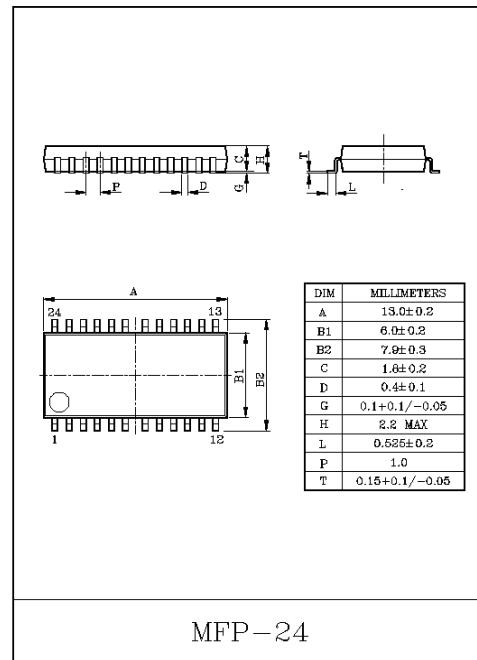


RF Amplifier for Digital servo CD system.

KIA2019F is a 3-beam type PUH compatible RF Amplifier for Digital Servo to be used in the CD system. In combination with a CMOS single chip processor KIC9432F/AF, a CD system can be composed very simply.

#### FEATURES

- Built in amplifier for reference (VREF, 2VREF) supply.
- Built in Auto Laser Power Control circuit.
- Built in RF amplifier.
- Built in focus error amp and tracking error amp.
- Built in sub-beam adder signal amplifier.
- Capable of tracking balance control with KIC9432F/AF.
- Capable of RF gain adjustment circuit with KIC9432F/AF.
- Built in signal amplifier for track counter.
- Capable of 4 times speed operation.
- 24 pin mini flat package.



Weight : 0.3g (Typ.)

# KIA2109F

AC CHARACTERISTICS (Unless otherwise specified, Ta=25°C, V<sub>CC</sub>=5V)

