

## INTRODUCTION

The KA22900/D is a monolithic integrated circuit which consists of a 3V one-chip tuner and FM multiplex for AM/FM radios and head-phone radios.

## FUNCTIONS

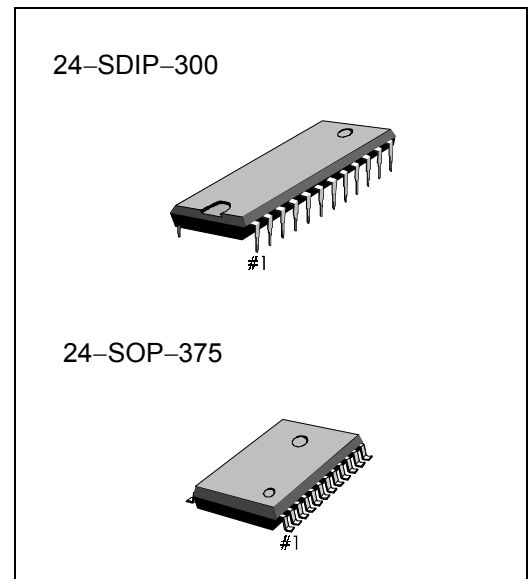
- FM Stage: RF/IF/AF amp, Quadrature Detector, MIX, OSC, Tuning Indicator.
- AM Stage: RF/IF/AF amp, Detector, MIX, OSC, AGC, Tuning Indicator.
- MPX Stage: PLL amp, Decoder, Flip Flop, VCO Stop, Phase Detector, Stereo Indicator.

## FEATURES

- 3 V one-chip tuner with built-in FM Multiplex
- No AM detect coil, IF coupling capacitor, FM IF by-pass capacitor needed
- Built-in tuning indicator function
- Built-in AM/FM selection switch
- Minimum number of external parts required
- Wide operating voltage range:  $V_{CC} = 1.8V \sim 7V$
- Low distortion (FM IF: 0.4%, AM IF: 1%, 0.2% (Typ))

## OPDERING INFORMATION

| Device   | Package     | Operature Temperature |
|----------|-------------|-----------------------|
| KA22900  | 24-SDIP-300 | - 20°C ~ +75°C        |
| KA22900D | 24-SOP-375  |                       |



