

# HA12190

## Voice Signal Processing IC for Answering Machines

The HA12190 system IC is a voice signal processor for semi-mechanical answering machines. Designed for systems using IC memory for outgoing messages (OGMs) and tape for incoming messages (ICMs), the HA12190 provides all the required switches and amplifiers on a single chip. The operating voltage is +5V.

### Features

- Designed for systems using IC memory for OGMs and tape for ICMs.
- Easily configured for a variety of voice paths, including interchange of the OGM and ICM signals, line monitoring during OGM output, etc.
- Built-in, high-sensitivity VOX function.
- Circuitry required for LINE, REC, PB, monitor, and VOX line switching is built in. Gain and frequency-characteristics are externally adjustable to ensure flexibility.

### Ordering Information

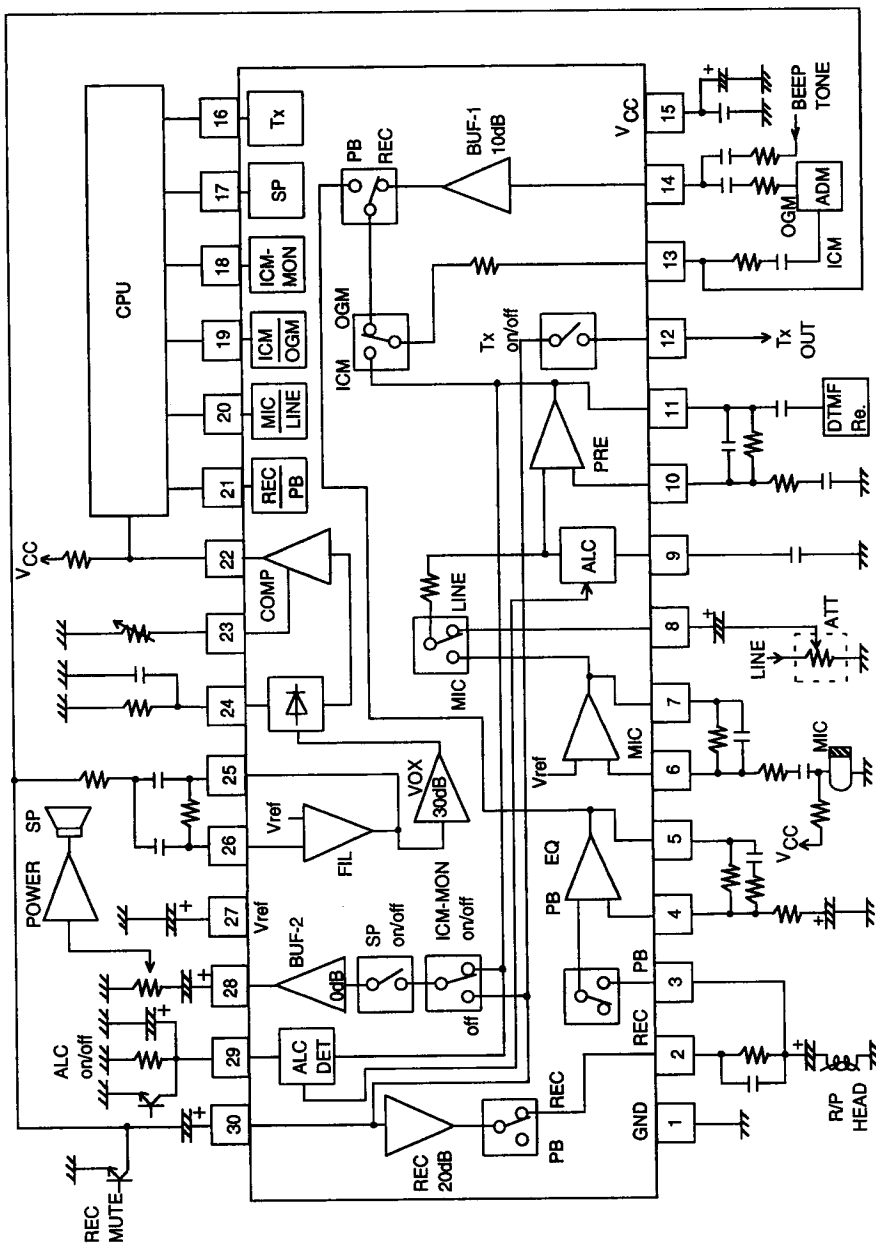
| Type Number | Package                            |
|-------------|------------------------------------|
| HA12190NT   | 30-pin plastic shrink DIP (DP-30S) |
| HA12190MA   | 44-pin plastic shrink QFI (MP-44S) |

