

# Single chip Hi-Fi audio signal processor

## BH7800K

The BH7800K incorporates the functions for a VHS audio signal processing system on a single chip. The circuits on the chip are a peak-noise reduction processor (PNR), an FM modulator / demodulator circuit, an I / O switcher, an automatic FM detector circuit, an FM bandpass filter, and a regulator circuit.

### ●Applications

VCRs

### ●Features

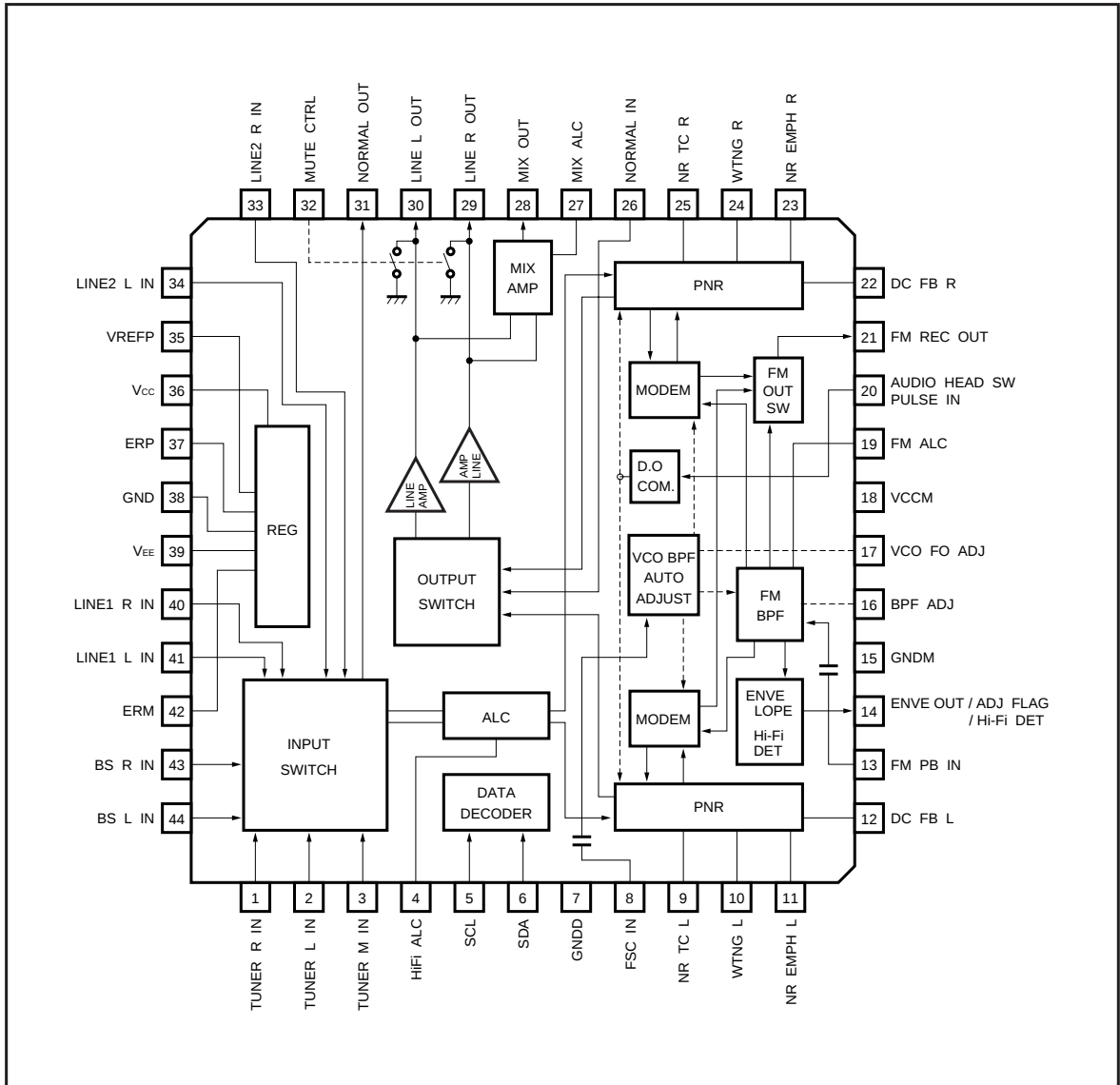
- 1) Operates off dual  $\pm$  power supply which allows a large reduction in the number of coupling capacitors required. A built-in regulator makes it easy to construct a power supply system.
- 2) A two-line SSB (Synchronized Serial Bus) control decoder circuit is provided, allowing the various IC modes to be set using serial control.
- 3) A four line input switcher is included (tuner, BS, and line 1 / 2). The output switcher can switch between STEREO, LEFT, and RIGHT, and Hi-Fi, MIX, and NORMAL, and a BS MONITOR function is also provided.
- 4) The PNR processor and FM modulator / demodulator circuit have reversed characteristics at recording and playback. In addition, the adjustment for carrier frequency and FM deviation / playback level are common.
- 5) The built-in bandpass filter excels at attenuation of other channels, and can be directly coupled to the playback amplifier. The FM recording output block has a high-performance low-pass filter to produce sine wave output.
- 6) Slope-control-type FM-switching-noise compensation circuit.
- 7) Envelope detector circuit and noise-detector-type automatic FM detector circuit.
- 8) VCO that uses the color signal sub-carrier frequency  $f_{sc}$  (NTSC: 3.59545MHz, PAL: 4.433619MHz) and auto-adjusting BPF circuit ensure stable adjustment with no fluctuation due to mounting stress or time.

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

| Parameter             | Symbol           | Limits                            | Unit |
|-----------------------|------------------|-----------------------------------|------|
| Applied voltage       | V <sub>CC</sub>  | 18, 36pin ..... 6.0               | V    |
|                       | V <sub>EE</sub>  | 39pin ..... - 6.0                 | V    |
|                       | V <sub>IN</sub>  | 5, 6, 32pin ..... 6.5             | V    |
|                       | V <sub>IN</sub>  | Pins other than the above ... 6.0 | V    |
| Power dissipation     | P <sub>d</sub>   | 850*                              | mW   |
| Operating temperature | T <sub>opr</sub> | - 10 ~ + 70                       | °C   |
| Storage temperature   | T <sub>stg</sub> | - 55 ~ + 125                      | °C   |

\* Reduced by 8.5mW for each increase in Ta of 1°C over 25°C when mounted on a 70mm × 70mm, t = 1.6mm glass epoxy board.

