

**LA1828**

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

Functions

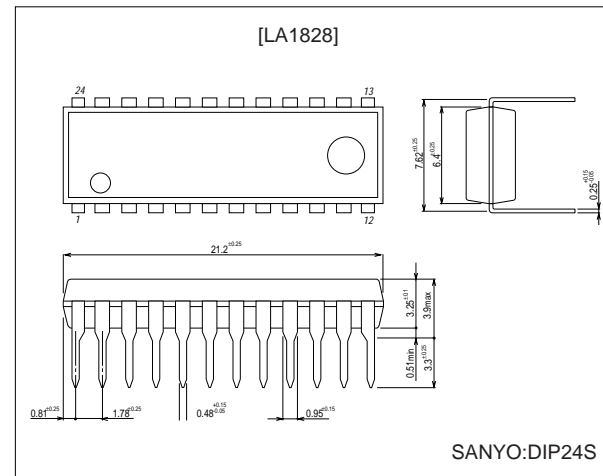
- AM: RF amplifier, mixer, oscillator, IF amplifier, detector, AGC, tuning display output
- FM-FE: RF amplifier, mixer, oscillator
- FM-IF: IF amplifier, quadrature detector, signal strength meter, tuning display output
- MPX: PLL stereo decoder, stereo display output, forced mono, internal VCO

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CCmax}		7.0	V
Indicator drive current	I_{LED}	pins 8, 9	20	mA
Allowable power dissipation	$P_d max$	$T_a \leq 70^\circ\text{C}$	300	mW
Operating temperature	T_{opr}		-20 to +70	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

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

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

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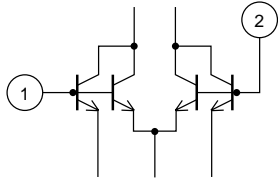
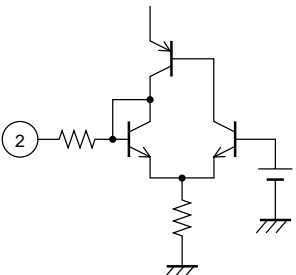
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

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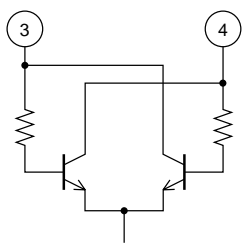
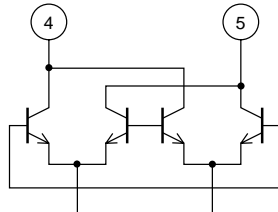
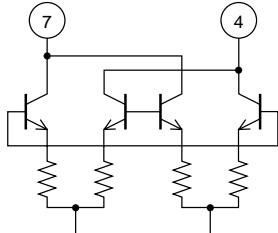
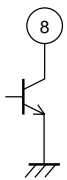
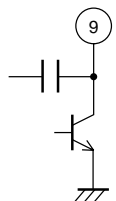
Operating Characteristics at Ta = 25°C, Vcc = 4.5V, in specified test circuit, using Yamaichi Electronics socket IC-179-2

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 *Measured with FET buffer (-10 dB gain)	40	80	160	mVrms
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
Demodulator 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
Demodulator 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

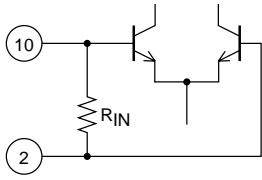
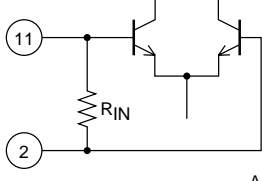
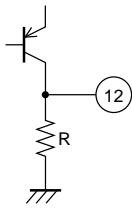
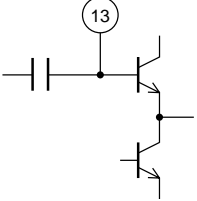
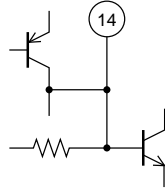
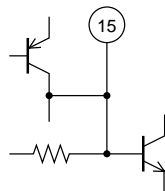
Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
1	AM RF input	1.3	1.3	 <p>A10247</p>	AM antenna coil connected between pins 1 and 2 (reg)
2	Reg	1.3	1.3	 <p>A10248</p>	V _{reg} =1.3V

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Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
3	AM-OSC	4.5	4.5	 <p>A10249</p>	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	 <p>A10250</p>	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	 <p>A10251</p>	Mixer coil connected between pins 7 and 4 (V_{CC1})
8	Tu-LED output	4.5	4.5	 <p>A10252</p>	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	 <p>A10253</p>	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.

