

## ● Applications

**Any other applications requiring an internal reference oscillator circuit**

- 1) Center frequency can be set with an external constant.
- 2) Internal sensitivity adjuster amplifier makes it possible to set the frequency control sensitivity with an external constant.
- 3) Internal 1 / 2 frequency divider for switchable output.

5) Three internal control sensitivity switches.

The pin diagram of the 74VHC04 IC shows 16 pins. The internal logic blocks include a VCO (Voltage-Controlled Oscillator) connected to pins 13 (VCTL), 12 (CT1), 11 (CT2), and 10 (Vcc). A SW (Switch) block is connected to pins 6 (1/2FB), 7 (FOUT), and 8 (GND). A 1/2 divider block is connected to pins 11 (CT2) and 10 (Vcc). The input section includes a buffer/inverter connected to pins 16 (IN1), 15 (IN2), and 14 (VO). The output section includes a buffer/inverter connected to pins 13 (VCTL), 12 (CT1), 11 (CT2), and 10 (Vcc). The pin connections are as follows: 1 (SW1), 2 (SW2), 3 (SW3), 4 (BW), 5 (BWB), 6 (1/2FB), 7 (FOUT), 8 (GND), 9 (FADJ), 10 (Vcc), 11 (CT2), 12 (CT1), 13 (VCTL), 14 (VO), 15 (IN2), 16 (IN1).

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

| Parameter             | Symbol               | Limits  | Unit |
|-----------------------|----------------------|---------|------|
| Power supply voltage  | V <sub>CC Max.</sub> | 7.0     | V    |
| Power dissipation     | P <sub>d</sub>       | 500*    | mW   |
| Operating temperature | T <sub>opr</sub>     | −20~70  | °C   |
| Storage temperature   | T <sub>stg</sub>     | −55~125 | °C   |

\* When mounted to a 50 × 50 × 1.6 mm glass epoxy board.  
Reduced by 5 mW for each increase in Ta of 1°C over 25°C.

## ● Recommended operating conditions (Ta=25°C)

| Parameter                | Symbol          | Min. | Typ. | Max. | Unit |
|--------------------------|-----------------|------|------|------|------|
| Recommended power supply | V <sub>CC</sub> | 4.5  | —    | 5.5  | V    |

○ Not designed for radiation resistance.

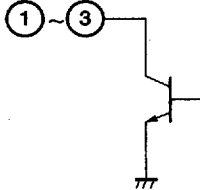
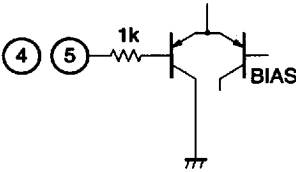
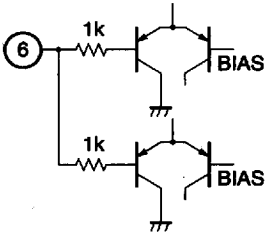
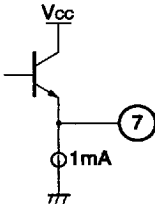
V<sub>CC</sub> for CD-ROM

For CDs/CD-ROMs

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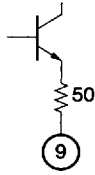
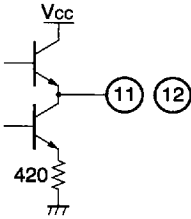
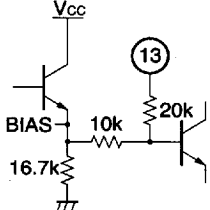
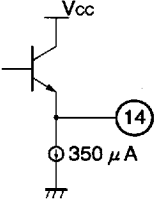
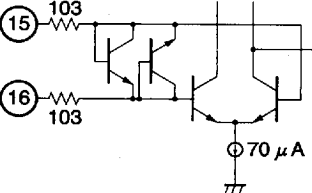
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## ●Pin descriptions

| Pin No. | Pin name | IN | OUT | Standard potential | Internal equivalent circuit                                                        | Function                                                                                                                                                                          |
|---------|----------|----|-----|--------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | SW1      |    | ○   | L<br>0.1V          |   | Collector-open output<br>Logic output pin for control sensitivity adjustment                                                                                                      |
| 2       | SW2      |    |     | OPEN<br>5V         |                                                                                    |                                                                                                                                                                                   |
| 3       | SW3      |    |     |                    |                                                                                    |                                                                                                                                                                                   |
| 4       | BW       | ○  |     | —                  |   | Logic input pin for control sensitivity adjustment<br>(0~2V) "L"<br>(3~5V) "H"                                                                                                    |
| 5       | BWB      |    |     |                    |                                                                                    |                                                                                                                                                                                   |
| 6       | 1/2FB    |    |     |                    |   | Logic input pin for control sensitivity adjustment<br>Switching pin for 1/2 frequency divider<br>Slew at HIGH, output to 1/2 frequency divider at LOW<br>(0~2V) "L"<br>(3~5V) "H" |
| 7       | FOUT     |    | ○   | 3.6V               |  | VCO output pin                                                                                                                                                                    |

