

## Video Accessory IC Series

# Sync Separation ICs with Built-in AFC



BA7046F, BA7071F

No.10069EAT03

### ●Description

The BA7046F and BA7071F perform synchronization signal separation of a NTSC mode or PAL mode video signal and output a horizontal synchronization signal ( $H_D$ ), vertical synchronization signal ( $V_D$ ), and composite synchronization signal (Sync-out). With a built in AFC circuit, the horizontal synchronization signal ( $H_D$ ) is output without being affected by the vertical return period or 1/2H pulses. Moreover, AFC circuit oscillation frequency adjustment is not necessary.

For both the BA7046F and BA7071F, the phase difference between the horizontal synchronization signal ( $H_D$ ) and the vertical synchronization signal ( $V_D$ ) is guaranteed. The BA7071F can be operated by a power supply voltage of 3 V.

### ●Features

- 1) Built-in AFC circuit
- 2) Horizontal free-run frequency requires no adjustment
- 3) Guaranteed phase difference between  $H_D$  and  $V_D$
- 4) Few externally attached components
- 5) Low power consumption (Approx. 21 mW) [BA7046F]
- 6) Wide operation power supply range (2.85 V~7.5 V) [BA7071F]
- 7) SOP8 Pin package [BA7046F, BA7071F]

### ●Applications

VCR, Movies, LCD TV etc.

### ●Line up matrix

| Part. No. | Supply Voltage (V) | Circuit Current (mA) | Minimum Sync Separation Level (Vpp) | Capture Range (kHz) | Lock-in Phase difference ( $\mu$ s) | $H_D, V_D$ Phase difference ( $\mu$ s) | $H_D$ Pulse width ( $\mu$ s) | $V_D$ Pulse width ( $\mu$ s) | Package |
|-----------|--------------------|----------------------|-------------------------------------|---------------------|-------------------------------------|--|------------------------------|------------------------------|---------|
| BA7046F   | 4.5 ~ 5.5          | 4.1                  | 0.08                                | $\pm 2.9$           | 0                                   | 23.5                                   | 5.1                          | 230                          | SOP8    |
| BA7071F   | 2.85 ~ 7.5         | 5.8                  | 0.08                                | $\pm 2.7$           | 1.6                                 | 24                                     | 10                           | 254                          | SOP8    |

### ●Absolute maximum ratings(Ta=25°C)



















| Parameter             | Symbol | Ratings   | Unit |
|-----------------------|--------|-----------|------|
| Supply voltage        | Vcc    | 8.0       | V    |
| Power dissipation     | Pd     | 350 ※     | mW   |
| Operating temperature | Topr   | -20 ~ 75  | °C   |
| Storage temperature   | Tstg   | -55 ~ 125 | °C   |

※: Derating is done at 3.5mW/°C above Ta=25°C.

### ●Operating Range(Ta=25°C)

| Parameter      | Symbol | Ratings   |            | Unit |
|----------------|--------|-----------|------------|------|
|                |        | BA7046F   | BA7071F    |      |
| Supply voltage | Vcc    | 4.5 ~ 5.5 | 2.85 ~ 7.5 | V    |

