Video ICs

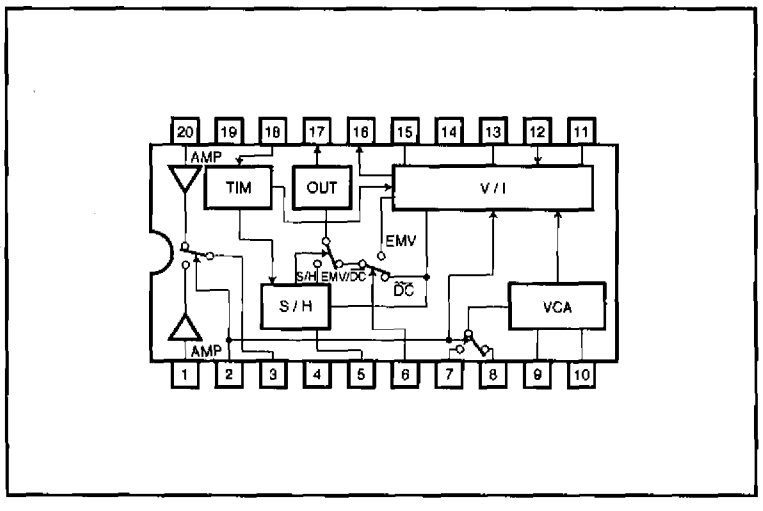
VCR auto tracking interface
BA7043FS

The BA7043FS is an auto tracking interface IC for VHS video cassette recorders that operates by detecting the playback RF signal. When FM audio or video signals are input, the IC outputs the peak detector output, the integrated waveform, or the peak hold voltage.

●Applications
VHS video cassette recorders

●Features
1)Reduces the load on the auto tracking microprocessor.
2)Internal switching and processing for audio and video FM signals.
3)Gain can be internally switched to suit the mode (video, audio, EP, or SP).
4)It is possible to integrate one frame, and sample and hold to output the peak value.
5)The output level is compressed to expand the dynamic range of the input.
6)Peak detection output and detection level down terminals provided.

