SYNC separator IC with AFC

BA7071F

The BA7071F contains a video synchronization separation circuit, a vertical video synchronization separation circuit, a horizontal oscillation circuit, and a phase comparator. It separates and outputs the horizontal and vertical synchronization signals (HD and VD), and the composite synchronization signal (Sync-out) from input video or composite synchronization signals. The phase difference between HD and VD is guaranteed for both the rising and falling edges of VD.

●Applications

TVs, VCRs and camcorders

●Features

1) Built in AFC circuit.
2) HD and VD phase difference guaranteed.
3) Wide supply voltage range (3V to 7V).
4) Horizontal free-run frequency does not require adjustment.
5) Low external parts count.
6) SOP 8-pin package.

●Absolute maximum ratings (Ta = 25°C)

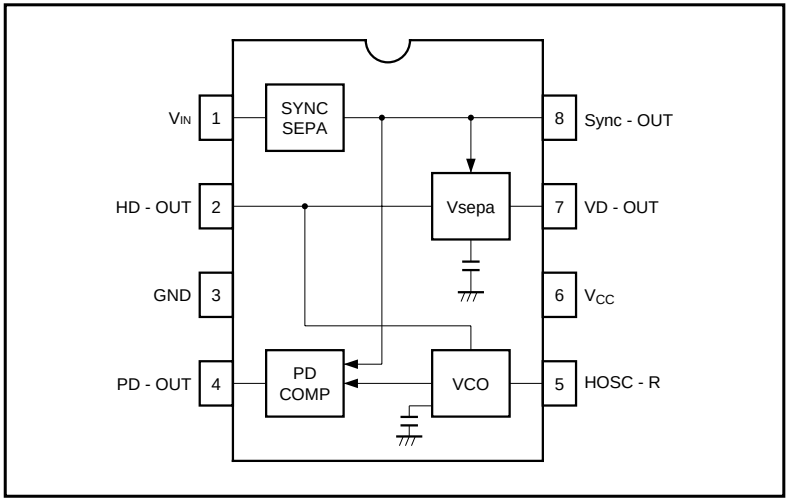
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	8.0	V
Power dissipation	Pd	350*	mW
Operating temperature	Topr	– 20 ~ + 75	°C
Storage temperature	Tstg	– 55 ~ + 125	°C

* Reduced by 3.5mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	2.85	—	7.5	V

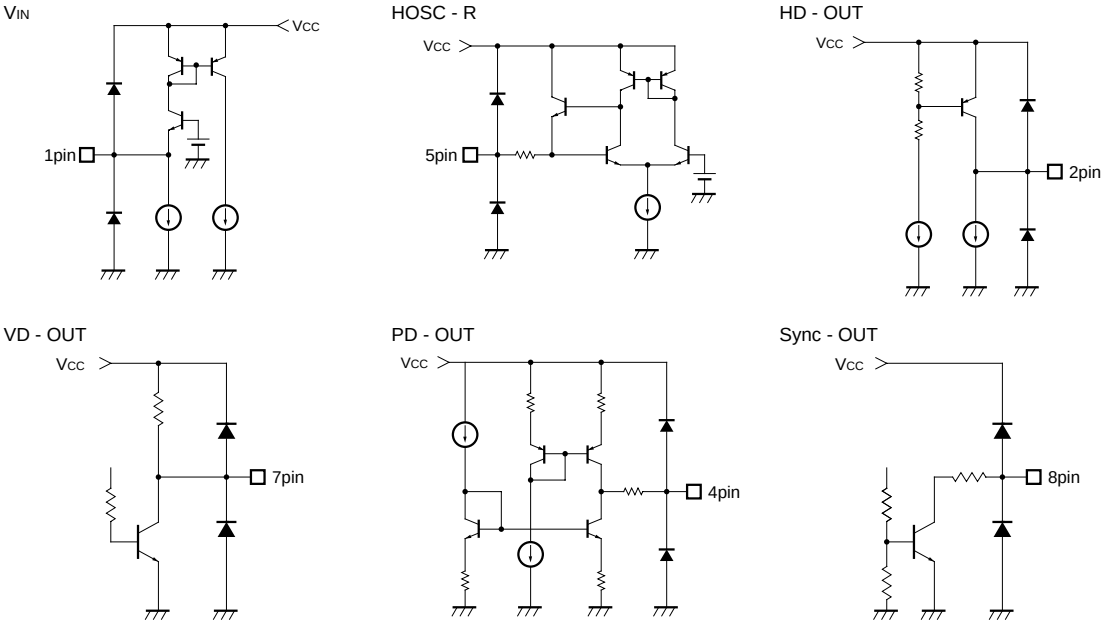
●Block diagram



●Pin descriptions

Pin No.	Pin name	Function
1	V_{IN}	Video input
2	HD - OUT	HD output
3	GND	GND
4	PD - OUT	Phase comparator output
5	HOSC - R	Horizontal oscillator resistor
6	V_{CC}	Power supply (V_{CC})
7	VD - OUT	VD output
8	Sync - OUT	Synchronization signal output

