AM radio / FM IF stereo system IC

BA1450S

The BA1450S is a tuner system IC for electronic tuning for AM radios, FM IF, and MPX. It has been developed for HiFi component applications.
The MPX VCO circuit requires no adjustment, which will enable a reduction in the number of production line processes. In particular, the laser lock technique used in the VCO means that no external adjustment is required.

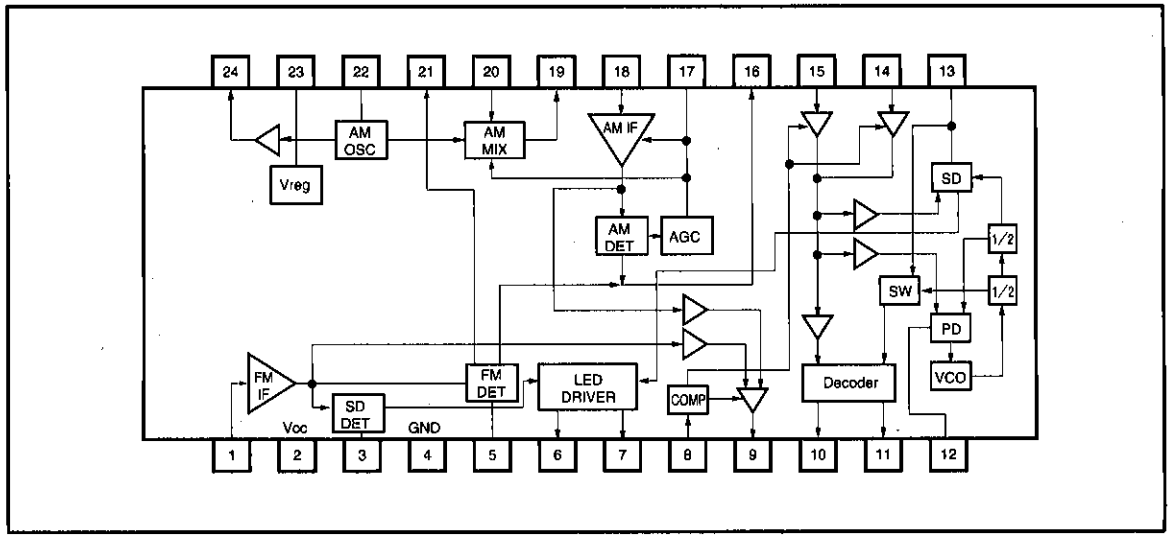
●Applications

Synthesized tuner for HiFi components.

●Features

1) Built-in AM monaural radio, FM IF amplifier/detector, and FM stereo demodulator.
2) DTS (both SD and IF count) compatible.
3) Built-in reference voltage power supply provides good shortwave band frequency stability.
4) Good FM stability.
5) The FM MPX VCO uses laser locking making adjustment and external components unnecessary.
6) Built-in forced monaural operation function for MPX (VCO stops, and LED goes off).
7) Low cutoff of audio is possible to improve AM fidelity.
8) MPX VCO stops in AM mode.
9) Audio muting is possible when an IF request is made.

●Block diagram



●Absolute maximum ratings (Ta = 25℃)

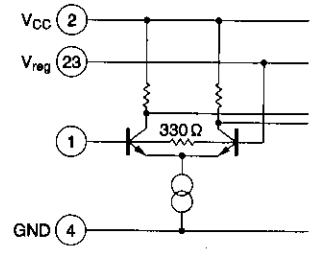
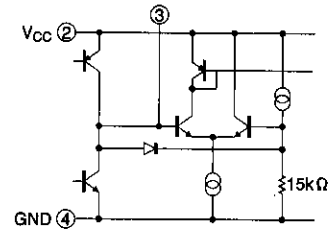
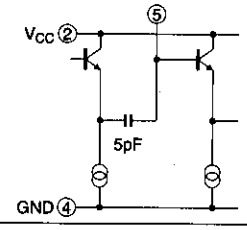
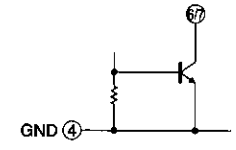
Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	9.0	V
Power dissipation	Pd	600*1	mW
Operating temperature	Topr	−25~75	℃
Storage temperature	Tstg	−55~125	℃

