SONY

CXD2011Q

Digital Comb filter

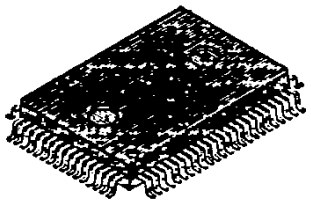
Description

The CXD2011Q is an adaptive comb filter compatible with both NTSC and PAL systems and provides good Y/C separation capability.

Features

- Y/C separation by adaptive processing
- Has two built-in 1H delay lines
- Under the PAL system, a comb filter can be easily realized by combined use of the CXD2011Q with a CXK1202S or CXK1203Q.
- Clock 4fsc, 8-bit configuration

80 pin QFP (Plastic)



Structure

Silicon gate CMOS IC

Application

Y/C separation for color TV and VCR

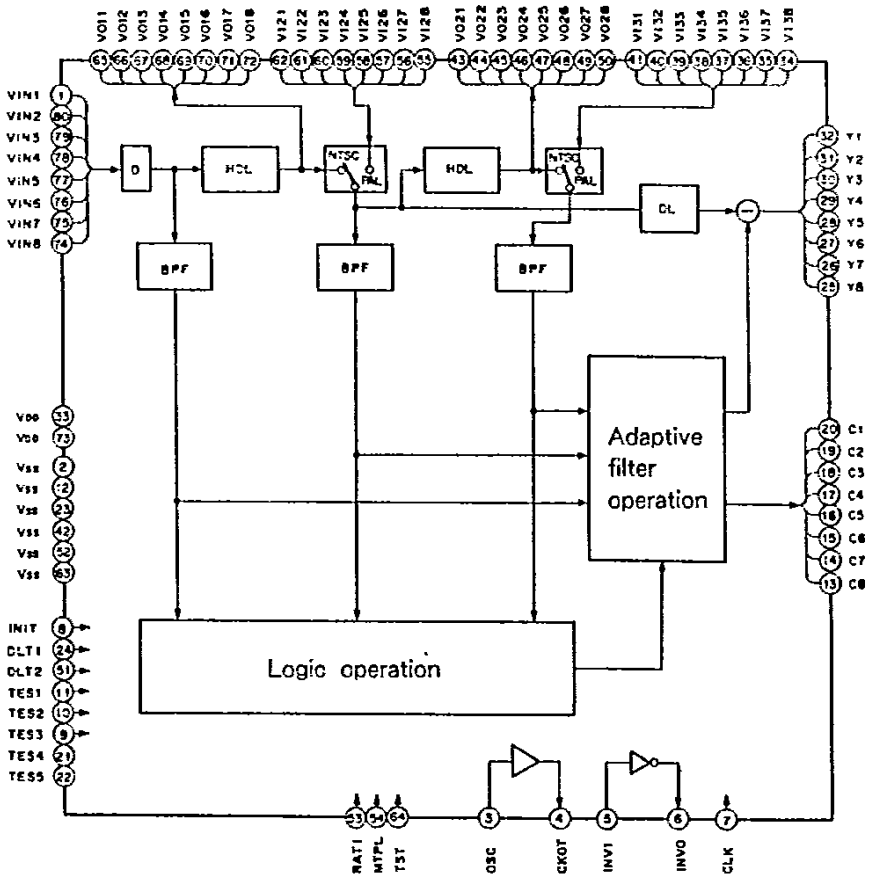
Absolute Maximum Ratings (Ta=25℃, Vss=0V)

• Supply voltage	V_{DD}	Vss–0.5 to +7.0	V
• Input voltage	V_I	Vss–0.5 to V_{DD}+0.5	V
• Output voltage	V_O	Vss–0.5 to V_{DD}+0.5	V
• Operating temperature	Topr	–20 to +75	℃
• Storage temperature	Tstg	–55 to +150	℃