## BLOCK DIAGRAM

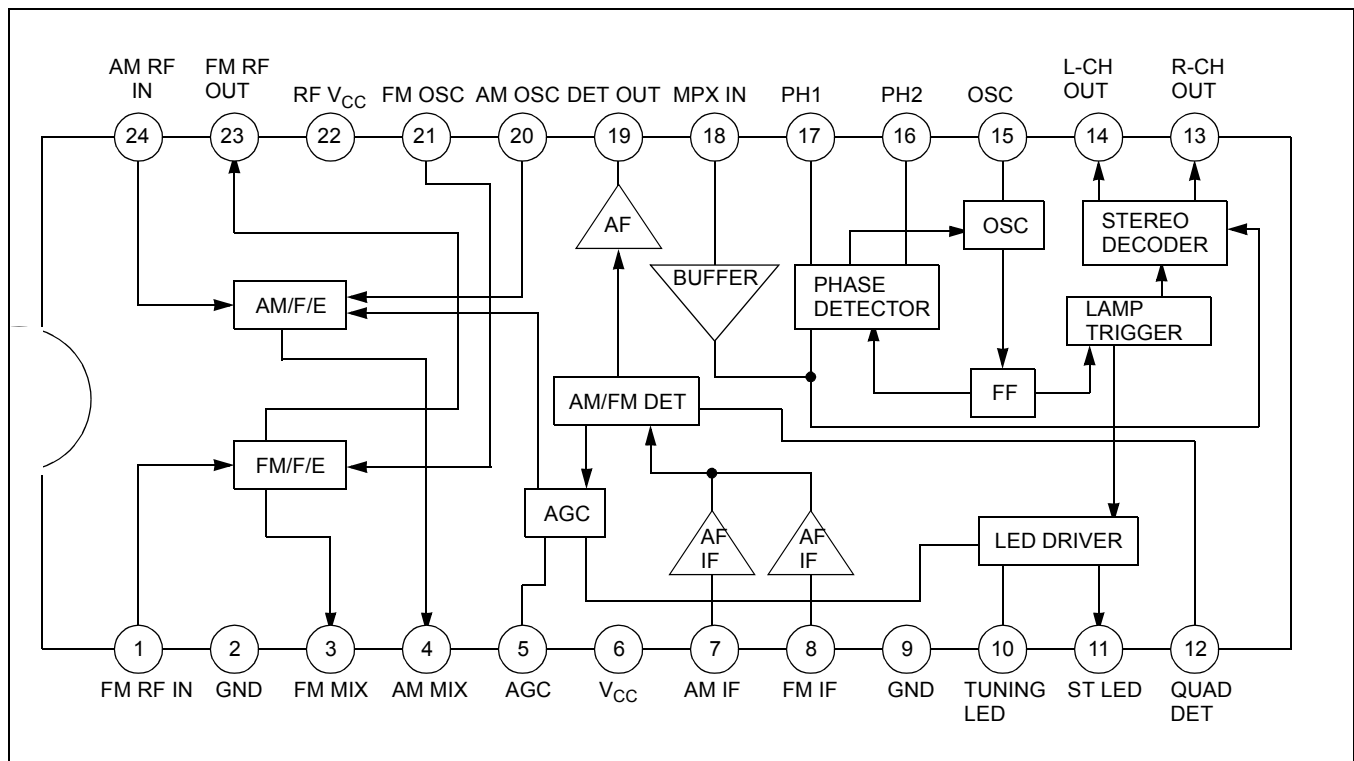


Figure 1.

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

| Characteristic        | Symbol           | Value      | Unit |
|-----------------------|------------------|------------|------|
| Supply Voltage        | V <sub>CC</sub>  | 8          | V    |
| Power Dissipation     | P <sub>D</sub>   | 1200       | mW   |
| Operating Temperature | T <sub>OPR</sub> | -20 ~ +75  | °C   |
| Storage Temperature   | T <sub>STG</sub> | -55 ~ +150 | °C   |
| LED Driver Voltage    | V <sub>DR</sub>  | 10         | V    |
| LED Driver Current    | I <sub>DR</sub>  | 10         | mA   |

## ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V<sub>CC</sub> = 3V, unless otherwise specified)

- FM F/E: f = 98MHz, fm = 1kHz, f = 22.5kHz, AM: f = 1kHz, 30 % Mod
- FM IF: f = 10.7MHz, fm = 1kHz, f = 22.5kHz, MPX: f = 1kHz, L + R = 90 %, P = 10%, V<sub>I</sub> = 150mV

| Characteristic            |                            | Symbol               | Test Conditions                    | Min. | Typ. | Max. | Unit            | Test Circuit |
|---------------------------|----------------------------|----------------------|------------------------------------|------|------|------|-----------------|--------------|
| Quiescent Circuit Current |                            | I <sub>CCQ1</sub>    | FM, V <sub>I</sub> = 0             | 8.4  | 13.2 | 20.0 | mA              | 1            |
|                           |                            | I <sub>CCQ2</sub>    | AM, V <sub>I</sub> = 0             | 4.4  | 8.4  | 13.4 | mA              | 1            |
| F/E                       | -3 dB Limiting Sensitivity | V <sub>I(LIM)1</sub> | V <sub>O</sub> = -3dB              | -    | 10   | -    | dB <sub>μ</sub> | 1            |
|                           | Oscillation Voltage        | V <sub>OSC</sub>     | f <sub>OSC</sub> = 98MHz           | 40   | 70   | 110  | mV              | 2            |
| FM<br>IF                  | -3 dB Limiting Sensitivity | V <sub>I(LIM)2</sub> | V <sub>O</sub> = -3dB              | 40   | 46   | 53   | dB <sub>μ</sub> | 1            |
|                           | Detector Output Voltage    | V <sub>O(DET)1</sub> | V <sub>I</sub> = 80dB <sub>μ</sub> | 55   | 80   | 110  | mV              | 1            |
|                           | Signal to Noise Ratio      | S/N <sub>1</sub>     | V <sub>I</sub> = 80dB <sub>μ</sub> | 60   | 70   | -    | dB              | 1            |
|                           | Total Harmonic Distortion  | THD <sub>1</sub>     | V <sub>I</sub> = 80dB <sub>μ</sub> | -    | 0.4  | 1    | %               | 1            |
|                           | AM Rejection Ratio         | AMR                  | V <sub>I</sub> = 80dB <sub>μ</sub> | 22   | 32   | -    | dB              | 1            |
|                           | Tuning Indication Voltage  | V <sub>LI</sub>      | I <sub>LED</sub> = 1mA             | 45   | 51   | 56   | dB <sub>μ</sub> | 1            |
| AM<br>IF                  | Voltage Gain               | G <sub>V1</sub>      | V <sub>I</sub> = 26dB <sub>μ</sub> | 40   | 70   | 110  | mV              | 1            |
|                           | Detector Output Voltage    | V <sub>O(DET)2</sub> | V <sub>I</sub> = 60dB <sub>μ</sub> | 55   | 80   | 110  | mV              | 1            |
|                           | Signal to Noise Ratio      | S/N <sub>2</sub>     | V <sub>I</sub> = 60dB <sub>μ</sub> | 32   | 42   | -    | dB              | 1            |
|                           | Total Harmonic Distortion  | THD <sub>2</sub>     | V <sub>I</sub> = 60dB <sub>μ</sub> | -    | 1    | 2    | %               | 1            |
|                           | Tuning Indication Voltage  | V <sub>L2</sub>      | I <sub>LED</sub> = 1mA             | 20   | 25   | 30   | dB <sub>μ</sub> | 1            |