## ●Electrical characteristics (Unless otherwise noted Ta=25°C and VCC=5.0V)

| Parameter                     | Symbol               | Typ.    |         | Unit | Conditions   |
|-------------------------------|----------------------|---------|---------|------|--|
|                               |                      | BA7046F | BA7071F |      |  |
| Quiescent current             | I <sub>Q</sub>       | 4.1     | 5.8     | mA   | Pin 3 open (BA7046F)   |
|                               |                      |         |         |      | Pin 8 open (BA7071F)   |
| Minimum sync separation level | V <sub>syn-Min</sub> | 0.08    | 0.08    | Vp-p | On 6pin 75Ω terminated input (BA7046F)   |
|                               |                      |         |         |      | On 1pin 75Ω terminated input (BA7071F)   |
| Pulse voltage, Low            | V <sub>P-L</sub>     | 0.1     | 0.1     | V    | 2pin, 4pin (BA7046F)   |
|                               |                      |         |         |      | 2pin, 7pin (BA7071F)   |
| Pulse voltage, High           | V <sub>P-H</sub>     | 4.9     | 5.0     | V    | 2pin, 4pin (BA7046F)   |
|                               |                      |         |         |      | 2pin, 7pin (BA7071F)   |
| Horizontal free-run frequency | F <sub>HO</sub>      | 15.7    | 15.7    | kHz  | When inputting no signal   |
| Capture range                 | ΔF <sub>CAP</sub>    | ±2.9    | ±2.7    | kHz  | —  |
| Lock-in phase difference      | T <sub>HPH</sub>     | 0       | 1.6     | μs   | From pin 2  to pin 6  (BA7046F)        |
|                               |                      |         |         |      | From pin 2  to pin 1  (BA7071F)        |
| HD, VD phase difference1      | T <sub>HVD1</sub>    | 23.5    | 24.0    | μs   | From pin 4  to pin 2  (BA7046F)        |
|                               |                      |         |         |      | From pin 7  to pin 2  (FLD1) (BA7071F) |
| HD, VD phase difference2      | T <sub>HVD2</sub>    | —       | 24.0    | μs   | —  |
|                               |                      |         |         |      | From pin 7  to pin 2  (FLD1) (BA7071F) |
| HD pulse width                | T <sub>HD</sub>      | 5.1     | 10.0    | μs   | pin 2                                  |
| VD pulse width                | T <sub>VD</sub>      | 230     | 254     | μs   | pin 4   (BA7046F)                      |
|                               |                      |         |         |      | pin 7   (BA7071F)                      |
| VIN,VD phase difference 2     | T <sub>INVD</sub>    | —       | 48      | μs   | —  |
|                               |                      |         |         |      | From pin 1  to pin 7  (BA7071F)        |

●Block diagram

BA7046F

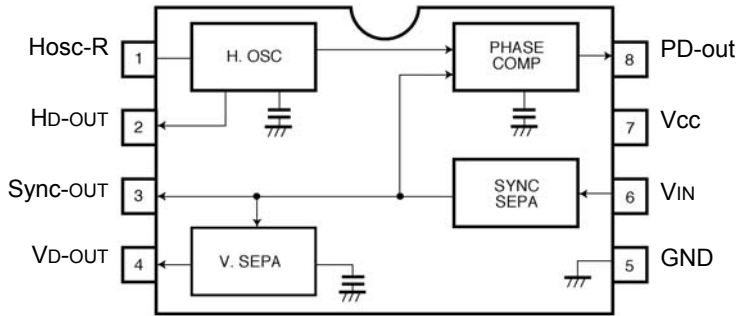


Fig.1

BA7071F

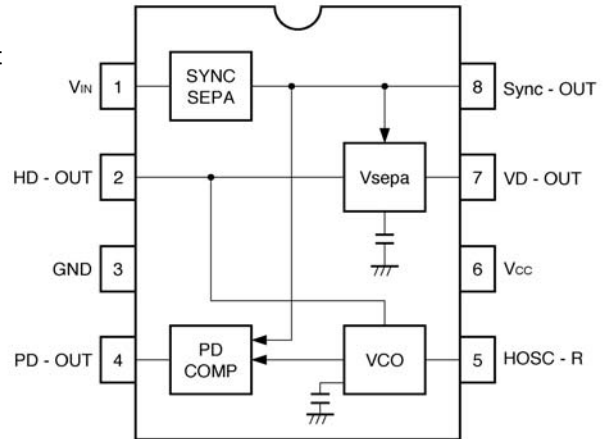


Fig.2

●Description of operations

1) Synchronization signal separation circuit

The synchronization signal separation circuit detects the charge/discharge current of an external capacitor and performs synchronization separation.

2) Horizontal oscillator

When a video signal is input, this circuit synchronizes it with Hsync by a PLL circuit.

The horizontal free-run frequency is determined by the external resistance R1.

$$f_{HO} = 2.05 \times 10^6 / R1 \text{ (BA7046F)}$$

$$f_{HO} = 1.57 \times 10^6 / R1 \text{ (BA7071F)}$$

3) Vertical synchronization signal separation circuit

When a video signal is input, this circuit performs synchronization separation of the vertical synchronization signal.

