Ordering number : ENN*6854

Monolithic Linear IC

LA1823

Single-Chip Tuner IC for Use in Radio Cassette Recorder

Preliminary

Overview

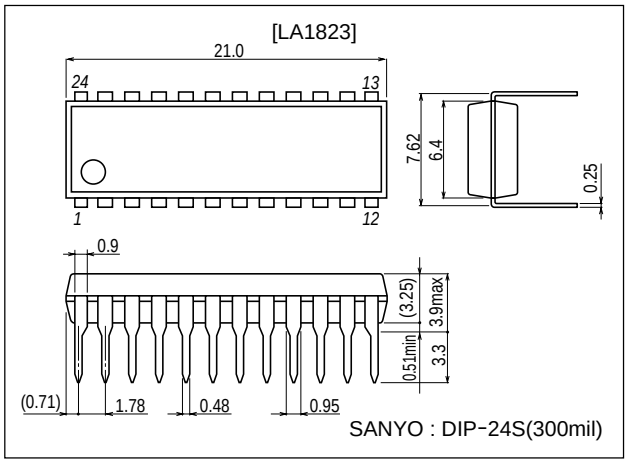
The LA1823 is a single-chip tuner IC that incorporates FM/AM and MPX circuits and supports electronic tuning. The built-in MPX-VCO allows this IC to be adjustment-free and to require no external components.

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	V_{CC} 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	Topg		-20 to +70	°C
Storage temperature	Tstg		-40 to +125	°C

Operating Conditions at Ta = 25 °C

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

SANYO Electric Co.,Ltd. Semiconductor Company
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Operating Characteristics at Ta = 25 °C, V_{CC} = 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	I_{CC}(FM)	No input	10.0	15.0	20.0	mA
AM-mode quiescent current	I_{CC}(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 V_{IN} = 60 dBμV EMF, 22.5 kHz dev, a 3 dB down input		12		dBμV EMF
Local oscillator voltage	V_{OSC}	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	V_O	V_{IN} = 100 dBμV	135	180	240	mVrms
Signal-to-noise ratio	S/N	V_{IN} = 100 dBμV	63	72		dB
Total harmonic distortion (mono)	THD	V_{IN} = 100 dBμV		0.5	1.5	%
Input limiting voltage	–3 dB L.S.	Referenced to V_{IN} = 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	$V_{IF\ buff}$	Test from pin 7 for V_{IN} = 100 dBμV, no modulation	120	180	240	mVrms