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## ● Pin descriptions

| Pin No. | Pin name         | IN | OUT | Standard potential | Internal equivalent circuit                                                         | Function                                                                                                                                                                                                               |
|---------|------------------|----|-----|--------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8       | GND              | —  | —   | 0V                 | GND                                                                                 | GND pin                                                                                                                                                                                                                |
| 9       | F <sub>ADJ</sub> | —  | —   | 2.5V               |    | fo adjustment pin<br>Current and fo adjusted with attached resistor (R <sub>ADJ</sub> ). A low value for R <sub>ADJ</sub> raises the oscillation frequency. (However, R <sub>ADJ</sub> must be set higher than 22 kΩ.) |
| 10      | V <sub>cc</sub>  | —  | —   | 5.0V               | V <sub>cc</sub>                                                                     | V <sub>cc</sub> pin                                                                                                                                                                                                    |
| 11      | CT2              | —  | —   | 1.9V               |    | VCO oscillation capacitor pin<br>Attach a capacitor between CT1 and CT2. A low value for the capacitor raises the oscillation frequency.                                                                               |
| 12      | CT1              |    |     |                    |                                                                                     |                                                                                                                                                                                                                        |
| 13      | VCTL             | ○  |     | 2.5V               |   | VCO control pin<br>Normally shorted along with VO (pin 14).                                                                                                                                                            |
| 14      | VO               |    | ○   | 2.5V               |  | Sensitivity adjustment amplifier output pin<br>Adjust the gain with an external constant.                                                                                                                              |
| 15      | IN2              | ○  |     | 2.5V               |  | Sensitivity adjustment amplifier input pin<br>IN1: Forward input<br>IN2: Reverse input                                                                                                                                 |
| 16      | IN1              |    |     |                    |                                                                                     |                                                                                                                                                                                                                        |

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VCO for CD-ROM

For CDs/CD-ROMs

## ●Electrical characteristics (unless otherwise noted, Ta=25°C, Vcc=5V)

| Parameter                        | Symbol             | Min. | Typ. | Max. | Unit             | Conditions                                                                        |
|----------------------------------|--------------------|------|------|------|------------------|-----------------------------------------------------------------------------------|
| Circuit current                  | I <sub>CC</sub>    | 9    | 14.5 | 20   | mA               | No load                                                                           |
| OP-AMP. output, D range          | V <sub>O</sub>     | 2.0  | 3.4  | —    | V <sub>P-P</sub> | f <sub>IN</sub> = 100 kHz, tertiary component = -35 dB                            |
| VCO control voltage              | V <sub>CTL</sub>   | 1.5  | 2.5  | 3.5  | V                |                                                                                   |
| Control sensitivity              | G <sub>fCTL</sub>  | 1.1  | 1.55 | 2.0  | MHz / V          | f <sub>o</sub> = 17 MHz                                                           |
| V <sub>CTL</sub> input impedance | Z <sub>I-CTL</sub> | 20   | 33   | 45   | kΩ               |                                                                                   |
| Adjustment sensitivity           | G <sub>fADJ</sub>  | 4.8  | 6.4  | 8.0  | MHz / 20kΩ       | R <sub>ADJ</sub> =27kΩ ~47kΩ C <sub>T</sub> =33pF                                 |
| Free-running frequency           | f <sub>o</sub>     | 14.4 | 18   | 21.6 | MHz              | R <sub>ADJ</sub> = 33 kΩ, C <sub>T</sub> = 33 pF, socket                          |
| Maximum oscillation frequency    | f <sub>max</sub>   | 60   | —    | —    | MHz              | R <sub>ADJ</sub> =22kΩ C <sub>T</sub> =5pF                                        |
| Frequency power supply variation | Δf <sub>v</sub>    | —    | 0.7  | 5.0  | % / V            | V <sub>CTL</sub> = 1/2 V <sub>CC</sub> when V <sub>CC</sub> = 5±0.5 V, f = 17 MHz |
| Oscillation output               | V <sub>OUT</sub>   | 0.7  | 1.1  | 1.5  | V <sub>P-P</sub> | Load = 5.1 kΩ output                                                              |
| Input voltage, HIGH              | V <sub>IH</sub>    | 3.0  | —    | —    | V                | BW, BWB, 1 / 2FB                                                                  |
| Input voltage, LOW               | V <sub>IL</sub>    | —    | —    | 2.0  | V                | BW, BWB, 1 / 2FB                                                                  |
| Input current, HIGH              | I <sub>IH</sub>    | —    | 0    | 3    | μA               | BW, BWB, 1 / 2FB                                                                  |
| Leak current, LOW                | I <sub>IL</sub>    | —    | 1    | 5    | μA               | BW, BWB, 1 / 2FB                                                                  |
| Output voltage, LOW              | V <sub>OL</sub>    | —    | —    | 0.5  | V                | I <sub>O</sub> = 1 mA, SW1, SW2, SW3                                              |