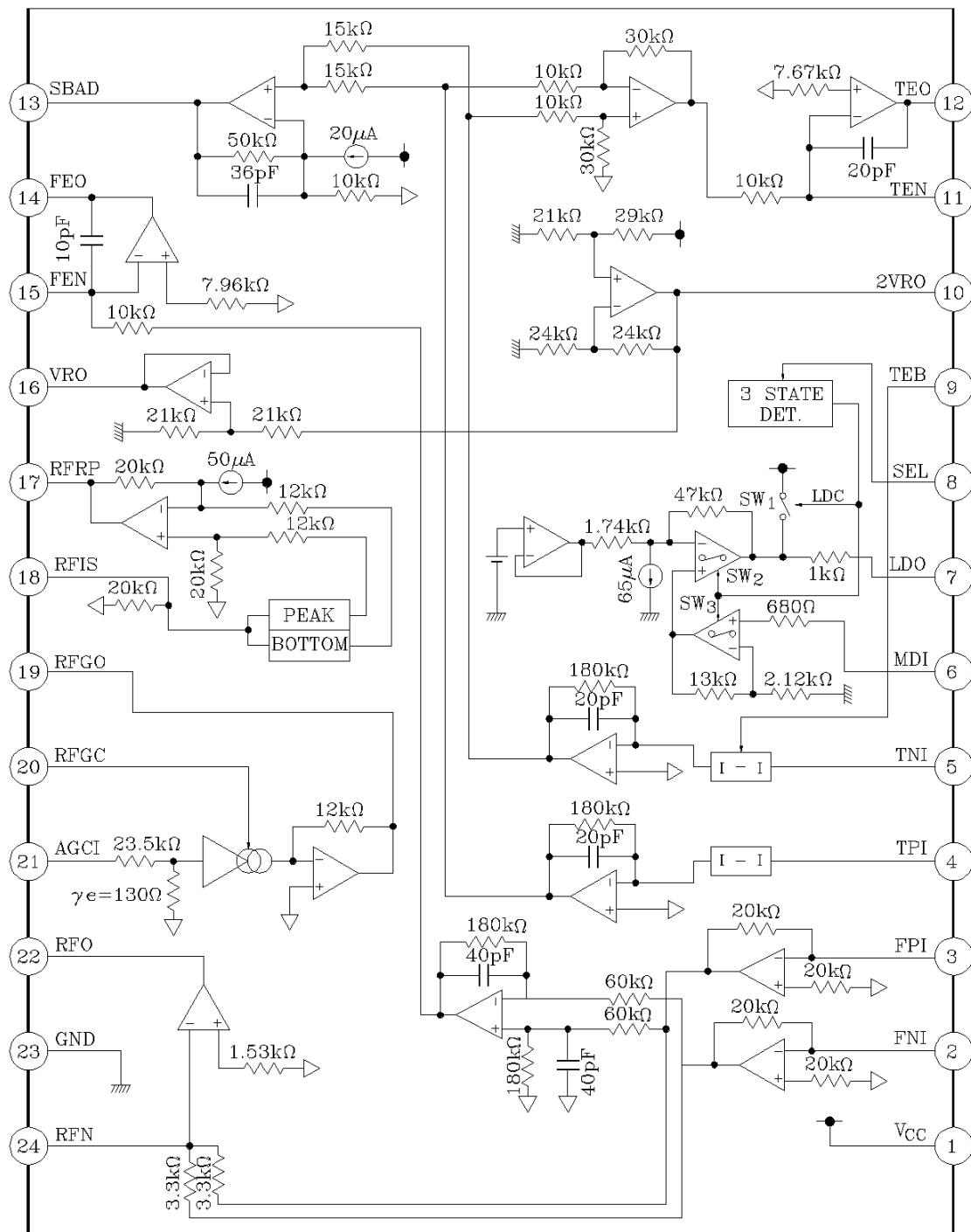
| CHARACTERISTIC            |                             | SYMBOL           | TEST CIRCUIT | TEST CONDITION                                       |  | MIN. | TYP. | MAX. | UNIT |
|---------------------------|-----------------------------|------------------|--------------|--|--|------|------|------|------|
| Power Supply              | Assured Supply Voltage      | V <sub>CC</sub>  | -            |  |  | 4.5  | 5.0  | 5.5  | V    |
|                           | Power Supply Voltage        | I <sub>CC</sub>  | -            | SEL=V <sub>CC</sub>                                  |  | 18   | 24   | 30   | mA   |
| Reference Voltage : 2VREF | Reference Voltage           | 2VR              | -            |  |  | 4.0  | 4.2  | 4.4  | V    |
|                           | Output Current              | I <sub>OH2</sub> | -            | $\Delta V=-0.1V$                                     |  | 3.0  | -    | -    | mA   |
|                           | Input Current               | I <sub>OL2</sub> | -            | $\Delta V=+0.1V$                                     |  | 0.1  | -    | -    | mA   |
| Reference Voltage : VREF  | Reference Voltage           | VR               | -            |  |  | 2.0  | 2.1  | 2.2  | V    |
|                           | Reference Voltage Limit     | $\Delta VR$      | -            | $2 \times VR / 2VR - 1$                              |  | -3.0 | 0.0  | 3.0  | %    |
|                           | Output Current              | I <sub>OH1</sub> | -            | $\Delta V=-0.1V$                                     |  | 5.0  | -    | -    | mA   |
|                           | Input Current               | I <sub>OL1</sub> | -            | $\Delta V=+0.1V$                                     |  | 5.0  | -    | -    | mA   |
| RF1 FPI (FNI) →RFO        | Transfer Resistance         | R <sub>T</sub>   | -            | $f=100\text{kHz}, R_{NF}=22\text{k}\Omega$           |  | 117  | 133  | 143  | kΩ   |
|                           | Frequency Characteristic    | f <sub>C</sub>   | -            | -3dB point   |  | -    | 5.0  | -    | MHz  |
|                           | Output Slew Rate            | SR               | -            | $C_{RFO}=20\text{pF}$                                |  | 10   | 20   | -    | V/us |
|                           | Noise/distortion rate       | THD              | -            | $f=100\text{kHz}, V_{RFO}=1.2\text{V}_{\text{P-P}}$  |  | -    | -40  | -    | dB   |
|                           | Upper Limit Output Voltage  | V <sub>OH</sub>  | -            | GND Reference  |  | 3.6  | -    | -    | V    |
|                           | Lower Limit Output Voltage  | V <sub>OL</sub>  | -            | GND Reference  |  | -    | -    | 0.7  | V    |
|                           | Permissive Load Resistance  | R <sub>LM</sub>  | -            |  |  | 10   | -    | -    | kΩ   |
| RF2 (AGC) RFO →RGFO       | Lower Limit Gain Voltage    | G <sub>V1</sub>  | -            | $f=100\text{kHz}, RFGC=0.6\text{V}$                  |  | 0.66 | 0.73 | 0.80 | V/V  |
