

急出货

### RF AMP FOR CDP

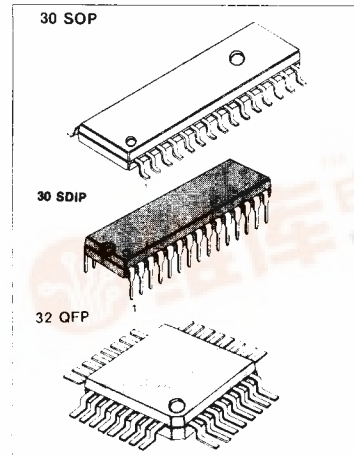
The KA9201, which is the RF amplifier, is a monolithic integrated circuit designed for three-spot type optical pick-up of the compact disc player. It consists of a RF signal processing circuit, Focus Error AMP, Tracking Error AMP, Focus OK Detector, Mirror Detector, Defect Detector, EFM Comparator and automatic power controller for laser diode.

### FEATURES

- Functions: RF AMP
- Focus Error AMP
- Tracking Error AMP
- Focus OK Detector
- Mirror Detector
- Defect Detector
- EFM (Eight to Fourteen Modulation) Comparator
- Automatic Asymmetry Control AMP
- Center Voltage Buffer
- APC (Automatic Power Control) AMP for Photo-Diode and Laser-Diode drive

- Single power supply operation (+5V) as well as split power supply operation ( $\pm 5V$ )
- Low power consumption (100mW at  $\pm 5V$ , 50mW at +5V)
- Built-in automatic power controller use for P-sub and N-sub of the laser diode
- Minimum number of external components required
- Built-in disc defect detection circuit for improvement to play ability
- Recommend operation supply voltage range:  $V_{CC}-V_{EE}$ : 3.4 ~ 11V  
 $V_{CC}-D_{GND}$ : 3.4 ~ 5.5V
- Power Supply Condition:

|                     | $V_{CC}$       | $V_{EE}$       | $V_C$     | $V_R (V_{ref})$ | $D_{GND}$ |
|---------------------|----------------|----------------|-----------|-----------------|-----------|
| Single Power Supply | Power Supply   | GND            | $V_R$     | VC              | GND       |
| Split Power Supply  | + Power Supply | - Power Supply | $D_{GND}$ | No Connecting   | GND       |



### ORDERING INFORMATION

| Device  | Package | Operating Temperature |
|---------|---------|-----------------------|
| KA9201M | 30 SDIP | - 25°C ~ + 75°C       |
| KA9201D | 30 SOP  |                       |
| KA9201Q | 32 QFP  |                       |