### Functions

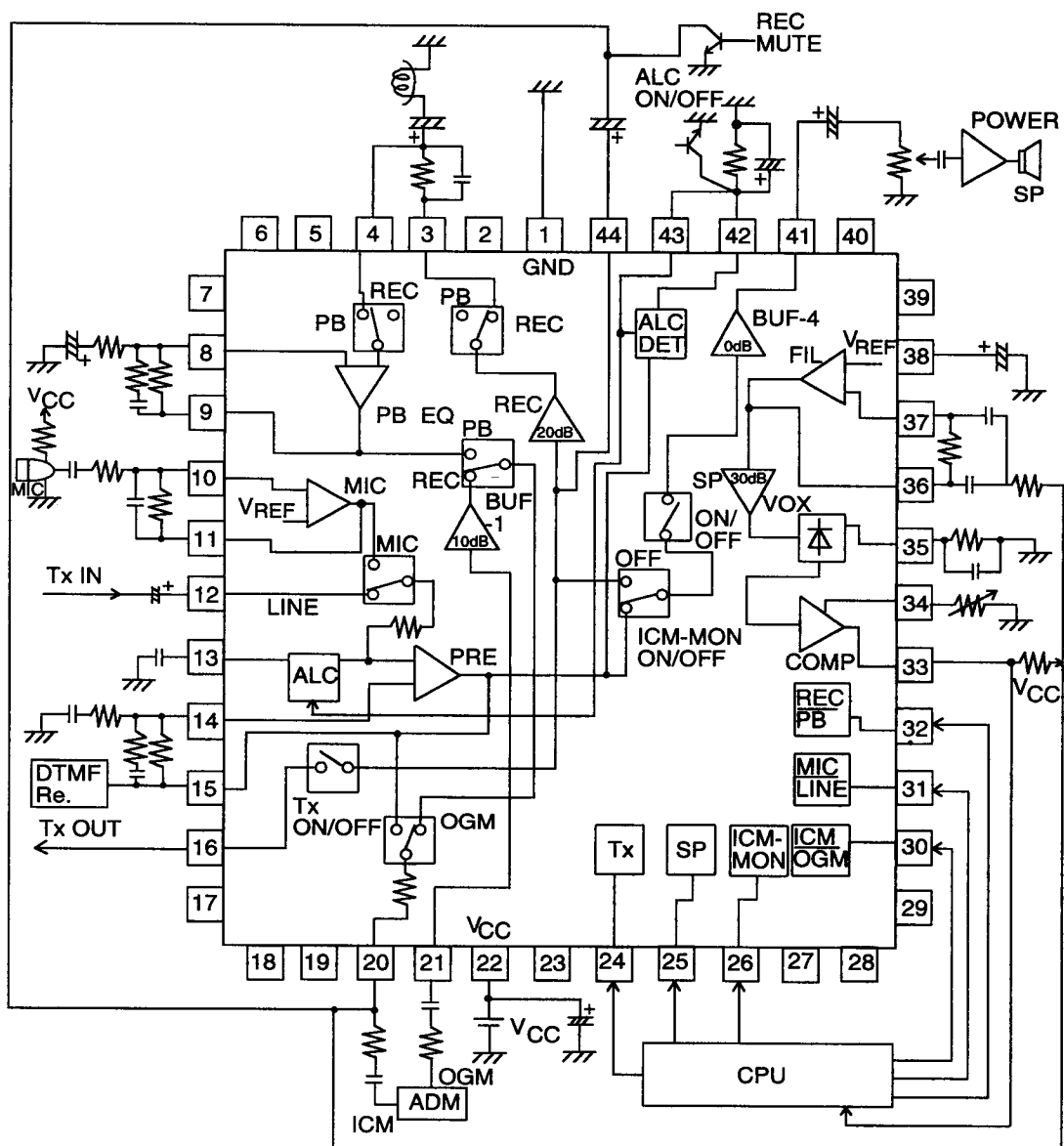
|        |                  |                             |
|--------|------------------|-----------------------------|
| SW     | RBC/PB           | MIC/LINE                    |
|        | ICM/OGM          | Tx ON/OFF                   |
|        | SP ON/OFF        | ICM-MON ON/OFF              |
| REC/PB | REC amp          | MIC preamp                  |
|        | PRE amp          | ALC circuit                 |
|        | PB equalizer amp | Speaker buffer amp          |
| VOX    | VOX amp          | Filter amp                  |
|        | Comparator       | Comparator level adjustment |

