) Measure (5) 2.3 V in	4
V parabola amplitude 1	G_{VP1}	0	0	0.3	V_{P-P}	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 3.5 V in (4) Measure (5) 1.0 V in	4
V parabola amplitude 2	G_{VP2}	2.1	2.4	2.7	V_{P-P}	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 3.5 V in (4) Measure (5) 2.0 V in	4
V parabola amplitude 3	G_{VP3}	4.2	4.7	5.2	V_{P-P}	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 3.5 V in (4) Measure (5) 3.0 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) 3.0 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) 3.0 V in	4

Electrical Characteristics (cont.)

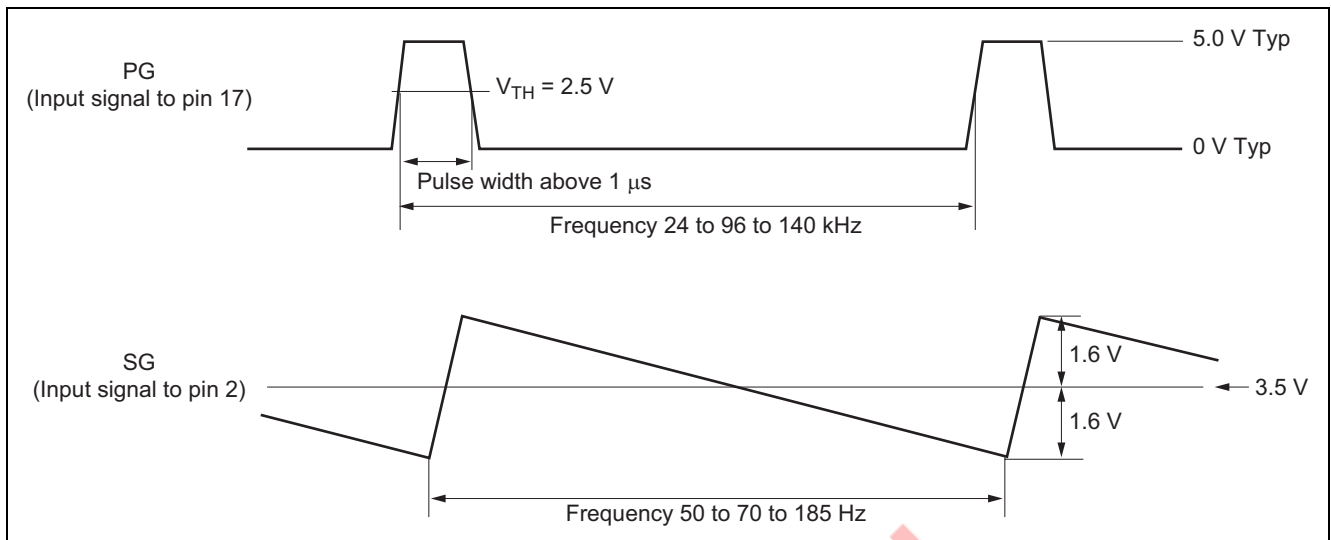
Item	Symbol	Limits			Unit	Test Conditions	Pin No.
		Min.	Typ.	Max.			
V para. V_{CC} -characteristics 1	V_{VP1}	-0.1	0.0	0.1	V	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 3.5 V in (4) Measure (5) 3.0 V in (10) (20) 11.5 V in	4
V para. V_{CC} -characteristics 2	V_{VP2}	-0.1	0.0	0.1	V	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 3.5 V in (4) Measure (5) 3.0 V in (10) (20) 12.5 V in	4
V para. temperature drift	D_{VP}	—	-2.2	—	mV/ deg	(2) $f_V = 70$ Hz, 3.2 V_{P-P} saw wave in (3) 3.5 V in (4) Measure (5) 3.0 V in	4
Pin 2 input current	I_2	-5.0	-0.3	-0.1	μA	(2) 3.5 V in, measure	2
Pin 3 input current	I_3	-5.0	-0.3	-0.1	μA	(3) 3.5 V in, measure	3
Pin 5 input current	I_5	-5.0	-0.3	-0.1	μA	(5) 2.3 V in, measure	5

Not recommended
for new design

Switch and Voltage Condition

Symbol	Switch									Voltage (V)							
	SW2	SW3	SW5	SW6	SW10	SW15	SW17	SW19	SW20	V _{CC}	V2	V3	V5	V6	V15	V17	V19
I _{CCH}	a	a	a	a	b	a	b	a	a	12.0	3.5	3.5	2.5	2.4	3.0	0	6.1
I _{CCV}	↓	↓	↓	↓	a	↓	↓	↓	b	↓	↓	↓	↓	↓	↓	↓	↓
V _{REF}	↓	↓	↓	↓	↓	↓	↓	↓	a	↓	↓	↓	↓	↓	↓	↓	↓
D _{REF}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
V _{IL}	↓	↓	↓	↓	↓	↓	a	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
V _{IH}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
I _{IL}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0	↓
I _{IH}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	5.0	↓
T _W	↓	↓	↓	↓	↓	↓	a	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
T _{D1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0	↓	↓
T _{D2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1.3	↓	↓
T _{D3}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	4.0	↓	↓
D _D	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	3.0	↓	↓
I ₁₅	↓	↓	↓	↓	↓	b	b	↓	↓	↓	↓	↓	↓	↓	↓	0	↓
U _{HP1}	↓	↓	↓	↓	↓	a	a	↓	↓	↓	↓	↓	↓	1.8	0	↓	5.7
U _{HP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	2.4	↓	↓	6.1
U _{HP3}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1.8	↓	↓	6.4
V _{UHP1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	11.5	↓	↓	↓	2.4	↓	↓	6.1
V _{UHP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	12.5	↓	↓	↓	↓	↓	↓	↓
D _{UHP}	↓	↓	↓	↓	↓	↓	↓	↓	↓	12.0	↓	↓	↓	↓	↓	↓	↓
G _{HP1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1.0	3.0	↓	↓
G _{HP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	2.5	↓	↓	↓
G _{HP3}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	4.0	↓	↓	↓
F _{HP1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
F _{HP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
V _{VHP1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	11.5	↓	↓	↓	↓	↓	↓	↓
V _{VHP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	12.5	↓	↓	↓	↓	↓	↓	↓
D _{HP}	↓	↓	↓	↓	↓	↓	↓	↓	↓	12.0	↓	↓	↓	↓	↓	↓	↓
I ₆	↓	↓	↓	b	↓	↓	b	↓	↓	↓	↓	↓	↓	↓	0	↓	↓
I ₁₉	↓	↓	↓	a	↓	↓	↓	b	↓	↓	↓	↓	↓	2.4	↓	↓	↓
A _{VP1}	↓	↓	↓	↓	↓	↓	↓	a	↓	↓	↓	↓	↓	↓	↓	↓	6.1
A _{VP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1.9	↓	↓	↓	↓	↓	↓
A _{VP3}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	2.7	↓	↓	↓	↓	↓	↓
A _{VP4}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	4.3	↓	↓	↓	↓	↓	↓
A _{VP5}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	5.1	↓	↓	↓	↓	↓	↓
U _{VP1}	b	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	2.8	1.6	↓	↓	↓	↓
U _{VP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	3.5	2.3	↓	↓	↓	↓
U _{VP3}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	4.2	1.6	↓	↓	↓	↓
V _{UVP1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	11.5	↓	3.5	2.3	↓	↓	↓	↓
V _{UVP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	12.5	↓	↓	↓	↓	↓	↓	↓
D _{UVP}	↓	↓	↓	↓	↓	↓	↓	↓	↓	12.0	↓	↓	↓	↓	↓	↓	↓
G _{VP1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1.0	↓	↓	↓
G _{VP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	2.0	↓	↓	↓
G _{VP3}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	3.0	↓	↓	↓
F _{VP1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
F _{VP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
V _{VP1}	↓	↓	↓	↓	↓	↓	↓	↓	↓	11.5	↓	↓	↓	↓	↓	↓	↓
V _{VP2}	↓	↓	↓	↓	↓	↓	↓	↓	↓	12.5	↓	↓	↓	↓	↓	↓	↓
D _{VP}	c	↓	↓	↓	↓	↓	↓	↓	↓	12.0	↓	↓	↓	↓	↓	↓	↓
I ₂	a	b	↓	↓	↓	↓	↓	↓	↓	↓	3.5	↓	2.3	↓	↓	↓	↓
I ₃	a	a	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
I ₅	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