## ●Block diagram



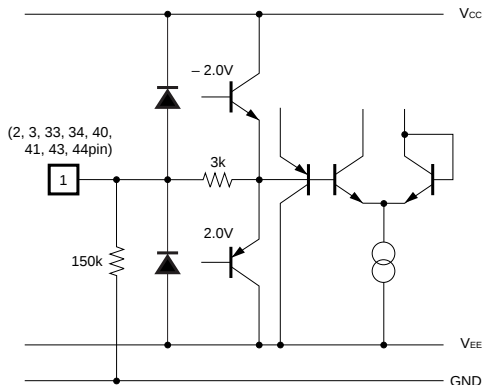
## ●Pin descriptions

| Pin No. | Pin name                              | Function                                                                                          | Voltage              | Format                        |
|---------|---------------------------------------|---------------------------------------------------------------------------------------------------|----------------------|-------------------------------|
| 2, 1, 3 | TUNER IN L, R, M                      | Tuner input (L, R, M)                                                                             | 0.0V                 | 150kΩ                         |
| 4       | Hi-Fi ALC                             | ALC time constant setting for Hi-Fi audio                                                         | 0.0V                 | EF (NPN) ~ 200Ω               |
| 5       | SCL                                   | CLOCK input for SSB control                                                                       | —                    | B (PNP)                       |
| 6       | SDA                                   | DATA input for SSB bus control                                                                    | —                    | B (PNP)                       |
| 7       | GNDD                                  | GND for serial control                                                                            | —                    | —                             |
| 8       | FSC IN                                | f <sub>sc</sub> input for VCO and BPF adjustment                                                  | 0.0V                 | 200kΩ                         |
| 9, 25   | NR TC L, R                            | PNR attack and recovery time setting<br>Attack R: 530Ω, Recovery R: 6.5kΩ                         | – 5.0V               | —                             |
| 10, 24  | WTNG L, R                             | Waiting characteristic, treble time constant (external C = 0.0047μF)                              | 0.0V                 | —                             |
| 11, 23  | NR EMPH L, R                          | NR emphasis time constant setting<br>(External C = 0.0047μF)                                      | 0.0V                 | —                             |
| 12, 22  | DC FB L, R                            | PNR operating reference potential point                                                           | 0.0V                 | 23kΩ                          |
| 13      | FM PB IN                              | Playback FM input 1320mV <sub>P-P</sub> Typ.<br>Input coupling capacitor (GND ~ V <sub>CC</sub> ) | 0.0V                 | 100kΩ                         |
| 14      | ENVE OUT<br>/ ADJ FLAG<br>/ Hi-Fi DET | FM Lch signal component envelope output<br>/ Hi-Fi DET output / ADJ FLAG output for ADJ           | EE: 0.8V<br>PB: 1.0V | EE: 50kΩ<br>PB, ADJ: EF (NPN) |
| 15      | GNDM                                  | GND for PNR, MODEM and BPF                                                                        | 0.0V                 | —                             |
| 16      | BPF f <sub>0</sub> ADJ                | Center frequency adjustment for FM BPF                                                            | 1.9V                 | EF (NPN) ~ 200Ω               |
| 17      | VCO f <sub>0</sub> ADJ                | VCO control current setting                                                                       | 2.5V                 | EF (NPN)                      |
| 18      | VCCM                                  | V <sub>CC</sub> for MODEM and BPF                                                                 | 5.0V                 | —                             |
| 19      | FM ALC                                | FM ALC time constant setting                                                                      | 0.0V                 | EF (NPN) ~ 2.5kΩ              |
| 20      | AHSPW IN                              | Audio head switching pulse input                                                                  | —                    | B (PNP)                       |
| 21      | FM REC OUT                            | EE: recording FM output, sine wave output<br>PB: FM BPF output monitor                            | 3.3V                 | EF (NPN) ~ 200Ω               |
| 26      | NORMAL IN                             | Normal input                                                                                      | 0.0V                 | 100kΩ                         |
| 27      | MIX ALC                               | ALC time constant setting for mixer amplifier<br>Attack and recovery time setting                 | – 5.0V               | EF (NPN) ~ 500Ω               |
| 28      | MIX OUT                               | Mixer amplifier output for RF converter                                                           | 0.0V                 | EF (NPN)                      |
| 30, 29  | LINE L, R OUT                         | Line output                                                                                       | 0.0V                 | 330Ω                          |
| 31      | NORMAL OUT                            | Normal output                                                                                     | 0.0V                 | EF (P-P)                      |
| 32      | MUTE CTRL                             | Line output mute control input                                                                    | —                    | 3kΩ (> 2.5V)                  |
| 34, 33  | LINE2 L, R IN                         | Line2 input (L, R)                                                                                | 0.0V                 | 150kΩ                         |
| 35      | VREFP                                 | V <sub>CC</sub> / 2 reference voltage (power on detect and pre-charge functions)                  | 2.5V                 | 10kΩ                          |
| 36      | V <sub>CC</sub>                       | V <sub>CC</sub> regulator                                                                         | 5.0V                 | —                             |
| 37      | ERP                                   | V <sub>CC</sub> regulator error output                                                            | 5.0V                 | C (NPN)                       |
| 38      | GND                                   | I / O switch GND                                                                                  | 0.0V                 | —                             |
| 39      | V <sub>EE</sub>                       | V <sub>EE</sub> regulator                                                                         | – 5.0V               | —                             |
| 41, 40  | LINE1 IN L, R                         | LINE1 input (L, R)                                                                                | 0.0V                 | 150kΩ                         |
| 42      | ERM                                   | V <sub>EE</sub> regulator error output                                                            | – 5.0V               | C (PNP)                       |
| 44, 43  | BS IN L, R                            | BS input (L, R)                                                                                   | 0.0V                 | 150kΩ                         |

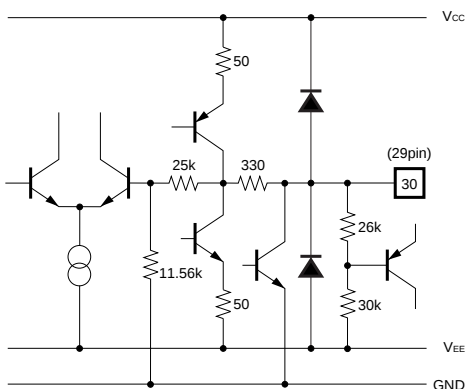
Note: EF: emitter follower, P-P: push pull, B: base, and C: collector.  
All numerical values are standardized values.