|                       | Characteristic            | Symbol       | Test Conditions   | Min.    | Typ.    | Max.    | Unit | Test Circuit |
|-----------------------|---------------------------|--------------|-------------------|---------|---------|---------|------|--------------|
| MPX                   | Maximum Input Voltage     | $V_{I(MAX)}$ | Stereo, THD = 3%  | 250     | 350     | –       | mV   | 1            |
|                       | Channel Separation        | $CS_1$       | Stereo, f = 100Hz | 35      | 42      | –       | dB   | 1            |
|                       |                           | $CS_2$       | Stereo, f = 1kHz  | 35      | 42      | –       | dB   | 1            |
|                       |                           | $CS_3$       | Stereo, f = 10kHz | 35      | 42      | –       | dB   | 1            |
|                       | Total Harmonic Distortion | $THD_3$      | Mono              | –       | 0.2     | 1       | %    | 1            |
|                       |                           | $THD_4$      | Stereo            | –       | 0.2     | 1       | %    | 1            |
|                       | Voltage Gain              | $G_{V2}$     | Mono              | –5      | –3      | –1      | dB   | 1            |
|                       | Channel Balance           | CB           | Mono              | –2      | 0       | 2       | dB   | 1            |
|                       | Lamp on Level             | $V_{L(ON)}$  | Pilot only        | –       | 8       | 16      | mV   | 1            |
|                       |                           | $V_{L(OFF)}$ | Pilot only        | 2       | 6       | –       | mV   | 1            |
|                       | Lamp Hysteresis           | HY           | –                 | –       | 2       | –       | mV   | 1            |
|                       | Capture Range             | CR           | Pilot only        | $\pm 1$ | $\pm 3$ | $\pm 5$ | %    | 1            |
| Signal to Noise Ratio | $S/N_3$                   | Mono         | 60                | 70      | –       | dB      | 1    |              |

