AM radio / FM IF stereo system IC

BA1448S / BA1449F

The BA1448S and BA1449F are electronic tuning system ICs for AM, FM IF, and MPX. They have been developed for use in radio cassette players and mini-component stereo systems.
The FM detector and MPX VCO circuits do not require adjustment, which will reduce the number of assembly line processes. In particular, the VCO is laser locked, and requires no adjustment or external components. The characteristics of the two chips are the same, but the packages are different (24-pin SDIP for the BA1448S and 24-pin SOP for the BA1449F).

●Applications

Synthesized tuners in radio cassette players and mini-component stereo systems.

●Features

1) Built-in mono AM radio, FM IF amplifier/detector, and FM stereo demodulator.
2) DTS compatible (both SD and IF count).
3) Built-in reference voltage supply for good short-wave band frequency stability.
4) Good FM stability.
5) FM detector does not require adjustment (ceramic discriminator).
6) FM MPX VCO is laser locked and requires no adjustment or external components.
7) Built-in forced monaural function for the MPX (VCO stops, LED off).
8) Audio can be low-cut to improve AM fidelity.
9) VCO for the MPX switches off during AM operation.
10) Mute possible for IF request.

●Absolute maximum ratings (Ta = 25°C)

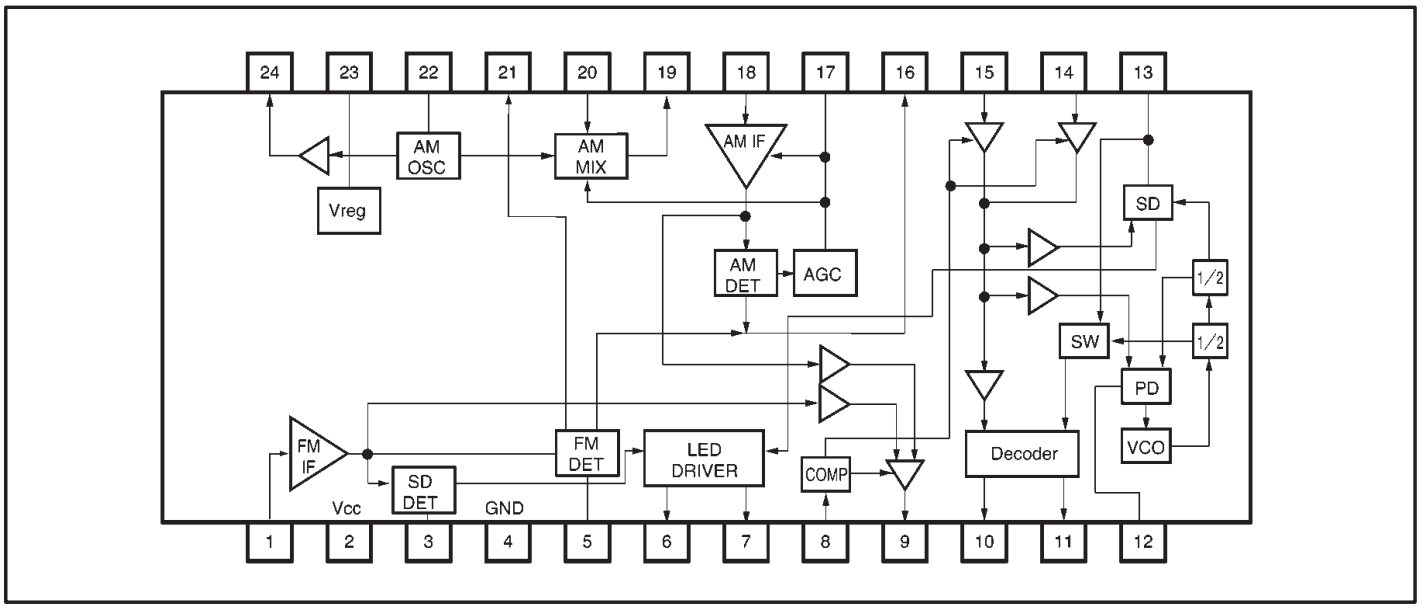
Parameter		Symbol	Limits	Unit
Power supply voltage		V_{CC}	9.0	V
Power dissipation	BA1448S	Pd	600*1	mW
	BA1449F		450*2	
Operating temperature		Topr	−25～+75	℃
Storage temperature		Tstg	−55～+125	℃

*1 Reduced by 6.0mW for each increase in Ta of 1°C over 25°C.
*2 Reduced by 4.5mW for each increase in Ta of 1°C over 25°C.