BLOCK DIAGRAM

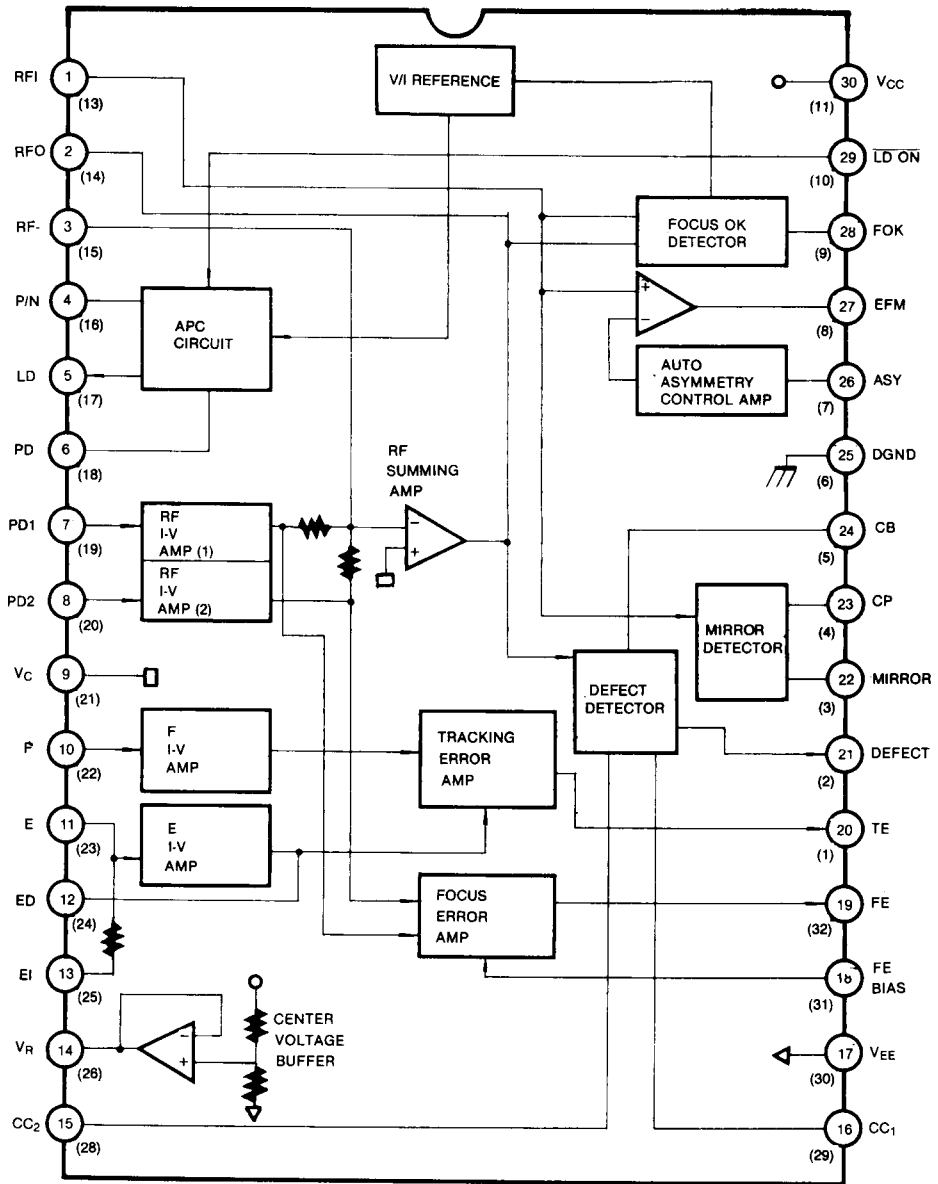


Fig. 1

· PIN12, 27 of 32 QFP is NC

\* The number of ( ) is the TYPE of 32 QFP

## ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

| Characteristic        | Symbol            | Value        | Unit |
|-----------------------|-------------------|--------------|------|
| Supply Voltage        | $V_{CC} - V_{EE}$ | 12           | V    |
| Power Dissipation     | $P_D$             | 800          | mW   |
| Operating Temperature | $T_{OPR}$         | - 25 ~ + 75  | °C   |
| Storage Temperature   | $T_{STG}$         | - 55 ~ + 150 | °C   |

## ELECTRICAL CHARACTERISTICS

(Ta = 25°C,  $V_{CC} = 2.5V$ ,  $V_{EE} = D_{GND} = -2.5V$ ,  $V_C = GND$ , unless otherwise specified)

| Stage              | No | Characteristic             | Symbol          | Test Conditions   | Min    | Typ    | Max   | Unit |
|--------------------|----|----------------------------|-----------------|---|--------|--------|-------|------|
| Circuit Current    | 1  | $V_{CC}$ Current           | $I_{CC}$        | DC Current  | 8.0    | 11.4   | 15.5  | mA   |
|                    | 2  | $V_{EE}$ Current           | $I_{EE}$        |   | - 15.0 | - 11.0 | - 7.5 | mA   |
|                    | 3  | $D_{GND}$ Current          | $I_D (GND)$     |   | - 1.1  | - 0.85 | - 0.6 | mA   |
| RF AMP             | 4  | Input Offset Voltage       | $V_{IO1}$       | DC voltage  | - 50   | 0      | 50    | mV   |
|                    | 5  | Voltage Gain               | $G_{V1}$        | $V_i = 2KHz, 40mV$ sinewave, Output; sinewave                       | 25.1   | 28.1   | 31.1  | dB   |
|                    | 6  | Maximum Output Amplitude   | $V_{O(MAX)1}$   | $V_i = 0.2V$ DC Output; + peak voltage                              | 1.3    |        |       | V    |
|                    | 7  | Maximum Output Amplitude   | $V_{O(MAX)2}$   | $V_i = -0.2V$ DC Output; - peak voltage                             |        |        | - 0.3 | V    |
| Focus Error AMP    | 8  | Input Offset Voltage       | $V_{IO2}$       | DC voltage  | - 20   |        | 120   | mV   |
|                    | 9  | Voltage Gain               | $G_{V2}$        | $V_i = 1KHz, 32mV$ sinewave, Output; sinewave                       | 27     | 30     | 33    | dB   |
|                    | 10 | Voltage Gain               | $G_{V3}$        |   | 27     | 30     | 33    | dB   |
|                    | 11 | Gain Difference            | $\Delta G_{V1}$ |   | - 3    | 0      | 3     | dB   |
|                    | 12 | Maximum Output Amplitude H | $V_{OH(MAX)1}$  | $V_i = -0.2V$ DC Output; - peak voltage                             | 1.9    |        |       | V    |
|                    | 13 | Maximum Output Amplitude L | $V_{OL(MAX)1}$  | $V_i = 0.2V$ DC Output; - peak voltage                              |        |        | - 1.9 | V    |
| Tracking Error AMP | 14 | Input Offset Voltage       | $V_{IO3}$       | DC voltage  | - 50   |        | 50    | mV   |
|                    | 15 | Voltage Gain F             | $G_{V4}$        | $V_i = 1KHz, 0.3V$ sinewave, input to output ratio Output; sinewave | 7      | 10     | 13    | dB   |
|                    | 16 | Voltage Gain E             | $G_{V5}$        |   | 7      | 10     | 13    | dB   |
|                    | 17 | Gain Difference            | $\Delta G_{V2}$ |   | - 3    | 0      | 3     | dB   |
|                    | 18 | Maximum Output Amplitude H | $V_{OH(MAX)2}$  | $V_i = 2.0V$ DC Output; + peak voltage                              | 1.9    |        |       | V    |
|                    | 19 | Maximum Output Amplitude L | $V_{OL(MAX)2}$  | $V_i = -2.0V$ DC Output; - peak voltage                             |        |        | - 1.9 | V    |