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

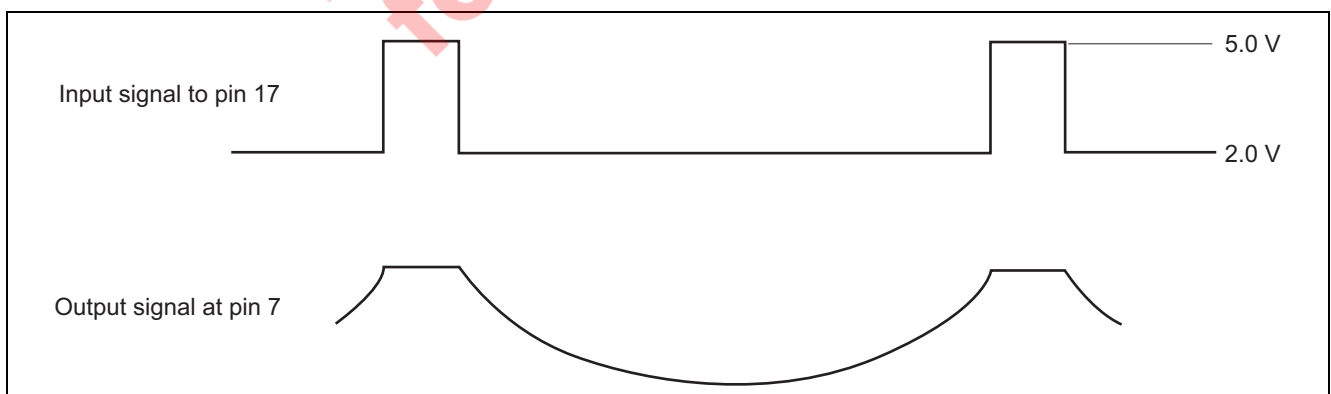
Measure the output voltage at pin 14.

