Ordering number : EN5837

Monolithic Linear IC

LA1828

Single-Chip Tuner IC for Portable Radio /Cassette Recorders with Manual Tuning

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

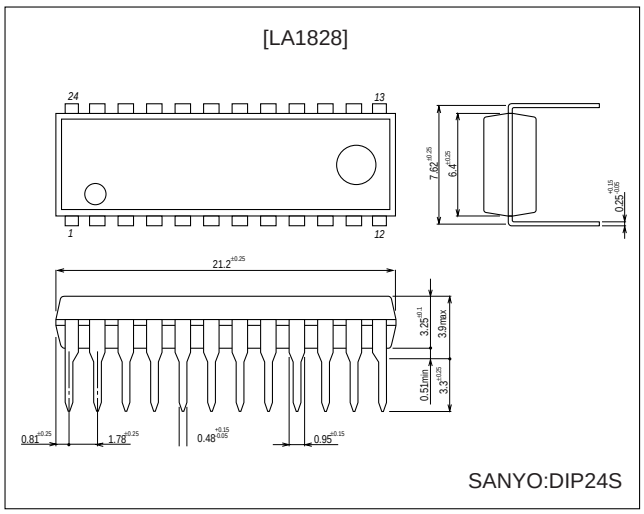
Features

- 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

Package Dimensions

unit:mm

3067-DIP24S



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	Topr		–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
Operating supply voltage range	V_{CC}op		2.5 to 6.0	V

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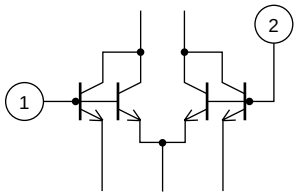
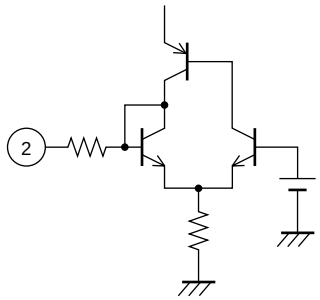
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Operating Characteristics at Ta = 25°C, Vcc = 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 = 98 MHz, fm = 1 kHz, 30% mod.						
Local oscillator voltage	V_{OSC}	f_{OSC}=108.7 MHz, pin 20 output	40	80	160	mVrms
		*Measured with FET buffer (-10 dB gain)				
3 dB sensitivity	3dB LS	60 dBμ, 30% mod. output, -3 dB input		13		dBμ
Effective sensitivity	Qs	Input for S/N = 30 dB		12		dBμ
[FM-IF monaural characteristics]: fc = 10.7 MHz, fm = 1 kHz, 100% mod.						
Quiescent current	I_{CCO} (FM)	No input	8	16	23	mA
Demdulator output	V_O	100 dBμ, pin 16 output	130	190	260	mVrms
Signal-to-noise ratio	S/N	100 dBμ, pin 16 output	62	70		dB
Total harmonic distortion (mono)	THD	100 dBμ, pin 16 output		0.4	1.2	%
3 dB sensitivity	3 dB LS	100 dBμ, 100% mod.output, -3 dB input	21	32	42	dBμ
TU-LED sensitivity	SD-ON			33		dBμ
[FM-IF stereo characteristics]: fc = 10.7 MHz, fm = 1 kHz, L+R = 90%, pilot = 10%						
Separation	SEP	100 dBμ, L-mod, pin 16/pin 17 output	25	40		dB
ST-LED sensitivity	ST-ON	100 dBμ, pilot modulation for pin 8 voltage < 0.5V	1.5	3.5	6.3	%
Total harmonic distortion (main)	THD	100 dBμ, main modulation, pin 16 output		0.5	1.2	%
[AM characteristics]: fc = 1000 kHz, fm = 1 kHz, 30% mod.						
Quiescent current	I_{CCO} (AM)	No input	5	8.5	15	mA
Demdulator output	V_O1	23 dBμ, pin 16 output	18	40	70	mVrms
	V_O2	80 dBμ, pin 16 output	50	85	130	mVrms
Signal-to-noise ratio	S/N1	23 dBμ, pin 16 output	15	20		dB
	S/N2	80 dBμ, pin 16 output	47	53		dB
Total harmonic distortion	THD1	80 dBμ, pin 16 output		0.5	1.3	%
	THD2	107 dBμ, pin 16 output		0.5	1.5	%
TU-LED sensitivity	SD-ON			26		dBμ

Pin Description and Quiescent Voltage at Vcc = 4.5V

Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
1	AM RF input	1.3	1.3	 A10247	AM antenna coil connected between pins 1 and 2 (reg)
2	Reg	1.3	1.3	 A10248	V_{reg}=1.3V

