

LA1823

SANYO

Single-Chip Tuner IC for Use in Radio Cassette Recorder

Preliminary

Overview

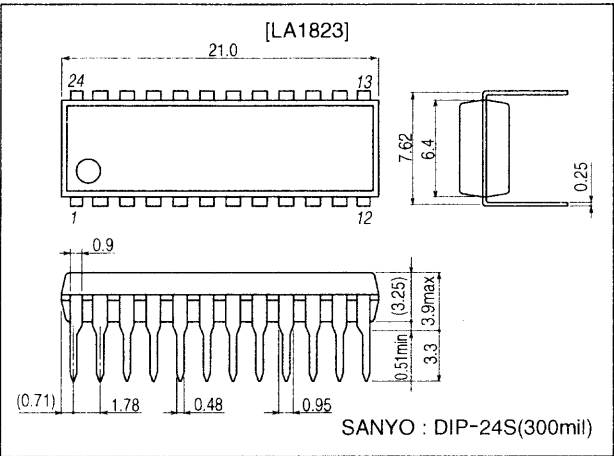
The LA1823 is a single-chip tuner IC that incorporates FM/AM and MPX circuits and supports electronic tuning. The built-in MPX-VCO allows this IC to be adjustment-free and to require no external components.

Features

- FM, AM and MPX integrated in a single-chip.
- FM front-end : Local OSC voltage reduced.
- Adjustment free MPX-VCO
: No ceramic resonator used.
- Adjustment free FM-DET
: Using ceramic discriminator.
- Build in FM stereo indicator.
- Build in FM/AM IF count buffer.
- Build in AM OSC buffer.
- Package : DIP-24S.

Package Dimensions

unit : mm
3067A



Functions

- FM : RF amplifier, mixer, oscillator, IF amplifier, detector, signal meter, IF count buffer output.
 AM : RF amplifier, mixer, oscillator (with ALC), oscillator buffer output, IF amplifier, detector, AGC, IF count buffer output.
 MPX : PLL stereo decoder, stereo indicator, VCO on chip, forced monaural, Audio mute.

Specifications

Maximum Ratings at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	VCC max		7.0	V
Indicator drive current	I _{LED}	Pin 8	20	mA
Allowable power dissipation	Pd max	Ta ≤ 70 °C	300	mW
Operating temperature	T _{opg}		-20 to +70	°C
Storage temperature	T _{stg}		-40 to +125	°C

Operating Conditions at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	VCC		4.5	V
Operation supply voltage range	VCC op		1.8 to 6.0	V

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Operating Characteristics at Ta = 25 °C, VCC = 4.5 V, in the specified test circuit using
the IC59-2043-2 socket (Yamaichi Electric Co.,Ltd.)

Quiescent supply current

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
FM-mode quiescent current	ICC(FM)	No input	10.0	15.0	20.0	mA
AM-mode quiescent current	ICC(AM)	No input	6.5	9.2	14.5	mA

FM front-end characteristics at fc = 98 MHz, fm = 1 kHz, 22.5 kHz dev

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input limiting voltage	-3 dB L.S.	Referenced to VIN = 60 dBμV EMF, 22.5 kHz dev, a 3 dB down input		12		dBμV EMF
Local oscillator voltage	VOSC	fosc = 108.7 MHz with FET buffer gain ≈ 0 dB		100		mVrms

FM IF characteristics (monaural) at fc = 10.7 MHz, fm = 1 kHz, 75 kHz dev

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Demodulation output	VO	VIN = 100 dBμV	135	180	240	mVrms
Signal-to-noise ratio	S/N	VIN = 100 dBμV	63	72		dB
Total harmonic distortion (mono)	THD	VIN = 100 dBμV		0.5	1.5	%
Input limiting voltage	-3 dB L.S.	Referenced to VIN = 100 dBμV, 75 kHz dev, a 3 dB down input	31	38	45	dBμV
IF count buffer on level	IF buff on	IF count buffer on	35	45	55	dBμV
IF count buffer output	VIF buff	Test from pin 7 for VIN = 100 dBμV, no modulation	120	180	240	mVrms