D_{REF} Reference Voltage Temperature Drift

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

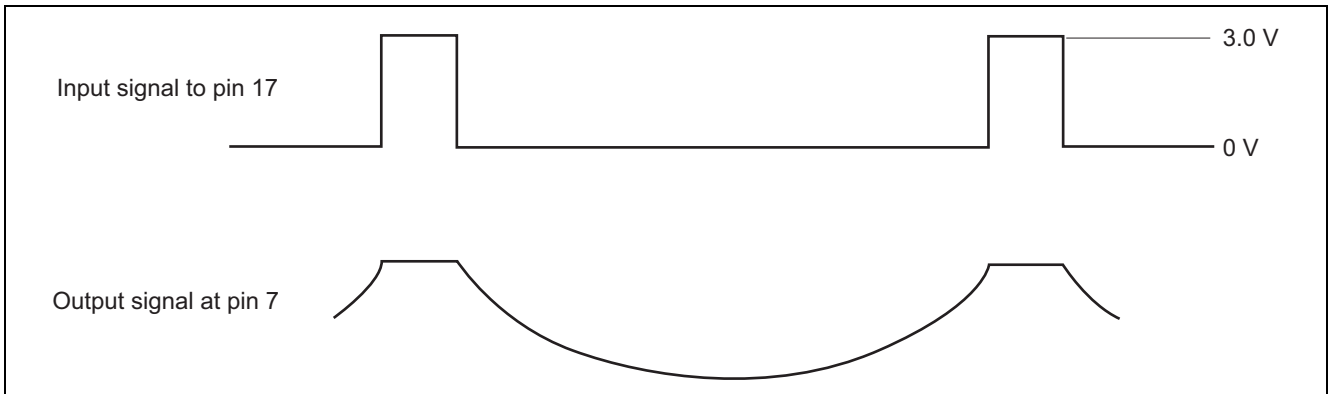
V_{IL} H-pulse Low Input Range

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



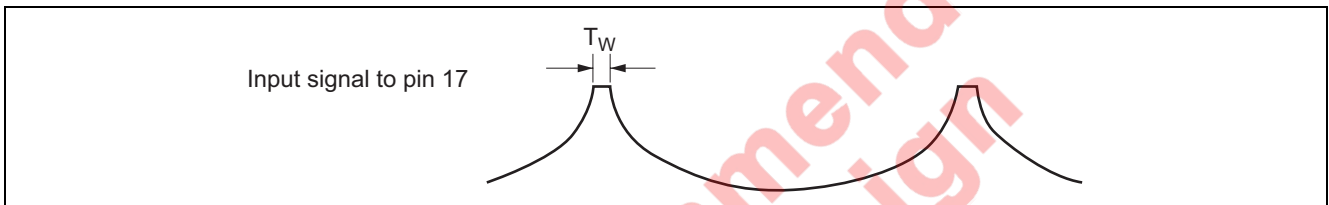
V_{IH} H-pulse High Input Range

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



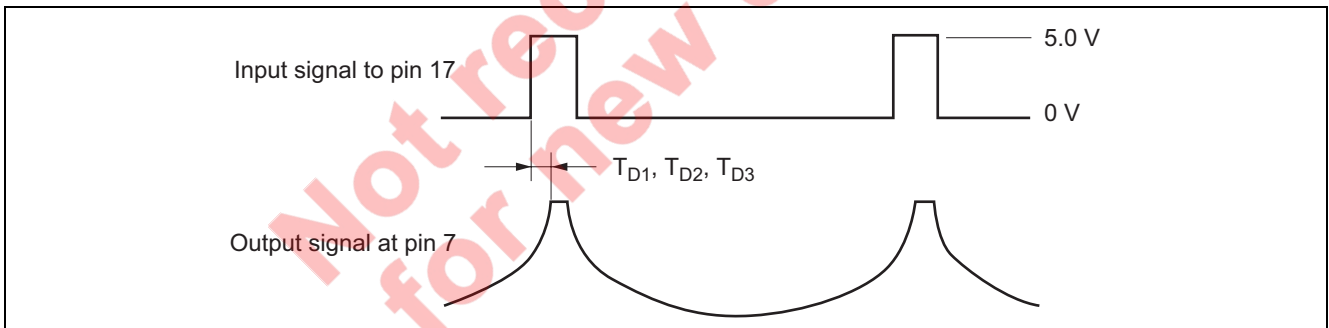
T_W H Parabola Width

Measure the time width of retrace period at pin 7.



T_{D1}, T_{D2}, T_{D3} H Parabola Delay

Measure the delay time from rise time of input signal to start of retrace period of output signal when the voltage of pin 15 is 0 V, 1.3 V, and 4 V.



D_D Delay Temperature Drift

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

I₁₅ Pin 15 Input Current

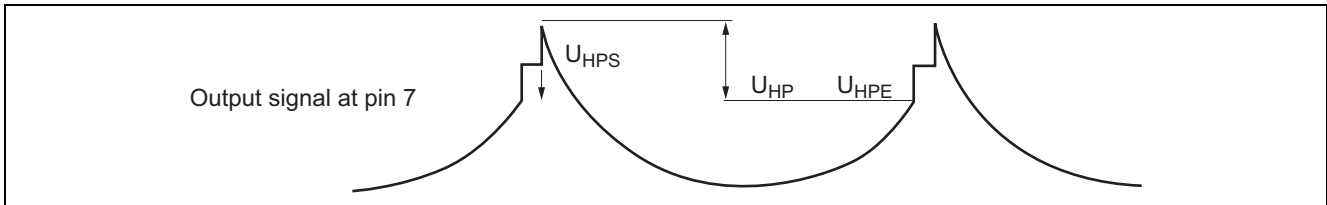
Measure the input current to pin 15 when the voltage of pin 15 is 2.5 V.

U_{HP1} , U_{HP2} , U_{HP3} H para. Unbalance Control

U_{HPS} is defined as the voltage of parabola start point. U_{HPE} is defined as the voltage of parabola end point. U_{HP1} , U_{HP2} , U_{HP3} is defined as follows

$$U_{HP1}, U_{HP2}, U_{HP3} = U_{HPS} - U_{HPE}$$

Measure the unbalance of parabola waveform at pin 4 when the voltage of pin 19 is 5.7 V, 6.1 V, and 6.4 V. Pin 6 is controlled so that the amplitude of parabola is 3 $V_{p,p}$ constant.

 **V_{UHP1} H para. Unbalance V_{CC} . Characteristics1**

When the supply voltage of pin 10, 20 is 11.5 V, the unbalance of parabola waveform at pin 7 is defined as $U_{HP11.5V}$.

$$V_{UHP1} = U_{HP2} - U_{HP11.5V}$$

 V_{UHP2} H para. Unbalance V_{CC} . Characteristics2

When the supply voltage of pin 10, 20 is 12.5 V, the unbalance of parabola waveform at pin 7 is defined as $U_{HP12.5V}$.

$$V_{UHP2} = U_{HP2} - U_{HP12.5V}$$

 D_{UHP} H para. Unbalance Temperature Drift

Measure temperature drift of U_{HP2} . (-20°C to 85°C)

 G_{HP1} H Para. Gain Control1

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

 G_{HP2} H Para. Gain Control2

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

 G_{HP3} H Para. Gain Control3

The amplitude of parabola waveform at pin 7 is defined as $HP_{-6, 4.0V}$.

 F_{HP1} H Para. Freq. Characteristics1

When the frequency of input signal in pin 17 is 96 kHz, the amplitude of parabola waveform at pin 7 is defined as $HP_{96\text{ kHz}}$. When the frequency of input signal is 24 kHz, the amplitude of parabola waveform is defined as $HP_{24\text{ kHz}}$.

$$F_{HP1} = HP_{96\text{ kHz}} - HP_{24\text{ kHz}}$$

 F_{HP2} H Para. Freq. Characteristics2

When the frequency of input signal in pin 17 is 140 kHz, the amplitude of parabola waveform at pin 7 is defined as $HP_{120\text{ kHz}}$.

$$F_{HP2} = HP_{96\text{ kHz}} - HP_{140\text{ kHz}}$$

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

When the supply voltage of pin 10, 20 is 12.0 V, the amplitude of parabola waveform at pin 7 is defined as HP_{12.0 V}.
When the supply voltage is 11.5 V, the amplitude of parabola waveform is defined as HP_{11.5 V}.

$$V_{VHP1} = HP_{12.0 V} - HP_{11.5 V}$$

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}.

$$V_{VHP2} = HP_{12.0 V} - HP_{12.5 V}$$

D_{HP} H Para. Size Temperature Drift

Measure the temperature drift of HP_{96 kHz}. (−20°C to 85°C)

I₆ Pin 6 Input Current

Measure the input current to pin 6 when voltage of pin 6 is 2.4 V.

I₁₉ Pin 19 Input Current

Measure the input current to pin 19 when voltage of pin 19 is 6.1 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}.

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

A_{VP3} V Parabola Accuracy3

The output voltage at pin 4 is defined as VP_{-2, 2.7 v}.

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

A_{VP4} V Parabola Accuracy4

The output voltage at pin 4 is defined as VP_{-2, 4.3 v}.

