

BA7039

VCR auto tracking interface

The BA7039 is an auto tracking interface device for VCRs.

Using the audio or video FM signal, the IC generates an integral waveform or peak hold voltage that is proportional to the peak detection output.

Features

- available in DIP16 package
- by using this IC, the load on the auto-tracking microcomputer is reduced
- video or audio FM signal selection is made by an internal switch
- internal gain can be changed depending on mode (audio, video, extended or standard play)
- possible to integrate signal from a single frame while sampling, then save the peak value and use this as the IC output
- input dynamic range is expanded by compressing the output level

Applications

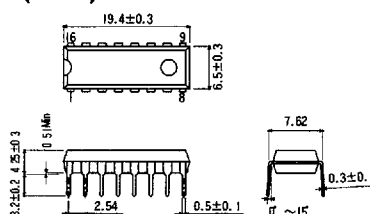
- VHS format video cassette recorders

Pin description

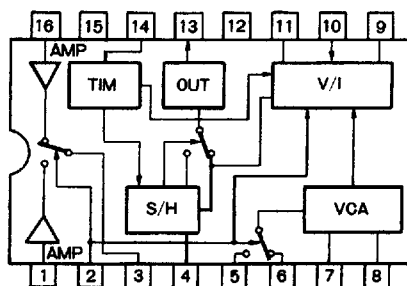
Pin no.	Pin name	Pin no.	Pin name
1	Audio FM IN	9	V/I register
2	VFM/AFM control	10	SP/EP gain control
3	Amplifier output	11	Charging capacitor
4	Hold capacitor	12	Ground
5	Audio filter in	13	DC out
6	Video filter in	14	DF. F IN
7	Video gain adjustment	15	Power supply (V _{CC})
8	Audio gain adjustment	16	Video FM in

Dimensions (Units : mm)

BA7039 (DIP16)



Block diagram



Absolute maximum ratings ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Limits	Unit	Conditions
Power supply	V_{CC}	8.0	V	
Power dissipation	P_d	500	mW	Reduce power by 5.0 mW/°C for each degree above 25°C.
Operating temperature	T_{opr}	-20~+75	°C	
Storage temperature	T_{stg}	-55 ~ +125	°C	

Recommended operating conditions ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Min	Typical	Max	Units
Power supply	V_{CC}	4.5		5.5	V

Electrical characteristics (unless otherwise noted, $T_a = 25^\circ\text{C}$)

Parameter	Symbol	Min	Typical	Max	Unit	Conditions
Power supply	V_{CC}	4.5	5.0	5.7	V	
Supply current	I_{CC}	10.0	18.2	33.0	mA	
Amplifier gain	G_{AMP}	4.7	5.5	6.3	dB	$V_{sig} = 0.2 V_{pk-pk}$, 4 MHz, loaded
Amplifier frequency characteristic	f_{AMP}	-3.0	-0.5	+2.0	dB	$V_{sig} = 0.2 V_{pk-pk}$, 1-6 MHz, loaded
Maximum amplifier output amplitude	$V_{A MAX}$	1.8	2.3		V_{pk-pk}	Loaded
VCA voltage, GND	V_{VCA1}	0.31	0.48	0.63	V	$E_7 = 0 V$, $V_{sig} = 1.6 V_{pk-pk}$
VCA voltage, $1/2V_{CC}$	V_{VCA2}	0.38	0.65	0.91	V	$E_7 = 2.5 V$, $V_{sig} = 0.4 V_{pk-pk}$
VCA voltage, V_{CC}	V_{VCA3}	0.60	0.97	1.34	V	$E_6 = 5.0 V$, $V_{sig} = 0.4 V_{pk-pk}$
Output voltage	V_{OUT}	1.3	2.35	2.9	V	$E_7 = 2.5 V$, $V_{sig} = 0.4 V_{pk-pk}$, V-SP mode
Droop voltage	V_{DLP}		50	150	V_{pk-pk}	$C = 0.01 \mu\text{F}$, $t = 5 \text{ ms}$
Saturation voltage	V_{P^+}	4.6	4.9		V	For integrated output waveform positive peak
Residual voltage	V_{P^-}		0.1	0.4	V	For integrated output waveform negative peak
Offset voltage	V_{OFS}		0.1	0.4	V	No signal
Control voltage	V_{CTL}	1.0	2.0	3.0	V	pin 2 (V/A), pin 12 (SP/EP)