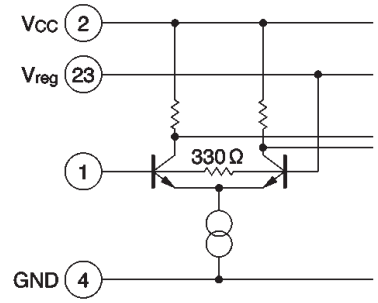
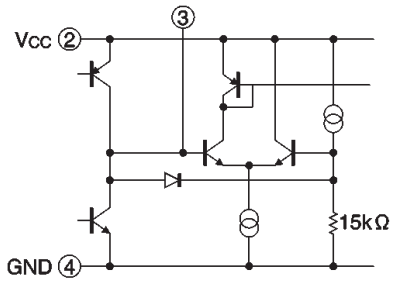
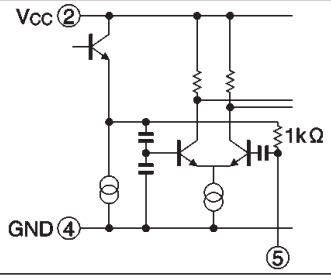
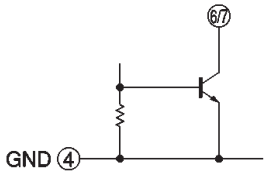
●Recommended operating conditions (Ta = 25°C)

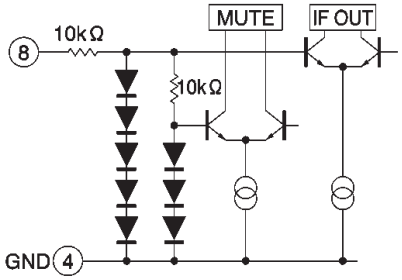
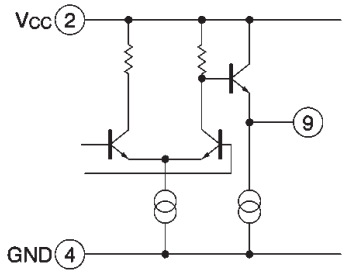
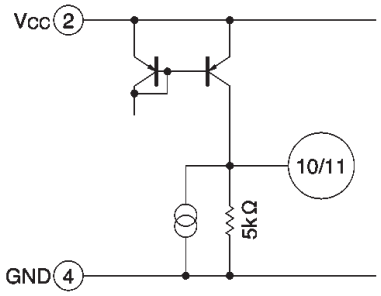
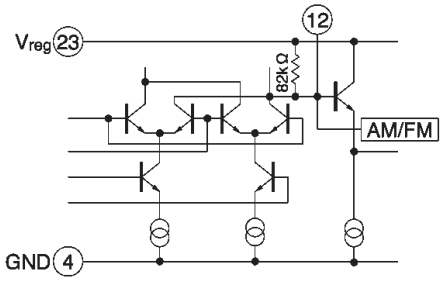
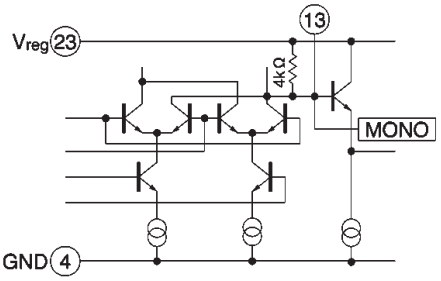
Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	3.8	5.0	8.0	V