## ELECTRICAL CHARACTERISTICS (Continued)

| Stage         | No                         | Characteristic                    | Symbol   | Test Conditions   | Min   | Typ  | Max  | Unit |
|---------------|----------------------------|-----------------------------------|--|---|---|------|------|------|
| APC<br>AMP    | 20                         | Output Voltage 1                  | $V_{O1}$   | $V_i = 190\text{mV DC}$   | 1.4   |      |      | V    |
|               | 21                         | Output Voltage 2                  | $V_{O2}$   | $V_i = 90\text{mV DC}$  |   |      | -1.4 | V    |
|               | 22                         | Output Voltage 3                  | $V_{O3}$   | $V_i = 100\text{mV DC}$   | 1.4   |      |      | V    |
|               | 23                         | Output Voltage 4                  | $V_{O4}$   | $V_i = 170\text{mV DC}$   |   |      | -1.4 | V    |
|               | 24                         | Output Voltage 5                  | $V_{O5}$   | $V_i = 0\text{V DC}$  | 1.4   |      |      | V    |
|               | 25                         | Output Voltage 6                  | $V_{O6}$   | $V_i = 0\text{V DC}$  |   |      | -1.4 | V    |
|               | 26                         | Maximum Output Amplitude H        | $V_{OH(MAX)3}$   | $V_a = 0\text{V}$ , $I_a = -0.8\text{mA}$<br>Output; + peak voltage   | 0   |      |      | V    |
| 27            | Maximum Output Amplitude L | $V_{OL(MAX)3}$                    | $V_a = 0.6\text{V}$ , $I_a = 0.8\text{mA}$<br>Output; - peak voltage |   |   | 0    | V    |      |
| Focus<br>OK   | 28                         | Threshold Voltage                 | $V_{TH1}$  | $V_i = \text{output } (V_{CC} + D_{GND})/2$<br>must be adjusted by<br>the DC voltage across<br>RFI and RFO      | -430  | -390 | -350 | mV   |
|               | 29                         | High Output Voltage               | $V_{OH(FOK)1}$   | Input across RFI and<br>RFO 1V, 375mV/(DC)<br>sinewave,<br>Output; pulse  | 2.2   |      |      | V    |
|               | 30                         | Low Output Voltage                | $V_{OL(FOK)1}$   |   |   |      | 1.8  | V    |
|               | 31                         | Maximum Operating Frequency       | $f_{(MAX)}$  |   | 45  |      |      | KHz  |
| Mirror<br>AMP | 32                         | High Output Voltage               | $V_{OH(MIR)1}$   |   | $V_i = 10\text{KHz } 0.8\text{V}$ , $-0.4\text{V(DC)}$<br>sinewave, Output; pulse | 1.8  |      |      |
|               | 33                         | Low Output Voltage                | $V_{OL(MIR)1}$   |   |   |      | -2.2 | V    |
|               | 34                         | Mirror Hold Frequency Response    | $f_{RES(M)}$   | $V_i = 0.8\text{V}$ , $0.2\text{V(DC)}$ ,<br>$f(\text{carrier}) = 500\text{KHz AM}$<br>modulation Output; pulse |   | 400  | 600  | Hz   |
|               | 35                         | Bottom Hold Frequency Response    | $f_{RES(B)}$   | $V_i = 0.8\text{V}$ , $0.4\text{V(DC)}$<br>sinewave, Output; pulse  |   | 500  | 900  | Hz   |
|               | 36                         | Maximum Input Operating Frequency | $f_{I(MAX)1}$  |   | 30  | 70   |      | KHz  |
|               | 37                         | Minimum Input Voltage             | $V_{I(MIN)1}$  | $V_i = 10\text{KHz}$ , $0.4\text{V(DC)}$<br>sinewave, Output; pulse   |   | 0.1  | 0.2  | V    |
|               | 38                         | Maximum Input Voltage             | $V_{I(MAX)1}$  |   | 1.8   |      |      | V    |
| Defect<br>AMP | 39                         | High Output Voltage               | $V_{OH(DEF)1}$   | $V_i = 32\text{mV}$ , $+15\text{mV(DC)}$<br>sinewave,<br>Output; pulse  | 1.8   |      |      | V    |
|               | 40                         | Low Output Voltage                | $V_{OL(DEF)1}$   |   |   |      | -2.2 | V    |

