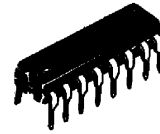


# HA1199

## AM TUNER FOR CAR RADIO

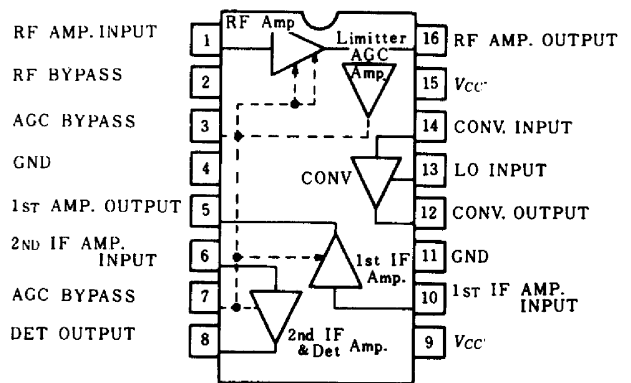
### FEATURES

- Complete 1-chip AM Tuner
- Good high-input characteristics provided with automatic dynamic range mag. control at RF stage (T.H.D = 1% type. at 130dB $\mu$ )
- High AGC FOM (63dB typ.)
- Good usable sensitivity (23dB $\mu$  typ.)
- Low distortion (0.4% typ. at 74dB $\mu$ )
- Good beat characteristics (3fi beat = 40dB at 108dB $\mu$  input, at fi = 262.5 kHz)
- Large two-signal selectivity (55dB typ. at desired 54dB $\mu$ )
- Cut-off pop noise at detuning
- Standard power supply voltage area is 10.8V through 15.6V (13.2V typ.) and local oscillation stopping voltage is less than 6V.
- High-performance car radio is quite easily designed by combining with HA1322 (or HA1339A)



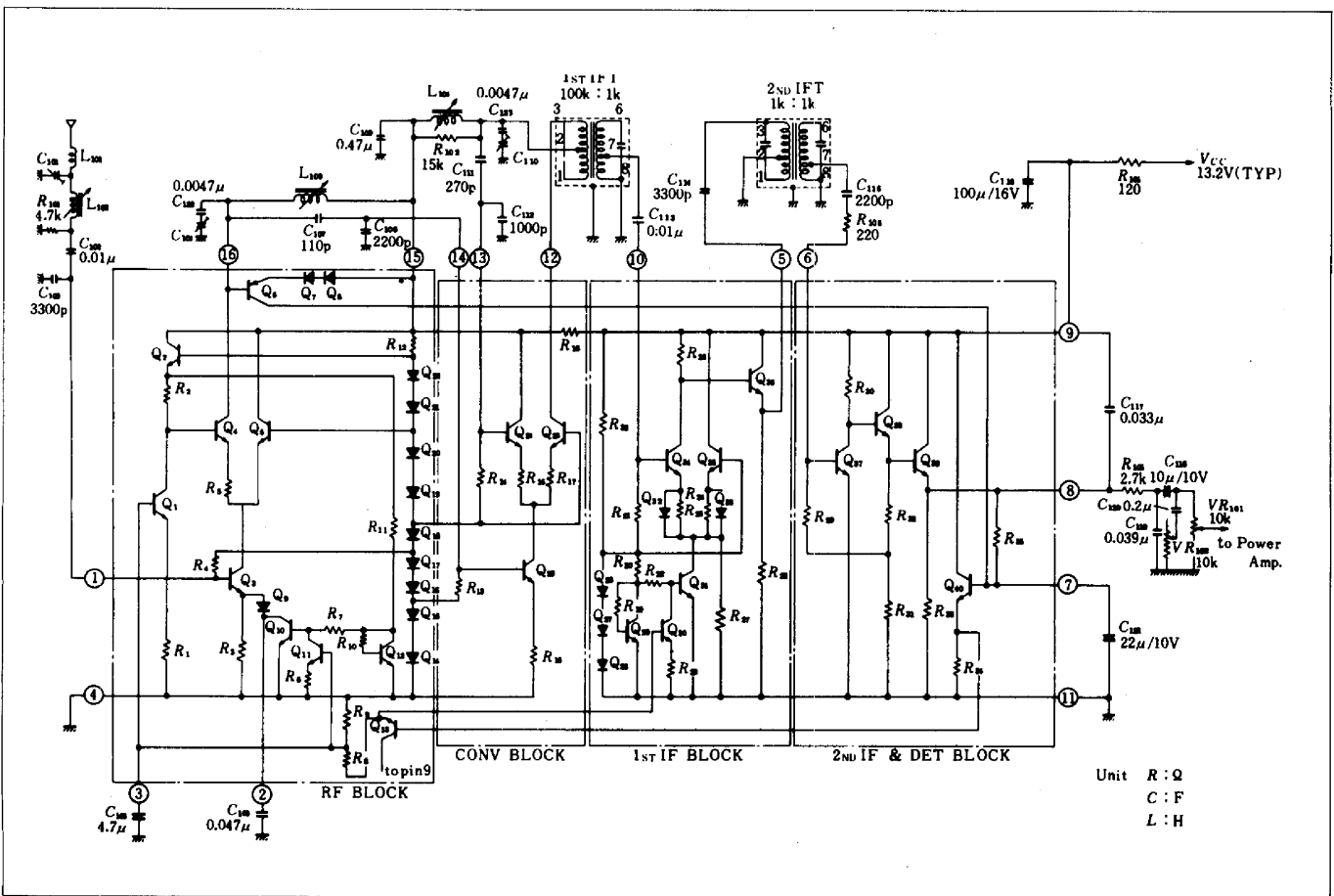
(DP-16)

