

## 8 mm VCR ATF

### Description

The CXA1814N is an IC developed for ATF (Automatic Track Finding) in 8 mm VCRs, and integrates the major functions necessary for ATF onto a single chip.

### Features

- Built-in pilot signal detector and BPF
- Adopts a high-precision analog filter with no switching noise
- Built-in SP/LP identification circuit and clog detection circuit
- Low noise, high-precision bipolar process

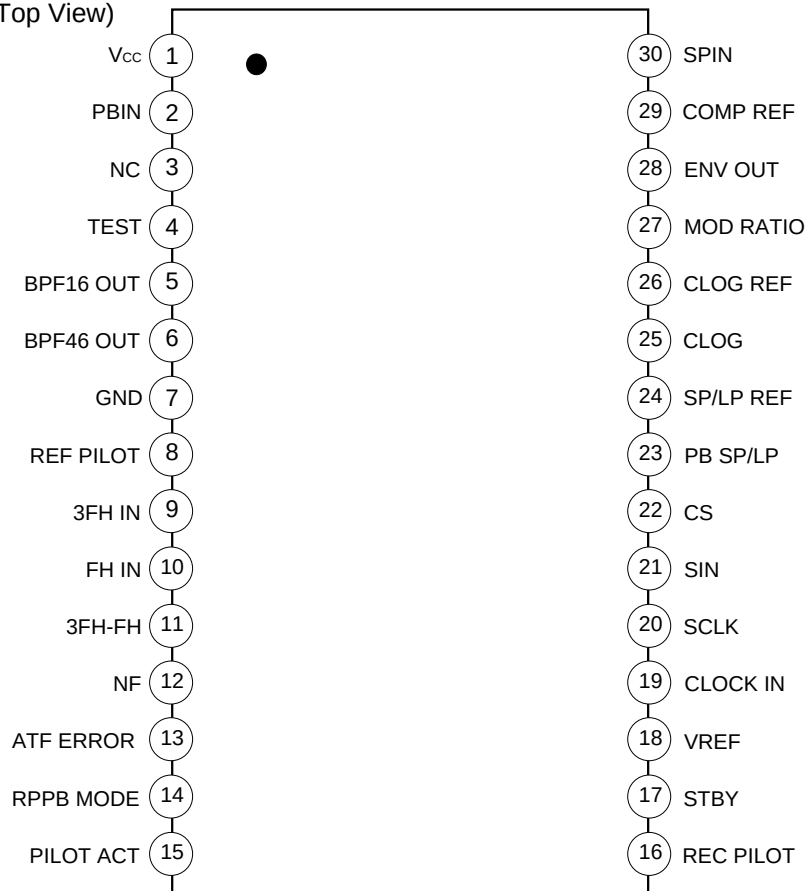
### Applications

ATF for 8 mm VCRs

### Structure

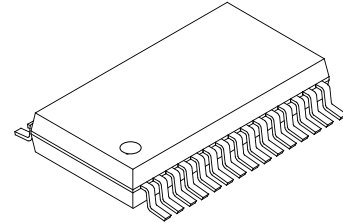
Bipolar silicon monolithic IC

### Pin Configuration (Top View)

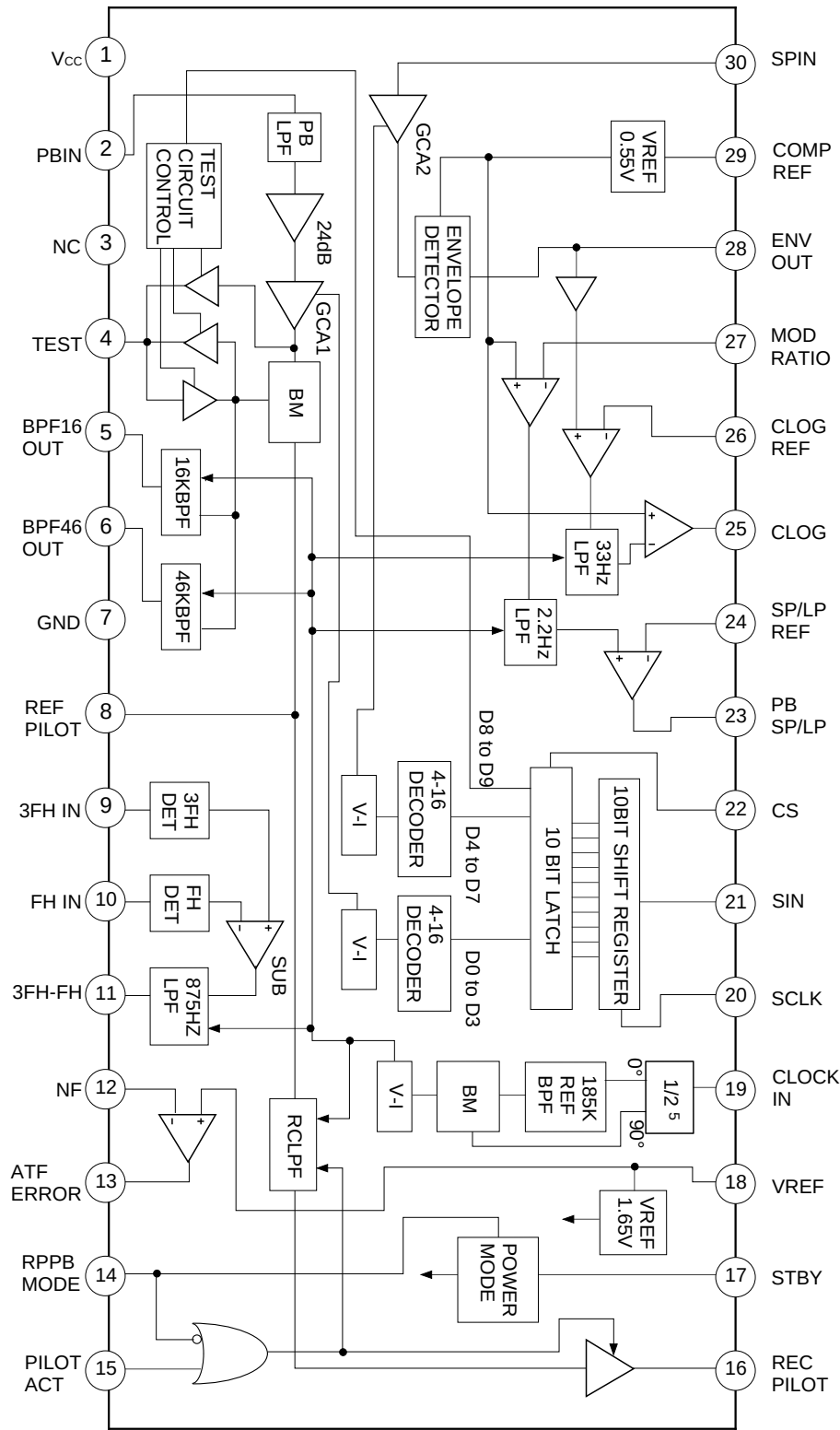


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30 pin SSOP (Plastic)

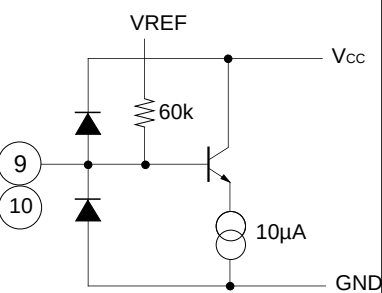
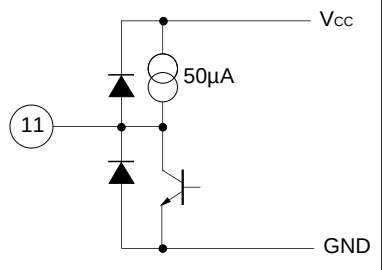
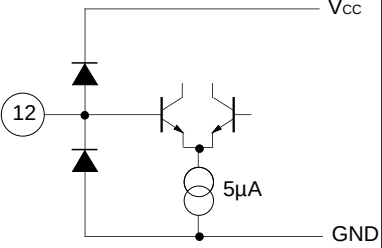
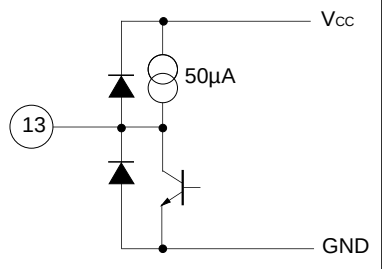
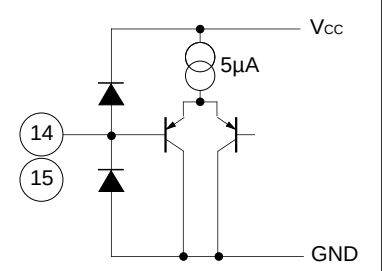