## ELECTRICAL CHARACTERISTICS (Continued)

| Stage   | No | Characteristic                    | Symbol         | Test Conditions   | Min  | Typ | Max  | Unit |
|---|----|-----------------------------------|----------------|---|------|-----|------|------|
| Defect AMP  | 41 | Minimum Input Operating Frequency | $f_{i(MIN)2}$  | $V_i = 32mV, +15mV(DC)$ sinewave, Output; pulse               |      | 670 | 1000 | Hz   |
|   | 42 | Maximum Input Operating Frequency | $f_{i(MAX)2}$  |   | 2.0  | 4.7 |      | KHz  |
|   | 43 | Minimum Input Voltage             | $V_{i(MIN)2}$  | $V_i = 50Hz, 15mV(DC)$ pulsewave, symmetry; 95% Output; pulse |      | 0.3 | 0.5  | V    |
|   | 44 | Maximum Input Voltage             | $V_{i(MAX)2}$  |   | 1.8  |     |      | V    |
| EFM Comparator  | 45 | Duty Cycle 1                      | $D_1$          | $V_i = 750KHz, 0.7V$ sinewave, Output; DC voltage             | -50  | 0   | 50   | mV   |
|   | 46 | Duty Cycle 2                      | $D_2$          | $V_i = 750KHz, 0.7V, +0.25V(DC)$ sinewave Output; DC voltage  | 0    | 50  | 100  | mV   |
|   | 47 | High Output Voltage               | $V_{OH(EFM)1}$ | $V_i = 750KHz, 0.7V$ sinewave Output; pulse                   | 1.2  |     |      | V    |
|   | 48 | Low Output Voltage                | $V_{OL(EFM)1}$ |   |      |     | -1.2 | V    |
|   | 49 | Minimum Input Voltage             | $V_{i(MIN)3}$  | $V_i = 750KHz$ sinewave Output; pulse                         |      |     | 0.12 | V    |
|   | 50 | Maximum Input Voltage             | $V_{i(MAX)3}$  |   | 1.8  |     |      | V    |
| Center Voltage Buffer   | 51 | Maximum Input Operating Frequency | $f_{i(MAX)3}$  | $V_i = 750KHz, 0.7V$ sinewave, Output; pulse                  | 4.0  |     |      | MHz  |
|   | 52 | Input Offset Voltage              | $V_{IO4}$      | DC voltage  | -100 | 0   | 100  | mV   |
|   | 53 | Maximum Output Current (+)        | $I_{O+(MAX)}$  |   | 5    |     |      | mA   |
|   | 54 | Maximum Output Current (-)        | $I_{O-(MAX)}$  |   |      |     | -5   | mA   |
| (Ta = 25°C, V <sub>CC</sub> = 5.0V, V <sub>EE</sub> = -5.0V, D <sub>GND</sub> = VC = GND, unless otherwise specified) |    |                                   |                |   |      |     |      |      |
| RF AMP  | 55 | Maximum Output Amplitude (H)      | $V_{OH(MAX)4}$ | $V_i = 0.2V$ DC Output; DC voltage                            | 3.5  |     |      | V    |
|   | 56 | Maximum Output Amplitude (L)      | $V_{OL(MAX)4}$ | $V_i = -0.2V$ DC Output; DC voltage                           |      |     | 0.3  | V    |
| Focus Error AMP   | 57 | Maximum Output Amplitude (H)      | $V_{OH(MAX)5}$ | $V_i = -0.2V$ DC Output; DC voltage                           | 4.2  |     |      | V    |
|   | 58 | Maximum Output Amplitude (L)      | $V_{OL(MAX)5}$ | $V_i = 0.2V$ DC Output; DC voltage                            |      |     | -2.2 | V    |
| Tracking Error AMP  | 59 | Maximum Output Amplitude (H)      | $V_{OH(MAX)6}$ | $V_i = 2.0V$ DC Output; DC voltage                            | 4.2  |     |      | V    |
|   | 60 | Maximum Output Amplitude (L)      | $V_{OL(MAX)6}$ | $V_i = -2.0V$ DC Output; DC voltage                           |      |     | -2.2 | V    |