TEST CIRCUIT 1

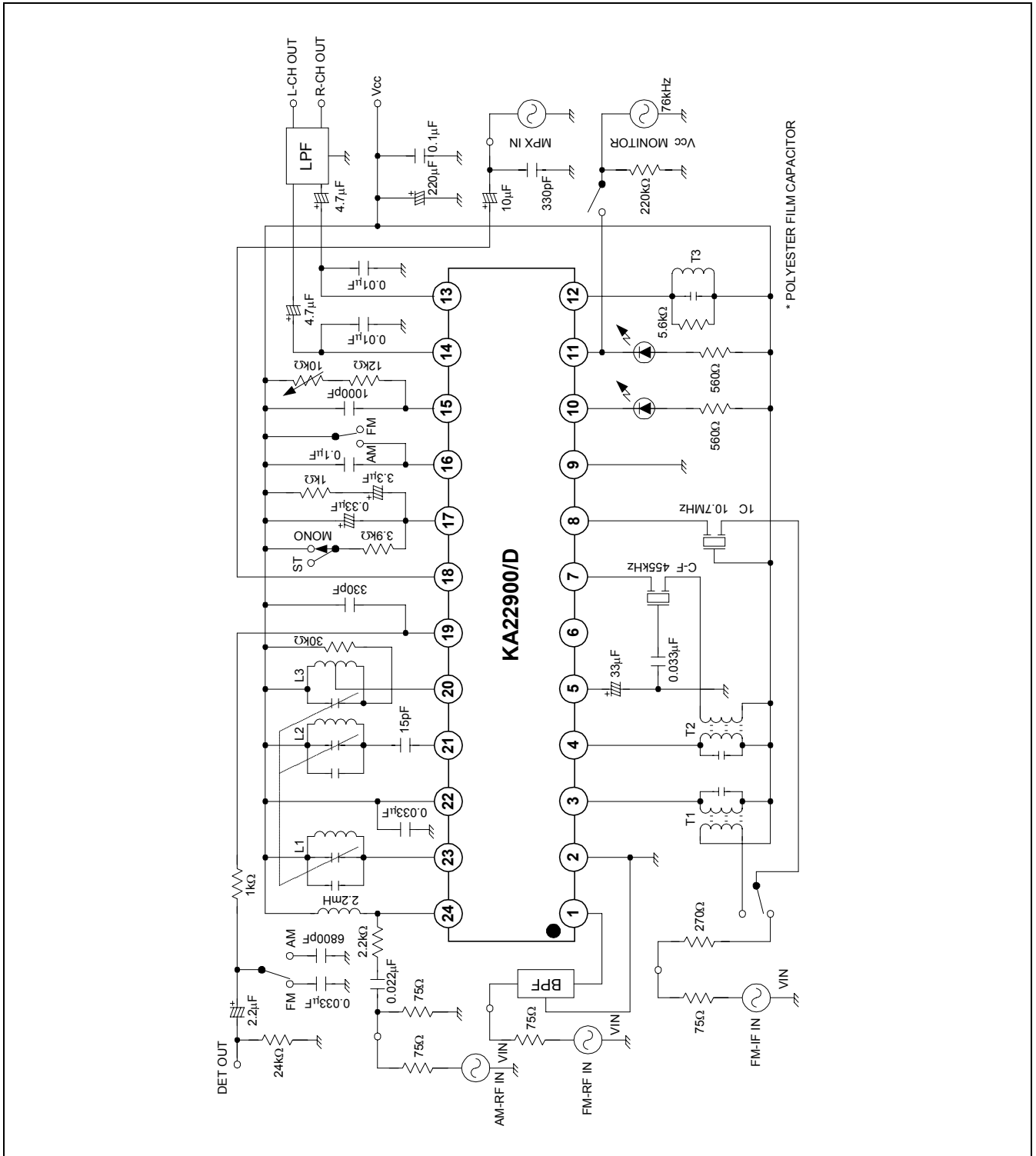


Figure 2.

