

# HA12189NT/MP

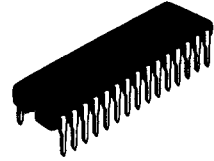
## Sound Signal Processing IC for Automatic Telephone Answering System

The HA12189 is the IC designed for sound signal processing for automatic telephone answering system. As the device builds mainly in fundamental features, necessary to the automatic answering telephone, it can construct the sound signal processing easily, and is suitable for answering system that use cassette for ICM and IC memory for OGM.

### Features

- Adjustable with frequency characteristic and each gain of LINE-REC-PB-Monitor series by external parts
- Suitable for answering system that use cassette for ICM and IC memory for OGM
- High Integration
  - (SW Part)
    - OGM/ICM Change SW Circuit
    - PLAY/REC Change SW Circuit
    - MIC/LINE Input Change SW Circuit
    - PRE Amp-Frequency Change Circuit
    - MUTE SW Circuit
  - (REC/PB Part)
    - PRE Amp, Buffer Amp, REC Amp
    - ALC Circuit, MUTE Circuit
  - (LINE Part)
    - LINE Amp, MUTE Circuit
  - (VOX Part)
    - VOX Amp, COMP Amp; (Detection Circuit)

HA12189NT



DP-30S

HA12189MP



MP-28

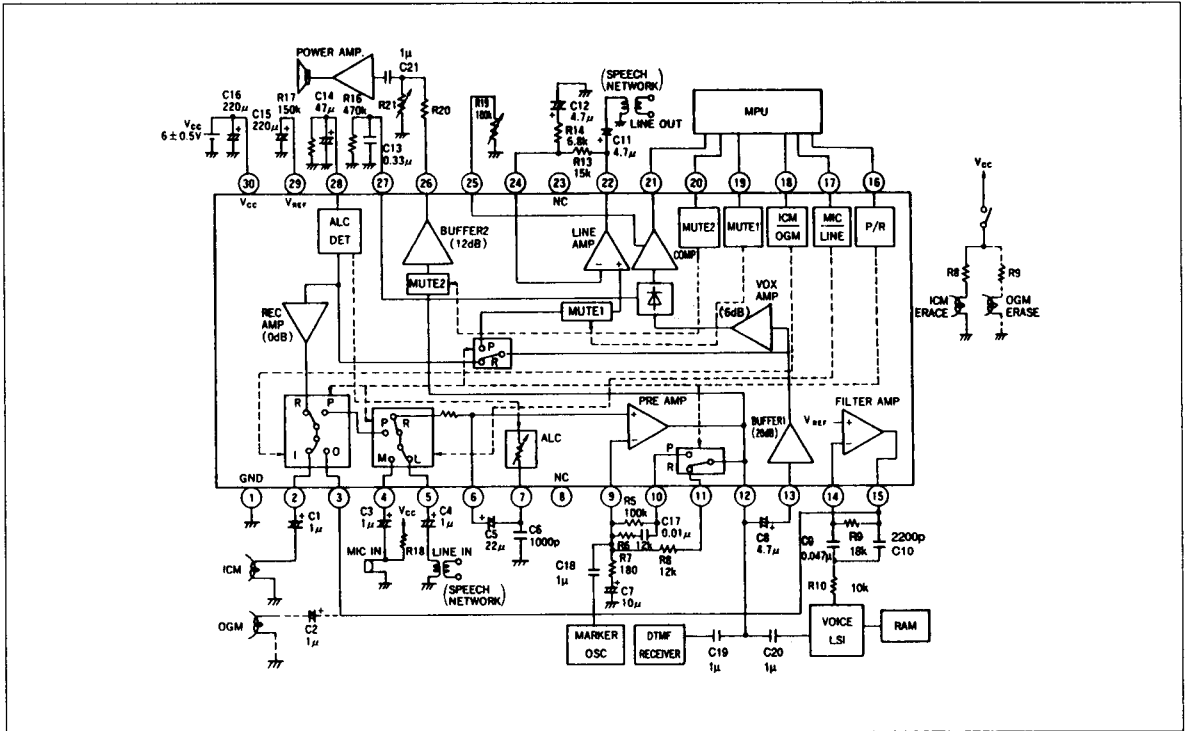


Figure 1-1 Standard External Circuit and Block Diagram. (HA12189NT)