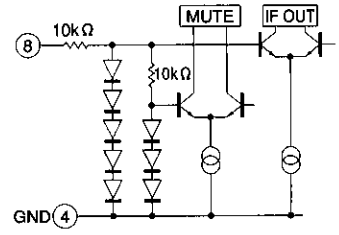
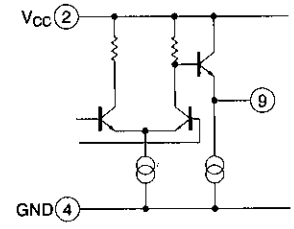
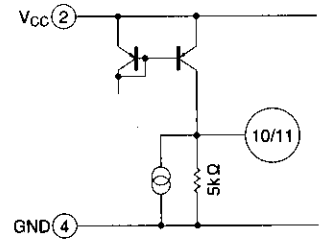
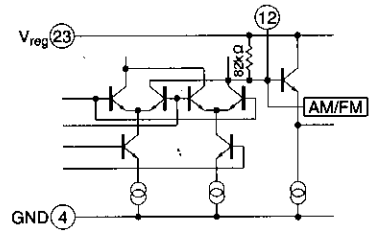
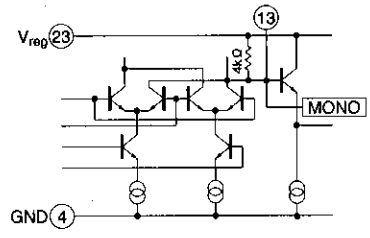
*1 Reduced by 6.0mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25℃)

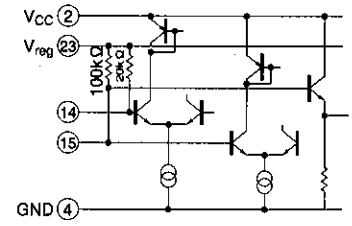
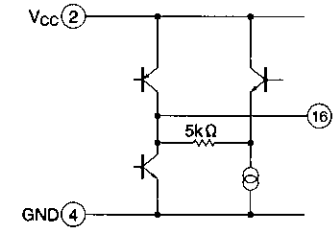
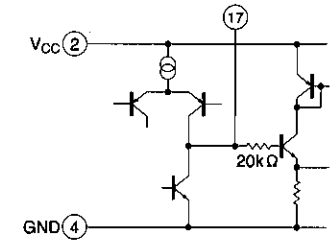
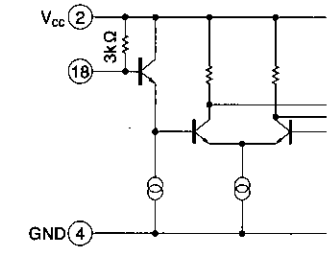
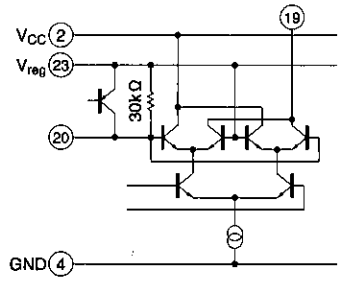
Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating supply voltage range	V_{CC}	3.8	5.0	8.0	V

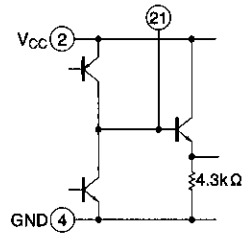
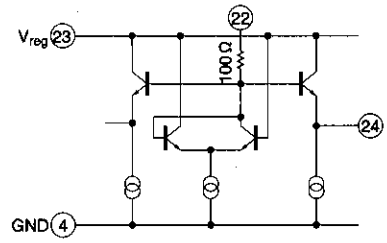
●Input and output circuits