Circuit Diagrams

• HA12190NT



• HA12190MA



## HA12190

### • Pin Assignment (HA12190NT)

| Pin No. | Symbol      | Pin Name                       | Recommended Gain |
|---------|-------------|--------------------------------|------------------|
| 1       | GND         | GND                            | —                |
| 2       | ICM REC     | ICM REC output                 | —                |
| 3       | ICM PB      | ICM PB input                   | —                |
| 4       | PB-EQ-IN    | PB equalizer amp I/O           | 40 dB            |
| 5       | PB-EQ-OUT   |                                |                  |
| 6       | MIC-IN      | MIC preamp I/O                 | 18 dB            |
| 7       | MIC-OUT     |                                |                  |
| 8       | LINE-IN     | Line input                     | —                |
| 9       | ALC         | ALC input                      | —                |
| 10      | PRE-IN      | Preamp I/O                     | 36 dB            |
| 11      | PRE-OUT     |                                |                  |
| 12      | TX-OUT      | Line output                    | —                |
| 13      | REC/PB OUT1 | REC and PB intermediate output | —                |
| 14      | OGM PB      | OGM PB or BEEP TONE input      | —                |
| 15      | VCC         | VCC                            | —                |
| 16      | TX ON/OFF   | Line output ON/OFF control     | —                |
| 17      | SP ON/OFF   | Monitor output ON/OFF control  | —                |
| 18      | ICM-MON     | ICM monitor ON/OFF control     | —                |
| 19      | ICM/OGM     | ICM/OGM switching control      | —                |
| 20      | MIC/LINE    | MIC/LINE switching control     | —                |
| 21      | REC/PB      | REC/PB switching control       | —                |
| 22      | COMP-OUT    | VOX detect output              | —                |
| 23      | COMP-ADJ    | Comparator level adjustment    | —                |
| 24      | VOX-DET     | VOX detect                     | —                |
| 25      | FIL-OUT     | Filter amp I/O                 | 6 dB             |
| 26      | FIL-IN      |                                |                  |
| 27      | VREF        | Reference                      | —                |
| 28      | BUF-OUT     | Monitor amp buffer output      | —                |
| 29      | ALC-DET     | ALC detect                     | —                |
| 30      | REC/PB OUT2 | REC and PB intermediate output | —                |

## • Pin Assignment (HA12190MA)

| Pin No. | Symbol      | Pin Name                       | Recommended Gain |
|---------|-------------|--------------------------------|------------------|
| 1       | GND         | GND                            | —                |
| 2       | NC          | No connect                     | —                |
| 3       | ICM REC     | ICM REC output                 | —                |
| 4       | ICM PB      | ICM PB input                   | —                |
| 5       | NC          | No connect                     | —                |
| 6       | NC          | No connect                     | —                |
| 7       | NC          | No connect                     | —                |
| 8       | PB-EQ-IN    | PB equalizer amp I/O           | 40 dB            |
| 9       | PB-EQ-OUT   |                                |                  |
| 10      | MIC-IN      | MIC preamp I/O                 | 18 dB            |
| 11      | MIC-OUT     |                                |                  |
| 12      | LINE-IN     | Line input                     | —                |
| 13      | ALC         | ALC input                      | —                |
| 14      | PRE-IN      | Preamp I/O                     | 36 dB            |
| 15      | PRE-OUT     |                                |                  |
| 16      | TX-OUT      | Line output                    | —                |
| 17      | NC          | No connect                     | —                |
| 18      | NC          | No connect                     | —                |
| 19      | NC          | No connect                     | —                |
| 20      | REC/PB OUT1 | REC and PB intermediate output | —                |
| 21      | OGM PB      | OGM PB or BEEP TONE input      | —                |
| 22      | VCC         | VCC                            | —                |
| 23      | NC          | No connect                     | —                |
| 24      | TX ON/OFF   | Line output ON/OFF control     | —                |
| 25      | SP ON/OFF   | Monitor output ON/OFF control  | —                |
| 26      | ICM-MON     | ICM monitor ON/OFF control     | —                |
| 27      | NC          | No connect                     | —                |
| 28      | NC          | No connect                     | —                |
| 29      | NC          | No connect                     | —                |
| 30      | ICM/OGM     | ICM/OGM switching control      | —                |