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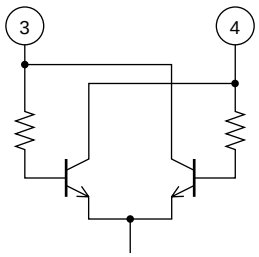
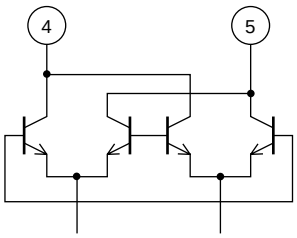
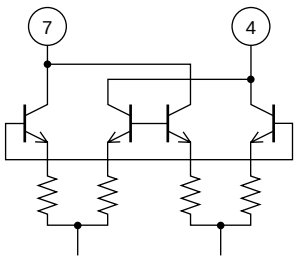
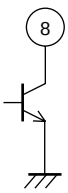
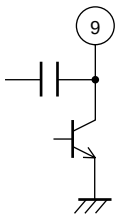
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
3	AM-OSC	4.5	4.5	 A10249	Oscillator coil connected between pins 3 and 4 ($V_{CC}1$)
4	$V_{CC}1$	4.5	4.5		AM/FM-IN/MPX block V_{CC}
5	FM mixer output	4.5	4.5	 A10250	Mixer coil connected between pins 5 and 4 ($V_{CC}1$)
6	GND1	0	0		AM/FM-IN/MPX section ground
7	AM mixer output	4.5	4.5	 A10251	Mixer coil connected between pins 7 and 4 ($V_{CC}1$)
8	Tu-LED output	4.5	4.5	 A10252	Active low Open-collector output can directly drive LED (I_C max = 20 mA)
9	ST-LED output and AM-IF output	4.5	4.5	 A10253	Active low Open-collector output can directly drive LED (I_C max = 20 mA) In AM operation, AM-IF signal (450 kHz) is output here.

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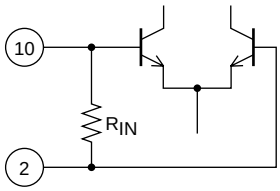
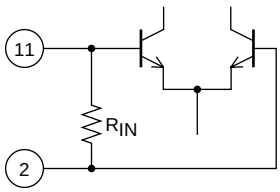
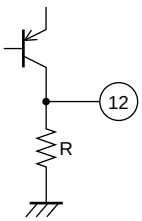
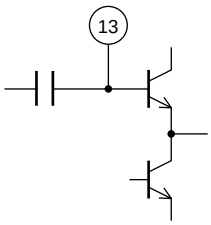
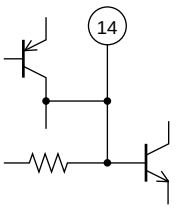
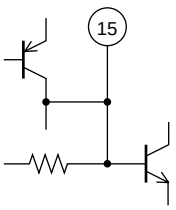
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
10	FM-IF input	1.3	1.3	 A10254	R_{IN} = 330 Ω
11	AM-IF input	1.3	1.3	 A10255	R_{IN} = 2 kΩ
12	AM-AGC output and FM S meter output	0.7	0.2	 A10256	Internal load impedance R = 16.6 kΩ
13	FM detector	4.5	4.5	 A10257	Detector coil connected between pins 13 and 4 (V_{CC}1)
14	Pilot tone detector filter and forced mono switching	2.9	3.8	 A10258	Mono mode is forced on by connecting pin 14 to ground.
15	Phase comparator filter and AM/FM switching	0	3.8	 A10259	FM reception mode is enabled when pin 15 is open. AM reception mode is enabled when pin 15 is connected to ground.

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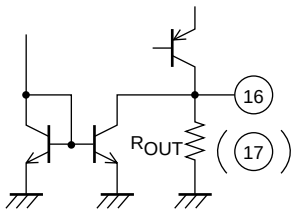
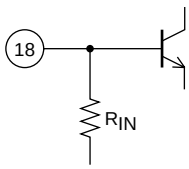
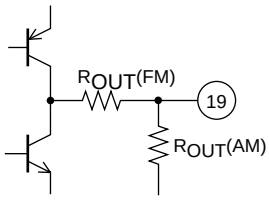
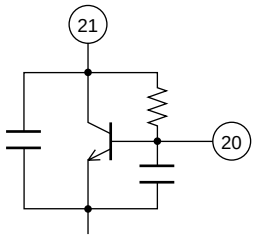
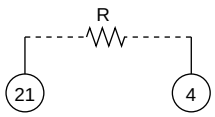
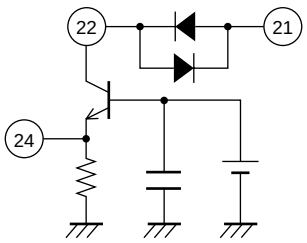
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
16 17	L output R output	1.4	1.4	 A10260	R_{OUT} = 7.5 kΩ
18	MPX input	1.3	1.3	 A10261	R_{IN} = 50 kΩ
19	FM detector output and AM detector output	0.5	1.5	 A10262	Output impedance AM: R_{OUT} = 50 kΩ FM: R_{OUT} = 500 Ω Capacitance between pin 19 and ground should be optimzed for the best separation characteristics.
20	FM-OSC	4.5	4.4	 A10263	Colpitts oscillator circuit FM oscillator coil connected to pin 20.
21	$V_{CC}2$	4.5	4.4	 A10264	FM-FE block V_{CC} Power is supplied from 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	 A10265	FM RF coil connected between pins 22 and 21 ($V_{CC}2$). R_{IN} = 1.8 kΩ
23	GND2	0	0		FM-FE brock ground

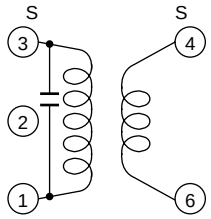
Coil specifications (bottom view)