Pin No.	Function	Internal circuit	Quiescent voltage (V) FM	Quiescent voltage (V) AM
1	FM IF amplifier input Connected to an FM ceramic filter.		2.1	2.1
2	Vcc	——	5.0	5.0
3	FM tuning ON level adjustment Connect a resistor from this pin to GND to set the required ON level for the tuning indicator.		0.25	0
4	GND	——	0	0
5	FM discriminator Connected to the discriminator coil.		5.0	5.0
6	Tuning indicator Connected to a tuning indicator display device (eg. LED)		—	—
7	Stereo indicator Connected to a stereo indicator display device (eg. LED)		—	—

Pin No.	Function	Internal circuit	Quiescent voltage (V) FM	Quiescent voltage (V) AM
8	• IF request IF signal is output when input is 3.5V or more. • MUTE MUTE on when input is 1.5V or more.		0	0
9	IF output Output for the IF signal.		4.2	4.2
10	R-channel output		1.5	1.5
11	L-channel output		1.5	1.5
12	• PLL filter Connected to a lag/lead filter. • AM/FM band switch AM band when connected to GND.		2.1	0
13	• Forced monaural Forced monaural operation when connected to GND. • Pilot filter Connected to a capacitor.		2.1	2.1

●Input and output circuits

Pin No.	Function	Internal circuit	Quiescent voltage (V) FM	AM
14	MPX input Input for the output of the FM detector.		2.1	2.1
15	MPX input Input for the output of the FM detector after AM low cut.		2.1	2.1
16	AM/FM detector output Connect to the following stage MPX. FM low pass filter.		2.1	2.1
17	AM AGC Connected to a capacitor.		0	0
18	AM IF input Connected to an AM ceramic filter.		5.0	5.0
19	AM mixer output Connected to primary side of AM IFT.		5.0	5.0
20	AM antenna Connected to AM antenna.		2.1	2.1

Pin No.	Function	Internal circuit	Quiescent voltage (V)	
			FM	AM
21	FM bandwidth adjustment Connect a resistor from this pin to the r eference voltage supply to set the required bandwidth.		2.1	2.1
23	Reference voltage supply, connected to a capacitor.	———	2.1	2.1
22	AM local oscillator Connected to the AM OCS circuit.		2.1	2.1
24	AM local oscillator output AM OCS output.		1.7	1.4

●Electrical characteristics

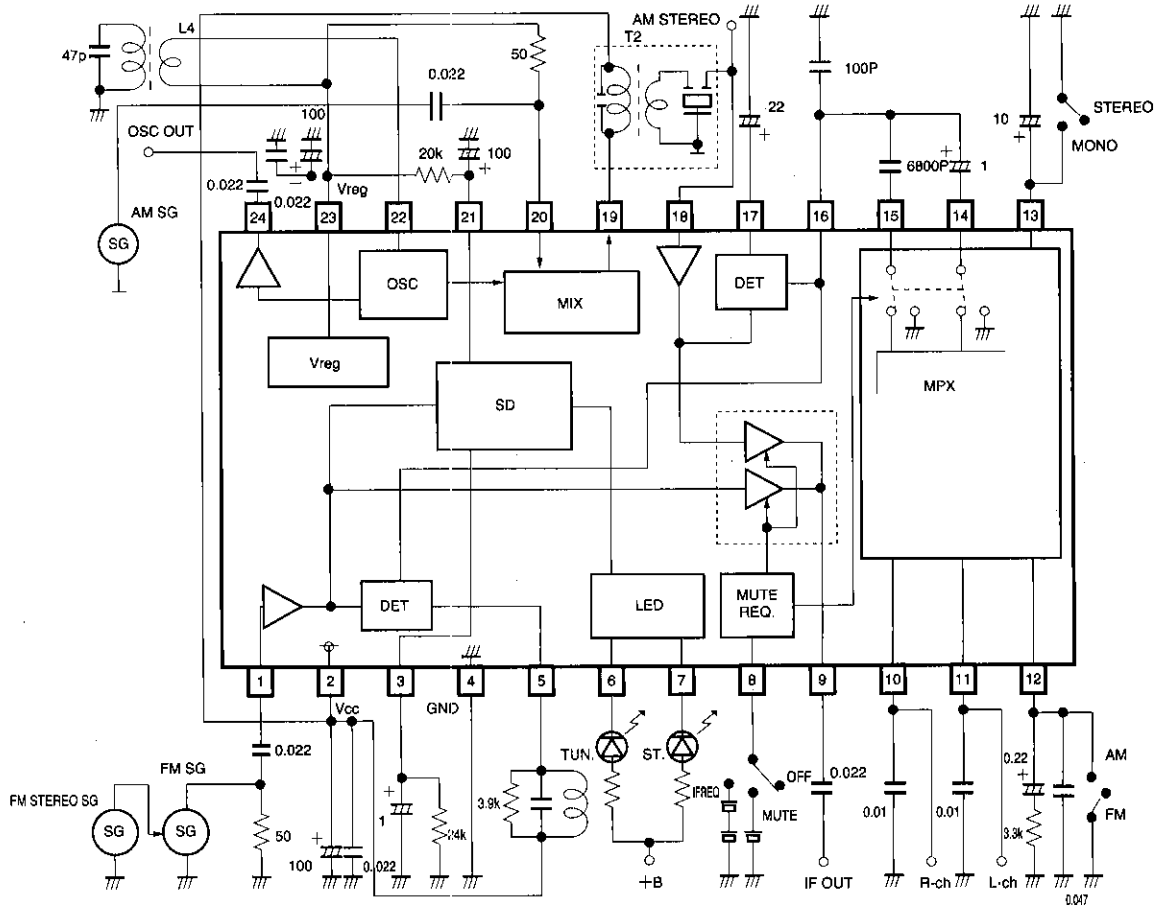
(Unless otherwise specified, Ta = 25℃ and V_{CC} = 5V)

