

## 8 mm VCR ATF

### Description

The CXA1481AQ/AR is an IC developed for the ATF\* in 8mm VCRs. Combined with the microcomputer (CXP80620/CXP80624), complete ATF processing is enabled.

\* ATF: Automatic Track Finding

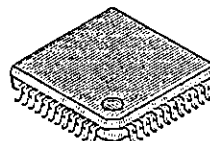
### Features

- Dramatic reduction of peripheral components due to the adoption of new functions
  - On-chip SP/LP discrimination circuit for special playback mode
  - On-chip clog detection circuit
- Optimum function allotment of the microcomputer (CXP80620/CXP80624)
  - Microcomputer creates recording pilots ( $f_1$  to  $f_4$ ) input into CXA1481AQ/AR
- On-chip playback pilot LPF and recording pilot LPF
- $f_H$  and  $3f_H$  subtracter enables minimum DC offset ( $\pm 30\text{mV}$ )
- PCM post-recording compatible
  - Enables pilot recording during playback
- Low current consumption (Reference value: 7.5mA during REC, 16mA during PB)

### Applications

8mm VCR

CXA1481AQ  
48pin QFP (Plastic)



CXA1481AR  
48pin VQFP (Plastic)



### Structure

Bipolar silicon monolithic IC

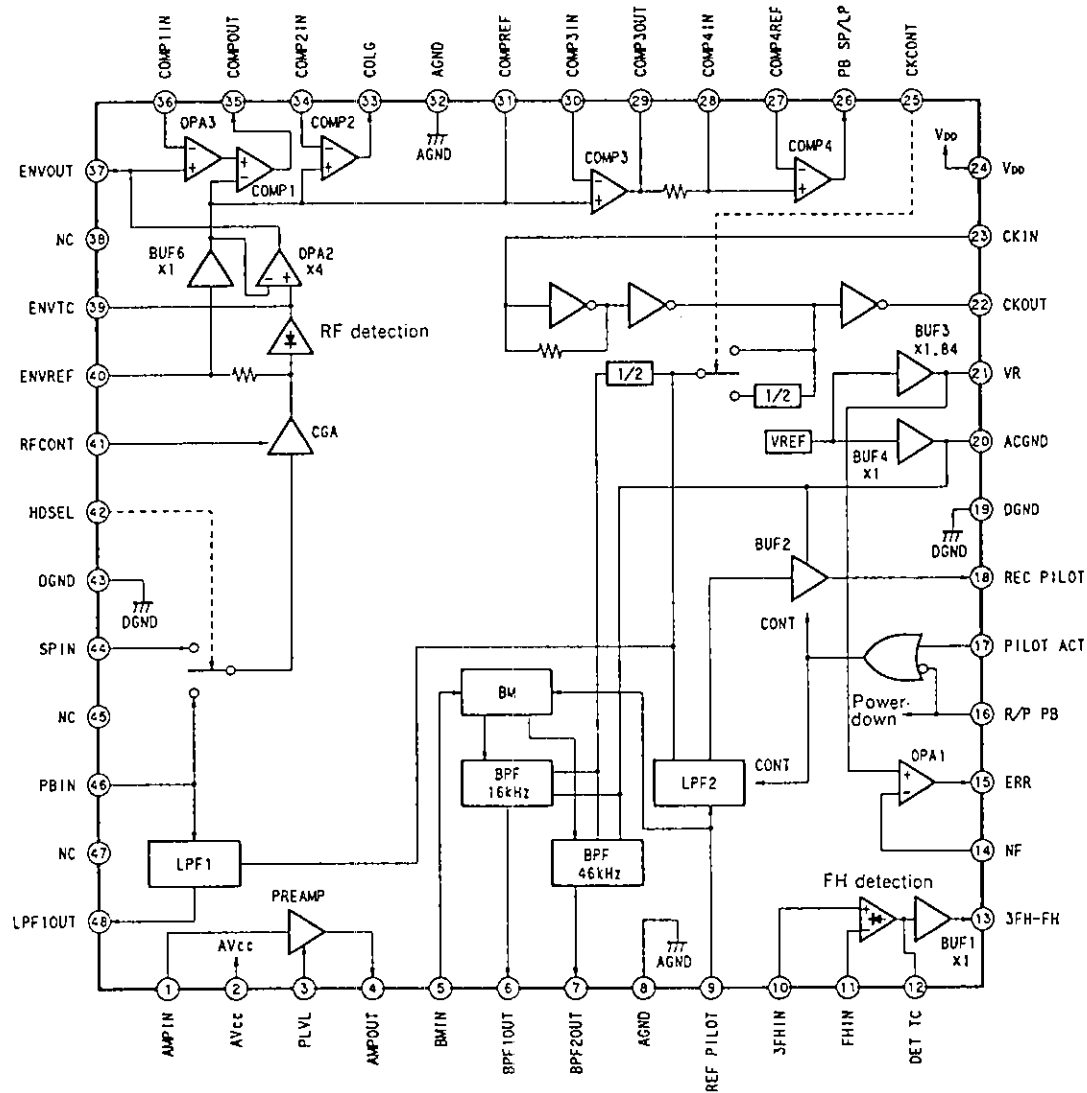
### Absolute Maximum Ratings

|                               |           |                                      |    |
|-------------------------------|-----------|--------------------------------------|----|
| • Supply voltage              | $V_{CC}$  | 7                                    | V  |
| • Operating temperature       | $T_{opr}$ | -10 to +75                           | °C |
| • Storage temperature         | $T_{stg}$ | -55 to +125                          | °C |
| • Allowable power dissipation | $P_D$     | CXA1481AQ 700 mW<br>CXA1481AR 540 mW |    |

### Operating Condition

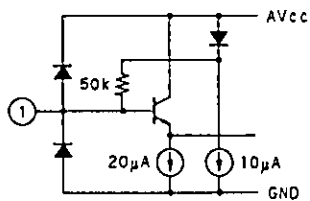
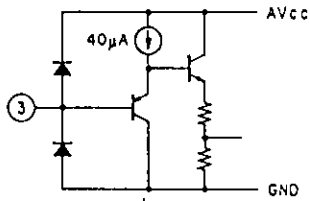
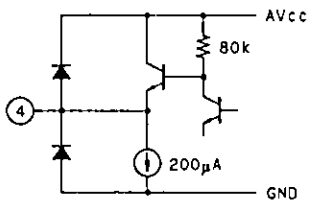
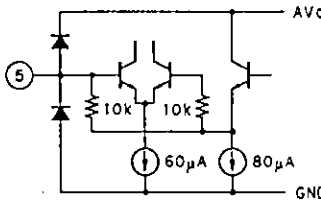
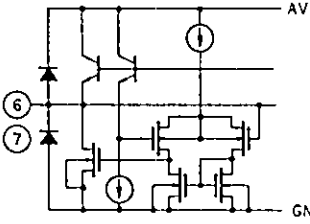
|                |          |                 |   |
|----------------|----------|-----------------|---|
| Supply voltage | $V_{CC}$ | $4.75 \pm 0.25$ | V |
|----------------|----------|-----------------|---|