## ELECTRICAL CHARACTERISTICS (Continued)

| Stage              | No | Characteristic             | Symbol         | Test Conditions  | Min  | Typ  | Max  | Unit |
|--------------------|----|----------------------------|----------------|--|------|------|------|------|
| APC<br>AMP         | 61 | Output Voltage 7           | $V_{O7}$       | $V_i = 190\text{mV DC}$<br>Output DC voltage   | 1.4  |      |      | V    |
|                    | 62 | Output Voltage 8           | $V_{O8}$       | $V_i = 90\text{mV DC}$<br>Output DC voltage  |      |      | -1.4 | V    |
|                    | 63 | Output Voltage 9           | $V_{O9}$       | $V_i = 100\text{mV DC}$<br>Output DC voltage   | 1.4  |      |      | V    |
|                    | 64 | Output voltage 10          | $V_{O10}$      | $V_i = 170\text{mV DC}$<br>Output DC voltage   |      |      | -1.4 | V    |
|                    | 65 | Output Voltage 11          | $V_{O11}$      | $V_i = 0\text{V DC}$<br>Output DC voltage  | 3.8  |      |      | V    |
|                    | 66 | Output Voltage 12          | $V_{O12}$      | $V_i = 190\text{mV DC}$<br>Output DC voltage   |      |      | -3.8 | V    |
|                    | 67 | Maximum Output Amplitude H | $V_{OH(MAX)7}$ | $V_a = 0\text{V DC}$ , $I_a = -0.8\text{mA}$<br>Output; DC voltage   | 2.5  |      |      | V    |
|                    | 68 | Maximum Output Amplitude L | $V_{OL(MAX)7}$ | $V_a = 0.6\text{V DC}$ , $I_a = 0.8\text{mA}$<br>Output; DC voltage  |      |      | -2.5 | V    |
| Focus<br>OK<br>AMP | 69 | Threshold Voltage          | $V_{TH2}$      | Input DC voltage; output<br>( $V_{CC} + D_{GND}$ )/2 must be<br>adjusted by the DC voltage<br>across RFI And RFO | -430 | -390 | -350 | mV   |
|                    | 70 | High Output Voltage        | $V_{OH(FOK)2}$ | $V_i = 1\text{V}$ , $-375\text{mV(DC)}$<br>across RFI and RFO;<br>sinewave, Output; pulse                        | 4.7  |      |      | V    |
|                    | 71 | Low Output Voltage         | $V_{OL(FOK)2}$ |  |      |      | 0.7  | V    |
| Mirror<br>AMP      | 72 | High Output Voltage        | $V_{OH(MIR)2}$ | $V_i = 10\text{KHz } 0.8\text{V}$ , $-0.4\text{V(DC)}$<br>sinewave, Output; pulse                                | 4.3  |      |      | V    |
|                    | 73 | Low Output Voltage         | $V_{OL(MIR)2}$ |  |      |      | 0.3  | V    |
| Defect<br>AMP      | 74 | High Output Voltage        | $V_{OH(DEF)2}$ | $V_i = 1\text{KHz } 32\text{mV}$ , $+15\text{mV(DC)}$<br>sinewave, Output; pulse                                 | 4.3  |      |      | V    |
|                    | 75 | Low Output Voltage         | $V_{OL(DEF)2}$ |  |      |      | -0.3 | V    |
| EFM<br>Comparator  | 76 | Duty 3                     | $D_3$          | $V_i = 750\text{KHz } 0.7\text{V}$ sinewave<br>Output; DC voltage  | 2.45 | 2.50 | 2.55 | V    |
|                    | 77 | Duty 4                     | $D_4$          | $V_i = 750\text{KHz } 0.7\text{V}$ , $+0.25\text{V(DC)}$<br>sinewave Output; pulse                               | 2.50 | 2.55 | 2.60 | V    |
|                    | 78 | High Output Voltage        | $V_{OH(EFM)2}$ | $V_i = 750\text{KHz } 0.7\text{V}$ ,<br>sinewave, Output; pulse  | 3.7  |      |      | V    |
|                    | 79 | Low Output Voltage         | $V_{OL(EFM)2}$ |  |      |      | 1.3  |      |