• FM-BPF: SA-309 (Sumida) 88 to 108 MHz

• FM-RF: SA-149 (Sumida) 3.6 mm dia., air core, 0.6 mm wire, 4 1/2 T

• FM-OSC: SA-151 (Sumida) 3.6 mm dia., air core, 0.6 mm wire, 3 1/2 T

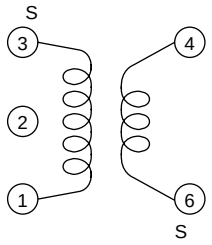
• FM-Mix: SA-165 (Sumida)



A10395

④ - ⑥ 2T
③ - ① 12T
0.12 UEW
f_0 = 10.7 MHz
$Q_0 \geq 50$
With 100 pF
internal capacitor

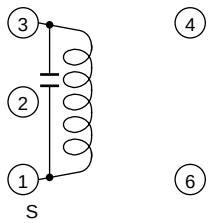
• AM-OSC: SA-181 (Sumida)



A10269

⑥ - ④ 37T
③ - ① 74T
0.06 UEW
f_0 = 796 kHz
$Q_0 \geq 80$
L = 140 µH

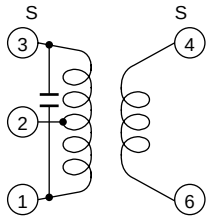
• FM-Det: SA-1134 (Sumida)



A10267

① - ③ 12T
0.10 UEW
f_0 = 10.7 MHz
$Q_0 \geq 70$
With 82 pF
internal capacitor

• AM-IFT: SA-1136 (Sumida)



A10270

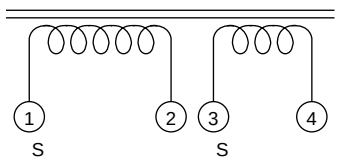
③ - ② 122T
④ - ⑥ 9T
② - ① 62T
0.06 UEW
f_0 = 450 kHz
$Q_0 \geq 65$
With 180 pF
internal capacitor

• FM-IF filter: SFE10.7MS2 (Murata)

• AM-IF filter: SFU450B (Murata)

• Poly-varicon: FT-2217 (Toko) or PVC-22KTL (Mitsumi)

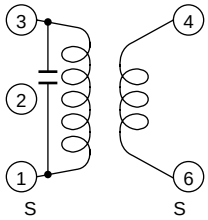
• MW bar antenna: TYA-1005 (Mitsumi)



A10394

① - ② 68T
③ - ④ 9T
f_0 = 796 kHz
$Q_0 \geq 230$
L = 260 µH

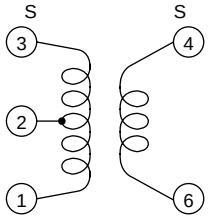
• FM-Mix: YT-30224 (Mitsumi) for DUT



A10266

⑥ - ④ 2T
① - ③ 8T
0.12 UEW
f_0 = 10.7 MHz
Q_0 = 80
With 150 pF
internal capacitor