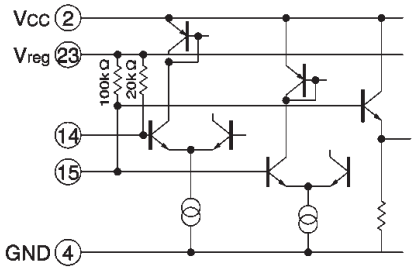
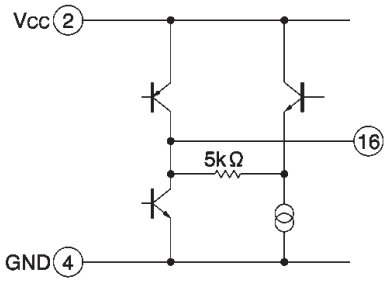
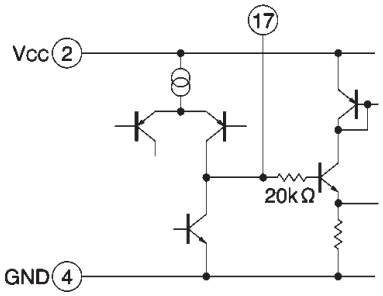
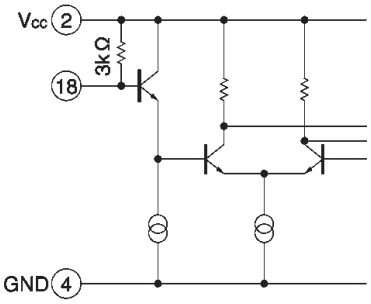
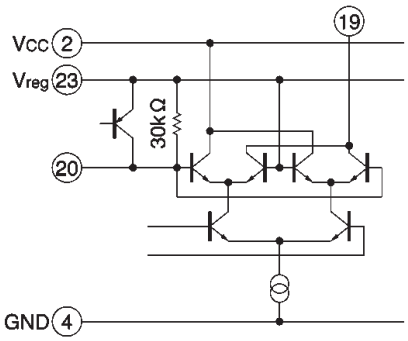
●Block diagram

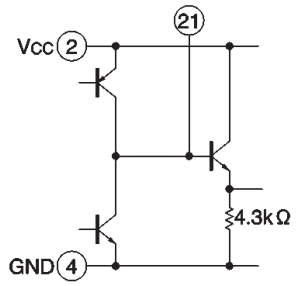
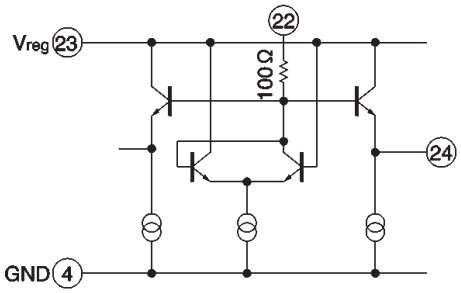


●Input/output circuits

Pin No.	Function	Internal circuit	Quiescent pin voltage (V)	
			FM	AM
1	FM IF input Connect to an FM ceramic filter.		2.1	2.1
2	Vcc	———	5.0	5.0
3	FM tuning ON level adjustment It is possible to set the tuning indicator ON level by choosing the value of the resistor connected to GND.		0.25	0
4	GND	———	0	0
5	FM discriminator Connect to a ceramic discriminator.		3.5	5.0
6	Tuning indicator Connect to an LED or tuning indicator device.		—	—
7	Stereo indicator Connect to an LED or stereo indicator device.		—	—

Pin No.	Function	Internal circuit	Quiescent pin voltage (V)	
			FM	AM
8	• IF request IF signal output when 4.0V or more. • MUTE MUTE on when 2.0V or more.		0	0
9	IF output IF signal output.		4.2	4.2
10	R channel output		1.5	1.5
11	L channel output		1.5	1.5
12	• PLL filter Connect to a lag/lead filter. • AM/FM band switch AM mode when connected to GND.		2.1	0
13	• Forced monaural Forced monaural when connected to GND. • Pilot filter Connect to a capacitor.		2.1	2.1

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

Pin No.	Function	Internal circuit	Quiescent pin voltage (V)	
			FM	AM
21	FM detector bandwidth adjustment Set the required FM detector bandwidth by adjusting a resistor value connected to the reference voltage source.		2.1	2.1
23	Reference voltage Connect to a capacitor.	———	2.1	2.1
22	AM station oscillator Connect to AM oscillator circuit.		2.1	2.1
24	AM oscillator output AM oscillator output.		1.7	1.4