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## HA12190

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### • Pin Assignment (HA12190MA) (cont)

| Pin No. | Symbol      | Pin Name                       | Recommended Gain |
|---------|-------------|--------------------------------|------------------|
| 31      | MIC-LINE    | MIC/LINE switching control     | —                |
| 32      | REC/PB      | REC/PB switching control       | —                |
| 33      | COMP-OUT    | VOX detect output              | —                |
| 34      | COMP-ADJ    | Comparator level adjustment    | —                |
| 35      | VOX-DET     | VOX detect                     | —                |
| 36      | FIL-OUT     | Filter amp I/O                 | 6 dB             |
| 37      | FIL-IN      |                                |                  |
| 38      | VREF        | Reference                      | —                |
| 39      | NC          | No connect                     | —                |
| 40      | NC          | No connect                     | —                |
| 41      | BUF-OUT     | Monitor amp buffer output      | —                |
| 42      | ALC-DET1    | ALC detect 1                   | —                |
| 43      | ALC-DET2    | ALC detect 2                   | —                |
| 44      | REC/PB OUT2 | REC and PB intermediate output | —                |

Gain Diagrams

| Mode              | Pin        |            | Diagram                                                                                                                                                                                                                                                                                                                                                                                  | Switch Setting |             |            |    |    |             |  |  |
|-------------------|------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|------------|----|----|-------------|--|--|
|                   | IN         | OUT        |                                                                                                                                                                                                                                                                                                                                                                                          | REC<br>PB      | MIC<br>LINE | ICM<br>OGM | Tx | SP | ICM-<br>MON |  |  |
| REC               |            |            | <p>MIC (-60dBm) → 18dB → -42dBm → ATT (-19dB) → -23dBm → BUF-1 (10dB) → -30dBm → 22dB (ALC on) → -20dBm → 20dB → REC (0dBm)</p> <p>LINE (-23dBm) → ATT (-19dB) → -23dBm → 22dB (ALC on) → -20dBm → 20dB → REC (0dBm)</p> <p>Graph: <math>V_o</math> vs <math>V_i</math> (MIC). ALC characteristic showing a linear region from -74 to -60 dBm and a saturation region above -60 dBm.</p> | 1              | 1           | 0          | *  | 1  | 0           |  |  |
| MIC REC           | 6<br>(10)  | 13<br>(20) |                                                                                                                                                                                                                                                                                                                                                                                          | 1              | 1           | 0          | 0  | 0  | 0           |  |  |
| LINE REC          | 8<br>(12)  | 2<br>(3)   |                                                                                                                                                                                                                                                                                                                                                                                          | 1              | 0           | 1          | 0  | 0  | 0           |  |  |
| ADM →<br>TAPE REC | 14<br>(21) | 2<br>(3)   |                                                                                                                                                                                                                                                                                                                                                                                          | 1              | *           | 0          | *  | 0  | 0           |  |  |

Gain Diagrams (cont.)

| Mode              | Pin         |              | Diagram | Switch Setting |      |     |    |    |      |   |   |
|-------------------|-------------|--------------|---------|----------------|------|-----|----|----|------|---|---|
|                   | IN          | OUT          |         | REC            | MIC  | ICM | Tx | SP | ICM- |   |   |
|                   |             |              |         | PB             | LINE | OGM |    |    | MON  |   |   |
| PB                |             |              |         |                |      |     |    |    |      |   |   |
| TAPE MONITOR<br>→ |             | 28 (41)      |         | 0              | *    | 0   | *  | 0  | 0    | 0 | 0 |
|                   | LINE<br>ADM | 3 (4) (16)   |         | 0              | *    | 0   | 1  | 0  | 0    | 0 | 0 |
| ADM MONITOR<br>→  |             | 13 (20)      |         |                |      |     |    |    |      |   |   |
|                   |             | 28 (41)      |         | 1              | *    | 0   | *  | 0  | 0    | 0 | 0 |
|                   | LINE        | 14 (21) (16) |         | 1              | *    | 0   | 1  | 0  | 0    | 0 | 0 |

| Mode               | Pin        |            | Diagram | Switch Setting |    |     |      |     |    |    |     |     |
|--------------------|------------|------------|---------|----------------|----|-----|------|-----|----|----|-----|-----|
|                    | IN         | OUT        |         | REC            | PB | MIC | LINE | ICM | Tx | SP | ICM | MON |
| LINE               |            |            |         |                |    |     |      |     |    |    |     |     |
| MONITOR during OGM | 3<br>(4)   | 12<br>(16) |         | 0              | 0  | 0   | 0    | 0   | 1  | 0  | 1   |     |
|                    | 14<br>(21) | 12<br>(16) |         | 1              | 0  | 0   | 0    | 0   | 1  | 0  | 1   |     |
|                    | 8<br>(12)  | 28<br>(41) |         | *              | 0  | 0   | 0    | 0   | 1  | 0  | 1   |     |

