



SANYO Semiconductors

DATA SHEET

LA1828 — Monolithic Linear IC For Portable Radio/Cassette Recorders with Manual Tuning Single-Chip Tuner IC

Overview

The LA1828 is a single-chip tuner IC for FM and AM with built-in MPX-VCO which requires no adjustment and no external parts.

Features

- Single-chip tuner with AM, FM-FE/FM-IF, MPX circuitry
- Built-in adjustment-free MPX-VCO (noceramic oscillator required)
- Reduced FM-FE oscillation level
- FM stereo indication and AM/FM tuning indication outputs can directly drive LEDs

Functions

- AM : RF amplifier, mixer, oscillator, IF amplifier, detector, AGC, tuning display output
- FM-FE : RF amplifier, mixer, oscillator
- FM-IF : IF amplifier, quadrature detector, signal strength meter, tuning display output
- MPX : PLL stereo decoder, stereo display output, forced mono, internal VCO

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}	pins 8, 9	20	mA
Allowable power dissipation	Pd max	Ta ≤ 70°C	300	mW
Operating temperature	T _{opr}		-20 to +70	°C
Storage temperature	T _{stg}		-40 to +125	°C

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Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V _{CC}		4.5	V
Operating supply voltage range	V _{CC op}		2.5 to 6.0	V

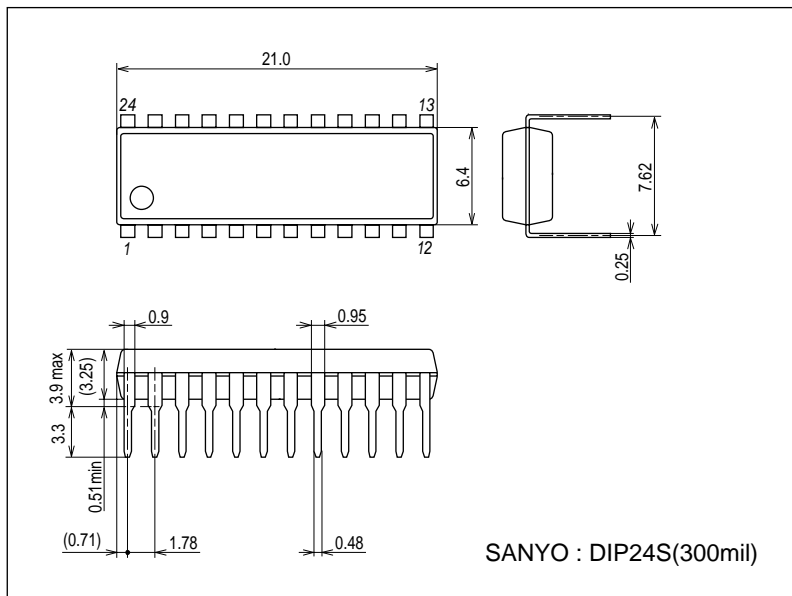
Electrical Characteristics at Ta = 25°C, V_{CC} = 4.5V, in specified test circuit, using Yamaichi Electronics socket IC-179-2

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
FM-FE characteristics fc = 98MHz, fm = 1kHz, 30% mod.						
Local oscillator voltage	V _{OSC}	f _{OSC} = 108.7MHz, pin 20 output *Measured with FET buffer (-10dB gain)	40	80	160	mVrms
3dB sensitivity	3dB LS	60dBμ, 30% mod. output, -3dB input		13		dBμ
Effective sensitivity	Qs	Input for S/N = 30dB		12		dBμ
FM-IF monaural characteristics fc = 10.7MHz, fm = 1kHz, 100% mod.						
Quiescent current	I _{CCO} (FM)	No input	8	16	23	mA
Demodulator output	V _O	100dBμ, pin 16 output	130	190	260	mVrms
Signal-to-noise ratio	S/N	100dBμ, pin 16 output	62	70		dB
Total harmonic distortion (mono)	THD	100dBμ, pin 16 output		0.4	1.2	%
3dB sensitivity	3dB LS	100dBμ, 100% mod. output, -3dB input	21	32	42	dBμ
TU-LED sensitivity	SD-ON			33		dBμ
FM-IF stereo characteristics fc = 10.7MHz, fm = 1kHz, L + R = 90%, pilot = 10%						
Separation	SEP	100dBμ, L-mod, pin 16/pin 17 output	25	40		dB
ST-LED sensitivity	ST-ON	100dBμ, pilot modulation for pin 8 voltage < 0.5V	1.5	3.5	6.3	%
Total harmonic distortion (main)	THD	100dBμ, main modulation, pin 16 output		0.5	1.2	%
AM characteristics fc = 1000kHz, fm = 1kHz, 30% mod.						
Quiescent current	I _{CCO} (AM)	No input	5	8.5	15	mA
Demodulator output	V _{O1}	23dBμ, pin 16 output	18	40	70	mVrms
	V _{O2}	80dBμ, pin 16 output	50	85	130	mVrms
Signal-to-noise ratio	S/N1	23dBμ, pin 16 output	15	20		dB
	S/N2	80dBμ, pin 16 output	47	53		dB
Total harmonic distortion	THD1	80dBμ, pin 16 output		0.5	1.3	%
	THD2	107dBμ, pin 16 output		0.5	1.5	%
TU-LED sensitivity	SD-ON			26		dBμ

