

AN6472NFBP

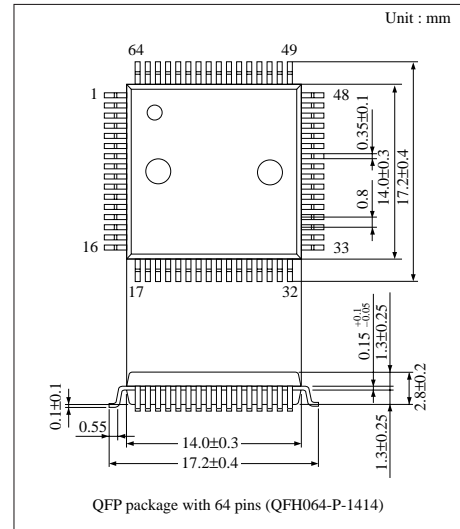
Cordless Telephone Speech Network IC Incorporating Cross-Point Switch

■ Overview

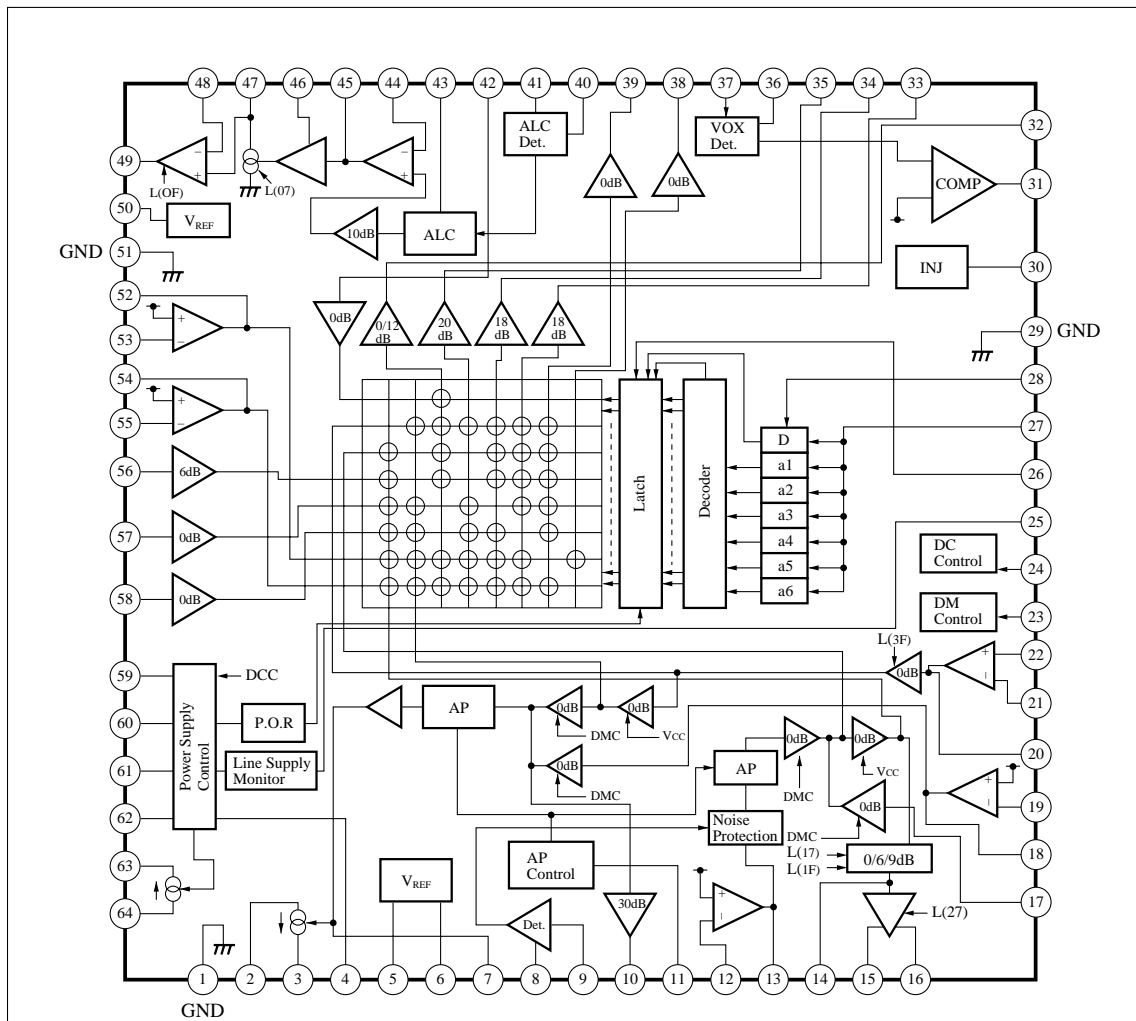
The AN6472NFBP is a speech network IC which includes a receiver noise reducing function and is most suitable for quality cordless telephones. It incorporates a cross-point switch controlled by serial input. It allows speech path switching and mixing, and provides for three- or four-person communication and other sophisticated functions. It also incorporates REC/PLAY amplifiers with VOX circuits.

■ Features

- The speech block can operate on line voltage, with no external power supply, and is operational even during a commercial power failure.
- Incorporates a receiver noise reducing function to improve the handset's howling margin.
- Incorporates auto. PAD, dial mute, DC voltage regulation, and other basic speech functions.
- The cross-point switch can be operated independently.
- Each output of the cross-point switch can correspond to multiple inputs, allowing three- or four-person communication.
- The REC/PLAY amplifiers incorporate ALC and VOX circuits.
- Receiver volume can be increased by 6 dB or 9 dB.



■ Block Diagram



■ Pin Descriptions

| Pin No. | Description | Pin No. | Description |
|---------|-----------------------------------|---------|-----------------------------------|
| 1 | Ground | 33 | RF2 link output |
| 2 | Line power (+) input | 34 | RF1 link output |
| 3 | Side-tone adjustment | 35 | Intercom link output |
| 4 | Line voltage control (1) | 36 | VOX detection control |
| 5 | Int. ref. voltage output (2) | 37 | VOX amp. input |
| 6 | Int. ref. voltage output (1) | 38 | Time stamp link output |
| 7 | Trans. preamp. output | 39 | Recording link output |
| 8 | Noise reduction detection output | 40 | ALC input |
| 9 | Noise reduction detection input | 41 | ALC detection control |
| 10 | Noise reduction amp. output | 42 | Loudspeaker link input |
| 11 | Auto. PAD control | 43 | Recording input |
| 12 | Rec. preamp. input | 44 | Recording inverse input |
| 13 | Rec. preamp. output | 45 | Recording preamp. output |
| 14 | Rec. amp. input | 46 | Recording bias current control |
| 15 | Rec. amp. output (1) | 47 | To recording head |
| 16 | Rec. amp. output (2) | 48 | EQ amp. inverse input |
| 17 | BT signal input | 49 | EQ amp. output |
| 18 | DTMF preamp. output | 50 | REC/PLAY int. ref. voltage output |
| 19 | DTMF signal input | 51 | Ground |
| 20 | MIC preamp. output | 52 | MIX preamp. output |
| 21 | MIC preamp. input (1) | 53 | MIX link input |
| 22 | MIC preamp. input (2) | 54 | AUX preamp. output |
| 23 | Dial mute control | 55 | AUX link input |
| 24 | Line voltage control | 56 | Intercom link input |
| 25 | Line interruption detector output | 57 | RF1 link input |
| 26 | Strobe signal input | 58 | RF2 link input |
| 27 | Clock signal input | 59 | Power-ON reset control |
| 28 | Data input | 60 | External supply voltage input |
| 29 | Ground | 61 | Internal supply voltage output |
| 30 | Logic power supply input | 62 | Circuit voltage control (2) |
| 31 | VOX detector output | 63 | Line current bypass (2) |
| 32 | SP link output | 64 | Line current bypass (1) |

■ Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|-------------------------------|------------------|------------|------|
| Supply voltage (1) | V _{CC} | 7.0 | V |
| Supply current (1) | I _{CC} | 50 | mA |
| Supply voltage (2) | V _L | 12.0 | V |
| Supply current (2) | I _L | 135 | mA |
| Power dissipation*1 | P _D | 640 | mW |
| Operating ambient temperature | T _{opr} | -20 to+75 | °C |
| Storage temperature | T _{stg} | -55 to+150 | °C |

