# SGS-THOMSON MICROELECTRONICS

TDA7211A

LOW VOLTAGE FM FRONT END

- LOW OSCILLATOR RADIATION
- OPERATING SUPPLY VOLTAGE: 1.3V TO 6V
- EXCELLENT GAIN STABILITY VS. SUPPLY VOLTAGE
- HIGH SIGNAL HANDLING
- FEW EXTERNAL COMPONENTS
- BUILT-IN VARICAP FOR AFC
- MINIDIP PACKAGE PERMITS RATIONAL LAYOUT AND LOW PROFILE
- COVERS JAPANESE, US AND EUROPEAN BANDS

The TDA7211A is a monolithic FM turner suitable for portable radio and radio/cassette player applications where a very low supply voltage is used and compactness is an important design consideration. It contains an RF amplifier, balanced mixer, one-pin local oscillator and a varicap diode for AFC. Very few external components are required. Mounted in a Minidip or SO-8 package, the TDA7211A is particularly suitable for slimline cassette-type radios.
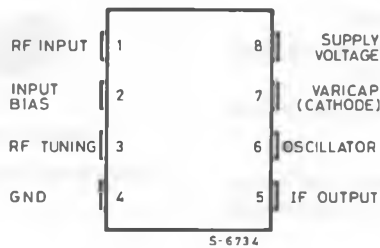
Minidip Plastic   SO-8J
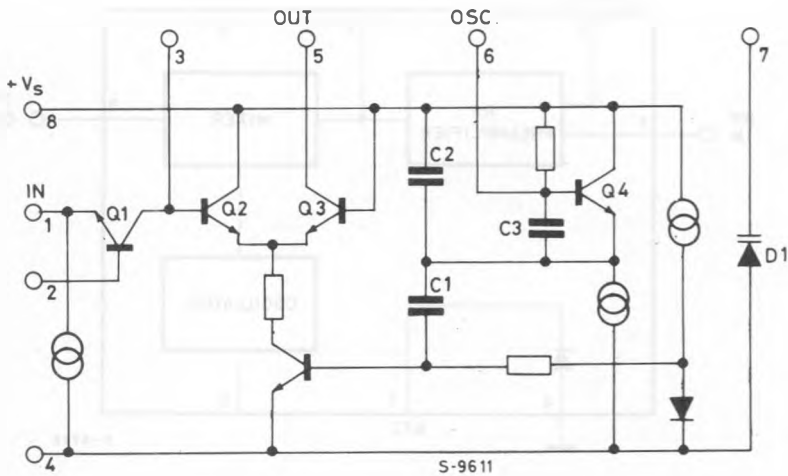
ORDERING NUMBER: TDA7211A (Minidip)
TDA7211D (SO-8J)

BLOCK DIAGRAM

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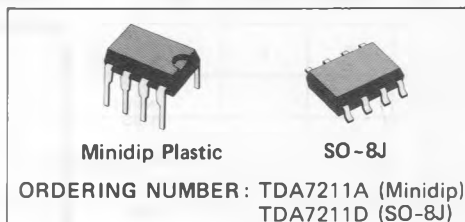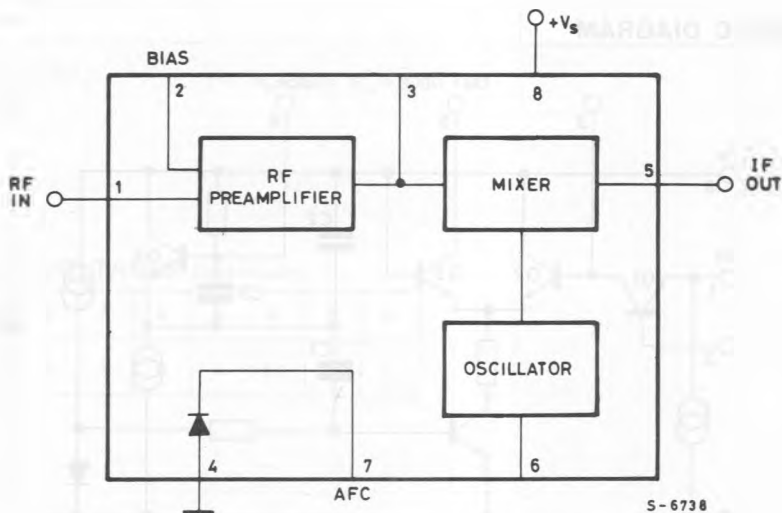
ABSOLUTE MAXIMUM RATINGS