## ● Input / output circuits

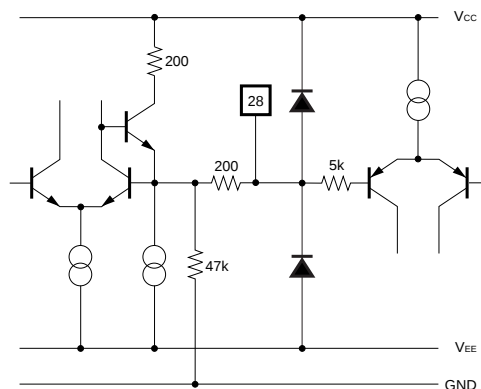
TUNER L / R / M IN (2, 1, 3pin) BS L / R IN (44, 43pin) LINE1 L / R IN (41, 40pin) LINE2 L / R IN (34, 33pin)



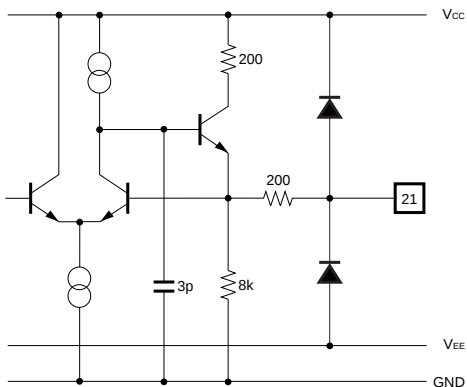
LINE L / R OUT (30, 29pin)



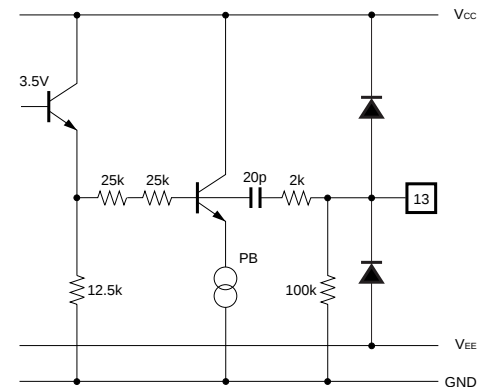
MIX OUT (28pin)



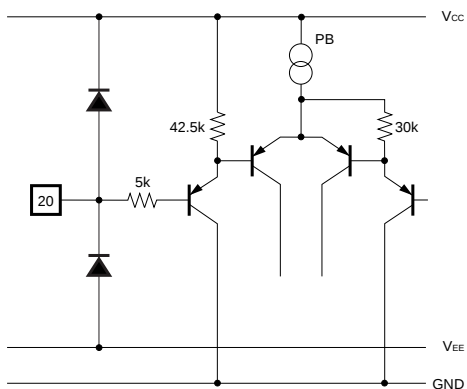
FM REC OUT (21pin)



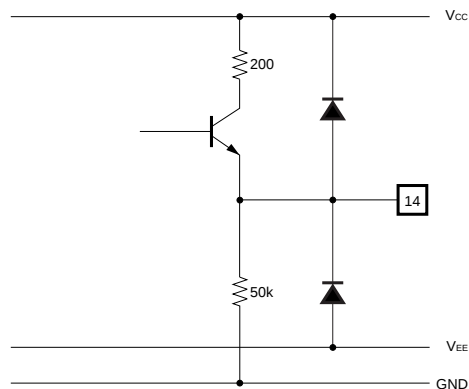
FM PB IN (13pin)



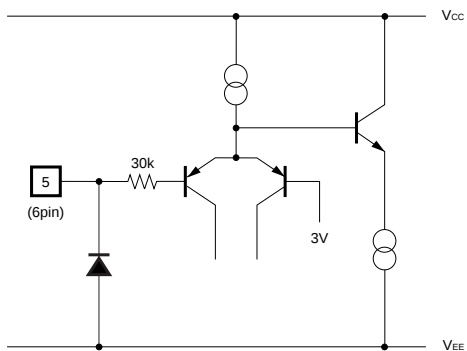
AHSWP IN (20pin)



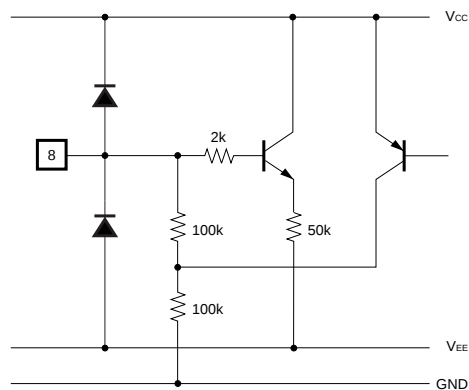
ENVE OUT / ADJ FLAG / Hi-Fi DET (14pin)



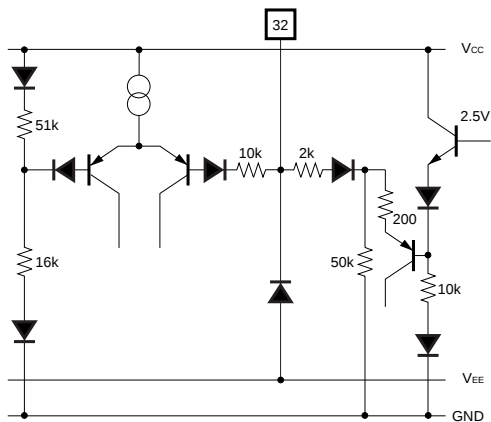
SCL (5pin) SDA (6pin)



FSC IN (8pin)



MUTE CTRL (32pin)



●Electrical characteristics (unless otherwise noted, Ta = 25°, UNREG – Vcc = + 10V, UNREG – VEE = – 10V)

|                                                                  |                                        |
|------------------------------------------------------------------|----------------------------------------|
| • Output switch control (W1bit5, W1bit4, W1bit3)                 | : STEREO                               |
| • BS L2 Through / LINE MUTE control (W1bit2, W1bit1)             | : BSL2 Through / LINE MUTE OFF         |
| • LINE AMP gain control (W1bit7, W1bit6)                         | : Typ. (+ 9.8dB)                       |
| • FM output cotrol (W5bit5)                                      | : FM OUTPUT ON                         |
| • FM OUT switch control (W2bit4, W2bit3, W2bit2)                 | : FM REC output, MIX ratio 1 (-12.5dB) |
| • NTSC / PAL control (W2bit0)                                    | : NTSC                                 |
| • Recording MUTE (W2bit1)                                        | : Recording <u>MUTE</u>                |
| • Hi-Fi MUTE (W1bit0)                                            | : OFF                                  |
| • Normal input switch control (W3bit4, W3bit3)                   | : Hi-Fi MIX                            |
| • Hi-Fi ALC control (W3bit0)                                     | : OFF                                  |
| • ENVELOPE GAIN (Typ. / + 4dB / + 6dB) control (W4bit4, W4bit3 ) | : Typ.                                 |
| • FM detector level control (W4bit7, W4bit6)                     | : Typ.                                 |
| • ENVE characteristic control (W4bit5)                           | : FNORM detect, no ENVE output         |
| • DAC TEST control (W4bit2)                                      | : OFF                                  |
| • MUTE control (pin 32)                                          | : L ( <u>MUTE</u> )                    |

