Ordering number : ENN*6855

Monolithic Linear IC

LA1824

Single Chip Tuner IC for Use in Radio/Cassette Products with Manual Tuning

Preliminary

Overview

The LA1824 is a single-chip tuner IC that incorporates FM/AM and MPX circuits.
The built-in MPX-VCO allows this IC to be adjustment free and to require no external components.

Features

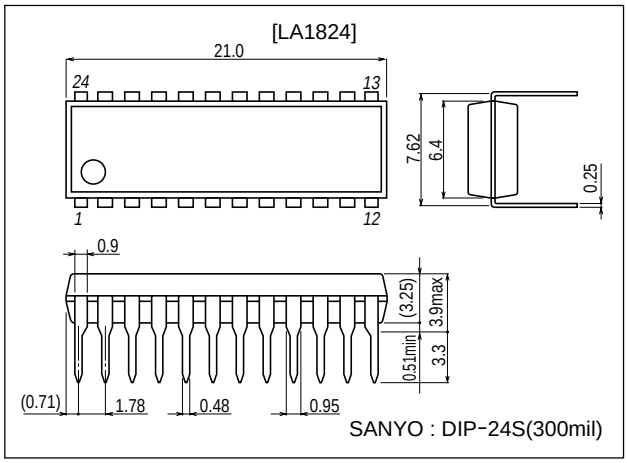
- FM, AM and MPX integrated in a single-chip.
- Adjustment free MPX-VCO
  : No ceramic resonator used.
- FM front-end : Local OSC voltage reduced.
- FM stereo and FM/AM tuning indicator output provided.
- Package : DIP-24S.

Functions

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

Package Dimensions

unit : mm
3067A



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, 9	20	mA
Allowable power dissipation	Pd max	Ta ≤ 70 °C	300	mW
Operation temperature	Topg		-20 to +70	°C
Ambient temperature	Tstg		-40 to +125	°C

Recommended 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		2.5 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 using the IC179-2 socket (Yamaichi Electric Co.,Ltd.)

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Local oscillator voltage	V_{OSC}	No input, fosc = 108.7 MHz, the pin 20 output with FET buffer gain ≒ -10 dB	15	30	60	mVrms
Input limiting voltage	3 dB L.S.	Referenced to V_{IN} = 60 dBμV EMF, 22.5 kHz dev, a 3 dB down input	-	13	-	dBμV EMF
Quieting sensitivity	Q.S.	30 dB quieting sensitivity	-	12	-	dBμV EMF

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	I_{CC}(FM)	No input	7.0	13.7	20	mA
Demodulation output	V_O	V_{IN} = 100 dBμV, the pin 16 output	130	190	260	mVrms
Signal-to-noise ratio	S/N	V_{IN} = 100 dBμV, the pin 16 output	62	70	-	dB
Total harmonic distortion (mono)	THD	V_{IN} = 100 dBμV, the pin 16 output	-	0.4	1.2	%
Input limiting voltage	3 dB L.S.	Referenced to V_{IN} = 100 dBμV, 75 kHz dev, a 3 dB down input	21	32	42	dBμV
Station detector sensitivity	SD-ON	No mod, an input level great enough to turn on the station detector	-	33	-	dBμV