Gain Diagrams (cont.)

| Mode       | Pin  |      | Diagram | Switch Setting |             |            |    |    |     |     |   |
|------------|------|------|---------|----------------|-------------|------------|----|----|-----|-----|---|
|            | IN   | OUT  |         | REC<br>PB      | MIC<br>LINE | ICM<br>OGM | TX | SP | ICM | MON |   |
| VOX        |      |      |         |                |             |            |    |    |     |     |   |
| TAPE → VOX | 3    | 22   |         | 0              | *           | 0          | *  | *  | *   | *   | * |
| MIC → VOX  | (4)  | (33) |         | *              | 1           | 1          | *  | *  | *   | *   | * |
| LINE → VOX | 6    | 22   |         | *              | 0           | 1          | *  | *  | *   | *   | * |
|            | (10) | (33) |         |                |             |            |    |    |     |     |   |
|            | 8    | 22   |         |                |             |            |    |    |     |     |   |
|            | (12) | (33) |         |                |             |            |    |    |     |     |   |

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

| Parameter             | Symbol | Rated Value | Unit |
|-----------------------|--------|-------------|------|
| Power supply voltage  | Vcc    | 7.0         | V    |
| Operating voltage     | Vopr   | 4.5 to 6.5  | V    |
| Power dissipation     | PT     | 300         | mW   |
| Operating temperature | Topr   | −20 to +70  | °C   |
| Storage temperature   | Tstg   | −55 to +125 | °C   |

**Electrical Characteristics (Ta=25°C, Vcc=5V)**

| Parameter                     | Symbol   | Min | Typ | Max | Unit | Pins               | Test Conditions              | Notes |
|-------------------------------|----------|-----|-----|-----|------|--------------------|------------------------------|-------|
| Quiescent current             | Iq       | —   | 10  | —   | mA   | 15 (22)            | Non-signal<br>Pin 21 (32)=0V |       |
| PB voltage gain               | Gv1      | 37  | 40  | 43  | dB   | 3 → 12<br>(4) (16) | Vo=−20dBm                    |       |
| PB maximum output voltage     | Vom1.    | 0.4 | 0.6 | —   | Vrms |                    | T. H. D.=10%                 |       |
| PB distortion ratio           | T. H. D1 | —   | 0.5 | 2   | %    |                    | Vo=−20dBm                    | 1     |
| REC voltage gain              | Gv2      | 65  | 68  | 71  | dB   | 6 → 2<br>(10) (3)  | Vin=−76dBm                   |       |
| REC maximum output voltage    | Vim1     | —   | —   | −30 | dBm  |                    | T. H. D.≤ 2%                 |       |
| REC distortion ratio          | T. H. D2 | —   | 0.7 | 2   | %    |                    | Vin=−50dBm                   | 1     |
| REC ALC operating voltage     | Gv ALC   | −3  | 0   | 3   | dBm  |                    | Vin=−50dBm                   |       |
| Buffer voltage gain           | Gv3      | 37  | 40  | 43  | dB   | 3 → 28<br>(4) (41) | Mode PB<br>Vo=−20dBm         |       |
| Buffer maximum output voltage | Vom2     | 0.4 | 0.6 | —   | Vrms |                    | Mode PB<br>T. H. D.=10%      |       |
| Buffer distortion ratio       | T. H. D3 | —   | 0.6 | 2   | %    |                    | Mode PB<br>Vo=−20dBm         | 1     |