Recommended Operating Conditions

• Supply voltage	V_{DD}	4.5 to 5.5	V
• Operating temperature	Topr	–20 to +75	℃

Block Diagram



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Pin Description

Pin No.	Symbol	I/O	Description
1	VIN7	I	Composite signal input (MSB)
2	Vss	——	GND
3	OSC	I	Clock amplifier input
4	CKOT	O	Clock amplifier output
5	INVI	I	Inverter input
6	INVO	O	Inverter output
7	CLK	I	Clock input
8	INIT	I	Test pins to be set at L level
9	TES3	I	
10	TES2	I	
11	TES1	I	
12	Vss	——	GND
13	C0	O	(LSB)
14	C1	O	Chrominance signal output
15	C2	O	
16	C3	O	
17	C4	O	
18	C5	O	
19	C6	O	
20	C7	O	(MSB)
21	TES4	O	Test pins to be open
22	TES5	O	
23	Vss	——	GND
24	DLT1	I	Test pin to be set at L level
25	Y0	O	(LSB)
26	Y1	O	Luminance signal
27	Y2	O	
28	Y3	O	
29	Y4	O	
30	Y5	O	
31	Y6	O	
32	Y7	O	(MSB)
33	V_{DD}	——	+5V

Pin No.	Symbol	I/O	Description
34	VI30	I	(LSB)
35	VI31	I	
36	VI32	I	
37	VI33	I	Under the PAL system, the signals which are VO20 through 27 delayed 1H by external line memory are to be input.
38	VI34	I	
39	VI35	I	
40	VI36	I	
41	VI37	I	(MSB)
42	Vss	—	GND
43	VO27	O	(MSB)
44	VO26	O	
45	VO25	O	
46	VO24	O	Built-in line memory output 2
47	VO23	O	
48	VO22	O	
49	VO21	O	
50	VO20	O	(LSB)
51	DLT2	I	Test pin to be set at L level
52	Vss	—	GND
53	RATI	I	Internal coefficient switchover: "L" for NTSC, "H" for PAL
54	NTPL	I	NTSC/PAL switchover: "L" for NTSC, "H" for PAL
55	VI20	I	(LSB)
56	VI21	I	
57	VI22	I	
58	VI23	I	Under the PAL system, the signals which are VO10 through 17 delayed 1H by external line memory are to be input.
59	VI24	I	
60	VI25	I	
61	VI26	I	
62	VI27	I	(MSB)
63	Vss	—	GND
64	TST	I	Test pin to be set at L level

Pin No.	Symbol	I/O	Description
65	VO17	O	(MSB)
66	VO16	O	
67	VO15	O	
68	VO14	O	Built-in line memory output 1
69	VO13	O	
70	VO12	O	
71	VO11	O	
72	VO10	O	(LSB)
73	V_{DD}	—	+5V
74	VIN0	I	(LSB)
75	VIN1	I	
76	VIN2	I	
77	VIN3	I	Composite video signal input
78	VIN4	I	
79	VIN5	I	
80	VIN6	I	

Electrical Characteristics

1) DC Characteristics

(V_{DD}=5V ± 10%, Vss=0V, Topr=–20 to +75℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply current	I_{DD}	Clock 14.3MHz *1	—	—	60	mA
H level output voltage	V_{OH}	I_{OH}=–2mA	V_{DD}–0.5	—	V_{DD}	V
		I_{OH}=–4mA *2	V_{DD}–0.5	—	V_{DD}	V
L level output voltage	V_{OL}	I_{OL}=4mA	Vss	—	0.4	V
		I_{OL}=8mA *2	Vss	—	0.4	V
H level input voltage	V_{IH}	TTL level	2.5	—	V_{DD}	V
		CMOS level *3	V_{DD} × 0.7	—	V_{DD}	V
L level input voltage	V_{IL}	TTL level	Vss	—	0.5	V
		CMOS level *3	Vss	—	V_{DD} × 0.3	V

*1) V_{IH}=V_{DD}, V_{IL}=Vss
*2) Applicable to Pins 4 and 6
*3) Applicable to Pin 5

2) Input/Output Capacity

(V_{DD}=V_I=0V, f_M=1MHz)

