

MITSUBISHI ICs (AV COMMON)
M52684AP/FP/BFP

SYNC SEPARATOR, HORIZONTAL AFC

DESCRIPTION

The M52684 is a semiconductor integrated circuit consisting of horizontal, vertical sync separator and horizontal AFC (Automatic Frequency Control) for TV and VCR applications.

FEATURES

- A small number of external components and no adjustment.
- Employment of a horizontal count-down, requiring no H-Hold.
- Capable of varying the timing and pulse width of VD OUT by external components.
- Stable HD pulse is available from horizontal sync signal.

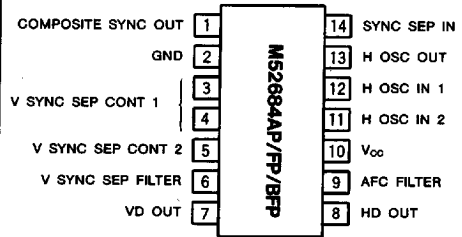
APPLICATION

TV, VTR

RECOMMENDED OPERATING CONDITION

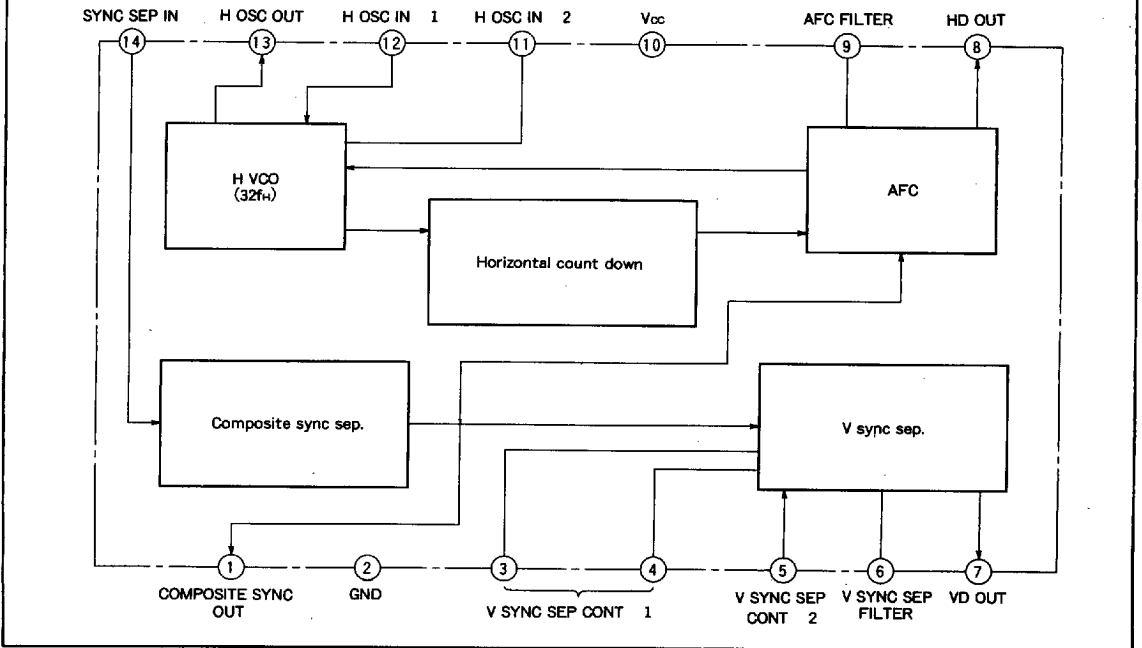
Supply voltage range.....4.5 ~ 5.5 V
 Rated supply voltage.....5.0 V

PIN CONFIGURATION (TOP VIEW)



Outline 14P4(AP)
 14P2N-A(AFP,BFP)

BLOCK DIAGRAM



6249826 0021253 512



SYNC SEPARATOR, HORIZONTAL AFC

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C, surge capacity = 200pF, unless otherwise noted)