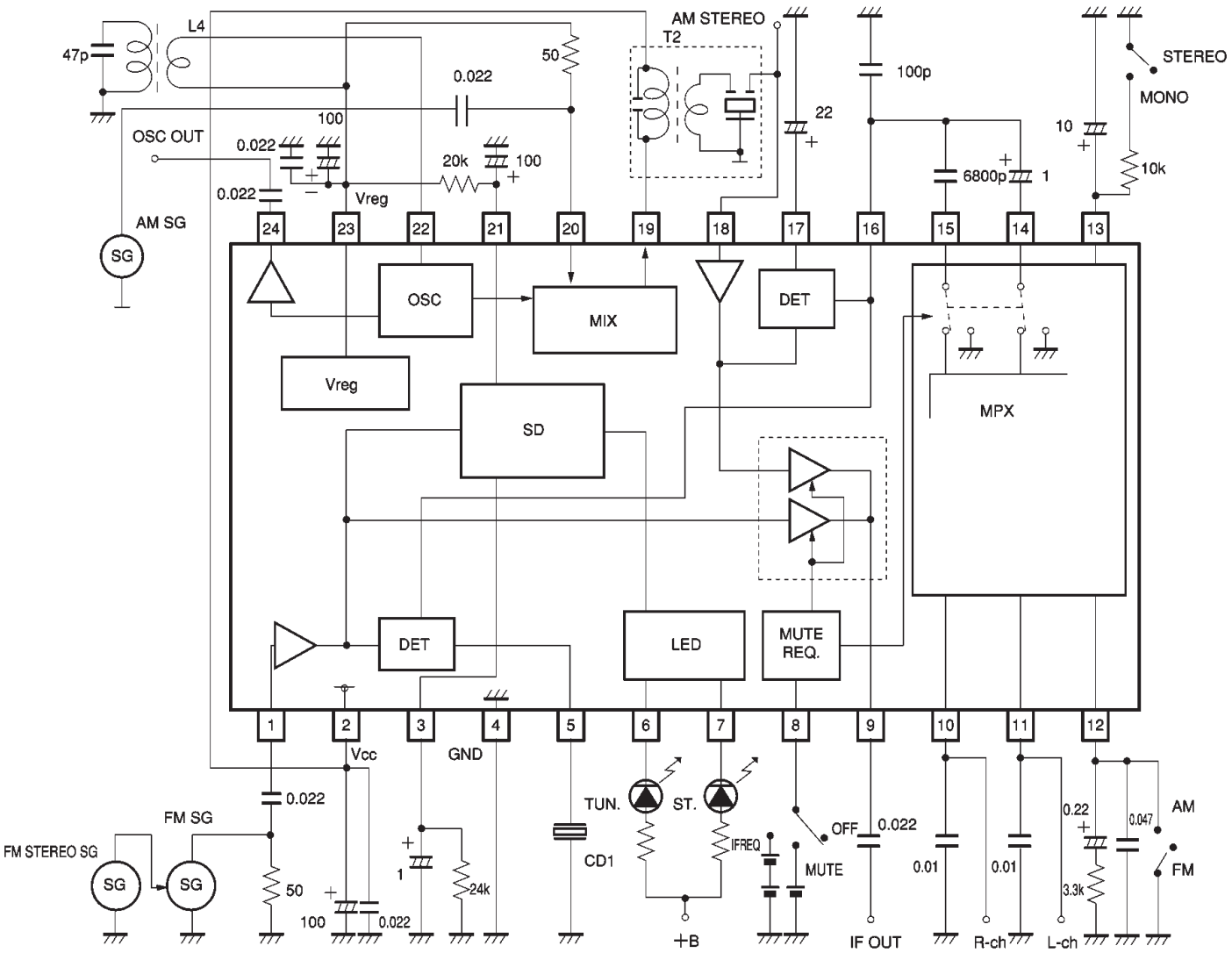
●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{CC} = 5V)

Signal source FM IF MPX: f_{IN} = 10.7MHz, 1kHz modulation 22.5kHz dev (30%),
19kHz modulation 7.5kHz dev (10%)