Signal frequency f = 1kHz

- INPUT condition 1: TU / BS / LINE1 / LINE2 VIN = – 20dBV
- INPUT condition 2: TU / BS / LINE1 / LINE2 VIN = – 9.8dBV
- INPUT condition 3: TU / BS / LINE1 / LINE2 VIN = – 5.0dBV

|                              |      |             |
|------------------------------|------|-------------|
| MODEM carrier frequency NTSC | Lch  | 1.30MHz     |
| MODEM carrier frequency NTSC | Rch  | 1.70MHz     |
| MODEM carrier frequency PAL  | Lch  | 1.40MHz     |
| MODEM carrier frequency PAL  | Rch  | 1.80MHz     |
| fsc                          | NTSC | 3.579545MHz |
| fsc                          | PAL  | 4.433619MHz |

| Parameter                                                                                                | Symbol                                 | Min.   | Typ.   | Max.   | Unit | Conditions                                                                      |
|----------------------------------------------------------------------------------------------------------|----------------------------------------|--------|--------|--------|------|---------------------------------------------------------------------------------|
| [REGULATOR]                                                                                              |                                        |        |        |        |      |                                                                                 |
| Quiescent current (positive supply) EE                                                                   | I <sub>qP</sub> EE                     | 30.0   | 40.0   | 53.0   | mA   | EE MODE, after carrier frequency adjustment with no input                       |
| Quiescent current (positive supply) PB                                                                   | I <sub>qP</sub> PB                     | 40.0   | 54.0   | 72.0   | mA   | PB MODE, carrier frequency adjustment FNORM, after BPF adjustment               |
| Quiescent current (negative supply) EE                                                                   | I <sub>qM</sub> EE                     | − 20.0 | − 15.0 | − 11.0 | mA   | EE MODE, after carrier frequency adjustment with no input                       |
| Quiescent current (negative supply) PB                                                                   | I <sub>qM</sub> PB                     | − 22.0 | − 16.0 | − 12.0 | mA   | PB MODE, carrier frequency adjustment FNORM, after BPF adjustment               |
| Regulator input voltage (positive)                                                                       | V <sub>CC</sub>                        | 4.75   | 5.10   | 5.45   | V    |                                                                                 |
| Regulator input voltage (negative)                                                                       | V <sub>EE</sub>                        | − 5.35 | − 5.00 | − 4.65 | V    |                                                                                 |
| [EE THROUGH] (INPUT: TU IN L / R, LINE1 IN L / R, LINE2 IN L / R, BS IN L / R    OUTPUT: LINE OUT L / R) |                                        |        |        |        |      |                                                                                 |
| Line output level                                                                                        | V <sub>OEE</sub>                       | − 11.4 | − 10.2 | − 9.0  | dBV  | INPUT condition 1                                                               |
| Channel balance (L / R)                                                                                  | CB <sub>EE</sub>                       | − 0.8  | 0.0    | 0.8    | dB   | INPUT condition 1                                                               |
| Distortion                                                                                               | THD <sub>EE</sub>                      | —      | 0.017  | 0.10   | %    | INPUT condition 1, *1                                                           |
| Maximum output level                                                                                     | V <sub>OME</sub>                       | 9.0    | 10.7   | —      | dBV  | THD = 1%, *1                                                                    |
| ALC level                                                                                                | V <sub>ALC</sub>                       | − 3.8  | − 1.8  | + 0.2  | dBV  | INPUT condition 2<br>ALC ON                                                     |
| ALC distortion                                                                                           | THD <sub>ALC</sub>                     | —      | 0.03   | 0.25   | %    | INPUT condition 2, *1<br>ALC ON                                                 |
| Output residual noise                                                                                    | V <sub>ONE</sub>                       | —      | − 94.0 | − 86.0 | dBV  | Relevant input shorted to GND, *2                                               |
| Crosstalk                                                                                                | CT <sub>EE</sub>                       | —      | − 88.0 | − 75.0 | dBV  | Relevant input: shorted to GND, *2<br>Non-relevant input: Input condition 2, *2 |
| Muting level                                                                                             | MT <sub>EE</sub>                       | —      | − 103  | − 90   | dBV  | INPUT condition 2, *2                                                           |
| (INPUT: TU L / R / M IN, BS L / R IN, LINE1 L / R IN, LINE2 L / R IN    OUTPUT: NORMAL OUT)              |                                        |        |        |        |      |                                                                                 |
| Normal out output level                                                                                  | V <sub>ONORM</sub>                     | − 21.5 | − 20.0 | − 18.5 | dBV  | INPUT condition 1<br>L & R input together, *1                                   |
| [BS / L2 THROUGH] (INPUT: BS / LINE2 L / R IN    OUTPUT: LINE OUT L / R)                                 |                                        |        |        |        |      |                                                                                 |
| Output level                                                                                             | V <sub>OBS</sub><br>V <sub>OL2</sub>   | − 11.4 | − 10.2 | − 9.0  | dBV  | V <sub>IN</sub> = − 20.0dBV                                                     |
| Distortion                                                                                               | THD <sub>BS</sub><br>THD <sub>L2</sub> | —      | 0.005  | 0.08   | %    | V <sub>IN</sub> = − 20.0dBV, *1                                                 |
| Output residual noise                                                                                    | V <sub>ONBS</sub><br>V <sub>ONL2</sub> | —      | − 99.0 | − 86.0 | dBV  | BS IN pin shorted to GND, *2                                                    |
| [LINE AMP] (INPUT: NORMAL IN    OUTPUT: LINE OUT L / R)                                                  |                                        |        |        |        |      |                                                                                 |
| Line amplifier gain1                                                                                     | V <sub>OLINE1</sub>                    | + 9.0  | + 9.8  | + 10.6 | dB   | V <sub>IN</sub> = − 20dBV                                                       |
| [MIX AMP] (INPUT: TU IN L / R, LINE1 IN L / R, LINE2 IN L / R, BS IN L / R    OUTPUT: MIX OUT)           |                                        |        |        |        |      |                                                                                 |
| Output level                                                                                             | V <sub>OMIX</sub>                      | − 7.2  | − 6.0  | − 4.8  | dBV  | INPUT condition 1<br>L & R input together                                       |
| Distortion                                                                                               | THD <sub>MIX</sub>                     | —      | 0.08   | 0.50   | %    | INPUT condition 1<br>L & R input together, *1                                   |
| MIX ALC level                                                                                            | V <sub>ALCMIX</sub>                    | − 4.2  | − 2.7  | − 1.2  | dBV  | INPUT condition 2<br>L & R input together                                       |