*1 In a free-air condition with Ta=75°C

■ Recommended Operating Range

| Parameter | Symbol | Range |
|------------------------------------|----------|---------------|
| Operating supply voltage range (1) | V_{CC} | 4.5V to 5.5V |
| Operating supply voltage range (2) | V_L | 3.0V to 11.0V |

■ Recommended Operating Conditions ($T_a = 20$ to $+75^\circ\text{C}$)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|--------------------------|-----------|-----------------------|-----|-----|----------|---------------|
| Supply voltage | V_{CC} | | 4.5 | 5 | 5.5 | V |
| Clock frequency | f_{CLK} | Input Duty 40% to 50% | — | — | 250 | kHz |
| Input pulse width | CLK | t_w | 1.6 | — | — | μs |
| | STB | | | | | |
| Setup time | DATA | t_{su} | 1.6 | — | — | μs |
| | STB | | | | | |
| Hold time | DATA | t_h | 1.6 | — | — | μs |
| | STB | | | | | |
| Input pulse width (high) | t_{wh} | | 0.8 | — | — | μs |
| Input pulse width (low) | t_{wl} | | 0.8 | — | — | μs |
| Clock pulse rise time | t_r | | — | — | 20 | μs |
| Clock pulse fall time | t_f | | — | — | 20 | μs |
| Input voltage | V_i | | 0 | — | V_{CC} | V |

■ Electrical Characteristics ($T_a = 25 \pm 2^\circ\text{C}$)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|---|-------------|--|-----|------|-----|------|
| Power Supply Characteristics During Power Failure | | | | | | |
| Line DC voltage (I-1) | V_{L-11} | V-DCC=HIGH, $I_L=20\text{mA}$, $V_{CC}=0\text{V}$ | 3.2 | 3.5 | 3.8 | V |
| Line DC voltage (I-2) | V_{L-12} | V-DCC=HIGH, $I_L=60\text{mA}$, $V_{CC}=0\text{V}$ | 4.5 | 4.8 | 5.2 | V |
| Line DC voltage (I-3) | V_{L-13} | V-DCC=HIGH, $I_L=120\text{mA}$, $V_{CC}=0\text{V}$ | 6.6 | 7.0 | 7.5 | V |
| Line DC voltage H (I-1) | V_{LH-11} | V-DCC= LOW, $I_L=30\text{mA}$, $V_{CC}=0\text{V}$ | 4.5 | 5.0 | 5.5 | V |
| Line DC voltage H (I-2) | V_{LH-12} | V-DCC= LOW, $I_L=60\text{mA}$, $V_{CC}=0\text{V}$ | 5.7 | 6.2 | 6.7 | V |
| Line DC voltage H (I-3) | V_{LH-13} | V-DCC= LOW, $I_L=120\text{mA}$, $V_{CC}=0\text{V}$ | 7.9 | 8.5 | 9.2 | V |
| Internal supply voltage (I) | V_{reg-I} | V-DCC=HIGH, $I_L=20\text{mA}$, $V_{CC}=0\text{V}$ | 1.8 | 2.0 | 2.2 | V |
| Internal ref. supply voltage (I) | V_{ref-I} | V-DCC=HIGH, $I_L=20\text{mA}$, $V_{CC}=0\text{V}$ | 0.9 | 1.0 | 1.1 | V |
| Normal power supply characteristics | | | | | | |
| Line DC voltage (E-1) | V_{L-E1} | V-DCC=HIGH, $I_L=20\text{mA}$, $V_{CC}=5\text{V}$ | 3.1 | 3.4 | 3.8 | V |
| Line DC voltage (E-2) | V_{L-E2} | V-DCC=HIGH, $I_L=20\text{mA}$, $V_{CC}=5\text{V}$ | 4.3 | 4.7 | 5.1 | V |
| Line DC voltage (E-3) | V_{L-E3} | V-DCC=HIGH, $I_L=20\text{mA}$, $V_{CC}=5\text{V}$ | 6.3 | 6.8 | 7.3 | V |
| Line DC voltage H (E-1) | V_{LH-E1} | V-DCC=HIGH, $I_L=20\text{mA}$, $V_{CC}=5\text{V}$ | 4.3 | 4.85 | 5.4 | V |

■ Electrical Characteristics (cont.) (Ta=25±2°C)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|----------------------------------|--------------------|--|------|------|-----|------|
| Line DC voltage H (E-2) | V _{LH-E2} | V-DCC=LOW, I _L =60mA, V _{CC} =5V | 5.3 | 5.95 | 6.6 | V |
| Line DC voltage H (E-3) | V _{LH-E3} | V-DCC=LOW, I _L =120mA, V _{CC} =5V | 7.55 | 8.2 | 8.9 | V |
| Internal supply voltage (E) | V _{reg-E} | V-DCC=HIGH, I _L =20mA, V _{CC} =5V | 4.6 | 4.85 | 5.0 | V |
| Internal ref. supply voltage (E) | V _{ref-E} | V-DCC=HIGH, I _L =20mA, V _{CC} =5V | 2.25 | 2.5 | 2.7 | V |
| Total circuit current | I _{total} | V-DCC=HIGH, I _L =20mA, V _{CC} =5V | 17 | 27 | 35 | mA |
| Power interruption detection (1) | V _{-HIT1} | V _L =2.7V, V _{CC} =5V | 0 | 0.1 | 0.6 | V |
| Power interruption detection (2) | V _{-HIT2} | V _L =1.5V, V _{CC} =5V | 4.4 | 4.95 | 5 | V |

Receiver During Power Failure

| | | | | | | |
|----------------------------|--------------------|--|------|------|------|-----|
| Rec. gain (I-1) | G _{V-IR1} | I _L =30mA, V _{CC} =0V V _{in} = -42dBm | 30.5 | 32.5 | 34.5 | dB |
| Rec. gain (I-2) | G _{V-IR2} | I _L =80mA, V _{CC} =0V V _{in} = -42dBm | 27 | 29 | 31 | dB |
| Rec. auto. PAD width (I)*1 | A _{P-IR} | I _L =30mA-80mA, V _{CC} =0V, V _{in} = -42dBm | 2.5 | 3.5 | 5 | dB |
| Rec. max. output (I) | V _{O-IR} | With I _L =30mA, V _{CC} =0V, and THD=5% | 0 | 4 | — | dBm |
| Rec. noise reduction (I) | N _{L-IR} | I _L =30mA, V _{CC} =0V, V _{in} = -42dBm V _{in-M} = -65/-50dBm | 4 | 6 | 8 | dB |
| BT amp. gain (I) | G _{V-IBT} | I _L =30mA, V _{CC} =0V, V-DMC=LOW, V _{in} = -30dBm | 19 | 21 | 23 | dB |

Receiver On External Power Supply

| | | | | | | |
|----------------------------|--------------------|--|------|------|------|-----|
| Rec. gain (E-1) | G _{V-ER1} | I _L =30mA, V _{CC} =5V V _{in} = -42dBm | 30.5 | 32.5 | 34.5 | dB |
| Rec. gain (E-2) | G _{V-ER2} | I _L =30mA, V _{CC} =5V V _{in} = -42dBm | 26.8 | 28.8 | 30.8 | dB |
| Rec. auto. PAD width (E)*1 | A _{P-ER} | I _L =30mA-80mA, V _{CC} =5V V _{in} = -42dBm | 2.5 | 3.7 | 5 | dB |
| Rec. max. output (E) | V _{O-ER} | With I _L =30mA, V _{CC} =5V, and THD=5% | 4 | 12 | — | dBm |
| Rec. noise reduction (E) | N _{L-ER} | I _L =30mA, V _{CC} =5V, V _{in} = -42dBm V _{in-M} = -65/-65dBm | 6 | 8 | 10 | dB |
| Rec. digital volume (1)*2 | G _{V-DV1} | I _L =30mA, V _{CC} =5V, V _{in} = -42dBm, DV-1 ON | 5 | 6 | 7 | dB |
| Rec. digital volume (2)*2 | G _{V-DV2} | I _L =30mA, V _{CC} =5V, V _{in} = -42dBm, DV-2 ON | 7.5 | 9 | 10.5 | dB |
| BT amp. gain (E) | G _{V-EBT} | I _L =30mA, V _{CC} =5V, V-DMC=LOW, V _{in} = -30dBm | 19.5 | 21.5 | 23.5 | dB |
| Rec. gain difference | DG-R | For V _{CC} =0V and 5V(between G _{v-IR1} and G _{v-ER1}) | -1.2 | -0.1 | 1.2 | dB |