Symbol	Parameter	Ratings	Unit
Vcc	Supply voltage	6.5	V
Pd	Power dissipation	1.2 (M52684AP)	W
		430 (M52684AFP, BFP)	mW
Surge	Permissible surge	±200	V
Topr	Operating temperature	-20~75	°C
Tstg	Storage temperature	-40~125	°C

ELECTRICAL CHARACTERISTICS (Ta = 25°C, unless otherwise noted)

Symbol	Parameter	Test conditions							Limits			Unit
		Test point	Input	3	5	SW3	SW14	Note	Min.	Typ.	Max.	
Icc	Circuit current	A1	SG1	—	—	ON	1		6.5	8.0	10.0	mA
fH	Horizontal free run frequency	8	—	—	—	ON	2		15.55	15.80	16.05	kHz
fP1	Horizontal pull-in range 1	8	SG2	—	—	ON	1	1	300	500	—	Hz
fP2	Horizontal pull-in range 2	8	SG2	—	—	ON	1	2	-2700	-3500	—	Hz
tH	Horizontal output pulse width	8	SG1	—	—	ON	1	3	3.5 (3.4)	3.9 (3.8)	4.3 (4.2)	μs
VHH	Maximum voltage of horizontal output	8	SG1	—	—	ON	1	4	3.9	4.2	—	V
VHL	Minimum voltage of horizontal output	8	SG1	—	—	ON	1	5	—	0	0.3	V
tPH	Horizontal output position	8	SG1	—	—	ON	1	6	1.7	2.2	2.7	μs
		(-1.2)							(-1.7)	(-2.2)		
tv	Vertical output pulse width	7	SG1	—	—	ON	1	7	0.2	0.3	0.4	ms
VvH	Maximum voltage of vertical output	7	SG1	—	—	ON	1	8	3.9	4.2	—	V
VvL	Minimum voltage of vertical output	7	SG1	—	—	ON	1	9	—	0	0.3	V
tpv	Vertical output position	7	SG1	—	—	ON	1	10	9	11	13	μs
		14										
Iss	Manimum input current of SYNC separation	1	—	—	—	ON	3	11	10	40	100	μA
		14										
VSH	Maximum voltage of SYNC SEP output	1	SG1	—	—	ON	1	12	3.8	4.1	—	V
VSL	Minimum voltage of SYNC SEP output	1	SG1	—	—	ON	1	13	—	0.75	1.0	V
V5	Pin⑤ voltage	5	—	—	—	ON	2		2.2	2.5	2.8	V

*1 : Symbol "—" denotes OPEN.
 *2 : Figures in () are applicable to BFP.

ELECTRICAL CHARACTERISTICS TEST METHOD

Note 1: Horizontal pull-in range 1 "fP1"

- Increase the frequency of input signal so that synchronusness of the input signal of SG2 and output waveform of pin ④ pulls out.
- Decrease the frequency of SG2. Measure f1, which is the frequency of SG2 when the output waveform of pin ④ synchronizes.
- $f_{P1} = f_1 - f_H$
(fH: horizontal free run frequency)

Note 2: Horizontal pull-in range 2 "fP2"

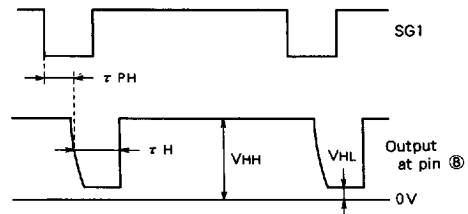
- Decrease the frequency of input signal so that synchronusness of the input signal of SG2 and output waveform of pin ④ pulls out.
- Increase the frequency of SG2. Measure f2, which is the frequency of SG2 when the output waveform of pin ④ synchronizes.
- $f_{P2} = f_2 - f_H$

Note 3: Horizontal output pulse width "τH"

Note 4: Maximum voltage of horizontal output "VHH"