TEST CIRCUIT

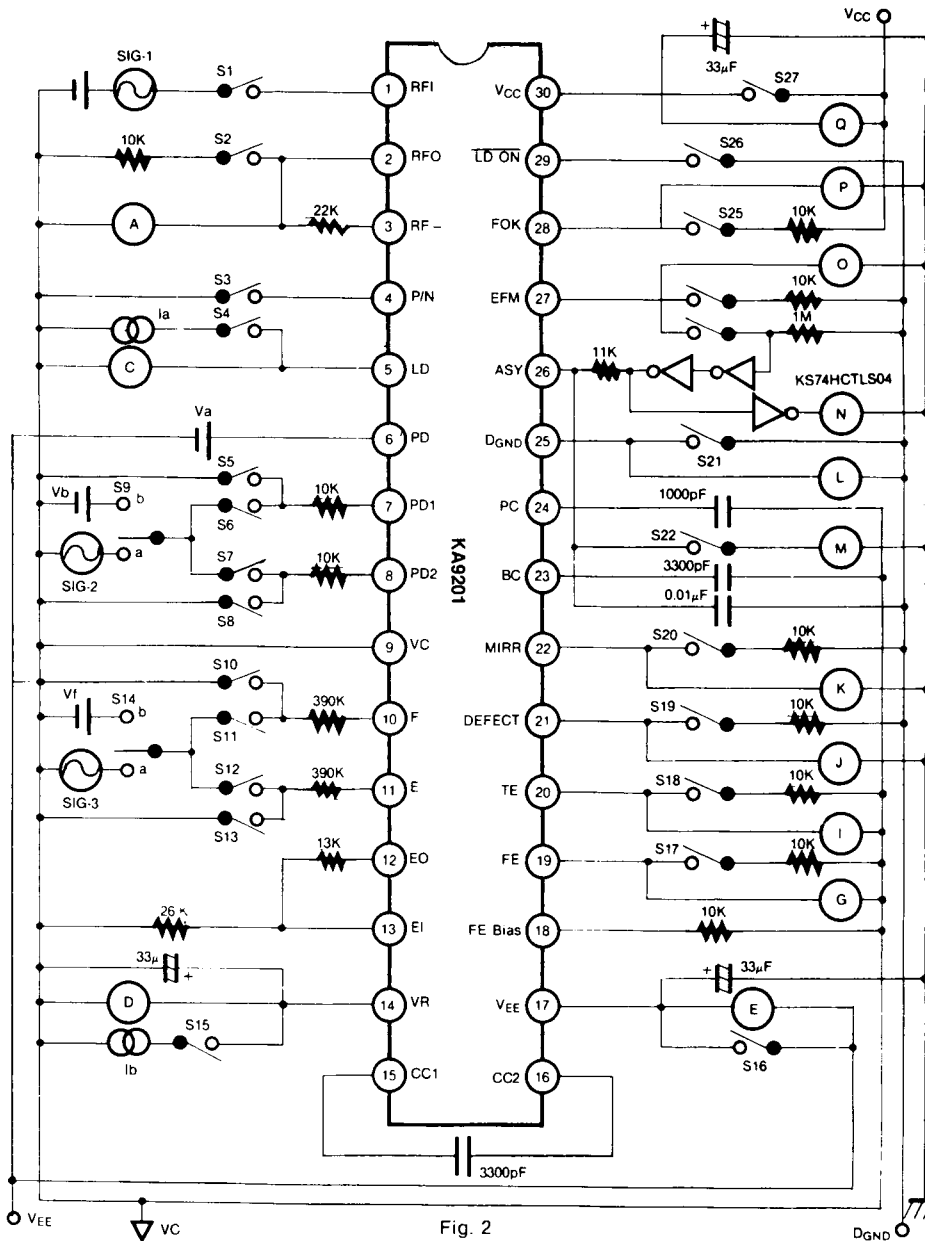


Fig. 2

\*) Note: KS74HCTLS04: Supply Voltage = 5V

TEST METHODE (SWITCH CONDITION) ( $V_{CC} = 2.5V$ ,  $V_{EE} = D_{GND} = -2.5V$ ,  $V_C = GND$ )

| Stage              | No | Characteristic  | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | S13 | S14 | S15 | S16 | S17 | S18 | S19 | S20 | S21 | S22 | S23 | S24 | S25 | S26 | S27 | Input | Test Point |  |       |   |
|--------------------|----|-----------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|------------|--|-------|---|
| Circuit Current    | 1  | $I_{CC}$        |    |    | ON |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | —     | Q |
|                    | 2  | $I_{EE}$        |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | —     | E |
|                    | 3  | $I_{b(GND)}$    |    |    | ON |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | —     | L |
|                    | 4  | $V_{or}$        |    |    | ON |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | —     | A |
| RF AMP             | 5  | $G_{r1}$        |    |    |    | ON | ON |    |    |    |    |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-2 | A |
|                    | 6  | $V_{O(MAX)1}$   |    | ON |    |    | ON | ON | b  |    |    |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_b$ | A |
|                    | 7  | $V_{O(MAX)2}$   |    | ON |    |    | ON | ON | b  |    |    |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_b$ | A |
|                    | 8  | $V_{o2}$        |    |    |    |    |    |    |    |    | ON | a   |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | —     | G |
| Focus Error AMP    | 9  | $G_{v2}$        |    |    |    | ON |    |    |    |    |    |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-2 | G |
|                    | 10 | $G_{v3}$        |    |    |    | ON |    |    |    |    | a  |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-2 | G |
|                    | 11 | $\Delta G_{v1}$ |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     |     |     |     |       |            |  |       |   |
|                    | 12 | $V_{OH(MAX)1}$  |    |    |    |    | ON |    |    |    | ON | b   |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_b$ | G |
| Tracking Error AMP | 13 | $V_{OL(MAX)1}$  |    |    |    |    | ON |    |    | ON | b  |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_b$ | G |
|                    | 14 | $V_{o3}$        |    |    | ON |    |    |    |    |    |    |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | —     | I |
|                    | 15 | $G_{v4}$        |    |    |    |    |    |    |    |    |    | ON  |     |     |     | a   |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-3 | I |
|                    | 16 | $G_{v5}$        |    |    |    |    |    |    |    |    |    | ON  |     |     |     | a   |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-3 | I |
| APC AMP            | 17 | $\Delta G_{v2}$ |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |       |            |  |       |   |
|                    | 18 | $V_{OH(MAX)2}$  |    |    |    |    |    |    |    |    |    | ON  |     |     |     | b   |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_t$ | I |
|                    | 19 | $V_{OL(MAX)2}$  |    |    |    |    |    |    |    |    |    | ON  |     |     |     | b   |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_t$ | I |
|                    | 20 | $V_{o1}$        |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_a$ | C |
| Focus OK AMP       | 21 | $V_{o2}$        |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_a$ | C |
|                    | 22 | $V_{o3}$        |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_a$ | C |
|                    | 23 | $V_{o4}$        |    |    | ON |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_a$ | C |
|                    | 24 | $V_{o5}$        |    |    | ON |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_a$ | C |
| Mirror AMP         | 25 | $V_{o6}$        |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_a$ | C |
|                    | 26 | $V_{OH(MAX)3}$  |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_a$ | C |
|                    | 27 | $V_{OL(MAX)3}$  |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | $V_a$ | C |
|                    | 28 | $V_{tH}$        |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | P |
| Focus Error AMP    | 29 | $V_{OH(FOR)1}$  |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | P |
|                    | 30 | $V_{OL(FOR)1}$  |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | P |
|                    | 31 | $f_{MAX}$       |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | P |
|                    | 32 | $V_{OH(MIR)1}$  |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | K |
| Mirror AMP         | 33 | $V_{OL(MIR)1}$  |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | K |
|                    | 34 | $f_{RES(M)}$    |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | K |
|                    | 35 | $f_{RES(IB)}$   |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | K |
|                    | 36 | $f_{I(MAX)1}$   |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | K |
| Mirror AMP         | 37 | $f_{I(MIR)1}$   |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | K |
|                    | 38 | $V_{I(MAX)1}$   |    | ON |    |    |    |    |    |    |    |     |     |     |     |     |     | ON  | ON  | ON  | ON  | ON  |     |     |     |     | ON  | ON  |     |       |            |  | SIG-1 | K |