LA1828

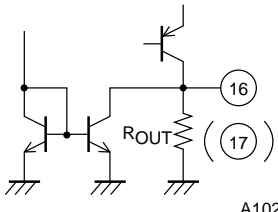
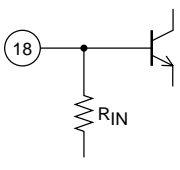
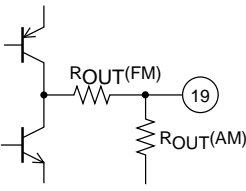
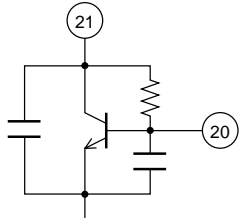
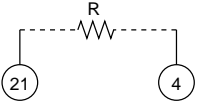
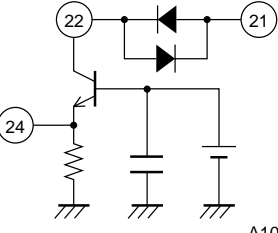
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Pin number	Function	Quiescent voltage (V)		Equivalent circuit	Remarks
		AM	FM		
10	FM-IF input	1.3	1.3	 <p style="text-align: right;">A10254</p>	$R_{IN} = 330 \Omega$
11	AM-IF input	1.3	1.3	 <p style="text-align: right;">A10255</p>	$R_{IN} = 2 \text{ k}\Omega$
12	AM-AGC output and FM S meter output	0.7	0.2	 <p style="text-align: right;">A10256</p>	Internal load impedance $R = 16.6 \text{ k}\Omega$
13	FM detector	4.5	4.5	 <p style="text-align: right;">A10257</p>	Detector coil connected between pins 13 and 4 (V_{CC1})
14	Pilot tone detector filter and forced mono switching	2.9	3.8	 <p style="text-align: right;">A10258</p>	Mono mode is forced on by connecting pin 14 to ground.
15	Phase comparator filter and AM/FM switching	0	3.8	 <p style="text-align: right;">A10259</p>	FM reception mode is enabled when pin 15 is open. AM reception mode is enabled when pin 15 is connected to ground.

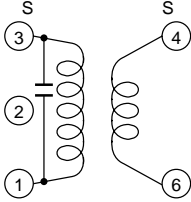
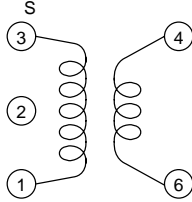
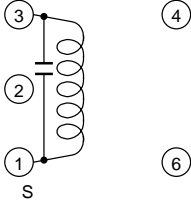
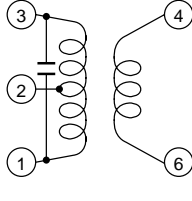
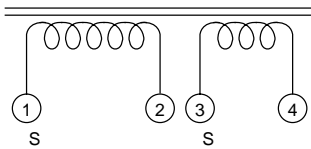
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LA1828

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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	 <p style="text-align: center;">A10260</p>	$R_{OUT} = 7.5 \text{ k}\Omega$
18	MPX input	1.3	1.3	 <p style="text-align: center;">A10261</p>	$R_{IN} = 50 \text{ k}\Omega$
19	FM detector output and AM detector output	0.5	1.5	 <p style="text-align: center;">A10262</p>	Output impedance AM: $R_{OUT} = 50 \text{ k}\Omega$ 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	 <p style="text-align: center;">A10263</p>	Colpitts oscillator circuit FM oscillator coil connected to pin 20.
21	V_{CC2}	4.5	4.4	 <p style="text-align: center;">A10264</p>	FM-FE block V_{CC} Power is supplied from pin 4 (V_{CC1}) via external resistor (10Ω).
22 24	FM-RF output FM-RF input	4.5 0	4.4 1.0	 <p style="text-align: center;">A10265</p>	FM RF coil connected between pins 22 and 21 (V_{CC2}). $R_{IN} = 1.8 \text{ k}\Omega$
23	GND2	0	0		FM-FE brock ground