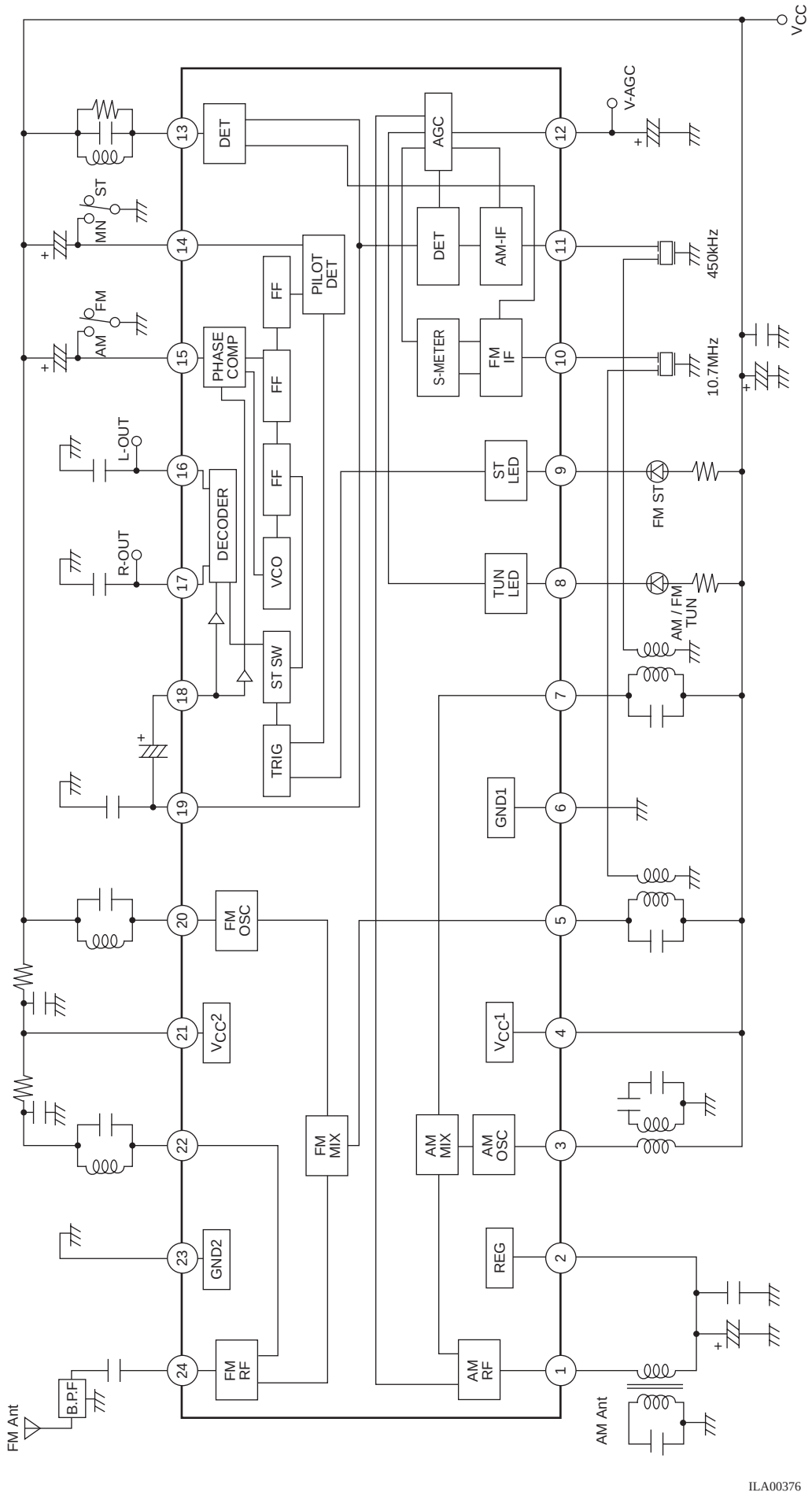
FM IF characteristics (stereo) at fc = 10.7 MHz, fm = 1 kHz, L + R = 90 %, Pilot = 10 %

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Separation	SEP	V_{IN} = 100 dBμV, L modulation, the pin 16 output/the pin 17 output	25	40	-	dB
Stereo on level	ST-ON	V_{IN} = 100 dBμV, the pilot modulation search that V8 < 0.5 V	1.5	3.5	6.3	%
Total harmonic distortion (main)	THD	V_{IN} = 100 dBμV, Main modulation, the pin 16 output	-	0.5	1.2	%