●Block diagram



●Internal circuits

1pin

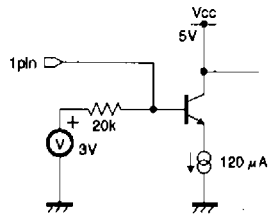


Fig.1

2pin

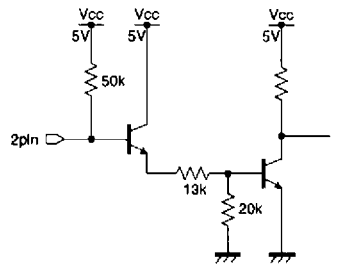


Fig.2

3pin

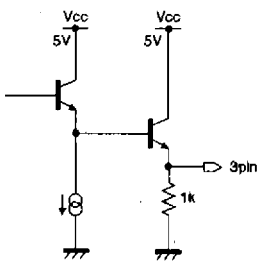


Fig.3

5pin

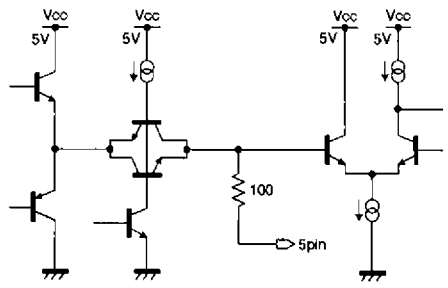


Fig.4

6pin

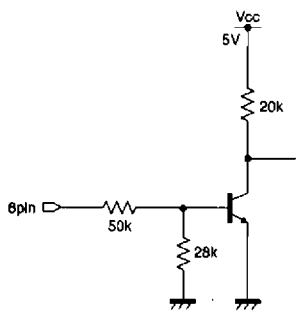


Fig.5

7pin

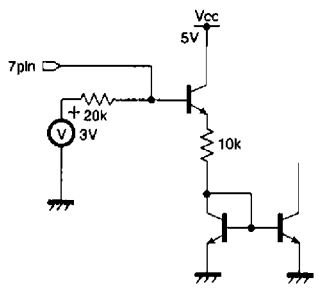


Fig.6

●Internal circuits

8pin

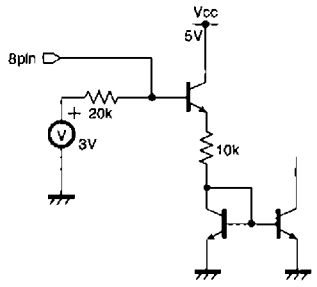


Fig.7

9pin

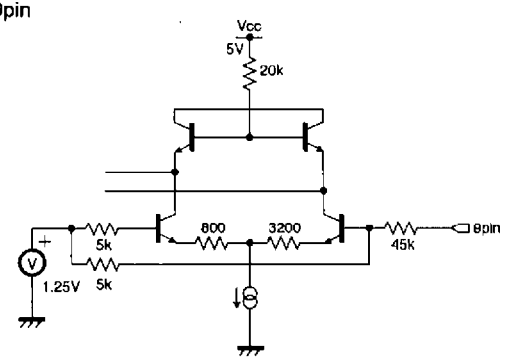


Fig.8

10pin

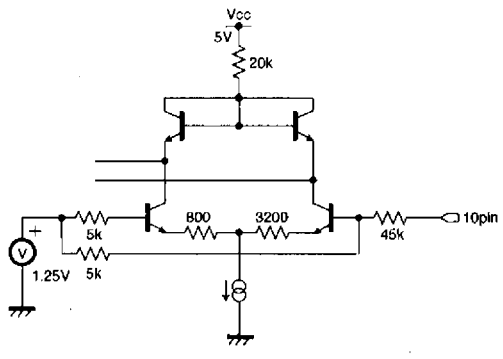


Fig.9

11pin

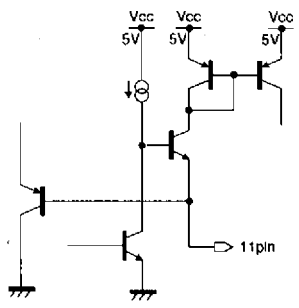


Fig.10

12pin

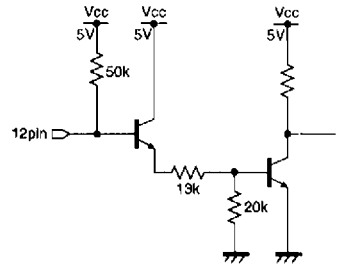


Fig.11

●Internal circuits

13pin

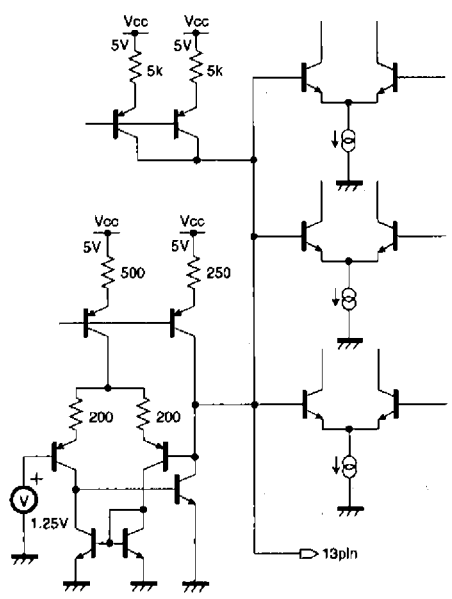


Fig.12

15pin

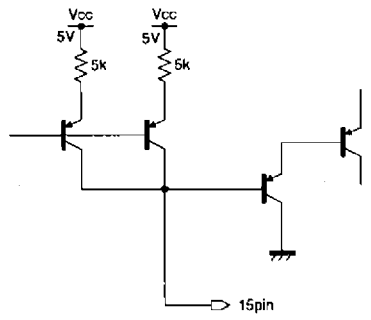


Fig.13

16pin

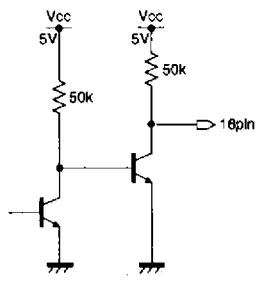


Fig.14

17pin

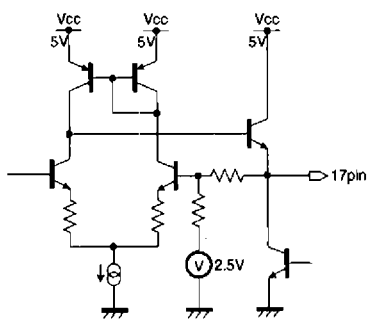


Fig.15

18pin

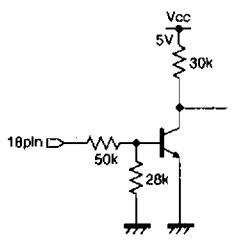


Fig.16

20pin

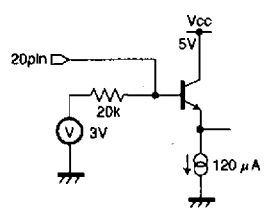


Fig.17

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Power supply voltage	$V_{CC\ Max.}$	8.0	V
Power dissipation	Pd	750 *	mW
Operating temperature	Topr	−20～75	℃
Storage temperature	Tstg	−55～125	℃

* Reduced by 7.5mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Recommended operating voltage	V_{CC}	4.5	—	5.5	V

