M52042FP

NTSC Video Chroma Signal Processor

REJ03F0180-0200
Rev.2.00
Sep 14, 2006

Description

The M52042FP is a semiconductor integrated circuit (IC) for picture signal processing that has been developed for NTSC system LCD color TV.

This IC has a built-in luminance signal processing circuit and color signal processing circuit, which is employed to convert a composite video signal to an RGB signal.

Features

- Low voltage and low power dissipation design
- Built-in Y/C separation circuit and external chroma trap switchable (fc is nearly equal to 1.5 MHz.)
- Built-in sync separation circuit
- Provided with Y-signal blanking function by HD pulse
- R.G.B. signal output
- Tint, contrast, picture quality and color control linearly adjustable
- 24-pin, shrink pitch, flat package employed
- Same package as in PAL system video chroma IC M52045FP, pin perfectly compatible

Application

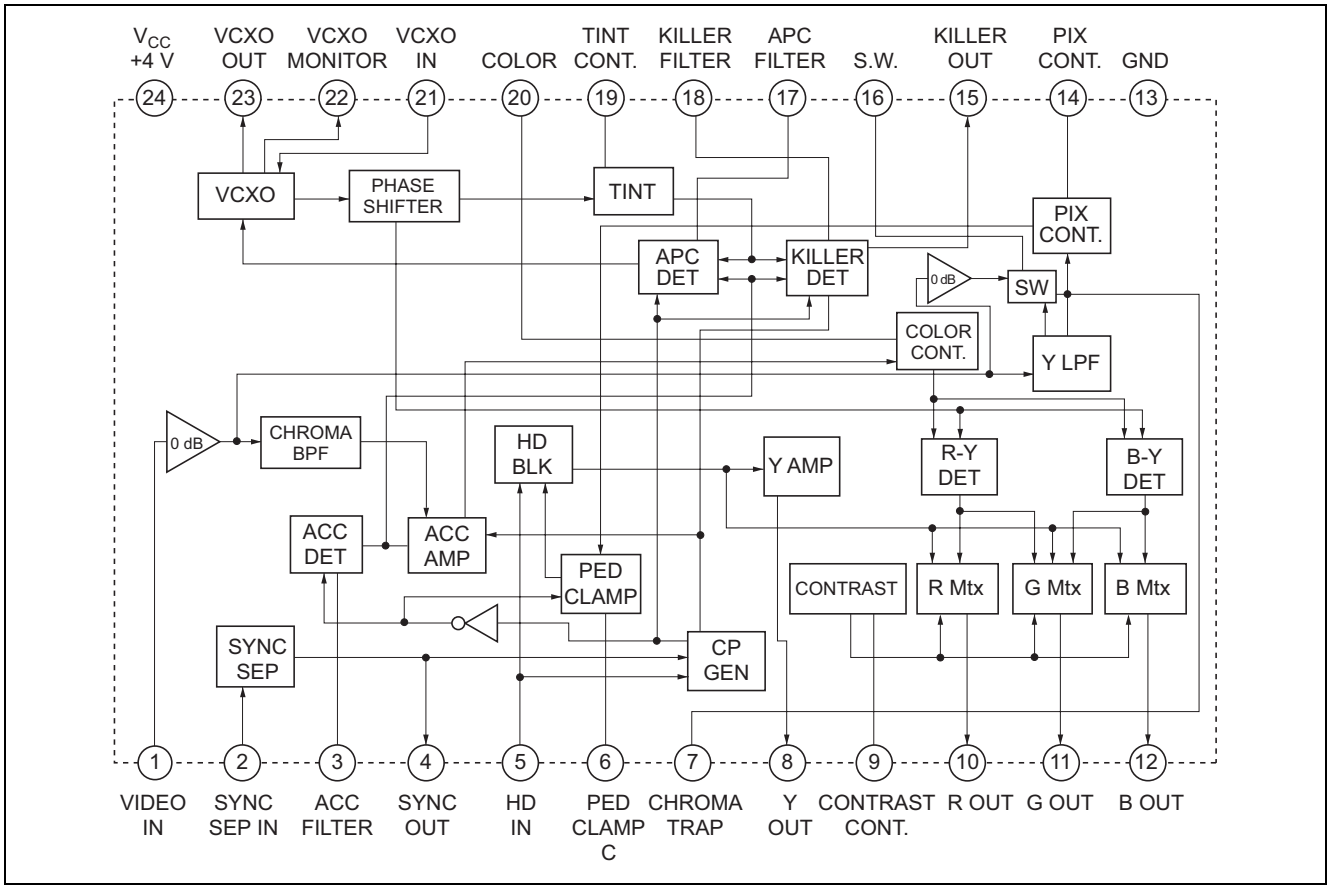
LCD color TV and LCD color view finder

Recommended Operating Condition

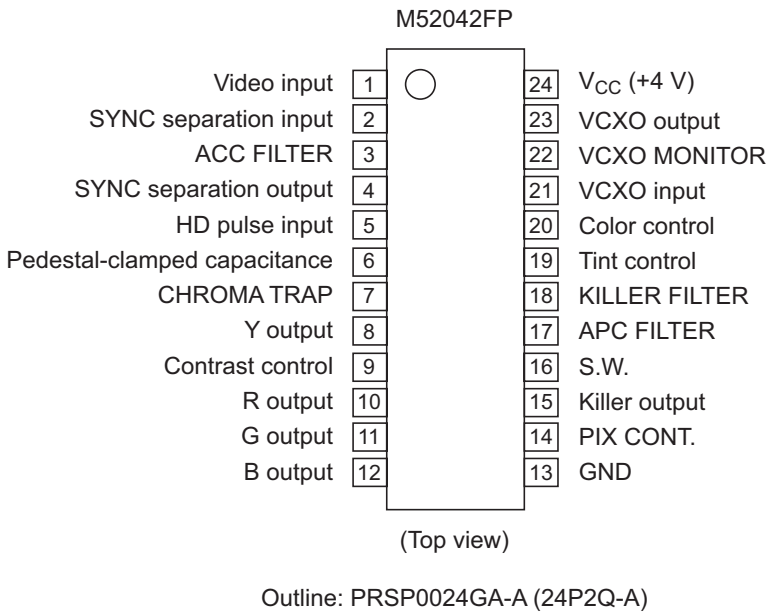
Supply voltage range: 3.7 to 4.5 V

Rated supply voltage: 4.0 V

Block Diagram



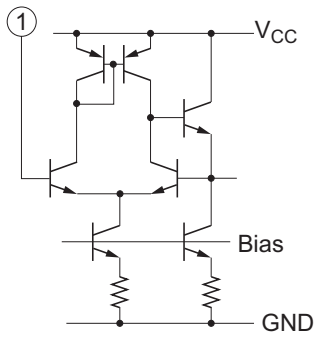
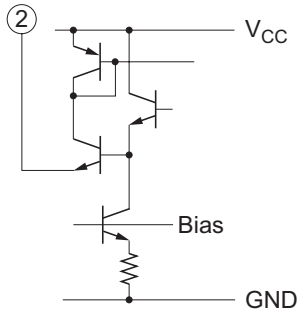
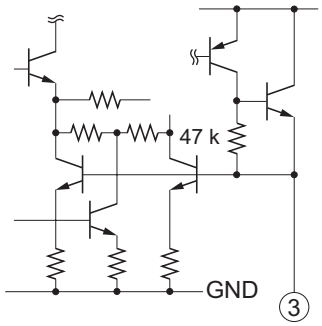
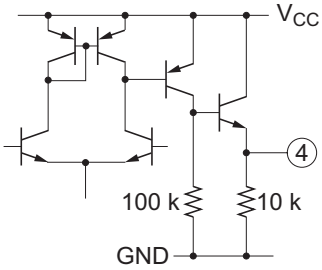
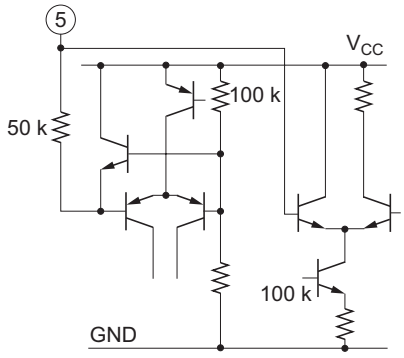
Pin Arrangement

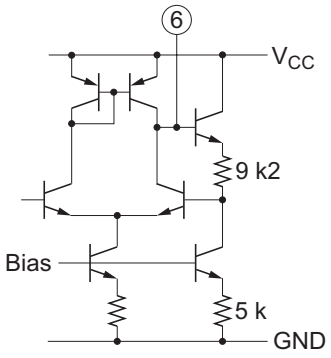
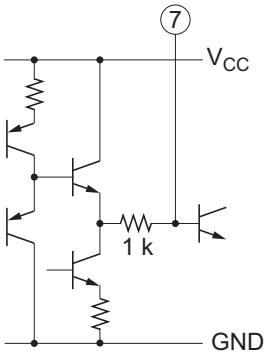
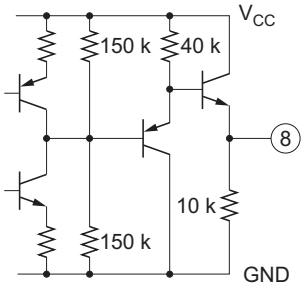
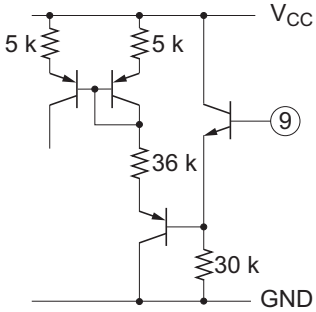
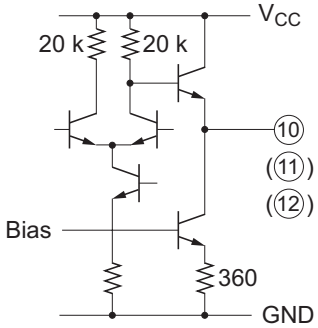