Timing Chart for  $V_{IN}$ ,  $H_D$ , and  $V_D$

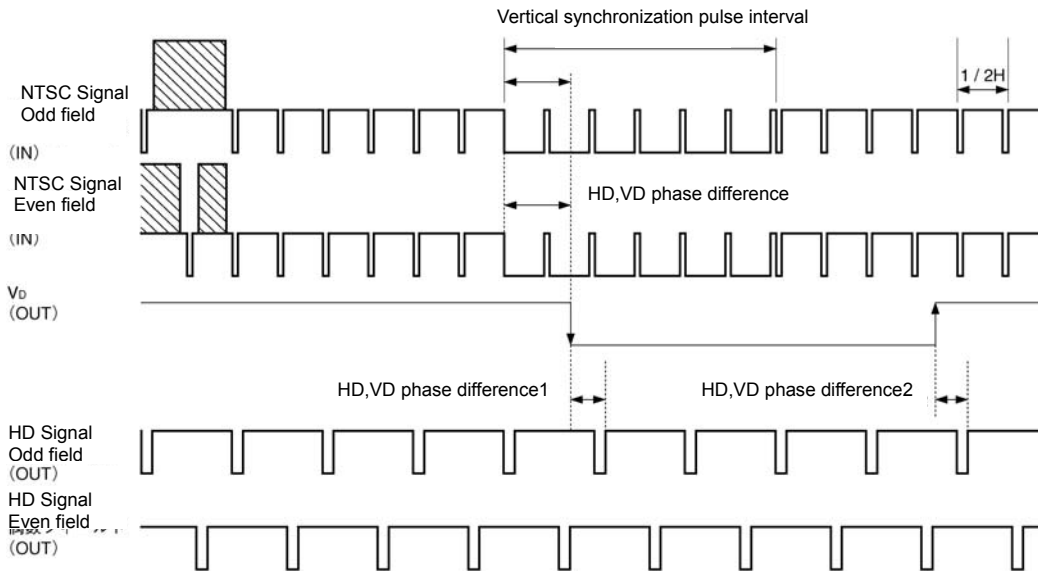


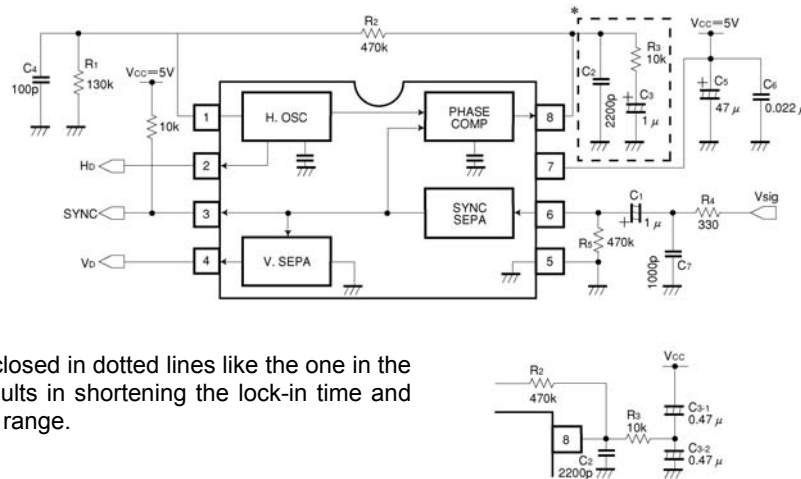
Fig.3

- 1) The rising and falling locations of  $V_D$  basically are the same in odd- and even-numbered fields.
- 2)  $H_D$  slips  $1/2H$  between odd- and even-numbered fields.
- 3) Only the odd-numbered fields are mentioned in specs.

●Pin descriptions

| PIN NO. | BA7046F  |                       | BA7071                                       |                       |
|---------|--|-----------------------|--|-----------------------|
|         | Pin name/Function                                  | Input/output circuits | Pin name/Function                            | Input/output circuits |
| 1       | HOSC-R<br>Horizontal oscillation<br>resistance pin |                       | VIN<br>Video input                           |                       |
| 2       | HD-OUT<br>HD output                                |                       | HD-OUT<br>HD output                          |                       |
| 3       | Sync-OUT<br>Synchronization<br>signal output pin   |                       | GND  | —                     |
| 4       | VD-OUT<br>VD output                                |                       | PD-OUT<br>Phase comparator<br>output pin     |                       |
| 5       | GND  | —                     | HOSC-R<br>Horizontal oscillator<br>resistor  |                       |
| 6       | VIN<br>Video input                                 |                       | Vcc<br>Power supply                          | —                     |
| 7       | Vcc<br>Power supply                                | —                     | VD-OUT<br>VD output                          |                       |
| 8       | PD-OUT<br>Phase comparator<br>output               |                       | Sync-OUT<br>Synchronization<br>signal output |                       |