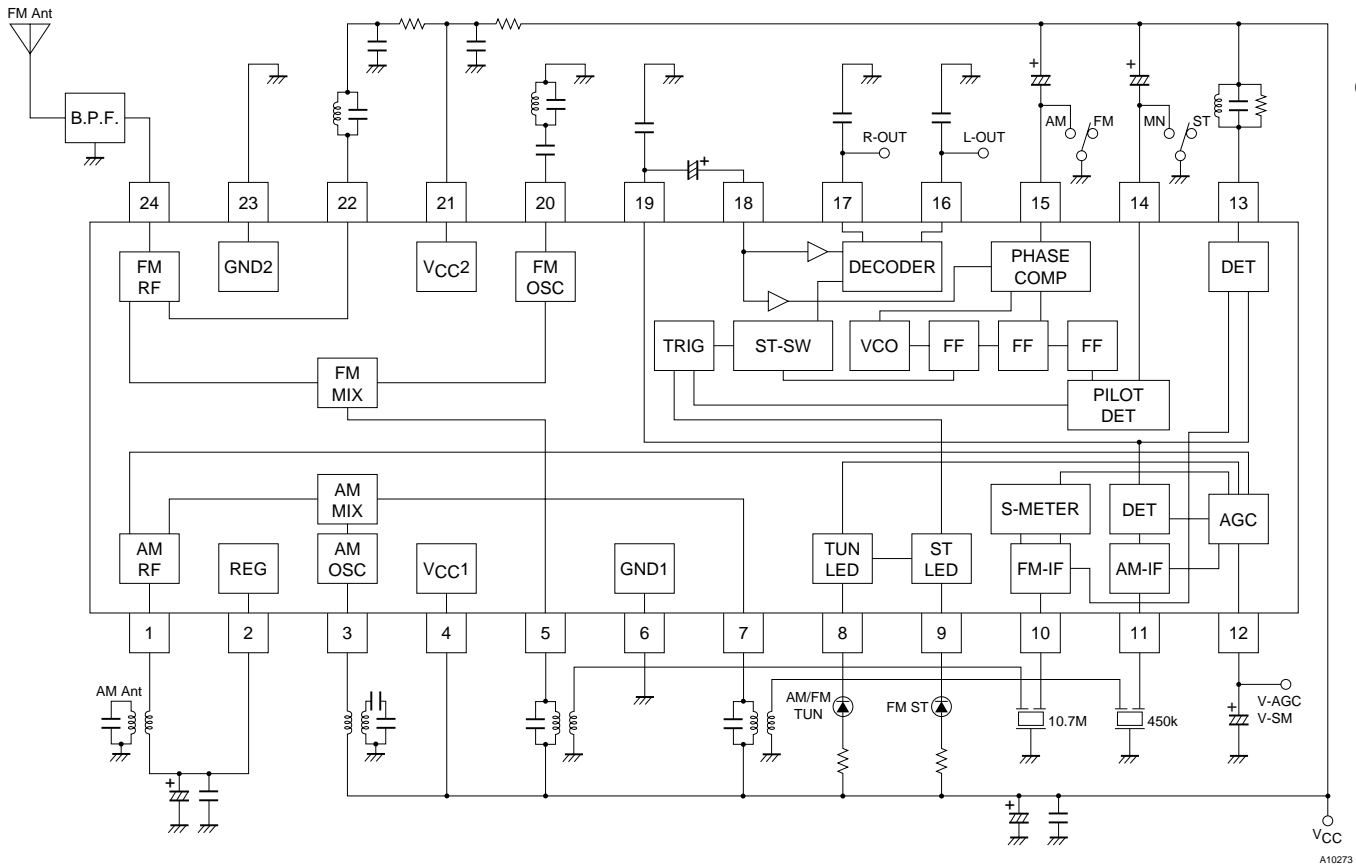
Coil specifications (bottom view)

<p>• FM-BPF: SA-309 (Sumida) 88 to 108 MHz</p>	
<p>• FM-RF: SA-149 (Sumida) 3.6 mm dia., air core, 0.6 mm wire, 4 1/2 T</p>	
<p>• FM-OSC: SA-151 (Sumida) 3.6 mm dia., air core, 0.6 mm wire, 3 1/2 T</p>	
<p>• FM-Mix: SA-165 (Sumida)</p>  <p>④ - ⑥ 2T ③ - ① 12T 0.12 UEW $f_0 = 10.7$ MHz $Q_0 \geq 50$ With 100 pF internal capacitor</p> <p>A10395</p>	<p>• AM-OSC: SA-181 (Sumida)</p>  <p>⑥ - ④ 37T ③ - ① 74T 0.06 UEW $f_0 = 796$ kHz $Q_0 \geq 80$ $L = 140$ μH</p> <p>A10269</p>
<p>• FM-Det: SA-1134 (Sumida)</p>  <p>① - ③ 12T 0.10 UEW $f_0 = 10.7$ MHz $Q_0 \geq 70$ With 82 pF internal capacitor</p> <p>A10267</p>	<p>• AM-IFT: SA-1136 (Sumida)</p>  <p>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</p> <p>A10270</p>
<p>• FM-IF filter: SFE10.7MS2 (Murata)</p>	<p>• AM-IF filter: SFU450B (Murata)</p>
<p>• Poly-varicon: FT-2217 (Toko) or PVC-22KTL (Mitsumi)</p>	
<p>• MW bar antenna: TYA-1005 (Mitsumi)</p>  <p>① - ② 68T ③ - ④ 9T $f_0 = 796$ kHz $Q_0 \geq 230$ $L = 260$ μH</p> <p>A10394</p>	