FM IF MPX signal source : f_{IN} = 10.7MHz, modulation 1kHz, 75kHzdev (100%)
19kHz 7.5kHzdev (10%)

AM : f_{IN} = 1000kHz, modulation 1kHz 30%

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent circuit current FM	$I_{Q\ (FM)}$	13	21	29	mA	No input
Quiescent circuit current AM	$I_{Q\ (AM)}$	11	19	27	mA	No input
<FM IF MPX>						
Detector output voltage	V_O	340	480	670	mVrms	V_{IN}=100dBμV,mono
-3dB limiting sensitivity	L.S	34	37	40	dBμV	mono
Signal to noise ratio	S/N	72	80	—	dB	V_{IN}=100dBμV, mono
Channel balance	C.B	−2	0	+2	dB	V_{IN}=100dBμV, mono
AM rejection ratio	AMR	45	55	—	dB	AM : V_{IN}=60dBμV, mod=30%、400Hz
Channel separation	SEP	35	45	—	dB	V_{IN}=100dBμV, main
Total harmonic distortion	THD	—	0.5	1.6	%	V_{IN}=100dBμV, main
Station detector sensitivity	SD_S	37	42	47	dBμV	Input for pin 6 current ≧ 1mA
Station detector bandwidth	SD_{SW}	70	100	150	kHz	V_{IN}=100dBμV, mono
IF OUT output voltage	V_{IF}	300	400	530	mVp-p	IF request ON
<AM>						
Detector output voltage	V_O	70	90	120	mVrms	V_{IN}=68dBμV
Sensitivity	Q.S	22	25	28	dBμV	Input for S/N = 20dB
Signal to noise ratio	S/N	42	52	—	dB	V_{IN}=68dBμV
Total harmonic distortion	THD	—	0.6	1.8	%	V_{IN}=68dBμV
Station detector sensitivity	SD_S	21	26	31	dBμV	Input for pin 6 current ≧ 1mA
IF OUT output voltage	V_{IF}	300	400	530	mVp-p	IF request ON
Local buffer output voltage	V_{OBuff}	140	200	280	mVrms	

●Measurement circuit



L4	: AM OSC	Sumida	2157-JPS-029	
T2	: AM IFT	Toko	CFMA-258	Unit : R [Ω]
CD1	: FM DISCRIMINATOR COIL	Murata Mfg. Co., Ltd.	0236-JPS-101	C [μF]
		TDK		