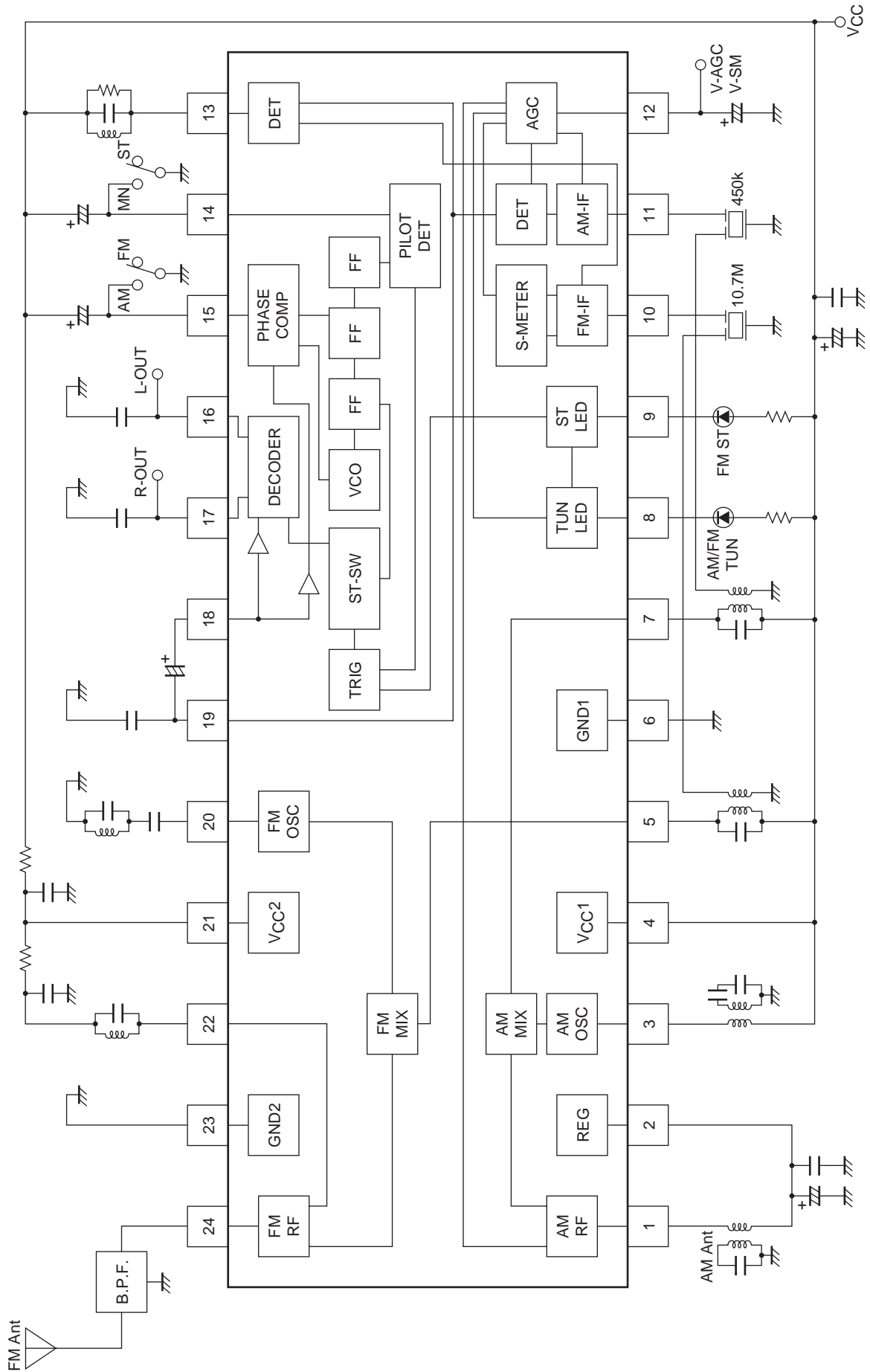
Package Dimensions

unit : mm (typ)