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent circuit (FM)	$I_{Q\ (FM)}$	11	19	29	mA	No signal
Quiescent circuit (AM)	$I_{Q\ (AM)}$	11	19	29	mA	No signal
〈FM IF MPX〉						
Detector output voltage	V_O	68	90	120	mV_{rms}	V_{IN}=100dBμV, mono
-3dB limiting sensitivity	L.S	32	36	40	dBμV	mono
Signal-to-noise ratio	S / N	62	70	—	dB	V_{IN}=100dBμV, mono
Channel balance	C.B	−2	0	2	dB	V_{IN}=100dBμV, mono
AM suppression ratio	AMR	40	50	—	dB	AM : V_{IN}=60dBμV, mod=30%, 400Hz
Channel separation	SEP	35	45	—	dB	V_{IN}=100dBμV, main
Total harmonic distortion	THD	—	0.1	0.8	%	V_{IN}=100dBμV, main
Station detector sensitivity	SD_S	36	43	50	dBμV	Input to make pin 6 current≧1mA
Station detector bandwidth	SD_{SW}	50	100	160	kHz	V_{IN}=100dBμV, mono
IF OUT pin output voltage	V_{IF}	300	400	530	mV_{P-P}	IF request on
〈AM〉						
Detector output voltage	V_O	68	90	120	mV_{rms}	V_{IN}=68dBμV
Usable sensitivity	Q.S	21	24	27	dBμV	Input to make 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	20	27	34	dBμV	Input to make pin 6 current≧1mA
IF OUT pin output voltage	V_{IF}	300	400	530	mV_{P-P}	IF request on
Buffer output voltage	V_{OBuff}	140	200	280	mV_{rms}	—

●Measurement circuit



L4	: AM OSC	Sumida	2157-JPS-029	
T2	: AM IFT	Toko	CFMA-258	Unit : R [Ω]
CD1	: FM CERAMIC DISCRIMINATOR	Murata	CDA10.7MG	C [μF]