TEST CIRCUIT 2

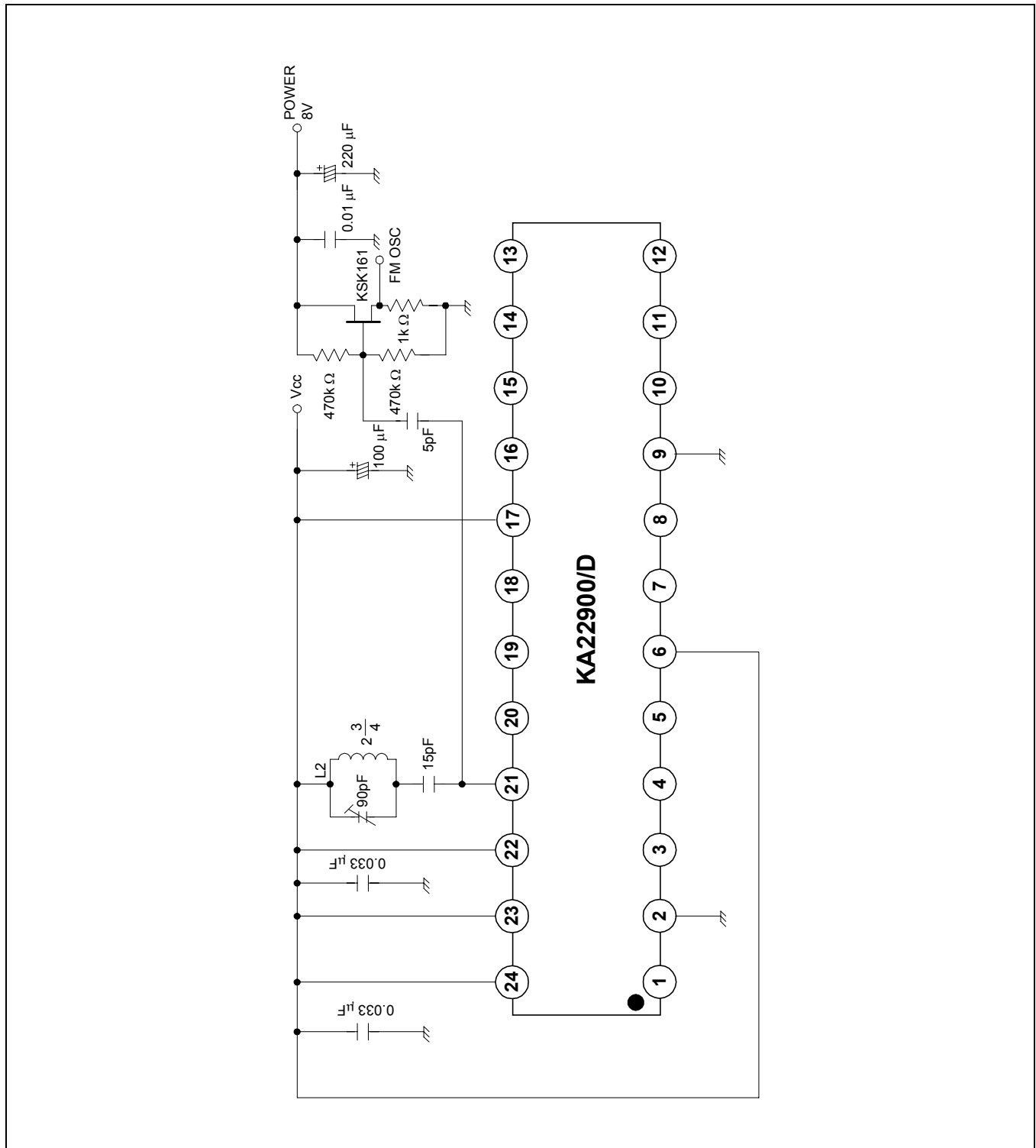
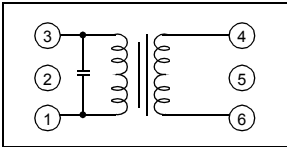


Figure 3.

**COIL SPECIFICATION**

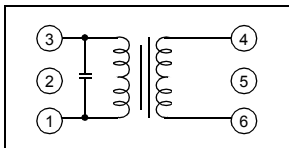
**T1 FM IFT (MIX OUT)**



| Co(pF) | f (MHz) | Qo      | TURNS |     |  |
|--------|---------|---------|-------|-----|--|
|        |         |         | 1-3   | 4-6 |  |
| 75     | 10.7    | 70(min) | 11    | 2   |  |

KOREA TOKO  
0.1 mmφ

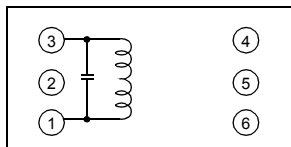
**T2 AM IFT (MIX OUT)**



| Co(pF) | f (MHz) | Qo      | TURNS |     |  |
|--------|---------|---------|-------|-----|--|
|        |         |         | 1-3   | 4-6 |  |
| 180    | 455     | 70(min) | 180   | 15  |  |

