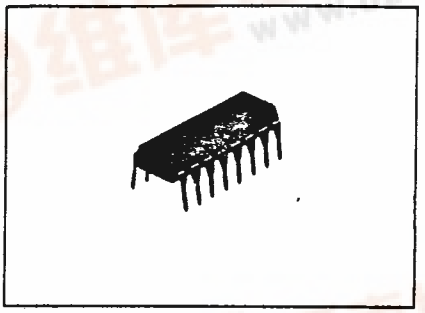
AM/FM IF Amplifier

BA4210

ROHM



The BA4210 is a monolithic integrated circuit consisting of two FM IF amplifiers, an AM mixer and an IF amplifier for use in low-voltage FM/AM radios and cassette recorders with built-in radios.

Features

1. Operates stably over a wide range of supply voltages and has excellent characteristics at low voltages (V_{CC}=2.5~6.0V).
2. High-gain FM section IF amplifier circuit.
3. The AM section includes a mixer, local oscillator, IF amplifier, and AGC circuit, and has excellent AGC and distortion characteristics.

Applications

AM/FM Radios
Radio cassette recorders

Dimensions (Unit: mm)

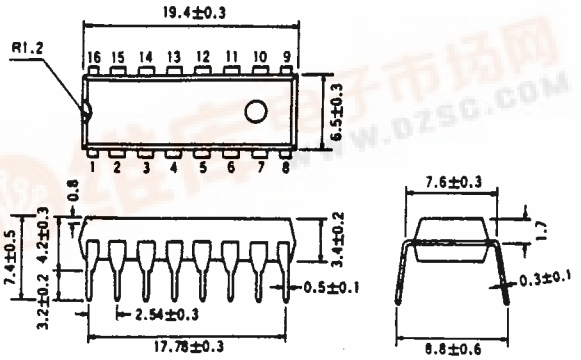


Fig. 1

Block Diagram

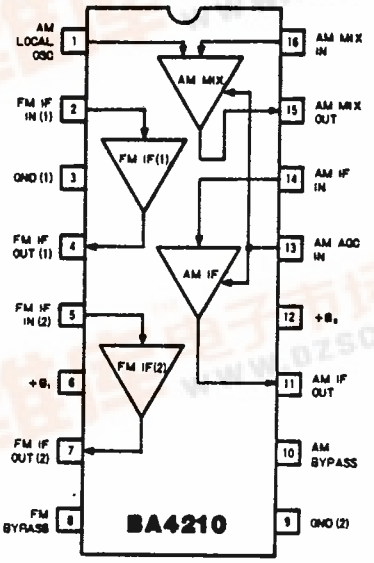


Fig. 2

Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	9	V
Power dissipation	Pd	550*	mW
Operating temperature range	Topr	−25~75	°C
Storage temperature range	Tstg	−40~125	°C

* Derating is done at 5.5mW/°C for operation above Ta=25°C

Recommended Operating Conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	2.5	4.0	6.0	V

Electrical Characteristics (Ta=25°C, V_{CC}=4.0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Test circuit
Quiescent current (AM)	I_Q (AM)	4.5	8.0	11.5	mA	—	Fig. 3-1
Voltage gain (MIX)	A_V (MIF)	7.5	11.5	15.5	dB	f=1MHz, R=50Ω, R_L=1kΩ (AM)	Fig. 3
Voltage gain (IF)	A_V (IF)	44.0	50.0	56.0	dB	f=455kHz, R_G=50Ω, R_L=330Ω (AM)	Fig. 3
Circuit current (FM)	I_Q (FM)	5.0	9.0	13.0	mA	—	Fig. 3-2
Voltage gain (IF_1)	A_V (IF_1)	38.0	42.0	46.0	dB	f=10.7MHz, R_G=50Ω, R_L=1kΩ (FM)	Fig. 3
Voltage gain (IF_2)	A_V (IF_2)	27.0	33.0	39.0	dB	f=10.7MHz, R_G=50Ω, R_L=330Ω (FM)	Fig. 3