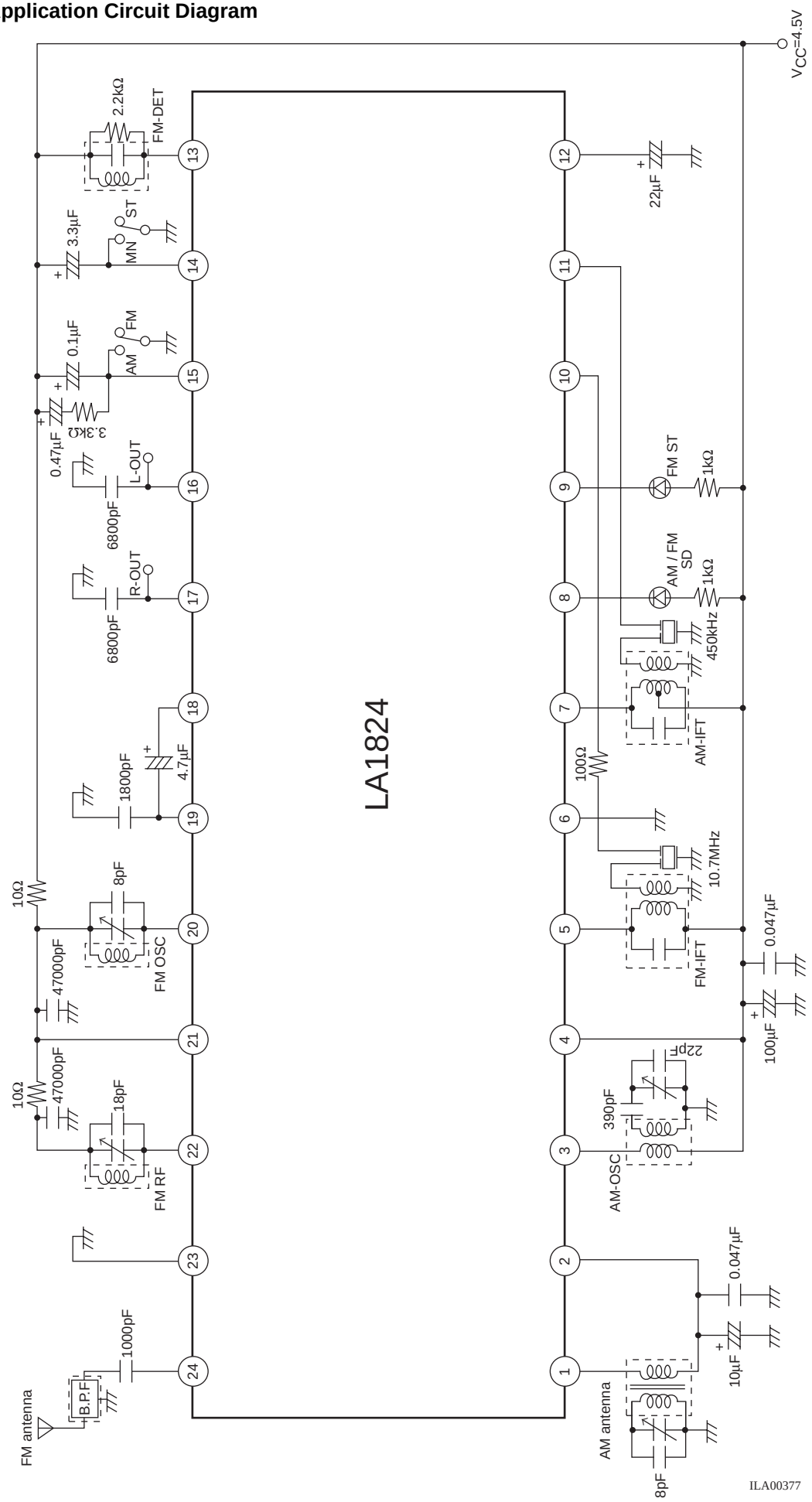
AM characteristics at fc = 1000 kHz, fm = 1 kHz, 30 % modulation