|                           | Upper Limit Gain Voltage    | G <sub>V2</sub>  | -            | $f=100\text{kHz}, RFGC=3.6\text{V}$                  |  | 1.60 | 1.75 | 1.90 | V/V  |
|                           | Frequency Characteristic    | f <sub>C</sub>   | -            | -3dB point   |  | -    | 5.0  | -    | MHz  |
|                           | Output Slew Rate            | SR               | -            | $C_{RGFO}=20\text{pF}$                               |  | 10   | 20   | -    | V/us |
|                           | Upper Limit Output Voltage  | V <sub>OH</sub>  | -            | GND Reference  |  | 3.6  | -    | -    | V    |
|                           | Lower Limit Output Voltage  | V <sub>OL</sub>  | -            | GND Reference  |  | -    | -    | 0.7  | V    |
|                           | Noise/distortion rate       | THD              | -            | $f=100\text{kHz}, V_{RGFO}=1.2\text{V}_{\text{P-P}}$ |  | -    | -40  | -    | dB   |
|                           | Permissive Load Resistance  | R <sub>LM</sub>  | -            |  |  | 10   | -    | -    | kΩ   |
| APC MDI →LDO              | Gain Voltage                | G <sub>V</sub>   | -            | $f=1\text{kHz}$                                      |  | -    | 200  | -    | V/V  |
|                           | Operation Reference Voltage | V <sub>MDI</sub> | -            | $V_{LDO}=3.5\text{V}_{\text{DC}}$                    |  | 170  | 178  | 192  | mA   |
|                           | LD Off Voltage              | V <sub>LDO</sub> | -            | LDC=L, V <sub>CC</sub> Reference, SEL=L              |  | -0.7 | -    | -    | V    |
|                           | Input Vias Current          | I <sub>I</sub>   | -            | $V_{MDI}=178\text{mV}$                               |  | -200 | -    | 200  | nA   |
| FE FNI (FPI) →FEO         | Transfer Resistance         | R <sub>T</sub>   | -            | $f=1\text{kHz}, R_{NF}=39\text{k}\Omega$             |  | 198  | 220  | 242  | kΩ   |
|                           | Gain Balance                | GB               | -            |  |  | -1.0 | -    | +1.0 | dB   |
|                           | Frequency Characteristic    | f <sub>C</sub>   | -            | -3dB point   |  | -    | 22   | -    | kHz  |
|                           | Output Offset Voltage       | V <sub>OS</sub>  | -            | VR Reference, input open                             |  | -30  | -    | 30   | mV   |
|                           | Noise/distortion rate       | THD              | -            | $f=1\text{kHz}, V_{FEO}=2.4\text{V}_{\text{P-P}}$    |  | -    | -40  | -    | dB   |
|                           | Upper Limit Output Voltage  | V <sub>OH</sub>  | -            | GND Reference  |  | 3.8  | -    | -    | V    |
|                           | Lower Limit Output Voltage  | V <sub>OL</sub>  | -            | GND Reference  |  | -    | -    | 0.5  | V    |
|                           | Permissive Load Resistance  | R <sub>LM</sub>  | -            |  |  | 10   | -    | -    | kΩ   |