Transmitter Amp. During Power Failure

| | | | | | | |
|------------------------------|--------------------|---|------|------|------|----|
| Trans. gain (I-1) | G _{V-IM1} | R=27Ω(Pin3), I _L =30mA, V _{CC} =0V, V _{in} = -38dBm | 28.2 | 30.2 | 32.2 | dB |
| Trans. gain (I-2) | G _{V-IM2} | I _L =80mA, V _{CC} =0V, V _{in} = -38dBm | 24.4 | 26.4 | 28.4 | dB |
| Trans. auto. PAD width (I)*1 | A _{P-IM} | I _L =30mA-80mA, V _{CC} =0V, V _{in} = -38dBm | 2.5 | 3.8 | 5 | dB |

Note) Unless otherwise specified, input signal Fin=1kHz, control voltage V-DOC = high, and control voltage V-DMC = high.

*1 Gain decrease when line current I_L is changed from 30 to 80 mA. If pin 11 (auto. PAD control) is connected to pin 61 (int. supply voltage output), the gain will not change.

*2 Gain increase from receiver gain (E-1).

■ Electrical Characteristics (cont.) (Ta=25±2°C)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|--|--------------------|--|------|------|------|------|
| Trans. max. output (I-1) | V _{O-IM1} | With I _L =30mA, V _{CC} =0V and HD=5% | 0 | 3.5 | — | dBm |
| Trans. max. output (I-2) | V _{O-IM2} | With I _L =30mA, V _{CC} =0V, THD=5% and V-DCC=LOW | 0 | 3.5 | — | dBm |
| DTMF gain (I-1) | G _{V-ID1} | I _L =30mA, V _{CC} =0V, V-DMC=LOW, V _{in} =-30dBm | 17.5 | 19.5 | 21.5 | dB |
| DTMF gain (I-2) | G _{V-ID2} | I _L =80mA, V _{CC} =0V, V-DMC=LOW, V _{in} =-30dBm | 13.7 | 15.7 | 17.7 | dB |
| DTMF auto. PAD width (I)*1 | A _{P-IDT} | I _L =30mA-80mA, V _{CC} =0V, V-DMC=LOW, V _{in} =-30dBm | 2.5 | 3.8 | 5 | dB |
| DTMF max. output (I-1) | V _{O-ID1} | I _L =30mA, V _{CC} =0V, V-DMC=LOW, THD=5% | 0 | 3.8 | — | dBm |
| DTMF max. output (I-2) | V _{O-ID2} | I _L =30mA, V _{CC} =0V, THD=5%, V-DMC=LOW, V-DCC=LOW | 0 | 3.5 | — | dBm |
| Transmitter Amp. On External Power Supply | | | | | | |
| Trans. gain (E-1) | G _{V-EM1} | I _L =30mA, V _{CC} =0V, V _{in} =-38dBm | 28.6 | 30.6 | 32.6 | dB |
| Trans. gain (E-2) | G _{V-EM2} | I _L =80mA, V _{CC} =5V, V _{in} =-38dBm | 25.0 | 27.0 | 29.0 | dB |
| Trans. auto. PAD width (E)*1 | A _{P-EM} | I _L =30mA-80mA, V _{CC} =5V, V _{in} =-38dBm | 2.5 | 4 | 5 | dB |
| Trans. max. output (E-1) | V _{O-EM1} | With I _L =30mA, V _{CC} =5V and THD=5% | 2 | 6 | — | dBm |
| Trans. max. output (E-2) | V _{O-EM2} | I _L =30mA, V _{CC} =5V, THD=5%, V-DCC=LOW | 2 | 6 | — | dBm |
| DTMF gain (E-1) | G _{V-ED1} | I _L =30mA, V _{CC} =5V, DM=ON, V _{in} =-30dBm | 18.1 | 20.1 | 22.1 | dB |
| DTMF gain (E-2) | G _{V-ED2} | I _L =80mA, V _{CC} =5V, V-DMC=LOW, V _{in} =-30dBm | 14.5 | 16.5 | 18.5 | dB |
| DTMF auto. PAD width (E)*1 | A _{P-EDT} | I _L =30mA-80mA, V _{CC} =5V, V-DMC=LOW, V _{in} =-30dBm | 2.5 | 4.1 | 5.5 | dB |
| DTMF max. output (E-1) | V _{O-ED1} | I _L =30mA, V _{CC} =5V, V-DMC=LOW, THD=5% | 2 | 6 | — | dBm |
| DTMF max. output (E-2) | V _{O-ED2} | I _L =30mA, V _{CC} =5V, DM=ON, V-DMC=LOW, THD=5% | 2 | 6 | — | dBm |
| Trans. gain difference | DG-M | For V _{CC} =0V and V _{CC} =5V (between G _{v-IM1} and G _{v-EM1}) | -1.8 | -0.8 | 0.7 | dB |
| DTMF gain difference | DG-MF | For V _{CC} =0V and 5V (between G _{v-ID1} and G _{v-ED1}) | -2.3 | -1.3 | 0.2 | dB |

Note) Unless otherwise specified, input signal Fin=1 kHz, control voltage V-DOC=high, and control voltage V-DMC=high.

*1 Gain decrease when line current I_L is changed from 30 to 80 mA. If pin 11 (auto. PAD control) is connected to pin 61(int. supply voltage output), the gain will not change.

■ Electrical Characteristics (cont.) (Ta=25±2°C)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|-------------------------------------|--------------|--|-------|-------|------|---------------|
| Recording Preamplifiers | | | | | | |
| Rec. preamp. gain | G_{V-RP} | $V_{in} = -60\text{dBm}$, $R_{in} = 0\Omega$ | 43 | 45 | 47 | dB |
| Rec. preamp. output | V_{O-RP} | $V_{in} = -45\text{dBm}$, $R_{in} = 10\Omega$ | -13.4 | -11.4 | -9.4 | dBm |
| Rec. preamp. output noise voltage*1 | V_{no-RP} | DIN/AUDIO, $R_g = 10\text{k}\Omega$ | — | 0.8 | 2.5 | mVrms |
| Recording Amplifier | | | | | | |
| Head bias current | I_{-REC} | L-SW (h07) = ON | 145 | 180 | 215 | μA |
| Head output | G_{V-REC} | L-SW (h07) = ON, $V_{in} = -15\text{dBm}$, $R_L = 1\text{k}\Omega$ | 40.0 | 50.0 | 63.0 | mVrms |
| Playing EQ Amplifier | | | | | | |
| EQ amp. gain | G_{V-EQ} | L-SW (h07) = ON, $V_{in} = -40\text{dBm}$ | 27.8 | 29.8 | 31.8 | dB |
| EQ amp. output noise voltage | V_{no-EQ} | L-SW (h07) = ON, DIN/AUDIO, $R_L = 1\text{k}\Omega$ | — | 0.45 | 1.2 | mVrms |
| VOX Detector | | | | | | |
| VOX sensitivity (1) | VS1 | I-VOX = 12.5 μA | 3.5 | 4.8 | — | V |
| VOX sensitivity (2) | VS2 | I-VOX = 24.5 μA | — | 0.025 | 0.5 | V |
| Link SW Input Amplifier | | | | | | |
| MIX amp. gain | G_{V-MIX} | $V_{in} = -36\text{dBm}$ | 5 | 6 | 7 | dB |
| AUX amp. gain | G_{V-AUX} | $V_{in} = -36\text{dBm}$ | 5 | 6 | 7 | dB |
| Link SW Output Amplifier | | | | | | |
| SP output gain (1)*1 | G_{V-SPO1} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h3A) = ON | 11 | 12 | 13 | dB |
| SP output gain (2)*1 | G_{V-SPO2} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h3A&h2F) = ON | -1.5 | -0.5 | 0.5 | dB |
| Intercom output gain*1 | G_{V-DHO} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h3B) = ON | 18.5 | 20 | 21.5 | dB |
| RF1 output gain*1 | G_{V-RF10} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h3C) = ON | 16.5 | 18 | 19.5 | dB |
| RF2 output gain*1 | G_{V-RF20} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h3D) = ON Ω | 16.5 | 18 | 19.5 | dB |
| Recording output gain*1 | G_{V-RECO} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h3E) = ON | -1.0 | 0 | 1.0 | dB |
| Recording output gain*1 | G_{V-RO} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h38) = ON | 19.9 | 21.4 | 22.9 | dB |
| Line output gain*1 | G_{V-TO} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h39) = ON | 17.7 | 19.2 | 20.7 | dB |
| Rec. output gain difference*2 | GD_{-RO} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h30) = ON | -1.0 | 0 | 1.0 | dB |
| Time stamp output gain*1 | G_{V-TSO} | Input AUX IN, $V_{in} = -36\text{dBm}$, L-SW (h37) = ON | -1.0 | 0 | 1.0 | dB |