KOREA TOKO  
0.08 mmφ

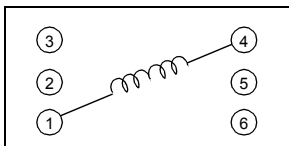
**T3 FM IFT (DET)**



| Co(pF) | f (MHz) | Qo      | TURNS |  |  |
|--------|---------|---------|-------|--|--|
|        |         |         | 1-3   |  |  |
| 47     | 10.7    | 80(min) | 14    |  |  |

KOREA TOKO  
0.1 mmφ

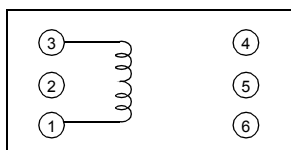
**L1 FM RF**



| f (MHz) | Qo  | TURNS   |  |  |
|---------|-----|---------|--|--|
|         |     | 1-3     |  |  |
| 100     | 100 | 2*(1/2) |  |  |

0.5 mmφ

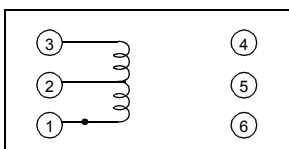
**L2 FM OSC**



| f (MHz) | Qo  | TURNS   |  |  |
|---------|-----|---------|--|--|
|         |     | 1-3     |  |  |
| 100     | 100 | 2*(3/4) |  |  |

0.5 mmφ

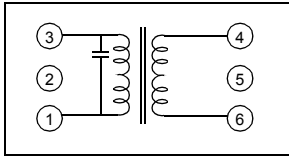
**L3 AM OSC**



| f (KHz) | Qo      | TURNS |     | L (μH) |
|---------|---------|-------|-----|--------|
|         |         | 1-2   | 2-3 |        |
| 796     | 80(min) | 13    | 15  | 288    |

KOREA TOKO  
0.08 mmφ

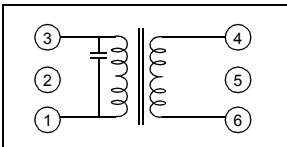
T1 FM IFT (MIX OUT)



KSI-FA2

| Co(pF) | F (MHz) | Qo      | TURNS |     | KWANG SUNG PART NO |
|--------|---------|---------|-------|-----|--------------------|
|        |         |         | 1-3   | 4-6 |                    |
| 75     | 10.7    | 70(min) | 11    | 2   | KSI-FA2            |

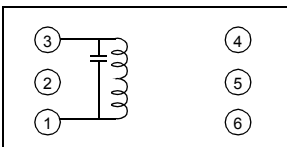
T2 AM IFT (MIX OUT)



KSI-AA1

| Co(pF) | F (MHz) | Qo      | TURNS |     | KWANG SUNG PART NO |
|--------|---------|---------|-------|-----|--------------------|
|        |         |         | 1-3   | 4-6 |                    |
| 180    | 455     | 70(min) | 146   | 14  | KSI-AA1            |

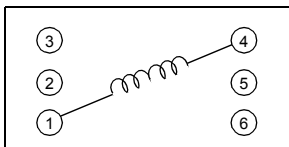
T3 FM IFT (DET)



KSI-FD3

| Co (pF) | F (MHz) | Qo      | TURNS | KWANG SUNG PART NO |
|---------|---------|---------|-------|--------------------|
|         |         |         | 1-3   |                    |
| 47      | 10.7    | 80(min) | 14    | KSI-FD3            |

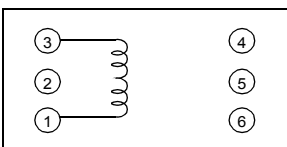
L1 FM RF



KST-FR1

| F (MHz) | Qo  | TURNS   |        | KWANG SUNG PART NO |
|---------|-----|---------|--------|--------------------|
|         |     | 1-3     | WIRE   |                    |
| 100     | 100 | 2*(1/2) | 0.5m/m | KST-FR1            |

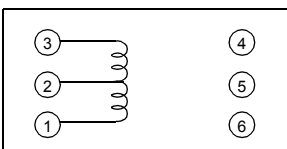
L2 FM OSC



KST-FO1

| F (MHz) | Qo  | TURNS   |        | KWANG SUNG PART NO |
|---------|-----|---------|--------|--------------------|
|         |     | 1-3     | WIRE   |                    |
| 100     | 100 | 2*(3/4) | 0.5m/m | KST-AO1            |