TEST METHODE (SWITCH CONDITION) (Continued)

| Stage  | No              | Characteristic  | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | S13 | S14 | S15 | S16 | S17 | S18 | S19 | S20 | S21 | S22 | S23 | S24 | S25 | S26   | S27    | Input | Test Point |
|--|-----------------|-----------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--------|-------|------------|
| Defect AMP   | 39              | $V_{OH}(DEF) 1$ |    |    |    |    |    | ON | ON |    | a  |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-2  | J     |            |
|  | 40              | $V_{OL}(DEF) 1$ |    |    |    |    | ON | ON | ON | a  |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-2  | J     |            |
|  | 41              | $I_{I(MIN) 2}$  |    |    |    |    | ON | ON | ON | a  |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-2  | J     |            |
|  | 42              | $I_{I(MAX) 2}$  |    |    |    |    | ON | ON | ON | a  |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-2  | J     |            |
|  | 43              | $V_{I(MIN) 2}$  |    |    |    |    | ON | ON | ON | a  |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-2  | J     |            |
| EFM Comparator                                       | 44              | $V_{I(MAX) 2}$  |    |    |    |    | ON | ON | ON | a  |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-2  | J     |            |
|  | 45              | $D_1$           |    | ON |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | M     |            |
|  | 46              | $D_2$           |    | ON |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | M     |            |
|  | 47              | $V_{OH}(EFM) 1$ |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | O     |            |
|  | 48              | $V_{OL}(EFM) 1$ |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | O     |            |
| Center Voltage Buffer                                | 49              | $V_{I(MIN) 3}$  |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | N     |            |
|  | 50              | $V_{I(MAX) 3}$  |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | N     |            |
|  | 51              | $I_{I(MAX) 3}$  |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | N     |            |
|  | 52              | $V_{OH}$        |    | ON |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | -      | D     |            |
|  | 53              | $I_{O-(MAX)}$   |    | ON |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | lb     | D     |            |
| 54   | $I_{O-(MIN)}$   |                 | ON |    |    |    |    |    |    |    |    |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON  | lb    | D      |       |            |
| $V_{CC} = 5.0V, V_{EE} = -5.0V, D_{DRD} = V_C = GND$ |                 |                 |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |       |        |       |            |
| RF AMP   | 55              | $V_{OH}(MAX) 4$ |    |    |    |    |    | ON | ON |    | b  |     |     |     |     |     | ON  |     |     |     |     | ON  |     |     |     |     |     | ON    | Vb     | A     |            |
|  | 56              | $V_{OL}(MAX) 4$ |    |    |    |    | ON | ON | ON |    | b  |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Vb     | A     |            |
| Focus Error AMP                                      | 57              | $V_{OH}(MAX) 5$ |    |    |    |    |    | ON | ON |    | b  |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Vb     | G     |            |
|  | 58              | $V_{OL}(MAX) 5$ |    |    |    |    |    | ON | ON |    | b  |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Vb     | G     |            |
| Tracking Error AMP                                   | 59              | $V_{OH}(MAX) 6$ |    |    |    |    |    |    |    |    |    | ON  |     |     | ON  | b   |     |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Vt     | I     |            |
|  | 60              | $V_{OL}(MAX) 6$ |    |    |    |    |    |    |    |    |    | ON  |     |     | ON  | b   |     |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Vt     | I     |            |
| APC AMP  | 61              | $V_{O7}$        |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Va     | C     |            |
|  | 62              | $V_{O8}$        |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Va     | C     |            |
|  | 63              | $V_{O9}$        |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Va     | C     |            |
|  | 64              | $V_{O10}$       |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Va     | C     |            |
|  | 65              | $V_{O11}$       |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Va     | C     |            |
| Focus OK AMP   | 66              | $V_{O12}$       |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Va     | C     |            |
|  | 67              | $V_{OH}(MAX) 7$ |    |    |    |    |    | ON | ON |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Va, la | C     |            |
|  | 68              | $V_{OL}(MAX) 7$ |    |    |    |    |    | ON | ON |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | Va, la | C     |            |
|  | 69              | $V_{I12}$       |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     | ON  |     |     | ON    | SIG-1  | P     |            |
|  | 70              | $V_{OH}(FOK) 2$ |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-1  | P     |            |
| Mirror AMP   | 71              | $V_{OL}(FOK) 2$ |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-1  | P     |            |
|  | 72              | $V_{OH}(MIR) 2$ |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-1  | K     |            |
|  | 73              | $V_{OL}(MIR) 2$ |    |    |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-1  | K     |            |
| Defect AMP   | 74              | $V_{OH}(DEF) 2$ |    |    |    |    |    |    |    |    | a  |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-2  | J     |            |
|  | 75              | $V_{OL}(DEF) 2$ |    |    |    |    |    |    |    |    | a  |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     |     |     |     |     | ON    | SIG-2  | J     |            |
| EFM Comparator                                       | 76              | $D_3$           |    | ON |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | M     |            |
|  | 77              | $D_4$           |    | ON |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | M     |            |
|  | 78              | $V_{OH}(EFM) 2$ |    | ON |    |    |    |    |    |    |    |     |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON    | SIG-1  | O     |            |
| 79   | $V_{OL}(EFM) 2$ |                 | ON |    |    |    |    |    |    |    |    |     |     |     |     | ON  |     |     | ON  |     | ON  |     | ON  | ON  |     |     | ON  | SIG-1 | O      |       |            |