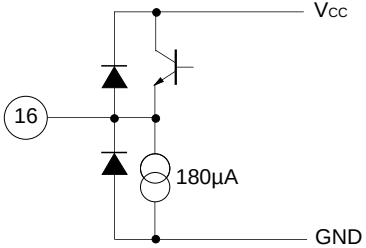
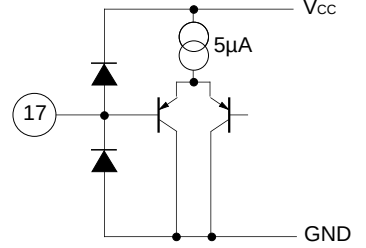
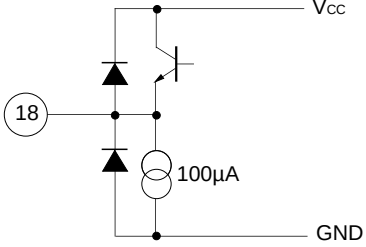
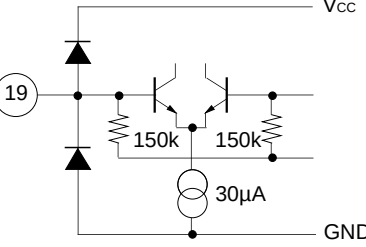
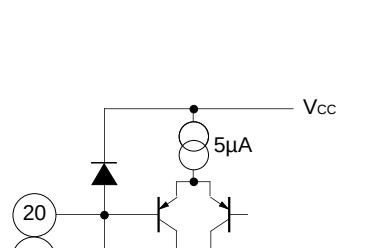
Block Diagram



# Pin Description

| Pin No. | Symbol          | Pin voltage                           |                                                                   | Equivalent circuit | I/O impedance | Description                                                                                              |
|---------|-----------------|---------------------------------------|-------------------------------------------------------------------|--------------------|---------------|----------------------------------------------------------------------------------------------------------|
|         |                 | DC                                    | AC                                                                |                    |               |                                                                                                          |
| 1       | V <sub>CC</sub> | 3.15 V                                | —                                                                 |                    | —             | Power supply for all circuits.                                                                           |
| 2       | PBIN            | 1.77 V typ                            | 0.1 to 1.0 Vp-p                                                   |                    | 50 kΩ         | Playback RF signal input.                                                                                |
| 3       | NC              |                                       | —                                                                 |                    | —             | Unconnected.                                                                                             |
| 4       | TEST            | 1.77 V for output<br>1.58 V for input | Approx. 0.5 Vp-p Typ.<br>for output<br>0.5 Vp-p or less for input |                    | 100 kΩ        | GCA1, BMIN and BMOUT test I/O.<br>Pull up to V <sub>CC</sub> with a 100 kΩ resistor during signal input. |
| 5       | BPF16 OUT       | 1.77 V                                | Approx. 0.5 Vp-p Typ.                                             |                    |               | BPF16K output.                                                                                           |
| 6       | BPF46 OUT       | 1.77 V                                | Approx. 0.5 Vp-p Typ.                                             |                    |               | BPF46K output.                                                                                           |
| 7       | GND             | 0 V                                   | —                                                                 |                    | —             | GND for all circuits.                                                                                    |
| 8       | REF PILOT       | 1.77 V                                | 1.0 Vp-p or less                                                  |                    | 130 kΩ        | Input for reference pilot signal. Maximum input level is 1 Vp-p.                                         |

| Pin No. | Symbol    | Pin voltage                           |                  | Equivalent circuit                                                                  | I/O impedance | Description                                                                         |
|---------|-----------|---------------------------------------|------------------|-------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|
|         |           | DC                                    | AC               |                                                                                     |               |                                                                                     |
| 9       | 3FHIN     | 1.58 V                                | 1.0 Vp-p or less |    | 60 k $\Omega$ | 3FH signal input.<br>Connect it to Pin 6 with capacitor coupled.                    |
| 10      | FHIN      |                                       |                  |                                                                                     |               | FH signal input.<br>Connect it to Pin 5 with capacitor coupled.                     |
| 11      | 3FH-FH    | 1.58 V                                | —                |    |               | FH detection circuit output.                                                        |
| 12      | NF        | 1.58 V                                | —                |   |               | Operational amplifier inverted input for the FH detection circuit output amplifier. |
| 13      | ATF ERROR | 1.58 V                                | —                |  |               | Operational amplifier output for the FH detection circuit output amplifier.         |
| 14      | RPPB MODE | LOW $\leq 0.8$ V<br>HIGH $\geq 2.1$ V | —                |  |               | Mode control.<br>High: Playback mode<br>Low: Recording mode                         |
| 15      | PILOT ACT |                                       |                  |                                                                                     |               | Pilot signal output control.<br>High: ENABLE<br>Low: DISABLE                        |

| Pin No. | Symbol    | Pin voltage                 |                       | Equivalent circuit                                                                  | I/O impedance | Description                                                      |
|---------|-----------|-----------------------------|-----------------------|-------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------|
|         |           | DC                          | AC                    |                                                                                     |               |                                                                  |
| 16      | REC PILOT | 1.10 V                      | Approx. 0.5 Vp-p      |    |               | Pilot signal output.                                             |
| 17      | STBY      | LOW ≤ 0.8 V<br>HIGH ≥ 2.1 V | —                     |    |               | Power save mode control.<br>High: STBY                           |
| 18      | VREF      | 1.58 V                      | —                     |   |               | Electric potential for FH detection operating point.             |
| 19      | CLOCK IN  | $V_{CC} - 0.7$ V            | Approx. 0.3 Vp-p Typ. |  | 150 kΩ        | External clock input.                                            |
| 20      | SCLK      | LOW ≤ 0.8 V<br>HIGH ≥ 2.1 V | —                     |  |               | Serial input clock for GCA1 and GCA2 gain and TEST mode control. |
| 21      | SIN       |                             |                       |                                                                                     |               | Serial data input for GCA1 and GCA2 gain and TEST mode control.  |
| 22      | CS        |                             |                       |                                                                                     |               | Chip select input for GCA1 and GCA2 gain and TEST mode control.  |

| Pin No. | Symbol       | Pin voltage                                      |    | Equivalent circuit | I/O impedance | Description                                                                                                                            |
|---------|--------------|--------------------------------------------------|----|--------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------|
|         |              | DC                                               | AC |                    |               |                                                                                                                                        |
| 23      | PB<br>SP/LP  | HIGH $\geq V_{CC}$<br>-0.8 V<br>LOW $\leq 0.4V$  | —  |                    |               | This pin is as follows during variable speed playback.<br>During SP mode: High<br>During LP mode: Low<br>“Low” during normal playback. |
| 24      | SP/LP<br>REF | 0 V to $V_{CC}$<br>-1.4 V                        | —  |                    |               | Threshold level setting for LP/SP identification during special playback.                                                              |
| 25      | CLOG         | HIGH $\geq V_{CC}$<br>-0.8 V<br>LOW $\leq 0.4 V$ | —  |                    |               | Clog detection output.<br>Clogged state: High<br>Normal state: Low                                                                     |
| 26      | CLOG<br>REF  | 0 V to $V_{CC}$<br>-1.4 V                        | —  |                    |               | Threshold level setting for clog detection.                                                                                            |
| 27      | MOD<br>RATIO |                                                  |    |                    |               | Input for DC shifted envelope signal.                                                                                                  |
| 28      | ENV<br>OUT   | 0.53 V                                           | —  |                    |               | Envelope detector output.                                                                                                              |

| Pin No. | Symbol   | Pin voltage |                 | Equivalent circuit | I/O impedance  | Description                              |
|---------|----------|-------------|-----------------|--------------------|----------------|------------------------------------------|
|         |          | DC          | AC              |                    |                |                                          |
| 29      | COMP REF | 0.53 V      | —               |                    |                | Reference voltage output for comparator. |
| 30      | SPIN     | 2.1 V       | 0.1 to 1.0 Vp-p |                    | 133 k $\Omega$ | Playback RF signal input.                |