V_s	Supply voltage	7	V
P_{tot}	Total power dissipation at $T_{amb} < 70°C$	400	mW
T_{op}	Operating temperature	-20 to 85	°C
T_{stg}, T_J	Storage and junction temperature	-40 to 150	°C

CONNECTION DIAGRAM
(Top view)

RF INPUT	1	8 — SUPPLY VOLTAGE
INPUT BIAS	2	7 — VARICAP (CATHODE)
RF TUNING	3	6 — OSCILLATOR
GND	4	5 — IF OUTPUT

S-6734

SCHEMATIC DIAGRAM

S-9611

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THERMAL DATA

$R_{th\,j-amb}$	Thermal resistance junction-ambient	max	200	°C/W

ELECTRICAL CHARACTERISTICS (V_s = 3V, test circuit of fig. 1, T_{amb}= 25°C, unless otherwise specified)

	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_s	Supply voltage		1.3	3	6	V
V_{osc}	Local oscillator voltage				330	mV_{rms}
I_s	Supply current	V_s = 1.5 to 4.5V	2	3	4.5	mA
C_{AFC}	AFC diode capacitance	V_{AFC}= 1V		4		pF
K(*)	AFC diode variation	V_{AFC}= 1 to 3V		0.24		
G_c(**)	Conversion gain	V_s = 3V $\quad$ f = 83 MHz $\qquad\qquad$ f = 98 MHz	25 25	34 34		dB
		V_s = 1.6V $\quad$ f = 83 MHz $\qquad\qquad$ f = 98 MHz		32 32		dB
V_{STP}	Local oscillator stop voltage			1.2		V

(*) $K = \dfrac{C\,(1V) - C\,(3V)}{C\,(3V)}$ $\qquad$ (**) R_i = 75Ω; R_L = 300Ω

TYPICAL DC VOLTAGES (test circuit)

Pin	1	2	3	4	5	6	7	8
(V)	2.3	3	3	0	3	2.9	0	3

Fig. 1 – Test circuit
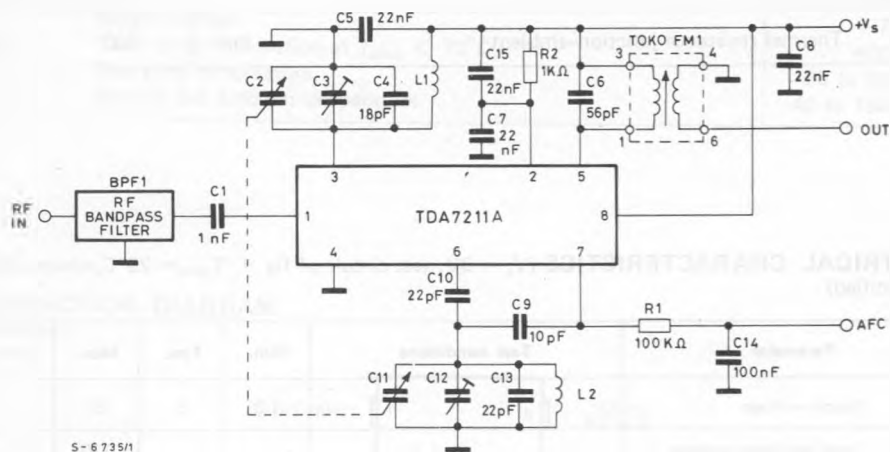
BPF1 = TAIYO YUDEN – B10861
C_V = C2, C3, C11, C12 = 20 + 20 pF
L1 = RF coil – 5 turns – 0.6 mm/4 mm.
L2 = OSC. coil – 4 turns – 0.6 mm/4 mm.

Fig. 2 – P.C. board and components layout of the test circuit (1:1 scale)