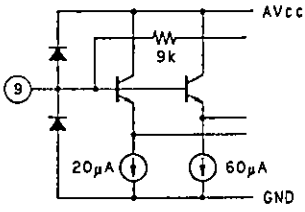
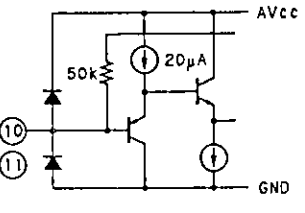
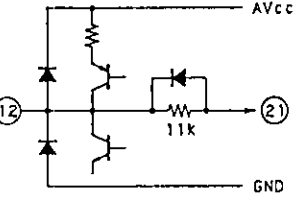
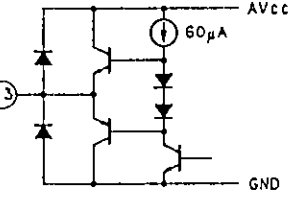
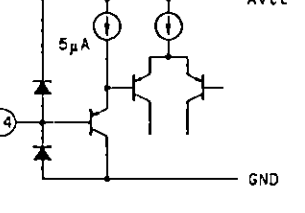
# Block Diagram and Pin Configuration



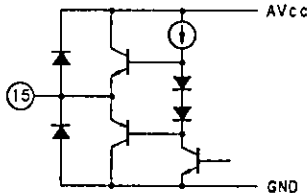
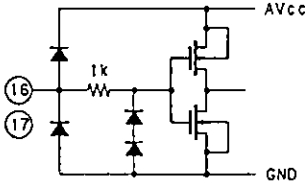
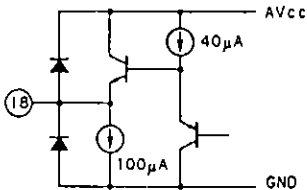
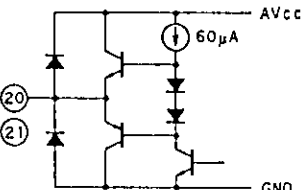
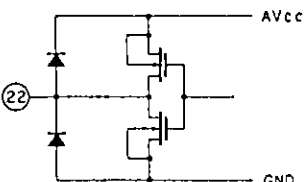
## Pin Description

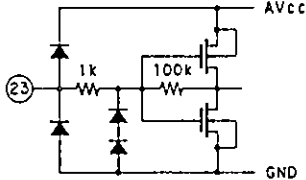
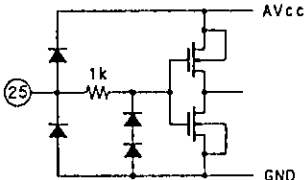
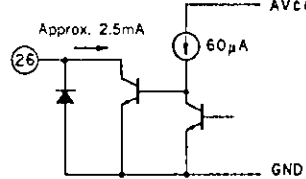
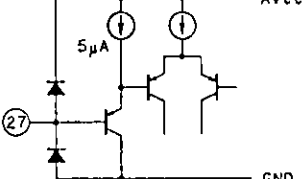
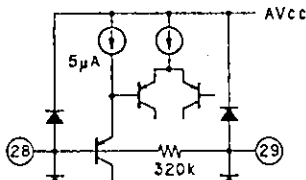
(AV<sub>CC</sub> · V<sub>DD</sub> = 4.75V, T<sub>a</sub> = 25°C, \* externally applied voltage)

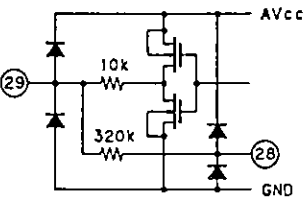
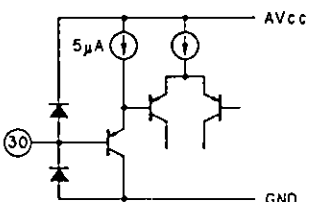
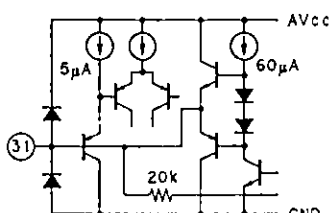
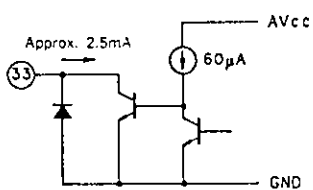
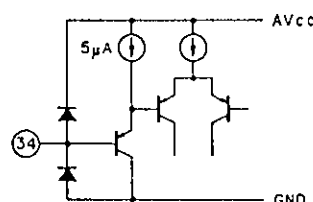
| Pin No. | Symbol           | Pin voltage   |                                 | Equivalent circuit                                                                   | I/O impedance | Description                                                                                           |
|---------|------------------|---------------|---------------------------------|--------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------|
|         |                  | DC            | AC                              |                                                                                      |               |                                                                                                       |
| 1       | AMPIN            | 4.0V Typ.     | 3 to 25mV <sub>P-P</sub>        |    | 50kΩ          | Preamplifier input                                                                                    |
| 2       | AV <sub>CC</sub> | * 4.75V       | —                               |                                                                                      | —             | Analog system power supply                                                                            |
| 3       | PLVL             | * 0.8 to 3.3V | —                               |    | —             | Gain control for pre-amplifier. Gain of pre-amplifier will change with the application of DC voltage. |
| 4       | AMPOUT           | 3.0V Typ.     | —                               |   | 650Ω          | Preamplifier output                                                                                   |
| 5       | BM IN            | 1.6V Typ.     | Approx.<br>30m V <sub>P-P</sub> |  | 10kΩ          | Balance modulator input                                                                               |
| 6       | BPF1 OUT         | 1.25V Typ     | 2V <sub>P-P</sub><br>and below  |  | ≈ 0Ω          | BPF16k output                                                                                         |
| 7       | BPF2 OUT         |               |                                 |                                                                                      |               | BPF46k output                                                                                         |
| 8       | AGND             | 0V            | —                               |                                                                                      | —             | Filter circuit GND                                                                                    |

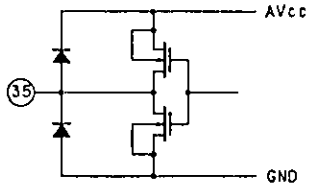
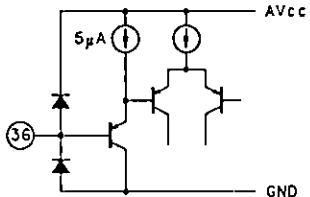
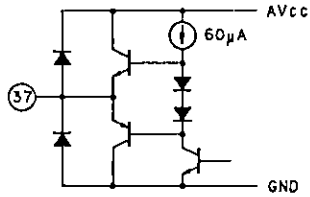
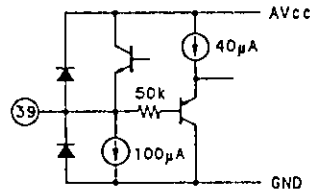
| Pin No. | Symbol    | Pin voltage    |                      | Equivalent circuit                                                                  | I/O impedance | Description                                                                                               |
|---------|-----------|----------------|----------------------|-------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------|
|         |           | DC             | AC                   |                                                                                     |               |                                                                                                           |
| 9       | REF PILOT | 2.3V Typ.      | Approx. $0.8V_{P-P}$ |    | 9kΩ           | Input for reference pilot signal. Maximum input level is $1V_{P-P}$ .                                     |
| 10      | 3FHIN     | 2.3V Typ.      | 2.0V and below       |    | 50kΩ          | 3FH signal input. Connect by capacitance coupling with Pin 7.                                             |
| 11      | FHIN      |                |                      |                                                                                     |               | FH signal input. Connect by capacitance coupling with Pin 6.                                              |
| 12      | DET TC    | 2.3V Typ.      | —                    |   | 11kΩ          | Capacitance connection for FH detection circuit. Do not obtain output from this pin as impedance is high. |
| 13      | 3FH-FH    | 2.3V Typ.      | —                    |  | S.E.P.P.      | FH detection circuit output                                                                               |
| 14      | NF        | * $\cong 2.3V$ | —                    |  | —             | Inverted input for operational amplifier of FH detective circuit output                                   |