Number inside ( ) shows terminal pin number for HA12190MA

# HA12190

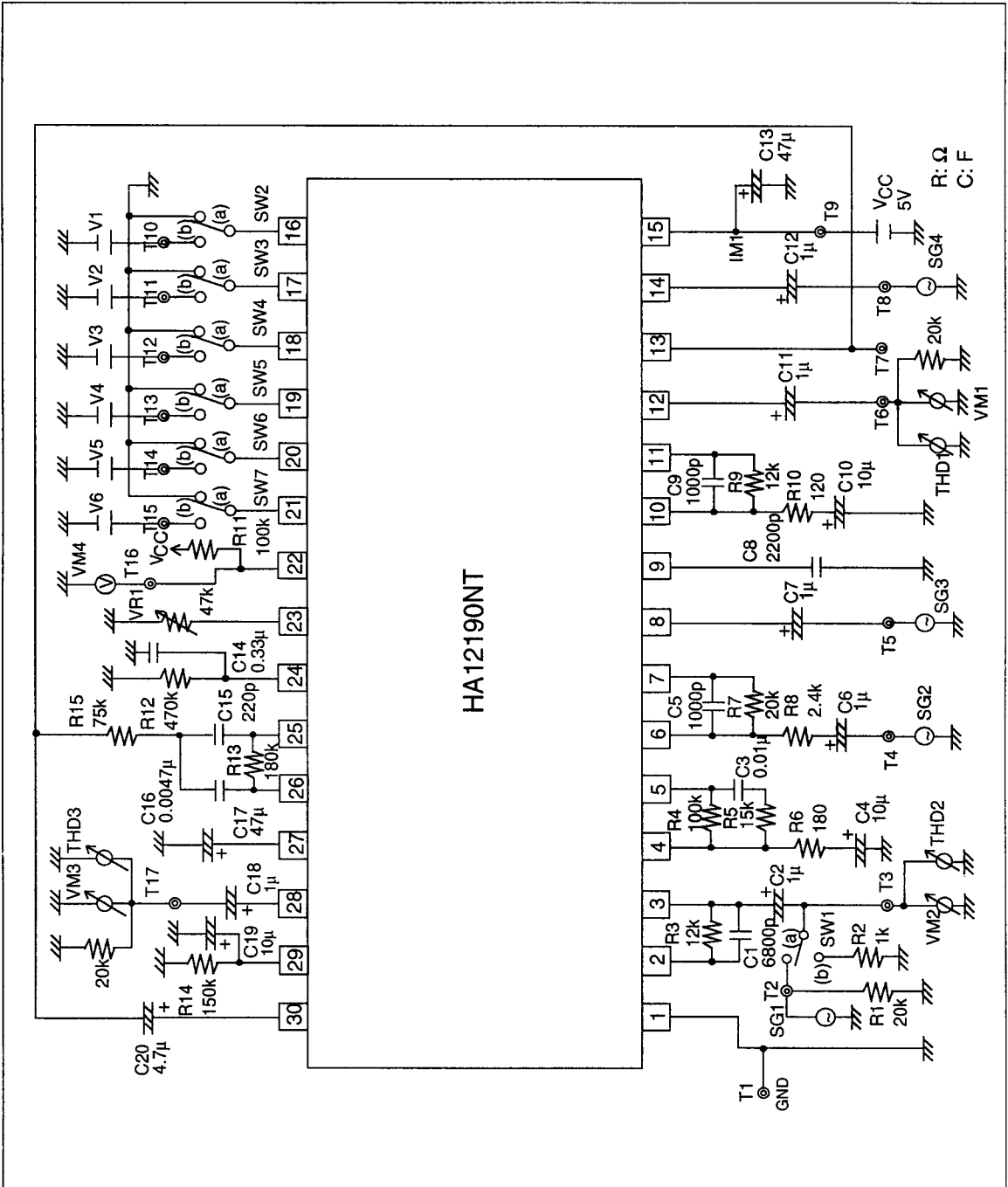
## Electrical Characteristics (cont)

| Parameter                         | Symbol | Min  | Typ | Max | Unit | Pins                  | Test Conditions Notes                           |
|-----------------------------------|--------|------|-----|-----|------|-----------------------|-------------------------------------------------|
| Comparator output<br>high voltage | VOH    | —    | Vcc | —   | V    | 22<br>(33)            | Pin 23 (34) =<br>1.5V<br>REC mode<br>silent     |
| Comparator output<br>low voltage  | VOL    | −0.3 | 0   | 0.5 | V    |                       | Pin 23 (34) =<br>1.5V<br>REC mode<br>Vin=−60dBm |
| Control H output<br>voltage       | VIH    | 3.3  | —   | Vcc | V    | 16 to 21<br>(24) (32) | LO to HI mode<br>switching voltage              |
| Control L<br>input voltage        | VIL    | 0    | —   | 0.5 | V    |                       | HI to LO mode<br>switching voltage              |

Note: B. P. F in 400Hz to 15kHz

Number inside ( ) shows terminal pin  
number for HA12190MA

### Test Circuit (HA12190NT)



# HA12190

## Test Circuit (HA12190MA)