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

A_{VP5} V Parabola Accuracy5

The output voltage at pin 4 is defined as VP_{-2, 5.1 v}.

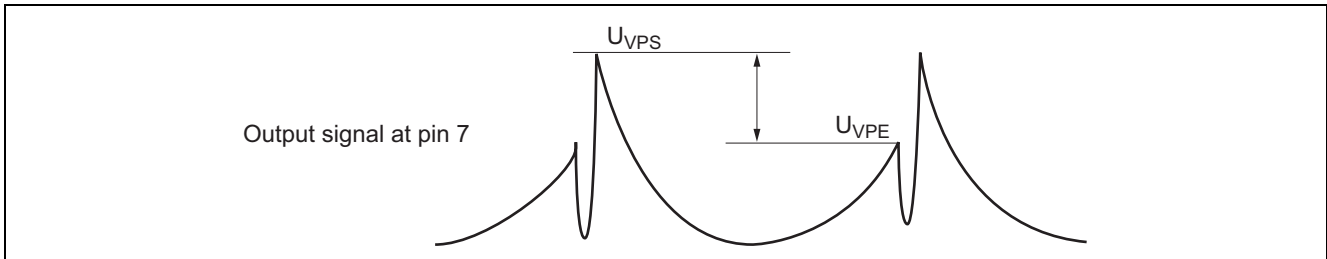
$$A_{VP5} = \frac{VP_{-2, 5.1 V} - VP_{-2, 3.5 V}}{VP_{-2, 1.9 V} - VP_{-2, 3.5 V}} \times 100 (\%)$$

U_{VP1} , U_{VP2} , U_{VP3} V Para. Unbalance Control

U_{VPS} is defined as the voltage of parabola start point. U_{VPE} is defined as the voltage of parabola end point. U_{VP1} , U_{VP2} , U_{VP3} is defined as follows

$$U_{VP1}, U_{VP2}, U_{VP3} = U_{VPS} - U_{VPE}$$

Measure the unbalance of parabola waveform at pin 4 when the voltage of pin 3 is 2.8 V, 3.5 V, and 4.2 V. Pin 5 is controlled so that the amplitude of parabola is 3 $V_{p,p}$ constant.

 **V_{UVP1} V Unbalance V_{CC} . Characteristics1**

When the supply voltage of pin 10, 20 is 11.5 V, the unbalance of parabola waveform at pin 4 is defined as $U_{VP11.5V}$.

$$V_{UHP1} = U_{VP2} - U_{VP11.5V}$$

 V_{UVP2} V Unbalance V_{CC} . Characteristics2

When the supply voltage of pin 10, 20 is 12.5 V, the unbalance of parabola waveform at pin 4 is defined as $U_{VP12.5V}$.

$$V_{UVP2} = U_{VP2} - U_{VP12.5V}$$

 D_{UVP} V Unbalance Temperature Drift

Measure temperature drift of U_{VP2} (-20°C to 85°C)

 G_{VP1} , G_{VP2} , G_{VP3} V Parabola Amplitude

Measure the amplitude of parabola waveform at pin 4 when the voltage of pin 5 is 1 V, 2 V, and 3 V.

 F_{VP1} V Para. Freq. Characteristics1

When the frequency of input signal in pin 2 is 70 Hz, the amplitude of parabola waveform at pin 4 is defined as $VP_{70\text{ Hz}}$. When the frequency of input signal is 50 Hz, the amplitude of parabola waveform is defined as $VP_{50\text{ Hz}}$.

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

 F_{VP2} V Para. Freq. Characteristics2

When the frequency of input signal in pin 2 is 185 Hz, the amplitude of parabola waveform at pin 4 is defined as $VP_{185\text{ Hz}}$.

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

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

When the voltage of pin 10, 20 is 12.0 V, the amplitude of parabola waveform is defined as $VP_{12.0V}$. When the voltage is 11.5 V, the amplitude of parabola waveform is defined as $VP_{11.5V}$.

$$V_{VP1} = VP_{12.0V} - VP_{11.5V}$$

 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 $VP_{12.5V}$.

$$V_{VP2} = VP_{12.0V} - VP_{12.5V}$$

D_{VP} V Para. Temperature Drift

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

I₂ Pin 2 Input Current

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

I₃ Pin 3 Input Current

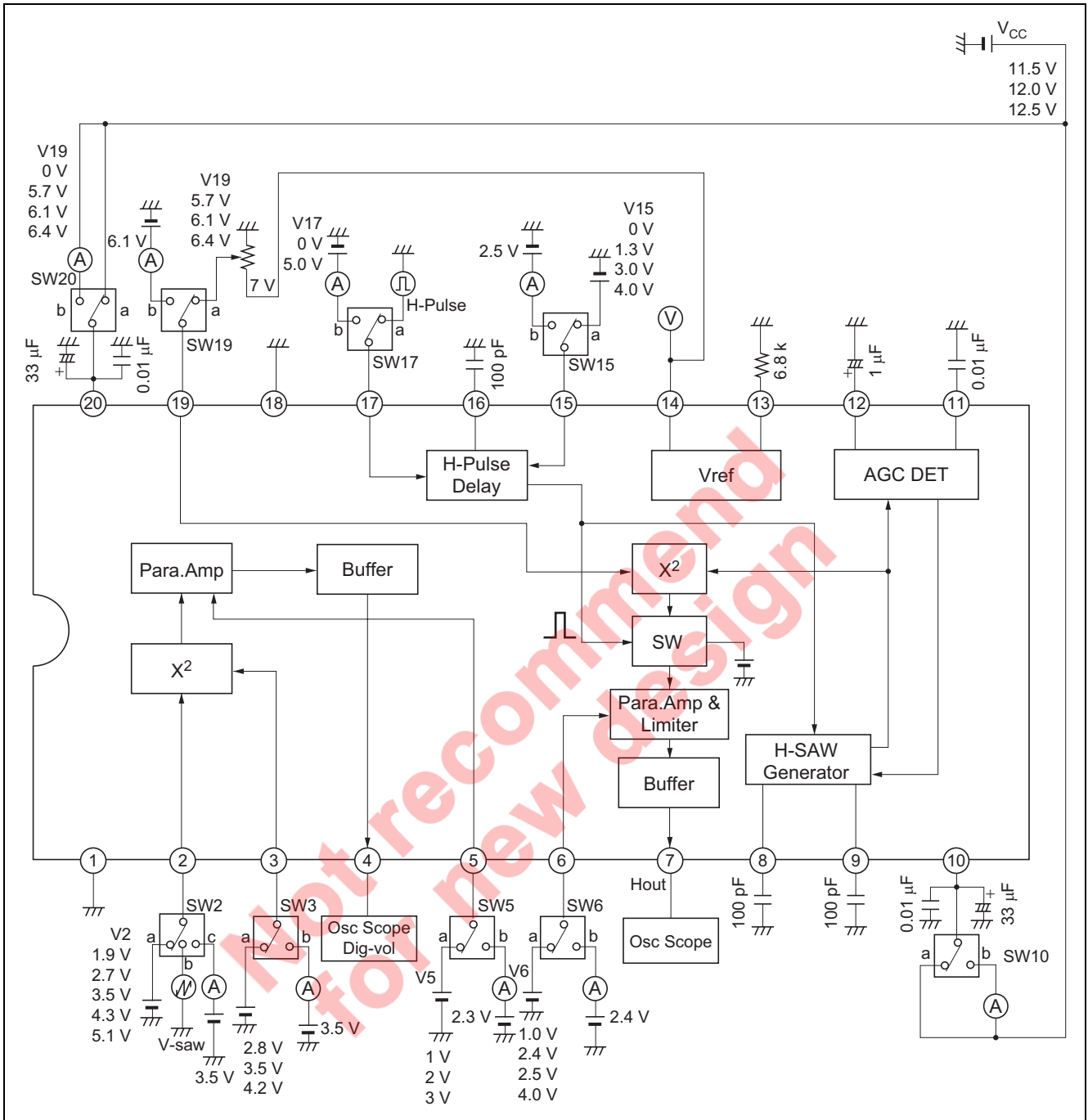
Measure the input current to pin 3 when the voltage of pin 3 is 3.5 V.