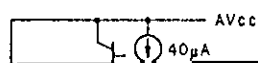
S.E.P.P. (SINGLE ENDED push — pull)

| Pin No. | Symbol    | Pin voltage                                                                       |                                              | Equivalent circuit                                                                   | I/O impedance | Description                                                                                                                       |
|---------|-----------|-----------------------------------------------------------------------------------|----------------------------------------------|--------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------|
|         |           | DC                                                                                | AC                                           |                                                                                      |               |                                                                                                                                   |
| 15      | ERR       | 2.3V Typ.                                                                         | —                                            |    | S.E.P.P.      | Operational amplifier output for the FH detection circuit output                                                                  |
| 16      | R/P PB    | High $\geq 2.0V$<br>Low $\leq 0.8V$                                               | —                                            |    | —             | Mode control.<br>High ( $\geq 2.0V$ ) : playback<br>Low ( $\leq 0.8V$ ) : recording                                               |
| 17      | PILOT ACT | High $\geq 2.0V$<br>Low $\leq 0.8V$                                               |                                              |                                                                                      |               | Pilot signal output control.<br>High ( $\geq 2.0V$ ) : pilot signal is output<br>Low ( $\leq 0.8V$ ) : pilot signal is not output |
| 18      | REC PILOT | Pins 16, 17, 18<br>Pin voltage<br>L L 1.25V<br>L H 1.25V<br>H L 0.8V<br>H H 1.25V | Approx.<br>$0.5V_{P-P}$                      |  | 260Ω          | Pilot signal output                                                                                                               |
| 19      | DGND      | 0V                                                                                |                                              |                                                                                      |               | Digital system GND                                                                                                                |
| 20      | ACGND     | 1.25V Typ.                                                                        | —                                            |  | S.E.P.P.      | Electric potential for BPF operating point                                                                                        |
| 21      | VR        | 2.3V Typ.                                                                         |                                              |                                                                                      |               | Electric potential for FH detection operating point                                                                               |
| 22      | CKOUT     | —                                                                                 | High $\geq V_{CC} - 0.5V$<br>Low $\leq 0.5V$ |  | 100Ω          | Crystal oscillator connection (output)                                                                                            |

| Pin No. | Symbol          | Pin voltage                                                                                                |                                 | Equivalent circuit                                                                  | I/O impedance | Description                                                                                                                                         |
|---------|-----------------|------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                 | DC                                                                                                         | AC                              |                                                                                     |               |                                                                                                                                                     |
| 23      | CKIN            | 2.0V Typ.                                                                                                  | * 0.2V <sub>P-P</sub> and above |    | 95k $\Omega$  | Crystal oscillator connection (input). External clock input.                                                                                        |
| 24      | V <sub>DD</sub> | * 4.75V                                                                                                    | —                               | —                                                                                   | —             | Power supply for digital system                                                                                                                     |
| 25      | CKCONT          | High $\geq 2.0V$<br>Low $\leq 0.8V$                                                                        | —                               |    | —             | Clock frequency demultiplication ratio switch.<br>High ( $\geq 2.0V$ ) : 5.94755MHz<br>Low ( $\leq 0.8V$ ) : 11.8951MHz                             |
| 26      | PB SP /LP       | High $\geq 4.25V$<br>Low $\leq 0.5V$<br>When 100k $\Omega$ is connected between V <sub>CC</sub> and Pin 26 | —                               |   | —             | This pin is as follows during variable speed playback :<br>SP mode $\rightarrow$ High<br>LP mode $\rightarrow$ Low<br>"Low" during normal playback. |
| 27      | COMP4 REF       | * 0.0V to V <sub>CC</sub> -1.6V                                                                            | —                               |  | —             | Threshold level setting for LP/SP discrimination during special playback                                                                            |
| 28      | COMP4 IN        | * 0.0V to V <sub>CC</sub> -1.6V                                                                            | —                               |  | 330k $\Omega$ | Integral capacitance connection                                                                                                                     |

| Pin No. | Symbol    | Pin voltage                                                                                 |    | Equivalent circuit                                                                   | I/O impedance | Description                                                                                      |
|---------|-----------|---------------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------|
|         |           | DC                                                                                          | AC |                                                                                      |               |                                                                                                  |
| 29      | COMP3 OUT | High $\geq V_{CC} - 0.5V$<br>Low $\leq 0.5V$                                                | —  |    | 10kΩ          | COMP3 output                                                                                     |
| 30      | COMP3 IN  | * 0.0V to $V_{CC} - 1.6V$                                                                   | —  |    | —             | Input for DC shifted envelope signal                                                             |
| 31      | COMP REF  | 1.3V Typ.                                                                                   | —  |   | S.E.P.P.      | Reference voltage output for comparator. (COMP1, 2, 3)                                           |
| 32      | AGND      | 0V                                                                                          | —  |                                                                                      | —             | Analog circuit GND                                                                               |
| 33      | CLOG      | High $\geq 4.25V$<br>Low $\leq 0.5V$<br>When 100kΩ is connected between $V_{CC}$ and Pin 33 | —  |  | —             | Analog detection circuit<br>Clog detection output.<br>{ Clogged state: High<br>Normal state: Low |
| 34      | COMP2 IN  | * 0.0V to $V_{CC} - 1.6V$                                                                   | —  |  | —             | Comparator 2 input                                                                               |

| Pin No. | Symbol    | Pin voltage                                  |    | Equivalent circuit                                                                  | I/O impedance | Description                                   |
|---------|-----------|----------------------------------------------|----|-------------------------------------------------------------------------------------|---------------|-----------------------------------------------|
|         |           | DC                                           | AC |                                                                                     |               |                                               |
| 35      | COMP1 OUT | High $\geq V_{CC} - 0.5V$<br>Low $\leq 0.5V$ | —  |    | 100Ω          | COMP1 output                                  |
| 36      | COMP1 IN  | * 0.0V to 1.2V                               | —  |    | —             | Threshold level setting for clog detection    |
| 37      | ENVOUT    | 1.3V Typ.                                    | —  |   | S.E.P.P.      | Envelope detector output                      |
| 38      | NC        |                                              | —  |                                                                                     | —             | Unconnected                                   |
| 39      | ENVTC     | 1.3V Typ.                                    | —  |  | 260Ω          | Capacitance connection for envelope detection |



| Pin No. | Symbol   | Pin voltage                           |                            | Equivalent circuit | I/O impedance | Description                                                                                                      |
|---------|----------|---------------------------------------|----------------------------|--------------------|---------------|------------------------------------------------------------------------------------------------------------------|
|         |          | DC                                    | AC                         |                    |               |                                                                                                                  |
| 41      | RFCONT   | * 0.7V to 4.5V                        | —                          |                    | —             | GCA gain control. GCA gain will change with the application of DC voltage.                                       |
| 42      | HDSEL    | * High $\geq 2.0V$<br>Low $\leq 0.8V$ | —                          |                    | —             | GCA input switch control.<br>High ( $\geq 2.0V$ ) :<br>PBIN selection<br>Low ( $\leq 0.8V$ ) :<br>SPIN selection |
| 43      | DGND     | 0V                                    | —                          |                    | —             | Digital circuit GND                                                                                              |
| 44      | SPIN     | 2.3V Typ.                             | 0.2 to 0.8V <sub>P-P</sub> |                    | 50k $\Omega$  | Playback RF signal input                                                                                         |
| 45      | NC       |                                       | —                          |                    | —             | Unconnected                                                                                                      |
| 46      | PBIN     | 2.3V Typ.                             | 0.2 to 0.8V <sub>P-P</sub> |                    | 50k $\Omega$  | Playback RF signal input                                                                                         |
| 47      | NC       |                                       | —                          |                    | —             | Unconnected                                                                                                      |
| 48      | LPF1 OUT | 0.8V Typ.                             | —                          |                    | 220 $\Omega$  | LPF1 output                                                                                                      |