●Application Circuit  
BA7046F



Making the circuit enclosed in dotted lines like the one in the figure to the right results in shortening the lock-in time and enlarging the capture range.

Fig.4

When using only SYNC SEPA output (When H<sub>D</sub> and V<sub>D</sub> output is unused)

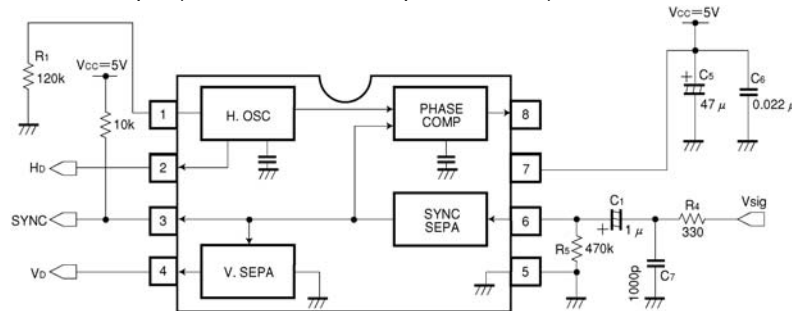


Fig.5

- 1) Connect resistance on the order of 120kΩ between the 1pin and GND.  
Leave the 2pin, 4pin, and 8pin open.
- 2) SYNC (3pin) output is positive polarity.
- 3) The SYNC (3pin) output rise delay time with respect to the Sync fall of the V<sub>sig</sub> (6pin) input signal is 850 ns (reference value).
- 4) The SYNC (3pin) output fall delay time with respect to the Sync rise of the V<sub>sig</sub> (6pin) input signal is 450 ns (reference value).

## BA7071F

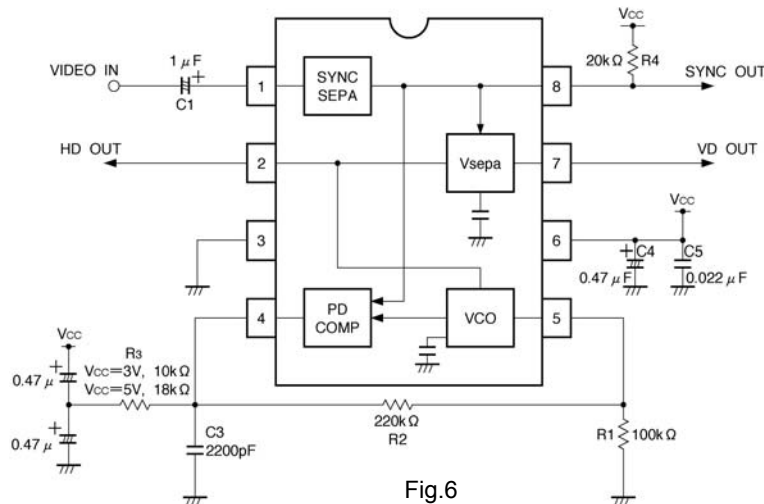


Fig.6

When using only SYNC SEPA output (When HD and VD output is unused)