### PIN ARRANGEMENT



(Top View)

### CIRCUIT SCHEMATIC AND TYPICAL EXTERNAL PARTS



Unit R :  $\Omega$   
C : F  
L : H

## ■ ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub>=25°C)

| Item                  | Symbol           | Rating      | Unit |
|-----------------------|------------------|-------------|------|
| Supply Voltage        | V <sub>CC</sub>  | 16          | V    |
| Power Dissipation*    | P <sub>T</sub>   | 550         | mW   |
| Operating Temperature | T <sub>opr</sub> | -30 to +70  | °C   |
| Storage Temperature   | T <sub>stg</sub> | -55 to +125 | °C   |

\* Value at T<sub>a</sub>=60°C

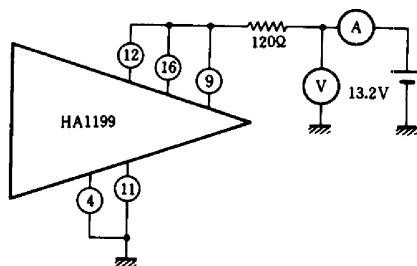
## ■ ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub>=13.2V, f<sub>c</sub>=1000kHz, f<sub>m</sub>=400Hz, Output Power of Power Stage=0.5W, R<sub>L</sub>=4Ω, and T<sub>a</sub>=25°C Unless otherwise noted)