\*1: B.W. = 0.4 to 30kHz

\*2: DIN AUDIO

| Parameter                                                                                                                                                             | Symbol | Min.                 | Typ.                       | Max.                      | Unit                      | Conditions        |                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------|----------------------------|---------------------------|---------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [MODEM REC MODE] (INPUT: TUNER IN L / R, LINE1 IN L / R, LINE2 IN L / R, BS IN L / R    OUTPUT: FM REC OUT)                                                           |        |                      |                            |                           |                           |                   |                                                                                                                                                                                                                                                                                             |
| NTSC carrier frequency                                                                                                                                                | Lch    | f <sub>NOL</sub>     | 1.2925                     | 1.2975                    | 1.3025                    | MHz               | No input, after automatic adjustment                                                                                                                                                                                                                                                        |
|                                                                                                                                                                       | Rch    | f <sub>NOR</sub>     | 1.6940                     | 1.6990                    | 1.7040                    | MHz               |                                                                                                                                                                                                                                                                                             |
| PAL carrier frequency                                                                                                                                                 | Lch    | f <sub>POL</sub>     | 1.3930                     | 1.3980                    | 1.4030                    | MHz               | No input, after automatic adjustment                                                                                                                                                                                                                                                        |
|                                                                                                                                                                       | Rch    | f <sub>POR</sub>     | 1.7945                     | 1.7995                    | 1.8045                    | MHz               |                                                                                                                                                                                                                                                                                             |
| Frequency deviation                                                                                                                                                   | Lch    | DEV <sub>L</sub>     | 44.0                       | 50.0                      | 56.0                      | ± kHz             | INPUT condition 1                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                       | Rch    | DEV <sub>R</sub>     | 44.0                       | 50.0                      | 56.0                      | ± kHz             |                                                                                                                                                                                                                                                                                             |
| Maximum frequency deviation                                                                                                                                           | Lch    | DEV <sub>Max.L</sub> | 118                        | 140                       | 162                       | ± kHz             | INPUT condition 3 (f = 10kHz)                                                                                                                                                                                                                                                               |
|                                                                                                                                                                       | Rch    | DEV <sub>Max.R</sub> | 118                        | 140                       | 162                       | ± kHz             |                                                                                                                                                                                                                                                                                             |
| FM output level                                                                                                                                                       | Lch    | V <sub>OFML</sub>    | 310                        | 355                       | 410                       | mV <sub>P-P</sub> | FM OUT SW: FM L mode                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                       | Rch    | V <sub>OFMR</sub>    | 320                        | 365                       | 420                       | mV <sub>P-P</sub> | FM OUT SW: FM R mode                                                                                                                                                                                                                                                                        |
| Carrier 2nd harmonic                                                                                                                                                  | Lch    | f <sub>2L</sub>      | —                          | − 53.0                    | − 40.0                    | dB                | Spectrum ratio of 2nd harmonic with respect to fundamental<br>Lch: FM L mode, Rch: FM R mode                                                                                                                                                                                                |
|                                                                                                                                                                       | Rch    | f <sub>2R</sub>      | —                          | − 48.0                    | − 40.0                    | dB                |                                                                                                                                                                                                                                                                                             |
| Carrier 3rd harmonic                                                                                                                                                  | Lch    | f <sub>3L</sub>      | —                          | − 52.0                    | − 40.0                    | dB                | Spectrum ratio of 3rd harmonic with respect to fundamental<br>Lch: FM L mode, Rch: FM R mode                                                                                                                                                                                                |
|                                                                                                                                                                       | Rch    | f <sub>3R</sub>      | —                          | − 55.0                    | − 42.0                    | dB                |                                                                                                                                                                                                                                                                                             |
| FM MIX ratio (FM MIX1 mode)                                                                                                                                           |        | f <sub>LR</sub>      | − 14.3                     | − 12.5                    | − 10.7                    | dB                | Spectrum ratio 1.30MHz / 1.70MHz                                                                                                                                                                                                                                                            |
| [MODEM PB MODE] (INPUT: FM PB IN, OUTPUT: LINE OUT L / R)<br>(After BPF f <sub>0</sub> adjustment, V <sub>IN</sub> = 1320mV <sub>P-P</sub> , 1.30MHz, 1.70MHz MIX IN) |        |                      |                            |                           |                           |                   |                                                                                                                                                                                                                                                                                             |
| Demodulation output level 1                                                                                                                                           | Lch    | V <sub>ODL</sub>     | − 12.4                     | − 10.2                    | − 8.0                     | dBV               | DEV <sub>L</sub> = ± 50.0kHz, f = 1kHz                                                                                                                                                                                                                                                      |
|                                                                                                                                                                       | Rch    | V <sub>ODR</sub>     | − 12.4                     | − 10.2                    | − 8.0                     | dBV               | DEV <sub>R</sub> = ± 50.0kHz, f = 1kHz                                                                                                                                                                                                                                                      |
| Demodulation output level 2                                                                                                                                           | Lch    | V <sub>ODL2</sub>    | V <sub>ODL</sub><br>− 10.0 | V <sub>ODL</sub><br>− 7.8 | V <sub>ODL</sub><br>− 5.6 | dBV               | DEV <sub>L</sub> = ± 50.0kHz, f = 10kHz                                                                                                                                                                                                                                                     |
|                                                                                                                                                                       | Rch    | V <sub>ODR2</sub>    | V <sub>ODR</sub><br>− 10.0 | V <sub>ODR</sub><br>− 7.8 | V <sub>ODR</sub><br>− 5.6 | dBV               | DEV <sub>R</sub> = ± 50.0kHz, f = 10kHz                                                                                                                                                                                                                                                     |
| Demodulation distortion                                                                                                                                               | Lch    | THD <sub>DL</sub>    | —                          | 0.12                      | 0.35                      | %                 | DEV <sub>L</sub> = ± 50.0kHz, f = 1kHz,*1                                                                                                                                                                                                                                                   |
|                                                                                                                                                                       | Rch    | THD <sub>DR</sub>    | —                          | 0.13                      | 0.35                      | %                 | DEV <sub>R</sub> = ± 50.0kHz, f = 1kHz,*1                                                                                                                                                                                                                                                   |
| Demodulation noise level                                                                                                                                              | Lch    | V <sub>ONDL</sub>    | —                          | − 98.0                    | − 85.0                    | dBV               | Unmodulated                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                       | Rch    | V <sub>ONDR</sub>    | —                          | − 98.0                    | − 85.0                    | dBV               | *2                                                                                                                                                                                                                                                                                          |
| [Recording→playback overall characteristics] (EE→INPUT: LINE IN L / R, OUTPUT: LINE OUT L / R)<br>(PB→INPUT: FM PB IN, OUTPUT: LINE OUT L / R)                        |        |                      |                            |                           |                           |                   |                                                                                                                                                                                                                                                                                             |
| Line output recording / playback level difference                                                                                                                     | Lch    | V <sub>RPL</sub>     | − 1.2                      | 0.0                       | + 1.2                     | dB                | Carrier frequency, after adjusting BPF<br>EE mode: INPUT condition 1<br>PB mode: FM PB IN = 1320mV <sub>P-P</sub><br>f = 1.30MHz, 1.70MHz 1: 1 MIX,<br>The difference between the EE and PB line out levels when input is DEV = DEV <sub>L,R</sub><br>(the frequency deviation given above) |
|                                                                                                                                                                       | Rch    | V <sub>RPR</sub>     | − 1.2                      | 0.0                       | + 1.2                     | dB                |                                                                                                                                                                                                                                                                                             |
| [FM BPF] (INPUT: FM PB IN, OUTPUT: BPF MONITOR L / R)                                                                                                                 |        |                      |                            |                           |                           |                   |                                                                                                                                                                                                                                                                                             |
| BPF L / R level difference NTSC                                                                                                                                       |        | ΔV <sub>BPFN</sub>   | − 5.0                      | 0.0                       | 5.0                       | dB                | After automatic adjustment, NTSC<br>f = 1.505MHz, V <sub>IN</sub> = 400mV <sub>P-P</sub>                                                                                                                                                                                                    |
| BPF L / R level difference PAL                                                                                                                                        |        | ΔV <sub>BPFP</sub>   | − 5.0                      | 0.0                       | 5.0                       | dB                | After automatic adjustment, PAL<br>f = 1.605MHz, V <sub>IN</sub> = 400mV <sub>P-P</sub>                                                                                                                                                                                                     |