Note) Unless otherwise specified, external supply voltage $V_{CC} = 5\text{V}$, line current $I_L = 0\text{mA}$, input signal frequency = 1 kHz, control voltage V-DOC = high, and control voltage V-DMC = high.

*1 Each amp. gain is measured from AUX OUT or MIX OUT to its output (the AUX or MIX preamp. gain is not included in the calculation).

*2 The difference from the receiver output gain (G_{V-RO}).

■ Electrical Characteristics (cont.) (Ta=25±2°C)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|----------------------------|--------------|---|-----|-----|-----|------|
| Link SW Input | | | | | | |
| MIC input gain*1 | G_{v-MI} | $V_{in} = -38\text{dBm}$, rec. output L-SW(h0E)= ON | -1 | 0 | 1 | dB |
| Rec. input gain*1 | G_{v-RI} | $V_{in} = -42\text{dBm}$, rec. output L-SW (h16)= ON | -1 | 0 | 1 | dB |
| Intercom input gain | G_{v-DHI} | $V_{in} = -30\text{dBm}$, rec. output L-SW (h1E)= ON | 5 | 6 | 7 | dB |
| RF1 input gain | G_{v-RF1I} | $V_{in} = -30\text{dBm}$, rec. output L-SW (h26)= ON | -1 | 0 | 1 | dB |
| RF2 input gain | G_{v-RF2I} | $V_{in} = -30\text{dBm}$, rec. output L-SW (h2E)= ON | -1 | 0 | 1 | dB |
| SP link input gain | G_{v-SPI} | $V_{in} = -30\text{dBm}$, SP rec. output L-SW (h02)= ON | 11 | 12 | 13 | dB |
| Link Maximum Output | | | | | | |
| SP OUT max. output | V_{o-SP} | Input L-SP IN, THD=5% L-SW (h02)= ON | 0 | 4 | — | dBm |
| DH OUT max. output | V_{o-DH} | Input RF1 IN, THD=5% L-SW (h23)= ON | 0 | 4 | — | dBm |
| RF1 OUT max. output | V_{o-RF1} | Input RF2 IN, THD=5% L-SW (h25)= ON | 0 | 4 | — | dBm |
| RF2 OUT max. output | V_{o-RF2} | Input RF1 IN, THD=5% L-SW (h2C)= ON | 0 | 4 | — | dBm |
| L-REC OUT max. output | V_{o-LR} | Input AUX IN, THD=5% L-SW (h3E)= ON | 0 | 4 | — | dBm |

Note) Unless otherwise specified, external supply voltage $V_{CC}=5\text{V}$, line current $I_L=0\text{mA}$, input signal frequency=1 kHz, control voltage V-DOC= high, and control voltage V-DMC= high.

*1 Each amp. gain is measured from MIC OUT or R PRE OUT to its output.

■ Electrical Characteristics (cont.) (Ta=25±2°C)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|---|-------------|--------------|------|------|----------------|------|
| Controls | | | | | | |
| Dial mute high level voltage | V_{DMC-H} | | 2 | — | $V_{CC} + 0.2$ | V |
| Dial mute high level control current | I_{DMC-H} | V- DMC = 5V | 15 | 38 | 80 | μA |
| Dial mute low level voltage | V_{DMC-L} | | -0.2 | — | 0.3 | V |
| Dial mute low level control current | I_{DMC-L} | V- DMC = 0V | -40 | -20 | -10 | μA |
| DC voltage control high level voltage | V_{DCC-H} | | 2 | — | $V_{CC} + 0.2$ | V |
| DC voltage control high level control current | I_{DCC-H} | V - DCC = 5V | 10 | 25 | 50 | μA |
| DC voltage control low level voltage | V_{DCC-L} | | -0.2 | — | 0.4 | V |
| DC voltage control low level control current | I_{DCC-L} | V- DCC = 0V | -2 | -0.1 | — | μA |

Note) Unless otherwise specified, $V_{CC}=5\text{V}$, and $I_L = 20\text{mA}$.

■ Electrical Characteristics (cont.) (Ta=25±2°C)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|---------------------------------------|--------------------|------------|------|------|--------------------------|------|
| Data input high level voltage | V _{DIN-H} | | 2 | — | V _{CC} + 0.2 | V |
| Data input high level control current | I _{DIN-H} | V-DIN=5V | 70 | 160 | 250 | μA |
| Data input low level voltage | V _{DIN-L} | | -0.2 | — | 0.3 | V |
| Data input low level control current | I _{DIN-L} | V-DIN = 0V | -1 | -0.1 | — | μA |

Power Supply Block

| | | | | | | |
|------------------|-------------------|---|-----|-----|-----|---|
| AC impedance (I) | Z _{AC-I} | I _L =80mA, V _{CC} =0V, V _{in} =200mVrms, Fin=1kHz | 450 | 570 | 750 | Ω |
| AC impedance (E) | Z _{AC-E} | I _L =80mA, V _{CC} =5V, V _{in} =200mVrms, Fin=1kHz | 450 | 580 | 750 | Ω |

Input impedance

| | | | | | | |
|----------------------------------|---------------------|--------------|------|------|------|----|
| BT amp. input impedance | Z _{in-BT} | Pin 17 Input | 8.7 | 9.5 | 10.7 | kΩ |
| ALC amp. input impedance | Z _{in-ALC} | Pin 40 Input | 8.5 | 9.5 | 10.5 | kΩ |
| Intercom preamp. input impedance | Z _{in-DH} | Pin 56 Input | 8.5 | 9.5 | 10.5 | kΩ |
| RF1 preamp. input impedance | Z _{in-RF1} | Pin 57 Input | 8.5 | 9.5 | 10.5 | kΩ |
| RF2 preamp. input impedance | Z _{in-RF2} | Pin 58 Input | 8.5 | 9.5 | 10.5 | kΩ |
| SP input impedance | Z _{in-SP} | Pin 42 Input | 37.5 | 50.0 | 62.5 | kΩ |

■ Electrical Characteristics (Design Values for Reference) (Ta=25±2°C)

The following are design values for reference, not guaranteed values.

| Parameter | Symbol | Condition | min | typ | max | Unit |
|-----------|--------|-----------|-----|-----|-----|------|
|-----------|--------|-----------|-----|-----|-----|------|

