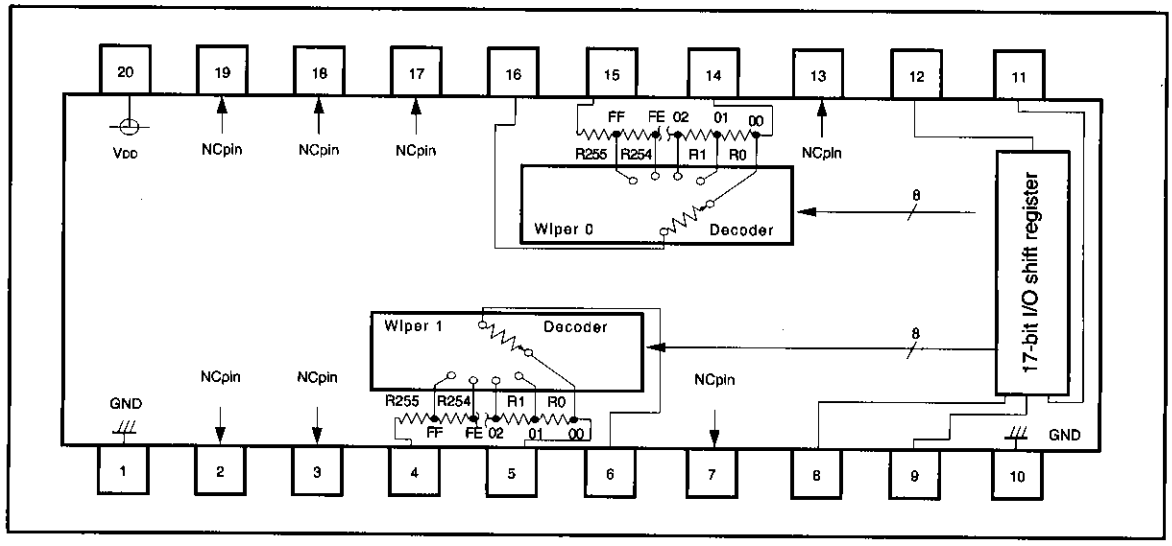
# Audio degital potentiometers
## BH3532FS

The BH3532FS is a digital potentiometer designed for use in audio devices. Its built-in 22Ω resistance systems can be used to set the data from the microcomputer in 256 steps.

●Applications
Volume of recording and playing

●Features
1) Resistance can be set to any of 256 steps using digital codes (serial data).
2) Two built-in channels (Lch, Rch)
3) SSOP-A20 package

●Block diagram



●Absolute maximum ratings (Ta = 25℃)

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 7 | V |
| Power dissipation | Pd | 600* | mW |
| Operating temperature | Topr | −25~75 | ℃ |
| Storage temperature | Tstg | −55~125 | ℃ |

* When used with Ta at greater than 25 ℃ moderate the power by 6 mW for every 1℃ above 25 ℃.

●Recommended operating conditions (Ta = 25℃)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Supply voltage | $V_{DD}$ | 3 | — | 5.5 | V |

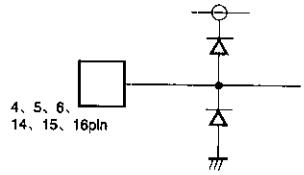
●Pin description

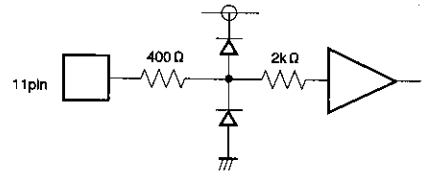
| Pin No. | Pin Name | Function |
|---|---|---|
| 1 | GND | GND |
| 2 | NC | NCpin |
| 3 | NC | NCpin |
| 4 | H1 | Ch 1 high position resistance pin |
| 5 | L1 | Ch 1 low position resistance pin |
| 6 | W1 | Pin for ch 1 wiper |
| 7 | NC | NCpin |
| 8 | EN | Overwrite authorization input pin |
| 9 | CLK | Clock input pin |
| 10 | GND | GND |

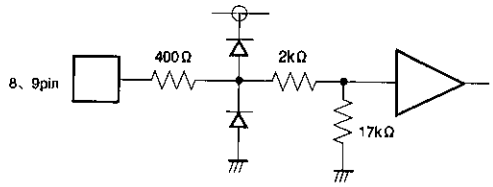
| Pin No. | Pin Name | Function |
|---|---|---|
| 11 | DIN | Serial data input pin |
| 12 | DOUT | Serial data output pin |
| 13 | NC | NCpin |
| 14 | L0 | Ch 0 low position resistance pin |
| 15 | H0 | Ch 0 high position resistance pin |
| 16 | W0 | Pin for Ch 0 wiper |
| 17 | NC | NCpin |
| 18 | NC | NCpin |
| 19 | NC | NCpin |
| 20 | $V_{DD}$ | $V_{DD}$ |

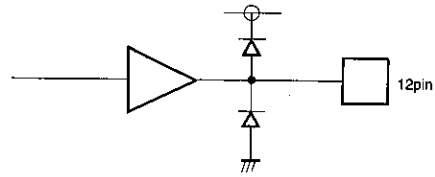
Note 1: Do not connect anything to the NC pin.