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	I_{CC}(AM)	No input	5.0	8.5	15	mA
Detector output	V_O(1)	V_{IN} = 23 dBμV, the pin 16 output	18	40	70	mVrms
	V_O(2)	V_{IN} = 80 dBμV, the pin 16 output	50	85	130	mVrms
Signal-to-noise ratio	S/N(1)	V_{IN} = 23 dBμV, the pin 16 output	15	20	-	dB
	S/N(2)	V_{IN} = 80 dBμV, the pin 16 output	47	53	-	dB
Total harmonic distortion	THD(1)	V_{IN} = 80 dBμV, the pin 16 output	-	0.5	1.3	%
	THD(2)	V_{IN} = 107 dBμV, the pin 16 output	-	0.5	1.5	%
Station detector sensitivity	SD-ON	No mod, an input level great enough to turn on the station detector	-	26	-	dBμV

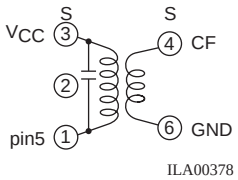
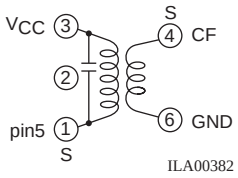
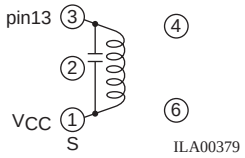
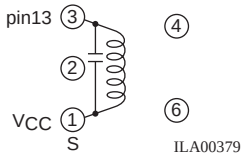
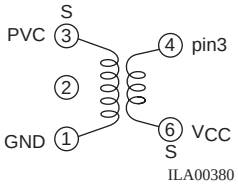
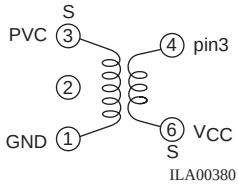
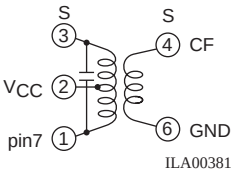
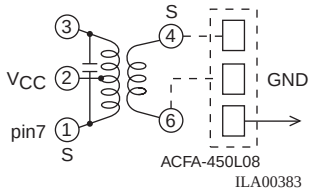
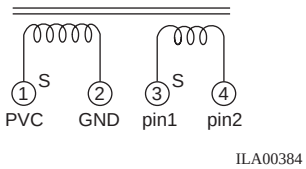
Block Diagram



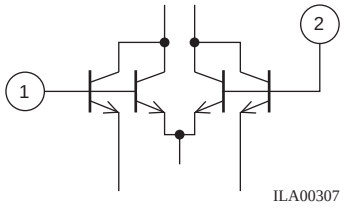
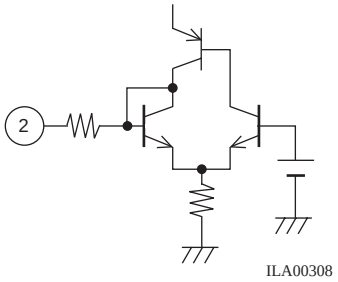
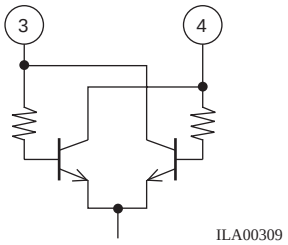
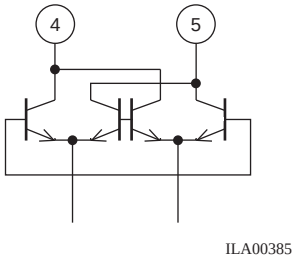
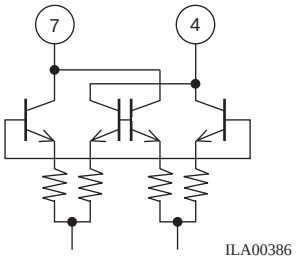
Sample Application Circuit Diagram