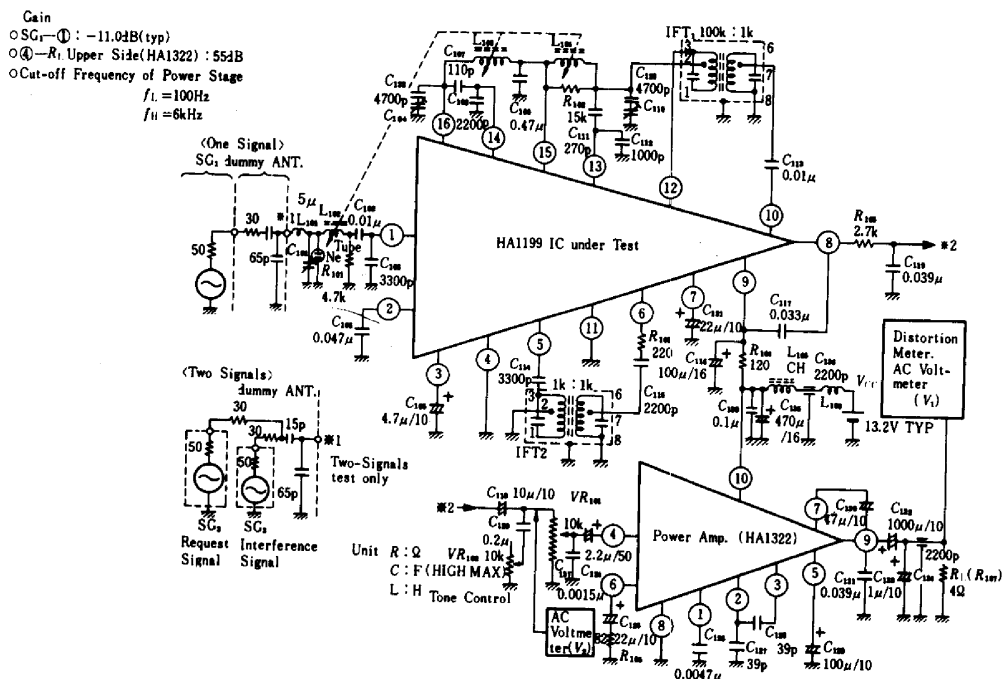
| Item                  | Symbol          | Test Circuit | Test Condition   | min  | typ | max | Unit |
|-----------------------|-----------------|--------------|--|------|-----|-----|------|
| Current Drain         | I <sub>CC</sub> | 1            | V <sub>CC</sub> =13.2V at zero signal                              | —    | 15  | —   | mA   |
| Signal-to-noise Ratio | S/N             | 2            | Input=34dBμ, 30% mod.  | 25.5 | 30  | —   | dB   |
| AGC FOM               |                 | 2            | Output Base at 74dBμ input, Test at the 10dB output down, 30% mod. | 51   | 63  | —   | dB   |
| Det. Output           |                 | 2            | Input=74dBμ, V <sub>2</sub> Test, 30% mod.                         | 51   | 80  | 127 | mV   |
| Distortion            | T.H.D           | 2            | Input=114dBμ, 30% mod.   | —    | 0.4 | 5   | %    |
| Sensitivity           |                 | 2            | Input at S/N=20dB, 30% mod.  | —    | 23  | —   | dBμ  |