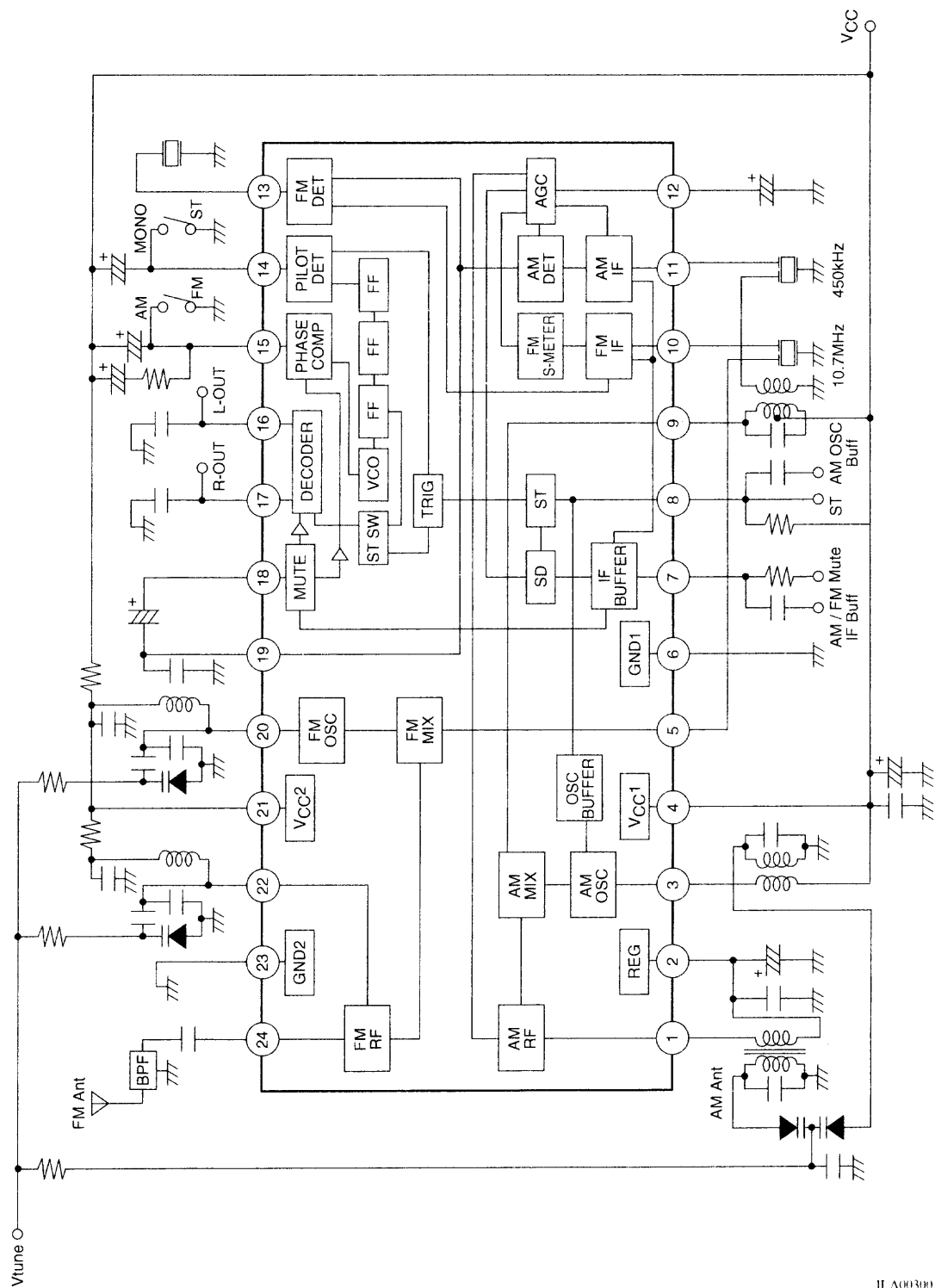
FM IF characteristics (stereo) at fc = 10.7 MHz, fm = 1 kHz, 75 kHz dev, L + R = 90 %, PILOT = 10 %