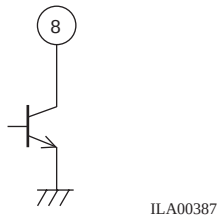
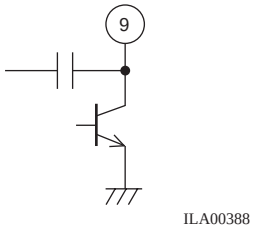
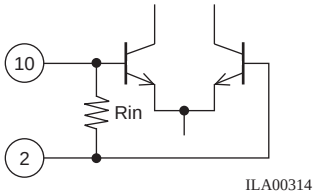
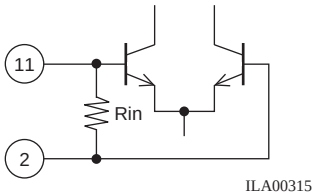
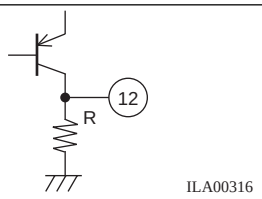
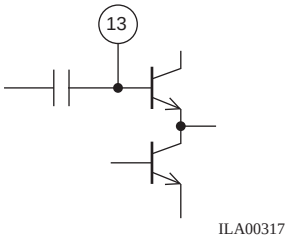


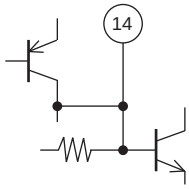
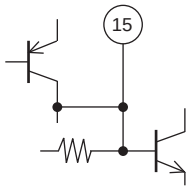
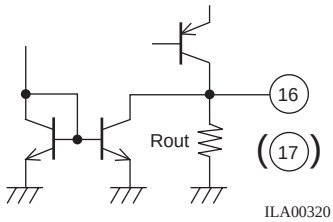
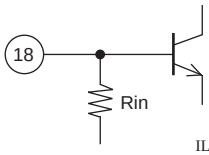
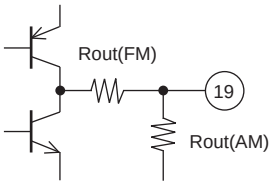
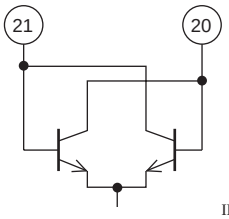
Coil specifications (bottom view)

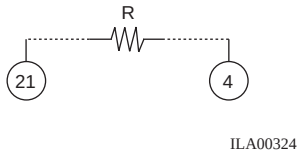
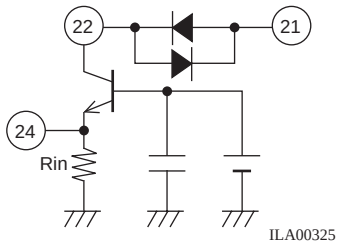
· FM-BPF : SA-309 (Sumida) 88 MHz to 108 MHz	
· FM-RF : SA-149 (Sumida) 3.6 mm diameter, air core, 0.6 mm wire, 4.5 T	
· FM-OSC : SA-151 (Sumida) 3.6 mm diameter, air core, 0.6 mm wire, 3.5 T	
· FM-MIX : SA-165 (Sumida)  4-6 2 T 3-1 12 T 0.12UEW fo = 10.7 MHz Qo ≥ 50 100 pF internal	: A119ACS-19458X (Toko)  3-1 10 T 4-6 2 T 0.1-2UEW fo = 10.7 MHz Qo ≥ 60 100 pF internal
· FM-DET : SA-1134 (Sumida)  1-3 12 T 0.10UEW fo = 10.7 MHz Qo ≥ 70 82 pF internal	: A119ACS-19459Z (Toko)  1-3 11 T 0.1-2UEW fo = 10.7 MHz Qo ≥ 70 82 pF internal
· AM-OSC : SA-181 (Sumida)  6-4 37 T 3-1 74 T 0.06UEW fo = 796 kHz Qo ≥ 80 L = 140 μH	: L7BRS-3132AQ (Toko)  3-1 64 T 6-4 32 T 0.06-2UEW fo = 796 kHz Qo ≥ 65 L = 140 μH
· AM-MIX : SA-1136 (Sumida)  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)  1-2 47 T 2-3 100 T 4-6 12 T fo = 450 kHz 180 pF internal With AM-IF filter
· FM-IF filter : SFE10.7MS2 (Murata)	
· AM-IF filter : SFU450B (Murata)	
· Poly-varicon : FT-2217 (Toko)	
· MW Bar-antenna : C8E-A0105 (Toko)  1-2 67 T 3-4 9 T fo = 796 kHz Qu = 180 min L = 260μH	