## Electrical Characteristics (DC)

Ta=25°C V<sub>CC</sub>=4.75V

| Item                                | Symbol            | Conditions                                                                                                                                                                  | Min. | Typ. | Max. | Unit |
|-------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Playback mode power supply current  | I <sub>CC1</sub>  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS17=0V<br>Test the current with ammeter A.                                                                                 | —    | 16   | 24   | mA   |
| Recording mode power supply current | I <sub>CC2</sub>  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS16=0V, VS17=0V<br>Test the current with ammeter A.                                                                        | —    | 7.5  | 12.0 | mA   |
| REF PILOT input resistance          | R <sub>ERR1</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9 = OPEN ± 0.3V<br>Equation R <sub>ERR1</sub> =<br>$\frac{0.6}{(I_9(VS9 = OPEN + 0.3V) - I_9(VS9 = OPEN - 0.3V))}$        | 6.5  | 9.0  | 11.5 | kΩ   |
| FH detection offset voltage         | V <sub>ERR1</sub> | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V<br>Test the voltage difference V13 - V21.                                                                           | -30  | 0    | 30   | mV   |
| Error output voltage                | V <sub>ERR2</sub> | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V<br>Test the voltage difference V15 - V21.                                                                           | -100 | 0    | 100  | mV   |
| Subtractor output voltage           | V <sub>SUB1</sub> | ON for SW13, SW15, SW23B. OFF for other SWs.<br>V11 = OPEN + 15mV, VS23=0V<br>Subtract V <sub>ERR1</sub> from the voltage difference V13 - V21.                             | -60  | -45  | -15  | mV   |
|                                     | V <sub>SUB2</sub> | ON for SW13, SW15, SW23B. OFF for other SWs.<br>V10 = OPEN + 15mV, VS23=0V<br>Subtract V <sub>ERR1</sub> from the voltage difference V13 - V21.                             | 15   | 45   | 60   | mV   |
|                                     | V <sub>SUB3</sub> | ON for SW13, SW15, SW23B. OFF for other SWs.<br>V11 = OPEN + 200mV, VS23=0V<br>Subtract V <sub>ERR1</sub> from the voltage difference V13 - V21.                            | -650 | -580 | -480 | mV   |
|                                     | V <sub>SUB4</sub> | ON for SW13, SW15, SW23B. OFF for other SWs.<br>V10 = OPEN + 200mV, VS23=0V<br>Subtract V <sub>ERR1</sub> from the voltage difference V13 - V21.                            | 480  | 580  | 650  | mV   |
|                                     | V <sub>SUB5</sub> | ON for SW13, SW15, SW23B. OFF for other SWs.<br>V10 = OPEN + 400mV,<br>V11 = OPEN + 410mV, VS23=0V<br>Subtract V <sub>ERR1</sub> from the voltage difference V13 - V21.     | -45  | -30  | -15  | mV   |
|                                     | V <sub>SUB6</sub> | ON for SW13, SW15, SW23B. OFF for other SWs.<br>V10 = OPEN + 400mV,<br>V11 = OPEN + 410mV, VS23=0V<br>Subtract V <sub>ERR1</sub> from the voltage difference V13 - V21.     | 15   | 30   | 45   | mV   |
| FH detection output resistance      | R <sub>SUB</sub>  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>V12 = OPEN ± 0.5V<br>Equation R <sub>SUB</sub> =<br>$\frac{1.0}{(I_{12}(VS12 = OPEN + 0.5V) - I_{12}(VS12 = OPEN - 0.5V))}$ | 8    | 11   | 14   | kΩ   |

| Item                                | Symbol           | Conditions                                                                                                                                                                                                                                                                                                          | Min. | Typ. | Max. | Unit          |
|-------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| ERR "High" level output voltage     | $V_{OHERR1}$     | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS14 = $V_R - 20\text{mV}$<br>Test the voltage of V15.                                                                                                                                                                                                              | 3.45 | 4.0  | —    | V             |
|                                     | $V_{OLERR2}$     | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS14 = $V_R - 20\text{mV}$ , $V_{CC}=4.5\text{V}$<br>Test the voltage of V15.                                                                                                                                                                                       | 3.2  | 3.8  | —    | V             |
| ERR "Low" level output voltage      | $V_{OLERR}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS14 = $V_R + 20\text{mV}$<br>Test the voltage of V15.                                                                                                                                                                                                              | —    | 0.72 | 0.9  | V             |
| Reference voltage                   | $V_R$            | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V<br>Test the voltage of V21.                                                                                                                                                                                                                                 | 2.18 | 2.30 | 2.42 | V             |
| Reference voltage input fluctuation | $\Delta V_{RIN}$ | ON for SW13, SW15, SW23B. OFF for other SWs.<br>$V_{CC} = 4.5/5.5\text{V}$ , VS23=0V<br>Test the voltage fluctuation of V21.                                                                                                                                                                                        | −10  | 0    | 10   | mV            |
| LPF2 linearity                      | $R_{LPF2}$       | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9 = OPEN $\pm 0.2\text{V} / \pm 0.5\text{V}$<br>Equation $R_{LPF2} =$<br>$\frac{0.4 \div (V18(VS9 = \text{OPEN} + 0.2\text{V}) - V18(VS9 = \text{OPEN} - 0.2\text{V}))}{1.0 \div (VS18(VS9 = \text{OPEN} + 0.5\text{V}) - V18(VS9 = \text{OPEN} - 0.5\text{V}))}$ | 0.95 | 0.99 | 1.05 |               |
| Clock input resistance              | $R_{CKIN}$       | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23 = OPEN $\pm 1.0\text{V}$<br>Equation $R_{CKIN} =$<br>$\frac{6.75}{(I23(VS23 = \text{OPEN} + 1.0\text{V}) - I23(VS23 = \text{OPEN} - 1.0\text{V}))}$                                                                                                            | 60   | 95   | 140  | k $\Omega$    |
| RFCONT input current                | $I_{RFC}$        | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS41=4.0V<br>Test the current of VS41.                                                                                                                                                                                                                              | —    | 0.4  | 3    | $\mu\text{A}$ |
| ENVREF output resistance            | $R_{EREF}$       | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS40 = OPEN $\pm 0.3\text{V}$<br>Equation $R_{EREF} =$<br>$\frac{0.6}{(I40(VS40 = \text{OPEN} + 0.3\text{V}) - I40(VS40 = \text{OPEN} - 0.3\text{V}))}$                                                                                                             | 30   | 45   | 60   | k $\Omega$    |
| ENVTC sync current                  | $I_{ENV}$        | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS39=4.75V<br>Test the current of VS39.                                                                                                                                                                                                                             | 65   | 100  | 150  | $\mu\text{A}$ |