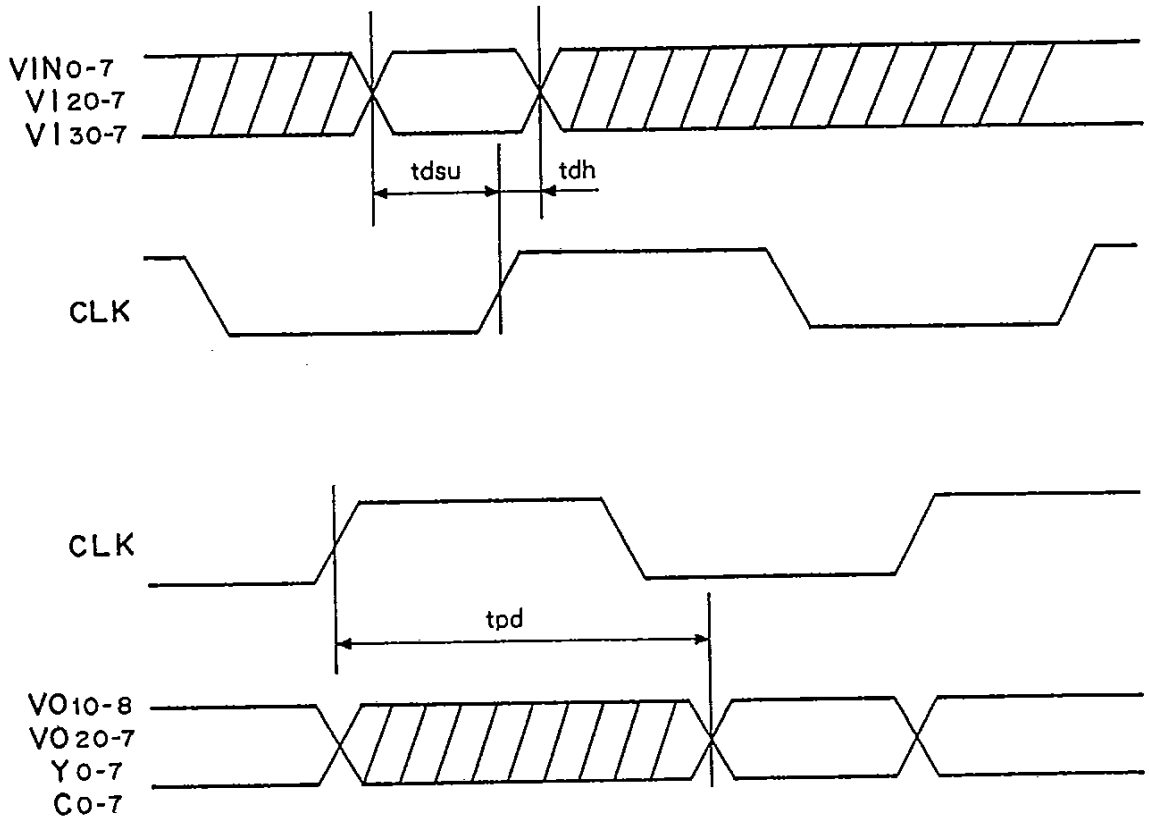
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Input pin	C_{IN}	Ta=25℃	—	—	9	pF
Output pin	C_{OUT}	Ta=25℃	—	—	11	pF

3) AC Characteristics

(V_{DD}=5V ± 10%, Vss=0V, Topr=–20 to +75℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Setup time for VIN0 to 7 CLK	tdsu		15	—	—	ns
Hold time for VIN0 to 7 CLK	tdh		5	—	—	ns
Setup time for VI20 to 27 CLK	tdsu		20	—	—	ns
Hold time for VI20 to 27 CLK	tdh		5	—	—	ns
Setup time for VI30 to 37 CLK	tdsu		15	—	—	ns
Hold time for VI30 to 37 CLK	tdh		5	—	—	ns
Time from when CLK is input to when VO10 to 17 data is set	tpd	C_L=20pF	—	—	45	ns
Time from when CLK is input to when VO20 to 27 data is set	tpd	C_L=20pF	—	—	45	ns
Time from when CLK is input to when Y0 to 7 data is set	tpd	C_L=20pF	—	—	45	ns
Time from when CLK is input to when C0 to 7 data is set	tpd	C_L=20pF	—	—	45	ns
CLK frequency	f		14	—	18	MHz

AC Characteristics Timing Chart



Description of Functions

The CXD2011Q is an NTSC and PAL compatible digital Y/C separation IC which offers higher performance than the conventional line comb, thanks to adaptive (two-dimensional) processing. Two-dimensional processing, compared with three-dimensional processing, makes it possible to get a lower cost system.

In the case of NTSC, the conventional simple line comb always produces an error in the vertical non-correlated portion, because it calculates non-correlated signals together as shown in Fig. 1. In order to minimize the possibility of calculating non-correlated signals together, two line combs are provided for Y/C separation of signals of a line. One of the line combs (referred to as the upper line comb for the sake of convenience) is for calculation of signals of the line and the one above the line, whereas the other line comb (referred to as the lower line comb for the sake of convenience) is for calculation of signals of the line and the one below the line. These two line combs are separately used to ensure calculation of correlated signals together.