Fig. 1

●Application example

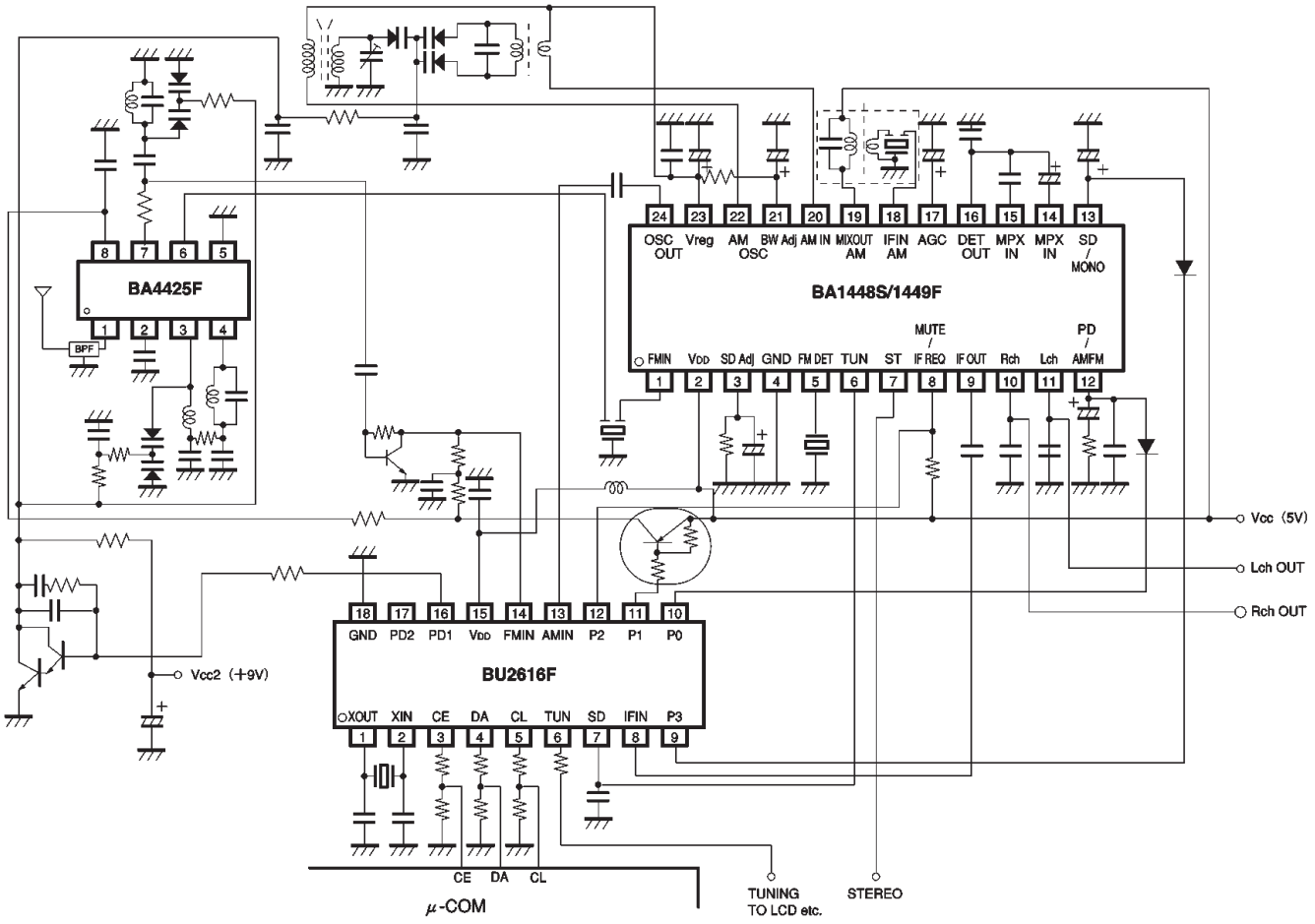


Fig. 2

●Electrical characteristic curves

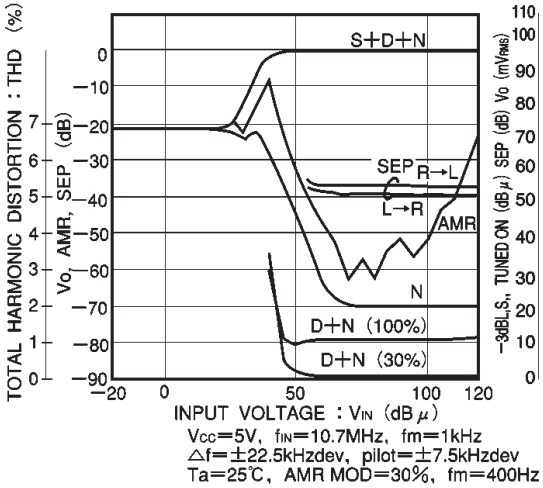


Fig. 3 FM I / O characteristics

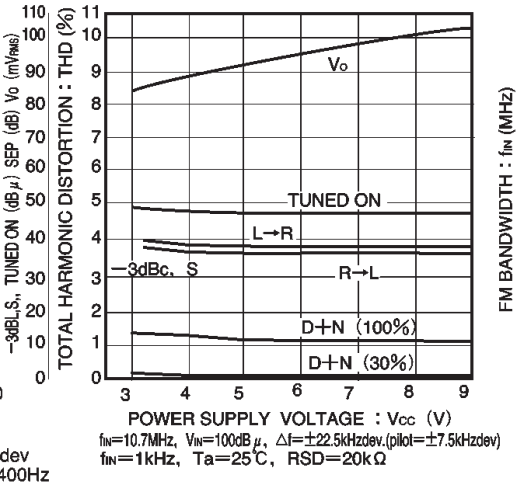


Fig. 4 FM characteristics vs. power supply voltage

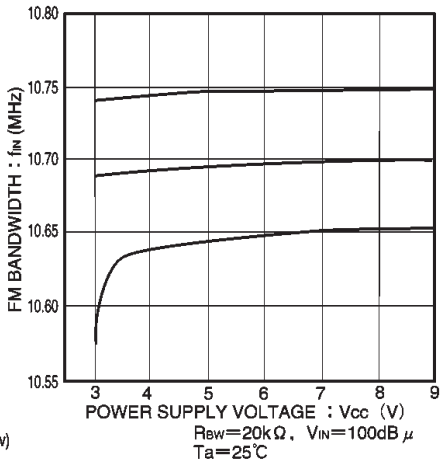


Fig. 5 FM bandwidth vs. power supply voltage

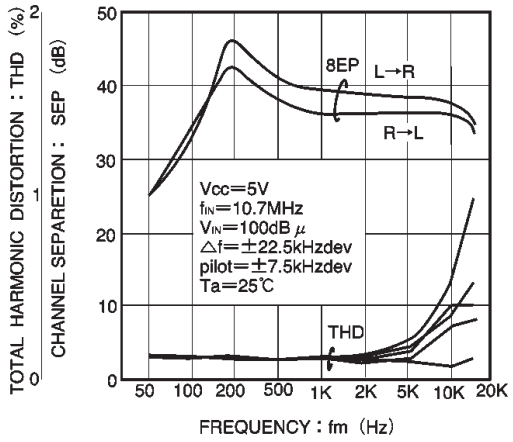