## ■ TEST CIRCUITS

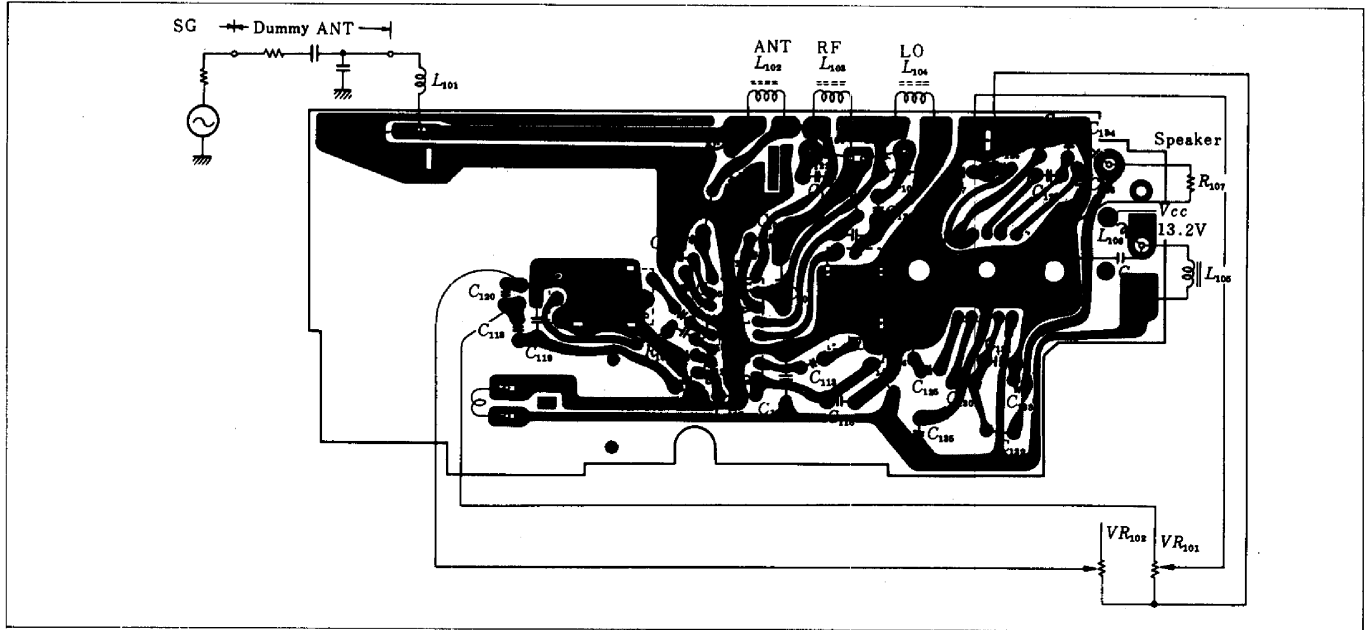
1.



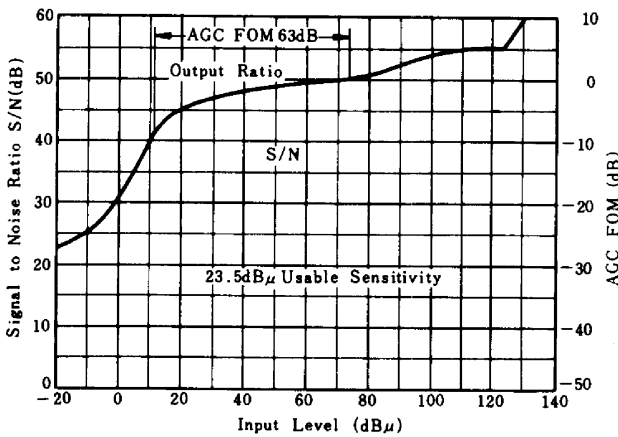
2.



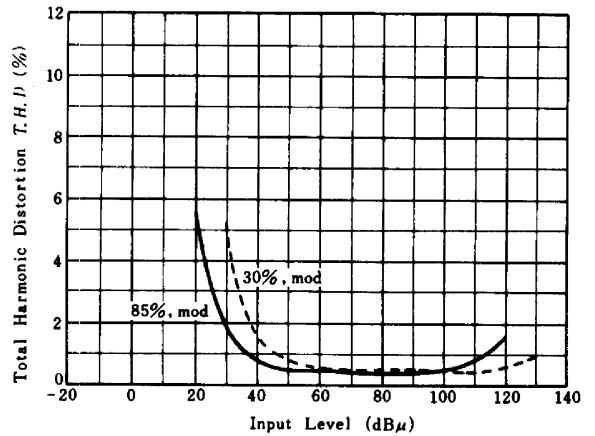
## STANDARD PRINTED CIRCUIT BOARD (Top View)