**Electrical Characteristics****Absolute Maximum Ratings**

| Item                                        | Symbol           | Rating                  | Unit |
|---------------------------------------------|------------------|-------------------------|------|
| Supply voltage (Note 1)                     | V <sub>CC</sub>  | −0.4 to 7.0             | V    |
| Input voltage (Note 1)                      | V <sub>I</sub>   | −0.4 to V <sub>CC</sub> | V    |
| Total power dissipation Ta ≤ 25 °C (Note 2) | P <sub>D</sub>   | 1025                    | mW   |
| Operating temperature range                 | T <sub>opr</sub> | −10 to 75               | °C   |
| Storage temperature range                   | T <sub>stg</sub> | −40 to 125              | °C   |

**Note 1)** The circuit GND pin is used as the reference for all voltages.

**Note 2)** Substrate mounting (Sony's standard pattern on a 50 mm × 50 mm, 1.6 mm thick glass fabric base epoxy substrate) and no-wind conditions.

Total power dissipation follows a load reduction ratio of 8.2 mW/°C at temperatures above Ta = 25 °C.

**Recommended Operating Conditions**

| Item                        | Symbol           | Min. | Typ. | Max. | Unit |
|-----------------------------|------------------|------|------|------|------|
| Supply voltage              | V <sub>CC</sub>  | 3.0  |      | 5.5  | V    |
| Operating temperature range | T <sub>OPE</sub> | −10  |      | 75   | °C   |



## Electrical Characteristics

(DC characteristics 1)

(Unless otherwise specified, Ta = 25 °C, Vcc = 3.15 V)

| Item                                     | Symbol | Conditions                                                                                       | Rating values |       |       | Unit | Remarks |
|------------------------------------------|--------|--------------------------------------------------------------------------------------------------|---------------|-------|-------|------|---------|
|                                          |        |                                                                                                  | Min.          | Typ.  | Max.  |      |         |
| Playback mode supply current             | Icc1   | 14 = H 15 = H 17 = L                                                                             |               | 7     | 10    | mA   |         |
|                                          |        | 14 = H 15 = L 17 = L                                                                             |               | 6     | 9     |      |         |
| Recording mode supply current            | Icc2   | 14 = L 15 = H 17 = L                                                                             |               | 3.5   | 5     |      |         |
|                                          |        | 14 = L 15 = L 17 = L                                                                             |               | 3.5   | 5     |      |         |
| Power mode supply current                | Icc3   | 14 = L 15 = L 17 = H                                                                             |               | 1     | 2     |      |         |
|                                          |        | 14 = H 15 = L 17 = H                                                                             |               | 1     | 2     |      |         |
|                                          |        | 14 = L 15 = H 17 = H                                                                             |               | 1     | 2     |      |         |
|                                          |        | 14 =H 15 = H 17 = H                                                                              |               | 1     | 2     |      |         |
| Reference voltage                        | Vref   | Vcc = 3.15 V, entire operating temperature range                                                 | 1.545         | 1.575 | 1.605 | V    |         |
| Power supply fluctuation characteristics | D Vr1  | Vcc = 3.0 V, Vref fluctuation range                                                              | −80           | −75   | −70   | mV   |         |
|                                          | D Vr2  | Vcc = 4.0 V, Vref fluctuation range                                                              | −445          |       | −405  |      |         |
| REF PILOT input resistance               | Rpi    | REFPILOT Vin/lin                                                                                 | 100           | 137   | 180   | kΩ   |         |
| FH detection offset voltage              | D Ver1 | FHIN and 3FHIN = AC GND, difference between Vref and 3FH-FH                                      | −40           | 0     | 40    | mV   |         |
| Error output voltage                     | D Ver2 | FHIN and 3FHIN = AC GND, difference between Vref and ATFError                                    | −200          | 0     | 200   |      |         |
| Subtractor output voltage                | Vsub0  | FHIN: 16.46 kHz, 20 mVp-p<br>3FHIN: 46.20 kHz, 20 mVp-p<br>3FH-FH pin voltage                    | 1.505         | 1.575 | 1.645 | V    |         |
|                                          | Vsub1  | FHIN: 16.46 kHz, 60 mVp-p<br>3FHIN: 46.20 kHz, 20 mVp-p<br>3FH-FH pin voltage, Vsub0 reference   | −60           | −40   | −20   | mV   |         |
|                                          | Vsub2  | FHIN: 16.46 kHz, 20 mVp-p<br>3FHIN: 46.20 kHz, 60 mVp-p<br>3FH-FH pin voltage, Vsub0 reference   | 20            | 40    | 60    |      |         |
|                                          | Vsub3  | FHIN: 16.46 kHz, 400 mVp-p<br>3FHIN: 46.20 kHz, 20 mVp-p<br>3FH-FH pin voltage, Vsub0 reference  | −430          | −370  | −310  |      |         |
|                                          | Vsub4  | FHIN: 16.46 kHz, 20 mVp-p<br>3FHIN: 46.20 kHz, 400 mVp-p<br>3FH-FH pin voltage, Vsub0 reference  | 310           | 370   | 430   |      |         |
|                                          | Vsub5  | FHIN: 16.46 kHz, 1000 mVp-p<br>3FHIN: 46.20 kHz, 20 mVp-p<br>3FH-FH pin voltage, Vsub0 reference | −1060         | −930  | −800  |      |         |
|                                          | Vsub6  | FHIN: 16.46 kHz, 20 mVp-p<br>3FHIN: 46.20 kHz, 1000 mVp-p<br>3FH-FH pin voltage, Vsub0 reference | 800           | 930   | 1060  |      |         |
|                                          | Vsub7  | FHIN: 16.46 kHz, 440 mVp-p<br>3FHIN: 46.20 kHz, 400 mVp-p<br>3FH-FH pin voltage, Vsub0 reference | −60           | −40   | −20   |      |         |
|                                          | Vsub8  | FHIN: 16.46 kHz, 400 mVp-p<br>3FHIN: 46.20 kHz, 440 mVp-p<br>3FH-FH pin voltage, Vsub0 reference | 20            | 40    | 60    |      |         |
| Error “High” level voltage               | Vher1  | NF = Vref −20 mV ATF Error Ioer = 10 μA                                                          | 2.95          | 3.05  |       | V    |         |
|                                          | Vher2  | NF = Vref −20 mV ATF Error Ioer = 10 μA Vcc = 3 V                                                | 2.8           | 2.9   |       |      |         |
| Error “Low” level voltage                | Vler1  | NF = Vref +20 mV ATF Error Ioer = −10 μA                                                         |               | 0.1   | 0.2   |      |         |
| LPF 2 linearity                          | Rlpf2  | REFPILOT = 100 kHz, 0.4orl Vp-p in RPPBMODE = H<br>PILOTACT = H RECPILLOT voltage ratio          | 0.95          | 0.99  | 1.05  |      |         |
| CLOCK IN input resistance                | Rck    | CLOCKIN Vin/lin                                                                                  | 80            | 150   |       | kΩ   |         |

