

**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.

**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  $T_a = 25\text{ }^\circ\text{C}$ 

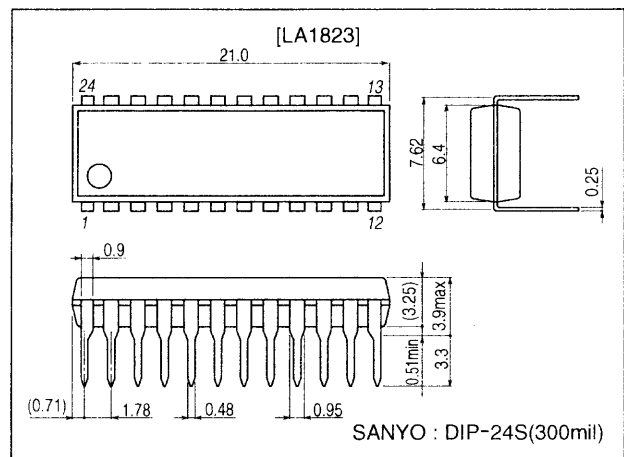
Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\text{ max}}$		7.0	V
Indicator drive current	$I_{LED}$	Pin 8	20	mA
Allowable power dissipation	$P_d\text{ max}$	$T_a \leq 70\text{ }^\circ\text{C}$	300	mW
Operating temperature	$T_{opg}$		-20 to +70	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

**Operating Conditions** at  $T_a = 25\text{ }^\circ\text{C}$ 

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		4.5	V
Operation supply voltage range	$V_{CC\text{ op}}$		1.8 to 6.0	V

**Package Dimensions**

unit : mm  
3067A



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**Operating Characteristics** at  $T_a = 25\text{ }^\circ\text{C}$ ,  $V_{CC} = 4.5\text{ V}$ , 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	I <sub>CC</sub> (FM)	No input	10.0	15.0	20.0	mA
AM-mode quiescent current	I <sub>CC</sub> (AM)	No input	6.5	9.2	14.5	mA

**FM front-end characteristics** at  $f_c = 98\text{ MHz}$ ,  $f_m = 1\text{ kHz}$ , 22.5 kHz dev

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input limiting voltage	-3 dB L.S.	Referenced to $V_{IN} = 60\text{ dB}\mu\text{V}$ EMF, 22.5 kHz dev, a 3 dB down input		12		dB $\mu\text{V}$ EMF
Local oscillator voltage	V <sub>OSC</sub>	$f_{osc} = 108.7\text{ MHz}$ with FET buffer gain $\approx 0\text{ dB}$		100		mVrms