APPLICATION CIRCUIT

1) +5V Single Power Supply for P-sub Laser Diode

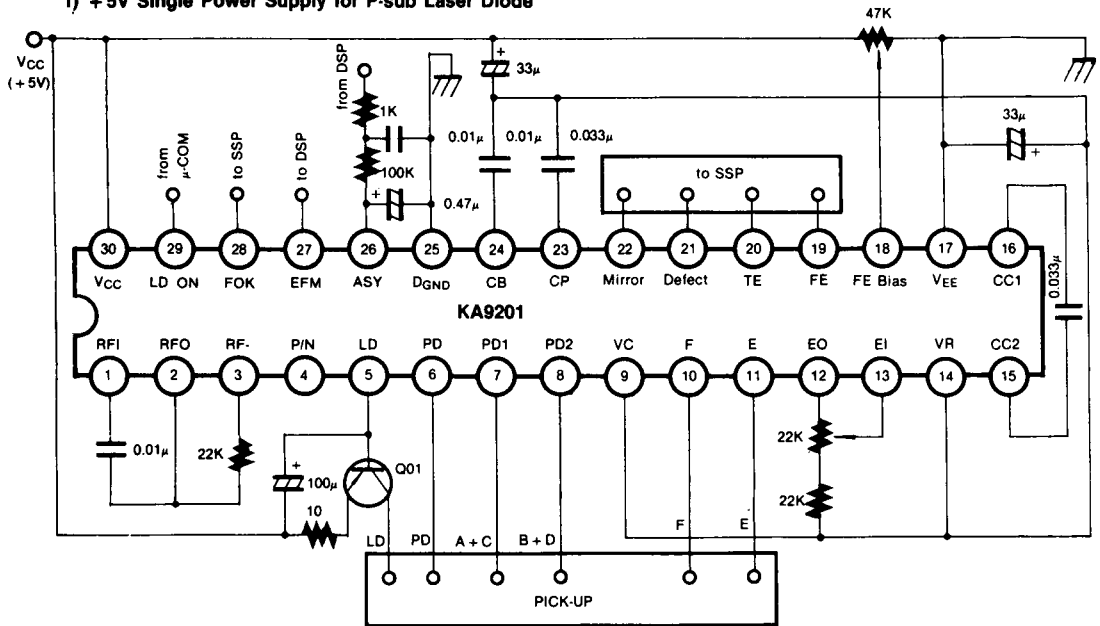


Fig. 3

2) +5V Single Power Supply for N-sub Laser Diode

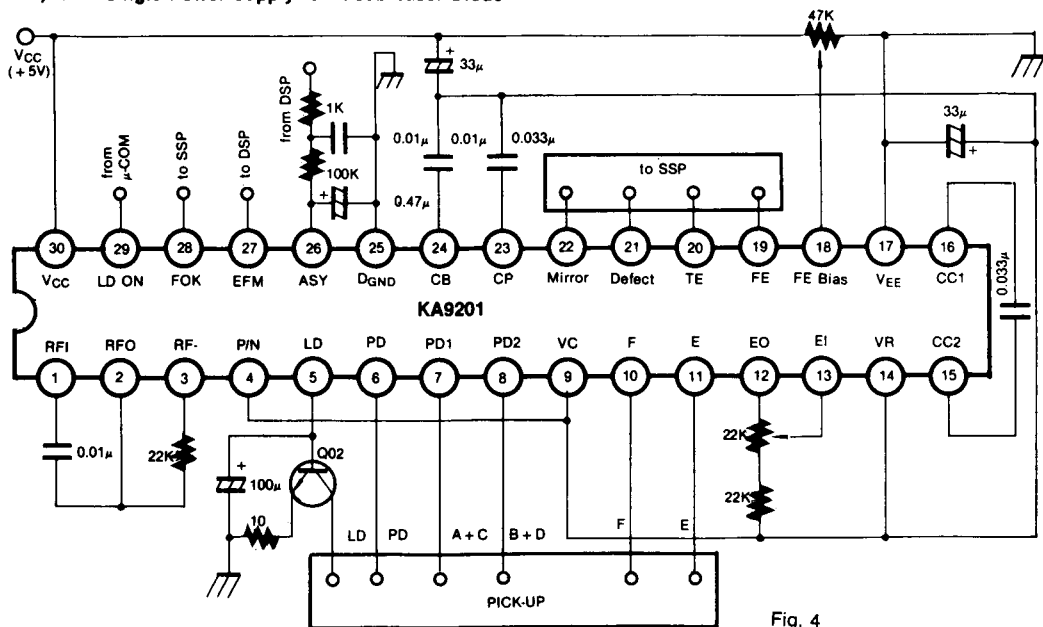


Fig. 4



Datasheets for electronics components.