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Separation	SEP	VIN = 100 dBμV	25	40		dB
Stereo on level	ST-ON	VIN = 100 dBμV, Pilot modulation	2.4	3.5	7.2	%
Total harmonic distortion (main)	THD	VIN = 100 dBμV		0.5	1.7	%

AM characteristics at fc = 1 MHz, fm = 1 kHz, mod = 30 %

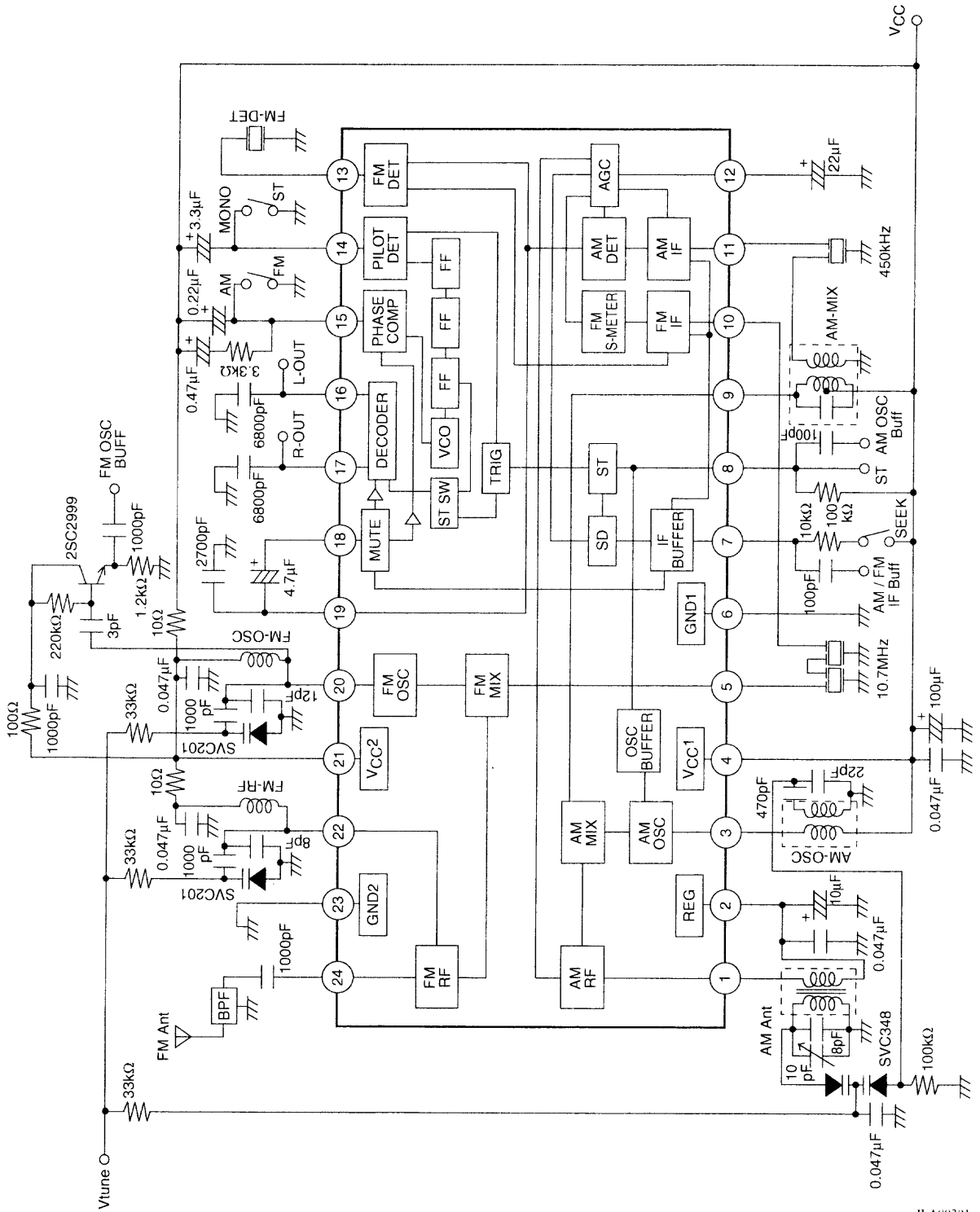
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Detector output	VO(1)	VIN = 23 dBμV	17	30	53	mVrms
	VO(2)	VIN = 80 dBμV	50	75	120	mVrms
Signal-to-noise ratio	S/N(1)	VIN = 23 dBμV	15	20		dB
	S/N(2)	VIN = 80 dBμV	47	54		dB
Total harmonic distortion	THD	VIN = 80 dBμV		0.5	1.5	%
OSC buffer output	VOSC buff	Test from pin 8 for no input	80	100	160	mVrms
IF count buffer on level	IF buff on	IF count buffer on	15	25	32	dBμV
IF count buffer output	VIF buff	Test from pin 7 for VIN = 80 dBμV, no modulation	110	180	220	mVrms