**FM IF characteristics (monaural)** at  $f_c = 10.7\text{ MHz}$ ,  $f_m = 1\text{ kHz}$ , 75 kHz dev

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

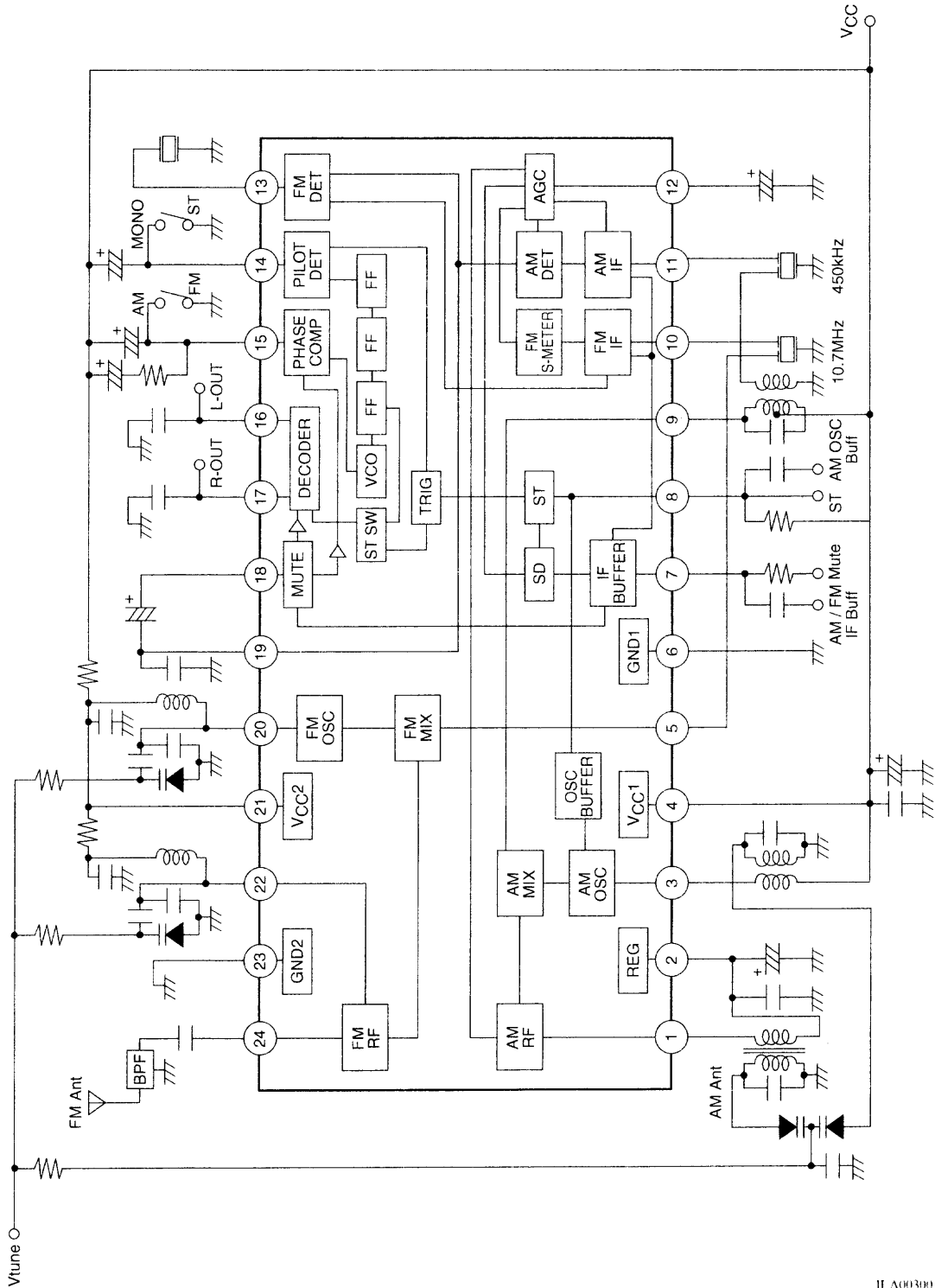
**FM IF characteristics (stereo)** at  $f_c = 10.7\text{ MHz}$ ,  $f_m = 1\text{ kHz}$ , 75 kHz dev, L + R = 90 %, PILOT = 10 %

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Separation	SEP	$V_{IN} = 100\text{ dB}\mu\text{V}$	25	40		dB
Stereo on level	ST-ON	$V_{IN} = 100\text{ dB}\mu\text{V}$ , Pilot modulation	2.4	3.5	7.2	%
Total harmonic distortion (main)	THD	$V_{IN} = 100\text{ dB}\mu\text{V}$		0.5	1.7	%

**AM characteristics** at  $f_c = 1\text{ MHz}$ ,  $f_m = 1\text{ kHz}$ , mod = 30 %

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Detector output	V <sub>O</sub> (1)	$V_{IN} = 23\text{ dB}\mu\text{V}$	17	30	53	mVrms
	V <sub>O</sub> (2)	$V_{IN} = 80\text{ dB}\mu\text{V}$	50	75	120	mVrms
Signal-to-noise ratio	S/N(1)	$V_{IN} = 23\text{ dB}\mu\text{V}$	15	20		dB
	S/N(2)	$V_{IN} = 80\text{ dB}\mu\text{V}$	47	54		dB
Total harmonic distortion	THD	$V_{IN} = 80\text{ dB}\mu\text{V}$		0.5	1.5	%
OSC buffer output	V <sub>OSC buff</sub>	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	dB $\mu\text{V}$
IF count buffer output	V <sub>IF buff</sub>	Test from pin 7 for $V_{IN} = 80\text{ dB}\mu\text{V}$ , no modulation	110	180	220	mVrms