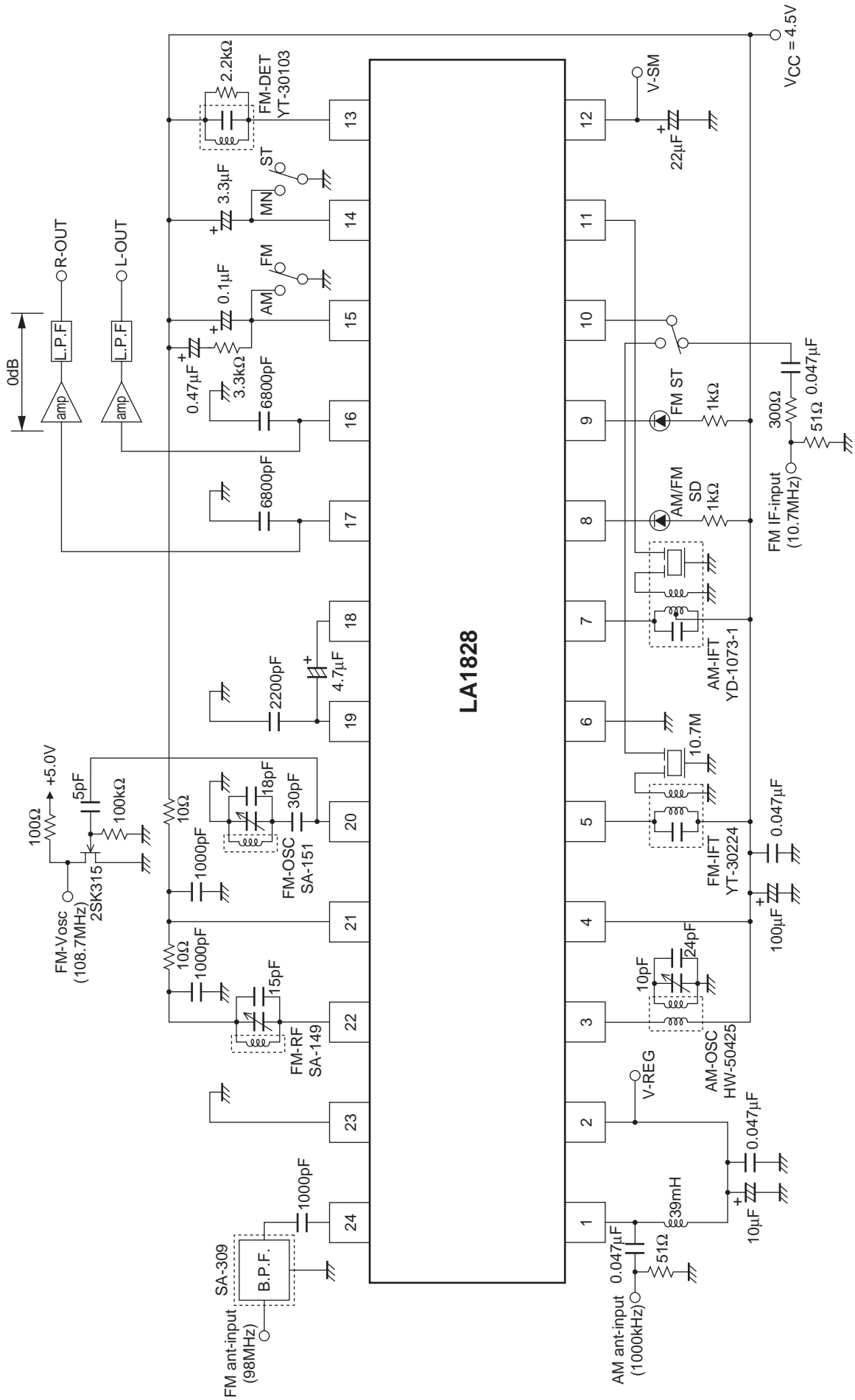
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Block Diagram

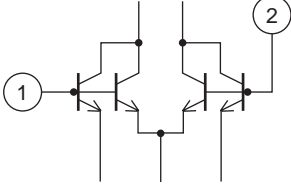
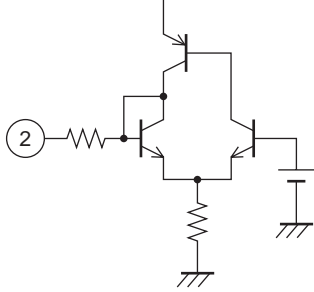
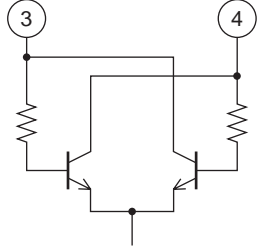
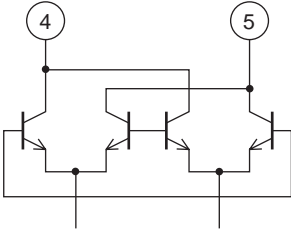
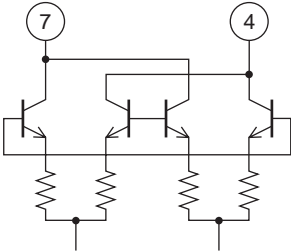
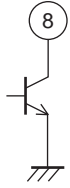


Test Circuit



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

Pin No.	Pin function	Quiescent voltage (V)		Description	Equivalent circuit
		AM	FM		
1	AM RF input	1.3	1.3	AM antenna coil connected between pins 1 and 2 (reg).	
2	Reg	1.3	1.3	$V_{reg} = 1.3V$	
3	AM-OSC	4.5	4.5	Oscillator coil connected between pins 3 and 4 (V_{CC1}).	
4	V_{CC1}	4.5	4.5	AM/FM-IN/MPX block V_{CC}	
5	FM mixer output	4.5	4.5	Mixer coil connected between pins 5 and 4 (V_{CC1}).	
6	GND1	0	0	AM/FM-IN/MPX section ground	
7	AM mixer output	4.5	4.5	Mixer coil connected between pins 7 and 4 (V_{CC1}).	
8	Tu-LED output	4.5	4.5	Active low Open-collector output can directly drive LED ($I_C \text{ max} = 20mA$)	