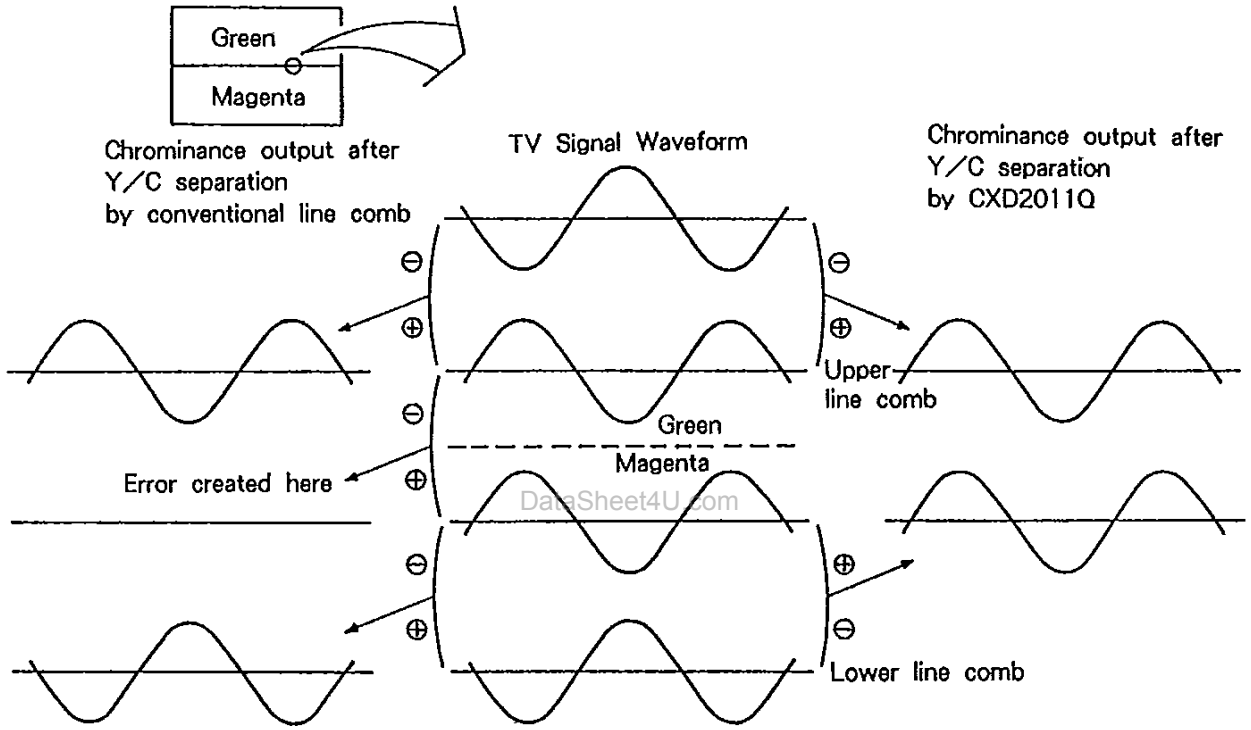


Fig. 1.

When only a line for example is colored as shown in Fig. 2, an error occurs in both the upper and lower line combs. In the case of signals like this where the vertical frequency is high but the horizontal frequency is low, the bandpass and trap are used for Y/C separation.