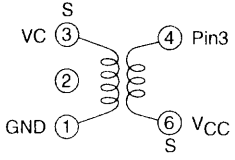
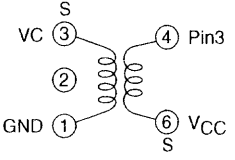
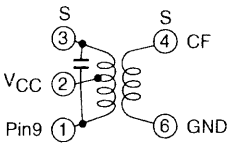
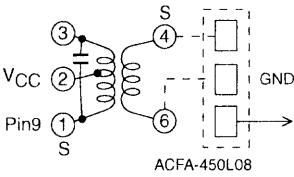
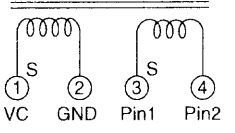
Block Diagram



IF A00300



**Coil specifications (bottom view)**

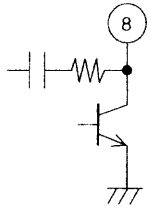
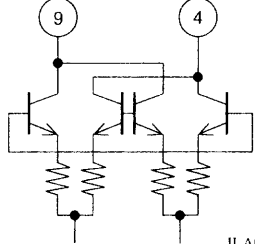
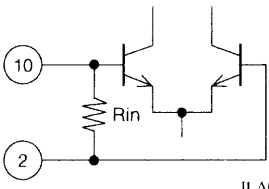
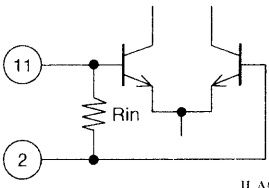
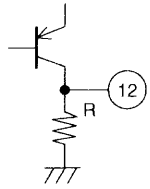
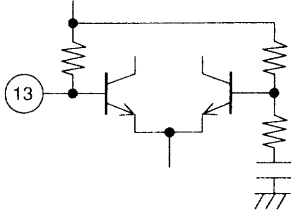
<p>• FM-BPF : SA-309 (Sumida) 88 MHz to 108 MHz</p>	
<p>• FM-RF : SA-149 (Sumida) 3.6 mm diameter, air core, 0.6 mm wire, 4.5 T</p>	
<p>• FM-OSC : SA-151 (Sumida) 3.6 mm diameter, air core, 0.6 mm wire, 3.5 T</p>	
<p>• FM-IF filter, discriminator :                  SK107M1-AE-10, CDF107F-AE-029 (Toko)                  SFE10.7MA5, CDA10.7MG1-A (Murata) : tentative</p>	
<p>• AM-OSC : SA-181 (Sumida)</p>  <p>6-4 37 T                  3-1 74 T                  0.06UEW  <math>f_o = 796 \text{ kHz}</math>  <math>Q_o \geq 80</math>  <math>L = 140 \mu\text{H}</math></p> <p>II A00302</p>	<p>: L7BRS-3132AQ (Toko)</p>  <p>3-1 64 T                  6-4 32 T                  0.06-2UEW  <math>f_o = 796 \text{ kHz}</math>  <math>Q_o \geq 65</math>  <math>L = 140 \mu\text{H}</math></p> <p>II A00302</p>
<p>• AM-MIX : SA-1136 (Sumida)</p>  <p>3-2 122 T                  4-6 9 T                  2-1 62 T                  0.06UEW  <math>f_o = 450 \text{ kHz}</math>, <math>Q_o \geq 65</math>                  180 pF internal</p> <p>II A00304</p>	<p>: PCFAZ-082 (Toko)</p>  <p>1-2 47 T                  2-3 100 T                  4-6 12 T  <math>f_o = 450 \text{ kHz}</math>                  180 pF internal                  With AM-IF filter</p> <p>II A00305</p>
<p>• AM-IF filter : SFU450B (Murata)</p>	
<p>• MW Bar-antenna : C8E-A0105 (Toko)</p>  <p>1-2 67 T                  3-4 9 T  <math>f_o = 796 \text{ kHz}</math>  <math>Q_u = 180 \text{ min}</math>  <math>L = 260 \mu\text{H}</math></p> <p>II A00306</p>	