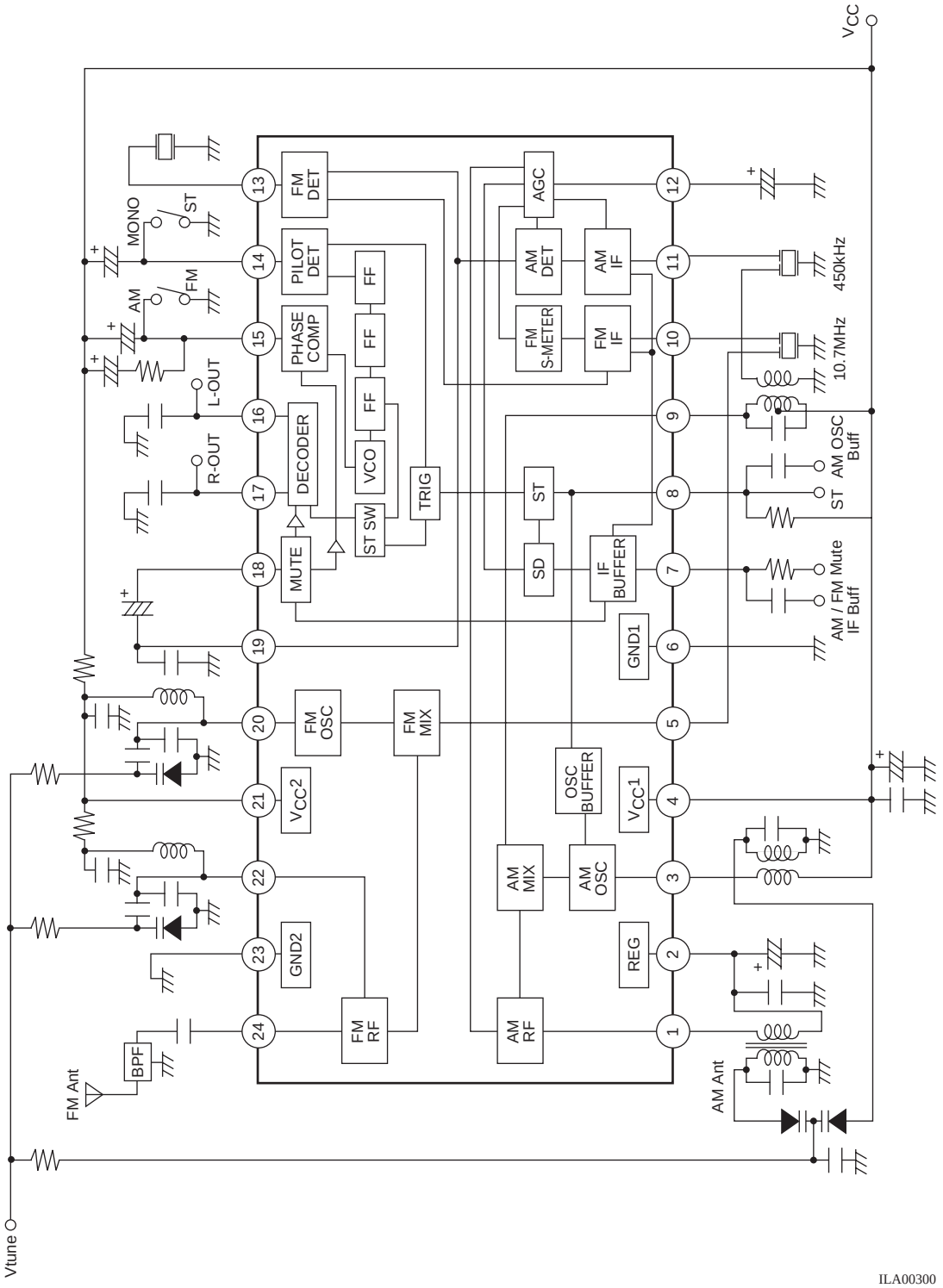
FM IF characteristics (stereo) at fc = 10.7 MHz, fm = 1 kHz, 75 kHz dev, L + R = 90 %, PILOT = 10 %