\*1: B.W. = 0.4 to 30kHz

\*2: DIN AUDIO

| Parameter                                                                                                                  | Symbol                    | Min.                        | Typ.                        | Max.                         | Unit | Conditions                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------|-----------------------------|------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (LCh, RCh mix input signal level 1320mV <sub>P-P</sub> (RATIO 1: 1))                                                       |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| (NTSC Lch)                                                                                                                 |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| 1.30MHz insertion loss                                                                                                     | ATT <sub>NLC</sub>        | − 20.1                      | − 17.1                      | − 14.1                       | dB   | 1.30MHz + 1.70MHz<br>FM ALC ON                                                                                                                                                               |
| 1.15MHz attenuation                                                                                                        | ATT <sub>NL</sub><br>1.15 | ATT <sub>NLC</sub><br>− 9.8 | ATT <sub>NLC</sub><br>− 5.3 | ATT <sub>NLC</sub><br>− 2.3  | dB   | 1.15MHz + 1.70MHz                                                                                                                                                                            |
| 1.45MHz attenuation                                                                                                        | ATT <sub>NL</sub><br>1.45 | ATT <sub>NLC</sub><br>− 8.1 | ATT <sub>NLC</sub><br>− 5.0 | ATT <sub>NLC</sub><br>− 2.5  | dB   | 1.45MHz + 1.70MHz                                                                                                                                                                            |
| 1.70MHz attenuation                                                                                                        | ATT <sub>NL</sub><br>1.70 | —                           | —                           | ATT <sub>NLC</sub><br>− 30.0 | dB   | 1.30MHz + 1.70MHz                                                                                                                                                                            |
| (NTSC Rch)                                                                                                                 |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| 1.70MHz insertion loss                                                                                                     | ATT <sub>NRC</sub>        | − 21.3                      | − 18.3                      | − 15.3                       | dB   | 1.30MHz + 1.70MHz<br>FM ALC ON                                                                                                                                                               |
| 1.55MHz attenuation                                                                                                        | ATT <sub>NR</sub><br>1.55 | ATT <sub>NRC</sub><br>− 8.8 | ATT <sub>NRC</sub><br>− 5.7 | ATT <sub>NRC</sub><br>− 3.4  | dB   | 1.55MHz + 1.30MHz                                                                                                                                                                            |
| 1.85MHz attenuation                                                                                                        | ATT <sub>NR</sub><br>1.85 | ATT <sub>NRC</sub><br>− 9.5 | ATT <sub>NRC</sub><br>− 4.7 | ATT <sub>NRC</sub><br>− 1.4  | dB   | 1.85MHz + 1.30MHz                                                                                                                                                                            |
| 1.30MHz attenuation                                                                                                        | ATT <sub>NR</sub><br>1.30 | —                           | —                           | ATT <sub>NRC</sub><br>− 30.0 | dB   | 1.30MHz + 1.70MHz                                                                                                                                                                            |
| (PAL Lch)                                                                                                                  |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| 1.40MHz insertion loss                                                                                                     | ATT <sub>PLC</sub>        | − 18.9                      | − 15.9                      | − 12.9                       | dB   | 1.40MHz + 1.80MHz                                                                                                                                                                            |
| 1.80MHz attenuation                                                                                                        | ATT <sub>PL</sub><br>1.80 | —                           | —                           | ATT <sub>PLC</sub><br>− 30.0 | dB   | 1.40MHz + 1.80MHz                                                                                                                                                                            |
| PAL Rch                                                                                                                    |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| 1.80MHz insertion loss                                                                                                     | ATT <sub>PRC</sub>        | − 20.3                      | − 17.3                      | − 14.3                       | dB   | 1.40MHz + 1.80MHz                                                                                                                                                                            |
| 1.40MHz attenuation                                                                                                        | ATT <sub>PR</sub><br>1.40 | —                           | —                           | ATT <sub>PRC</sub><br>− 30.0 | dB   | 1.40MHz + 1.80MHz                                                                                                                                                                            |
| [FNORM→Hi-Fi recovery delay circuit]                                                                                       |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| Return delay time                                                                                                          | τ <sub>FNDLY</sub>        | 110                         | 125                         | 140                          | mS   | Delay time from input of FM PB IN<br>(1.30MHz, 1.70MHz 1: 1 MIX)<br>1320mV <sub>P-P</sub> to rise of ENVE OUT<br><br>AUDIO HEAD PULSE IN<br>: f = 30Hz, 5V <sub>P-P</sub> , rectangular wave |
| (Envelope output circuit) (INPUT: FM PB IN, OUTPUT: ENVE OUT)<br>0dB = 1320mV <sub>P-P</sub> , 1.30MHz & 1.70MHz MIX input |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| Envelope output level SP0                                                                                                  | V <sub>ENVSP0</sub>       | —                           | 0                           | 100                          | mV   | No signal, STANDARD MODE                                                                                                                                                                     |
| Envelope output level SP1                                                                                                  | V <sub>ENVSP1</sub>       | 2.08                        | 2.58                        | 3.08                         | V    | V <sub>IN</sub> = 0dB, STANDARD MODE                                                                                                                                                         |
| Envelope output level SP2                                                                                                  | V <sub>ENVSP2</sub>       | 3.70                        | 3.95                        | 4.20                         | V    | V <sub>IN</sub> = + 10dB, STANDARD MODE                                                                                                                                                      |
| Envelope output level EP1                                                                                                  | V <sub>ENVEP1</sub>       | 1.96                        | 2.46                        | 2.96                         | V    | V <sub>IN</sub> = − 4dB, + 4dB MODE                                                                                                                                                          |
| [Control system mode holding voltage]                                                                                      |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| (CLOCK IN)                                                                                                                 |                           |                             |                             |                              |      |                                                                                                                                                                                              |
| L mode holding voltage                                                                                                     | V <sub>H5L</sub>          | 0.0                         | —                           | 0.5                          | V    |                                                                                                                                                                                              |
| H mode holding voltage                                                                                                     | V <sub>H5H</sub>          | 2.5                         | —                           | V <sub>CC</sub>              | V    |                                                                                                                                                                                              |