(DC characteristics 2)

(Unless otherwise specified, Ta = 25 °C, Vcc = 3.15 V)

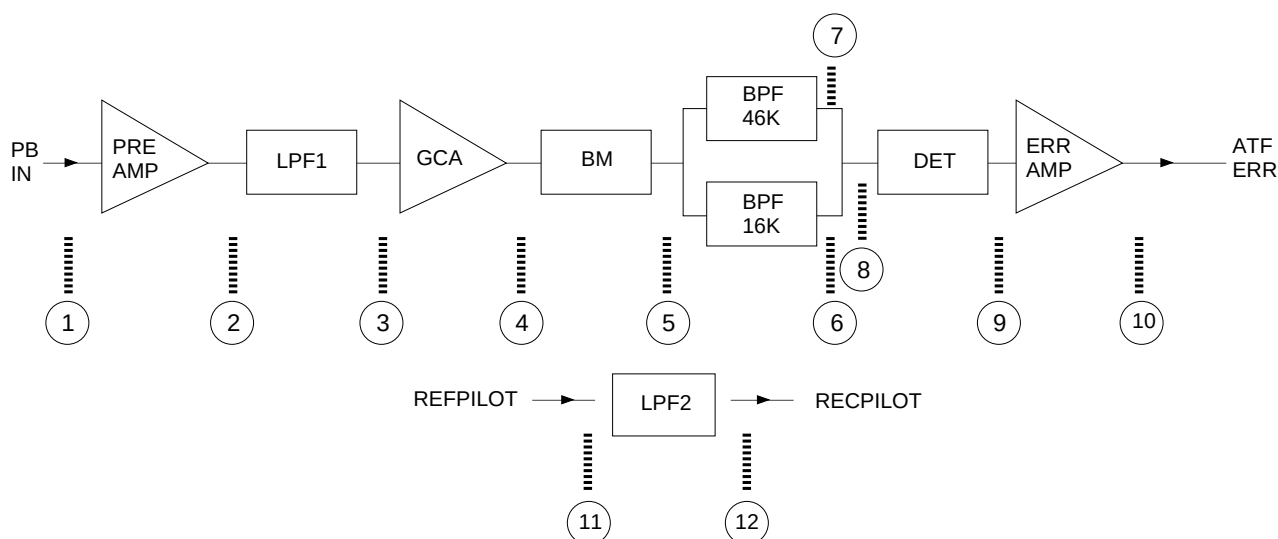
| Item                                               | Symbol | Conditions                                                                                  | Rating values |       |       | Unit | Remarks |
|----------------------------------------------------|--------|---------------------------------------------------------------------------------------------|---------------|-------|-------|------|---------|
|                                                    |        |                                                                                             | Min.          | Typ.  | Max.  |      |         |
| CLOG REF input voltage                             | Vcc1   |                                                                                             | 0             |       | Vcc   | V    |         |
| SP/LP REF input voltage                            | Vsc2   |                                                                                             | 0             |       | Vcc   |      |         |
| CLOG detection high check                          |        | SPIN = 50 mVp-p, 5 MHz/GCA2 = 1000/CLOGREF = 0.39 V                                         | 2.4           |       |       |      |         |
| CLOG detection low check                           |        | SPIN = 150 mVp-p, 5 MHz/GCA2 = 1000/CLOGREF = 0.39 V                                        |               |       | 0.4   |      |         |
| CLOG output voltage                                | Vclgl  | SPIN = 500 mVp-p, 5 MHz/GCA2 = 1000/CLOGREF = COMPREF<br>Vcc = 3.0...4.0 V                  |               | 0.01  | 0.4   | V    | Note 1  |
|                                                    | Vclgh  | SPIN = AC GND/GCA2=1000/CLOGREF = COMPREF<br>Vcc = 3.0...4.0 V                              | 2.5           | 3.0   |       |      |         |
| PB SP/LP output voltage                            | Vspl   | SPIN = AC GND/MODRATIO: See fig1<br>SPLPREF = Vref/Vcc=3...4 V/GCA2 = 1000                  | 2.5           | 3.0   |       |      |         |
|                                                    | Vsph   | SPIN = 500 mVp-p, 5 MHz/MODRATIO: See fig1<br>SPLPREF = Vref/Vcc=3...4 V/GCA2 = 1000        |               | 0.01  | 0.4   |      |         |
| "High" level input voltage                         | Vih    | Pins 14, 15 and 17; Vcc = 3 to 4 V                                                          | 2.1           |       | Vcc   | μA   | Note 1  |
| "Low" level input voltage                          | Vil    | Pins 14, 15 and 17; Vcc = 3 to 4 V                                                          | -0.4          |       | 0.8   |      |         |
| "High" level input current                         | Iih    | Pins 14, 15 and 17; Vcc = 3 to 4 V                                                          |               | 0     | 1     |      |         |
| "Low" level input current                          | Iil    | Pins 14, 15 and 17; Vcc = 3 to 4 V                                                          | -1            | -0.5  |       |      |         |
| CLOG identification time                           | Tcl1   | SPIN = 500 mVp-p, 5 MHz/Burst = 0.5 Hz/GCA2 = 1000                                          | 0.7           | 1.3   | 2.6   | mS   |         |
|                                                    | Tcl2   | CLOGREF = COMPREF (See: fig2)                                                               | 4             | 7.5   | 10.6  |      |         |
| SPLP identification time                           | Tsp1   | SPIN = 500 mVp-p, 5 MHz/Burst = 0.5 Hz/GCA2 = 1000                                          | 30            | 50    | 70    |      |         |
|                                                    | Tsp2   | SPLPREF = Vref/MODRATIO = See: fig1 (See: fig3)                                             | 30            | 50    | 70    |      |         |
| ENV OUT DC voltage                                 | VEnv0  | SPIN = AC GND, GCA2 = 0000; ENVOUT pin voltage                                              | 0.425         | 0.525 | 0.625 | V    |         |
| RF detection offset voltage                        | Denv   | SPIN = AC GND, GCA2 = 0000; ENVOUT – COMPREF voltage                                        | -80           | 0     | 80    | mV   |         |
| RF detection output voltage                        | Venv1  | ENVOUT voltage difference when SPIN = 0 V and 0.5 Vp-p, 5 MHz, GCA2 = 1111 and Vcc = 3.15 V | 2.3           | 2.5   |       | V    |         |
|                                                    | Venv2  | ENVOUT voltage difference when SPIN = 0 V and 0.5 Vp-p, 5 MHz, GCA2 = 1111 and Vcc = 3.0 V  | 2.2           | 2.4   |       |      |         |
| CLOG REF input current                             | Icc1h  | Pin current value when CLOG REF = 3.15 V                                                    |               | 0     | 1     | μA   |         |
|                                                    | Icc1l  | Pin current value when CLOG REF = 0 V                                                       | -1            | -0.1  |       |      |         |
| MOD RATIO input current                            | Icc1h  | Pin current value when MOD RATIO = 3.15 V                                                   |               | 0     | 1     |      |         |
|                                                    | Icc1l  | Pin current value when MOD RATIO = 0 V                                                      | -1            | -0.1  |       |      |         |
| SP/LP REF input current                            | Icc1h  | Pin current value when SPLPREF = 3.15 V                                                     |               | 0     | 1     |      |         |
|                                                    | Icc1l  | Pin current value when SPLPREF = 0 V                                                        | -1            | -0.1  |       |      |         |
| Switching time between playback and recording mode |        | Time until RECATF stabilizes when RPPBMODE goes from high to low                            |               |       | 20    | μS   |         |
| Switching time between standby and playback mode   |        | Time until PBATF Error stabilizes when STBY goes from high to low                           |               |       | 25    | mS   |         |

**Note 1)** The Typ. value is Vcc = 3.15 V

## Electrical Characteristics

(AC characteristics 1)

(Unless otherwise specified, Ta = 25 °C, Vcc = 3.15 V)