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

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

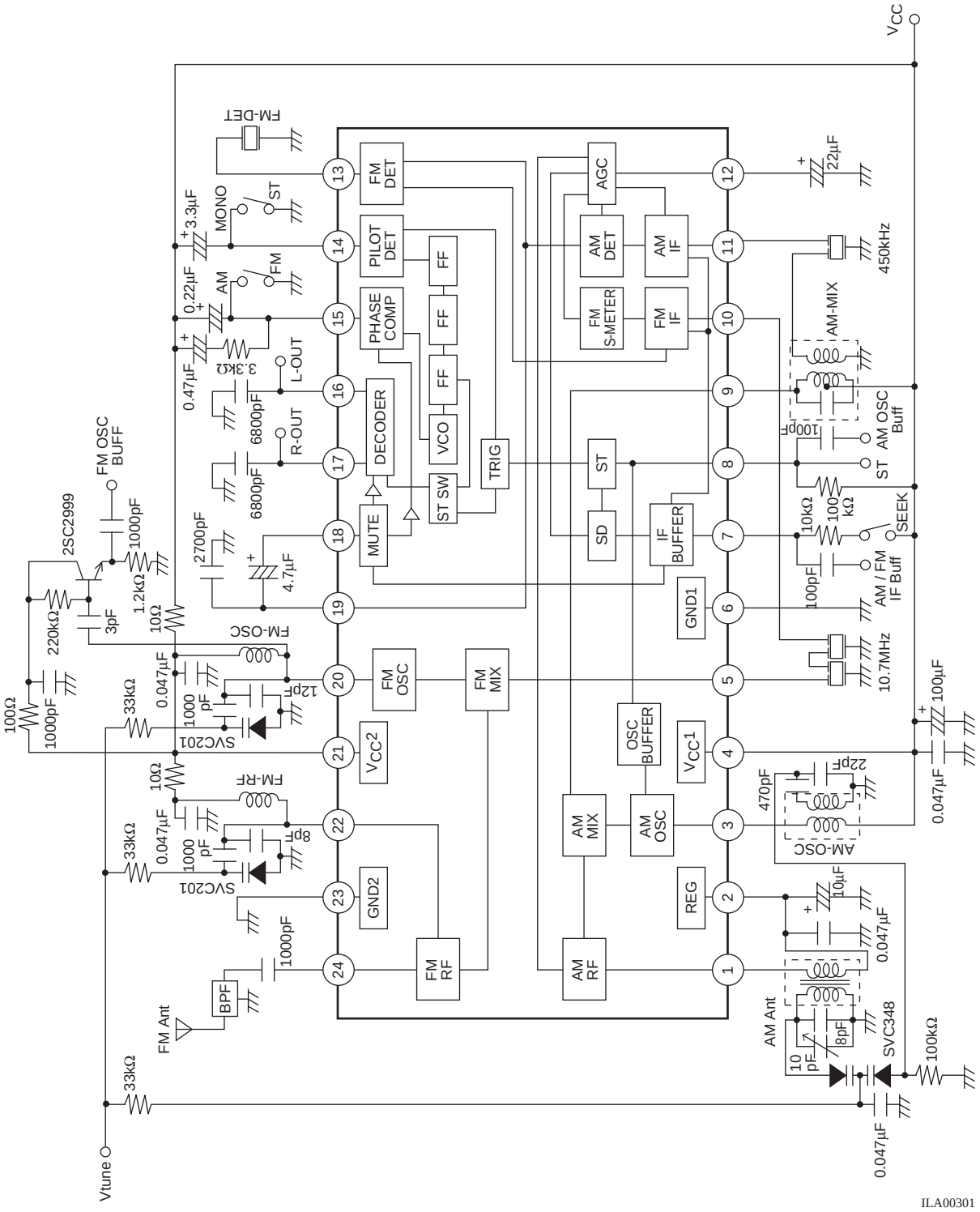
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Detector output	V_O(1)	V_{IN} = 23 dBμV	17	30	53	mVrms
	V_O(2)	V_{IN} = 80 dBμV	50	75	120	mVrms
Signal-to-noise ratio	S/N(1)	V_{IN} = 23 dBμV	15	20		dB
	S/N(2)	V_{IN} = 80 dBμV	47	54		dB
Total harmonic distortion	THD	V_{IN} = 80 dBμV		0.5	1.5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

Block Diagram



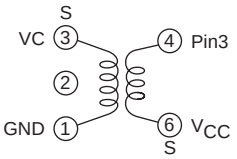
ILA00300

Sample Application Circuit Diagram



Coil specifications (bottom view)

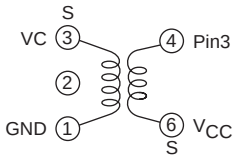
- FM-BPF : SA-309 (Sumida) 88 MHz to 108 MHz
- FM-RF : SA-149 (Sumida) 3.6 mm diameter, air core, 0.6 mm wire, 4.5 T
- FM-OSC : SA-151 (Sumida) 3.6 mm diameter, air core, 0.6 mm wire, 3.5 T
- FM-IF filter, discriminator :
  SK107M1-AE-10, CDF107F-AE-029 (Toko)
  SFE10.7MA5, CDA10.7MG1-A (Murata) : tentative
- AM-OSC : SA-181 (Sumida)



ILA00302

6-4 37 T
3-1 74 T
0.06UEW
fo = 796 kHz
Qo ≥ 80
L = 140 µH

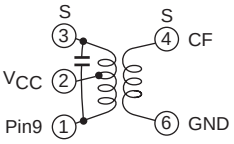
: L7BRS-3132AQ (Toko)