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Test circuit

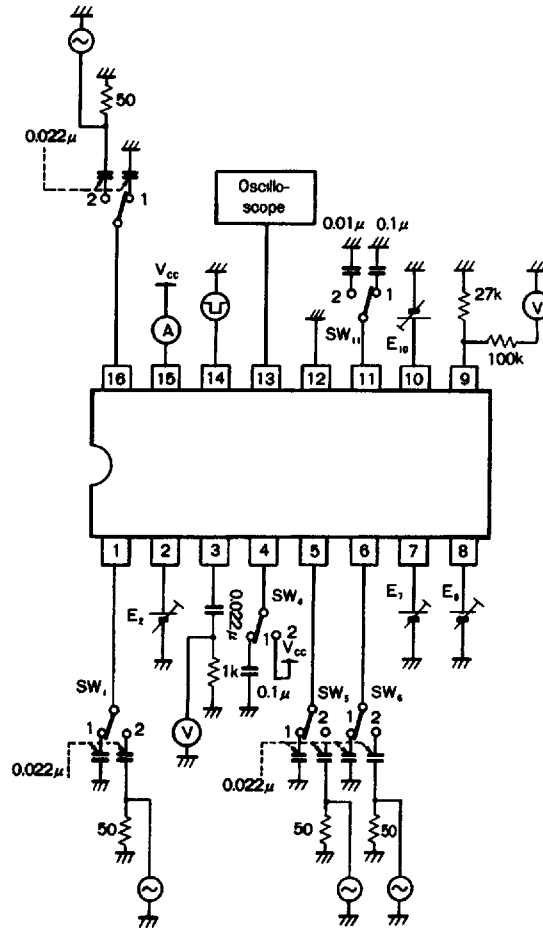
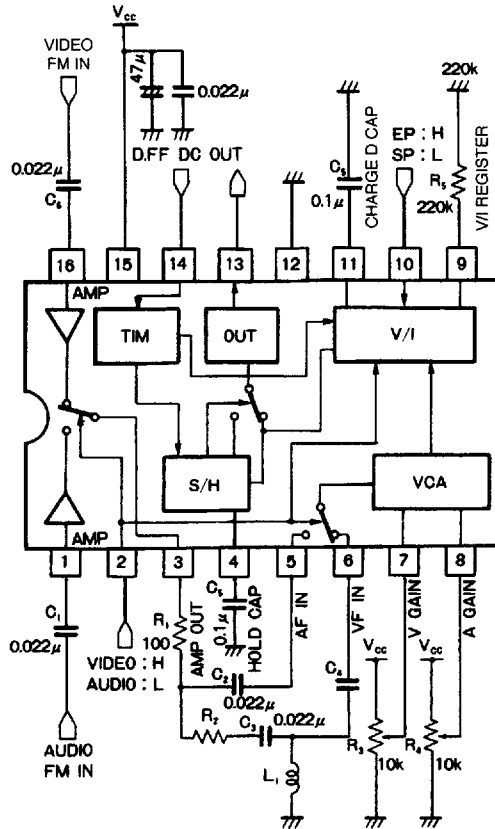
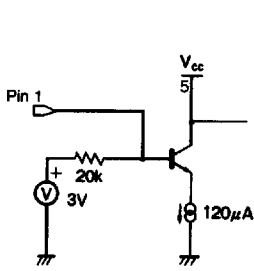


Figure 1 Application example

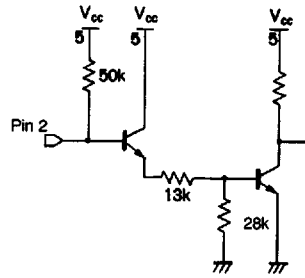


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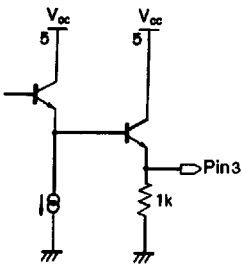
Input and output equivalent circuits