Test Circuits

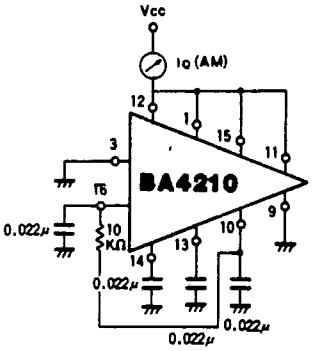


Fig. 3-1

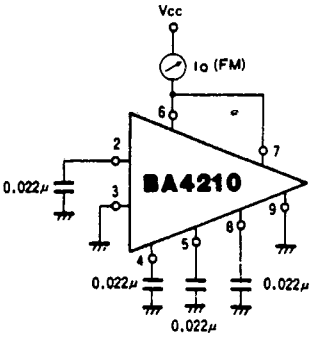


Fig. 3-2

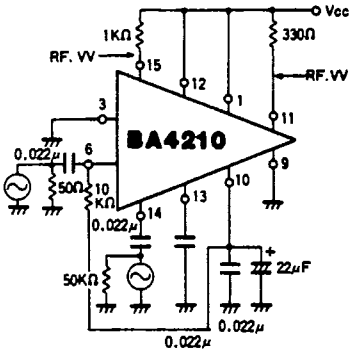


Fig. 3-3

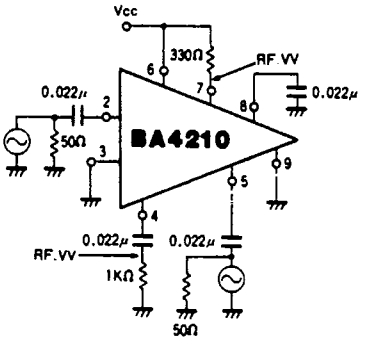


Fig. 3-4

Application Example

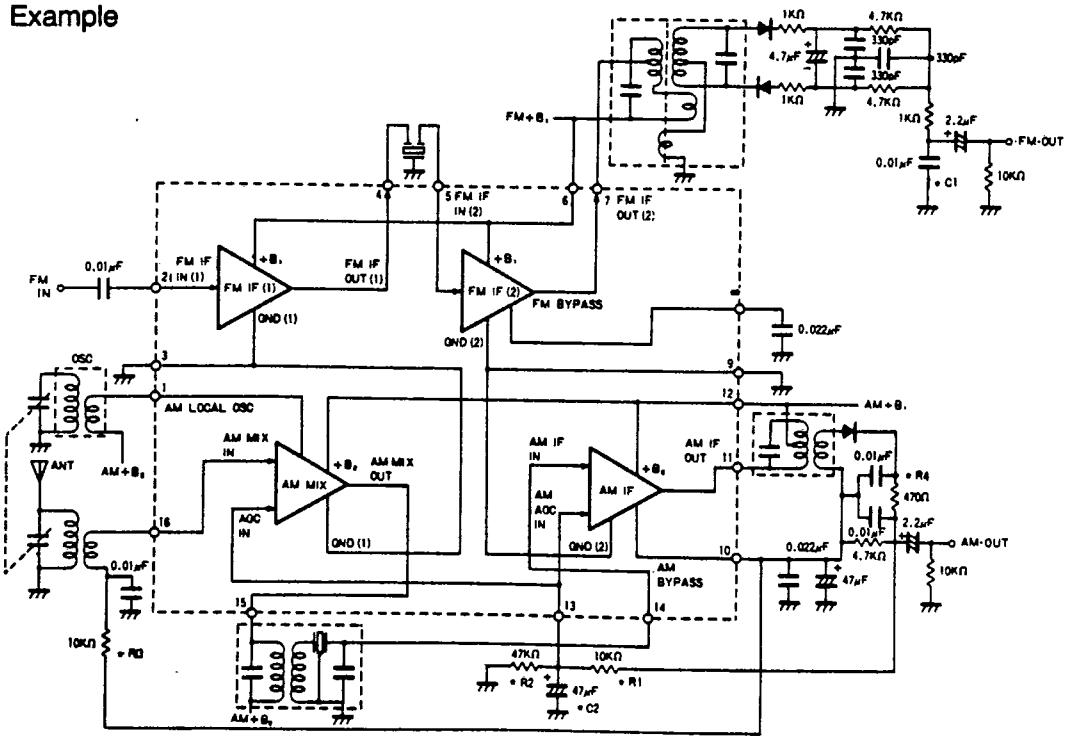


Fig. 4

Circuit Description

1. FM Section

In the application example shown, the output of the ratio detector after limiting is 180mVrms for 1kHz modulation input and ±75kHz dviation. When connecting a ceramic filter to the first IF section stage, if the filter characteristics are not the same as the ceramic filter connected between pin 4 and pin 5, non-coincidence of the passbands of the two filters may result in deterioration of distortion characteristics. Also, it is possible to replace the ceramic filter between pin 4 and pin 5 with a ceramic capacitor.

When connecting a stereo demultiplexer IC (MPX IC) to the last stage, capacitor C_1 should be removed.