Fig. 6 Frequency vs. FM channel separation and THD

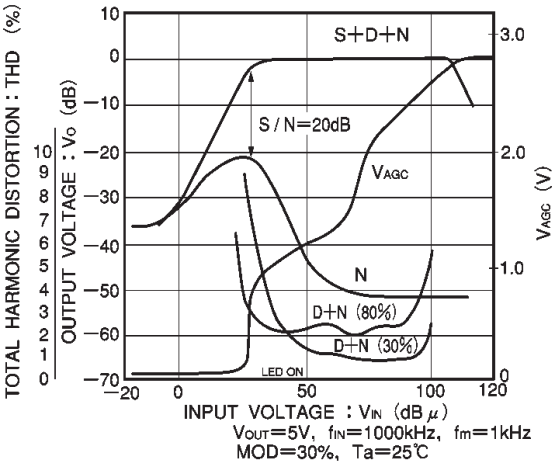


Fig. 7 AM I / O characteristics

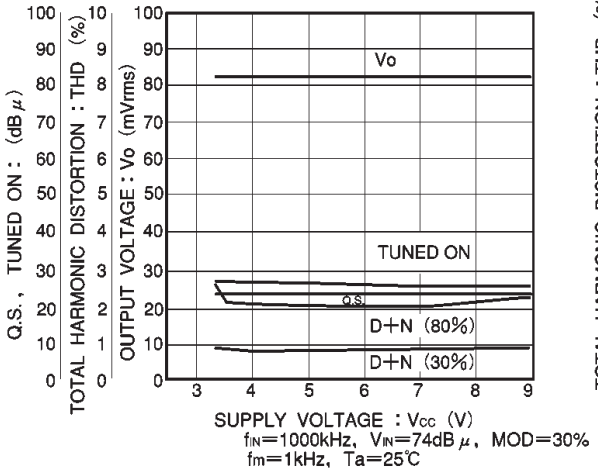


Fig. 8 AM characteristics vs. power supply voltage

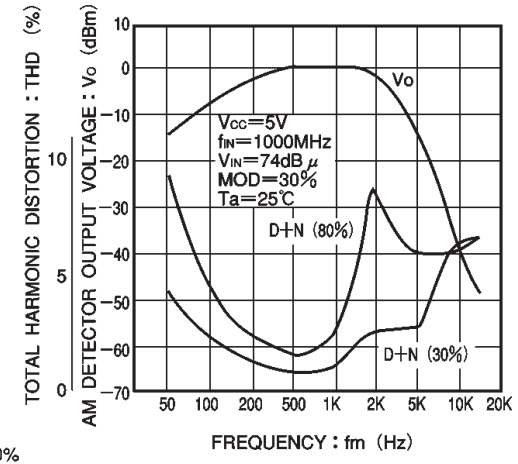
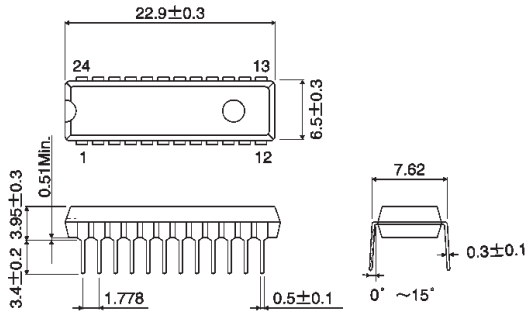


Fig. 9 AM detector output and THD vs. frequency

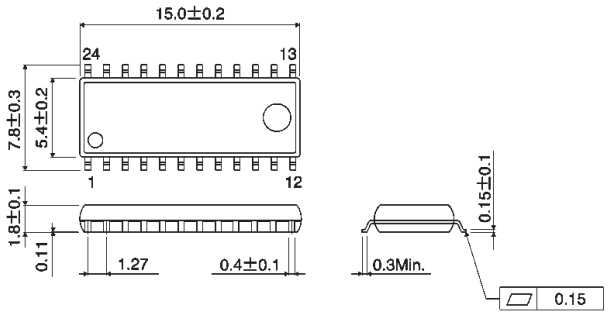
●External dimensions (Units: mm)

BA1448S



SDIP24

BA1449F



SOP24