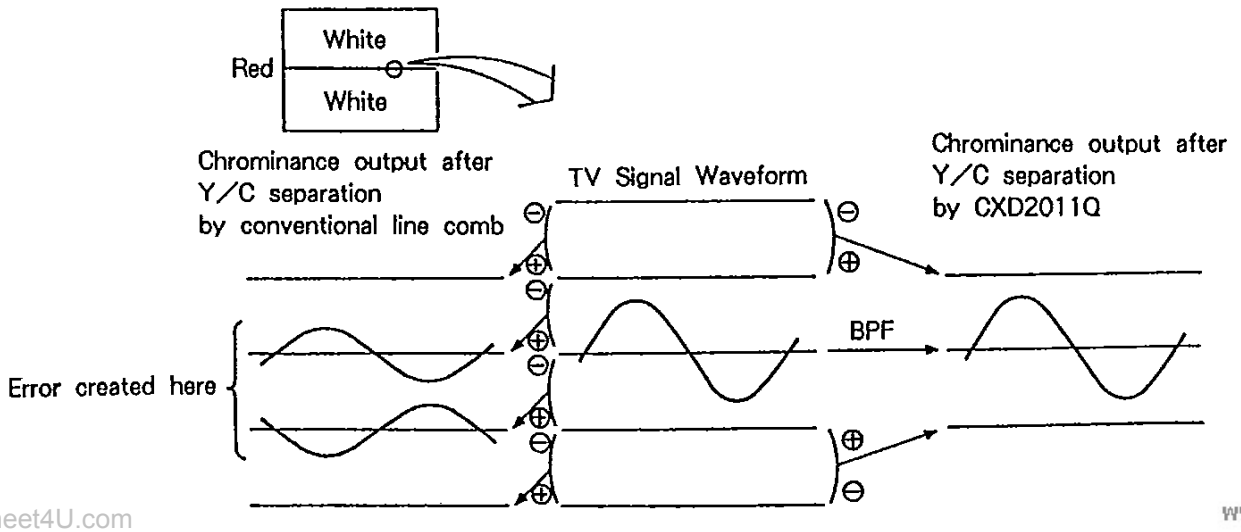


Fig. 2.

When both the vertical and horizontal frequencies are high and vertical correlation strong, the 2H comb output derived by averaging the upper and lower comb outputs is used.

In this manner the upper comb, lower comb, 2H comb or BPF output whichever is an optimum output is selected on the basis of signal correlation, thereby assuring much higher accuracy in Y/C separation than by the conventional line comb.

In addition, digital implementation eliminates ringing, etc. that used to occur in the conventional glass delay line.

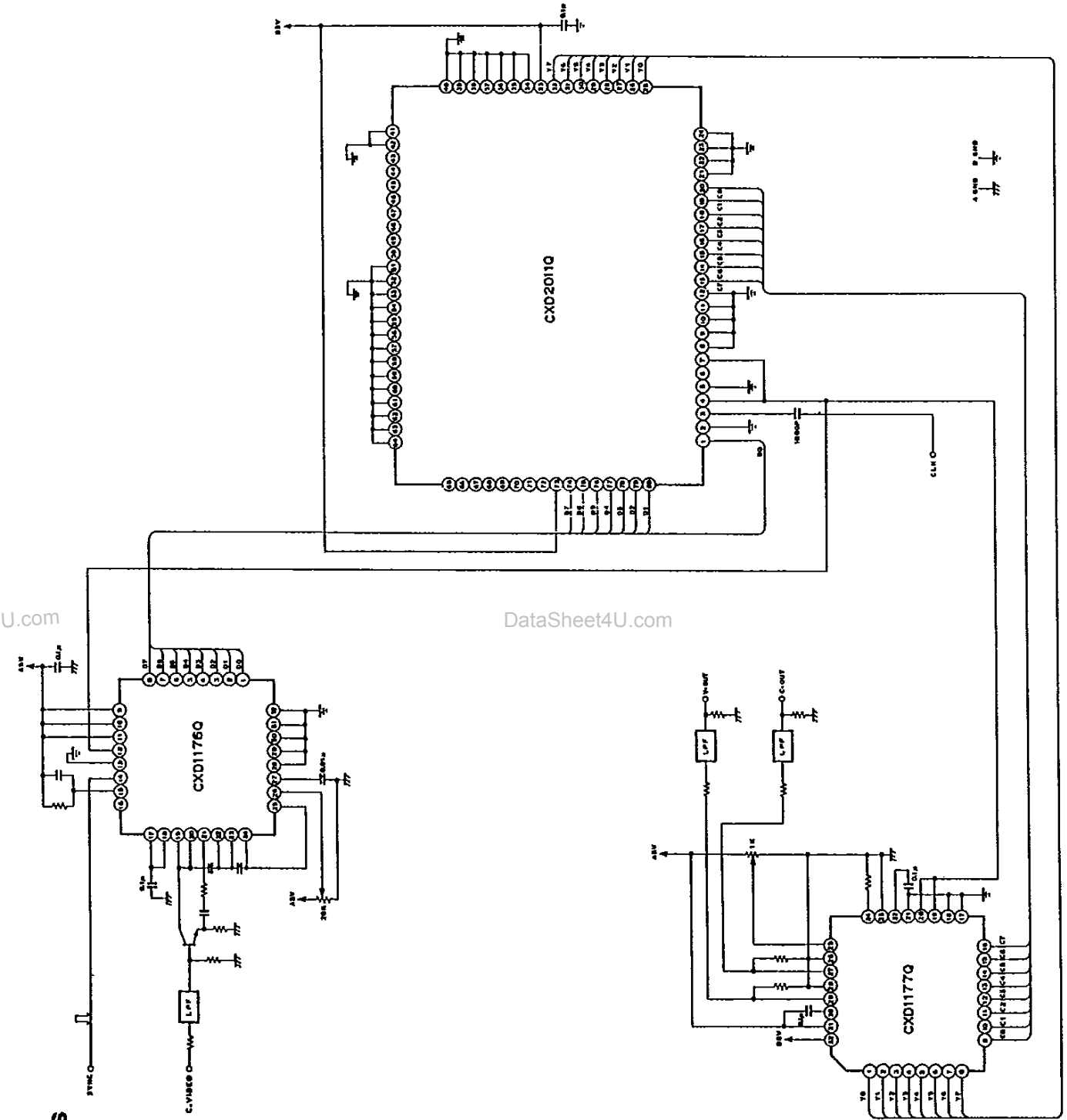
In the case of PAL, Y/C separation by use of the conventional BPF and trap presented problems such as considerable cross color and poor frequency response. These problems can be solved by use of the CXD2011Q without causing any side effects.