ILA00302

3-1 64 T
6-4 32 T
0.06-2UEW
fo = 796 kHz
Qo ≥ 65
L = 140 µH

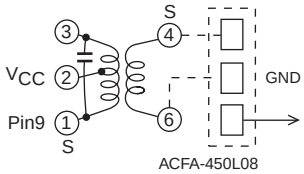
- AM-MIX : SA-1136 (Sumida)



ILA00304

3-2 122 T
4-6 9 T
2-1 62 T
0.06UEW
fo = 450 kHz, Qo ≥ 65
180 pF internal

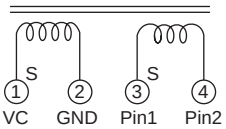
: PCFAZ-082 (Toko)



ILA00305

1-2 47 T
2-3 100 T
4-6 12 T
fo = 450 kHz
180 pF internal
With AM-IF filter

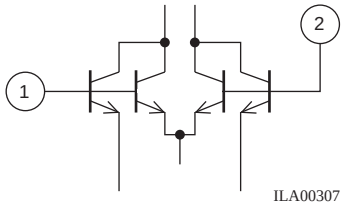
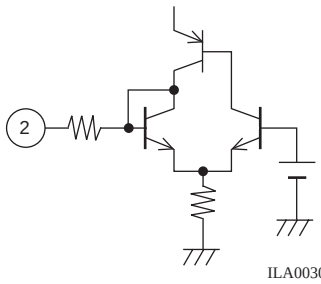
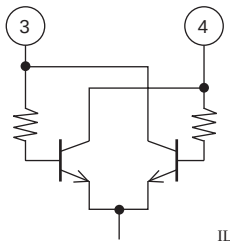
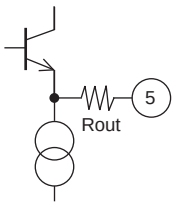
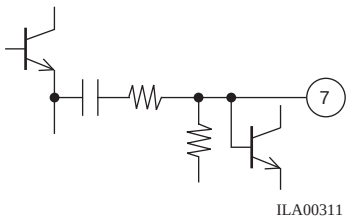
- AM-IF filter : SFU450B (Murata)
- MW Bar-antenna : C8E-A0105 (Toko)

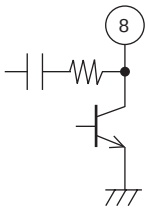
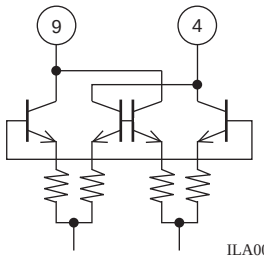
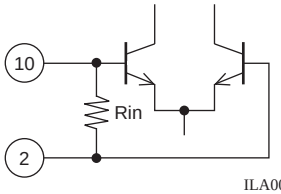
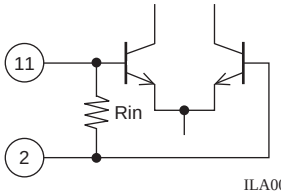
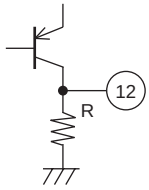
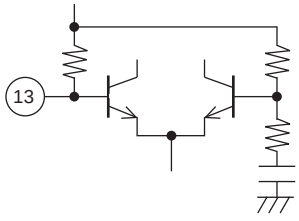


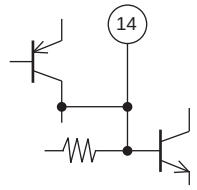
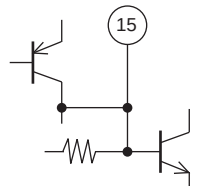
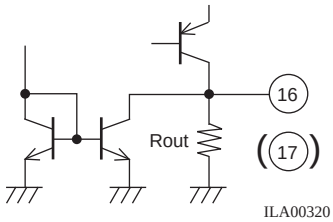
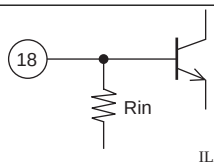
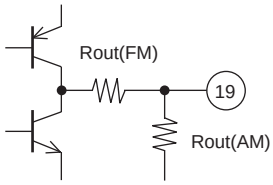
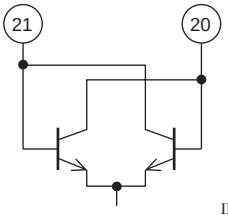
ILA00306