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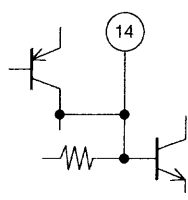
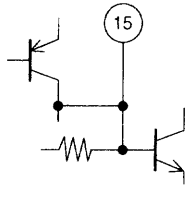
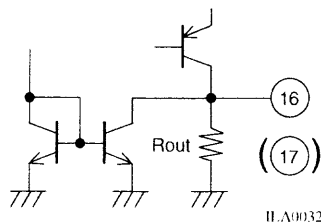
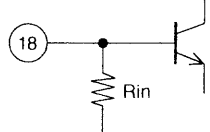
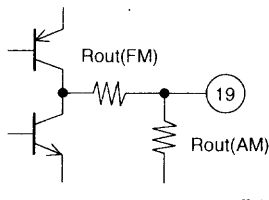
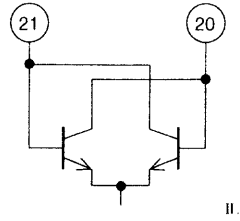
## Pin Descriptions and Quiescent Voltage at VCC = 4.5 V

Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
1	AM-RF input	1.2	1.2	<p style="text-align: right;">II.A00307</p>	Connect the AM antenna coil between this pin and pin 2 (Reg)
2	Reg	1.2	1.2	<p style="text-align: right;">II.A00308</p>	
3	AM-OSC	4.5	4.5	<p style="text-align: right;">II.A00309</p>	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	<p style="text-align: right;">II.A00310</p>	Rout = 270 Ω
6	GND1	0	0		AM/FM-IF/MPX block ground
7	IF buffer output and mute switch	4.5	4.5	<p style="text-align: right;">II.A00311</p>	V7 ≥ 1.3 V : IF buffer output and muting on

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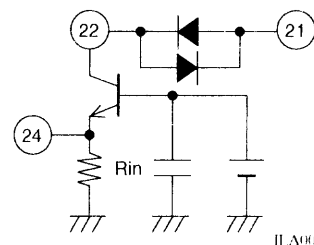
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
8	Stereo indicator, AM-oscillator buffer output	4.5	4.5	 <p>II.A00312</p>	Active-low Open-collector output  AM oscillator signal is output in AM mode
9	AM-MIX output	4.5	4.5	 <p>II.A00313</p>	Connect the AM mixer coil between this pin and pin 4 (VCC1)
10	FM-IF input	1.2	1.2	 <p>II.A00314</p>	Rin = 330 Ω
11	AM-IF input	1.2	1.2	 <p>II.A00315</p>	Rin = 2 kΩ
12	AM-AGC output and FM signal meter output	0.4	0.1	 <p>II.A00316</p>	Internal load resistance R = 16.6 kΩ
13	FM-DET	3.9	3.7	 <p>II.A00317</p>	Recommended ceramic discriminator : CDF107F-AE-029 (Toko) CDA10.7MG** (Murata)