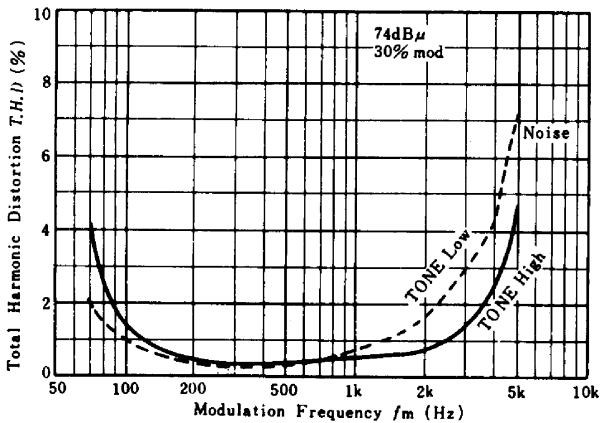
### SIGNAL-TO-NOISE RATIO AND OUTPUT RATIO VS. INPUT LEVEL



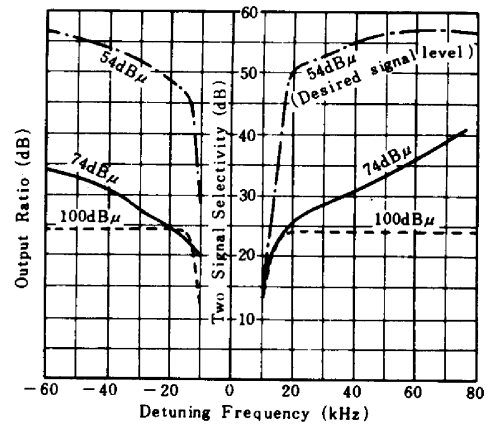
### TOTAL HARMONIC DISTORTION VS. INPUT LEVEL



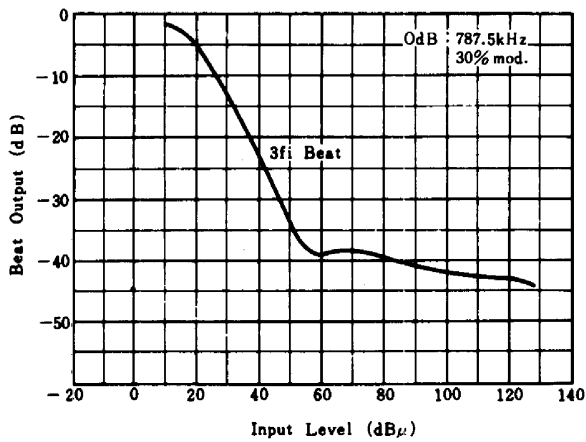
### TOTAL HARMONIC DISTORTION VS. MODULATION FREQUENCY



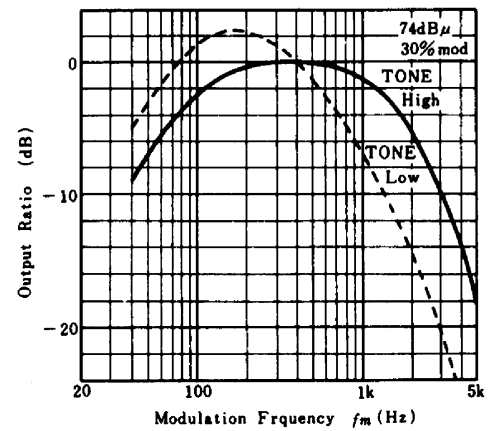
### TWO-SIGNAL SELECTIVITY CHARACTERISTICS