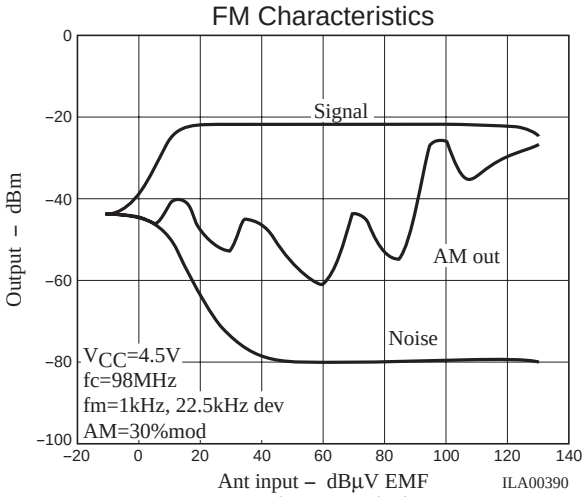
Pin Descriptions and Quiescent Voltage at V_{CC} = 4.5 V

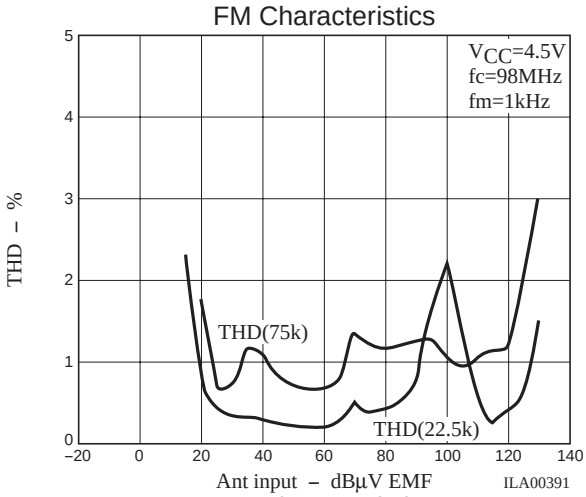
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
1	AM-RF input	1.3	1.3		Connect the AM antenna coil between this pin and pin 2 (Reg)
2	Reg	1.3	1.3		
3	AM-OSC	4.5	4.5		Connect the AM oscillator coil between this pin and pin 4 ($V_{CC}1$)
4	$V_{CC}1$	4.5	4.5		AM/FM-IF/MPX block V_{CC}
5	FM-MIX output	4.5	4.5		Connect the FM mixer coil between this pin and pin 4 ($V_{CC}1$)
6	GND1	0	0		AM/FM-IF/MPX block GND
7	AM-MIX output	4.5	4.5		Connect the AM mixer coil between this pin and pin 4 ($V_{CC}1$)