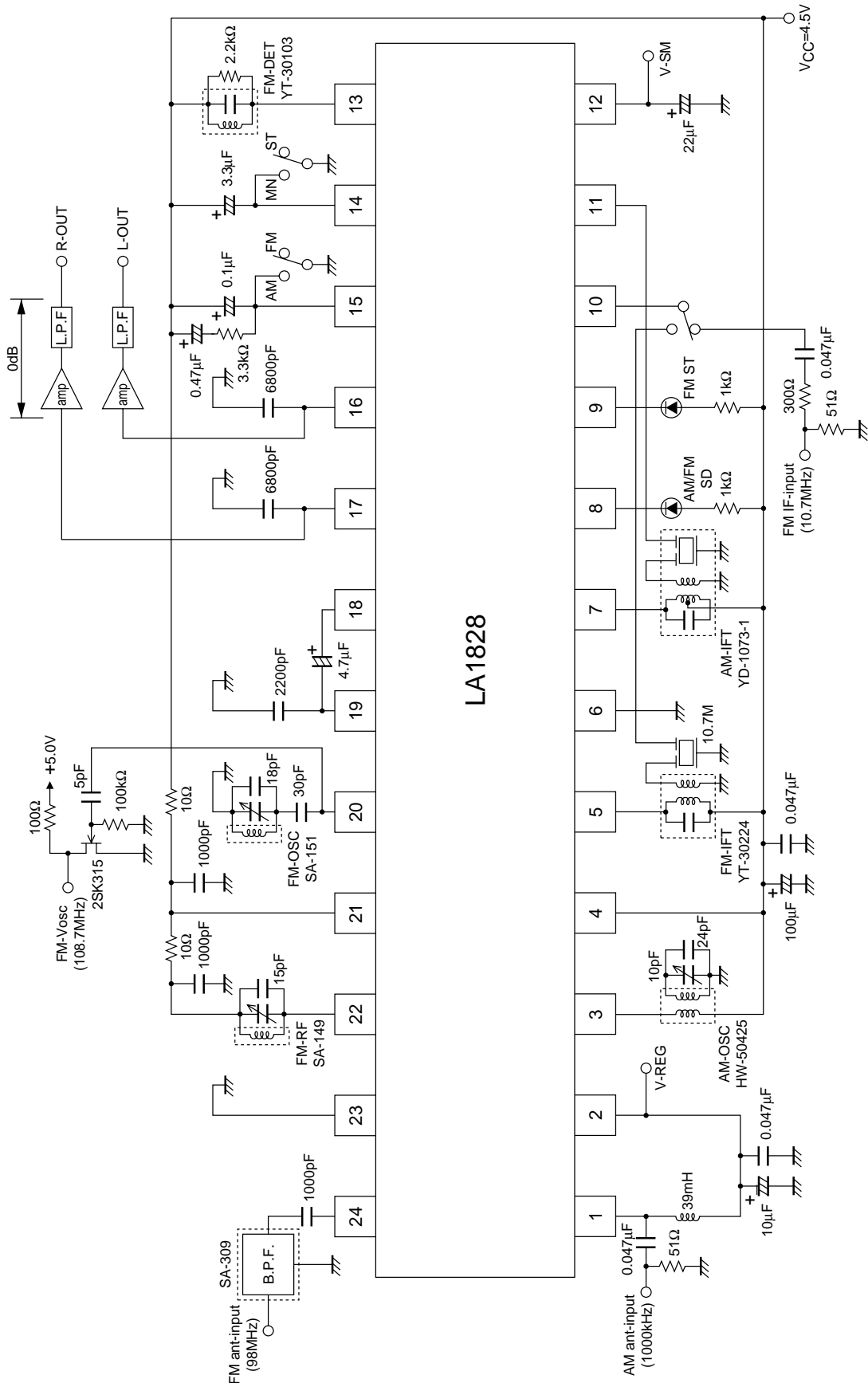
<p>• FM-Mix: YT-30224 (Mitsumi) for DUT</p> <p>⑥ - ④ 2T ① - ③ 8T 0.12 UEW $f_0 = 10.7$ MHz $Q_0 = 80$ With 150 pF internal capacitor</p> <p>A10266</p>	<p>• AM-OSC: HW-50425 (Mitsumi) for DUT</p> <p>③ - ② 2T ④ - ⑥ 9T ② - ① 86T $Q_0 \geq 80$ $L = 270$ μH</p> <p>A10271</p>
<p>• FM-Det: YT-30103 (Mitsumi) for DUT</p> <p>① - ③ 10T $f_0 = 10.7$ MHz $Q_0 = 90$ With 82 pF internal capacitor</p> <p>A10268</p>	<p>• AM-IFT: YD-1073-1 (Mitsumi) for DUT</p> <p>① - ② 58T ④ - ⑥ 7T ② - ③ 94T $f_0 = 450$ kHz With 180 pF internal capacitor</p> <p>SFU450B</p> <p>A10272</p>