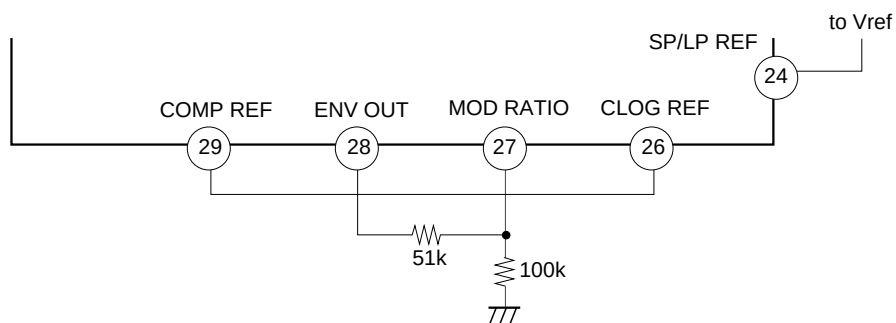
| Item                  | Symbol | Conditions                                                                                                 | Rating values |      |       | Unit  | Remarks                   |
|-----------------------|--------|------------------------------------------------------------------------------------------------------------|---------------|------|-------|-------|---------------------------|
|                       |        |                                                                                                            | Min.          | Typ. | Max.  |       |                           |
| LPF1 Gain             | Glp1M  | PBIN – GCA1OUT Vin=30 mVp-p, 100 kHz, GCA1: 0000                                                           | 23            | 25   | 27    | dB    | Measurement points 1 to 4 |
|                       | Glp11  | PBIN = 30 mVp-p, 120 kHz, GCA1: 0000                                                                       | -1.5          | 0.5  | 1.5   |       |                           |
|                       | Glp12  | PBIN = 30 mVp-p, 150 kHz, GCA1: 0000                                                                       | -1.5          | 0.5  | 1.5   |       |                           |
|                       | Glp13  | PBIN = 30 mVp-p, 170 kHz, GCA1: 0000                                                                       | -1.5          | 0    | 1.5   |       |                           |
|                       | Glp14  | PBIN = 100 mVp-p, 250 kHz, GCA1: 0000                                                                      |               | -10  | -6.5  |       |                           |
|                       | Glp15  | PBIN = 300 mVp-p, 400 kHz, GCA1: 0000                                                                      |               | -27  | -17.5 |       |                           |
|                       | Glp16  | PBIN = 800 mVp-p, 750 kHz, GCA1: 0000                                                                      |               | -50  | -35   |       |                           |
|                       | Glp17  | PBIN = 800 mVp-p, 3 MHz, GCA1: 0000                                                                        |               | -65  | -50   |       |                           |
| GCA1 S/N ratio        | Vgca11 | PBIN = 10 mVp-p, 100 kHz; Measure GCA1OUT.<br>RBW = 300 Hz, VBW = 100 Hz; Maximum value from 50 to 250 kHz | 40            | 50   |       | mVp-p |                           |
| GCA1 folded noise     | Vgca   | PBIN = 0.6 Vp-p, 6 MHz; Measure GCA1OUT.<br>RBW = 300 Hz, VBW = 100 Hz; Maximum value from 50 to 250 kHz   |               | 1    | 50    |       |                           |
| BPF16K reference gain | Gbp1M  | BPFIn = 0.5 Vp-p, 16.46 kHz                                                                                | 1             | 4    | 7     | dB    | Measurement points 5 to 6 |
| BPF16K Gain           | Gbp11  | BPFIn = 0.5 Vp-p, 9 kHz; Gbp1M reference                                                                   |               | -24  | -20   |       |                           |
|                       | Gbp12  | BPFIn = 0.5 Vp-p, 28 kHz; Gbp1M reference                                                                  |               | -22  | -20   |       |                           |
|                       | Gbp13  | BPFIn = 0.5 Vp-p, 150 kHz; Gbp1M reference                                                                 |               | -35  | -26   |       |                           |
| BPF46K reference gain | Gbp2M  | BPFIn = 0.5 Vp-p, 46.2 kHz                                                                                 | 1             | 4    | 7     |       | Measurement points 5 to 7 |
| BPF46K Gain           | Gbp21  | BPFIn = 0.5 Vp-p, 16 kHz; Gbp2M reference                                                                  |               | -31  | -26   |       |                           |
|                       | Gbp22  | BPFIn = 0.5 Vp-p, 33 kHz; Gbp2M reference                                                                  |               | -26  | -20   |       |                           |
|                       | Gbp23  | BPFIn = 0.5 Vp-p, 60 kHz; Gbp2M reference                                                                  |               | -24  | -20   |       |                           |
|                       | Gbp24  | BPFIn = 0.5 Vp-p, 150 kHz; Gbp2M reference                                                                 |               | -36  | -26   |       |                           |
| BPF Gain Diff         | D Gbp  | Difference between Gbp1M and Gbp2M                                                                         | -2            | 0    | 2     |       | Measurement point 4       |
| Cross Talk            | Gcap   | REFPILOT = 0.5 Vp-p, 200 kHz; PILOTACT = Low<br>PBIN = AC GND; Measure GCA1OUT                             |               | -60  | -46   |       |                           |
| LPF2 reference gain   | Glp2M  | 500 mVp-p, 100 kHz                                                                                         | -1            | 0    | 1     |       | Measurement points 1 to 4 |
|                       | Glp21  | 500 mVp-p, 120 kHz; Glp2M reference                                                                        | -1.5          | 0.5  | 1.5   |       |                           |
|                       | Glp22  | 500 mVp-p, 150 kHz; Glp2M reference                                                                        | -1.5          | 0.4  | 1.5   |       |                           |
|                       | Glp23  | 500 mVp-p, 170 kHz; Glp2M reference                                                                        | -1.5          | -0.5 | 1.5   |       |                           |
|                       | Glp24  | 500 mVp-p, 300 kHz; Glp2M reference                                                                        |               | -16  | -12   |       |                           |
|                       | Glp25  | 500 mVp-p, 500 kHz; Glp2M reference                                                                        |               | -37  | -33   |       |                           |
|                       | Glp26  | 500 mVp-p, 1.5 MHz; Glp2M reference                                                                        |               | -80  | -40   |       |                           |

(AC characteristics 2)

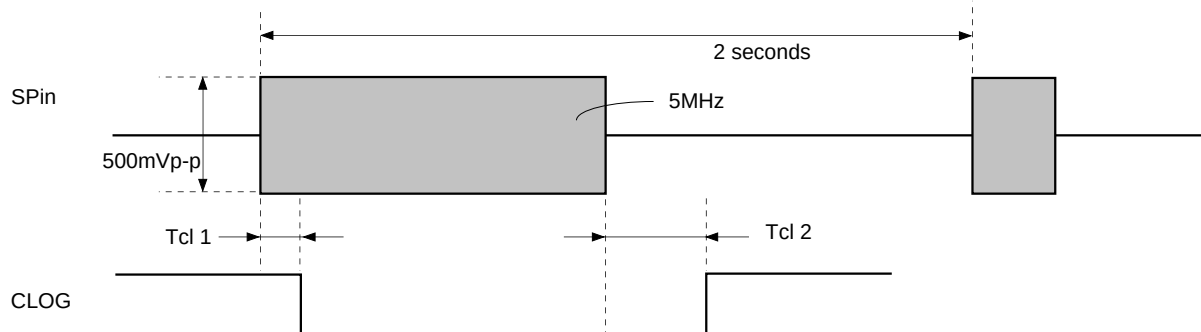
(Unless otherwise specified, Ta = 25 °C, V<sub>CC</sub> = 3.15 V)