●Input/output circuit



●Electrical characteristics (Unless otherwise specified, Ta = 25℃, $V_{CC}$ = 3.5V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| <DC characteristics> | | | | | | |
| Quiescent current | $I_Q$ | 50 | 100 | 150 | μA | |
| Input leakage current | $I_{LI}$ | −1.0 | — | 1.0 | μA | *1 |
| H input voltage | $I_{IH}$ | 3.0 | — | — | V | |
| L input voltage | $I_{IL}$ | — | — | 0.5 | V | |
| H output voltage | $I_{OH}$ | 3.0 | — | — | V | $I_{OH}$=−100 μA |
| L output voltage | $I_{OL}$ | — | — | 0.5 | V | $I_{OL}$=100 μA |
| Total resistance | $R_T$ | 17.6 | 22 | 26.4 | kΩ | |
| Wiper resistance | $R_W$ | 0.4 | 0.8 | 1.6 | kΩ | $I_{OP}$=500 μA |
| <AC characteristics>*2 | | | | | | |
| Clock frequency | $F_{CLK}$ | — | — | 1 | MHz | |
| Clock pulse width | $T_W$ | 500 | — | — | nS | |
| Data setup time | $T_{SU}$ | 300 | — | — | nS | |
| Data hold time | $T_H$ | 100 | — | — | nS | |
| Transmission lag time CLK→DOUT | $T_{OLH}$<br>$T_{OHL}$ | —<br>— | —<br>— | 500<br>500 | nS | |
| Transmission lag time EN→CLK | $T_{CLH}$<br>$T_{CHL}$ | 500<br>500 | —<br>— | —<br>— | nS | |

◎Not designed for radiation resistence

*1 CLK input and EN input are pulled down when internal resistance is 17 kΩ.

*2 $V_{DD}$=3.5V

*3 Input capacity (reference value): 5 pF (max.) Output capacity (reference value): 7 pF (max.)

●Measurement circuit

The command during the Rw measurement is 00H.

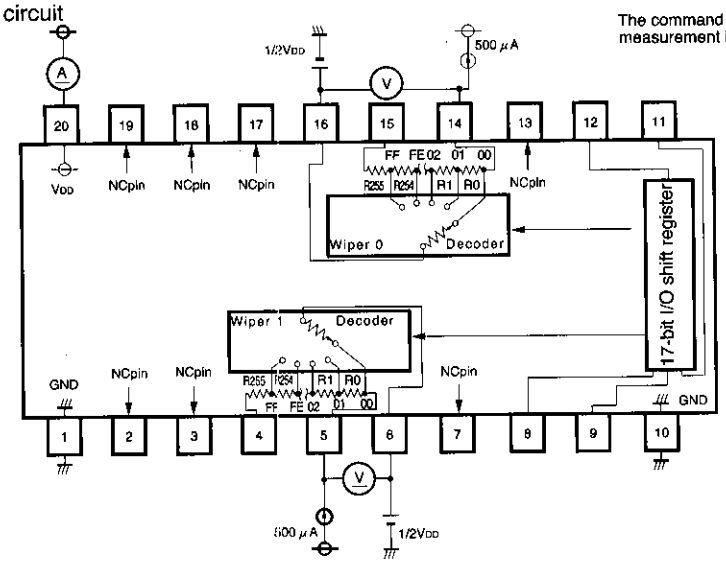



Fig. 1

●Circuit operation

The BH3532FS has two 22kΩ variable resistance systems which can be set in 256 steps (86Ω intervals).
Resistance can be set in 256 steps using the MSB first 8-bit data.
Input data is 17-bit serial data. The first bit is always "L". The next eight bits set the resistance for wiper 1. The last eight bits set the resistance for wiper 0.

Input data is effective when the EN terminal is set to "H", and is put on hold when the EN terminal is set to "L". Also, the reading of the data is performed when CLK rises.
When input data is effective, the previous output data is output serially to the DOUT terminal.
See the figures below for more details.