Block Diagram

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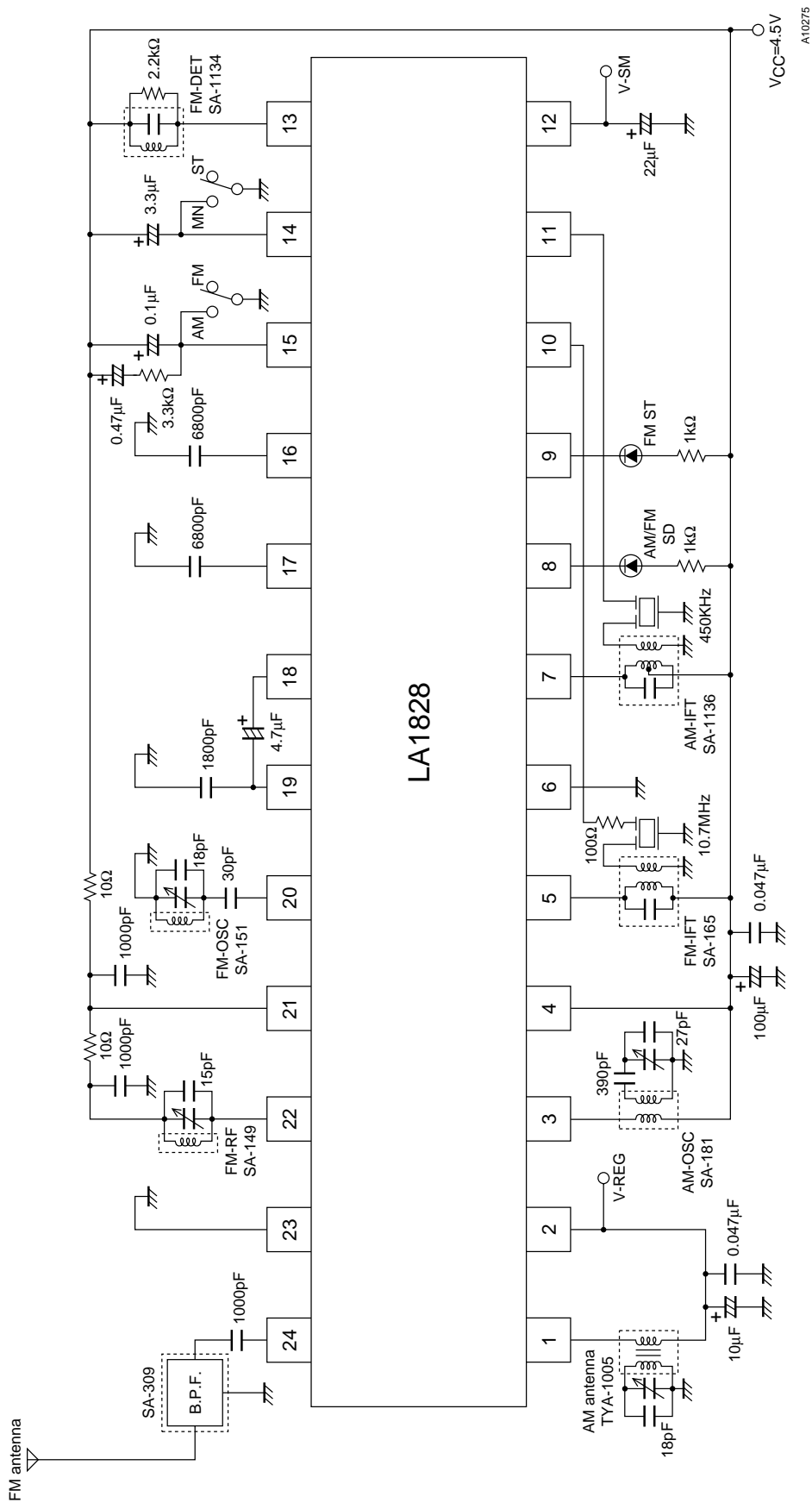