Block Diagram



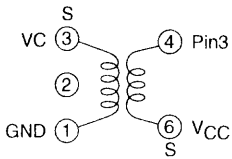
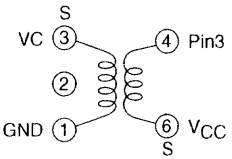
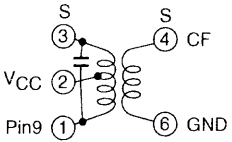
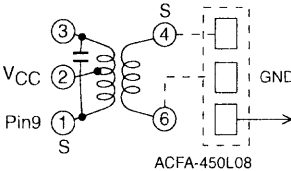
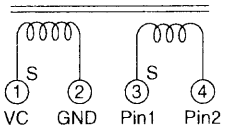
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Sample Application Circuit Diagram

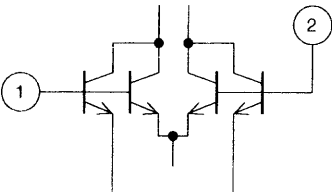
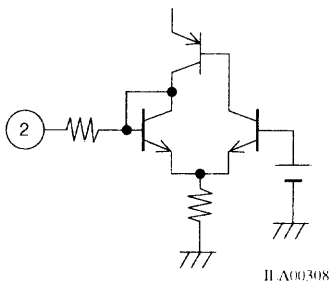
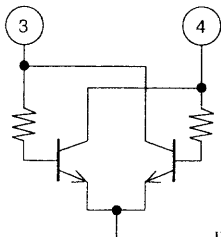
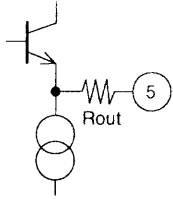
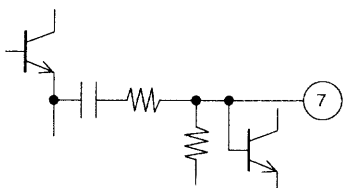


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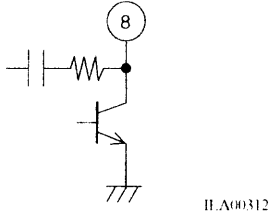
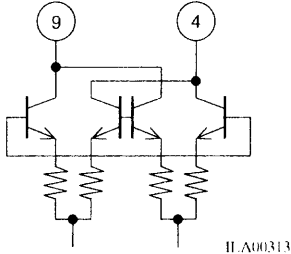
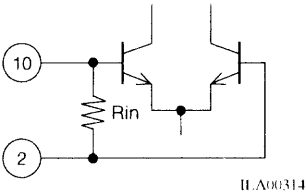
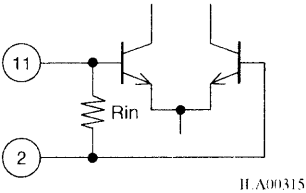
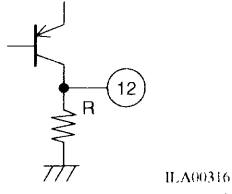
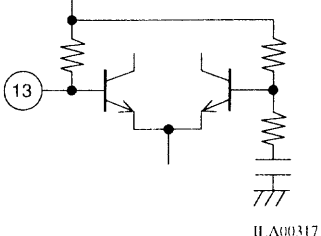
Coil specifications (bottom view)