| Parameter                                | Symbol            | Min. | Typ. | Max.            | Unit | Conditions |
|------------------------------------------|-------------------|------|------|-----------------|------|------------|
| 〈DATA IN〉                                |                   |      |      |                 |      |            |
| L mode holding voltage                   | V <sub>H6L</sub>  | 0.0  | —    | 0.5             | V    |            |
| H mode holding voltage                   | V <sub>H6H</sub>  | 2.5  | —    | V <sub>CC</sub> | V    |            |
| 〈MUTE CTRL〉                              |                   |      |      |                 |      |            |
| $\overline{\text{MUTE}}$ holding voltage | V <sub>H32L</sub> | 0.0  | —    | 1.0             | V    |            |
| DC MUTE holding voltage                  | V <sub>H32H</sub> | 3.9  | —    | V <sub>CC</sub> | V    |            |

- Measurement circuit

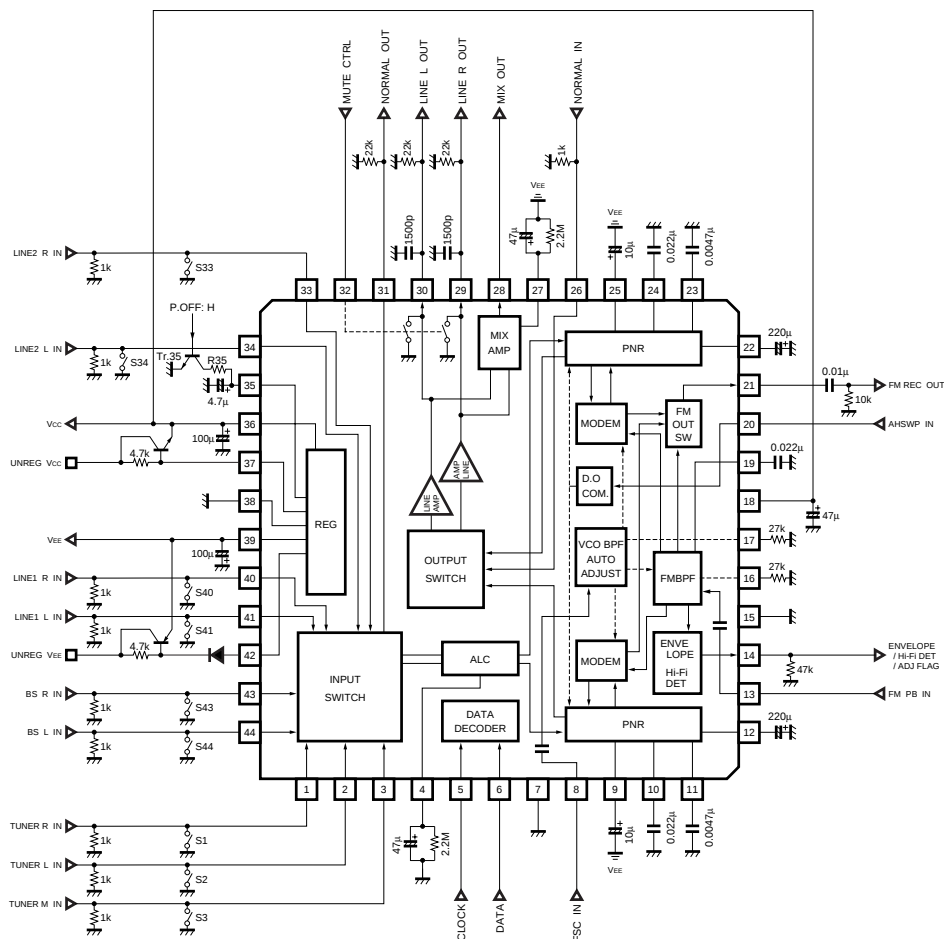


Fig.1

●Circuit operation

Function table

The BH7800K includes the following functions on one chip.

| No. | Block name          | Main function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Pin numbers                          | Power supply                                                          |
|-----|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------|
| 1   | Regulator           | <ul style="list-style-type: none"> <li>· <math>\pm 5V</math> regulator (<math>V_{CC}</math>, <math>V_{EE}</math>)</li> <li>· Anti-pop circuit (ANTI—POP)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                    | 35 ~ 39, 42                          | UNREG— $V_{CC}$ : + 10V<br>UNREG— $V_{EE}$ : - 10V<br>GND: 38         |
| 2   | SSB control         | <ul style="list-style-type: none"> <li>· SSB data decoder</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5 ~ 7                                | $V_{CC3}$ (internal power supply)<br>GND: 7                           |
| 3   | Input switcher      | <ul style="list-style-type: none"> <li>· TUNER (L, R, M) / LINE 1, 2 (L,R) / BS (L, R) switch</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                               | 33, 34,<br>40, 41<br>43, 44<br>1 ~ 3 | $V_{CC}$ (internally wired)<br>$V_{EE}$ (internally wired)<br>GND: 38 |
| 4   | Output switcher     | <ul style="list-style-type: none"> <li>· Line amplifier: + 9.8dB, + 10.8dB, + 12.0dB, + 14.8dB</li> <li>· STEREO / LEFT / RIGHT / NORMAL switch</li> <li>· MIX ON / OFF switch</li> <li>· Mute switch</li> <li>· MIXER amplifier for RF converter (with ALC function)</li> <li>· BS / LINE2 through mode</li> </ul>                                                                                                                                                                                                                    | 27 ~ 30<br>32                        | $V_{CC}$ (internally wired)<br>$V_{EE}$ (internally wired)<br>GND: 38 |
| 6   | PNR processor       | <ul style="list-style-type: none"> <li>· 20kHz line low-pass filter (secondary LPF)</li> <li>· 20kHz PNR low-pass filter (secondary LPF)</li> <li>· PNR processor (MOA, CCA, WTNG, DET)</li> <li>· Emphasis / de-emphasis (EMPH / DEEMPH)</li> <li>· Switching noise slope-control type differential compensation circuit</li> </ul>                                                                                                                                                                                                   | 9 ~ 12<br>22 ~ 25                    | $V_{CC}$ (internally wired)<br>$V_{EE}$ (internally wired)<br>GND: 38 |
| 7   | Modulator           | <ul style="list-style-type: none"> <li>· FM modulation circuit (VCO, DEV)</li> <li>· FM demodulation / FM BPF MONITOR output switch (FMOUT SW)</li> <li>· FM MIX1 to 4, FM L, FM R, BPF L, BPF R</li> <li>· Recording FM treble cutoff filter (FM LPF)</li> <li>· Over modulation limiter (AUDIO LIM)</li> <li>· Playback FM limiter (FM LIM)</li> <li>· VCO, BPF automatic adjustment circuit (AUTO AUDIO ADJUST)</li> <li>· NTSC / PAL switch function</li> <li>· Auto adjustment complete FLAG output circuit (ADJ FLAG)</li> </ul> | 8, 14<br>17, 21                      | $V_{CC}$ : 18<br>$V_{EE}$ (internally wired)<br>GND: 15               |
| 8   | FM detector control | <ul style="list-style-type: none"> <li>· D.O.detector circuit (D.O. DET)</li> <li>· Auto FM detector circuit (noise detect method) (FM DET)</li> <li>· Typ. , + 30%, - 10%</li> <li>· Envelope detector circuit (ENVE)</li> <li>· Hold pulse generator</li> </ul>                                                                                                                                                                                                                                                                      | 14, 20                               | $V_{CC}$ : 18<br>(internally wired)<br>GND: 15                        |
| 9   | FM BPF              | <ul style="list-style-type: none"> <li>· FM bandpass filter (FM BPF)</li> <li>· NTSC / PAL switch function</li> <li>· FM input automatic level adjust circuit (FM ALC: ON / OFF)</li> </ul>                                                                                                                                                                                                                                                                                                                                            | 13, 16, 19                           | $V_{CC}$ : 18<br>GND: 15                                              |