Summary of Advantages Offered by CXD2011Q

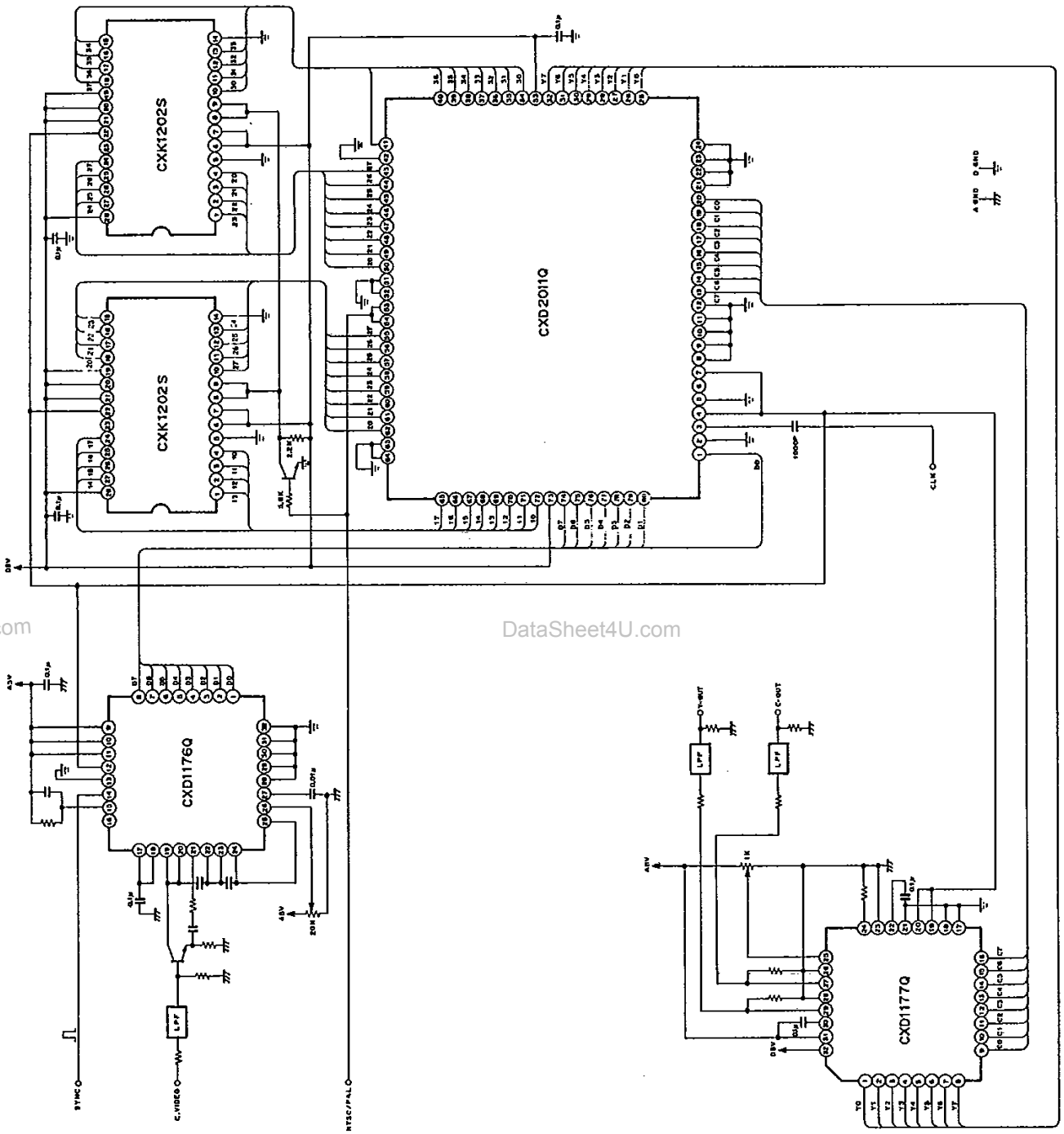
(1) Accomplishes Y/C separation with much higher accuracy than the conventional line comb.
(2) Helps reduce the number of parts in sets because of compatibility with both NTSC and PAL.
(3) Reduces cross colors and improves the frequency response in the PAL system.
(4) Digital implementation eliminates ringing, etc. encountered in the glass delay line.
(5) Reduces the load on the manufacturing line because there is no need for comb adjustments.