• FM-BPF : SA-309 (Sumida) 88 MHz to 108 MHz		
• FM-RF : SA-149 (Sumida) 3.6 mm diameter, air core, 0.6 mm wire, 4.5 T		
• FM-OSC : SA-151 (Sumida) 3.6 mm diameter, air core, 0.6 mm wire, 3.5 T		
• FM-IF filter, discriminator : SK107M1-AE-10, CDF107F-AE-029 (Toko) SFE10.7MA5, CDA10.7MG1-A (Murata) : tentative		
• AM-OSC : SA-181 (Sumida)  II A00302	6-4 37 T 3-1 74 T 0.06UEW $f_o = 796 \text{ kHz}$ $Q_o \geq 80$ $L = 140 \mu\text{H}$: L7BRS-3132AQ (Toko)  II A00302
• AM-MIX : SA-1136 (Sumida)  II A00304	3-2 122 T 4-6 9 T 2-1 62 T 0.06UEW $f_o = 450 \text{ kHz}$, $Q_o \geq 65$ 180 pF internal	: PCFAZ-082 (Toko)  II A00305
• AM-IF filter : SFU450B (Murata)		
• MW Bar-antenna : C8E-A0105 (Toko)  II A00306	1-2 67 T 3-4 9 T $f_o = 796 \text{ kHz}$ $Q_u = 180 \text{ min}$ $L = 260 \mu\text{H}$	

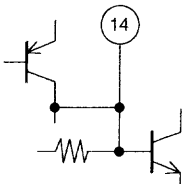
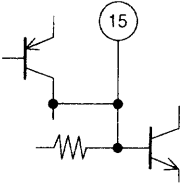
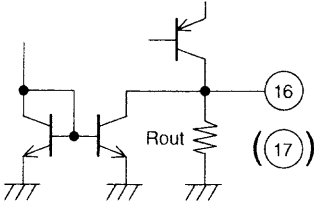
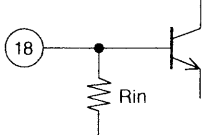
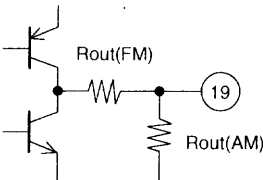
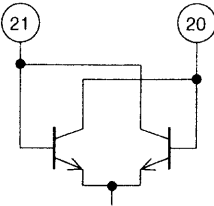
Pin Descriptions and Quiescent Voltage at VCC = 4.5 V

Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
1	AM-RF input	1.2	1.2	 II.A00307	Connect the AM antenna coil between this pin and pin 2 (Reg)
2	Reg	1.2	1.2	 II.A00308	
3	AM-OSC	4.5	4.5	 II.A00309	Connect the AM oscillator coil between this pin and pin 4 (VCC1)
4	VCC1	4.5	4.5		AM/FM-IF/MPX block VCC
5	FM-MIX output	2.4	2.2	 II.A00310	Rout = 270 Ω
6	GND1	0	0		AM/FM-IF/MPX block ground
7	IF buffer output and mute switch	4.5	4.5	 II.A00311	V7 ≥ 1.3 V : IF buffer output and muting on