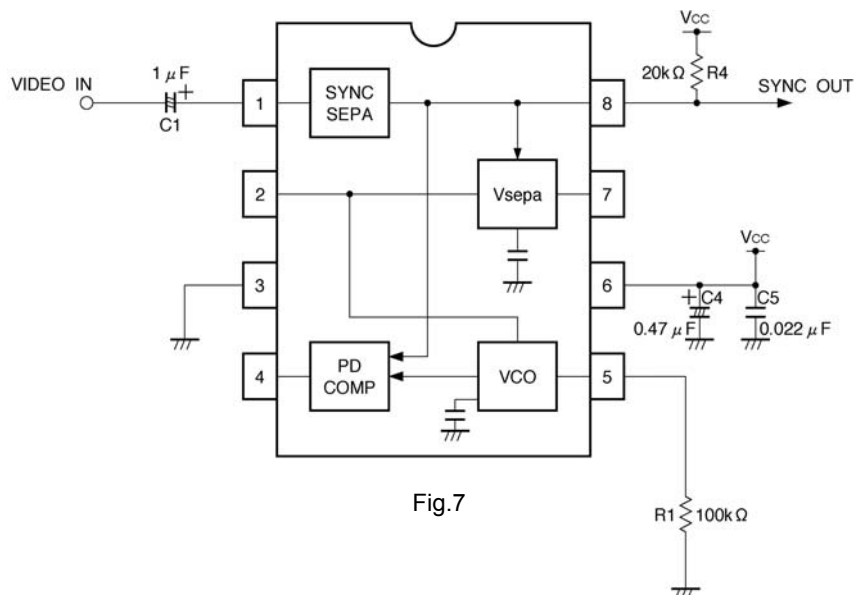


Fig.7

- 1) Connect resistance of  $100\text{k}\Omega$  between the 5pin and GND.  
Leave the 2pin, 4pin, and 7pin open.
- 2) SYNC OUT (8pin) output is positive polarity.
- 3) The SYNC OUT (8pin) output rise delay time with respect to the Sync fall of the VIDEO IN (1pin) input signal is  
830 ns (reference value) if  $V_{cc}=5\text{ V}$   
880 ns (reference value) if  $V_{cc}=3\text{ V}$
- 4) The SYNC OUT (8pin) output with respect to the Sync rise of the VIDEO IN (1pin) input signal is  
150 ns (reference value) if  $V_{cc}=5\text{ V}$   
220 ns (reference value) if  $V_{cc}=3\text{ V}$
- 5) For R1, use resistors for which the allowable difference is within  $\pm 2\%$  and the temperature coefficient is within  $\pm 100\text{ ppm}$ .