| Item                        | Symbol           | Conditions                                                                                                                                                                                                     | Min. | Typ. | Max. | Unit    |
|-----------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------|
| RF detection offset voltage | $\Delta V_{ENV}$ | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V<br>Test the voltage of V37 - V31.                                                                                                                      | -100 | 0    | 100  | mV      |
| RF detection output voltage | $V_{ENV1}$       | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V<br>Test V39.                                                                                                                                           | 0.9  | 1.3  | 1.7  | V       |
|                             | $V_{ENV21}$      | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V, SG44=5MHz, 0.5V <sub>P-P</sub> /0V<br>Test the variation of V37.<br>Equation $V_{ENV21} = V37(SG44=0.5V_{P-P}) - V37(SG44=0V)$                        | 2.05 | 2.7  | —    | V       |
|                             | $V_{ENV22}$      | ON for SW13, SW15, SW23B. OFF for other SWs.<br>V <sub>CC</sub> =4.5V, VS23=0V, SG44=5MHz, 0.5V <sub>P-P</sub> /0V<br>Test the variation of V37.<br>Equation $V_{ENV22} = V37(SG44=0.5V_{P-P}) - V37(SG44=0V)$ | 2.05 | 2.45 | —    | V       |
| COMP1 input current         | $I_{CMP1IH}$     | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS36=4.75V<br>Test the current of VS36.                                                                                                                        | —    | 0    | 1    | $\mu A$ |
|                             | $V_{CMP1IL}$     | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS36=0V<br>Test the current of VS36.                                                                                                                           | -1   | 0    | —    | $\mu A$ |
| COMP1 output voltage        | $V_{CMP10H}$     | ON for SW13, SW15, SW23A. OFF for other SWs.<br>IS35=-1mA, VS36=0.2V,<br>VS39 = OPEN + 0.1V<br>Test V35.                                                                                                       | 4.25 | 4.6  | —    | V       |
|                             | $V_{CMP10L}$     | ON for SW13, SW15, SW23A. OFF for other SWs.<br>IS35=1mA, VS36=0.6V,<br>VS39 = OPEN + 0.1V<br>Test V35.                                                                                                        | —    | 0.1  | 0.5  | V       |
| COMP2 input current         | $I_{CMP2IH}$     | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS34=4.75V<br>Test the current of VS34.                                                                                                                        | —    | 0    | 1    | $\mu A$ |
|                             | $I_{CMP2IL}$     | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS34=0V<br>Test the current of VS34.                                                                                                                           | -1   | 0    | —    | $\mu A$ |
| CLOG output voltage         | $V_{CLOGH}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS34 = OPEN at Pin 31 - 20mV<br>Test V33.                                                                                                                      | 4.25 | 4.6  | —    | V       |

| Item                          | Symbol       | Conditions                                                                                                                                      | Min. | Typ. | Max. | Unit       |
|-------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------------|
| CLOG<br>output voltage        | $V_{CLOGL}$  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS34 = OPEN at Pin 31 + 20mV<br>Test V33.                                                       | —    | 0.1  | 0.5  | V          |
| COMP3<br>input current        | $I_{CMP3IH}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS30=4.75V<br>Test the current of V30.                                                          | —    | 0    | 1    | $\mu A$    |
|                               | $I_{CMP3IL}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS30=0V.<br>Test the current of V30.                                                            | −1   | 0    | —    | $\mu A$    |
| COMP3<br>output<br>resistance | $R_{CMP31}$  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS29=0V, VS30 = voltage of OPEN at Pin 31 - 20mV<br>Equation $R_{CMP31}$ = current of 4.75/VS29 | 7    | 10   | 13   | k $\Omega$ |
|                               | $R_{CMP32}$  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS28=0V, VS30 = voltage of OPEN at Pin 31 - 20mV<br>Equation $R_{CMP32}$ = current of 4.75/VS28 | 230  | 330  | 430  | k $\Omega$ |
| COMP4<br>input current        | $I_{CMP4IH}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS27=4.75V<br>Test the current of VS27.                                                         | —    | 0    | 1    | $\mu A$    |
|                               | $I_{CMP4IL}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS27=0V<br>Test the current of V27.                                                             | −1   | 0    | —    | $\mu A$    |
| PB SP/LP<br>output voltage    | $V_{PBSPH}$  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS27=2.28V, VS28=2.3V<br>Test V26.                                                              | 4.25 | 4.6  | —    | V          |
|                               | $V_{PBSP L}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS28=2.28V<br>Test V26.                                                                         | —    | 0.1  | 0.5  | V          |
| "High" level<br>input voltage | $V_{IH}$     | $V_{CC}$ = 4.5 to 5.5V; Pins 16, 17, 25, and 42                                                                                                 | 2.0  | —    | —    | V          |
| "Low" level<br>input voltage  | $V_{IL}$     | $V_{CC}$ = 4.5 to 5.5V; Pins 16, 17, 25, and 42                                                                                                 | —    | —    | 0.8  | V          |
| "High" level<br>input current | $I_{IH}$     | $V_{CC}$ = 4.5 to 5.5V; Pins 16, 17, 25, and 42<br>Applied voltage = 4.75V                                                                      | —    | 0    | 1    | $\mu A$    |
| "Low" level<br>input current  | $I_{IL}$     | $V_{CC}$ = 4.5 to 5.5V; Pins 16, 17, 25, and 42<br>Applied voltage = 0V                                                                         | −1   | 0    | —    | $\mu A$    |