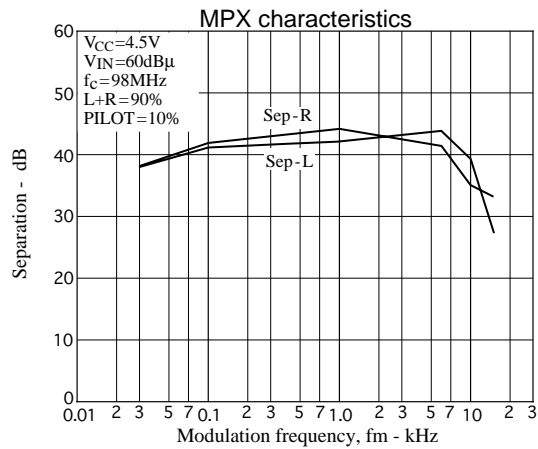
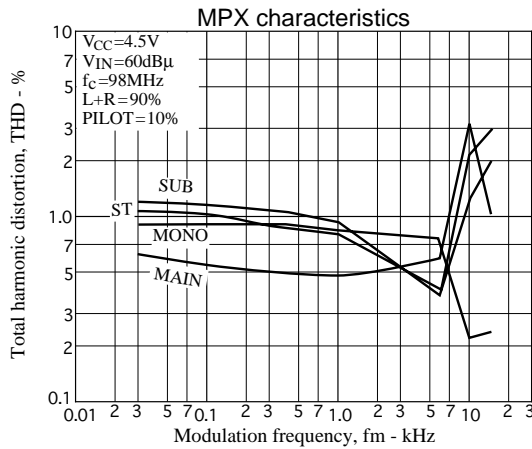
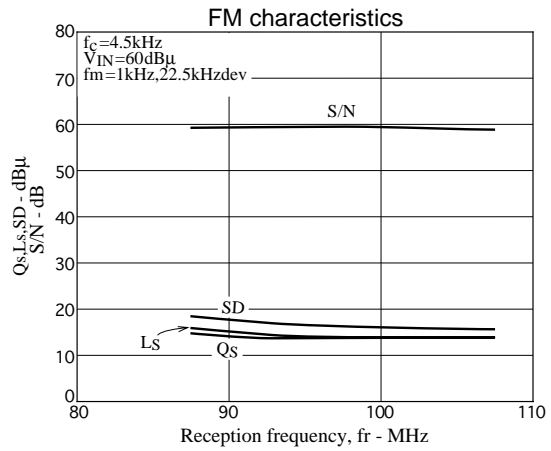
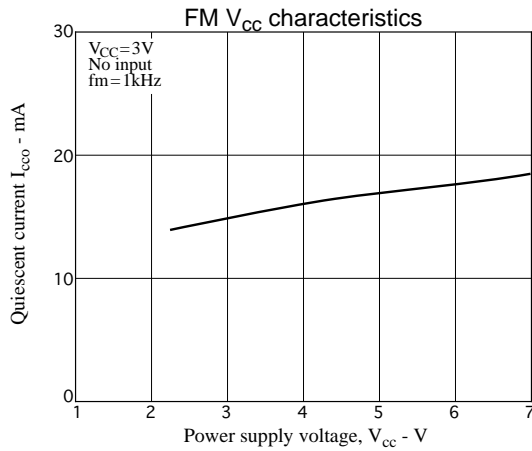