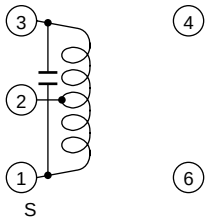
• AM-OSC: HW-50425 (Mitsumi) for DUT



A10271

③ - ② 2T
④ - ⑥ 9T
② - ① 86T
$Q_0 \geq 80$
L = 270 μH

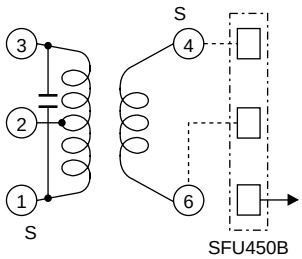
• FM-Det: YT-30103 (Mitsumi) for DUT



A10268

① - ③ 10T
f_0 = 10.7 MHz
Q_0 = 90
With 82 pF
internal capacitor

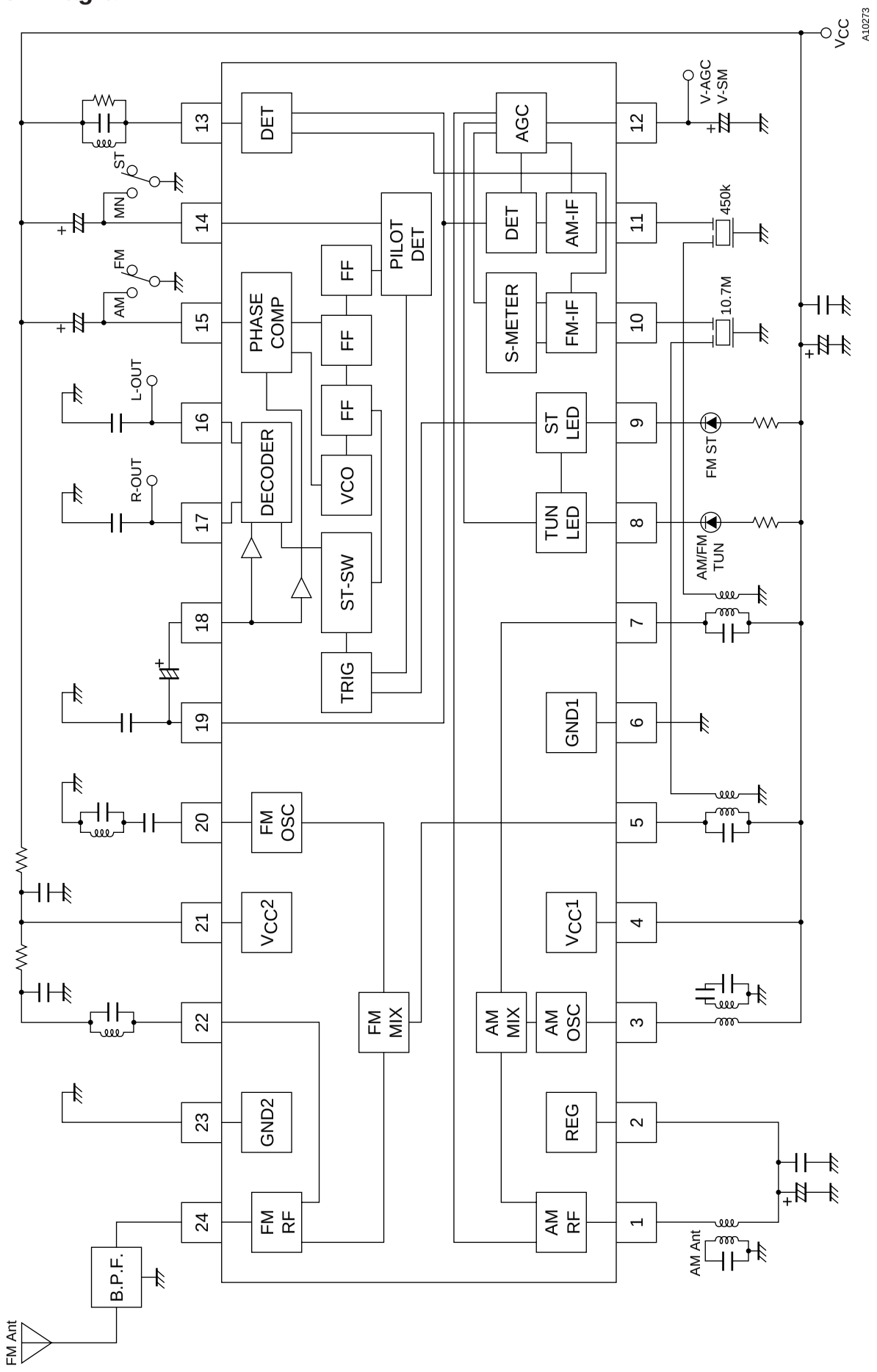
• AM-IFT: YD-1073-1 (Mitsumi) for DUT



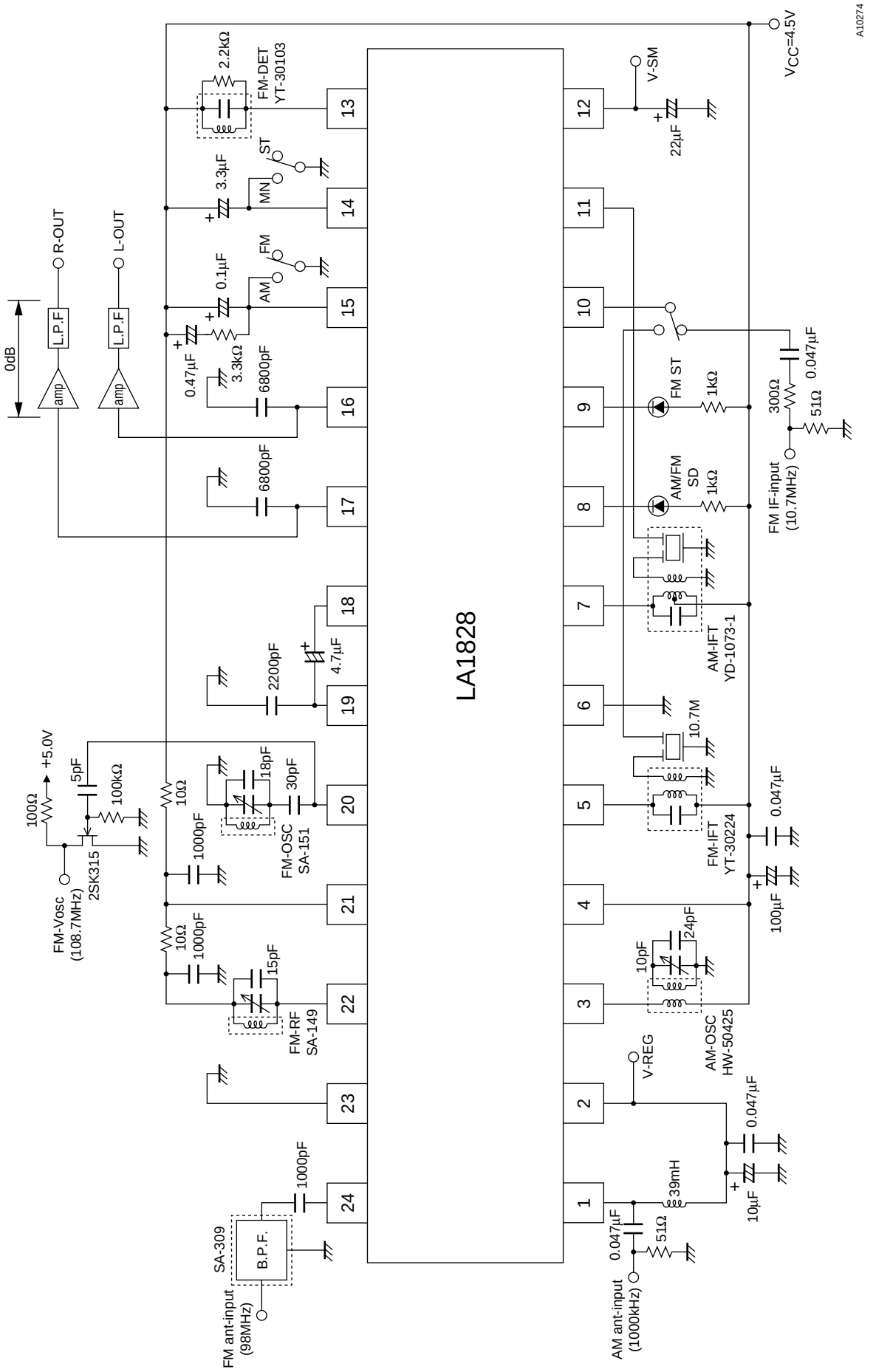
A10272

① - ② 58T
④ - ⑥ 7T
② - ③ 94T
f_0 = 450 kHz
With 180 pF