## Electrical Characteristics (AC)

Ta = 25°C V<sub>CC</sub> = 4.75 V

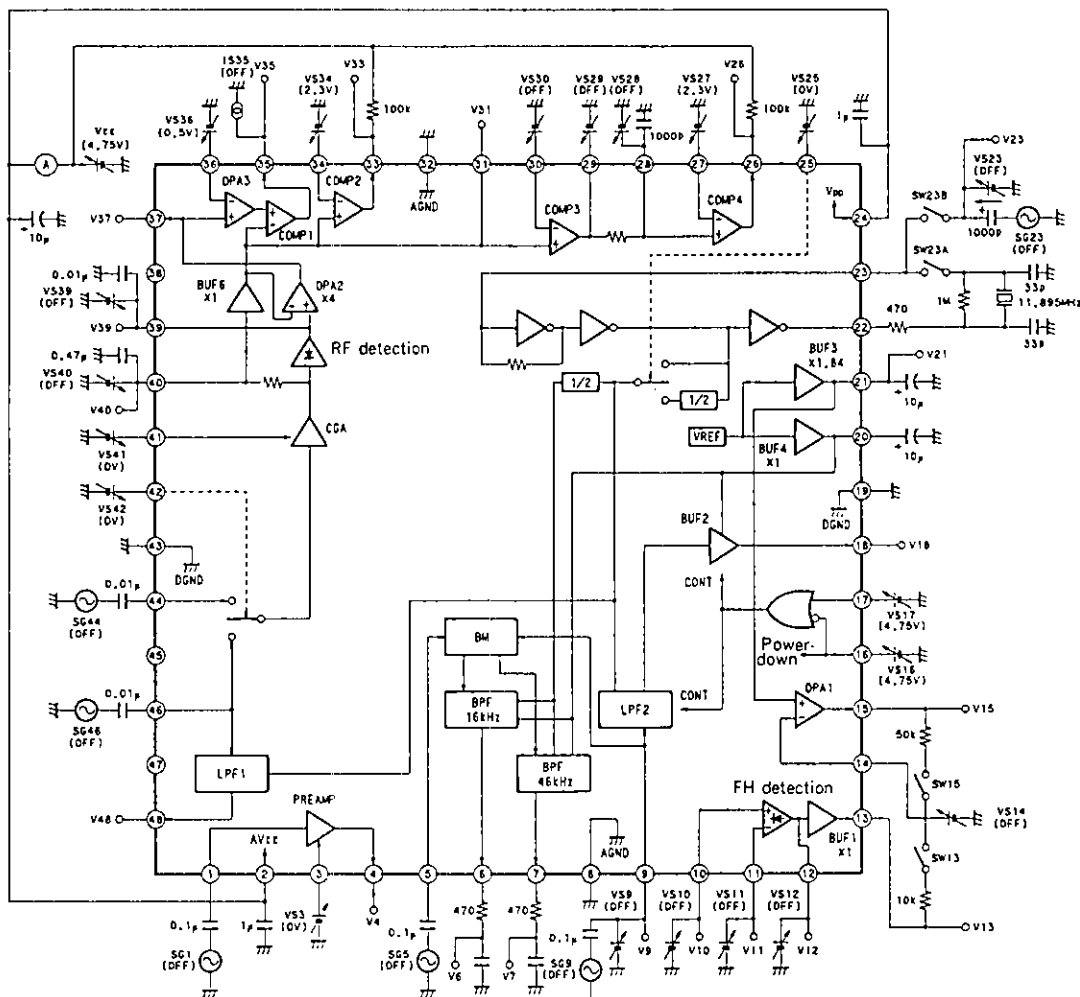
| Item                   | Symbol            | Conditions                                                                                                                                             | Min. | Typ. | Max. | Unit |
|------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| LPF1<br>reference gain | G <sub>LP1M</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=100kHz, 30mV <sub>P-P</sub><br>Equation $G_{LP1M} = 20 * \text{LOG} ( V48/V46 )$ [dB]             | -7.5 | -2.5 | -1.0 | dB   |
| LPF1 gain              | G <sub>LP11</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=120kHz, 30mV <sub>P-P</sub><br>Equation $G_{LP11} = 20 * \text{LOG} ( V48/V46 ) - G_{LP1M}$ [dB]  | -1.5 | 0.3  | 1.5  | dB   |
|                        | G <sub>LP12</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=150kHz, 30mV <sub>P-P</sub><br>Equation $G_{LP12} = 20 * \text{LOG} ( V48/V46 ) - G_{LP1M}$ [dB]  | -1.5 | 0.4  | 1.5  | dB   |
|                        | G <sub>LP13</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=170kHz, 30mV <sub>P-P</sub><br>Equation $G_{LP13} = 20 * \text{LOG} ( V48/V46 ) - G_{LP1M}$ [dB]  | -1.5 | 0.0  | 1.5  | dB   |
|                        | G <sub>LP14</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=250kHz, 100mV <sub>P-P</sub><br>Equation $G_{LP14} = 20 * \text{LOG} ( V48/V46 ) - G_{LP1M}$ [dB] | —    | -5.8 | -5.0 | dB   |
|                        | G <sub>LP15</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=400kHz, 800mV <sub>P-P</sub><br>Equation $G_{LP15} = 20 * \text{LOG} ( V48/V46 ) - G_{LP1M}$ [dB] | —    | -18  | -16  | dB   |
|                        | G <sub>LP16</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=750kHz, 800mV <sub>P-P</sub><br>Equation $G_{LP16} = 20 * \text{LOG} ( V48/V46 ) - G_{LP1M}$ [dB] | —    | -37  | -33  | dB   |
|                        | G <sub>LP17</sub> | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=3MHz, 800mV <sub>P-P</sub><br>Equation $G_{LP17} = 20 * \text{LOG} ( V48/V46 ) - G_{LP1M}$ [dB]   | —    | -62  | -50  | dB   |
| Preamplifier<br>gain   | G <sub>PR1</sub>  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS3=0.8V, SG1=200kHz, 30mV <sub>P-P</sub><br>Equation $G_{PR1} = 20 * \text{LOG} ( V4/V1 )$ [dB]       | 4    | 6    | 8    | dB   |
|                        | G <sub>PR2</sub>  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS3=2.6V, SG1=200kHz, 30mV <sub>P-P</sub><br>Equation $G_{PR1} = 20 * \text{LOG} ( V4/V1 )$ [dB]       | 12   | 15   | 18   | dB   |

| Item                     | Symbol          | Conditions                                                                                                                                                    | Min. | Typ. | Max. | Unit |
|--------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Preamplifier gain        | $G_{PR3}$       | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS3=3.3V, SG1=200kHz, 5mV <sub>P-P</sub><br>Equation $G_{PR2} = 20 * \text{LOG} ( V4/V1 )$ [dB]               | 19   | 22   | 25   | dB   |
| BPF16k reference gain    | $G_{BP1M}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=16.46kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP1M} = 20 * \text{LOG} ( V6/V5 )$ [dB]          | 30   | 33   | 36   | dB   |
| BPF16k attenuation level | $G_{BP11}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=9kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP11} = 20 * \text{LOG} ( V6/V5 ) - G_{BP1M}$ [dB]   | —    | −24  | −20  | dB   |
|                          | $G_{BP12}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=28kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP12} = 20 * \text{LOG} ( V6/V5 ) - G_{BP1M}$ [dB]  | —    | −22  | −20  | dB   |
|                          | $G_{BP13}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=150kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP13} = 20 * \text{LOG} ( V6/V5 ) - G_{BP1M}$ [dB] | —    | −35  | −26  | dB   |
| BPF46k reference gain    | $G_{BP2M}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=46.2kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP2M} = 20 * \text{LOG} ( V7/V5 )$ [dB]           | 30   | 33   | 36   | dB   |
| BPF46k attenuation level | $G_{BP21}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=16kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP21} = 20 * \text{LOG} ( V7/V5 ) - G_{BP2M}$ [dB]  | —    | −31  | −26  | dB   |
|                          | $G_{BP22}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=33kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP22} = 20 * \text{LOG} ( V7/V5 ) - G_{BP2M}$ [dB]  | —    | −26  | −20  | dB   |
|                          | $G_{BP23}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=60kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP23} = 20 * \text{LOG} ( V7/V5 ) - G_{BP2M}$ [dB]  | —    | −24  | −20  | dB   |
|                          | $G_{BP24}$      | ON for SW13, SW15, SW23A. OFF for other SWs.<br>VS9=1.25V, SG5=150kHz, 10mV <sub>P-P</sub><br>Equation $G_{BP24} = 20 * \text{LOG} ( V7/V5 ) - G_{BP2M}$ [dB] | —    | −36  | −26  | dB   |
| Fo gain difference       | $\Delta G_{BP}$ | Difference of $G_{BP1M}$ and $G_{BP2M}$                                                                                                                       | −2   | 0    | 2    | dB   |