| Item                         | Symbol | Conditions                                                                                                                        | Rating values |      |      | Unit | Remarks |
|------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------|---------------|------|------|------|---------|
|                              |        |                                                                                                                                   | Min.          | Typ. | Max. |      |         |
| Clock input                  | Vck    | CLOCKIN = 6 MHz, C = 5Pf                                                                                                          | 0.1           | 0.3  | 1.5  | Vp-p |         |
| Clock Duty                   | Vdk    |                                                                                                                                   | 30            | 50   | 70   | %    |         |
| PBIN input                   | Vpd    |                                                                                                                                   | 0.1           | 0.4  | 1.0  | Vp-p |         |
| SPIN input                   | Vsp    |                                                                                                                                   | 0.1           | 0.4  | 1.0  |      |         |
| REF PILOT input              | Vpi    |                                                                                                                                   | 0.1           | 0.5  | 1.0  |      |         |
| REF PILOT output             | Vrec   | REFPILOT = 0.5 Vp-p input                                                                                                         |               | 0.5  |      | V    |         |
| GCA1 gain fluctuation        | D Gpd  | Vcc = 3.0...3.6 V Gpd (Vcc = 3.6 V) – Gpd (Vcc = 3.0 V)                                                                           | –1.5          | 0    | 1.5  | dB   |         |
| GCA2 gain fluctuation        | D Grf  | Vcc = 3.0...3.6 V Gpd (Vcc = 3.6 V) – Gpd (Vcc = 3.0 V)                                                                           | –1.0          | 0    | 1.0  |      |         |
| GCA2 Gain                    | Grf1   | Value obtained by dividing the ENVOUT electric potential difference when SPIN = 5 MHz, 0.4 Vp-p and 0 Vp-p by 0.2 V; GCA2 = 0000  | 2.0           | 5.0  | 8.0  |      |         |
|                              | Grf2   | Value obtained by dividing the ENVOUT electric potential difference when SPIN = 5 MHz, 0.2 Vp-p and 0 Vp-p by 0.1 V; GCA2 = 1000  | 10.0          | 13.0 | 16.0 |      |         |
|                              | Grf3   | Value obtained by dividing the ENVOUT electric potential difference when SPIN = 5 MHz, 0.1 Vp-p and 0 Vp-p by 0.05 V; GCA2 = 1111 | 17.0          | 20.0 | 23.0 |      |         |
| GCA2 frequency response      | fw     | Frequency –3 dB from SPIN = 0.2 Vp-p, 3 MHz; GCA2 = 1000                                                                          | 10            | 14   |      | MHz  |         |
| GCA1 gain difference         | Gdif1  | PBIN = 10 mVp-p, 100 kHz; Gain difference between GCA1 = n–1 → n (n = 1 to 15)                                                    | 0.2           | 1.0  | 1.8  | dB   |         |
| GCA2 gain difference         | Gdif2  | SPIN = 200 mVp-p, 5 MHz; Gain difference between GCA1 = n – 1 →n (n = 1 to 15)                                                    | 0.2           | 1.0  | 1.8  |      |         |
| ATF total gain               | Gerr1  | PBIN = 30 mVp-p. 116.46 kHz/GCA1 = 0000<br>REFPILOT=100 kHz/PBIN → BPF16OUT Gain                                                  | 22            | 25   | 28   |      |         |
|                              | Gerr2  | PBIN = 30 mVp-p. 146.2 kHz/GCA1 = 0000<br>REFPILOT = 100 kHz/PBIN → BPF46OUT Gain                                                 | 22            | 25   | 28   |      |         |
| ATF total gain difference    |        | Gerr1– Gerr2                                                                                                                      | –2            | 0    | 2    |      |         |
| ENV OUT output Tr/Tf time    | Trenv  | SPIN = 5 MHz, 1 Vp-p/Burst 10 Hz GCA2 = 1000 (Fig-4)                                                                              | 50            | 100  | 150  | μS   |         |
|                              | Tfenv  |                                                                                                                                   | 50            | 100  | 150  |      |         |
| Subtractor output Tr/Tf time | Trsub1 | FHIN = 1 Vp-p, 16 kHz/Burst = 10 Hz/3FHIN = AC GND                                                                                | 320           | 400  | 600  |      |         |
|                              | Tfsub1 | Measure 3FH-FH (fig. 5)                                                                                                           | 320           | 400  | 600  |      |         |
|                              | Trsub2 | 3FHIN = 1 Vp-p, 46 kHz/Burst = 10 Hz/FHIN = AC GND                                                                                | 320           | 400  | 600  |      |         |
|                              | Tfsub2 | Measure 3FH-FH (fig. 6)                                                                                                           | 320           | 400  | 600  |      |         |

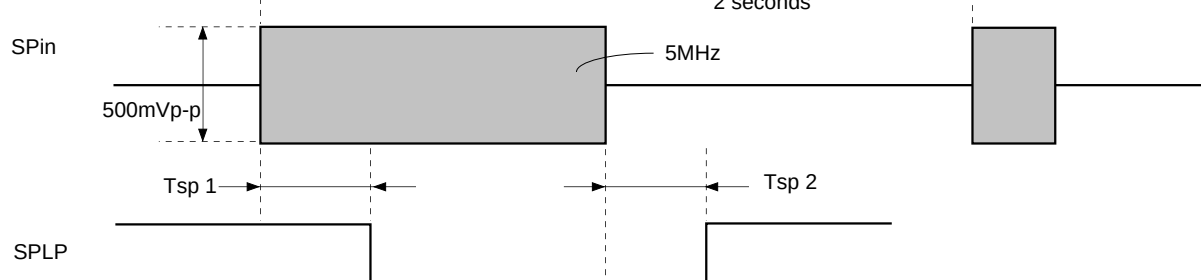
(fig 1)



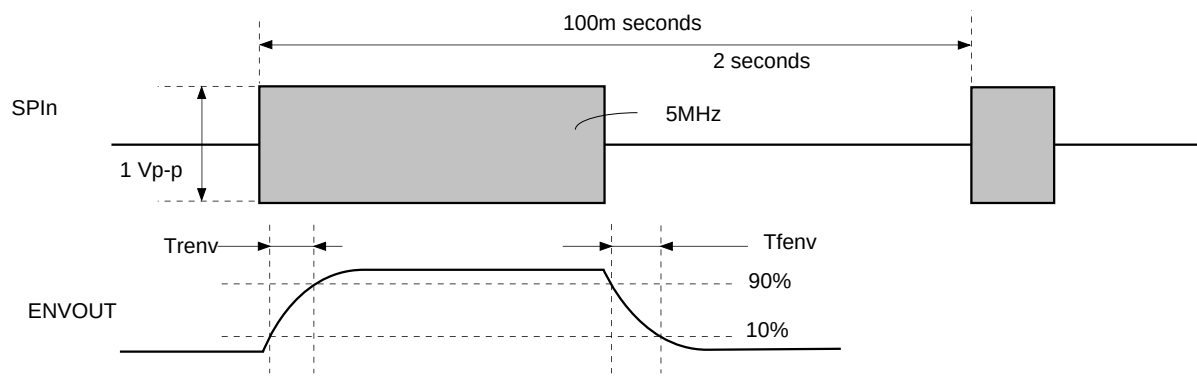
(fig 2)



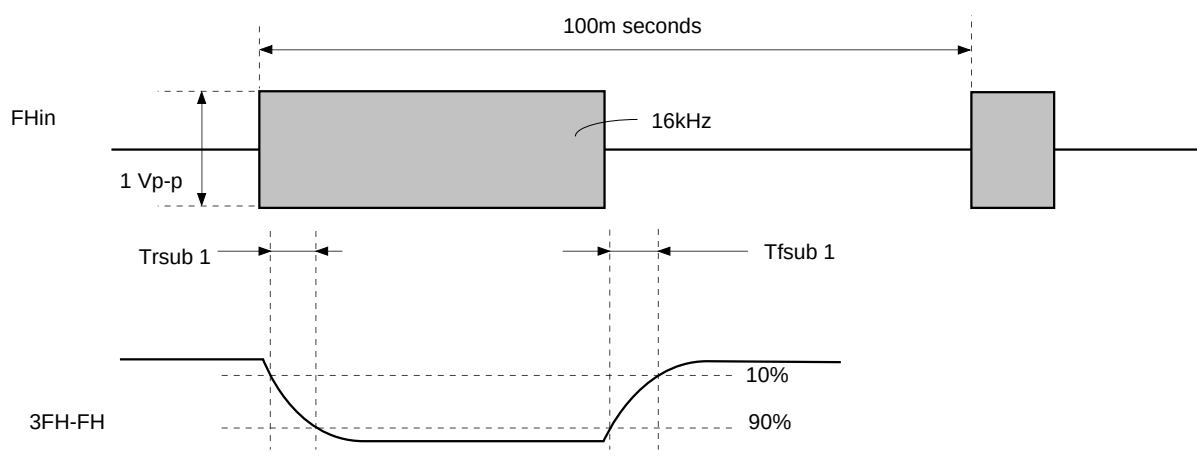
(fig 3)