# KIA2109F

| CHARACTERISTIC              |   | SYMBOL                             | TEST CIRCUIT | TEST CONDITION                                 |           | MIN.      | TYP.      | MAX.       | UNIT |
|-----------------------------|---|------------------------------------|--------------|--|-----------|-----------|-----------|------------|------|
| TE<br>TPI (TNI)<br>→ TEO    | Transfer Resistance   | R <sub>T</sub>                     | -            | f=1kHz, TEB=VR,<br>R <sub>NF</sub> =33kΩ       |           | 1.53      | 1.70      | 1.87       | MΩ   |
|                             | Transfer Resistance Range<br>max. Transfer Resistance<br>max. Transfer Resistance | ΔR <sub>T</sub>                    | -            | TEB=VR Reference<br>TEB=GND<br>TEB=2VR         | 35<br>-55 | 45<br>-45 | 55<br>-35 | %<br>%     |      |
|                             | Gain Balance  | G <sub>B</sub>                     | -            | TEB=VR   | -1.0      | -         | +1.0      | dB         |      |
|                             | Frequency Characteristic<br>Cut-Off Frequency 1<br>Cut-Off Frequency 2            | f <sub>C1</sub><br>f <sub>C2</sub> | -            | R <sub>NF</sub> =33kΩ                          | -<br>-    | 44<br>240 | -<br>-    | kHz<br>kHz |      |
|                             | Output Offset Voltage   | V <sub>OS</sub>                    | -            | VR Reference, input open                       | -80       | -         | +80       | mV         |      |
|                             | Noise/distortion rate   | THD                                | -            | f=1kHz, V <sub>TEO</sub> =2.0V <sub>P-P</sub>  | -         | -40       | -         | dB         |      |
|                             | Upper Limit Output Voltage  | V <sub>OH</sub>                    | -            | GND Reference                                  | 3.8       | -         | -         | V          |      |
|                             | Lower Limit Output Voltage  | V <sub>OL</sub>                    | -            | GND Reference                                  | -         | -         | 0.5       | V          |      |
|                             | Permissive Load Resistance  | R <sub>LM</sub>                    | -            |  | 10        | -         | -         | kΩ         |      |
| SBAD<br>TPI (TNI)<br>→ SBAD | Transfer Resistance   | R <sub>T</sub>                     | -            | f=1kHz, TEB=VR                                 | 416       | 520       | 624       | kΩ         |      |
|                             | Frequency Characteristic  | f <sub>C</sub>                     | -            | -3dB point                                     | -         | 44        | -         | kHz        |      |
|                             | Noise/distortion rate   | THD                                | -            | f=1kHz, V <sub>SBAD</sub> =1.5V <sub>P-P</sub> | -         | -40       | -         | dB         |      |
|                             | Operation Reference Voltage   | V <sub>OPR</sub>                   | -            | TNI/TPI=VR<br>VR Reference                     | -1.1      | -1.0      | -0.9      | V          |      |
|                             |   |                                    |              | TNI/TPI=Hi-Z<br>VR Reference                   | -1.2      | -1.1      | -1.0      | V          |      |
|                             | Upper Limit Output Voltage  | V <sub>OH</sub>                    | -            | GND Reference                                  | 3.8       | -         | -         | V          |      |
| RFRP<br>RFRI<br>→ RFRP      | Permissive Load Resistance  | R <sub>LM</sub>                    | -            |  | 10        | -         | -         | kΩ         |      |
|                             | Gain Voltage  | G <sub>V</sub>                     | -            |  | 1.37      | 1.46      | 1.54      | V/V        |      |
|                             | Operation Reference Voltage 1   | V <sub>OPR1</sub>                  | -            | VR Reference,<br>No Signal                     | -1.1      | -1.0      | -0.9      | V          |      |
|                             | Operation Reference Voltage 2   | V <sub>OPR2</sub>                  | -            | VR Reference<br>700kHz, 1.2V <sub>P-P</sub>    | 0.65      | 0.75      | 0.85      | V          |      |
| Permissive Load Resistance  |   | R <sub>LM</sub>                    | -            |  | 10        | -         | -         | kΩ         |      |