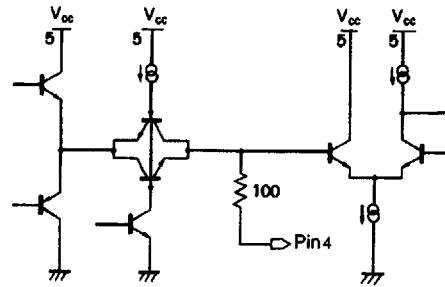
Pin 1



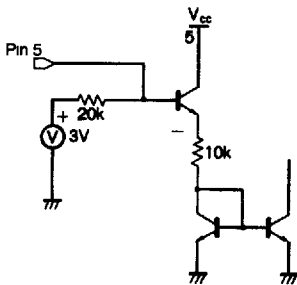
Pin 2



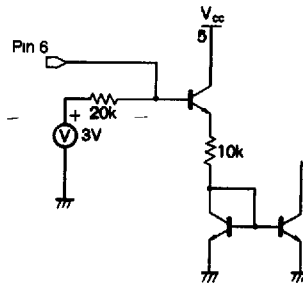
Pin 3



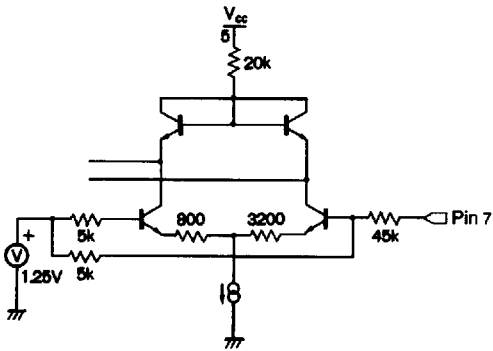
Pin 4



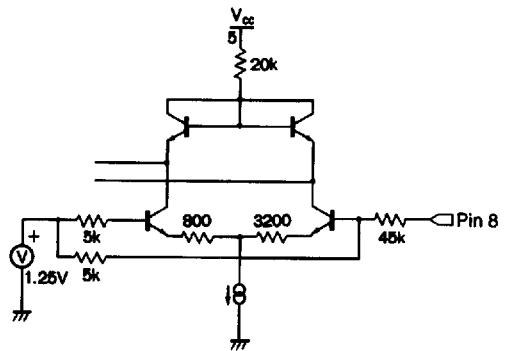
Pin 5



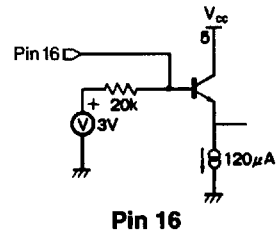
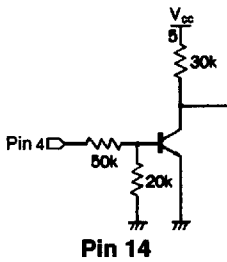
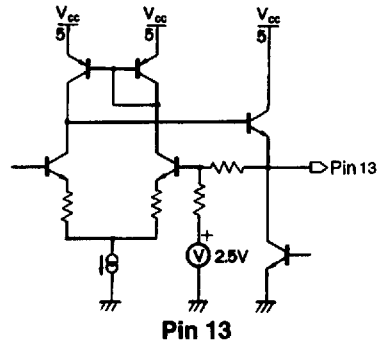
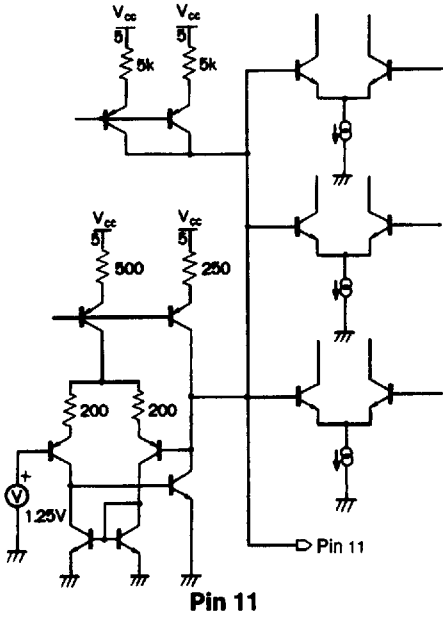
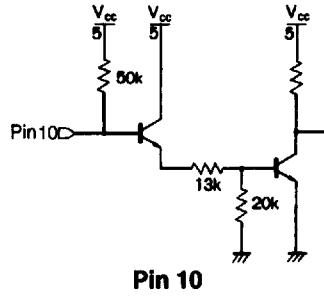
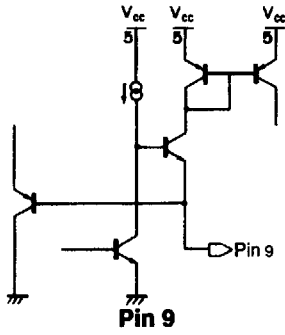
Pin 6



Pin 7



Pin 8



Circuit operation

Input amplifier

The video and audio FM signals are amplified by the 6 dB input amplifier. Each of the amplified FM signals can be selectively output using the audio/video switch.