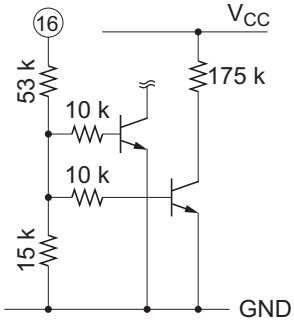
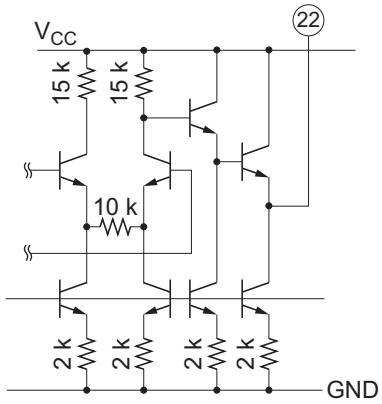
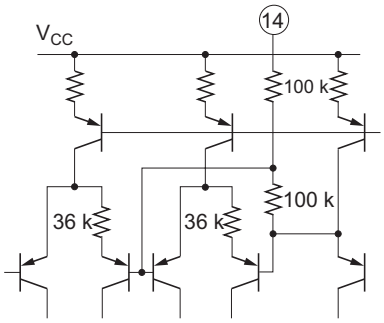
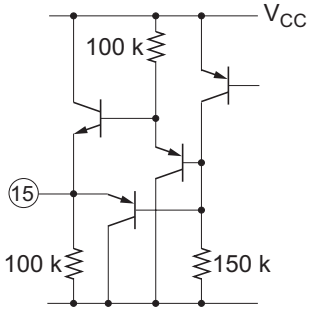
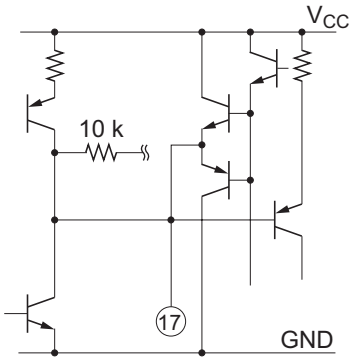
(Top view)

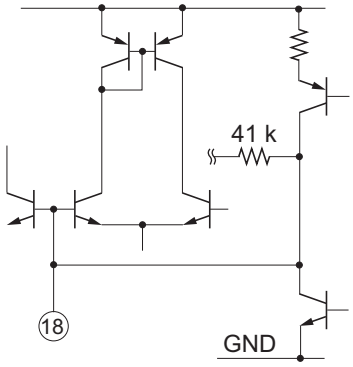
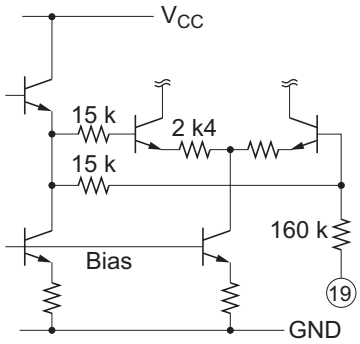
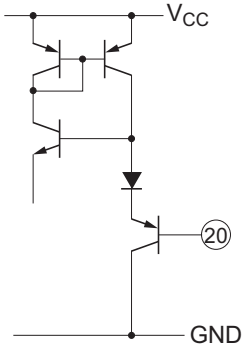
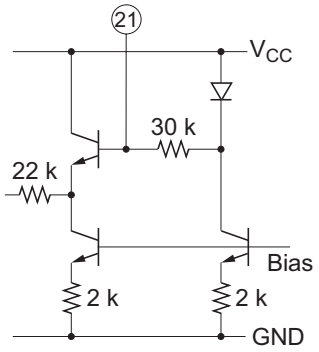
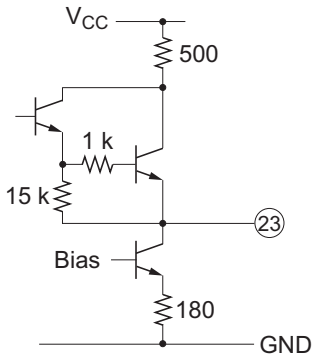
Outline: PRSP0024GA-A (24P2Q-A)

Pin Description

Pin No.	Name	Peripheral Circuit of Pins
1	VIDEO IN (Video input)	
2	SYNC SEP IN (SYNC separation input)	
3	ACC FILTER	
4	SYNC OUT (SYNC separation output)	
5	HD IN (HD pulse input)	

Pin No.	Name	Peripheral Circuit of Pins
6	PED CLAMP C (Pedestal-clamped capacitance)	
7	CHROMA TRAP	
8	Y OUT (Y output)	
9	CONTRAST CONT. (Contrast control)	
10	R OUT (R output)	
11	G OUT (G output)	
12	B OUT (B output)	
13	GND (Grounding)	—
24	V_{CC} +4 V (Power supply)	—