## ●Application example

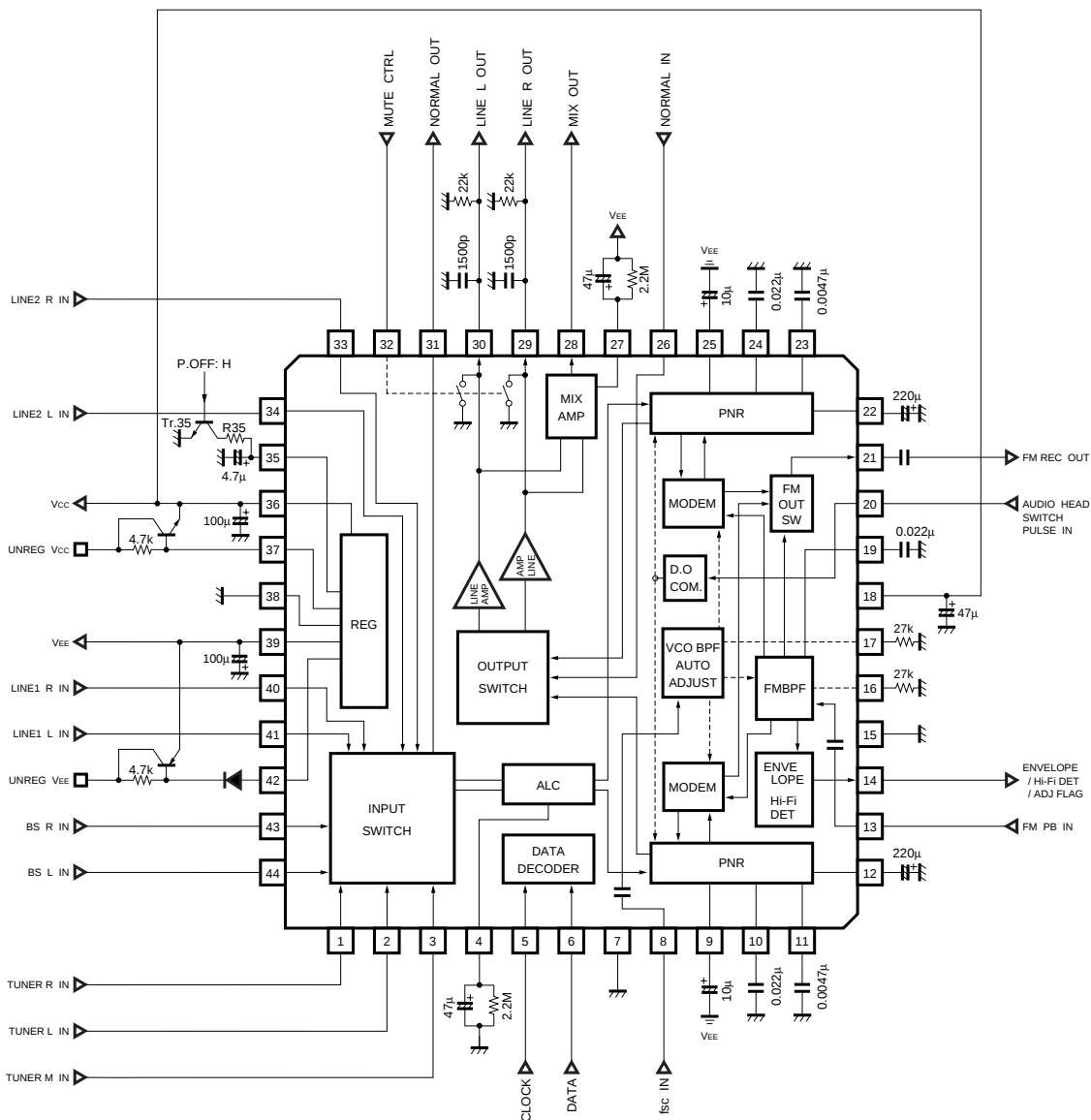


Fig.2

## ●Operation notes

The VCO oscillation frequency and frequency deviation, and the BPF center frequency are directly influenced by the temperature characteristics of the setting resistors connected to pins 16 and 17. Use metal-film components.

● Electrical characteristic curves

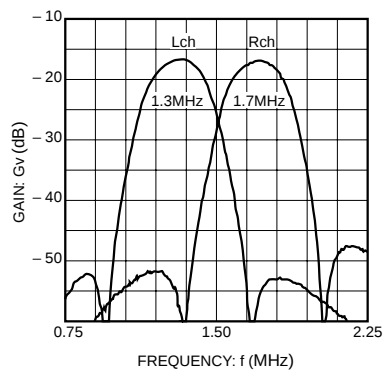


Fig. 3 FM BPF frequency characteristics (NTSC)

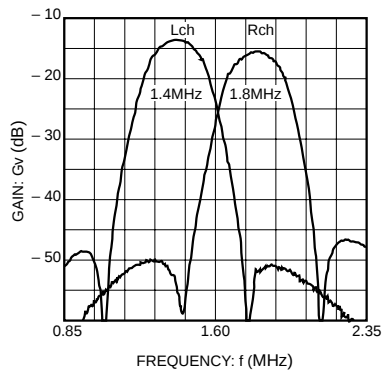


Fig. 4 FM BPF frequency characteristics (PAL)

● External dimensions (Units: mm)