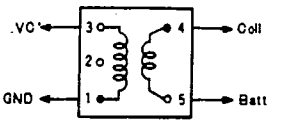
2. AM Section

In the application example shown, for direct input to the 50Ω input at pin 16, 60mVrms output is obtainable with 60dBμV modulation of 30% at 1kHz frequency.

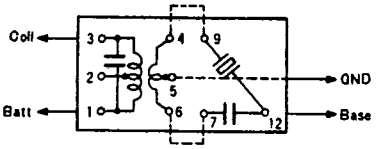
By adjusting the ratio of R_1 and R_2, the input level at which AGC begins to take effect can be selected. R_1 and C_2 form a filter so that the value of R_1 should be chosen to be approximately 10kΩ. Note that the C_2 47μF, if made a value approximately 10μF, will cause filter characteristics to deteriorate, resulting in increased distortion in the low and high frequency ranges. C_2 should be kept in the range 33~47μF.

Coil Specifications

1. AM Oscillator Coil (MW) 7BR-4398X (TOKO)
   Type: 7P 1-3 65T
   Color coding: Black 4-6 11T

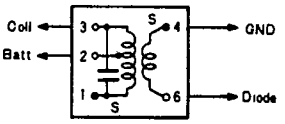


2. AM Interstage Coil CFZ-455C (TOKO) L=150μH (±6%) Q_u>80 (f=1.4MHz)



Bandwidth: 6kHz (min.)
Selectivity: 20dB (min.) or better (at ±10kHz detuning)

3. AM Detector Coil (455kHz) 7LC-252222 No. (TOKO)
   Type: 7P
   Color coding: Black 1-3 146T
   2-3 37T
   4-6 33T



Internal capacitor C=180pF
Q_u=70±20%

4. FM Detector Transformer (10.7MHz) (TOKO)

		Internal C				
Primary	119AC-470085L_8	(Gray) 47pF	4-2 5½T	2-3 8T	1-5 5½T	
Secondary	119FC-560061N_6	(Blue) 56pF	1-2 6T	2-3 6T	4-6 1T	