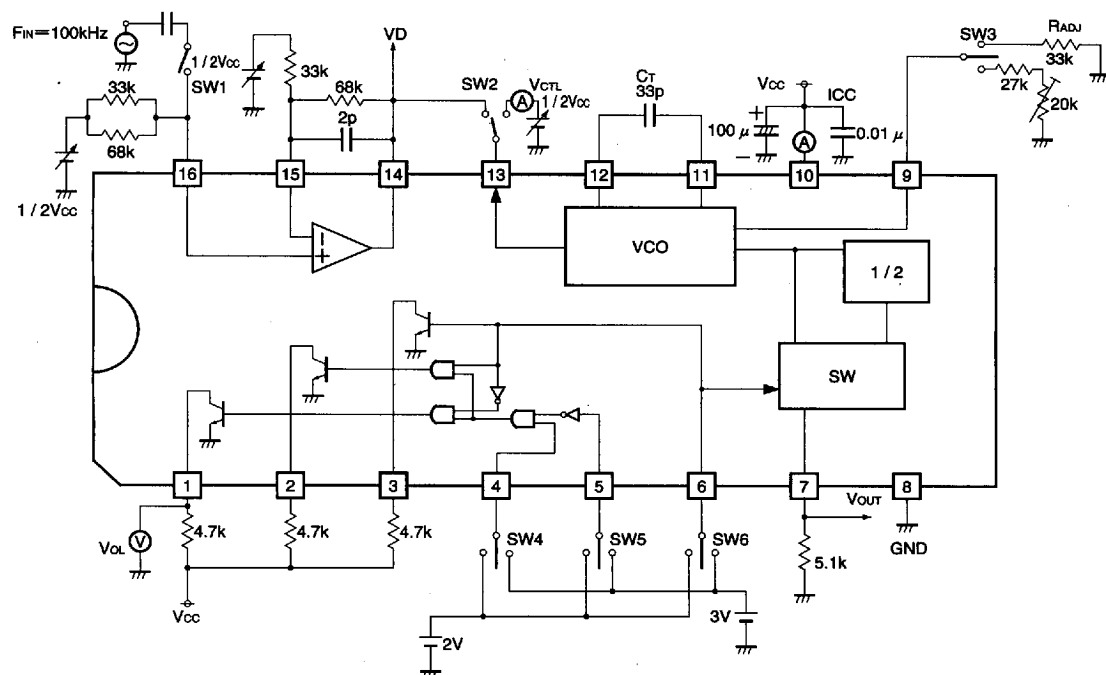
## ●Logic truth table

| Input   |          |              | Output   |          |          |
|---------|----------|--------------|----------|----------|----------|
| 4pin BW | 5pin BWB | 6pin 1 / 2FB | 1pin SW1 | 2pin SW2 | 3pin SW3 |
| 0       | 0        | 0            | —        | —        | —        |
| 0       | 0        | 1            | —        | —        | L        |
| 0       | 1        | 0            | —        | —        | —        |
| 0       | 1        | 1            | —        | —        | L        |
| 1       | 0        | 0            | L        | —        | —        |
| 1       | 0        | 1            | —        | L        | L        |
| 1       | 1        | 0            | —        | —        | —        |
| 1       | 1        | 1            | —        | —        | L        |