| Item                | Symbol     | Conditions                                                                                                                                                                                                                         | Min. | Typ. | Max. | Unit             |
|---------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------------------|
| LPF2 reference gain | $G_{LP2M}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG9=100kHz, 100mV <sub>P-P</sub><br>Equation $G_{LP2M} = 20 * \text{LOG} ( V18/V9 )$ [dB]                                                                                          | -6   | -4   | -1.5 | dB               |
| LPF2 gain           | $G_{LP21}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG9=120kHz, 100mV <sub>P-P</sub><br>Equation $G_{LP21} = 20 * \text{LOG} ( V18/V9 ) - G_{LP2M}$ [dB]                                                                               | -1.5 | 0.2  | 1.5  | dB               |
|                     | $G_{LP22}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG9=150kHz, 100mV <sub>P-P</sub><br>Equation $G_{LP22} = 20 * \text{LOG} ( V18/V9 ) - G_{LP2M}$ [dB]                                                                               | -1.5 | -0.2 | 1.5  | dB               |
|                     | $G_{LP23}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG9=170kHz, 100mV <sub>P-P</sub><br>Equation $G_{LP23} = 20 * \text{LOG} ( V18/V9 ) - G_{LP2M}$ [dB]                                                                               | -1.5 | -0.7 | 1.5  | dB               |
|                     | $G_{LP24}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG9=300kHz, 100mV <sub>P-P</sub><br>Equation $G_{LP24} = 20 * \text{LOG} ( V18/V9 ) - G_{LP2M}$ [dB]                                                                               | —    | -14  | -12  | dB               |
|                     | $G_{LP25}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG9=500kHz, 100mV <sub>P-P</sub><br>Equation $G_{LP25} = 20 * \text{LOG} ( V18/V9 ) - G_{LP2M}$ [dB]                                                                               | —    | -35  | -33  | dB               |
|                     | $G_{LP26}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG9=1.5kHz, 100mV <sub>P-P</sub><br>Equation $G_{LP26} = 20 * \text{LOG} ( V18/V9 ) - G_{LP2M}$ [dB]                                                                               | —    | -58  | -40  | dB               |
| Crosstalk           | $G_{CAP}$  | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG9=200kHz, 500mV <sub>P-P</sub><br>Equation $G_{CAP} = 20 * \text{LOG} ( V4/V9 )$ [dB]                                                                                            | —    | -60  | -46  | dB               |
| Minimum CK input    | $V_{CK}$   | ON for SW13, SW15, SW23B. OFF for other SWs.<br>SG9=100kHz, 100mV <sub>P-P</sub> , SG23=12MHz<br>Test value is attained by changing the amplitude of SG23 to the minimum level within $G_{LP2M}$ specifications.                   | 0.2  | —    | —    | V <sub>P-P</sub> |
| GCA gain            | $G_{RF1}$  | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V, VS41=1.7V, SG44=5MHz, 500mV <sub>P-P</sub><br>Equation $G_{RF1} = 20 * \text{LOG} ((V37(SG44=500mV_{P-P}) - V37(SG44=0V))/250mV)$ [dB]<br>Note: The voltage of V37 is DC. | 14   | 17   | 20   | dB               |

| Item                                   | Symbol     | Conditions                                                                                                                                                                                                                                           | Min. | Typ. | Max. | Unit              |
|----------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|-------------------|
| GCA gain                               | $G_{RF2}$  | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V, VS41=2.5V, SG44=5MHz, 200mV <sub>P-P</sub><br>Equation $G_{RF2} = 20 * \text{LOG} ((V37(SG44=200\text{mV}_{P-P}) - V37(SG44 = 0V)) / 100\text{mV})$ [dB]<br>Note: The voltage of V37 is DC. | 19   | 22   | 25   | dB                |
|                                        | $G_{RF3}$  | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V, VS41=4.5V, SG44=5MHz, 100mV <sub>P-P</sub><br>Equation $G_{RF3} = 20 * \text{LOG} ((V37(SG44=100\text{mV}_{P-P}) - V37(SG44 = 0V)) / 50\text{mV})$ [dB]<br>Note: The voltage of V37 is DC.  | 24   | 27   | 30   | dB                |
| GCA frequency response characteristics | $f_w$      | ON for SW13, SW15, SW23B. OFF for other SWs.<br>VS23=0V, VS41=2.5V, SG44=5MHz, 200mV <sub>P-P</sub><br>The test value is attained by changing the frequency of SG44 to a value 3dB lower than the test value for $G_{RF2}$ .                         | 7    | 14   | —    | MHz               |
| ENVOUT output voltage                  | $V_{ENVB}$ | ON for SW13, SW15, SW23A. OFF for other SW.<br>VS39 = OPEN / OPEN + 0.4V<br>Test the voltage variation of V37.<br>Equation<br>$V_{ENVB} = V37(VS39 = \text{OPEN} + 0.4V) - V37(VS39 = \text{OPEN})$                                                  | 1.5  | 1.6  | 1.7  | V                 |
| LPF1 noise (white noise)               | $V_{ENVB}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=100kHz, 10mV <sub>P-P</sub> . Test the S/N of V48 with spectrum analyzer.<br>Resolution band = 300Hz<br>Video band = 100Hz                                                                      | —    | 53   | —    | dB                |
| LPF1 noise (aliasing noise)            | $V_{ENVB}$ | ON for SW13, SW15, SW23A. OFF for other SWs.<br>SG46=6MHz, 600mV <sub>P-P</sub><br>Test the maximum value of V48 within the range of 50kHz to 250kHz with spectrum analyzer.<br>Resolution band = 300Hz<br>Video band = 100Hz                        | —    | 3    | —    | mV <sub>P-P</sub> |

## Electrical Characteristics Test Circuit



## Note)

1. VSXX is the Pin XX voltage source, which includes an ammeter.
2. IS35 is the current source for Pin 35. OFF under normal operation.
3. Unless otherwise specified in the Electrical Characteristics (under Conditions), circuit will be as shown in the figure above. ("OFF" is in OPEN state; "2.3V" refers to 2.3V application)
4. When SG is OFF, connect to GND under low resistance. ( $<100\Omega$ )

## Control Logic Signals

## 1) Mode description

| P/P PB | PILOT ACT | REC PILOT | Operation Mode |
|--------|-----------|-----------|----------------|
| High   | High      | Output    | Playback       |
| High   | Low       | No output | Playback       |
| Low    | High      | Output    | Recording      |
| Low    | Low       | Output    | Recording      |

Playback mode: All circuits are active except for REC PILOT, which will depend on the state of PILOT ACT.  
 Recording mode: Reference voltage, crystal oscillator, REC PILOT, and circuits from FH detection to ERR output are active.