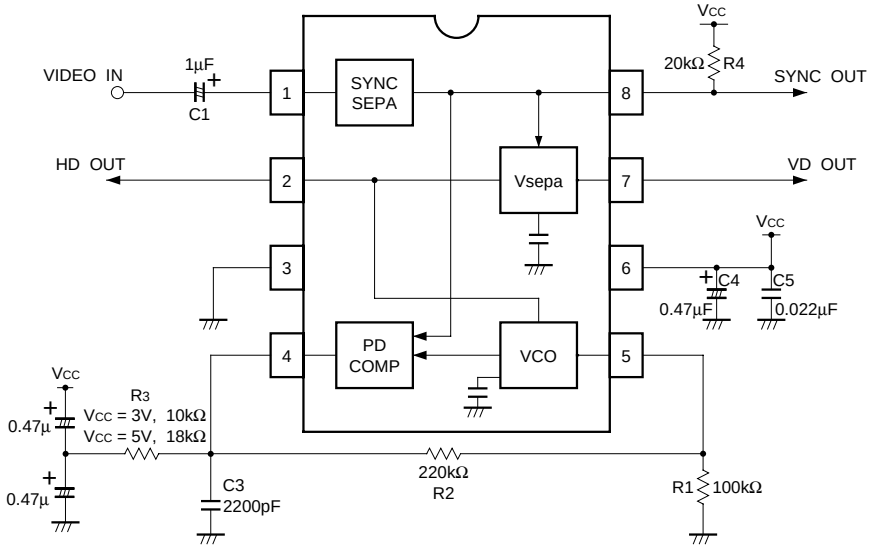
●Input / output circuits



●Electrical characteristics (unless otherwise noted Ta = 25°C and V_{CC} = 5.0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current	I_Q	3.0	5.8	8.6	mA	pin 8 open
Minimum SYNC separation level	Vsyn-min	—	0.08	0.15	V_{P-P}	pin 1 terminated with 75Ω resistor
Pulse voltage low	V_p-L	—	0.1	0.3	V	pins 2, 7
Pulse voltage high	V_p-H	4.7	5.0	—	V	pins 2, 7
(Horizontal) free-running frequency	$f_{H.O}$	13.5	15.7	17.9	kHz	No input signal
Capture range	Δf_{CAP}	2.3	2.7	—	kHz	—
Lock-in phase	T_{HPH}	0.6	1.6	2.6	µs	pin 2 ↓ pin – 1 ↓
HD, VD phase deviation 1	T_{HVD1}	19.0	24.0	29.0	µs	pin 7 ↓ pin – 2 ↑ (FLD1)
HD, VD phase deviation 2	T_{HVD2}	19.0	24.0	29.0	µs	pin 7 ↑ pin – 2 ↑ (FLD1)
HD pulse width	T_{HD}	9.0	10.0	11.0	µs	pin 2 ↓↑
VD pulse width	T_{VD}	249	254	259	µs	pin 7 ↓↑
V_{IN}, VD phase difference	T_{INVD}	41.0	48.0	55.0	µs	pin 1 ↓ pin – 7 ↓

●Measurement circuit (application example)



When SYNC SEPA output only is used. HD and VD unused.