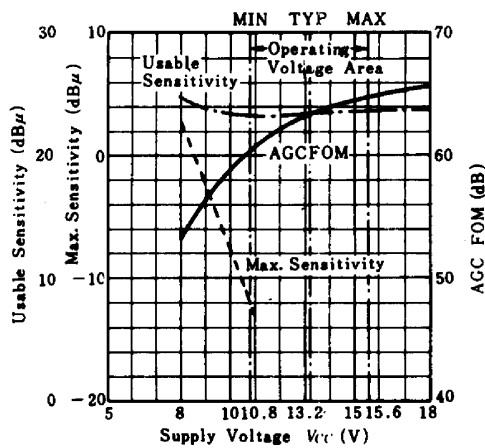
BEAT OUTPUT VS. INPUT LEVEL



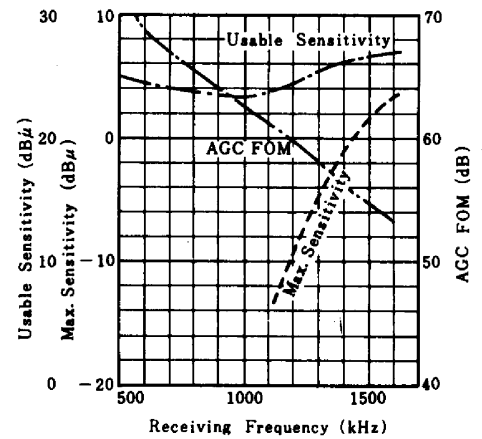
ELECTRICAL FIDELITY CHARACTERISTICS



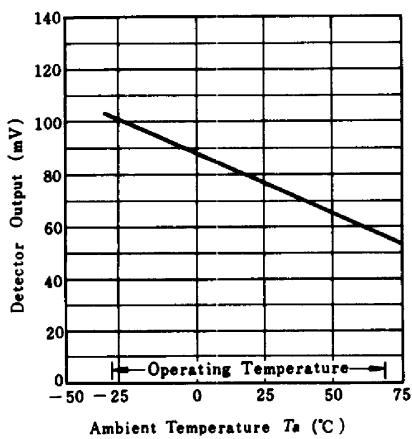
SENSITIVITY AND AGC FOM VS. SUPPLY VOLTAGE



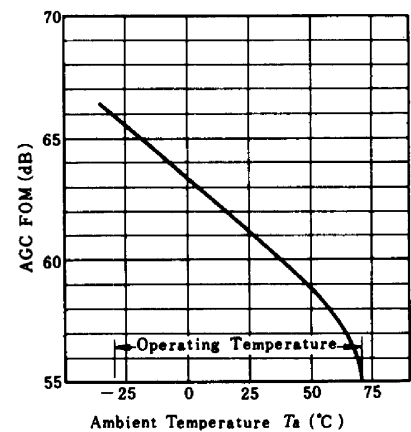
SENSITIVITY AND AGC FOM VS. RECEIVING FREQUENCY