Note 5: Minimum voltage of horizontal output "VHL"

Note 6: Horizontal output position "τPH"



Note 7: Vertical output pulse width "τv"

Note 8: Maximum voltage of vertical output "VvH"

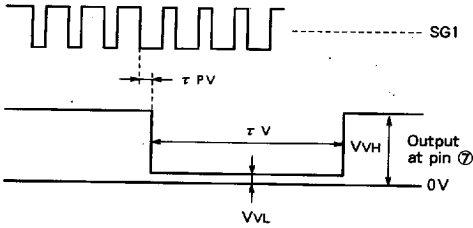
Note 9: Minimum voltage of vertical output "VvL"

6249826 0021254 459



SYNC SEPARATOR, HORIZONTAL AFC

Note 10: Vertical output position "τ_{PV}"

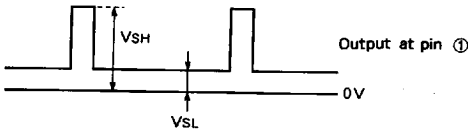


Note 11: Minimum input current of SYNC separation "I_{ss}"

- Set I_s to 0 mA.
- Increase I_s and obtain I_{ss}, which is the value of I_s when the output of pin ① becomes approximately 4 V.

Note 12: Maximum voltage of SYNC SEP output "V_{SH}"

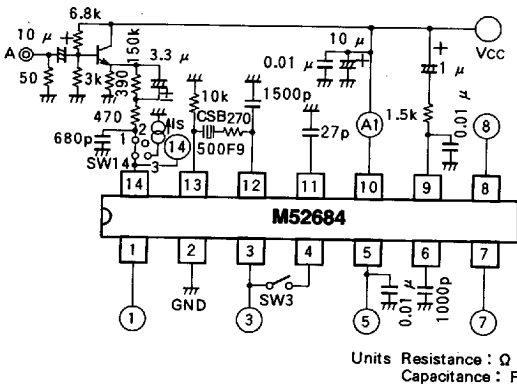
Note 13: Minimum voltage of SYNC SEP output "V_{SL}"



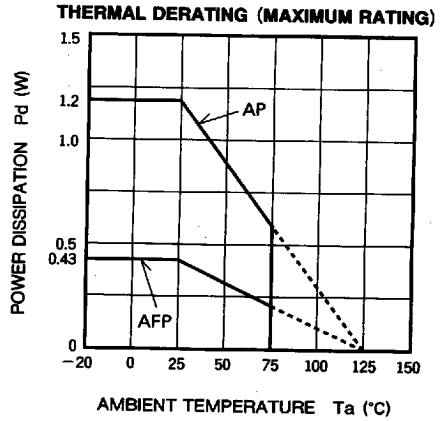
INPUT SIGNAL

SG. NO	Signal	Standard SYNC signal
SG1	Standard SYNC signal	<p>SYNC signal of which horizontal period is 63.5 μs, including vertical SYNC signal with a sync period of 16.7 ms</p>
SG2	SYNC signal for measuring horizontal pull in frequency	<p>Frequency-variable pulse signal with 90% duty</p>