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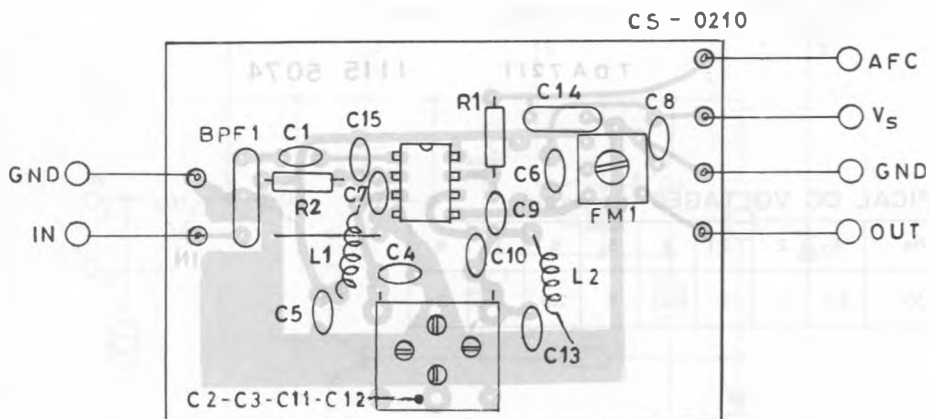
APPLICATION INFORMATION

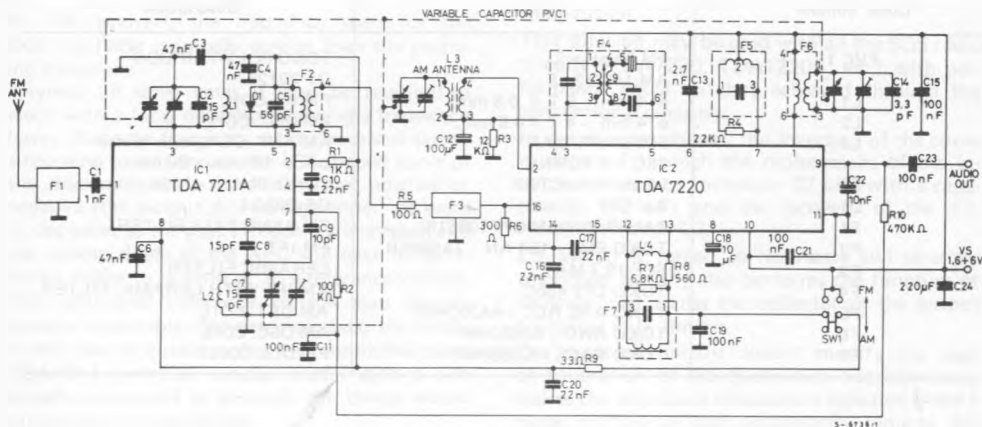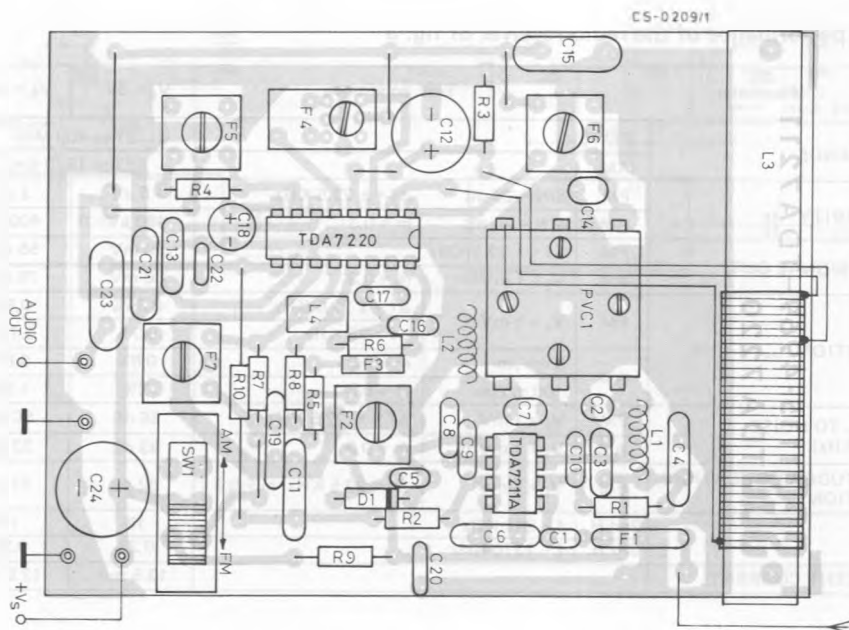Fig. 3 - Typical application for portable AM/FM radio

Fig. 4 - P.C. board and components layout of the circuit of fig. 3 (1:1 scale)

APPLICATION INFORMATION (continued)

PARTS LIST (Radioreceiver of fig. 3)