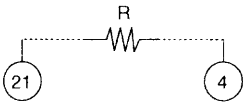
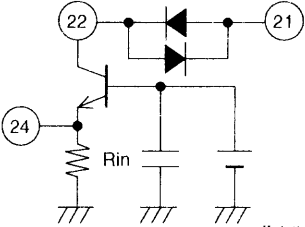
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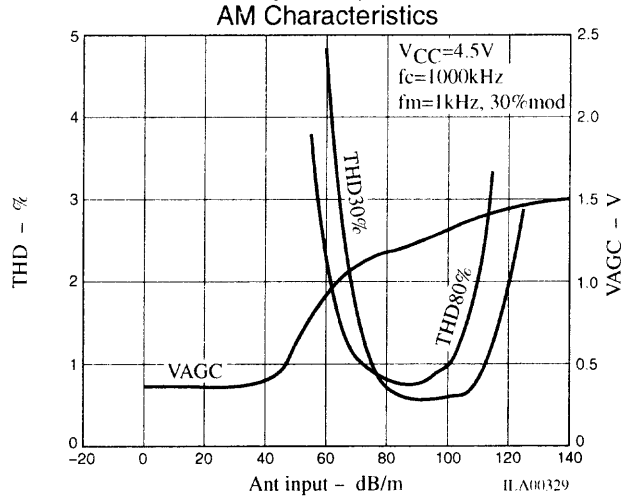
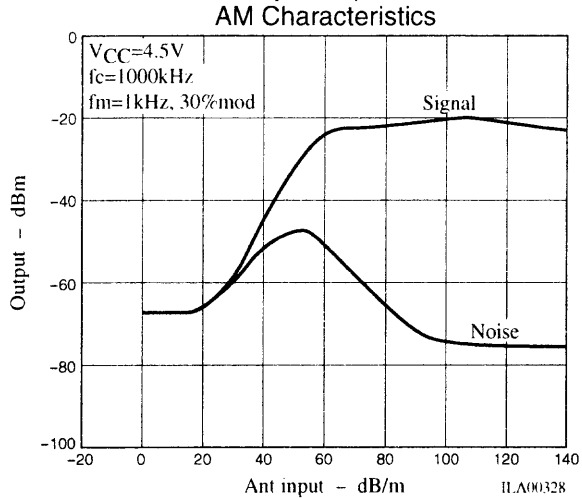
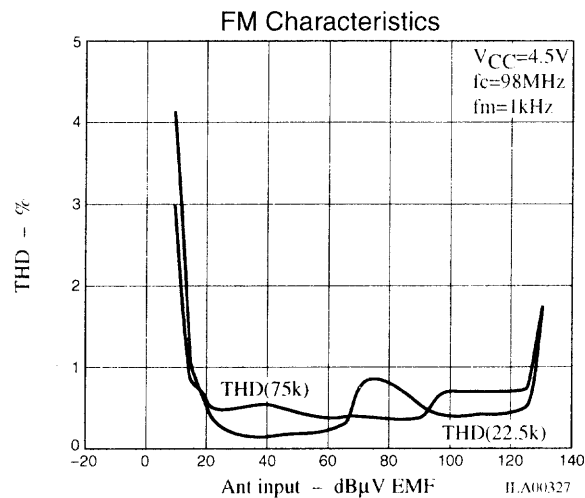
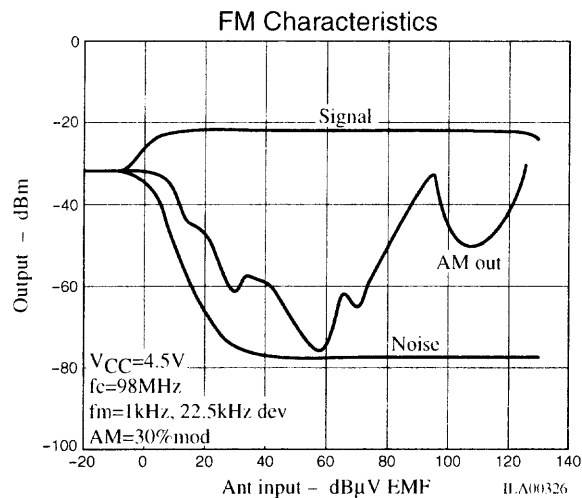
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
8	Stereo indicator, AM-oscillator buffer output	4.5	4.5		Active-low Open-collector output AM oscillator signal is output in AM mode
9	AM-MIX output	4.5	4.5		Connect the AM mixer coil between this pin and pin 4 (VCC1)
10	FM-IF input	1.2	1.2		$R_{in} = 330\ \Omega$
11	AM-IF input	1.2	1.2		$R_{in} = 2\ \text{k}\Omega$
12	AM-AGC output and FM signal meter output	0.4	0.1		Internal load resistance $R = 16.6\ \text{k}\Omega$
13	FM-DET	3.9	3.7		Recommended ceramic discriminator : CDF107F-AE-029 (Toko) CDA10.7MG** (Murata)