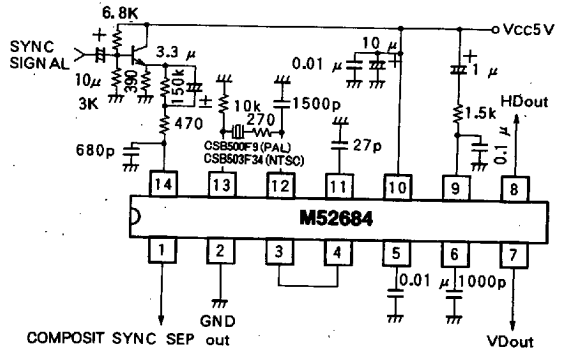
TEST CIRCUIT



TYPICAL CHARACTERISTICS



APPLICATION EXAMPLE



Units Resistance : Ω
Capacitance : F

6249826 0021255 395



SYNC SEPARATOR, HORIZONTAL AFC

DESCRIPTION OF PIN

Pin No.	Name	Function	DC Voltage (V)	Peripheral circuit of pins
①	COMPOSITE SYNC OUT	Csync output pin	with no input (0.75)	
③	V SYNC SEP REF CONT1	By varying current flowing in to pin ③, VD OUT position changes.	1V	
④	V SYNC SEP REF CONT1	To be connected to pin ③ for use under condition of a phase difference of 11 μs between SYNC and VD OUT.	5V	
⑤	V SYNC SEP REF CONT2	By varying the voltage applied to pin ⑤, the phase difference between SYNC and VD OUT changes. 	2.5V	
⑥	V SYNC SEP FILTER	Integrates composite sync signal by internal time constant and external capacitor. (waveform)	with no input	
⑦	VD OUT	VD output	with no input (4.2)	

6249826 0021256 221



SYNC SEPARATOR, HORIZONTAL AFC

DESCRIPTION OF PIN (cont.)

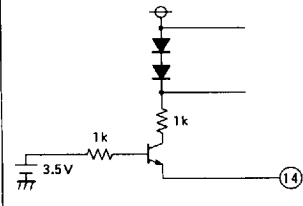
Pin No.	Name	Function	DC Voltage (V)	Peripheral circuit of pins
⑧	HD OUT	HD output	with no input (4.2)	
⑨	AFC FILTER	-	2.5	
⑩	H OSC IN 1	-	2.0	
⑪	H OSC IN 2	-	2.15	
⑬	H OSC OUT	32 fh output pin	2.35	

6249826 0021257 168



SYNC SEPARATOR, HORIZONTAL AFC

DESCRIPTION OF PIN (cont.)

Pin No.	Name	Function	DC Voltage (V)	Peripheral circuit of pins
⑭	SYNC SEP IN	Composite video signal input pin	2.8	

SPECIAL PARTS

Part name	Model code	Manufacturer
Ceramic oscillator	CSB500F9 (PAL) CSB503F34(NTSC)	Murata Mfg. Co., Ltd

PRECAUTIONS FOR APPLICATIONS

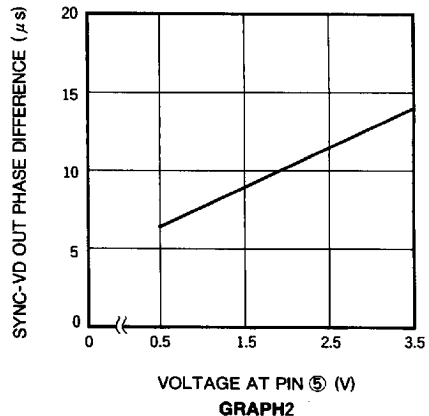
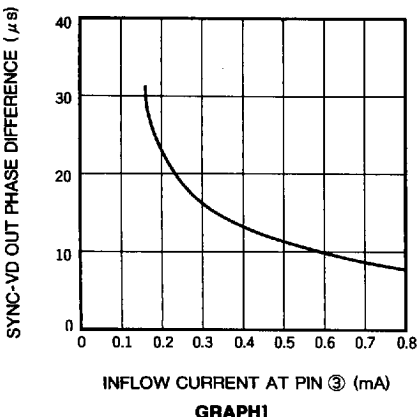
How to Change Vertical Output Position

1. Usually pins ③ and ④ are short-circuited.
2. By varying the current flowing in to pin ③, the vertical output position changes. To change the current, change the resistance at pin ③ by inserting a resistor between Vcc and pin ③.
3. Apply a DC voltage to pin ⑤. The reference voltage for vertical sync separation will vary changing the vertical output position.

Note: When letting the vertical output position change, the vertical output pulse width also changes simultaneously.