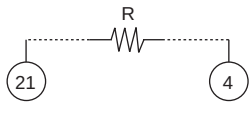
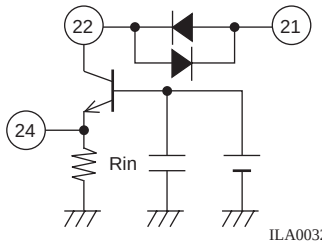
1-2 67 T
3-4 9 T
fo = 796 kHz
Qu = 180 min
L = 260µH

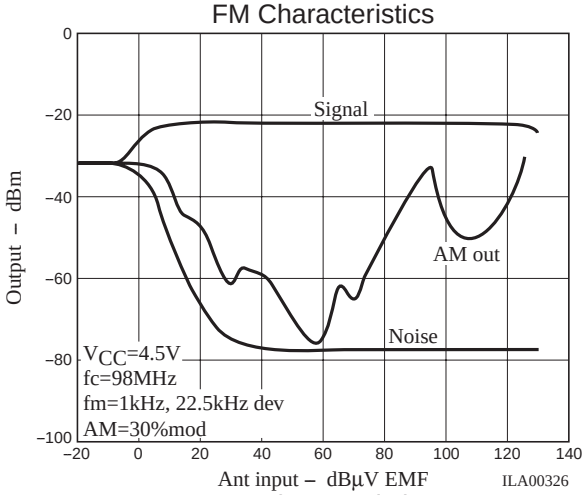
Pin Descriptions and Quiescent Voltage at V_{CC} = 4.5 V

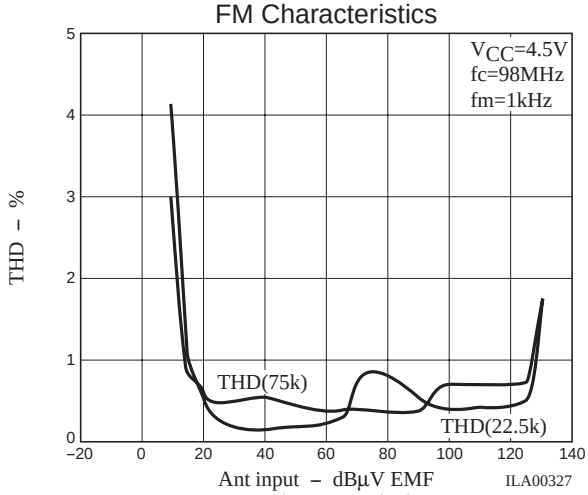
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
1	AM-RF input	1.2	1.2		Connect the AM antenna coil between this pin and pin 2 (Reg)
2	Reg	1.2	1.2		
3	AM-OSC	4.5	4.5		Connect the AM oscillator coil between this pin and pin 4 ($V_{CC}1$)
4	$V_{CC}1$	4.5	4.5		AM/FM-IF/MPX block V_{CC}
5	FM-MIX output	2.4	2.2		Rout = 270 Ω
6	GND1	0	0		AM/FM-IF/MPX block ground
7	IF buffer output and mute switch	4.5	4.5		$V_7 \geq 1.3$ V : IF buffer output and muting on

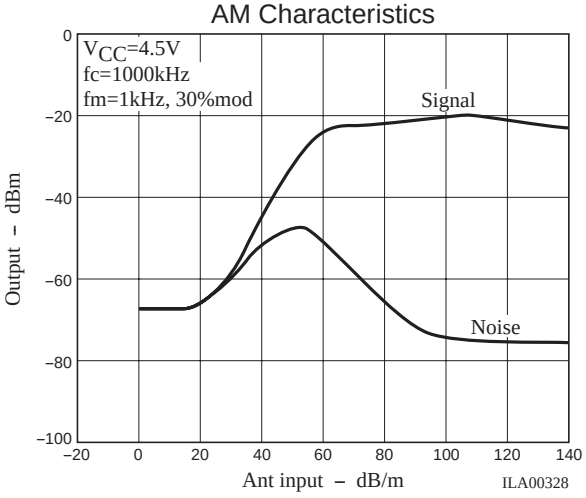
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
8	Stereo indicator, AM-oscillator buffer output	4.5	4.5	 ILA00312	Active-low Open-collector output AM oscillator signal is output in AM mode
9	AM-MIX output	4.5	4.5	 ILA00313	Connect the AM mixer coil between this pin and pin 4 ($V_{CC}1$)
10	FM-IF input	1.2	1.2	 ILA00314	Rin = 330 Ω
11	AM-IF input	1.2	1.2	 ILA00315	Rin = 2 kΩ
12	AM-AGC output and FM signal meter output	0.4	0.1	 ILA00316	Internal load resistance R = 16.6 kΩ
13	FM-DET	3.9	3.7	 ILA00317	Recommended ceramic discriminator : CDF107F-AE-029 (Toko) CDA10.7MG** (Murata)