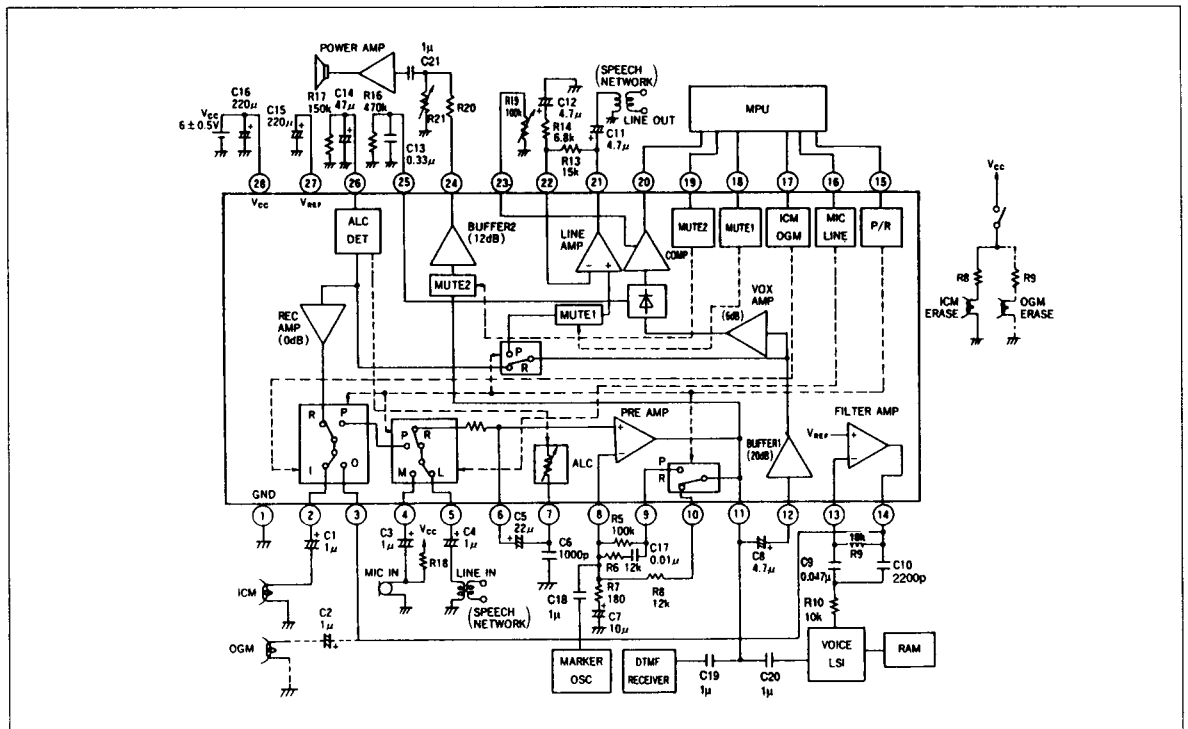


Figure 1-2 Standard External Circuit and Block Diagram. (HA12189MP)