I₅ Pin 5 Input Current

Measure the input current to pin 5 when the voltage of pin 5 is 2.4 V.

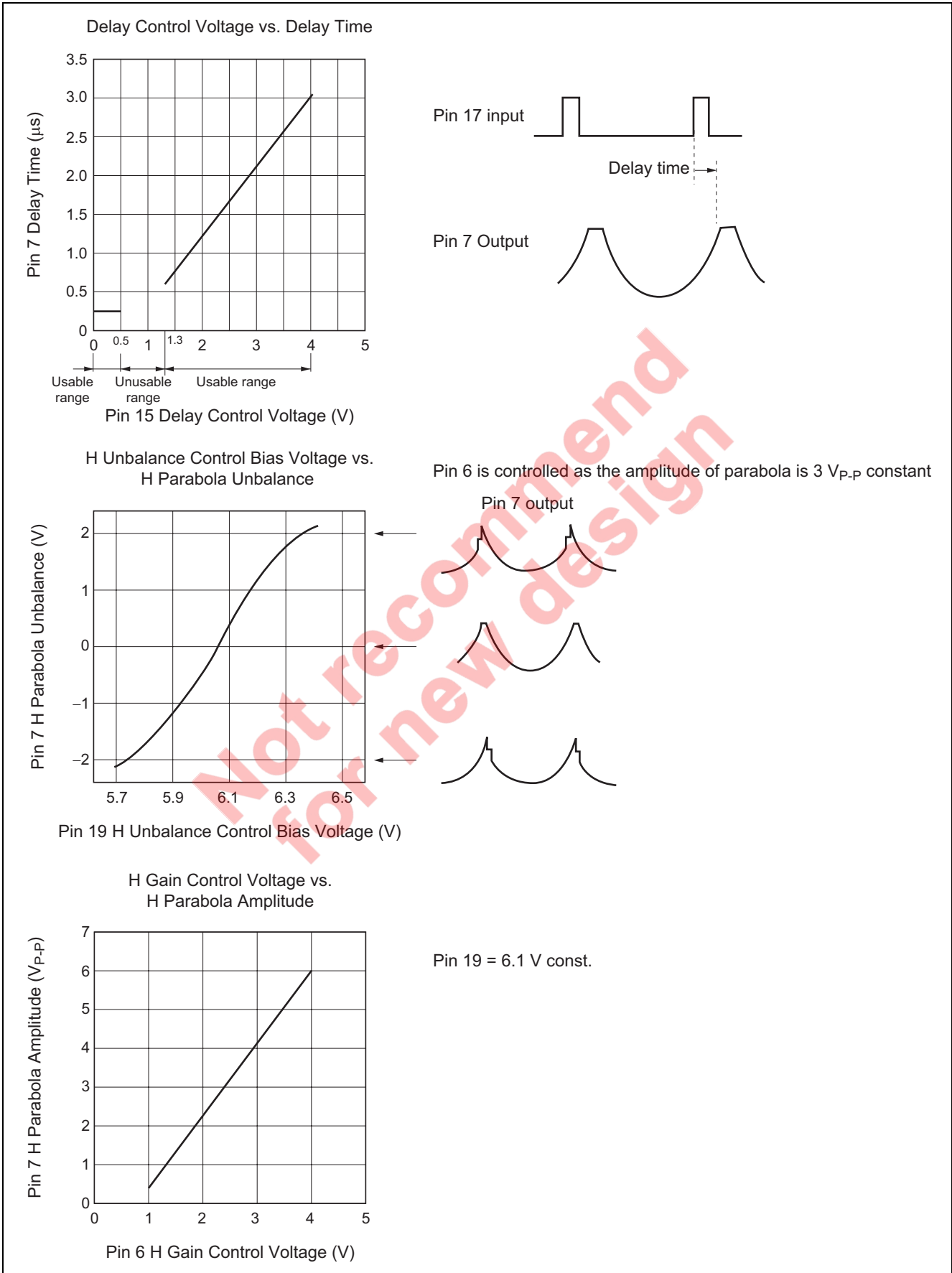
Not recommend
for new design

Test Circuit

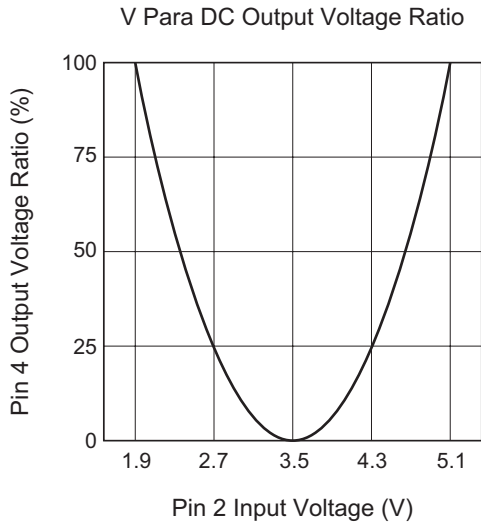


Typical Characteristics

Horizontal Block

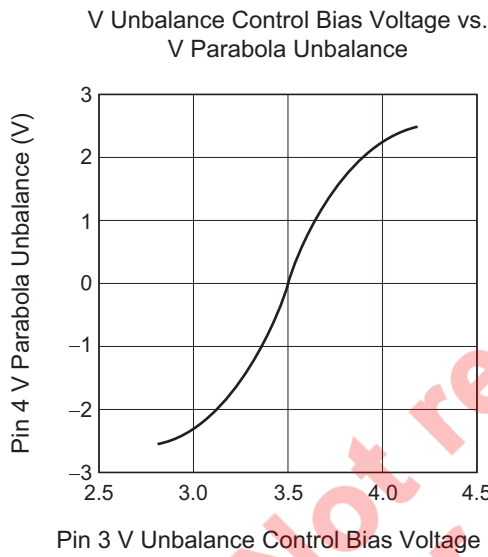


Vertical Block



Pin 3 = 3.5 V const.
Pin 5 = 2.3 V const.