Speech Block

| | | | | | | |
|--|-------------------|--|---|-----|---|-------|
| Rec. output noise voltage (I) | V _{n-IR} | I _L =30mA, V _{CC} =0V, DIN/AUDIO | — | 0.3 | — | mVrms |
| Rec. output noise voltage (E) | V _{n-ER} | I _L =30mA, V _{CC} =5V, DIN/AUDIO | — | 0.3 | — | mVrms |
| Trans. output noise voltage (I) | V _{n-IT} | I _L =30mA, V _{CC} =0V, DIN/AUDIO | — | 0.3 | — | mVrms |
| Trans. output noise voltage (E) | V _{n-ET} | I _L =30mA, V _{CC} =5V, DIN/AUDIO | — | 0.3 | — | mVrms |
| Dial mute trans. amp. mute attenuation | M _{-TDM} | I _L =30mA, V _{CC} =5V, V _{in} = -30dBm, V-DBM-H/L | — | 75 | — | dB |
| Trans. preamp. mute attenuation | M _{-TM} | I _L =30mA, V _{in} = -30dBm, V _{CC} =5V, L _{sw} (h3F)=OFF/ON | — | 70 | — | dB |
| Rec. output mute attenuation | M _{-RO} | I _L =30mA, V _{in} = -30dBm, V _{CC} =5V, L _{sw} (h27)= OFF/ON | — | 50 | — | dB |
| Rec. preamp. input impedance | Z _{in-R} | Pin 12 Input | — | 500 | — | kΩ |
| MIC preamp. input impedance | Z _{in-M} | Pin 21 and 22 Input | — | 500 | — | kΩ |

REC/PLAY Block

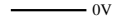
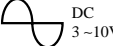
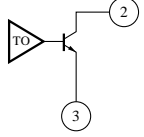
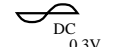
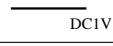
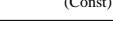
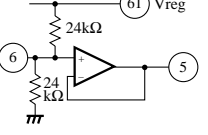
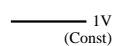

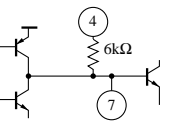
| | | | | | | |
|----------------------------|-------------------|--|---|----|---|----|
| ALC amp. ALC width | W _{-ALC} | I _L =0mA, V _{CC} =5V, and ALC output distortion≤2% | — | 40 | — | dB |
| ALC amp. ALC effect | DALC | I _L =0mA, V _{CC} =5V, and V _{in} = -45dBm to -20dBm | — | 1 | — | dB |
| Rec. amp. mute attenuation | M _{-REC} | V _{CC} =5V, V _{in} = -10dBm I _L =0mA, and LSW (h07)= ON/OFF | — | 80 | — | dB |

■ Electrical Characteristics (Cont.) (Design Values for Reference) (Ta=25±2°C)

The following are design values for reference, not guaranteed values.

| Parameter | Symbol | Condition | min | typ | max | Unit |
|--------------------------------------|----------------------|---|-----|-----|-----|------|
| EQ amp. mute attenuation | M _{EQ} | V _{CC} =5V, V _{in} = -30dBm I _L = 0mA, LSW(h0F)=ON/OFF | — | 80 | — | dB |
| Rec. preamp. input impedance | Z _{in-REC} | Pin 43 input | — | 10 | — | kΩ |
| EQ amp. input impedance | Z _{in-EQ} | Pins 47 and 48 input | — | 500 | — | kΩ |
| VOX amp. input impedance | Z _{in-VOX} | Pin 47 input | — | 500 | — | kΩ |
| Link Switch | | | | | | |
| Link SW mute attenuation | M _{LS} | V _{CC} =5V, I _L =30mA, AC output measured at link ON/OFF | — | 75 | — | dB |
| MIX preamp. input impedance | Z _{in-MIX} | Pin 53 input | — | 500 | — | kΩ |
| AUX preamp. input impedance | Z _{in-AUX} | Pin 55 input | — | 500 | — | kΩ |
| CPC output impedance | Z _{out-CPC} | Pin 25 input | — | 100 | — | kΩ |
| Noise reduction amp. input impedance | Z _{in-NL} | Pin 9 input | — | 45 | — | Ω |
| VOX cross talk | V _{OX-CT} | V _{CC} =5V, I _L =30mA, cross talk to line during VOX | — | -70 | — | dBm |

■ Pin Descriptions


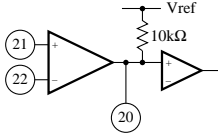


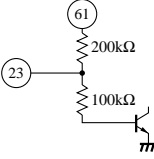
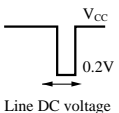
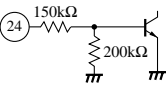
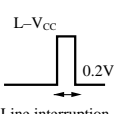
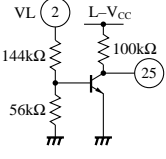
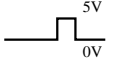
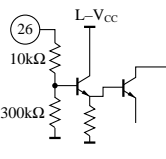
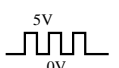
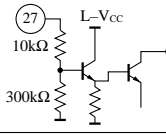
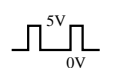
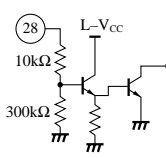
| Pin No. | Pin name | I/O | Waveform | Description | Equivalent circuit | Remarks |
|---------|----------|-----|--|---|--|--|
| 1 | GND | — |  0V | Ground : •This is the ground pin for the speech network. | GND for REC/PLY, VREG, SPEECH and LINK | — |
| 2 | VL | I |  DC 3~10V | Line power input: •Connects to the positive output of the diode bridge. |  | The line drive gain (G) is : $G = \frac{Z_{Line}/Z_{Tel}}{R_1}$ Also assuming Z _{Line} ≈600Ω Z _{Tel} ≈600Ω R ₁ = 27Ω $G = 20\log\frac{300}{27} = 20.9\text{db}$ |
| 3 | ST | O |  DC 0.3V | Side-tone adjustment: •Grounded through R1 (27Ω) •Connects to the side-tone adjusting circuit to adjust side tone and receiver level. | | |
| 4 | VL-CONT | I |  DC 1V | Line voltage control (1) : | — | C2 and the internal resistance determine the f. characteristics. |
| 5 | Vref-SN | O |  1V (Const) | Int. ref. voltage output (2) : •Output impedance=50Ω |  | Grounded through a 0.01μF capacitor. |
| 6 | Vref | O |  1V (Const) | Int. ref. voltage output (1) : •Outputs half the Vreg reference voltage. | | |
| 7 | T-FILTER | O |  DC 1V | Trans. preamp. output : •C7 as connected between this pin and the ground forms a low-pass filter. |  | — |

Note) The symbols are the same as those used in the application circuit.

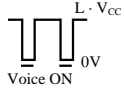
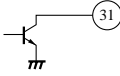

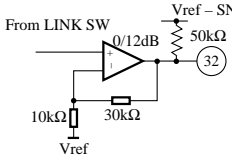

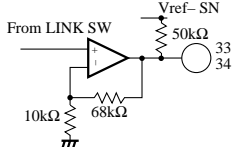

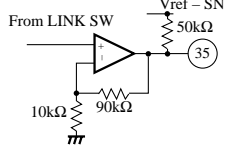
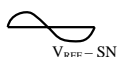
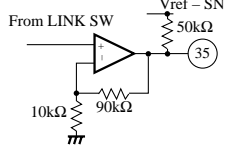
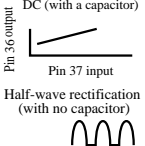
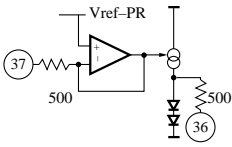



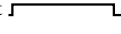
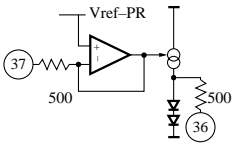

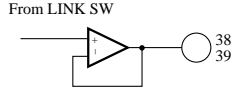

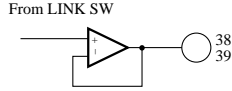
■ Pin Descriptions (cont.)

