AN7235S

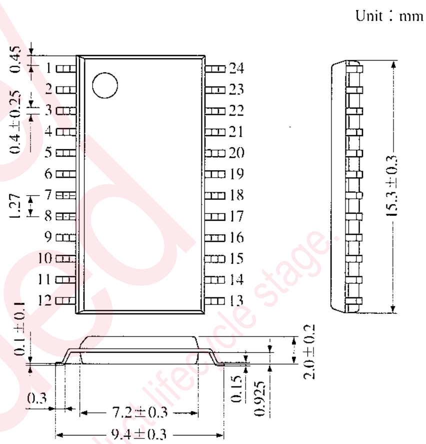
FM Tuner+AM Tuner+FM Stereo Demodulator Single Chips (For Three Volts)

■ Overview

The AN7235S is a single chip incorporating AM/FM front end, AM/FM intermediate frequency amplifier and FM stereo demodulator. It is a bipolar IC suitable for three volt radio/radio-cassette recorder.

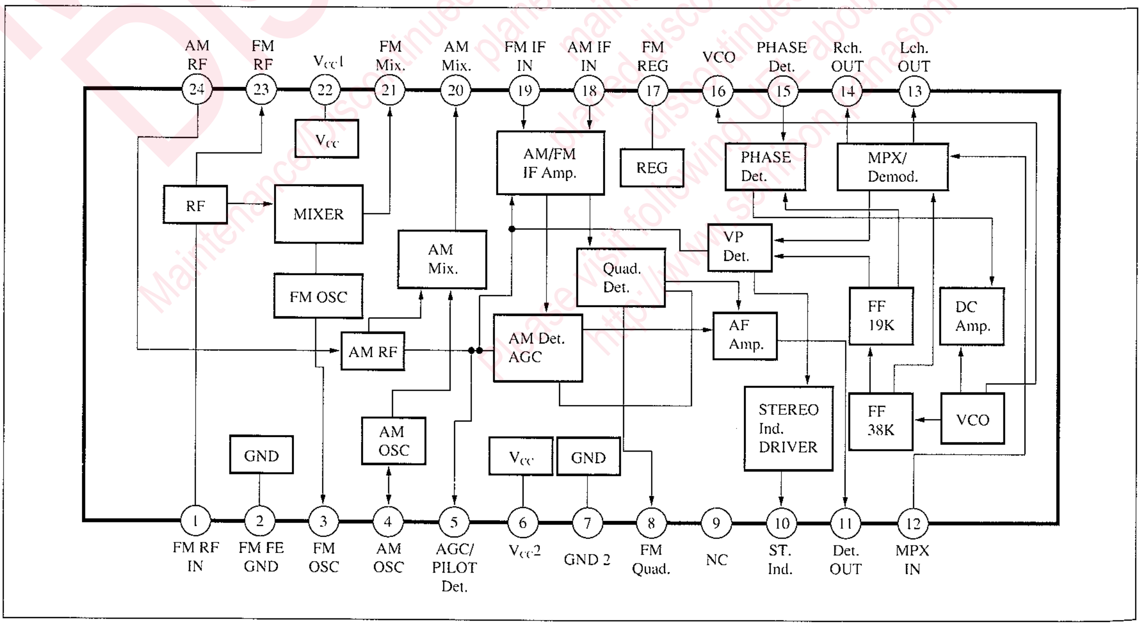
■ Features

- Single chip IC incorporating FM tuner, AM tuner, stereo demodulator
- Good mutual modulation interference characteristics
- Good AM rejection ratio
- High sensitivity
- Fewer external parts required
- Wide operating voltage range available
- AM/FM switch built-in



24-Lead SOP Package (SOP024-P-0375)

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{CC}	7	V
Supply Current	I_{CC}	25	mA
Power Dissipation	P_D	175	mW
Operating Ambient Temperature	T_{opr}	−20～+75	℃
Storage Temperature	T_{stg}	−55～+150	℃

■ Recommended Operating Range (Ta=25℃)

Parameter	Symbol	Range
Operating Supply Voltage Range	V_{CC}	1.8V～7.0V

■ Electrical Characteristics (V_{CC}=3V, Ta=25℃)