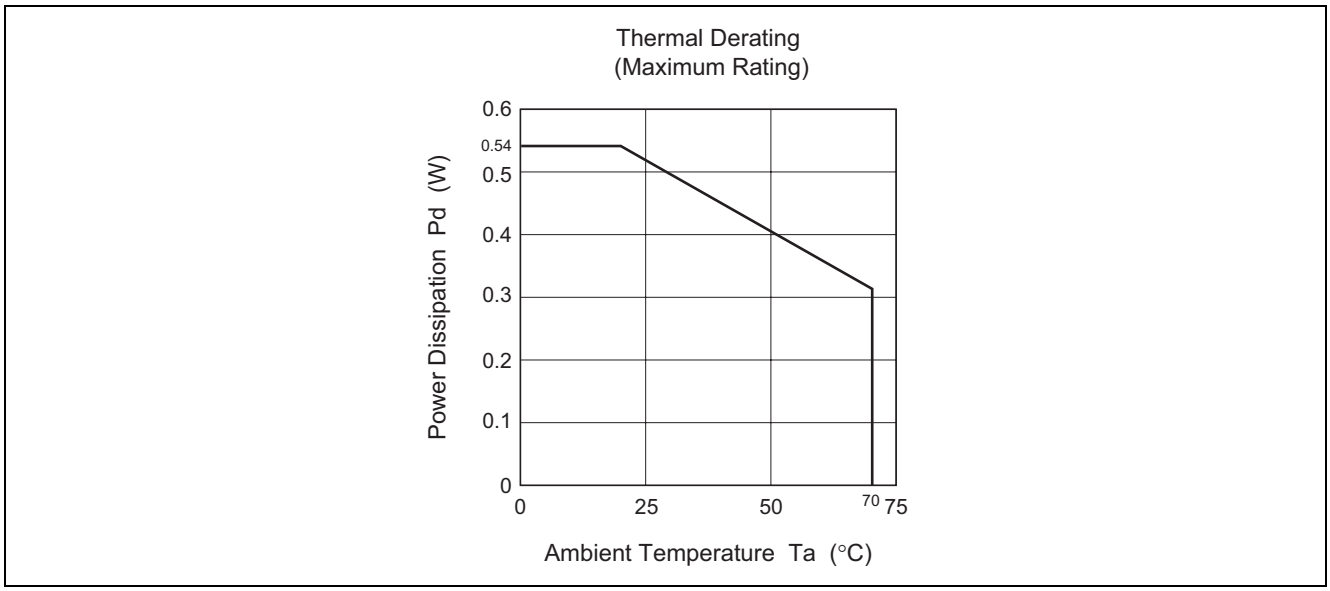
Pin No.	Name	Peripheral Circuit of Pins
16	S.W. (Selector switch)	
22	VCXO MONITOR	
14	PIX CONT. (Picture quality control)	
15	KILLER OUT (Killer output)	
17	APC FILTER	

Pin No.	Name	Peripheral Circuit of Pins
18	KILLER FILTER	
19	TINT CONT. (Tint control)	
20	COLOR (Color control)	
21	VCXO IN (VCXO input)	
23	VCXO OUT (VCXO output)	

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	4.8	V
Power dissipation	Pd	680	mW
Operating temperature	Topr	–10 to 70	°C
Storage temperature	Tstg	–45 to 120	°C
Thermal derating	Kθ	5.4	mW/°C
Electrostatic capacity	Vmax	±200*	V