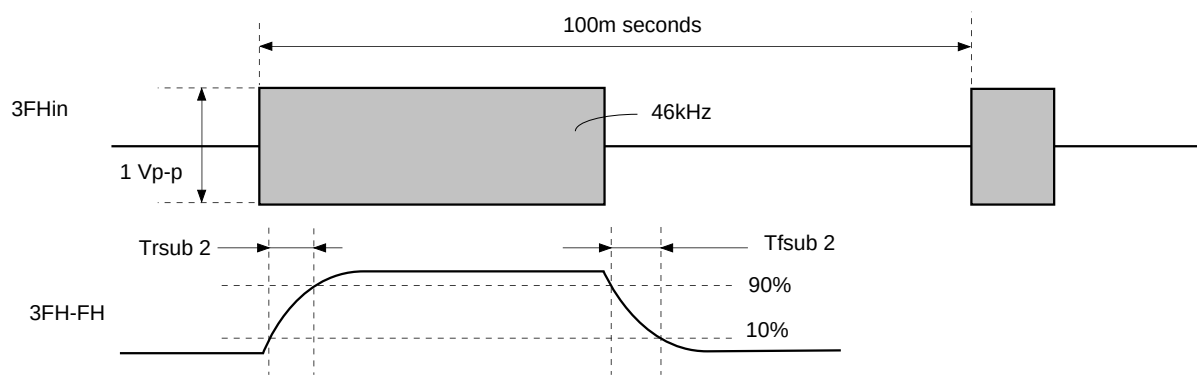
(fig 4)



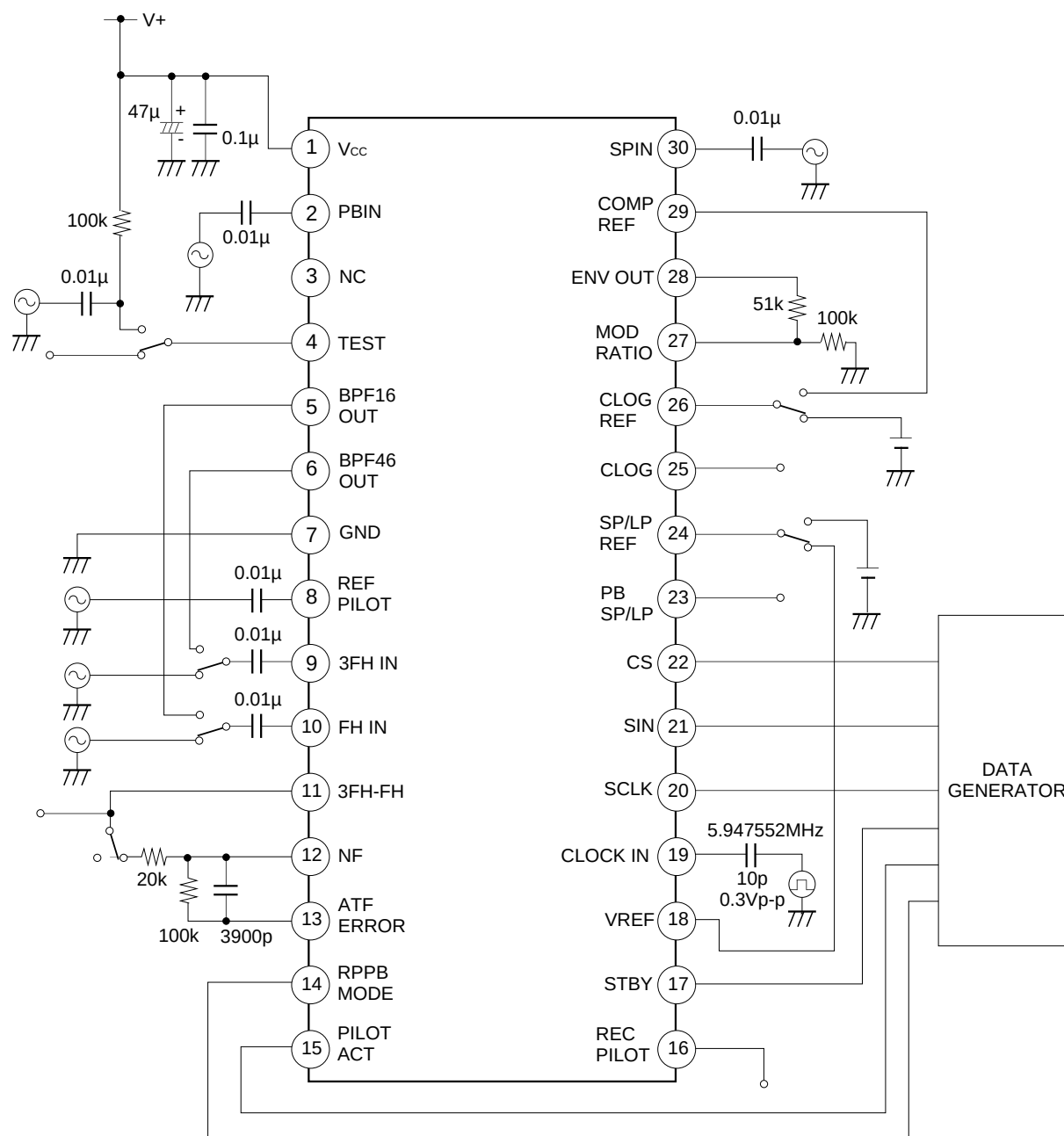
(fig 5)



(fig 6)

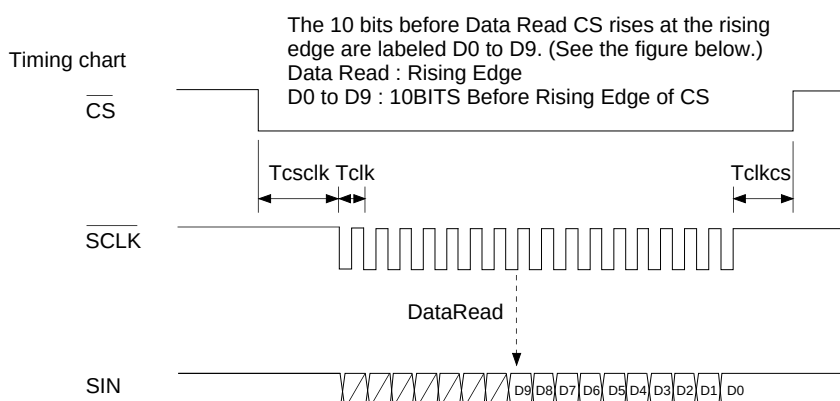
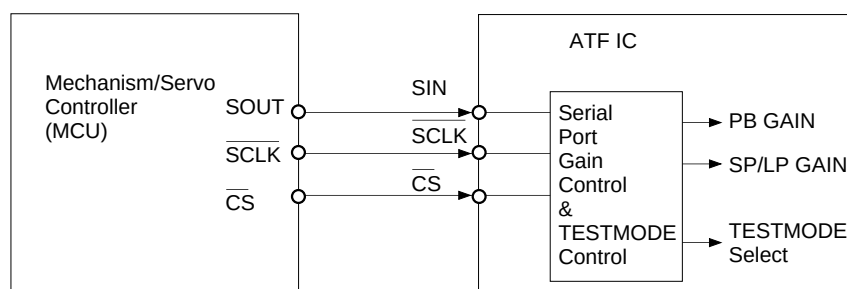