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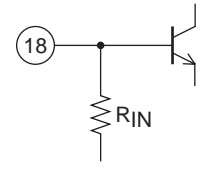
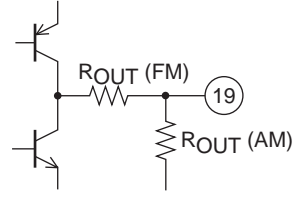
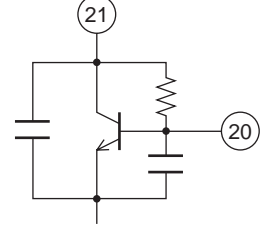
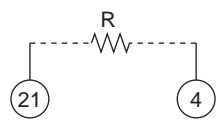
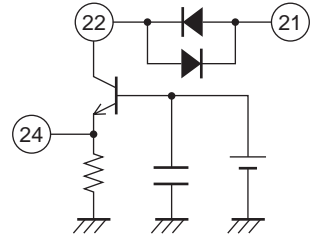
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Pin No.	Pin function	Quiescent voltage (V)		Description	Equivalent circuit
		AM	FM		
9	ST-LED output and AM-IF output	4.5	4.5	Active low Open-collector output can directly drive LED ($I_C \text{ max} = 20\text{mA}$) In AM operation, AM-IF signal (450kHz) is output here.	
10	FM-IF input	1.3	1.3	$R_{IN} = 330\Omega$	
11	AM-IF input	1.3	1.3	$R_{IN} = 2k\Omega$	
12	AM-AGC output and FM S meter output	0.7	0.2	Internal load resistance $R = 16.6k\Omega$	
13	FM detector	4.5	4.5	Detector coil connected between pins 13 and 4 (V_{CC1}).	
14	Pilot tone detector filter and forced mono switching	2.9	3.8	Mono mode is forced on by connecting pin 14 to ground.	
15	Phase comparator filter and AM/FM switching	0	3.8	FM reception mode is enabled when pin 15 is open. AM reception mode is enabled when pin 15 is connected to ground.	
16 17	L output R output	1.4	1.4	$R_{OUT} = 7.5k\Omega$	