**Pin Function (HA12189NT)**

| Pin No. | Symbol           | Description                 |
|---------|------------------|-----------------------------|
| 1       | GND              | GND                         |
| 2       | ICM              | ICM Input/Output            |
| 3       | OGM              | OGM Input/Output            |
| 4       | MIC              | MIC Input                   |
| 5       | LINE             | Line Input                  |
| 6       | ALC-DC-CUT       | ALC DC CUT                  |
| 7       | ALC              | ALC Input                   |
| 8       | NC               | No Connect                  |
| 9       | PRE-IN           | Pre Amp Input               |
| 10      | PB-FB            | PLAY Pre Amp Output         |
| 11      | REC-FB           | REC Pre Amp Output          |
| 12      | PRE-OUT          | Pre Amp Output              |
| 13      | BUFF-IN          | Buffer Amp Input            |
| 14      | FIL-IN           | Filter Amp Input            |
| 15      | FIL-OUT          | Filter Amp Output           |
| 16      | PB/REC           | PLAY/REC SW Control         |
| 17      | MIC/LINE         | MIC/LINE Input SW Control   |
| 18      | ICM/OGM          | IGM/OGM SW Control          |
| 19      | MUTE1            | Line Mute Control           |
| 20      | MUTE2            | Buffer Output Mute Control  |
| 21      | COMP-OUT         | Comparator Output           |
| 22      | LINE-OUT         | Line Amp Output             |
| 23      | NC               | No Connect                  |
| 24      | LINE-IN          | Line Amp Input              |
| 25      | COMP-ADJ         | Comparator Level Adjustment |
| 26      | BUFF-OUT         | Buffer Amp Output           |
| 27      | VOX-DET          | VOX Detector                |
| 28      | ALC-DET          | ALC Detector                |
| 29      | V <sub>REF</sub> | Reference                   |
| 30      | V <sub>CC</sub>  | Vcc                         |

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|---------|------------------|-----------------------------|
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| 3       | OGM              | OGM Input/Output            |
| 4       | MIC              | MIC Input                   |
| 5       | LINE             | LINE Input                  |
| 6       | ALC-DC-CUT       | ALC DC CUT                  |
| 7       | ALC              | ALC Input                   |
| 8       | PRE-IN           | Pre Amp Input               |
| 9       | PB-FB            | PLAY Pre Amp Output         |
| 10      | REC-FB           | REC Pre Amp Output          |
| 11      | PRE-OUT          | Pre Amp Output              |
| 12      | BUFF-IN          | Buffer Amp Input            |
| 13      | FIL-IN           | Filter Amp Input            |
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| 26      | ALC-DET          | ALC Detector                |
| 27      | V <sub>REF</sub> | Reference                   |
| 28      | V <sub>CC</sub>  | V <sub>CC</sub>             |

## Absolute Maximum Ratings (Ta = 25°C)

| Item                  | Symbol                | Ratings      | Unit | Note |
|-----------------------|-----------------------|--------------|------|------|
| Supply Voltage        | V <sub>CC</sub> (Max) | 7.0          | V    | 1    |
| Power Dissipation     | P <sub>T</sub> (Max)  | 300          | mW   |      |
| Operating Temperature | T <sub>opr</sub>      | -20 to + 70  | °C   |      |
| Storage Temperature   | T <sub>stg</sub>      | -55 to + 125 | °C   |      |