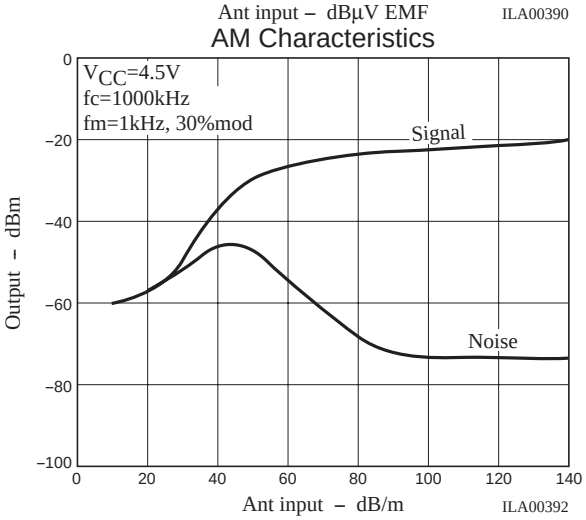
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
8	Tuning indicator	4.5	4.5		Active-low Open-collector output can directly drive LED (I_C max = 20 mA)
9	Stereo indicator and AM IF output	4.5	4.5		Active-low Open-collector output can directly drive LED (I_C max = 20 mA) AM-IF signal is output in AM mode
10	FM-IF input	1.3	1.3		Rin = 330 Ω
11	AM-IF input	1.3	1.3		Rin = 2 kΩ
12	AM-AGC output and FM signal meter output	0.7	0.2		Internal load resistance R = 16.6 kΩ
13	FM-DET	4.5	4.5		Connect the FM detector coil between this pin and pin 4 ($V_{CC}1$)

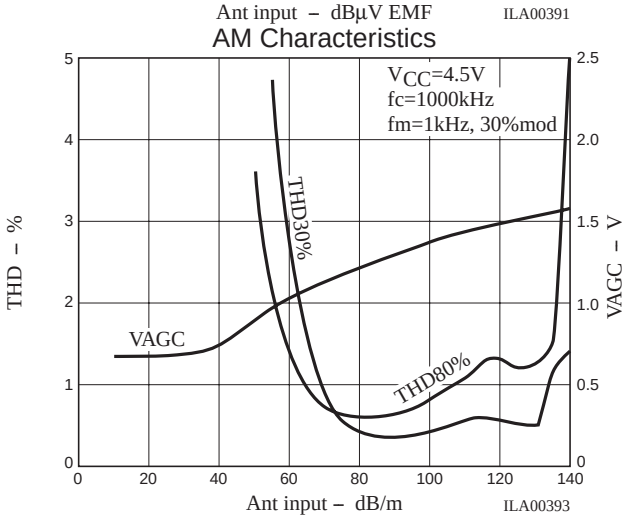
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
14	Pilot detector filter (forced mono)	2.9	3.8	 ILA00318	Forced monaural mode when pin 14 is connected to ground
15	Phase comparator filter (AM/FM switch)	0	3.8	 ILA00319	FM mode is when pin 15 is open, and AM mode is when pin 15 is connected to ground
16 17	L output R output	1.4	1.4	 ILA00320	Rout = 7.5 kΩ
18	MPX input	1.3	1.3	 ILA00321	Rin = 50 kΩ
19	AM/FM detector output	0.5	1.5	 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 pin 4 ($V_{CC}1$) via external resistor (10 Ω)
22 24	FM-RF output FM-RF input	4.5 0	4.4 1.0		Connect the FM-RF coil between this pin and pin 21 ($V_{CC}2$) Rin = 500 Ω
23	GND2	0	0		FM-FE block ground

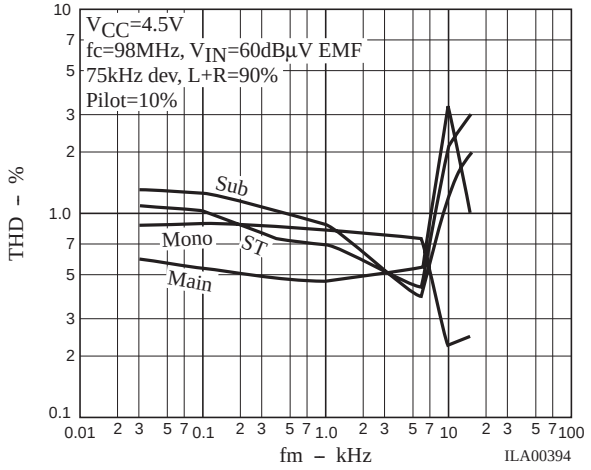








FM st Characteristics



FM st Characteristics