internal capacitor

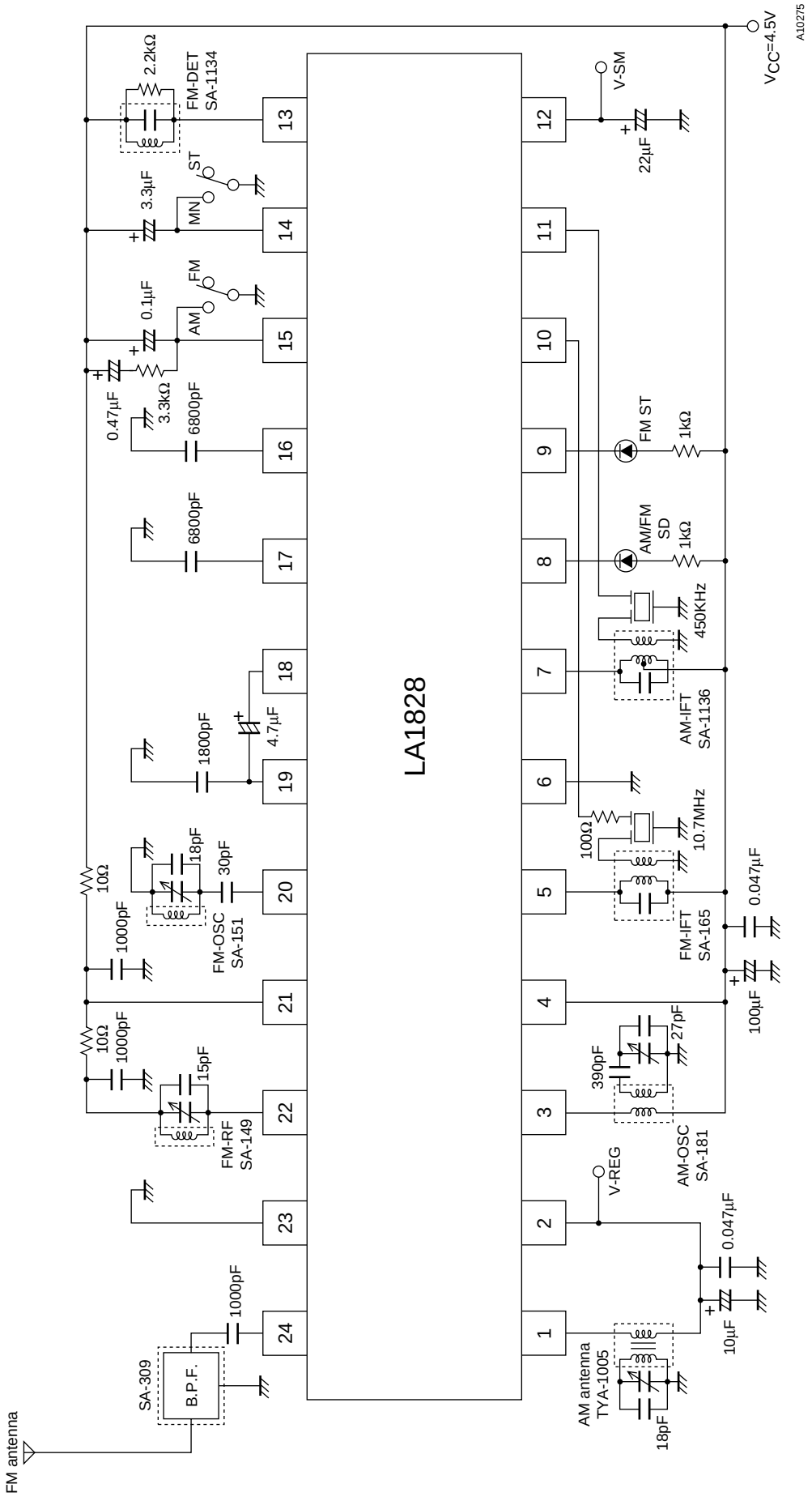
Block Diagram



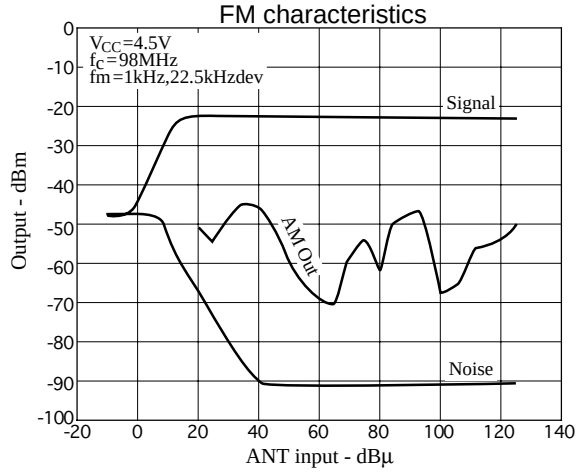
Test Circuit



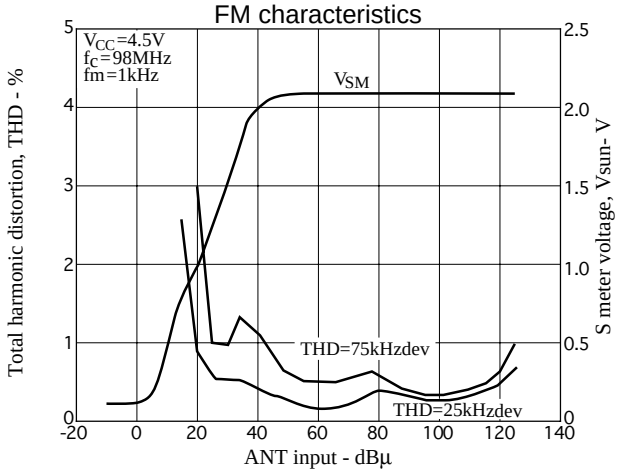
Sample Application Circuit



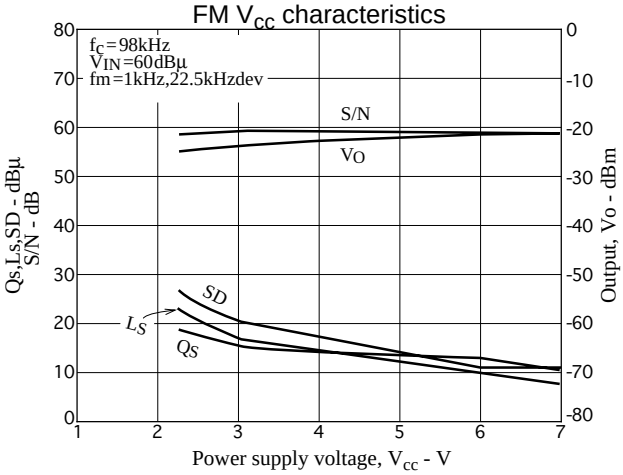
FM characteristics



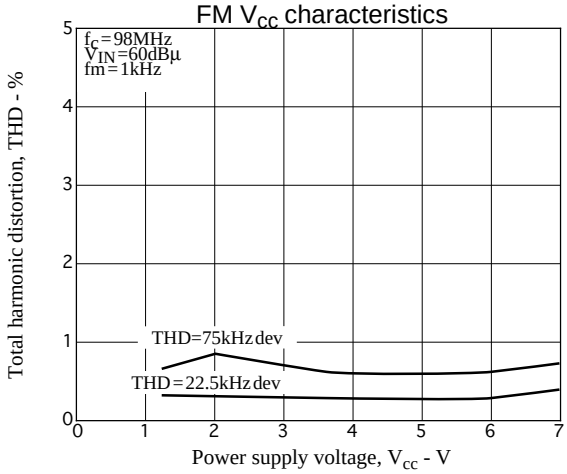
FM characteristics



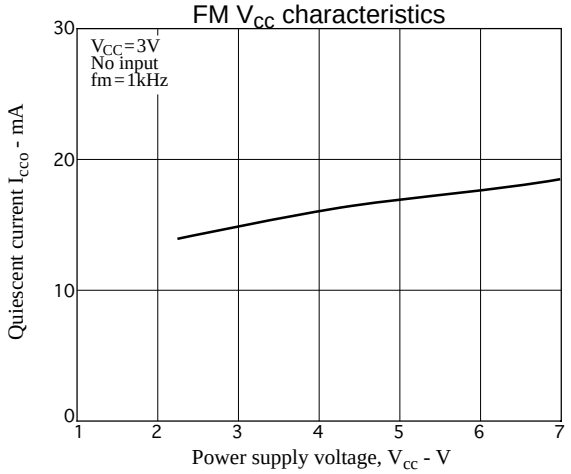
FM V_{CC} characteristics



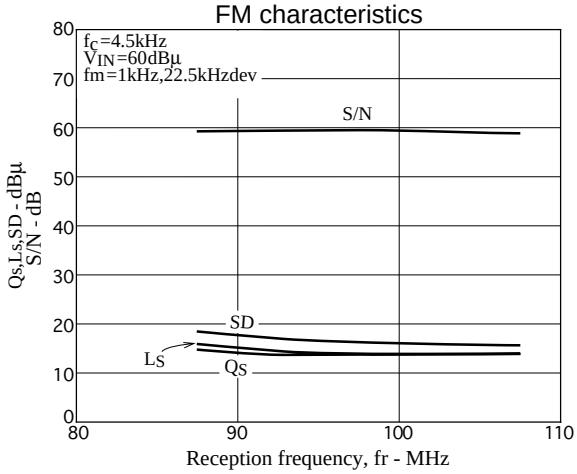
FM V_{CC} characteristics