# KIA2109F

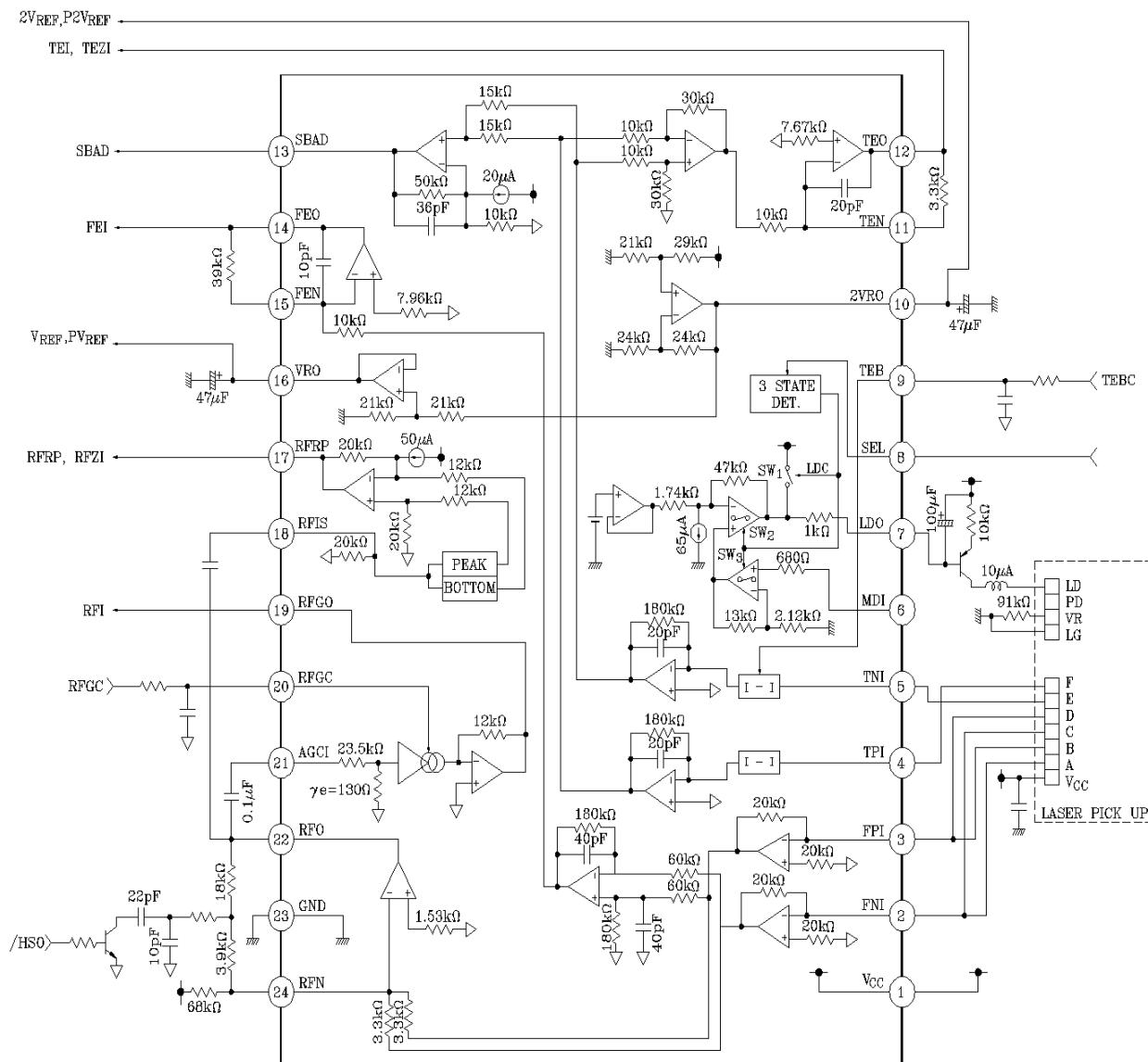
## BLOCK DIAGRAM



| SEL  | LDC |     |     |
|------|-----|-----|-----|
|      | SW1 | SW2 | SW3 |
| L    | ON  | OFF | OFF |
| Hi-Z | OFF | ON  | ON  |
| H    | OFF | ON  | ON  |

# KIA2109F

## APPLICATION CIRCUIT



# KIA2109F

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## PIN FUNCTION

| PIN No. | SYMBOL | I/O | FUNCTIONAL DESCRIPTION   | REMARK                                     |
|---------|--------|-----|--|--|
| 1       | VCC    | -   | Power supply input terminal  | -  |
| 2       | FNI    | I   | Main beam I-V amp input terminal   | connected to pin diode A,C                 |
| 3       | FPI    | I   | Main beam I-V amp input terminal   | connected to pin diode B,D                 |
| 4       | TPI    | I   | Sub beam I-V amp input terminal  | connected to pin diode F                   |
| 5       | TNI    | I   | Sub beam I-V amp input terminal  | connected to pin diode E                   |
| 6       | MDI    | I   | Monitor photo diode amp input terminal   | connected to monitor photo diode           |
| 7       | LDO    | O   | Laser diode amp output terminal  | connected to laser control circuit         |
| 8       | SEL    | I   | Laser diode control signal input terminal and APC circuit ON/OFF control signal input terminal           | 3 signal input (VCC, Hi-Z, VSS)            |
| 9       | TEB    | I   | Tracking error balance adjustment signal input terminal Controlled by 3 PWM signal (PWM carrier=88.2kHz) | 3 signal input (2VREF, VREF, VSS)          |