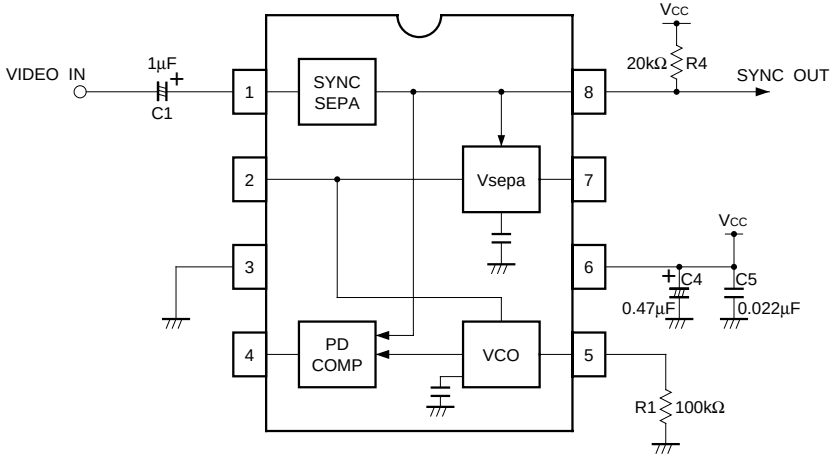


Fig. 1

(1) Connect a 100kΩ resistor between pin 5 and ground.
Leave pins 2, 4 and 7 open.
(2) SYNC OUT (pin 8) has positive output.
(3) The SYNC OUT (pin 8) output rise delay times in relation to the VIDEO IN (pin 1) input signal Sync fall are as follws:

830 ns (reference value) ,when V_{CC} = 5V
880 ns (reference value) ,when V_{CC} = 3V

(4) The SYNC OUT (pin 8) output fall delay times in relation to the VIDEO IN (pin 1) input signal Sync rise are as follws:

150 ns (reference value) ,when V_{CC} = 5V
220 ns (reference value) ,when V_{CC} = 3V

●Circuit operation

(1) Synchronization separation circuit

Detects the charging current to a externally-connected capacitor, and performs synchronization separation.

(2) Horizontal oscillation circuit

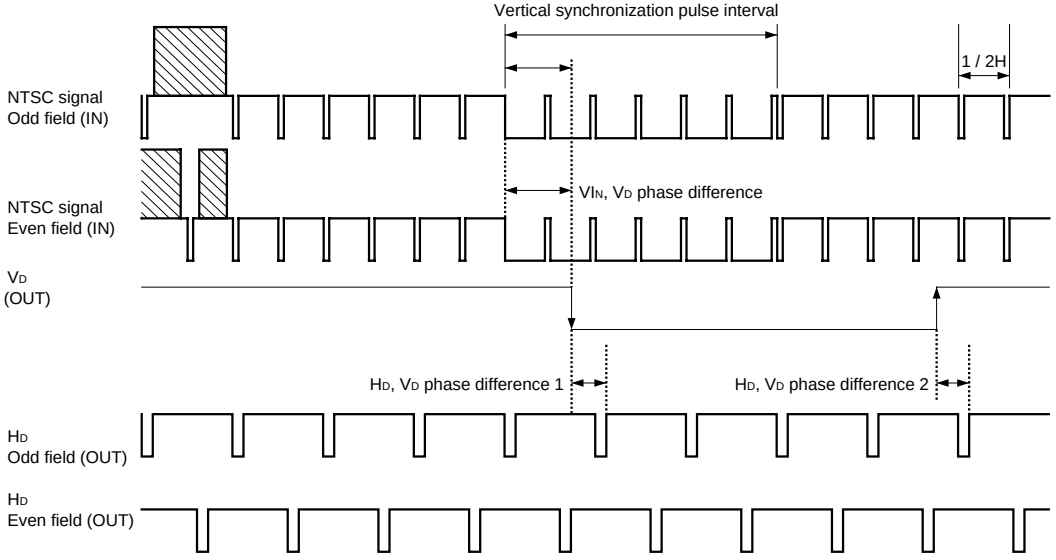
When a video signal is input, it is synchronized with Hsync by the PLL. The horizontal free-running frequency is determined by external resistor R_1.

$$f_{H \cdot O} = \frac{1.57E6}{R_1} \quad [kHz]$$

(3) Vertical synchronization separation circuit

When a video signal is input, synchronization signal separation is done over the vertical synchronization pulse interval.

(4) V_{IN}, H_D, and V_D timing charts



1. The rise and fall positions for V_D are basically the same for both odd and even fields.
2. H_D shifts by 1 / 2H during the odd and even field interval.
3. Only the odd field is given for the specification.

Fig. 2

●Attached components

Resistor R_1 should have a tolerance of ± 2%, and a temperature coefficient of 100ppm or lower.