Characteristic Changes caused by Variation of External Constant

- Graph 1 shows the phase difference between SYNC OUT and VD OUT occurring when varying the current flowing in at pin ③.
- Graph 2 shows the phase difference between SYNC OUT and VD OUT occurring when varying the voltage applied to pin ⑤.



How to Determine External Constant at Pin ⑭

1. Operation of M52684

Sync separation is performed by comparing the input at pin ⑭ with the internal reference voltage. When the input at pin ⑭ is equal to or lower than the reference voltage (2.8 V) and the flowing current is equal to or larger than the minimum input current of SYNC separation, the output of pin ① will be Hi level.

2. Function of External Element

- a) The external circuit consists of R₁, R₂, C₁, and C₂ as shown in Fig. 1.
- b) R₂ defines current I_S of pin ⑭ flowing during sync signal period. R₁ and R₂ set sync separation level V_{TH}. C₁ defines the time constant C₁*R₂.

6249826 0021258 0T4



SYNC SEPARATOR, HORIZONTAL AFC

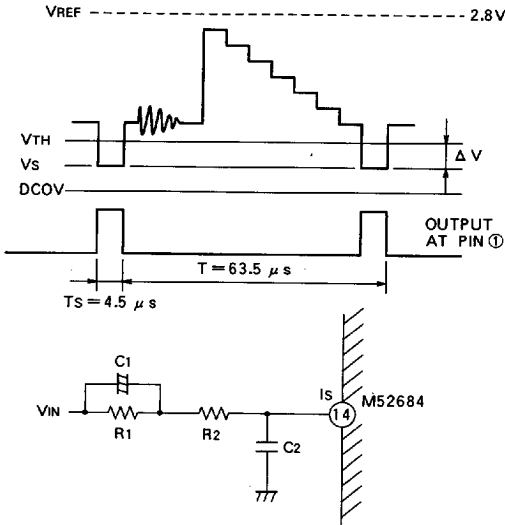


Fig. 1

c) R₁ and C₁ function as a battery that absorbs the DC voltage difference between the input V_{IN} and the input at pin ⑭.

This circuit becomes stationary at a point where the power charged during the T_s period equals the power discharged during other periods.

d) R₂ and C₂ make up a low-pass filter and attenuate noise.

3. How to Determine the Constant

Regarding the input signal, make settings for the DC voltage V_{IN} so that V_{TH} is equal to or lower than V_{REF} (2.8 V). If V_{TH} is higher than V_{REF}, sync separation becomes impossible, so that care should be taken. Assume that the input signal has the following waveform.

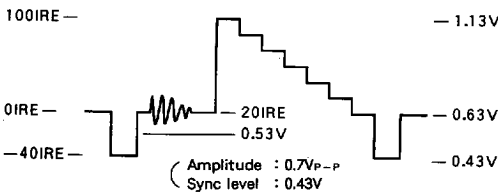


Fig. 2

Let V_{TH} be 0.51 V in order to avoid the effect of burst signal.

$$R_2 = \frac{V_{IH} - V_S}{I_S}$$

Although the limit of I_S is 10 to 100 μA, choose 200 μA for I_S taking into consideration fluctuation of input signals and the weak electric field.

$$R_2 = \frac{0.08}{200 \mu A} = 400 \Omega$$

Given the stationary state, R₁ is determined by the following expression.

$$R_1 = \frac{V_{REF} - V_{TH}}{I_S} \times \frac{(T - T_s)}{T_s} = \frac{2.75 - 0.51}{200} \times \frac{(63.5 - 4.5)}{4.5} = 147 \text{ k}\Omega$$

C₁ is determined from the value of R₁, making the time constant become larger than the vertical period.

In practice, V_{TH} is checked using a two-event oscilloscope for comparing the waveform of pin ⑭ with the input waveform. If some problem occurs from using R₁ and R₂ obtained by theoretical expressions, choose an optimum value for R₁, reading the oscilloscope.