Note: Charging capacity: 200 pF



Electrical Characteristics

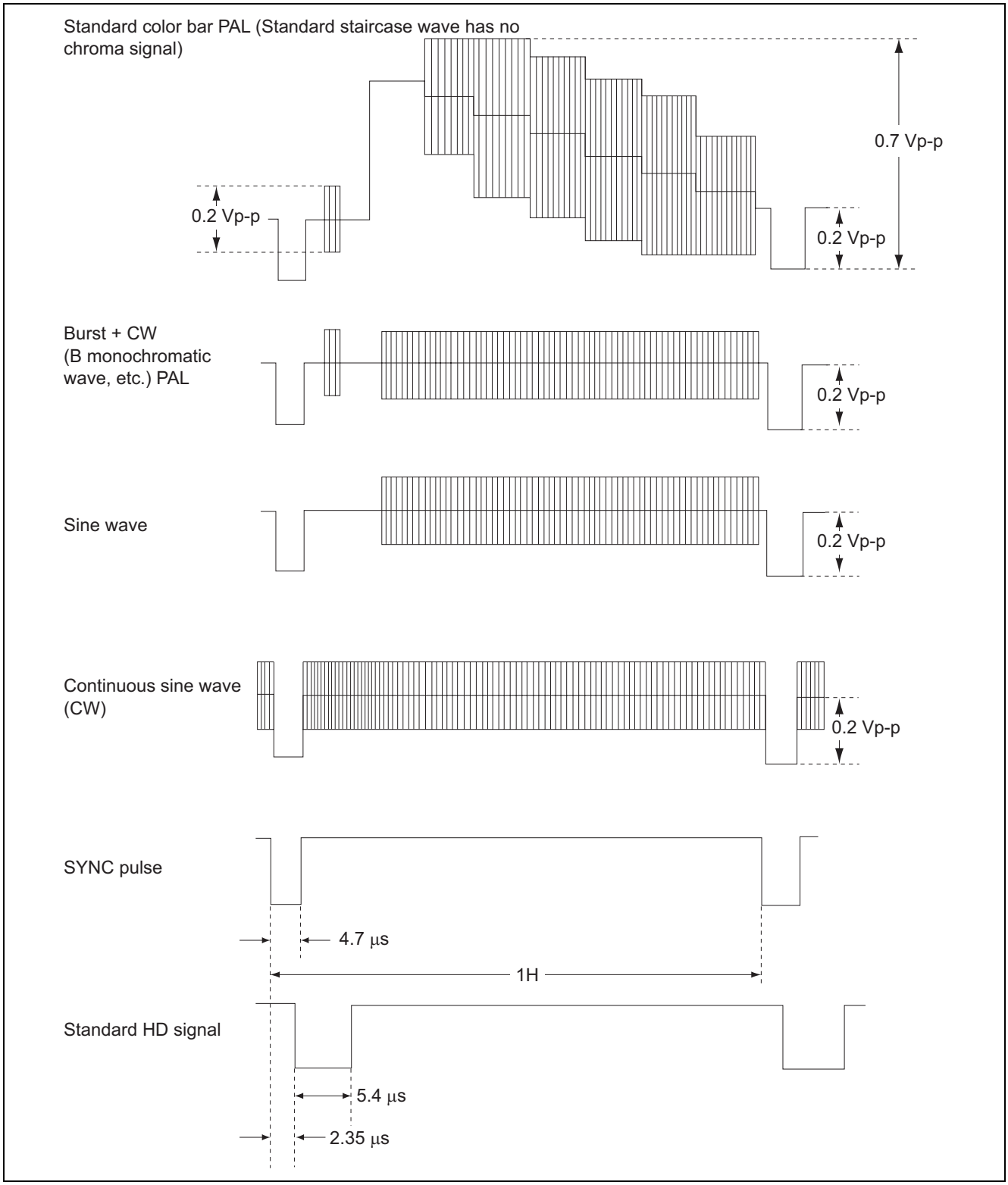
(Ta = 25°C, unless otherwise noted)

Item	Symbol	Min	Typ	Max	Unit	Test No	Test Conditions
Circuit current	I_{CC}	—	17	21	mA	1	Input standard color bar signal of V_{CC} = 4 V.
SYNC SEP section							
SYNC tip voltage	Vsync 1	2.20	2.30	2.40	V	2	Measure each output signal SYNC tip voltage at pins (1), (7) when standard color bar signal of 0.7 Vp-p is input.
	Vsync 7	1.25	1.40	1.50			
SYNC output amplitude	Vsync H	2.7	3.1	3.4	Vp-p	3	Input only SYNC pulse of pulse width 4.7 µs to pin (1). Measure the output amplitude at pin (4) when the input SYNC pulse amplitudes are 0.2 and 0.05 Vp-p.
	Vsync L	2.7	3.1	3.4			
SYNC output pulse width	Tsync H	3.7	4.7	5.7	µs	4	Input only SYNC pulse of pulse width 4.7µs to pin (1). Measure the output amplitude at pin (4) when the input SYNC pulse amplitudes are 0.2 and 0.05 Vp-p.
	Tsync L	3.7	4.7	5.7			
SYNC output pulse delay	Dsync H	3.7	4.7	6.0	µs	5	Input only SYNC pulse of pulse width 4.7µs to pin (1). Measure the pulse width + delay time when the input SYNC pulse amplitudes are 0.2 and 0.05 Vp-p.
	Dsync L	3.7	4.7	6.0			
Video section							
YLPF frequency characteristics (Pin (7))	YLPF (L)	1.45	1.55	—	MHz	6	Measure the frequency at which the sine wave output amplitude is –3 dB when the input signal () 0.2 Vp-p is input. Also measure the output gain at input sine wave 3.58 MHz.
	YLPF (H)	–30	–24	–21	dB		
YLPF frequency characteristics (through mode)	YLPF through	5.0	7.0	10.0	MHz	7'	Measure the frequency at which the sine wave output amplitude is –3 dB when the input signal () 0.2 Vp-p is input, and V16 is 4.0 V_{PC} input.
Maximum output	Ymax	1.1	1.7	1.7	Vp-p	7	Input standard staircase wave of 0.7 Vp-p. Measure the output amplitude at pin (12) when V9 is 0 V.
Video amplifier gain	GYmax	4.0	6.0	8.0	dB	8	Input standard staircase wave of 0.7 Vp-p. Calculate the ratio between the output amplitude at pin (12) and input amplitude when V9 is 1.7 V.
Contrast control characteristics	Yctrast (1)	1.20	2.45	4.50	dB	9	Input standard staircase wave of 0.7 Vp-p, and calculate the ratio of the input amplitude to the output amplitude in Test No.8 above when V9 is changed 1 V, 2.5 V and 3.5 V.
	Yctrast (2, 5)	–7.3	–5.0	–2.7			
	Yctrast (3, 5)	—	–30	–17			
PIX control characteristics	XPIX (4)	–3.5	–2.0	–0.5	dB	10	Input 1.5 MHz sine wave of 0.2 Vp-p to the input. Measure each output amplitude at pin (12) when V9 is 1.7 V, and V14 is changed to 2, 4 and 0 V and calculate the ratio between the input amplitude and the output amplitude when V14 = 2 V.
	XPIX (0)	10.0	12.0	14.0	dB		
Y AMP gain	GYmap	9.1	11.0	12.6	dB	11	Input standard staircase wave of 0.7 Vp-p and calculate the ratio between the output amplitude at pin (8) and input amplitude.
PED offset level	Vped	0.00	0.05	0.06	—	12	With input SYNC pulse at 0.2 Vp-p, measure pin (12) output pedestal offset, and calculate ratio of the offset to that when 0.7 Vp-p standard staircase is input.