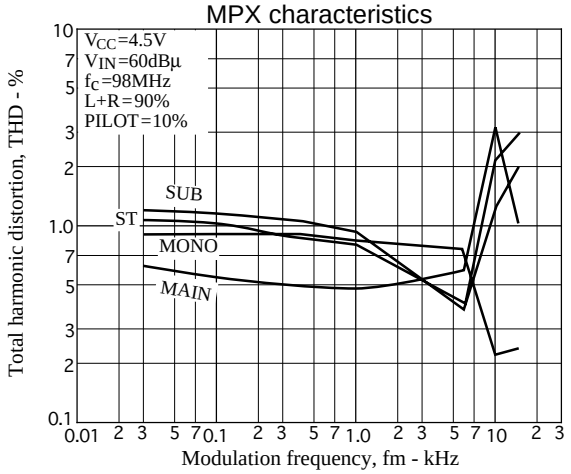
FM V_{CC} characteristics



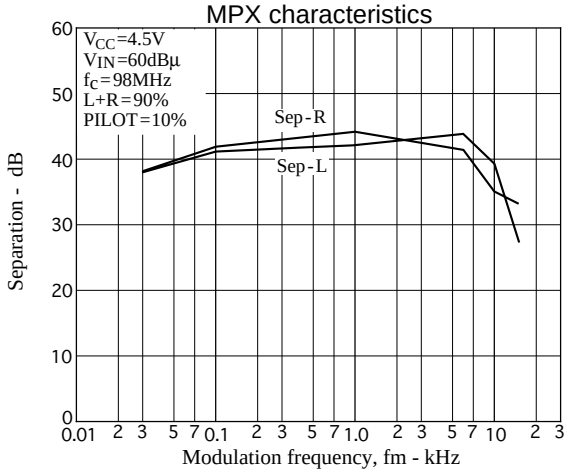
FM characteristics

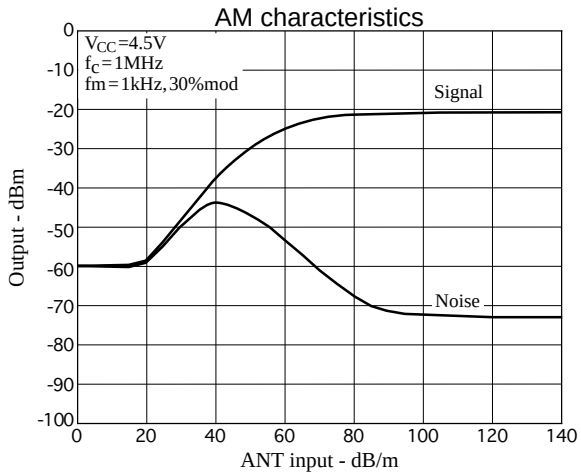


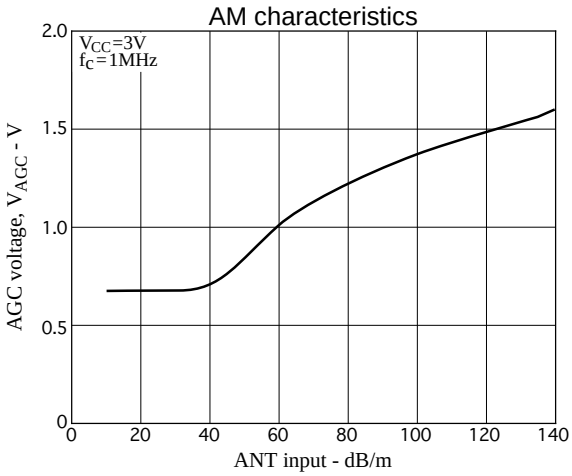
MPX characteristics

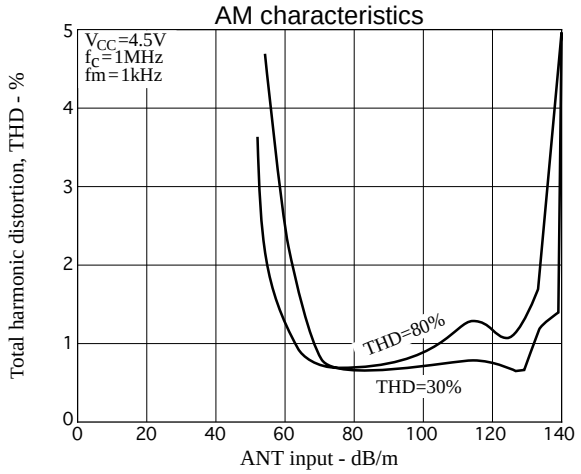


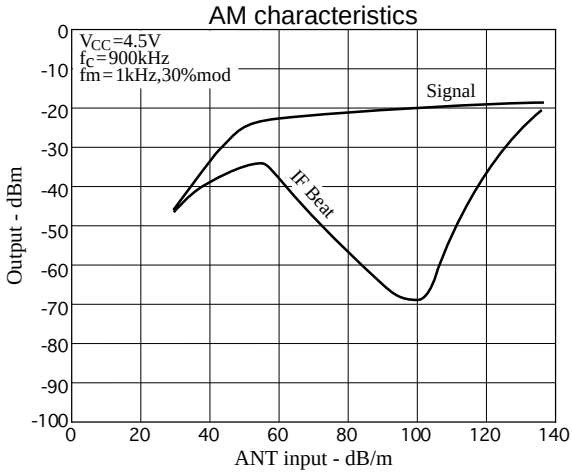
MPX characteristics

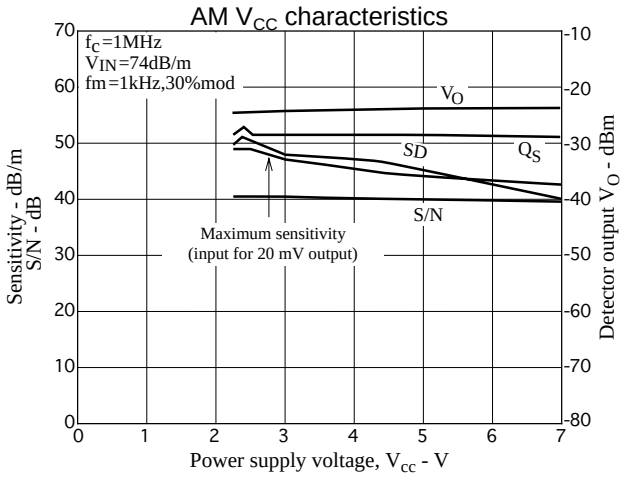


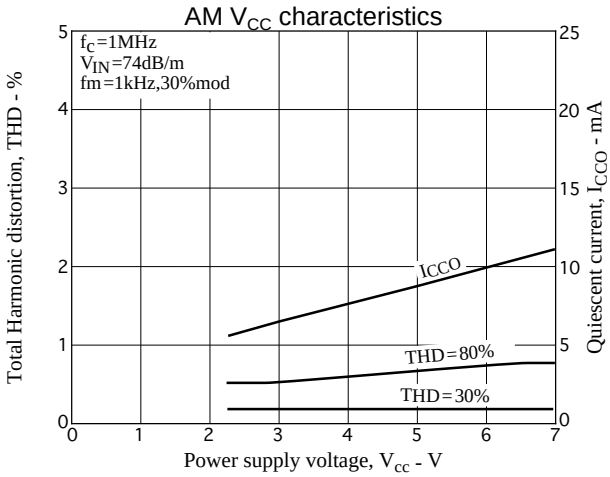

AM characteristics
V_{CC}=4.5V
f_C=1MHz
fm=1kHz,30%mod
Signal