Fig. 1

●Application example

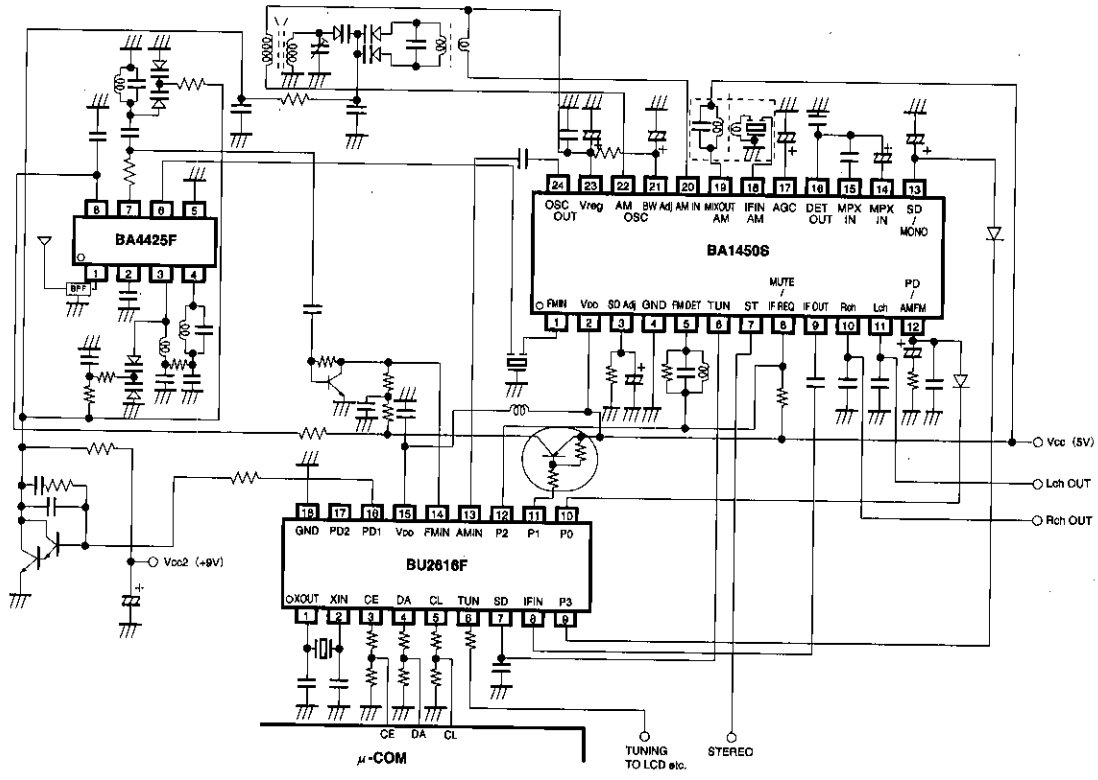


Fig. 2

●Electrical characteristics curves

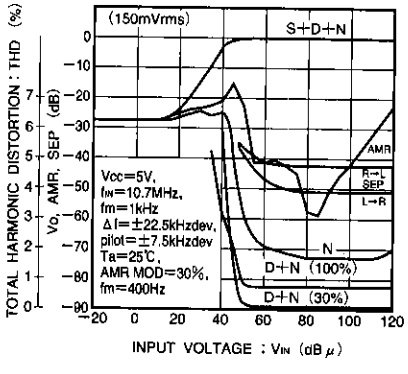


Fig. 3 FM input/output characteristics

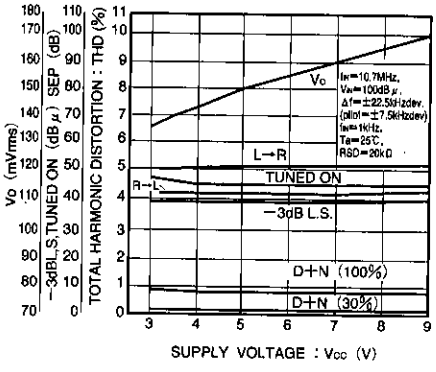


Fig. 4 Supply voltage vs. FM characteristics

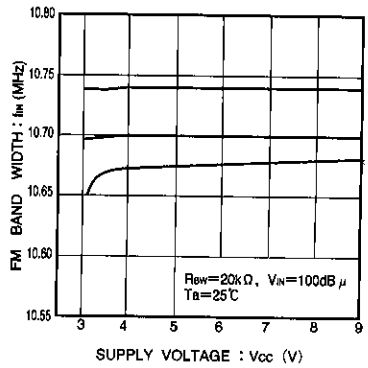


Fig. 5 Supply voltage vs. FM bandwidth characteristics

●Electrical characteristics curves

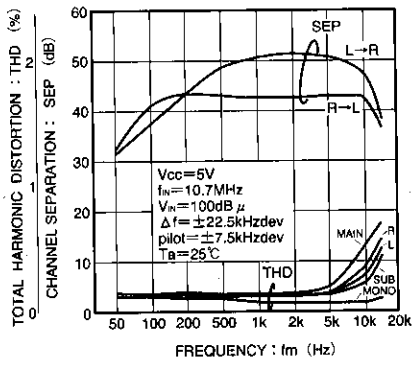