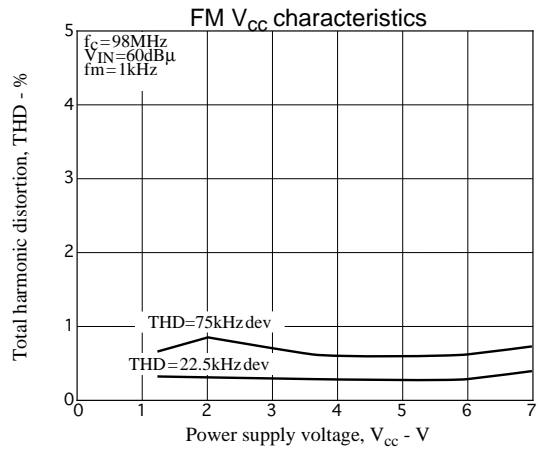
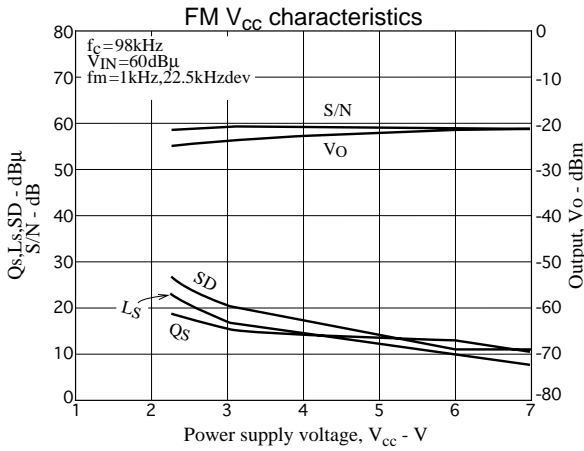
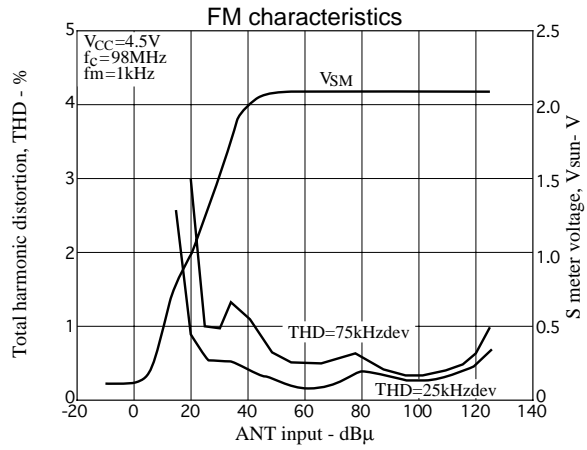
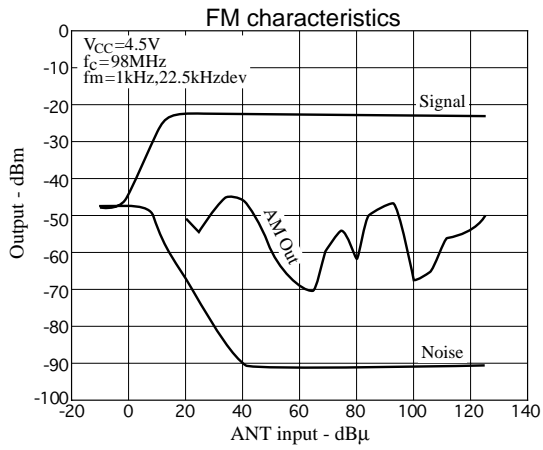
Test Circuit