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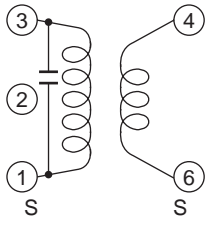
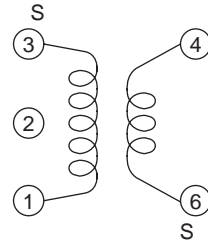
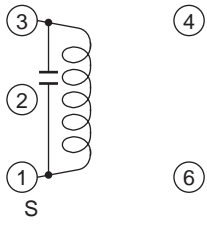
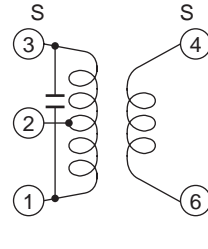
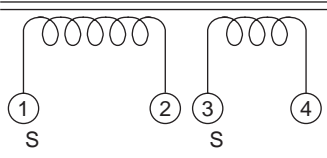
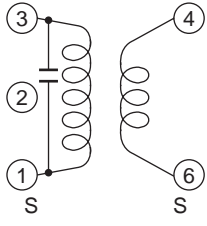
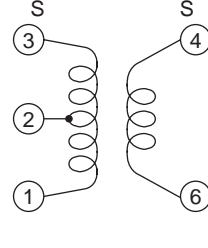
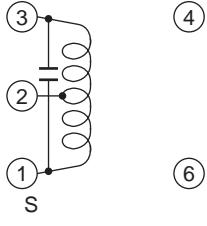
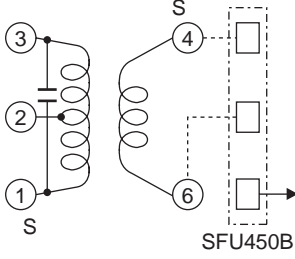
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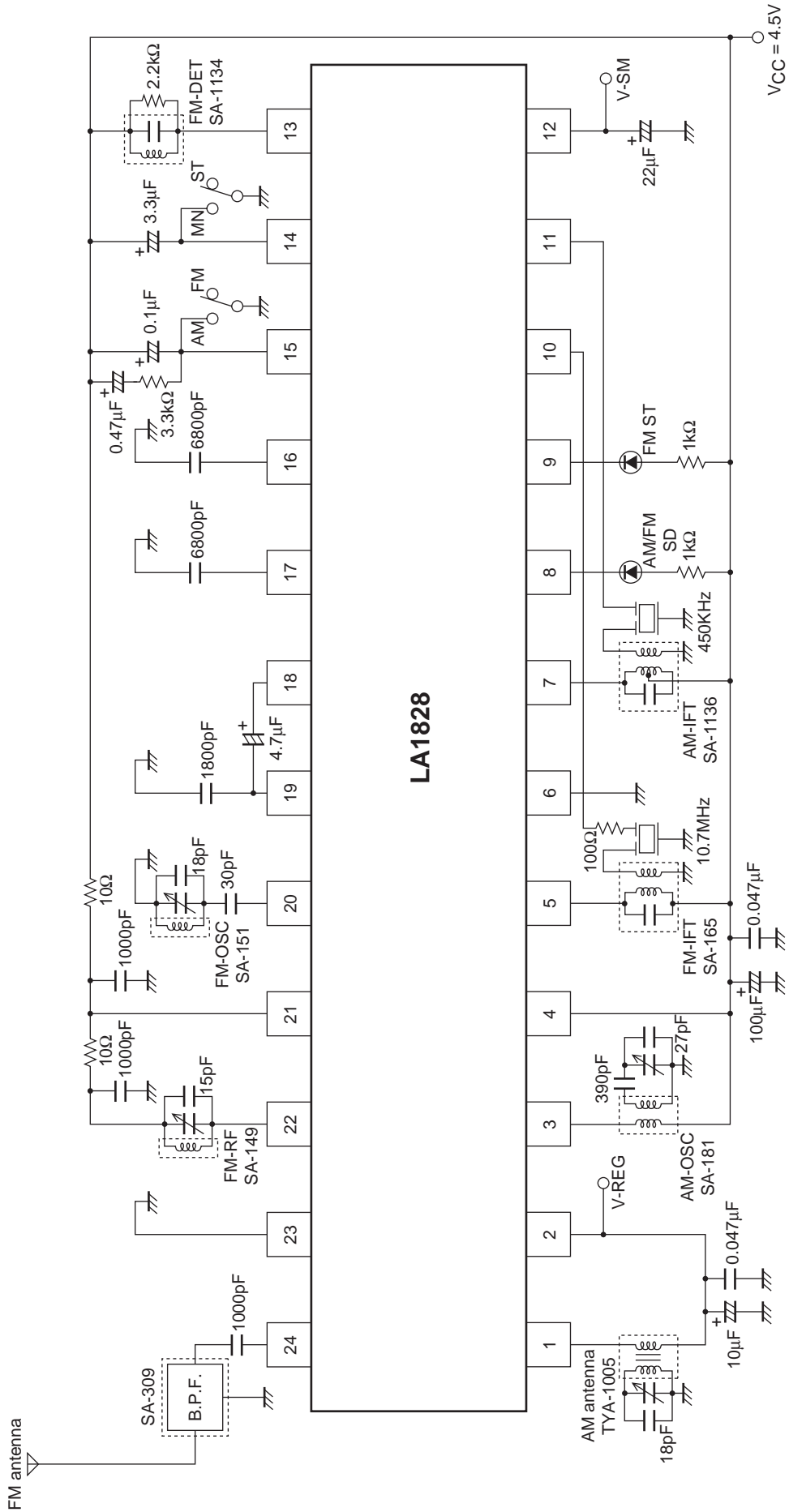
Pin No.	Pin function	Quiescent voltage (V)		Description	Equivalent circuit
		AM	FM		
18	MPX input	1.3	1.3	$R_{IN} = 50k\Omega$	
19	FM detector output and AM detector output	0.5	1.5	Output impedance AM : $R_{OUT} = 50k\Omega$ FM : $R_{OUT} = 500\Omega$ Capacitance between pin 19 and ground should be optimized for the best separation characteristics.	
20	FM-OSC	4.5	4.4	Colpitts oscillator circuit FM oscillator coil is connected to pin 20.	
21	V _{CC2}	4.5	4.4	FM-FE block V _{CC} Power is supplied from pin 4 (V _{CC1}) via external resistor (10Ω).	
22	FM-RF output	4.5	4.4	FM RF coil is connected between pins 22 and 21 (V _{CC2}).	
24	FM-RF input	0	1.0	$R_{IN} = 1.8k\Omega$	
23	GND2	0	0	FM-FE block ground	