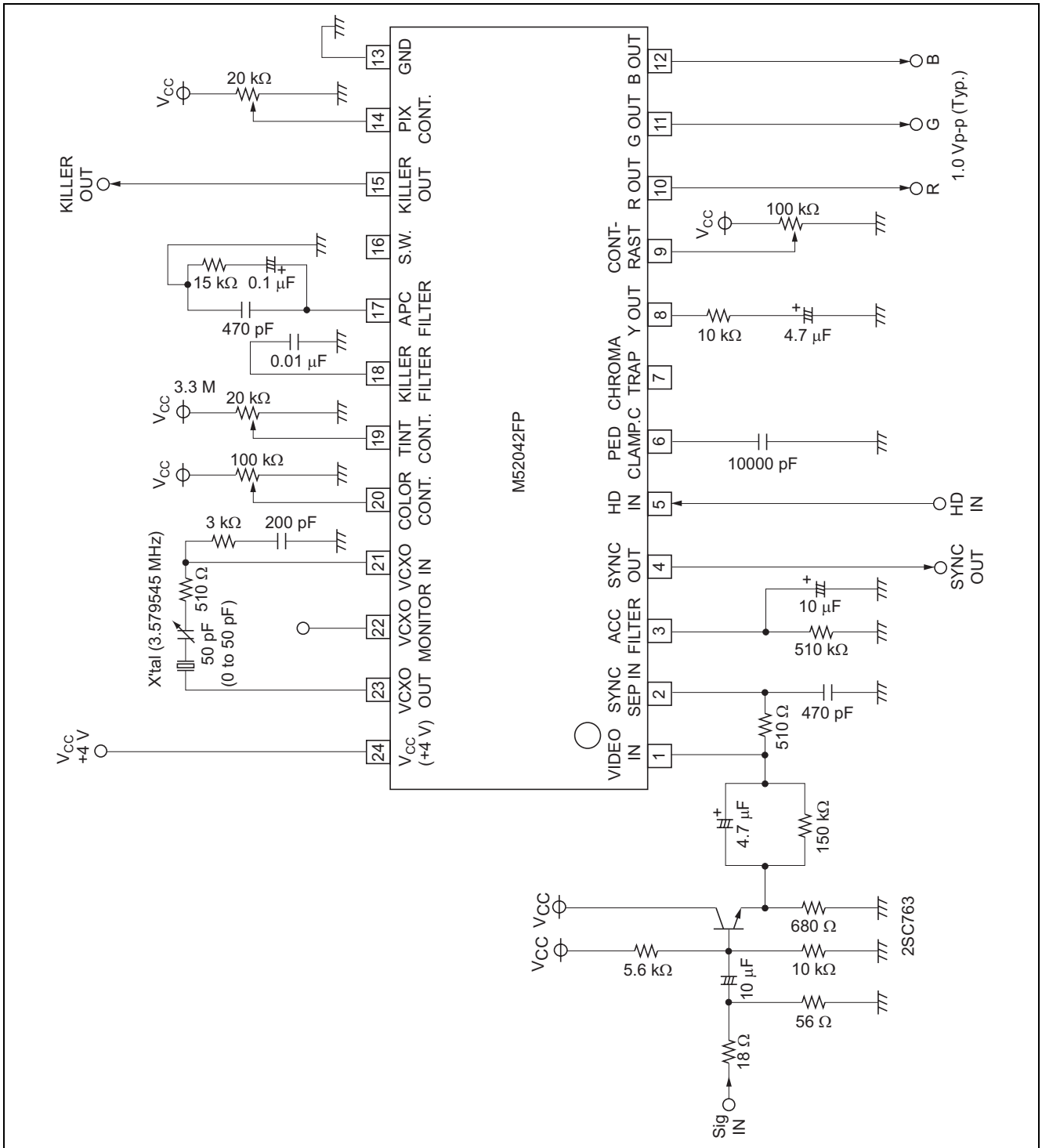
Electrical Characteristics (cont.)