L3 AM OSC



KSI-AO1

| F (MHz) | Qo    | TURNS |     | L (uH) | KWANG SUNG PART NO |
|---------|-------|-------|-----|--------|--------------------|
|         |       | 1-2   | 2-3 |        |                    |
| 796     | 80min | 13    | 73  | 288    | KSI-AO1            |



APPLICATION CIRCUIT

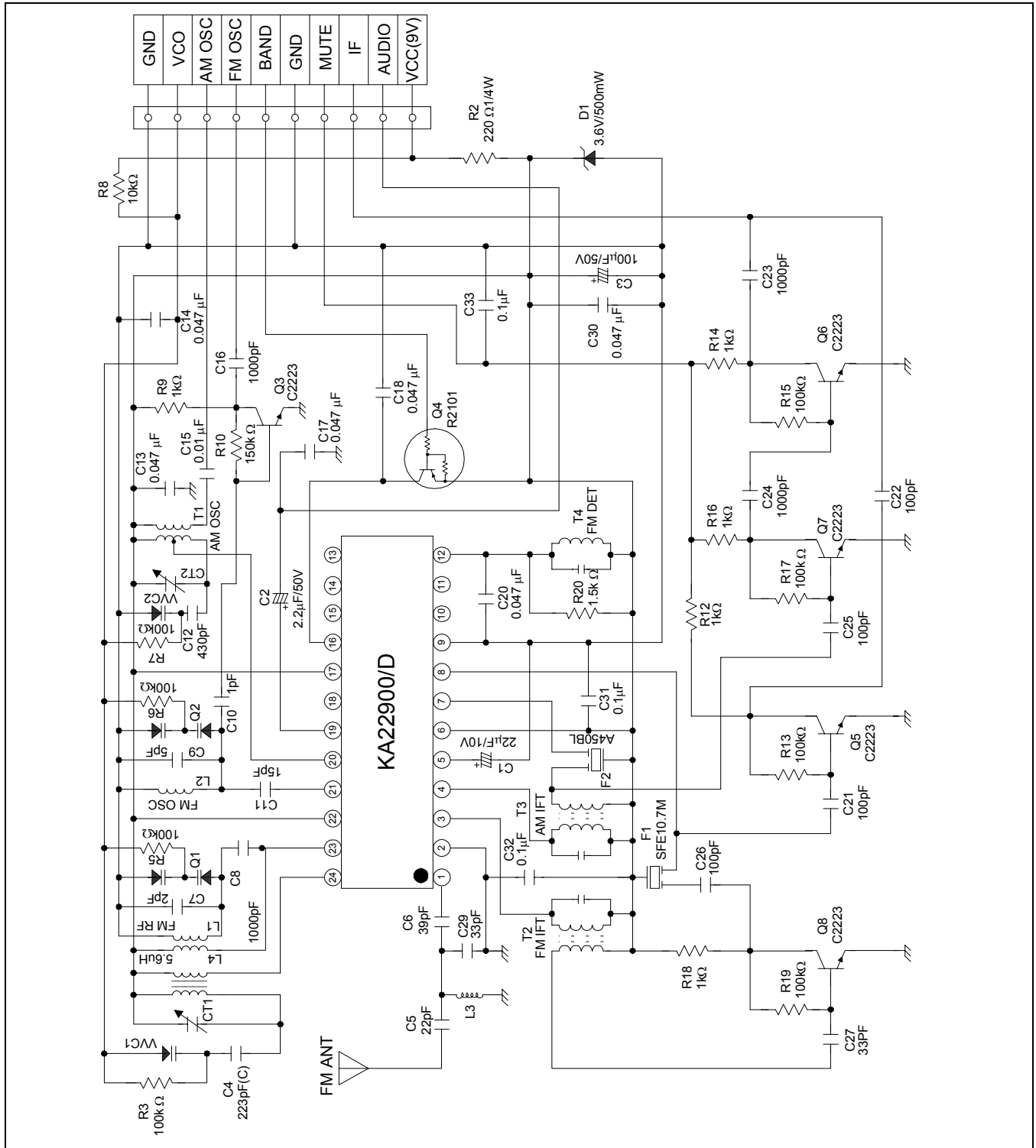


Figure 4.

NOTES