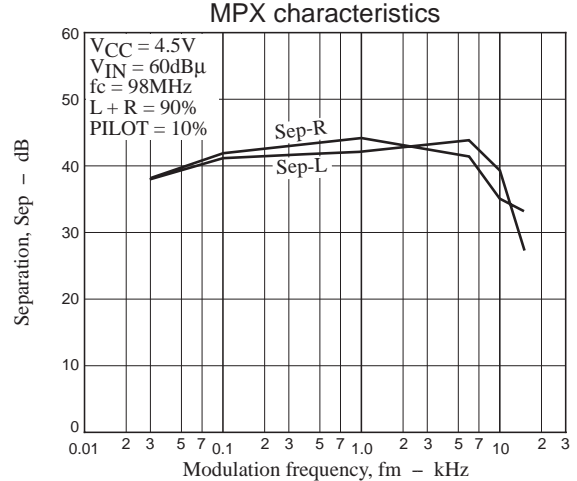
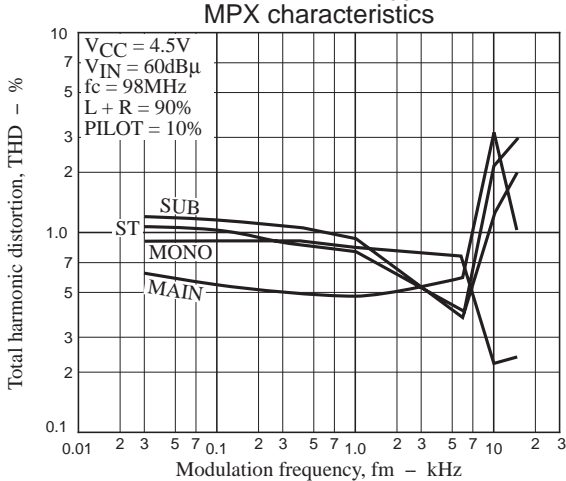
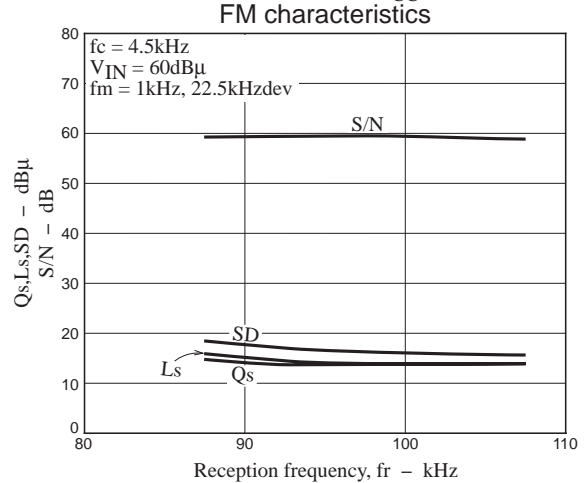
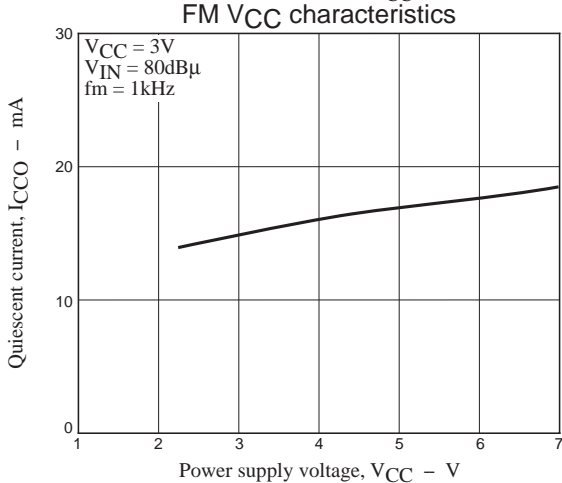
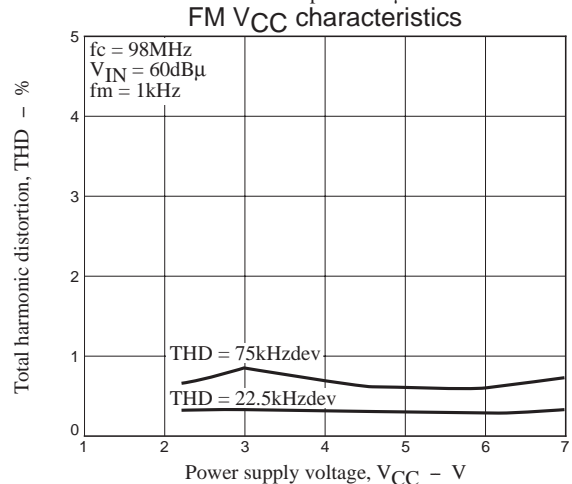
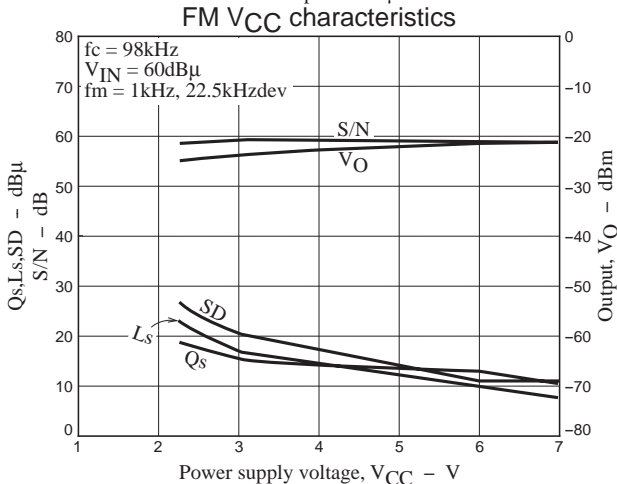
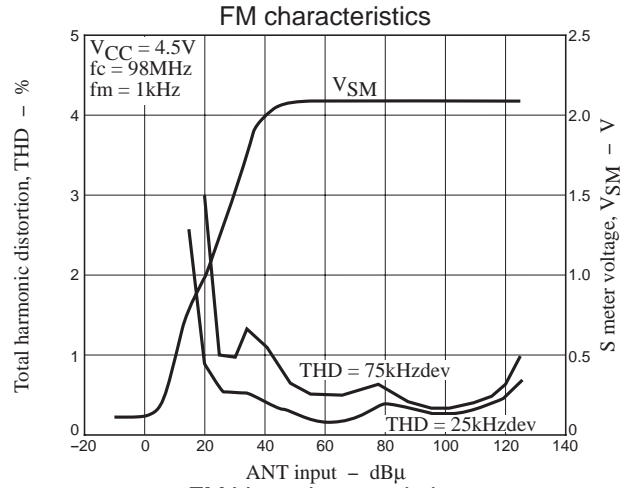
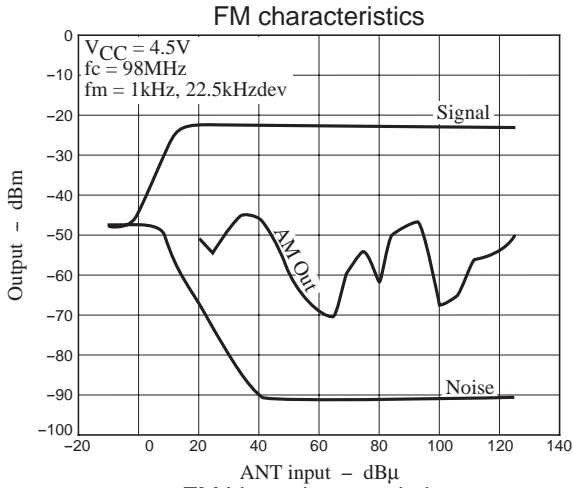