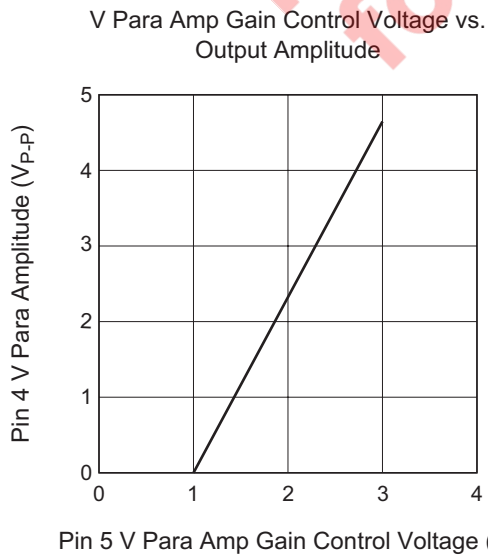
$$\text{Output ratio} = \frac{\text{Pin 4out} - \text{Pin 4out@Pin 4} = 3.5 \text{ V}}{\text{Pin 4out@Pin 2} = 1.9 \text{ V} - \text{Pin 4out@Pin 2} = 3.5 \text{ V}} \times 100 (\%)$$



Pin 5 is controlled as the amplitude of parabola is 3 V_{P-P} constant



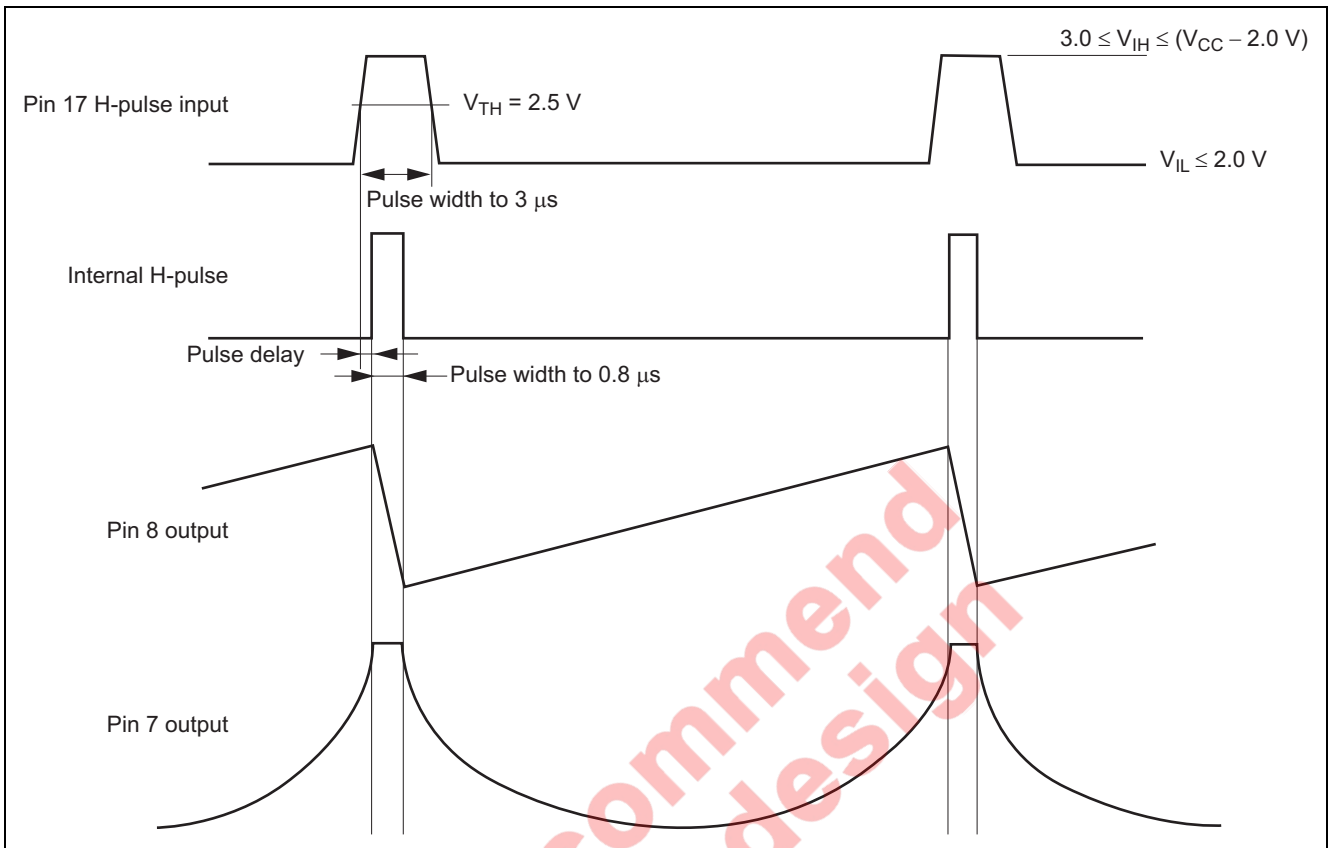
Pin 3 V Unbalance Control Bias Voltage (V)