●Reference data

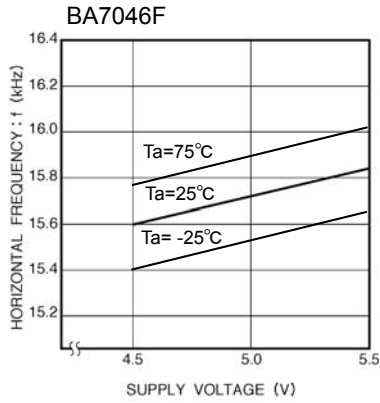


Fig.8 Horizontal Free running Frequency vs. Power supply voltage

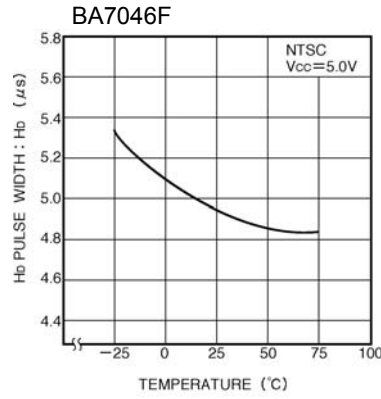


Fig.9 Hd pulse width vs. Temperature

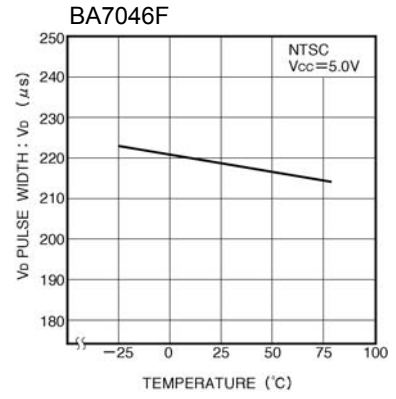


Fig.10 Vd pulse width vs. Temperature

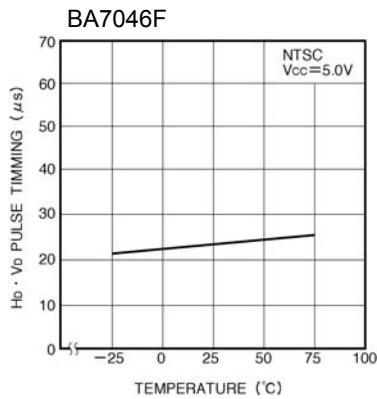


Fig.11 Vd · Hd phase difference vs. Temperature

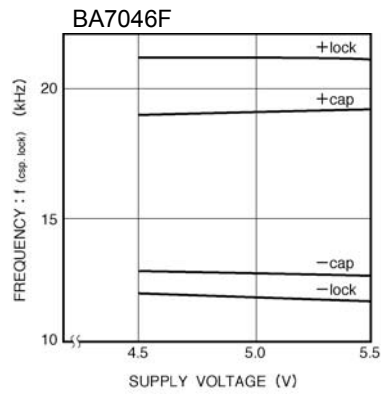


Fig.12 Capture range/lock range vs. Power supply voltage

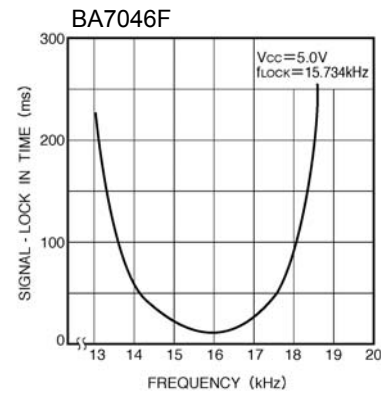


Fig.13 Time from no signal to pull in

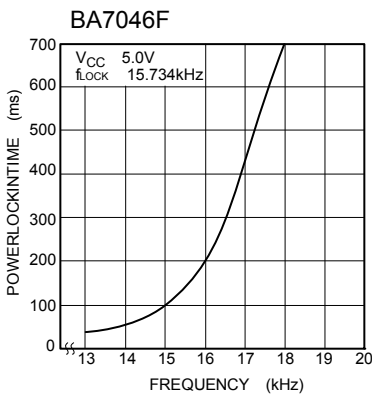


Fig.14 Time from power on to pull in

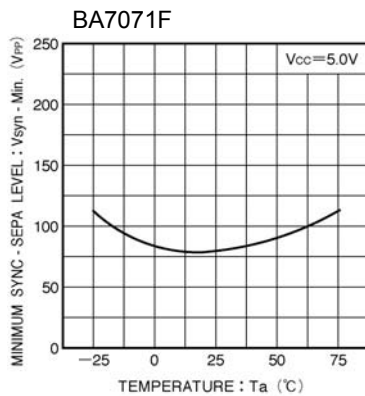


Fig.15 Minimum synchronization separation level vs. Temperature

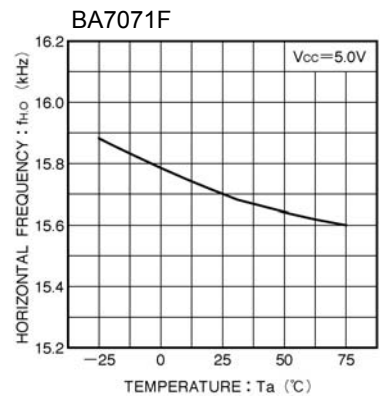


Fig.16 Horizontal free-running frequency vs. Temperature

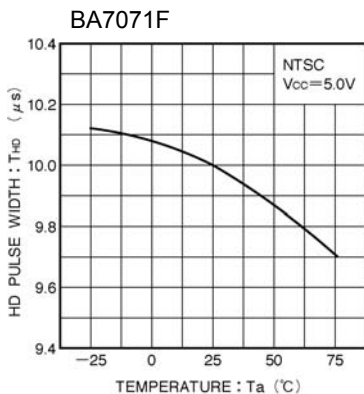


Fig.17 Hd pulse width vs. Temperature

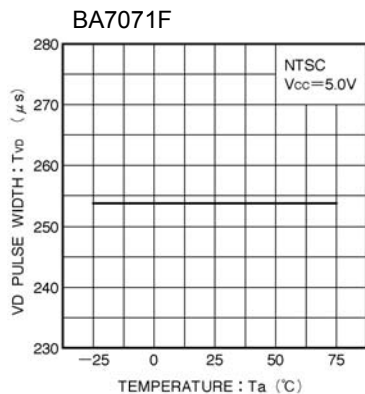


Fig.18 Vd pulse width vs. Temperature

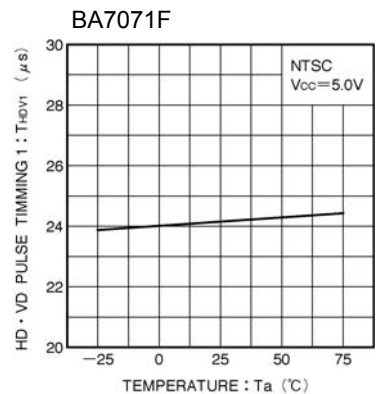


Fig.19 Hd · Vd phase difference vs. Temperature

**●Notes for use**

- 1) Numbers and data in entries are representative design values and are not guaranteed values of the items.
- 2) Although we are confident in recommending the sample application circuits, carefully check their characteristics further when using them. When modifying externally attached component constants before use, determine them so that they have sufficient margins by taking into account variations in externally attached components and the Rohm LSI, not only for static characteristics but also including transient characteristics.
- 3) Absolute maximum ratings  