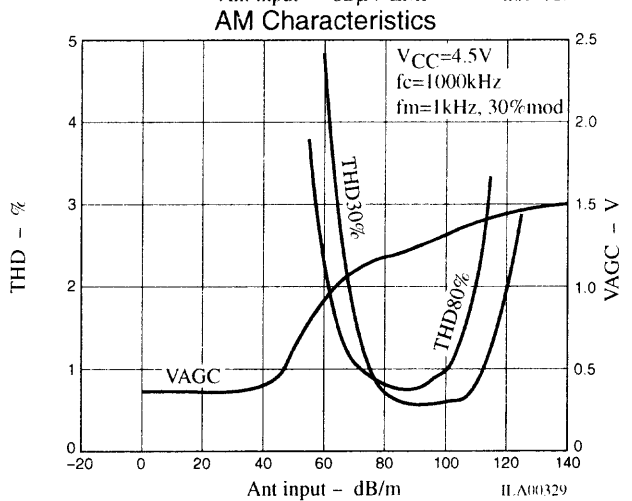
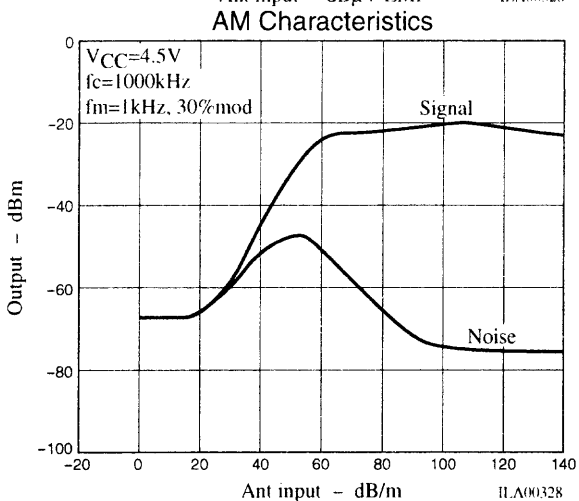
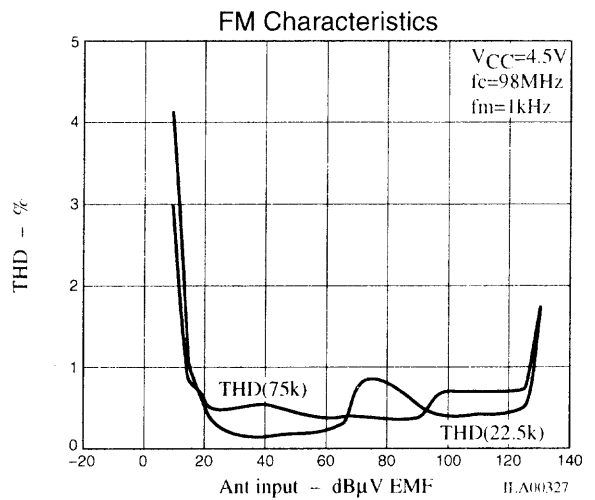
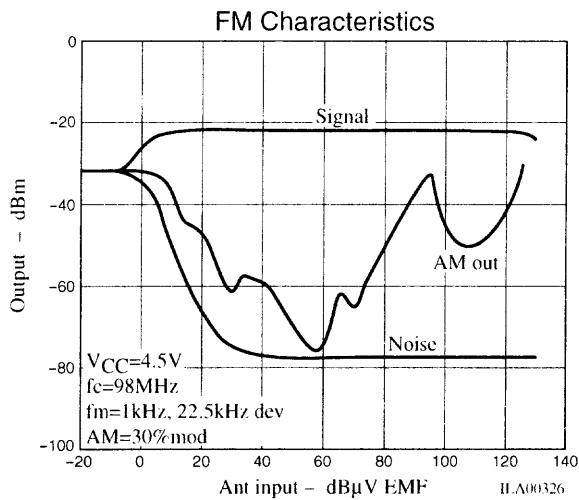
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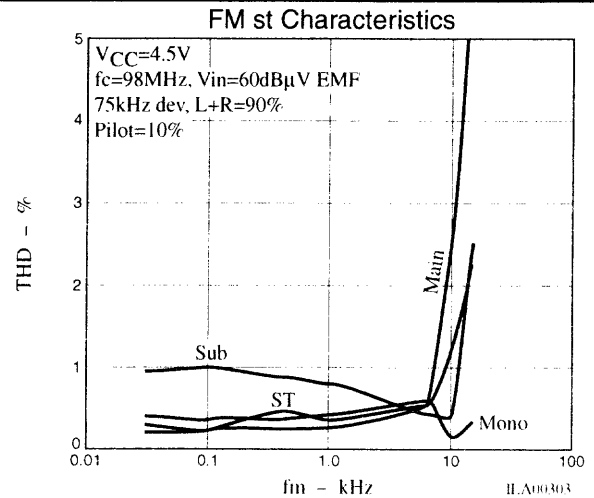
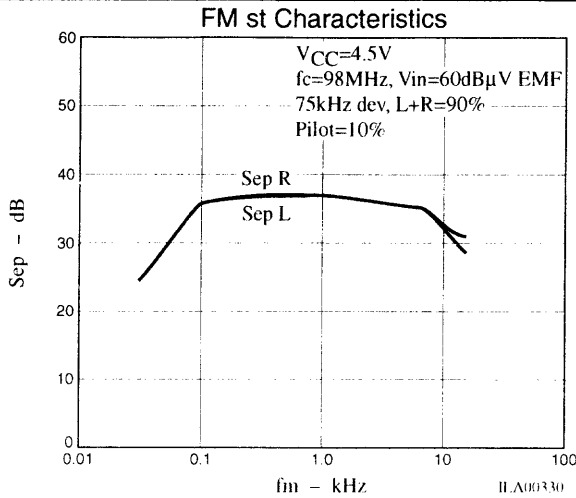
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
14	Pilot detector filter (forced mono)	2.9	3.8	 <p style="text-align: right;">II.A00318</p>	Forced monaural mode when pin 14 is connected to ground
15	Phase comparator filter (AM/FM switch)	0	3.8	 <p style="text-align: right;">II.A00319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





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