Type 7P

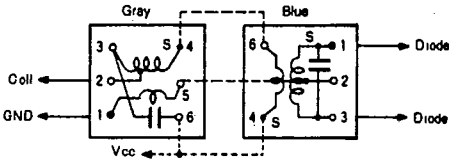


Fig. 5 Coil used in the application example

Electrical Characteristic Curves

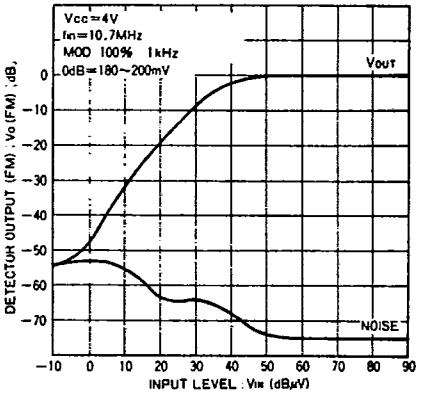


Fig. 6 FM input/output characteristics

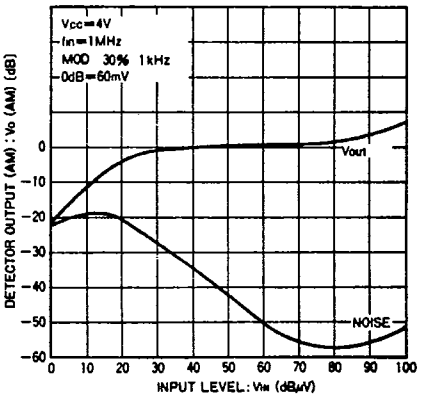


Fig. 7 AM input/output characteristics

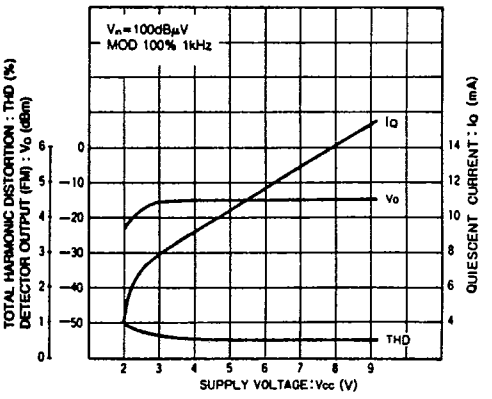


Fig. 8 FM low-voltage performance

Electrical Characteristic Curves

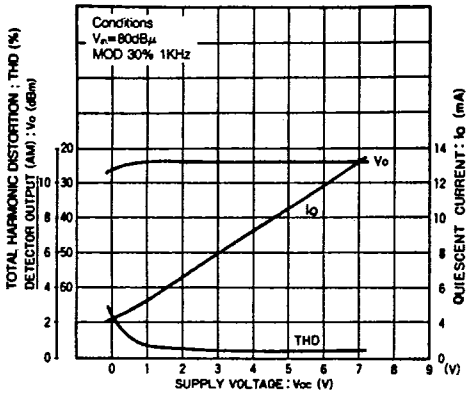


Fig. 9 AM low-voltage performance

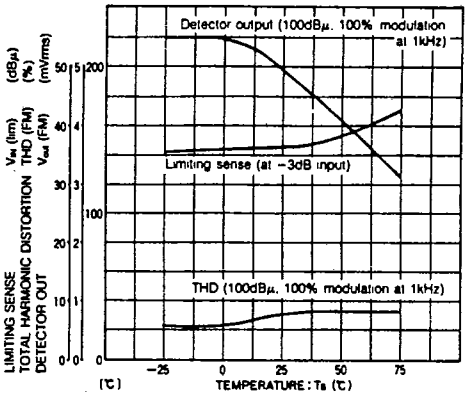


Fig. 10 FM temperature characteristics

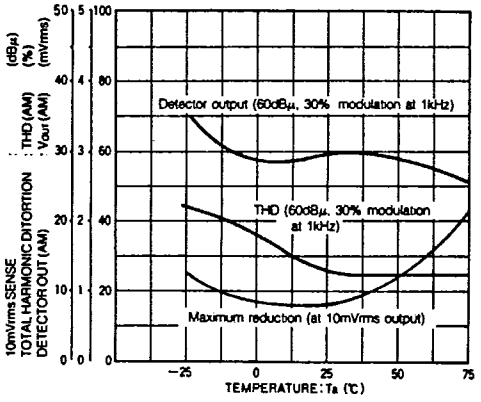


Fig. 11 AM temperature characteristics

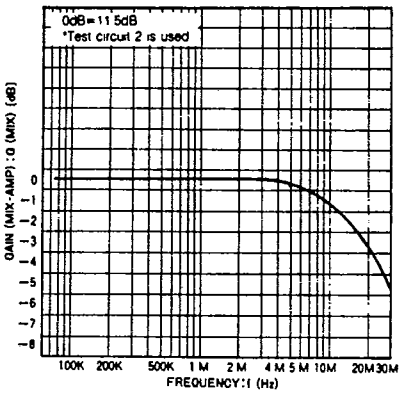


Fig. 12 AM-Mixer stage frequency characteristics

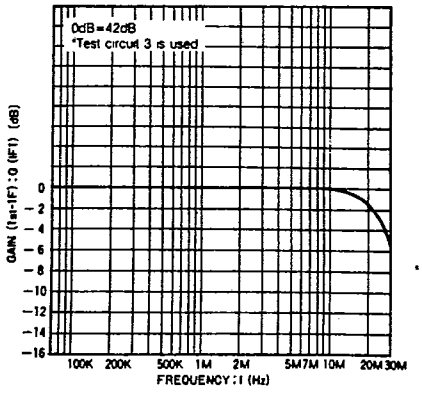