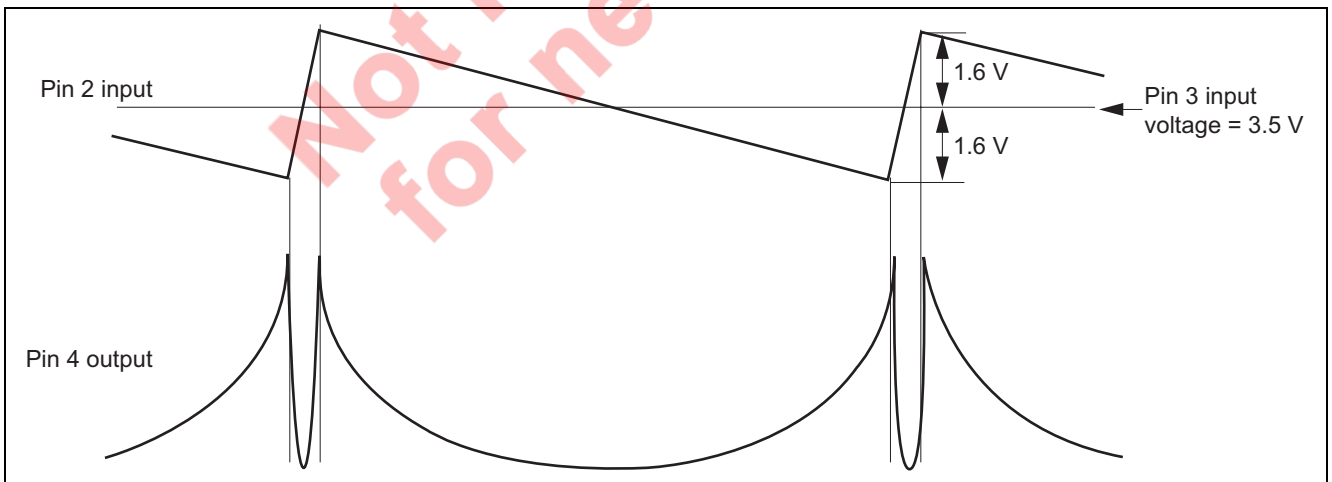
Pin 2 3.2 V_{P-P} sawtooth wave input

Timing Chart

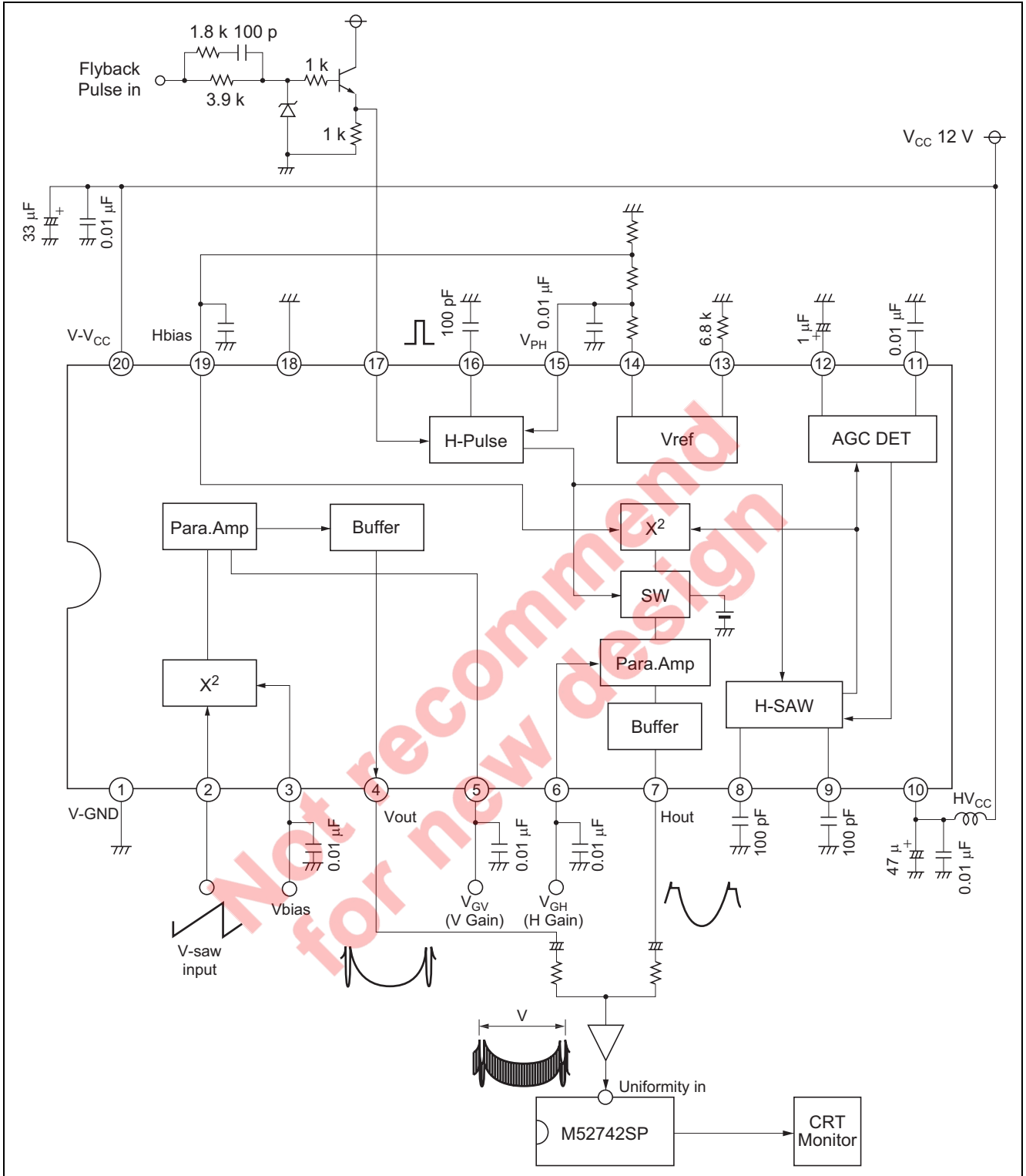
Horizontal Block

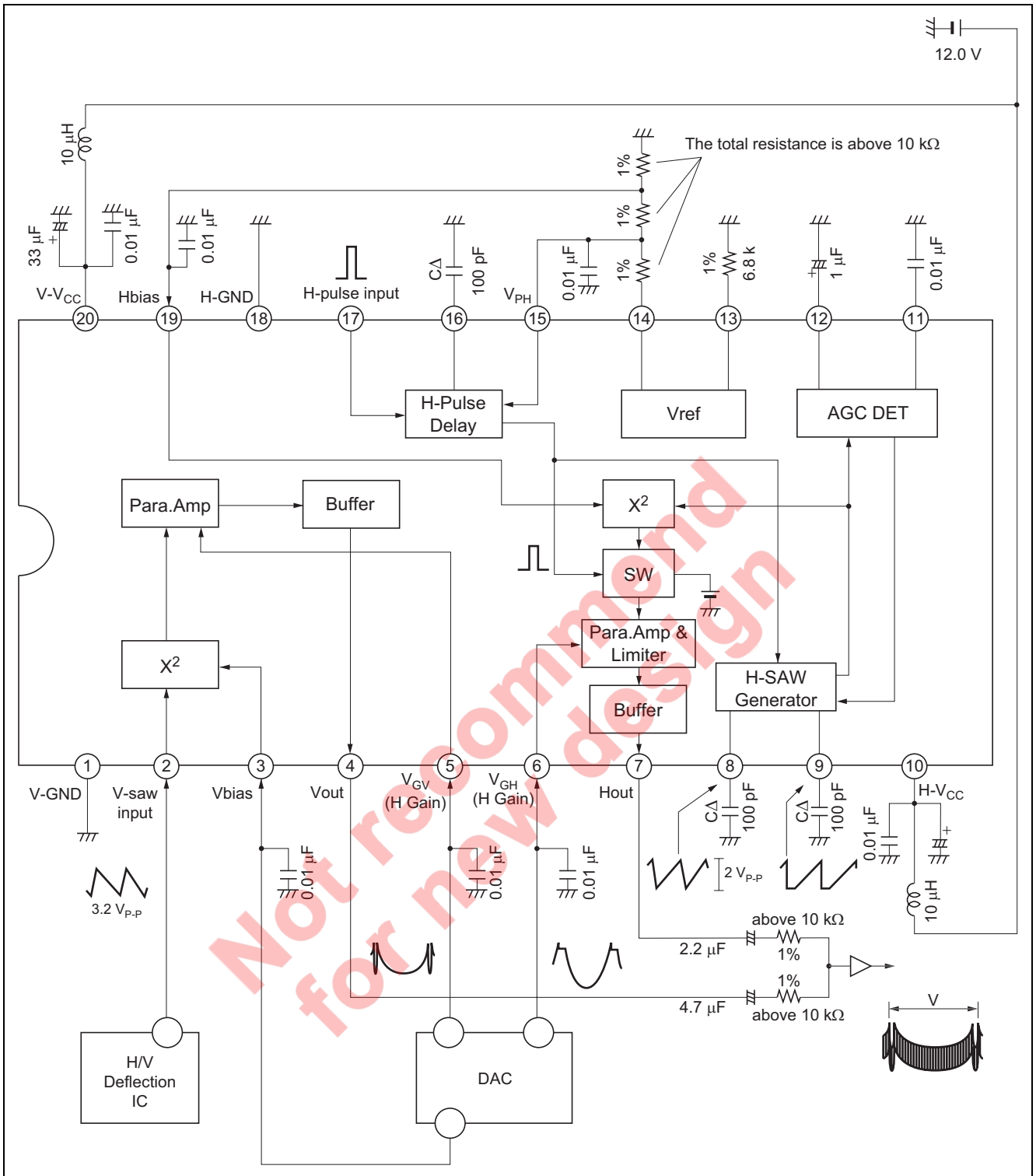


Vertical Block



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.
3	Vbias	2.8 to 4.2 V		Vertical parabola unbalance control bias voltage input pin. Input voltage range is 2.8 to 4.2 V
4	Vout	5 V (Bottom)		Vertical parabola wave output pin. Amplitude is possible to control by pin 5
5	V _{Gv}	1.0 to 3.0 V		Vertical parabola wave gain control voltage input pin. Input voltage range is 1.0 to 3.0 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	2.4 to 9.2 V		Horizontal parabola wave output pin. Amplitude is possible to control by pin 6
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 _{CC}	12.0 V	—	V _{CC} of horizontal block.