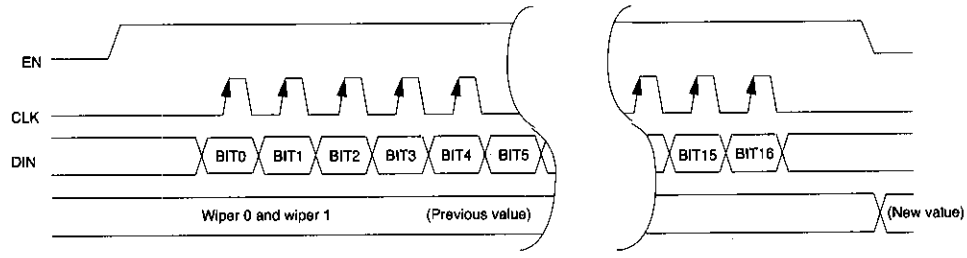



Fig. 2 Timing, figure 1

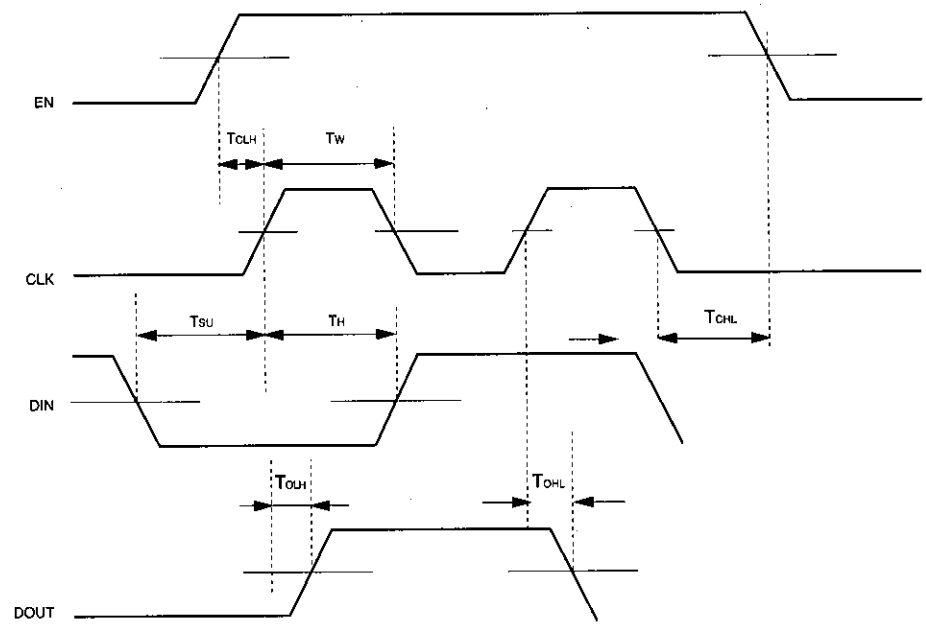



Fig. 3 Timing, figure 2

●Electrical characteristic curve

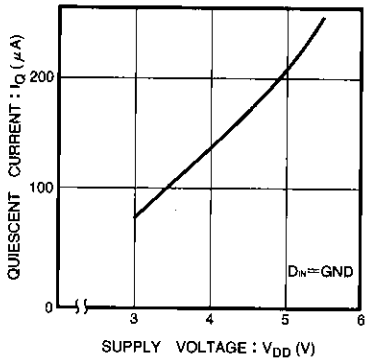



Fig. 4 Supply voltage vs .Quiescent curve

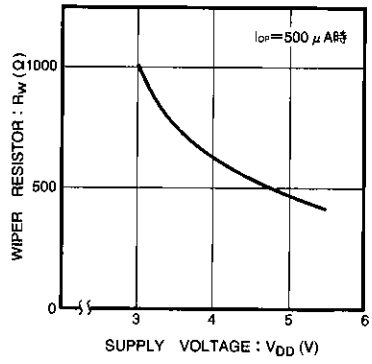
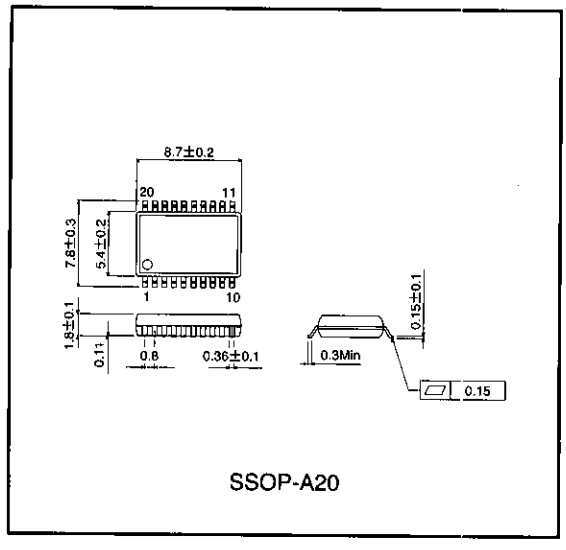



Fig. 5 Supply voltage vs. Wiper resistance

●External dimensions (Unit: mm)



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