Voltage controlled amplifier (VCA)

Amplifier gain can be varied up to a maximum of about 20 dB by varying the dc voltage externally. The VCA voltage should be set to obtain an appropriate output voltage.

Detection and integration circuit

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

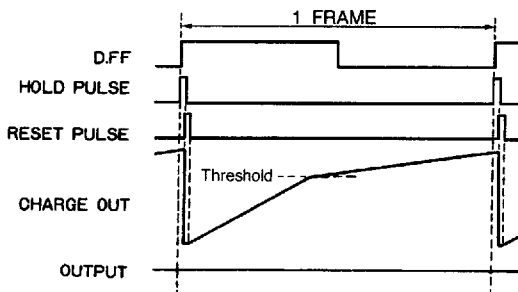
By using the V/I-converted output current to charge an external capacitor, the detection output between two consecutive rising edges of the drum switching signal (that is, for one frame) is integrated. The integrated output is sampled at the rising edge of the next drum switching signal, and is held during the next frame interval. When the charging voltage exceeds the threshold value, the charging current is reduced by half, to compress the integrated output voltage.

V/I current logic

The following table shows the current flowing to the V/I register from the charging capacitor (pin 11) for the different IC states. These values are for reference only.

	Pin 10	LOW	HIGH
Pin 2	CTL	SP	EP
LOW	Audio	× 2	× 2
HIGH	Video	× 1	× 2

Figure 2 Peak hold and integrated output waveform switching



Note 1: When pin 4 is connected to V_{CC} , the integrated waveform is output. When pin 4 is connected to the capacitor, the integrated waveform peak hold voltage is output.

Sample hold and output circuit

The sampling and hold operations are performed using the externally input drum switching signal as a reference. The rising edge of the drum switching signal triggers sampling of the maximum integrated level in the previous frame, which is held in an external holding capacitor.

Charging capacitor and dc output characteristics

When input to the VCA filter input (pins 7 and 8), the detection voltage is converted to a current by the V/I register (pin 9). This current is also supplied to the charging capacitor pin (pin 13).

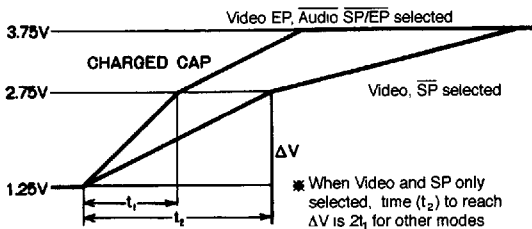


Figure 3

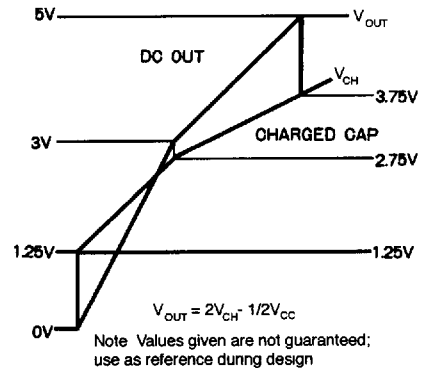


Figure 4

Electrical characteristic curve

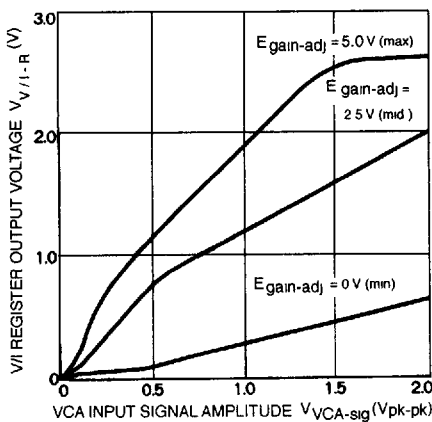


Figure 5