| Pin No. | Pin name | I/O | Waveform | Description | Equivalent circuit | Remarks |
|---------|------------------|-----|--|--|--------------------|---|
| 8 | VN DET | — | <p>DC (with a capacitor) Full-wave detection (with no capacitor)</p> | <ul style="list-style-type: none"> Noise reduction detection amp. output : A smoothing capacitor C6 and R5 connect to this pin to adjust the attack and recovery times of noise reduction. | | <ul style="list-style-type: none"> This pin must be grounded if noise reduction is not used. The greater C7, the longer the attack time. The smaller R6, the shorter the recovery time. Noise reduction detection amp. gain (G) is : $G = \frac{64K}{R6}$ |
| 9 | VN DET- IN | I | | <ul style="list-style-type: none"> Noise reduction detection amp. input : Noise reduction amp. output is fed through C7 and R6 to this pin. | | |
| 10 | VN OUT | O | <p>V_{REF}</p> | <ul style="list-style-type: none"> Noise reduction amp. output : Connects to the noise reduction detection amp. input. | | |
| 11 | APC | I | <p>Vreg-R · I IL</p> | <p>Auto. PAD control :</p> <ul style="list-style-type: none"> Connects through a resistance to Pin 61(Vreg). If the resistance increases, the PAD operates closer to the near end. If the resistance decreases, the PAD operates closer to the far end. | | — |
| 12 | RV IN | I | <p>V_{REF-SN}</p> | <p>Rec. preamp. input :</p> <ul style="list-style-type: none"> Receiver signals are input from the side-tone circuit to this pin. R8 and C9 connected between Pin 13 and this pin determine the f. characteristics. | | <p>The receiver preamplifier gain (G) is :</p> |
| 13 | RV PREOUT | O | <p>V_{REF-SN}</p> | <p>Rec. preamp. output :</p> <ul style="list-style-type: none"> R8 and C9 connected between Pin 12 and this pin determine the f. characteristics. The output impedance is up to 1 kΩ. | | $G = - \frac{1}{R9 + \frac{1}{j\omega C9}} \cdot \frac{1}{R8 + j\omega C10}$ |
| 14 | RV FILTER | O | <p>V_{REF-SN}</p> | <p>Rec. amp. input :</p> | | |
| 15 | RV OUT (1) | O | <p>V_{REF-SN}</p> | <p>Rec. amp. outputs (1 and 2) :</p> <ul style="list-style-type: none"> A ceramic or dynamic receiver is connected. The output circuit is a BTL configuration. The output impedance is up to 50 Ω. | | — |
| 16 | RV OUT (2) | | <p>V_{REF-SN}</p> | | | |
| 17 | BT- IN | I | <p>V_{REF-SN} Signal input</p> | <p>BT signal input :</p> <ul style="list-style-type: none"> BT (beep tone) signals are input through C15 to this pin. Input impedance is 10 kΩ. | | <p>In the application circuit, MIC. IN (-) is input through a capacitor. This capacitor and R12-R14, and C15 and C16 determine the f. characteristics.</p> |
| 18 | MF - OUT | O | <p>V_{REF-SN}</p> | <p>DTMF preamp. output :</p> <ul style="list-style-type: none"> A C/R combination between Pin 19 and this pin determines the f. characteristics of the DTMF preamp. | | |
| 19 | MF - IN | I | <p>V_{REF-SN} Signal input</p> | <p>DTMF signal input :</p> <ul style="list-style-type: none"> DTMF signals are input through a capacitor to this pin. DTMF signals are enabled when DMC is low at Pin 40. | | <p>The 10 kΩ input impedance and C12 or C13 form a HPF.</p> |

■ Pin Descriptions (cont.)

| Pin No. | Pin name | I/O | Waveform | Description | Equivalent circuit | Remarks |
|---------|------------|-----|---|--|--|---------|
| 20 | MIC OUT | O |  | MIC preamp. output : •R12 and C14 connected between Pin 22 and this pin determine the f. characteristics. •The output impedance is up to 1 kΩ. |  | _____ |
| 21 | MIC IN (+) | I |  | MIC preamp. input (1) : •A bias resistor and a microphone connect to this pin. | | _____ |
| 22 | MIC IN (-) | I |  | MIC preamp. input (2) : •R12 and C14 connected between Pin 20 and this pin determine the f. characteristics. | | _____ |
| 23 | DMC | I | | Dial mute control : •Normal speech mode when Pin 23 is high or open (MIC amp. ON and rec. amp. ON). •DTMF mode when Pin 23 is low (DTMF amp. ON and BT amp. ON). |  | _____ |
| 24 | DC - CONT | I |  | Line voltage control : •Line voltage is normal when the input voltage at this pin is high. Line voltage increases by 1-1.5 V when the input voltage is low. |  | _____ |
| 25 | CPC | O |  | Line interruption detector output : •This is an open collector output to a microprocessor, requiring a pull-up resistor connected to the microprocessor's power supply. This pin goes low when line voltage is 3.0 V or more, and goes high when 1.5 V or less. |  | _____ |
| 26 | STR | I |  | Strobe signal input : •The strobe signal for serial control data is input to this pin. The rising edge of the strobe signal determines the timing at which internal control address or ON/OFF status is validated. |  | _____ |
| 27 | CLK | I |  | Clock signal input : •The clock signal for serial control data is input to this pin. The rising edge of the clock signal determines the timing at which data is read. |  | _____ |
| 28 | DATA | I |  | Data input : •Serial data is input to this pin. Data is read into the internal shift register in synchronization with clock signals. |  | _____ |

■ Pin Descriptions (cont.)

| Pin No. | Pin name | I/O | Waveform | Description | Equivalent circuit | Remarks |
|---------|-----------------------|-----|---|---|--|--|
| 29 | GND | — | | Ground : •This is the ground pin for the logic circuits. | _____ | _____ |
| 30 | L- V _{CC} | — | | Logic power supply input : | _____ | _____ |
| 31 | VOX- OUT | O |  | Vox detector output : •This is an open collector output. •This pin goes high when voice signals are input to Pin 37. |  | _____ |
| 32 | SP- OUT | O |  | Loudspeaker link output : •This is a link switch output to an external loudspeaker amplifier. •The output amplifier gain is selectable between 12 and 0 dB. •Output impedance is 50 ± 30Ω. |  | When address 2F of the cross-point switch is OFF, the output amplifier gain is set to 12 dB. |
| 33 | RF2- OUT | O |  | RF2 link output : •This is a link switch output. •Output impedance is 50Ω. |  | _____ |
| 34 | RF1- OUT | O |  | RF1 link output : •This is a link switch output. •Output impedance is 50Ω. |  | _____ |
| 35 | DH- OUT | O |  | Intercom link output : •This is a link switch output to an intercom. •Output impedance is 50Ω. |  | _____ |
| 36 | VOX DET | O |  | VOX detection control : •A smoothing capacitor (C18) and a resistor (R18) connect in parallel to this pin to adjust the attack and recovery times of the VOX detector. |  | VOX detection can be done in two ways : A) With small C18 (560 pF) and small R18 (39kΩ) VOX input  VOX output  B) With large C18 (22 μF) and large R18 (100 kΩ) VOX input  VOX output  |
| 37 | VOX IN | I | | VOX amp. input : •VOX (voice detection) signals are input to this pin. •Input impedance is 500Ω. |  | |
| 38 | LTS- OUT | O |  | Time stamp link output : •This is a buffered link switch output. •Output impedance is 50Ω. |  | _____ |
| 39 | LRC- OUT | O |  | Recording link output : •This is a buffered link switch output. •Output impedance is 50Ω. |  | _____ |

■ Pin Descriptions (cont.)