Note 1) Standard Operating Voltage: V<sub>CC</sub> = 6.0 V ± 0.5 V

**Electrical Characteristics** (Ta = 25°C, VCC = 6 V)

| Item                           | Symbol             | Test Condition  | Min  | Typ | Max             | Unit             | Application Terminal | Remark |
|--------------------------------|--------------------|---|------|-----|-----------------|------------------|----------------------|--------|
| Quiescent Current              | I <sub>Q</sub>     | No-signal<br>Pin ⑩ (⑮) = 5 V                            | —    | 12  | 19              | mA               | ⑩ (⑲)                |        |
| PB Voltage Gain                | G <sub>v1</sub>    | V <sub>in</sub> = -74 dBm                               | 69   | 72  | 75              | dB               | ②→⑳                  |        |
| PB Maximum Output Voltage      | V <sub>om1</sub>   | THD = 10%   | 1.2  | 1.7 | —               | V <sub>rms</sub> | (②→⑳)                |        |
| PB Distortion Ratio            | T.H.D1             | V <sub>in</sub> = -74 dBm                               | —    | 0.5 | 2               | %                |                      | 1      |
| REC Voltage Gain               | G <sub>v2</sub>    | V <sub>in</sub> = -70 dBm                               | 48   | 51  | 54              | dB               | ⑤→⑳                  |        |
| REC Maximum Input Voltage      | V <sub>im1</sub>   | THD ≤ 2%  | —    | —   | -30             | dBm              |                      |        |
| REC Distortion Ratio           | T.H.D2             | V <sub>in</sub> = -50 dBm                               | —    | 0.7 | 2               | %                |                      | 1      |
| REC Voltage When ALC Operating | G <sub>v</sub> ALC | V <sub>in</sub> = -50 dBm                               | -9   | -6  | -3              | dBm              |                      |        |
| Buffer Voltage Gain            | G <sub>v3</sub>    | PB Mode<br>V <sub>in</sub> = -74 dBm                    | 52   | 55  | 58              | dB               | ②→㉔<br>(②→㉔)         |        |
| Buffer Maximum Output Voltage  | V <sub>om2</sub>   | PB Mode<br>THD = 10%                                    | 0.7  | 1.0 | —               | V <sub>rms</sub> |                      |        |
| Buffer Distortion Ratio        | T.H.D3             | PB Mode<br>V <sub>in</sub> = -74 dBm                    | —    | 0.6 | 2               | %                |                      | 1      |
| Buffer Mute Attenuation        | ATT1               | V <sub>o</sub> = 0 dBm PB Mode<br>Pin ㉔ (⑲) = 5 V       | —    | -65 | -40             | dB               | ②→㉔<br>(②→㉔)         | 1      |
| PB Mute Attenuation            | ATT2               | V <sub>o</sub> = 0 dBm PB Mode<br>Pin ⑲ (⑮) = 5 V       | —    | -65 | -40             | dB               | ②→⑳<br>(②→⑳)         | 1      |
| Comparator H Output Voltage    | V <sub>OH</sub>    | Pin ㉔ (⑲) = 1.9 V<br>REC Mode V <sub>in</sub> = -60 dBm | 3.8  | 4.5 | 5.0             | V                | ㉔ (⑲)                |        |
| Comparator L Output Voltage    | V <sub>OL</sub>    | Pin ㉔ (⑲) = 1.9 V<br>REC Mode No-Signal                 | -0.3 | 0   | 0.5             | V                |                      |        |
| Control H Input Voltage        | V <sub>IH</sub>    | Lo Mode → Hi Mode<br>Change Voltage                     | 3.8  | —   | V <sub>CC</sub> | V                | ⑮→⑲<br>(⑮→⑲)         |        |
| Control L Input Voltage        | V <sub>IL</sub>    | Hi Mode → Lo Mode<br>Change Voltage                     | 0    | —   | 0.5             | V                |                      |        |

Remark 1) B.P.F in 400 Hz to 15 kHz

Number inside ( ) shows terminal pin number for HA12189MP.

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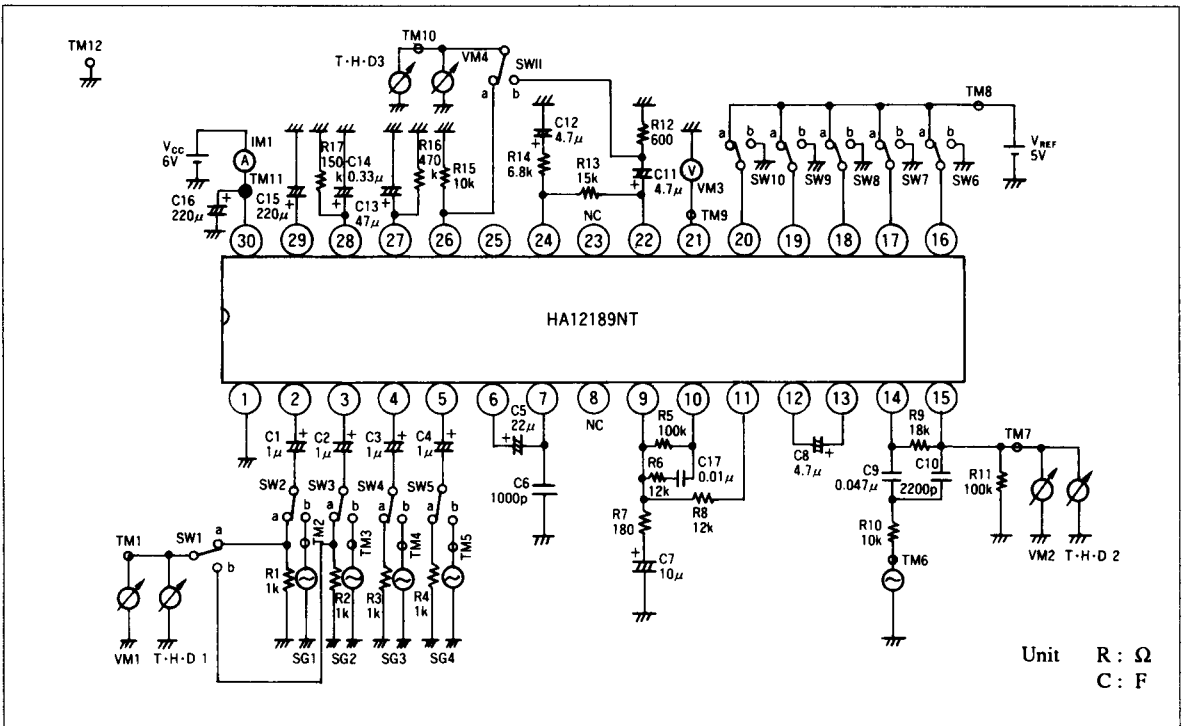