| 10      | 2VRO   | O   | Reference voltage (2VREF) output terminal<br>2VREF=4.2V when VCC=5V                                      | -  |
| 11      | TEN    | I   | TE amp negative input terminal   | connected to TEO through feedback register |
| 12      | TEO    | O   | TE error signal output terminal  | -  |
| 13      | SBAD   | O   | Sub beam adder signal output terminal  | -  |
| 14      | FEO    | O   | Focus error signal output terminal   | -  |
| 15      | FEN    | I   | FE amp negative input terminal   | connected to FEO through feedback register |
| 16      | VRO    | O   | Reference signal(VREF) output terminal<br>VREF=2.1V when VCC=5V  | -  |
| 17      | RFRP   | O   | Track count signal output terminal   | -  |
| 18      | RFIS   | I   | RFRP detect circuit input terminal   | connected to RFO through condenser         |
| 19      | RFGO   | O   | RF gain signal output terminal   | -  |
| 20      | RGFC   | I   | RF amplitude adjustment control signal input terminal controlled by 3 PWM signal (PWM carrier=88.2kHz)   | 3 signal input (2VREF, VREF, VSS)          |
| 21      | AGCI   | I   | RF signal amplitude adjustment amp input terminal  | connected to RFO through condenser         |
| 22      | RFO    | O   | RF signal output terminal  | -  |
| 23      | GND    | -   | Ground terminal  | -  |
| 24      | RFN    | I   | RF amp negative input terminal   | -  |