Application Circuits

For NTSC



Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.



For NTSC/PAL

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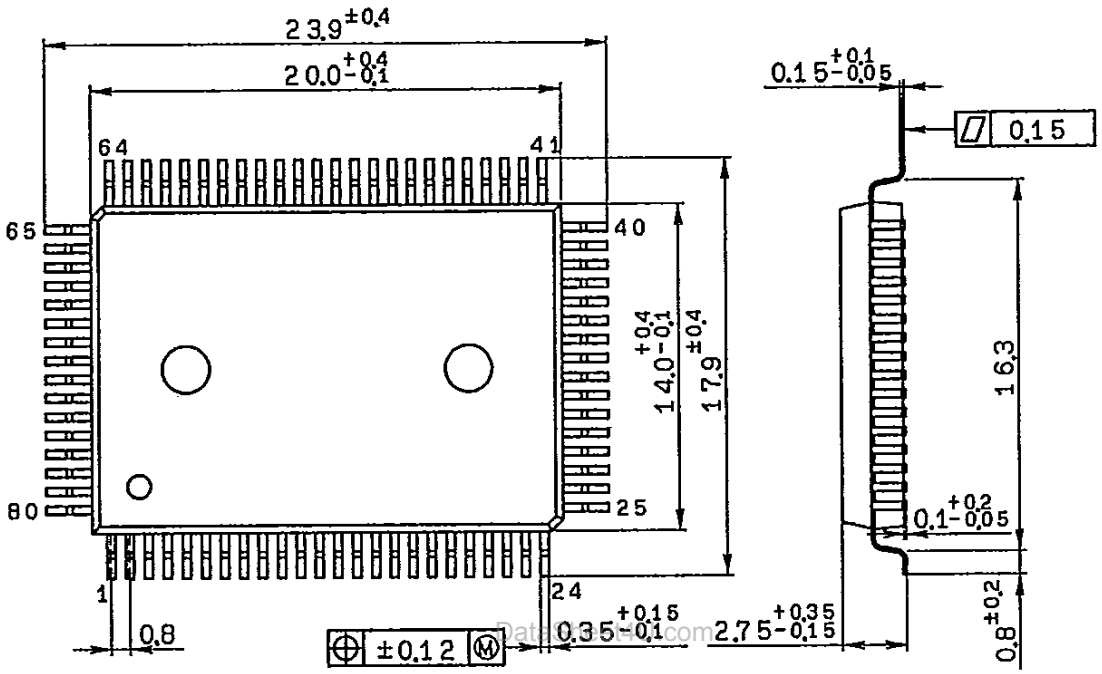
Package Outline

Unit : mm

80pin QFP (Plastic) 1.6g



SONY NAME	QFP-80P-L01
EIAJ NAME	*QFP080-P-1420-A
JEDEC CODE	———