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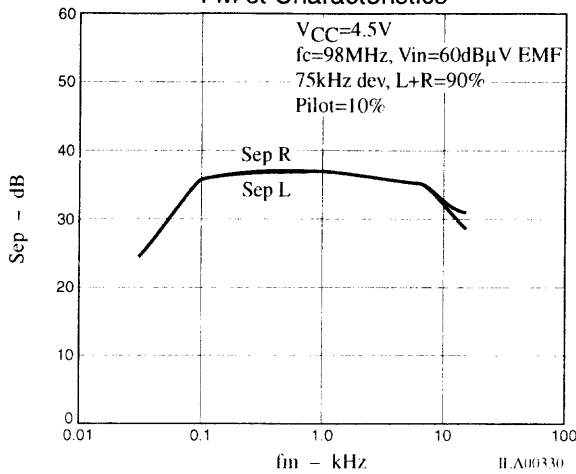
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
14	Pilot detector filter (forced mono)	2.9	3.8	 II.A00318	Forced monaural mode when pin 14 is connected to ground
15	Phase comparator filter (AM/FM switch)	0	3.8	 II.A00319	FM mode is when pin 15 is open, and AM mode is when pin 15 is connected to ground
16 17	L output R output	1.2	1.2	 II.A00320	$R_{out} = 7.5\text{ k}\Omega$
18	MPX input	1.2	1.2	 II.A00321	$R_{in} = 50\text{ k}\Omega$
19	AM/FM detector output	0.3	1.0	 II.A00322	Output impedance AM : $R_{out} = 50\text{ k}\Omega$ FM : $R_{out} = 500\text{ }\Omega$ The channel separation can be adjusted with an external capacitor connected between this pin and ground
20	FM-OSC	4.5	4.4	 II.A00323	Connect the FM oscillator coil between this pin and pin 21 (VCC2)

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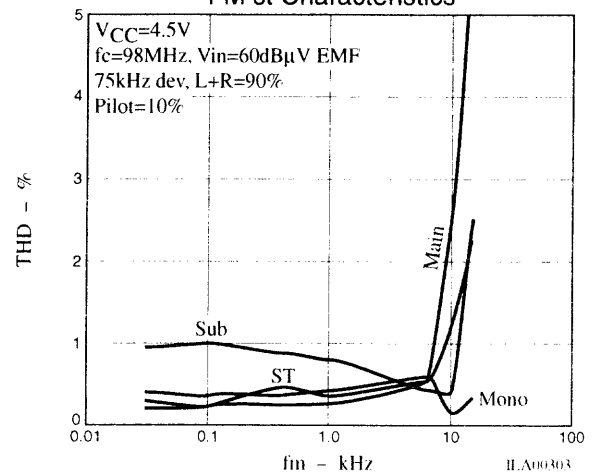
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
21	VCC2	4.5	4.4	 II A00324	FM-FE block VCC Power is supplied from pin 4 (VCC1) via external resistor (10 Ω)
22	FM-RF output	4.5	4.4	 II A00325	Connect the FM-RF coil between this pin and pin 21 (VCC2) Rin = 1.8 kΩ
24	FM-RF input	0	0.9		
23	GND2	0	0		FM-FE block ground



FM st Characteristics



FM st Characteristics



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