Note:  
 Input 1: HIGH  
 Input 0: LOW  
 Output L: ON  
 Output -: OPEN

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### ●Measurement circuit



**Fig. 1**

VCO for CD-ROM

### For CDs/CD-ROMs

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## ●Application example

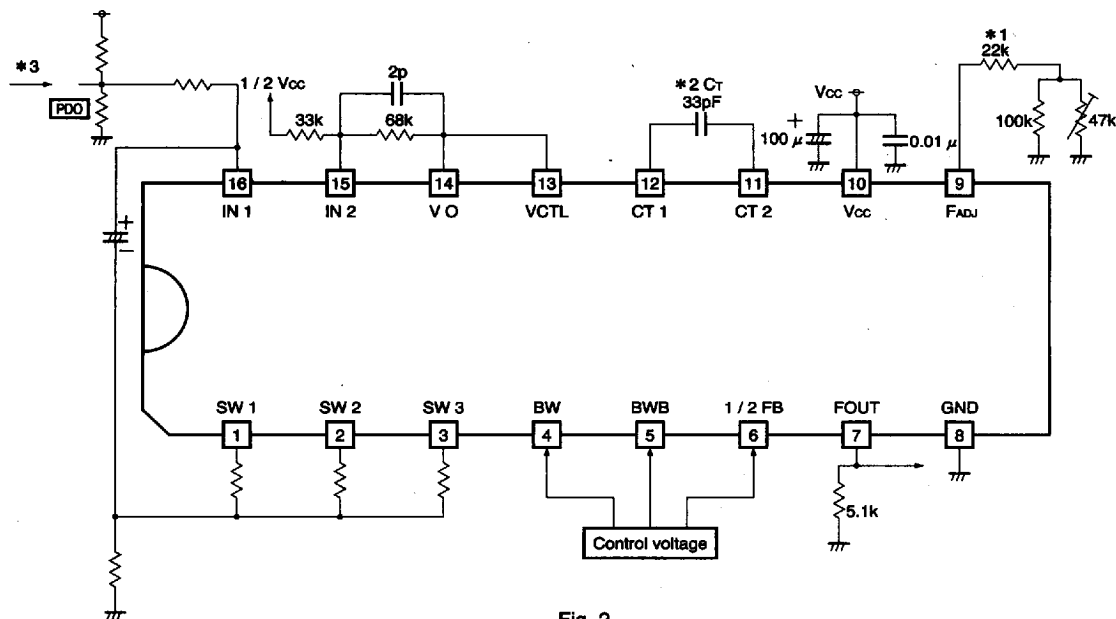


Fig. 2

## Notes:

- \*1.  $R_{Adj}$  must always remain below 22 k $\Omega$ .
- \*2. Adjust by altering the board.
- \*3. The input AC amplitude must not exceed 1 Vp-p.

## ●Electrical characteristic curves

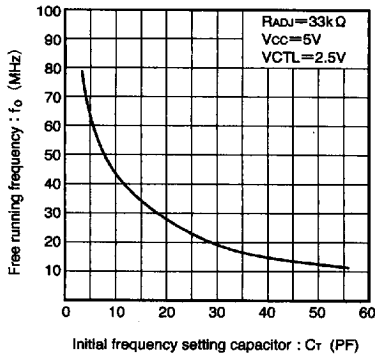


Fig. 3 Frequency setting capacitor characteristics

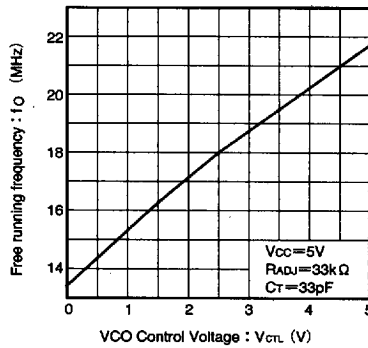
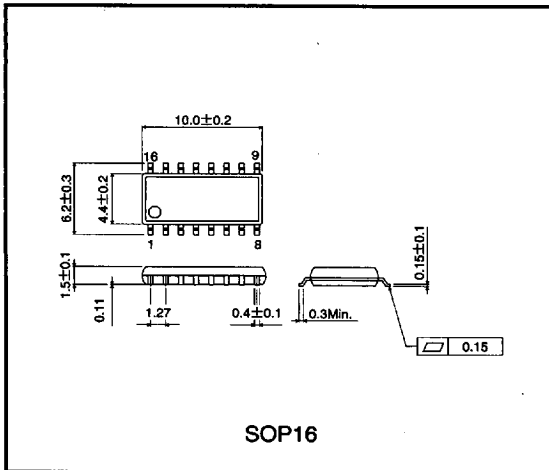


Fig. 4 Frequency vs. control voltage characteristics

## ●External dimensions (Units: mm)



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