## Electrical Characteristics Measurement Circuit



## Serial Control Block

Block connection



|        | NIN         | MAX |
|--------|-------------|-----|
| Tcsclk | 5 $\mu$ sec |     |
| Tclk   | 1 $\mu$ sec |     |
| Tclkcs | 5 $\mu$ sec |     |

## Serial Data Contents (SERIAL DATA)

### GCA1

| D0 | D1 | D2 | D3 | PBAMP GAIN (dB) |
|----|----|----|----|-----------------|
| 0  | 0  | 0  | 0  | $0 \pm 0.5$     |
| 0  | 0  | 0  | 1  | $1 \pm 0.5$     |
| 0  | 0  | 1  | 0  | $2 \pm 0.5$     |
| 0  | 0  | 1  | 1  | $3 \pm 0.5$     |
| 0  | 1  | 0  | 0  | $4 \pm 0.5$     |
| 0  | 1  | 0  | 1  | $5 \pm 0.5$     |
| 0  | 1  | 1  | 0  | $6 \pm 0.5$     |
| 0  | 1  | 1  | 1  | $7 \pm 0.5$     |
| 1  | 0  | 0  | 0  | $8 \pm 0.5$     |
| 1  | 0  | 0  | 1  | $9 \pm 0.5$     |
| 1  | 0  | 1  | 0  | $10 \pm 0.5$    |
| 1  | 0  | 1  | 1  | $11 \pm 0.5$    |
| 1  | 1  | 0  | 0  | $12 \pm 0.5$    |
| 1  | 1  | 0  | 1  | $13 \pm 0.5$    |
| 1  | 1  | 1  | 0  | $14 \pm 0.5$    |
| 1  | 1  | 1  | 1  | $15 \pm 0.5$    |

\*Glp1M REF  
(Glp1M =  $25 \pm 2$  dB)

### GCA2

| D4 | D5 | D6 | D7 | SPAMP GAIN (dB) |
|----|----|----|----|-----------------|
| 0  | 0  | 0  | 0  | $0 \pm 0.5$     |
| 0  | 0  | 0  | 1  | $1 \pm 0.5$     |
| 0  | 0  | 1  | 0  | $2 \pm 0.5$     |
| 0  | 0  | 1  | 1  | $3 \pm 0.5$     |
| 0  | 1  | 0  | 0  | $4 \pm 0.5$     |
| 0  | 1  | 0  | 1  | $5 \pm 0.5$     |
| 0  | 1  | 1  | 0  | $6 \pm 0.5$     |
| 0  | 1  | 1  | 1  | $7 \pm 0.5$     |
| 1  | 0  | 0  | 0  | $8 \pm 0.5$     |
| 1  | 0  | 0  | 1  | $9 \pm 0.5$     |
| 1  | 0  | 1  | 0  | $10 \pm 0.5$    |
| 1  | 0  | 1  | 1  | $11 \pm 0.5$    |
| 1  | 1  | 0  | 0  | $12 \pm 0.5$    |
| 1  | 1  | 0  | 1  | $13 \pm 0.5$    |
| 1  | 1  | 1  | 0  | $14 \pm 0.5$    |
| 1  | 1  | 1  | 1  | $15 \pm 0.5$    |

\*Grf1 REF  
(Grf1 =  $5 \pm 2$  dB)

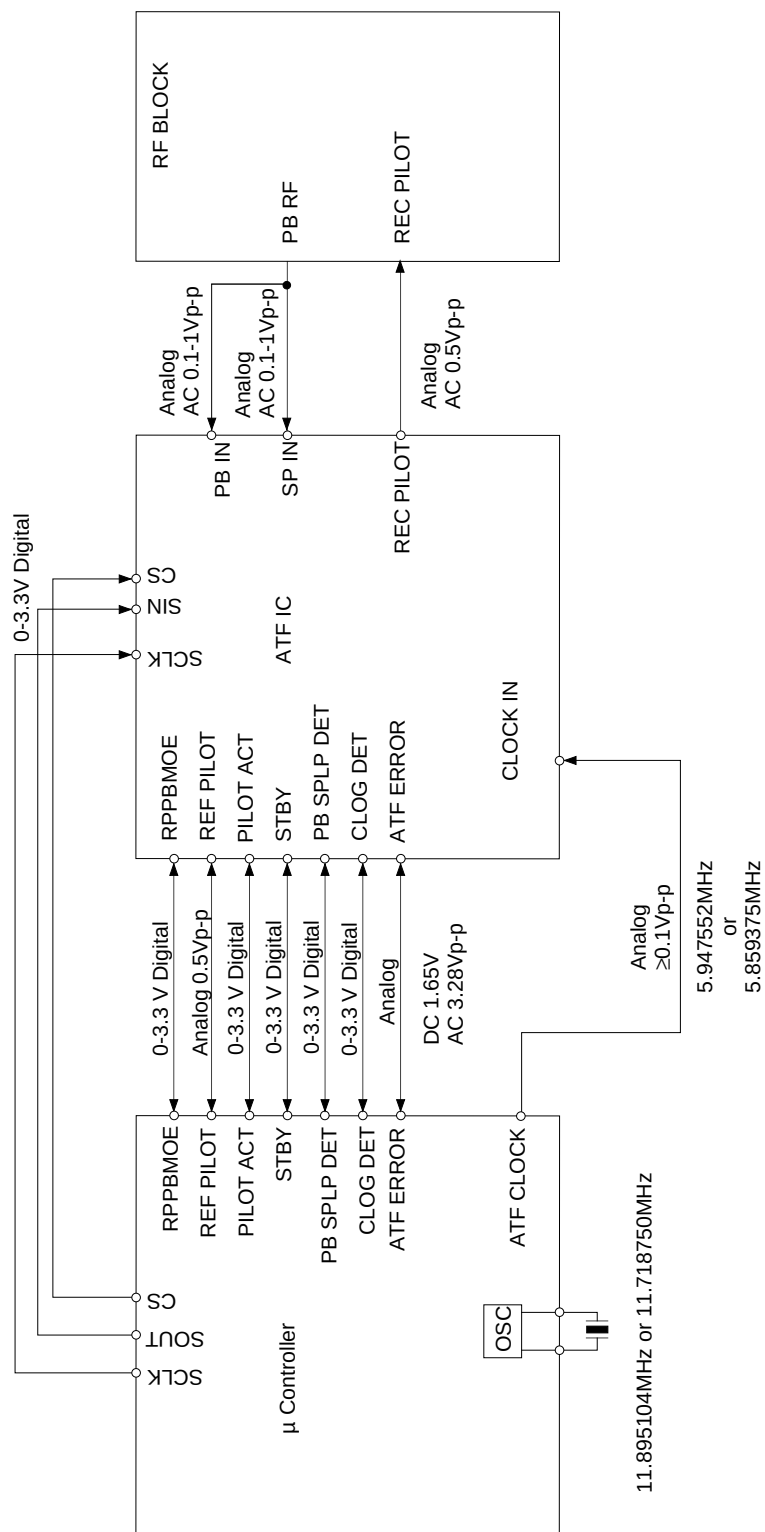
### TEST

| D8 | D9 | TESTMODE               |
|----|----|------------------------|
| 0  | 0  | OUTPUT OF GCA          |
| 0  | 1  | OUTPUT OF B.M          |
| 1  | 0  | INPUT OF BPF16 k, 46 k |
| 1  | 1  | NOT USED               |

**Note)** For input mode, pull up to  $V_{CC}$  with a 100 k $\Omega$  resistor. Input voltage is 0.5 Vp-p or less.



# Example of External Connections





Example of Representative Characteristics (TA = 25 °C, VCC = 3.15 V)