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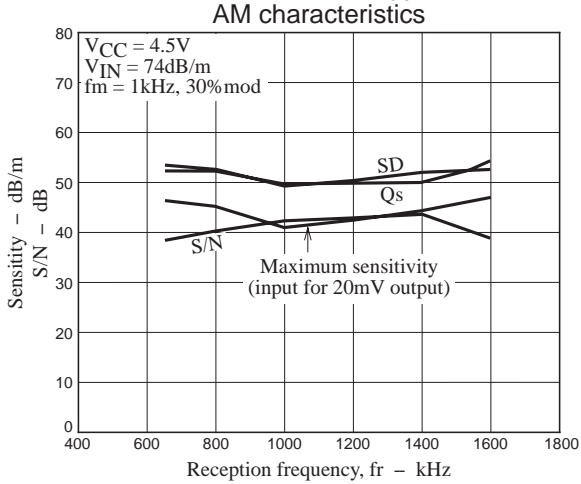
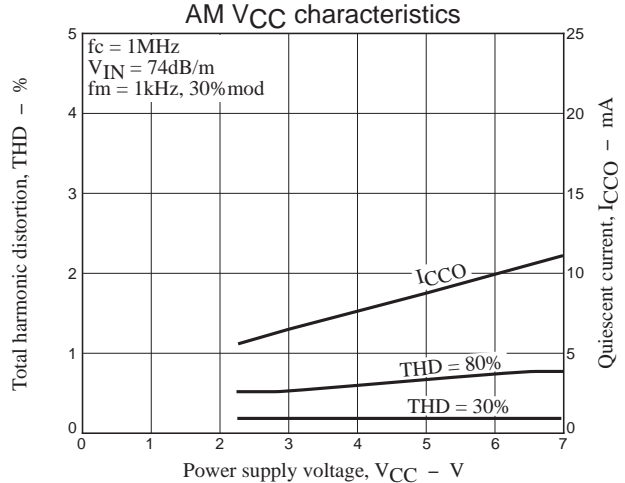
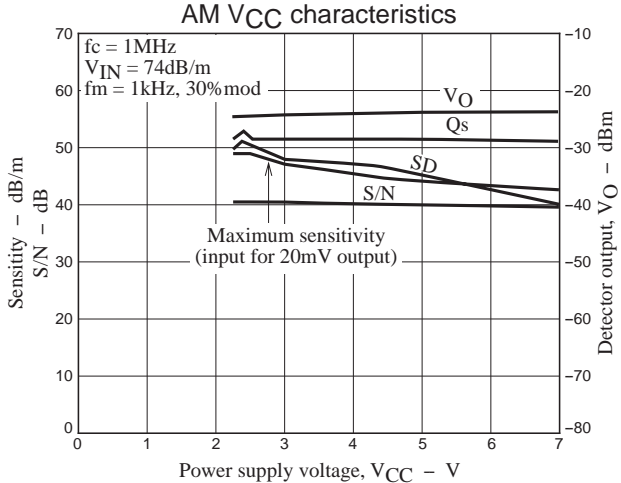
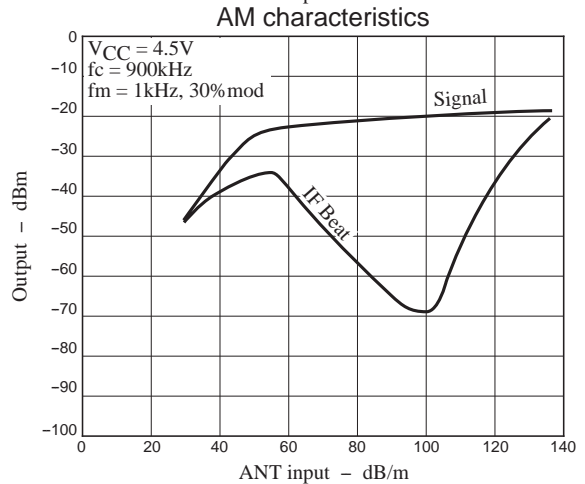
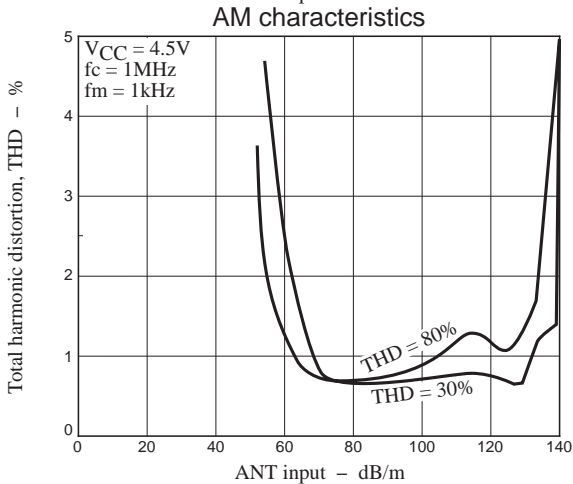
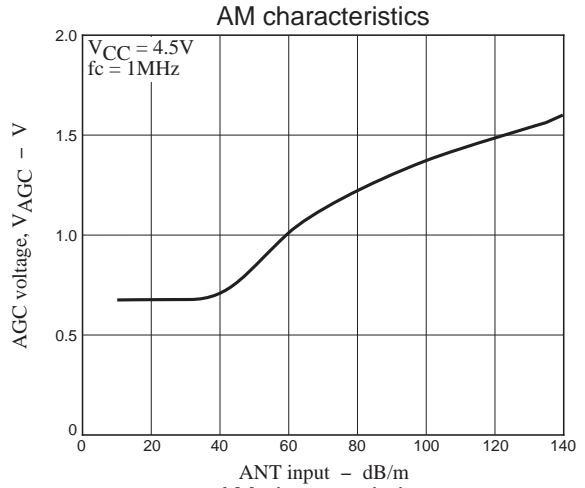
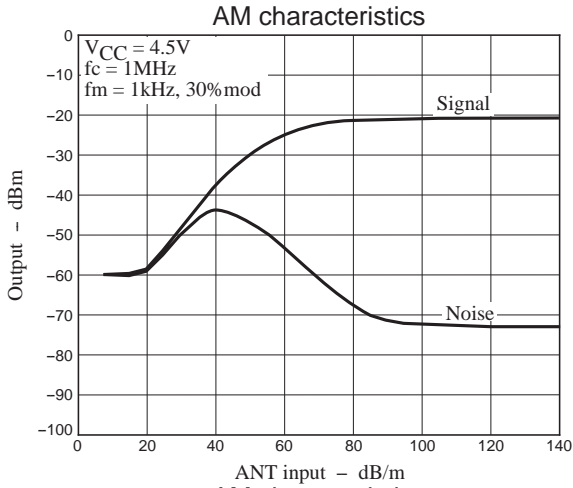
Coil specifications (bottom view)