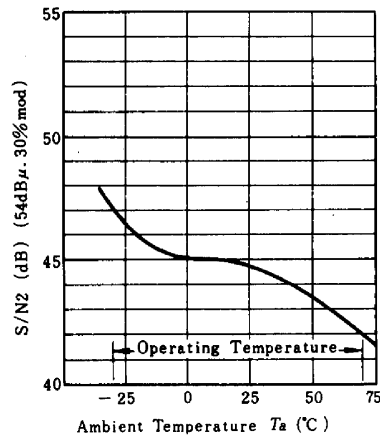
DETECTOR OUTPUT VS. AMBIENT TEMPERATURE



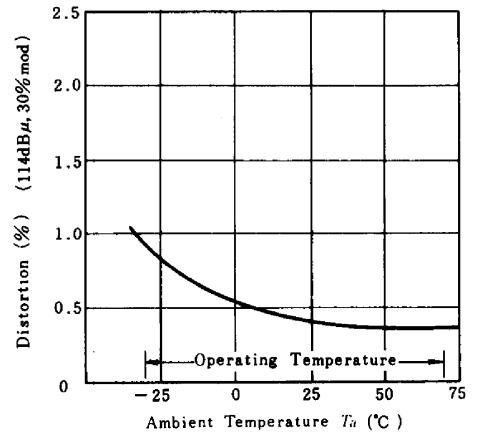
AGC FOM VS. AMBIENT TEMPERATURE



## SIGNAL-TO-NOISE RATIO VS. AMBIENT TEMPERATURE



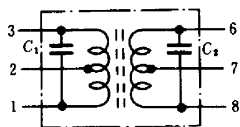
## DISTORTION VS. AMBIENT TEMPERATURE



## EXTERNAL COMPONENTS

| Parts No.        | Recommended Value | Purpose                           | Influence   |   | Additional Information                         |
|------------------|-------------------|-----------------------------------|---|---|--|
|                  |                   |                                   | Larger than Recommended Value   | Smaller than Recommended Value                            |  |
| R <sub>102</sub> | 15k $\Omega$      | Dumping of local oscillation coil | Increase of unwanted radiation  | Local oscillation stop                                    |  |
| R <sub>103</sub> | 220 $\Omega$      | Gain adjust for 2nd IF stage      | Decrease in gain  | Increase in gain. Instability                             |  |
| R <sub>104</sub> | 120 $\Omega$      | Decoupling resistor               | Drop in supply voltage  | Leads to "Motorboating"                                   |  |
| R <sub>105</sub> | 2.7k $\Omega$     | Part of detective filter          | Decrease in output voltage<br>Poor frequency response (at higher frequency) | Degradation of S/N  |  |
| C <sub>102</sub> | 0.01 $\mu$ F      |                                   | Increase in ANT gain  | Decrease in ANT gain                                      |  |
| C <sub>103</sub> | 3300pF            | ANT Tuning circuit                | Improvement in usable sensitivity<br>Decrease of ANT gain                   | Degradation of usable sensitivity<br>Increase of ANT gain |  |
| C <sub>105</sub> | 4.7 $\mu$ F       | AGC Ripple filter & Time constant | Poor AGC response   | Degradation of T.H.D at middle- and high-level input      |  |
| C <sub>106</sub> | 0.047 $\mu$ F     | RF by-passing                     | Poor cross-modulation characteristics                                       | Poor usable sensitivity                                   |  |
| C <sub>107</sub> | 110pF             | RF tuning & coupling              | Increase in gain  | Decrease in gain  |  |
| C <sub>108</sub> | 2200pF            | Coupling divider                  | Decrease in gain  | Increase in gain  |  |
| C <sub>109</sub> | 0.47 $\mu$ F      | Decoupling capacitor              | —   | Poor beat characteristics                                 | Good RF characteristics should be required     |
| C <sub>112</sub> | 1000pF            | Coupling divider                  | Stop of local oscillation   | —   |  |
| C <sub>113</sub> | 0.01 $\mu$ F      | Coupling capacitor                | —   | Decrease of gain  |  |
| C <sub>114</sub> | 3300pF            | Coupling capacitor                | Decrease of gain  | Decrease of gain  | It should be determined by matching to 2nd IFT |
| C <sub>115</sub> | 2200pF            |                                   |   |   |  |
| C <sub>116</sub> | 100 $\mu$ F       | Decoupling capacitor              | —   | Leads to "Motorboating"                                   |  |
| C <sub>119</sub> | 0.039 $\mu$ F     | Part of detective filter          | Poor frequency response (at higher frequency)                               | Degradation of S/N  |  |
| C <sub>121</sub> | 22 $\mu$ F        | AGC Ripple filter & Time constant | Poor AGC response   | Degradation of T.H.D at low modulation frequency input    |  |
| L <sub>101</sub> | 5 $\mu$ H         | Prevention of incoming noise      | Tracking error  | ineffective   |  |

## SPECIFICATION OF THE IFT'S



|         | Q <sub>0</sub> | Number of turns |     |     |     | C <sub>1</sub> (pF) | C <sub>2</sub> (pF) | Tuned frequency (kHz) |
|---------|----------------|-----------------|-----|-----|-----|---------------------|---------------------|-----------------------|
|         |                | 1-2             | 2-3 | 6-7 | 7-8 |                     |                     |                       |
| 1st IFT | 70             | 66              | 220 | 260 | 26  | 180                 | 180                 | 262.5                 |
| 2nd IFT | 70             | 271             | 23  | 271 | 23  | 180                 | 180                 | 262.5                 |