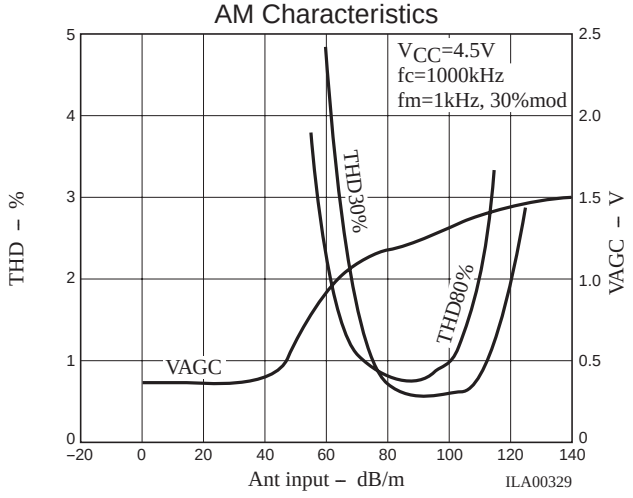
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
14	Pilot detector filter (forced mono)	2.9	3.8	 ILA00318	Forced monaural mode when pin 14 is connected to ground
15	Phase comparator filter (AM/FM switch)	0	3.8	 ILA00319	FM mode is when pin 15 is open, and AM mode is when pin 15 is connected to ground
16 17	L output R output	1.2	1.2	 ILA00320	Rout = 7.5 kΩ
18	MPX input	1.2	1.2	 ILA00321	Rin = 50 kΩ
19	AM/FM detector output	0.3	1.0	 ILA00322	Output impedance AM : Rout = 50 kΩ FM : Rout = 500 Ω The channel separation can be adjusted with an external capacitor connected between this pin and ground
20	FM-OSC	4.5	4.4	 ILA00323	Connect the FM oscillator coil between this pin and pin 21 ($V_{CC}2$)

Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
21	$V_{CC}2$	4.5	4.4		FM-FE block V_{CC} Power is supplied from pin 4 ($V_{CC}1$) via external resistor (10 Ω)
22	FM-RF output	4.5	4.4		Connect the FM-RF coil between this pin and pin 21 ($V_{CC}2$) Rin = 1.8 kΩ
24	FM-RF input	0	0.9		
23	GND2	0	0		FM-FE block ground

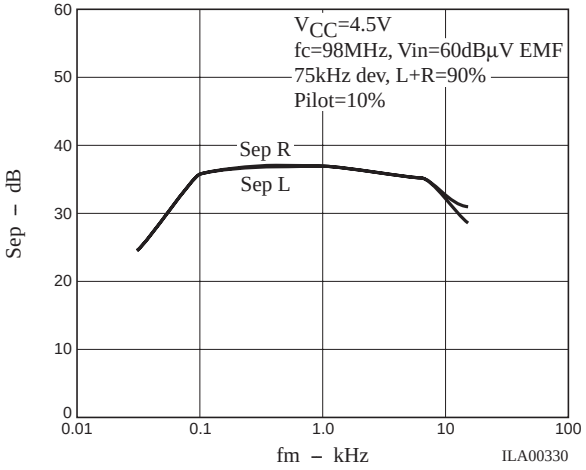








FM st Characteristics



FM st Characteristics