Figure 2-1 Test Circuit (HA12189NT)

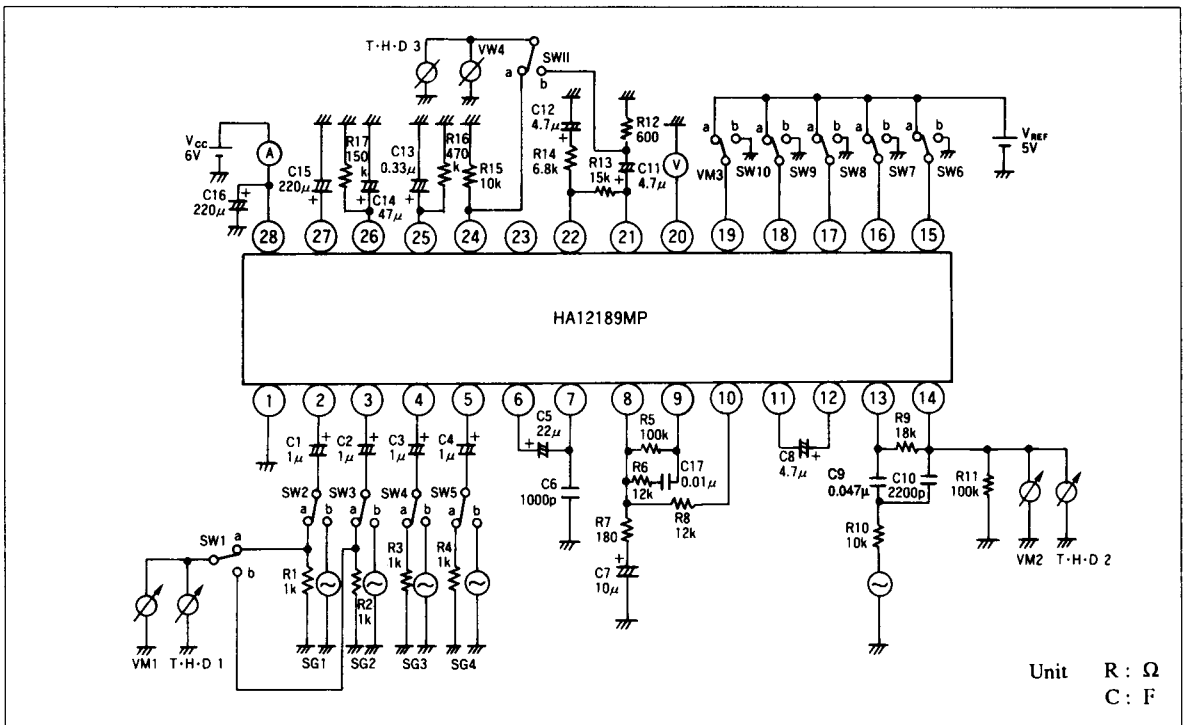


Figure 2-2 Test Circuit (HA12189MP)