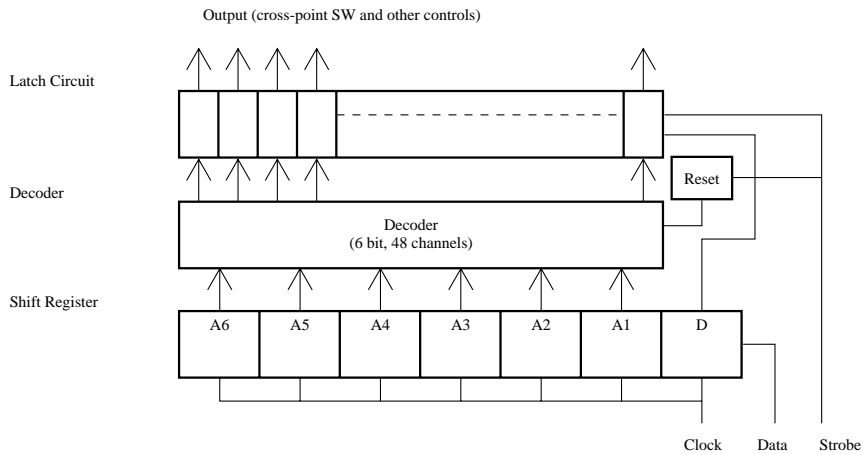
| Pin No. | Pin name | I/O | Waveform | Description | Equivalent circuit | Remarks |
|---------|---------------------|-----|---|--|--------------------|--|
| 40 | ALC. IN | I | | ALC input : •Pin 45 connects through a coupling capacitor to this pin. •Input impedance is 10kΩ. | | •Ground Pin 41 if no ALC circuit is used. •The larger C20, the longer the attack time. The smaller R20, the shorter the recovery time |
| 41 | ALC. DET | O | Pin 41 output DC (with a capacitor) Input Full-wave rectification (with no capacitor) | ALC detection control : •A smoothing capacitor (C20) and a resistor (R20) connect in parallel to this pin to adjust the attack and recovery times of the ALC. | | |
| 42 | SP- IN | I | | Loudspeaker link input : •SP signals to this pin are output through a coupling capacitor to the link switch. •Input impedance is 50kΩ. | | |
| 43 | RD PRE- IN | I | | Recording input : •Recording signals are input through a coupling capacitor to this pin. •Input impedance is normally 10kΩ. It decreases during ALC operation. | | |
| 44 | RD PRE- NF | I | | Recording preamp. inverse input : •A/C/R combination between Pin 45 and this pin determines the gain and f. characteristics of the recording preamplifier. | | The gain (G) of the recording preamplifier is : |
| 45 | REC PRE- OUT | O | | Recording preamp. output : •Outputs amplified recording signals. •Output impedance is 50Ω. | | $G = - \frac{R23}{R22+j\omega C23}$ |
| 46 | BIASS ADJ | | | Recording bias current control : •A C/R combination connected to this pin determines the recording bias current and gain of a recording head. •The smaller the resistance of the C/R combination, the greater the bias current and gain. | | •Address 07 of the cross-point SW determines the ON/OFF status of the rec. preamp. •The bias current to the head is : |
| 47 | HEAD | I/O | Bias voltage During recording 0V During playing 0V | To recording head : •A recording head connects to this pin. | | $I_H = \frac{V_{REF-PR}}{R25} \times 3$ $V_{REF-PR} = \frac{1}{2} V_{reg}$ |
| 48 | EQ. NF | I | | EQ amp. inverse input : •A C/R combination between Pin 49 and this pin determines the equalizer characteristics. | | •The gain of the equalizer amp. is calculated the same way as the receiver preamp. |
| 49 | EQ. OUT | O | | EQ amp. output : •Outputs amplified equalizer signals. •Output impedance is 50Ω. | | •Address 0F of the cross-point SW determines the ON/OFF status of the EQ amp. |
| 50 | V _{REF-PR} | O | | REC/PLAY int. ref. voltage output : •The Pin 5 ref. voltage is buffered and output from this pin. •Output impedance is 50Ω | | |
| 51 | GND | | | Ground : | | |

■ Pin Descriptions (cont.)

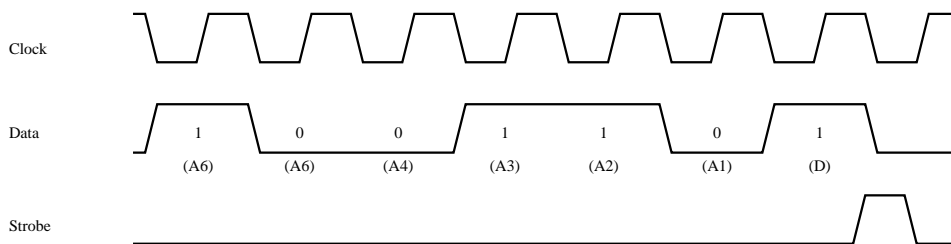
| Pin No. | Pin name | I/O | Waveform | Description | Equivalent circuit | Remarks |
|---------|----------|-----|-------------------------------|---|--------------------|--|
| 52 | MIX OUT | O | | MIX preamp. output : • A C/R combination between Pin 53 and this pin determines the gain and f. characteristics of the MIX preamp. • Output impedance is 50Ω. | | The gain of the MIX preamp. is calculated the same way as the rec. preamp. |
| 53 | MIX IN | I | | MIX link input : • MIX signals are input through a coupling capacitor to this pin. | | |
| 54 | AUX OUT | O | | AUX preamp. output : • A C/R combination between Pin 55 and this pin determines the gain and f. characteristics of the AUX preamp. • Output impedance is 50Ω. | | The gain of the AUX preamp. is calculated the same way as the rec. preamp. |
| 55 | AUT IN | I | | AUX link input : • AUX signals are input through a coupling capacitor to this pin. | | |
| 56 | DH IN | I | | Intercom link input : • Intercom signals are input through a coupling capacitor C30 to this pin. • Input impedance is 10kΩ | | The input impedance as illustrated left and C30, C31, or C32 form a HPF. |
| 57 | RF1 IN | I | | RF1 link input : • RF1 signals are input through a coupling capacitor C31 to this pin. • Input impedance is 10kΩ. | | |
| 58 | RF2 IN | I | | RF2 link input : • Same as above. | | |
| 59 | PR | I | | Power-ON reset control : • C33 between this pin and GND determines the power-ON reset time of the logic circuits. | | <ul style="list-style-type: none"> •The larger C33, the longer the power-ON reset time. •The power-ON reset signal is output when the supply voltage reaches 4V. |
| 60 | VCC | — | | External supply voltage input : • $-5\pm 0.5V$ power supply is input to this pin. | — | — |
| 61 | Vreg | O | | Internal supply voltage output : • A power supply derived from line voltage is output from this pin to the internal speech network. | | — |
| 62 | VLC | — | 2 to 5 VDC depending on V_L | Circuit voltage control (2) : • This pin is grounded through C36. | | C36 (typically 47μF) determines how the circuit voltage fluctuates. |
| 63 | PD2 | O | | Line current bypass : • Line current is bypassed from this pin through R35 to GND. R35 must be 1/2 W or more. | | Z_{Te1} is 1.5-2.0kΩ on the IC side. It must be adjusted to 600Ω by inserting a 820Ω resistor between VL and GND. |
| 64 | PD1 | I | | Line current bypass (1) : • Line current is bypassed from this pin through R36 to Pin 2. R36 must be 1/2 W or more. | | |
| | | | | | | |

Logic Specifications

■ Basic Block Diagrams



■ Time Charts (Assuming the address h26 latch is to be set)



1. Data is read into the shift register in synchronization with a rising edge of the clock, with the higher data being shifted sequentially on a first-come highest-bit basis.
2. When the strobe is low, data is shifted sequentially on the shift register in synchronization with the clock. Data on the latch circuit will not change.
3. When the strobe goes high, the latched data whose address is represented by the highest six bits of the shift register is updated. Latched data is set when the least significant bit is 1, and reset when the bit is 0.
4. Referring to 3 above, if the address is h00 (the highest six bits of the shift register are all 0s), the latch circuit is cleared (all reset) regardless of the data content.
5. At power-on (VCC ON), the latch circuit is cleared (by power-ON reset).