•FM-BPF : SA-309 (Sumida) 88 to 108MHz	
•FM-RF : SA-149 (Sumida) 3.6mm dia., air core, 0.6mm wire, 4 1/2 T	
•FM-OSC : SA-151 (Sumida) 3.6mm dia., air core, 0.6mm wire, 3 1/2 T	
<p>•FM-Mix : SA-165 (Sumida)</p>  <p>4-6 2T 3-1 12T 0.12UEW fo = 10.7MHz Qo ≥ 50 With 100pF internal capacitor</p>	<p>•AM-OSC : SA-181 (Sumida)</p>  <p>6-4 37T 3-1 74T 0.06UEW fo = 796kHz Qo ≥ 80 L = 140μH</p>
<p>•FM-Det : SA-1134 (Sumida)</p>  <p>1-3 12T 0.10UEW fo = 10.7MHz Qo ≥ 70 With 82pF internal capacitor</p>	<p>•AM-IFT : SA-1136 (Sumida)</p>  <p>3-2 122T 4-6 9T 2-1 62T 0.06UEW fo = 450kHz Qo ≥ 65 With 82pF internal capacitor</p>
•FM-IF filter : SFE10.7MS2 (Murata)	
•AM-IF filter : SFU450B (Murata)	
•Poly-varicon : FT-2217 (Toko) or PVC-22KTL (Mitsumi)	
•MW bar antenna : TYA-1005 (Mitsumi)	
 <p>1-2 68T 3-4 9T fo = 796kHz Qo ≥ 230 L = 260μH</p>	
<p>•FM-Mix : YT-30224 (Mitsumi) for DUT</p>  <p>6-4 2T 1-3 8T 0.12UEW fo = 10.7MHz Qo ≥ 80 With 150pF internal capacitor</p>	<p>•AM-OSC : HW-50425 (Mitsumi) for DUT</p>  <p>3-2 2T 4-6 9T 2-1 86T Qo ≥ 80 L = 270μH</p>
<p>•FM-Det : YT-30103 (Mitsumi) for DUT</p>  <p>1-3 10T fo = 10.7MHz Qo ≥ 90 With 82pF internal capacitor</p>	<p>•AM-IFT : YD-1073-1 (Mitsumi) for DUT</p>  <p>1-2 58T 4-6 7T 2-3 94T fo = 450kHz With 180pF internal capacitor</p> <p style="text-align: center;">SFU450B</p>

Sample Application Circuit







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