Table 1. Switched Position Table

| No. | Symbol          | Control Terminal |        |        |        |        | SW Position |     |     |     |     |      | Source Signal Measurement |
|-----|-----------------|------------------|--------|--------|--------|--------|-------------|-----|-----|-----|-----|------|---------------------------|
|     |                 | 16(15)           | 17(16) | 18(17) | 19(18) | 20(19) | SW1         | SW2 | SW3 | SW4 | SW5 | SW11 |                           |
| 1   | I <sub>Q</sub>  | H                | L      | L      | L      | L      | a           | a   | a   | a   | a   | a    | IMI                       |
| 2   | Gv1             | ↓                | ↓      | H      | ↓      | ↓      | ↓           | b   | ↓   | ↓   | ↓   | b    | SG1, VM4                  |
| 3   | Vom1            | ↓                | ↓      | ↓      | ↓      | ↓      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    | SG1, VM4, THD3            |
| 4   | THD1            | ↓                | ↓      | ↓      | ↓      | ↓      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    |                           |
| 5   | Gv2             | L                | ↓      | ↓      | ↓      | ↓      | ↓           | a   | ↓   | ↓   | b   | a    | SG4, VM1                  |
| 6   | Vim1            | ↓                | ↓      | ↓      | ↓      | ↓      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    | SG4, VM1 THD1             |
| 7   | THD2            | ↓                | ↓      | ↓      | ↓      | ↓      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    |                           |
| 8   | Gv ALC          | ↓                | ↓      | ↓      | ↓      | ↓      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    | SG4, VM1                  |
| 9   | Gv3             | H                | ↓      | ↓      | ↓      | ↓      | ↓           | b   | ↓   | ↓   | a   | ↓    | SG1, VM4                  |
| 10  | Vom2            | ↓                | ↓      | ↓      | ↓      | ↓      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    | SG1, VM4 THD3             |
| 11  | THD3            | ↓                | ↓      | ↓      | ↓      | ↓      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    |                           |
| 12  | ATT1            | ↓                | ↓      | ↓      | L      | H      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    | SG1, VM4                  |
| 13  | ATT2            | ↓                | ↓      | ↓      | H      | L      | ↓           | ↓   | ↓   | ↓   | ↓   | b    |                           |
| 14  | V <sub>OH</sub> | L                | ↓      | ↓      | L      | ↓      | ↓           | a   | ↓   | ↓   | b   | ↓    | SG4, VM3                  |
| 15  | V <sub>OL</sub> | ↓                | ↓      | ↓      | ↓      | ↓      | ↓           | ↓   | ↓   | ↓   | a   | ↓    |                           |
| 16  | V <sub>IH</sub> | H                | H      | ↓      | H      | H      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    | —                         |
| 17  | V <sub>IL</sub> | L                | L      | L      | L      | L      | ↓           | ↓   | ↓   | ↓   | ↓   | ↓    | —                         |

\*H = 5 (V), L = 0 (V)