●Electrical characteristics (Unless otherwise specified Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Operating voltage	V_{CC}	4.5	5.0	5.7	V		
Circuit current consumption	I_{CC}	10.0	18.2	33.0	mA		
Amplifier gain	G_{AMP}	4.7	5.5	6.3	dB	V_{sig} = 0.2V_{P-P}, 4MHz, with load	
Amplifier frequency characteristic	f_{AMP}	−3.0	−0.5	2.0	dB	V_{sig} = 0.2V_{P-P}, 1 to 6MHz, with load	
Amplifier maximum output amplitude	$V_{A\cdot Max.}$	1.8	2.3	—	V_{P-P}	with load	
VCA voltage, GND	V_{VCA1}	0.31	0.48	0.63	V	E_9=0V, V_{sig}=1.6V_{P-P}	
VCA voltage, 1/2Vcc	V_{VCA2}	0.38	0.65	0.91	V	E_9=2.5V, V_{sig}=0.4V_{P-P}	
VCA voltage, Vcc	V_{VCA3}	0.60	0.97	1.34	V	E_9=5.0V, V_{sig}=0.4V_{P-P}	
Output voltage	V_{OUT}	1.3	2.35	2.9	V	E_9=2.5V, V_{sig}=0.4V_{P-P}, V−SP mode	Fig.19
Droop voltage	V_{DLP}	--	50	150	mV_{P-P}	C=0.01 μF, T=5ms	
Saturation voltage	V_P^+	4.6	4.9	—	V	For integrated output waveform (plus peak)	
Residual voltage	V_P^-	--	0.1	0.4	V	For integrated output waveform(negative peak)	
Offset voltage	V_{DLP}	—	0.1	0.4	V	No signal	
Control voltage	V_{CTL}	1.0	2.0	3.0	V	2(V / $\overline{A}$), 12($\overline{SP}$ / EP), 6 ($\overline{DC}$ / EMV)	
Level down pin "L" voltage	V_{L-L}	--	0.1	0.4	V	E_{15}≦0.5V	
Level down pin "H" voltage	V_{L-H}	4.6	4.9	—	V	E_{15}≧1.1V	

©Not designed for radiation resistance.