Code number	Value	Description
PVC 1	FM 20 pF x 2	TOKO POLYVARICON
	AM 140/82 pF	QT 22124
L1	φ 4 mm. – 5 T # 0.6 mm.	FM RF COIL
L2	φ 4 mm. – 4 T # 0.6 mm.	FM OSC. COIL
L3	600 μH PRIMARY	AM ANT. COIL with ferrite
	SEC. – 7 TURNS	bar φ 10 mm. x 80 mm.
L4	22 μH INDUCTOR	TOKO 144LY – 220K
D1	AA 119	GE DIODE
F1	TAIYO YUDEN BPF10861K	FM BAND PASS FILTER
F2	TOKO FM1 – 154 AN – 7A5965R	FM IFT
F3	SFE 10.7 MA	CERAMIC FILTER
F4	TOKO CF2 455C	AM IFT WITH CERAMIC FILTER
F5	TOKO AM2 RLC – 4A7524EK	AM DET. COIL
F6	TOKO RWO – 6A6574N	AM OSC. COIL
F7	TOKO KACS – K586HM	FM DIS. COIL

Typical performance of the radio receiver of fig. 3

Parameter		Test conditions		V_s = 3V	V_s = 1.6V
WAVEBANDS	FM			87 to 109 MHz	
	AM			523 to 1620 KHz	
SENSITIVITY	FM	S/N = 26 dB	Δf = ± 22.5 KHz	1.8 μV	2 μV
	AM	S/N = 20 dB	m = 0.3	400 μV	400 μV
AUDIO SIGNAL OUT	FM	Δf = ± 22.5 KHz		70 mV	55 mV
	AM	V_i = 1 mV/m	m = 0.3	80 mV	75 mV
DISTORTION (f_m= 1 KHz)	FM	V_I = 1 mV	Δf = ± 22.5 KHz	0.35%	0.5%
			Δf = 75 KHz	0.7%	0.75%
	AM	5 mV/m	m = 0.3	0.8%	0.8%
		100 mV/m	m = 0.8	2%	1.9%
SIGNAL TO NOISE (f_m= 1 KHz)	FM	V_I = 1 mV	Δf = ± 22.5 KHz	50 dB	50 dB
	AM	V_i = 1 mV/m	m = 0.3	33 dB	32 dB
AMPLITUDE MODULATION REJECTION	FM	V_i = 1 mV	Δf = 22.5 KHz m = 0.3	32 dB	31 dB
TWEET	2nd H.	f = 911 KHz		1%	1%
	3rd H.	f = 1370 KHz		0.2%	0.2%
QUIESCENT CURRENT				13.5 mA	12.5 mA

APPLICATION INFORMATION (continued)

Inversion of "S" shaped curve in quadrature discriminators

In FM receivers, the frequency used for the local oscillator is usually greater than the receiving frequency.

Anyway, in some cases it may be required to work with a local oscillator showing a frequency lower than the frequency of the received signal. According to this choice, the "S" shaped curve of the discriminator is therefore either positive or negative (the output d.c. voltage either increases or decreases as the input frequency increases) and the varicap diode of the AFC will have to be referred either to ground or to a reference voltage. The additional reference voltage may be circuitally unsuitable, besides increasing the costs. In the case of circuits using the monolithic tuner TDA7211 (internal varicap diode, with a side already connected to ground) the things would get still more complicated.

To overcome the problem, figure 5 shows a simple circuit solution to perform the inversion. The traditional diagram is shown in figure 6 for comparision.

This solution may be used with all the SGS radio circuits (TDA7220, TDA1220B, etc.) with performance equal to that achieved through the conventional circuitry.

In the diagram shown, the inversion of the curve is obtained through the replacement of the inductive reactance (normally 22 μH) with a capacitance (12 pF) and the recovery of the d.c. voltages through L3.

L3, which is forced to resonance and strongly smoothed by R1, also performs the function of resistive load across the collector of the output transistor in IF limiter.

The described circuit doesn't modify the ease of calibration of the quadrature discriminators, makes the amplitude modulation rejection (AMR) more continuous and significantly reduces the harmonic radiation from the last limiter stage.
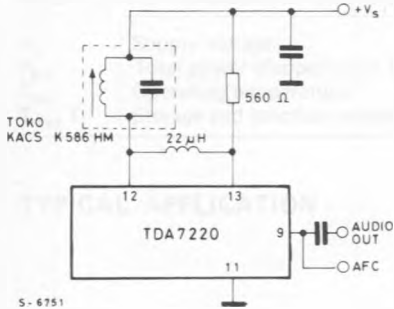
Fig. 5

Fig. 6