If applied voltage, operating temperature range, or other absolute maximum ratings are exceeded, the LSI may be damaged. Do not apply voltages or temperatures that exceed the absolute maximum ratings. If you think of a case in which absolute maximum ratings are exceeded, enforce fuses or other physical safety measures and investigate how not to apply the conditions under which absolute maximum ratings are exceeded to the LSI.
- 4) GND potential  
Make the GND pin voltage such that it is the lowest voltage even when operating below it. Actually confirm that the voltage of each pin does not become a lower voltage than the GND pin, including transient phenomena.
- 5) Thermal design  
Perform thermal design in which there are adequate margins by taking into account the allowable power dissipation in actual states of use.
- 6) Shorts between pins and misinstallation  
When mounting the LSI on a board, pay adequate attention to orientation and placement discrepancies of the LSI. If it is misinstalled and the power is turned on, the LSI may be damaged. It also may be damaged if it is shorted by a foreign substance coming between pins of the LSI or between a pin and a power supply or a pin and a GND.
- 7) Operation in strong magnetic fields  
Adequately evaluate use in a strong magnetic field, since there is a possibility of malfunction.



●Ordering part number

|   |   |
|---|---|
| B | A |
|---|---|

Part No.

|   |   |   |   |
|---|---|---|---|
| 7 | 0 | 4 | 6 |
|---|---|---|---|

Part No.  
7046  
7071

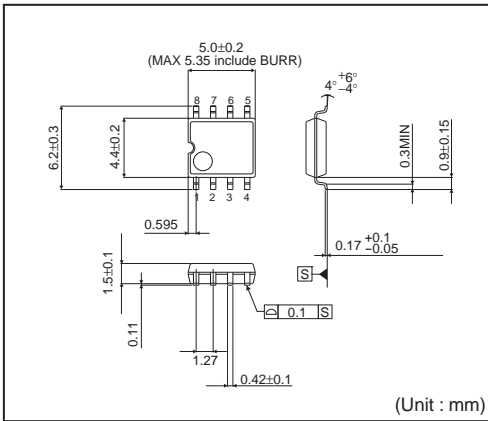
|   |
|---|
| F |
|---|

Package  
F :SOP8

|   |   |
|---|---|
| E | 2 |
|---|---|

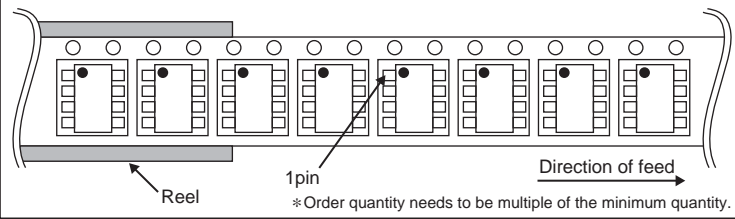
Packaging and forming specification  
E2: Embossed tape and reel

SOP8



<Tape and Reel information>

|                   |   |
|-------------------|---|
| Tape              | Embossed carrier tape   |
| Quantity          | 2500pcs   |
| Direction of feed | E2<br>( The direction is the 1pin of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand ) |



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