Fig. 6 Frequency vs. channel separation and THD

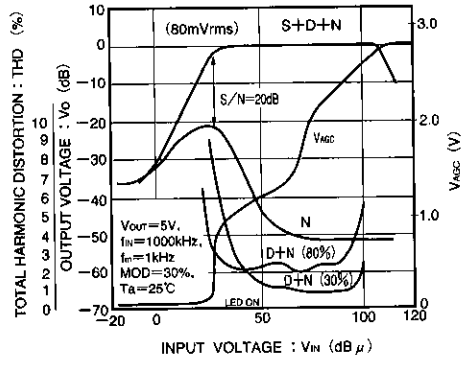


Fig. 7 AM input/output characteristics

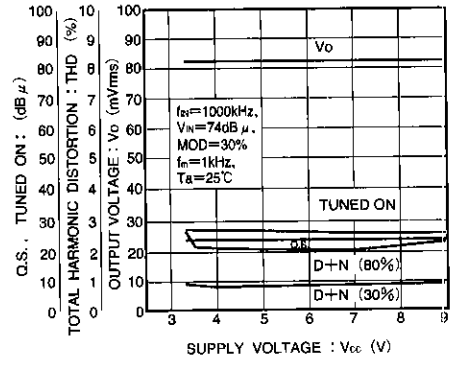


Fig. 8 Supply voltage vs. AM characteristics

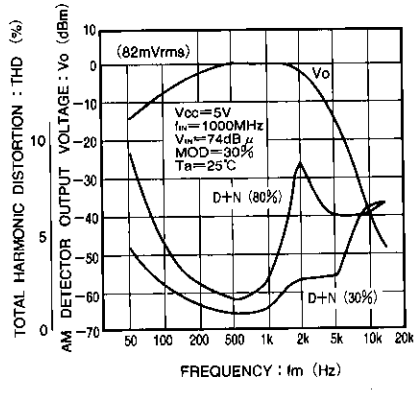
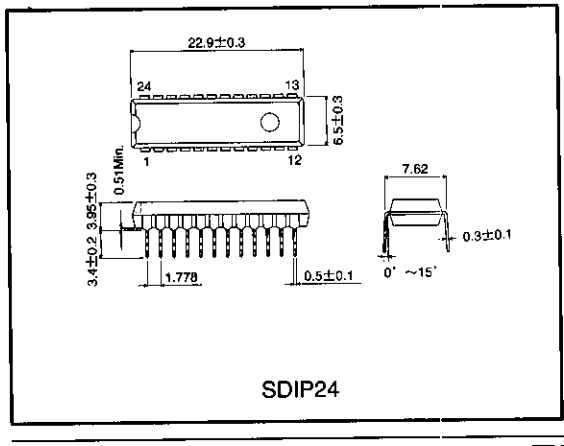


Fig. 9 Frequency vs. AM detector output and THD

●External dimensions (Unit: mm)



SDIP24

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