■ Logic Circuits Address Specifications

1. Cross-point switch

| Input | Output | Handset rec. | Line output | Loudspeaker | Intercom | RF1 | RF2 | Recording | Time stamp |
|-------------|--------|--------------|-------------|-------------|----------|-----|-----|-----------|------------|
| Loudspeaker | | | | 02 | | | | | |
| Microphone | | | 09 | 0A | 0B | 0C | 0D | 0E | |
| Receiver | | 10 | | 12 | | 14 | 15 | 16 | |
| Intercom | | 18 | | 1A | | 1C | 1D | 1E | |
| RF1 | | 20 | 21 | | 23 | | 25 | 26 | |
| RF2 | | 28 | 29 | | 2B | 2C | | 2E | |
| MIX | | 30 | 31 | 32 | 33 | 34 | 35 | | 37 |
| AUX | | 38 | 39 | 3A | 3B | 3C | 3D | 3E | |

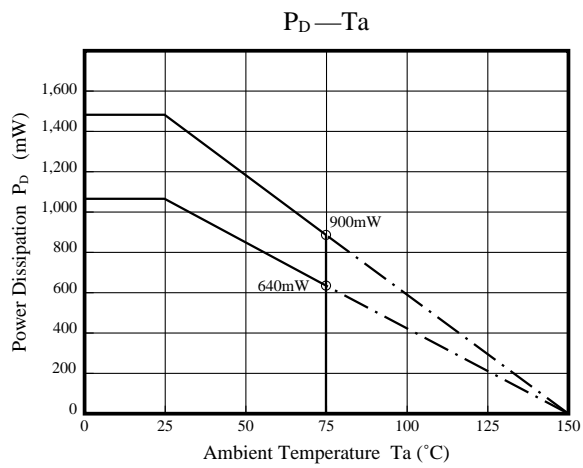
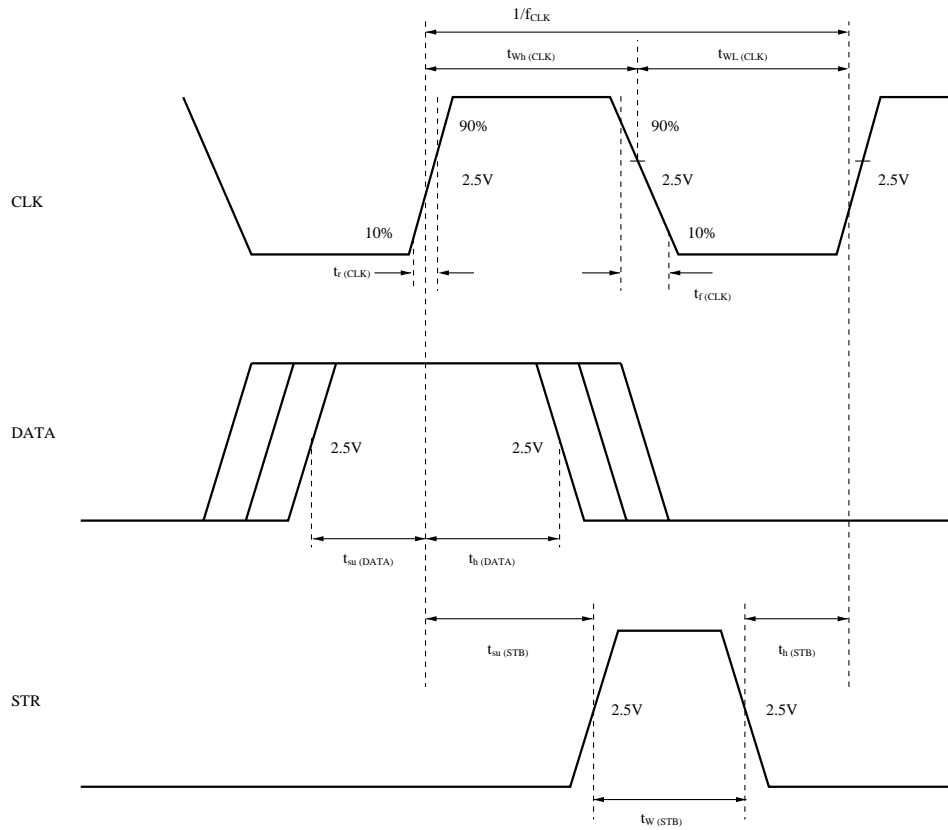
Note) Empty space means “not applicable.” Address is in hexadecimal.

2. Other control switches

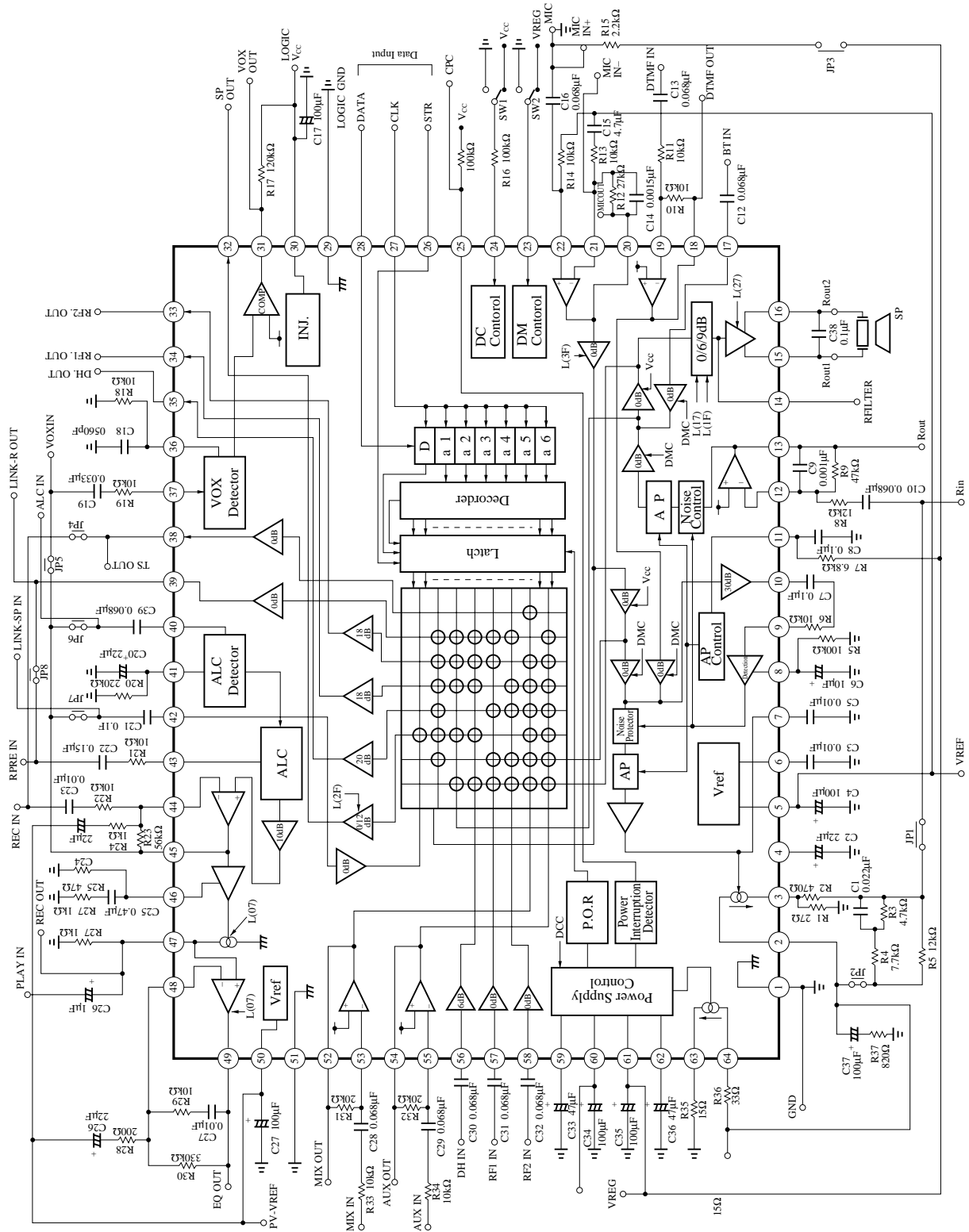
| Address | Description |
|------------|--------------------------------------|
| 00 | Cross-point SW all reset |
| 07 | Recording amp. ON |
| 0F | Playing amp. ON |
| 17 | Receiver volume 6 dB up |
| 1F | Receiver volume 9 dB up |
| 27 | Handset receiver amp. mute |
| 2F | SP output amp. gain 12 dB down |
| 3F | MIC preamp. mute |
| 09, 21, 29 | Receiver noise reduction is enabled. |

Note) Address is in hexadecimal.

■ Timing Charts



■ AN6472NFBP Applicant Circuit





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