Item	Symbol	Min	Typ	Max	Unit	Test No	Test Conditions
Chroma section							
Acc control characteristics	Cacc (+4)	0	0.7	1.5	dB	14	Input burst 0.2 Vp-p + CW 4.33 MHz shall be 0 dB. Measure the output at pin (12) when the input is changed to +4 dB and –20 dB, and calculate the ratio of the measured amplitude to the output amplitude at 0 dB.
	Cacc (–20)	–6.0	–2.0	0			
Killer operation	Ckilr	–53	–49	–43	dB	15	Input a chroma signal of 0.2 Vp-p to the input. Reduce the amplitude and measure the amplitude ratio when the voltage at pin (15) exceeds 2.5 V.
Color control characteristics	Cast (4)	2	2.2	4.5	dB	16	Input burst 0.2 Vp-p + CW 4.33 MHz, change V20 to 2 V, 4 V, 3 V, 1 V and 0.5 V to measure each output (100 kHz beat) amplitude at pin (12), and calculate the ratio between the measured amplitude and the output amplitude at V20 = 1 V.
	Cast (3)	1.5	2.0	4.0			
	Cast (1)	–8.5	–6	–4			
	Cast (0, 5)	–17	–13	–10			
APC pull-in range	Δfapc	+400	+600	—	Hz	17	Input only SYNC, and after adjusting free run, input 0.2 Vp-p CW (), then change the frequency. Measure the frequency when VCXO oscillator is placed in a locked condition from the free-run condition.
		—	–300	–200			
B demodulator sensitivity	DB	0.8	1.2	1.6	Vp-p	18	Input CW 4.33 MHz of 0.2 Vp-p to the input, and measure the output amplitude at pin (12) when V20 = 1 V.
Demodulated output voltage ratio	R (R/B)	0.46	0.52	0.60	—	19	Input CW 4.33 MHz of 0.2 Vp-p to the input, measure the output amplitude at pins (10), (11) when V20 = 1 V, and calculate the ratio of the measured amplitude to the output amplitude in Test No.18 above.
	R (G/B)	0.20	0.30	0.40			
Killer output voltage H	Vkiller H	2.5	3.2	—	V	21	Measure DC voltage at pin (15) when 0 V and 4 V are applied to pin (18).
Killer output voltage L	Vkiller L	—	0.20	0.40			
TINT control variance	T	75	85	100	deg	22	Input a chroma signal of 0.4 Vp-p to the input, and measure the phase variance at pin (12) when 0 V and 4 V are applied to V19.
TINT control characteristics	Topen	–5	+5	+15	deg	23	Apply B monochromatic wave, (variable phase) 0.4 Vp-p and burst 0.2 Vp-p to the input. Measure the input phase in which the output at pin (12) becomes maximum with V19 open as burst phase –180 degrees.
	Tmin	–55	40	–25	deg		Apply B monochromatic wave (variable phase) 0.4 Vp-p and burst 0.2 Vp-p to the input. Measure the input phase in which the output at pin (12) becomes "maximum" when V19 is 0 V and 4 V as burst phase –180 degrees.
	Tmax	+30	–40	+60			
HD for chroma delay	Dhd	—	2.0	2.2	μs	24	Apply B monochromatic wave 0.4 Vp-p and burst 0.2 Vp-p to the input. Measure the delay time from HD pulse rise to the chroma rise of pin (12) output.