Number inside ( ) shows terminal pin number for HA12189MP

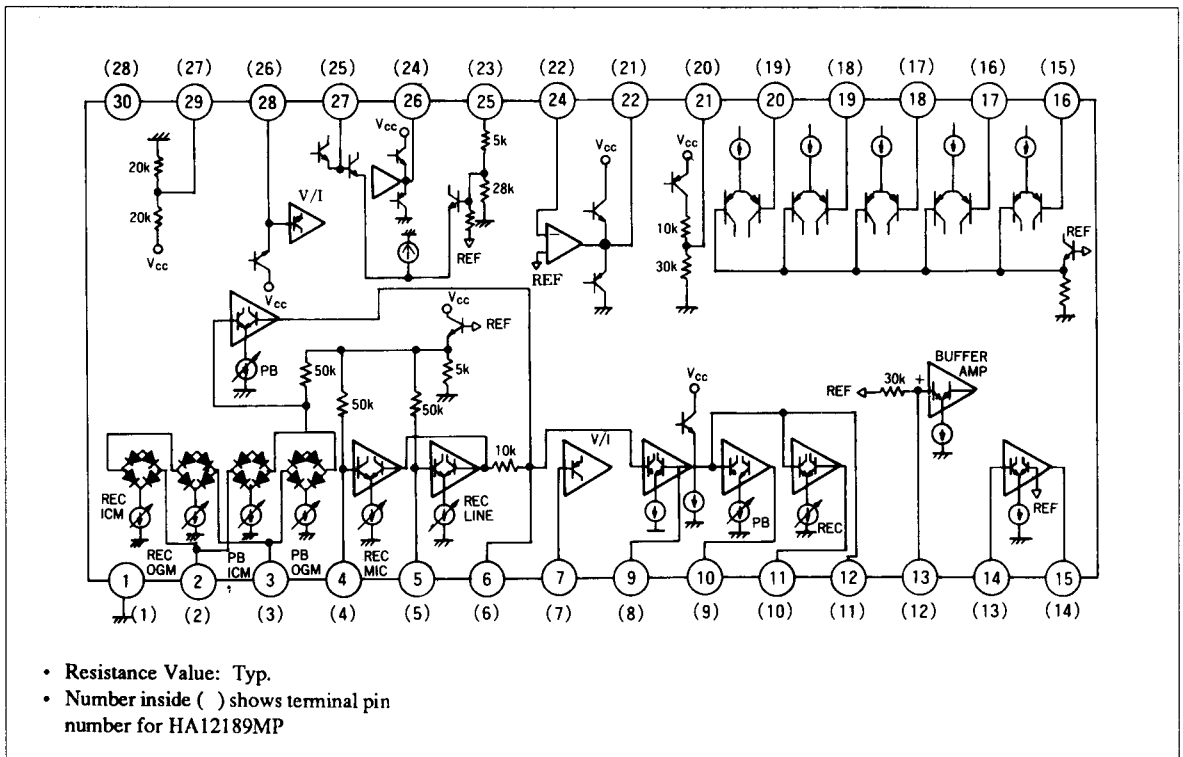


Figure 3 Input/Output Circuit

# HA12189NT/MP

## Function Description (HA12189NT)

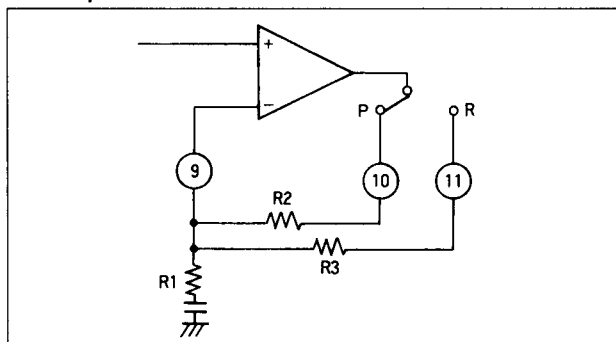
Signal-pass to Control SW (ex.)

| Input        | Output           | ⑯ | ⑰ | ⑱ | Pass  |
|--------------|------------------|---|---|---|---|
| MIC ④        | VOICE LSI ⑫      | L | H | L | ④→(PRE AMP)→⑫→VOICE LSI                                     |
| LINE ⑤       | ICM HEAD ②       | L | L | H | ⑤→(PRE AMP)→(BUF1)→(PRE AMP)→②<br>20 dB      0 dB           |
| ICM ②        | Speaker BUFFER ⑳ | H | * | H | ②→(PRE AMP)→(BUF2)→⑳→SP<br>12 dB                            |
| OGM ③        | LINE Output ㉔    | H | * | L | ③→(PRE AMP)→(BUF1)→(LINE AMP)→㉔<br>20 dB      10 dB         |
| VOICE LSI ⑮  | LINE Output ㉔    | H | * | L | VOICE →(FILTER AMP)→⑮→③→the same<br>LSI as No. 4            |
| LINE ⑤       | OTMF Receiver ⑫  | L | L | * | ⑤→(PRE AMP)→⑫→DTMF Receiver                                 |
| MARKER OSC ⑨ | OGM ③            | L | L | L | ⑨→(PRE AMP)→(BUF1)→(REC AMP)→③<br>0 dB      20 dB      0 dB |