●Electrical characteristic curve

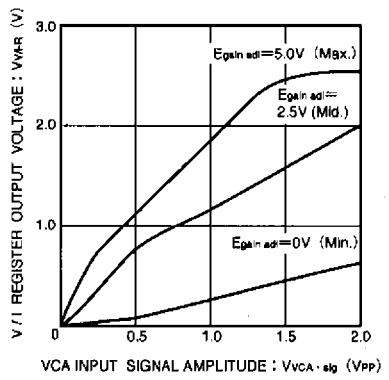


Fig. 18 V/I register output voltage vs VCA input signal amplitude

●Measurement circuit

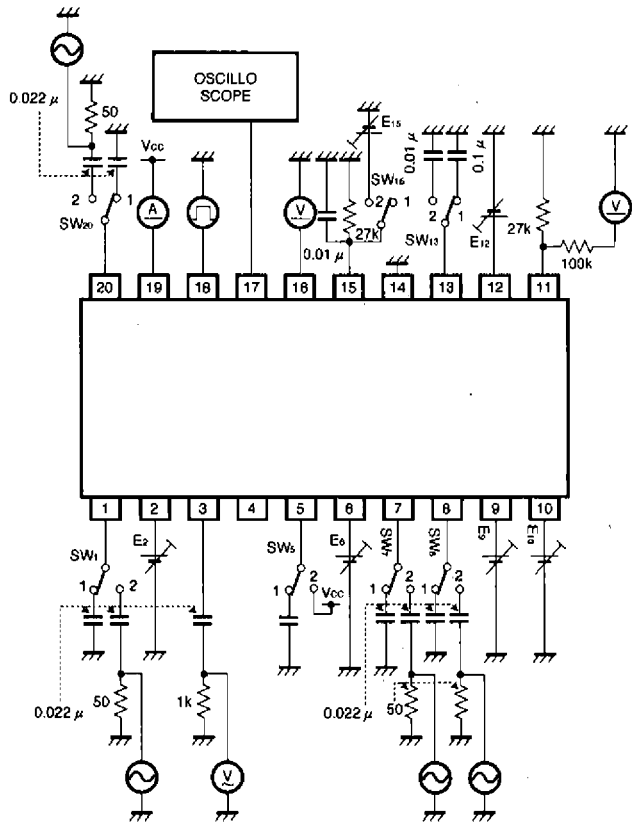


Fig.19

●Circuit operation

(1) Input amplifier

The audio and video FM signals are amplified by the 6dB amplifier. Use the audio/video switch signal to select which of these amplified signals will be output.

(2) VCA

By application of an external DC voltage, it is possible to increase the amplifier gain up to approximately 20dB.

(3) Detector and integrator circuit

The signal output from the VCA is selected by the audio/video switch, and the detected output is converted from a voltage to a current. The converted output can be adjusted using an external resistor. The gain is different for audio/video and EP/SP modes.

The current output from the voltage-to-current converter charges an external capacitor, and the detector output between consecutive rising edges of the drum switch signal (i.e. one frame) is integrated. The integrated output is sampled at the next rising edge of the drum switch signal, and is held for the next frame interval.

When the charging voltage exceeds the threshold value, the charging current is halved to compress the integrated output voltage.

The V/I current logic, and detector output, peak and hold and integrated output waveform switching are described below.

●V/I current logic (charging capacitor current vs. V/I register current)

	12 pin	L	H
2 pin	CTL	SP	EP
L	Audio	×2 *	×2 *
H	Video	×1 *	×2 *

* These values are for reference only.

●Detector output, peak hold and integrated output switching

a) When CTL pin 6 is high the envelope voltage is output.

b) When pin 5 is connected to a capacitor, the peak hold voltage of the integrated waveform is output.

c) When pin 5 is connected to Vcc, the integrated output waveform is output.

The timing chart is shown in Fig. 20.

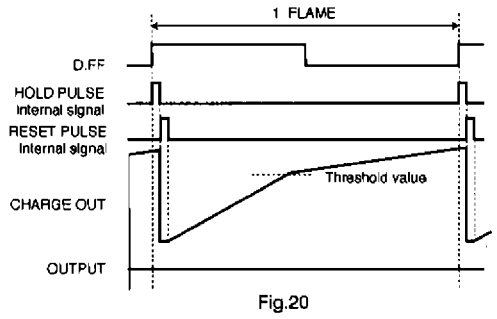


Fig.20

(4) Sample and hold, and output circuits

Sample and hold is done using the drum switching signal input as a reference. On the rising edge of the drum switching signal, the maximum level integrated in the previous frame is sampled, and held in the external hold capacitor.

The envelope output used for detection, and the comparator output for monitoring that level is also obtained.

(5) Charging capacitor and DC output characteristics

When input is applied to the VCA Filter In pins (5 and 6), the detector voltage is converted to a current at the V/I register (pin9). This current is supplied to the charging capacitor (pin11). The charging capacitor and DC outputs characteristics are given in Fig.21.