11	C _{AGCr}	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 _{AGC}	4.0 V		<p>Connection pin of horizontal AGC capacitor.</p> <p>Recommended capacitance is 1 μF.</p>
13	V _{refr}	1.28 V		<p>Connection pin of reference current source resistor.</p> <p>Recommended resistance is 6.8 kΩ.</p>
14	V _{refo}	7.0 V		<p>Reference voltage output for horizontal pulse delay circuit.</p> <p>Should be connect more than 10 kΩ external resistor.</p>
15	V _{PH}	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>

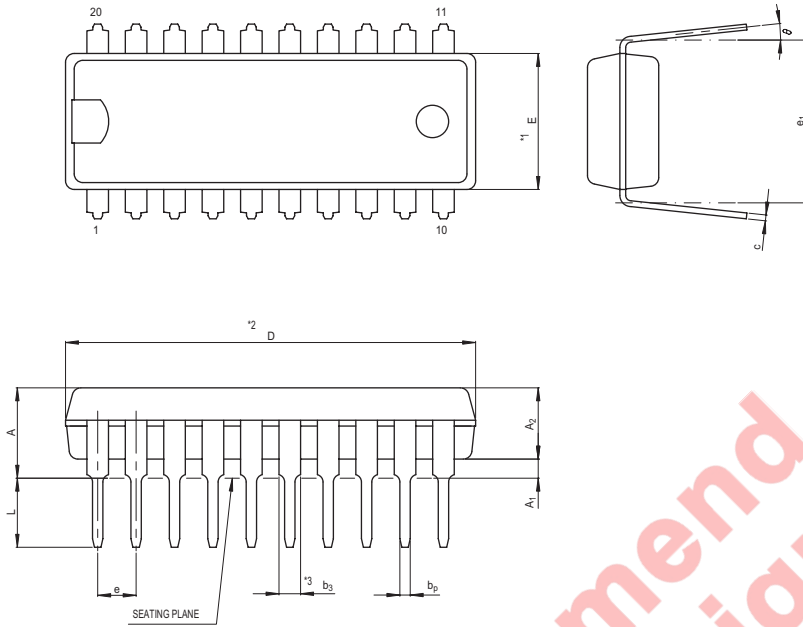
Pin Description (cont.)

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 $V_{CC} = 12$ V)
18	H-GND	—	—	GND of horizontal block
19	Hbias	5.7 to 6.4 V		Horizontal parabola unbalance control bias voltage input pin. Input voltage range is 5.7 to 6.4 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
θ	0°	—	15°
e	1.528	1.778	2.028
L	3.0	—	—

Not recommend for new design

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