## 2) Clock

CKCONT = "High" : 6MHz oscillation compatible

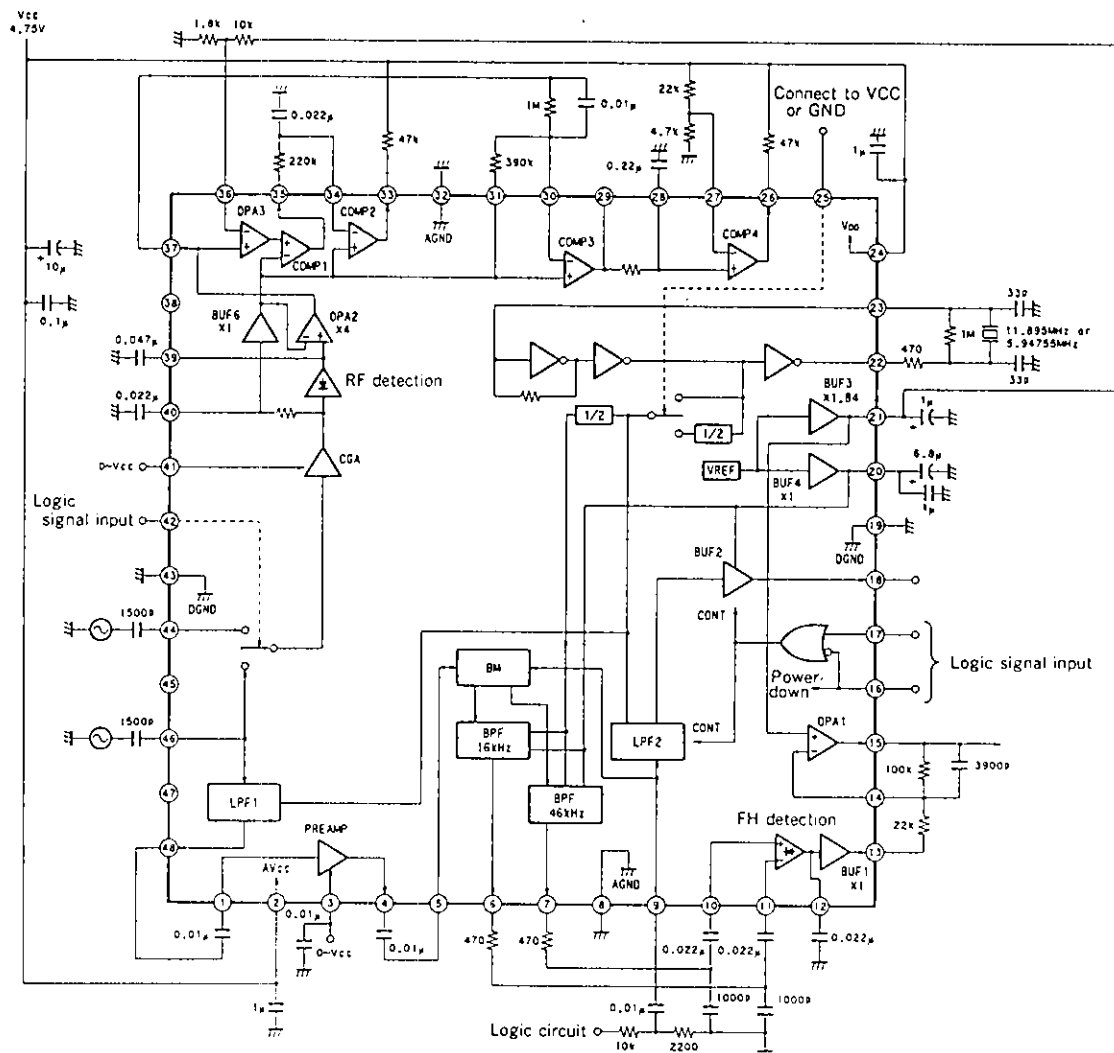
CKCONT = "Low" : 12MHz oscillation compatible

## 3) RF input

HDSEL = "High" : PBIN selection

HDSEL = "Low" : SPIN selection

## Application Circuit

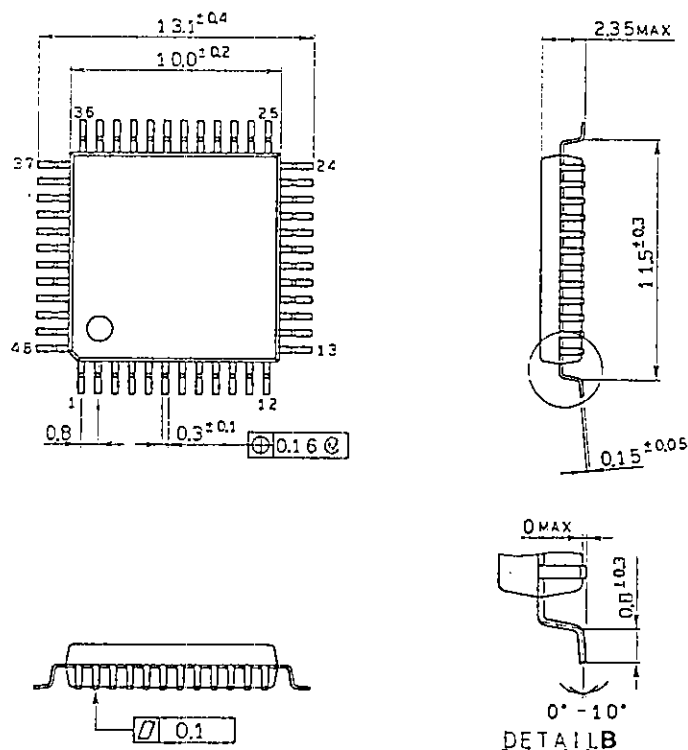


Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Package Outline Unit: mm

CXA1481AQ

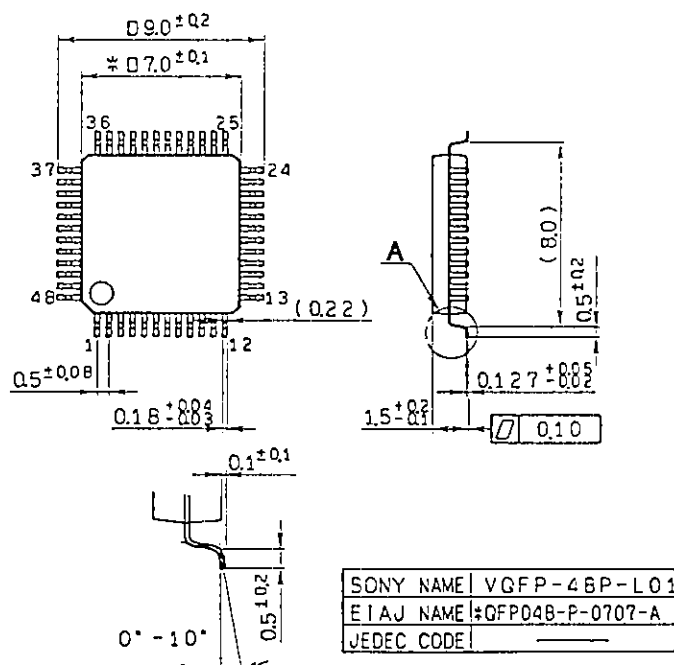
48pin QFP (Plastic)



|            |                   |
|------------|-------------------|
| SONY NAME  | QFP-48P-L023      |
| EIAJ NAME  | *QFP048-P-1010-AF |
| JEDEC CODE |                   |

CXA1481AR

48pin VQFP (Plastic) 0.2g



|            |                  |
|------------|------------------|
| SONY NAME  | VQFP-48P-L01     |
| EIAJ NAME  | *QFP048-P-0707-A |
| JEDEC CODE |                  |

Detailed diagram of A

Note) Dimensions marked with \* do not include resin residue.