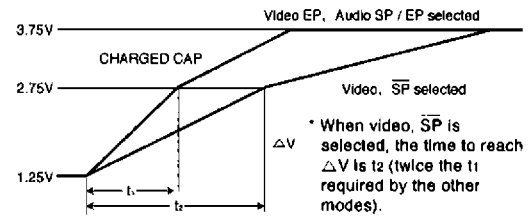


Fig.21 Charging capacitor voltage characterstic

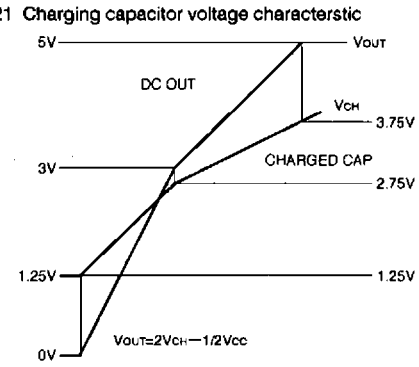


Fig. 22 Charging capacitor vs. DC output characteristic

* These values are for reference only.

●Pin description

Pin No.	Function	Pin No.	Function
1	AUDIO FM IN	11	V / I REGISTER
2	VFM / $\overline{\text{AFM}}$ CTL	12	$\overline{\text{SP}}$ / EP GAIN CTL
3	AMP OUT	13	CHARGED CAPACITOR
4	NC	14	GND
5	HOLD CAPACITOR	15	EMV LEVEL ADJ.
6	$\overline{\text{DC}}$ / EMV CTL	16	$\overline{\text{EMV LEVEL DOWN}}$
7	AUDIO FILTER IN	17	$\overline{\text{DC}}$ / EMV OUT
8	VIDEO FILTER IN	18	D・FF IN
9	VIDEO GAIN ADJ.	19	Vcc
10	AUDIO GAIN ADJ.	20	VIDEO FM IN

●Operation notes

Set the VCA voltage to give a suitable output voltage and detection output level.

●Application example

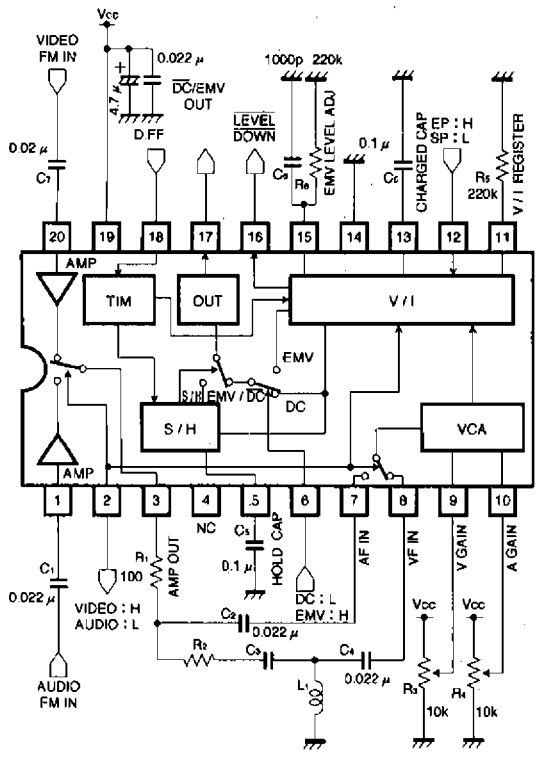
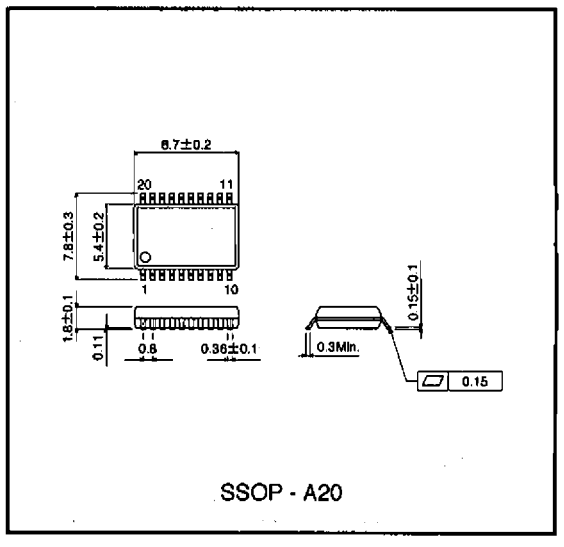


Fig.23

●External dimensions (Units: mm)



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