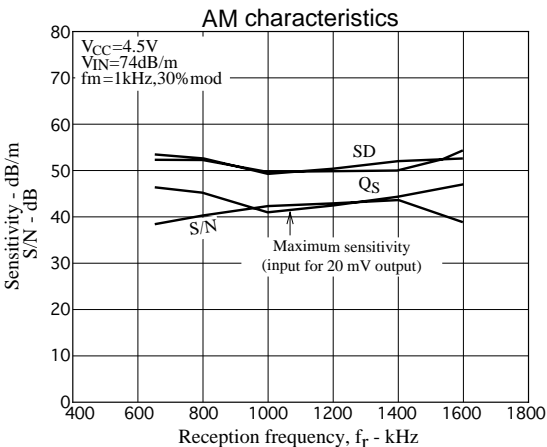
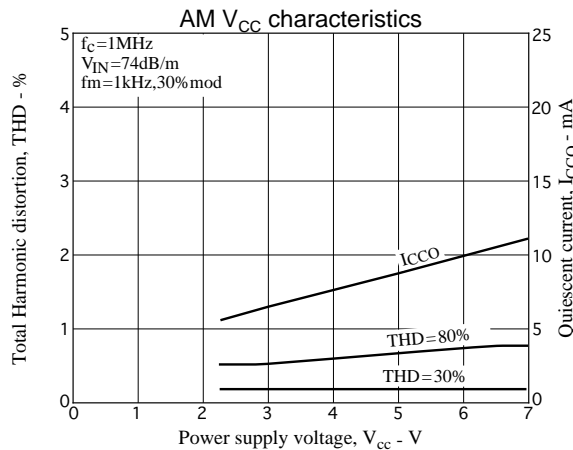
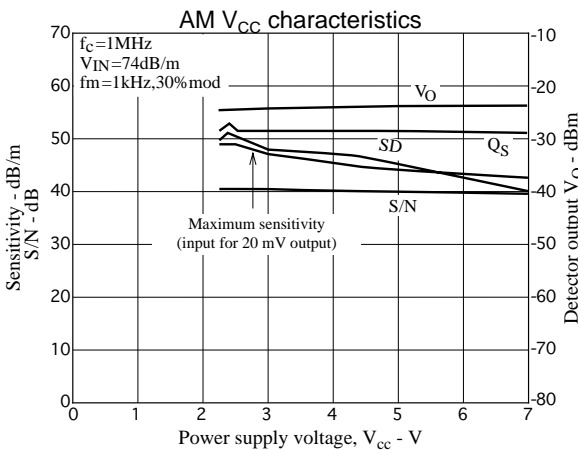
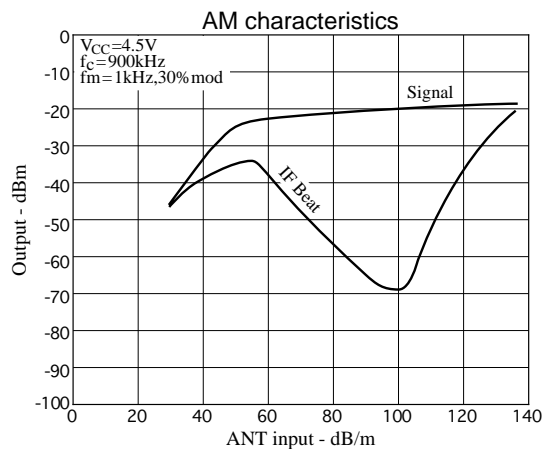
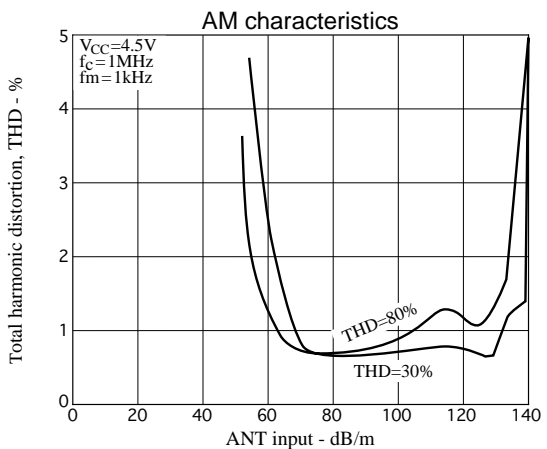
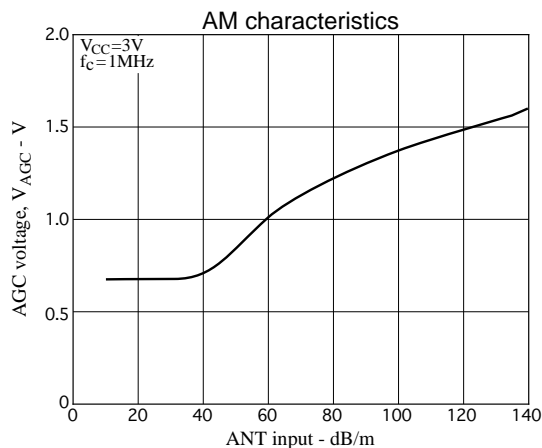
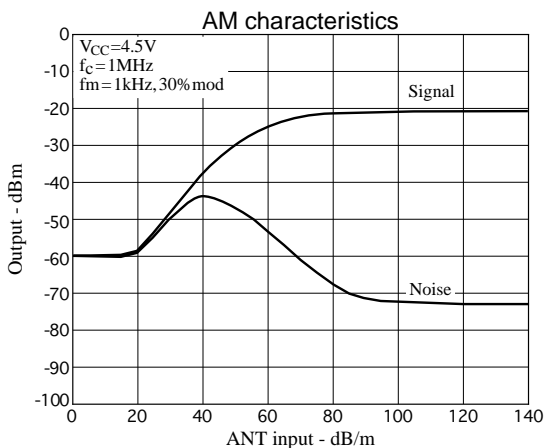


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Sample Application Circuit







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