Fig. 13 1st FM IF stage frequency characteristics

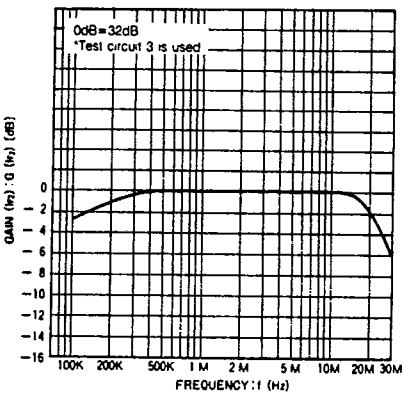
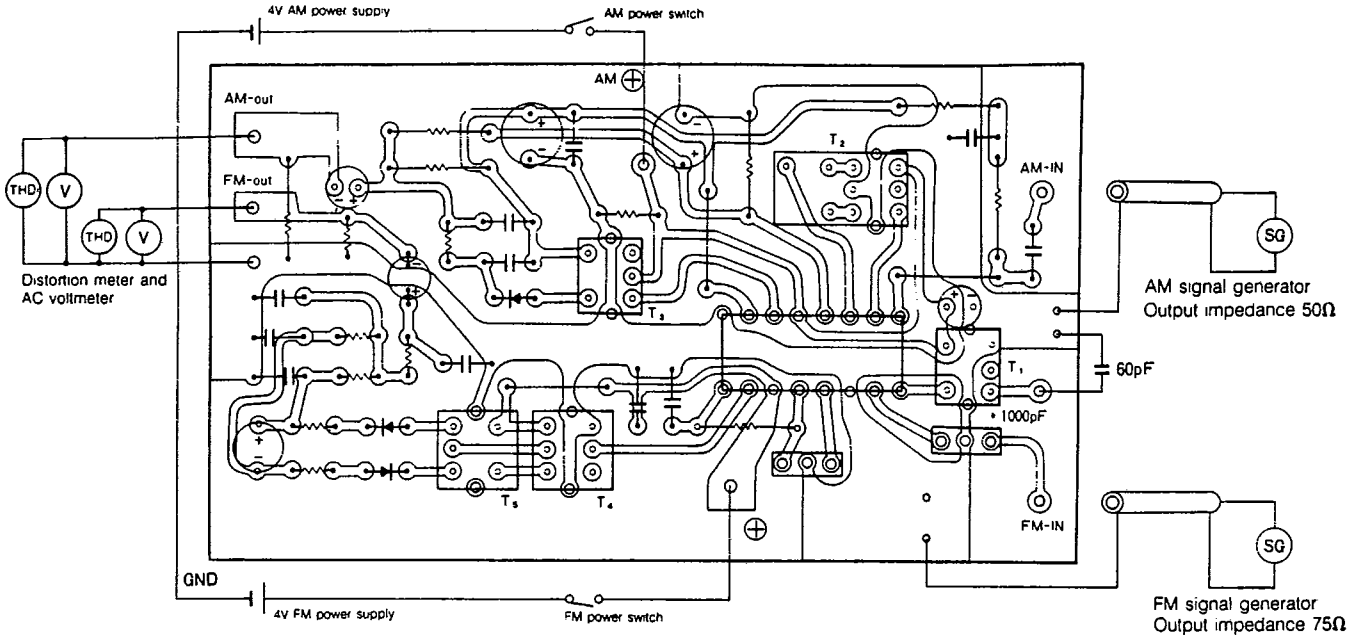
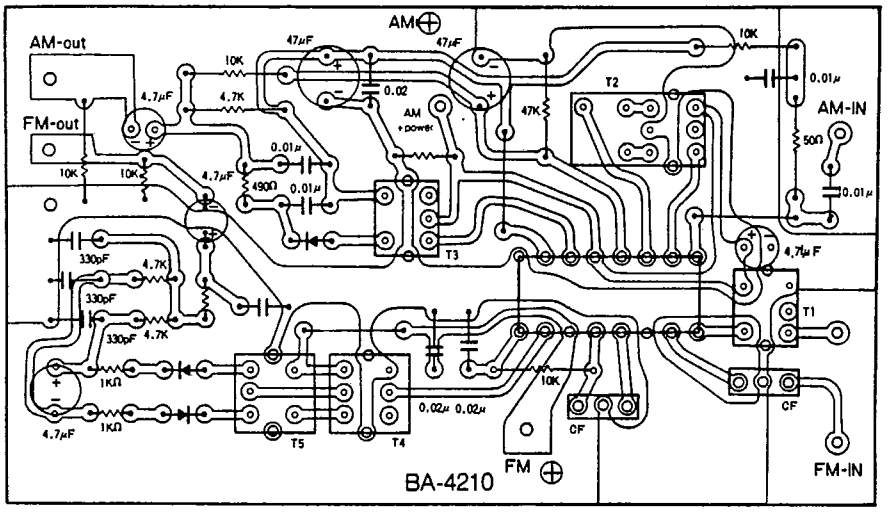


Fig. 14 2nd FM IF stage frequency characteristics



AM: T_1 is adjusted for oscillation at approximately 1.5MHz.
T_2 and T_3 are adjusted using a sweeper marker generator for maximum waveform amplitude at 1MHz.
FM: T_4 and T_5 are adjusted using a sweeper marker generation for best S-curve slope and linearity.

Fig. 15 Test circuit setup



T_1: AM oscillator coil (MW band) 7BR-4398X
T_2: AM interstage coil CFZ-455C
T_3: AM detector coil 7LC-25222
T_4: FM detector coil (primary) 119AC-470085L_8
T_5: FM detector coil (secondary) 119FC-560061N_6

Fig. 16 Application example board layout