●Electrical characteristic curves

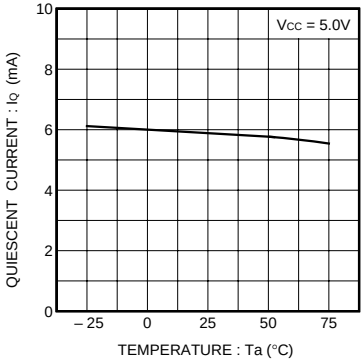


Fig. 3 Quiescent current vs. temperature

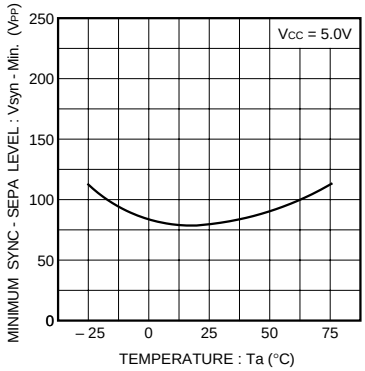


Fig. 4 Minimum synchronization separation level vs. temperature

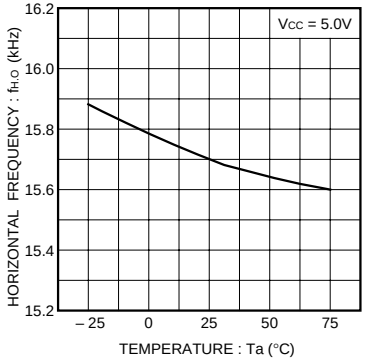


Fig. 5 Horizontal free-running frequency vs. temperature

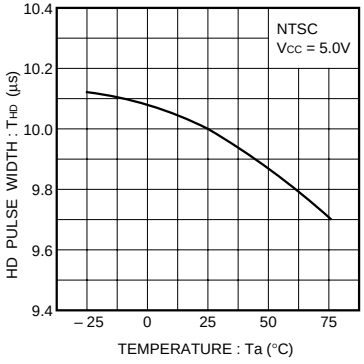


Fig. 6 H_D pulse width vs. temperature

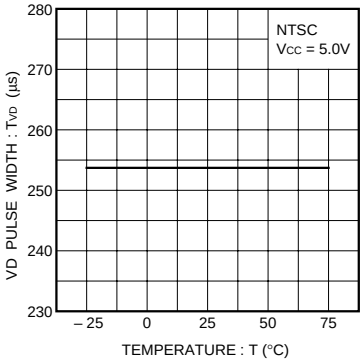


Fig. 7 V_D pulse width vs. temperature

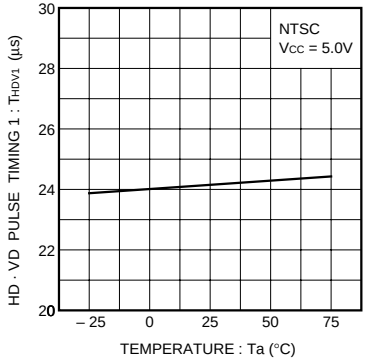


Fig. 8 H_D, V_D phase difference 1 vs. temperature

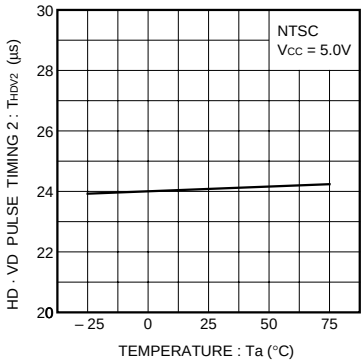
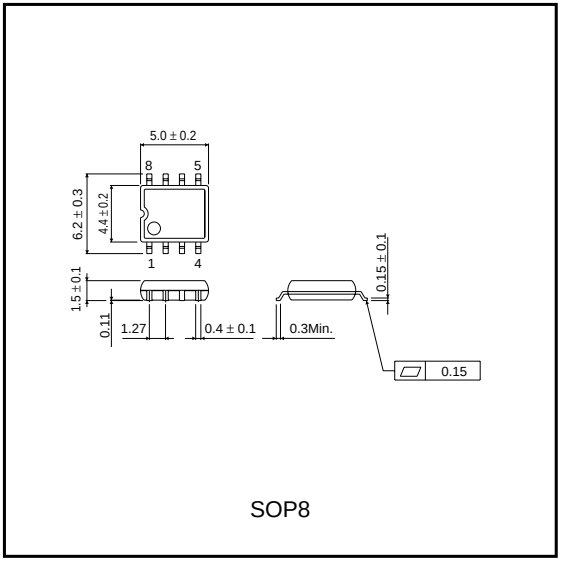


Fig. 9 H_D, V_D phase difference 2 vs. temperature

●External dimensions (Units: mm)



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