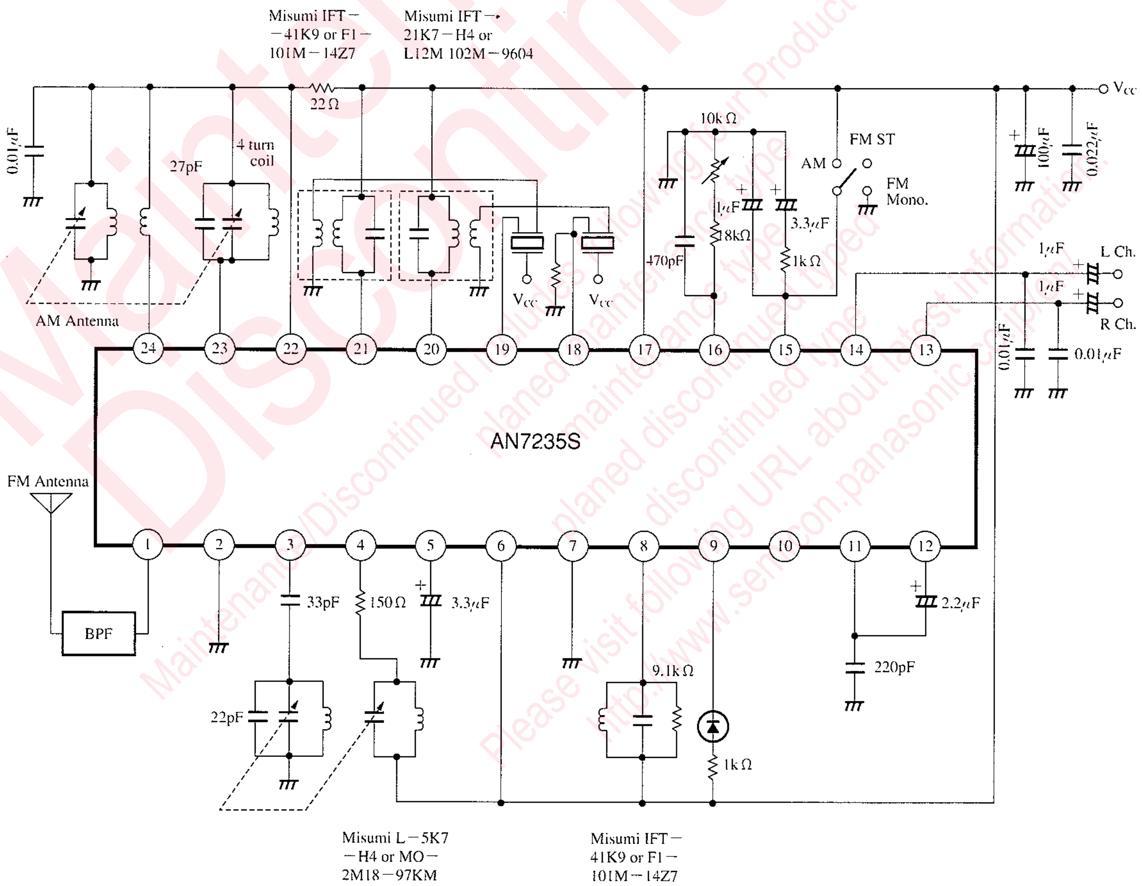
Parameter	Symbol	Condition	min.	typ.	max.	Unit
Quiescent Circuit Current (FM)	I_{tot}	No input	10	15	22	mA
Quiescent Circuit Current (AM)	I_{tot}	No input	6	11	23	mA
FM FE						
IF Output	V_{IF}	V_{in}=55dBμ	81	85	89	dBμ
Oscillation Output	V_{OSC}	No input	72	—	—	dBμ
FM						
Detection Output Voltage	$V_{O(FM)}$	V_{in}=80dBμ	42	56	80	mV
Limiting Sensitivity	$V_{in(lim)}$	V_{out}=−3dB	27	30	34	dBμ
S/N Ratio	S/N	V_{in}=80dBμ	−50	−60	—	dB
Total Harmonics Distortion	THD	V_{in}=80dBμ	—	0.5	1.5	%
AM Rejection Ratio	AMR	V_{in}=80dBμ	−25	−32	−40	dB
AM						
Detection Output Voltage	$V_{O(AM)}$	V_{in}=60dBμ	35	50	75	mV
Maximum Sensitivity	$S_{max.}$	V_{out}=10mV	10	17	26	dBμ
S/N Ratio	S/N	V_{in}=80dBμ	−40	−45	—	dB
Total Harmonics Distortion	THD	V_{in}=80dBμ	—	1.0	3.0	%
Oscillation Output	V_{OSC}	No input	70	—	—	dBμ
MPX						
Separation	Sep.	V_{in}=80dBμ, Stereo	30	40	—	dB
Total Harmonics Distortion (Mono)	$THD_{(Mono.)}$	V_{in}=80dBμ, Mono	—	0.5	1.5	%
Total Harmonics Distortion (Stereo)	$THD_{(Stereo)}$	V_{in}=80dBμ, Stereo	—	0.5	1.5	%
S/N Ratio (Mono)	$S/N_{(Mono.)}$	V_{in}=80dBμ, Mono	50	60	—	dB
S/N Ratio (Stereo)	$S/N_{(Stereo)}$	V_{in}=80dBμ, Stereo	50	60	—	dB
Carrier Leak	CL		30	39	—	dB
Pilot ON Level	$V_{P(ON)}$	V_{in}=80dBμ, Stereo	—	5.5	18	mV
Pilot OFF Level	$V_{P(OFF)}$	V_{in}=80dBμ, Stereo	1.1	4	—	mV
Capture Range	CR	V_{in}=80dBμ, Pilot 10%	±1.8	±3	—	%
Channel Balance	CB	V_{in}=80dBμ, Mono	−1.2	0	1.2	dB