Noise
Output - dBm
ANT input - dB/m

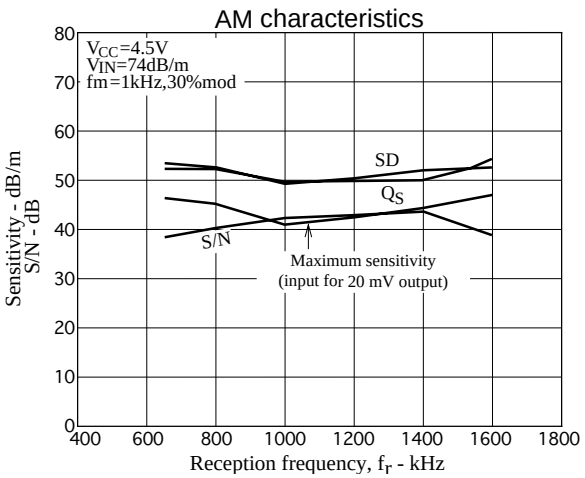

AM characteristics
V_{CC}=3V
f_C=1MHz
AGC voltage, V_{AGC} - V
ANT input - dB/m


AM characteristics
V_{CC}=4.5V
f_C=1MHz
fm=1kHz
THD=80%
THD=30%
Total harmonic distortion, THD - %
ANT input - dB/m


AM characteristics
V_{CC}=4.5V
f_C=900kHz
fm=1kHz,30%mod
Signal
IF Beat
Output - dBm
ANT input - dB/m


AM V_{CC} characteristics
f_C=1MHz
V_{IN}=74dB/m
fm=1kHz,30%mod
V_O
SD
Q_S
S/N
Maximum sensitivity
(input for 20 mV output)
Sensitivity - dB/m
S/N - dB
Detector output V_O - dBm
Power supply voltage, V_{cc} - V


AM V_{CC} characteristics
f_C=1MHz
V_{IN}=74dB/m
fm=1kHz,30%mod
ICCO
THD=80%
THD=30%
Total Harmonic distortion, THD - %
Quiescent current, I_{CCO} - mA
Power supply voltage, V_{cc} - V


AM characteristics
V_{CC}=4.5V
V_{IN}=74dB/m
fm=1kHz,30%mod
SD
Q_S
S/N
Maximum sensitivity
(input for 20 mV output)
Sensitivity - dB/m
S/N - dB
Reception frequency, f_r - kHz