Control SW (Possible to be controlled by CPU)

| Level | Pin 16 | Pin 17 | Pin 18 | Pin 19 | Pin 20 |
|-------|--------|--------|--------|--------|--------|
| H     | PLAY   | MIC    | ICM    | ON     | ON     |
| L     | REC    | LINE   | OGM    | OFF    | OFF    |

Pre Amp



| SW   | P             | R             |
|------|---------------|---------------|
| Gain | $(1 + R2/R1)$ | $(1 + R3/R1)$ |

- Gain is controlled by voltage of Pin 16.

IGM/OGM

|   | ICM      | OGM       | Pin 2         |
|---|----------|-----------|---------------|
| 1 | cassette | cassette  | a dotted line |
| 2 | cassette | VOICE LSI | a solid line  |



# HA12189NT/MP

## External Component

| Part No. | Standard Value | Function                           | Influence                               |   |
|----------|----------------|------------------------------------|---|---|
|          |                |                                    | Standard Value or less                  | Standard Value or more                  |
| C1       | 1 $\mu$        | DC Cut                             |   |   |
| C2       | 1 $\mu$        | DC Cut                             |   |   |
| C3       | 1 $\mu$        | DC Cut                             |   |   |
| C4       | 1 $\mu$        | DC Cut                             |   |   |
| C5       | 22 $\mu$       | DC Cut                             | Frequency characteristics becomes worse | Rising of AGC becomes slow              |
| C6       | 1000p          | Oscillation stop                   | ALC circuit oscillation                 | Frequency characteristics becomes worse |
| C7       | 10 $\mu$       | High cut-off Frequency             | Large cut-off frequency                 | Small cut-off frequency                 |
| C8       | 4.7 $\mu$      | DC Cut                             | Breaking off when attacking             |   |
| C9       | 0.047 $\mu$    | Constant when filter               |   |   |
| C10      | 2200 p         |                                    |   |   |
| C11      | 4.7 $\mu$      | DC Cut                             |   |   |
| C12      | 4.7 $\mu$      | Low cut-off Frequency              | Small cut-off frequency                 | Large cut-off frequency                 |
| C13      | 0.33 $\mu$     | Detection circuit                  | Unstability of comparator operating     | Delay of comparator response            |
| C14      | 47 $\mu$       | Constant when ALC                  | Distortion ratio becomes worse          | Long attack recovery time               |
| C15      | 220 $\mu$      | Ripple Rejection                   | Ripple rejection ratio becomes worse    |   |
| C16      | 220 $\mu$      | Supply Voltage<br>Ripple Rejection | Ripple rejection ratio becomes worse    |   |
| C17      | 0.01 $\mu$     | Low Cut-off Frequency              | Small cut-off frequency                 | Large cut-off frequency                 |
| R5       | 100k           | PB Gv                              | Small Gv                                | Large Offset Voltage of Pin ②④          |
| R6       | 12k            | PB Gv                              | Small Gv                                | Large Gv                                |
| R7       | 180            | Pre. Amp Gv                        | Large Gv                                | Small Gv                                |
| R8       | 12k            | REC Gv                             | Small Gv                                | Large Gv                                |
| R9       | 18k            | Filter Amp Gv                      | Small Gv                                | Large Offset Voltage of Pin ⑮⑭          |
| R10      | 10k            | Filter Amp Gv                      | Large Gv                                | Small Gv                                |
| R13      | 15k            | Line Amp Gv                        | Small Gv                                | Large Gv                                |
| R14      | 6.8k           | Line Amp Gv                        | Large Gv                                | Small Gv                                |
| R16      | 470k           | Detection Circuit                  | Unstability of Comparator Operating     | Delay of Comparator response            |

Number inside ( ) shows terminal pin number for HA12189MP