Note) Unless otherwise specified, FM : f_C=10.7MHz, f=1kHz 30% modulation
AM : f_C=455kHz, f=400Hz 30% modulation

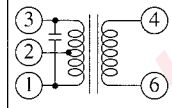
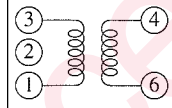
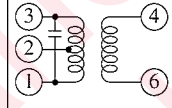
■ Pin Description

Pin No.	Pin Name	Pin No.	Pin Name
1	FM RF Input	13	L Ch. Output
2	FM FE GND	14	R Ch. Output
3	FM Osc	15	Phase Det.
4	AM Osc	16	VCO
5	AGC/Pilot Det.	17	IF Regulator
6	Supply Voltage (V_{CC})	18	AM IF Input
7	GND	19	FM IF Input
8	FM Detector	20	AM Mix. Output
9	NC	21	FM Mix. Output
10	Stereo Indicator	22	FM FE Supply Voltage
11	Det. Output	23	FM RF
12	MPX Input	24	AM RF Input

■ Application Circuit



Coil Specifications

Symbol	Application, Frequency	Parameter No.	Manufacturer	Wiring Diagram	Number of Turns	Tuning Capacitance	No Load Q
T_1	FM Quad. Coil 10.7MHz	IFT−41K9	Mitsumi		①−②7T ②−③4T ④−⑥2T	100pF	90±20%
T_2	AM MW Osc. Coil	L−5K7−H4	Mitsumi		①−③87T ④−⑥6T	—	100±20%
T_3	AM Mix. Output 455kHz	IFT−21K7 H−4	Mitsumi		①−②10T ②−③43T ④−⑥14T	1500pF	130±20%

Explanation for Use

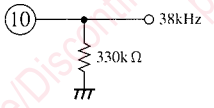
1. Stereo Indicator (Pin⑩)

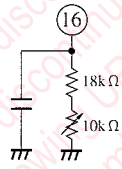
This pin is used as a stereo indicator and VCO check pin.

a) In stereo mode, connect it as follows :

b) When it is not used, open Pin⑩.

c) For checking 38kHz (1/2 VCO free-run frequency), connect it as follows :

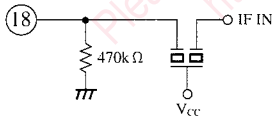




Adjustment of 38kHz is done at Pin⑯. 38kHz tuning can be obtained by adjusting 10kΩ volume.

2. AM IF Input (Pin⑱)

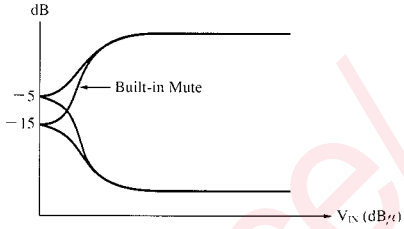
This is an input pin for AM IF limiter. The following shows its connection.



The resistor of 470kΩ is used to compensate DC offset of input differential amp. of AM IF limiter.

3. FM Muting

This IC incorporates the muting circuit of FM internal channel noise. (Mute can detect weak station signals to remove noise between channels.)



4. V_{CC} Pattern

a) FM front end V_{CC} (Pin㉒)

Pin㉒ is used only for FM front end, whether it is internal or external. 22 Ω of resistance and 0.01 μF of capacitance function as filter from FM mixer.

b) Regulator Pin (Pin⑰)

This pin is used for FM IF limiter. It is for input differential amp. and AM mixer and oscillation bias. For printed board, AM ceramic filter is connected to it and also AM oscillation coil is directly connected to this pin. Pin⑰ is branched from V_{CC} line.

c) IC V_{CC} (Pin⑥)

This is V_{CC} pin common to the ICs.

5. GND Pattern

a) FM front end GND (Pin②)

This pin is used only for FM, FE inside. It functions as path in the same way as IC, GND (Pin⑦) outside.

b) This pin is a common GND pin.

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