Input Signal

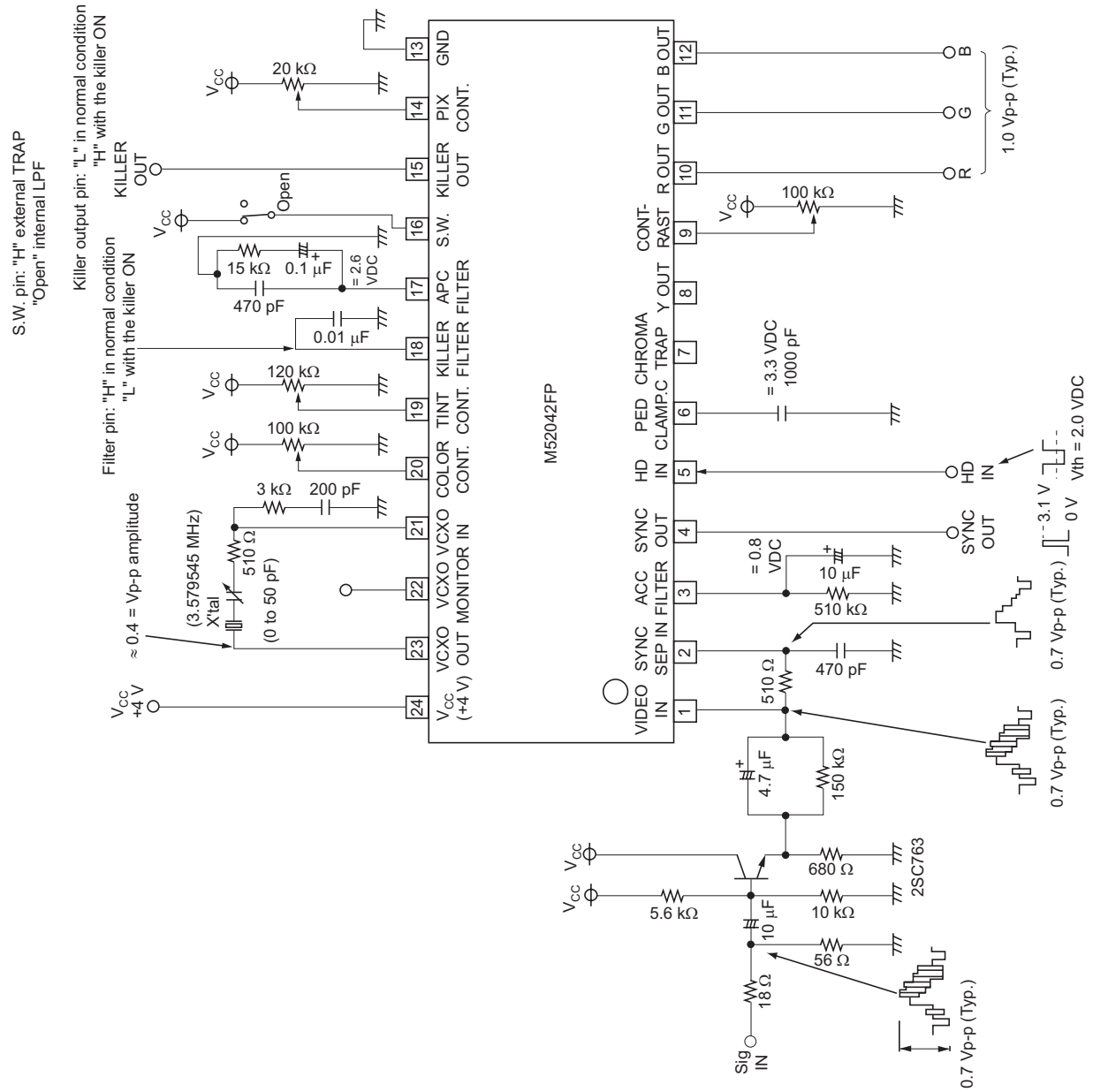


Test Circuit



Note : The evaluation of the above application circuit should be performed with great care, because APC characteristics, etc. differ considerably according to crystal characteristics and board pattern.

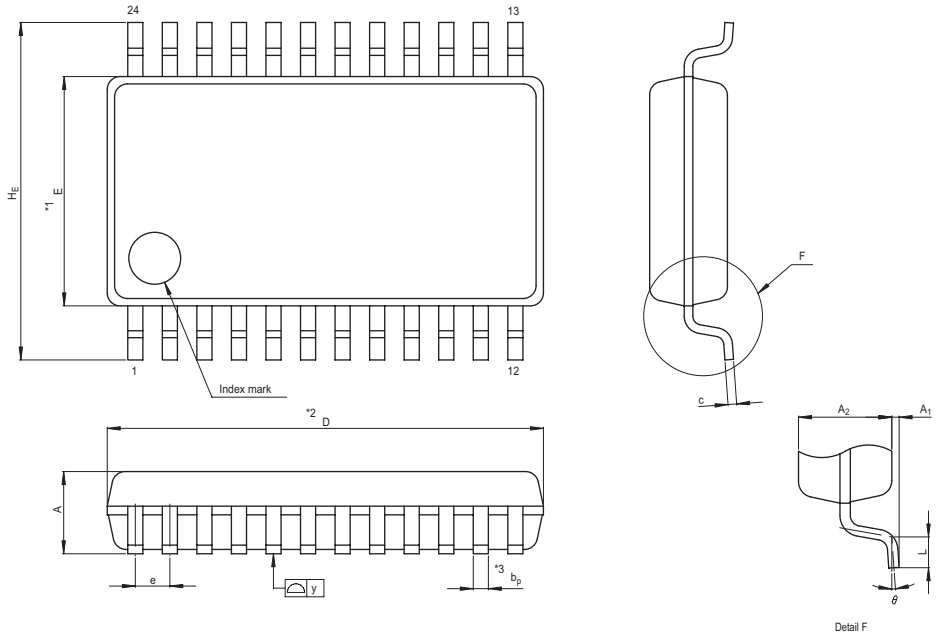
Application Example



Note : The evaluation of the above application circuit should be performed with great care, because APC characteristics, etc. differ considerably according to crystal characteristics and board pattern.

Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SSOP24-5.3x10.1-0.80	PRSP0024GA-A	24P2Q-A	0.2g



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
D	10.0	10.1	10.2
E	5.2	5.3	5.4
A_2	—	1.8	—
A	—	—	2.1
A_1	0	0.1	0.2
b_p	0.3	0.35	0.45
c	0.18	0.2	0.25
θ	0°	—	8°
H_E	7.5	7.8	8.1
e	0.65	0.8	0.95
y	—	—	0.10
L	0.4	0.6	0.8

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Colophon .6.0